DevelopmentWA

Ocean Reef Marina

Breakwater Development
Native Vegetation Clearing Permit – Purpose Permit
Supporting Documentation

17 June 2020

58225-128,126 (Rev 0)

JBS&G Australia Pty Ltd T/A Strategen-JBS&G

www.jbsg.com.au

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1. Introduction

1.1 Purpose

This clearing permit application is to support the terrestrial aspects of the proposed breakwater construction, for the Ocean Reef Marina Development (the Development), located at Ocean Reef within the City of Joondalup (the City). The Development is a State Government priority project for which the Western Australian Land Authority (trading as Development WA) is the Proponent.

The breakwater development works which is the subject of the Development Application comprises the following items:

- Construction of two new outer breakwaters;
- Removal of the existing breakwater from the boat launching harbour;
- Dredging of sand and rock inside the new outer harbour;
- Disposal of capital dredge spoil into land reclamations inside the breakwaters;
- Construction of jetties to support piled boat mooring pens; and
- Piling works for new boat mooring pens.

The Joint Development Assessment Panel recently granted two separate development approvals for the proposed breakwater construction as follows:

- The portion of works located on land reserved for 'Parks and Recreation' and 'Waterways' under the MRS; (Western Australian Planning Commission (WAPC)); and
- The portion of works located on land zoned 'Urban' under the Metropolitan Region Scheme (MRS) (City of Joondalup).

The land use zoning under the MRS is provided in Figure 1.1.

A third Development Application is applicable to the proposed clearing area, associated with the northern batters which extend into Bush Forever Site 325.

The marine-based aspects of the Ocean Reef Marina development were assessed by the EPA under Section 38 of the *Environmental Protection Act 1986* (EP Act). Further details are provided below.

This clearing permit application is for clearing of up to 2.89 ha of native vegetation for the purpose of facilitating the following land-based support work areas related to breakwater construction:

- Access from Ocean Reef Road and haulage access to the northern outer breakwater structure;
- Access and haulage access to the southern outer breakwater structure and existing southern breakwater (to be removed) from the existing southern carpark area; and
- Northern stockpile area.

1.2 Project Scope

This document has been prepared to support the NVCP application for the proposed clearing of up to 2.89 ha (Figure 1.2), for assessment under s.51E of the *Environmental Protection Act 1986* (EP Act), and includes the following information relating to clearing impacts:

- An overview of the existing environmental conditions of the proposed clearing footprint;
- An evaluation of the proposed clearing against the '10 Clearing Principles' listed under Schedule 5 of the EP Act; and
- environmental approvals and management requirements.

1.3 Ocean Reef Marina background and description

DevelopmentWA proposes to develop a world class recreational, residential, boating and tourist development, referred to as the Ocean Reef Marina (the Development) within a preferred Concept Plan boundary of 61 ha, including land and sea components at Ocean Reef, Western Australia. The terrestrial portion of the Concept Plan has an area of approximately 42 ha.

In April 2014, a Metropolitan Region Scheme (MRS) amendment (1270/41) was initiated by the Western Australian Planning Commission (WAPC) to establish the appropriate MRS zonings to be established to enable the Development. The MRS amendment was referred to the Environmental Protection Authority (EPA) under s 48A of the *Environmental Protection Act 1986* (EP Act) in May 2014. The EPA determined that the amendment did not require formal assessment as it was considered that the terrestrial aspects could be adequately managed through the relevant planning processes and Negotiated Planning Outcome (NPO), outlined in Section 1.4.

The EPA provided a 'Statement of reasons and public advice' for this decision in June 2014. In its decision, the EPA noted that the WAPC will require an NPO that secures an appropriate conservation outcome before final approval of the MRS Amendment is given. An NPO was prepared and formed part of WAPC's consideration of the MRS Amendment, leading to its gazettal on 29 November 2019. The amendment enabled the appropriate MRS zonings to facilitate the Development. The Development area is zoned 'urban', 'parks and recreation', 'waterways', 'public purpose' and 'regional roads' (Figure 1.1).

The marine component of the Development was separately referred to the EPA under s 38 of the EP Act in May 2014. In June 2014 the EPA determined that the marine component (including coastal processes) of the Development would be assessed at a Public Environmental Review (PER) level of assessment with an eight-week public comment period. The marine portion of the Development has now been approved subject to conditions set in Ministerial Statement 1107 dated 7 August 2019. A Change to Proposal (under s45C of the EP Act), has also be assessed and was approved on 6 January 2020.

With DevelopmentWA taking the role as lead agency for the Ocean Reef Marina project, it was considered that an Improvement Plan and Improvement Scheme would be the most suitable planning framework to progress the strategic planning and development for the Ocean Reef Marina site.

The Improvement Scheme will provide land use and development controls over the scheme area, and also provides heads of power to prepare Improvement Scheme policies and Local Development Plans. The draft Improvement Scheme was submitted to the Western Australian Planning Commission (WAPC) for consideration in December 2019, and initiated in January 2020. It is anticipated that draft the Improvement Scheme would be advertised and finalised during 2020.

DevelopmentWA is progressing with a forward work program to enable the commencement of construction by the end of 2020 in accordance with the State Government commitment. Given the Improvement Scheme is not due to come into effect until late 2020, in order to progress with those forward works clearing permit approvals have been required. Two clearing permit applications have been lodged with the Department of Water and Environmental Regulation (DWER) to date:

1. Geotechnical investigations - involving a series of test pits across the Development area. Clearing permit 8787/1 to facilitate clearing required for these investigations was granted by DWER on 30 April 2020. This clearing permit has also been the subject of appeals and is under investigation by the Appeals Convenor's Office.
2. Early works– comprising new Hodges Drive extension, new Boat Harbour Quays entry road, diversion of existing Coastal Shared Use Path, laydown area, site office and facilities and diversion of existing club and boat ramp. Clearing Permit 8788/1 was granted by DWER on 26 May 2020. This clearing permit has also been the subject of appeals and is under investigation by the Appeals Convenor's Office.

   A Development Application was lodged with the Western Australian Planning Commission and City of Joondalup to support the early works program which was approved on 27 February 2020.

1.4 Negotiated Planning Outcome

Until gazettal of MRS Amendment 1271/40 the land component of the Proposal area was almost entirely within Bush Forever site 325 (BF 325) (including the existing boat harbour), except for the portion associated with the Water Corporation's ocean outfall from the Beenyup Waste Water treatment plant[1].

BF 325 is a semi-contiguous north-south coastal strip of native vegetation between Burns Beach and Hillarys and covers approximately 195.3 ha. BF 325 represents a linkage between adjacent bushland to the east recognised as part of a regionally significant fragmented bushland/wetland linkage (Government of Western Australia 2000).

MRS amendment 1270/41 resulted in the removal of an approximate 26 ha portion of the Development area (inclusive of the majority of the proposed clearing footprint) from within BF 325.

To mitigate impacts to Bush Forever, Priority flora and Priority Ecological Communities (PEC; inferred), and as part of the rezoning process, DevelopmentWA developed an NPO for impacts to Bush Forever to support the MRS amendment, in accordance with *State Planning Policy 2.8 Bushland Policy for the Perth Metropolitan Region* (SPP 2.8). In addition, the NPO has been developed to achieve an appropriate conservation outcome with reference to the public advice of the EPA regarding the MRS amendment.

The NPO included the following components:

1. 90% land acquisition: 22.7 ha of coastal vegetation has been acquired. The acquired land will comprise coastal vegetation in similar or better condition and with similar or higher conservation value than the area to be cleared.
2. 10% rehabilitation within BF 325: Rehabilitation of 5 ha of degraded vegetation within BF 325.

A suitable offset site that achieves the site selection criteria outlined in the NPO has been identified and acquired by DevelopmentWA. This work has been completed in consultation with EPA Services, Department of Biodiversity, Conservation and Attractions (DBCA) and Department of Planning Lands and Heritage (DPLH).

[1] And now minor batter requirements identified as part of the detailed design process

The offset site achieved the following agreed NPO selection criteria:

- Native vegetation in Very Good to Excellent condition;
- Within 10 km of the coast;
- Contains conservation significant species and communities of similar value and priority for protection;
- Contain vegetation communities as similar as practicable to the impacted site;
- Occur within the Perth subregion of the Swan Coastal Plain bioregion;
- An improved area to perimeter ratio than the impacted site;
- Is contiguous with an existing conservation area; and
- Enhances biological corridors or ecological linkages between conservation areas.

The acquisition of a suitable offset site formed part of WAPCs consideration of the MRS Amendment, leading to its gazettal on 29 November 2019. Further details are provided in Section 1.4.1 on the acquisition land).

Development WA is also committed to ensuring the rehabilitation component of the NPO is undertaken. It is anticipated that a Rehabilitation Plan will be a condition of the future subdivision approval. The preparation of this plan to support rehabilitation of 5 ha of degraded vegetation adjacent to the Development is currently in progress.

1.4.1 Acquisition site

Background and Surveys

An offset site that achieves the requirements of the NPO has been secured, namely a portion of Lot 51 Walding Road, Carabooda (Carabooda property).

The property is located adjacent to Yanchep National Park, approximately 50 km north-northwest of Perth and approximately 20 km from the proposed Ocean Reef Marina. The entire property is approximately 53 ha in size and is currently zoned as 'Rural Resource' in the City of Wanneroo District Planning Scheme. An area of 22.7 ha on the western portion of this site (acquisition area) has been allocated to the Development to achieve the acquisition requirements of the approved NPO. An additional area of 3.3 ha of the Carabooda property was also purchased to offset any minor additional impacts to BF 325 as part of the detailed design stages of the Development i.e. road battering.

A vegetation assessment of Lot 51 Walding Road, Carabooda was undertaken by:

- Landform Research in September 1998; and
- ATA Environmental in May 2002.

As part of the site acquisition process, Strategen-JBS&G is aware that a more recent assessment of vegetation types and condition of the Carabooda site was undertaken in 2017. This survey report was used by Department of Biodiversity Conservation and Attractions (DBCA), Department of Planning, Lands and Heritage (DPLH) and DWER (EPA Services) to inform its view as to the suitability of the site as an appropriate offset for the ORM development and in meeting the requirements of the Negotiated Planning Outcome (NPO). Strategen-JBS&G is aware that DWER has been provided with a copy of this report to inform its assessment of the previous clearing permit applications.

Topography, soils and landform

The topography of the property is influenced by the Spearwood dunes, undulating from a low of 14 AHD at the western and southern boundaries to a ridge in the western half ranging from 25m to 29m AHD which runs parallel to Walding Road. The highest elevation occurs in the north-eastern corner of the property with a high point of up to 31m AHD (ATA Environmental 2002).

The property is underlain by the Tamala Limestone formation, covered in places by sand from the Spearwood Dune System. The Tamala Limestone is exposed in places, particularly on the western ridge. The soils on the property are primarily shallow brown/grey sands overlaying yellow sands and limestone at variable depths (ATA Environmental 2002).

Vegetation

A vegetation assessment of Lot 51 was undertaken by ATA Environmental in May 2002. On a regional scale, the Carabooda property is mostly within the Cottesloe Complex: Central and South, with some representation of the Herdsman Complex (ATA Environmental 2002).

The site is dominated by Tuart (*Eucalyptus gomphocephala*) woodland to forest over mixed shrublands and heath, with some Jarrah (*Eucalyptus marginata*) and Banksia (*Banksia menziesii, B. attenuata*) woodland (ATA Environmental 2002). A total of nine vegetation communities were mapped on the site (Figure 2.5). The vegetation of the study area corresponds most closely with Floristic Community Type (FCT) 25 (Northern Spearwood Shrublands and Woodlands) and Type 28 (Spearwood *Banksia attenuata* or Banksia – *Eucalyptus* Woodlands. In addition, small pockets of the study area comprising vegetation on the limestone ridges and outcrops was thought to correspond to FCT 26a (*Melaleuca huegelii – M. acerosa* Shrublands of limestone ridge).

Table 1.1: Vegetation types of Lot 51, Walding Road, Carabooda

Vegetation type	Area (ha)
Cleared.	5.48
E.g.: Tuart (*Eucalyptus gomphocephala*) woodland over a degraded understorey of *Acacia saligna, Jacksonia furcellata* and *J. sternbergiana.*	3.26
EgAsDs: Upland area comprising a Tuart Open Woodland over an Open Heath to Open Scrub of *Acacia saligna, Banksia sessilis, Calothamnus quadrifidus, Hakea prostrata, Spyridium globulosum* and occasional *Melaleuca huegelii.*	6.62
EgAsDsJfSg: Tuart Closed to Open Forest over a variable understorey comprising monospecific stands or an admixture of *Acacia saligna, Banksia sessilis, Jacksonia furcellata, Spyridium globulosum.*	31.43
EgBmBa: Tuart Woodland over an Open Woodland of *Banksia menziesii* and *B. attenuata.*	1.31
EgDsMh: Upland areas and limestone ridges comprising a Tuart Open Forest over a Closed to Open Heath of *Banksia sessilis* and *Melaleuca huegelii* with *Hakea trifurcata*, *Eremophila glabra, Xanthorrhoea preissii* and *Hibbertia hypericoides.*	2.65
EgEmBa: Tuart and Jarrah (Eucalyptus marginata) Woodland over Banksia attenuata and occasional *B. menziesii* over *Xanthorrhoea preissii* and *Hibbertia hypericoides.*	2.02
Gv: Closed heath of *Grevillea vestita.*	0.13
Jc: Low closed heath of *Jacksonia calcicola* and *Calothamnus quadrifidus.*	0.19
Mr: Degraded wetland area with scattered Paperbarks (*Melaleuca rhaphiophylla)* and regrowth Tuart.	0.25
TOTAL	53.38

Based on the vegetation mapping there is approximately 47.88 ha of remnant vegetation on Lot 51, the majority of which is in Very Good to Excellent condition (Figure 2.7). Some cleared areas exist in the southeast corner of the site (5.48 ha).

Table 1.2: Vegetation condition of Lot 51, Walding Road, Carabooda

Vegetation condition	Area (ha)	Proportion
Degraded	4.48	9.36%
Good	2.85	5.95%
Very Good to Excellent	40.55	84.69%
TOTAL	53.38	100%

Ecological communities

The Carabooda site was determined to meet or partially meet all of the selection criteria. While the Carabooda site does not fully support the same vegetation communities as the Development site, it was determined to be 'as similar as practicable' to the Proposal site by DBCA, DPLH and DWER (EPA Services) acknowledging the difficulties in locating a site that achieved all of the criteria.

Both the Development site and the Carabooda site support shrubland and heath type communities with an overlap of some species. The 2002 vegetation survey noted the inferred presence of FCT 24, FCT 28 and FCT 26a (ATA Environmental 2002). More recent information suggests FCT 26a, may be FCT 26b due the presence of Tuart, which is not found in FCT 26a.

The site acquired was assessed as having a higher conservation value than the Proposal site due to the presence of the following listed floristic community types:

- FCT 24 Northern Spearwood shrublands and woodlands (State listed Priority 3 Priority Ecological Community). This is a sub community of Banksia woodlands of the Swan Coastal Plain TEC and may also meet criteria as a sub community of Tuart (*Eucalyptus gomphocephala*) woodlands of the Swan Coastal Plain, which is currently under assessment at Commonwealth level.
- FCT 28 Spearwood *Banksia attenuata* or *Banksia attenuata* – Eucalyptus woodlands. Sub community of Banksia woodlands of the Swan Coastal Plain TEC, where areas meet the Approved Conservation Advice key diagnostic characteristics and condition thresholds. FCT 28 is not listed as a TEC or PEC.
- FCT 26b Woodlands and mallees on limestone. May align with Priority 3 ecological community Tuart (*Eucalyptus gomphocephala*) woodlands of the Swan Coastal Plain, which is currently under assessment at Commonwealth level. FCT 26b is not listed as a TEC or PEC.
- Threatened Ecological Community (TEC) - Aquatic Root Mat Community in Caves of the Swan Coastal Plain, which is listed as Critically Endangered at state level and Endangered under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Both FCT 24 and 28 are sub-communities of the Commonwealth listed TEC 'Banksia Woodlands of the Swan Coastal Plain'. Banksia attenuata and Banksia menziesii only occur in isolated patches on the site. Both species are in very low densities in the area considered potentially to be FCT 24 in the northern Tuart Mixed Heath. Therefore, small patches of the site may qualify as the TEC 'Banksia Woodlands of the Swan Coastal Plain'.

The FCT SCP 29a is known to occur within coastal parts of the Swan Coastal Plain over a range of 238 km, from Seabird in the north, to Bunbury in the south. Locally this FCT in known to occur within remnant vegetation 2.5km north of the project area, within Bush Forever Site 325. From quadrats surveyed by Mattiske in 2013, the Mean Species Richness (MSR) for SCP 29a was 17.1. This is much less than the MSR of 33.7 reported for reference quadrats for this FCT in Gibson et al. (1994) and DEP (1996). Based on the known local occurrences, and the comparatively low species richness of the FCT within the Project area, the Project area is not considered to be a significant occurrence of the PEC.

The FCT 29b, is known to occur within coastal parts of the Swan Coastal Plain over a range of 175 km, from Seabird in the north, to Yalgorup National Park in the south. Locally this FCT is known to occur within remnant vegetation 6.5km north of the project area, within Bush Forever Site 322. From quadrats surveyed by Mattiske in 2013, the Mean Species Richness (MSR) for SCP 29b was 20.5 (inclusive of weed species). This is much less than the MSR of 34.2 reported for reference quadrats for this FCT in Gibson et al. (1994) and DEP (1996). Based on the known local occurrences, and the comparatively low species richness of the FCT within the broader project area, the Project area is not considered to be a significant occurrence of the PEC.

Flora

Additional values of the Carabooda site include the potential presence of three Priority listed flora identified as potentially occurring by ATA Environmental (2002), which included *Acacia benthamii* P2, *Jacksonia sericea* P4 and *Sarcozona bicarinata* P3.

A NatureMap search and *Environment Protection and Biodiversity Conservation Act 1999* (EPBC) Protected Matters Search Tool (PMST) was also conducted for the Carabooda site with a 2 km buffer to identify other potentially occurring Priority or Threatened flora species (Appendix A).

One priority species, *Stylidum maritimum* (P3) was identified as potentially occurring at the Carabooda site (Parks and Wildlife 2007).

The EPBC PMST identified four Threatened species including *Diuris micrantha* (Vulnerable), *Drakaea elastica* (Endangered), *Eleocharis keigheryi* (Vulnerable) and *Lepidosperma rostratum* (Endangered) (DEE 2018) as potentially occurring in the area of the Carabooda site.

Fauna

NatureMap and EPBC PMST searches were undertaken (2km radial buffer) to identify whether any terrestrial vertebrate fauna species of conservation significance have the potential occur in the Carabooda site (Appendix A). A total of 11 conservation significant fauna species (nine Threatened and two Priority listed) were identified from the database searches (Parks and Wildlife 2007, DEE 2018) (Table 1.3).

Table 1.3: Conservation significant fauna considered to potentially occur in the survey area

Species	Conservation Status (EPBC Act & WC Act)
Birds	
Australasian Bittern (*Botaurus poiciloptilus*)	Endangered
Australian Painted Snipe (*Rostratula australis*)	Endangered
Blue-billed Duck (*Oxyura australis*)	Priority 4
Carnaby's Cockatoo (*Calyptorhynchus latirostris*)	Endangered
Curlew Sandpiper (*Calidris ferruginea*)	Critically Endangered
Eastern Curlew (*Numenius madagascariensis*)	Critically Endangered
Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*)	Vulnerable
Malleefowl (*Leipoa ocellata*)	Vulnerable
Red Knot (*Calidris canutus*)	Endangered
Mammals	
Chuditch, Western Quoll (*Dasyurus geoffroii*)	Vulnerable
Quenda, Southern Brown Bandicoot (*Isoodon fusciventer*)	Priority 4

Assessment against site selection criteria

An assessment of the site against the established NPO criteria is provided in Table 1.4.

Table 1.4: Site selection criteria assessment

Site selection criteria	Development area environmental values	Carabooda property environmental values	Outcome
Minimum of 22.7 ha of native vegetation in Very Good to Excellent condition	Vegetation condition of the Development area and surrounds was assessed as ranging from Completely Degraded (cleared) to Excellent with the majority of the survey area being in Good to Very Good condition.	22.7ha of the western portion of the site has been allocated to the Ocean Reef Marina development. Approximately 94% of the Western portion is in Very Good to Excellent Condition.	**Achieves criteria**
Within 10 km of the coast	The Development area is located on the coast.	The property is located approximately 5.5 km from the coast.	**Achieves criteria**

Site selection criteria	Development area environmental values	Carabooda property environmental values	Outcome
Contain conservation significant species and communities of similar value and priority for protection	No Threatened flora species have been identified within the Development area during surveys. Two state listed Priority flora species have been recorded: Grevillea sp. Ocean Reef (Priority 1) and *Conostylis bracteata* (Priority 3). No Threatened Ecological Communities (TECs) have been identified as existing within the Development area. Three Priority 3 Ecological Communities (PECs) were inferred to occur: • Swan Coastal Plain (SCP) 24 – Northern Spearwood shrublands and woodlands • SCP 29a – Coastal shrublands on shallow sands, southern Swan Coastal Plain • SCP 29b – Acacia shrublands on taller dunes, southern Swan Coastal Plain.	The Carabooda property supports at least three Priority flora species. The site also supports the following listed floristic community types: FCT 24 Northern Spearwood shrublands and woodlands (State listed Priority 3 Priority Ecological Community). This is a sub community of Banksia woodlands of the Swan Coastal Plain TEC and may also meet criteria as a sub community of Tuart (*Eucalyptus gomphocephala*) woodlands of the Swan Coastal Plain, which is currently under assessment at Commonwealth level. FCT28 Spearwood *Banksia attenuata* or *Banksia attenuata* – Eucalyptus woodlands. Sub community of Banksia woodlands of the Swan Coastal Plain TEC, where areas meet the Approved Conservation Advice key diagnostic characteristics and condition thresholds. FCT26b Woodlands and mallees on limestone. May align with Priority 3 ecological community Tuart (*Eucalyptus gomphocephala*) woodlands of the Swan Coastal Plain, which is currently under assessment at Commonwealth level. Threatened Ecological Community - Aquatic Root Mat Community in Caves of the Swan Coastal Plain, which is listed as Critically Endangered at state level and Endangered under the EPBC Act.	**Achieves criteria** The Carabooda property has higher conservation value than the Development area.
Contain vegetation communities as similar as practicable to the impacted site.	On a regional scale, vegetation of the Development area falls within the Quindalup Complex, with some influence from the Cottesloe Complex: Central and South. The vegetation types mapped included shrubland/scrubland and heath communities with a clear coastal mosaic of vegetation types, with occurrence primarily determined by dune type and position.	On a regional scale, the proposed offset is within Cottesloe Complex – Central and South and Herdsman Complex. The site is dominated by Tuart (*Eucalyptus gomphocephala*) woodland to forest over mixed shrublands and heath communities, with some Jarrah (*Eucalyptus marginata*) and Banksia (*Banksia menziesii, B. attenuata*) woodland. Overall, vegetation communities of the Proposal area are different to those mapped at Lot 51, although there is some overlap of species. The Western portion contains four vegetation types that share at least one species in common with vegetation types from Lot 51. Shared species include *Acacia saligna, Hibbertia hypericoides, Spyridium globulosum, Melaleuca huegelii* and *Banksia sessilis*.	Both sites support shrubland and heath type communities with an overlap of some species. Both sites also contain FCT 24. While the site does not fully support the same vegetation communities, it was determined to be *as similar as practicable* to the Development area. **The site is therefore assessed as meeting this criterion.**
Occur within the Perth subregion of the Swan Coastal Plain bioregion	The Development area is located within the Perth subregion of the Swan Coastal Plain bioregion.	The Carabooda property is located within the Perth subregion of the Swan Coastal Plain bioregion.	**Achieves criteria**

Site selection criteria	Development area environmental values	Carabooda property environmental values	Outcome
Have an improved area to perimeter ratio than the impacted site	The Development area is within the long linear remnant vegetation of BF 325 which is partially interrupted by roads and carparks. Thus, the Proposal area has a medium area to perimeter ratio.	The Western Portion of Lot 51 is a substantial remnant which is partially bounded by vegetation along its entire western boundary. Therefore, this area has been assessed as having a high area to perimeter ratio.	**Achieves criteria**
Contiguous with an existing conservation area	The Development area is within the long linear remnant vegetation of BF 325.	The acquisition site is east of and contiguous with Yanchep National Park.	**Achieves criteria**
Enhance biological corridors or ecological linkages between conservation areas		The acquisition site is contiguous with Yanchep National Park, the addition of a portion of Lot 51 to the conservation estate will enlarge the National Park and thus enhance biological linkages within the region.	**Achieves criteria**

1.5 Ownership and tenure

Site identification details for the proposed clearing footprint are provided in Table 1.5.

Table 1.5: Site identification details

Lot No	C/T Details	Survey Plan	Owner	Reserve #/ tenure
1029	1957/865	D57604	City of Joondalup	N/A
10098	LR3048/270	DP 216093	State of WA	36732 Water Corporation
10518	LR3146/799	P216093	State of WA	39014 to Minister for Transport (Harbour Purposes)
15446	LR3133/571	DP 40340	State of WA	47831 City of Joondalup (Recreation, telecommunications and purposes incidental thereto)
555	LR3166/566	P402198	State of WA	45122 to City of Joondalup (Recreation)

1.6 Related applications

1.6.1 Planning and Development Act 2005

The Joint Development Assessment Panel recently granted two separate development approvals for the proposed breakwater construction as follows:

- The portion of works located on land reserved for 'Parks and Recreation' and 'Waterways' under the MRS; (Western Australian Planning Commission (WAPC)); and
- The portion of works located on land zoned 'Urban' under the Metropolitan Region Scheme (MRS) (City of Joondalup).

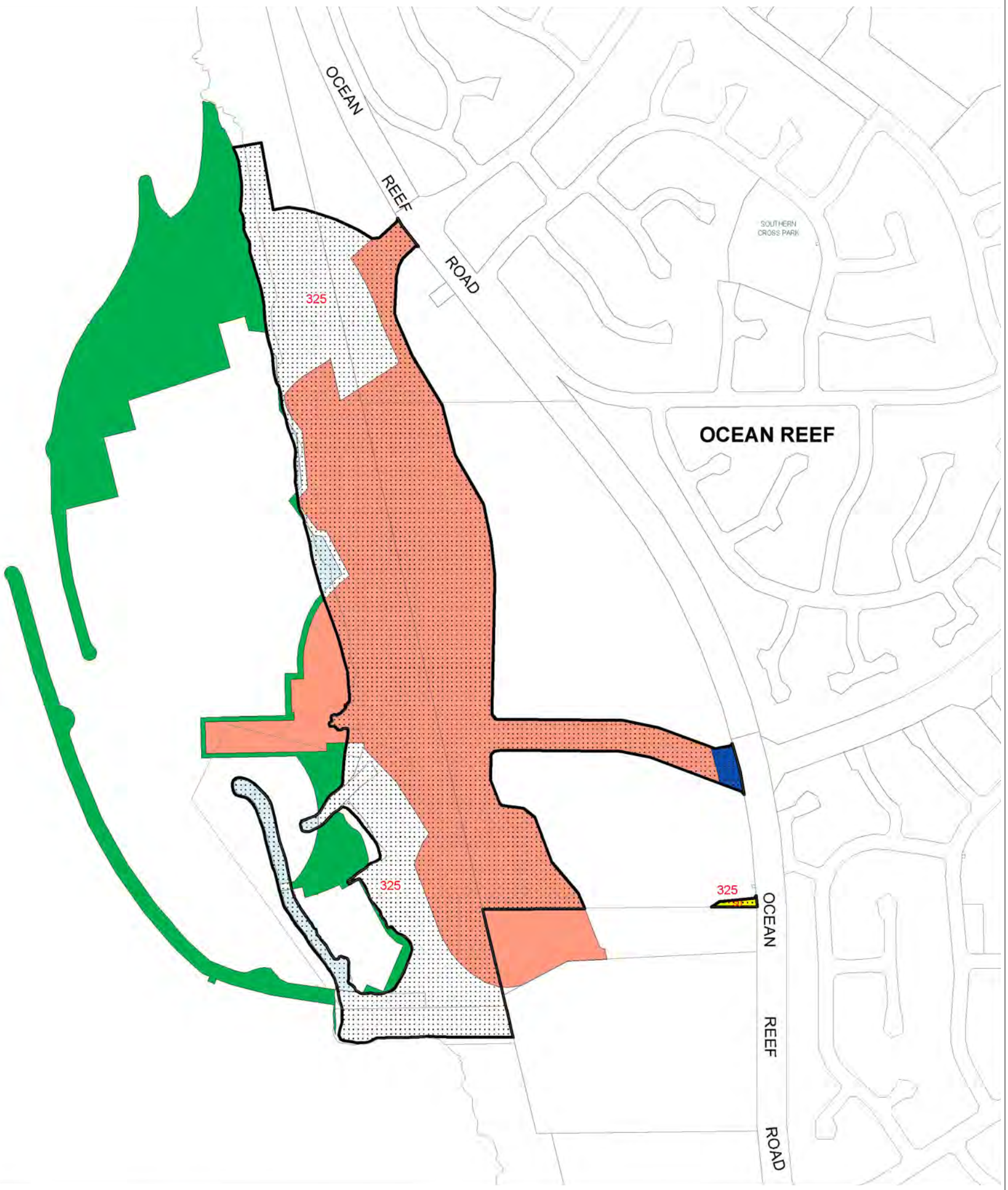
A third Development Application is applicable to the proposed clearing area, associated with the northern batters which extend into Bush Forever Site 325.

1.6.2 Environmental Protection Act

As identified previously, DevelopmentWA has also lodged clearing permit applications to facilitate the following work programmes across the terrestrial/land based Development area (Strategen-JBS&G 2020).

- Geotechnical investigations: 3.9 ha; and
- Early works programme: 4.47 ha.

The proposed clearing footprint which is the subject of this application partially overlaps the northern portion of the geotechnical investigation area.



Western Australian Planning Commission

Legend

- Excluded from parks and recreation reservation and included in other regional roads reservation
- Excluded from waterways reservation and included in parks and recreation reservation
- SU — Excluded from parks and recreation reservation and included in public purposes - special uses reservation
- Excluded from parks and recreation, waterways, and public purposes (special uses) reservations and included in urban zone
- Excluded from parks and recreation reservation and included in waterways reservation
- Excluded from Bush Forever area *(Site No. 325)*

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0 100 metres

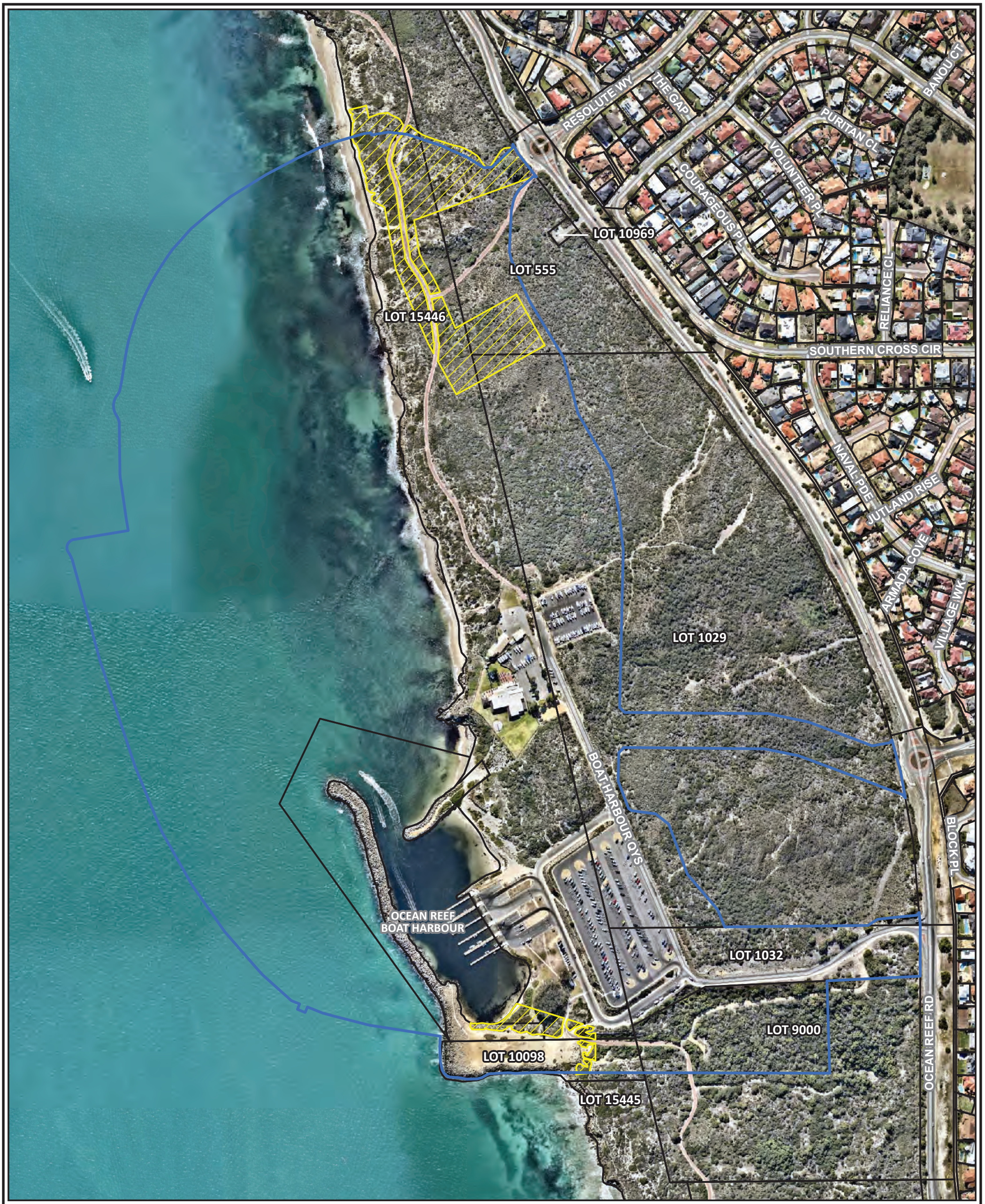
Ocean Reef Marina Development Breakwater works

METROPOLITAN REGION SCHEME AMENDMENT NO. 1270/41

Job No: 58225				
Client: DevelopmentWA				
Drawn By: hsullivan	Checked By: CT	Version: A	Date: 07-Jan-2020	**FIGURE: 1-1**

Document Path: W:\Projects\1)Open\LandCorp\58049 Ocean Reef early works NVCP\GIS\Maps\R01 Rev A\58049_01_1_MRSAmendment.mxd

Image Reference: Data Analytics, Department of Planning, Lands and Heritage, Perth WA.



Legend:

- Proposed clearing footprint
- Concept plan boundary
- Cadastral boundaries
- Roads (MRWA)

Scale 1:6,000 at A4	0 50 100 150 metres
Coord. Sys. GDA 1994 MGA Zone 50	
Job No: 58225	
Client: DevelopmentWA	
Version: 2	Date: 16-Jun-2020
Drawn By: hsullivan	Checked By: CoB

Ocean Reef Marina Development Breakwater works

PROPOSED CLEARING FOOTPRINT

FIGURE 1-2

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File Name: W:\Projects\1)Open\LandCorp\58225 Ocean Reef Breakwater NVCP\GIS\Maps\R02_Rev_A\58225_01_2_PpsdClearingArea.mxd
Image Reference: www.nearmap.com© - Imagery Date: 10 May 2020

2. Existing environment

2.1 Climate

The locality has a Mediterranean climate, characterised by hot dry summers and mild wet winters, typical of coastal areas in the Perth metropolitan region. Temperatures range from a mean maximum of 30.4°C in February to a mean minimum of 9.7°C in July and the long term mean annual rainfall at Swanbourne (009215) was 734 mm (Bureau of Meteorology 2019).

Winds are an important feature of coastal environmental settings as they are a major determinant of landwards sand migration, landforms and landscape. During summer, winds blow from the south-east in the morning and from the southwest in the afternoon with the local sea breeze. Winter is characterised by north-westerly storm winds that back around to the west and southwest, interspersed with calmer periods.

The nearest official meteorological weather station is the Swanbourne station located approximately 25 km south of the Development. Summary climate data for the nearest meteorological station is presented in Figure 2.1.

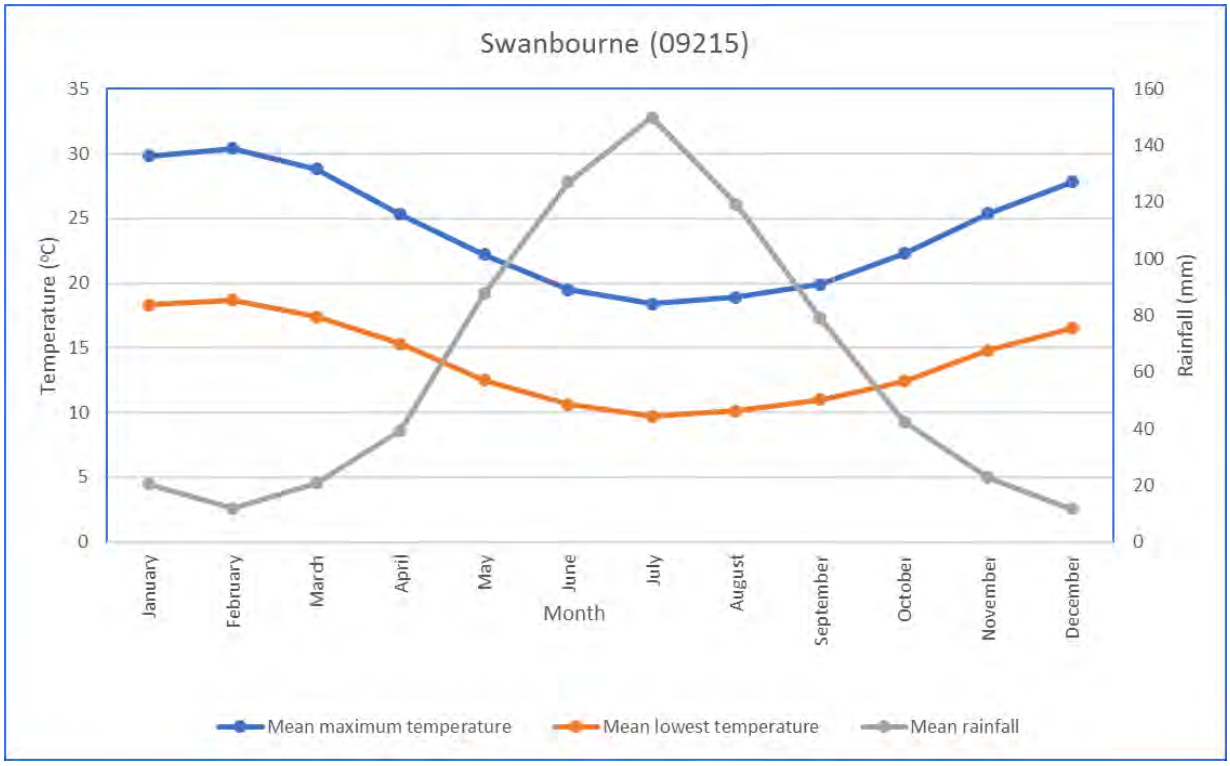
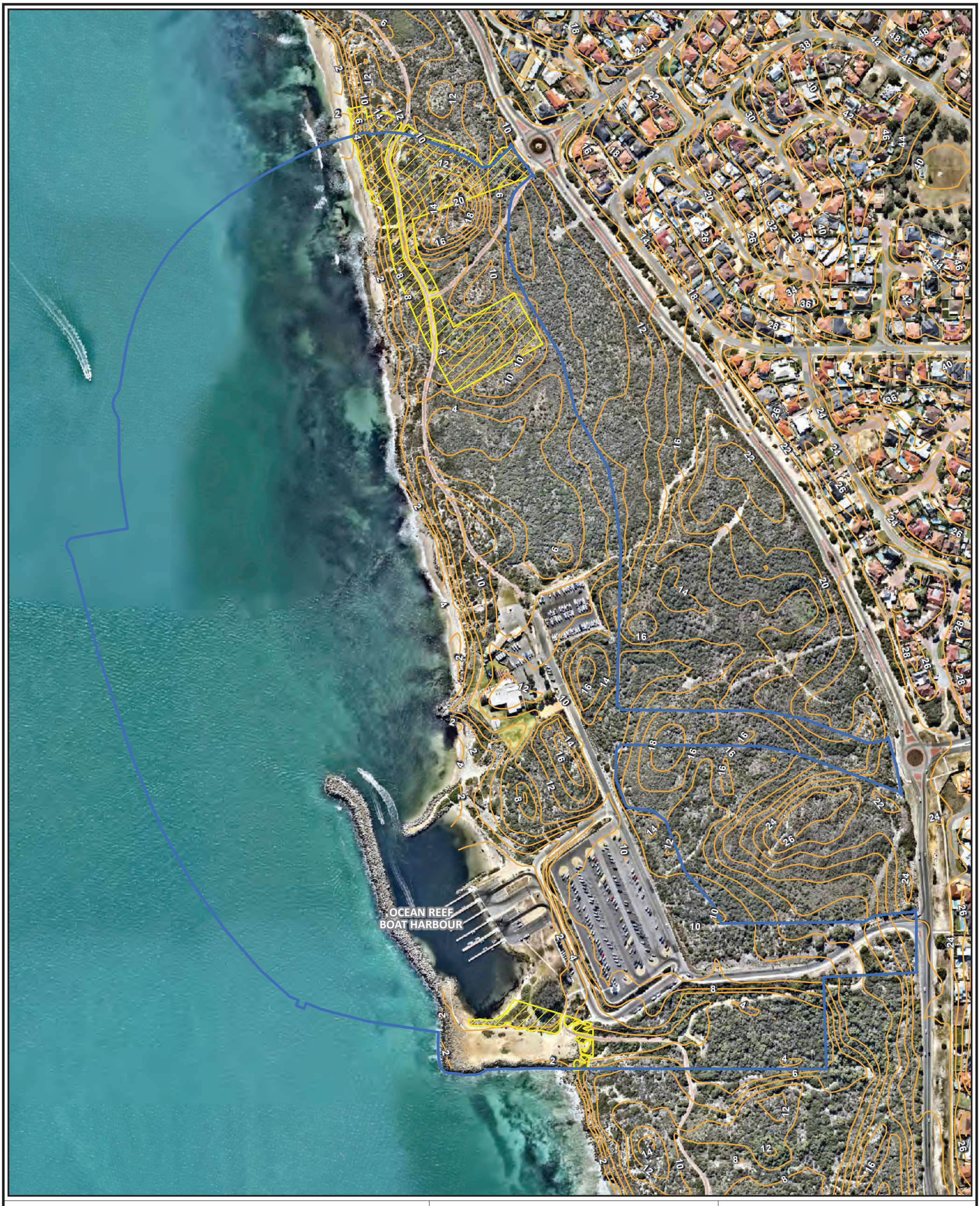


Figure 2.1: Climate data for Swanbourne - 09215 (nearest meteorological station) (Source: Bureau of Meteorology 2019)



Legend:

- Proposed clearing footprint
- Concept plan boundary
- Topographic contours (mAHD)

Scale 1:6,000 at A4

0 50 100 150
metres

Coord. Sys. GDA 1994 MGA Zone 50

Job No: 58225

Client: DevelopmentWA

Version: 2 | Date: 16-Jun-2020

Drawn By: hsullivan | Checked By: CoB

Ocean Reef Marina Development Breakwater works

TOPOGRAPHY

FIGURE 2-2

strategen JBS&G

File Name: W:\Projects\1)Open\LandCorp\58225 Ocean Reef Breakwater NVCP\GIS\Maps\R02_Rev_A\58225_02_2_Topography.mxd
Image Reference: www.nearmap.com© - Imagery Date: 10 May 2020

2.2 Landform and topography

The Development area is characteristic of a typical coastal landscape with undulating sand dunes and steep limestone cliffs adjacent to the coastline. Previous development has resulted in significant localised earthwork activity across portions of the Development area to form car parks and other recreational facilities.

For the Development area, as a whole, ground elevations vary from approximately 26 m Australian height Datum (AHD) in the eastern portion to 0 m AHD along the coast (Figure 2.2).

The majority of the proposed clearing footprint is dominated by undulating topography formed by dune systems that vary in height by up to approximately 12 m. The dunes are locally bound to the west by limestone cliffs that vary in height from 2 to 4 m AHD.

Modifications to topography within the Development area and specifically the proposed clearing footprint have occurred as a result of construction of the harbour wall, groyne, boat launching facilities, car park and footpaths. The two car park areas required the use of fill material to ensure that a flat, stable area was created (Golder Associates 2015). As a result, the southern car parking facility is approximately 8 m to 10 m higher than the present boat launching facilities and playground.

2.3 Soils and geology

2.3.1 Geology

The Site is located on the Swan Coastal Plain forming part of a deep linear trough of sedimentary rocks known as the Perth Basin. The Perth Basin extends north-south parallel to the coastline with sediments of marine, alluvial and aeolian origin.

The Swan Coastal Plain comprises five major geomorphological systems that lie parallel to the coast, namely (from west to east) the Quindalup Dunes, Spearwood Dunes, Bassendean Dunes, Pinjarra Plain and Ridge Hill Shelf (Churchward and McArthur 1980, Gibson *et al*. 1994 in Mattiske 2013). Each major system is composed of further subdivisions in the form of detailed geomorphological units (Churchward and McArthur 1980, Gibson *et al*. 1994 in Mattiske 2013). The Swan Coastal Plain forms part of a deep linear trough of sedimentary rocks known as the Perth Basin. The Perth Basin extends north-south parallel to the coastline with sediments of marine, alluvial and aeolian origin.

The proposed clearing footprint is largely situated on the Quindalup, with a minor component occurring within the Spearwood Dunes. This is illustrated by the Department of Mines, Industry Regulation and Safety (DMIRS) geomorphology mapping (Figure 2.3). These dunes systems may be described as follows:

- Quindalup Dune System consists of unconsolidated calcareous sands, locally over limestone; and
- Spearwood Dune system consists of leached and podzolized surface sands overlying yellow reddish-brown sands at depth.

Geological logging undertaken by Strategen (now Strategen-JBS&G) to install bores as part of a Detailed Site Investigation (DSI) over the Development area confirms that the Development consists of Safety Bay Sand and Tamala Limestone (Strategen 2015a). These units can be described as:

- Safety Bay Sand: white, fine to medium grained, sub-rounded quartz and shell debris, of aeolian origin, associated with the Quindalup Dune System; and
- Tamala Limestone: white to light brown, fine to coarse grained, subangular to well-rounded quartz sand, shell debris, variably lithified/cemented, often overlain by a variable thickness of residual sandy gravel residual soil (Gozzard 1982).

2.3.2 Karst features

The Tamala Limestone may potentially contain karst features such as caves, vugs and solution channels. These features may vary in size and location within the rock mass and present a risk to building stability as a result of localised collapse and associated settlement. A broad geotechnical survey of the Development has been undertaken.

A *Preliminary Geotechnical Investigation* was undertaken by Golder Associates (2015) to assess the likelihood of these structures occurring. The survey included a walk over survey, test pits and boreholes, with the deepest holes being drilled to -6 mAHD. With respect to the karst features, the study identified:

- Limestone comprising generally weakly to moderately cemented rock with some well cemented zones, typically medium to high strength, moderately to highly leached with highly fractures and gravelly zones. The limestone is variable both in terms of the extent and degree of cementation with numerous zones of weakly to moderately cemented calcarenite;
- No surface expressions of karst or cavernous features were identified across the Development during the investigation; and
- Limestone solution features in the form of outcropping limestone pinnacles, root tubes sand pockets and cap rock.

Golder Associates (2015) advised that the risks posed by such karstic features in the Development area are low. However, a series of recommendations were provided to assist manage the karstic risk during development and construction (of the Development). These included adoption of specific foundations designs where solution features are encountered, site inspections during construction and the completion of additional geotechnical investigations prior to subdivision.

2.3.3 Acid sulfate soils

A review of the WAPC *Planning Bulletin No. 64 - Acid Sulfate Soils* (2003) and the Landgate WA Atlas (2013), has identified that the proposed clearing footprint does not contain geology consistent with the presence of actual acid sulfate soils (AASS) or potential acid sulfate soil (PASS) occurring at depths greater than 3 m.

Soil and rock materials indicative of the presence of acid sulfate soils were not observed during the investigations undertaken by Strategen (2015a) or Golder Associates (2015).

2.3.4 Contamination

The DSI undertaken (2015a) for the terrestrial portion of the broader Development area indicated that:

1. Soils were tested for a range of contaminants including hydrocarbons and trace metals. Concentrations of contaminants in soil samples complied with adopted assessment criteria. Soil within the Development area is not contaminated and there is no risk to human health or the environment from exposure to the soil. The soil is suitable for use in the development as proposed.
2. With the exception of nickel at one location, no contaminants in groundwater were identified that are a risk to human health.
3. Limited Potential Asbestos Containing Material (PACM) has been identified, but this appears to be localised (Strategen 2015). The City [of Joondalup] has previously been acting to remove the identified PACM fragments, however, further PACM is likely to be present within the Development area.

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Legend:

- Concept plan boundary
- Proposed clearing footprint

Coastal geomorphology

- Barrier complex, Spearwood Dune System calcarenite
- Made ground
- Parabolic and nested parabolic dune complexes, Quindalup Dune System

strategen JBS&G

0 100 metres

Ocean Reef Marina Development Breakwater works

GEOLOGY

Job No: 58225		Scale 1:4,000 at A3		
Client: DevelopmentWA		Coord. Sys. GDA 1994 MGA Zone 50		
Drawn By: hsullivan	Checked By: CoB	Version: A	Date: 16-Jun-2020	**FIGURE: 2-3**

Document Path: W:\Projects\1)Open\LandCorp\58225 Ocean Reef Breakwater NVCP\GIS\Maps\R02_Rev_A\58225_02_3_Geology.mxd

Image Reference: www.nearmap.com© - Imagery Date: 10 May 2020

2.4 Groundwater and surface water

Monitoring by Strategen (2019) indicates that groundwater levels vary from approximately 0 m AHD at the western boundary, to 1 m AHD near the eastern boundary of the broader Development area. Given the variable topography of the Development area, this corresponds to a depth to groundwater of between 0 m at the coast and 23 m below ground level (Strategen 2015a) at the eastern boundary. Groundwater at the coast is affected by changes in sea level including tides and storm surge[2] events. Moving away from the coast, this effect reduces until the groundwater levels are only affected by seasonal trends related to rainfall.

Climate change is estimated to cause a rise in mean sea level of 0.3 m by 2060 and 0.9 m by 2110 (DoT 2010). In near coastal areas, groundwater levels are expected to rise as a consequence of the rise in sea levels. In the immediate coastal area, the rise in sea level as a result of climate change is anticipated to result in an equivalent rise in groundwater levels. Further from the land directly adjacent to the coast, other factors affecting groundwater flow and levels (such as rainfall patterns) will have a greater effect on groundwater levels.

Due to the location of the proposed clearing footprint on the coast, a rise in sea level as a result of climate change is anticipated to result in an equivalent rise in groundwater levels. This results in an estimated maximum groundwater level for 2110 of between 1.89 m AHD and 2.19 m AHD (Strategen 2015a, Figure 2.4).

Wetlands and terrestrial surface waters are not present within or adjacent to the proposed clearing footprint.

[2] The rising of the sea as a result of wind and atmospheric pressure changes associated with a storm.

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6485000

MB01
MGL: 2.09

MB01

MB02
MGL: 2.09

MB02

MB03
MGL: 1.89

MB03

DoW 4931
MGL: 2.09

DOW 4931

1.9

2.0

2.1

379000 379500 380000

Legend:

- Concept plan boundary
- Proposed clearing footprint
- Design groundwater level contour (mAHD)
- WIN Site bore
- Monitoring bores

strategen JBS&G

0 100 metres

Ocean Reef Marina Development Breakwater works

GROUNDWATER

Job No: 58225		Scale 1:4,000 at A3		
Client: DevelopmentWA		Coord. Sys. GDA 1994 MGA Zone 50		
Drawn By: hsullivan	Checked By: CoB	Version: A	Date: 16-Jun-2020	**FIGURE: 2-4**

Document Path: W:\Projects\1)Open\LandCorp\58225 Ocean Reef Breakwater NVCP\GIS\Maps\R02_Rev_A\58225_02_4_Groundwater.mxd

Image Reference: www.nearmap.com© - Imagery Date: 10 May 2020

2.5 Vegetation and flora

2.5.1 Surveys conducted

A number of vegetation and flora surveys of the Development area have been undertaken to date, comprising:

- Mattiske Consulting (2000), *Flora and Vegetation Assessment of Lot 1029 and Bushplan Site 325*, City of Joondalup, prepared for The Planning Group (survey conducted in June 2000);
- Bowman Bishaw Gorham (2002), *Vegetation and Flora Assessment Pt Lot 1029, Lots 1032 and 1033 Ocean Reef Road, Ocean Reef*, prepared for City of Joondalup (surveys conducted in April & May 2002);
- Natural Area Management Services (2008), Vegetation Condition, Ecological Community and Flora Search Report, Ocean Reef Marina, prepared for the City of Joondalup (surveys conducted 19 & 23 September 2008);
- SMEC Australia Limited & Natural Area Management Services (2009), *Additional Flora Survey, Northern Portion of Proposed ORM Development Site*, prepared for the City of Joondalup (survey conducted September 2009);
- Mattiske Consulting (2013), *Level 2 Flora and Vegetation Survey of the Proposed Ocean Reef Marina Survey Area*, prepared for Strategen on behalf of City of Joondalup (surveys conducted 14 to 17 October 2013);
- Strategen-JBS&G undertook a walkover of the Proposal site in Spring 2019 by to confirm the boundaries and results of the previous vegetation community and condition mapping undertaken. This walkover resulted in minor boundary changes to the vegetation community mapping of VTs S4 and H4. Vegetation composition and condition of the remaining VTs were recorded as consistent with mapping by Mattiske (2013). Based on the site walkover, and conformation of the majority of the mapping it was determined that additional updated detailed surveys were not required. Minor amendments have been made to the Mattiske (2013) mapping which are reflected in Figure 2.5 where relevant to the proposed clearing footprint; and
- Strategen-JBS&G (2020). An Associate Ecologist undertook a site visit in May 2020 to assess the likelihood of *Grevillea sp. Ocean Reef* occurring in other areas of the Ocean Reef vegetation within and adjacent to the Development area. A Memorandum has been prepared outlining the findings of this assessment (Appendix B).

2.5.2 Regional context

The proposed clearing footprint is located in the South Western Botanical Province of Western Australia, in the Darling Botanical District and the Swan Coastal Plain subregion of the Drummond Botanical District (Mattiske 2013).

2.5.2.1 Swan Coastal Plain Bioregion

The Site is located in the South Western Botanical Province of Western Australia, in the Darling Botanical District and the Swan Coastal Plain subregion of the Drummond Botanical District (Mattiske 2013). Vegetation types of the Site are dominated by the Quindalup vegetation complex, with some influence from the Cottesloe vegetation complex: Central and South, and Karrakatta vegetation complex: Central and South (Mattiske 2013).

The Quindalup Complex is restricted to the coastal dunes. Here, the vegetation differs in its structure and species composition from one area to another. The resulting mosaic largely reflects variation in the dunal environment in association with soil and topographic factors and the degree of shelter from salt laden winds.

The Cottesloe Complex: Central and South supports heaths on limestone outcrops. The deeper sands support a mosaic of tuart woodland and an open forest of tuart, jarrah and marri.

The Karrakatta Complex: Central and South consists predominately of an open tuart, jarrah and marri forest, commonly supporting *Banksia attenuata*, *Banksia menziesii*, *Banksia grandis* and *Allocasuarina fraseriana*. Shrubs include *Jacksonia sternbergiana*, *Jacksonia furcellata*, *Acacia Cyclops*, *Acacia saligna*, *Hibbertia* spp., *Allocasuarina humilis*, *Calothamnus quadrifidus* and *Grevillea preissii* subsp. p*reissii* (Mattiske 2013). In the deeper sands the tuart is replaced by jarrah, with marri on the moister areas.

2.5.3 Vegetation communities

A total of six vegetation communities have been defined and mapped within the clearing footprint (Table 2.1, Figure 2.5).

Table 2.1: Vegetation types within the clearing footprint

Plant Community	Description	Area (ha)
Heath		
H1	Low open scrubland to heath of *Acacia cyclops, Acacia rostellifera, Spyridium globulosum* and *Templetonia retusa* over *Scaevola crassifolia, Olearia axillaris, Myoporum insulare* and *Rhagodia baccata* subsp. *dioica* over *Acanthocarpus preissii, Threlkeldia diffusa, Senecio pinnatifolius* and *Frankenia pauciflora* over *Lepidosperma gladiatum, Spinifex longifolius, Sporobolus virginicus* and mixed exotics on white sands or light grey sands of fore-and primary dunes with frequent limestone outcropping.	2.34
H2	Open heath of *Melaleuca systena, Acanthocarpus preissii, Leucopogon insularis* and *Acacia lasiocarpa* var. *lasiocarpa* with emergent *Acacia rostellifera* and *Santalum acuminatum* over *Lomandra maritima, Conostylis bracteata* (P3), *Poa drummondii* and mixed exotics on grey sands of secondary dune slopes.	0.19
Shrublands and scrublands		
S1	Mid closed scrubland of *Acacia rostellifera* and *Melaleuca huegelii* with occasional emergent *Banksia sessilis* var. *cygnorum* over *Spyridium globulosum, Rhagodia baccata* subsp. *dioica* and *Hibbertia cuneiformis* over *Acanthocarpus preissii, Clematis linearifolia, Hardenbergia comptoniana* and mixed exotics on deep grey sands of primary and secondary dunes.	0.16
S2	Tall shrubland of *Banksia sessilis* var. *cygnorum, Spyridium globulosum, Santalum acuminatum* and *Acacia saligna* with occasional emergent *Eucalyptus todtiana* over *Rhagodia baccata* subsp. *dioica, Alyogyne huegelii* and *Trymalium odoratissimum* over *Conostylis bracteata* (P3), *Desmocladus asper, Lepidosperma pubisquameum* and mixed exotics on deep grey or brown sands of secondary dune swales.	0.05
S3	Tall shrubland of *Spyridium globulosum, Acacia rostellifera, Banksia sessilis* var. *cygnorum* and *Santalum acuminatum* over *Phyllanthus calycinus, Hibbertia hypericoides* and *Melaleuca systena* over *Clematis linearifolia, Austrostipa flavescens, Desmocladus flexuosus* and mixed exotics on light grey or brown sands of secondary dune swales.	0.07
Woodland		
Tuart Woodland	Low woodland of *Eucalyptus gomphocephala* over mixed native and introduced species.	0.08
TOTAL		**2.89**

Adapted from: Mattiske (2013).

2.5.4 Threatened and Priority Vegetation Communities

No State or Commonwealth listed Threatened Ecological Communities (TECs) occur within the proposed clearing footprint.

The Department of Biodiversity Conservation and Attractions (DBCA) categorises PECs according to their conservation priority, using five categories. Three Priority 3 Priority Ecological Communities (P3 PECs) were inferred by Mattiske (2013) to occur within the Development area (Figure 2.6) and are present within the proposed clearing footprint, being:

- SCP 24: 0.05 ha 'Northern Spearwood shrublands and woodlands';
- SCP 29a: 2.50 ha 'Coastal shrublands over shallow sands, southern Swan Coastal Plain'; and
- SCP 29b: 0.26 ha 'Acacia shrublands on taller dunes, southern Swan Coastal Plain'.

The three P3 PECs identified within the proposed clearing footprint are currently listed (DBCA 2019) as 'communities that are known from several to many occurrences, a significant number or area of which are not under threat of habitat destruction or degradation'.

Northern Spearwood shrublands and woodlands

It is noted that SCP 24: 'Northern Spearwood shrublands and woodlands' is listed (within the approved conservation advice (TSSC 2016)) as a Floristic Community Type (FCT) with relationships to the EPBC Act listed 'Banksia Woodlands of the Swan Coastal Plain' TEC. However, vegetation within the Site does not contain any of the four diagnostic Banksia species, and therefore does not meet the criteria to be classified as the EPBC Act listed TEC.

FCT SCP24 in known to occur over 37 point locations within the Swan Coastal Plain. Currently there is 1009 ha mapped over a range of 170 km from Nowergup to Binningup. This community occurs as heaths or heaths with scattered *Eucalyptus gomphocephala* on the western Swan Coastal Plain, principally on the Cottesloe unit of the Spearwood system.

Locally this FCT is known to occur within remnant vegetation 6.5 km north of the development, within Bush Forever Site 322. Based on quadrats surveyed by Mattiske in 2013, the Mean Species Richness (MSR) for SCP 24 was 6.6. This is much less than the MSR of 38.9 reported for reference quadrats for this FCT in Gibson et al. (1994) and DEP (1996). Based on the known local occurrences, and the comparatively low species richness of the FCT within the application area, this is not considered to be a significant, diverse occurrence of the PEC. In addition, the clearing of 0.05 ha of this community represents 0.005% of the current mapped occurrence and the loss of this area will not alter the conservation status of the community.

Coastal shrublands over shallow sands, southern Swan Coastal Plain

The proposed clearing footprint will impact up to 2.50 ha of SCP 29a which is Priority 3 PEC.

The FCT SCP 29a is known to occur over a number of locations (>10) within coastal parts of the Swan Coastal Plain, over a range of 238 km, from Seabird in the north, to Bunbury in the south. This FCT has been recorded by Keighery et al. at 21 quadrat locations across this range.

Locally this FCT in known to occur within remnant vegetation 2.5 km north of the development, protected within Bush Forever Site 325. Based on quadrats surveyed by Mattiske in 2013, the Mean Species Richness (MSR) for SCP 29a was 17.1. This is much less than the MSR of 33.7 reported for reference quadrats for this FCT in Gibson et al. (1994) and DEP (1996). Based on the known local occurrences, and the comparatively low species richness of the FCT within the application area, this is not considered to be a significant, diverse occurrence of the PEC.

In addition, the clearing of 2.50 ha of this community is unlikely to alter the conservation status of the community.

Acacia shrublands on taller dunes, southern Swan Coastal Plain

The proposed clearing footprint will impact up to 0.26 ha of SCP 29b, which is a Priority 3 PEC.

The FCT 29b, is known to occur over a number of locations (>10) within coastal parts of the Swan Coastal Plain over a range of 175 km, from Seabird in the north, to Yalgorup National Park in the south. Locally this FCT is known to occur within remnant vegetation 6.5 km north of the development, within Bush Forever Site 322. This FCT has been recorded by Keighery et al. at 38 quadrat locations across this range.

From quadrats surveyed by Mattiske in 2013, the Mean Species Richness (MSR) for SCP29b was 20.5 (inclusive of weed species). This is much less than the MSR of 34.2 reported for reference quadrats for this FCT in Gibson *et al*. (1994) and DEP (1996). Based on the known local occurrences, and the comparatively low species richness of the FCT within the broader project area, the Project area is not considered to be a significant occurrence of the PEC.

Given the broad geographical distribution across the Swan Coastal Plain, and the low floristic diversity of SCP 29b within the application areas as compared with reference quadrants for these FCTs, the loss of up to 0.26 ha of this community as a result of the proposed clearing is not likely to alter the conservation status of this community.

2.5.5 Vegetation condition

Vegetation condition was assessed as part of all recent flora and vegetation surveys. The most recent survey by Mattiske (2013) covered the proposed clearing footprint (Figure 2.7). Investigations undertaken by Mattiske (2013) have characterised vegetation condition in the clearing footprint as ranging from completely degraded (cleared) to excellent based on the Keighery (1994) vegetation condition scale (Table 2.1). A total of 0.15 ha within the proposed clearing footprint is bare sand/limestone or cleared.

Table 2.2 Vegetation Condition

Vegetation condition	Area within Clearing Footprint (ha)
Degraded	0.26
Degraded - Good	0.04
Good	1.40
Very Good	0.99
Very Good to Excellent	0.04
Excellent	0.15
TOTAL	**2.89**

2.5.6 Flora

A total of 137 vascular plant taxa which are representative of 105 plant genera and 43 plant families were recorded within the terrestrial component of the broader Development area by Mattiske (2013). Of the 137 plant taxa recorded within the survey area, 49 species (36%) were introduced. The high percentage of introduced species is considered to reflect the fragmentation of the Development, historical clearing, dumping of refuse and its proximity to adjacent residential areas.

No Threatened flora species have been identified within the proposed clearing footprint, or the broader Development area.

Mattiske (2013) recorded two state listed Priority flora species:

- *Grevillea* sp. Ocean Reef (Priority 1[3])
- *Conostylis bracteata* (Priority 3[4]).

Conostylis bracteate occurs within the proposed clearing footprint. This species is relatively common and the proposed clearing is unlikely to alter the conservation status of this species.

Grevillea sp. Ocean Reef is less well conserved and this is the only known population of the Ocean Reef species in the database of the Western Australian Herbarium. However, the mapped locations of *Grevillea* sp. Ocean Reef occur outside of the Development area and the proposed clearing footprint (Mattiske 2013). A further survey by Strategen-JBSG was undertaken in 2020 of potential suitable habitat that may support this species within and surrounding the Development site. While the survey was not undertaken in Spring, the species is easily identified without reproductive material due to its size and distinctive foliage. No occurrences of Grevillea with similar morphological features were recorded during the targeted survey (Appendix B).

Strategen-JBS&G have undertaken an updated flora likelihood assessment, based on:

- Purchased DBCA database search results;
- NatureMap database search results; and
- Species identified by Department of Biodiversity Conservation and Attractions (DBCA) during the investigation of appeals lodged against previous clearing permits within the Development area; including:
    - *Jacksonia gracillima* (P3)- WAHERB Sheet 8755396, (9km)
    - *Fabronia hampeana* (P2)- WAHERB Sheet 8076626, 5939658- (4.5 and 6km)
    - *Lecania turicensis var. turicensis* (P2)- WAHERB Sheet 2973499. (3km).
    - *Poranthera moorokatta*- WAHERB Sheet 8766185 (9km)
    - *Stylidium maritimum* (P3) WAHERB Sheet 8755361, (9km)
    - *Stylidium paludicola* (P3) WAHERB Sheet 8540942, (3.5km)
    - *Styphelia filifolia* (P3) –WAHERB Sheet 1016539 (7.5km).

Only vascular plant taxa were considered as part of the assessment, resulting in both *Fabronia hampeana* (P2) and *Lecania turicensis var. turicensis* (P2) being excluded.

Based on the results of the likelihood assessment, the following species were determined to occur/ potentially occur within or adjacent to the development footprint:

- *Austrostipa mundula* (P2) – this species is known from 15 records occurring in coastal locations from Esperance to Wanneroo. The closest recorded location to the development area occurs on soils that are not consistent with those within the development area.
- *Jacksonia sericea* (P4) – this species is known from 128 records across the Perth Metropolitan Area spreading over a 120 km range north to south. An occurrence within the development area would not be considered a significant population as it would not extent its range, or represent additional habitat.

[3] Species that are considered by DBCA to be 'known from one or a few locations (generally five or less) which are potentially at risk'.

[4] Species that are considered by DBCA to be poorly known and ' known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat'.

- Stylidium maritimum (P3) – this species is known from 111 records along the west coast of WA over a range of 375km (Leeman to Myalup). An occurrence within the development area would not be considered a significant population as it would not extent its range, or represent additional habitat.
- *Styphelia filifolia* (P3) – this species is known from 36 records along the west coast of WA with its main populations occurring over a range of 238km (Gingin to Myalup). An occurrence within the development area would not be considered a significant population as it would not extent its range, or represent additional habitat.

None of the species listed above have been recorded during any of the survey conducted historically within the Development area.

During previous clearing permit assessments, it was identified that the Development area contains habitat that may be suitable for *Marianthus paralius* - a listed Threatened species. On this basis, it was contended that the Development site may provide habitat considered critical for the survival of this species and clearing of this potential habitat would be inconsistent with the conservation advice for the species.

Marianthus paralius is a woody, almost prostrate shrub, approximately 50 cm wide, with red-orange flowers (September to November), occurring on white sand over limestone, on coastal cliffs. The closest recorded location of this species is approximately 3 km north of the Development site. This individual was recorded within coastal limestone heath and associated species including *Melaleuca cardiophylla*, *Thomasia triphylla*, *Templetonia retusa*, *Spyridium globulosum*, *Olearia axillaris*, *Acanthocarpus preissii* and *Scaevola crassifolia*. This corresponds to vegetation community H1 (Mattiske 2013) of which there is approximately 2.34 ha in the proposed clearing area for the breakwater works.

Whilst this species has the potential to occur in the coastal strip of the Development area, two surveys have been completed in the vicinity of the Development area which indicate that the species is unlikely to be present within the clearing footprint for the breakwater works or the larger Development area.

- Mattiske (2000) conducted a flora and vegetation survey of Lot 1029, part of which lies within the Proposal site (Figure 1.2). The Mattiske survey identified no Threatened or Priority Flora, including *Marianthus paralius,* within the Lot 1029 survey area.
- Mattiske (2013) assessed 65 sampling sites, as well as recorded opportunist observations, and did not identify any occurrences of the threatened species; *Marianthus paralius.*

While specific targeted surveys for this species have not been undertaken, given this species would have been identifiable and distinctive during the time of survey, and the level of survey coverage within the H1 community (20 quadrats), it is unlikely that this species was present and not recorded.

The lack of individuals across the Development area may be attributed to threats including weeds, feral species (i.e. rabbits) and recreational activities across the site (DBCA 2009).

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Legend:

- Concept plan boundary
- Proposed clearing footprint

Vegetation type

- BSL (0.01 ha)
- H1 (2.34 ha)
- H2 (0.19 ha)
- S1 (0.16 ha)
- S2 (0.05 ha)
- S3 (0.07 ha)
- Tuart woodland (0.08 ha)
- CL

strategen JBS&G

0 100 metres

Ocean Reef Marina Development Breakwater works

VEGETATION TYPE

Job No: 58225		Scale 1:4,000 at A3		
Client: DevelopmentWA		Coord. Sys. GDA 1994 MGA Zone 50		
Drawn By: hsullivan	Checked By: CoB	Version: A	Date: 16-Jun-2020	**FIGURE: 2-5**

Document Path: W:\Projects\1)Open\LandCorp\58225 Ocean Reef Breakwater NVCP\GIS\Maps\R02_Rev_A\58225_02_5_VegetationType.mxd

Image Reference: www.nearmap.com© - Imagery Date: 10 May 2020

379000 379500 380000

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6485000

Legend:

- Concept plan boundary
- Proposed clearing footprint

Protected Ecological Communities

- SCP 24 (0.05 ha)
- SCP 29a (2.50 ha)
- SCP 29b (0.26 ha)

Conservation significant flora species

- *Grevillea* sp. Ocean Reef (D. Pike Joon 4) (P1)
- *Conostylis bracteata* (P3)

strategen JBS&G

0 100 metres

Job No: 58225		Scale 1:4,000 at A4	
Client: DevelopmentWA		Coord. Sys. GDA 1994 MGA Zone 50	
Drawn By: hsullivan	Checked By: CoB	Version: A	Date: 16-Jun-2020

Ocean Reef Marina Development Breakwater works

PRIORITY ECOLOGICAL COMMUNITIES AND PRIORITY FLORA

FIGURE: 2-6

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Image Reference: www.nearmap.com© - Imagery Date: 10 May 2020

379000 379500 380000

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379000 379500 380000

Legend:

- Concept plan boundary
- Proposed clearing footprint

Vegetation condition

- BSL (0.01 ha)
- Excellent (0.15 ha)
- Very good - excellent (0.04 ha)
- Very good (0.99 ha)
- Good (1.40 ha)
- Degraded - good (0.04 ha)
- Degraded (0.26 ha)
- Cleared

strategen JBS&G

0 100 metres

Ocean Reef Marina Development Breakwater works

VEGETATION CONDITION

Job No: 58225		Scale 1:4,000 at A3		
Client: DevelopmentWA		Coord. Sys. GDA 1994 MGA Zone 50		
Drawn By: hsullivan	Checked By: CoB	Version: A	Date: 16-Jun-2020	**FIGURE: 2-7**

Document Path: W:\Projects\1)Open\LandCorp\58225 Ocean Reef Breakwater NVCP\GIS\Maps\R02_Rev_A\58225_02_7_VegetationCond.mxd

Image Reference: www.nearmap.com© - Imagery Date: 10 May 2020

2.6 Fauna

2.6.1 Surveys Conducted

A Level 1 fauna assessment was undertaken by Western Wildlife in 2008, including a desktop assessment and site survey. Based on available habitat, only four conservation significant species were considered likely to occur in the Development area: Carnaby's Black-Cockatoo, Rainbow Bee-eater, Black-Striped Snake and Quenda (Western Wildlife 2008).

A site visit was undertaken on 14 March 2014 by an Ecologist from Strategen (now Strategen-JBS&G), to provide ground truthing of previous mapping for Carnaby's Black Cockatoo habitat within the Development site and adjacent areas. The 2014 survey found that the mapping of Black Cockatoo habitat as completed in 2008 was still valid and could be used to determine the impacts of the proposed Development on these species.

2.6.2 Carnaby's Black-Cockatoo

Carnaby's Black-Cockatoo (*Calyptorhynchus latirostris*) is listed as Endangered under the Commonwealth EPBC Act and the State *Biodiversity Conservation Act 2016*. This species is endemic to the south-west of Western Australia, mainly occurring in uncleared remnant native eucalypt woodlands, especially those that contain Salmon gum and wandoo, and in shrubland or kwongan heathland dominated by *Hakea, Dryandra, Banksia* and *Grevillea* species (DSEWPaC 2012). The Development site was referred under the EPBC Act and resulted in a "Not a Controlled Action" decision in 4 July 2014.

The proposed clearing footprint does not contain any trees suitable for Carnaby's Black-Cockatoo nesting hollows. However, it is noted there is a confirmed breeding site for Carnaby's cockatoo and night roosting site within 3.8 km and 4.5 kilometres respectively from the proposed clearing area.

The Development area does contain a number of flora species that may be used as food sources, primarily *Banksia sessilis*. Accordingly, it is expected that Carnaby's Black-Cockatoo will not reside in the proposed clearing footprint but may visit intermittently to feed.

The broader Development site includes an area of approximately 0.58 ha of suitable good quality foraging habitat for Carnaby's Black-Cockatoo (Strategen 2016b, Figure 2.8) none of which is located within the proposed clearing footprint. Results from 2014 site visit indicate that Carnaby's Black Cockatoo habitat is evident in previously mapped locations.

The remainder of the NVCP clearing area was rated as nil to very poor foraging habitat based on the presence and density of suitable species reported from the Strategen (2014) site visit.

Isolated *B. sessilis* individuals have been identified within the site at low densities (<10% of foliage cover) within VTs S1 and S3. Areas containing *B. sessilis* are outlined in Table 2.3. The number of sample sites are consistent with current guidelines (>3 sample sites per VT).

Table 2.3: Vegetation types with potential CBC foraging habitat

Vegetation type	Number of quadrats sampled per VT (Mattiske 2013)	Area (ha) within NVCP Boundary
S1	10	0.16
S2	7	0.05
S3	5	0.07
Total		**0.28**

Other species noted within the application area that may provide very marginal foraging habitat including *Acacia saligna* and *Allocasuarina spp*., however based on records of utilisation of the species it is not considered significant (DWER 2020).

It is noted that the NPO provides 22.7 ha of greater quality habitat for black cockatoos (including breeding trees), and as such adequately offsets any significant residual impacts.

2.6.3 Black-striped Snake

The Black-striped Snake (*Neelaps calonotos*) is a DBCA State listed Priority 3 listed species restricted to coastal plains between Mandurah and Lancelin and as such is vulnerable to habitat loss, primarily resulting from urban development (Western Wildlife 2008). The Black-striped Snake is known to occur in Banksia and Eucalyptus woodlands, as well as sandy areas. The species has the potential to occur in within the Development area as suitable habitat occurs; the Development therefore has the potential to result in the loss of some habitat.

2.6.4 Quenda

The Quenda is known to occur in areas with dense understorey and is often particularly common in dense wetland vegetation (Western Wildlife 2008). The Quenda has been recorded in proximity to the Development area as identified in the Parks and Wildlife Threatened and Priority Fauna database (Western Wildlife 2008). Characteristic diggings of the species were not observed within the Development area however, it is possible that Quenda may occur. The proposed clearing therefore has the potential to result in loss of 2.89 ha of potential Quenda habitat (Western Wildlife 2008).

2.6.5 Graceful Sun Moth

The Graceful Sun Moth is currently categorised as a Priority 4 conservation significant fauna species. This moth is associated with *Lomandra maritima*, which was recorded predominately in the mapped heathland communities, although the plant species was also associated with the more open shrubland communities (S2) (Mattiske Consulting, 2013).

Based on this, up to 2.67 ha of potential habitat may be present within the proposed clearing area.

It is noted that considerable areas of suitable habitat for this species will be retained and protected within the adjacent Bush Forever Site 325.

It is also noted that the Graceful Sun Moth is known to occur in coastal habitat over a range of 630 km, from Kalbarri south to Binningup (DEC 2012).

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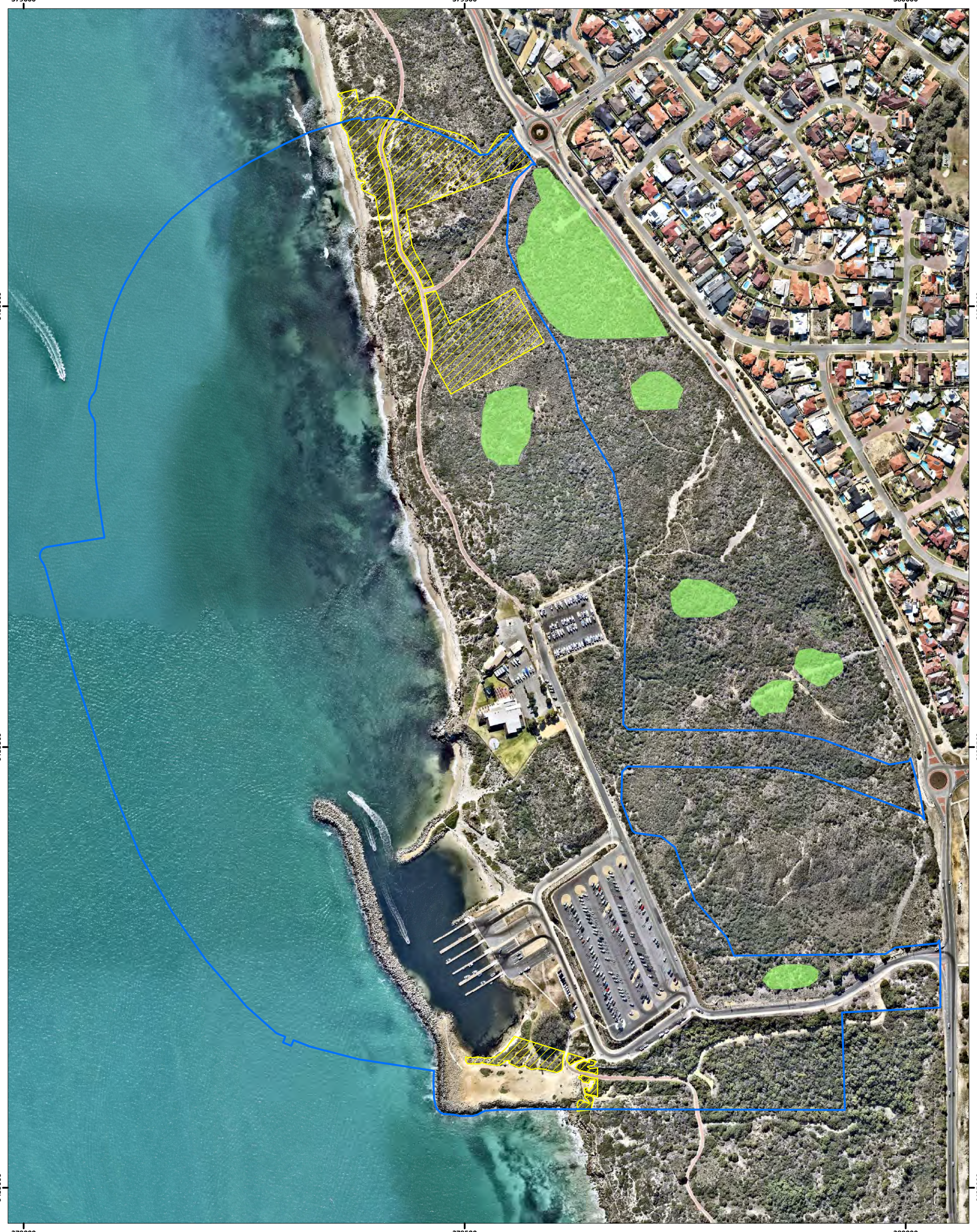

379000 379500 380000

Legend:

- Concept plan boundary
- Proposed clearing footprint
- Potential Carnaby's Black Cockatoo habitat

strategen JBS&G

0 100 metres

Ocean Reef Marina Development Breakwater works

GOOD QUALITY CARNABY'S BLACK COCKATOO FORAGING HABITAT

Job No: 58225		Scale 1:4,000 at A4		
Client: DevelopmentWA		Coord. Sys. GDA 1994 MGA Zone 50		
Drawn By: hsullivan	Checked By: CoB	Version: A	Date: 16-Jun-2020	**FIGURE: 2-8**

Document Path: W:\Projects\1)Open\LandCorp\58225 Ocean Reef Breakwater NVCP\GIS\Maps\R02_Rev_A\58225_02_8_PotlBCHabitat.mxd

Image Reference: www.nearmap.com© - Imagery Date: 10 May 2020

2.7 Bush Forever

As outlined in Sections 1.3 and 1.4, until gazettal of MRS Amendment 1271/40 the land component of the Development area was almost entirely within Bush Forever site 325 (BF 325) (including the existing boat harbour).

The proposed clearing area is located within the MRS Amendment area, which is no longer Bush Forever, with the exception of 0.17 ha which has been identified as being required for battering associated with the haulage access road required for construction of the breakwaters, given the topography of the proposed clearing area (Figure 2.9).

It is intended that this 0.17 ha area will be retained as Bush Forever and as such, to mitigate this minor additional impact on Bush Forever, will be rehabilitated once the final batter levels have been determined through future detailed design (anticipated 2023). Until such time, batters within Bush Forever will be stabilised with jute matting. It is noted that the rehabilitation management plan has been provided to the Department of Planning, Lands and Heritage as part of the associated Development Application for the breakwater construction.

The additional minor impact resulting from battering will be mitigated through rehabilitation. Precedence exists for rehabilitation to provide adequate mitigation to Bush Forever. An example is the Capricorn Investment Group Pty Ltd CPS 7809/1 where the area of Bush Forever rehabilitation was deducted from the overall clearing area:

> *The applicant avoided, minimised and mitigated impacts to Bush Forever Site 397 by proposing to revegetate and rehabilitate 0.65 hectares (0.25 hectares of full revegetation and 0.4 hectares of low fuel mitigation), effectively reducing the impact to the Bush Forever site from 2.38 hectares to 1.73 hectares*.

Based on the above, it is anticipated that impacts to Bush Forever Site 325 associated with the 0.17 ha batter area, will be effectively mitigated and will not require offsetting.

379000 379500 380000

6486000

6485500

6485000

379000 379500 380000

Legend:

- Concept plan boundary
- Proposed clearing footprint
- Bush Forever site (DOP)

strategen JBS&G

0 100 metres

Ocean Reef Marina Development Breakwater works

BUSH FOREVER

Job No: 58225		Scale 1:4,000 at A4		
Client: DevelopmentWA		Coord. Sys. GDA 1994 MGA Zone 50		
Drawn By: hsullivan	Checked By: CoB	Version: A	Date: 16-Jun-2020	**FIGURE: 2-9**

Document Path: W:\Projects\1)Open\LandCorp\58225 Ocean Reef Breakwater NVCP\GIS\Maps\R02_Rev_A\58225_02_9_BushForever.mxd

Image Reference: www.nearmap.com© - Imagery Date: 10 May 2020

2.8 Social environment

2.8.1 Indigenous heritage

The Development area has been subject to five Aboriginal heritage surveys, which did not identify any registered sites within the Development area.

The closest registered Aboriginal site is located approximately 1 km south of the Development area (Aboriginal Site ID 3673 containing artefacts/scatter) and will not be impacted by the Development.

There are currently no known Aboriginal sites or historical heritage sites within the Development area (Archaeological and Heritage Management Solutions (AHMS 2015)). The potential for sub-surface Aboriginal or historical archaeological sites is generally low (AHMS 2015).

Table 2.4: Aboriginal heritage surveys incorporating the Development

Survey date	Survey title	Survey conducted by	Survey purpose
1 April 1970	An Archaeological survey project: the Perth Area, Western Australia	University of Western Australia	Archaeological and Ethnographic
1 January 1994	Bullarook Aboriginal site recording project	Heritage Council of Western Australia	Ethnographic
1 July 1997	Cultural Significance of Aboriginal sites in the Wanneroo area – Final report	Australian Heritage Commission and Heritage Council of Western Australia	Ethnographic
17 June 2005	Study of Groundwater – related Aboriginal Cultural Values on the Gnangara Mound, Western Australia	Department of Environment	Ethnographic
20-21 January 2015	Ocean Reef Marina: Indigenous and European Heritage Investigation	Archaeological and Heritage Management Services	Historical and Indigenous archaeological, anthropological

2.8.2 European heritage

There are no historical heritage places within the Project clearing footprint, or the broader Development area currently included on the State Heritage Register (AHMS 2015).

A potential *Vergulde Draeck* inscription is located on the Development (AHMS 2015). The *Vergulde Draeck* inscription is a rock engraving located on the beach foredune in the northern portion of the Development area, which originally bore the words “VERGULDE DRAECK 1656” and was purportedly left behind by shipwrecked Dutch sailors (AHMS 2015). The inscription is considered to be a hoax as noted on the WA Maritime Museum Shipwrecks database. The site was also assessed by the State Heritage Office and found not to meet the threshold for State Heritage Register listing (WAM, 2020).

3. Assessment against the ten clearing principles

The following table presents an assessment against the ten clearing principles as set out in the EP Act.

Table 3.1: Assessment against ten clearing principles

Principle	Assessment	Conclusion
(a) Native vegetation should not be cleared if it comprises a high level of biological diversity	The proposed clearing footprint comprises approximately 2.89 ha of native vegetation. **Listed flora** Mattiske (2013) recorded two state listed Priority flora species (Figure 2.6) as occurring within or in proximity to the Development area: • *Grevillea* sp. Ocean Reef (Priority 1) • Conostylis bracteata (Priority 3). The Project will not result in the clearing of threatened flora. One Priority 3 flora species (*Conostylis bracteata*) occurs at three locations within the proposed clearing footprint (refer Figure 2.6). These comprise: • One population of 12 individuals; • One population of 90 individuals; and • One population of 25 individuals. *Conostylis bracteate* occurs at three locations within the proposed clearing footprint. This species is relatively common and the proposed clearing is unlikely to alter the conservation status of this species (refer Figure 2.6). Of the recorded occurrences of *C. bracteate,* 10 populations (totalling 638 individuals) will remain protected within the adjacent Bush Forever site 325. This represents retention/ protection of over 70% of the populations, and over 78% of individuals recorded within and adjacent to the development area. The distribution of this species ranges from Armadale in the south to Seabird in the north (122 km). The proposed clearing will therefore not impact the conservation status of this species. *Grevillea* sp. Ocean Reef is less well conserved, and this is the only known population of the Ocean Reef species in the database of the Western Australian Herbarium. However, the mapped locations of Grevillea sp. Ocean Reef occur outside of the proposed clearing footprint for the breakwater works (Mattiske 2013). This has been confirmed also via a targeted search undertaken by Strategen-JBSG in May 2020. While the survey was not undertaken in Spring, the species is easily identified without reproductive material due to its size and distinctive foliage. No occurrences of Grevillea with similar morphological features were recorded during the targeted survey (Appendix B). Based on the results of an updated search and likelihood assessment undertaken in May 2020, four species were determined to occur/ potentially occur within or adjacent to the development footprint. OF these, potentially suitable habitat was determined to occur for three of those species; however, given their current known range impacts to any which may occur within the proposed clearing footprint would not be considered a significant population as it would not extend its range, or represent additional habitat. In addition, none of	The proposed clearing is not likely to be at variance with this principle.

Principle	Assessment	Conclusion
	the four species listed above have been recorded during any of the surveys conducted historically within the Development area (whether they were listed at the time or not). **Listed Communities** No State or Commonwealth listed TECs occur within the proposed clearing footprint. Three Priority 3 Priority Ecological Communities (P3 PECs) were inferred by Mattiske (2013) to occur within the Development area, being: • SCP 24: 'Northern Spearwood shrublands and woodlands' • SCP 29a: 'Coastal shrublands over shallow sands, southern Swan Coastal Plain' • SCP 29b: 'Acacia shrublands on taller dunes, southern Swan Coastal Plain'. Based on the updated mapping, the proposed clearing footprint will impact the following extents of Priority 3 Priority Ecological Communities (PEC): • 2.50 ha of SCP 29a; • 0.26 ha of SCP 29b; and • 0.05 ha of SCP 24. The FCT SCP 29a is known to occur over a number of locations (>10) within coastal parts of the Swan Coastal Plain, over a range of 238 km, from Seabird in the north, to Bunbury in the south. This FCT has been recorded by Keighery *et al*. at 21 quadrat locations across this range. Locally this FCT in known to occur within remnant vegetation 2.5 km north of the development, protected within Bush Forever Site 325. Based on quadrats surveyed by Mattiske in 2013, the MSR for SCP 29a was 17.1. This is much less than the MSR of 33.7 reported for reference quadrats for this FCT in Gibson *et al.* (1994) and DEP (1996). Based on the known local occurrences, and the comparatively low species richness of the FCT within the application area, this is not considered to be a significant, diverse occurrence of the PEC. The FCT 29b, is known to occur over a number of locations (>10) within coastal parts of the Swan Coastal Plain over a range of 175 km, from Seabird in the north, to Yalgorup National Park in the south. Locally this FCT is known to occur within remnant vegetation 6.5 km north of the development, within Bush Forever Site 322. This FCT has been recorded by Keighery et al. at 38 quadrat locations across this range. Based on quadrats surveyed by Mattiske in 2013, the Mean Species Richness (MSR) for SCP29b was 20.5 (inclusive of weed species). This is much less than the MSR of 34.2 reported for reference quadrats for this FCT in Keighery et al. et al. (1994) and DEP (1996). Based on the known local occurrences, and the comparatively low species richness of the FCT within the broader project area, this is not considered to be a significant, diverse occurrence of the PEC. Given the broad geographical distribution across the Swan Coastal Plain, and the low floristic diversity of SCP 29a and 29b within the application areas as compared with reference quadrants for these FCTs, the loss of up to 4.09 ha of these communities as a result of the proposed clearing is not considered significant.	

Principle	Assessment	Conclusion
	The third PEC that is located within the clearing footprint, FCT SCP24 in known to occur over 37 point locations within the Swan Coastal Plain. Currently the of 1009 ha mapper aver a range of 170 km from Nowergup to Binningup. This community occurs as heaths or heaths with scattered *Eucalyptus gomphocephala* on the western Swan Coastal Plain, principally on the Cottesloe unit of the Spearwood system. Locally this FCT is known to occur within remnant vegetation 6.5 km north of the development, within Bush Forever Site 322. Based on quadrats surveyed by Mattiske in 2013, the Mean Species Richness (MSR) for SCP 24 was 6.6. This is much less than the MSR of 38.9 reported for reference quadrats for this FCT in Gibson et al. (1994) and DEP (1996). Based on the known local occurrences, and the comparatively low species richness of the FCT within the application area, this is not considered to be a significant, diverse occurrence of the PEC. **Listed fauna** The Development site supports a range of fauns species including the following listed species: • Carnaby's Cockatoo (*Calyptorhynchus latirostris*); • Graceful Sun Moth (*Synemon gratiosa*); and • Quenda (*Isoodon fusciventer*). A number of other species may utilise the vegetation within the proposed clearing area but have a wide distribution, and the removal of 2.89 ha of vegetation is unlikely to be significant. Large areas of remnant vegetation providing habitat for fauna remain locally and regionally. Although the proposed clearing area exhibits high biodiversity, significant areas of remnant vegetation remain locally and regionally. In addition, the NPO offset site is a large parcel of land in Very Good to Excellent vegetation condition (Keighery, 1994) which is contiguous with Yanchep National Park. This parcel of land is considered to have a higher level of environmental value and was determined to be sufficient to mitigate a proportion of the impacts of Development. The offset was endorsed by DPLH, DBCA and the EPA as being suitable to mitigate the environmental impacts of the proposed clearing within the MRS amendment boundary.	
(b) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia	Clearing of native vegetation to enable completion of the land based component of the breakwater works will result in the removal of approximately 2.89 ha of native vegetation. This may comprise a limited number of individual *Banksia sessilis*. The proposed clearing will not impact areas of higher density Black Cockatoo foraging habitat (refer Figure 2.8). The predominant vegetation type within the proposed clearing area is H1 (occupying 80.9% of the clearing area), within which Mattiske (2013) recorded only two flora species that are considered suitable foraging habitat for Carnaby's Cockatoo (Groom 2011). There are no breeding or potential breeding trees within the Development or proposed clearing footprint and there are no records of Black Cockatoos breeding within the clearing footprint area. However, it is noted there is a confirmed breeding site for Carnaby's cockatoo and night roosting site within 3.8 km and 4.5 kilometres respectively from the proposed clearing area. The Development area does contain a number of flora species that may be used as food sources, primarily *Banksia sessilis*. Accordingly, it is expected that Carnaby's Black-Cockatoo will not reside in the proposed clearing footprint but may visit intermittently to feed.	The proposed clearing is not likely to be at variance with this principle.

Principle	Assessment	Conclusion
	The broader Development site includes an area of approximately 0.58 ha of suitable good quality foraging habitat for Carnaby's Black-Cockatoo (Strategen 2016b, Figure 2.8) none of which is located within the proposed clearing footprint. The remainder of the NVCP clearing area was rated as nil to very poor foraging habitat based on the presence and density of suitable species reported, including *Acacia saligna* and *Allocasuarina spp*., however based on records of utilisation of the species it is not considered significant. Significant extents of Black Cockatoo habitat occur locally and regionally. Clearing within the proposed clearing footprint represents < 1% of the total foraging habitat available within the surrounding area. In addition, *Banksia sessilis* will be incorporated as a priority in the rehabilitation works where it naturally occurs to provide local foraging habitat for Carnaby's black cockatoo. It is noted that the NPO provides 22.7 ha of greater quality habitat for black cockatoos (including breeding trees), and as such adequately offsets any significant residual impacts. Clearing will also result in clearing of potential habitat for Black-striped Snake (P3), Rainbow Bee-eater, Quenda (P3) and Graceful Sun Moth (P4) habitat. No more than 2.89 ha of potential habitat (2.67 ha of potential Graceful Sun Moth habitat) will be impacted by clearing. Substantial areas of suitable habitat for these species occurs in the remainder of BF 325 and nearby conservation areas. The remaining portion of BF 325 is approximately 169 ha. For the purpose of MRS amendment 1270/41, an NPO has been developed that comprises the acquisition of land into the conservation estate and rehabilitation of 5 ha of degraded vegetation within BF 325, adjacent to the Ocean Reef Marina Development area. The NPO was developed in accordance with State Planning Policy 2.8 Bushland Policy for the Perth Metropolitan Region (SPP 2.8). A suitable offset site that achieves the site selection criteria outlined in the NPO has been identified and acquired. The NPO provides 22.7 ha of greater quality habitat for black cockatoos (including breeding trees), and as such adequately offsets any significant residual impacts. The offset site also has the presence of *Lomandra maritima*, although the presence of the Graceful Sun Moth at this site had not been confirmed (DWER, 2020). *Lomandra maritima* will also be considered for use in the rehabilitation works where appropriate to support Graceful Sun Moth population. The nature and scale of vegetation to be cleared is not considered to be significant at a local or regional scale in regard to indigenous fauna habitat. The clearing required as part of the Development, and the proposed clearing footprint, has been adequately offset through the NPO. As outlined in the previous early works clearing permit assessment, the most suitable mitigation method for the disruption of ecological linkage function would be the installation of fencing that excluded the public but allowed for fauna movement across the areas (such as conservation fencing used elsewhere along the coastline) and measures to reduce vehicle speed and increase driver awareness to minimise the risk of vehicle strike on fauna. Fauna underpasses have been considered, however given the length of the proposed underpass would be approximately 40 metres, other mitigation measures would optimise environmental outcomes. Residual impacts to fauna have been will be minimised and managed as outlined in Section 4.	

<table>
<tr><th>Principle</th><th>Assessment</th><th>Conclusion</th></tr>
<tr><td>(c) Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, rare flora</td><td>No Threatened flora species have been identified within the proposed clearing footprint during surveys, including the most recent spring survey undertaken by Mattiske (2013).

During previous clearing permit assessments, it was identified that the Development area contains habitat that may be suitable for Marianthus paralius, which is listed as Threatened. The closest recorded location of this species is approximately 3 km north of the Development site. This individual was recorded within coastal limestone heath and associated species which corresponds to vegetation community H1 (Mattiske 2013) of which there is approximately 2.34 ha in the proposed clearing area for the breakwater works.

While this species has the potential to occur in the coastal strip of the Development area and specific targeted surveys for this species have not been undertaken, this species would have been identifiable and distinctive during the time of survey and given the level of survey coverage within the H1 community (20 quadrats), it is unlikely that this species was present and not recorded.

As part of the NPO, an area of 0.66 ha of this vegetation community has been identified to be rehabilitated. In addition, the batter areas within Bush Forever which support this community impacted by the proposed clearing, will be rehabilitated.

Based on the above information with respect to flora species, the clearing to undertake the breakwater works is unlikely to be at variance with this principle.</td><td>The proposed clearing is not likely to be at variance with this principle.</td></tr>
<tr><td>(d) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of a threatened ecological community</td><td>No State or Commonwealth listed TECs have been identified as existing within the proposed clearing footprint.</td><td>The proposed clearing is not at variance with this principle.</td></tr>
<tr><td>(e) Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared</td><td>The proposed clearing footprint comprises two pre-European vegetation associations: Guilderton_1007 and to a lesser extent Guilderton_129. The following table summarises the extent of remaining of these vegetation associations.

<table><tr><th>Characteristic</th><th>Guilderton_129 (ha)</th><th>Guilderton_1007 (ha)</th></tr><tr><td>Total pre-1750 extent</td><td>9074.45</td><td>25375.49</td></tr><tr><td>Total current extent</td><td>8718.40</td><td>18129.90</td></tr><tr><td>% of Total pre-1750 extent remaining</td><td>96%</td><td>71.5%</td></tr></table>
The proposed clearing footprint lies within a constrained area of the Swan Coastal Plain; however, the vegetation complex will be retained at well above the 10% threshold.

The proposed clearing footprint occurs within a large contiguous remnant patch of vegetation. Clearing 2.89 ha within the proposed clearing footprint is not considered a significant impact to the native vegetation at the Development area and in the adjacent BF 325.</td><td>The proposed clearing is not likely to be at variance with this principle.</td></tr>
</table>

Principle	Assessment	Conclusion
(f) Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland	The proposed clearing footprint comprises sandy calcareous soils (Safety Bay Sands) locally overlying variably cemented limestone of the Tamala Formation (Golders 2015, Strategen 2015a). Areas of wetland and water courses are typically associated with this geological environment. Vegetation and flora surveys (to undertake reconnaissance, detailed and verification work) conducted between 2000 and 2019 have not identified any watercourses or wetlands within the proposed clearing footprint.	The proposed clearing is not to be variance with this principle.
(g) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation	The breakwater works program will result in the removal of 2.89 ha of native vegetation. Surveys undertaken by Mattiske (2013) have characterised vegetation condition in the proposed clearing footprint as ranging from completely degraded (cleared) to excellent based on the Keighery (1994) vegetation condition scale (refer Figure 2.6 and Table 2.2). The Development area is located in an area underlain by highly permeable sandy calcareous soils locally overlying variably cemented limestone with some voids (karsts). Infiltration of rainwater and stormwater in this area is typically very effective and efficient with little or no evidence of flooding. Given its extent and purpose, the proposed clearing footprint is unlikely to give rise to salinity, nutrient export, acidification, waterlogging or flooding. However, these soils generally have a high risk of wind erosion. To manage this risk of erosion, clearing will be undertaken no more than one month prior to the commencement of works. In consideration of the above, the clearing is not likely to cause appreciable land degradation due to: • the small area of total proposed clearing; • the large extent of vegetation that would remain within the local and regional areas; and • cleared areas will either be stabilised through development (i.e. bitumised, compacted hardstands) or otherwise treated. Clearing for the breakwater works will be guided by a Construction Management Plan (CMP) which will include measures to manage the anticipated direct and indirect environmental impacts (refer to Section 4).	The proposed clearing is not likely to be at variance with this principle.
(h) Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area	The proposed clearing area is located within the MRS Amendment area and is no longer Bush Forever, with the exception of 0.17 ha which has been identified through the details design phase as being required for battering given the topography of the proposed clearing area. It is intended that this 0.17 ha area will be retained as Bush Forever and as such, to mitigate this minor additional impact on Bush Forever, will be rehabilitated following establishment of final batters. The proposed clearing footprint does however occur adjacent to BF 325 and indirect impacts to Bush Forever will require management. Indirect impacts may include: • weed and dieback spread; • erosion; • disruption to ecological linkages; and • dust generation. The issue of ecological linkage disruption as a result of the Development was considered as part of the NPO. The NPO notes that it has been minimised as far as practicable through the retention of vegetation to the east of the application area, the avoidance of areas of	The proposed clearing is not likely to be at variance with this principle.

Principle	Assessment	Conclusion
	excellent vegetation to the northeast of the existing boat harbour and a decrease in the broader proposal area from earlier proposed designs. The clearing proposed will leave vegetation within the surrounding Bush Forever site intact. Rehabilitation along the batters of the roads will be undertaken with locally endemic species will reduce the impacts of habitat fragmentation and provide additional environmental value to the application area. Clearing for the breakwater works will be guided by a Construction Management Plan (CMP) which will include measures to manage the anticipated direct and indirect environmental impacts (refer to Section 4). Given the rehabilitation of impacted areas within BF 325 and the proposed management measures to minimise the risk of indirect impacts, the proposal is considered unlikely to be at variance to Principle (h).	
(i) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water	The Development area is located in an area underlain by highly permeable sandy calcareous soils locally overlying variably cemented limestone with some voids (karsts). Infiltration of rainwater and stormwater in this area is typically very effective and efficient with little or no evidence of flooding (and erosion). Clearing within the proposed clearing footprint is not expected to result in sediment or nutrient impacts, soil acidity, or increased salinity. The clearing of 2.89 ha of vegetation is not expected to substantially affect hydrological processes that could affect groundwater quality (i.e. salinity or acidity). To mitigate the potential for indirect impacts, measures will be adopted to minimise and mitigate the risk of erosion, sediment runoff (to the adjacent marine environment) and associated impacts. Clearing for the breakwater works will be guided by a Construction Management Plan (CMP) which will include measures to manage the anticipated direct and indirect environmental impacts (refer to Section 4).	The proposed clearing is not likely to be variance with this principle.
(j) Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence of flooding	The proposed clearing will affect a small amount of vegetation and is not part of, or associated with, a flood management zone, a drainage basin or creek line, therefore the proposed clearing is not at variance with this principle.	The proposed clearing is not at variance with this principle.

4. Environmental mitigation and management

The assessment against the 10 clearing principles concluded that the proposed clearing, whilst resulting in a very small impact to vegetation within Bush Forever Site 325 (0.17 ha) for road battering, an impact to one Priority flora species (three occurrences) and three Priority 3 PECs (FCT 24, FCT 29a and FCT 29b) should not result in a significant impact to any flora or fauna species, or threatened ecological communities particularly with consideration of the proposed mitigation and management measures outlined below.

In order to manage potential impacts associated with the proposed clearing of native vegetation in close proximity and adjacent to BF 325, DevelopmentWA will implement a range of environmental management measures, focussing on key aspects and potential impacts. These include:

- Site inductions;
- Establishing clearing boundaries through use of GPS and on-ground demarcation (inclusive of spoil stockpiles and access tracks);
- Ensure vehicles are clean on entry;
- Weed monitoring;
- Seed and hygiene controls for equipment and personnel;
- Accurate and well-maintained clearing records during and post clearing;
- Conservation fencing to allow ground dwelling fauna to pass underneath the mesh, and fauna sensitive road design will minimise the risk of impacts to fauna crossing the entrance roads;
- Slow, directional clearing from non-vegetated areas to areas of remnant vegetation to allow for the movement of fauna into adjacent vegetation; and
- Vehicle speeds on entrance roads and implement measures to minimise the risk of vehicle strike on fauna.

Clearing will be guided by a Construction Management Plan (CMP) which will include measures to manage the anticipated direct and indirect environmental impacts. These measures may include and are not limited to:

- Implementation of erosion control measures including soil bunds and geotextiles;
- Clear demarcation of clearing boundaries to minimise the risk of over or accidental clearing (inclusive of spoil stockpiles and access tracks);
- Use of existing roads and access tracks to access the site;
- Inclusion of buffer zones to minimise the risk of over or accidental clearing;
- Seed, weed and hygiene controls for equipment and personnel; and
- Accurate and well-maintained clearing records during and post clearing.

It is anticipated that the preparation of the CMP, will be a requirement of the Development Application process. This plan will be developed by the appointed contractor and approved prior to implementation.

5. Conclusion

DevelopmentWA proposes to develop the Ocean Reef Marina as a world class recreational, residential, boating and tourist development. The Local Preferred Concept Plan boundary encloses an area of 61 ha, including land and sea at Ocean Reef, Western Australia. The terrestrial portion of the Concept Plan has an area of approximately 42 ha (the Development area). To facilitate the breakwater construction work, clearing 2.89 ha of native vegetation within the 42 ha Development footprint is proposed.

An assessment of the impacts of the proposed native vegetation clearing against the ten clearing principles has determined that the clearing:

- Not at variance with three principles.
- Not likely to be at variance with seven principles.

The findings of the assessment against the ten clearing principles are presented in Table 5.1 below.

Table 5.1: Summary of Clearing Assessment

Clearing Principle	Finding
(a) Native vegetation should not be cleared if it comprises a high level of biological diversity	The proposed clearing is not likely to be at variance with this principle
(b) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia	The proposed clearing is not likely to be at variance with this principle
(c) Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, rare flora	The proposed clearing is not likely to be at variance with this principle
(d) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of a threatened ecological community	The proposed clearing is not at variance with this principle
(e) Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared	The proposed clearing is not likely to be at variance with this principle
(f) Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland	The proposed clearing is not at variance with this principle
(g) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation	The proposed clearing is not likely to be at variance with this principle
(h) Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area	The proposed clearing not likely to be at variance with this principle
(i) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water	The proposed clearing is not likely to be at variance with this principle
(j) Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence of flooding	The proposed clearing is not at variance with this principle

Until gazettal of MRS Amendment 1271/40 the land component of the Proposal area was almost entirely within Bush Forever site 325 (BF 325) (including the existing boat harbour), except for the portion associated with the Water Corporation's ocean outfall from the Beenyup Waste Water treatment plant. For the purpose of MRS amendment 1270/41, an NPO was developed that comprises the acquisition of land into the conservation estate and rehabilitation of 5 ha of degraded vegetation within BF 325, adjacent to the Ocean Reef Marina Development area. The NPO was developed in accordance with State Planning Policy 2.8 Bushland Policy for the Perth Metropolitan Region (SPP 2.8). A suitable offset site that achieves the site selection criteria outlined in the NPO has been identified and acquired. The majority of the clearing required as part of the Development, and the proposed clearing footprint the subject of this application (with the exception of 0.17 ha subject to rehabilitation), has already been offset through the NPO.

6. Limitations

Scope of services

This report ("the report") has been prepared by Strategen-JBS&G in accordance with the scope of services set out in the contract, or as otherwise agreed, between the Client and Strategen-JBS&G. In some circumstances, a range of factors such as time, budget, access and/or site disturbance constraints may have limited the scope of services. This report is strictly limited to the matters stated in it and is not to be read as extending, by implication, to any other matter in connection with the matters addressed in it.

Reliance on data

In preparing the report, Strategen-JBS&G has relied upon data and other information provided by the Client and other individuals and organisations, most of which are referred to in the report ("the data"). Except as otherwise expressly stated in the report, Strategen-JBS&G has not verified the accuracy or completeness of the data. To the extent that the statements, opinions, facts, information, conclusions and/or recommendations in the report ("conclusions") are based in whole or part on the data, those conclusions are contingent upon the accuracy and completeness of the data. Strategen-JBS&G has also not attempted to determine whether any material matter has been omitted from the data. Strategen-JBS&G will not be liable in relation to incorrect conclusions should any data, information or condition be incorrect or have been concealed, withheld, misrepresented or otherwise not fully disclosed to Strategen-JBS&G. The making of any assumption does not imply that Strategen-JBS&G has made any enquiry to verify the correctness of that assumption.

The report is based on conditions encountered and information received at the time of preparation of this report or the time that site investigations were carried out. Strategen-JBS&G disclaims responsibility for any changes that may have occurred after this time. This report and any legal issues arising from it are governed by and construed in accordance with the law of Western Australia as at the date of this report.

Environmental conclusions

Within the limitations imposed by the scope of services, the preparation of this report has been undertaken and performed in a professional manner, in accordance with generally accepted environmental consulting practices. No other warranty, whether express or implied, is made.

The advice herein relates only to this project and all results conclusions and recommendations made should be reviewed by a competent person with experience in environmental investigations, before being used for any other purpose.

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7. References

Australian and New Zealand Environment and Conservation Council (ANZECC) & Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ) 2000, *Australian Guidelines for Water Quality Monitoring and Reporting, National Water Quality Management Strategy Paper No. 7,* Canberra.

Archaeological and Heritage Management Solutions (AHMS) 2015, *Indigenous and European Heritage Investigation, Archaeological Report (Draft),* unpublished report to City of Joondalup, March 2015.

Bowman Bishaw Gorham 2002, Vegetation and Flora Assessment Pt Lot 1029, Lots 1032 and 1033 Ocean Reef Road, Ocean Reef, report prepared for City of Joondalup.

Bureau of Meteorology (2019) Climate Data Online, Commonwealth of Australia, Available from <http://www.bom.gov.au/climate/data. [accessed 11 October 2019].

Department of Environment and Conservation (2009) *Marianthus paralius* Interim Recovery Plan 2009-2014. Interim Recovery Plan No. 291. Department of Environment and Conservation, Western Australia.

Department of Environment and Conservation (DEC) 2012, *Nomination to delist Synemon gratiosa (graceful sun-moth).*

Department of Transport 2010, *Sea Level Change in Western Australia: Application to Coastal Planning*, Department of Transport, Perth.

Department of Water and Environment Regulation (DWER) 2020, *CPS 8788/1 decision report,* Government of Western Australia.

Golder Associates 2015, *Preliminary Geotechnical Investigation*: Ocean Reef Marina, unpublished report to City of Joondalup, September 2015.

Government of Western Australia (2000), *Bush Forever Volume 2 – Directory of Bush Forever sites,* Available from hhtp://www.planning.wa.gov.au/publications/5911.asp.

Gozzard, J.R. (1982). *Muchea Sheet 2034 I and part Sheet 2134 IV*, Environmental Geology Series. Geological Survey of Western Australia. Department of Minerals and Energy, Perth.

Groom, C. (2011) *Plants used by Carnaby's Black Cockatoo*. Prepared for the Department of Environment and Conservation, 15 April 2011.

Keighery B 1994, *Bushland plant survey: a guide to plant community survey for the community*, Wildflower Society of Western Australia, Perth, Western Australia.

Landgate 2014, *Map Viewer* [Online], Western Australian Land Information Authority, Available from: https://www.landgate.wa.gov.au/bmvf/app/mapviewer/ [8 Jan 2015].

Mattiske Consulting 2000, *Flora and Vegetation Assessment of Lot 1029 and Bushplan Site 325*, *City of Joondalup*, report prepared for The Planning Group.

Mattiske Consulting 2013, *Level 2 Flora and Vegetation Survey of the Proposed Ocean Reef Marina Survey Area,* report prepared for Strategen.

Natural Area Management Services 2008, *Vegetation Condition, Ecological Community and Flora Search Report, Ocean Reef Marina,* report prepared for the City of Joondalup.

SMEC Australia Limited & Natural Area Management Services 2009, *Additional Flora Survey, Northern Portion of Proposed ORM Development Site*, report prepared for the City of Joondalup.

Strategen 2015, *Ocean Reef Marina Development Detailed Site Investigation*, report prepared for City of Joondalup.

Strategen-JBS&G 2019, *Ocean Reef Marina Development Local Water Management Strategy*, report prepared for DevelopmentWA.

Strategen-JBS&G 2020, *Ocean Reef Marina Development Geotechnical Investigation Native Vegetation Clearing Permit- Supporting Document,* application prepared for DevelopmentWA.

Threatened Species Scientific Committee (TSSC) 2016, *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) (s 266B) Approved Conservation Advice (incorporating listing advice) for the Banksia Woodlands of the Swan Coastal Plain ecological community*. Available via: http://www.environment.gov.au/biodiversity/threatened/communities/pubs/131-conservation-advice.pdf

Western Australian Herbarium (1998-). FloraBase – the Western Australian Flora. Department of Biodiversity, Conservation and Attractions. https://florabase.dpaw.wa.gov.au accessed 23 March 2020.

Western Wildlife 2008 Ocean Reef Marina Redevelopment Level 1 Fauna Assessment 2008, report prepared by Western Wildlife for SMEC Australia Ltd, 29 November 2008.

Appendix A Naturemap and Protected Matters Search results- Offset site

NatureMap
Mapping Western Australia's biodiversity

NatureMap Species Report

Created By Guest user on 12/05/2020

Kingdom	Animalia
Current Names Only	Yes
Core Datasets Only	Yes
Method	'By Circle'
Centre	115° 42' 11" E,31° 34' 32" S
Buffer	2km
Group By	Conservation Status

Conservation Status	Species	Records
Non-conservation taxon	119	719
Priority 4	3	8
Protected under international agreement	8	11
Rare or likely to become extinct	5	70
TOTAL	**135**	**808**

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Rare or likely to become extinct					
1.	24784	*Calidris ferruginea (Curlew Sandpiper)*		T	
2.	24790	*Calidris tenuirostris (Great Knot)*		T	
3.	24734	*Calyptorhynchus latirostris (Carnaby's Cockatoo, White-tailed Short-billed Black Cockatoo)*		T	
4.	48400	*Calyptorhynchus sp. (white-tailed black cockatoo)*		T	
5.	24092	*Dasyurus geoffroii (Chuditch, Western Quoll)*		T	
Protected under international agreement					
6.	25736	*Arenaria interpres (Ruddy Turnstone)*		IA	
7.	24779	*Calidris acuminata (Sharp-tailed Sandpiper)*		IA	
8.	25738	*Calidris canutus (Red Knot, knot)*		IA	
9.	24788	*Calidris ruficollis (Red-necked Stint)*		IA	
10.	24789	*Calidris subminuta (Long-toed Stint)*		IA	
11.	30932	*Limosa lapponica (Bar-tailed Godwit)*		IA	
12.	24383	*Pluvialis squatarola (Grey Plover)*		IA	
13.	24808	*Tringa nebularia (Common Greenshank, greenshank)*		IA	
Priority 4					
14.	48588	*Isoodon fusciventer (Quenda, southwestern brown bandicoot)*		P4	
15.	24328	*Oxyura australis (Blue-billed Duck)*		P4	
16.	33992	*Synemon gratiosa (Graceful Sunmoth)*		P4	
Non-conservation taxon					
17.	24260	*Acanthiza apicalis (Broad-tailed Thornbill, Inland Thornbill)*			
18.	24261	*Acanthiza chrysorrhoa (Yellow-rumped Thornbill)*			
19.	24262	*Acanthiza inornata (Western Thornbill)*			
20.	25535	*Accipiter cirrocephalus (Collared Sparrowhawk)*			
21.	25536	*Accipiter fasciatus (Brown Goshawk)*			
22.	25755	*Acrocephalus australis (Australian Reed Warbler)*			
23.		*Amblyomma triguttatum*			
24.	24312	*Anas gracilis (Grey Teal)*			
25.	24315	*Anas rhynchotis (Australasian Shoveler)*			
26.	24316	*Anas superciliosa (Pacific Black Duck)*			
27.	47414	*Anhinga novaehollandiae (Australasian Darter)*			
28.	24561	*Anthochaera carunculata (Red Wattlebird)*			
29.	24562	*Anthochaera lunulata (Western Little Wattlebird)*			
30.	24991	*Aprasia repens (Sand-plain Worm-lizard)*			
31.	41324	*Ardea modesta (great egret, white egret)*			
32.	24340	*Ardea novaehollandiae (White-faced Heron)*			
33.	24341	*Ardea pacifica (White-necked Heron)*			
34.		*Australomimetus djuka*			
35.	24318	*Aythya australis (Hardhead)*			
36.		*Barnardius zonarius*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
37.	24319	*Biziura lobata (Musk Duck)*			
38.	25714	*Cacatua pastinator (Western Long-billed Corella)*			
39.	25716	*Cacatua sanguinea (Little Corella)*			
40.	24729	*Cacatua tenuirostris (Eastern Long-billed Corella)*	Y		
41.	25598	*Cacomantis flabelliformis (Fan-tailed Cuckoo)*			
42.	42307	*Cacomantis pallidus (Pallid Cuckoo)*			
43.	24377	*Charadrius ruficapillus (Red-capped Plover)*			
44.	24321	*Chenonetta jubata (Australian Wood Duck, Wood Duck)*			
45.	24980	*Christinus marmoratus (Marbled Gecko)*			
46.		*Chroicocephalus novaehollandiae*			
47.	24288	*Circus approximans (Swamp Harrier)*			
48.	24289	*Circus assimilis (Spotted Harrier)*			
49.	25675	*Colluricincla harmonica (Grey Shrike-thrush)*			
50.	24399	*Columba livia (Domestic Pigeon)*	Y		
51.	25568	*Coracina novaehollandiae (Black-faced Cuckoo-shrike)*			
52.	25592	*Corvus coronoides (Australian Raven)*			
53.	25595	*Cracticus tibicen (Australian Magpie)*			
54.	25596	*Cracticus torquatus (Grey Butcherbird)*			
55.	30893	*Cryptoblepharus buchananii*			
56.	25020	*Cryptoblepharus plagiocephalus*			
57.	24322	*Cygnus atratus (Black Swan)*			
58.	30901	*Dacelo novaeguineae (Laughing Kookaburra)*	Y		
59.	25673	*Daphoenositta chrysoptera (Varied Sittella)*			
60.	25607	*Dicaeum hirundinaceum (Mistletoebird)*			
61.	24470	*Dromaius novaehollandiae (Emu)*			
62.	25100	*Egernia napoleonis*			
63.		*Egretta garzetta*			
64.		*Egretta novaehollandiae*			
65.		*Elanus axillaris*			
66.		*Eolophus roseicapillus*			
67.	24652	*Eopsaltria georgiana (White-breasted Robin)*			
68.	25622	*Falco cenchroides (Australian Kestrel, Nankeen Kestrel)*			
69.	25623	*Falco longipennis (Australian Hobby)*			
70.	25727	*Fulica atra (Eurasian Coot)*			
71.	25729	*Gallinula tenebrosa (Dusky Moorhen)*			
72.	25530	*Gerygone fusca (Western Gerygone)*			
73.	24443	*Grallina cyanoleuca (Magpie-lark)*			
74.	24487	*Haematopus longirostris (Pied Oystercatcher)*			
75.	24295	*Haliastur sphenurus (Whistling Kite)*			
76.	25410	*Heleioporus eyrei (Moaning Frog)*			
77.	25119	*Hemiergis quadrilineata*			
78.	25734	*Himantopus himantopus (Black-winged Stilt)*			
79.	24491	*Hirundo neoxena (Welcome Swallow)*			
80.	24511	*Larus novaehollandiae subsp. novaehollandiae (Silver Gull)*			
81.	25133	*Lerista elegans*			
82.	25005	*Lialis burtonis*			
83.	25661	*Lichmera indistincta (Brown Honeyeater)*			
84.	25415	*Limnodynastes dorsalis (Western Banjo Frog)*			
85.	25654	*Malurus splendens (Splendid Fairy-wren)*			
86.	25184	*Menetia greyii*			
87.	24598	*Merops ornatus (Rainbow Bee-eater)*			
88.		*Microcarbo melanoleucos*			
89.	25240	*Morelia spilota subsp. imbricata (Carpet Python)*			
90.	25192	*Morethia obscura*			
91.	24223	*Mus musculus (House Mouse)*	Y		
92.	24738	*Neophema elegans (Elegant Parrot)*			
93.	25564	*Nycticorax caledonicus (Rufous Night Heron)*			
94.	24407	*Ocyphaps lophotes (Crested Pigeon)*			
95.	25680	*Pachycephala rufiventris (Rufous Whistler)*			
96.	25681	*Pardalotus punctatus (Spotted Pardalote)*			
97.	25682	*Pardalotus striatus (Striated Pardalote)*			
98.	24648	*Pelecanus conspicillatus (Australian Pelican)*			
99.	48061	*Petrochelidon nigricans (Tree Martin)*			
100.	48066	*Petroica boodang (Scarlet Robin)*			
101.	25697	*Phalacrocorax carbo (Great Cormorant)*			
102.	25698	*Phalacrocorax melanoleucos (Little Pied Cormorant)*			
103.	24667	*Phalacrocorax sulcirostris (Little Black Cormorant)*			
104.	24409	*Phaps chalcoptera (Common Bronzewing)*			
105.	48071	*Phylidonyris niger (White-cheeked Honeyeater)*			
106.	24596	*Phylidonyris novaehollandiae (New Holland Honeyeater)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
107.		*Pinkfloydia harveii*			
108.	24841	*Platalea flavipes (Yellow-billed Spoonbill)*			
109.	25703	*Podargus strigoides (Tawny Frogmouth)*			
110.	25704	*Podiceps cristatus (Great Crested Grebe)*			
111.	24907	*Pogona minor subsp. minor (Dwarf Bearded Dragon)*			
112.	24681	*Poliocephalus poliocephalus (Hoary-headed Grebe)*			
113.	25731	*Porphyrio porphyrio (Purple Swamphen)*			
114.		*Protochelifer cavernarum*			
115.		*Purpureicephalus spurius*			
116.	24243	*Rattus fuscipes (Western Bush Rat)*			
117.	24776	*Recurvirostra novaehollandiae (Red-necked Avocet)*			
118.	48096	*Rhipidura albiscapa (Grey Fantail)*			
119.	25614	*Rhipidura leucophrys (Willie Wagtail)*			
120.	25534	*Sericornis frontalis (White-browed Scrubwren)*			
121.	25266	*Simoselaps bertholdi (Jan's Banded Snake)*			
122.	30948	*Smicrornis brevirostris (Weebill)*			
123.	24522	*Sterna bergii (Crested Tern)*			
124.	25589	*Streptopelia chinensis (Spotted Turtle-Dove)*	Y		
125.	25590	*Streptopelia senegalensis (Laughing Turtle-Dove)*	Y		
126.	24942	*Strophurus spinigerus subsp. spinigerus*			
127.	25705	*Tachybaptus novaehollandiae (Australasian Grebe, Black-throated Grebe)*			
128.	24331	*Tadorna tadornoides (Australian Shelduck, Mountain Duck)*			
129.		*Taphiassa robertsi*			
130.	24845	*Threskiornis spinicollis (Straw-necked Ibis)*			
131.	25519	*Tiliqua rugosa*			
132.	25207	*Tiliqua rugosa subsp. rugosa*			
133.	25549	*Todiramphus sanctus (Sacred Kingfisher)*			
134.	25723	*Trichoglossus haematodus (Rainbow Lorikeet)*			
135.	25765	*Zosterops lateralis (Grey-breasted White-eye, Silvereye)*			

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 wholely 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.

NatureMap
Mapping Western Australia's biodiversity

NatureMap Species Report

Created By Guest user on 16/06/2020

Kingdom Plantae
Current Names Only Yes
Core Datasets Only Yes
Method 'By Circle'
Centre 115° 42' 11" E,31° 34' 32" S
Buffer 2km
Group By Conservation Status

Conservation Status	Species	Records
Non-conservation taxon	131	185
Priority 3	1	2
TOTAL	**132**	**187**

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Priority 3					
1.	13127	*Stylidium maritimum*		P3	
Non-conservation taxon					
2.	3409	*Acacia lasiocarpa (Panjang)*			
3.	3502	*Acacia pulchella (Prickly Moses)*			
4.	15482	*Acacia pulchella var. goadbyi*			
5.	3584	*Acacia truncata*			
6.	184	*Aira caryophyllea (Silvery Hairgrass)*	Y		
7.	1732	*Allocasuarina humilis (Dwarf Sheoak)*			
8.	1409	*Anigozanthos humilis (Catspaw)*			
9.	6949	*Anthocercis littorea (Yellow Tailflower)*			
10.	1264	*Arnocrinum preissii*			
11.	1800	*Banksia attenuata (Slender Banksia, Piara)*			
12.	1819	*Banksia grandis (Bull Banksia, Pulgarla)*			
13.	1834	*Banksia menziesii (Firewood Banksia)*			
14.	743	*Baumea juncea (Bare Twigrush)*			
15.	3710	*Bossiaea eriocarpa (Common Brown Pea)*			
16.	7878	*Brachyscome iberidifolia*			
17.	244	*Briza maxima (Blowfly Grass)*	Y		
18.	1592	*Caladenia flava (Cowslip Orchid)*			
19.	5426	*Calothamnus quadrifidus (One-sided Bottlebrush, Kwowdjard)*			
20.	5429	*Calothamnus sanguineus (Silky-leaved Blood flower, Pindak)*			
21.	2951	*Cassytha flava (Dodder Laurel)*			
22.	2957	*Cassytha racemosa (Dodder Laurel)*			
23.	11799	*Cassytha racemosa forma racemosa*			
24.	1125	*Centrolepis drummondiana*			
25.	2889	*Cerastium glomeratum (Mouse Ear Chickweed)*	Y		
26.	6348	*Conostephium pendulum (Pearl Flower)*			
27.	1418	*Conostylis aculeata (Prickly Conostylis)*			
28.	1427	*Conostylis candicans (Grey Cottonhead)*			
29.	1454	*Conostylis setigera (Bristly Cottonhead)*			
30.	11283	*Corynotheca micrantha var. micrantha*			
31.	3137	*Crassula colorata (Dense Stonecrop)*			
32.	7454	*Dampiera linearis (Common Dampiera)*			
33.	6218	*Daucus glochidiatus (Australian Carrot)*			
34.	1259	*Dianella revoluta (Blueberry Lily)*			
35.	1287	*Dichopogon capillipes*			
36.	7054	*Dischisma arenarium*	Y		
37.	3095	*Drosera erythrorhiza (Red Ink Sundew)*			
38.	3118	*Drosera pallida (Pale Rainbow)*			
39.	347	*Ehrharta calycina (Perennial Veldt Grass)*	Y		
40.	1643	*Elythranthera brunonis (Purple Enamel Orchid)*			
41.	6132	*Epilobium ciliatum*	Y		

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
42.	6133	*Epilobium hirtigerum (Hairy Willow Herb)*			
43.	1646	*Eriochilus dilatatus (White Bunny Orchid)*			
44.	4336	*Erodium moschatum (Musky Crowfoot)*	Y		
45.	5659	*Eucalyptus gomphocephala (Tuart, Duart)*			
46.	1520	*Gladiolus caryophyllaceus (Wild Gladiolus)*	Y		
47.	3945	*Gompholobium aristatum*			
48.	3957	*Gompholobium tomentosum (Hairy Yellow Pea)*			
49.	2119	*Grevillea vestita*			
50.	1468	*Haemodorum laxum*			
51.	2146	*Hakea costata (Ribbed Hakea)*			
52.	2175	*Hakea lissocarpha (Honey Bush)*			
53.	2197	*Hakea prostrata (Harsh Hakea)*			
54.	2214	*Hakea trifurcata (Two-leaf Hakea)*			
55.	3961	*Hardenbergia comptoniana (Native Wisteria)*			
56.	3016	*Heliophila pusilla*	Y		
57.	5112	*Hibbertia aurea*			
58.	5135	*Hibbertia hypericoides (Yellow Buttercups)*			
59.	45534	*Hibbertia hypericoides subsp. hypericoides*			
60.	5162	*Hibbertia racemosa (Stalked Guinea Flower)*			
61.	6222	*Homalosciadium homalocarpum*			
62.	5216	*Hybanthus calycinus (Wild Violet)*			
63.	12007	*Hybanthus floribundus subsp. floribundus*			
64.	6232	*Hydrocotyle hispidula*			
65.	8086	*Hypochaeris glabra (Smooth Catsear)*	Y		
66.	9352	*Hypochaeris radicata (Flat Weed, Cats-ear)*	Y		
67.	917	*Isolepis marginata (Coarse Club-rush)*			
68.	4029	*Jacksonia sternbergiana (Stinkwood, Kapur)*			
69.	4044	*Kennedia prostrata (Scarlet Runner)*			
70.	18585	*Lagenophora huegelii*			
71.	7580	*Lechenaultia linarioides (Yellow Leschenaultia)*			
72.	925	*Lepidosperma angustatum*			
73.	933	*Lepidosperma gladiatum (Coast Sword-sedge, Kerbin)*			
74.	940	*Lepidosperma pubisquameum*			
75.	6427	*Leucopogon parviflorus (Coast Beard-heath)*			
76.	6434	*Leucopogon polymorphus*			
77.	6436	*Leucopogon propinquus*			
78.	7408	*Lobelia tenuior (Slender Lobelia)*			
79.	1223	*Lomandra caespitosa (Tufted Mat Rush)*			
80.	1231	*Lomandra maritima*			
81.	1239	*Lomandra preissii*			
82.	1246	*Lomandra suaveolens*			
83.	5959	*Melaleuca rhaphiophylla (Swamp Paperbark)*			
84.	4085	*Melilotus indicus*	Y		
85.	955	*Mesomelaena pseudostygia*			
86.	485	*Microlaena stipoides (Weeping Grass)*			
87.	8106	*Millotia tenuifolia (Soft Millotia)*			
88.	2401	*Nuytsia floribunda (Christmas Tree, Mudja)*			
89.	4343	*Pelargonium capitatum (Rose Pelargonium)*	Y		
90.	4346	*Pelargonium littorale*			
91.	2258	*Persoonia comata*			
92.	2299	*Petrophile linearis (Pixie Mops)*			
93.	2301	*Petrophile macrostachya*			
94.	2309	*Petrophile serruriae*			
95.	4675	*Phyllanthus calycinus (False Boronia)*			
96.	573	*Poa drummondiana (Knotted Poa)*			
97.	8184	*Podotheca gnaphalioides (Golden Long-heads)*			
98.	8189	*Pseudognaphalium luteoalbum (Jersey Cudweed)*			
99.		*Pterostylis aff. nana*			
100.	15426	*Pterostylis aspera*			
101.	1698	*Pterostylis vittata (Banded Greenhood)*			
102.	2933	*Ranunculus muricatus (Sharp Buttercup)*	Y		
103.	11341	*Rhagodia baccata subsp. baccata*			
104.	15035	*Rhodanthe corymbosa*			
105.	2433	*Rumex crispus (Curled Dock)*	Y		
106.	2906	*Sagina apetala (Annual Pearlwort)*	Y		
107.	13182	*Scaevola repens var. repens*			
108.	2909	*Silene gallica (French Catchfly)*	Y		
109.	8231	*Sonchus oleraceus (Common Sowthistle)*	Y		
110.	1312	*Sowerbaea laxiflora (Purple Tassels)*			
111.	4828	*Spyridium globulosum (Basket Bush)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
112.	4733	*Stackhousia monogyna*			
113.	2918	*Stellaria media (Chickweed)*	Y		
114.	3080	*Stenopetalum robustum*			
115.	2316	*Stirlingia latifolia (Blueboy)*			
116.	7693	*Stylidium brunonianum (Pink Fountain Triggerplant)*			
117.	7694	*Stylidium bulbiferum (Circus Triggerplant)*			
118.	7696	*Stylidium calcaratum (Book Triggerplant)*			
119.	7785	*Stylidium repens (Matted Triggerplant)*			
120.	4256	*Templetonia retusa (Cockies Tongues)*			
121.	1319	*Thysanotus arenarius*			
122.	6280	*Trachymene pilosa (Native Parsnip)*			
123.	1361	*Tricoryne elatior (Yellow Autumn Lily)*			
124.	4292	*Trifolium campestre (Hop Clover)*	Y		
125.	152	*Triglochin trichophora*			
126.	33418	*Trymalium odoratissimum subsp. odoratissimum*			
127.	8255	*Ursinia anthemoides (Ursinia)*	Y		
128.	724	*Vulpia myuros (Rat's Tail Fescue)*	Y		
129.	33101	*Vulpia myuros forma myuros*	Y		
130.	8282	*Waitzia suaveolens (Fragrant Waitzia)*			
131.	1256	*Xanthorrhoea preissii (Grass tree, Palga)*			
132.	44861	*Xerochrysum macranthum*			

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 wholely 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.

Australian Government
Department of the Environment and Energy

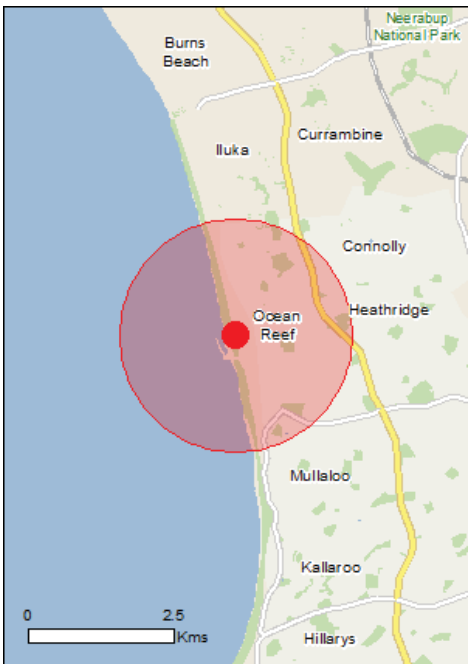
EPBC Act Protected Matters Report

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

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

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

Report created: 16/06/20 17:32:36



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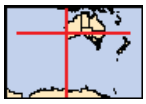
Coordinates
Buffer: 2.0Km



Summary

Matters of National Environmental Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	2
Listed Threatened Species:	42
Listed Migratory Species:	42

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Land:	1
Commonwealth Heritage Places:	None
Listed Marine Species:	66
Whales and Other Cetaceans:	12
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

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

State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	33
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Listed Threatened Ecological Communities [Resource Information]

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

Name	Status	Type of Presence
Banksia Woodlands of the Swan Coastal Plain ecological community	Endangered	Community may occur within area
Tuart (Eucalyptus gomphocephala) Woodlands and Forests of the Swan Coastal Plain ecological community	Critically Endangered	Community likely to occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Anous tenuirostris melanops Australian Lesser Noddy [26000]	Vulnerable	Species or species habitat may occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat likely to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calyptorhynchus banksii naso Forest Red-tailed Black-Cockatoo, Karrak [67034]	Vulnerable	Species or species habitat likely to occur within area
Calyptorhynchus latirostris Carnaby's Cockatoo, Short-billed Black-Cockatoo [59523]	Endangered	Species or species habitat known to occur within area
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat may occur within area

Name	Status	Type of Presence
Limosa lapponica baueri Bar-tailed Godwit (baueri), Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat may occur within area
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Bar-tailed Godwit (menzbieri) [86432]	Critically Endangered	Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat likely to occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Thalassarche cauta cauta Shy Albatross [82345]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta steadi White-capped Albatross [82344]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Insects		
Hesperocolletes douglasi Douglas' Broad-headed Bee, Rottnest Bee [66734]	Critically Endangered	Species or species habitat may occur within area
Mammals		
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Dasyurus geoffroii Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat likely to occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Breeding known to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area

Name	Status	Type of Presence
Neophoca cinerea Australian Sea-lion, Australian Sea Lion [22]	Vulnerable	Species or species habitat known to occur within area
Plants		
Diuris micrantha Dwarf Bee-orchid [55082]	Vulnerable	Species or species habitat likely to occur within area
Drakaea elastica Glossy-leafed Hammer Orchid, Glossy-leaved Hammer Orchid, Warty Hammer Orchid [16753]	Endangered	Species or species habitat likely to occur within area
Drakaea micrantha Dwarf Hammer-orchid [56755]	Vulnerable	Species or species habitat may occur within area
Eucalyptus argutifolia Yanchep Mallee, Wabling Hill Mallee [24263]	Vulnerable	Species or species habitat may occur within area
Lepidosperma rostratum Beaked Lepidosperma [14152]	Endangered	Species or species habitat likely to occur within area
Marianthus paralius [83925]	Endangered	Species or species habitat likely to occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area
Sharks		
Carcharias taurus (west coast population) Grey Nurse Shark (west coast population) [68752]	Vulnerable	Species or species habitat known to occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species [Resource Information]

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

Name	Threatened	Type of Presence
Migratory Marine Birds		
Anous stolidus Common Noddy [825]		Species or species habitat likely to occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Ardenna carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Species or species habitat likely to occur within area
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Hydroprogne caspia Caspian Tern [808]		Foraging, feeding or related behaviour known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Onychoprion anaethetus Bridled Tern [82845]		Foraging, feeding or related behaviour likely to occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Sterna dougallii Roseate Tern [817]		Foraging, feeding or related behaviour likely to occur within area
Thalassarche cauta Shy Albatross [89224]	Vulnerable*	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Migratory Marine Species		
Balaena glacialis australis Southern Right Whale [75529]	Endangered*	Breeding known to occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Caperea marginata Pygmy Right Whale [39]		Species or species habitat may occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat may occur within area
Manta alfredi Reef Manta Ray, Coastal Manta Ray, Inshore Manta Ray, Prince Alfred's Ray, Resident Manta Ray [84994]		Species or species habitat may occur within area
Manta birostris Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
Migratory Terrestrial Species		
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat likely to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within

Name	Threatened	Type of Presence
		area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

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

Name
Commonwealth Land -

Listed Marine Species [Resource Information]

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

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Anous stolidus Common Noddy [825]		Species or species habitat likely to occur within area
Anous tenuirostris melanops Australian Lesser Noddy [26000]	Vulnerable	Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat likely to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat likely to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within

Name	Threatened	Type of Presence
		area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Larus pacificus Pacific Gull [811]		Foraging, feeding or related behaviour may occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pachyptila turtur Fairy Prion [1066]		Species or species habitat likely to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Puffinus assimilis Little Shearwater [59363]		Foraging, feeding or related behaviour known to occur within area
Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area
Sterna anaethetus Bridled Tern [814]		Foraging, feeding or related behaviour likely to occur within area
Sterna caspia Caspian Tern [59467]		Foraging, feeding or related behaviour known to occur within area
Sterna dougallii Roseate Tern [817]		Foraging, feeding or related behaviour likely to occur within area
Thalassarche cauta Shy Albatross [89224]	Vulnerable*	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thinornis rubricollis Hooded Plover [59510]		Species or species habitat may occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area
Fish		
Acentronura australe Southern Pygmy Pipehorse [66185]		Species or species habitat may occur within area
Campichthys galei Gale's Pipefish [66191]		Species or species habitat may occur within area
Choeroichthys suillus Pig-snouted Pipefish [66198]		Species or species habitat may occur within area
Halicampus brocki Brock's Pipefish [66219]		Species or species habitat may occur within area
Hippocampus angustus Western Spiny Seahorse, Narrow-bellied Seahorse [66234]		Species or species habitat may occur within area
Hippocampus breviceps Short-head Seahorse, Short-snouted Seahorse [66235]		Species or species habitat may occur within area
Hippocampus subelongatus West Australian Seahorse [66722]		Species or species habitat may occur within area
Lissocampus fatiloquus Prophet's Pipefish [66250]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Maroubra perserrata Sawtooth Pipefish [66252]		Species or species habitat may occur within area
Mitotichthys meraculus Western Crested Pipefish [66259]		Species or species habitat may occur within area
Nannocampus subosseus Bonyhead Pipefish, Bony-headed Pipefish [66264]		Species or species habitat may occur within area
Phycodurus eques Leafy Seadragon [66267]		Species or species habitat may occur within area
Phyllopteryx taeniolatus Common Seadragon, Weedy Seadragon [66268]		Species or species habitat may occur within area
Pugnaso curtirostris Pugnose Pipefish, Pug-nosed Pipefish [66269]		Species or species habitat may occur within area
Solegnathus lettiensis Gunther's Pipehorse, Indonesian Pipefish [66273]		Species or species habitat may occur within area
Stigmatopora argus Spotted Pipefish, Gulf Pipefish, Peacock Pipefish [66276]		Species or species habitat may occur within area
Stigmatopora nigra Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
Urocampus carinirostris Hairy Pipefish [66282]		Species or species habitat may occur within area
Vanacampus margaritifer Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area
Mammals		
Arctocephalus forsteri Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat may occur within area
Neophoca cinerea Australian Sea-lion, Australian Sea Lion [22]	Vulnerable	Species or species habitat known to occur within area
Reptiles		
Aipysurus pooleorum Shark Bay Seasnake [66061]		Species or species habitat may occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur

Name	Threatened	Type of Presence within area
Disteira kingii Spectacled Seasnake [1123]		Species or species habitat may occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area
Pelamis platurus Yellow-bellied Seasnake [1091]		Species or species habitat may occur within area

Whales and other Cetaceans [Resource Information]

Name	Status	Type of Presence
Mammals		
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Caperea marginata Pygmy Right Whale [39]		Species or species habitat may occur within area
Delphinus delphis Common Dophin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Breeding known to occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area

Extra Information

Invasive Species [Resource Information]

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

Name	Status	Type of Presence
Birds		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Passer montanus Eurasian Tree Sparrow [406]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Streptopelia senegalensis Laughing Turtle-dove, Laughing Dove [781]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Funambulus pennantii Northern Palm Squirrel, Five-striped Palm Squirrel [129]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus norvegicus Brown Rat, Norway Rat [83]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Asparagus aethiopicus Asparagus Fern, Ground Asparagus, Basket Fern, Sprengi's Fern, Bushy Asparagus, Emerald Asparagus [62425]		Species or species habitat likely to occur within area
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Brachiaria mutica Para Grass [5879]		Species or species habitat may occur within area
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		Species or species habitat may occur within area
Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]		Species or species habitat may occur within area
Chrysanthemoides monilifera subsp. monilifera Boneseed [16905]		Species or species habitat likely to occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Lantana camara Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]		Species or species habitat likely to occur within area
Olea europaea Olive, Common Olive [9160]		Species or species habitat may occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Salvinia molesta Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]		Species or species habitat likely to occur within area
Tamarix aphylla Athel Pine, Athel Tree, Tamarisk, Athel Tamarisk, Athel Tamarix, Desert Tamarisk, Flowering		Species or species habitat likely to occur

Name	Status	Type of Presence
Cypress, Salt Cedar [16018]		within area
Reptiles		
Hemidactylus frenatus Asian House Gecko [1708]		Species or species habitat likely to occur within area

Caveat

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

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

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

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

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

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

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

- migratory and
- marine

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

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

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

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

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

Coordinates

-31.76021 115.72922

Acknowledgements

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

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

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

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

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Appendix B Grevillea population census

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Population census and targeted survey – *Grevillea* sp. Ocean Reef (D. Pike Joon 4)

1. Background

The proposed Ocean Reef Marina Development (the Site), located at Ocean Reef within the City of Joondalup (the City), requires the clearing of vegetation to facilitate the commencement of construction works. Within the Site, one population of the Priority 1 species *Grevillea* sp. Ocean Reef (D. Pike Joon 4), is known to occur (Mattiske 2013). This population is located outside of the proposed clearing areas; however, its occurrence within other areas of the site has not been ruled out through targeted surveys. To determine the presence of this species within the proposed clearing area, a population census and targeted survey was conducted. This memorandum present the findings of this assessment.

2. Scope

The scope of this assessment was:

- Undertake a population census of the known occurrence of *Grevillea* sp. Ocean Reef (D. Pike Joon 4); and
- Undertake a targeted survey of proposed clearing areas for *Grevillea* sp. Ocean Reef (D. Pike Joon 4) within suitable habitat.

3. Methods

A population census and mapping of population boundary was undertaken of *Grevillea* sp. Ocean Reef (D. Pike Joon 4) within the site on 28 May 2020. The previously known record occurrences of the species were revisited, numbers counted, and the boundary of the population traversed to produce a polygon containing all recorded individuals.

Based on the habitat of the known individuals, similar habitat occurring within the proposed clearing areas was traversed on foot to attempt to locate additional occurrences of the target species. The extent of the targeted survey is shown in Figure 1.

4. Results

4.1 Population Census

The population census recorded 71 individuals occurring within the known population (Plate 1). This represents an increase of 3 individuals from the 2013 survey (Mattiske); however, given the density of the population, this difference is likely to be within the margin of error for the survey. Regrowth of the species was noted within an area of recent clearing unrelated to the within the population boundary (Plate 2).

The population boundary was determined to cover 0.39 ha (Figure 1). The population is restricted to inter dune swales on light grey or brown sands. The presence of regrowth within the previously cleared areas suggests this population is healthy and self-sustaining.

4.2 Targeted survey

The targeted survey within areas of suitable habitat (Acacia shrubland on inter-dune swales) within the proposed clearing areas, recorded no additional occurrences of *Grevillea* sp. Ocean Reef (D. Pike Joon 4). The targeted survey was undertaken outside of the flowering period for this species; however, this species is easily identified without reproductive material due to its size and distinctive foliage. No occurrences of Grevillea with similar morphological features were recorded during the targeted survey.

Based on the results of the targeted survey, it is considered likely that *Grevillea* sp. Ocean Reef (D. Pike Joon 4) is confined to the known mapped population boundary and does not occur within the proposed clearing areas.

Plate 1: *Grevillea* sp. Ocean Reef (D. Pike Joon 4)

Plate 2: Regrowth of *Grevillea* sp. Ocean Reef (D. Pike Joon 4) within cleared area

Legend:

- Concept plan boundary
- Revised clearing boundary (5.14 ha)
- Breakwater clearing footprint (3.13 ha)
- *Grevillea* sp. Ocean Reef (D. Pike Joon 4) Population

Conservation significant flora

- *Grevillea* sp. Ocean Reef (P1)
- Targeted survey tracks
- Roads (MRWA)

Scale 1:6,000 at A4 (0 50 100 metres)		**Ocean Reef Marina Development**
Coord. Sys. GDA 1994 MGA Zone 50		**CONSERVATION SIGNIFICANT FLORA WITHIN PROPOSED CLEARING BOUNDARIES**
Job No: 57431		
Client: DevelopmentWA		**FIGURE 1**
Version: A	Date: 28-May-2020	strategen JBS&G
Drawn By: cthatcher	Checked By: CoB	

File Name: W:\Projects\1)Open\LandCorp\57431 Ocean Reef NVCP\GIS\Maps\M03_Rev_A\57431_01_ConSigFlora_Internal.mxd
Image Reference: www.nearmap.com© - Imagery Date: 19 October 2019

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