DevelopmentWA

Ocean Reef Marina

Early Works
Native Vegetation Clearing Permit – Purpose Permit
Supporting Documentation

10 January 2020

58049-126,630 (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 Early Works program required to facilitate development of 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 Early Works program comprises the following items:

- new Hodges Drive extension
- new Boat Harbour Quays entry road
- diversion of existing Coastal Shared Use Path
- laydown area, site office and facilities (Site Compound).
- diversion of existing club and boat ramp access
- construction-site related signage.

1.2 Project background and description

DevelopmentWA proposes to develop a world class recreational, residential, boating and tourist development, referred to as the Ocean Reef Marina 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. 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 a Negotiated Planning Outcome (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 enables 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).

It is noted that 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, has also be assessed and approved on 6 January 2020.

1.3 Scope

This document provides supporting information for a Native Vegetation Clearing Permit (NVCP) application (purpose permit) to clear up to 6.35 ha of native vegetation within a 7.38 hectares (ha) proposed clearing footprint (Figure 1.2).

This document has been prepared to support the NVCP application for the proposed clearing, 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
- environmental approvals and management requirements.

1.4 Ownership and tenure

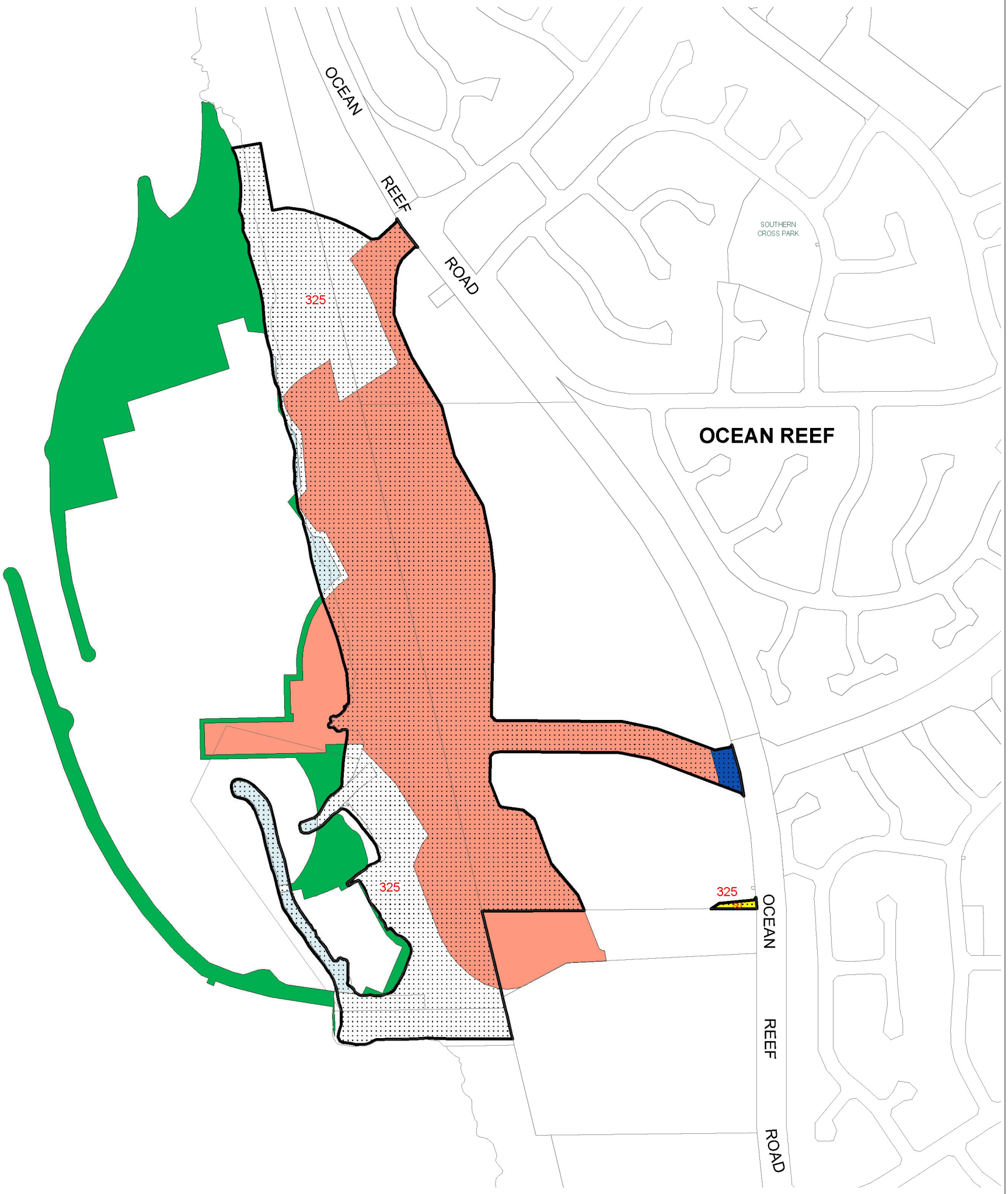
Site identification details for the proposed clearing footprint are provided in Table 1.1.

Table 1.1: Site identification details

Lot No	C/T Details	Survey Plan	Owner	Reserve #/ tenure
9000	2701/335	DP 54595	Water Corporation	N/A
1032	1667/921	P13198	City of Joondalup	N/A
1029	1957/865	D57604	City of Joondalup	N/A
10098	LR3048/270	DP 216093	State of WA	36732 Water Corporation
15446	LR3133/571	DP 40340	State of WA	47831 City of Joondalup

1.5 Related applications

DevelopmentWA has also lodged a clearing permit application to facilitate geotechnical investigations across the development area (Strategen-JBS&G 2020). Based on a conservative estimate, it is anticipated that up to 2.65 ha of native vegetation within the Development area will be cleared as part of those geotechnical investigations. The proposed clearing footprint which is the subject of this application is located within the application area of the clearing permit application for the required geotechnical investigations.



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)*

strategen JBS&G

0 100 metres

Job No: 58049

Client: DevelopmentWA

Drawn By: hsullivan | Checked By: CT | Version: A | Date: 07-Jan-2020

Ocean Reef Marina Development

METROPOLITAN REGION SCHEME AMENDMENT NO. 1270/41

FIGURE: 1-1

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

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LOT 10969

LOT 555

LOT15446

LOT 1029

LOT 1032

LOT 10098

LOT 9000

LOT 15445

Legend:

- Concept plan boundary
- Cadastral boundaries
- Proposed clearing footprint (7.38 ha)

strategen JBS&G

0 100 metres

Ocean Reef Marina Development

PROPOSED CLEARING FOOTPRINT

Job No: 58049		Scale 1:4,000 at A4		
Client: DevelopmentWA		Coord. Sys. GDA 1994 MGA Zone 50		
Drawn By: hsullivan	Checked By: CT	Version: A	Date: 09-Jan-2020	**FIGURE: 1-2**

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Image Reference: www.nearmap.com© - Imagery Date: 19 October 2019.

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.

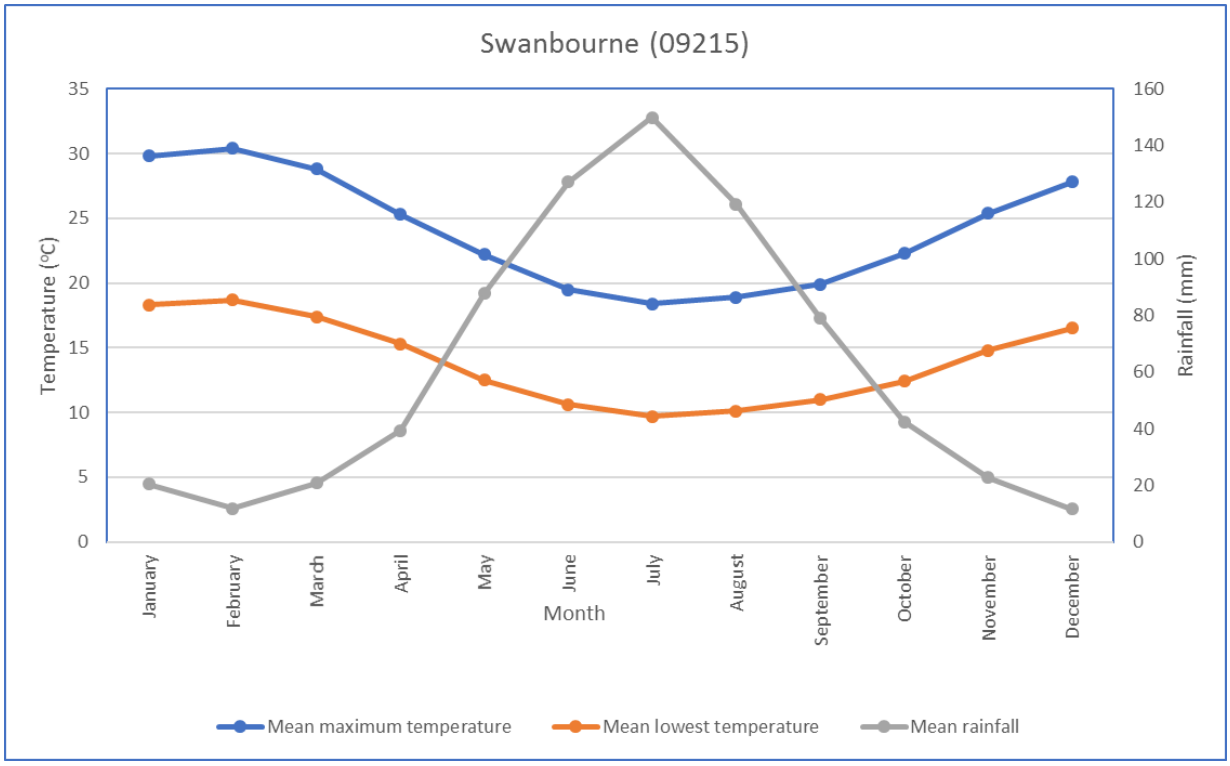

Figure 2.1: Climate data for Swanbourne - 09215 (nearest meteorological station) (Source: Bureau of Meteorology 2019)

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Legend:

- Concept plan boundary
- Proposed clearing footprint (7.38 ha)
- Topographic contours (mAHD)

strategen JBS&G

0 100 metres

Ocean Reef Marina Development

TOPOGRAPHY

Job No: 58049		Scale 1:4,000 at A4		
Client: DevelopmentWA		Coord. Sys. GDA 1994 MGA Zone 50		
Drawn By: hsullivan	Checked By: CT	Version: A	Date: 07-Jan-2020	**FIGURE: 2-2**

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Image Reference: www.nearmap.com© - Imagery Date: 19 October 2019.

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 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 situated on the Quindalup and 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:

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

Geological logging undertaken by 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
- 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

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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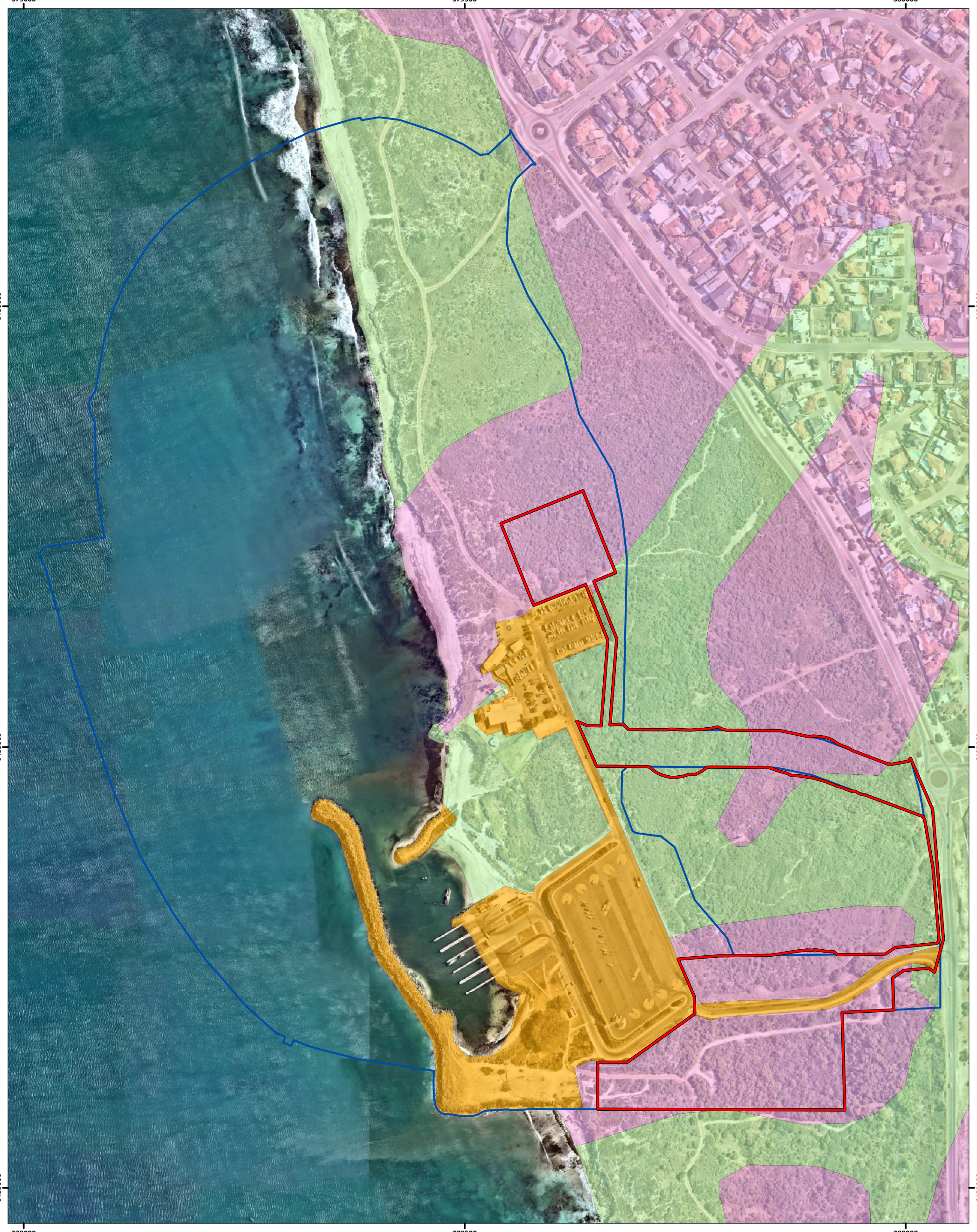

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Legend:

- Concept plan boundary
- Proposed clearing footprint (7.38 ha)

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

GEOLOGY

Job No: 58049		Scale 1:4,000 at A4		
Client: DevelopmentWA		Coord. Sys. GDA 1994 MGA Zone 50		
Drawn By: hsullivan	Checked By: CT	Version: A	Date: 07-Jan-2020	**FIGURE: 2-3**

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Image Reference: www.nearmap.com© - Imagery Date: 19 October 2019.

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[1] 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.

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

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MGL: 2.09

MB01

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2.0

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DOW 4931

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Legend:

- Concept plan boundary
- Proposed clearing footprint (7.38 ha)
- Design groundwater level contour (mAHD)
- WIN Site bore
- Monitoring bores

strategen JBS&G

0 100
metres

Ocean Reef Marina Development

GROUNDWATER

Job No: 58049		Scale 1:4,000 at A4		
Client: DevelopmentWA		Coord. Sys. GDA 1994 MGA Zone 50		
Drawn By: hsullivan	Checked By: CT	Version: A	Date: 07-Jan-2020	**FIGURE: 2-4**

Document Path: W:\Projects\1)Open\LandCorp\58049 Ocean Reef early works NVCP\GIS\Maps\R01 Rev A\58049_02_4_Groundwater.mxd
Image Reference: www.nearmap.com© - Imagery Date: 19 October 2019.

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)

Given previous mapping was undertaken in 2013, an additional walkover was completed in Spring 2019 by Strategen-JBS&G to confirm the results of the previous mapping undertaken. This resulted in minor amendments to the Mattiske (2013) mapping which are reflected in Figure 2.8 where relevant to the proposed clearing footprint.

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

Regional scale vegetation complex mapping by Heddle *et al* (1980 in Mattiske 2013) indicates that vegetation associations in the proposed clearing footprint are dominated by the Quindalup vegetation complex (Mattiske 2013) (Figure 2.5).

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 vegetation typically comprises a mix of *Acacia* species, *Melaleuca systena*, *Pimelea ferruginea* and occasional tall woodlands of *Agonis flexuosa*.

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Legend:

- Concept plan boundary
- Proposed clearing footprint (7.38 ha)

Vegetation complexes

- Cottesloe Complex-Central and South
- Quindalup Complex

strategen JBS&G

0 100 metres

Ocean Reef Marina Development

VEGETATION COMPLEXES

Job No: 56726		Scale 1:4,000 at A4		
Client: DevelopmentWA		Coord. Sys. GDA 1994 MGA Zone 50		
Drawn By: hsullivan	Checked By: CT	Version: A	Date: 07-Jan-2020	**FIGURE: 2-5**

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Image Reference: www.nearmap.com© - Imagery Date: 19 October 2019.

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Legend:

- Concept plan boundary
- Proposed clearing footprint (7.38 ha)
- Bush Forever Site 325 (DOP)

strategen JBS&G

0 100 metres

Ocean Reef Marina Development

BUSH FOREVER

Job No: 58049		Scale 1:4,000 at A4		
Client: DevelopmentWA		Coord. Sys. GDA 1994 MGA Zone 50		
Drawn By: hsullivan	Checked By: CT	Version: A	Date: 07-Jan-2020	**FIGURE: 2-6**

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Image Reference: www.nearmap.com© - Imagery Date: 19 October 2019.

2.5.3 Bush Forever

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.

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 has removed the approximate 26 ha portion of the Development area (inclusive of the majority of the proposed clearing footprint) from within BF 325 . As such, the clearing footprint will only impact Bush Forever for localised battering to an extent of 0.13 ha.

To mitigate impacts to Bush Forever, Priority flora and Priority Ecological Communities (PEC; inferred), as part of the rezoning process, DevelopmentWA committed to an NPO that resulted in an appropriate conservation outcome with consideration of SPP 2.8 and 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.
2. 10% rehabilitation within BF 325: Rehabilitation of 5 ha of degraded vegetation within BF 325 to at least Very Good condition within five years will be undertaken in accordance with a Rehabilitation Plan.

A suitable offset site that achieves the site selection criteria outlined in the NPO was identified in consultation with EPA Services, Department of Biodiversity, Conservation and Attractions and Department of Planning and acquired by DevelopmentWA. The offset site achieved the following 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
- 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 information on the acquisition site is provided in Section 2.5.3.1.

Development WA is also committed to ensuring the rehabilitation component of the NPO is undertaken. A Rehabilitation Plan is being prepared to support rehabilitation of 5 ha of degraded vegetation adjacent to the Development area and is expected to be a requirement of subsequent planning approvals required to facilitate the Development.

The proposed clearing footprint contains 0.13 ha of land that remains within 'Parks and Recreation' zoning (BF 325). This area was identified as part of the later detailed design states of the Development are being required to accommodate road batters given the topography of the site.

These areas are not required to be removed from BF site 325 and can be rehabilitated following construction as mitigation for the required clearing.

In addition, DevelopmentWA has secured an additional 3 ha area of the acquisition site to mitigate additional minor clearing of vegetation within BF 325. The application of the 1.5:1 ratio within SPP 2.8 would equate to an offset area of 0.195 ha. Accordingly, 0.195 ha of that additional acquisition area is allocated to this clearing permit application to offset the temporary impact to 0.13 ha of BF 325.

The proposed clearing has therefore already been offset through the acquisition of a suitable offset site. The areas to be cleared within 'Parks and Recreation' for the purpose of road battering will be rehabilitated on completion of works.

2.5.3.1 Acquisition site

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.

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 (Table 2.1). 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 2.1: Vegetation types of Lot 51, Walding Road, Carabooda

Vegetation type	Area (ha)
Cleared	5.48

Vegetation type	Area (ha)
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, Dryandra 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, Dryandra 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 *Dryandra 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 (Table 2.2). Some cleared areas exist in the southeast corner of the site (5.48 ha).

Table 2.2: 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 2002 vegetation survey noted the inferred presence of FCT 24, FCT 28 and FCT 26a (ATA Environmental 2002). More recent information suggests FCT26a, may be FCT 26b due the presence of Tuart, which is not found in FCT 26a.

FCT 24 is recognised as PEC at State level. FCT 26b and FCT 28 are not listed as TEC or PECs.

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'.

Tuart woodlands have also been nominated as a TEC at Commonwealth level. The nomination is currently being assessed with possible listing in 2018. The Tuart vegetation on the site is likely to meet the Tuart woodland TEC.

Flora

Additional values of the 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 EPBC Protected Matters Search Tool (PMST) was also conducted for the site with a 2km buffer to identify other potentially occurring Priority or Threatened flora species (Attachment 1).

One priority species, *Stylidum maritimum* (P3) was identified as potentially occurring at the 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.

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 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 2.3).

Table 2.3: 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 madafascariensis*)	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 2.4.

Table 2.4: 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**
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	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	**Achieves criteria** The Carabooda property has higher conservation value than the Development area

	• SCP 29a – Coastal shrublands on shallow sands, southern Swan Coastal Plain • SCP 29b – Acacia shrublands on taller dunes, southern Swan Coastal Plain.	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 *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act).	
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**
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**

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 2.7), being:

- SCP 24: 'Northern Spearwood shrublands and woodlands';
- SCP 29a: 'Coastal shrublands over shallow sands, southern Swan Coastal Plain'; and
- SCP 29b: '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'.

SCP 29a (1.8 ha) and 29b (4.56 ha)are present within the proposed clearing footprint.

2.5.5 Vegetation communities

A total of eight vegetation communities have been defined and mapped within the clearing footprint (Table 2.5, Figure 2.8).

Table 2.5: 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.	0.64
H3	Closed heath of *Acacia lasiocarpa* var. *lasiocarpa, Cryptandra mutila, Leucopogon insularis* and *Melaleuca systena* over *Comesperma confertum, Gompholobium tomentosum* and *Opercularia vaginata* over *Lepidosperma pubisquameum, Dianella revoluta* var. *divaricata* and mixed exotics on light grey sands of secondary dune slopes.	0.06
H4	Low open scrub to heath of *Acacia rostellifera, Spyridium globulosum* and *Acacia saligna* over *Melaleuca systena, Acanthocarpus preissii, Olearia axillaris, Phyllanthus calycinus* and mixed exotics on white to light grey sands of primary and secondary dune crests.	0.05
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.	1.16
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.	1.06
S4	Mid to tall scrubland of *Acacia rostellifera, Spyridium globulosum, Templetonia retusa, Melaleuca huegelii* and *Melaleuca cardiophylla* over *Leucopogon parvifolius, Thomasia cognata, Acanthocarpus preissii, Phyllanthus calycinus* and mixed exotics on grey sands of secondary dunes with frequent limestone outcropping.	1.17
S5	Tall closed shrubland of *Acacia cochlearis, Acacia cyclops, Acacia rostellifera, Allocasuarina lehmanniana* subsp. *lehmanniana, Melaleuca huegelii* and *Templetonia retusa* over *Melaleuca systena, Scaevola crassifolia* and mixed exotics on grey sands of secondary dune swales with frequent limestone outcropping.	2.21
Other		
CL	Cleared.	1.03
TOTAL		7.38

Adapted from: Mattiske (2013).

2.5.6 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 2.9). 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 2.5).

Table 2.6 Vegetation Condition

Condition	Area within Clearing Footprint (Ha)
Cleared	0.86
Degraded	0.05
Degraded - Good	1.55
Good	1.09
Very Good	2.50
Very Good to Excellent	0.30
Excellent	0.91
Unmapped (partially cleared)	0.12
TOTAL	**7.38**

2.5.7 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[2])
- *Conostylis bracteata* (Priority 3[3]) .

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).

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

[3] 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'.

379000 379500 380000

6486000

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6485000

Legend:

- Concept plan boundary
- Proposed clearing footprint (7.38 ha)
- Bush Forever site (DOP)

Protected Ecological Communities

- SCP29a
- SCP29b

Conservation significant flora species

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

strategen JBS&G

0 100 metres

Job No: 58049

Scale 1:4,000 at A4

Client: DevelopmentWA

Coord. Sys. GDA 1994 MGA Zone 50

Drawn By: hsullivan | Checked By: CT | Version: A | Date: 07-Jan-2020

Ocean Reef Marina Development

PROTECTED ECOLOGICAL COMMUNITIES AND THREATENED AND PRIORITY FLORA

FIGURE: 2-7

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Image Reference: www.nearmap.com© - Imagery Date: 19 October 2019.

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Legend:

- Concept plan boundary
- Proposed clearing footprint (7.38 ha)
- Bush Forever Site 325 (DOP)

Vegetation communities

- H1
- H3
- H4
- S1
- S3
- S4
- S5
- CL

strategen JBS&G

0 100 metres

Ocean Reef Marina Development

VEGETATION COMMUNITIES

Job No: 58049		Scale 1:4,000 at A4	
Client: DevelopmentWA		Coord. Sys. GDA 1994 MGA Zone 50	
Drawn By: hsullivan	Checked By: CT	Version: A	Date: 07-Jan-2020

FIGURE: 2-8

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Image Reference: www.nearmap.com© - Imagery Date: 19 October 2019.

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Legend:

- Concept plan boundary
- Proposed clearing boundary (7.38 ha)
- Bush Forever Site 325 (DOP)

Vegetation condition

- EX (0.91 ha)
- VG-EX (0.30 ha)
- VG (2.50 ha)
- G (1.09 ha)
- D-G (1.55 ha)
- D (0.05 ha)
- CL (0.86 ha)

strategen JBS&G

0 100 metres

Ocean Reef Marina Development

VEGETATION CONDITION

Job No: 58049		Scale 1:4,000 at A4	
Client: DevelopmentWA		Coord. Sys. GDA 1994 MGA Zone 50	
Drawn By: hsullivan	Checked By: CT	Version: A	Date: 07-Jan-2020

FIGURE: 2-9

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Image Reference: www.nearmap.com© - Imagery Date: 19 October 2019.

2.6 Fauna

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).

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 proposed clearing footprint does not contain any trees suitable for Carnaby's Black-Cockatoo nesting hollows. However, it 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 Development includes an area of approximately 0.43 ha of suitable foraging habitat for Carnaby's Black-Cockatoo (Strategen 2016b, Figure 2.10).

Approximately 0.15 ha of suitable foraging habitat for Carnaby's Black-Cockatoo will be cleared as a result of the proposed clearing (Strategen 2016b; Figure 2.10).

The Development was referred under the EPBC Act and resulted in a "Not a Controlled Action" decision (4 July 2014).

Rainbow Bee-eater

The Rainbow Bee-eater (*Merops ornatus*) is listed as Marine under the EPBC Act and is afforded protection in marine areas. The Rainbow Bee-eater is a common summer visitor to Perth, where it breeds in sandy banks (Western Wildlife 2008). This species will forage and breed in relatively degraded areas and is likely to be a breeding visitor to the Development area. Clearing of vegetation is unlikely to result in the loss of nesting sites. The Rainbow bee-eater is common with a broad distribution and populations of this species are unlikely to be significantly affected by the proposed clearing.

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.

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 6.35 ha of potential Quenda habitat (Western Wildlife 2008).

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6485000

Legend:

- Concept plan boundary
- Proposed clearing footprint (7.38 ha)
- Potential Carnaby's Black Cockatoo habitat

strategen JBS&G

0 100 metres

Ocean Reef Marina Development

POTENTIAL BLACK COCKATOO HABITAT

Job No: 58049		Scale 1:4,000 at A4		
Client: DevelopmentWA		Coord. Sys. GDA 1994 MGA Zone 50		
Drawn By: hsullivan	Checked By: CT	Version: A	Date: 07-Jan-2020	**FIGURE: 2-10**

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Image Reference: www.nearmap.com© - Imagery Date: 19 October 2019.

2.7 Social environment

2.7.1 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 2.7: 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	Ballaruk 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

2.7.2 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 but is included on the WA Maritime Museum Shipwrecks database and on the State Heritage Office inHerit database (AHMS 2015).

The proposed clearing will not impact this site.

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 6.35 ha of native vegetation. The Project will not result in clearing of threatened flora. One Priority 3 flora species (*Conostylis bracteata*) occurs at two 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. 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'; and • SCP 29b: 'Acacia shrublands on taller dunes, southern Swan Coastal Plain'. The proposed clearing footprint impacts 1.8 ha of SCP 29a and 4.56 ha of SCP 29b. SCP24 is not present within the proposed clearing area. Total clearing amounts to 6.35 ha of native vegetation which is unlikely to impact biological diversity across the clearing footprint and surrounding area. For the purpose of MRS amendment 1270/41, a 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 including an additional area to account for the temporary impact to 0.13 ha of BF 325 for road battering. This 0.13 ha area which remains in BF 325 will also be rehabilitated following completion of the Early Works program and DevelopmentWA is also committed to ensuring the rehabilitation component of the NPO is undertaken. A Rehabilitation Plan is being prepared and will be submitted as part of the subdivision application process. The proposed clearing will not result in clearing of native vegetation representative of an area of high biodiversity, or that has a higher diversity than other examples of the vegetation in the region. Furthermore, the clearing required as part of the Development already been offset through the NPO as part of the MRS amendment to enable the Development.	The proposed clearing is unlikely be at variance with this principle

Principle	Assessment	Conclusion
(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 early works will result in the removal of approximately 6.35 ha of native vegetation. The proposed clearing footprint includes approximately 0.15 ha of suitable Black Cockatoo foraging habitat. Accordingly, it is expected that Carnaby's Black-Cockatoo will not reside in the proposed clearing footprint but may visit the area intermittently to feed. 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. Significant extents of Black Cockatoo habitat occur locally and regionally and clearing within the proposed clearing footprint represents < 1% of the total foraging habitat available within the surrounding area. Clearing for the Early Works will result in clearing of up to 6.35 ha of potential Black-striped Snake and Quenda habitat, both of which are Priority 3 species. 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, a 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 including an additional area to account for the temporary impact to 0.13 ha of BF 325 for road battering. This 0.13 ha area which remains in BF 325 will also be rehabilitated following completion of the Early Works program and DevelopmentWA is also committed to ensuring the rehabilitation component of the NPO is undertaken. A Rehabilitation Plan is being prepared and will be submitted as part of the subdivision application process. The proposed clearing footprint is not considered to represent habitat critical for fauna species, therefore 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 offset through the NPO.	The proposed clearing is unlikely 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	A total of 137 vascular plant taxa which are representative of 105 plant genera and 43 plant families were recorded within the survey area encompassing the clearing footprint by Mattiske (2013). Of the 137 plant taxa recorded within the broader Development area, 49 species (36%) were introduced. The high percentage of introduced species is considered to reflect the fragmentation of the Development area, historical clearing and dumping of refuse, as well as proximity to residential areas. No Threatened flora species have been identified within the proposed clearing footprint during surveys, including the most recent spring survey undertaken by Mattiske (2013).	The proposed clearing is not at variance with this principle

Principle	Assessment	Conclusion
	Mattiske (2013) recorded two state listed Priority flora species (Figure 2 5) as occurring within or in proximity to the Development area: • *Grevillea* sp. Ocean Reef (Priority 1) • *Conostylis bracteata* (Priority 3). *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 (Mattiske 2013). *Conostylis bracteate* occurs at two locations within the proposed clearing footprint but this species is relatively common and the proposed clearing is unlikely to alter the conservation status of this species. Clearing for the Early Works will be guided by a Construction Management Plan which will include the following measures to minimise impacts to vegetation: • clear demarcation of clearing boundary (inclusive of spoil stockpiles and access tracks); • seed and hygiene controls for equipment and personnel • accurate and well-maintained clearing records during and post clearing.	
(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	Clearing of native vegetation to enable completion of the Early Works will result in the removal of approximately 6.35 ha of native vegetation. No State or Commonwealth listed TECs have been identified as existing within the proposed clearing footprint. Three inferred P3 PECs occur within the proposed clearing footprint, being: • SCP 29a: 'Coastal shrublands over shallow sands, southern Swan Coastal Plain' • SCP 29b: 'Acacia shrublands on taller dunes, southern Swan Coastal Plain'. The removal of 1.8 ha of SCP 29a: 'Coastal shrublands over shallow sands, southern Swan Coastal Plain' and 4.56 ha of SCP 29b: 'Acacia shrublands on taller dunes, southern Swan Coastal Plain' is unlikely to have a significant impact to the PECs within the clearing footprint as they are known from several occurrences outside of the proposed clearing footprint of which a significant number or area of which are not under threat of habitat destruction or degradation. The proposed clearing is not expected to result in a significant impact at the local or regional scale due to the small scale of clearing.	The proposed clearing is unlikely to be at variance with this principle
(e) Native vegetation should not be cleared if it is significant as a remnant of native vegetation in	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.	The proposed clearing is unlikely to be at variance with this principle

<table>
<tr><th>Principle</th><th>Assessment</th><th>Conclusion</th></tr>
<tr><td>an area that has been extensively cleared</td><td>
<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 6.35 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.

For the purpose of MRS amendment 1270/41, a 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 including an additional area to account for the temporary impact to 0.13 ha of BF 325 for road battering. This 0.13 ha area which remains in BF 325 will also be rehabilitated following completion of the Early Works program and DevelopmentWA is also committed to ensuring the rehabilitation component of the NPO is undertaken. A Rehabilitation Plan is being prepared and will be submitted as part of the subdivision application process.

The clearing required as part of the Development, and the proposed clearing footprint, has already been offset through the NPO.</td><td></td></tr>
<tr><td>(f) Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland</td><td>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 conducted between 2000 and 2013 have not identified any watercourses or wetlands within the proposed clearing footprint.</td><td>The proposed clearing is at not at variance with this principle</td></tr>
<tr><td>(g) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation</td><td>The Early Works program will result in the removal of 6.35 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.</td><td>The proposed clearing is unlikely to be at variance with this principle</td></tr>
</table>

Principle	Assessment	Conclusion
	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). However, these soils generally have a high risk of wind erosion. To manage this risk, clearing will be undertaken no more than one month prior to the commencement of works. Given its extent and purpose, the proposed clearing footprint is unlikely to give rise to soil erosion, salinity, nutrient export, acidification, waterlogging or flooding. 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 • cleared areas will either be stabilised through development (i.e. bitumised, compacted hardstands) or rehabilitated (i.e. road batters).	
(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 footprint occurs adjacent to BF 325. BF 325 comprises an area of approximately 195.3 ha. The majority of the clearing does not occur within BF 325. A small area (0.13 ha) of BF 325 will however be disturbed to accommodate road batters. Vegetation condition in the 0.13 ha area affected ranges from excellent to degraded, with the majority being in very good condition. The MRS Amendment (MRS 1270/41) has formally removed 26 ha (the Development area) from BF 325. For the purpose of MRS amendment 1270/41, a NPO has 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). The majority of the proposed clearing footprint is no longer within Bush Forever. As outlined in State Planning Policy 2.8 Bushland Policy for the Perth Metropolitan Region (SPP 2.8) mitigation and offset measures are required for direct impacts to Bush Forever sites. A suitable offset site that achieves the site selection criteria outlined in the NPO has been identified and acquired, including the additional area to account for the temporary impact to 0.13 ha of BF 325 for road battering. This 0.13 ha area which remains in BF 325 will also be rehabilitated following completion of the Early Works program. The clearing required as part of the Development, and the proposed clearing footprint, has already been offset through the NPO. Environmental values within the remaining portion of BF 325 are unlikely to be significantly impacted as a result of clearing activities. Given the above information, including the offsets implemented under the NPO, and the rehabilitation of impacted areas within BF 325, the proposal is not considered to be at variance to principle h.	The proposed clearing is not at variance with this principle

Principle	Assessment	Conclusion
(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. Clearing of 6.35 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.	The proposed clearing is not 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 footprint for Early Works to be undertaken within the broader 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). Where possible the (uncleared) access tracks will be formed along the contours and not downslope to minimise the occurrence and impacts of overload flow following a rainfall event and associated erosion. 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 approval and management

The key approvals identified as being required and/or potentially required to support the proposed clearing include the following:

- Native Vegetation Clearing Permit (NVCP) under s 51 E of the EP Act
- Development Application in accordance with City of Joondalup requirements.

The assessment against the 10 clearing principles concluded that the proposed clearing, whilst resulting in some temporary reduction in vegetation within Bush Forever Site 325 (0.13 ha) for road battering, and impacts on one Priority flora species and two Priority 3 PECs (FCT 29a and FCT 29b) will 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.

4.1 Environmental mitigation and management

In order to manage potential impacts associated with the proposed clearing of 0.13 ha of Bush Forever, DevelopmentWA will implement a range of environmental management measures, focussing on key aspects and potential impacts, including the following:

- acquisition and rehabilitation of land as part of the NPO to support the MRS amendment which facilitates the Development.
- rehabilitation of areas of BF 325 impacted to a level that is representative of established reference sites
- 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.

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 Early Works component of the project, clearing 6.35 ha of native vegetation within the 7.38 ha clearing footprint is proposed.

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, a 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 clearing required as part of the Development, and the proposed clearing footprint the subject of this application, has already been offset through the NPO.

An area of 0.13 ha of BF 325 will be temporarily impacted as a result of the requirement for road batters identified during the later detailed design stages of the development. These areas will be rehabilitated following completion of the Early Works program.

An assessment of the impacts of the proposed native vegetation clearing against the ten clearing principles has determined that the clearing is not at variance or is unlikely to be at variance with these 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 unlikely 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 unlikely 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 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 unlikely be 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 unlikely 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 unlikely 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 is unlikely 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 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 unlikely be at variance with this principle

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.

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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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