



# **Cattle Bay Marina**

## **Responses to Agency Submissions Relating to Aquatic Ecology**



**FINAL REPORT**

Prepared on behalf of Eden Resort Hotel Pty Ltd.

30 March 2015

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## SUMMARY

Ocean Environmental was engaged by Eden Resort Hotel Pty Ltd to prepare responses to agency submissions relating to aquatic ecology for the proposed development of a marina at Cattle Bay, Eden, New South Wales.

This document outlines responses to submissions from the following agencies:

1. NSW Office of Environment and Heritage
2. NSW Environment Protection Authority
3. NSW Department of Primary Industries (Fisheries)



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### **APPENDIX 1 – EPBC Act Report**



## 1. RESPONSE TO NSW OFFICE OF ENVIRONMENT AND HERITAGE

**There are no diagrams showing the location of the floating boom nor is it discussed in terms of entanglement risk for marine fauna.**

Floating booms used to contain any spills would only be deployed temporarily in the case of a spillage incident from small craft. When not deployed, these floating booms would be stored on land or on the floating marina. The floating boom proposed for the marina will typically have a floating surface structure with a short curtain underneath the surface (around 600 mm depth to contain contaminants (oils) which are at the surface). This depth is similar to the draft of the marina pontoons). The booms have no other drop lines/ hanging lines/ anchors below this surface curtain. A typical floating boom used for spill containment is shown in Figure 1.1. Note that this boom is much larger in size than one which would be required to contain a bilge water pump out spill from small craft at the marina.

Given that the floating boom would only be deployed temporarily in response to an incident, that it would be within or immediately adjacent to the marina (areas in which it is unlikely that large marine fauna would occur regularly) that the boom only has a very shallow draft, that there are no hanging lines below the shallow curtain and that when deployed there would be multiple personnel on site to watch for marine mammals and other fauna, the risk of entanglement is considered to be very low. If marine mammals or turtles happened to be present in the immediate area at the time of the spill, deployment of the boom could be delayed until they had left the immediate area. Furthermore, the risks to marine fauna (including mammals, birds, reptiles and fish) and habitats from not containing spills are considered to be much more significant than the low risk of entanglement from the temporary structure.



**Figure 1.1 Typical spill containment boom.**

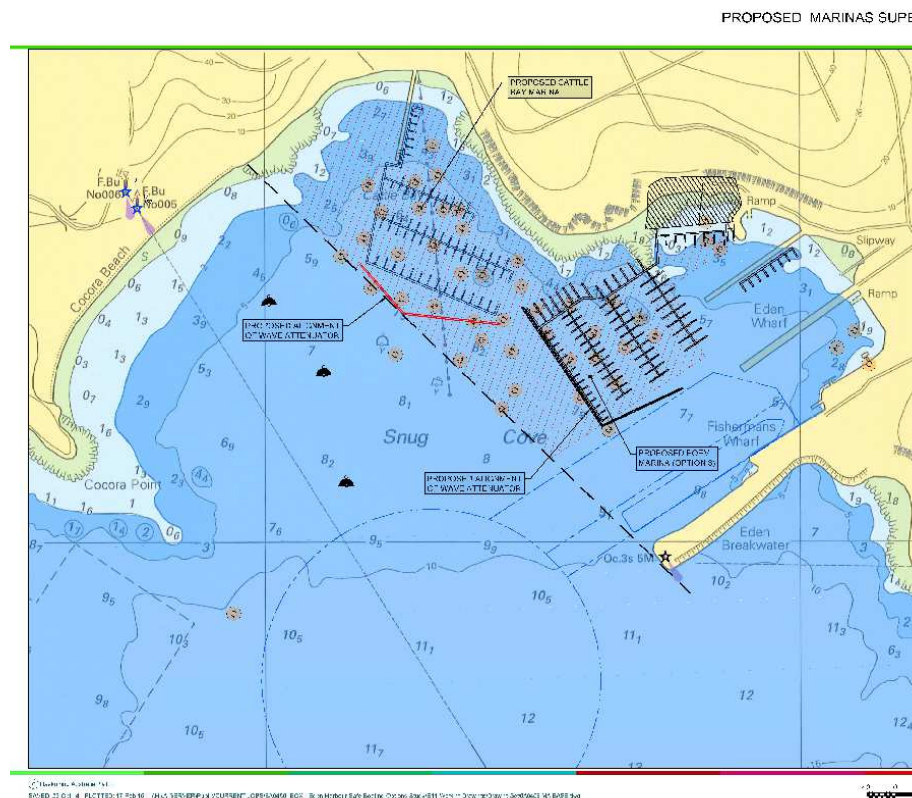
Source: <http://www.nauticexpo.com/prod/empteezy/pollution-control-booms-floating-inflatable-34428-252943.html>



**Section 6.5.1 Impact on Swing Mooring Access:** The relocation of the current swing mooring access has not been discussed in terms of the increased area which will no longer be available to marine mammals or increase the area where entanglement is a risk.

#### *Mooring Relocation*

Final plans for the relocation of the swing moorings currently within the footprint of the proposed marina development will not be available until further discussion with Roads and Maritime Services (RMS). Figure 1.2 is a constraints and opportunities plan provided by Royal Haskoning DHV which shows the proposed location of the Cattle Bay Marina (left) and the Port of Eden Marina (right) and the location of all current swing moorings in Snug Cove (denoted by orange circles, supplied by RMS). There are currently 48 swing moorings located in Snug Cove and it is estimated that around 25 of these would need to be relocated to accommodate the proposed Cattle Bay Marina (all stages). It should be noted that it is very unlikely that both the Cattle Bay Marina and Port of Eden Marina would be developed to their full potential as there is not the demand.



**Figure 1.2 Location of swing moorings in Snug Cove and the proposed Cattle Bay Marina and Port of Eden Marina footprints (Source: Royal Haskoning DHV).**

There are only two locations along the northern shore of Twofold Bay where swing moorings currently exist and that provide realistic options for relocations. These are Snug Cove and Quarantine Bay. Snug Cove is close to the Eden township and receives a level of protection from ocean storms by the Eden Breakwater. Quarantine Bay, which was created as a safe





recreational boating haven by the NSW Government in the 1970s / 1980s, is protected from ocean storms by a breakwater and also has ample parking. There are no other similarly protected bays between Snug Cove and Quarantine Bay and it is unlikely that relocated swing moorings would be placed anywhere else between them due to the level of exposure and distance from infrastructure.

The most likely scenario will be relocation of some selected moorings to nearby areas in Snug Cove, possibly involving a denser arrangement (e.g. fore and aft moorings); complete removal of any currently vacant moorings and moorings from those who transfer to marina berths; and movement of some people to moorings in Quarantine Bay. Some relocation could be deferred until later stages of the marina development. For further detail please refer to the proposed Mooring Relocation Strategy (Royal Haskoning DHV 2015).

#### *Impact on Marine Mammals*

The risk to marine mammals from swing moorings relates mainly to the chance of animals becoming entangled in mooring lines and / or floating surface lines. This is more likely to occur to 'curious' species such as seals than cetacean species (dolphins and whales). Seals have been shown to regularly utilise the areas within Snug Cove, especially around the Eden Breakwater. Dolphins are also known to feed in the area (especially off Cocora Beach). The likelihood of whales entering Snug Cove itself and becoming entangled in mooring lines is much lower, with most whales being observed in the middle and outer sectors of Twofold Bay and immediate coastal areas (refer to data in Marine Mammal Risk Profile Report, Ocean Environmental 2014).

As there will likely be an overall reduction in the actual number of swing moorings in Snug Cove compared to the current number, the overall risk of entanglement in mooring lines will also be reduced. However, while any relocated moorings will probably be placed in very similar locations to their present positions, these areas will still become slightly higher risk zones for entanglement. Considering the regularity with which animals such as seals and dolphins are seen amongst moorings, entanglement in mooring lines is considered to be rare. Other NSW bays such as Port Stephens, which support large resident populations of Indo-Pacific Bottlenose dolphins (OEH 2011), have high numbers of swing moorings in numerous bays and inlets and a number of large marinas (including Soldiers Point Marina, The Anchorage and D'Albora Marina) compared to Twofold Bay. Boats approaching swing moorings will be doing so at very low speeds so the risk of vessel strike is also low.

It is not thought that relocation of swing moorings will result in new mooring areas becoming unavailable to marine mammals. It is common to see fur seals and dolphins in Snug Bay, including around swing moorings and boats, and it is expected that they would still occur following mooring relocation. During the hydrographic survey seals were recorded amongst the moorings in Quarantine Bay and Snug Cove. It is more likely that waters within the proposed marina structure itself will be avoided by these species.



The removal/ relocation of traditional moorings from Snug Cove, which have been shown to scour the seabed and eliminate localised areas of seagrass in Cattle Bay (refer to *Hydrographic Mapping and Marine Mammal Risk Profile Report*, Ocean Environmental 2014) will, over time, result in the enhancement of benthic habitat in Snug Cove. After mooring removal it is possible that the seafloor in these areas will slowly become recolonised with local seagrass species (Rasheed 2004) providing important nursery areas for small fishes and foraging areas for larger marine fauna such as mammals, turtles and birds. Any new moorings deployed would be Seagrass Friendly Moorings. These moorings enable vessels to be moored without damaging the seabed. The system uses a single point screwed into place (the mooring post) as the anchor point. Attached to the mooring post, just below the seabed, is a set of load spreaders to stabilize the post. A shock absorber is attached to the swivel head and a hawser rope run from the shock absorber to a surface buoy. The lack of a heavy chain dragging on the seabed prevents damage to the subtidal habitat. Further information and pictures of these moorings can be found at:

<http://www.seagrassmooring.com.au/index.html>.

Refer to further information in the Mooring Relocation Strategy (Royal Haskoning DHV 2015).

**Appendix 1: The direct and indirect impacts on flora and fauna cannot be assessed because there has not been an adequate survey undertaken. The location and extent of the seagrass beds has not been mapped. Specific analysis of the use of Cattle Bay by migratory waders or threatened shore birds has not been done. The location of threatened marine fauna and their use of the Cattle Bay area as well as the use of Cattle Bay by migratory marine fauna has also not been assessed. These issues are discussed further in the comments below.**

Responses to these issues are included within the ensuing sections.

#### **Appendix 5: Aquatic Ecology Assessment**

**Executive Summary: There has been no bird survey or usage study of the site. The rest of the Aquatic Ecology Assessment does not describe impacts other than to say that lights may be a problem but there is no way of quantifying this in relation to the size of the population.**

There have been no targeted bird usage surveys undertaken for the site, however, it is not expected that the marina development will have any significant impacts on marine or migratory birds with the potential to occur in the area so this is not considered necessary.

Threatened and protected marine and migratory marine bird species are listed in the Threatened Species Conservation Act (TSC Act) 1995 and Environment Protection and Biodiversity Conservation Act (EPBC Act) 1999 searches provided in Appendix 2 of the Cattle Bay Marina Aquatic Ecology Assessment (Marine Pollution Research May 2013). They are also addressed in the various environmental studies and impact assessments which this report referenced in its literature review. It has been stated that Cattle Bay aquatic habitats do not support permanent populations of any bird species but it is expected that individuals may utilise the resources of the bay on occasion. Little penguins, plus a variety of sea birds and





fishing birds, are expected to utilise the bay for feeding, with fishing birds roosting on shores and other artificial structures.

The Office of Environment and Heritage (OEH) has noted (in an email, February 2015) that the following marine and migratory bird species have been observed within Twofold Bay over the last 20 years: Wandering Albatross, Shy Albatross, Black-browed Albatross, Flesh-footed Shearwater, Northern Giant Petrel, Providence Petrel, Eastern Osprey, Sooty Oystercatcher, Pied Oystercatcher and Hooded Plover. They have also commented that these records are mostly the results of incidental sightings and targeted surveys may result in more records.

An additional EPBC Act 1999 Protected Matters Search was undertaken in February 2015 as requested by OEH (i.e. to cover the Cattle Bay area). This is provided in **Appendix 1**. The search lists 39 threatened or protected marine and migratory marine birds with the potential to occur in the study area (i.e. within a 5 km radius around Cattle Bay). Table 1.1 lists each of these species, their conservation status (under the EPBC Act 1999) and their potential of occurrence in the study area. The potential of occurrence is determined by the database and relates to the availability of suitable habitat and / or feeding / foraging areas in the study area.

The original TSC Act 1995 search undertaken by Marine Pollution Research (2013) covers the study areas and is still considered relevant (refer to Appendix 2 of Cattle Bay Marina Aquatic Ecology Assessment).

To determine the likelihood of each species listed in Table 1.1 occurring at the study site and being impacted by the proposed development a review of available aquatic habitats in Cattle Bay which may be utilised by these species was undertaken. The Marine Pollution Research field survey in January 2013 recorded the following aquatic habitats in Cattle Bay:

- Sandy beach (including Cocora Beach south of Cattle Bay).
- Shallow intertidal sands (unvegetated).
- Inshore and offshore subtidal sands (vegetated and unvegetated).
- Intertidal rocky shores.
- Subtidal rocky reef.
- Artificial habitats (jetty support piles, mooring tackle and pipelines).

Terrestrial habitats may also be utilised by marine / migratory bird species. In December 2014 South East Local Land Services provided comment regarding the terrestrial vegetation present at the proposed development site. They stated that “the old cannery site is highly disturbed with some regrowth and exotic vegetation. The surrounding headlands are well represented vegetation communities in the region.” Therefore, it is not expected that the terrestrial vegetation community in the footprint of the marina development would provide any significant breeding, sheltering or feeding habitat for threatened and protected marine or migratory marine birds. Furthermore, considering the abundance of undisturbed areas of native vegetation in the local area, and since the surrounding headlands will not be directly



disturbed by the proposed construction or operation of the marina (there is the potential for some minor indirect impacts such as noise and light impacts), no significant impacts on marine birds occasionally visiting these terrestrial areas are expected.

Table 1.1 lists information on aquatic habitats utilised by each listed species including their main nesting and feeding habitats. From this data it is considered that the Antipodean Albatross, Wandering Albatross, Bulwer's Albatross, Shy Albatross, Campbell Albatross, Black-browed Albatross, White-capped Albatross, Southern Giant Petrel, Northern Giant Petrel, Flesh-footed Shearwater, Osprey, Hooded Plover and Hooded Plover (eastern) all have the potential to forage in the study area, and many of these species are scavengers that are known to follow fishing vessels into bays and harbours. If these species do occasionally occur in the study area, behavioural data suggest that many would occur as individuals or in pairs. However, it is also considered unlikely that the proposed marina development would have any significant impact on these species or their populations when coming inshore to scavenge from fishing vessels or feed in the waters of the bay.

The Little Tern has the potential to forage, roost or nest in aquatic and terrestrial habitats that are present at the study site. However, due to the small beach area which backs onto a highly disturbed area of terrestrial habitat at the site it is unlikely that the area provides a significant nesting area for the Little Tern. No Little Tern nesting sites have been recorded in the study area in the Little Tern Recovery Plan (NPWS 2003)

(<http://www.environment.nsw.gov.au/resources/nature/recoveryplanfinalittletern.pdf>).

The Little Penguin, which is listed under the TSC Act is also known regularly from Twofold Bay and has the potential to occur at the site. Most penguins that occur in the bay are likely from the large colonies at Montague Island (6000 breeding pairs) and Gabo Island (18,000 breeding pairs). A minor breeding colony at Eagles Claw Nature Reserve (24 breeding pairs) was present around the time of the Plan of Management but was decimated by dogs in 1993.

Potential impacts of the proposed marina on marine and migratory bird species during construction and operation phases include:

- Direct impacts on aquatic habitats (e.g. loss of seagrass beds) used during foraging.
- Direct impacts on aquatic or terrestrial habitats used for nesting or shelter.
- Indirect impacts of marina lighting (attracting seabirds).
- Noise impacts during construction and / or operation.
- Entanglement in, or ingestion of, marine debris causing harm, illness or death.
- Impacts of water pollution e.g. oil spills.
- Increased risk of vessel strike.
- Increased interaction with humans including inappropriate feeding.

While these impacts were not specifically assigned to marine birds in the original Cattle Bay Aquatic Ecology Assessment (Marine Pollution Research 2013), the majority of these impacts,



and measures to mitigate these impacts, also apply to other marine fauna and have been discussed in Section 3 of that document (Marine Pollution Research 2013).

Overall, the study site provides foraging habitat but little breeding habitat for the listed marine and migratory birds. No known breeding colonies of any listed species would be affected. The potential impact of the proposed marina development on marine birds is not likely to be significant.

**Table 1.1 Marine and migratory bird species listed under the Commonwealth EPBC Act 1999 with the potential to occur in Cattle Bay.**

Species	Conservation Status	Potential of Occurrence	Aquatic Habitats Utilised
<p>Fork-tailed Swift</p> <p><i>Apus pacificus</i></p>	Migratory, Listed	Species or species habitat likely to occur within area	Non-breeding visitor to Australia. Almost exclusively aerial, found mostly over inland plains but sometimes seen in coastal areas. Insectivorous aerial feeder. NOT LIKELY TO OCCUR AT STUDY SITE OR BE IMPACTED.
<p>Antipodean Albatross</p> <p><i>Diomedea antipodensis</i></p>	Vulnerable, Migratory, Listed	Foraging, feeding or related behaviour likely to occur within area	Endemic to New Zealand. Forages in open water in the south-west Pacific Ocean, Southern Ocean and the Tasman Sea, notably off NSW. Marine, pelagic and aerial. Nests in open patchy vegetation e.g. tussock grassland or shrubs. Feeds on ocean surface on cephalopods, fish and crustaceans. Attracted to fishing boats. POTENTIAL TO FORAGE IN AREA BUT UNLIKELY TO BE IMPACTED.
<p>Tistan Albatross</p> <p><i>Diomedea dabbenena</i></p>	Endangered, Migratory, Listed	Species or species habitat may occur within area	Only one definitive record of the Tistan Albatross from Australian waters (Wollongong, NSW). Marine, pelagic seabird. Forages in open water in the Atlantic. Feeds pelagically close to the waters surface on squid, fish and crustaceans at surface. Sleeps on ocean waters when not breeding. NOT LIKELY TO OCCUR AT STUDY SITE OR BE IMPACTED.
<p>Southern Royal Albatross</p> <p><i>Diomedea epomophora</i></p> <p>(sensu stricto)</p>	Vulnerable, Migratory, Listed	Foraging, feeding or related behaviour likely to occur within area	Common throughout the year in offshore waters of southern Australia. Marine and pelagic. Occurs in sub Antarctic, subtropical and occasionally Antarctic waters. Nests on flat or gently sloping ground on slopes, ridges, gullies and plateaux of large islands. Feeds pelagically (in the open ocean) on squid and fish. NOT LIKELY TO OCCUR AT STUDY SITE OR BE IMPACTED.
<p>Wandering Albatross</p> <p><i>Diomedea exulans</i></p> <p>(sensu lato)</p> <p>*reported by OEH</p>	Vulnerable, Migratory, Listed	Foraging, feeding or related behaviour likely to occur within area	Breeds on Macquarie Island. Feeds in the Southern Ocean. Marine, pelagic and aerial. On breeding islands nests on coastal or inland ridges, slopes, plateaux and plains. Feeds in pelagic, offshore and inshore waters from the sea surface or just below and eats mainly squid and fish. Often feeds in sheltered harbours. POTENTIAL TO FORAGE IN AREA BUT UNLIKELY TO BE IMPACTED SIGNIFICANTLY.



Gibson's Albatross <i>Diomedea gibsoni</i>	Vulnerable, Migratory, Listed	Foraging, feeding or related behaviour likely to occur within area	Recorded foraging between Coffs Harbour, NSW, and Wilson's Promontory, Victoria. Marine, pelagic and aerial. No breeding colonies in Australia. Visits Australian waters while foraging and during the non-breeding season. On breeding islands nests on coastal or inland ridges, slopes, plateaux and plains, often on marshy ground. Feeds pelagically, from the sea surface or just below it, on squid, fish and crustaceans. NOT LIKELY TO OCCUR AT STUDY SITE OR BE IMPACTED.
Northem Royal Albatross <i>Diomedea sanfordi</i>	Endangered, Migratory, Listed	Foraging, feeding or related behaviour likely to occur within area	Ranges widely over the Southern Ocean, with individuals seen in Australian waters off south-eastern Australia. Feeds regularly in Tasmanian and South Australian waters, and less frequently in NSW waters. Marine, pelagic and aerial. Nests on flat or gently sloping ground, on slopes, ridges, gullies and plateaux of large islands. Feed at the ocean surface on cephalopods, fish, crustaceans and salps (pelagic tunicates). NOT LIKELY TO OCCUR AT STUDY SITE OR BE IMPACTED.
Southern Giant Petrel <i>Macronectes giganteus</i>	Endangered, Migratory, Listed	Species or species habitat may occur within area	Marine bird. Occurs in Antarctic to subtropical waters. Breeds on the Antarctic Continent, Peninsula and islands, subantarctic islands and South America. At sea, the Southern Giant-Petrel forages largely by surface-seizing (cephalopods (octopus and squid), crustaceans, kelp, fish, jellyfish. It also scavenges on land and regularly follows fishing vessels and ships. Will feed on penguin carcasses and a wide variety of smaller seabirds. POTENTIAL TO FORAGE IN AREA BUT UNLIKELY TO BE SIGNIFICANTLY IMPACTED.
Northem Giant Petrel <i>Macronectes halli</i> * reported by OEH in area	Vulnerable, Migratory, Listed	Species or species habitat may occur within area	Breeds in the sub-Antarctic, visits areas off the Australian mainland during the winter months (May-October). Marine and oceanic. Its range extends into subtropical waters mainly between winter and spring. It frequents both oceanic and inshore waters near breeding islands and in the non-breeding range. Eats seal, whale, and penguin carion, and seal placenta. It often follows ships to obtain offal. It also eats euphausiids (krill) and other crustaceans, cephalopods (octopus and squid) and fish. POTENTIAL TO FORAGE IN AREA BUT UNLIKELY TO BE SIGNIFICANTLY IMPACTED.



<p>Sooty Albatross <i>Phoebastria fuscata</i></p>	<p>Vulnerable, Migratory, Listed</p>	<p>Species or species habitat may occur within area</p>	<p>Observed foraging in inshore waters in southern Australia. Rare but probably regular migrant to Australia, mostly in the autumn-winter months. Marine and pelagic. In summer, occurs mainly south of 35° S in subtropical and subantarctic waters. In late autumn and winter occurs mainly in the subtropical zone. Immature albatrosses restricted to the subtropical zone. Breed on subtropical and subantarctic islands in the Indian and Atlantic Oceans. Eat cephalopods, fish, crustaceans, siphonophores and penguin carrion at sea. NOT LIKELY TO OCCUR AT STUDY SITE OR BE IMPACTED.</p>
<p>Flesh-footed Shearwater <i>Puffinus camipes</i> *reported by OEH in area</p>	<p>Migratory, Listed</p>	<p>Foraging, feeding or related behaviour likely to occur within area</p>	<p>A locally common visitor to waters of the continental shelf and continental slope off southern Australia and around Lord Howe Island. Mainly occurs in the subtropics over continental shelves and slopes and occasionally inshore waters. Pairs breed on islands in burrows on sloping ground in coastal forest, scrubland, shrubland or grassland. Forages almost entirely at sea and very rarely on land. Feed on small fish, cephalopod molluscs (squid, cuttlefish, nautilus and argonauts), crustaceans (barnacles and shrimp), other soft-bodied invertebrates (such as <i>Velutella</i>) and offal. Attracted to fishing vessels. POTENTIAL TO FORAGE IN AREA BUT UNLIKELY TO BE IMPACTED SIGNIFICANTLY.</p>
<p>Little Tern <i>Sterna albibronchus</i></p>	<p>Migratory, Listed</p>	<p>Species or species habitat may occur within area</p>	<p>Inhabit sheltered coastal environments, including lagoons, estuaries, river mouths and deltas, lakes, bays, harbours and inlets, especially those with exposed sandbanks or sand-spits. Nest on sand-spits, banks, ridges or islets in sheltered coastal environments, such as coastal lakes, estuaries and inlets, and also on wide and flat or gently sloping sandy ocean beaches, occasionally, in sand-dunes. Forage in shallow waters of estuaries, coastal lagoons and lakes. Primarily diurnal, and feed by plunging in shallow water of channels and estuaries, or in surf on beaches. Feed mainly on small fish, crustaceans, insects, annelids and molluscs. POTENTIAL TO FORAGE, NEST OR ROOST IN STUDY AREA.</p>





Buller's Albatross <i>Thalassarche bulleri</i>	Vulnerable, Migratory, Listed	Foraging, feeding or related behaviour likely to occur within area	Marine and pelagic, inhabiting subtropical and subantarctic waters of the southern Pacific Ocean. Have been observed in association with fishing boats inshore and offshore. Breeding habitat occurs on subtropical and subantarctic islands and rock stacks in the New Zealand region. Feeds by surface seizing, mostly on squid, supplemented by fish, krill and tunicates. POTENTIAL TO FORAGE IN AREA BUT UNLIKELY TO BE IMPACTED SIGNIFICANTLY.
Shy Albatross <i>Thalassarche cauta</i> (sensu stricto) * reported by OEH in area	Vulnerable, Migratory, Listed	Foraging, feeding or related behaviour likely to occur within area	Marine species occurring in subantarctic and subtropical waters. Birds have been noted in shelf-waters around breeding islands and over adjacent rises. During the non-breeding season, occurs over continental shelves around continents, both inshore and offshore, and enters harbours and bays. Scarce in pelagic waters. Feeds in waters over the continental shelf, including harbours and bays and follows fishing vessels in flocks. Main foods of the Shy Albatross are fish, cephalopods (squid), crustaceans and tunicates. POTENTIAL TO FORAGE IN AREA BUT UNLIKELY TO BE IMPACTED SIGNIFICANTLY.
Chatham Albatross <i>Thalassarche eremita</i>	Endangered, Migratory, Listed	Foraging, feeding or related behaviour likely to occur within area	Breeds only on The Pyramid, a large rock stack in the Chatham Islands, New Zealand. The principal foraging range for this species is in coastal waters off eastern and southern New Zealand, and Tasmania. Satellite tracking (1997-1999) and other observations indicate that it disperses within the south Pacific Ocean west to Tasmania and east to Chile and Peru. At sea the species appears to be largely pelagic. Thought to feed mostly on cephalopods + fish. NOT LIKELY TO OCCUR AT STUDY SITE OR BE IMPACTED.
Campbell Albatross <i>Thalassarche impavida</i>	Vulnerable, Migratory, Listed	Species or species habitat may occur within area	Non-breeding visitor to Australian waters. Most commonly seen foraging over the continental slopes off TAS, VIC and NSW. Inhabit sub-Antarctic and subtropical waters. Breed on Campbell Island. Specialised shelf feeders, concentrating around breeding islands or over adjacent submarine banks. Feed on krill and fish, cephalopods, salps and jellyfish. Scavengers, and often follow fishing boats. POTENTIAL TO FORAGE IN AREA BUT UNLIKELY TO BE IMPACTED SIGNIFICANTLY.



Black-browed Albatross <i>Thalassarche melanophrys</i> * reported by OEH in area	Vulnerable, Migratory, Listed	Species or species habitat may occur within area	Breeds in Australian territory, at four geographically isolated locations: Heard Island, McDonald Islands, Macquarie Island and The Bishop and Clerk Islets. Marine species that inhabits Antarctic, subantarctic and temperate waters + occasionally enters the tropics. Forages around breaks of continental and island shelves and nearby underwater banks. Scavenger that regularly trails fishing vessels to collect discarded items. POTENTIAL TO FORAGE IN AREA BUT UNLIKELY TO BE IMPACTED SIGNIFICANTLY.
Salvin's Albatross <i>Thalassarche salvini</i>	Vulnerable, Migratory, Listed	Foraging, feeding or related behaviour likely to occur within area	A non-breeding visitor to Australian waters. Marine species occurring in subantarctic and subtropical waters. During the non-breeding season, the species occurs over continental shelves around continents. It occurs both inshore and offshore and enters harbours and bays. Is scarce in pelagic waters. Feeds primarily in shelf waters, takes food from the surface or just below. Commonly follow fishing boats. POTENTIAL TO FORAGE IN AREA BUT UNLIKELY TO BE IMPACTED SIGNIFICANTLY.
White-capped Albatross <i>Thalassarche steadi</i>	Vulnerable, Migratory, Listed	Foraging, feeding or related behaviour likely to occur within area	Common off the coast of south-east Australia throughout the year. Marine species and occurs in subantarctic and subtropical waters. Occurs inshore and offshore and enters harbours and bays. The species is scarce in pelagic waters. Birds gather to scavenge at commercial fishing grounds. Nest on slopes vegetated with tussock and succulents on Auckland Island. Diet of inshore cephalopods and fish. POTENTIAL TO FORAGE IN AREA BUT UNLIKELY TO BE IMPACTED SIGNIFICANTLY.
Great Egret <i>Ardea alba</i>	Listed	Species or species habitat known to occur within area	Widespread in Australia. Reported in a wide range of wetland habitats including swamps and marshes; margins of rivers and lakes; damp or flooded grasslands, pastures or agricultural lands; reservoirs; sewage treatment ponds; drainage channels; salt pans and salt lakes; salt marshes; estuarine mudflats, tidal streams; mangrove swamps; coastal lagoons; and offshore reefs. Breeding sites located in wooded and shrubby swamps. NOT LIKELY TO OCCUR AT STUDY SITE OR BE IMPACTED.



Cattle Egret <i>Ardea ibis</i>	Listed	Species or species habitat likely to occur within area	Widespread and common in Australia. In Australia the principal breeding sites are the central east coast from Newcastle to Bundaberg. Occurs in tropical and temperate grasslands, wooded lands and terrestrial wetlands. Often forages away from water on low lying grasslands, improved pastures and croplands. Roosts in trees, or amongst ground vegetation in or near lakes and swamps. NOT LIKELY TO OCCUR AT STUDY SITE OR BE IMPACTED.
Great Skua <i>Catharacta skua</i>	Listed	Species or species habitat may occur within area	Migratory marine bird. Breeds in Iceland, Norway, Svalbard (to Norway), the Faroe Islands (to Denmark), the Scottish islands and mainland Scotland. Avoids land during migration and winter, aggregating in winter in areas where it can scavenge from fisheries. Opportunistic feeder. NOT LIKELY TO OCCUR AT STUDY SITE OR BE IMPACTED.
Latham's Snipe <i>Gallinago hardwickei</i>	Listed	Foraging, feeding or related behaviour may occur within area	Wader. Non-breeding visitor to south-eastern Australia. Breed in Japan and far eastern Russia during the northern hemisphere summer. Migrate south after the breeding season, travelling across PNG to winter in eastern Australia. In Australia occurs in permanent and ephemeral wetlands up to 2000 m above sea-level. Inhabits open, freshwater wetlands with low, dense vegetation. NOT LIKELY TO OCCUR AT STUDY SITE OR BE IMPACTED.
Swinhoe's Snipe <i>Gallinago megala</i>	Listed	Foraging, feeding or related behaviour likely to occur within area	Few definite records exist in Australia. Breeds in central and southern Siberia. During the non-breeding season occurs at the edges of wetlands, such as wet paddy fields, swamps and freshwater streams. NOT LIKELY TO OCCUR AT STUDY SITE OR BE IMPACTED.
Pin-tailed Snipe <i>Gallinago stejnegeri</i>	Listed	Foraging, feeding or related behaviour likely to occur within area	The distribution within Australia is not well understood with very few records. Breeds in Russia. Occurs most often in or at the edges of shallow freshwater swamps, ponds and lakes with emergent, sparse to dense cover of grass/sedge or other vegetation. NOT LIKELY TO OCCUR AT STUDY SITE OR BE IMPACTED.



Painted Snipe <i>Rostratula benghalensis</i> (sensu lato)	Listed	Species or species habitat may occur within area	Stocky wading bird recorded at wetlands in all states of Australia. Most common in eastern Australia. Generally inhabits shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and clays. NOT LIKELY TO OCCUR AT STUDY SITE OR BE IMPACTED.
White-bellied Sea Eagle <i>Haliaeetus leucogaster</i>	Listed	Species or species habitat known to occur within area	Distributed along the coastline of mainland Australia and Tasmania. Found in coastal habitats (especially those close to the sea-shore) and around terrestrial wetlands in tropical and temperate regions. Habitats occupied are characterised by the presence of large areas of open water (larger rivers, swamps, lakes, the sea). Breeding territories are located close to water, and mainly in tall open forest or woodland. Generally forages over large expanses of open water. NOT LIKELY TO OCCUR AT STUDY SITE OR BE IMPACTED.
Blue Petrel <i>Halobaena caerulea</i>	Vulnerable, Listed	Species or species habitat may occur within area	A marine species of the Subantarctic and Antarctic seas. Prefers open water. Breeds and roosts in nesting burrows on subantarctic islands. Feeds around the periphery of icebergs. Has been recorded off the Australian coast between Victoria and Western Australia. It is recorded regularly in small numbers in Victoria and Tasmania, and occasionally in NSW. NOT LIKELY TO OCCUR AT STUDY SITE OR BE IMPACTED.
White-throated Needle tail <i>Hirundapus caudacutus</i>	Listed	Species or species habitat known to occur within area	Widespread in eastern and south-eastern Australia. Often occurs in large flocks. Recorded in all coastal regions of Queensland and NSW, extending inland to the western slopes of the Great Divide. Almost exclusively aerial. Recorded most often above wooded areas, including open forest and rainforest. NOT LIKELY TO OCCUR AT STUDY SITE OR BE IMPACTED.
Swift Parrot <i>Lathamus discolor</i>	Endangered, Listed	Species or species habitat likely to occur within area	Breeds in Tasmania during spring and summer, migrating in autumn and winter to south-eastern Australia. In NSW mostly occurs on the coast and south west slopes. On the mainland they occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. NOT LIKELY TO OCCUR AT STUDY SITE OR BE IMPACTED.



Rainbow Bee-eater <i>Merops ornatus</i>	Listed	Species or species habitat may occur within area	Distributed across much of mainland Australia and several near-shore islands. Occurs mainly in open forests and woodlands, shrub lands, and in various cleared or semi-cleared habitats, including farmland and areas of human habitation. It also occurs in inland and coastal sand dune systems, and in mangroves in northern Australia. Mainly feeds on insects and feeds from open perches. NOT LIKELY TO OCCUR AT STUDY SITE OR BE IMPACTED.
Black-faced Monarch <i>Monarcha melanopsis</i>	Listed	Species or species habitat known to occur within area	Mainly occurs in rainforest ecosystems, including semi-deciduous vine-thickets, complex nothophyll vine-forest, tropical (mesophyll) rainforest, subtropical (nothophyll) rainforest, mesophyll (broadleaf) thicket / shrub land, warm temperate rainforest, dry (monsoon) rainforest and (occasionally) cool temperate rainforest. NOT LIKELY TO OCCUR AT STUDY SITE OR BE IMPACTED.
Satin Flycatcher <i>Myiagra cyanoleuca</i>	Listed	Species or species habitat known to occur within area	Widespread in eastern Australia. Inhabits heavily vegetated gullies in eucalypt-dominated forests and taller woodlands, and on migration, occurs in coastal forests, woodlands, mangroves and drier woodlands and open forests. NOT LIKELY TO OCCUR AT STUDY SITE OR BE IMPACTED.
Orange-bellied Parrot <i>Nephele chrysogaster</i>	Critically Endangered	Species or species habitat may occur within area	A small 'grass parrot'. Found in salt marshes, coastal dunes, pastures, shrub lands, estuaries, islands, beaches and moorlands within 10 km of the coast. Holes in eucalypts are used for nesting. Breeding habitat is usually within 30 km of the coast of south-western Tasmania. Feeds almost exclusively on seeds and fruits, mainly of sedges, and salt-tolerant coastal and salt marsh plants. NOT LIKELY TO OCCUR AT STUDY SITE OR BE IMPACTED.
Little Curlew <i>Numenius minutus</i>	Listed	Foraging, feeding or related behaviour likely to occur within area	Spend the non-breeding season in northern Australia. Most often found feeding in short, dry grassland and sedge land, including dry floodplains and black soil plains. When resting during the heat of day, the Little Curlew congregates around pools, riverbeds and water-filled tidal channels, and shallow water at edges of billabongs. NOT LIKELY TO OCCUR AT STUDY SITE OR BE IMPACTED.



Osprey <i>Pandion haliaetus</i>	Listed	Species or species habitat known to occur within area	Occur in littoral and coastal habitats and terrestrial wetlands of tropical and temperate Australia. Mostly found in coastal areas. Require extensive areas of open fresh, brackish or saline water for foraging. They frequent a variety of wetland habitats including inshore waters, reefs, bays, coastal cliffs, beaches, estuaries, mangrove swamps, broad rivers, reservoirs and large lakes and waterholes. Feed on fish, especially mullet, and rarely take molluscs, crustaceans, insects, reptiles, birds and mammals. POTENTIAL TO FORAGE IN STUDY AREA BUT NO SIGNIFICANT IMPACT EXPECTED.
Rufous Fantail <i>Rhipidura rufifrons</i>	Listed	Species or species habitat known to occur within area	Occurs in coastal and near coastal districts of northern and eastern Australia. In east and south-east Australia, the Rufous Fantail mainly inhabits wet sclerophyll forests. They also occur in subtropical and temperate rainforests. NOT LIKELY TO OCCUR IN STUDY AREA OR BE IMPACTED.
Hooded Plover <i>Thinomis rubricollis</i> * recorded by OEH	Listed	Species or species habitat known to occur within area	Widely dispersed on or near high energy sandy beaches and adjacent dunes. Beaches tend to be broad and flat, with a wide wave-wash zone for foraging and much seaweed, and backed by sparsely-vegetated sand-dunes that provide shelter and foraging and nesting sites. Avoid beaches that are narrow or steep. Feed on marine invertebrates (e.g. polychaete worms, molluscs and crustaceans). Forage near the shoreline in coastal areas. POTENTIAL TO FORAGE OR SHELTER IN AREA BUT NO SIGNIFICANT IMPACT EXPECTED.
Hooded Plover (eastern) <i>Thinomis rubricollis</i> <i>rubricollis</i>	Vulnerable, Listed	Species or species habitat known to occur within area	As above.  POTENTIAL TO FORAGE OR SHELTER IN AREA BUT NO SIGNIFICANT IMPACT EXPECTED.

\* All marine / migratory bird species habitat data sourced from <http://www.environment.gov.au>





**2.1: The area of seagrass has not been accurately mapped. The impact of partial shading from the marina on the seagrass beds has not been analysed. A statement has been made without any references to studies or examples elsewhere.**

The seagrass mapping for this project was undertaken within the proposed marina footprint, and areas immediately adjacent, to allow the impacts of the proposed construction and operation to be determined. It is believed that the amount of background and field data collected on seagrass distribution within Cattle Bay (particularly within the proposed marina footprint) is sufficient for this purpose.

Based on the seagrass mapping data provided by Marine Pollution Research (2013) and Ocean Environmental (2014) and the assessment of impacts and mitigation measures provided in both reports, NSW Fisheries has advised (16 December 2014) that they are prepared to issue a Part 7 Permit to Harm Marine Vegetation.

Seagrass data provided within the *Cattle Bay Aquatic Ecology Assessment* (Marine Pollution Research 2013) included NSW Fisheries (I&I) Estuarine Vegetation Mapping (based on aerial photography and ground truthed during field surveys undertaken in 2004) and broad-scale seabed and marine vegetation mapping for Two Fold Bay (DECC 2010). Seagrass mapping undertaken in Cattle Bay by The Ecology Lab (2002) was also described. The following is an excerpt from that report:

“Fisheries NSW have indicated a *Zostera* bed off the northern end of Cocora Beach. In addition to this bed, TEL(2002) reported patchy *Zostera muelleri* in a strip running parallel to the wharf growing between the boulders making up the rubble reef and along the outside of the rubble reef to a depth of 6.9 m. On the eastern side of the bay TEL(2002) reported a strapweed *Posidonia australis* bed running parallel to the shore and parallel to the old cannery effluent pipeline. This bed was about 4 m wide inshore and 12 m wide offshore. Density was higher in shallow water (5 m) and in deeper waters (7 m) it was sparse and patchy”.

This background review was followed by a field study by Marine Pollution Research (2013) to verify and extend the original survey and include the offshore areas within the proposed marina footprint. Marine Pollution Research (2013) undertook an inspection of the *Posidonia* seagrass bed along the bay's eastern rocky shore, inspection of the *Zostera* distribution on the western side of the jetty and a number of spot dives and random swim transects through the remainder of marina footprint. They reported that “Cattle Bay aquatic habitats include a predominantly sandy seabed that supports a dense *Posidonia* based seagrass bed along the eastern shore, scattered *Zostera* seagrass amongst the boulder reef along the western shore and sparse plus patchy *Hyetozostera* seagrass cover in deeper waters to about - 8 m depth”... “From the present study it is concluded that the *Posidonia* bed is similar to that described by TEL(2002) with similar dimensions and density distributions. In addition, the bed also included two other seagrass species, a *Zostera* species (most probably *Zostera muelleri*)

and paddle weed *Halophila ovalis*”... “The *Heterozostera* distribution is thought to be part of a much larger distribution around the sandy perimeter of Two Fold Bay.”

The habitat map showing these various areas of seagrass is reproduced in Figure 1.3 below (refer to original in Figure 8 of Marine Pollution Research 2013).



**Figure 1.3 Habitat and seagrass map (Marine Pollution Research 2013).**

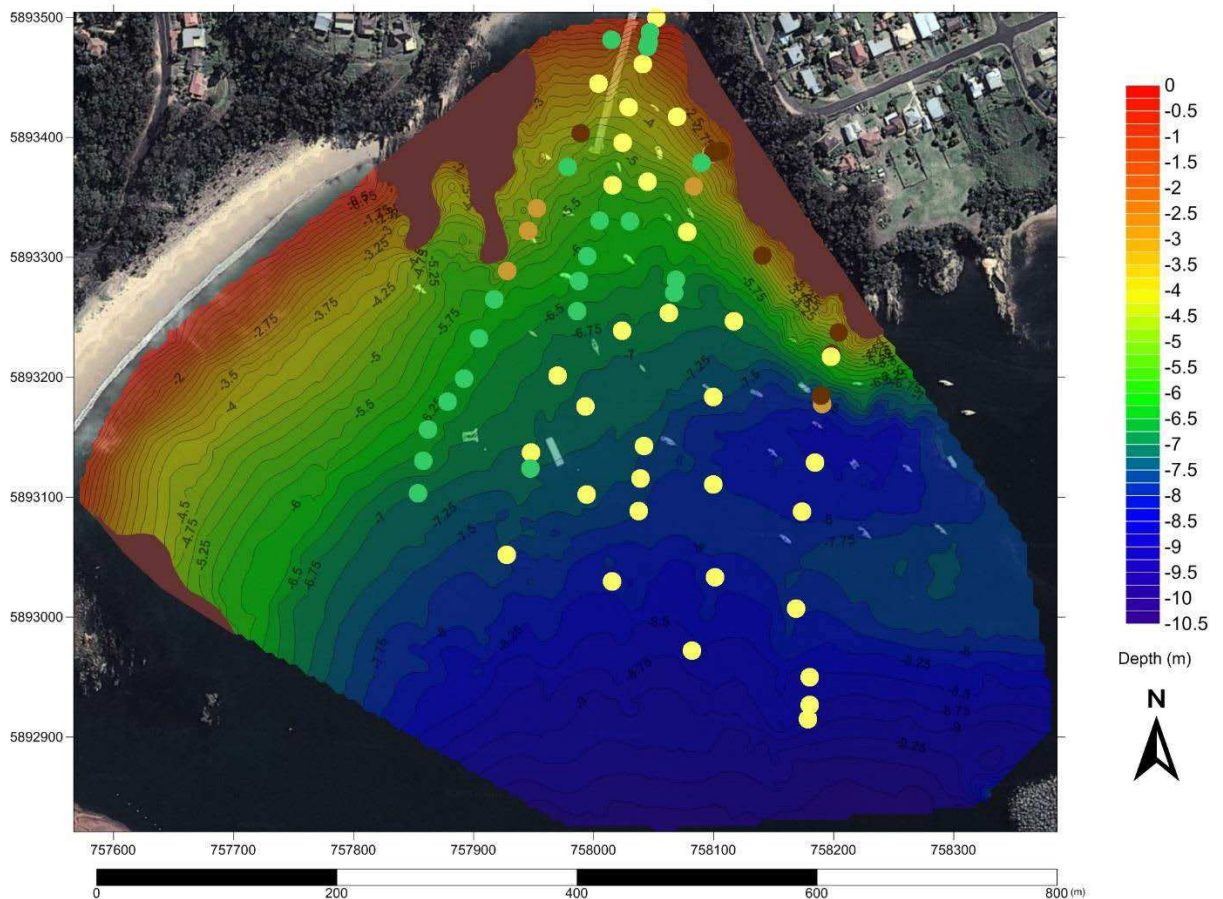
Marine Pollution Research (2013) recommended that a hydrographic survey of Cattle Bay was undertaken to include delineation of the in-shore and off-shore limits of the *Heterozostera* seagrass. This was undertaken by Ocean Environmental and Marine Solutions in July 2014.

Additional habitat mapping was conducted over the proposed development footprint and immediate surrounds utilising towed video, drop video and diver investigations. Four major classes of habitat were identified (a. high profile rocky reef dominated by brown macroalgae; b. cobble, shell and broken stone; c. seagrasses; d. unconsolidated sand and silt) and their approximate distribution mapped, with particular note taken of the inner and outer edge of seagrass where it was present (refer to Figure 1.4). A close up of this map over the marina footprint can be found in the original report.



Seagrasses identified included *Heterostera*, *Posidonia* and *Halophila*. The seagrass exhibited some level of zonation, with *Halophila* being present only within mixed seagrass patches close inshore at the head of Cattle Bay. This survey confirmed the location and extent of the larger *Posidonia* patches identified in previous surveys (i.e. TEL2002 and Marine Pollution Research 2013), along the eastern shore of Cattle Bay, just offshore of the rocky reef edge. *Heterostera* occurred throughout much of the study area as sparse patches but no dense beds of *Heterostera* were noted (Figure 1.4 and Figure 1.5).

The mapping undertaken by Ocean Environmental and Marine Solutions (2014) indicated the 7 m depth contour as an approximation of the outer boundary between unvegetated sand and seagrass habitats, and the inner boundary at approximately 1 m depth, at the head of Cattle Bay.



**Figure 1.4** Habitat types in the marina footprint including the distribution of seagrass. Each point represents a separate drop camera point (Marine Solutions 2014).

(Habitat Sampling Points. Green – Seagrass, Dark Brown – Reef, Yellow – Sand, Light Brown – Cobbles)





Typical patchy *Heterostera* beds offshore underneath the main marina footprint.



Mixed *Halophila* beds inshore.



*Posidonia* beds to the east of the Cannery Wharf.

**Figure 1.5 Seagrasses identified during hydrographic mapping (Marine Solutions 2014).**



OEH has produced and provided a seagrass map of Snug Cove and Cattle Bay which has been produced using a high quality aerial image but without field verification (Figure 1.6). This map covers a much larger area than the marina footprint and that field surveys were required for.

Similar to the mapping undertaken by Marine Pollution Research (2013) and Ocean Environmental (2014), this map also shows a large area of seagrass to the west and south-west of the site (which has been identified in field surveys as *Zostera*), patches of seagrass to the east of the existing Cannery Wharf (identified as *Posidonia* with some *Halophila*) during field surveys) and seagrass under the main marina footprint (which has been mapped and identified by Marine Pollution Research (2013), Ocean Environmental (2014) and Marine Solutions (2014) as very sparse and patchy *Heptastemon*).

There are a number of areas defined incorrectly as seagrass in this map, which are in fact areas of subtidal rocky reef with macroalgae cover (e.g. *Eklonia radiata* and *Sargassum* sp.) or cobble reef areas. These lie along the eastern foreshore (to the east of the Cannery Wharf and proposed marina footprint) and to the west of the Cannery wharf around the point. We consider that all of the correctly identified seagrass areas on this map (which lie within the required study areas) have already been shown in the seagrass and habitat maps provided by Marine Pollution Research (2013) and Marine Solutions (2014).



**Figure 1.6** OEH seagrass map (2015).



### *Shading Impacts*

Considering the location of the floating structures of the proposed marina, the only areas of seagrass likely to be affected by shading are the offshore sparse and patchy *He terozostera* beds. Areas of *Posidonia* and *Halophila* inshore will not be affected by shading structures.

Detail on shading impacts on seagrasses have been provided in the reports as follows:

Marine Pollution Research (2013):

“The design of the marina ensures that there are no significant risks to the shallow and shore-based aquatic habitats in Cattle Bay, specifically the shallow *Posidonia* and *Zostera* seagrass plus rock rubble algae beds around the shores.

The marina structure with associated vessels will create shading on the seabed, which has the potential to affect the *He terozostera* seagrass. The orientation of the structure to the available sunlight, combined with the width of the fairways between the moored vessels is such that there would be periods of direct sunlight penetration to most of the seabed, and the depth of the waters means that there would also be refracted and reflected sunlight reaching the seabed. Accordingly it is considered that the risk of total or significant loss of the *He terozostera* under the marina footprint is low whilst the potential for some measurable loss is possible.

Notwithstanding this conclusion, the patchiness and sparseness of the seagrass plus the probability that the distribution of this seagrass throughout Two Fold Bay is much greater than currently known would indicate that an incremental loss of some *He terozostera* under the marina footprint would not be significant for overall *He terozostera* habitat in Two Fold Bay and for the animals that utilise that habitat in Two Fold Bay.”

Ocean Environmental (2014):

“A range of factors have been linked to seagrass decline, however, the most common direct cause of decline is the reduction of light availability (Jordan et al 2002; Burdick and Short 1999; Shafer 2002), with increased nutrient levels and turbidity from a range of point and diffuse sources the key causes of such reductions. High levels of nutrients often result in increased epiphytic algal growth that can smother and shade seagrass blades, while higher turbidity reduces the amount of light reaching the beds, with deeper parts of the bed most vulnerable to light reductions. Decreased light availability can also occur due to increases in phytoplankton that cause a dramatic reduction in light penetration for a limited time (Walker and McComb 1992). As seagrass density strongly influences both the community structure and abundance of fishes (Jordan et al 2002) and invertebrates (Edgar et al 1995), decreases in seagrass density can result in considerable loss of benthic diversity and productivity.”

“The amount of available light is one of the most important factors affecting the survival, growth and distribution of seagrasses (Shafer 2002), therefore the development of structures





which shade substrates supporting existing seagrasses should be carefully planned and considered.”

“In the instance of marina developments, light reduction through shading has the potential to have an impact on an area of seabed and therefore seagrasses. Of the structures built above seagrass beds, floating structures are likely to result in greater reduction of seagrass density than fixed marinas of comparable size and construction (Shafer 2002). Given the importance of light to successful maintenance of seagrass beds it is prudent to take measures to maximize the light available under the marina, and therefore useful to seagrasses.”

“The proposed marina orientation is toward solar north, thus allowing maximum direct light penetration under the longest arm of the marina. Refracted light will continue to reach the seabed under the berthing arms where the vessel orientations are also close to solar noon.”

Marine Solutions has been involved with other marina developments (e.g. Ripple side Village, VIC; Margate Marina, TAS; St Helens, TAS) for which once the construction phase has been completed, seagrass has colonised in and around marina arms where the habitat is suitable.

**2.1: The relationship between the seagrass beds and Cattle Bay and their importance as a food source for threatened fauna has not been adequately described. It is unknown whether the marina would sterilise the area for foraging due to the increased noise and human activity.**

Threatened marine fauna which have the potential to use the seagrass beds in Snug Cove and Cattle Bay as foraging areas (either by directly feeding on seagrass or indirectly by feeding on various other small fish and crustaceans found in these seagrass areas) include:

- Syngnathids
- Marine Turtles
- Dolphins
- Seals
- Marine Birds

As discussed in the previous response, the main area of *Zostera* seagrass to the south-east of the site (off Cocora Beach and Point) will not be impacted by the proposal, nor will the dense areas of *Posidonia* or *Halophila* in the shallower areas of the study site. The only seagrass which has the potential to be impacted by the proposal is the sparse and patchy *Hyetozostera*. It is expected that the denser mapped areas of *Zostera* off Cocora Beach and Cocora Point provide more important and higher quality feeding areas for marine species (this has been noted by the public in relation to dolphins).

It is not expected that the area would become sterilised for foraging. The main areas of seagrass off Cocora Beach and Cocora Point are hundreds of meters from the proposed marina. While there will no doubt be some minor impacts of noise on marine species (e.g.



avoidance of the marina area during large vessel movements may occur), for the majority of the time vessels berthed within the marina will not be under power. And following construction of the marina, the day to day operation of the marina is not expected to generate a significant level of noise. Speed zones will be in force to reduce potential collision impacts and this will also limit general noise impacts from vessels. The area is currently used by a variety of marine species despite being in close proximity to the Port of Eden and the numerous commercial fishing vessels located here.

**2.1: The lack of a CEMP in this DA means that there is no way to assess whether the turbidity mitigation measures will be sufficient to ensure that the seagrass beds are not smothered during the construction process.**

A CEMP has now been developed by Royal Haskoning DHV for the proposed works. Background turbidity data will also be collected at the site prior to construction.

Turbidity mitigation measures included within the CEMP and which would be implemented during construction include:

- The use of silt curtains to divide construction areas from any major seagrass beds.
- During construction monitoring to ensure that the level of total suspended solids (TSS) within 1 m outside of the silt curtains do not exceed the background TSS by more than 50 mg/l. A turbidity meter will be used to measure nephelometric turbidity units (NTU). Readings of less than 25 NTU would be considered to be less than 50 mg/l TSS. In the event that turbidity levels exceed the background levels by 25 NTU a sample of the water would be taken to be analysed for TSS, and the NTU and TSS levels would be recorded in a logbook that would be made available to OEH on request.
- "Stop work" protocols for occasions where turbidity values exceed those outlined in the CEMP, to be in place until turbidity levels fall below background + 50 mg/l TSS.
- Undertake works during periods of calm weather where possible so the potential for spread of suspended sediments smothering inshore seagrass beds is lessened (seagrasses were absent below ~7 m).

Note that much of the piling work will be in areas where only sparse patchy *Heterozostera* is present, and much of the piling will also be undertaken in unvegetated soft sediment. The sediment is mainly sandy and is expected to fall rapidly to the sea floor.

**2.4: The DA refers to a Marine Mammal Protection Plan but this has not been produced so it is difficult to judge how the risks to marine fauna would be ameliorated during construction and operation.**

If approval for the marina is obtained a Marine Mammal Protection Plan will be prepared prior to commencement of construction activities and provided to all contractors. It would also be made available to marina tenants after construction is completed.



This Plan will include all information regarding potential impacts on marine mammals during construction and operation phases and all of the mitigation measures which have been outlined in the Cattle Bay Marina Aquatic Ecology Assessment (Marine Pollution Research 2013) and the Hydrographic Mapping and Marine Mammal Risk Profile Report (Ocean Environmental 2014). In addition, the mitigation measures relating to the noise impacts of piling, which have been provided later in this document, would be included in the Plan.

Refer to the following sections of previous reports:

- Section 3 of the Cattle Bay Marina Aquatic Ecology Assessment (Marine Pollution Research 2013).
- Section 3.5 of the Hydrographic Mapping and Marine Mammal Risk Report (Ocean Environmental 2014).

A summary of potential impacts and mitigation described in these reports is provided below:

#### **POTENTIAL CONSTRUCTION IMPACTS**

- Displacement of benthic habitat and related food sources / habitat
- Disturbance of sediments
- Impacts of floating plant
- Construction noise e.g. from piling and construction vessels
- Cable strike or entanglement
- Pollution via spillage of liquids and solids

#### **MITIGATION MEASURES FOR MARINA CONSTRUCTION**

- Potential construction impacts can be avoided by minimising construction activity in the core whale visitation season and undertaking all work within the framework of the Marine Mammal Protection Plan that sets out the requirements for monitoring marine mammal proximity and protocols for ceasing and resuming works related to the proximity.
- Peak usage periods for whales, dolphins and seals should be referred to and avoided.
- The overall risk of cable strike can be managed by avoiding works during the peak marine mammal visitation period and by undertaking works in the framework of a MMPP.
- The risk of overnight cable strike can be minimised by placing floating plant on a swing mooring rather than leaving plant in a fixed mooring configuration.
- The risk of fuel, transfer and construction spillages can be mitigated by implementation of the CEMP that addresses these issues.
- Mitigation measures for piling noise as per the response on Page 37 of this document.

#### **POTENTIAL OPERATIONAL IMPACTS**

- Entanglement or ingestion of rubbish
- Trapping or stranding of animals
- Water pollution



- Light pollution
- Noise impacts from vessels
- Vessel strike

#### MITIGATION MEASURES FOR MARINA OPERATIONS

- The risk of ingestion of, or entanglement in, rubbish / debris by marine mammals can be mitigated by implementing the marina Operational Environmental Management Plan (OEMP) that includes provision for inspection and regular clearing of marine debris from the waters inside the marina and along the Cattle Bay beach-line.
- In regards to water pollution, the risk of hydrocarbon spills is negligible as the marina will not be providing fuel services or any form of mechanical servicing. The marina will be operated on a zero bilge, sewage and ships liquid waste discharge policy, meaning vessels will not be allowed to discharge bilge, grey or black waters to the bay whilst in the marina. The marina will not be providing a public sewage pump out facility but will be providing a managed sewage pump-out facility via a portable collection system. The trolley transport system will have safeguards to ensure against accidental spillages.
- Installation of downwards directed lighting supplemented with dimmer systems, or timed lights with trip mechanisms as necessary.
- Much of the noise generated within the marina would be absorbed by the surrounding structures (e.g. intertidal beach to north, rocky reefs to east and west) and a proportion of the noise transmitted south would be reflected by the wave attenuator structure back towards the shores. As a result, residual underwater noise would likely be attenuated, reflected or refracted noise. As for the most part vessels will be stationary within the marina, the overall increase in noise from marina operations in relation to existing noise sources from the port in Snug Cove would not likely be significant and would not pose any additional risk to marine mammals. The 2011 Conservation Management Plan for Southern Right Whales has also concluded that shipping noise risk to these whales was minor (i.e. individuals may be affected but there is no effect at the population level).
- The overall mitigation measure for excessive vessel noise and for marine animal interactions is education, with protocols and specific information on the marine animals that boaters are likely to encounter at various times of the year, and the steps that boaters should take to minimise their impact on these animals, including lower speeds and minimum off-set distances.
- Vessel strike is a world-wide problem (Marsh *et al.* 2003) and there is a clear relationship between the number of vessels within a given area and the incident of vessel strike. The 2011 Conservation Management Plan for Southern Right Whales, concluded that from an east Australian coast population perspective, vessel collision risk was moderate (i.e. population recovery could be stalled or reduced). Management of this risk requires a mix of education and active management such as daily information on known marine mammal activity (via close relationships with the existing network of whale watchers including residents, commercial fishers, mussel farmers, NPWS whale-watch and Cat Balou Cruise).
- As the number of recreational vessels from Twofold Bay increases there may be a future need for variable or zoned (time and place) speed limits to be enforced, particularly in



relation to Southern Right Whales and Humpback Whale feeding aggregations and during peak marine mammal visitation periods.

- Local boaters need to be educated to be constantly aware of marine mammals co-existing in these waters and to adopt appropriate speeds and clearance when near.

**2.4: All construction works must only be undertaken from December to March to avoid the whale migration.**

If possible, and this aligns with other constraints of the proposed activity, it would be preferable for construction works to be undertaken to avoid the whale migration season as this would limit the majority of potential impacts on whale species relating to construction.

However, due to other constraints associated with the proposal, along with issues associated with weather conditions, the timeframe needed to complete construction, availability of contractors etc. this may not be possible.

There are a number of factors that should be considered here by OEH:

- Whale use of Snug Cove and Cattle Bay is very infrequent. While some whale sightings near the Eden Breakwall and Wharf were recorded during the 2012-14 whale season there are no sightings within Snug Cove or Cattle Bay. The majority of whale sightings are coastal, with a large number also occurring within the centre of Twofold Bay, a matter of kilometers from the proposed marina site (refer to data in following response).
- October and November are the highest risk months for mother/calf pods – this timeframe should be avoided.
- It is thought that even if construction needs to occur within April to November that effective mitigation measures can be adopted. There are a range of measures which would be applied to mitigate potential construction impacts on whales as described in the previous response and the response in regards to the impact of piling (include safety zone, stop/start procedures, shut down of operations if whales or other marine mammals are within a certain distance of the activity, use of most appropriate piling techniques to limit impacts and use of marine mammal observers during construction).

**2.4: It is important to know where the whales are being seen in relation to the site and how long they remain there.**

The Marine Mammal Risk Profile Report (Ocean Environmental 2014) provides further analysis of the Cat Balou Data from 2012-2014 for whales, dolphins and pinnipeds. This data provides information on the various sites within and outside Twofold Bay which are used by whales. However, the data does not provide information on the length of time that whales spent at each site. It is considered that the data showing use of various parts of the bay used by whales is more important in regards to the proposed marina development.



The descriptive data provided by Cat Balou included sightings at numerous locations. Sightings were allocated to the following: Aslings Beach, Calle Calle Bay, Leather Jacket = Coastal (East), Leonards Island and The Pinnacles = Coastal (North), Murwaree and South Head to Murwaree = Coastal (South), Eden Breakwall, Eden Wharf, Heads of Twofold Bay, Honeysuckle Bay, North Head, South Head, The Lookout, Twofold Bay, Whale Spit and Not specified.

Cat Balou marine mammal records from 2012 to 2014 include the following whale species: Whale (unidentified), Humpback Whales, Dwarf Minke Whales, Southern Right Whales, Orca's, Bryde's Whale.

Descriptive text often utilised language such as "a number" or "numerous" or "several", to vaguely quantify marine mammal counts. This is often the case when large numbers of sightings occurred within a short time frame. During data entry, qualitative descriptive words were captured along with numeric counts of marine mammal individuals and groups. For descriptive, frequently used words, a numeric value was placed on the word based on its perceived intent.

Term utilised in Cat Balou diary entries	Designated value
"+" (implied additional sightings)	1
A couple	2
A number / a few / more	3
Several	4
Many / lots / numerous	5

Sightings of whales, dolphins and seals was analysed using bar charts showing the mean frequency of days that whales were sighted in each month as a proportion of total survey days and bubble plots overlain onto maps of Twofold Bay (and the immediate coastal environment), showing the relative frequency of sightings at each location.

Analysis of whale data by 'pod type' (i.e. occurrence of adults, sub-adults and mother/ calf pairs over time) shows a peak in juvenile / sub-adult whales around September (Figure 1.7). The data suggests that October and November are the highest risk months for mother/ calf pods as the frequency of mother/ calf pod sightings during this time is significantly higher than earlier in the whale season (Figure 1.7). The total number of whale pods sighted in 2012 and 2013 peaks around October and November (Figure 1.7).

A bubble plot showing the relative frequency of whale sightings (2012 - 2014) at different locations around Eden shows that whale sightings occurred and were equally likely within Twofold Bay and the immediate coastal areas to the north and south (Figure 1.8 and Table 1.2). While some whales were sighted around the Eden break-wall and wharf (3 and 4 of 158 survey days), these sightings were very infrequent when compared to use of the outer areas of the bay and immediate coastal environment.

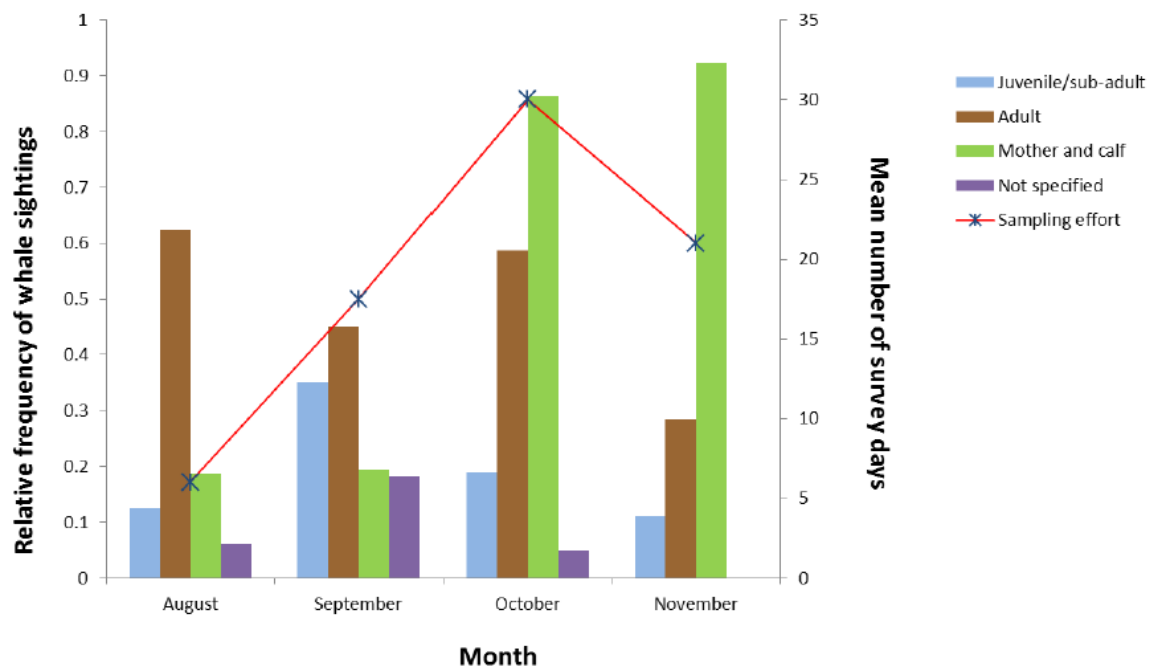


Figure 1.7 Mean relative frequency of whale sightings by pod type.

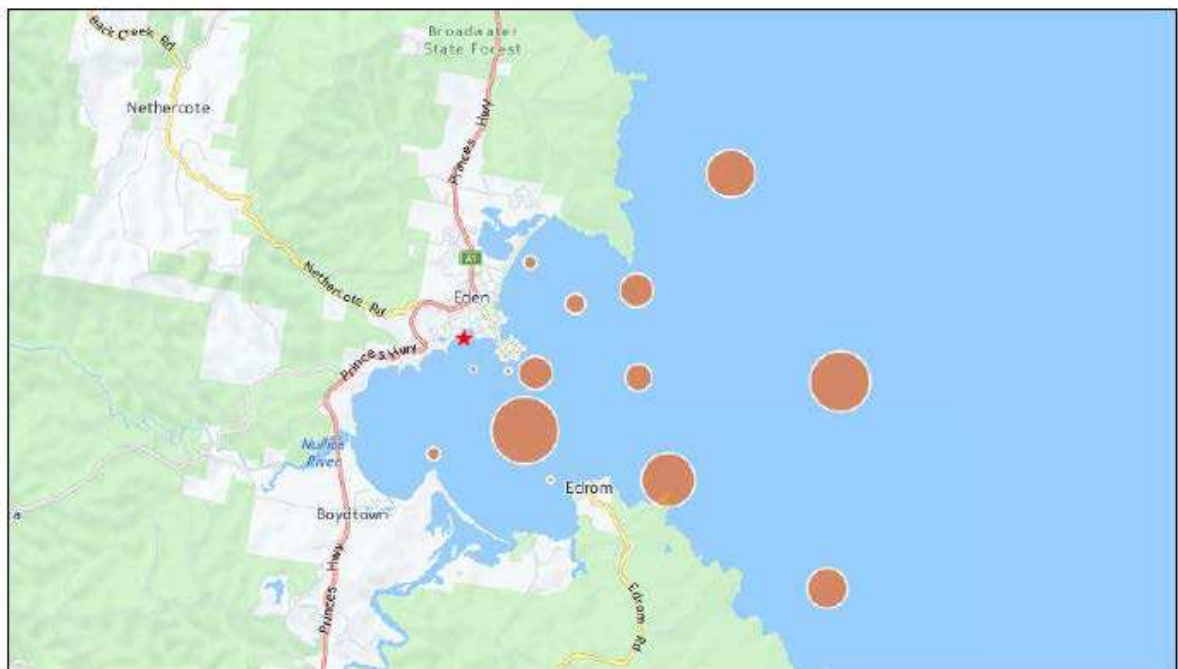


Figure 1.8 Relative frequency of whale sightings at locations around Eden (2012-14). Cattle Bay is indicated with a red star.



**Table 1.2 Number of days whales were sighted at each location during the 2012-14 season.**

Location	July 2012	Aug 2012	Sept 2012	Oct 2012	Nov 2012	Aug 2013	Sept 2013	Oct 2013	Nov 2013	May 2014	July 2014	Total days sighted
Aslings Beach	1	0	0	1	1	0	2	1	0	0	0	6
Calle Calle Bay	0	1	0	1	3	0	0	1	3	0	0	9
Coastal (East)	0	0	9	11	7	3	11	3	2	0	1	47
Coastal (North)	0	0	7	8	2	2	6	4	5	0	0	34
Coastal (South)	0	0	2	8	3	1	3	14	1	0	0	32
Eden Break-wall	0	0	0	1	2	0	0	0	0	0	0	3
Eden Wharf	0	0	0	1	1	0	0	0	1	1	0	4
Heads of Twofold Bay	0	0	2	3	3	0	3	1	0	1	0	13
Honeysuckle Bay	1	0	0	0	1	0	0	1	0	0	0	3
North Head	0	0	2	2	2	0	5	4	2	0	0	17
South Head	0	0	6	6	4	2	9	15	4	0	0	46
The Lookout	0	1	0	4	6	0	2	7	0	0	0	20
Twofold Bay	1	1	3	20	16	0	7	20	10	1	0	79
Whale Spit	0	2	0	0	2	0	0	2	0	0	0	6
Not specified	0	0	0	2	1	3	1	11	5	0	2	25

**2.4: The presence / absence data from Cat Balou does not describe the relative importance of the area to whales, seals, dolphins or marine turtles. Further analysis of this data is recommended. It would be of assistance to see data in Table 3 mapped.**

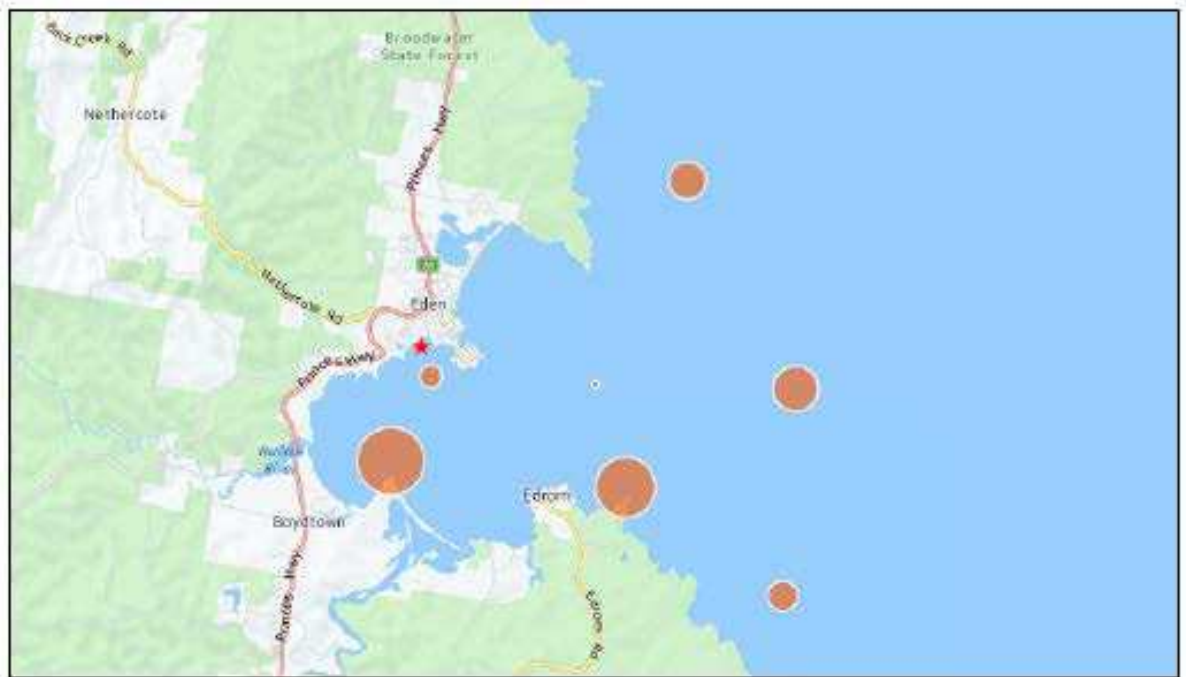
Please refer to the additional data analysis undertaken for whales, seals and dolphins in the Marine Mammal Risk Profile Report (Ocean Environmental 2014). This report includes data analysis and mapping relating to the use of different areas of Twofold Bay for each taxa.

Of these taxa, the area near to Snug Cove / Cattle Bay appears to be most significant for pinnipeds.

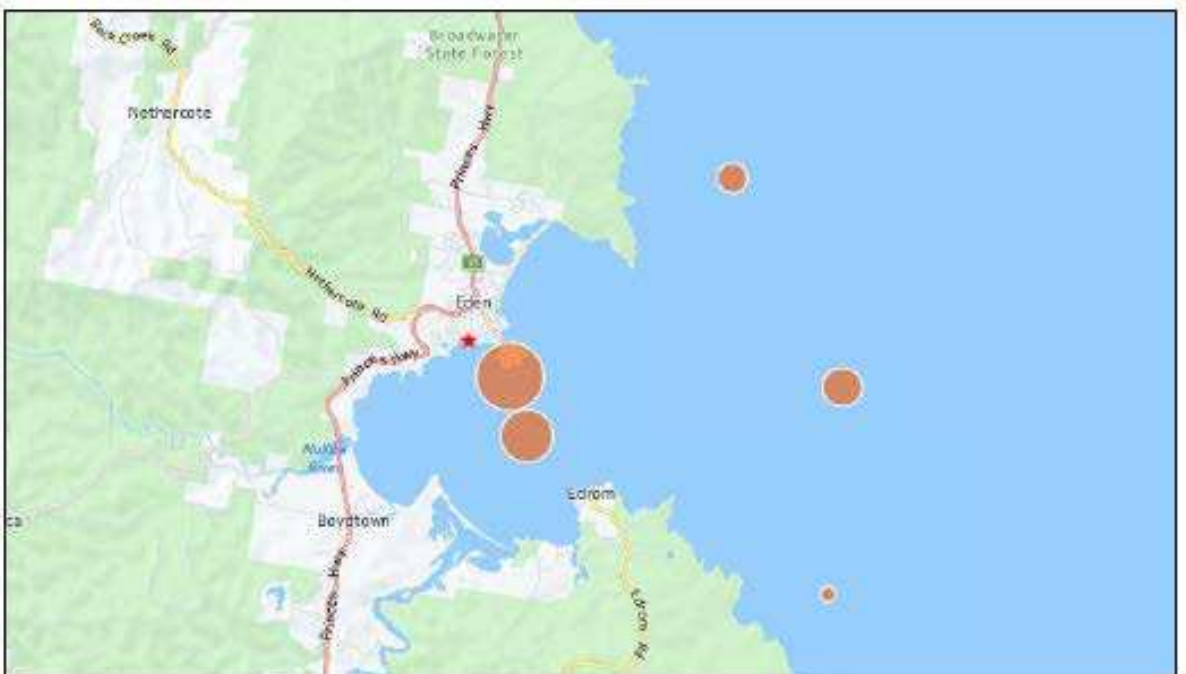
**Whales** - See section above and Ocean Environmental (2014) report.

**Dolphins** - The majority of dolphin sightings from 2012 - 2014 occurred within Twofold Bay (unspecified location) and immediate coastal areas while some dolphin sightings occurred around Snug Cove, Eden. Species sighted included Common and Bottle nose Dolphins. The majority of dolphin sightings were in the months of September and October. Refer to Figure 1.9.

**Seals** - The majority of sightings were from within Twofold Bay and in particular, area's close to Eden (e.g. Eden break wall). These locations are nearby to Snug Cove and Cattle Bay and it is considered from this data that seals are the most likely to be impacted by the proposed marina development, especially during the construction phase. Seals were sighted most frequently in the months of September and November. Refer to Figure 1.10.



**Figure 1.9** Relative frequency of dolphin sightings at locations around Eden from July 2012 to July 2014. The location of Cattle Bay is indicated with the red star.



**Figure 1.10** Relative frequency of Australian fur seal sightings at locations around Eden from July 2012 to July 2014. The location of Cattle Bay is indicated with the red star.



**2.4: The statement that there is likely to be a resident population of Indo-Pacific Bottle nose Dolphins should be confirmed and included in the assessment of significance.**

It is highly likely that the Indo-Pacific Bottle nose dolphins (also known as Indian Ocean Bottle nose Dolphin) found in Twofold Bay are from a resident breeding population. However, this cannot be confirmed without genetic evidence and there are no published genetic studies currently available for Twofold Bay dolphin populations, as noted by Marine Pollution Research (2013). The fact that the population is most likely resident has already been taken into account in the assessment of significance.

Separate inshore and offshore forms of *Tursiops* sp. occur in many regions. In South Africa Ross (1977) equated the offshore form of the Bottle nose Dolphin to *T. truncatus*, and the inshore form to *T. aduncus*. The same two forms have been distinguished in Australia, and both forms occur widely in NSW waters (Ross and Cockcroft 1990, Hale et al. 2000, Möller and Beheregaray 2001).

In south-eastern Australia, inshore Indian Ocean Bottle nose Dolphins show a high degree of site fidelity and appear to belong to relatively small communities or populations (Möller & Beheregaray 2001; Möller et al. 2002). It has been hypothesised that high site fidelity of bottle nose dolphins in sheltered environments may lead to genetic differentiation between adjacent dolphin communities (Curry & Smith 1998). *Tursiops aduncus* are known to form large more or less closed population groups in large NSW embayments such as Port Stephens and Jervis Bay (Möller and Beheregaray 2004). Therefore, it is highly likely that the large groups of Indo-Pacific Bottle nose Dolphins recorded in Twofold Bay are also from a closed resident population.

Local population estimates for *T. aduncus* suggest that 102 individuals occur in Jervis Bay, 140 in Port Stephens (Möller et al. 2002), 350 in Moreton Bay (Corke et al. 1990), 900 in coastal waters off North Stradbroke Island (Chilvers & Corke et al. 2003) and about 1800 – 2400 in Shark Bay, Western Australia (Preen et al. 1997). Schools of over 200 were reported in Twofold Bay in June-August 1996 (Sapphire Coast whale watch reports).

Calving peaks in spring and summer or spring and autumn (Mann et al. 2000; Möller & Harcourt 1998; Ross 2006). Gestation lasts about 12 months so the peak mating period coincides with peak calving time (Ross 2006). The inter-birth interval (period between pregnancies) is about three to six years. Mortality rates of calves are high for the first three years of life (Mann et al. 2000). Therefore, population recovery is slow.

Indian Ocean Bottle nose Dolphins from eastern Australia feed on a variety of fish and cephalopods (Amir et al. 2005; Cockcroft & Ross 1990; Corke et al. 1990). They mainly feed individually, however, they have also been observed taking advantage of human activities such as feeding behind trawlers (Corke et al. 1990; Möller & Harcourt 1998; Chilvers & Corke et al. 2001; Möller et al. 2002).



Inshore dolphins are vulnerable to a range of threats including habitat degradation, pollution, excessive disturbance, boat strikes, incidental catches and direct catches. There are a number of examples of local population declines around the world (Klinowska 1991, Reeves and Leatherwood 1994, Wells and Scott 1999).

The main threats likely to affect Australian populations of Indian Ocean Bottle nose Dolphins include indirect catches in trawl nets; gillnets (including in shark nets to protect bathers); purse seine and trap fisheries entanglements (Shaughnessy et al. 2003); tourism (Bedjer et al. 2006); habitat destruction and degradation (Ross 2006); and overfishing.

The proposed Cattle Bay Marina development may result in noise impacts during the construction phase, some localised degradation of foraging habitat, an increase in risk of human disturbance and vessel strike, and increased potential for pollution. Risks and mitigation for dolphins have been discussed in Marine Pollution Research (2013) and Ocean Environmental (2014).

#### **2.4: The assessment of piling works does not describe the potential acoustic impacts on whales and dolphins.**

##### Acoustic Characteristics of Marine Piling

There are two types of piling, impact and vibro-driving. Sound levels generated by piling activities depend on the size of the pile as well as type of piling. Impact driving is an impulsive noise source while vibro-driving is a continuous noise source. For impact driving, peak levels are 190-245 dB mostly at 100 Hz and 1 kHz. For vibro-driving, the average noise level over the time of measurement (called the sound pressure level – SPL) is 160-200 dB mostly at 100 Hz and 2 kHz.

Ambient noise levels in the environment influence how far piling noise will travel. High energy environments are generally noisier e.g. surf noise and thermal noise (ocean turbulence). Direct transmission of noise through spherical spreading is the main way acoustic signals propagate. For direct transmission, noise levels will drop according to  $20 \log 10 R$  where  $R$  is the distance from the source. Noise is also reflected from the surface (or the thermocline) and the seabed. Rough surface conditions or an uneven seabed can cause scattering of the noise signal. The seabed also absorbs some of the noise.

Transmission loss calculated using the above equation for direct transmission may be counteracted by reflection from the surface and seabed such that the noise is greater than predicted at a given distance. Semi-empirical models can be used to predict transmission loss in situations where the bottom is flat or slopes uniformly.

##### Impacts on Marine Mammals

For the purpose of assessing acoustic impacts on marine mammals, different species can be divided into groups based upon their auditory sensitivity. Sensitivity categories depend on the



ability of different species to perceive sound of a certain frequency. This is important to determine safe zones for marine mammals present during piling activities.

- Baleen whales such as the humpback (*Megaptera novaeangliae*) and southern right whales (*Eubalaena australis*) are believed to be most sensitive to sound in the range of 7 Hz to 22 kHz.
- Most toothed whales, including dolphins (e.g. *Delphinus sp.*, *Tursiops sp.*) and killer whales (*Orcinus orca*), are most sensitive to sound in the range of 150 Hz to 160 kHz.
- Pinnipeds (seals and sea lions) are sensitive to higher frequencies in the range of 75 Hz to 30 kHz.

Underwater sound can affect marine mammals in a number of ways:

- Excessive noise can cause behavioural impacts, temporary hearing damage or permanent hearing damage.
- Behavioural impacts include avoidance of the acoustic source, changes in communication, diving frequency and respiration.
- Temporary or permanent hearing damage results in the individual animal's ability to perceive sound in their environment and for marine mammals; this has consequences for communication, navigation, reproduction and possibly feeding.

#### Mitigation Measures

The South Australian Government Department of Planning, Transport and Infrastructure have developed *Underwater Piling Noise Guidelines* (2012). These aim to:

1. Provide practical management and mitigation measures to minimise the risk of injury to marine mammals within the vicinity of piling activities; and
2. Provide a framework that minimises the risk of significant impacts to occur on marine mammals in biologically important habitats or during critical behaviours (e.g. breeding and calving).

The Guidelines do not intend to prevent all behavioural changes in marine mammals that might occur in response to audible but non-traumatic noise events. To some extent, avoidance behaviour is expected to provide a form of mitigation as it prevents the marine mammal from approaching the piling activity closely enough for noise-induced hearing injury to occur from intense or prolonged noise exposure.

Mitigation measures which should be adopted for the Cattle Bay Marina project include:

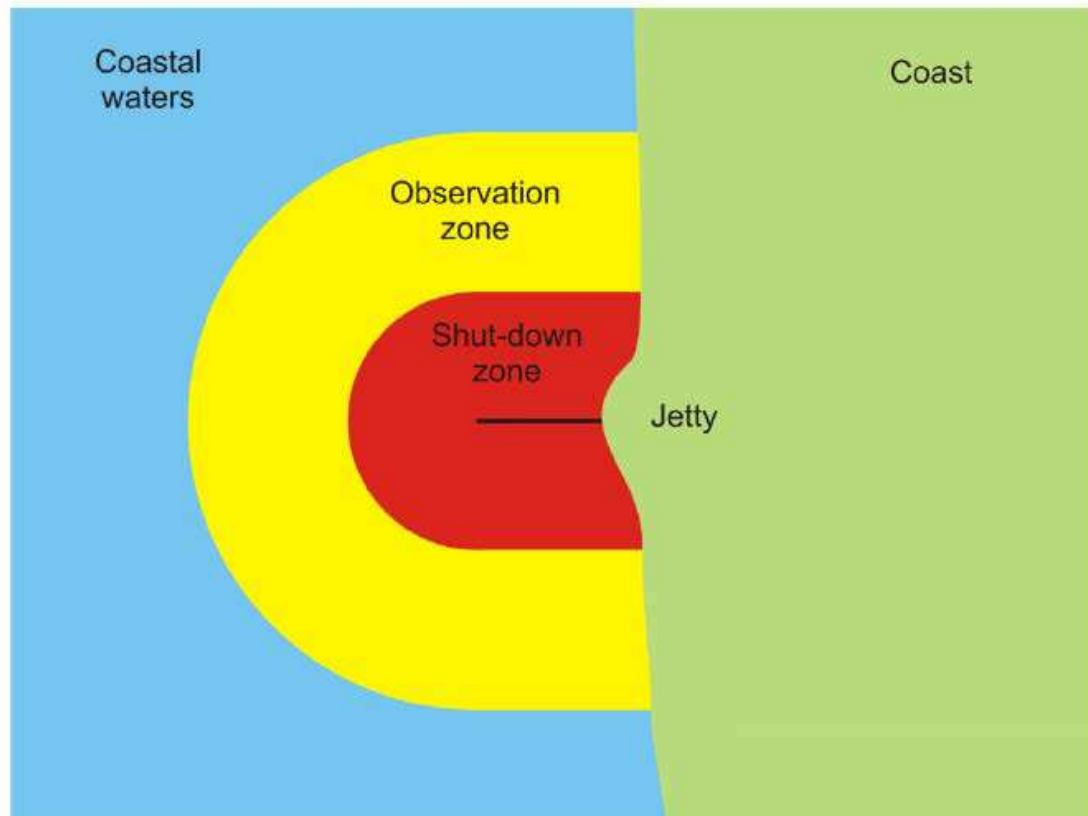
- Safety Zones (including Shut Down Zones)
- Planning of Piling Activities
- Standard Operational Procedures
- Compliance and Sighting Reports
- Marine Mammal Observers



### *Safety Zones*

Safety zones include observation and shut-down zones that are sized based on the likely noise levels produced by the piling activity. A diagram showing example safety zones around a jetty is included in Figure 1.7. Safety zones aim to minimise the likelihood of hearing injury to occur to marine mammals, and do not intend to prevent behavioural responses to audible but non-traumatic noise events. It is likely that marine mammals in the vicinity of a piling activity will show an avoidance reaction, which reduces the chance of approaching the source close enough to enter the zone of hearing injury. The impacts of temporary displacement are unlikely to be significant unless they occur during critical behaviours, such as breeding, feeding and resting, or in important areas such as migratory corridors. For this reason, timing construction activities out of the main migration seasons is preferable.

In the observation zone, movement of marine mammals is monitored to determine whether they are approaching or entering the shut-down zone. When a marine mammal is sighted within or enters the shut-down zone, piling activities must be stopped as soon as reasonably practical. The shut-down zones allow for the cumulative effect of multiple impacts, i.e. in the order of 30 minutes of exposure to pile driving noise for cetaceans and 2 minutes for pinniped. This allows some time to move away from the noise source thereby reducing the likelihood of hearing injury to occur.



**Figure 1.11 Example of safety zones around a jetty.**





Safety zones for impact piling and vibro-driving activities are presented in Table 1.3, together with the estimated zone of behavioural response. The safety zones are sized by comparing expected received noise levels with the following noise exposure thresholds.

- Impact piling – Noise exposure threshold is SEL 150 dB(M) re 1  $\mu\text{Pa}^2\text{s}$  for a single impact at either 100 m or 300 m.
- Vibro-driving – Noise exposure threshold is SPL 180 dB re 1  $\mu\text{Pa}$  at 10 m for cetaceans and SPL 190 dB re 1  $\mu\text{Pa}$  at 10 m for pinniped.

Compliance with the noise exposure thresholds may be demonstrated through noise modelling or empirical measurements of a similar piling activity.

**Table 1.3 Safety zones recommended for marine mammals during piling activities.**

Species	Noise exposure threshold	Observation zone	Shut-down zone	Zone of behavioural response
<b>Impact piling</b>	<b>SEL in dB(M) re 1 <math>\mu\text{Pa}^2\text{s}</math> for single impact</b>			
Low-frequency cetaceans	$\leq 150 \text{ dB}(M_{\text{LF}})$ at 100 m	1 km	100 m	$\leq 150 \text{ m}$
	$\leq 150 \text{ dB}(M_{\text{LF}})$ at 300 m	1.5 km	300 m	$\leq 500 \text{ m}$
	$> 150 \text{ dB}(M_{\text{LF}})$ at 300 m	2 km	1 km	$\leq 3 \text{ km}$
Mid-frequency cetaceans	$\leq 150 \text{ dB}(M_{\text{MF}})$ at 100 m	1 km	100 m	$\leq 150 \text{ m}$
	$\leq 150 \text{ dB}(M_{\text{MF}})$ at 300 m	1.5 km	300 m	$\leq 500 \text{ m}$
	$> 150 \text{ dB}(M_{\text{MF}})$ at 300 m	2 km	1 km	$\leq 3 \text{ km}$
Species	Noise exposure threshold	Observation zone	Shut-down zone	Zone of behavioural response
High-frequency cetaceans	$\leq 150 \text{ dB}(M_{\text{HF}})$ at 100 m	1 km	100 m	$\leq 150 \text{ m}$
	$\leq 150 \text{ dB}(M_{\text{HF}})$ at 300 m	1.5 km	300 m	$\leq 500 \text{ m}$
	$> 150 \text{ dB}(M_{\text{HF}})$ at 300 m	2 km	1 km	$\leq 3 \text{ km}$
Pinnipeds	$\leq 150 \text{ dB}(M_{\text{PW}})$ at 100 m	1 km	100 m	$\leq 150 \text{ m}$
	$\leq 150 \text{ dB}(M_{\text{PW}})$ at 300 m	1.5 km	300 m	$\leq 500 \text{ m}$
	$> 150 \text{ dB}(M_{\text{PW}})$ at 300 m	2 km	1 km	$\leq 3 \text{ km}$
<b>Vibro-driving</b>	<b>SPL in dB re 1 <math>\mu\text{Pa}</math> for single impact</b>			
Cetaceans	$\leq 180 \text{ dB}$ at 10 m	500 m	10 m when no avoidance	$\leq 5 \text{ km}$
	$> 180 \text{ dB}$ at 10 m	1 km	100 m when no avoidance	$\leq 10 \text{ km}$
Pinnipeds	$\leq 190 \text{ dB}$ at 10 m	500 m	10 m when no avoidance	$\leq 5 \text{ km}$
	$> 190 \text{ dB}$ at 10 m	1 km	100 m when no avoidance	$\leq 10 \text{ km}$



### *Planning of Piling Activities*

The planning stage of piling activities should consider the following:

- Timing and duration – Avoid conducting piling activities during times when marine mammals are likely to be breeding, calving, feeding, or resting in biologically important habitats located within the potential noise impact footprint.
- Piling method – Use low noise piling methods, such as vibro-driving, instead of impact piling methods where possible. Vibro-driving methods produce lower noise levels and are not impulsive in character. This reduces the likelihood of hearing injury.
- Contract documentation – Include the standard management and mitigation procedures, and any additional measures to be put in place, in the CEMP.
- Trained crew – Ensure that a suitably qualified person is available during piling activities to conduct the standard operational procedures outlined below. Likely marine mammal concentration areas, peak migration paths and times, key feeding sites, and other aggregation areas should be identified during the planning stage and this information should be provided to trained crew members and the marine mammal observer to improve the identification and observation of marine mammals.

### *Standard Operational Procedures*

Standard operation procedures that must be undertaken by contractors during piling activities include pre-start, soft start, normal operation, stand-by operation, and shut-down procedures.

- Pre-start procedure – The presence of marine mammals should be visually monitored by a suitably trained crew member for at least 30 minutes before the commencement of the soft start procedure. Particular focus should be put on the shut-down zone but the observation zone should be inspected as well, for the full extent where visibility allows.
- Soft start procedure – If marine mammals have not been sighted within or are likely to enter the shut-down zone during the pre-start procedure, the soft start procedure may commence in which the piling impact energy is gradually increased over a 10 minute time period. The soft start procedure should also be used after long breaks of more than 30 minutes in piling activity. Visual observations of marine mammals within the safety zones should be maintained by trained crew throughout soft starts. The soft start procedure may alert marine mammals to the presence of the piling rig and enable animals to move away to distances where injury is unlikely.
- Normal operation procedure – If marine mammals have not been sighted within or are not likely to enter the shut-down or observation zone during the soft start procedure, piling may start at full impact energy. Trained crew should continuously undertake visual observations during piling activities and shut-down periods. After long breaks in piling activity or when visual observations ceased or were hampered by poor visibility, the pre-start procedure should be used. Night-time or low visibility



operations may proceed provided that no more than 3 shut-downs occurred during the preceding 24 hour period.

- **Stand-by operations procedure** – If a marine mammal is sighted within the observation zone during the soft start or normal operation procedures, the operator of the piling rig should be placed on stand-by to shut-down the piling rig. An additional trained crew member should continuously monitor the marine mammal in sight.
- **Shut-down procedure** – If a marine mammal is sighted within or about to enter the shut-down zone, the piling activity should be stopped immediately. If a shut-down procedure occurred and marine mammals have been observed to move outside the shut-down zone, or 30 minutes have lapsed since the last marine mammal sighting, then piling activities should recommence using the soft start procedure. If marine mammals are detected in the shut-down zone during poor visibility, operations should stop until visibility improves.

#### *Compliance and Sighting Report*

The contractor conducting the piling activities should maintain a record of procedures employed during operations. Information on any marine mammals sighted during the piling activity, and their reaction to the piling activity, may be used in the planning and assessment of future projects.

A report on the piling activity should at a minimum contain the location, date, start and completion time of the piling activity, information on the piling rig (hammer weight and drop height, pile size, number of piles, number of impacts per pile, etc.), details on the trained crew members conducting the visual observations, times when observations were hampered by poor visibility or high winds, times when start-up delays or shut-down procedures occurred, and the time and distance of any marine mammal sightings.

#### *Additional Management and Mitigation Measures*

Additional management and / or mitigation measures are to be used when the impacts of the piling activity on listed marine mammal species are likely to be significant.

Additional management measures that could be considered include some or all of the following.

- **Increased safety zones** – For biologically important habitats, such as breeding, resting or feeding areas, the shut-down zone should be increased to ensure that behavioural disturbance does not occur. As an example, it should be used for piling activities undertaken adjacent known whale breeding and calving sites during whale migration season.
- **Marine mammal observers** – The contractor conducting the piling should engage a suitably qualified marine mammal observer(s) (MMO) when migratory, vulnerable or endangered marine mammals are likely to be present within the area surrounding the piling activity.
- **Operations during night time or poor visibility** – The soft start procedure should not be initiated until conditions allow visual inspection of the safety zones. If marine mammals



are spotted within or likely to enter the safety zones during night time operations, piling activities should be postponed.

- *Spotter vessel or aircraft* – If clear observations cannot be made from land or the piling rig, visual observations for the presence of marine mammals within the safety zones may be improved by employing a spotter vessel and/or aircraft. The spotter vessel and aircraft should maintain continuous contact with the piling operator. An MMO should be on board of both the vessel and aircraft.

Additional mitigation measures that could be considered include some or all of the following:

- *Press-in piling* – Press-in piling machines use static forces to install piles such that impacts are not required. Underwater noise levels are expected to be significantly less than those produced by conventional piling methods. Current technology allows for installation of piles with diameters of up to 1.5 m.
- *Suction piling* – Suction piling uses tubular piles that are driven into the seabed, or dropped a few metres into a soft seabed, after which air and water are sucked out the top of the tubular pile thereby sinking the pile into the ground. Noise levels are expected to be low as the only source of noise is the pump.
- *Pile type selection* – There is some evidence that steel H-piles produce significantly lower peak levels, potentially in the order of 10 to 20 dB, than circular concrete and steel piles. Use of alternative piles that produce less noise should be considered but may be somewhat limited as H-piles may not be suitable for all situations.
- *Bubble curtain* – A bubble curtain is a sheet of air bubbles that are produced around the location where the piling activity occurs. The bubbles are created by forcing air through small holes drilled in metal or PVC rings using air compressors, with either one ring deployed on the sea bottom or several vertically stacked rings forming a bubble 'tree'. The bubbles in the bubble curtain create an acoustic impedance mismatch between the water and air trapped in the bubble, which results in sound attenuation across the bubble curtain.
- *Cofferdam* – A cofferdam is created by placing a solid casing around a pile and removing the water from the casing. This approach has the potential to result in significant noise reductions.

**2.4: Marine turtles are known to occur periodically in these waters but little data is presented on possible impacts to these species given that any increase in vessel numbers within Twofold Bay translates into a higher risk of vessel strike. The leathery turtle is listed as endangered under both the TSC Act and EPBC Act (see comment on page 45).**

Four marine turtle species have the potential to occur in the waters of Twofold Bay and Cattle Bay. These are the Loggerhead Turtle, Green Turtle, Leatherback Turtle and Hawksbill Turtle. The Conservation Status of each of these turtles under the EPBC Act 1999 is provided in Table 1.4.

The reference made to the Leatherback Turtle (Leathery Turtle) on page 45 of the Cattle Bay Aquatic Ecology Assessment (Marine Pollution Research 2013) as being 'Vulnerable' under the TSC Act 1995 and EPBC Act 1999 is incorrect and should read 'Endangered'.



**Table 1.4 Marine turtles with the potential to occur at the site.**

<b>Reptiles (Marine Turtles)</b>		
<b>Species</b>	<b>Conservation Status</b>	<b>Potential of Occurrence</b>
Loggerhead Turtle <i>Caretta caretta</i>	Endangered, Migratory, Listed	Breeding likely to occur within area
Green Turtle <i>Chelonia mydas</i>	Vulnerable, Migratory, Listed	Foraging, feeding or related behaviour known to occur within area
Leatherback Turtle <i>Demochelys coriacea</i>	Endangered, Migratory, Listed	Species or species habitat known to occur within area
Hawksbill Turtle <i>Eretmochelys imbricata</i>	Vulnerable, Migratory, Listed	Species or species habitat known to occur within area

Further information on these four species and potential impacts on marine turtles from the proposed marina development is provided below.

#### Loggerhead Turtle

Loggerhead turtles occur in tropical and subtropical waters worldwide. In Australia, they occur in coral reefs, bays and estuaries in tropical and warm temperate waters off the coast of Queensland, Northern Territory, Western Australia and New South Wales. Loggerhead turtles are carnivorous, feeding mostly on shellfish, crabs, sea urchins and jellyfish (Australian Government Department of the Environment 2015a).

Australia has two unique breeding populations; the eastern Australian population which nests on the southern Great Barrier Reef and adjacent coastal areas, and western Australian population with major nesting sites in the Miron Islands, Ningaloo Coast and islands near Shark Bay. Mating on the east coast starts in late October, peaking in November to early December. Nesting occurs from late October, peaking in late December and finishing in late February or early March. Hatchlings emerge from late December until April with most hatching from February to early March (Australian Government Department of the Environment 2015a).

#### Green Turtle

Green turtles occur in seaweed-rich coral reefs and inshore seagrass pastures in tropical and subtropical areas of the Indo-Pacific region. Adults feed mainly on seagrasses and algae, while immature animals are carnivorous. Australia has seven regional populations of green turtles that nest in the southern Great Barrier Reef, the northern Great Barrier Reef, the Coral Sea, the Gulf of Carpentaria, Western Australia's north-west shelf, the Ashmore and Cartier Reefs and Scott Reef. Nesting in the Great Barrier Reef population occurs between October and March, peaking in late December to early January (Australian Government Department of the Environment 2015b).



### Leatherback Turtle

Leatherback turtles occur in tropical and temperate waters. They are carnivorous and feed mainly in the open ocean on jellyfish and other soft-bodied invertebrates. They are most commonly reported feeding in coastal waters of central eastern Australia (from southern Queensland to central New South Wales); south-east Australia (from Tasmania, Victoria and eastern South Australia) and in south-western Western Australia. Leatherback turtles migrate to breed in neighbouring countries particularly in Indonesia, Papua New Guinea and the Solomon Islands. There are no large rookeries recorded in Australia. Scattered nesting has been reported along the south Queensland coast and coast of Amhem Land. Some nesting has occurred in northern New South Wales. Breeding in south-eastern Queensland occurs mostly during December and January (Australian Government Department of the Environment 2015c).

### Hawksbill Turtle

Hawksbill turtles typically occur in tidal and sub-tidal coral and rocky reef habitats throughout tropical waters, extending into warm temperate areas as far south as northern New South Wales. While sponges make up a large proportion of their diet they also feed on seagrasses, algae, soft corals and shellfish. In Australia the main feeding area extends along the east coast. Two major breeding areas occur in Australia: Northern Great Barrier Reef, Torres Strait and northern Amhem Land, and the north-west shelf of Western Australia. Although hawksbill turtles breed throughout the year, the peak nesting period in the Torres Strait and Great Barrier Reef region occurs between January and February. In Amhem Land, nesting peaks between July and October. The Western Australian nesting season occurs primarily from October to January (Australian Government Department of the Environment 2015d).

### Impacts on Marine Turtles

Threats to marine turtles which have the potential to be associated with the proposed Cattle Bay Marina include marine debris/pollution, vessel collision and habitat damage.

#### Marine Debris & Pollution:

- Marine debris and pollution may be associated with both the construction and operation phases of the marina if not managed correctly.
- Injury and fatality as a result of ingestion or entanglement of marine debris has been listed as a key threatening process under the EPBC Act.
- Fishing line, rope / cord fragments, styrofoam beads, tarballs, plastic bags and balloons are all known to have killed marine turtles through ingestion or entanglement (Carr 1987).
- Floating debris particularly affects juvenile turtles as they spend their first years drifting in convergences (rips, fronts and drift lines formed by ocean currents). Such convergences affect debris and young turtles similarly, drawing both into the convergence by downwellings in the open ocean (Carr 1987).





- Oil and tar on beaches and on the water surface can choke or poison turtles, or inhibit swimming. Other potentially harmful pollutants include pesticides, heavy metals, organochlorides, and sewage from the land or from boats. These substances can pollute feeding grounds and increase disease in turtles (Robins et al. 2002).
- There is an average annual reported mortality of five deaths per year of Loggerhead Turtles in Queensland from entanglement in rope, fishing-line or bags and 1.5 deaths per year from ingestion of synthetic material, usually fishing line (Limpus 2008).
- As Leatherback Turtles consume large quantities of jellyfish, it is proposed that they are more likely to ingest plastic debris mistakenly. Mrosovsky et al. (2009) examined autopsy records of 408 Leatherback Turtles, spanning 123 years (1885–2007), for the presence of plastic in the digestive tract. Plastic was reported in 34% of these cases.
- Hamann et al. (2006) record that in Queensland there were 0.07 deaths of Leatherback Turtles per year between 1990 and 2003 through ingestion of marine debris. They note a rapid increase in the incidence of ingestion of plastic from the late 1960s to the 1980s with levelling off after that.

#### Direct Habitat Damage and Degradation of Habitat

- Pendoley (2005) records habitat damage as a result of dredging and construction a main threat to marine turtles. In Queensland, between 1999 and 2002, the average annual reported mortality was 1.7 Loggerhead Turtles per year (with a maximum of 3) from large scale port dredging operations.
- Direct damage to soft bottom subtidal habitat, some of which may be vegetated, will occur as a result of piling activities. Shading of some seagrass beds as a result of newly erected pontoons may result in a localised decline in its cover. However, this is not expected to be significant given the angle of the marina layout. There may also be direct impacts on very small areas of rocky subtidal reef if needed to be removed for navigation purposes.
- There are no beach nesting sites in Cattle Bay (or Twofold Bay) and while marine turtles may occasionally use the area for foraging, it is unlikely that the subtidal habitats within Cattle Bay are a significant foraging area for marine turtles. In addition, there are widespread seagrass beds in Twofold Bay which provide an alternative food source for those turtle species that feed on seagrass.

#### Boat Strike / Vessel Collision

- Fast moving boats have the potential to cause injury or death of marine turtles, especially in shallow waters over seagrass beds where turtles may be foraging.
- In recent decades there has been an increase in the number of turtles killed by collision with vessels and cuts from propellers (Greenland et al. 2004). With an increase in the numbers of vessels being used in coastal waters, injuries to turtles from collisions and propeller cuts from vessels is expected to increase.
- The increase in the number of boats travelling within Twofold Bay as a result of the proposed marina facilities will result in an increased risk of vessel collision.



- Hamann et al. (2006) reported that in Queensland, boat strike caused 0.07 turtle deaths per year between 1990 and 2003.
- Figures provided by Limpus (2008) are significantly greater – Limpus suggests that there are likely to be higher than eight Loggerhead Turtles killed as a result of boat strike per year in Moreton Bay and Hervey Bay, Queensland,
- The number of Green Turtles affected annually from collisions with boats is unknown. However, the effect of shipping and recreational boating is likely to be similar to that of Hawksbill Turtles, with which they share much of their distribution. Hawksbill Turtles migrate close to the ocean surface along the coast and use shipping channels between their breeding and feeding grounds. In eastern Queensland, at least 65 turtles were killed between 1999 and 2002 when they were hit by vessels, a mortality risk comparable to that of trawling without Turtle Excluder Devices in the region. However, Hawksbills are not as frequently struck by boats in Queensland as some other species of turtles (Hazel & Gyuris 2006).
- While the figures above are alarming, the incidence of marine turtles in waters of Queensland is much higher than in Two Fold Bay, with major nesting and foraging grounds there. Therefore, the risk of vessel collision will be lower due to this fact.

#### Light Pollution

- Light pollution can cause significant impacts on marine turtles on nesting beaches. Light pollution alters nocturnal behaviours including how turtles choose nesting sites; how they return to the sea after nesting; and how hatchlings find the sea after emerging from their nests.
- The lack of nesting sites at Cattle Bay indicates that any additional lighting from the marina will not impact on Loggerhead Turtles utilising the area.

#### Mitigation:

- Limitations on vessel speeds should be put in place on the approach to and within the marina. They should also be put in place within shallows of Cattle Bay where seagrass beds occur. This will reduce the likelihood of accidental collision with marine turtles and the severity of injury if collision cannot be avoided. Lower vessel speeds will result in an increased capacity of the skipper to spot and avoid marine turtles.
- Educating marina users of the potential for these species to occur through signs / pamphlets provided on admission.
- The management of marine debris and pollution will also indirectly benefit marine turtles and reduce the likelihood of entanglement and / or ingestion causing harm or death.
- By reducing and managing impacts on seagrass beds and other subtidal habitats that may be used by marine turtles there will be indirect benefits for these species.



**2.4: The EIS fails to provide comment on potential impacts to *Tursiops spp.*, especially *T. aduncus*, given there may be a resident population. The proponent should detail how any impacts on resident / non-resident species may be ameliorated.**

We consider that this information has been provided. The Cattle Bay Marina Hydrographic Mapping & Marine Mammal Risk Profiles Report (Ocean Environmental 2014) provides information on the potential risks to marine mammals during the construction and operation stages of the proposed Cattle Bay Marina along with measures to mitigate these identified risks (refer to Section 3.5 of that report).

The majority of the risks identified are common for whales, dolphins and seals so have been addressed accordingly (i.e. impacts are not addressed separately for *Tursiops spp.* or any other species, in some cases a group of species may be identified as at risk). It is considered that the mitigation measures detailed in this report apply whether a marine mammal species is resident or not (refer to Section 3.5).

It is understood that as a potentially 'resident population' the risk to *Tursiops spp.* is higher than that for species which may be encountered occasionally or only at certain times of the year. To address this, Section 3.6 of the Cattle Bay Marina Hydrographic Mapping & Marine Mammal Risk Profiles Report (Ocean Environmental 2014) provides 'risk profiles' for each species (including *Tursiops spp.*). These take into account the species' conservation status, habitat requirements, distribution, main areas of use within Two Fold Bay and the immediate coast (from the analysis of Cat Balou records from 2012-14), the main period of use, potential threats (as identified in Section 3.5), mitigation and then determine an overall risk from the proposal.

The 'risk profile' for the Bottlenose Dolphin (which includes *Tursiops truncatus s. str.* and *Tursiops aduncus*, as Cat Balou records do not distinguish between these two species) is reproduced below.

Species	<b>Bottlenose Dolphin, <i>Tursiops truncatus s. str.</i></b> <b>Indian Ocean Bottlenose, <i>Tursiops aduncus</i></b> (Note no distinction within Cat Balou Records)
Conservation Status	Whales and other cetaceans (EPBC Act)
Required Habitat / Distribution	The Bottlenose Dolphin lives in coastal waters and oceans. Found worldwide in temperate and tropical waters. They are resident or frequent inhabitants of bays and coastal areas. In some areas populations will maintain defined home ranges within recognised coastal landforms. Others are pelagic animals, found well out to sea, often off or quite close to a continental shelf edge. This species occupies a broader range of habitats than any other marine mammal, giving it access to a huge variety of organisms including invertebrates, bottom-dwelling fish and squid, plus the full range of pelagic (oceanic) fish species. Bottlenose Dolphins are a very social



	species and feed together, although they are known to feed alone. They also take advantage of human-induced prey abundance and regularly approach fishing trawlers.
Like lihood of Occurrence	Moderate - High (year round) – many local records.
Main Areas of Use	Two fold Bay and immediate coastal areas.
Main Period of Use	A resident population is most likely to be present year-round in Two fold Bay. Cat Balou data indicates that sightings are most prevalent in September and October.
Potential Threats	Entanglement in discarded or in-use fishing gear. Vessel and cable strike. Noise impacts. Light pollution impacts (through impact on food source). Habitat modification. Biological pollution.
Mitigation Available	Yes – as per Section 3.5.
Overall Risk	Moderate (year round)

Potential impacts and mitigation for marine mammals included in the Cattle Bay Marina Hydrographic Mapping & Marine Mammal Risk Profiles Report (Ocean Environmental 2014) are reproduced in short below.

#### POTENTIAL CONSTRUCTION IMPACTS

- Displacement of benthic habitat and related food sources/ habitat
- Disturbance of sediments
- Impacts of floating plant
- Construction noise
- Cable strike or entanglement
- Pollution via spillage of liquids and solids

#### MITIGATION MEASURES FOR MARINA CONSTRUCTION

- Potential construction impacts can be avoided by minimising construction activity in the core whale visitation season and undertaking all work within the framework of a Marine Mammal Protection Plan that sets out the requirements for monitoring marine mammal proximity and protocols for ceasing and resuming works related to the proximity.
- Peak usage periods for whales, dolphins and seals should be referred to and avoided.
- The overall risk of cable strike can be managed by avoiding works during the peak marine mammal visitation period and by undertaking works in the framework of a MMPP.
- The risk of overnight cable strike can be minimised by placing floating plant on a swing mooring rather than leaving plant in a fixed mooring configuration.
- The risk of fuel, transfer and construction spillages can be mitigated by implementation of management / mitigation measures outlined in the CEMP.



- Piling noise mitigation as described in this report.

#### POTENTIAL OPERATIONAL IMPACTS

- Entanglement or ingestion of rubbish
- Trapping or stranding of animals
- Water pollution
- Light pollution
- Noise impacts from vessels
- Vessel strike

#### MITIGATION MEASURES FOR MARINA OPERATIONS

- The risk of ingestion of, or entanglement in, rubbish / debris by marine mammals can be mitigated by implementing a marina Operational Environmental Management Plan (OEMP) that includes provision for inspection and regular clearing of marine debris from the waters inside the marina and along the Cattle Bay beach-line.
- In regards to water pollution, the risk of hydrocarbon spills is negligible as the marina will not be providing fuel services or any form of mechanical servicing. The marina will be operated on a zero bilge, sewage and ships liquid waste discharge policy, meaning vessels will not be allowed to discharge bilge, grey or black waters to the bay whilst in the marina. The marina will not be providing a public sewage pump out facility but will be providing a managed sewage pump-out facility via a portable collection system. The trolley transport system will have safeguards to ensure that there cannot be accidental spillages.
- Installation of downwards directed lighting supplemented with dimmer systems, or timed lights with trip mechanisms as necessary.
- Much of the noise generated within the marina would be absorbed by the surrounding structures (e.g. intertidal beach to north, rocky reefs to east and west) and a proportion of the noise transmitted south would be reflected by the wave attenuator structure back towards the shores. As a result, residual underwater noise would likely be attenuated, reflected or refracted noise. As for the most part vessels will be stationary within the marina, the overall increase in noise from marina operations in relation to existing noise sources from the port in Snug Cove would not likely be significant and would not pose any additional risk to marine mammals. The 2011 Conservation Management Plan for Southern Right Whales has also concluded that shipping the noise risk to these whales was minor (i.e. individuals may be affected but there is no affect at the population level).
- The overall mitigation measure for excessive vessel noise and for marine animal interactions is education, with protocols and specific information on the marine animals that boaters are likely to encounter at various times of the year, and the steps that boaters should take to minimise their impact on these animals, including lower speeds and minimum off-set distances.
- Vessel strike is a world-wide problem (Marsh *et al.* 2003) and there is a clear relationship between the number of vessels within a given area and the incident of vessel strike. The 2011 Conservation Management Plan for Southern Right Whales, concluded that from a n



east Australian coast population perspective, vessel collision risk was moderate (i.e. population recovery could be stalled or reduced). Management of this risk requires a mix of education and active management such as daily information on known marine mammal activity (via close relationships with the existing network of whale watchers including residents, commercial fishers, mussel farmers, NPWS whale-watch and Cat Balou Cruises). As the number of recreational vessels from Twofold Bay increases there may be a future need for variable or zoned (time and place) speed limits to be enforced, particularly in relation to Southern Right Whales and Humpback Whale feeding aggregations and during peak marine mammal visitation periods.

- Local boaters need to be educated to be constantly aware of marine mammals co-existing in these waters and to adopt appropriate speeds and clearance when near.

**3.2.1 (impact of marina operations): The assessment of underwater noise impacts has been based on reviews of a shipping noise analysis. It would be better to have actual measurements from marina construction and operation of the marina, from Cattle Bay and Twofold Bay to determine the level of impact.**

A Noise and Vibration Assessment for the proposed Cattle Bay Marina has now been produced. This should be referred to for potential noise impacts of the marina operation.

Further detail on piling noise impacts have been provided from page 37 of this document.

Impacts relating to recreational vessel noise have also been discussed by Marine Pollution Research (2013).

**3.2.2: OEH would determine the risk of vessel strike to be high (unlike the moderate risk rating provided in the 2011 Conservation Management Plan). In recent years at least 1 whale calf has been struck and killed within Twofold Bay.**

This risk of vessel collision was considered in the 2011 Conservation Plan for Southern Right Whales. This Plan states the following in regards to vessel collision:

- Vessel disturbance can occur in the form of collisions or by disrupting behaviours.
- The type of vessels involved can range from large commercial vessels to recreational vessels, including personal watercraft.
- Southern right whales appear to be the primary species involved in vessel collisions in the southern hemisphere although there are low numbers of recorded strikes in Australian waters.
- Vessel collision can lead to mortality or significant injury.
- Although collisions in Australian waters are rare this issue is of concern, particularly as whale numbers increase and especially for the south-east population.
- Chronic disturbance leading to increased energetic costs as individual animals try to avoid vessels may result from activities such as boat-based whale watching, particularly by recreational boats.
- Vessel collisions fall into four categories: indeterminate collisions with the bow or hull of a vessel where the animal suffers blunt trauma; bow bulb draping where animals become wedged on the front of ships; propeller strike; and collisions where animals bump into vessels.





- There were two fatal vessel collisions and three non-fatal collisions with southern right whales recorded in Australian waters in the period 1950–2006, albeit this is likely to be under-reported and therefore an underestimate of the incidence of vessel collisions. Two additional fatal collisions with southern right whales were recorded in Australian waters in the period 2007–2010 in Australia's report on ship strikes to the IWC.
- Vessel collision is a greater risk for southern right whales when they are in the coastal zone due to the higher probability of encountering vessels. It is likely that this risk will increase as shipping traffic grows and the impact on an individual, especially in south-east Australia, is likely to have a significant, potentially population-scale effect, if further evidence confirms this as a small demographically discrete population.

Considering this information, the Plan concluded that the risk to east-coast Southern Right Whales from vessel collision (inclusive of large commercial vessels, recreational vessels and personal watercraft) was moderate. We note that OEH has indicated that this risk rating was in relation to commercial shipping only, however, from the information presented above from the Plan we would consider that this risk is in relation to all vessel types listed.

The cumulative aquatic ecology impacts of the use of the Cattle Bay Marina in conjunction with other approved and proposed future developments in Twofold Bay were considered by Marine Pollution Research (2013). It was concluded in this report that the incremental risk to marine mammals from disturbance, including the risk of vessel collision, will increase as the number of vessels transiting through and around Twofold Bay increases.

The marina will provide berths for 154 vessels, ranging from 12 to 15 m length and the close proximity to open coastal waters would indicate that for the most part the non-sailing vessels could be expected to utilise waters of Twofold Bay and associated coastal waters out to the continental shelf. The marina is conveniently located for deep-sea fishers targeting fish utilising the many undersea canyons along the continental slope. As a consequence, the overall increase of high speed vessels in these waters and the possibility of more high speed vessels once the Boyd town marina is built and if the Port of Eden Marina (POEM) proposal also goes ahead (see Project EIS), increases the risk for marine mammals and reptiles of behaviour disruption from vessel noise and harassment, for injuries or death from ingesting marine debris and from vessel strike.

Collisions within the confines of the marina are not likely to present any or very little risk to aquatic fauna by virtue of the low vessel speeds that vessels will be travelling here.

Marine Pollution Research (2013) presented the following mitigation / management measures to reduce the impacts of vessel collision:

- Education of boaters (i.e. using passive management tools such as information packs given to boaters, signage at the marina, and active management such as daily information on known marine mammal activity within and outside Twofold Bay).
- Specific risk management via a Marine Mammal Protection Plan.
- Boat speed limitations.



**Appendix A1: Use of 2002 data is not appropriate. The most recent data should be used.**

The most recent survey data (as collected by Marine Pollution Research in 2013) has been provided and described in detail, including photographs, in Section 2 of the Cattle Bay Aquatic Ecology Assessment (Marine Pollution Research 2013).

The Ecology Lab (2002) marine ecological survey data is simply presented in Appendix 1 as part of the literature review component for this site and to allow for comparisons between the two data sets, both undertaken within Cattle Bay. The Cattle Bay Aquatic Ecology Assessment (Marine Pollution Research 2013) notes that “*The Ecology Lab (TEL 2002) undertook a detailed field survey of Cattle Bay in relation to an earlier marina proposal for the site ... As this original survey is now 11 years old, and as it did not extend out into the proposed marina footprint for the present proposal, a follow-up aquatic ecology survey was required*”.

The follow-up aquatic ecology field study was undertaken in January 2013 to verify and extend the original survey and include the offshore areas within the proposed marina footprint. The results of this are provided within the main text of Section 2 of the document. The data obtained during this survey is compared with the results of the TEL 2002 survey and any similarities or discrepancies are described within the document. It is considered that the use of this data for this purpose is warranted.

**Appendix A2: The EPBC Act report only shows records within a 1 km radius of the centre of Twofold Bay. This area does not cover Cattle Bay and should be extended.**

It is noted that the text within the Cattle Bay Aquatic Ecology Assessment (Marine Pollution Research 2013) states that an EPBC Act 1999 search was undertaken using a 10 km radius around the study site. However, the search results (in Appendix A2 of the report) only show a 1 km radius and do not cover Cattle Bay itself. The TSC Act 1995 search radius was correct. The initial results (which are described in the text as a combination of both the TSC Act 1995 and EPBC Act 1999 searches) list 63 listed marine species comprising 14 sea birds, 3 shore bird species, 13 cetaceans (whales and dolphins), 4 reptiles (turtles), 4 sharks and 26 fish (mainly sea horses and pipe fish) with the potential to occur at the site.

To rectify the matter, an additional EPBC Act 1999 Protected Matters Report was prepared on 16 February 2015 and is provided in Appendix 1. This report was undertaken using a 5 km radius around Cattle Bay itself. This report includes 72 ‘listed marine species’ (comprising 39 marine / migratory birds, 28 fish – the majority of which are syngnathids, 12 whales and other cetaceans, 2 seals, 4 turtles and 4 sharks). Table 1.5 lists these species, their conservation status under the EPBC Act 1999 and the potential of occurrence as determined by the database.

The potential impacts of the marina construction and operation on all taxa listed within this revised report have already been assessed in the Aquatic Ecology Report (Marine Pollution Research 2013) and in the Marine Mammal Risk Profile Report (Ocean Environmental 2014).



**Table 1.5 Marine species listed under the EPBC Act 1999 with the potential to occur at the study site.**

Species	Conservation Status	Potential of Occurrence
<b>Fish</b>		
Black Cod <i>Epinephelus daemeli</i>	Vulnerable	Species or species habitat may occur within area
Syngnathids (27 spp.)	Listed	Species or species habitat may occur within area
<b>Mammals (Whales, Dolphins and Seals)</b>		
Blue Whale <i>Balaenoptera musculus</i>	Endangered, Migratory, Whales & Cetaceans	Species or species habitat likely to occur within area
Southern Right Whale <i>Eubalaena australis</i>	Endangered, Migratory, Whales & Cetaceans	Breeding likely to occur within area
Humpback Whale <i>Megaptera novaeangliae</i>	Vulnerable, Migratory, Whales & Cetaceans	Congregation or aggregation known to occur within area
Bryde's Whale <i>Balaenoptera edeni</i>	Migratory, Whales & Cetaceans	Species or species habitat may occur within area
Pygmy Right Whale <i>Capeerea marginata</i>	Migratory, Whales & Cetaceans	Species or species habitat may occur within area
Killer Whale (Orca) <i>Orcinus orca</i>	Migratory, Whales & Cetaceans	Species or species habitat may occur within area
Minke Whale <i>Balaenoptera acutorostrata</i>	Whales & Cetaceans	Species or species habitat may occur within area
Dusky Dolphin <i>Lagenorhynchus obscurus</i>	Migratory, Whales & Cetaceans	Species or species habitat may occur within area
Common Dolphin <i>Delphinus delphis</i>	Whales & Cetaceans	Species or species habitat may occur within area
Risso's Dolphin <i>Grampus griseus</i>	Whales & Cetaceans	Species or species habitat may occur within area
Indian Ocean Bottle nose Dolphin <i>Tursiops aduncus</i>	Whales & Cetaceans	Species or species habitat likely to occur within area
Bottle nose Dolphin <i>Tursiops truncatus s. str.</i>	Whales & Cetaceans	Species or species habitat may occur within area
New Zealand Fur Seal <i>Arctocephalus forsteri</i>	Listed	Species or species habitat may occur within area
Australian Fur Seal	Listed	Species or species habitat may



<i>Archaeophagus pusillus</i>		occur within area
<b>Reptiles (Marine Turtles)</b>		
Loggerhead Turtle <i>Caretta caretta</i>	Endangered, Migratory, Listed	Breeding likely to occur within area
Green Turtle <i>Chelonia mydas</i>	Vulnerable, Migratory, Listed	Foraging, feeding or related behaviour known to occur within area
Leatherback Turtle <i>Demochelys coriacea</i>	Endangered, Migratory, Listed	Species or species habitat known to occur within area
Hawksbill Turtle <i>Eretmochelys imbricata</i>	Vulnerable, Migratory, Listed	Species or species habitat known to occur within area
<b>Sharks</b>		
Grey Nurse Shark <i>Carcharias taurus</i> (east coast population)	Critically Endangered	Species or species habitat likely to occur within area
Great White Shark <i>Carcharodon carcharias</i>	Vulnerable, Migratory	Species or species habitat known to occur within area
Whale Shark <i>Rhincodon typus</i>	Vulnerable, Migratory	Species or species habitat may occur within area
Porbeagle Shark <i>Lamna nasus</i>	Migratory	Species or species habitat likely to occur within area
<b>Marine Birds</b>		
Fork-tailed Swift <i>Apus pacificus</i>	Migratory, Listed	Species or species habitat likely to occur within area
Antipodean Albatross <i>Diomedea antipodensis</i>	Vulnerable, Migratory, Listed	Foraging, feeding or related behaviour likely to occur within area
Tristan Albatross <i>Diomedea dabbenena</i>	Endangered, Migratory, Listed	Species or species habitat may occur within area
Sooty Tern Royal Albatross <i>Diomedea epomophora</i> (sensu stricto)	Vulnerable, Migratory, Listed	Foraging, feeding or related behaviour likely to occur within area
Wandering Albatross <i>Diomedea exulans</i> (sensu lato)	Vulnerable, Migratory, Listed	Foraging, feeding or related behaviour likely to occur within area
Gibson's Albatross <i>Diomedea gibsoni</i>	Vulnerable, Migratory, Listed	Foraging, feeding or related behaviour likely to occur within area



Northem Royal Albatross <i>Diomedea sanfordi</i>	Endangered, Migratory, Listed	Foraging, feeding or related behaviour likely to occur within area
Southern Giant Petrel <i>Macroneptes giganteus</i>	Endangered, Migratory, Listed	Species or species habitat may occur within area
Northem Giant Petrel <i>Macroneptes halli</i>	Vulnerable, Migratory, Listed	Species or species habitat may occur within area
Sooty Albatross <i>Phoebastria fuscata</i>	Vulnerable, Migratory, Listed	Species or species habitat may occur within area
Flesh-footed Shearwater <i>Puffinus carneipes</i>	Migratory, Listed	Foraging, feeding or related behaviour likely to occur within area
Little Tern <i>Sterna albigrons</i>	Migratory, Listed	Species or species habitat may occur within area
Buller's Albatross <i>Thalassarche bulleri</i>	Vulnerable, Migratory, Listed	Foraging, feeding or related behaviour likely to occur within area
Shy Albatross <i>Thalassarche cauta</i> (sensu stricto)	Vulnerable, Migratory, Listed	Foraging, feeding or related behaviour likely to occur within area
Chatham Albatross <i>Thalassarche eremita</i>	Endangered, Migratory, Listed	Foraging, feeding or related behaviour likely to occur within area
Campbell Albatross <i>Thalassarche impavida</i>	Vulnerable, Migratory, Listed	Species or species habitat may occur within area
Black-browed Albatross <i>Thalassarche melanophrys</i>	Vulnerable, Migratory, Listed	Species or species habitat may occur within area
Salvin's Albatross <i>Thalassarche salvini</i>	Vulnerable, Migratory, Listed	Foraging, feeding or related behaviour likely to occur within area
White-capped Albatross <i>Thalassarche steadi</i>	Vulnerable, Migratory, Listed	Foraging, feeding or related behaviour likely to occur within area
Great Egret <i>Ardea alba</i>	Listed	Species or species habitat known to occur within area
Cattle Egret <i>Ardea ibis</i>	Listed	Species or species habitat likely to occur within area
Great Skua <i>Catharacta skua</i>	Listed	Species or species habitat may occur within area



Latham's Snipe <i>Gallinago hardwickei</i>	Listed	Foraging, feeding or related behaviour may occur within area
Swinhoe's Snipe <i>Gallinago megala</i>	Listed	Foraging, feeding or related behaviour likely to occur within area
Pin-tailed Snipe <i>Gallinago stenura</i>	Listed	Foraging, feeding or related behaviour likely to occur within area
Painted Snipe <i>Rostratula benghalensis</i> (sensu lato)	Listed	Species or species habitat may occur within area
White-bellied Sea Eagle <i>Haliaeetus leucogaster</i>	Listed	Species or species habitat known to occur within area
Blue Petrel <i>Halobaena caerulea</i>	Vulnerable, Listed	Species or species habitat may occur within area
White-throated Needle-tail <i>Hirundapus caudacutus</i>	Listed	Species or species habitat known to occur within area
Swift Parrot <i>Lathamus discolor</i>	Endangered, Listed	Species or species habitat likely to occur within area
Rainbow Bee-eater <i>Merops ornatus</i>	Listed	Species or species habitat may occur within area
Black-faced Monarch <i>Monarcha melanopsis</i>	Listed	Species or species habitat known to occur within area
Satin Flycatcher <i>Myiagra cyaneoleuca</i>	Listed	Species or species habitat known to occur within area
Orange-bellied Parrot <i>Nephelea chrysogaster</i>	Critically Endangered	Species or species habitat may occur within area
Little Curlew <i>Numenius minutus</i>	Listed	Foraging, feeding or related behaviour likely to occur within area
Osprey <i>Pandion haliaetus</i>	Listed	Species or species habitat known to occur within area
Rufous Fantail <i>Rhipidura rufifrons</i>	Listed	Species or species habitat known to occur within area
Hooded Plover <i>Thinomis rubricollis</i>	Listed	Species or species habitat known to occur within area
Hooded Plover (eastern) <i>Thinomis rubricollis rubricollis</i>	Vulnerable, Listed	Species or species habitat known to occur within area





**Appendix 17: Hydrographic mapping and marine mammal risk report – Wave model runs should have also included 100 year ARI which may have more bearing on potential impacts to Cocora Beach and performance of wave attenuator.**

Please refer to the response prepared by Royal Haskoning DHV (2015).

The purpose of the hydrographic mapping study was to provide information on the current condition of the seafloor at the site. While changes to the seafloor and nearby beach profiles may occur in the medium to long term as a result of the wave attenuator, these are expected to be gradual and marine mammals are most likely to be able to adapt to any small changes in local habitat availability over this time frame. It is considered that the immediate impacts of construction and operation are of much more importance.



## 2. RESPONSE TO NSW ENVIRONMENT PROTECTION AUTHORITY

### Water Quality – Construction and Operation Phase:

- No information has been included on the water quality of the receiving waters where the marina will be constructed. Water quality testing is important to establish a baseline by which water quality objectives can be determined. An understanding of the water quality of the receiving waters is essential for predicting and assessing impacts to waters including the quantity and physico-chemical properties of all potential water pollutants and the risks posed to the environment and human health, including the risk to the Water Quality Objectives in the ambient waters using criteria set out in ANZECC (2000).
- The environmental assessment should fully assess the potential water quality impact due to the construction of the marina (including sediment, erosion and stormwater controls and installation techniques to mitigate impacts and to ensure construction operations do not pollute waters).
- The impacts of any specific activities involved in site preparation during the construction phase should be identified and mitigation measures put in place.
- The EIA raises the issue of water pollution from copper ablation and propeller wash disturbing sediments on the seabed. More detail should be included regarding this potential impact in light of ambient water quality information.
- Further information on managing water impacts from Marinas and Boat Repair Facilities can be found in the publications “Environmental Action for Marinas, Boatsheds and Slipways (DECC 2007) and “Best Practice for Marinas and Boat Repair Facilities” (EPA 1999).

It is noted that little information is provided in the EIA or Aquatic Ecology Assessment in regard to marine water quality and the potential impacts during the construction and operation phases of the marina. No site specific water quality data for the site has been undertaken to date. An additional review of background water quality data for Twofold Bay has now been undertaken. An assessment of potential impacts and mitigation measures has also been done. These data and information are presented in a standalone Water Quality Management Plan for the Cattle Bay Marina (Ocean Environmental 2015).

Additional background water quality sampling will be undertaken prior to construction and this data added to the background data section of the Water Quality Management Plan for the Cattle Bay Marina due to the lack of ambient water quality data on all parameters of concern.

A CEMP and OEMP have also been produced by Royal Haskoning DHV (2015) and these documents should also be referred to.



### **3. RESPONSE TO NSW DEPARTMENT OF PRIMARY INDUSTRIES (FISHERIES)**

**Approvals: The proponent must apply for a Part 7 Permit to Harm Marine Vegetation (s.205) under the Fisheries Management Act prior to the commencement of any piling works on site.**

We confirm that an application for a Part 7 Permit to Harm Marine Vegetation will be prepared and submitted to NSW Fisheries once the development plans for the proposed Cattle Bay Marina are finalised and council approval is gained (we note that the permit application cannot be submitted until development approval is obtained).

The permit application will be submitted to NSW Fisheries to allow time for processing and approval before the commencement of any piling works or other activities on site which have the potential to harm marine vegetation.

**An aquatic CEMP is to be developed and provided to NSW Fisheries for comment and approval prior to commencement of any works.**

A CEMP for the Cattle Bay Marina has now been developed and will be submitted to NSW Fisheries for comment and approval prior to any works commencing.

The CEMP includes all mitigation measures pertaining to potential impacts on aquatic ecology and the marine environment as provided in:

- Section 3 of the *Cattle Bay Marina EIS Aquatic Ecology Assessment* (Marine Pollution Research Pty Ltd 2013).
- Section 3.5 of the *Cattle Bay Marina Hydrographic Mapping and Marine Mammal Risk Report* (Ocean Environmental 2014).
- Section 3 of the *Cattle Bay Marina Water Quality Impact Assessment* (Ocean Environmental 2015).
- This report.

**A Hydrographic Survey to adequately delineate aquatic habitats as outlined in the Cattle Bay Marina EIS Aquatic Ecology Assessment (2013) is to be completed and results used to inform the development of the CEMP and OEMP.**

A Hydrographic Survey to provide additional information on aquatic habitats and the delineation of seagrass beds at the site was undertaken in July 2014 (*Cattle Bay Marina Hydrographic Mapping and Marine Mammal Risk Report*, Ocean Environmental 2014). This report should have been submitted to NSW Fisheries along with the Cattle Bay Marina EIS and Aquatic Ecology Assessment.



The information in the *Hydrographic Mapping and Marine Mammal Risk Report* relating to the location of various marine habitats, seagrass beds and potential impacts to marine habitats has been taken into account in the development of the CEMP and OEMP.

**An Introduced Marine Species Management Plan for construction and operation must be developed and provided to Fisheries for comment and approval prior to commencement of any works.**

We confirm that an Introduced Marine Species Management Plan will be developed once approval for the project has been received. This Plan would be provided to Fisheries for comment and approval prior to any works commencing at the site.

**An additional principle that “no relocated moorings are to be placed into or in close proximity to seagrass beds” must be included in the swing mooring relocation plan.**

Royal Haskoning DHV has prepared a Swing Mooring Relocation Plan. The final location of swing moorings will depend on a number of constraints, including environmental factors, such as the location of seagrasses.

There are currently 48 swing moorings located in Snug Cove and it is estimated that around 25 of these would need to be relocated. There are only two locations along the northern shore of Twofold Bay that provide realistic options for relocations. These are Snug Cove and Quarantine Bay. The most likely scenario will be relocation of some selected moorings to nearby areas in Snug Cove, complete removal of any currently vacant moorings and moorings from those who are happy to transfer to marina berths, and movement of some people to vacant moorings in Quarantine Bay (if available).

Seagrass mapping undertaken by NSW I&I, Marine Pollution Research and Ocean Environmental indicate that there are large areas of patchy *Zostera* sp. within Snug Cove and smaller areas of *Posidonia* and *Halophila* close to shore. The 7 m depth contour has been determined to be an approximation of the outer boundary between unvegetated sand and seagrass habitats.

In determining the final areas for mooring relocation seagrass maps would be referred to and all efforts to avoid mapped areas of seagrass would be made. By allocating swing moorings to areas outside the 7 m depth contours seagrass beds should be avoided. However, due to other constraints and the extensive cover of *Zostera* sp. (albeit patchy and sparse) throughout most of Snug Cove, it may not be possible to relocate all moorings away from mapped seagrass beds.

To mitigate this, any relocated moorings would be required to be Seagrass Friendly Moorings. It is expected that even if some moorings are required to be relocated in or near areas of patchy *Zostera* sp. seagrass, the removal of the 25 moorings currently located within these seagrass areas, which have been shown scour the seabed (~200 m<sup>2</sup> per mooring of scoured seabed was measured during the field survey), and replacement with Seagrass Friendly



Moorings, will result in a net benefit to seagrasses here (i.e. if 25 moorings are removed and / or relocated there will be ~5,000 m<sup>2</sup> of seabed which will have the opportunity to be recolonised by seagrasses over time).

Rather than the additional principle suggested by Fisheries, is recommended that the Mooring Relocation Plan include a recommendation as follows:

*“Relocated moorings should avoid areas of mapped seagrass and be placed outside of the 7 m depth contour where possible. To mitigate potential impacts in cases where this is not feasible, all relocated moorings should be Seagrass Friendly Moorings.”*



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## **APPENDIX 1 – EPBC Act Report**



# 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: 16/02/15 17:05:17

[Summary](#)

[Details](#)

[Matters of NES](#)

[Other Matters Protected by the EPBC Act](#)

[Extra Information](#)

[Caveat](#)

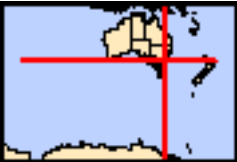
[Acknowledgements](#)



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[Coordinates](#)

[Buffer: 5.0Km](#)



# 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](#).

<a href="#">World Heritage Properties:</a>	None
<a href="#">National Heritage Places:</a>	None
<a href="#">Wetlands of International Importance:</a>	None
<a href="#">Great Barrier Reef Marine Park:</a>	None
<a href="#">Commonwealth Marine Areas:</a>	None
<a href="#">Listed Threatened Ecological Communities:</a>	3
<a href="#">Listed Threatened Species:</a>	53
<a href="#">Listed Migratory Species:</a>	44

## 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 and the heritage values of a place on the Register of the National Estate.

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.

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.

<a href="#">Commonwealth Land:</a>	1
<a href="#">Commonwealth Heritage Places:</a>	None
<a href="#">Listed Marine Species:</a>	72
<a href="#">Whales and Other Cetaceans:</a>	12
<a href="#">Critical Habitats:</a>	None
<a href="#">Commonwealth Reserves Terrestrial:</a>	None
<a href="#">Commonwealth Reserves Marine</a>	None



## Extra Information

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

<a href="#">Place on the RNE:</a>	9
<a href="#">State and Territory Reserves:</a>	5
<a href="#">Regional Forest Agreements:</a>	1
<a href="#">Invasive Species:</a>	40
<a href="#">Nationally Important Wetlands:</a>	1
<a href="#">Key Ecological Features (Marine)</a>	1

## Details

### Matters of National Environmental Significance

#### 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
<a href="#">Littoral Rainforest and Coastal Vine Thickets of Eastern Australia</a>	Critically Endangered	Community likely to occur within area
<a href="#">Lowland Grassy Woodland in the South East Corner Bioregion</a>	Critically Endangered	Community likely to occur within area
<a href="#">Subtropical and Temperate Coastal Saltmarsh</a>	Vulnerable	Community likely to occur within area

#### Listed Threatened Species [\[ Resource Information \]](#)

Name	Status	Type of Presence
Birds		
<a href="#">Anthochaera phrygia</a> Regent Honeyeater [82338]	Endangered	Species or species habitat known to occur within area
<a href="#">Botaurus poiciloptilus</a> Australasian Bittern [1001]	Endangered	Species or species habitat likely to occur within area
<a href="#">Dasyornis brachypterus</a> Eastern Bristlebird [533]	Endangered	Species or species habitat likely to occur within area
<a href="#">Diomedea epomophora epomophora</a> Southern Royal Albatross [25996]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Diomedea epomophora sanfordi</a> Northern Royal Albatross [82331]	Endangered	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Diomedea exulans antipodensis</a> Antipodean Albatross [82269]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Diomedea exulans exulans</a> Tristan Albatross [82337]	Endangered	Species or species

Name	Status	Type of Presence
		habitat may occur within area
<a href="#">Diomedea exulans gibsoni</a> Gibson's Albatross [82271]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Diomedea exulans (sensu lato)</a> Wandering Albatross [1073]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Fregetta grallaria grallaria</a> White-bellied Storm-Petrel (Tasman Sea), White-bellied Storm-Petrel (Australasian) [64438]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Halobaena caerulea</a> Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area
<a href="#">Lathamus discolor</a> Swift Parrot [744]	Endangered	Species or species habitat likely to occur within area
<a href="#">Macronectes giganteus</a> Southern Giant-Petrel [1060]	Endangered	Species or species habitat may occur within area
<a href="#">Macronectes halli</a> Northern Giant-Petrel [1061]	Vulnerable	Species or species habitat may occur within area
<a href="#">Neophema chrysogaster</a> Orange-bellied Parrot [747]	Critically Endangered	Species or species habitat may occur within area
<a href="#">Phoebetria fusca</a> Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
<a href="#">Pterodroma leucoptera leucoptera</a> Gould's Petrel [26033]	Endangered	Species or species habitat may occur within area
<a href="#">Rostratula australis</a> Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area
<a href="#">Sternula nereis nereis</a> Australian Fairy Tern [82950]	Vulnerable	Breeding likely to occur within area
<a href="#">Thalassarche bulleri</a> Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Thalassarche cauta cauta</a> Shy Albatross, Tasmanian Shy Albatross [82345]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Thalassarche cauta salvini</a> Salvin's Albatross [82343]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Thalassarche cauta steadi</a> White-capped Albatross [82344]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Thalassarche eremita</a> Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Thalassarche melanophris</a> Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area

Name	Status	Type of Presence
<a href="#">Thalassarche melanophris impavida</a> Campbell Albatross [82449]	Vulnerable	Species or species habitat may occur within area
<a href="#">Thinornis rubricollis rubricollis</a> Hooded Plover (eastern) [66726]	Vulnerable	Species or species habitat known to occur within area
Fish		
<a href="#">Epinephelus daemeli</a> Black Rockcod, Black Cod, Saddled Rockcod [68449]	Vulnerable	Species or species habitat may occur within area
<a href="#">Prototroctes maraena</a> Australian Grayling [26179]	Vulnerable	Species or species habitat known to occur within area
Frogs		
<a href="#">Heleioporus australiacus</a> Giant Burrowing Frog [1973]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Litoria aurea</a> Green and Golden Bell Frog [1870]	Vulnerable	Species or species habitat may occur within area
<a href="#">Litoria littlejohni</a> Littlejohn's Tree Frog, Heath Frog [64733]	Vulnerable	Species or species habitat may occur within area
Mammals		
<a href="#">Balaenoptera musculus</a> Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
<a href="#">Dasyurus maculatus maculatus (SE mainland population)</a> Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat likely to occur within area
<a href="#">Eubalaena australis</a> Southern Right Whale [40]	Endangered	Breeding likely to occur within area
<a href="#">Isoodon obesulus obesulus</a> Southern Brown Bandicoot (Eastern) [68050]	Endangered	Species or species habitat likely to occur within area
<a href="#">Megaptera novaeangliae</a> Humpback Whale [38]	Vulnerable	Congregation or aggregation known to occur within area
<a href="#">Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)</a> Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Potorous longipes</a> Long-footed Potoroo [217]	Endangered	Species or species habitat likely to occur within area
<a href="#">Potorous tridactylus tridactylus</a> Long-nosed Potoroo (SE mainland) [66645]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Pseudomys fumeus</a> Konoom, Smoky Mouse [88]	Endangered	Species or species habitat likely to occur within area
<a href="#">Pseudomys novaehollandiae</a> New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Pteropus poliocephalus</a> Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour known

Name	Status	Type of Presence
to occur within area		
Plants		
<a href="#">Cryptostylis hunteriana</a> Leafless Tongue-orchid [19533]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Streblus pendulinus</a> Siah's Backbone, Sia's Backbone, Isaac Wood [21618]	Endangered	Species or species habitat likely to occur within area
<a href="#">Thesium australe</a> Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat likely to occur within area
Reptiles		
<a href="#">Caretta caretta</a> Loggerhead Turtle [1763]	Endangered	Breeding likely to occur within area
<a href="#">Chelonia mydas</a> Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
<a href="#">Dermochelys coriacea</a> Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
<a href="#">Eretmochelys imbricata</a> Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Sharks		
<a href="#">Carcharias taurus (east coast population)</a> Grey Nurse Shark (east coast population) [68751]	Critically Endangered	Species or species habitat likely to occur within area
<a href="#">Carcharodon carcharias</a> Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Rhincodon typus</a> Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
Listed Migratory Species		
[ <a href="#">Resource Information</a> ]		
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Migratory Marine Birds		
<a href="#">Apus pacificus</a> Fork-tailed Swift [678]		Species or species habitat likely to occur within area
<a href="#">Diomedea antipodensis</a> Antipodean Albatross [64458]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Diomedea dabbenena</a> Tristan Albatross [66471]	Endangered*	Species or species habitat may occur within area
<a href="#">Diomedea epomophora (sensu stricto)</a> Southern Royal Albatross [1072]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Diomedea exulans (sensu lato)</a> Wandering Albatross [1073]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Diomedea gibsoni</a> Gibson's Albatross [64466]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area



Name	Threatened	Type of Presence
<a href="#">Diomedea sanfordi</a> Northern Royal Albatross [64456]	Endangered*	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Macronectes giganteus</a> Southern Giant-Petrel [1060]	Endangered	Species or species habitat may occur within area
<a href="#">Macronectes halli</a> Northern Giant-Petrel [1061]	Vulnerable	Species or species habitat may occur within area
<a href="#">Phoebetria fusca</a> Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
<a href="#">Puffinus carneipes</a> Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Foraging, feeding or related behaviour likely to occur within area
<a href="#">Sterna albifrons</a> Little Tern [813]		Species or species habitat may occur within area
<a href="#">Thalassarche bulleri</a> Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Thalassarche cauta (sensu stricto)</a> Shy Albatross, Tasmanian Shy Albatross [64697]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Thalassarche eremita</a> Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Thalassarche impavida</a> Campbell Albatross [64459]	Vulnerable*	Species or species habitat may occur within area
<a href="#">Thalassarche melanophris</a> Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
<a href="#">Thalassarche salvini</a> Salvin's Albatross [64463]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Thalassarche steadi</a> White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Migratory Marine Species		
<a href="#">Balaenoptera edeni</a> Bryde's Whale [35]		Species or species habitat may occur within area
<a href="#">Balaenoptera musculus</a> Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
<a href="#">Caperea marginata</a> Pygmy Right Whale [39]		Species or species habitat may occur within area
<a href="#">Carcharodon carcharias</a> Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Caretta caretta</a> Loggerhead Turtle [1763]	Endangered	Breeding likely to occur within area

Name	Threatened	Type of Presence
<a href="#">Chelonia mydas</a> Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
<a href="#">Dermochelys coriacea</a> Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
<a href="#">Eretmochelys imbricata</a> Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Eubalaena australis</a> Southern Right Whale [40]	Endangered	Breeding likely to occur within area
<a href="#">Lagenorhynchus obscurus</a> Dusky Dolphin [43]		Species or species habitat may occur within area
<a href="#">Lamna nasus</a> Porbeagle, Mackerel Shark [83288]		Species or species habitat likely to occur within area
<a href="#">Megaptera novaeangliae</a> Humpback Whale [38]	Vulnerable	Congregation or aggregation known to occur within area
<a href="#">Orcinus orca</a> Killer Whale, Orca [46]		Species or species habitat may occur within area
<a href="#">Rhincodon typus</a> Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
Migratory Terrestrial Species		
<a href="#">Haliaeetus leucogaster</a> White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
<a href="#">Hirundapus caudacutus</a> White-throated Needletail [682]		Species or species habitat known to occur within area
<a href="#">Merops ornatus</a> Rainbow Bee-eater [670]		Species or species habitat may occur within area
<a href="#">Monarcha melanopsis</a> Black-faced Monarch [609]		Species or species habitat known to occur within area
<a href="#">Myiagra cyanoleuca</a> Satin Flycatcher [612]		Species or species habitat known to occur within area
<a href="#">Rhipidura rufifrons</a> Rufous Fantail [592]		Species or species habitat known to occur within area
Migratory Wetlands Species		
<a href="#">Ardea alba</a> Great Egret, White Egret [59541]		Species or species habitat known to occur within area
<a href="#">Ardea ibis</a> Cattle Egret [59542]		Species or species habitat likely to occur within area
<a href="#">Gallinago hardwickii</a> Latham's Snipe, Japanese Snipe [863]		Foraging, feeding or related behaviour may occur within area



Name	Threatened	Type of Presence
<a href="#">Numenius minutus</a> Little Curlew, Little Whimbrel [848]		Foraging, feeding or related behaviour likely to occur within area
<a href="#">Rostratula benghalensis (sensu lato)</a> Painted Snipe [889]	Endangered*	Species or species habitat may occur within area

### Other Matters Protected by the EPBC Act

Commonwealth Land	<a href="#">[ Resource Information ]</a>
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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 -

Listed Marine Species	<a href="#">[ Resource Information ]</a>
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\* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
<a href="#">Apus pacificus</a> Fork-tailed Swift [678]		Species or species habitat likely to occur within area
<a href="#">Ardea alba</a> Great Egret, White Egret [59541]		Species or species habitat known to occur within area
<a href="#">Ardea ibis</a> Cattle Egret [59542]		Species or species habitat likely to occur within area
<a href="#">Catharacta skua</a> Great Skua [59472]		Species or species habitat may occur within area
<a href="#">Diomedea antipodensis</a> Antipodean Albatross [64458]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Diomedea dabbenena</a> Tristan Albatross [66471]	Endangered*	Species or species habitat may occur within area
<a href="#">Diomedea epomophora (sensu stricto)</a> Southern Royal Albatross [1072]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Diomedea exulans (sensu lato)</a> Wandering Albatross [1073]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Diomedea gibsoni</a> Gibson's Albatross [64466]	Vulnerable*	Foraging, feeding or related behaviour likely

Name	Threatened	Type of Presence
		to occur within area
<a href="#">Diomedea sanfordi</a> Northern Royal Albatross [64456]	Endangered*	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Gallinago hardwickii</a> Latham's Snipe, Japanese Snipe [863]		Foraging, feeding or related behaviour may occur within area
<a href="#">Gallinago megala</a> Swinhoe's Snipe [864]		Foraging, feeding or related behaviour likely to occur within area
<a href="#">Gallinago stenura</a> Pin-tailed Snipe [841]		Foraging, feeding or related behaviour likely to occur within area
<a href="#">Haliaeetus leucogaster</a> White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
<a href="#">Halobaena caerulea</a> Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area
<a href="#">Hirundapus caudacutus</a> White-throated Needletail [682]		Species or species habitat known to occur within area
<a href="#">Lathamus discolor</a> Swift Parrot [744]	Endangered	Species or species habitat likely to occur within area
<a href="#">Macronectes giganteus</a> Southern Giant-Petrel [1060]	Endangered	Species or species habitat may occur within area
<a href="#">Macronectes halli</a> Northern Giant-Petrel [1061]	Vulnerable	Species or species habitat may occur within area
<a href="#">Merops ornatus</a> Rainbow Bee-eater [670]		Species or species habitat may occur within area
<a href="#">Monarcha melanopsis</a> Black-faced Monarch [609]		Species or species habitat known to occur within area
<a href="#">Myiagra cyanoleuca</a> Satin Flycatcher [612]		Species or species habitat known to occur within area
<a href="#">Neophema chrysogaster</a> Orange-bellied Parrot [747]	Critically Endangered	Species or species habitat may occur within area
<a href="#">Numenius minutus</a> Little Curlew, Little Whimbrel [848]		Foraging, feeding or related behaviour likely to occur within area
<a href="#">Pandion haliaetus</a> Osprey [952]		Species or species habitat known to occur within area
<a href="#">Phoebetria fusca</a> Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
<a href="#">Puffinus carneipes</a> Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Foraging, feeding or related behaviour likely to occur within area

Name	Threatened	Type of Presence
<a href="#">Rhipidura rufifrons</a> Rufous Fantail [592]		Species or species habitat known to occur within area
<a href="#">Rostratula benghalensis (sensu lato)</a> Painted Snipe [889]	Endangered*	Species or species habitat may occur within area
<a href="#">Sterna albifrons</a> Little Tern [813]		Species or species habitat may occur within area
<a href="#">Thalassarche bulleri</a> Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Thalassarche cauta (sensu stricto)</a> Shy Albatross, Tasmanian Shy Albatross [64697]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Thalassarche eremita</a> Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Thalassarche impavida</a> Campbell Albatross [64459]	Vulnerable*	Species or species habitat may occur within area
<a href="#">Thalassarche melanophris</a> Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
<a href="#">Thalassarche salvini</a> Salvin's Albatross [64463]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Thalassarche steadi</a> White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Thinornis rubricollis</a> Hooded Plover [59510]		Species or species habitat known to occur within area
<a href="#">Thinornis rubricollis rubricollis</a> Hooded Plover (eastern) [66726]	Vulnerable	Species or species habitat known to occur within area
Fish		
<a href="#">Heraldia nocturna</a> Upside-down Pipefish, Eastern Upside-down Pipefish, Eastern Upside-down Pipefish [66227]		Species or species habitat may occur within area
<a href="#">Hippocampus abdominalis</a> Big-belly Seahorse, Eastern Potbelly Seahorse, New Zealand Potbelly Seahorse [66233]		Species or species habitat may occur within area
<a href="#">Hippocampus breviceps</a> Short-head Seahorse, Short-snouted Seahorse [66235]		Species or species habitat may occur within area
<a href="#">Hippocampus minotaur</a> Bullneck Seahorse [66705]		Species or species habitat may occur within area
<a href="#">Hippocampus whitei</a> White's Seahorse, Crowned Seahorse, Sydney Seahorse [66240]		Species or species habitat may occur within area
<a href="#">Histiogamphelus briggsii</a> Crested Pipefish, Briggs' Crested Pipefish, Briggs' Pipefish [66242]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
<a href="#">Histiogamphelus cristatus</a> Rhino Pipefish, Macleay's Crested Pipefish, Ring-back Pipefish [66243]		Species or species habitat may occur within area
<a href="#">Hypselognathus rostratus</a> Knifesnout Pipefish, Knife-snouted Pipefish [66245]		Species or species habitat may occur within area
<a href="#">Kaupus costatus</a> Deepbody Pipefish, Deep-bodied Pipefish [66246]		Species or species habitat may occur within area
<a href="#">Kimblaeus bassensis</a> Trawl Pipefish, Bass Strait Pipefish [66247]		Species or species habitat may occur within area
<a href="#">Leptoichthys fistularius</a> Brushtail Pipefish [66248]		Species or species habitat may occur within area
<a href="#">Lissocampus runa</a> Javelin Pipefish [66251]		Species or species habitat may occur within area
<a href="#">Maroubra perserrata</a> Sawtooth Pipefish [66252]		Species or species habitat may occur within area
<a href="#">Mitotichthys semistriatus</a> Halfbanded Pipefish [66261]		Species or species habitat may occur within area
<a href="#">Mitotichthys tuckeri</a> Tucker's Pipefish [66262]		Species or species habitat may occur within area
<a href="#">Notiocampus ruber</a> Red Pipefish [66265]		Species or species habitat may occur within area
<a href="#">Phyllopteryx taeniolatus</a> Common Seadragon, Weedy Seadragon [66268]		Species or species habitat may occur within area
<a href="#">Solegnathus robustus</a> Robust Pipehorse, Robust Spiny Pipehorse [66274]		Species or species habitat may occur within area
<a href="#">Solegnathus spinosissimus</a> Spiny Pipehorse, Australian Spiny Pipehorse [66275]		Species or species habitat may occur within area
<a href="#">Stigmatopora argus</a> Spotted Pipefish, Gulf Pipefish [66276]		Species or species habitat may occur within area
<a href="#">Stigmatopora nigra</a> Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area
<a href="#">Stipecampus cristatus</a> Ringback Pipefish, Ring-backed Pipefish [66278]		Species or species habitat may occur within area
<a href="#">Syngnathoides biaculeatus</a> Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
<a href="#">Urocampus carinirostris</a> Hairy Pipefish [66282]		Species or species habitat may occur within area



Name	Threatened	Type of Presence
<a href="#">Vanacampus margaritifer</a> Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area
<a href="#">Vanacampus phillipi</a> Port Phillip Pipefish [66284]		Species or species habitat may occur within area
<a href="#">Vanacampus poecilolaemus</a> Longsnout Pipefish, Australian Long-snout Pipefish, Long-snouted Pipefish [66285]		Species or species habitat may occur within area
Mammals		
<a href="#">Arctocephalus forsteri</a> New Zealand Fur-seal [20]		Species or species habitat may occur within area
<a href="#">Arctocephalus pusillus</a> Australian Fur-seal, Australo-African Fur-seal [21]		Species or species habitat may occur within area
Reptiles		
<a href="#">Caretta caretta</a> Loggerhead Turtle [1763]	Endangered	Breeding likely to occur within area
<a href="#">Chelonia mydas</a> Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
<a href="#">Dermochelys coriacea</a> Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
<a href="#">Eretmochelys imbricata</a> Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Whales and other Cetaceans		[ <a href="#">Resource Information</a> ]
Name	Status	Type of Presence
Mammals		
<a href="#">Balaenoptera acutorostrata</a> Minke Whale [33]		Species or species habitat may occur within area
<a href="#">Balaenoptera edeni</a> Bryde's Whale [35]		Species or species habitat may occur within area
<a href="#">Balaenoptera musculus</a> Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
<a href="#">Caperea marginata</a> Pygmy Right Whale [39]		Species or species habitat may occur within area
<a href="#">Delphinus delphis</a> Common Dophin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
<a href="#">Eubalaena australis</a> Southern Right Whale [40]	Endangered	Breeding likely to occur within area
<a href="#">Grampus griseus</a> Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
<a href="#">Lagenorhynchus obscurus</a> Dusky Dolphin [43]		Species or species habitat may occur within area

Name	Status	Type of Presence
<a href="#">Megaptera novaeangliae</a> Humpback Whale [38]	Vulnerable	Congregation or aggregation known to occur within area
<a href="#">Orcinus orca</a> Killer Whale, Orca [46]		Species or species habitat may occur within area
<a href="#">Tursiops aduncus</a> Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area
<a href="#">Tursiops truncatus s. str.</a> Bottlenose Dolphin [68417]		Species or species habitat may occur within area

Extra Information

Places on the RNE	<a href="#">[ Resource Information ]</a>
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Note that not all Indigenous sites may be listed.

Name	State	Status
Natural		
<a href="#">Bell Bird Creek Nature Reserve</a>	NSW	Registered
<a href="#">Ben Boyd National Park</a>	NSW	Registered
<a href="#">Eden Geological Site</a>	NSW	Registered
Historic		
<a href="#">East Boyd Bay Area</a>	NSW	Indicative Place
<a href="#">Post Office (former)</a>	NSW	Indicative Place
<a href="#">Boydtown Group</a>	NSW	Registered
<a href="#">Church Ruins</a>	NSW	Registered
<a href="#">Eden Courthouse</a>	NSW	Registered
<a href="#">Sea Horse Inn</a>	NSW	Registered

State and Territory Reserves	<a href="#">[ Resource Information ]</a>
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Name	State
Bell Bird Creek	NSW
Ben Boyd	NSW
Eagles Claw	NSW
Eden Region	NSW
FMA's in EDEN	NSW

Regional Forest Agreements	<a href="#">[ Resource Information ]</a>
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Note that all areas with completed RFAs have been included.

Name	State
<a href="#">Eden RFA</a>	New South Wales

Invasive Species	<a href="#">[ Resource Information ]</a>
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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		
<a href="#">Alauda arvensis</a> Skylark [656]		Species or species habitat likely to occur within area
<a href="#">Anas platyrhynchos</a> Mallard [974]		Species or species habitat likely to occur



Name	Status	Type of Presence
		within area
<a href="#">Carduelis carduelis</a> European Goldfinch [403]		Species or species habitat likely to occur within area
<a href="#">Carduelis chloris</a> European Greenfinch [404]		Species or species habitat likely to occur within area
<a href="#">Columba livia</a> Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
<a href="#">Passer domesticus</a> House Sparrow [405]		Species or species habitat likely to occur within area
<a href="#">Streptopelia chinensis</a> Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
<a href="#">Sturnus vulgaris</a> Common Starling [389]		Species or species habitat likely to occur within area
<a href="#">Turdus merula</a> Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
Mammals		
<a href="#">Bos taurus</a> Domestic Cattle [16]		Species or species habitat likely to occur within area
<a href="#">Canis lupus familiaris</a> Domestic Dog [82654]		Species or species habitat likely to occur within area
<a href="#">Felis catus</a> Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
<a href="#">Feral deer</a> Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
<a href="#">Lepus capensis</a> Brown Hare [127]		Species or species habitat likely to occur within area
<a href="#">Mus musculus</a> House Mouse [120]		Species or species habitat likely to occur within area
<a href="#">Oryctolagus cuniculus</a> Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
<a href="#">Rattus norvegicus</a> Brown Rat, Norway Rat [83]		Species or species habitat likely to occur within area
<a href="#">Rattus rattus</a> Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
<a href="#">Sus scrofa</a> Pig [6]		Species or species habitat likely to occur within area
<a href="#">Vulpes vulpes</a> Red Fox, Fox [18]		Species or species habitat likely to occur

Name	Status	Type of Presence
		within area
Plants		
<a href="#">Anredera cordifolia</a> 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
<a href="#">Asparagus aethiopicus</a> Asparagus Fern, Ground Asparagus, Basket Fern, Sprengi's Fern, Bushy Asparagus, Emerald Asparagus [62425]		Species or species habitat likely to occur within area
<a href="#">Asparagus asparagoides</a> Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
<a href="#">Asparagus plumosus</a> Climbing Asparagus-fern [48993]		Species or species habitat likely to occur within area
<a href="#">Asparagus scandens</a> Asparagus Fern, Climbing Asparagus Fern [23255]		Species or species habitat likely to occur within area
<a href="#">Chrysanthemoides monilifera subsp. monilifera</a> Boneseed [16905]		Species or species habitat likely to occur within area
<a href="#">Chrysanthemoides monilifera subsp. rotundata</a> Bitou Bush [16332]		Species or species habitat likely to occur within area
<a href="#">Cytisus scoparius</a> Broom, English Broom, Scotch Broom, Common Broom, Scottish Broom, Spanish Broom [5934]		Species or species habitat likely to occur within area
<a href="#">Genista monspessulana</a> Montpellier Broom, Cape Broom, Canary Broom, Common Broom, French Broom, Soft Broom [20126]		Species or species habitat likely to occur within area
<a href="#">Lantana camara</a> Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]		Species or species habitat likely to occur within area
<a href="#">Nassella neesiana</a> Chilean Needle grass [67699]		Species or species habitat may occur within area
<a href="#">Nassella trichotoma</a> Serrated Tussock, Yass River Tussock, Yass Tussock, Nassella Tussock (NZ) [18884]		Species or species habitat likely to occur within area
<a href="#">Opuntia spp.</a> Prickly Pears [82753]		Species or species habitat likely to occur within area
<a href="#">Pinus radiata</a> Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
<a href="#">Protasparagus plumosus</a> Climbing Asparagus-fern, Ferny Asparagus [11747]		Species or species habitat likely to occur within area
<a href="#">Rubus fruticosus aggregate</a> Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
<a href="#">Salix spp. except S.babylonica, S.x calodendron &amp; S.x reichardtii</a> Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
<a href="#">Salvinia molesta</a> Salvinia, Giant Salvinia, Aquarium Watermoss,		Species or species

Name	Status	Type of Presence
Kariba Weed [13665]		habitat likely to occur within area
<a href="#">Senecio madagascariensis</a>		
Fireweed, Madagascar Ragwort, Madagascar Groundsel [2624]		Species or species habitat likely to occur within area
<a href="#">Ulex europaeus</a>		
Gorse, Furze [7693]		Species or species habitat likely to occur within area

Nationally Important Wetlands		[ Resource Information ]
Name	State	
<a href="#">Twofold Bay</a>	NSW	

Key Ecological Features (Marine)	[ Resource Information ]
Key Ecological Features are the parts of the marine ecosystem that are considered to be important for the biodiversity or ecosystem functioning and integrity of the Commonwealth Marine Area.	

Name	Region
Upwelling East of Eden	South-east

# Coordinates

-37.06981 149.9021

## 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 Heritage and Register of National Estate properties, Wetlands of International 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.

For species where the distributions are well known, maps are digitised from sources such as recovery plans and detailed habitat studies. Where appropriate, core breeding, foraging and roosting areas are indicated under 'type of presence'. For species whose distributions are less well known, point locations are collated from government wildlife authorities, museums, and non-government organisations; bioclimatic distribution models are generated and these validated by experts. In some cases, the distribution maps are based solely on expert knowledge.

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.

# 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:

- [-Department of Environment, Climate Change and Water, New South Wales](#)
- [-Department of Sustainability and Environment, Victoria](#)
- [-Department of Primary Industries, Parks, Water and Environment, Tasmania](#)
- [-Department of Environment and Natural Resources, South Australia](#)
- [-Parks and Wildlife Service NT, NT Dept of Natural Resources, Environment and the Arts](#)
- [-Environmental and Resource Management, Queensland](#)
- [-Department of Environment and Conservation, Western Australia](#)
- [-Department of the Environment, Climate Change, Energy and Water](#)
- [-Birds Australia](#)
- [-Australian Bird and Bat Banding Scheme](#)
- [-Australian National Wildlife Collection](#)
- Natural history museums of Australia
- [-Museum Victoria](#)
- [-Australian Museum](#)
- [-SA 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, Atherton and Canberra](#)
- [-University of New England](#)
- [-Ocean Biogeographic Information System](#)
- [-Australian Government, Department of Defence](#)
- [-State Forests of NSW](#)
- [-Geoscience Australia](#)
- [-CSIRO](#)
- 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.