

MARINE FAUNA MANAGEMENT PLAN

Koombana Bay Marine Structures, Bunbury



AU213001693.005
Rev 1
28 March 2023

REPORT

Document status

Version	Purpose of document	Authored by	Reviewed by	Approved by	Review date
Draft A	Draft for internal review	TesMcG	TamAl-H	NA	07/05/2019
Draft B	Draft for client review	RhiWar	JerFit / GilGla	NA	09/05/2022
Rev 0	Final for issue	RhiWar	GilGla	GilGla	04/07/2022
Rev 1	Final for issue	GilGla	GilGla	GilGla	22/03/2023

Approval for issue

G. Glasson

28 March 2023

This report was prepared by RPS within the terms of RPS' engagement with its client and in direct response to a scope of services. This report is supplied for the sole and specific purpose for use by RPS' client. The report does not account for any changes relating the subject matter of the report, or any legislative or regulatory changes that have occurred since the report was produced and that may affect the report. RPS does not accept any responsibility or liability for loss whatsoever to any third party caused by, related to or arising out of any use or reliance on the report.

Prepared by:

RPS

Dr Rhianne Ward
Senior Marine Scientist

Level 3, 500 Hay Street
Subiaco, WA 6008

T +61 8 9211 1111
E rhianne.ward@rpsgroup.com.au

Prepared for:

South West Development Commission

Ashley Clements
Director Regional Development – Infrastructure and
Land

9th Floor, 61 Victoria Street
Bunbury WA 6230

T (08) 9792 2000
E ashley.clements@swdc.wa.gov.au

Contents

EXECUTIVE SUMMARY	1
1 INTRODUCTION	2
2 SCOPE AND RATIONALE	5
2.1 Environmental scoping document requirements	5
2.2 Receiving environment.....	5
2.2.1 Database searches	5
2.2.2 Fish, marine invertebrates and fisheries.....	7
2.2.3 Marine reptiles	12
2.2.4 Marine mammals	12
2.2.5 Seabirds and shorebirds	18
2.3 Summary of key marine fauna values.....	23
2.4 Key construction and operation elements.....	24
2.5 Relationships to other plans	24
2.6 Rationale and approach	24
2.6.1 Environmental objectives	24
2.6.2 Previous surveys and studies	25
2.6.3 Key assumptions and uncertainties	26
2.7 Objective-based – risk-based approach	26
2.7.1 Key potential impacts.....	26
2.7.2 Rationale for choice of management and mitigation measures	30
3 MFMP KEY COMPONENTS	32
4 ADAPTIVE MANAGEMENT AND REVIEW	38
5 STAKEHOLDER CONSULTATION	39
6 MFMP AMENDMENTS	40
7 REFERENCES	41

Tables

Table 1: Summary of the KBMS strategic proposal	2
Table 2: Identified future proposal description and elements	2
Table 3: KBMS strategic proposal ESD requirements	5
Table 4: Conservation significant fish potentially found within and proximate to the KBMS strategic proposal.....	7
Table 5: Average catch rates of target juvenile target fish species between 1993 and 2008 using 61 m and 21 m nets only.....	11
Table 6: Conservation significant marine reptiles potentially found within or proximate to the KBMS strategic proposal.....	12
Table 7: Conservation significant cetacean species potentially found within or proximate to the KBMS strategic proposal.....	14
Table 8: Protected or listed seabirds potentially found within the proposal area.....	18
Table 9: Summary of key marine fauna values, their conservation significance and sensitivity within or proximate to the KBMS strategic proposal	23
Table 10: Magnitude of change expected time frame for mitigation for each potential impact arising from construction and operation of the KBMS strategic proposal.....	30
Table 11: Management and mitigation measures for potential impacts from temporary / permanent loss or degradation of habitat.....	32

REPORT

Table 12:	Management and mitigation measures for potential for impacts from elevated underwater noise	32
Table 13:	Management and mitigation measures for potential impacts from increased vessel collision risk	33
Table 14:	Management and mitigation measures for potential impacts from increased risk of entanglement.....	33
Table 15:	Management and mitigation measures for potential impacts from increased risk of entrainment	34
Table 16:	Management and mitigation measures for potential impacts from increased risk of introduced marine species	34
Table 17:	Management and mitigation measures for potential impacts from increased risk of pollution incidents.....	35
Table 18:	Management and mitigation measures for potential impacts from increased light emissions	35
Table 19:	Management and mitigation measures for potential impacts from elevated onshore noise.....	36
Table 20:	Management and mitigation measures for potential impacts from increased recreational fishing pressure	36
Table 21:	Management and mitigation measures for potential impacts from increase in human - fauna interactions	37
Table 22:	Stakeholder engagement relating to marine fauna	39
Table 23:	Record of MFMP amendments	40

Figures

Figure 1:	KBMS strategic proposal.....	4
Figure 2:	DBCAs Threatened and priority fauna database results for marine fauna and shorebirds	6
Figure 3:	Koombana Bay boat ramps and artificial reef	9
Figure 4:	Southern right whale, blue whale and humpback whale BIAs	13
Figure 5:	Sea and shore bird BIAs	21
Figure 6:	Fairy tern nesting sites	22

Appendices

- Appendix A: Protected matters report
- Appendix B: NatureMap Search

EXECUTIVE SUMMARY

Proposal name	Koombana Bay Marine Structures
Proponent name	South West Development Commission
Marine Fauna Management Plan purpose	Consistent with the Environmental Protection Authority's (EPA) Environmental Scoping Document (EPA 2015) the purpose of this Marine Fauna Management Plan (MFMP) is to identify and detail the measures the future proposal proponents will implement during construction and operation of the future proposals to manage and mitigate potential impacts to marine fauna to demonstrate and ensure that the EPA's objective for marine fauna and proposed KBMS strategic proposal environmental objectives are capable of being met
Environmental Protection Authority (EPA) Marine Fauna objective	To protect marine fauna so that biological diversity and ecological integrity are maintained
Koombana Bay Marine Structures environmental objectives	<ol style="list-style-type: none"> 1. Maintain extent of potential marine fauna habitat outside of the development envelopes 2. Continuity of existing dolphin behaviours and use of Koombana Bay 3. Maintain blue swimmer crab and fin fish fisheries 4. Continuity of fairy tern nesting opportunity within Koombana Bay 5. Continuity of existing little penguin use of Koombana Bay
Impact specific objectives	<ul style="list-style-type: none"> • Minimise the modification / loss of habitat during construction that may lead to direct or indirect effects on marine fauna during construction • Reduce the risk of injury to marine fauna resulting from underwater water noise during piling • Reduce the risk of injury or death to marine fauna arising from collisions with vessels during construction and operation • Reduce the risk of entanglement arising from marine debris associated with construction and operation • Reduce the risk of entrainment arising during dredging • Reduce the elevated risk of introduced species becoming established during construction and operation • Reduce the risk of adverse effects on marine fauna from hydrocarbon and chemical spills during construction and operation • Reduce artificial light emissions affecting the marine environment during construction and operation in line with Commonwealth guidance • Reduce the risk of displacement of breeding seabirds and shorebirds from elevated onshore noise during construction and operation • Reduce the risk of increased recreational fishing pressure leading to a decline in local fisheries target species during operation • Reduce the risk of human - fauna interactions associated with an increase in public access to the waterfront from land-based pedestrian access and an increase in recreational vessels during operation
Condition clauses (if applicable)	N/A
Key components or legal requirements of the MFMP	See Table 11 to Table 21
Proposed construction date	Construction dates and time frames for the future proposals are yet to be determined
MFMP required pre-construction?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>

1 INTRODUCTION

The South West Development Commission (SWDC) is the proponent for the Koombana Bay Marine Structures (KBMS) strategic proposal.

The KBMS proposal was referred to the Environment Protection Authority (EPA) on 24 March 2015 under Section 38 of the *Environment Protection Act 1986* (EP Act). The EPA determined the KBMS proposal required assessment at the level of “Strategic Proposal (Public Environmental Review” or SPER) primarily because this proposal identified that the three future proposals may individually, or in combination, have a significant impact on the environment. The EPA approved an Environmental Scoping Document (ESD) for the KBMS strategic proposal on 26 June 2015.

The KBMS strategic proposal is located within the City of Bunbury, about 174 kilometres (km) south of Perth, Western Australia. The marine structures subject to the KBMS strategic proposal are situated within Koombana Bay which neighbours the Bunbury Central Business District and the Marlston North residential and waterfront developments. Figure 1 illustrates the indicative KBMS strategic proposal.

An overarching summary of the KBMS strategic proposal is provided in Table 1.

Table 1: Summary of the KBMS strategic proposal

Proposal title	Koombana Bay Marine Structures
Proponent name	South West Development Commission
Brief description	<p>The KBMS strategic proposal is for the construction and operation of small craft marine infrastructure in Bunbury, south-west Western Australia. The proposed marine infrastructure includes construction and operation of jetties, boat ramps and boat pens</p> <p>The identified future proposals under the strategic proposal for the construction and operation of:</p> <ul style="list-style-type: none"> • Casuarina Boat Harbour • Koombana Bay Sailing Club marina • Dolphin Discovery Centre finger jetty. <p>The construction of the future proposals will be undertaken in stages. The marine infrastructure is located adjacent to, or proximate to existing infrastructure in Koombana Bay, Bunbury</p>

A description and identification of the elements for each future proposal in provided in Table 2.

Table 2: Identified future proposal description and elements

Casuarina Boat Harbour

This future proposal includes a dredging and dredge spoil disposal component, a piling component, land reclamation and construction of a breakwater and revetment walls. The marine infrastructure includes the construction and operation of floating jetties, boat ramps and boat pens

Proposal element	Location / description	Maximum extent, capacity or range
Physical elements		
Development envelope	Figure 1	Up to 40 ha
(Indicative) Casuarina Boat Harbour disturbance footprint		Up to 32 ha within indicative disturbance footprint
Breakwater		Up to 3.5 ha within indicative disturbance footprint
Reclamation		Up to 3.5 ha within indicative disturbance footprint
Marine infrastructure		Floating jetties, boat ramps and boat pens to be located within indicative disturbance footprint

KBSC marina

This future proposal includes a dredging component, a piling component, land reclamation (including onshore dredge spoil disposal) and construction of two breakwaters. The marine infrastructure includes the construction and operation of floating jetties, boat ramps and boat pens

Proposal element	Location / description	Maximum extent, capacity or range
Physical elements		
Development envelope	Figure 1	Up to 16 ha
(Indicative) KBSC marina disturbance footprint		Up to 10 ha within indicative disturbance footprint
Breakwaters		Up to 2.5 ha within indicative disturbance footprint
Reclamation		Up to 2 ha within indicative disturbance footprint
Marine infrastructure		Floating jetties, boat ramps and boat pens to be located within indicative disturbance footprint

DDC finger jetty

This future proposal includes a finger jetty, a piling component and a temporary onshore construction laydown area

Proposal element	Location / description	Maximum extent, capacity or range
Physical elements		
Development envelope	Figure 1	Up to 0.5 ha
(Indicative) DDC jetty indicative disturbance footprint		Up to 0.15 ha within indicative disturbance footprint
Marine infrastructure		Jetty up to 110 metres long

Other elements which affect extent of effects on the environment

Proposal time	Maximum project life	100 years
	Construction phase	Construction time frames yet to be determined
	Operations phase	100 years



Figure 1: KBMS strategic proposal

2 SCOPE AND RATIONALE

This Marine Fauna Management Plan (MFMP) identifies and details the measures the future proposal proponents will implement during construction and operation of the future proposals to manage and mitigate potential impacts to marine fauna to demonstrate and ensure that the EPA's objective for marine fauna and proposed KBMS strategic proposal environmental objectives are capable of being met.

This MFMP details an objective-based monitoring and management framework and has been prepared to accord with the EPA's Instructions on how to prepare EP Act Part IV Environmental Management Plans (EPA 2021a).

2.1 Environmental scoping document requirements

This MFMP was specifically prepared to address the relevant ESD (EPA 2015) requirements for the KBMS strategic proposal (Table 3).

Table 3: KBMS strategic proposal ESD requirements

Marine fauna required work	Relevant section
7. Identify management and mitigation measures for each of the future proposals to demonstrate that the EPA's objectives for marine fauna can be met and to ensure residual impacts are not greater than predicted. This is to include management and monitoring protocols for introduced marine organisms during construction and operation and protocols to reduce the impacts to marine fauna during construction and operation	Section 4
8. Include a MFMP which details the monitoring and management that will apply during and after construction to demonstrate and ensure that residual impacts to marine fauna are not greater than predicted	This MFMP

2.2 Receiving environment

2.2.1 Database searches

A search of Department of Climate Change, Energy, the Environment and Water's (DCCEEW) Protected Matters Search Tool (PMST) was undertaken using a circular search area within a 5 km radius of the KBMS strategic proposal was undertaken on 6 December 2021 to determine a list of marine fauna Matters of National Environmental Significance that are either known or likely to occur proximate to the proposal. A search of the Department of Biodiversity, Conservation and Attraction's (DBCA) NatureMap database, using a circle search within a 5 km radius of 115° 38' 40" E, 33° 18' 53" S was also undertaken to determine a list of marine fauna species that have been recorded within 5 km of the KBMS strategic proposal. A search of the DBCA's Threatened and priority fauna database, using a circle search within a 5 km radius of 115° 38' 40" E, 33° 18' 53" S, was also undertaken. The conservation significant marine fauna and shorebird species which have been recorded within 5 km of the KBMS strategic proposal are presented in Figure 2. The NatureMap and DBCA databases contain point records of where a particular species has been identified (i.e. a known occurrence).

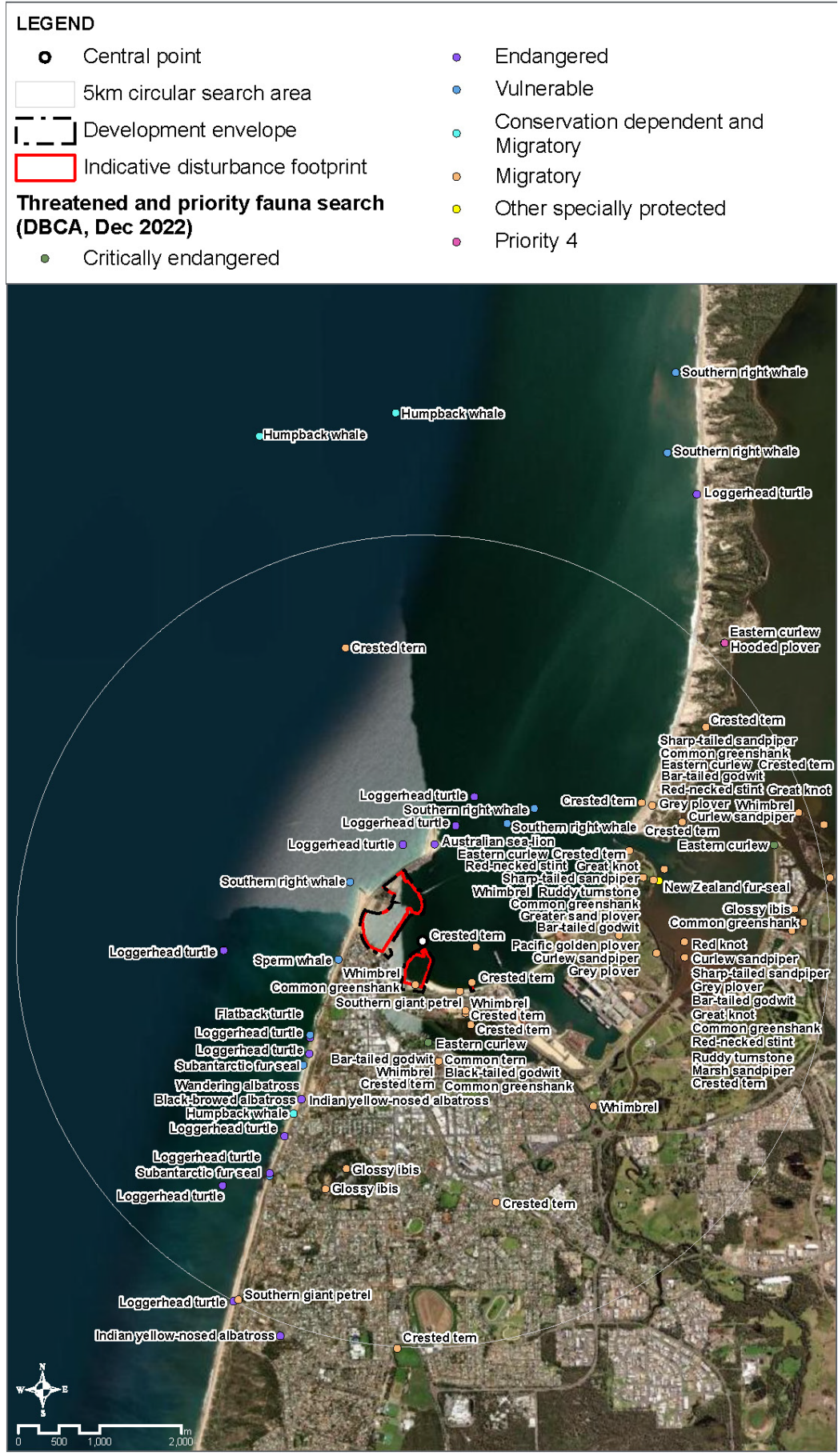


Figure 2: DBCA Threatened and priority fauna database results for marine fauna and shorebirds

2.2.2 Fish, marine invertebrates and fisheries

2.2.2.1 Fish and marine invertebrates

The key findings of the DCCEE PMST and the DBCA NatureMap and Threatened and priority fauna searches relevant to fish are shown in Table 4. There were no threatened marine invertebrates identified by either database, however blue swimmer crabs have been included in this assessment due to their importance to the local fishery industry.

Table 4: Conservation significant fish potentially found within and proximate to the KBMS strategic proposal

Common name	Scientific name	EPBC Act status			BC Act	
		Listed threatened	Listed migratory	Conservation dependent	Status	Record (yes/no)
Great white shark	<i>Carcharodon carcharias</i>	VU	✓	-	VU	No
Grey nurse shark (west coast population)	<i>Carcharias taurus</i>	VU	-	-	VU	No
School shark, eastern school shark, snapper shark, tope, soupfin shark	<i>Galeorhinus galeus</i>	-	-	✓	-	No
Reef manta ray	<i>Mobula alfredi</i>	-	✓	-	-	No
Oceanic (giant) manta ray	<i>Mobula birostris</i>	-	✓	-	-	No
Whale shark	<i>Rhincodon typus</i>	VU	✓	-	Other specially protected fauna	No
Scalloped hammerhead	<i>Sphyrna lewini</i>	-	-	✓	-	No
Southern bluefin tuna	<i>Thunnus maccoyii</i>	-	-	✓	-	No

Note 'VU': Vulnerable.

2.2.2.1.1 Southern bluefin tuna

Southern bluefin tuna have a broad distribution surrounding Australia. In summer months, adults spawn in the north-east Indian Ocean and then post-larval fish are dispersed southwards along the coast of Western Australia (Fujioka et al. 2012). It is thought that southern bluefin tuna arriving on the south-west coast are migrating through towards nursery grounds on the shelf in the Great Australian Bight (Fujioka et al. 2012). Therefore, since southern blue fin tuna are more concentrated along the southern coast, and being a highly mobile pelagic species, it is highly unlikely they would be present within or proximate to the KBMS strategic proposal.

2.2.2.1.2 Scalloped hammerhead

The scalloped hammerhead is a coastal and semi-oceanic species found in warm temperate and tropical waters. Although they have a distribution that spans most of Western Australia's coastline (from the Timor Sea to the south-west cape), they are rarely found south of the Abrolhos Islands (DBCA 2019) and, are therefore, highly unlikely to be present within or proximate to the KBMS strategic proposal.

2.2.2.1.3 School shark

School sharks occur throughout the temperate coastal waters of southern Australia, from Moreton Bay in southern Queensland to Perth (Pogonoski et al. 2002). Although they are wide ranging, they are primarily a deep-water demersal species and use inshore waters for birthing and nursery sites. No nursery areas are identified in Western Australia, as they are located around Victoria, Tasmania, and parts of South Australia (Pogonoski et al. 2002). They are, therefore, unlikely to be present within or proximate to the KBMS strategic proposal.

2.2.2.1.4 Whale shark

Whale sharks have a broad distribution and are usually found in tropical and warm temperate seas. Large numbers of whale sharks gather off Ningaloo Reef between March and June each year to feed on schools of euphausiids and baitfishes associated with the seasonal development of a closed Leeuwin current/Ningaloo current recirculation pattern (Wilson et al. 2006). The long-term movement patterns of six whale sharks were documented, all of which travelled north-east into the Indian Ocean after departing Ningaloo Reef (Wilson et al. 2006). Therefore, it is unlikely they would be present within or proximate to the KBMS strategic proposal.

2.2.2.1.5 Great white shark

The great white shark is widely, but not evenly, distributed in southern Australia. There is a south-western population, the range of which includes Koombana Bay (Department of Agriculture, Water and the Environment (DAWE) 2021a). Great white sharks travel up the Western Australian coast but are mainly >10 km from the coast in waters >50 m deep (Government of Western Australia 2018). Although present in the wider region, the great white shark is not expected to occur within or proximate to the KBMS strategic proposal other than on a sporadic and infrequent basis.

2.2.2.1.6 Grey nurse shark

The grey nurse shark is restricted to two populations in Australia, one on the east coast and one on the west coast. The west coast population is listed as Vulnerable under the EPBC Act, although it is reported to be widely distributed along the Western Australian coast from Albany to Exmouth, with known aggregation sites at Rottneet Island and Exmouth (Fisheries Research and Development Corporation 2019). Four individuals (including a potentially pregnant female) were also recorded 130 m water depth at a seamount in the Bonaparte Basin (Jacobs 2016), which may suggest the presence of a north-western population, or that the western population is more extensive than previously considered. Sightings of the grey nurse shark are uncommon in the Bunbury area, which suggests that they are moving through the area rather than resident (Chidlow et al. 2006). Therefore, it is unlikely that the grey nurse shark would be present within or proximate to the KBMS strategic proposal.

Grey nurse shark aggregation sites around inshore rocky reefs or islands at depths of 10–40 m, in deep sandy or gravel filled gutters, or in rocky caves should be considered habitat critical to the survival of the species. None of these sites occur within or proximate to the KBMS strategic proposal.

2.2.2.1.7 Manta rays

There are two listed species of migratory manta ray that may occur in Koombana Bay. These species are the reef and oceanic (giant) manta ray (*Mobula alfredi* and *Mobula birostris*, respectively). Sighting records of both species showed them to be mainly distributed north of Shark Bay, with very occasional, anecdotal, sightings further south (Armstrong et al. 2020). They are not expected to be present within or proximate to the KBMS strategic proposal.

2.2.2.1.8 Blue swimmer crabs

Blue swimmer crab (*Portunus armatus*) is widely distributed along the entire Western Australia coastline (Harris et al. 2017) and reside in sandy bottom nearshore and estuarine habitats up to 50 m in depth (Johnston et al. 2020). It is a short-lived fast-growing species with a high fecundity and potential for wide dispersal and distribution of recruits (Johnston et al. 2020). Timing and movements of blue swimmer crabs vary between locations. Based on the findings of breeding stock surveys undertaken by Harris et al. (2017) between 2013-16 for the Leschenault Estuary and broader Koombana Bay area, the KBMS strategic proposal intersects areas of high abundance of juvenile and male blue swimmer crabs and, to a lesser extent, sexually mature female crabs. Key periods for the crabs' reproductive cycle in the broader Koombana Bay area is the mating period from January to April and the spawning period from October to January.

2.2.2.2 Fisheries

Koombana Bay is currently used by recreational and commercial fishers. Crabbing, line fishing and beach seining for whitebait (*Hyperlophus vittatus*) and Australian herring (*Arripis georgianus*) are the most common fishing practices in the area (Graeme Hall, Department of Fisheries (DoF), pers comm. 2 February 2017).

The key areas in the region that are used by commercial fishers to target fin fish include the area from Forest Beach to Binningup (to the north of Bunbury) and the area around Power Station Beach (directly to the east of the Bunbury Port), with BP / Casuarina Beach only being used opportunistically by commercial fishers using nets from the beach (Graeme Hall, DoF, pers comm. 2 February 2017).

The target species for recreational fishers in Koombana Bay include blue swimmer crab (*Portunus armatus*), tailor (*Pomatomus saltatrix*), Australian herring (*Arripis georgianus*), mullet and mulloway (*Argyrosomus japonicus*), during the summer period. Another key recreational fishing location in the Koombana Bay area is the artificial reef outside the bay, which was relatively recently extended (Figure 3). The removal of the historic timber jetty has reduced available fishing locations and the recreational fishing community supports creation of new structures which support shore-based fishing (Recfishwest 2019).

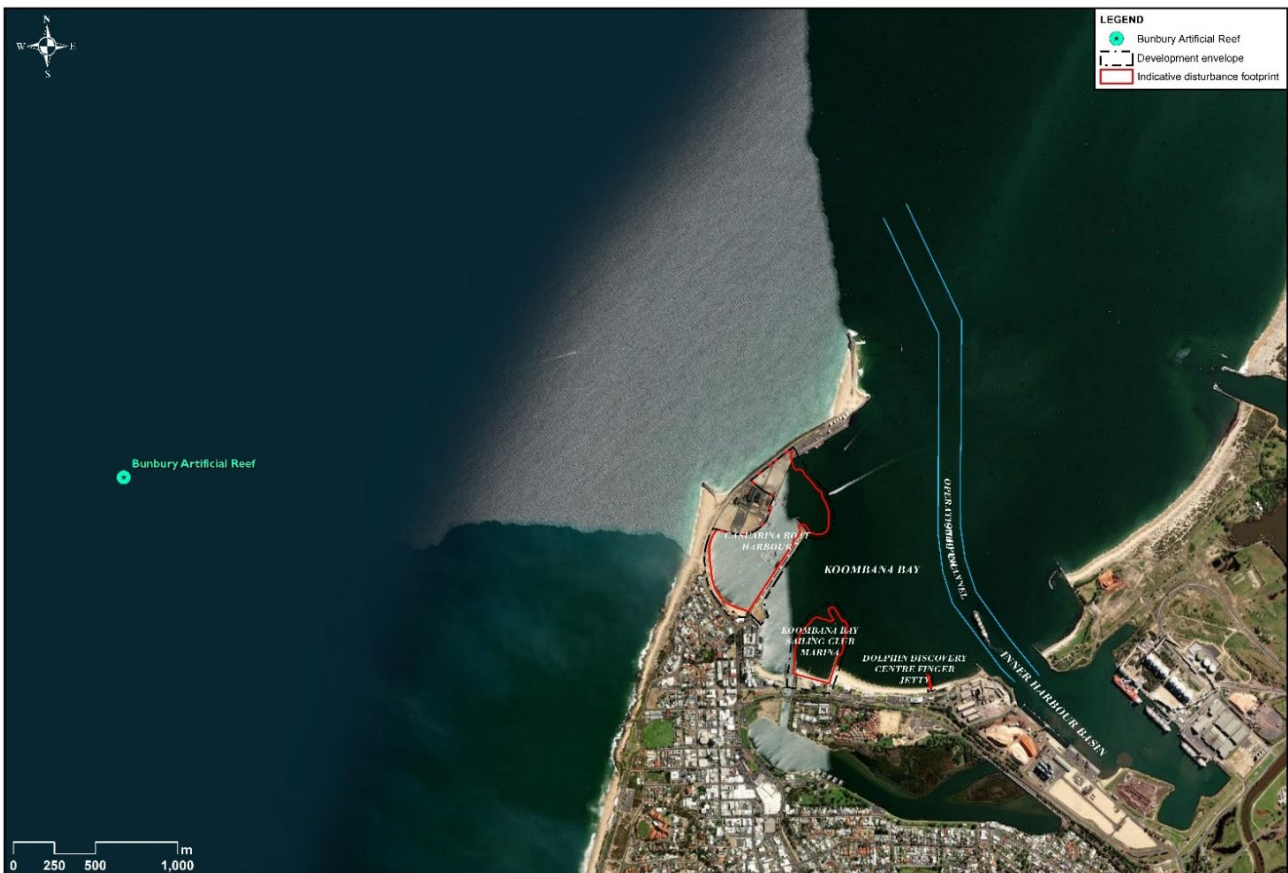


Figure 3: Koombana Bay boat ramps and artificial reef

Commercial blue swimmer crabbing is prohibited in the Leschenault Estuary and Koombana Bay and the Mandurah to Bunbury area south of Comet Bay has not been fished commercially since 2014 (Johnston et al. 2020). Recreational blue swimmer crabbing is still permitted, and participation rates are the highest of any inshore species in south-west Western Australia (Newman et al. 2021). Koombana Bay is an important recreational fishery for blue swimmer crabs, with most fishing undertaken in the summer months using drop nets set from boats, before crabs move into the Leschenault Estuary to spawn (Graeme Hall, DoF, pers comm. 2 February 2017). The Bunbury blue swimmer crab fishery is closed from 1 September to 30 November each year, after a fisheries stock review in 2018. Recreational catch rates for the Leschenault Estuary obtained through a voluntary angler programme have been variable between 2013–2014 and 2017–2018, however the 2017–2018 catch rate of four retained crabs / ten drop net pulls was the highest recorded over a five-year period (Johnston et al. 2020). The 2019 catch rate of sexually mature females from fishery-independent breeding stock surveys was 11.5 crabs/traplift, with an egg production index of 17.8×10^6 eggs/traplift (Johnston et al. 2020). On this basis, the fisheries crab stock assessment classified Leschenault Estuary (and broader Bunbury area) as Sustainable (Johnston et al. 2020).

The Department of Primary Industries and Regional Development’s (DPIRD) Fisheries’ research group has conducted a juvenile fish recruitment annual netting survey at Koombana Bay and various other representative south-west and south coast sites from 1995 targeting:

- Yellow-eye mullet (*Aldrichetta forsteri*)

REPORT

- Australian herring (*Arripis georgianus*)
- Western Australian salmon (*Arripis truttaceus*)
- Whitebait (*Hyperlophus vittatus*)
- Sea garfish (*Hyporhamphus melanichir*)
- Sea mullet (*Mugil cephalus*)
- Tailor (*Pomatomus saltatrix*)
- King George whiting (*Sillaginodes punctatus*)
- YELLOW fin whiting (*Sillago schombergkii*)
- Blue sprat (*Spratelloides robustus*)
- Banded toadfish (*Torquigener pleurogramma*)
- Hardyhead.

The average catch rates at each sampling site for the juvenile target fish species between 1993 and 2008 using 61 m and 21 m nets only as reported by Smith et al. (2008) are presented in Table 5. Compared to all other representative south-west sites sampled over the years, Koombana Bay has relatively high abundance and diversity of juvenile fish. The average catch rates for the Leschenault Estuary sites also highlight the importance of this estuary system as a nursery ground for juvenile fish. Koombana Bay is currently sampled by DPIRD eight times a year with 61 m net between September and April, with the largest numbers of juvenile fishes caught nearest to the groyne (Rodney Duffy, DPIRD, pers comm. 15 March 2023).

These long-term research-based fisheries data set for Koombana Bay provide a robust baseline to underpin future KBMS strategic proposal specific monitoring programs identified in Section 2.7. Community monitoring programmes have also been undertaken, for example the City of Bunbury has provided funding to Manea Senior College to monitor blue swimmer crabs in Koombana Bay and Leschenault Inlet for the last five years (pers comm. Crystelle Evangelista, City of Bunbury (CoB), 15 March 2023), which could provide additional anecdotal context.

Table 5: Average catch rates of target juvenile target fish species between 1993 and 2008 using 61 m and 21 m nets only

Site	Net type	Average catch rate (total no. caught / total sampling days)								
		Sea mullet	Yellow-eye mullet	Banded toadfish	Australian herring	Hardyhead	Whitebait	Blue sprat	Sea garfish	Tailor
Leschenault Estuary – Town Site	21 m	10.00	46.67	26.33	-	994.67	114.00	-	-	-
Leschenault Estuary – Preston River	21 m	0.50	38.50	-	-	283.00	153.50	99.50	-	-
Leschenault Estuary – Pelican Point	21 m	14.00	173.33	5.33	-	886.67	49.67	-	-	-
Woodman Point	21 m	-	6.43	39.71	-	36.00	12.00	5,153.00	0.29	-
Safety Bay	21 m	20.25	16.00	39.25	-	1,336.13	0.13	265.33	-	-
Point Peron	21 m	-	3.00	8.25	-	141.50	0.00	-	0.50	-
Koombana Bay	61 m	5.53	59.97	17.33	27.45	20.58	326.82	3.43	14.20	5.1
Warnbro Sound	61 m	1.33	36.08	8.74	7.27	44.89	250.01	388.27	1.76	1.16
Pinnaroo	61 m	0.31	27.40	3.50	0.57	12.50	152.43	348.29	1.32	7.23
Mangles Bay	61 m	53.79	18.51	145.47	0.37	594.12	55.94	3.00	2.29	0.03
Dead Fish Anchorage	61 m	-	4.47	-	4.87	-	124.53	91.73	-	-
Toby's Inlet	61 m	1.21	7.32	-	1.68	-	27.42	2.95	-	0.26
Thirsty Point – Cervantes	61 m	0.45	12.34	-	2.26	-	4.34	7.75	0.26	0.84
Dunsborough Town Beach	61 m	7.55	17.09	-	1.00	-	2.36	3.73	-	-
Quindalup Beach	61 m	0.79	10.10	-	2.05	-	0.26	178.76	-	0.14
Challenger Beach	61 m	-	13.44	11.89	-	249.22	1.00	38.78	0.33	-
Hamlin Bay	61 m	-	0.23	-	3.54	-	-	12.73	-	-
Point Walter	61 m	1.00	14.27	-	-	-	-	-	-	-
Leschenault Estuary	61 m	76.25	110.75	42.50	-	690.25	-	-	-	-
Woodman Point	61 m	-	-	3.50	1.50	94.00	-	512.00	6.00	-
Emu Point	61 m	5.76	79.42	0.10	5.81	87.76	2.61	40.61	2.73	0.05
Horton Beach	61 m	0.82	9.59	-	9.18	-	2.65	8.78	0.47	-
Two Peoples Bay	61 m	-	16.63	-	3.26	-	-	217.53	-	-
Shoal Bay	61 m	20.33	37.67	-	-	-	-	-	-	-
Cheyne Beach	61 m	-	-	-	-	-	-	-	-	-
Esperance Town Beach	61 m	0.21	46.00	-	4.42	-	0.16	0.05	-	-
Poison Creek	61 m	1.67	51.12	1.87	170.03	2.53	-	10.06	4.43	-
Duke of Orleans	61 m	-	9.94	-	5.50	-	-	41.44	-	-
Eucla Jetty	61 m	-	173.50	-	0.50	-	-	-	-	0.50
Israelite Bay	61 m	2.00	85.50	-	2.00	-	-	-	0.5	-
Noonaera Beach	61 m	-	123.50	-	4.00	-	-	-	-	-
Red Rock Point	61 m	-	14.00	-	4.00	-	-	-	-	-
Eyre Bird Observatory	61 m	-	8.00	-	4.00	-	-	-	-	-
Twilight Cove	61 m	-	12.00	-	-	-	-	-	-	-

(Source: Smith et al. 2008)

2.2.3 Marine reptiles

The key findings of the DCCEE PMST and the DBCA NatureMap and Threatened and priority fauna searches relevant to marine reptiles are shown Table 6.

Table 6: Conservation significant marine reptiles potentially found within or proximate to the KBMS strategic proposal

Common name	Scientific name	EPBC Act		BC Act	
		Threatened	Migratory	Status	Record (yes/no)
Loggerhead turtle	<i>Caretta caretta</i>	EN	✓	EN	Yes
Green turtle	<i>Chelonia mydas</i>	VU	✓	VU	No
Leatherback turtle	<i>Dermochelys coriacea</i>	EN	✓	VU	No
Flatback turtle	<i>Natator depressus</i>	VU	✓	VU	Yes

Note: 'EN': Endangered, 'VU': Vulnerable.

Six of the world's seven marine turtle species occur in Australian waters and for several species, nesting activity in Australia is globally significant. The KBMS strategic proposal is within the known species range of four marine turtle species; however, there are no biologically important areas (BIAs) or habitats critical to the survival of marine turtles in the area. Furthermore, there are no important nesting or inter-nesting sites in southern Western Australia (Department of Energy and the Environment 2017). However, individual turtles may be transient visitors to the KBMS strategic proposal.

2.2.4 Marine mammals

Marine mammals are a diverse group of marine animals that include whales, dolphins, seals and sea lions. All whales, dolphins, seals and sea lions are protected in Australian waters under the EPBC Act. When the Bunbury Timber Jetty was decommissioned in 2013, dedicated marine fauna observers (MFOs) recorded a number of cetaceans, primarily bottlenose dolphins (1,384 sightings), five sightings of an unidentified species of seal or sea lion and one humpback whale over 180 days (DDC 2013). These sightings may not represent total individual animals as some of these sightings are likely to be re-sightings of the same individuals that live in Koombana Bay.

2.2.4.1 Cetaceans

Baleen whales migrate along the Western Australian coast and continental shelf and may visit the KBMS strategic proposal and include southern right, humpback and blue whales. Baleen whales use the region for calving (southern right), feeding (blue whale), and as a migration pathway (including resting areas) between their feeding and breeding areas (humpback whales). The KBMS strategic proposal therefore overlaps BIAs for these three common species (southern right whale, blue whale and humpback whale) (Figure 4).

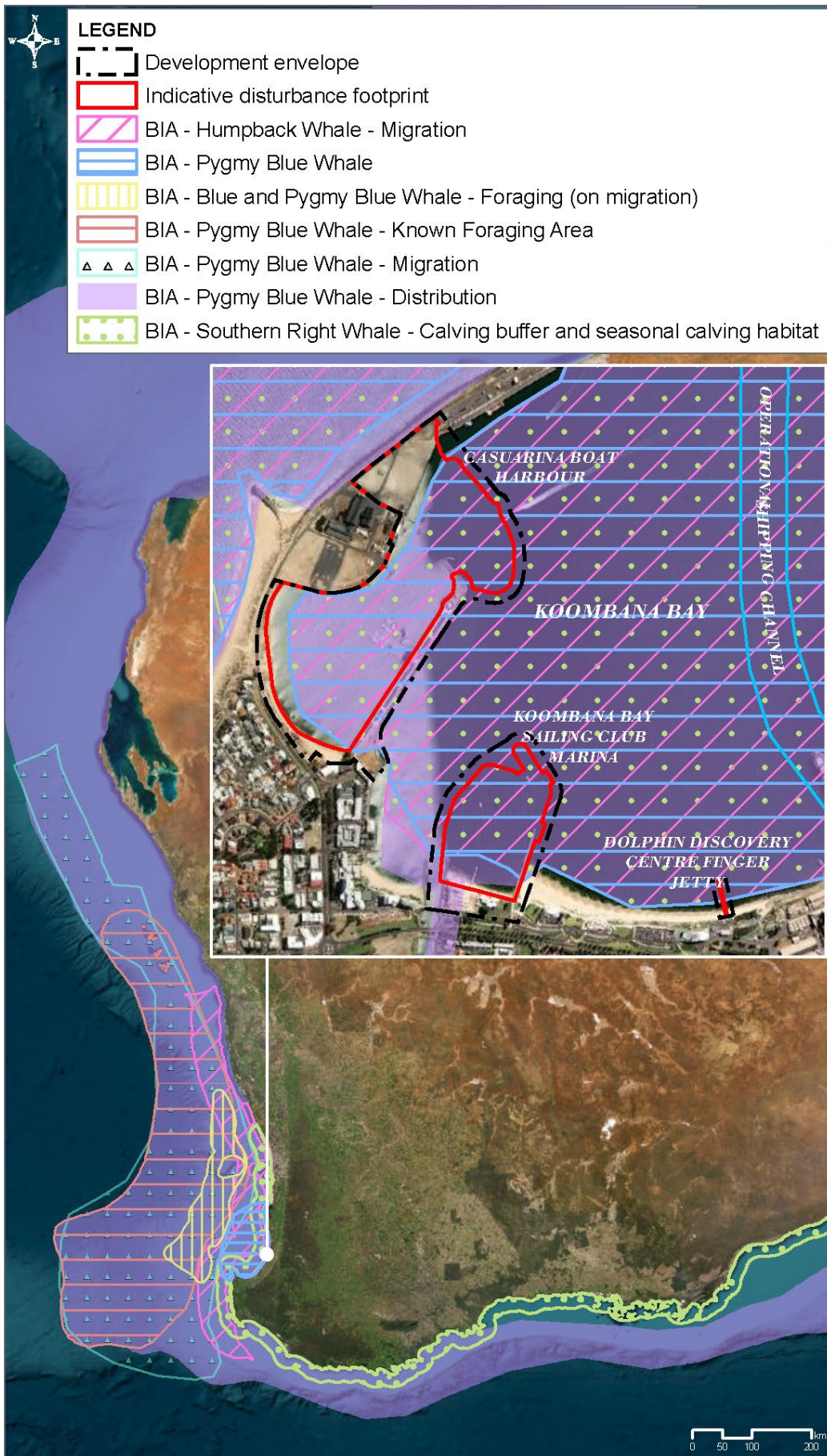


Figure 4: Southern right whale, blue whale and humpback whale BIAs

REPORT

Those less common in the region include the fin, sei and pygmy right whales. Toothed whales currently found in the region are sperm whales, killer whales and pilot whales. In March 2015, approximately 20 pilot whales were stranded against the Outer harbour breakwater. Most species of cetaceans are transient and move through the wider offshore deeper waters. Only bottlenose dolphins are known to reside within and proximate to the KBMS strategic proposal and the broader Koombana Bay environment. No ship strikes have been recorded within or proximate to the KBMS strategic proposal; or Koombana Bay on the national marine mammal database (database accessed 15 December 2021) (DAWE 2022).

The key findings of the DAWE PMST and the DBCA NatureMap and Threatened and priority fauna searches relevant to cetaceans are shown in Table 7. Although not specially protected under the EPBC Act or BC Act, bottlenose dolphins are an iconic species in Koombana Bay and are key to this assessment.

Table 7: Conservation significant cetacean species potentially found within or proximate to the KBMS strategic proposal

Common name	Scientific name	EPBC Act			BC Act	
		Listed threatened	Listed migratory	Conservation dependent	Status	Record (yes/no)
Whales						
Bryde's whale	<i>Balaenoptera edeni</i>	-	✓	-	-	No
Blue whale	<i>Balaenoptera musculus</i>	EN	✓	-	EN	No
Pygmy right whale	<i>Caperea marginata</i>	-	✓	-	-	No
Southern right whale	<i>Eubalaena australis</i>	EN	✓	-	VU	Yes
Humpback whale	<i>Megaptera novaeangliae</i>	-	✓	-	Conservation dependent fauna	Yes
Sperm whale	<i>Physeter macrocephalus</i>	-	✓	-	VU	Yes
Dolphins						
Dusky dolphin	<i>Lagenorhynchus obscurus</i>	-	✓	-	-	No
Killer whale	<i>Orcinus orca</i>	-	✓	-	-	No
Spinner dolphin	<i>Stenella longirostris</i>	--	-	-	P4	Yes
Indian Ocean bottlenose dolphin, spotted bottlenose dolphin	<i>Tursiops aduncus</i>	-	-	-	-	Yes
Common bottlenose dolphin	<i>Tursiops truncatus</i>	-	-	-	-	Yes
Pinnipeds						
New Zealand fur seal	<i>Arctocephalus forsteri</i>	-	-	-	Other specially protected fauna	Yes
Subantarctic fur-seal	<i>Arctocephalus tropicalis</i>	EN	-	-	EN	Yes
Australian sea lion	<i>Neophoca cinerea</i>	EN	-	-	VU	Yes

Note: 'EN': Endangered. 'VU': Vulnerable. Fauna of special conservation need. 'P4': Rare, Near Threatened or other species in need of monitoring.

2.2.4.1.1 Blue whale

There are two recognised subspecies of blue whale in the southern hemisphere recorded in Australian waters; the Antarctic blue whale (*Balaenoptera musculus intermedia*) and the 'pygmy' blue whale (*Balaenoptera musculus breviceuda*). Most of the blue whales sighted around Australia are confirmed to be pygmy blue whales and acoustic records suggest only a small number of Antarctic blue whales are likely to be present in Australian waters (DAWE 2021b).

During their northern migration, tagged whales have been recorded between 40 km and 100 km from the coastline in March and April. The southern migration down the Western Australian coast occurs between September and late December (McCauley and Jenner 2010, Double et al. 2014). Individuals have been recorded passing along the shelf edge at depths of 500 m to 1,000 m (McCauley and Jenner 2010).

The only known feeding area in Western Australia is in the Perth Canyon, where pygmy blue whales feed between December and April, with evidence suggesting that feeding likely occurs along the shelf in water depths from 500 m to 1,000 m (McCauley et al. 2004). This location is distant from the KBMS strategic proposal and any level of impact during construction is not considered credible.

Geographe Bay is thought to be an important migratory habitat for pygmy blue whale from September to December, with cows and calves observed resting in the area. Pygmy blue whale BIAs intersects the KBMS strategic proposal, however migratory and foraging areas not included (Figure 4). The inner waters of Koombana Bay are considered too shallow for their entry. Therefore, it is considered unlikely that the pygmy whale would enter the Koombana Bay and be present within or proximate to the KBMS strategic proposal. Although the dredge vessel will be travelling further offshore to the disposal area (located approximately 10 km north-west of the KBMS strategic proposal), it is highly unlikely to encounter blue whales given the shallow offshore depths within the three nautical mile transect.

2.2.4.1.2 Southern right whale

Southern right whales are found in Australian waters for seven months of the year, from approximately May to November (DAWE 2021c). This species inhabits and feeds in the southern and subantarctic oceans, close to Antarctica, during the summer months. Foraging/feeding locations are coastal or offshore, depending on oceanographic features, although more commonly offshore in association with large-scale features such as the Sub-Tropical and Polar Fronts (Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) 2012). This species is a highly mobile migratory species, travelling thousands of kilometres between habitats. On the Australian coast, individual southern right whales use widely separated coastal areas (200 km to 1,500 km apart) within a season, indicating substantial coast-wide movement (DSEWPaC 2012).

The southern right whale main aggregation and calving/feeding areas are located in southern Western Australia, South Australia, Victoria and around Tasmania (DAWE 2021c). There are no aggregation areas in the Bunbury region, the closest being Flinders Bay, Augusta (which is approximately 120 km south-west of Bunbury) (DSEWPaC 2012). During the calving season, between May and October, female southern right whales that are either pregnant or with calf can be present in shallow protected waters along the entire south coast of the Australia (DSEWPaC 2012). There is considerable overlap of foraging/feeding areas with calving areas, meaning that migration between the two is not necessarily from lower to higher latitudes (DSEWPaC 2012).

A seasonal calving habitat and calving buffer BIA for the southern right whale intersects the KBMS strategic proposal and extends north of coastal Perth and south along the rest of the West Australian coastline (DAWE 2020a; Figure 4). This BIAs is of low-level use proximate to the KBMS strategic proposal, with rare or infrequent incidental sightings and no breeding/calving has been observed (H. Raudino, Department of Parks and Wildlife (DPaW)¹, pers. comms, 3 February 2017).

Occasional southern right whale sightings have been made in the broader Geographe Bay area, with three records of this species proximate to the KBMS strategic proposal held by the DBCA (Figure 4). The inner waters of Koombana Bay are considered too shallow for their entry, however, it is possible that the dredge vessel may encounter southern right whales when travelling to and from the offshore disposal area during times of seasonal migration.

2.2.4.1.3 Humpback whale

Humpback whales migrate seasonally from polar feeding grounds to tropical breeding/calving grounds in every ocean throughout the world (Jenner et al. 2001). In Western Australia, humpback whales have a wide distribution as their migratory path extends from the calving grounds in the Kimberley region (Bannister et al. 1996; Jenner and Jenner 1996) to feeding grounds in the Australian Antarctic waters south of 56°S.

¹ Now the DBCA.

The northern migration through the Perth Basin to Jurien Bay region commences in April, peaks in mid-to-late June (from) and tapers off by August. The migrating whales tend to follow the continental shelf edge, generally out to the 200 m depth contour (Jenner et al. 2001). During the northern migration, most pods are observed within water depths <500 m, with lower numbers of humpback whales observed further offshore. A transition period occurs during the crossover between the northern and southern migrations, spanning early August to early September. Pod sizes during the transition period tend to be larger, possibly due to the intermingling of northbound and southbound pods. The southern migration in this region begins in late August and generally peaks around mid-October (Jenner et al. 2001). During the southern migration period, the majority of pods are observed in water depths <200 m. The coastline from Bunbury to Lancelin has been identified as a BIA for humpback whales during their northward (mid-June to mid-July, animals up to 30 nautical miles offshore) and southward migrations (late September to mid-October, animals close to inshore), which includes the KBMS strategic proposal (DAWE 2020a; Figure 4). This BIA is recognised as a migratory staging point, with socialising and low levels of calving, and some resting observed in the area (DAWE 2020a). Annual sightings of humpback whales within Geographe Bay shows they are at their peak in October (Jenner et al. 2001). A dead humpback whale has been recorded by the DBCA along the Bunbury coastline (Figure 2). Humpback whales are highly unlikely to enter Koombana Bay given it is too shallow for them and if present are likely to be out in Geographe Bay. However, it is possible that the dredge vessel may encounter humpback whales when travelling to and from the offshore disposal area.

2.2.4.1.4 Bryde's whale

Bryde's whales (*Balaenoptera edeni*) occur year-round in oceanic and offshore waters between 40°S and 40°N, primarily in waters warmer than 16.3 °C (DAWE 2021d). Bryde's whales have been recorded in water depths of 500 to 1,000 metres, however, little is known about their habitat use and no specific feeding, breeding grounds or migration patterns have been identified or documented in Australian waters. The nearest known area of aggregation of this species is near Ningaloo Reef. It is unlikely that Bryde's whales would be encountered within or proximate to the KBMS strategic proposal.

2.2.4.1.5 Pygmy right whale

Pygmy right whales have primarily been recorded in areas associated with upwellings and with high zooplankton abundance. Similar to Bryde's whales, the patterns of migration for the pygmy whale are not clearly understood. It is very unlikely that the pygmy right whale would be present within or proximate to the KBMS strategic proposal, as they have been rarely sighted off the coast of Western Australia (Kemper 2002).

2.2.4.1.6 Sperm whale

Sperm whales (*Physeter macrocephalus*) are found in deep offshore areas off Western Australia (Johnson et al. 2016). Females and calves inhabit warmer waters north of 45°S, while adult males travel between the colder waters of Antarctica (Gero et al. 2000). Recent sightings and modelling suggest that sperm whales are limited to the south coast, particularly around Albany (Johnson et al. 2016). There are no important or critical habitats for sperm whales proximate to the KBMS strategic proposal. A dead sperm whale has been recorded by the DBCA along the Bunbury coastline (Figure 2), however sightings in the south-west region are generally very rare. It is very unlikely that the sperm whale would be present within or proximate to the KBMS strategic proposal, as they have been rarely sighted off the south-west coast of Western Australia.

2.2.4.1.7 Killer whale

Killer whales (*Orcinus orca*) are the largest member of the dolphin family. The killer whale has a worldwide distribution, generally inhabiting cold, deep waters, however, they have been observed in continental slope and shelf habitats (DAWE 2021e). There are no breeding grounds or important foraging areas for the killer whale within or proximate to the KBMS strategic proposal. In 2012, killer whales were observed within Geographe Bay; however, these sightings are rare (GHD 2014). Given the infrequency of the sightings and the distance from Koombana Bay, killer whales are unlikely to be present within or proximate to the KBMS strategic proposal.

2.2.4.1.8 Dusky dolphin

Dusky dolphins are a small dolphin species mainly found in temperate and sub-Antarctic waters, generally inshore. Sightings of these dolphins have been rare in Australia, and no calving areas have been identified in Australian waters (DAWE 2021f). Despite a high level of dolphin observations occurring across the region, there are no known records or reports of dusky dolphins within or proximate to the KBMS strategic proposal.

2.2.4.1.9 Bottlenose dolphin

Two species of bottlenose dolphins are resident within and proximate to the KBMS strategic proposal, the Indian Ocean (or spotted) bottlenose dolphin and the common bottlenose dolphin.

The South West Marine Research Programme is a partnership between Murdoch University and the DDC and has been studying the coastal dolphin population since 2006. The bottlenose dolphin populations at Bunbury fluctuates seasonally from approximately 60–76 during winter months to 140–180 (peaking at 200) during summer (Smith et al. 2016; Sprogis et al. 2016a). However, Manlik et al. (2016) forecast a future decline in this population based on current breeding rates. The dolphin density has been observed to change seasonally with adult female dolphins aggregating in the inner waters of Koombana Bay in summer and autumn, at which time they formed bonds with other adult female dolphins (Smith et al. 2016). Further, the timing of peak female sociality and use of inner waters coincided with the majority of calving (Smith et al. 2016). At least two latent groups of Indian Ocean bottlenose dolphin have been identified in Bunbury harbour and the surrounding open waters (Sprogis et al. 2016b). One group had a large open range and was predominantly male and found in open water. The other group was predominantly female, with a smaller range, most often in sheltered water habitat, such as in the bay or estuary coinciding with areas of high human usage.

During the bottlenose breeding season (December to May; Coulthard 2006), males return to the area with calving occurring from December to March (Sprogis et al. 2016a; Smith 2012). Further research indicated the quantity and quality of social relationships influences fitness measures, which is particularly relevant in bottlenose dolphins where fitness influences reproductive success and survival (Smith et al. 2016).

Key dolphin habitat exists in Koombana Bay, particularly adjacent to the Leschenault Estuary near the Cut, where dolphins aggregate in groups for nursing, resting and breeding opportunities in the warmer months (summer and autumn) (DDC 2023). This coincides with a peak in calving and abundance in Koombana Bay (H. Raudino, DPaW, pers comm. 3 February 2017).

The Indian Ocean bottlenose dolphin population in Bunbury is locally iconic and there is a well-established dolphin-watching tourism industry. As the bottlenose dolphins currently use the KBMS strategic proposal area and wider region year-round, there is potential for the proposal to impact this population. Calving (December–March) is the most susceptible period for disturbance potentially impacting on recruitment success into the population.

2.2.4.1.10 Spinner dolphin

The long-snouted spinner dolphin is listed as a Priority 4 species under the BC Act. Long-snouted spinner dolphins are primarily oceanic, but they can be neritic (occurring over the continental shelf) in some regions and occur in tropical, subtropical and occasionally temperate waters around the world. In Australia, there are records of long-snouted spinner dolphins in Western Australia, as far south as Bunbury. Long-snouted spinner dolphins are not well surveyed in Australian waters and the population size is unknown, although long-snouted spinner dolphins are not considered rare (DAWE 2021g). Spinner dolphins were recorded by the NatureMap search and may be occasional visitors within or proximate to the KBMS strategic proposal in low numbers.

2.2.4.2 Pinnipeds

The Australian sea lion (*Neophoca cinerea*), New Zealand fur seal (*Arctocephalus forsteri*) and the sub-Antarctic fur seal (*Arctocephalus tropicalis*) were all recorded by the NatureMap and Threatened and priority fauna searches. Anecdotal reports confirm that sea lions (and seals) are occasionally sighted in the Koombana Bay region with approximately a dozen encounters a year, as they appear to be resting between their travels along the coast (D Kerr, DDC, pers comm., 2 February 2022).

Although sea lions (and seals) are occasional visitors to Koombana Bay (H. Raudino, DPaW, pers. comms, 3 February 2017), there are no breeding colonies, haul-out sites or foraging areas within or proximate to the KBMS strategic proposal. Sea lions and seals may be occasional visitors within or proximate to the KBMS strategic proposal in low numbers.

2.2.5 Seabirds and shorebirds

The key findings of the DAWE PMST and the DBCA NatureMap and Threatened and priority fauna searches relevant to sea and shorebirds are shown Table 8. Although it is not listed under either the EPBC or BC Acts, the little penguin has also been included in the assessment as it was recorded by the NatureMap search and is an iconic marine species.

Table 8: Protected or listed seabirds potentially found within the proposal area

Common name	Scientific name	EPBC Act		BC Act	
		Threatened	Migratory	Status	Record (yes/no)
Seabirds					
Common noddy	<i>Anous stolidus</i>	-	✓	IA	No
Australian lesser noddy	<i>Anous tenuirostris melanops</i>	VU		EN	No
Flesh-footed shearwater	<i>Ardenna carneipes</i>	-	✓	VU and IA	Yes
Wedged-tailed shearwater	<i>Ardenna pacifica</i>	-	✓	IA	No
Amsterdam albatross	<i>Diomedea amsterdamensis</i>	EN	✓	CE and IA	No
Tristan albatross	<i>Diomedea dabbenena</i>	EN	✓	CE and IA	No
Southern royal albatross	<i>Diomedea epomophora</i>	VU	✓	VU and IA	No
Wandering albatross	<i>Diomedea exulans (sensu lato)</i>	VU	✓	VU and IA	Yes
Northern royal albatross	<i>Diomedea sanfordi</i>	EN	✓	EN and IA	No
Little penguin	<i>Eudyptula minor</i>	-	-	-	Yes
Blue petrel	<i>Halobaena caerulea</i>	VU	-	-	Yes
Fairy prion	<i>Pachyptila turtur subantartica</i>	VU	-	-	No
Sooty albatross	<i>Phoebastria fusca</i>	VU	✓	EN and IA	No
Soft-plumaged petrel	<i>Pterodroma mollis</i>	VU	-	-	Yes
Southern giant-petrel	<i>Macronectes giganteus</i>	EN	✓	IA	Yes
Northern giant-petrel	<i>Macronectes halli</i>	VU	✓	IA	No
Caspian tern	<i>Sterna caspia</i>	-	✓	IA	Yes
Common tern	<i>Sterna hirundo</i>	-	✓	IA	Yes
Fairy tern	<i>Sternula nereis</i>	VU	-	VU	Yes
Bridled tern	<i>Sterna anaethetus</i>	-	✓	IA	Yes
Campbell albatross	<i>Thalassarche impavida</i>	VU	✓	VU and IA	No
Indian yellow nosed albatross	<i>Thalassarche carteri</i>	VU	✓	EN and IA	Yes
Shy albatross, Tasmanian shy albatross	<i>Thalassarche cauta</i>	VU	✓	VU and IA	No
White-capped albatross	<i>Thalassarche cauta steadi</i>	VU	✓	VU and IA	No
Black-browed albatross	<i>Thalassarche melanophris</i>	EN	✓	EN and IA	Yes
Crested tern	<i>Thalasseus bergii</i>	-	✓	IA	Yes
Shorebirds					
Fork-tailed swift	<i>Apus pacificus</i>	-	✓	IA	No
Ruddy turnstone	<i>Arenaria interpres</i>	-	✓	IA	Yes
Sharp-tailed sandpiper	<i>Calidris acuminata</i>	-	✓	IA	Yes
Red knot	<i>Calidris canutus</i>	EN	-	EN	Yes
Curlew sandpiper	<i>Calidris ferruginea</i>	CE	-	CE	Yes
Red-necked stint	<i>Calidris ruficollis</i>	-	✓	IA	Yes

REPORT

Common name	Scientific name	EPBC Act		BC Act	
		Threatened	Migratory	Status	Record (yes/no)
Great knot	<i>Calidris tenuirostris</i>	CE	✓	CE and IA	Yes
Greater sand plover	<i>Charadrius leschenaultia</i>	VU		VU	Yes
Bar-tailed godwit	<i>Limosa lapponica baueri</i>	VU	-	VU	Yes
Northern Siberian godwit	<i>Limosa lapponica menzbieri</i>	CE	-	CE	No
Black-tailed godwit	<i>Limosa limosa</i>	-	✓	IA	Yes
Eastern curlew	<i>Numenius madagascariensis</i>	CE	-	CE	Yes
Whimbrel	<i>Numenius phaeopus</i>	-	✓	IA	Yes
Glossy ibis	<i>Plegadis falcinellus</i>	-	✓	IA	Yes
Pacific golden plover	<i>Pluvialis fulva</i>	-	✓	IA	Yes
Grey plover	<i>Pluvialis squatarola</i>	-	✓	IA	Yes
Australian painted snipe	<i>Rostratula australis</i>	EN	-	EN	No
Common greenshank	<i>Tringa nebularia</i>	-	✓	IA	Yes
Marsh sandpiper	<i>Tringa stagnatilis</i>	-	✓	IA	Yes

Note: 'CE': Critically Endangered. 'EN': Endangered. 'VU': Vulnerable. 'IA': Migratory birds protected under an international agreement.

Various species of shorebirds and seabirds have been recorded in Koombana Bay. Bunbury's Inner Harbour was surveyed by Bennelongia in 2008 for the planned harbour expansion. Bennelongia (2008) reported sightings of low numbers of terns, gulls, penguin, egrets, oystercatchers and cormorants and concluded that the inner harbour was not important for migratory birds. The eastern osprey (*Pandion cristatus*), an EPBC Act-listed migratory wetland species, has also been observed to be using of two purpose-built nest platforms within Bunbury Port.

The BIA for the fairy tern extends from Geraldton to Bunbury and this area is designated for foraging in high numbers (DAWE 2020a; Figure 5). DBCA has an annual fairy tern (*Sternula nereis*) monitoring programme for the Bunbury fairy tern population. Seasonally, fairy terns have been recorded to establish colonies at various sites throughout the Bunbury region, including McKenna Point sand trap, Barr Island, Point Douro and the Leschenault Peninsula (Figure 6). The McKenna Point sand trap is an important nesting area for fairy terns (DBCA 2023). It is situated within the Southern Ports Authority's (SPA) Outer Harbour secured management zone and is therefore protected from uncontrolled public access and disturbance (DBCA 2023). Breeding colonies of up to 70 fairy terns have previously been observed at the McKenna Point site (Dunlop 2016). The McKenna Point sand trap is also used as a fairy tern roost (Dunlop 2016; DBCA 2023).

The McKenna Point sand trap is susceptible to sediment build-up due to wave action. The SPA is required to remove the sediment build-up regularly, using large excavators which depending upon the timing of the operation may disturb nesting birds (DBCA 2023). In the summer of 2022/23, the SPA's removal of sediment build-up at McKenna Point coincided with the arrival of fairy terns and early nesting attempts (DBCA 2023). Fairy terns were observed resting at possible nesting locations at McKenna Point, with a small breeding group initially establishing before then moving to a rehabilitated area (DBCA 2023). This was the first recorded use of the rehabilitation area for nesting and as a chick refuge, with approximately 80 nesting pairs recorded, and was second largest colony recorded at Bunbury in the 2015–2022 period (DBCA 2023). The 2.04 ha rehabilitated area is situated within the indicative disturbance footprint of the KBMS strategic proposal (Figure 6).

The little penguin is endemic to Australasia and is distributed across temperate Australia and New Zealand. The population in the Perth region is the largest in Western Australia and is geographically isolated from the south coast population, which makes them vulnerable to local declines due to limited recolonisation from neighbouring colonies (DSEWPaC 2012). The penguins at Penguin and Garden islands are genetically distinct from little penguins along the east coast and elsewhere in Western Australia. The home range of penguins from Penguin and Garden islands extends from near Rottneest to Geographe Bay, adjacent to Quindalup (Cannell 2016; Cannell 2018). Foraging areas while incubating eggs (i.e. between April and November) include Cockburn Sound; west and north west of Garden Island; Warnbro Sound; Comet Bay; seaward mouth of the Mandurah Channel; nearshore and adjacent to Lake Clifton/Preston Beach; near Dalyelup and in and around Koombana Bay (Cannell 2016; Cannell 2018). The BIA for the little penguin

extends from offshore Perth to Bunbury, including Koombana Bay, and is recognised as a foraging area for the provisioning of young little penguins, mainly in inshore waters (DAWE 2020a; Figure 5). Adult little penguins are mainly sedentary and spend the entire year near breeding grounds (DAWE 2020a). Little penguins were not recorded within 5 km of the KBMS strategic proposal by the DBCA NatureMap search. While decommissioning the Bunbury Timber Jetty in 2013, dedicated MFOs sighted a little penguin in Koombana Bay (DDC 2013). Little penguins are likely to forage whitebait (*Hyperlophus vittatus*) in and around Koombana Bay (Cannell 2001; Smith et al. 2008; Newman et al. 2021).

The abundance of little penguins from Penguin Island was estimated at 518 penguins in 2017, which is approximately one quarter of the relative abundance of little penguins in 2007 (Cannell 2018). This decline is likely due to reduced prey stocks, poor breeding participation and success since 2011 and penguins skipping breeding (Cannell 2018).

Whitebait removals by fishing pose a moderate risk to little penguins when whitebait abundance is low (Newman et al. 2021). Other anthropogenic threats to little penguins include interactions with commercial and recreational watercraft (e.g. collisions causing injury and/or death), potential contaminants and plastic pollution (Cannell 2016).

The Bunbury outer harbour is part of the BIA for three species of seabird for foraging in high numbers: bridled tern, little shearwater and wedged-tailed shearwater. Koombana Bay does not, however, form part of the key foraging areas for any of these species. The BIA for the bridled tern is large and occurs along the west coast of Western Australia and around to the Recherche Archipelago including offshore waters, although foraging occurs mainly in blue-water seas further offshore (DAWE 2020a; Figure 5). The BIA for the little shearwaters extends from Kalbarri to Eucla including offshore waters but is most commonly seen in the Houtman Islands and off the south coast of Western Australia (DAWE 2020a; Figure 5). The BIA for the wedged-tailed shearwater is along the coast from Bunbury to the north of Geraldton and it is a pelagic and offshore forager (Figure 5). The KBMS strategic proposal is not within a BIA or of known local or regional significance for the remaining marine seabird or shorebird species listed under either the EPBC or BC Acts.

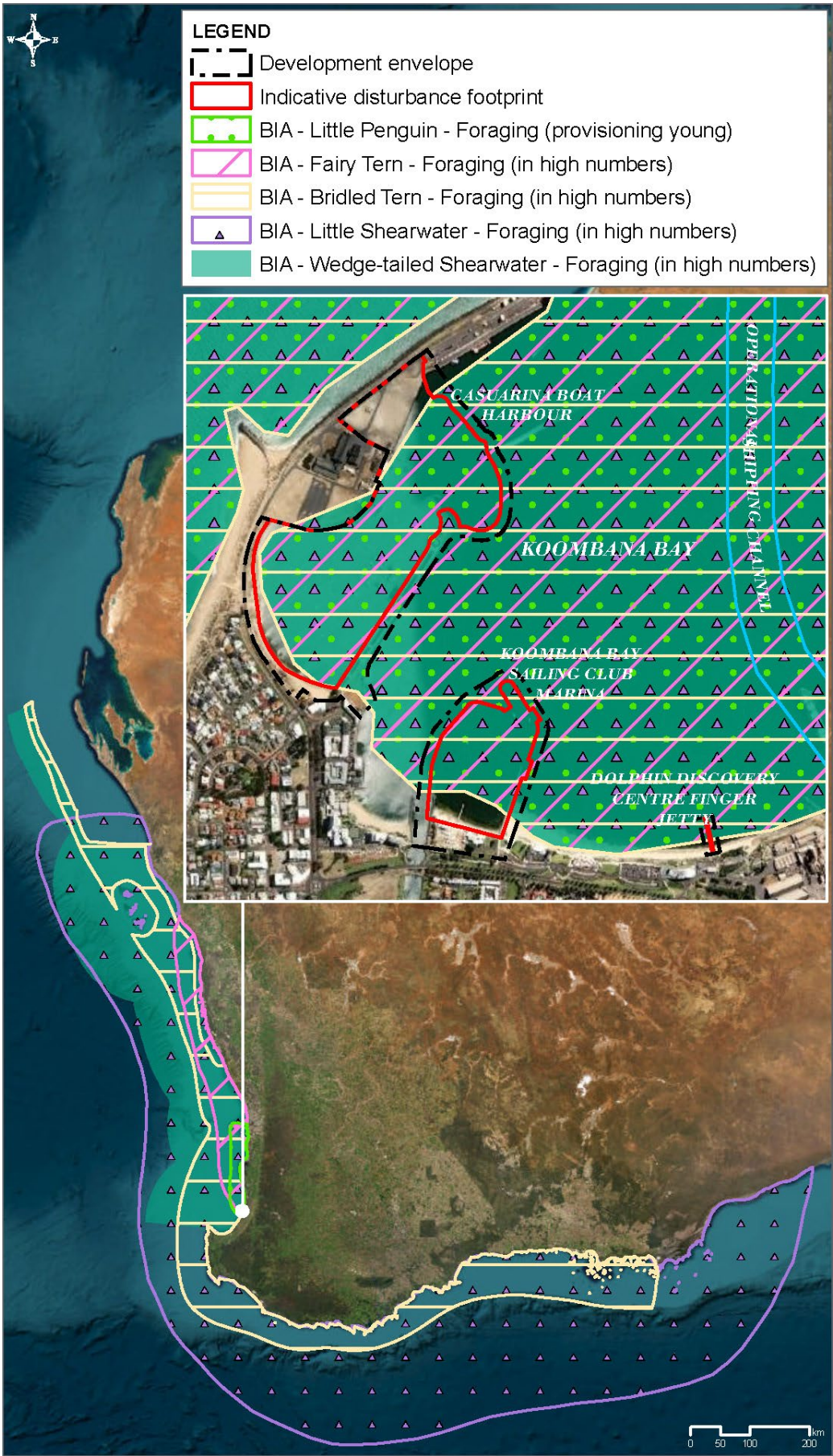


Figure 5: Sea and shore bird BIAs



Figure 6: Fairy tern nesting sites

2.3 Summary of key marine fauna values

While Koombana Bay is neither a biodiversity hot spot nor home to a suite of endemic species, it supports several key marine fauna values. Some marine fauna occurs in the bay year-round; others are migratory visitors. There are critical times of the year where marine fauna species are undergoing key stages of their life cycle and are more susceptible to disturbance. Table 9 summarises the conservation significance and sensitivity of the key marine fauna values identified within or proximate to the KBMS strategic proposal.

Table 9: Summary of key marine fauna values, their conservation significance and sensitivity within or proximate to the KBMS strategic proposal

Species	Significance	Sensitivity
Fish and marine invertebrates		
Blue swimmer crab	The blue swimmer crab is a key recreational fishery in the Bunbury area, with the Leschenault Estuary, Koombana Bay and to lesser degree Leschenault Inlet known fishing locations. Fisheries crab stock assessment classified Leschenault Estuary (and broader Bunbury area) as Sustainable (Johnston et al. 2020)	The mating period for blue crab is January to April and the spawning period is from October to January
Whitebait	The Bunbury area is the main location for whitebait commercial fishing in Western Australia (Newman et al. 2021). Landings have been declining since 1990's, with measures implemented in July 2019 to reduce commercial catches to 50% of historical average catches (Newman et al. 2021)	Population supports commercial fishing values
Marine reptiles		
Marine turtles: <ul style="list-style-type: none"> • Loggerhead turtle • Green turtle • Leatherback turtle • Flatback turtle 	Marine turtles are listed as Threatened under the Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i> (EPBC Act) and State <i>Biodiversity Conservation Act 2016</i> (BC Act). No species of marine turtle is known to nest within or proximate to the KBMS strategic proposal	There are no important foraging, nesting or inter-nesting areas for marine turtle species within or proximate to the KBMS strategic proposal. Marine turtles may occasionally visit Koombana Bay
Marine mammals – pinnipeds		
Australian sea lion	The Australian sea lion are listed as Threatened under the EPBC and BC Acts	There are no breeding sites, haul-out sites or major foraging areas within or proximate to the KBMS strategic proposal. Australian sea lions may occasionally visit Koombana Bay
Marine mammals – cetaceans		
Baleen whales (blue whale, southern right whale and humpback whale)	Blue and southern right whales are listed as Threatened under the EPBC and BC Acts. The humpback whale is listed as a migratory species under the EPBC Act and as Conservation Dependent Fauna under the BC Act	Present occasionally in low numbers offshore of the KBMS strategic proposal. No breeding or calving observed in Koombana Bay
Bottlenose dolphins	Bottlenose dolphins are a locally iconic species, with a well-established tourism industry in the area. There is a resident breeding population of approximately 50 bottlenose dolphins present in Koombana Bay (Smith 2012; DDC 2023).	In the warmer month, dolphins aggregate in Koombana Bay for nursing, resting and breeding opportunities (H. Raudino, Department of Parks and Wildlife, pers comm.. 3 February 2017). Calving occurs between December and March, and this is the most susceptible period for disturbance
Seabirds and shorebirds		
Fairy tern	The fairy tern is listed as Threatened under the EPBC and BC Act. There are known key breeding sites for fairy terns proximate to KBMS strategic proposal, which are monitored by the Department of Biodiversity, Conservation and Attractions (DBCA)	The fairy tern breeding season is between October and March (Dunlop 2016)

Species	Significance	Sensitivity
Little penguin	<ul style="list-style-type: none"> • Koombana Bay is within the little penguin biologically important area • Known to forage in Koombana Bay, as well as other locations along the west coast of Western Australia, whilst incubating eggs 	Penguin and Garden island egg incubation period (hence Koombana Bay foraging period) is between April and November
Seabird and shorebird species	Seabird and shorebird species are listed as Threatened and / or Migratory under the EPBC and BC Acts	There are no important breeding or foraging areas for these species within or proximate to the KBMS strategic proposal

2.4 Key construction and operation elements

The key construction elements of the KBMS strategic proposal which have the potential to impact marine fauna are:

- Dredging and dredge spoil disposal
- Piling
- Land reclamation
- Breakwater and revetment wall construction
- Temporary onshore construction laydown area.

The key operation elements of the KBMS strategic proposal which have the potential to impact marine fauna are:

- Floating jetties
- Boat ramps
- Boat pens.

2.5 Relationships to other plans

This MFMP provides a management framework to mitigate potential environmental impacts to marine fauna during future proposal construction and operation to address the ESD (EPA 2015) requirements. The MFMP Plan will, therefore, be complemented by the following plans:

- Marine Environmental Quality Management Plan (MEQMP; GHD 2023a) provides the management framework to mitigate potential environmental impacts to marine environmental quality during future proposal operation
- Marine Construction Monitoring and Management Plan (MCMMP; RPS 2023) provides the monitoring and management framework to mitigate potential environmental impacts to marine environmental quality and benthic communities and habitats during future proposal construction
- Coastal Processes Management Plan (GHD 2023b) provides the management framework to mitigate potential environmental impacts to coastal processes during future proposal operation.

2.6 Rationale and approach

2.6.1 Environmental objectives

2.6.1.1 EPA marine fauna objective

To protect marine fauna so that biological diversity and ecological integrity are maintained (EPA 2021b).

2.6.1.2 KBMS strategic proposal environmental objectives

The proposed overarching KBMS strategic proposal environmental objectives will ensure the biological diversity and ecological integrity of marine fauna are maintained during construction and operation of the future proposals:

1. Maintain extent of potential marine fauna habitat outside of the development envelopes
2. Continuity of existing dolphin behaviours and use of Koombana Bay
3. Maintain blue swimmer crab and fin fish fisheries
4. Continuity of fairy tern nesting opportunity within Koombana Bay
5. Continuity of existing little penguin use of Koombana Bay.

2.6.1.3 Impact specific objectives

Impact specific objectives have been proposed to provide a target for the implementation of management and mitigation measures:

- Minimise the modification / loss of habitat during construction that may lead to direct or indirect effects on marine fauna during construction.
- Reduce the risk of injury to marine fauna resulting from underwater water noise during piling.
- Reduce the risk of injury or death to marine fauna arising from collisions with vessels during construction and operation.
- Reduce the risk of entanglement arising from marine debris associated with construction and operation.
- Reduce the risk of entrainment arising during dredging.
- Reduce the elevated risk of introduced species becoming established during construction and operation.
- Reduce the risk of adverse effects on marine fauna from hydrocarbon and chemical spills during construction and operation.
- Reduce artificial light emissions affecting the marine environment during construction and operation in line with Commonwealth guidance.
- Reduce the risk of displacement of breeding seabirds and shorebirds from elevated onshore noise during construction and operation.
- Reduce the risk of increased recreational fishing pressure leading to a decline in local fisheries' target species during operation.
- Reduce the risk of human – fauna interactions associated with an increase in public access to the waterfront from land-based pedestrian access and an increase in recreational vessels during operation.

2.6.2 Previous surveys and studies

This MFMP has been informed by relevant information from previous surveys and studies proximate to and within the KBMS strategic proposal area, including:

- Independent review of underwater noise modelling, Bunbury Port Berth 14 (Magnus Wahlberg 2011)
 - Reported on potential risks of construction works for the Bunbury Port Berth 14 expansion project for marine life, with a specific emphasis on the resident population of bottlenose dolphins
- Marine Fauna Studies, Berth 14, Bunbury Port Berth 14 (Wave Solutions 2012)
 - Summarised key marine fauna species that may use the Bunbury Port Berth 14 expansion project area
- Marine Fauna Study, Inner Harbour Strategic PER (GHD 2014)

- Assessed habitat utilisation of marine fauna, potential for impact and discussion of measures to reduce / eliminate the likelihood / scale of impact
- Population Dynamics and Habitat Use of Bottlenose Dolphins (*Tursiops aduncus*), Bunbury, Western Australia (Smith 2012)
 - Investigated the spatial and temporal variability in population abundance, social dynamics, calving seasonality, home range size and habitat use of dolphins in Bunbury waters over a three-year study period. From 2007–2010, year-round boat-based, photo-identification surveys followed pre-determined transect lines within a 120 km² study area to achieve intensive and consistent sampling effort.
- Home range size of adult Indo-Pacific bottlenose dolphins (*Tursiops aduncus*) in a coastal and estuarine system is habitat and sex-specific (Sprogis et al. 2016a)
 - Examined sex-specific differences in home range size of adult Indo-Pacific bottlenose dolphins off Bunbury, Western Australia
- Sex-specific Patterns in Abundance, Temporary Emigration and Survival of Indo-Pacific Bottlenose Dolphins (*Tursiops aduncus*) in Coastal and Estuarine Waters (Sprogis et al. 2016b)
 - Aimed to quantify sex-specific abundance, movement patterns and survival rates of *T. aduncus* across austral seasons to test the hypothesis that there is an influx of males into the study area during summer or autumn months
- Underwater Noise Assessment (SVT Engineering Consultants 2018)
 - Assessed the underwater noise due to pile driving activities likely to occur at Casuarina Boat Harbour, KBSC marina and DDC finger jetty; and the impact on the sensitive species identified by comparison with established criteria
- Detailed marine desktop assessment (Section 8.3 of the SPER document)
- Invasive marine species survey – Koombana Bay Marine Structures (RPS 2022)
 - Baseline survey that assessed the presence of invasive marine species (IMS) within Koombana Bay.

2.6.3 Key assumptions and uncertainties

The assessment approach was based on consideration of the worst-case scenario for the KBMS strategic proposal and therefore presents a precautionary estimate of the potential impacts on marine fauna values from the implementation of the future proposals.

2.7 Objective-based – risk-based approach

2.7.1 Key potential impacts

2.7.1.1 Temporary / permanent loss or degradation of habitat

Loss of marine habitat, primarily the loss of seagrass species associated with future proposal construction, has the potential to result in:

- Direct impacts to recreational and commercial fisheries through the loss of potential feeding, spawning and predator avoidance habitat
- Indirect impacts to marine fauna species (e.g. bottlenose dolphins and, little penguins) through the loss of foraging opportunity and changes to marine environmental quality.

The total predicted loss of marine fauna habitat is up to 40.81 ha (or 0.78% of the marine fauna habitat within the LAU), with the temporary loss of bare sediment due to dredging comprising 70% of the predicted direct impacts. The total change of marine fauna habitat resulting from the KBMS strategic proposal is low in a regional context. Hence the potential impacts to marine fauna species (e.g. blue swimmer crabs, fin fish) which use these benthic environments for habitat, and are also considered to be important local fisheries, is also predicted to be low.

The Zone of High Impact (ZoHI) is the area where impacts on benthic communities or habitats are predicted to be irreversible. The ZoHI is associated with the release of fines during breakwater construction and TSS during dredging. The worst-case spatial extent of the ZoHI is within the Casuarina Boat Harbour and KBSC marina indicative disturbance footprint, hence no additional irreversible indirect losses of marine fauna habitats are associated with dredging.

The Zone of Moderate Impact (ZoMI) is area within which predicted impacts on benthic organisms are recoverable within a period of five years following completion of the dredging activities. The ZoMI, as a 'likely worst' case scenario, is predicted to be limited primarily to the western and southern margins of Koombana Bay in proximity to the construction activities. This may result in indirect recoverable impacts occurring to 32.31 ha of marine fauna habitat.

The Zone of Influence (Zoi) is associated with temporary changes in environmental quality from dredge plumes. As a 'likely worst' case scenario, the Zoi is anticipated to extend into the Leschenault Inlet, the northern and southern coastal waters from Koombana Bay and in the vicinity of the offshore disposal ground. Marine fauna habitats within the modelled extent of the Zoi will be exposed to effects of dredging and construction, which may have some minor impacts to habitat quality.

Given the limited extents of the ZoHI, ZoMI and Zoi in comparison to the much larger extent of the LAU, the temporary changes to marine environmental quality proximate to the KBMS strategic proposal are unlikely to significantly reduce the abundance of marine fauna species regionally in the LAU.

Fairy terns were recorded opportunistically using a 2.04 ha rehabilitated area for nesting and a chick refuge during the 2022–2023 period. This was the first recorded use of the rehabilitation area for nesting, with all prior accounts of nesting occurring at the Port's Outer Harbour associated with the McKenna Point sand trap. The rehabilitated area is situated within the indicative disturbance footprint of the KBMS strategic proposal and will be subject to temporary disturbance during construction of the Casuarina Boat Harbour. This will result in the temporary loss of the rehabilitated area for opportunistic breeding during Casuarina Boat Harbour construction. The rehabilitated area is within Stage 3 of the TBW project. It will likely be subject to future development resulting in permanent loss of this opportunistic habitat.

2.7.1.1.1 Dredging

Physical injury or mortality from vessel collisions (Section 2.6.1.3), underwater noise production (Section 2.6.1.2) and temporary total suspended solids (TSS) increases are the key pathways that dredging can directly affect marine fauna, including bottlenose dolphins and little penguin (Todd et al. 2016; Cannell 2016). Suspended sediment from dredging activities could have an impairing effect on sight and communication abilities (Morris et al. 1985; Jefferson et al. 2009), which could alter dolphin and little penguin fish feeding ability. Dredging may also affect the behaviour of fin fish on which dolphins and little penguin prey (Wilber and Clarke 2001).

Dolphins have also demonstrated avoidance responses to dredging in urbanised settings, similar to Koombana Bay, with patterns of attendance altered (Pirota et al. 2013; Marley et al. 2016). Specifically, dolphin sightings / presence has been shown to decrease in response to dredging activity (Pirota et al. 2013; Marley et al. 2016). Regarding the Koombana Bay dolphin populations, this may result in the use of foraging habitat more proximate to Leschenault Estuary, than the areas immediately proximate to the future proposals when dredging is occurring.

Dredging impacts marine fauna indirectly through loss or degradation of habitat (Section 2.6.1.1), underwater noise (Section 2.6.1.2), entrainment (Section 2.6.1.4) and temporary increases in TSS and sedimentation (Todd et al. 2016).

It should also be noted that the SPA conducts a biannual maintenance dredge programme in areas proximate to KBMS strategic proposal (i.e. Bunbury Port, shipping channel) with minimal direct or indirect impacts to marine fauna reported.

2.7.1.2 Elevated underwater noise

Marine fauna uses sound for foraging, orientation, communication, navigation, echolocation of prey and predator avoidance (Richardson et al. 1995) and therefore may be affected by high levels of underwater noise. High levels of anthropogenic underwater sound can have negative impacts; ranging from changes in acoustic communication, displacement from an area, and in more severe cases temporary hearing loss, physical injury or mortality (Richardson et al. 1995). The greatest source of noise will be associated with

piling for construction of boating facilities and jetties. Operational noise levels are not anticipated to be noticeably different than existing levels and are unlikely to have a material impact on marine fauna behaviours.

The Underwater Noise Assessment (SVT Engineering Consultants 2018) concluded that the impacts associated with underwater noise associated with construction of the future proposals are manageable, with minimal impact on marine fauna, because:

- The likelihood of impact of injury to marine fauna can be managed with the use of a 500 m exclusion zone during piling, based on the largest range for behavioural disturbance of dolphins.
- This exclusion zone is reasonable as they are within a visual range and are typically used by marine mammal observers.
- The Underwater Noise Assessment (SVT Engineering Consultants 2018) is an overestimation of the potential underwater noise impacts or a worst-case scenario for the Casuarina Boat Harbour and KBSC marina future proposals as the modelling has been undertaken for an open water environment. However, piling will be undertaken for these proposals after the construction of the breakwaters. Hence the surrounding waters will be shielded, to a degree, from underwater noise by the constructed breakwaters. Notwithstanding the likely shielding effect of the constructed breakwaters, a conservative 500 m exclusion zone from piling activities will be implemented during the construction of each future proposal to mitigate the risk to marine fauna.

2.7.1.3 Increased vessel collision risk

An increased risk of collision could result from an increase in the number of vessels using the Koombana Bay during operation of the future proposals and to a significantly lesser degree during construction.

Whilst most of the construction activities will be undertaken using land-based machinery; a small number of vessels will be used throughout the construction phase for various marine-based activities and vessels will be transporting dredged sediment to and from the offshore disposal area.

The operation of the future proposals will result in an increase in vessel activity in Koombana Bay. Vessel collisions with marine fauna have the potential to result in injury or death to the affected animal. Vessels travelling at 14 knots or faster are those most likely to cause death or serious injury to marine mammals (Wilson et al. 2007). Collisions causing injury and/or death with vessels are also considered a key risk to little penguins (Cannell 2016). In addition, there is the potential for the increase in vessel activity to disturb marine fauna, potentially interrupting key activities (e.g. foraging) or displacing animals from preferred habitat.

2.7.1.4 Increased risk of entanglement or entrainment

Activities involved in the construction and operational of the future proposals have the potential to cause both entanglement and entrainment to marine fauna. Entanglement may lead to injury, death, displacement, adverse behavioural and physiological changes. In addition, incidental mortality of marine fauna caught in ropes, lines and fishing gear, is now recognised as a significant conservation problem (Benjamins et al. 2014). Building materials and general litter associated with the construction and operation phases of the future proposals have the potential to cause entanglement. Several factors including the visibility, dimensions, how important the location is for feeding or breeding and the extent of close-range evasion all interact to determine the likelihood of entanglement.

Entrainment, the direct uptake of aquatic organisms by suction, during activities such as dredging has the potential to cause mortality to marine fauna species (Dabble 2012). The marine fauna with potential exposure to the risk of entrainment are those that inhabit or transit through the inner Koombana Bay near the KBMS strategic proposal, include blue swimmer crabs, marine turtles and little penguin.

2.7.1.5 Increased risk of introduced marine species

The introduction of IMS generates ecological impacts that can propagate along the food web triggering trophic cascades (Strayer 2010; Gallardo et al. 2016). Impacts may be caused by direct interaction with a resident community, resulting in non-native competition or predation, the introduction of pathogens, and hybridisation with natives (Crooks 2002). This may lead to a loss of genetic diversity, as well as indirect changes in habitat conditions, such as turbidity and habitat structure (Crooks 2002).

The main risk associated with the KBMS strategic proposal for IMS is species introduction through fouling on recreational vessel hulls arriving from waters outside Australia and from commercial shipping (through ballast water and hull fouling). Twenty-seven of the 62 or more IMS documented in Western Australia have been recorded within the Bunbury Port. Implementation of the KBMS strategic proposal would not result in a major change in the activities that already exist but will result in increased recreational boat traffic and vessels docking in Casuarina Boat Harbour and the KBSC marina, which is generally associated with an increased occurrence of IMS. The National System for the Prevention and Management of Marine Pest Incursions for Non-trading Vessels, Commercial Fishing Vessels and Recreational Vessels (Commonwealth of Australia (CoA) 2009a, 2009b and 2009c) will be followed to reduce the potential introduction of non-native species. This will ensure risk of IMS is minimised and as such there would not be any increase in the existing level of IMS occurring proximate to the future proposals.

2.7.1.6 Increased risk of pollution incidents

Increased boat numbers during operation, and to lesser degree construction, of the future proposals has the potential to increase the risk of pollution, including from antifouling paints, anti-corrosion anodes, increased risk of accidental discharges (e.g. fuel spills, oils and greases) and sullage. Most of the construction activities will be undertaken using land-based machinery; however, a small number of vessels will be used throughout the construction phase for various marine-based activities. An increase in vessels using Koombana Bay is expected during the operational phase, and quantities and types of material that might conceivably enter the marine environment are limited to spills relating to these vessels using the Koombana Bay.

The magnitude of this impact is entirely dependent upon the quantities and nature of the spillage, the dilution and dispersal properties of the waters and the bioavailability of the contaminant to species. The more toxic components of fuel spills are volatile and relatively short-lived. Heavier hydrocarbons, while less toxic, may persist for longer in the marine environment.

Whilst marine fauna such as seabirds, marine mammals and elasmobranchs are likely to be able to detect and avoid pollutants, sessile species of shellfish are potentially more vulnerable. Likely effects of release of contaminants into the marine environment may result in direct impacts through ingestion, inhalation and absorption through the skin, and abandonment of polluted feeding habitat and potentially longer-term impacts from bioaccumulation in the food chain.

2.7.1.7 Increased light emissions

Increased light emissions during operation of the future proposals could lead to disturbance to marine fauna in the vicinity. An increase in artificial light can disrupt critical animal behaviours and cause physiological changes (Russart and Nelson 2018). The key marine fauna values that may be affected by an increase in artificial light emissions are nesting shorebirds and seabirds (e.g. fairy terns) at McKenna Point (Department of Energy and the Environment 2020). The flight success of fledgling seabirds can be impeded if their nesting environment is not naturally dark (Rodríguez et al. 2017) and the ability for migratory seabirds to undertake long-distance migrations can also be compromised by increased light emissions. The impacts from artificial light emissions during operation of the future proposals is not expected to be any different or greater than the existing harbour facilities in Koombana Bay and other similar facilities in Western Australia.

The potential for artificial light emissions to impact shorebirds and seabirds during construction is considered to be low, as construction works will be undertaken during nominated daylight hours, with likely lighting requirements limited to security / safety installations.

2.7.1.8 Elevated onshore noise

Elevated levels of airborne noise during construction of the future proposals could lead to behaviour disruption/displacement for marine fauna using terrestrial habitats. Noise may mask and inhibit animal sounds and/or animal audition, affect communication, use of space and reproduction (Sordello et al. 2020). The key marine fauna values that may be affected by elevated levels of airborne noise are shorebirds and seabirds (e.g. fairy terns). Operational noise levels are not anticipated to be noticeably different than existing levels and are unlikely to have a material impact on marine fauna behaviours.

2.7.1.9 Increased recreational fishing pressure

An increase boat pen numbers at the Casuarina Boat Harbour and KBSC marina will result in an increase of the number of vessels using Koombana Bay. This may in turn result in an increase in recreational fishing activity. The KBMS strategic proposal aims to facilitate the general growth of the tourism and marine industries. It is therefore unlikely that all the additional pens will be utilised by recreational fishers. Additionally, recreational fishing is known generally to have a relatively low impact on fish stock numbers. As such any increase is likely to be proportionately low when considering the existing fishing pressure in Western Australia and in the Koombana Bay area. It is also conceivable that an increase in boat pens will simply result in vessels being moved from one area to another, thereby shifting fishing pressure rather than increasing it, resulting in little to no impact on regional populations.

2.7.1.10 Increase in human – fauna interactions

A human – fauna interaction refers to the interaction between people and animals that could occur from a direct action (e.g. approaching an animal) or an indirect action (e.g. disposal of litter in an animal's habitat). Thus, a human — fauna interaction has the potential to affect an animal's potential to survive through disruption of the ecological functions of the animal (e.g. feeding, breeding, communication, migration) or the habitat in which it lives. Human — fauna interactions considered here include:

- Marine litter
- Harassment and illegal feeding
- Increased vessel disturbance.

2.7.2 Rationale for choice of management and mitigation measures

Table 10 presents a summary of the magnitude of change and expected time frame for management and mitigation measures to take effect for each key potential impact. Management and mitigation measures have been proposed to reduce potential impacts on marine fauna from the construction and operation of the future proposals as far as practicable.

Table 10: Magnitude of change expected time frame for mitigation for each potential impact arising from construction and operation of the KBMS strategic proposal

Potential impact	Magnitude of change	Expected time frame for mitigation to take effect
Temporary / permanent loss or degradation of habitat	<ul style="list-style-type: none"> • Removal of potential marine fauna habitats as a result of the construction of the future proposals: <ul style="list-style-type: none"> – Permanent loss of potential marine fauna habitats (seagrass + turf algae) is up to 12.07 ha – Temporary loss of up to 28.96 ha of bare sediment – Temporary loss of up to 2.04 ha of opportunistic fairy tern nesting area within the onshore rehabilitation area • There are no spawning or nursery grounds within the future proposal indicative disturbance footprints • KBMS strategic proposal area is an already disturbed system and dredged areas not built on may be recolonised / reutilised by marine fauna after construction 	<ul style="list-style-type: none"> • Dredging areas will be minimised • Mitigation will take immediate effect
Elevated underwater noise	<ul style="list-style-type: none"> • Risk will be temporary and intermittent during piling works • Impact will cause a change immediately and is expected to stop when piling ceases 	<ul style="list-style-type: none"> • Mitigation will be provided to reduce the risk of injury to marine fauna during piling • Mitigation is expected to take immediate effect, including adaptive management measures to cease piling should marine fauna be recorded

Potential impact	Magnitude of change	Expected time frame for mitigation to take effect
Increased vessel collision risk	<ul style="list-style-type: none"> Risk will occur within the KBMS strategic proposal area and broader Koombana Bay vicinity Risk is ongoing and primarily associated with an increase in marine vessels during operation Impact will cause a change immediately to marine fauna and is not expected to be immediately reversible 	<ul style="list-style-type: none"> Mitigation will be implemented to reduce the risk of collision of vessels with marine fauna during construction Mitigation is expected to take effect immediately Adaptive management will be adopted if there are recorded cases of injury/ mortality of marine fauna due to collision with vessels during operation
Risk of entanglement	<ul style="list-style-type: none"> Risk primarily relates to construction Entanglement will cause a change immediately to marine fauna and with the risk expected to significantly decrease when construction stops 	<ul style="list-style-type: none"> Mitigation will be implemented to reduce the risk of marine fauna entanglement Mitigation is expected to take effect immediately
Risk of entrainment	<ul style="list-style-type: none"> Risk will be temporary and short-term during dredging Entrainment will cause a change immediately to marine fauna and expected to stop when dredging ceases 	<ul style="list-style-type: none"> Mitigation will be implemented to reduce the risk of entrainment to marine fauna during dredging Mitigation is expected to take effect immediately
Increased risk of IMS	<ul style="list-style-type: none"> Risk primarily relates to Casuarina Boat Harbour and KBSC marina future proposals Introduction of IMS could have potentially long-term consequences Impact may be reversible/irreversible depending on species introduced 	<ul style="list-style-type: none"> Mitigation will be implemented to reduce the risk of IMS during construction and operation Mitigation is expected to take effect immediately
Increased risk of pollution incidents	<ul style="list-style-type: none"> Risk relates to the KBMS strategic proposal area and the broader Koombana Bay marine environment Pollution incident could have potentially long-term consequences (depending upon the severity) Impact will cause a change immediately and is expected to be reversible over the short term 	<ul style="list-style-type: none"> Mitigation will be implemented to reduce the risk of pollution incidents during construction and operation Mitigation is expected to take effect immediately
Increased light emissions	<ul style="list-style-type: none"> Potential for artificial light emissions to impact shorebirds and seabirds during construction is considered to be low, as construction works will be undertaken during nominated daylight hours, with likely lighting requirements limited to security / safety installations Introduction of permanent artificial lighting for the future proposals has the potential to affect movements and behaviours of marine fauna 	<ul style="list-style-type: none"> Mitigation will be taken to reduce artificial light emissions on the marine environment Mitigation is expected to take immediate effect Adaptive management will be adopted if disturbance to marine fauna is recorded
Elevated onshore noise	<ul style="list-style-type: none"> Risk will be temporary and intermittent and primarily associated with construction Impact will cause a change immediately and is expected to stop following cessation of construction 	<ul style="list-style-type: none"> Mitigation will be provided to reduce the risk of disruption / displacement of nesting seabirds and shorebirds Mitigation is expected to take immediate effect
Increased recreational fishing pressure	<ul style="list-style-type: none"> Risk relates to the KBMS strategic proposal area and the broader Koombana Bay marine environment Increased fishing pressure could have potentially long-term consequences Impact will cause a change immediately and is expected to be reversible over the short term 	<ul style="list-style-type: none"> Management measures will be introduced to reduce fishing pressure on key species Mitigation is expected to take effect in the immediate to short term Adaptive management should be adopted to increase efforts should a reduction in local fishery species be recorded
Increase in human – fauna interactions (marine litter, harassment and illegal feeding, vessel disturbance)	<ul style="list-style-type: none"> Risk relates to the KBMS strategic proposal area and the broader Koombana Bay marine environment primarily during operation Increased human – fauna could have potentially long-term consequences Impact may be reversible (harassment and illegal feeding, vessel disturbance) or potential irreversible (marine litter) 	<ul style="list-style-type: none"> Management measures will be introduced to reduce the interactions between humans and marine fauna Mitigation is expected to take effect in the immediate to short term Adaptive management should be adopted should an increase in human -fauna interactions be recorded

3 MFMP KEY COMPONENTS

Table 11: Management and mitigation measures for potential impacts from temporary / permanent loss or degradation of habitat

EPA Marine Fauna objective

To protect marine fauna so that biological diversity and ecological integrity are maintained

KBMS strategic proposal objectives

- Maintain extent of potential marine fauna habitat outside of the development envelopes
- Maintain blue swimmer crab and fin fish fisheries

Impact specific objective

Minimise the modification / loss of habitat during construction that may lead to direct or indirect effects on marine fauna during construction

Key environmental values

Fish, marine invertebrates, breeding fairy terns

Key impacts and risks

- Temporary loss of up to 2.04 ha of opportunistic fairy tern nesting area within the onshore rehabilitation area
- Loss of key habitat (e.g. feeding, spawning, predator avoidance) and loss of foraging opportunity for marine species

Objective-based

Management targets	Management actions	Monitoring	Timing/frequency of actions	Reporting
<ul style="list-style-type: none"> • Avoid loss/ degradation to marine habitats where possible • Minimise area of habitat (including seagrass) permanently lost/ modified 	<p>Construction:</p> <ul style="list-style-type: none"> • DoT to consult with SPA to avoid in-combination impacts of construction of Casuarina Boat Harbour and SPA's sediment maintenance at McKenna Point to ensure nesting habit is available to fairy terns within the Outer Harbour area during the nesting period • Implementation of Marine Construction Monitoring and Management Plan (MCMMP; RPS 2023) provides the monitoring and management framework to address reduced marine environmental quality (and hence potential degradation of marine fauna habitat) during construction • Where practicable, minimise indirect impacts to marine habitats (including seagrass) through use of silt curtains at KBSC marina to limit the extent of turbidity plumes <p>Operation:</p> <ul style="list-style-type: none"> • Maintenance dredging (if required) will be undertaken in previously disturbed / dredged areas, hence will not result in permanent loss marine habitats • Maintenance dredging (if required) will be in accordance with an approved maintenance dredging framework • Implementation of the Marine Environmental Quality Management Plan (MEQMP; GHD 2023a) provides management and monitoring framework to address impacts to marine environmental quality during operation 	<p>In accordance with:</p> <ul style="list-style-type: none"> • DBCA currently monitors fairy terns annually during nesting • MCMMP (RPS 2023) during construction • MEQMP (GHD 2023a) during operation • Approved maintenance dredging framework during operation (if maintenance dredging is required) 	<p>In accordance with:</p> <ul style="list-style-type: none"> • Fairy terns are anticipated to be monitored on an annual basis by DBCA • MCMMP (RPS 2023) during construction • MEQMP (GHD 2023a) during operation • Approved maintenance dredging framework during operation (if maintenance dredging is required) 	<p>In accordance with:</p> <ul style="list-style-type: none"> • After monitoring of fairy terns by DBCA • MCMMP (RPS 2023) during construction • MEQMP (GHD 2023a) during operation • Approved maintenance dredging framework during operation (if maintenance dredging is required)

Table 12: Management and mitigation measures for potential for impacts from elevated underwater noise

EPA Marine Fauna objective

To protect marine fauna so that biological diversity and ecological integrity are maintained

KBMS strategic proposal objectives

- Continuity of existing dolphin behaviours and use of Koombana Bay
- Continuity of existing little penguin use of Koombana Bay

Impact specific objective

Reduce the risk of injury to marine fauna resulting from underwater water noise during piling

Key environmental values

Cetaceans, sea lions, marine turtles, little penguins

Key impacts and risks

Hearing impairment (permanent threshold shift and temporary threshold shift), behavioural disturbance, displacement, masking

Objective-based

Management targets	Management actions	Monitoring	Timing/frequency of actions	Reporting
<p>Minimise risk of injury to cetaceans, sea lions, marine turtles and little penguins by ensuring animals are out of the mitigation zone prior to the start of piling</p>	<p>Standard mitigation practices will be adopted to reduce the risk of injury to marine fauna, and include:</p> <ul style="list-style-type: none"> • 15 min observation prior to soft start over 500 m exclusion zone • In the event that a marine mammal, marine turtle or little penguin is detected, piling will not commence until the marine fauna is outside a 500 m exclusion zone • Marine mammals, marine turtles and little penguins must be absent from the 500 m exclusion zone for at least 20 minutes • Five-minute soft start at a lower hammer energy will commence before ramping up to full energy <p>Additional mitigation includes:</p> <ul style="list-style-type: none"> • Construction piling outside of breakwaters timed to avoid the bottlenose dolphin calving period (December to March) • If a dolphin is detected within the breakwaters during the dolphin calving period (December to March), piling will shut down and not recommence until the dolphin is outside of the breakwaters or has not been sighted for at least 20 minutes. 	<ul style="list-style-type: none"> • Visual monitoring will be undertaken by a suitably qualified and experienced marine fauna observer (MFO) from a stationary platform in close proximity to the piling source (i.e. jetty or piling vessel) ensuring that all directions of the mitigation zone can be observed from the platform • Additional MFO positioned at the entrance of the breakwater during piling activities within the breakwaters during the dolphin calving period (December to March) 	<ul style="list-style-type: none"> • Visual monitoring undertaken daily during the 15 min observation period prior to pile driving activities • Visual monitoring undertaken daily throughout the duration of pile driving activities 	<ul style="list-style-type: none"> • MFO training records • Daily MFO observation log of marine fauna in a Marine Observations Form • Any observed fauna injuries and/or deaths to be reported to DBCA within 24 hours

Table 13: Management and mitigation measures for potential impacts from increased vessel collision risk

EPA Marine Fauna objective

To protect marine fauna so that biological diversity and ecological integrity are maintained

KBMS strategic proposal objectives

- Continuity of existing dolphin behaviours and use of Koombana Bay
- Continuity of existing little penguin use of Koombana Bay

Impact specific objective

Reduce the risk of injury or death to animals arising from collisions with vessels during construction and operation

Key environmental values

Cetaceans, sea lions, marine turtles, seabirds and migratory shorebirds

Key impacts and risks

Mortality, serious injury and/or superficial injury to marine fauna

Objective-based

Management targets	Management actions	Monitoring	Timing/frequency of actions	Reporting
Minimise risk of injury or mortality of cetaceans, sea lions, marine turtles and seabirds and migratory shorebirds arising from vessel strike	<p>Construction:</p> <ul style="list-style-type: none"> • Construction vessel crews to undertake inductions covering procedures to minimise collision risk to marine fauna • Dedicated MFO active on-board each construction vessel • MFO will report observations of marine fauna to vessel master as soon as practicable and this information relayed to other vessels operating in the area if appropriate to reducing collision risk • During transit, a maximum speed of 6 knots will be maintained if marine fauna sighted within 300 m • Compliance with EPBC Regulations 2000 – Part 8 Division 8.1 (Regulation 8.04): vessel masters will implement precautionary measures to avoid vessel strikes <p>Operation:</p> <ul style="list-style-type: none"> • Vessels will adhere to speed limits (six knots), or any speed limit designated by the DoT and SPA • Adherence to Australian National Guidelines for Whale and Dolphin Watching (DAWE 2017) 	<p>Construction:</p> <ul style="list-style-type: none"> • Visual monitoring will be undertaken by a suitably trained MFO on-board each vessel from a high observation platform or bridge using the naked-eye and binoculars <p>Operation:</p> <ul style="list-style-type: none"> • DDC currently undertakes marine fauna/ dolphin monitoring programmes in Koombana Bay • Monitoring and enforcement of vessel speed limits by DoT / SPA 	<p>Construction:</p> <ul style="list-style-type: none"> • Daily on-board the construction vessels while in transit <p>Operation:</p> <ul style="list-style-type: none"> • DDC to continue to marine fauna / dolphin monitoring programmes in Koombana Bay • DoT / SPA to undertake regular monitoring and enforcement of vessel speed limits (as required) 	<p>Construction:</p> <ul style="list-style-type: none"> • Vessel operations log (vessel speed) if appropriate • MFO training records • Daily observation log of marine fauna in a Marine Observations Form • Any vessel strike/death to be reported to DBCA within 24 hours • Any vessel strike/death to be reported to the National Ship Strike Database (https://data.marinemammals.gov.au/report/shipstrike) <p>Operation:</p> <ul style="list-style-type: none"> • As required to meet the DDC marine fauna / dolphin monitoring programme objectives

Table 14: Management and mitigation measures for potential impacts from increased risk of entanglement

EPA Marine Fauna objective:

To protect marine fauna so that biological diversity and ecological integrity are maintained

KBMS strategic proposal objectives:

- Continuity of existing dolphin behaviours and use of Koombana Bay
- Continuity of existing little penguin use of Koombana Bay

Impact specific objective:

Reduce the risk of entanglement arising from marine debris associated with construction and operation

Key environmental values:

Cetaceans, marine turtles, sea lions, little penguins

Key impacts and risks:

Mortality, serious injury and/or superficial injury to marine fauna

Objective-based

Management targets	Management actions	Monitoring	Timing/frequency of actions	Reporting
Minimise risk of injury or mortality to cetaceans, sea lions, marine turtles and little penguins attributable to entanglement with lines	<p>Construction:</p> <ul style="list-style-type: none"> • Construction vessels to manage mooring lines to avoid loops, especially in lighter ropes • Correct disposal of waste to minimise debris entering the marine environment • Induction of site personnel about correct waste management procedures • Provision of waste bins for disposal of litter • Implementing strict environmental standards for the Proposal during construction to reduce the risk of debris entering the marine environment • Dropped objects that accidentally enter the water will be recovered (where practicable) • Information-boards erected during operations to encourage appropriate disposal of litter and the inform of the dangers of entanglement <p>Operation:</p> <ul style="list-style-type: none"> • Educational measures to encourage appropriate disposal of fishing line through the provision of bins for used fishing lines and informative signage • Engagement with the facilities manager to support clean up measures around popular fishing areas and within the KBMS strategic proposal areas. For example, patrolling of marina to remove lines or other entanglement sources 	<p>Construction:</p> <ul style="list-style-type: none"> • Construction vessels to maintain watch for debris when transiting <p>Operation:</p> <ul style="list-style-type: none"> • DDC currently undertakes marine fauna / dolphin monitoring programmes in Koombana Bay 	<p>Construction:</p> <ul style="list-style-type: none"> • Dropped objects that enter the water will be recovered (where practicable) as soon as possible after the event <p>Operation:</p> <ul style="list-style-type: none"> • DDC to continue to marine fauna / dolphin monitoring programmes in Koombana Bay 	<p>Construction:</p> <ul style="list-style-type: none"> • Reporting of dropped objects overboard to vessel master • Any fauna injuries and/or deaths to be reported to DBCA within 24 hours <p>Operation:</p> <ul style="list-style-type: none"> • As required to meet the DDC marine fauna/ dolphin monitoring programme objectives

Table 15: Management and mitigation measures for potential impacts from increased risk of entrainment

EPA Marine Fauna objective

To protect marine fauna so that biological diversity and ecological integrity are maintained

KBMS strategic proposal objectives

- Continuity of existing dolphin behaviours and use of Koombana Bay
- Continuity of existing little penguin use of Koombana Bay

Impact specific objective

Reduce the risk of entrainment arising during dredging

Key environmental values

Cetaceans, sea lions, marine turtles, little penguins

Key impacts and risks

Mortality, serious injury, superficial injury

Objective-based

Management targets	Management actions	Monitoring	Timing/frequency of actions	Reporting
Minimise risk of injury or mortality to cetaceans, sea lions, marine turtles and little penguins through entrainment in dredge head or excavator bucket, during construction or maintenance	Standard mitigation practices will be adopted to reduce the risk of injury to marine fauna, and include: <ul style="list-style-type: none"> • Prior to commencing dredging or excavating, the contractor must check for whales within a 300 m observation zone and a 100 m exclusion zone • Prior to commencing dredging or excavating, the contractor must check for dolphins, marine turtles, sea lions and little penguins within a 150 m observation zone and a 50 m exclusion zone • Dredging or excavating can only commence if no dolphins, marine turtles, sea lions and little penguins have been observed in 50 m exclusion zone, and no whales within 100 m • If any cetaceans, marine turtles, sea lions and little penguins are sighted during dredging or excavating in their respective exclusion zones, dredging will cease until the fauna have left the monitoring zones, or have not been sighted for 30 minutes • These monitoring and exclusion zones are based on the national standards for vessels described in the Australian National Guidelines for Whale and Dolphin Watching (DAWE 2017) • If a cutter-suction dredge is used, the dredge's pump will only start once the cutter head touches the seabed and stop before leaving seabed 	<ul style="list-style-type: none"> • Visual monitoring will be undertaken by a suitably qualified and experienced MFO from a stationary platform in close proximity to the dredging / excavation activity (i.e. construction vessel) ensuring that all directions of the exclusion zone can be observed from the platform • Dredge hopper and onshore disposal areas to be monitored for marine fauna 	Daily throughout the duration of excavation and dredging activities	Any fauna injuries and/or deaths to be reported to DBCA within 24 hours

Table 16: Management and mitigation measures for potential impacts from increased risk of introduced marine species

EPA Marine Fauna objective:

To protect marine fauna so that biological diversity and ecological integrity are maintained

KBMS strategic proposal objectives:

Maintain blue swimmer crab and fin fish fisheries

Impact specific objective:

Reduce the elevated risk of introduced species becoming established during construction and operation

Key environmental values:

Benthic and encrusting marine faunal assemblages

Key impacts and risks:

Predation, competition, disease effects on local species by IMS, depletion of recreational and commercially harvested marine life (e.g. shellfish), loss of biodiversity

Objective-based

Management targets	Management actions	Monitoring	Timing/frequency of actions	Reporting
No new recorded IMS established in Koombana Bay during the construction and operation phases	<p>Construction:</p> <ul style="list-style-type: none"> • Vessel operators provided with the current Western Australian Prevention List for Marine Pests to ensure they are aware of potential IMS and the reporting requirements (DoF 2016) • Construction vessels will adhere to the National Biofouling Management Guidelines For Non-Trading Vessels (CoA 2009a) • Vessels will adhere to the DAWE guidelines on ballast water exchange outlined in Australian Ballast Water Management Requirements (DAWE 2020b) • Biofouling Record Book kept outlining marine fouling management actions • Immersible equipment inspected and cleaned to 'low risk' of introducing IMS prior to use <p>Operation:</p> <ul style="list-style-type: none"> • Vessels arriving from outside Australian waters will undertake a biofouling risk assessment of the vessel and immersible equipment prior to vessel entry into Australian waters to determine whether the vessel should be either cleaned (hull, niches, workboat and equipment), or can be cleared as a low risk of introducing marine pest species. The risk assessment will follow the recommended approach of the National Biofouling Management Guidance for Non-trading vessels (CoA 2009a); Commercial Fishing Vessels (CoA 2009b) and Recreational Vessels (CoA 2009c), as applicable 	<p>Construction:</p> <ul style="list-style-type: none"> • Vessel or equipment inspections • Biofouling record book • Compliance with risk assessment protocols for non-trading vessels <p>Operation:</p> <ul style="list-style-type: none"> • Compliance with risk assessment protocols for non-trading vessels, commercial fishing vessels and recreational vessels • Biennial IMS surveys are undertaken by SPA. Additional IMS monitoring locations will be identified for the future proposals and that IMS monitoring at these sites will be undertaken at the same time as the SPA's IMS survey 	<p>Construction:</p> <ul style="list-style-type: none"> • Vessel or equipment inspections prior to mobilisation of the vessel to the construction site <p>Operation:</p> <ul style="list-style-type: none"> • International vessels, including cruising yachts, to confirm low biosecurity risk status prior to entry to the bay • IMS monitoring to be undertaken at the same time as the SPA IMS survey 	<p>Construction:</p> <ul style="list-style-type: none"> • Verification that the current Western Australian Prevention List has been provided to vessel operators (e.g. photos, inspection records) • Vessel or equipment inspection records to be provided to Department of Primary Industry and Regional Development (DPIRD; Fisheries) as completed • Any invasive species identified by vessel operators reported to the DPIRD (Fisheries) within 24 hours of sighting <p>Operation:</p> <ul style="list-style-type: none"> • Findings of IMS monitoring reported as the same time as the SPA's IMS survey findings

Table 17: Management and mitigation measures for potential impacts from increased risk of pollution incidents

EPA Marine Fauna objective

To protect marine fauna so that biological diversity and ecological integrity are maintained

KBMS strategic proposal objectives

- Continuity of existing dolphin behaviours and use of Koombana Bay
- Maintain blue swimmer crab and fin fish fisheries
- Continuity of fairy tern nesting opportunity within Koombana Bay
- Continuity of existing little penguin use of Koombana Bay

Impact specific objective

Reduce the risk of adverse effects on marine fauna from hydrocarbon and chemical spills during construction and operation

Key environmental values

All marine fauna

Key impacts and risks

Mortality/injury through ingestion, inhalation and absorption through the skin, abandonment of polluted feeding habitat, bioaccumulation in the food chain

Objective-based

Management targets	Management actions	Monitoring	Timing/frequency of actions	Reporting
Minimise risks to marine fauna from pollution incidents	<ul style="list-style-type: none"> • Minimum volumes of hazardous substances will be stored in accordance with the relevant Australian standards (AS1940:2004) • Material Safety Data Sheets will be available for all hazardous substances • Hazardous substances handling is to be carried out by suitably trained personnel only • Refuelling procedure to be developed by vessels • Spill response procedures and oil spill contingency plan to be developed by vessels • Any fuel or oil spills within port limits will be managed in accordance with SPA's oil spill arrangement and procedures • Spill kits will be located proximate to storage and operational areas • Vessels will manage chemical and fuel spill risks in accordance with the SPA's Spill Procedure (SPA 2020) 	Monitoring will be carried out in response to a pollution incident. The scope of such monitoring will be agreed with the Department of Water and Environmental Regulation (DWER) / DBCA as appropriate	<ul style="list-style-type: none"> • All vessel masters and crew to have reviewed the spill response procedures and oil spill contingency plan prior to mobilisation • Monitoring to be conducted in the event of a spill 	<ul style="list-style-type: none"> • Verification that spill kits are provided on vessels and located proximate to storage and operational areas (e.g. vessel inventory, inspection records) • All environmental incidents, including spills and leaks will be reported to SPA and DWER / DBCA as appropriate

Table 18: Management and mitigation measures for potential impacts from increased light emissions

EPA Marine Fauna objective:

To protect marine fauna so that biological diversity and ecological integrity are maintained

KBMS strategic proposal objectives:

Continuity of fairy tern nesting opportunity within Koombana Bay

Impact specific objective:

Reduce artificial light emissions affecting the marine environment during construction and operation in line with Commonwealth guidance

Key environmental values:

Breeding fairy terns

Key impacts and risks:

Disturbance to nesting fairy terns due to increased artificial light spill during construction and operational activities

Objective-based

Management targets	Management actions	Monitoring	Timing/frequency of actions	Reporting
Minimise the increase in artificial light spill to the marine environment over the current levels	<p>Construction:</p> <ul style="list-style-type: none"> • Implementation of MCMMP (RPS 2023) provides the monitoring and management framework to address the potential for artificial light emissions to significantly increase during construction • General construction work (i.e. breakwater forming) will be limited to daylight hours only, however Trailing suction hopper dredge dredging will be undertaken on a 24-hour basis • Artificial lighting on dredging vessel will be of lowest allowable intensity to meet legislative and regulatory requirements for human safety / navigational purposes • Reduce light spill by shielding lights and using directional alignment to point only at work area and not marine environment <p>Operation:</p> <ul style="list-style-type: none"> • Best practice lighting design consistent with the National Light Pollution Guidelines for Wildlife (Department of the Environment and Energy 2020) will be employed to reduce light pollution on marine fauna during operation, including: <ul style="list-style-type: none"> – Start with natural darkness and only add light for specific purposes – Use adaptive light controls to manage light timing, intensity and colour – Light only the object or area intended – keep lights close to the ground, directed and shielded to avoid light spill – Use the lowest intensity lighting appropriate for the task – Use non-reflective, dark coloured surfaces – Use lights with reduced or filtered blue, violet and ultra-violet wavelengths 	<p>Construction:</p> <ul style="list-style-type: none"> • In accordance with MCMMP (RPS 2023) during construction <p>Operation:</p> <ul style="list-style-type: none"> • DBCA currently monitors fairy terns annually during nesting • Biological and artificial light monitoring / auditing will be undertaken in accordance with the National Light Pollution Guidelines for Wildlife (Department of the Environment and Energy 2020) to confirm the anticipated impacts from the lighting design and provide a feedback mechanism for adaptive lighting management. This will include a pre-development artificial light survey for comparison against the post development outcome, with reporting and adaptive management measures (if required) implemented through the agreed KBMS governance framework 	<p>Construction:</p> <ul style="list-style-type: none"> • In accordance with MCMMP (RPS 2023) during construction <p>Operation:</p> <ul style="list-style-type: none"> • Fairy terns are anticipated to be monitored on an annual basis by DBCA • As required to confirm the anticipated impacts from the lighting design and provide a feedback mechanism for adaptive lighting management 	<p>Construction:</p> <ul style="list-style-type: none"> • In accordance with MCMMP (RPS 2023) during construction <p>Operation:</p> <ul style="list-style-type: none"> • After monitoring of fairy terns by DBCA • After implementation of biological and artificial light monitoring/ auditing event

Table 19: Management and mitigation measures for potential impacts from elevated onshore noise

EPA Marine Fauna objective

To protect marine fauna so that biological diversity and ecological integrity are maintained

KBMS strategic proposal objectives

Continuity of fairy tern nesting opportunity within Koombana Bay

Impact Specific objective

Reduce the risk of displacement of breeding seabirds and shorebirds from elevated onshore noise during construction and operation

Key environmental values

Breeding fairy terns

Key impacts and risks

Disruption / Displacement

Objective-based

Management targets	Management actions	Monitoring	Timing / frequency of actions	Reporting
Avoid disruption/ disturbance to nesting seabirds and shorebirds	<p>Construction:</p> <ul style="list-style-type: none"> Implementation of MCMMP (RPS 2023) provides the monitoring and management framework to address the potential for elevated onshore noise emissions during construction <p>Operation:</p> <ul style="list-style-type: none"> Operational noise levels are not anticipated to be noticeably different than existing levels and are unlikely to have a material impact on marine fauna behaviours 	<p>Construction:</p> <ul style="list-style-type: none"> In accordance with MCMMP (RPS 2023) during construction <p>Operation:</p> <ul style="list-style-type: none"> DBCA currently monitors fairy terns annually during nesting Noise will be managed and monitored during future proposal operation through the agreed KBMS governance framework, with contingency actions implemented should noise triggers be breached 	<p>Construction:</p> <ul style="list-style-type: none"> In accordance with MCMMP (RPS 2023) during construction <p>Operation:</p> <ul style="list-style-type: none"> Fairy terns are anticipated to be monitored on an annual basis by DBCA As required to address noise complaints and provide a feedback mechanism for adaptive management 	<p>Construction:</p> <ul style="list-style-type: none"> In accordance with MCMMP (RPS 2023) during construction <p>Operation:</p> <ul style="list-style-type: none"> After monitoring of fairy terns by DBCA As required to address noise complaints

Table 20: Management and mitigation measures for potential impacts from increased recreational fishing pressure

EPA Marine Fauna objective

To protect marine fauna so that biological diversity and ecological integrity are maintained

KBMS strategic proposal objectives

Maintain blue swimmer crab and fin fish fisheries

Impact specific objective

Reduce the risk of increased recreational fishing pressure leading to a decline in local fisheries target species during operation

Key environmental values

Blue swimmer crab and other fisheries target species

Key impacts and risks

Increased fishing pressure on recreationally fished species due to increased access

Objective-based

Management targets	Management actions	Monitoring	Timing / frequency of actions	Reporting
Minimise impacts to recreationally fished stocks due an increased number of vessels utilising Koombana Bay	<ul style="list-style-type: none"> Signposting in key water access areas to encourage responsible and lawful fishing practices DPIRD (Fisheries) has conducted a juvenile fish recruitment annual netting survey at Koombana Bay and various other sites from 1995 The blue swimming crab fishery is currently regulated by the DPIRD (Fisheries) to ensure sustainable fisheries and includes limits on: <ul style="list-style-type: none"> Size of individuals landed Number of individuals landed Number of boats allowed to engage in this fishery 	<ul style="list-style-type: none"> DPIRD (Fisheries) currently monitors recruitment through an annual netting survey of juvenile fish in Koombana Bay <ul style="list-style-type: none"> Should the recruitment monitoring of juvenile fish cease the annual DPIRD State of Fisheries reporting will be used as an ongoing reference for the sustainability of Bunbury fin fish stocks DPIRD (Fisheries) currently regulates the blue swimmer crab fishery 	<ul style="list-style-type: none"> Annual netting survey of juvenile fish in Koombana Bay is anticipated to be undertaken on an annual basis by DPIRD (Fisheries) <ul style="list-style-type: none"> Should the recruitment monitoring of juvenile fish cease the annual DPIRD State of Fisheries reporting will be used as an ongoing reference for the sustainability of Bunbury fin fish stocks Blue swimmer crab fishery is anticipated to be regulated by DPIRD (Fisheries) 	<ul style="list-style-type: none"> After netting survey by DPIRD (Fisheries) <ul style="list-style-type: none"> DPIRD State of Fisheries reporting As required by DPIRD (Fisheries) to regulate blue swimmer crab fishery

Table 21: Management and mitigation measures for potential impacts from increase in human - fauna interactions

EPA Marine Fauna objective

To protect marine fauna so that biological diversity and ecological integrity are maintained

KBMS strategic proposal objectives

- Continuity of existing dolphin behaviours and use of Koombana Bay
- Maintain blue swimmer crab and fin fish fisheries
- Continuity of fairy tern nesting opportunity within Koombana Bay
- Continuity of existing little penguin use of Koombana Bay

Impact specific objective

Reduce the risk of human - fauna interactions associated with an increase in public access to the waterfront from land-based pedestrian access and an increase in recreational vessels during operation

Key environmental values

All marine fauna

Key impacts and risks

Marine litter, harassment and illegal feeding and increased vessel disturbance

Objective-based

Management targets	Management actions	Monitoring	Timing / frequency of actions	Reporting
Minimise risk of impacts to marine fauna associated with human activities	<p>Construction:</p> <ul style="list-style-type: none"> • Implementation of MCMMP (RPS 2023) provides the monitoring and management framework to address the potential threats to marine fauna during construction <p>Operation:</p> <ul style="list-style-type: none"> • Provision of sufficient recycling and waste bins on site • Waste stored in accordance with Australian standards, Codes of Practice and relevant legislation • Information-boards to encourage appropriate disposal of litter and the inform of the dangers of marine litter • Informative signage to discourage illegal feeding of marine fauna. This includes throwing food or rubbish in the water and feeding dolphins from boats. Signage to include relevant wildlife regulations • Feeding to be prohibited in the marina areas • Provide contact numbers to report any incidents 	<p>Construction:</p> <ul style="list-style-type: none"> • In accordance with MCMMP (RPS 2023) during construction <p>Operation:</p> <ul style="list-style-type: none"> • DDC currently undertakes marine fauna / dolphin monitoring programmes in Koombana Bay 	<p>Construction:</p> <ul style="list-style-type: none"> • In accordance with MCMMP (RPS 2023) during construction <p>Operation:</p> <ul style="list-style-type: none"> • DDC to continue to marine fauna / dolphin monitoring programmes in Koombana Bay 	<p>Construction:</p> <ul style="list-style-type: none"> • In accordance with MCMMP (RPS 2023) during construction <p>Operation:</p> <ul style="list-style-type: none"> • As required to meet the DDC marine fauna / dolphin monitoring programme objectives

4 ADAPTIVE MANAGEMENT AND REVIEW

The future proposal proponents are committed to undertaking activities in a manner that considers the sensitivities of the environment, minimises potential impacts in accordance with industry practices and state and Commonwealth guidelines, and thereby promotes environmentally responsible development

As such, this MFMP will be reviewed on an annual basis and updated if required (for example in response to new information) to ensure that the stated environmental objectives are being met. Reviews will address matters including:

- Overall effectiveness of the MFMP in providing the management framework to meet the stated environmental objectives
- Future proposal proponent environmental performance
- Changes to environmental values (e.g. revised species listing, identification of a new species requiring management)
- Review environmental objectives / management and mitigation measures as part of adaptive management processes
- Any relevant emerging environmental issues

An annual review of observation data and incident reports will be undertaken in consultation with marine fauna specialists and future proposal proponents to enable consideration of the need for changes to fauna impact controls and practical management procedures. A review of this MFMP may also occur after a significant change in the design parameters, or a significant non-conformance or incident relating to the implementation of management / mitigation measures

Any observed breaches in conformance will be investigated fully and additional corrective measures will be devised with the aim of preventing recurrences

The adaptive management and review processes will be implemented by the future proposal proponents during construction and through the agreed KBMS governance framework during operation

5 STAKEHOLDER CONSULTATION

Stakeholder groups have been consulted in the preparation of this MFMP. Table 22 summarises the consultation undertaken, the comments and issues raised during the consultation and the SWDC's response

Key stakeholders of the TBW project provided a recent review of fauna monitoring outcomes. Long-term marine fauna monitoring was anticipated to primarily continue, with only DPIRD indicating that the recruitment monitoring of juvenile fish will probably cease

Table 22: Stakeholder engagement relating to marine fauna

Stakeholder group	Date	Comment topics	Response to comments
DoF (Head Office)	12 January 2017	Introduction of marine pest species	Mitigation actions to prevent introduction of marine pest species as part of the strategic proposal identified
		Fate of moorings in Koombana Bay	Options for managing the existing of moorings, and their associated infrastructure identified
		Loss of potential habitats for local fin fish and potential impacts recreational fishers / research programmes	<ul style="list-style-type: none"> Department to determine if any recent investigations have been undertaken which identified fin fish presence in the vicinity of the reclamation works, or potential for conflict with existing fisheries research programs Recfishwest (Hillarys) were also consulted
		Blue swimmer crab shell disease	<ul style="list-style-type: none"> Additional information for specific information on blue swimmer crabs requested from Department Blue swimmer crab context identified
		IMS survey methodology	<ul style="list-style-type: none"> Proposed introduced marine pest species monitoring methodology reviewed Department research staff contacted for advice on proposed monitoring methodology
Recfishwest (Hillarys)	24 January 2017	Restriction in access to fishing beaches and boating facilities	<ul style="list-style-type: none"> Access to fishing beaches and boating facilities to be maintained and enhanced by implementation of the future proposals Future access considerations for future proposals to include access for people of all abilities
DDC	02 February 2017	DDC has local marine fauna observer (MFO) experience	Capability of DDC to undertake MFO project work identified
		Dolphin Discover Centre has developed detailed management protocols for monitoring / managing of dolphins / turtles	Management actions for dolphins and turtles have been informed by the DDC protocols
DoF (Bunbury District Office)	02 February 2017	Identification of key fishing areas and times in Koombana Bay	<ul style="list-style-type: none"> Key fishing areas and times for Koombana Bay identified Timing of construction activities to avoid significantly impacting fishers and fisheries
		Importance of Koombana Bay blue swimmer crab fishery	<ul style="list-style-type: none"> Blue swimmer crab context identified Timing of construction activities proposed to avoid significantly impacting fishers and fisheries
DBCA (Kensington)	03 February 2017	Shorebird and marine bird context identified	<ul style="list-style-type: none"> Shorebird and marine bird context identified Marine species sensitivity mapping used to inform appropriate construction time frames
		Little penguin, southern right whale and Australian sea lion context identified	<ul style="list-style-type: none"> Little penguin, southern right whale and Australian sea lion context identified Marine species sensitivity mapping used to inform appropriate construction time frames
		Key dolphin habitat adjacent to the Leschenault Estuary and dolphin movements within Koombana Bay	Marine species sensitivity mapping used to inform appropriate construction time frames
Presentation to Project Control Group by Murdoch University – Cetacean Research Unit on Koombana Bay Dolphins	7 February 2017	<ul style="list-style-type: none"> Review of the historical dolphin research undertaken by Murdoch University Potential for increased use of Koombana Bay After construction of the marine structures to adversely impact local dolphin population 	Ongoing management actions for dolphins have been informed by DDC protocols
Newton Moore Senior High School	15 March 2017	Student involvement in IMS survey.	Student findings incorporated into introduced marine species information
DDC	02 February 2022	Meeting regarding: <ul style="list-style-type: none"> Existing and proposed marine fauna / dolphin monitoring programmes (current and future) Proposed dolphin research programme Marine observation protocols 	Outlined the existing and proposed dolphin (and marine fauna) monitoring programmes
DBCA	15 March 2023	Ongoing supply of monitoring data to TBW project	Provided 2022–2023 fairy tern reporting for SPA's Outer Harbour area
SPA			Confirmed continuity biennial IMS surveys
DPIRD			<ul style="list-style-type: none"> Provided a summary of the Koombana Bay juvenile fin fish monitoring effort and findings Identified that the recruitment monitoring of juvenile fish will probably cease
CoB			<ul style="list-style-type: none"> CoB has provided funding to Manea Senior College to monitor blue swimmer crabs in Koombana Bay and Leschenault Inlet for the last five years CoB has requested access to this dataset
DDC			Confirmed continuity of dolphin population monitoring

6 MFMP AMENDMENTS

As noted in Section 5, this MFMP will be reviewed on an annual basis and updated, as required, to ensure that the stated environmental objectives are being met. Amendments to the MFMP will be provided to DWER for endorsement / acceptance, on the advice of DBCA. Table 23 has been provided as a framework to capture and track any updates or amendments to the MFMP

Table 23: Record of MFMP amendments

Complexity of changes		Minor revisions <input type="checkbox"/>	Moderate revisions <input type="checkbox"/>	Major revisions <input type="checkbox"/>
Number of key environmental factors		One <input type="checkbox"/>	2-3 <input type="checkbox"/>	>3 <input type="checkbox"/>
Date revision submitted to EPA		DD/MM/YYYY		
Proponent's operational requirement time frame for approval of revision		< One month <input type="checkbox"/>	< Six months <input type="checkbox"/>	> Six months <input type="checkbox"/> None <input type="checkbox"/>
Reason for time frame				
Item no.	Section no.	Page no.	Summary of change	Reason for change
1.				
2.				
3.				

7 REFERENCES

- Armstrong, A. J. Armstrong, A. O. Bennett, M. B. McGregor, F. Abrantes, K. G. Barnett, A. and C.L. Dudgeon. 2020. The geographic distribution of reef and oceanic manta rays (*Mobula alfredi* and *Mobula birostris*) in Australian coastal waters. *Journal of fish biology*, 96(3), 835-840
- Bannister, J.L. Kemper, C.M. and R.M. Warneke. 1996. The Action Plan for Australian Cetaceans. Wildlife Australia, Endangered Species Programme, Project No. 380. Australian Nature Conservation Agency, Canberra, Australia. 272 pp
- Benjamins, S. Harnois, V, Smith, H. Johanning, L. Greenhill, L. Carter, C. and B. Wilson. 2014. Understanding the potential for marine megafauna entanglement risk from marine renewable energy developments. <https://ore.exeter.ac.uk/repository/bitstream/handle/10871/21616/Understanding?sequence=1>
- Cannell, B. 2001. Status of little penguins in Western Australia: A management review. Report: MMS/LNE/SIS-40/2001
- Cannell, B. 2016. How resilient are the Little Penguins and the coastal marine habitats they use? Report year 3. Unpublished Report for City of Rockingham, Fremantle Ports
- Cannell, B. 2018. Understanding the toll of consecutive years of warm waters on little penguins and refining their capacity as bioindicators of the marine coastal ecosystem. Report for the City of Rockingham and Fremantle Ports
- Commonwealth of Australia. 2009a. National Biofouling Management Guidelines for Non-trading Vessels. – The National System for the Prevention and Management of Marine Pest Incursions. Canberra, ACT, April 2009
- Commonwealth of Australia. 2009b. National Biofouling Management Guidance for Commercial Fishing Vessels – The National System for the Prevention and Management of Marine Pest Incursions. Canberra, ACT, January 2009
- Commonwealth of Australia. 2009c. National Biofouling Management Guidance for Recreational Vessels – The National System for the Prevention and Management of Marine Pest Incursions Canberra, ACT, January 2009
- Coulthard, P. 2006. Spatial and temporal distribution patterns and habitat use by Bottlenose Dolphins (*Tursiops* sp.) in Bunbury, WA. Honours, Curtin University of Technology, Perth 103 pp
- Crooks J. 2002. Characterizing ecosystem-level consequences of biological invasions: the role of ecosystem engineers. *Oikos*, 97, 153–166
- Dabble, R. 2012. Projected entrainment of fish resulting from aggregate dredging, *Marine Pollution Bulletin*, 64, 373 – 381
- Department of Agriculture, Water and the Environment. 2017. Australian National Guidelines for Whale and Dolphin Watching. Canberra, Australian Capital Territory
- Department of Agriculture, Water and the Environment. 2020a. National Conservation Values Atlas. <http://www.environment.gov.au/webgis-framework/apps/ncva/ncva.jsf>
- Department of Agriculture, Water and the Environment. 2020b. Australian Ballast Eater Management Requirements, Version 8. Canberra, Australian Capital Territory
- Department of Agriculture, Water and the Environment. 2021a. *Carcharodon carcharias* in Species Profile and Threats Database. http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?axon_id=64470
- Department of Agriculture, Water and the Environment. 2021b. *Balaenoptera musculus* in Species Profile and Threats Database. http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=36
- Department of Agriculture, Water and the Environment. 2021c. *Eubalaena australis* in Species Profile and Threats Database. http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=40
- Department of Agriculture, Water and the Environment. 2021d. *Balaenoptera edeni* in Species Profile and Threats Database. http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=35
- Department of Agriculture, Water and the Environment. 2021e. *Orcinus orca* in Species Profile and Threats Database. http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=46

- Department of Agriculture, Water and the Environment. 2021f. *Lagenorhynchus obscurus* in Species Profile and Threats Database: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=43
- Department of Agriculture, Water and the Environment. 2021g. *Stenella longirostris* in Species Profile and Threats Database. http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=29
- Department of Agriculture, Water and the Environment. 2022. Marine mammal database Australian Antarctic Division. [https://data.marinemammals.gov.au/nmmdb/events/?spatial_bounds=115.46082,-33.381,115.82336,-33.12835andevent_class=\[Shipstrike\]andtemporal_date_start=1880andtemporal_date_end=2020](https://data.marinemammals.gov.au/nmmdb/events/?spatial_bounds=115.46082,-33.381,115.82336,-33.12835andevent_class=[Shipstrike]andtemporal_date_start=1880andtemporal_date_end=2020)
- Department of Biodiversity, Conservation and Attractions. 2019. Hammerhead sharks. <https://www.dpaw.wa.gov.au/management/marine/marine-parks-wa/fun-facts/419-hammerhead-sharks>
- Department of Biodiversity, Conservation and Attractions. 2023. Bunbury Fairy Tern Population, Summary 2022/2023. Unpublished DBCA dataset
- Department of Energy and the Environment. 2017. Recovery Plan for Marine Turtles in Australia. <http://www.environment.gov.au/system/files/resources/46eedcfc-204b-43de-99c5-4d6f6e72704f/files/recovery-plan-marine-turtles-2017.pdf>
- Department of Energy and the Environment. 2020. National Light Pollution Guidelines for Wildlife: Including marine turtles, seabirds and migratory shorebirds. <https://www.awe.gov.au/sites/default/files/documents/national-light-pollution-guidelines-wildlife.pdf>
- Department of Fisheries. 2016. Western Australian Prevention List for Introduced Marine Pests. http://www.fish.wa.gov.au/Documents/biosecurity/epa_introduced_marine_pests.pdf
- Department of Sustainability, Environment, Water, Population and Communities. 2012. *Marine bioregional plan for the South-West Marine Region*. <http://www.environment.gov.au/system/files/pages/a73fb726-8572-4d64-9e33-1d320dd6109c/files/south-west-marine-plan.pdf>
- Double, M.C. Andrews-Goff, V. Curt, K. Jenner, S. Jenner, M.N. Laverick, S.M. Branch, T.A. and N.J. Gales. 2014. Migratory Movements of pygmy blue whales (*Balaenoptera musculus breviicauda*) between Australia and Indonesia as revealed by satellite telemetry. *PLoS one* 9(4): e93578
- Dolphin Discovery Centre. 2013. Final Report – Bunbury Timber Jetty, June 2012 to March 2013. Unpublished report prepared for the City of Bunbury
- Dolphin Discovery Centre. 2023. Dolphins. Accessed 13 January 2023 <https://dolphindiscovery.com.au/research/dolphins>
- Dunlop, J.N. 2016. Local Fairy Tern Conservation Strategy for the South West Coastal Region. Unpublished report for the Conservation Council WA
- Environmental Protection Authority. 2015. Environmental Scoping Document. EPA, Western Australia
- Environmental Protection Authority. 2021a. Instructions: How to prepare Environmental Protection Act 1986 Part IV Environmental Management Plans. EPA, Western Australia
- Environmental Protection Authority. 2021b. Statement of Environmental Principles, Factors and Objectives. EPA, Western Australia
- Fisheries Research and Development Corporation. 2019. Shark futures: A report card for Australia's sharks and rays. <https://www.frdc.com.au/sites/default/files/products/2013-009-DLD.pdf>
- Fujioka, K.O., Hobday, A.J., Kawabe, R.Y., Miyashita, K., Takao Y., Sakai O. and T. Itoh. 2012. Departure behaviour of juvenile southern bluefin tuna (*Thunnus maccoyii*) from southern Western Australia temperate waters in relation to the Leeuwin Current. *Fisheries Oceanography*. 21(4):269-80
- Gallardo, B., Clavero, M., Sanchez, M. and M. Vila. 2016. Global ecological impacts of invasive species in aquatic ecosystems. *Global Change Biology*, 22: 151-163. doi: 10.1111/gcb.13004
- Gero, S., Gordon, J. and H. Whitehead. 2013. Calves as social hubs: dynamics of the social network within sperm whale units. *Proceedings. Biological Sciences*, 280(1763), 20131113. <https://royalsocietypublishing.org/doi/10.1098/rspb.2013.1113>
- GHD. 2014. SPER Technical Investigations- Marine Fauna. Unpublished report prepared for Southern Ports Authority, Port of Bunbury
- GHD. 2023a. Marine Environmental Quality Management Plan. Unpublished report prepared for the South West Development Commission

- GHD. 2023b. Coastal Processes Management Plan. Unpublished report prepared for the South West Development Commission
- Government of Western Australia. 2018. White shark movement and population. http://www.fish.wa.gov.au/Documents/shark_hazard/white_shark_fact_sheet.pdf
- Harris, D., Johnston, D., Baker, J. and M. Foster. 2017. Adopting a Citizen science approach to develop cost-effective methods that will deliver annual information for managing small-scale recreational fisheries: the Southwest Recreational Crabbing Project, Fisheries Research Report No. 281. North Beach, Western Australia
- Jacobs. 2016. Barossa Environmental Studies – Benthic Habitat Report. <https://static.conocophillips.com/files/resources/appendix-d-2.pdf>
- Jefferson, T.A., Hung, S.K. and B. Würsig. 2009. Protecting small cetaceans from coastal development: impact assessment and mitigation experience in Hong Kong. *Mar. Policy* 33, 305–311
- Jenner, K.C.S. and M.N. Jenner. 1996. Group IV humpback whale calving ground and population monitoring programme 1995. Prepared for Australian Nature Conservation Agency project # SCA01842. Unpublished
- Jenner, K.C.S. Jenner, M.N. and K.A. McCabe. 2001. Geographical and temporal movements of humpback whales in Western Australian waters. *APPEA journal*. Page(s) 749-765
- Johnson, C. M., Beckley, L. E., Kobryn, H., Johnson, G. E., Kerr, I. and R. Payne. 2016. Crowdsourcing Modern and Historical Data Identifies Sperm Whale (*Physeter macrocephalus*) Habitat Offshore of South-Western Australia. In *Frontiers in Marine Science* (Vol. 3). <https://www.frontiersin.org/article/10.3389/fmars.2016.00167>
- Johnston, D. Harris, D. and D. Yeoh. 2020. Blue Swimmer Crab (*Portunus armatus*) Resource in the West Coast Bioregion, Western Australia. Part 2: Warnbro Sound, Comet Bay, Mandurah to Bunbury, Leschenault Estuary, Geographe Bay and Hardy Inlet. Fisheries Research Report No. 309. Department of Primary Industries and Regional Development, Western Australia. 94pp
- Kemper, C.A. 2002. Distribution of the pygmy right whale, *Caperea marginata*, in the Australasian region. *Marine Mammal Science*. 18(1):99-111
- Magnus Wahlberg. 2011. Technical Report 7A, Independent Specialist Review for Underwater Noise Modelling. Unpublished report prepared for Lanco Resources Australia
- Manlik, O, McDonald, JA, Mann J, Raudino, HC, Bejder L, Krutzen M, Connor RC, Heithause MR, Lacy RC and Sherwin WB (2016). The relative importance of reproduction and survival for the conservation of two dolphin populations. *Ecology and Evolution*, 6(11) pp 3496 – 3512
- Marley, S.A., Erbe. C. and C. S. Kent. 2016. Occupancy of bottlenose dolphins (*Tursiops aduncus*) in relation to vessel traffic, dredging, and environmental variables within a highly urbanised estuary. *Hydrobiologia*. DOI 10.1007/s10750-016-3061-7
- McCauley, R.D. Bannister, J. Burton, C. Jenner, C. Rennie, S. and C.S Kent. 2004. Western Australian Exercise Area Blue Whale Project. Final Summary Report. Milestone 6, September 2004. CMST Report R2004-29, Project 350. 71pp
- McCauley, R.D. and C. Jenner. 2010. Migratory patterns and estimated population size of pygmy blue whales (*Balaenoptera musculus breviicauda*) traversing the Western Australian coast based on passive acoustics. Paper SC/62/Sh26 presented to the IWC Scientific Committee
- Morris, R., McCartney, M., Lockyer, C. and R. Hoborn. 1985. The particulate load of the Red River, St Ives Bay: its geochemical composition and the effect of its discharge plume on the behaviour of a resident wild dolphin. *Mar. Pollut. Bull.* 16, 106–108
- Newman, S.J., Wise, B.S., Santoro, K.G. and D.J. Gaughan (eds). 2021. Status Reports of the Fisheries and Aquatic Resources of Western Australia 2020/21: The State of the Fisheries. Department of Primary Industries and Regional Development, Western Australia
- Pirotta, E., Laesser. B.E., Hardaker, A., Riddoch, N., Marcoux, M. and D. Lusseau. 2013. Dredging displaces bottlenose dolphins from an urbanised foraging patch. *Marine Pollution Bulletin* 74 (2013) 396–402
- Pogonoski, J.J. D.A. Pollard and J.R. Paxton. 2002. Conservation Overview and Action Plan for Australian Threatened and Potentially Threatened Marine and Estuarine Fishes. Canberra, ACT: Environment Australia. <http://www.environment.gov.au/coasts/publications/marine-fish-action/pubs/marine-fish.pdf>

- Recfishwest. 2019. Bunbury's artificial reef boosting fishing. <https://recfishwest.org.au/news/better-fishing-for-bunbury/>
- Richardson, W. J. Greene Jr, C. R. Malme, C. I. and D.H. Thomson. 1995. Marine mammals and noise. Academic press
- Rodríguez, A. Holmes, N, Ryan, P. Wilson, K. Faulquier, L. Murillo, Y. Raine, A. Penniman, J. Neves, V. Rodríguez, B. and J. Negro .2017. Seabird mortality induced by land-based artificial lights. *Conservation Biology*, 31(5), 986-1001
- RPS. 2022. Invasive marine species survey. Unpublished report prepared for the South West Development Commission
- RPS. 2023. Marine construction monitoring and management plan. Unpublished report prepared for the South West Development Commission
- Russart, K.L. and R.J. Nelson. 2018. Artificial light at night alters behavior in laboratory and wild animals. *Journal of Experimental Zoology Part A: Ecological and Integrative Physiology*, 329(8-9), 401-408
- Smith, K.A., Brown, J., Hammond, M. and A. Nardi. 2008. Development of cost-effective indices to monitor the nearshore fish communities of the Swan region. Report prepared for the Swan Catchment Council
- Smith, H.C. 2012. Population Dynamics and Habitat Use of Bottlenose Dolphins (*Tursiops aduncus*), Bunbury, Western Australia. PhD Thesis, Murdoch University
- Smith, H. Frère, C. Kobryn, H. and L. Bejder. 2016. Dolphin sociality, distribution and calving as important behavioural patterns informing management. *Animal Conservation*, 19(5), 462-471
- Sordello, R., Ratel, O., De Lachapelle, F.F., Leger, C., Dambry, A. and S. Vanpeene. 2020. Evidence of the impact of noise pollution on biodiversity: a systematic map. *Environ Evid* 9, 20 (2020). <https://doi.org/10.1186/s13750-020-00202-y>
- Southern Ports Authority. 2020. Spill Procedure. Available from https://www.southernports.com.au/sites/default/files/2020-07/Spill%20Procedure_1.pdf?1645484254
- Sprogis, K.R., Raudino, H.R. and R. Rankin. 2016b. Sex-specific Patterns in Abundance, Temporary Emigration and Survival of Indo-Pacific Bottlenose Dolphins (*Tursiops aduncus*) in Coastal and Estuarine Waters. *Frontiers in Marine Science*, Vol 3, Article 12
- Sprogis, K.R., Raudino, H.R and R. Rankin. 2016a. Home range size of adult Indo-Pacific bottlenose dolphins (*Tursiops aduncus*) in a coastal and estuarine system is habitat and sex specific. *Marine Mammal Science*, 3 2(1): 287-308
- Strayer, D.L. 2010. Alien species in fresh waters: ecological effects, interactions with other stressors, and prospects for the future. *Freshwater Biology*, 55: 152-174. <https://doi.org/10.1111/j.1365-2427.2009.02380.x>
- SVT Engineering Consultants.2018. Koombana Bay Marine Structures Project: Underwater Noise Assessment. Unpublished report prepared for RPS
- Todd, V.L.G, Todd, I.B., Gardiner, J.C., Morrin, E.C.N., MacPherson, N.A., DiMarzio, N.A. and F Thomsen. A review of impacts of marine dredging activities on marine mammals. – *ICES Journal of Marine Science*, 72: 328–340
- Wave Solutions. 2012. Technical Report 7 – Marine Fauna Studies. Unpublished report prepared for Lanco Australia for the Bunbury Port Berth 14A Expansion and Coal Storage Facility
- Wilber, D. and D. Clarke. 2001. Biological effects of suspended sediments: a review of suspended sediment impacts on fish and shellfish with relation to dredging activities in estuaries. *North Am. J. Fish. Manag.* 21, 855–875
- Wilson, S.G. Polovina, J.J. Stewart, B.S. and M.G. Meekan. 2006. Movements of Whale Sharks (*Rhincodon typus*) Tagged at Ningaloo Reef, Western Australia. *Marine Biology* 148(5): 1157–1166
- Wilson, B. Batty, R. Daunt, F. and C. Carter. 2007. *Collision Risks Between Marine Renewable Energy Devices and Mammals, Fish and Diving Birds*. <https://tethys.pnnl.gov/sites/default/files/publications/Wilson-et-al-2007.pdf>.

Appendix A

Protected matters 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. Please see the caveat for interpretation of information provided here.

Report created: 06-Dec-2021

[Summary](#)

[Details](#)

[Matters of NES](#)

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

[Extra Information](#)

[Caveat](#)

[Acknowledgements](#)

Summary

Matters of National Environment Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance (Ramsar)	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	1
Listed Threatened Ecological Communities:	4
Listed Threatened Species:	62
Listed Migratory Species:	45

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

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

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

Commonwealth Lands:	12
Commonwealth Heritage Places:	None
Listed Marine Species:	69
Whales and Other Cetaceans:	13
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

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

State and Territory Reserves:	2
Regional Forest Agreements:	None
Nationally Important Wetlands:	None
EPBC Act Referrals:	18
Key Ecological Features (Marine):	1
Biologically Important Areas:	11
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

Commonwealth Marine Area

[[Resource Information](#)]

Approval is required for a proposed activity that is located within the Commonwealth Marine Area which has, will have, or is likely to have a significant impact on the environment. Approval may be required for a proposed action taken outside a Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area.

Feature Name

EEZ and Territorial Sea

Buffer Status

In buffer area only

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.

Status of Vulnerable, Disallowed and Ineligible are not MNES under the EPBC Act.

Community Name

[Banksia Woodlands of the Swan Coastal Plain ecological community](#)

Threatened Category

Endangered

Presence Text

Community likely to occur within area

Buffer Status

In feature area

[Clay Pans of the Swan Coastal Plain](#)

Critically Endangered

Community likely to occur within area

In buffer area only

[Subtropical and Temperate Coastal Saltmarsh](#)

Vulnerable

Community likely to occur within area

In buffer area only

[Tuart \(*Eucalyptus gomphocephala*\) Woodlands and Forests of the Swan Coastal Plain ecological community](#)

Critically Endangered

Community likely to occur within area

In feature area

Listed Threatened Species

[[Resource Information](#)]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.

Number is the current name ID.

Scientific Name

BIRD

[Anous tenuirostris melanops](#)

Australian Lesser Noddy [26000]

Threatened Category

Vulnerable

Presence Text

Species or species habitat may occur within area

Buffer Status

In feature area

[Botaurus poiciloptilus](#)

Australasian Bittern [1001]

Endangered

Species or species habitat likely to occur within area

In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Calyptorhynchus banksii naso Forest Red-tailed Black-Cockatoo, Karrak [67034]	Vulnerable	Species or species habitat known to occur within area	In feature area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area	In feature area
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area	In feature area
Diomedea dabbenena Tristan Albatross [66471]	Endangered	Species or species habitat may occur within area	In feature area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area	In feature area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat may occur within area	In feature area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Russkoye Bar-tailed Godwit [86432]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area	In feature area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area	In feature area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Phoebastria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area	In feature area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area	In feature area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area	In feature area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area	In feature area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Zanda baudinii listed as Calyptorhynchus baudinii Baudin's Black-Cockatoo, Long-billed Black-cockatoo [87736]	Endangered	Breeding known to occur within area	In feature area
Zanda latirostris listed as Calyptorhynchus latirostris Carnaby's Black Cockatoo, Short-billed Black-cockatoo [87737]	Endangered	Species or species habitat known to occur within area	In feature area

FISH

Nannatherina balstoni Balston's Pygmy Perch [66698]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Thunnus maccoyii Southern Bluefin Tuna [69402]	Conservation Dependent	Species or species habitat likely to occur within area	In feature area

MAMMAL

Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area	In feature area
Dasyurus geoffroi Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat known to occur within area	In feature area
Eubalaena australis Southern Right Whale [40]	Endangered	Breeding known to occur within area	In feature area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Congregation or aggregation known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Neophoca cinerea Australian Sea-lion, Australian Sea Lion [22]	Endangered	Species or species habitat may occur within area	In feature area
Pseudocheirus occidentalis Western Ringtail Possum, Ngwayir, Womp, Woder, Ngoor, Ngoolangit [25911]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Setonix brachyurus Quokka [229]	Vulnerable	Species or species habitat may occur within area	In feature area
OTHER			
Westralunio carteri Carter's Freshwater Mussel, Freshwater Mussel [86266]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
PLANT			
Andersonia gracilis Slender Andersonia [14470]	Endangered	Species or species habitat may occur within area	In buffer area only
Austrostipa bronwenae [87808]	Endangered	Species or species habitat known to occur within area	In feature area
Austrostipa jacobiana [87809]	Critically Endangered	Species or species habitat known to occur within area	In buffer area only
Banksia nivea subsp. uliginosa Swamp Honeypot [82766]	Endangered	Species or species habitat may occur within area	In feature area
Caladenia huegelii King Spider-orchid, Grand Spider-orchid, Rusty Spider-orchid [7309]	Endangered	Species or species habitat likely to occur within area	In feature area
Diuris drummondii Tall Donkey Orchid [4365]	Vulnerable	Species or species habitat known to occur within area	In feature area
Diuris micrantha Dwarf Bee-orchid [55082]	Vulnerable	Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Diuris purdiei Purdie's Donkey-orchid [12950]	Endangered	Species or species habitat may occur within area	In feature area
Drakaea elastica Glossy-leafed Hammer Orchid, Glossy-leafed Hammer Orchid, Warty Hammer Orchid [16753]	Endangered	Species or species habitat likely to occur within area	In buffer area only
Drakaea micrantha Dwarf Hammer-orchid [56755]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Eleocharis keigheryi Keighery's Eleocharis [64893]	Vulnerable	Species or species habitat may occur within area	In feature area
Lambertia echinata subsp. occidentalis Western Prickly Honeysuckle [64528]	Endangered	Species or species habitat may occur within area	In feature area
Synaphea sp. Fairbridge Farm (D. Papenfus 696) Selena's Synaphea [82881]	Critically Endangered	Species or species habitat likely to occur within area	In feature area
Synaphea sp. Serpentine (G.R. Brand 103) [86879]	Critically Endangered	Species or species habitat may occur within area	In buffer area only
REPTILE			
Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area	In feature area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area	In feature area
Natator depressus Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
SHARK			
Carcharias taurus (west coast population)			
Grey Nurse Shark (west coast population) [68752]	Vulnerable	Species or species habitat known to occur within area	In feature area
Carcharodon carcharias			
White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area	In feature area
Galeorhinus galeus			
School Shark, Eastern School Shark, Snapper Shark, Tope, Soupfin Shark [68453]	Conservation Dependent	Species or species habitat may occur within area	In buffer area only
Rhincodon typus			
Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area	In feature area
Sphyrna lewini			
Scalloped Hammerhead [85267]	Conservation Dependent	Species or species habitat likely to occur within area	In feature area

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

Scientific Name	Threatened Category	Presence Text	Buffer Status
Migratory Marine Birds			
Anous stolidus			
Common Noddy [825]		Species or species habitat may occur within area	In feature area
Apus pacificus			
Fork-tailed Swift [678]		Species or species habitat likely to occur within area	In feature area
Ardenna carneipes			
Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Species or species habitat likely to occur within area	In feature area
Diomedea amsterdamensis			
Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area	In feature area
Diomedea dabbenena			
Tristan Albatross [66471]	Endangered	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area	In feature area
Hydroprogne caspia Caspian Tern [808]		Foraging, feeding or related behaviour known to occur within area	In feature area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area	In feature area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area	In feature area
Onychoprion anaethetus Bridled Tern [82845]		Foraging, feeding or related behaviour likely to occur within area	In feature area
Phoebastria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area	In feature area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area	In feature area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area	In feature area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Migratory Marine Species			
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area	In feature area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area	In feature area
Caperea marginata Pygmy Right Whale [39]		Species or species habitat may occur within area	In feature area
Carcharhinus longimanus Oceanic Whitetip Shark [84108]		Species or species habitat may occur within area	In feature area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area	In feature area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area	In feature area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Eubalaena australis as Balaena glacialis australis Southern Right Whale [40]	Endangered	Breeding known to occur within area	In feature area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area	In feature area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Congregation or aggregation known to occur within area	In feature area
Mobula alfredi as Manta alfredi Reef Manta Ray, Coastal Manta Ray [90033]		Species or species habitat may occur within area	In feature area
Mobula birostris as Manta birostris Giant Manta Ray [90034]		Species or species habitat may occur within area	In feature area
Natator depressus Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area	In feature area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area	In feature area
Migratory Terrestrial Species			
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area	In feature area
Migratory Wetlands Species			
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area	In feature area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area	In feature area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area	In feature area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area	In feature area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area	In feature area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area	In feature area

Other Matters Protected by the EPBC Act

Commonwealth Lands [\[Resource Information \]](#)

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

Commonwealth Land Name	State	Buffer Status
Defence		
Defence - BUNBURY TRAINING DEPOT [50142]	WA	In buffer area only
Unknown		
Commonwealth Land - [51490]	WA	In feature area

Commonwealth Land Name	State	Buffer Status
Commonwealth Land - [51108]	WA	In buffer area only
Commonwealth Land - [50409]	WA	In buffer area only
Commonwealth Land - [50400]	WA	In buffer area only
Commonwealth Land - [50403]	WA	In buffer area only
Commonwealth Land - [50407]	WA	In buffer area only
Commonwealth Land - [50399]	WA	In buffer area only
Commonwealth Land - [50398]	WA	In feature area
Commonwealth Land - [51107]	WA	In buffer area only
Commonwealth Land - [50406]	WA	In buffer area only
Commonwealth Land - [50397]	WA	In feature area

Listed Marine Species [[Resource Information](#)]

Scientific Name	Threatened Category	Presence Text	Buffer Status
Bird			
Actitis hypoleucos			
Common Sandpiper [59309]		Species or species habitat known to occur within area	In feature area
Anous stolidus			
Common Noddy [825]		Species or species habitat may occur within area	In feature area
Anous tenuirostris melanops			
Australian Lesser Noddy [26000]	Vulnerable	Species or species habitat may occur within area	In feature area
Apus pacificus			
Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area	In feature area
Ardenna carneipes as Puffinus carneipes			
Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Bubulcus ibis as Ardea ibis Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area	In feature area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area	In feature area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area overfly marine area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area overfly marine area	In feature area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area	In feature area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area	In feature area
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area	In feature area
Diomedea dabbenena Tristan Albatross [66471]	Endangered	Species or species habitat may occur within area	In feature area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area	In feature area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area	In feature area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Hydroprogne caspia as Sterna caspia Caspian Tern [808]		Foraging, feeding or related behaviour known to occur within area	In feature area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area	In feature area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area	In feature area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area	In feature area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area	In feature area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area overfly marine area	In feature area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Onychoprion anaethetus as Sterna anaethetus Bridled Tern [82845]		Foraging, feeding or related behaviour likely to occur within area	In feature area
Pachyptila turtur Fairy Prion [1066]		Species or species habitat likely to occur within area	In feature area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area	In feature area
Phoebastria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area	In feature area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Puffinus assimilis Little Shearwater [59363]		Foraging, feeding or related behaviour known to occur within area	In feature area
Rostratula australis as Rostratula benghalensis (sensu lato) Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area overfly marine area	In feature area
Stercorarius skua as Catharacta skua Great Skua [823]		Species or species habitat may occur within area	In buffer area only
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area	In feature area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area	In feature area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thinornis cucullatus as Thinornis rubricollis Hooded Dotterel, Hooded Plover [87735]		Species or species habitat known to occur within area overfly marine area	In feature area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area overfly marine area	In feature area
Fish			
Acentronura australe Southern Pygmy Pipehorse [66185]		Species or species habitat may occur within area	In feature area
Campichthys galei Gale's Pipefish [66191]		Species or species habitat may occur within area	In feature area
Heraldia nocturna Upside-down Pipefish, Eastern Upside-down Pipefish, Eastern Upside-down Pipefish [66227]		Species or species habitat may occur within area	In feature area
Hippocampus angustus Western Spiny Seahorse, Narrow-bellied Seahorse [66234]		Species or species habitat may occur within area	In feature area
Hippocampus breviceps Short-head Seahorse, Short-snouted Seahorse [66235]		Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Hippocampus subelongatus West Australian Seahorse [66722]		Species or species habitat may occur within area	In feature area
Histiogamphelus cristatus Rhino Pipefish, Macleay's Crested Pipefish, Ring-back Pipefish [66243]		Species or species habitat may occur within area	In feature area
Lissocampus caudalis Australian Smooth Pipefish, Smooth Pipefish [66249]		Species or species habitat may occur within area	In feature area
Lissocampus fatiloquus Prophet's Pipefish [66250]		Species or species habitat may occur within area	In feature area
Lissocampus runa Javelin Pipefish [66251]		Species or species habitat may occur within area	In feature area
Maroubra perserrata Sawtooth Pipefish [66252]		Species or species habitat may occur within area	In feature area
Mitotichthys meraculus Western Crested Pipefish [66259]		Species or species habitat may occur within area	In feature area
Nannocampus subosseus Bonyhead Pipefish, Bony-headed Pipefish [66264]		Species or species habitat may occur within area	In feature area
Phycodurus eques Leafy Seadragon [66267]		Species or species habitat may occur within area	In feature area
Phyllopteryx taeniolatus Common Seadragon, Weedy Seadragon [66268]		Species or species habitat may occur within area	In feature area
Pugnaso curtirostris Pugnose Pipefish, Pug-nosed Pipefish [66269]		Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Solegnathus lettiensis Gunther's Pipehorse, Indonesian Pipefish [66273]		Species or species habitat may occur within area	In feature area
Stigmatopora argus Spotted Pipefish, Gulf Pipefish, Peacock Pipefish [66276]		Species or species habitat may occur within area	In feature area
Stigmatopora nigra Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area	In feature area
Urocampus carinirostris Hairy Pipefish [66282]		Species or species habitat may occur within area	In feature area
Vanacampus margaritifer Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area	In feature area
Vanacampus phillipi Port Phillip Pipefish [66284]		Species or species habitat may occur within area	In feature area
Vanacampus poecilolaemus Longsnout Pipefish, Australian Longsnout Pipefish, Long-snouted Pipefish [66285]		Species or species habitat may occur within area	In feature area
Mammal			
Arctocephalus forsteri Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat may occur within area	In feature area
Neophoca cinerea Australian Sea-lion, Australian Sea Lion [22]	Endangered	Species or species habitat may occur within area	In feature area
Reptile			
Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area	In feature area
Natator depressus Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area

Whales and Other Cetaceans [Resource Information]

Current Scientific Name	Status	Type of Presence	Buffer Status
Mammal			
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area	In feature area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area	In feature area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area	In feature area
Caperea marginata Pygmy Right Whale [39]		Species or species habitat may occur within area	In feature area
Delphinus delphis Common Dolphin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area	In feature area
Eubalaena australis Southern Right Whale [40]	Endangered	Breeding known to occur within area	In feature area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area	In feature area

Current Scientific Name	Status	Type of Presence	Buffer Status
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area	In feature area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Congregation or aggregation known to occur within area	In feature area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area	In feature area
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area	In feature area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area	In feature area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area	In feature area

Extra Information

State and Territory Reserves			[Resource Information]
Protected Area Name	Reserve Type	State	Buffer Status
Leschenault Peninsula	Conservation Park	WA	In buffer area only
Morangarel	Nature Reserve	WA	In buffer area only

EPBC Act Referrals				[Resource Information]
Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Controlled action				
Bunbury Port Berth 14A Expansion & Coal Storage & Loading Facility, WA	2014/7200	Controlled Action	Post-Approval	In feature area
Preston Industrial Park	2012/6312	Controlled Action	Completed	In buffer area only
Residential development, College Grove, WA	2015/7579	Controlled Action	Completed	In buffer area only

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Controlled action				
Somerville Drive Extension	2011/6153	Controlled Action	Post-Approval	In buffer area only
Stage 2 of the Bunbury Port Access Project	2010/5768	Controlled Action	Post-Approval	In buffer area only
Urban development subdivision	2013/6955	Controlled Action	Post-Approval	In buffer area only
VV Walsh Cold Stores Expansion	2021/8902	Controlled Action	Assessment Approach	In buffer area only
Yarragadee Water Supply Development	2005/2073	Controlled Action	Completed	In buffer area only
Not controlled action				
Extension of Brittain Road to connect with the South Western Hwy/Robertson Drive intersection	2007/3707	Not Controlled Action	Completed	In buffer area only
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed	In feature area
INDIGO Central Submarine Telecommunications Cable	2017/8127	Not Controlled Action	Completed	In feature area
New automotive centre at the Southwest Institute of Technology, Bunbury, WA	2010/5766	Not Controlled Action	Completed	In buffer area only
Proposed Fuel Reduction Burn, Loughton Park, Bunbury, WA	2014/7148	Not Controlled Action	Completed	In buffer area only
Residential development, Lot 54 Vittoria Road, Glen Iris, WA	2018/8308	Not Controlled Action	Completed	In buffer area only
Residential Development - Assorted Lots Parade Rd, Washington Av & Bussell Hwy, Usher WA	2013/6935	Not Controlled Action	Completed	In buffer area only
Woodcrest Rise Estate Residential Development	2007/3794	Not Controlled Action	Completed	In buffer area only
Not controlled action (particular manner)				
INDIGO Marine Cable Route Survey (INDIGO)	2017/7996	Not Controlled Action (Particular Manner)	Post-Approval	In feature area
Referral decision				
Bunbury Port Berth 14 Development, Bunbury Port Inner Harbour	2011/6023	Referral Decision	Completed	In feature area

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	Buffer Status
Western rock lobster	South-west	In buffer area only

Biologically Important Areas

Scientific Name	Behaviour	Presence	Buffer Status
-----------------	-----------	----------	---------------

Seabirds

[Ardenna pacifica](#)

Wedge-tailed Shearwater [84292]	Foraging (in high numbers)	Known to occur	In feature area
---------------------------------	----------------------------	----------------	-----------------

[Eudyptula minor](#)

Little Penguin [1085]	Foraging (provisioning young)	Known to occur	In feature area
-----------------------	-------------------------------	----------------	-----------------

[Onychoprion anaethetus](#)

Bridled Tern [82845]	Foraging (in high numbers)	Known to occur	In feature area
----------------------	----------------------------	----------------	-----------------

[Puffinus assimilis tunneyi](#)

Little Shearwater [59363]	Foraging (in high numbers)	Known to occur	In feature area
---------------------------	----------------------------	----------------	-----------------

[Sternula nereis](#)

Fairy Tern [82949]	Foraging (in high numbers)	Known to occur	In feature area
--------------------	----------------------------	----------------	-----------------

Whales

[Balaenoptera musculus brevicauda](#)

Pygmy Blue Whale [81317]	Distribution	Known to occur	In feature area
--------------------------	--------------	----------------	-----------------

[Balaenoptera musculus brevicauda](#)

Pygmy Blue Whale [81317]	Migration	Known to occur	In feature area
--------------------------	-----------	----------------	-----------------

[Eubalaena australis](#)

Southern Right Whale [40]	Calving buffer	Known to occur	In buffer area only
---------------------------	----------------	----------------	---------------------

[Eubalaena australis](#)

Southern Right Whale [40]	Seasonal calving habitat	Known to occur	In feature area
---------------------------	--------------------------	----------------	-----------------

Scientific Name	Behaviour	Presence	Buffer Status
Megaptera novaeangliae Humpback Whale [38]	Migration (north and south)	Known to occur	In feature area
Megaptera novaeangliae Humpback Whale [38]	Migration (south)	Known to occur	In feature area

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data are available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance

3 DATA SOURCES

Threatened ecological communities

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

Threatened, migratory and marine species

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

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

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

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded
- seals which have only been mapped for breeding sites near the Australian continent

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

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Acknowledgements

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

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

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

Appendix B

NatureMap Search



Koombana Bay NatureMap Species Report

Created By Guest user on 06/12/2021

Current Names Only Yes
Core Datasets Only Yes
Method 'By Circle'
Centre 115° 38' 40" E, 33° 18' 53" S
Buffer 5km
Group By Conservation Status

Conservation Status	Species	Records
Non-conservation taxon	693	9023
Other specially protected fauna	3	8
Priority 1	1	4
Priority 3	6	10
Priority 4	11	76
Protected under international agreement	23	598
Rare or likely to become extinct	23	261
TOTAL	760	9980

Name ID	Species Name	Naturalised	Conservation Code	Endemic To Query Area
Rare or likely to become extinct				
1.	24209 <i>Arctocephalus tropicalis</i> (Subantarctic fur-seal)		T	
2.	41326 <i>Ardenna carneipes</i> (Flesh-footed Shearwater, Fleshy-footed Shearwater)		T	
3.	24784 <i>Calidris ferruginea</i> (Curlew Sandpiper)		T	
4.	24790 <i>Calidris tenuirostris</i> (Great Knot)		T	
5.	24731 <i>Calyptorhynchus banksii subsp. naso</i> (Forest Red-tailed Black Cockatoo)		T	
6.	24733 <i>Calyptorhynchus baudinii</i> (Baudin's Cockatoo, White-tailed Long-billed Black Cockatoo)		T	
7.	24734 <i>Calyptorhynchus latirostris</i> (Carnaby's Cockatoo, White-tailed Short-billed Black Cockatoo)		T	
8.	48400 <i>Calyptorhynchus sp.</i> (white-tailed black cockatoo)		T	
9.	25335 <i>Caretta caretta</i> (Loggerhead Turtle)		T	
10.	25575 <i>Charadrius leschenaultii</i> (Greater Sand Plover)		T	
11.	24092 <i>Dasyurus geoffroii</i> (Chuditch, Western Quoll)		T	
12.	25618 <i>Diomedea exulans</i> (Wandering Albatross)		T	
13.	30836 <i>Diomedea exulans subsp. exulans</i> (Snowy Albatross)		T	
14.	24043 <i>Eubalaena australis</i> (Southern Right Whale)		T	
15.	25344 <i>Natator depressus</i> (Flatback Turtle)		T	
16.	24210 <i>Neophoca cinerea</i> (Australian Sea-lion)		T	
17.	24798 <i>Numenius madagascariensis</i> (Eastern Curlew)		T	
18.	24073 <i>Physeter macrocephalus</i> (Sperm Whale)		T	
19.	24166 <i>Pseudocheirus occidentalis</i> (Western Ringtail Possum, ngwayir)		T	
20.	24388 <i>Psophodes nigrogularis subsp. nigrogularis</i> (Western Whipbird (western heath))		T	
21.	34134 <i>Thalassarche carteri</i> (Indian Yellow-nosed Albatross)		T	
22.	44607 <i>Thalassarche melanophris</i> (Black-browed Albatross)		T	
23.	34113 <i>Westralunio carteri</i> (Carter's Freshwater Mussel)		T	
Protected under international agreement				
24.	41323 <i>Actitis hypoleucos</i> (Common Sandpiper)		IA	
25.	25736 <i>Arenaria interpres</i> (Ruddy Turnstone)		IA	
26.	24779 <i>Calidris acuminata</i> (Sharp-tailed Sandpiper)		IA	
27.	24780 <i>Calidris alba</i> (Sanderling)		IA	
28.	25738 <i>Calidris canutus</i> (Red Knot, knot)		IA	
29.	24788 <i>Calidris ruficollis</i> (Red-necked Stint)		IA	
30.	48587 <i>Hydroprogne caspia</i> (Caspian Tern)		IA	
31.	30932 <i>Limosa lapponica</i> (Bar-tailed Godwit)		IA	
32.	25741 <i>Limosa limosa</i> (Black-tailed Godwit)		IA	
33.	24690 <i>Macronectes giganteus</i> (Southern Giant Petrel)		IA	
34.	25742 <i>Numenius phaeopus</i> (Whimbrel)		IA	
35.	24497 <i>Oceanites oceanicus</i> (Wilson's Storm-petrel)		IA	
36.	41347 <i>Onychoprion anaethetus</i> (Bridled Tern)		IA	
37.	48591 <i>Pandion cristatus</i> (Osprey, Eastern Osprey)		IA	

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
38.	24843 <i>Plegadis falcinellus</i> (Glossy Ibis)		IA	
39.	24382 <i>Pluvialis fulva</i> (Pacific Golden Plover)		IA	
40.	24383 <i>Pluvialis squatarola</i> (Grey Plover)		IA	
41.	25642 <i>Sterna hirundo</i> (Common Tern)		IA	
42.	48597 <i>Thalasseus bergii</i> (Crested Tern)		IA	
43.	24806 <i>Tringa glareola</i> (Wood Sandpiper)		IA	
44.	24808 <i>Tringa nebularia</i> (Common Greenshank, greenshank)		IA	
45.	24809 <i>Tringa stagnatilis</i> (Marsh Sandpiper, little greenshank)		IA	
46.	41351 <i>Xenus cinereus</i> (Terek Sandpiper)		IA	
Other specially protected fauna				
47.	24208 <i>Arctocephalus forsteri</i> (New Zealand Fur Seal, long-nosed fur-seal)		S	
48.	25624 <i>Falco peregrinus</i> (Peregrine Falcon)		S	
49.	48070 <i>Phascogale tapoatafa</i> subsp. <i>wambenger</i> (South-western Brush-tailed Phascogale, Wambenger)		S	
Priority 1				
50.	31673 <i>Puccinellia vassica</i>		P1	
Priority 3				
51.	34030 <i>Geotria australis</i> (Pouched Lamprey)		P3	
52.	48935 <i>Idiosoma sigillatum</i> (Swan Coastal Plain shield-backed trapdoor spider)		P3	
53.	5038 <i>Lasiopetalum membranaceum</i>		P3	
54.	974 <i>Schoenus benthamii</i>		P3	
55.	25800 <i>Stylidium paludicola</i>		P3	
56.	12392 <i>Verticordia attenuata</i>		P3	
Priority 4				
57.	3339 <i>Acacia flagelliformis</i>		P4	
58.	3537 <i>Acacia semitrullata</i>		P4	
59.	13862 <i>Caladenia speciosa</i>		P4	
60.	13512 <i>Eucalyptus rudis</i> subsp. <i>cratyantha</i>		P4	
61.	24215 <i>Hydromys chrysogaster</i> (Water-rat, Rakali)		P4	
62.	48588 <i>Isoodon fusciventer</i> (Quenda, southwestern brown bandicoot)		P4	
63.	24328 <i>Oxyura australis</i> (Blue-billed Duck)		P4	
64.	4183 <i>Pultenaea skinneri</i> (Skinner's Pea)		P4	
65.	48114 <i>Stenella longirostris</i> (Spinner Dolphin)		P4	
66.	48135 <i>Thinornis rubricollis</i> (Hooded Plover, Hooded Dotterel)		P4	
67.	24803 <i>Tringa brevipes</i> (Grey-tailed Tattler)		P4	
Non-conservation taxon				
68.	3282 <i>Acacia cyclops</i> (Coastal Wattle)			
69.	18217 <i>Acacia iteaphylla</i>	Y		
70.	17464 <i>Acacia longifolia</i> subsp. <i>longifolia</i>	Y		
71.	24260 <i>Acanthiza apicalis</i> (Broad-tailed Thornbill, Inland Thornbill)			
72.	24261 <i>Acanthiza chrysorrhoa</i> (Yellow-rumped Thornbill)			
73.	24262 <i>Acanthiza inornata</i> (Western Thornbill)			
74.	1208 <i>Acanthocarpus preissii</i>			
75.	24560 <i>Acanthorhynchus superciliosus</i> (Western Spinebill)			
76.	25535 <i>Accipiter cirrocephalus</i> (Collared Sparrowhawk)			
77.	25536 <i>Accipiter fasciatus</i> (Brown Goshawk)			
78.	<i>Acentrogobius bifrenatus</i>			
79.	42368 <i>Acritoscincus trilineatus</i> (Western Three-lined Skink)			
80.	25755 <i>Acrocephalus australis</i> (Australian Reed Warbler)			
81.	1790 <i>Adenanthos meisneri</i>			
82.	28281 <i>Adenanthos</i> sp. <i>Whicher Range</i> (G.J. Keighery 9736)			
83.	4582 <i>Adriana quadripartita</i> (Bitter Bush)			
84.	<i>Aetapcus maculatus</i>			
85.	23501 <i>Agrostocrinum scabrum</i> subsp. <i>scabrum</i>			
86.	48513 <i>Aizoon pubescens</i>	Y		
87.	<i>Aldrichetta forsteri</i>			
88.	<i>Allothereua maculata</i>			
89.	6565 <i>Alyxia buxifolia</i> (Dysentery Bush)			
90.	35909 <i>Amansia pinnatifida</i>			
91.	35159 <i>Ammophila arenaria</i> subsp. <i>arenaria</i>	Y		
92.	126 <i>Amphibolis antarctica</i> (Sea Nymph)			
93.	<i>Aname mainae</i>			
94.	<i>Aname tepperi</i>			
95.	24310 <i>Anas castanea</i> (Chestnut Teal)			
96.	24312 <i>Anas gracilis</i> (Grey Teal)			
97.	24313 <i>Anas platyrhynchos</i> (Mallard)			
98.	<i>Anas platyrhynchos</i> subsp. <i>domesticus</i>			
99.	24315 <i>Anas rhynchotis</i> (Australasian Shoveler)			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
100.	24316 <i>Anas superciliosa</i> (Pacific Black Duck)			
101.	7833 <i>Angianthus preissianus</i>			
102.	47414 <i>Anhinga novaehollandiae</i> (Australasian Darter)			
103.	11434 <i>Anigozanthos humilis</i> subsp. <i>humilis</i>			
104.	11261 <i>Anigozanthos manglesii</i> subsp. <i>manglesii</i>			
105.	29487 <i>Anigozanthos manglesii</i> var. <i>x angustifolius</i>			
106.	<i>Anoplocapros lenticularis</i>			
107.	6949 <i>Anthocercis littorea</i> (Yellow Tailflower)			
108.	24561 <i>Anthochaera carunculata</i> (Red Wattlebird)			
109.	24562 <i>Anthochaera lunulata</i> (Western Little Wattlebird)			
110.	8595 <i>Apium graveolens</i> (Wild Celery)	Y		
111.	12040 <i>Apium prostratum</i> subsp. <i>prostratum</i> var. <i>prostratum</i> (Sea Celery)			
112.	24991 <i>Aprasia repens</i> (Sand-plain Worm-lizard)			
113.	24285 <i>Aquila audax</i> (Wedge-tailed Eagle)			
114.	<i>Aracana aurita</i>			
115.	17355 <i>Araujia sericifera</i>	Y		
116.	7839 <i>Arctotheca populifolia</i> (Dune Arctotheca, Beach Pumpkin, Coast Capeweed, Beach Daisy)	Y		
117.	25558 <i>Ardea ibis</i> (Cattle Egret)			
118.	41324 <i>Ardea modesta</i> (great egret, white egret)			
119.	24340 <i>Ardea novaehollandiae</i> (White-faced Heron)			
120.	24341 <i>Ardea pacifica</i> (White-necked Heron)			
121.	<i>Arenigobius bifrenatus</i>			
122.	<i>Arripis truttacea</i>			
123.	25566 <i>Artamus cinereus</i> (Black-faced Woodswallow)			
124.	<i>Artoria linnaei</i>			
125.	8779 <i>Asparagus asparagoides</i> (Bridal Creeper)	Y		
126.	16943 <i>Asparagus declinatus</i>	Y		
127.	16945 <i>Asparagus plumosus</i>	Y		
128.	45213 <i>Astartea pulchella</i>			
129.	6323 <i>Astroloma ciliatum</i> (Candle Cranberry)			
130.	<i>Asymbolus submaculatus</i>			
131.	<i>Atherinosoma elongata</i>			
132.	2452 <i>Atriplex cinerea</i> (Grey Saltbush)			
133.	2460 <i>Atriplex hortensis</i> (Garden Orache)	Y		
134.	2463 <i>Atriplex isatidea</i> (Coast Saltbush)			
135.	<i>Aulohalaelurus labiosus</i>			
136.	<i>Austracantha minax</i>			
137.	17234 <i>Austrostipa compressa</i>			
138.	<i>Auxis thazard</i>			
139.	233 <i>Avena barbata</i> (Bearded Oat)	Y		
140.	235 <i>Avena sativa</i> (Common Oat)	Y		
141.	6828 <i>Avicennia marina</i> (White Mangrove)			
142.	14555 <i>Avicennia marina</i> subsp. <i>marina</i>			
143.	24318 <i>Aythya australis</i> (Hardhead)			
144.	<i>Backobourkia heroine</i>			
145.	<i>Baiami volucripes</i>			
146.	24044 <i>Balaenoptera acutorostrata</i> (Dwarf Minke Whale)			
147.	1822 <i>Banksia ilicifolia</i> (Holly-leaved Banksia)			
148.	32315 <i>Barbula calycina</i>			
149.	<i>Barnardius zonarius</i>			
150.	7853 <i>Berkheya rigida</i> (African Thistle, Hamelin Thistle)	Y		
151.	24319 <i>Biziura lobata</i> (Musk Duck)			
152.	749 <i>Bolboschoenus caldwellii</i> (Marsh Club-rush)			
153.	46074 <i>Boletellus ananiceps</i>			
154.	4417 <i>Boronia dichotoma</i>			
155.	24251 <i>Bos taurus</i> (European Cattle)	Y		
156.	48782 <i>Bossiaea angustifolia</i>			
157.	14396 <i>Bossiaea aquifolium</i> subsp. <i>aquifolium</i>			
158.	7878 <i>Brachyscome iberidifolia</i>			
159.	2994 <i>Brassica x juncea</i> (Indian Mustard)	Y		
160.	248 <i>Bromus catharticus</i> (Prairie Grass)	Y		
161.	249 <i>Bromus diandrus</i> (Great Brome)	Y		
162.	12770 <i>Burchardia congesta</i>			
163.	1385 <i>Burchardia multiflora</i> (Dwarf Burchardia)			
164.	24359 <i>Burhinus grallarius</i> (Bush Stone-curlew)			
165.	25714 <i>Cacatua pastinator</i> (Western Long-billed Corella)			
166.	25716 <i>Cacatua sanguinea</i> (Little Corella)			
167.	25598 <i>Cacomantis flabelliformis</i> (Fan-tailed Cuckoo)			
168.	42307 <i>Cacomantis pallidus</i> (Pallid Cuckoo)			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
169.	1277 <i>Caesia occidentalis</i>			
170.	3002 <i>Cakile maritima</i> (Sea Rocket)	Y		
171.	1595 <i>Caladenia hirta</i> (Sugar Candy Orchid)			
172.	15354 <i>Caladenia hirta</i> subsp. <i>hirta</i>			
173.	1605 <i>Caladenia marginata</i> (White Fairy Orchid)			
174.	15503 <i>Caladenia paludosa</i>			
175.	19309 <i>Calectasia narragara</i>			
176.	4717 <i>Callitriche stagnalis</i> (Common Starwort)	Y		
177.	27628 <i>Caloplaca erythrostickta</i>			
178.	16493 <i>Calycopseplus oligandrus</i>			
179.	25717 <i>Calyptorhynchus banksii</i> (Red-tailed Black-Cockatoo)			
180.	19713 <i>Campsis radicans</i>	Y		
181.	32338 <i>Campylopus introflexus</i>	Y		
182.	27645 <i>Candelariella xanthostigmoides</i>			
183.	13488 <i>Canna x generalis</i>	Y		
184.	<i>Carcharhinus</i> sp.			
185.	754 <i>Carex divisa</i> (Divided Sedge)	Y		
186.	2957 <i>Cassytha racemosa</i> (Dodder Laurel)			
187.	26586 <i>Caulocystis uvifera</i>			
188.	41570 <i>Cenchrus spinifex</i> (Spiny Burrgrass)	Y		
189.	<i>Cephalozia exiliflora</i>			
190.	17685 <i>Chaetanthus aristatus</i>			
191.	26607 <i>Chaetomorpha aerea</i>			
192.	24377 <i>Charadrius ruficapillus</i> (Red-capped Plover)			
193.	<i>Chelidonichthys kumu</i>			
194.	24321 <i>Chenonetta jubata</i> (Australian Wood Duck, Wood Duck)			
195.	2483 <i>Chenopodium album</i> (Fat Hen)	Y		
196.	2490 <i>Chenopodium glaucum</i> (Glaucous Goosefoot)	Y		
197.	2494 <i>Chenopodium murale</i> (Nettle-leaf Goosefoot)	Y		
198.	267 <i>Chloris gayana</i> (Rhodes Grass)	Y		
199.	8971 <i>Chorizema cordatum</i>			
200.	24980 <i>Christinus marmoratus</i> (Marbled Gecko)			
201.	<i>Chroicocephalus novaehollandiae</i>			
202.	24432 <i>Chrysococcyx lucidus</i> subsp. <i>plagosus</i> (Shining Bronze Cuckoo)			
203.	7935 <i>Cichorium intybus</i> (Chicory)	Y		
204.	24288 <i>Circus approximans</i> (Swamp Harrier)			
205.	24774 <i>Cladorhynchus leucocephalus</i> (Banded Stilt)			
206.	26663 <i>Cladurus elatus</i>			
207.	<i>Cleidopus gloriamaris</i>			
208.	26666 <i>Cliftonaea pectinata</i>			
209.	26667 <i>Codiophyllum flabelliforme</i>			
210.	25675 <i>Colluricincla harmonica</i> (Grey Shrike-thrush)			
211.	24399 <i>Columba livia</i> (Domestic Pigeon)	Y		
212.	4554 <i>Comesperma flavum</i>			
213.	4564 <i>Comesperma virgatum</i> (Milkwort)			
214.	11826 <i>Conostylis aculeata</i> subsp. <i>aculeata</i>			
215.	19881 <i>Convolvulus angustissimus</i> subsp. <i>angustissimus</i>			
216.	6611 <i>Convolvulus arvensis</i> (Field Bindweed)	Y		
217.	20074 <i>Conyza sumatrensis</i>	Y		
218.	25568 <i>Coracina novaehollandiae</i> (Black-faced Cuckoo-shrike)			
219.	2891 <i>Corrigiola litoralis</i> (Strapwort)	Y		
220.	48259 <i>Cortaderia selloana</i> subsp. <i>selloana</i>	Y		
221.	25592 <i>Corvus coronoides</i> (Australian Raven)			
222.	24417 <i>Corvus coronoides</i> subsp. <i>perplexus</i> (Australian Raven)			
223.	7946 <i>Cotula cotuloides</i> (Smooth Cotula)			
224.	7947 <i>Cotula turbinata</i> (Funnel Weed)	Y		
225.	24420 <i>Cracticus nigrogularis</i> (Pied Butcherbird)			
226.	25595 <i>Cracticus tibicen</i> (Australian Magpie)			
227.	25596 <i>Cracticus torquatus</i> (Grey Butcherbird)			
228.	42009 <i>Craspedia</i> sp. Yalgorup National Park (G.J. Keighery 14449)			
229.	3136 <i>Crassula alata</i>	Y		
230.	15706 <i>Crassula natans</i> var. <i>minus</i>	Y		
231.	25400 <i>Crinia insignifera</i> (Squelching Froglet)			
232.	13484 <i>Cryptandra arbutiflora</i> var. <i>tubulosa</i>			
233.	25039 <i>Ctenotus fallens</i>			
234.	16411 <i>Cucumis</i> sp. Bunbury (G. Brayshaw s.n. 26/2/91)	Y		Y
235.	13732 <i>Cuscuta campestris</i> (Golden dodder)	Y		
236.	6663 <i>Cuscuta epithymum</i> (Lesser Dodder, Greater Dodder)	Y		
237.	15114 <i>Cyanicula gemmata</i>			
238.	24322 <i>Cygnus atratus</i> (Black Swan)			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
239.	783 <i>Cyperus congestus</i> (Dense Flat-sedge)	Y		
240.	18318 <i>Cyperus involucratus</i>	Y		
241.	801 <i>Cyperus laevigatus</i>	Y		
242.	816 <i>Cyperus tenuiflorus</i> (Scaly Sedge)	Y		
243.	<i>Cyrtophora parnasia</i>			
244.	10916 <i>Cyrtostylis huegelii</i>			
245.	26720 <i>Cystophora grevillei</i>			
246.	30901 <i>Dacelo novaeguineae</i> (Laughing Kookaburra)	Y		
247.	<i>Dactylophora nigricans</i>			
248.	7454 <i>Dampiera linearis</i> (Common Dampiera)			
249.	3832 <i>Daviesia physodes</i>			
250.	17691 <i>Desmocladius fasciculatus</i>			
251.	32345 <i>Didymodon australasiae</i>			
252.	32346 <i>Didymodon torquatus</i>			
253.	<i>Diodon nichemerus</i>			
254.	<i>Diodon</i> sp.			
255.	4454 <i>Diplolaena dampieri</i> (Southern Diplolaena)			
256.	3012 <i>Diplotaxis tenuifolia</i> (Sand Rocket)	Y		
257.	3867 <i>Dipogon lignosus</i> (Dolichos Pea)	Y		
258.	7961 <i>Dittrichia graveolens</i> (Stinkwort)	Y		
259.	10938 <i>Diuris filifolia</i> (Cat's Face Orchid)			
260.	1640 <i>Drakaea glyptodon</i> (King-in-his-carriage)			
261.	48751 <i>Drosera drummondii</i>			
262.	3097 <i>Drosera gigantea</i> (Giant Sundew)			
263.	48769 <i>Drosera indumenta</i>			
264.	33500 <i>Dysphania ambrosioides</i> (Mexican Tea)	Y		
265.	33517 <i>Dysphania multifida</i> (Scented Goosefoot)	Y		
266.	33480 <i>Dysphania pumilio</i> (Clammy Goosefoot)			
267.	<i>Echeneis naucrates</i>			
268.	<i>Egretta garzetta</i>			
269.	<i>Egretta novaehollandiae</i>			
270.	349 <i>Ehrharta longiflora</i> (Annual Veldt Grass)	Y		
271.	<i>Elanus axillaris</i>			
272.	25250 <i>Elapognathus coronatus</i> (Crowned Snake)			
273.	47937 <i>Elseyonis melanops</i> (Black-fronted Dotterel)			
274.	1644 <i>Elythranthera emarginata</i> (Pink Enamel Orchid)			
275.	1067 <i>Empodisma gracillimum</i>			
276.	<i>Eolophus roseicapillus</i>			
277.	24651 <i>Eopsaltria australis</i> subsp. <i>griseogularis</i> (Western Yellow Robin)			
278.	24652 <i>Eopsaltria georgiana</i> (White-breasted Robin)			
279.	24567 <i>Epthianura albifrons</i> (White-fronted Chat)			
280.	376 <i>Eragrostis curvula</i> (African Lovegrass)	Y		
281.	17175 <i>Eremophila glabra</i> subsp. <i>albicans</i>			
282.	<i>Erigone prominens</i>			
283.	1646 <i>Eriochilus dilatatus</i> (White Bunny Orchid)			
284.	15410 <i>Eriochilus dilatatus</i> subsp. <i>dilatatus</i>			
285.	15412 <i>Eriochilus dilatatus</i> subsp. <i>multiflorus</i>			
286.	15415 <i>Eriochilus scaber</i> subsp. <i>scaber</i>			
287.	<i>Eriophora biapicata</i>			
288.	4336 <i>Erodium moschatum</i> (Musky Crowfoot)	Y		
289.	<i>Eubalichthys</i> sp.			
290.	5659 <i>Eucalyptus gomphocephala</i> (Tuart, Duart)			
291.	24813 <i>Eudyptes chrysocome</i> subsp. <i>filholi</i> (Rockhopper Penguin)			Y
292.	25746 <i>Eudyptula minor</i> (Little Penguin)			
293.	<i>Euleptorhamphus viridis</i>			
294.	4636 <i>Euphorbia paralias</i> (Sea Spurge)	Y		
295.	10765 <i>Exocarpos sparteus</i> (Broom Ballart, Djuk)			
296.	25622 <i>Falco cenchroides</i> (Australian Kestrel, Nankeen Kestrel)			
297.	25623 <i>Falco longipennis</i> (Australian Hobby)			
298.	430 <i>Festuca arundinacea</i> (Tall Fescue)	Y		
299.	20216 <i>Ficinia nodosa</i> (Knotted Club Rush)			
300.	1747 <i>Ficus carica</i> (Common Fig)	Y		
301.	894 <i>Fimbristylis velata</i>			
302.	32367 <i>Fissidens megalotis</i>			
303.	32369 <i>Fissidens tenellus</i>			
304.	27744 <i>Flavoparmelia ferax</i>			
305.	41286 <i>Flavoparmelia virensica</i>			
306.	6221 <i>Foeniculum vulgare</i> (Fennel)	Y		
307.	5209 <i>Frankenia pauciflora</i> (Seaheath)			
308.	25727 <i>Fulica atra</i> (Eurasian Coot)			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
309.	24761 <i>Fulica atra</i> subsp. <i>australis</i> (Eurasian Coot)			
310.	2969 <i>Fumaria capreolata</i> (Whiteflower Fumitory)	Y		
311.	<i>Furgaleus macki</i>			
312.	<i>Galeorhinus galeus</i>			
313.	25729 <i>Gallinula tenebrosa</i> (Dusky Moorhen)			
314.	24763 <i>Gallinula tenebrosa</i> subsp. <i>tenebrosa</i> (Dusky Moorhen)			
315.	25730 <i>Gallirallus philippensis</i> (Buff-banded Rail)			
316.	20475 <i>Gastrobium capitatum</i>			
317.	20473 <i>Gastrobium ebracteolatum</i>			
318.	20512 <i>Gastrobium praemorsum</i>			
319.	16311 <i>Gazania linearis</i>	Y		
320.	32380 <i>Gemmabryum pachythecum</i>			
321.	3936 <i>Genista linifolia</i> (Flaxleaf Broom)	Y		
322.	25404 <i>Geocrinia leai</i> (Ticking Frog)			
323.	25530 <i>Gerygone fusca</i> (Western Gerygone)			
324.	26854 <i>Gigartina disticha</i>			
325.	1524 <i>Gladiolus undulatus</i> (Wild Gladiolus)	Y		
326.	46134 <i>Glebionis segetum</i>	Y		
327.	49050 <i>Gloriosa superba</i>	Y		Y
328.	3948 <i>Gompholobium capitatum</i>			
329.	3956 <i>Gompholobium shuttleworthii</i>			
330.	<i>Gonorynchus greyi</i>			
331.	7505 <i>Goodenia eatoniana</i>			
332.	24443 <i>Grallina cyanoleuca</i> (Magpie-lark)			
333.	26877 <i>Gratelopia filicina</i>			
334.	2066 <i>Grevillea pilulifera</i> (Woolly-flowered Grevillea)			
335.	2122 <i>Grevillea wilsonii</i> (Native Fuchsia)			
336.	<i>Gymnapistes marmoratus</i>			
337.	<i>Gymnothorax woodwardi</i>			
338.	24487 <i>Haematopus longirostris</i> (Pied Oystercatcher)			
339.	2216 <i>Hakea varia</i> (Variable-leaved Hakea)			
340.	24293 <i>Haliaeetus leucogaster</i> (White-bellied Sea-Eagle)			
341.	24295 <i>Haliastur sphenurus</i> (Whistling Kite)			
342.	24689 <i>Halobaena caerulea</i> (Blue Petrel)			
343.	25410 <i>Heleioporus eyrei</i> (Moaning Frog)			
344.	8008 <i>Helianthus annuus</i> (Sunflower, Common Sunflower)	Y		
345.	12016 <i>Helianthus debilis</i> subsp. <i>cucumerifolius</i>	Y		
346.	11451 <i>Hemarthria uncinata</i> var. <i>uncinata</i>			
347.	6839 <i>Hemiandra pungens</i> (Snakebush)			
348.	30919 <i>Hemiergis gracilipes</i> (skink)			
349.	25119 <i>Hemiergis quadrilineata</i>			
350.	41020 <i>Hemiphora bartlingii</i> (Woolly Dragon)			
351.	<i>Hemipristis elongata</i>			
352.	27775 <i>Heterodermia japonica</i>			
353.	<i>Heterodontus portusjacksoni</i>			
354.	5117 <i>Hibbertia cuneiformis</i> (Cutleaf Hibbertia)			
355.	20051 <i>Hibbertia diamesogenos</i>			
356.	45534 <i>Hibbertia hypericoides</i> subsp. <i>hypericoides</i>			
357.	5162 <i>Hibbertia racemosa</i> (Stalked Guinea Flower)			
358.	5172 <i>Hibbertia stellaris</i> (Orange Stars)			
359.	48381 <i>Hibbertia striata</i>			
360.	47965 <i>Hieraaetus morphnoides</i> (Little Eagle)			
361.	25734 <i>Himantopus himantopus</i> (Black-winged Stilt)			
362.	<i>Hippocampus</i> sp.			
363.	24491 <i>Hirundo neoxena</i> (Welcome Swallow)			
364.	6222 <i>Homalosciadium homalocarpum</i>			
365.	5216 <i>Hybanthus calycinus</i> (Wild Violet)			
366.	12007 <i>Hybanthus floribundus</i> subsp. <i>floribundus</i>			
367.	6223 <i>Hydrocotyle alata</i>			
368.	6224 <i>Hydrocotyle blepharocarpa</i>			
369.	6225 <i>Hydrocotyle bonariensis</i>	Y		
370.	11546 <i>Hydrocotyle pilifera</i> var. <i>glabrata</i>			
371.	44656 <i>Hydrophis major</i> (Olive-headed seasnake, greater seasnake)			
372.	42410 <i>Hydrophis ornatus</i> (Ornate Reef Seasnake, Sea Snake)			
373.	43384 <i>Hydrophis platurus</i> (Yellow-bellied Seasnake)			
374.	<i>Hyperlophus vittatus</i>			
375.	5817 <i>Hypocalymma angustifolium</i> (White Myrtle, Kudjid)			
376.	35070 <i>Hypocalymma angustifolium</i> subsp. <i>Swan Coastal Plain</i> (G.J. Keighery 16777)			
377.	5825 <i>Hypocalymma robustum</i> (Swan River Myrtle)			
378.	9352 <i>Hypochoeris radicata</i> (Flat Weed, Cats-ear)	Y		

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
379.	27787	<i>Hypogymnia subphysodes</i>		
380.	17841	<i>Hypolaena pubescens</i>		
381.		<i>Hyporhamphus melanochir</i>		
382.		<i>Ichthyoscopus barbatus</i>		
383.	6630	<i>Ipomoea indica</i> (Morning Glory)	Y	
384.	20199	<i>Isolepis cernua</i> var. <i>cernua</i>		
385.		<i>Isopeda leishmanni</i>		
386.	45299	<i>Jackelixia elixii</i>		
387.	4012	<i>Jacksonia furcellata</i> (Grey Stinkwood)		
388.	4017	<i>Jacksonia horrida</i>		
389.	4028	<i>Jacksonia spinosa</i>		
390.	1178	<i>Juncus bufonius</i> (Toad Rush)	Y	
391.	11922	<i>Juncus kraussii</i> subsp. <i>australiensis</i>		
392.	4037	<i>Kennedia coccinea</i> (Coral Vine)		
393.	4044	<i>Kennedia prostrata</i> (Scarlet Runner)		
394.	15498	<i>Kunzea glabrescens</i> (Spearwood)		
395.	17461	<i>Kunzea micrantha</i> subsp. <i>micrantha</i>		
396.	3669	<i>Labichea punctata</i> (Lance-leaved Cassia)		
397.	8096	<i>Lactuca serriola</i> (Prickly Lettuce)	Y	
398.		<i>Lagocephalus sceleratus</i>		
399.	14646	<i>Lagunaria patersonia</i>	Y	
400.		<i>Lampona cylindrata</i>		
401.	6733	<i>Lantana camara</i> (Common Lantana)	Y	
402.	24511	<i>Larus novaehollandiae</i> subsp. <i>novaehollandiae</i> (Silver Gull)		
403.	25638	<i>Larus pacificus</i> (Pacific Gull)		
404.	4047	<i>Lathyrus tingitanus</i> (Tangier Pea)	Y	
405.		<i>Latrodectus hasseltii</i>		
406.	4958	<i>Lawrenzia spicata</i>		
407.	7572	<i>Lechenaultia expansa</i>		
408.	7574	<i>Lechenaultia floribunda</i> (Free-flowering Leschenaultia)		
409.	6880	<i>Leonotis leonurus</i> (Lion's Ear)	Y	
410.	19989	<i>Lepidium didymum</i>	Y	
411.	46376	<i>Leptocarpus denmarkicus</i>		
412.	46377	<i>Leptocarpus scoparius</i>		
413.	46374	<i>Leptocarpus trisepalus</i>		
414.	25131	<i>Lerista distinguenda</i>		
415.	25133	<i>Lerista elegans</i>		
416.	1493	<i>Leucojum aestivum</i> (Snowflake)	Y	
417.	16449	<i>Leucophyta brownii</i>		
418.	6425	<i>Leucopogon oxycedrus</i>		
419.	6428	<i>Leucopogon pendulus</i>		
420.	6434	<i>Leucopogon polymorphus</i>		
421.	6440	<i>Leucopogon racemosus</i>		
422.	25005	<i>Lialis burtonis</i>		
423.	25661	<i>Lichmera indistincta</i> (Brown Honeyeater)		
424.	25415	<i>Limnodynastes dorsalis</i> (Western Banjo Frog)		
425.	4363	<i>Linum trigynum</i> (French Flax)	Y	
426.	36180	<i>Liparophyllum latifolium</i>		
427.	42413	<i>Lissolepis luctuosa</i> (Western Swamp Skink)		
428.	25378	<i>Litoria adelaidensis</i> (Slender Tree Frog)		
429.	25388	<i>Litoria moorei</i> (Motorbike Frog)		
430.	9289	<i>Lobelia anceps</i> (Angled Lobelia)		
431.	7408	<i>Lobelia tenuior</i> (Slender Lobelia)		
432.		<i>Lobodon carcinophaga</i>		
433.	3048	<i>Lobularia maritima</i> (Sweet Alyssum)	Y	
434.	476	<i>Lolium perenne</i> (Perennial Ryegrass)	Y	
435.	478	<i>Lolium rigidum</i> (Wimmera Ryegrass)	Y	
436.		<i>Lolium</i> sp.		
437.	1228	<i>Lomandra hermaphrodita</i>		
438.	1236	<i>Lomandra odora</i> (Tiered Matrush)		
439.	1092	<i>Loxocarya cinerea</i>		
440.	4067	<i>Lupinus luteus</i> (Yellow Lupin)	Y	
441.	18049	<i>Lyginia imberbis</i>		
442.	1656	<i>Lyperanthus serratus</i> (Rattle Beak Orchid)		
443.	34736	<i>Lysinema pentapetalum</i>		
444.	5281	<i>Lythrum hyssopifolia</i> (Lesser Loosestrife)	Y	
445.		<i>Macroramphosus scolopax</i>		
446.		<i>Makaira indica</i>		
447.	24326	<i>Malacorhynchus membranaceus</i> (Pink-eared Duck)		
448.	25654	<i>Malurus splendens</i> (Splendid Fairy-wren)		

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
449.	36480 <i>Malva arborea</i> (Tree Mallow)	Y		
450.	4075 <i>Medicago littoralis</i> (Strand Medic)	Y		
451.	4079 <i>Medicago polymorpha</i> (Burr Medic)	Y		
452.	25758 <i>Megalurus gramineus</i> (Little Grassbird)			
453.	13273 <i>Melaleuca incana</i> subsp. <i>incana</i>			
454.	5926 <i>Melaleuca lateritia</i> (Robin Redbreast Bush)			
455.	5938 <i>Melaleuca microphylla</i>			
456.	5946 <i>Melaleuca pauciflora</i>			
457.	48990 <i>Melaleuca quinquenervia</i>	Y		
458.	18598 <i>Melaleuca systema</i>			
459.	5978 <i>Melaleuca teretifolia</i> (Banbar)			
460.	5980 <i>Melaleuca thymoides</i>			
461.	4785 <i>Melianthus major</i>	Y		
462.	4085 <i>Melilotus indicus</i>	Y		
463.	19827 <i>Melilotus siculus</i>	Y		
464.	14985 <i>Melinis repens</i>	Y		
465.	25663 <i>Melithreptus brevirostris</i> (Brown-headed Honeyeater)			
466.	25184 <i>Menetia greyii</i>			
467.	6885 <i>Mentha suaveolens</i> (Apple Mint)	Y		
468.	24598 <i>Merops ornatus</i> (Rainbow Bee-eater)			
469.	24076 <i>Mesoplodon bowdoini</i> (Andrew's Beaked Whale)			
470.	24078 <i>Mesoplodon grayi</i> (Gray's Beaked Whale)			
471.	24081 <i>Mesoplodon mirus</i> (True's Beaked Whale)			
472.	<i>Meuschenia freycineti</i>			
473.	<i>Microcarbo melanoleucos</i>			
474.	15419 <i>Microtis media</i> subsp. <i>media</i>			
475.	<i>Missulena granulosa</i>			
476.	<i>Missulena hoggi</i>			
477.	<i>Missulena occatoria</i>			
478.	29418 <i>Monoculus monstrosus</i>	Y		
479.	4666 <i>Monotaxis occidentalis</i>			
480.	19179 <i>Moraea flaccida</i> (One-leaf Cape Tulip)	Y		
481.	48008 <i>Morus serrator</i> (Australasian Gannet)			
482.	16896 <i>Muehlenbeckia complexa</i>	Y		Y
483.	<i>Mugil cephalus</i>			
484.	<i>Myiobatis</i> sp.			
485.	7289 <i>Myoporum caprarioides</i> (Slender Myoporum)			
486.	27090 <i>Myriodesma quercifolium</i>			
487.	6189 <i>Myriophyllum crispatum</i>			
488.	44496 <i>Narcissus tazetta</i> subsp. <i>italicus</i>	Y		
489.	25248 <i>Neelaps bimaculatus</i> (Black-naped Snake)			
490.	<i>Nelusetta ayraudi</i>			
491.	24738 <i>Neophema elegans</i> (Elegant Parrot)			
492.	24739 <i>Neophema petrophila</i> (Rock Parrot)			
493.	<i>Nephila edulis</i>			
494.	<i>Nicodamus mainae</i>			
495.	1381 <i>Nothoscordum gracile</i>	Y		
496.	<i>Nunciella aspera</i>			
497.	25564 <i>Nycticorax caledonicus</i> (Rufous Night Heron)			
498.	24407 <i>Ocyphaps lophotes</i> (Crested Pigeon)			
499.	16390 <i>Oenothera drummondii</i> subsp. <i>drummondii</i>	Y		
500.	6140 <i>Oenothera mollissima</i>	Y		
501.	8127 <i>Olearia axillaris</i> (Coastal Daisybush)			
502.	8133 <i>Olearia elaeophila</i>			
503.	<i>Omegophora armilla</i>			
504.	<i>Ophisurus serpens</i>			
505.	<i>Ophthalmolepis lineolatus</i>			
506.	46316 <i>Orianthera serpyllifolia</i> subsp. <i>angustifolia</i>			
507.	36177 <i>Ornduffia albiflora</i>			
508.	4113 <i>Ornithopus compressus</i> (Yellow Serradella)	Y		
509.	7122 <i>Orobanche minor</i> (Lesser Broomrape)	Y		
510.	24085 <i>Oryctolagus cuniculus</i> (Rabbit)	Y		
511.	14531 <i>Ottelia ovalifolia</i> subsp. <i>ovalifolia</i>			
512.	25680 <i>Pachycephala rufiventris</i> (Rufous Whistler)			
513.	24692 <i>Pachyptila belcheri</i> (Slender-billed Prion)			
514.	24693 <i>Pachyptila desolata</i> (Antarctic Prion)			
515.	25707 <i>Pachyptila salvini</i> (Salvin's Prion)			
516.	502 <i>Panicum capillare</i> (Witchgrass)	Y		
517.	25253 <i>Parasuta gouldii</i>			
518.	25255 <i>Parasuta nigriceps</i>			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
519.	<i>Parazanclostius hutchinsi</i>			
520.	25681 <i>Pardalotus punctatus</i> (Spotted Pardalote)			
521.	25682 <i>Pardalotus striatus</i> (Striated Pardalote)			
522.	30458 <i>Parmotrema reticulatum</i>			
523.	34481 <i>Parthenocissus quinquefolia</i>	Y		
524.	25687 <i>Passer domesticus</i> (House Sparrow)	Y		
525.	24642 <i>Passer montanus</i> (Eurasian Tree Sparrow)	Y		
526.	5225 <i>Passiflora filamentosa</i>	Y		
527.	6244 <i>Pastinaca sativa</i> (Wild Parsnip)	Y		
528.	43762 <i>Pauridia occidentalis</i> var. <i>quadriloba</i>			
529.	4343 <i>Pelargonium capitatum</i> (Rose Pelargonium)	Y		
530.	4346 <i>Pelargonium littorale</i>			
531.	24649 <i>Pelecanoides urinatrix</i> subsp. <i>exsul</i> (Common Diving Petrel)			
532.	24648 <i>Pelecanus conspicillatus</i> (Australian Pelican)			
533.	16477 <i>Pericalymma ellipticum</i> var. <i>ellipticum</i>			
534.	16478 <i>Pericalymma ellipticum</i> var. <i>floridum</i>			
535.	11052 <i>Persicaria prostrata</i>			
536.	27126 <i>Petalonia fascia</i>			
537.	48061 <i>Petrochelidon nigricans</i> (Tree Martin)			
538.	48066 <i>Petroica boodang</i> (Scarlet Robin)			
539.	2299 <i>Petrophile linearis</i> (Pixie Mops)			
540.	19825 <i>Petrohragia dubia</i>	Y		
541.	27131 <i>Phacelocarpus alatus</i>			
542.	25697 <i>Phalacrocorax carbo</i> (Great Cormorant)			
543.	24664 <i>Phalacrocorax carbo</i> subsp. <i>novaeollandiae</i> (Great Cormorant)			
544.	24665 <i>Phalacrocorax fuscescens</i> (Black-faced Cormorant)			
545.	25698 <i>Phalacrocorax melanoleucos</i> (Little Pied Cormorant)			
546.	24667 <i>Phalacrocorax sulcirostris</i> (Little Black Cormorant)			
547.	25699 <i>Phalacrocorax varius</i> (Pied Cormorant)			
548.	24668 <i>Phalacrocorax varius</i> subsp. <i>hypoleucos</i> (Pied Cormorant)			
549.	547 <i>Phalaris angusta</i>	Y		
550.	24409 <i>Phaps chalcoptera</i> (Common Bronzewing)			
551.	25587 <i>Phaps elegans</i> (Brush Bronzewing)			
552.	18529 <i>Philothea spicata</i> (Pepper and Salt)			
553.	1478 <i>Phlebocarya ciliata</i>			
554.	48071 <i>Phylidonyris niger</i> (White-cheeked Honeyeater)			
555.	24596 <i>Phylidonyris novaeollandiae</i> (New Holland Honeyeater)			
556.	4675 <i>Phyllanthus calycinus</i> (False Boronia)			
557.	<i>Phyllopteryx taeniolatus</i>			
558.	31275 <i>Physalis hederifolia</i> (Sticky Cape Gooseberry)	Y		Y
559.	27975 <i>Physcia stellaris</i>			
560.	<i>Phytophthora cinnamomi</i>			
561.	2408 <i>Pilostyles hamiltonii</i>			
562.	11402 <i>Pimelea imbricata</i> var. <i>piligera</i>			
563.	5252 <i>Pimelea lanata</i>			
564.	18117 <i>Pimelea rosea</i> subsp. <i>rosea</i>			
565.	18352 <i>Pithocarpa pulchella</i> var. <i>melanostigma</i>			
566.	16322 <i>Pittosporum undulatum</i>	Y		
567.	7303 <i>Plantago lanceolata</i> (Ribwort Plantain)	Y		
568.	24841 <i>Platalea flavipes</i> (Yellow-billed Spoonbill)			
569.	24842 <i>Platalea regia</i> (Royal Spoonbill)			
570.	<i>Platycephalus speculator</i>			
571.	25720 <i>Platycercus icterotis</i> (Western Rosella)			
572.	24747 <i>Platycercus spurius</i> (Red-capped Parrot)			
573.	25721 <i>Platycercus zonarius</i> (Australian Ringneck, Ring-necked Parrot)			
574.	6253 <i>Platysace filiformis</i>			
575.	27151 <i>Platythalia angustifolia</i>			
576.	4524 <i>Platytheca galioides</i>			
577.	577 <i>Poa poliformis</i> (Coastal Poa)			
578.	25704 <i>Podiceps cristatus</i> (Great Crested Grebe)			
579.	86 <i>Podocarpus drouynianus</i> (Wild Plum, Kula)			
580.	8179 <i>Podolepis nutans</i> (Nodding Podolepis)			
581.	24907 <i>Pogona minor</i> subsp. <i>minor</i> (Dwarf Bearded Dragon)			
582.	8188 <i>Pogonolepis stricta</i>			
583.	24681 <i>Poliocephalus poliocephalus</i> (Hoary-headed Grebe)			
584.	2905 <i>Polycarpon tetraphyllum</i> (Fourleaf Allseed)	Y		
585.	25722 <i>Polytelis anthopeplus</i> (Regent Parrot)			
586.	25731 <i>Porphyrio porphyrio</i> (Purple Swamphen)			
587.	24767 <i>Porphyrio porphyrio</i> subsp. <i>bellus</i> (Purple Swamphen)			
588.	24771 <i>Porzana tabuensis</i> (Spotless Crane)			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
589.	122 <i>Posidonia angustifolia</i>			
590.	110 <i>Potamogeton drummondii</i>			
591.	15424 <i>Praecoxanthus aphyllus</i>			
592.	1674 <i>Prasophyllum giganteum</i> (Bronze Leek Orchid)			
593.	1680 <i>Prasophyllum parvifolium</i> (Autumn Leek Orchid)			
594.	<i>Prionace glauca</i>			
595.	<i>Pristiophorus nudipinnis</i>			
596.	<i>Pseudogobius olorum</i>			
597.	25433 <i>Pseudophryne guentheri</i> (Crawling Toadlet)			
598.	27195 <i>Pterocladia lucida</i>			
599.	24702 <i>Pterodroma brevirostris</i> (Kerguelen Petrel)			
600.	24703 <i>Pterodroma lessonii</i> (White-headed Petrel)			
601.	<i>Pterodroma macroptera</i> subsp. <i>macroptera</i>			
602.	25711 <i>Pterodroma mollis</i> (Soft-plumaged Petrel)			
603.	1685 <i>Pterostylis angusta</i>			
604.	15426 <i>Pterostylis aspera</i>			
605.	44723 <i>Pterostylis glebosa</i>			
606.	11118 <i>Pterostylis pyramidalis</i> (Snail Orchid)			
607.	1694 <i>Pterostylis rogersii</i> (Curled-tongue Shell Orchid)			
608.	<i>Pterostylis</i> sp.			
609.	10998 <i>Pterostylis turfosa</i> (Bird Orchid)			
610.	1698 <i>Pterostylis vittata</i> (Banded Greenhood)			
611.	<i>Pterygotrigla polyommata</i>			
612.	15856 <i>Ptilotus sericostachyus</i> subsp. <i>sericostachyus</i>			
613.	24711 <i>Puffinus assimilis</i> subsp. <i>assimilis</i> (Little Shearwater)			
614.	4181 <i>Pultenaea reticulata</i>			
615.	28007 <i>Punctelia subalbicans</i>			
616.	<i>Purpureicephalus spurius</i>			
617.	16367 <i>Pyrorchis nigricans</i> (Red beaks, Elephants ears)			
618.	32480 <i>Racopilum cuspidigerum</i> var. <i>convolutaceum</i>			
619.	28223 <i>Ramalina celastri</i> subsp. <i>ovalis</i>			
620.	28224 <i>Ramalina inflata</i> subsp. <i>australis</i>			
621.	24243 <i>Rattus fuscipes</i> (Western Bush Rat)			
622.	24245 <i>Rattus rattus</i> (Black Rat)	Y		
623.	24776 <i>Recurvirostra novaehollandiae</i> (Red-necked Avocet)			
624.	19183 <i>Retama raetam</i>	Y		
625.	11341 <i>Rhagodia baccata</i> subsp. <i>baccata</i>			
626.	48096 <i>Rhipidura albiscapa</i> (Grey Fantail)			
627.	25614 <i>Rhipidura leucophrys</i> (Willie Wagtail)			
628.	25616 <i>Rhipidura rufiventris</i> (Northern Fantail)			
629.	13300 <i>Rhodanthe citrina</i>			
630.	4705 <i>Ricinus communis</i> (Castor Oil Plant)	Y		
631.	14485 <i>Romulea flava</i> var. <i>minor</i>	Y		
632.	1555 <i>Romulea obscura</i>	Y		
633.	3066 <i>Rorippa nasturtium-aquaticum</i> (Watercress)	Y		
634.	32424 <i>Rosulabryum albolimbatum</i>			
635.	44608 <i>Rosulabryum billardieri</i>			
636.	2433 <i>Rumex crispus</i> (Curled Dock)	Y		
637.	2443 <i>Rumex vesicarius</i> (Ruby Dock)	Y		
638.	2908 <i>Sagina maritima</i>	Y		
639.	48433 <i>Salicornia blackiana</i>			
640.	6484 <i>Samolus repens</i> (Creeping Brookweed)			
641.	14107 <i>Samolus repens</i> var. <i>paucifolius</i>			
642.	27238 <i>Sargassum distichum</i>			
643.	27249 <i>Sargassum linearifolium</i>			
644.	7613 <i>Scaevola glandulifera</i> (Viscid Hand-flower)			
645.	41660 <i>Schenkia australis</i>			
646.	48834 <i>Schinus terebinthifolia</i>	Y		
647.	6263 <i>Schoenolaena juncea</i>			
648.	968 <i>Schoenoplectus pungens</i> (Sharpleaf Rush)			
649.	<i>Scomber australasicus</i>			
650.	35911 <i>Scytosiphon lomentaria</i>			
651.	20663 <i>Senecio multicaulis</i> subsp. <i>multicaulis</i>			
652.	20161 <i>Senecio pinnatifolius</i>			
653.	25534 <i>Sericornis frontalis</i> (White-browed Scrubwren)			
654.	609 <i>Setaria palmifolia</i> (Palm Grass)	Y		
655.	<i>Sillago fraseri</i> (invalid)			Y
656.	8227 <i>Silybum marianum</i> (Variegated Thistle)	Y		
657.	25266 <i>Simoselaps bertholdi</i> (Jan's Banded Snake)			
658.	30948 <i>Smicrornis brevirostris</i> (Weebill)			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
659.	7005 <i>Solanum elaeagnifolium</i> (White Horse Nettle, Silverleaf Nightshade)	Y		
660.	7022 <i>Solanum nigrum</i> (Black Berry Nightshade)	Y		
661.	1765 <i>Soleirolia soleirolii</i> (Babys Tears)	Y		
662.	10920 <i>Soliva sessilis</i> (Jo-jo, Onehunga Weed)	Y		
663.	8231 <i>Sonchus oleraceus</i> (Common Sowthistle)	Y		
664.	1312 <i>Sowerbaea laxiflora</i> (Purple Tassels)			
665.	<i>Sphyræna obtusata</i>			
666.	625 <i>Spinifex longifolius</i> (Beach Spinifex)			
667.	635 <i>Sporobolus virginicus</i> (Marine Couch)			
668.	4828 <i>Spyridium globulosum</i> (Basket Bush)			
669.	<i>Squalus megalops</i>			
670.	<i>Squatina australis</i>			
671.	6930 <i>Stachys arvensis</i> (Staggerweed)	Y		
672.	<i>Steatoda capensis</i>			
673.	<i>Steatoda grossa</i>			
674.	2918 <i>Stellaria media</i> (Chickweed)	Y		
675.	48113 <i>Stenella coeruleoalba</i> (Striped Dolphin)			
676.	636 <i>Stenotaphrum secundatum</i> (Buffalo Grass)	Y		
677.	24522 <i>Sterna bergii</i> (Crested Tern)			
678.	48594 <i>Sternula nereis</i> (Fairy Tern)			
679.	24329 <i>Stictonetta naevosa</i> (Freckled Duck)			
680.	<i>Stigmatopora argus</i>			
681.	25655 <i>Stipiturus malachurus</i> (Southern Emu-wren)			
682.	24554 <i>Stipiturus malachurus</i> subsp. <i>westernensis</i> (Southern Emu-wren)			
683.	25597 <i>Strepera versicolor</i> (Grey Currawong)			
684.	25589 <i>Streptopelia chinensis</i> (Spotted Turtle-Dove)	Y		
685.	25590 <i>Streptopelia senegalensis</i> (Laughing Turtle-Dove)	Y		
686.	7696 <i>Stylidium calcaratum</i> (Book Triggerplant)			
687.	7713 <i>Stylidium dichotomum</i> (Pins-and-needles)			
688.	7798 <i>Stylidium schoenoides</i> (Cow Kicks)			
689.	7806 <i>Stylidium utricularioides</i> (Pink Fan Triggerplant)			
690.	6476 <i>Styphelia tenuiflora</i> (Common Pinheath)			
691.	2639 <i>Suaeda australis</i> (Seablite)			
692.	24259 <i>Sus scrofa</i> (Pig)	Y		
693.	2323 <i>Synaphea gracillima</i>			
694.	2324 <i>Synaphea petiolaris</i> (Synaphea)			
695.	<i>Synsphyronus magnus</i>			
696.	32437 <i>Syntrichia antarctica</i>			
697.	25705 <i>Tachybaptus novaehollandiae</i> (Australasian Grebe, Black-throated Grebe)			
698.	24682 <i>Tachybaptus novaehollandiae</i> subsp. <i>novaehollandiae</i> (Australasian Grebe, Black-throated Grebe)			
699.	24331 <i>Tadorna tadornoides</i> (Australian Shelduck, Mountain Duck)			
700.	45613 <i>Taraxacum khatoonae</i>	Y		
701.	<i>Tasmanicosa leuckartii</i>			
702.	33236 <i>Tecticornia halocnemoides</i> (Shrubby Samphire)			
703.	33319 <i>Tecticornia indica</i> subsp. <i>bidens</i>			
704.	28065 <i>Teloschistes chrysophthalmus</i>			
705.	4535 <i>Tetradlea hirsuta</i> (Black Eyed Susan)			
706.	48341 <i>Tetradlea hirsuta</i> subsp. <i>viminea</i>			
707.	27327 <i>Thamnochloa dichotomum</i>			
708.	11053 <i>Thelymitra macrophylla</i>			
709.	5084 <i>Thomasia grandiflora</i> (Large Flowered Thomasia)			
710.	24845 <i>Threskiornis spinicollis</i> (Straw-necked Ibis)			
711.	32486 <i>Thuidium sparsum</i> var. <i>hastatum</i>			
712.	<i>Thyrsites atun</i>			
713.	1318 <i>Thysanotus arbuscula</i>			
714.	25549 <i>Todiramphus sanctus</i> (Sacred Kingfisher)			
715.	<i>Trachinotus baillonii</i>			
716.	<i>Trachurus novaezelandiae</i>			
717.	1368 <i>Trachyandra divaricata</i>	Y		
718.	6280 <i>Trachymene pilosa</i> (Native Parsnip)			
719.	<i>Trapeliopsis flexuosa</i>			
720.	1481 <i>Tribonanthes australis</i> (Southern Tiurmdin)			
721.	<i>Trichiurus lepturus</i>			
722.	<i>Trichiurus</i> sp.			
723.	25723 <i>Trichoglossus haematodus</i> (Rainbow Lorikeet)			
724.	24755 <i>Trichoglossus haematodus</i> subsp. <i>moluccanus</i> (Rainbow Lorikeet)	Y		
725.	4291 <i>Trifolium arvense</i> (Hare's Foot Clover)	Y		
726.	17763 <i>Trifolium campestre</i> var. <i>campestre</i> (Hop Clover)	Y		
727.	4293 <i>Trifolium cernuum</i> (Drooping Flower Clover)	Y		

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
728.	17759 <i>Trifolium fragiferum</i> var. <i>fragiferum</i>	Y		
729.	4298 <i>Trifolium hirtum</i> (Rose Clover)	Y		
730.	<i>Trifolium</i> sp.			
731.	147 <i>Triglochin mucronata</i>			
732.	151 <i>Triglochin striata</i>			
733.	<i>Trygonoptera mucosa</i>			
734.	27345 <i>Turbinaria gracilis</i>			
735.	30954 <i>Tursiops aduncus</i> (Indo-Pacific Bottlenose Dolphin)			
736.	24069 <i>Tursiops truncatus</i> (Bottlenose Dolphin)			
737.	35260 <i>Ulva compressa</i>			
738.	35262 <i>Ulva intestinalis</i>			
739.	<i>Urolophus</i> sp.			
740.	28087 <i>Usnea inermis</i>			
741.	45895 <i>Ustilago avenae</i>			
742.	24386 <i>Vanellus tricolor</i> (Banded Lapwing)			
743.	8257 <i>Vellereophyton dealbatum</i> (White Cudweed)	Y		
744.	<i>Venator immansueta</i>			
745.	<i>Venatrix pullastra</i>			
746.	7107 <i>Verbascum virgatum</i> (Twiggy Mullein)	Y		
747.	20120 <i>Verbena littoralis</i>	Y		Y
748.	19511 <i>Verbena officinalis</i>	Y		
749.	7108 <i>Veronica arvensis</i> (Wall Speedwell)	Y		
750.	4322 <i>Vicia sativa</i> (Common Vetch)	Y		
751.	11474 <i>Vicia sativa</i> subsp. <i>nigra</i>	Y		
752.	8282 <i>Waitzia suaveolens</i> (Fragrant Waitzia)			
753.	1566 <i>Watsonia marginata</i>	Y		
754.	18108 <i>Watsonia meriana</i> var. <i>bulbillifera</i>	Y		
755.	18118 <i>Watsonia meriana</i> var. <i>meriana</i>	Y		
756.	6658 <i>Wilsonia backhousei</i> (Narrow-leaf Wilsonia)			
757.	6659 <i>Wilsonia humilis</i> (Silky Wilsonia)			
758.	2331 <i>Xylomelum occidentale</i> (Woody Pear, Djandin)			
759.	1049 <i>Zantedeschia aethiopica</i> (Arum Lily)	Y		
760.	25765 <i>Zosterops lateralis</i> (Grey-breasted White-eye, Silveryeye)			

Conservation Codes

T - Rare or likely to become extinct
X - Presumed extinct
IA - Protected under international agreement
S - Other specially protected fauna
1 - Priority 1
2 - Priority 2
3 - Priority 3
4 - Priority 4
5 - Priority 5

¹ For NatureMap's purposes, species flagged as endemic are those whose records are wholly contained within the search area. Note that only those records complying with the search criterion are included in the calculation. For example, if you limit records to those from a specific datasource, only records from that datasource are used to determine if a species is restricted to the query area.