

Satterley Madora Bay Pty Ltd
Seaside Estate, Madora Bay

Native Vegetation Clearing Permit – Purpose Permit
Supporting Documentation

16 March 2021

59894-134414 (Rev 1)

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

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Appendices

Appendix A Strategen-JBS&G (2021) Seaside Madora Bay Flora and Vegetation Survey
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Executive Summary

Satterley Madora Bay Pty Ltd is currently undertaking the development of Lot 101 on Plan 73957 as part of Satterley's Seaside Estate. Seaside Estate is located within the City of Mandurah, Western Australia, approximately 57 km south of the Perth CBD.

Following a review of the bulk earthworks programme at Seaside Estate, it was determined that to facilitate the development of a proposed primary school, the clearing of up to 14.54 ha of native vegetation would be required within a 16.11 ha area (the application area; Figure 1.1)

To inform the application for a Native Vegetation Clearing Permit, an assessment of environmental values was conducted in the application area and immediately adjacent area to the east of the site, to the boundary of Lot 101 (collectively the survey area). This assessment involved a desktop review, as well as a site-specific flora, vegetation, and black cockatoo habitat survey (Strategen-JBS&G 2021; Appendix A).

A total of 47 native vascular plant taxa were identified within the survey area. Four native vegetation types were mapped within the application area ranging in condition from 'Completely Degraded' to 'Good'. Additionally, approximately 1.57 ha of the application area is comprised of completely cleared land. One DBCA-listed Priority flora species *Jacksonia sericea* (Priority 4) was identified. Additionally, 1.81 ha of Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain ecological community (listed as Threatened under EPBC Act; Priority 3 under BC Act) was recorded within the application area. The application area contains a total of 13.896 ha of foraging habitat for Carnaby's and Baudin's Black Cockatoos. All foraging habitat within the Application area is of 'negligible to low' quality for Baudin's Cockatoos, while for Carnaby's Cockatoos 13.892 ha is of 'low' quality and the remaining 0.004 ha is of 'low to moderate' quality.

The environmental values present within the application area were assessed against the ten clearing principles. Through this assessment, it was determined that impacts from the proposed clearing are likely to be at variance with principle (d), may be at variance with principles (a) and (b), unlikely to be at variance with principles (g), (i) and (j), and are not at variance with principles (c), (e), (f) and (h).

1. Introduction

1.1 Project background and description

Satterley Madora Bay Pty Ltd (Satterley) are currently developing Lot 101 on Plan 73957 for urban development as part of Satterley's Seaside Estate. Seaside Estate is located within the City of Mandurah, Western Australia, approximately 57 km south of the Perth CBD. Lot 101 is currently zoned as Urban under the Peel Region Scheme (DPLH 2019), and as Urban Development under the City of Mandurah Local Planning Scheme No. 3 (City of Mandurah 2021).

Development has been progressing at Satterley's Seaside Estate since 2016, consistent with the Madora Bay North Local Structure Plan. Clearing and development commenced in the south east of the development envelope and is progressing via subdivision approval.

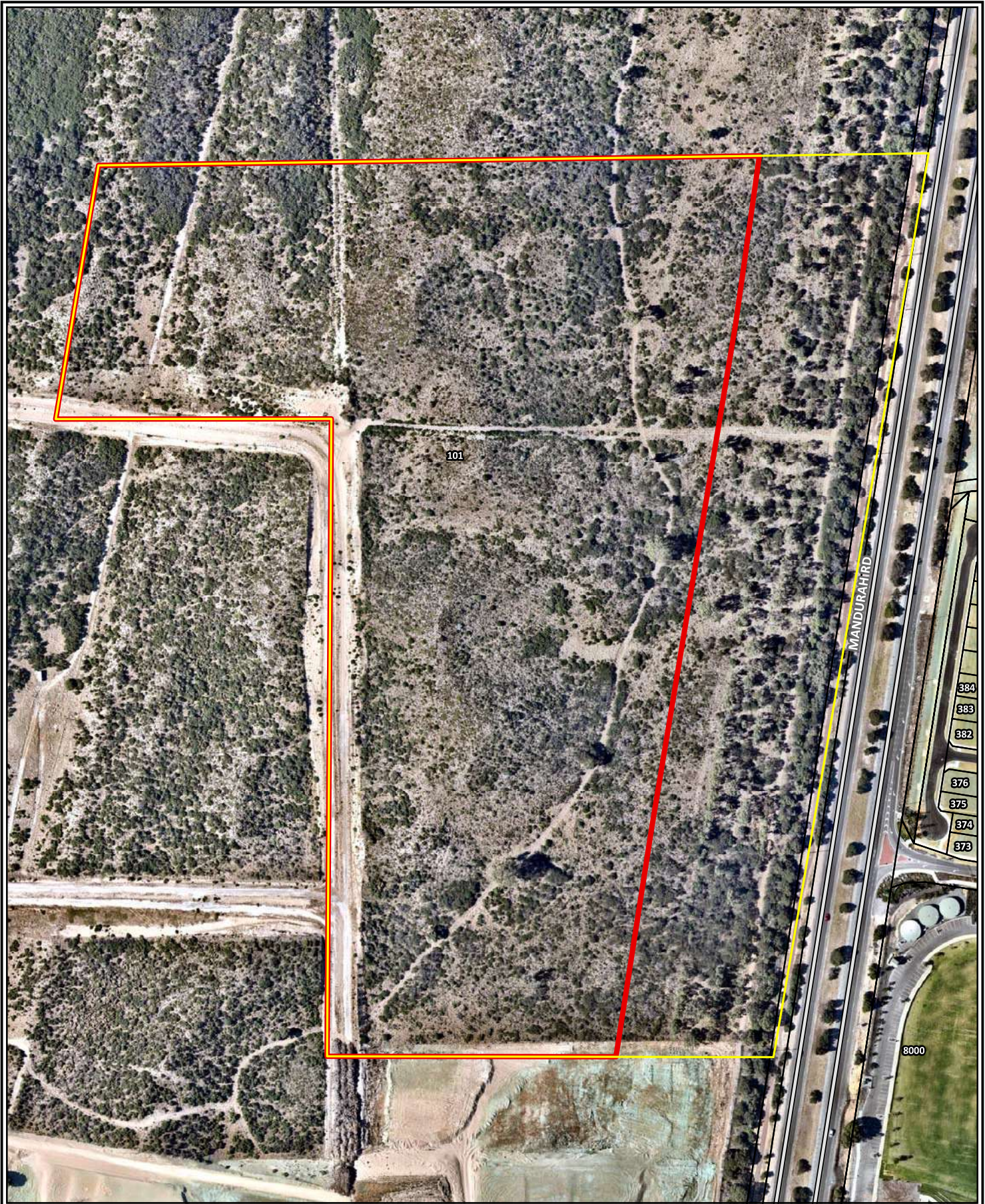
Following a review of the bulk earthworks programme at Seaside Estate, it was determined that to facilitate the development of a proposed primary school, the clearing of up to 14.54 ha of native vegetation would be required within a 16.11 ha area (the application area; Figure 1.1). Clearing will enable levelling of the site to commence consistent with the requirements of *Draft Operation Policy 2.4 – Planning for school sites* (WAPC 2020).

All clearing of native vegetation associated with this permit application is proposed to be undertaken within Lot 101 on Plan 73957, which is currently owned by Satterley.

1.2 Purpose

This document has been prepared to provide supporting information for a Native Vegetation Clearing Permit (NVCP) application (Purpose Permit) to clear no more than 14.54 ha of native vegetation within an area of 16.11 ha. Accordingly, this document has been prepared to support assessment under section 51E of the *Environmental Protection Act 1986* (EP Act), and includes the following information related to the clearing impacts:

- An overview of the existing environmental conditions of the application area
- an evaluation of the proposed clearing against the "10 Clearing Principles" listed under Schedule 5 of EP Act
- Environment approvals and management requirements.



Legend Application area Survey area Cadastral boundary Highways	Scale 1:3,250 at A4 02550 metres		Madora Bay City of Mandurah	
	Coord. Sys. GDA2020 MGA Zone 50			APPLICATION AREA
	Job No: 59894			
	Client: Satterley Property Group		FIGURE 1.1	
	Version: A	Date: 17-Feb-2021	strategen JBS&G	
	Drawn By: hsullivan	Checked By: HS		

2. Existing environment

2.1 Climate

The Swan Coastal Plain Region has a Mediterranean climate consisting of hot, dry summers and cool, wet winters. The nearest weather station which records both temperature and rainfall data is the Mandurah Weather Station (station 009977), approximately 6.8 km from the survey site. The average rainfall from 2001-2020 was 656.7 mm with the highest monthly rainfall occurring from May to September. (Figure 2.1). The wettest year on record was 2005, with an annual rainfall of 915.2 mm, 753.8 mm of which fell during the May to September period (BOM, 2020). Rainfall for the twelve months prior to survey was 506.4 mm. This is below the long-term average for the area.

The average maximum temperatures range from 17.5°C in July to 29.7°C in February. The average minimum temperatures range from 10.7°C in July to 19.4°C in February.

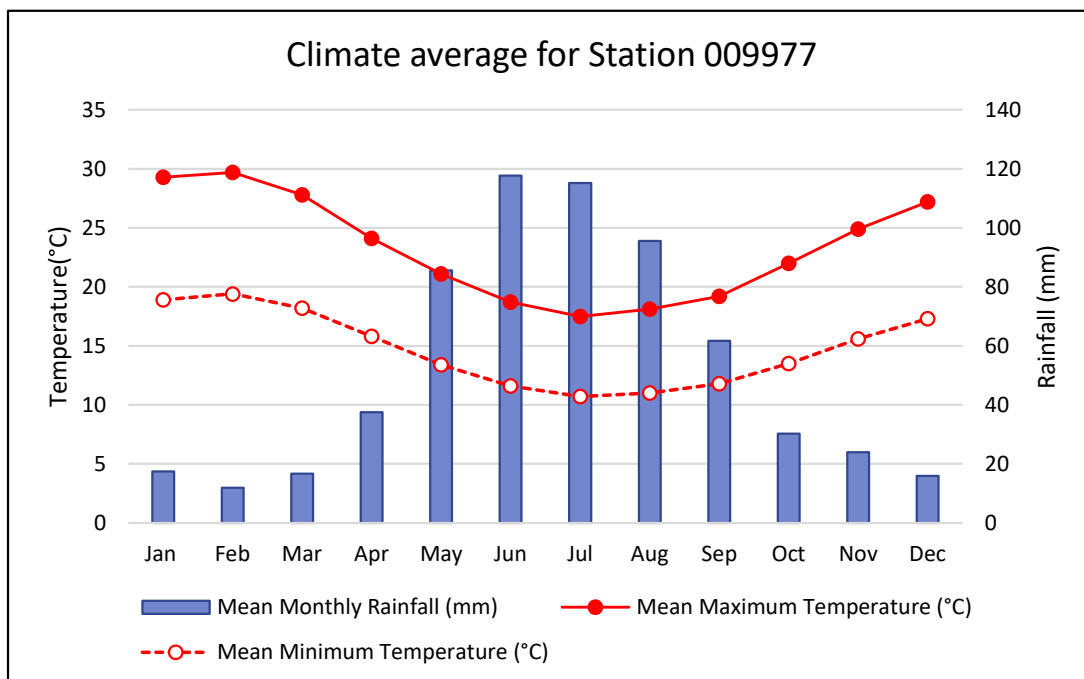


Figure 2.1: Monthly average rainfall and temperature at Mandurah weather station (Station 009977)

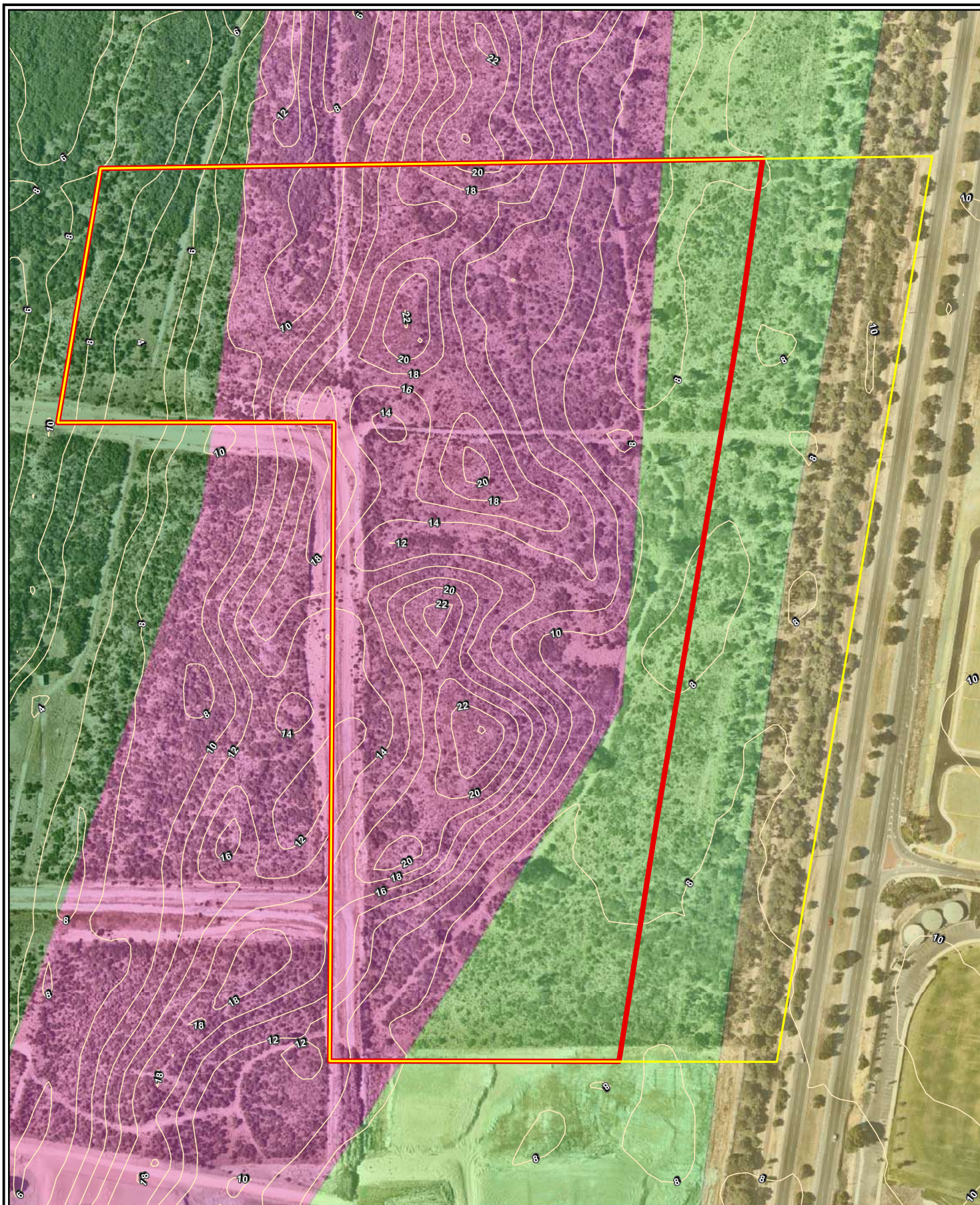
2.2 Landforms and topography

The application area is typical of a coastal dune environment, comprised of undulating dune systems adjacent to the coastline. Significant previous developments exist both north and south of the application area.

Surface elevation over the application area ranges from 4 m Australian Height Datum (mAHD) along the western boundary to 24 mAHD along the eastern boundary (Figure 2.2).

The majority of the application area is dominated by lowly undulating dunes varying between 4m to 8m AHD. A single dominant dune ridge traverses the application area in a north-south orientation along the eastern boundary and ranges in height from 8m to 24m AHD.

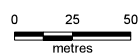
Historical modification to topography is evident across the application area, with areas of previously cleared land in the north and south, and the presence of multiple access tracks (Figure 1.1).



Legend

- Application area
- Survey area
- Soil landscape mapping (DPIRD)
 - 211Qu__Qf2 - Quindalup South Qf2 Phase
 - 211Qu__Qp1 - Quindalup South Qp1 Phase
 - 211Sp__S2b - Spearwood S2b Phase
 - 211Sp__S5 - Spearwood S5 Phase
- Topographic contours (mAHD)

Scale 1:3,250 at A4



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City of Mandurah**

SOILS, GEOLOGY AND TOPOGRAPHY

FIGURE 2.2



2.3 Soils and geology

2.3.1 Geology

The application area is located within the Swan Coastal Plain 1 (SWA01 – Dandaragan Plateau subregion) of Western Australia (Mitchell et al. 2002). The Swan Coastal Plain comprises five major geomorphologic 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 & McArthur 1980; Gibson et al. 1994). Each major system is composed of further subdivisions in the form of detailed geomorphologic units (Churchward & McArthur 1980; Semeniuk 1990; Gibson et al. 1994). Beard (1990) describes the Swan Coastal Plain as a low-lying coastal plain, often swampy, with sandhills also containing dissected country rising to the duricrusted Dandaragan plateau on Mesozoic, mainly sandy, yellow soils.

Specifically, the application area is located within the Quindalup South System, and Spearwood System (Figure 2.2). The Quindalup South System is a relatively young geology located on the western-most edge of the Swan Coastal Plain. The System is between 0 to 7000 years old and is characterised by calcareous deep sands and yellow sands. The Spearwood System borders the Quindalup South System to the east and is characterised as sand dunes and plains. Yellow deep sands, pale deep sands and yellow/brown shallow sands (Smolinski & Scholz, 1997; McPherson & Jones, 2005).

The application area is further described by Gozzard (2007) by the replacement of beach-ridge formation geomorphic processes with dune building processes resulting in irregularly shaped and parabolic dune forming along this section of coast. This transition is characterised by a reduction in sand deposition from offshore areas, leading to an increase in coastal erosion in response to increasing relative importance of locally generated longshore drift currents.

2.3.2 Acid Sulfate Soils

A review of the Department of Water and Environmental Regulation (DWER) spatial dataset (DWER 2020a) and The Department of Primary Industry and Regional Development's (DPRID) Natural Resource Information spatial software (DPRID 2020) indicates that the application area does not contain geology consistent with the presence of acid sulfate soils (ASS) or potential acid sulfate soils (PASS) occurring at depths greater than 3m.

2.3.3 Contamination

A review of the DWER Contaminated Sites Database (DWER 2020b) indicates that no known contamination occurs within the application area.

2.4 Groundwater and Surface Waters

Mapping of the geomorphic wetlands of the Swan Coastal Plain indicates no wetlands occurring within the application area. The closest wetland occurrence is the Conservation Category Wetland (CCW), Paganoni Swamp (UFI 13887) approximately 1.1km east of the application area.

The depth to groundwater ranges from approximately 7m to 17.5m within the application area (DER 2020). One groundwater extraction license is registered within the application area (WRI no: 179182), to extract 107250 KL from the Perth – Superficial Swan aquifer.



Legend

Application area

Survey area

Vegetation associations

Rockingham 3048

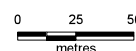
Rockingham 997

Vegetation complexes

Coastal dune complex - low closed forest and closed scrub

Woodland and open forest and closed heath

Scale 1:3,250 at A4



Coord. Sys. GDA2020 MGA Zone 50



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**REGIONAL VEGETATION
ASSOCIATIONS AND COMPLEXES**

FIGURE 2.3



2.5 Vegetation and flora

To inform the application for a Native Vegetation Clearing Permit, an assessment of environmental values was conducted across the application area and immediately east to the boundary of Lot 101 (collectively the survey area; Strategen-JBS&G 2021). The results of this assessment built upon the findings of a flora and fauna assessment undertaken of Lot 101 by Ecoscape in 2011.

The 2021 assessment involved a desktop review, as well as a site-specific flora, vegetation, and black cockatoo habitat survey. A summary of the results of this assessment is provided in the following sections, while a complete copy of this report is provided within Appendix A.

2.5.1 Desktop assessment

2.5.1.1 Vegetation

The application area is located within the South West Botanical Province of Western Australia, in the Swan Coastal Plain (SWA02) IBRA subregion (Beard 1980). One pre-European Vegetation Association (VA) occurs within the application area, being VA Rockingham 997 (Beard 1980) (Figure 2.3).

According to regional scale vegetation complex mapping by Heddle et al (1980), the application area contains vegetation representative of the Cottesloe Central and South, and Quindalup vegetation complexes (Figure 2.3).

The Cottesloe Central and South complex is described as a Mosaic of woodland of *Eucalyptus gomphocephala* (Tuart), open forest of *Eucalyptus gomphocephala* (Tuart) - *Eucalyptus marginata* (Jarrah) - *Corymbia calophylla* (Marri), or a closed heath on the Limestone outcrops (GoWA 2019). 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 Quindalup vegetation complex is described as a coastal dune complex consisting mainly of two alliances - the strand and fore-dune alliance and the mobile and stable dune alliance (GoWA 2019). 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 systema*, *Pimelea ferruginea* and occasional tall woodlands of *Agonis flexuosa*.

2.5.1.2 Threatened and Priority Ecological Communities

Strategen- JBS&G (2021) undertook a comprehensive desktop assessment within a 10 km radius of the application area, which included a review of previous studies within the area, comparison of community descriptions and assessment against diagnostic criteria (DBCA 2018; TSSC 2016; TSSC 2019). This indicated that one TEC listed under the EPBC Act and four communities listed as a PEC by DBCA were potentially present within the application area (Table 2.1).

Table 2.1: Threatened and Priority Ecological Communities within 10 km of the application area

Ecological Community	Conservation Status (State)	Conservation Status (Commonwealth)
Tuart (<i>Eucalyptus gomphocephala</i>) woodlands and forests of the Swan Coastal Plain	Priority 3	Threatened
Northern Spearwood shrublands and woodlands (community type 'SCP 24')	Priority 3	-
Coastal shrublands on shallow sands, southern Swan Coastal Plain (community type 'SCP 29a')	Priority 3	-
Acacia shrublands on taller dunes, southern Swan Coastal Plain (community type 'SCP 29b')	Priority 3	-

2.5.1.3 Threatened and Priority Flora Species

A desktop assessment of information from NatureMap (DPaW 2007-), the Western Australian Herbarium (WA 1998-), and the EPBC Protected Matters Search Tool (PMST) (DEE 2017) indicated three Threatened and 25 Priority flora species have been recorded in the local area. Based on the habitat requirements of each species, Strategen-JBS&G (2021) considered nine Priority flora species may potentially occur within the application area. One species, *Conostylis pauciflora* subsp. *pauciflora* (Priority 4), had been previously recorded within the survey area (Ecoscape 2011). A total of two flora species listed as Threatened and 12 listed as Priority under the *Biodiversity Conservation Act 2016* (BC Act) were mapped within 10 km of the application area, and are presented in Table 2.2. Table 2.2 also indicates the likelihood of each species occurring within the Strategen-JBS&G (2021) survey area.

Table 2.2: Threatened and Priority flora species mapped within 10 km of the application area

Taxon	Conservation Status (State)	Conservation Status (Commonwealth)	Likelihood of occurrence within survey area (Strategen-JBS&G 2021)
<i>Acacia benthamii</i>	Priority 2	-	Possible
<i>Acacia lasiocarpa</i> var. <i>bracteolata</i> long peduncle variant (G.J. Keighery 5026)	Priority 1	-	Unlikely
<i>Amanita drummondii</i>	Priority 3	-	Unlikely
<i>Beyeria cinerea</i> subsp. <i>cinerea</i>	Priority 3	-	Possible
<i>Boronia capitata</i> subsp. <i>gracilis</i>	Priority 3	-	Unlikely
<i>Caladenia speciosa</i>	Priority 4	-	Unlikely
<i>Calandrinia oraria</i>	Priority 3	-	Likely
<i>Cardamine paucijuga</i>	Priority 2	-	Unlikely
<i>Chamaescilla gibsonii</i>	Priority 3	-	Unlikely
<i>Conostylis pauciflora</i> subsp. <i>pauciflora</i>	Priority 4	-	Previously recorded
<i>Dillwynia dillwynioides</i>	Priority 3	-	Unlikely
<i>Diuris drummondii</i>	Threatened	Vulnerable	Unlikely
<i>Diuris micrantha</i>	Threatened	Vulnerable	Unlikely
<i>Drakaea elastica</i>	Threatened	Critically Endangered	Unlikely
<i>Eucalyptus rudis</i> subsp. <i>cratyantha</i>	Priority 4	-	Possible
<i>Grevillea manglesii</i> subsp. <i>ornithopoda</i>	Priority 2	-	Possible
<i>Jacksonia gracillima</i>	Priority 3	-	Unlikely
<i>Jacksonia sericea</i>	Priority 4	-	Likely
<i>Johnsonia pubescens</i> subsp. <i>cygnorum</i>	Priority 2	-	Unlikely
<i>Lasiopetalum membranaceum</i>	Priority 3	-	Likely
<i>Ornduffia submersa</i>	Priority 4	-	Unlikely
<i>Parsonsia diaphanophleba</i>	Priority 4	-	Unlikely
<i>Pimelea calcicola</i>	Priority 3	-	Likely
<i>Schoenus capillifolius</i>	Priority 3	-	Unlikely
<i>Sphaerolobium calcicola</i>	Priority 3	-	Unlikely
<i>Stachystemon exilis</i>	Priority 1	-	Unlikely
<i>Stylidium longitubum</i>	Priority 4	-	Unlikely
<i>Styphelia filifolia</i>	Priority 3	-	Likely

2.5.2 Site assessment

The following ecological investigations have been undertaken within the application area:

- Ecoscape (2011). Lot 100 Mandurah Road – Flora and Fauna Assessments. Prepared for Madora Bay Partnership.
- Endplan Environmental (2013). Part Lot 100 Mandurah Road, Madora Bay North – Environmental Assessment. Prepared for Madora Bay Partnership.
- Strategen-JBS&G (2021). Madora Bay Flora and Vegetation Survey. Prepared for Satterley Property Group.

Given the age of the surveys undertaken by Ecoscape (2011) and Endplan Environmental (2013), the results of Strategen-JBS&G (2021) is considered to provide the most accurate and up-to-date information relevant to the Application area.

2.5.2.1 Flora

A total of 47 native vascular plant taxa from 25 families and 34 genera were recorded within the survey area (Strategen-JBS&G 2021). No species listed as Threatened under the EPBC Act or BC Act were recorded. Two Priority flora species were identified within the survey area, with these being *Jacksonia sericea* (Priority 4) and *Grevillea olivacea* (Priority 4). *G. olivacea* is to the east of the Application area within a planted belt of vegetation. The species was considered to be established during planting as the species is native to the Geraldton Sandplains IBRA region and is outside of its natural range (Strategen-JBS&G 2021).

A total of 18 introduced (exotic) taxa were recorded within the Survey area, of which one, *Gomphocarpus fruticosus*, is a Declared Pest under section 22 of the *Biosecurity and Agriculture Management Act (2007)* (BAM Act) according to the Western Australian Department of Agriculture and food (DAFWA 2017).

2.5.2.2 Vegetation type

Four vegetation types (VTs) were defined and mapped within the application area (Table 2.3; Figure 2.4). The total quantum of native vegetation within the application area is 14.54 ha.

Table 2.3: Vegetation types within the Application area

Vegetation Type	Description	Area (ha)	Percentage of Application area
VT1	Tall, closed shrubland of <i>Acacia rostellifera</i> over <i>Spyridium globulosum</i> , <i>Rhagodia baccata</i> , <i>Acanthocarpus preissii</i> and weeds.	0.64	3.97
VT2	Open shrubland of <i>Acacia rostellifera</i> and <i>Spyridium globulosum</i> over <i>Grevillea preissii</i> and <i>Melaleuca systema</i> , with isolated clumps of <i>Allocasuarina humilis</i> and <i>Hakea prostrata</i> , over <i>Acanthocarpus preissii</i> , <i>Desmodium flexuosus</i> and weeds.	11.04	68.54
VT3	Open shrubland of <i>Spyridium globulosum</i> , <i>Acacia saligna</i> and <i>Adriana quadripartita</i> over <i>Jacksonia furcellata</i> , <i>Acacia lasiocarpa</i> and <i>Melaleuca systema</i> over <i>Acanthocarpus preissii</i> , <i>Conostylis candicans</i> and weeds.	2.85	17.71
VT4	Planted tree belt of <i>Eucalyptus gomphocephala</i> , <i>Eucalyptus erythrocorys</i> and introduced Eucalypts over <i>A. iteaphylla</i> , <i>Melaleuca huegelii</i> , <i>M. systema</i> , <i>Spyridium globulosum</i> , <i>Grevillea</i> spp., <i>Allocasuarina humilis</i> and weeds.	0.004	0.02
CL	Cleared; non-native vegetation	1.57	9.75
Total		16.11	100
Total native vegetation		14.54	90.25

2.5.2.3 Vegetation condition

The application area has historically been subject to recreational vehicle use, partial clearing, cattle grazing and weed invasion, leading to a high level of degradation being observed during the survey (Strategen-JBS&G 2021). A total of 1.58 ha of the application area was mapped as 'Cleared', being comprised of areas with no native vegetation present. Native vegetation within the application area ranged from 'Good' to 'Completely Degraded' condition (Table 2.4; Figure 2.5).

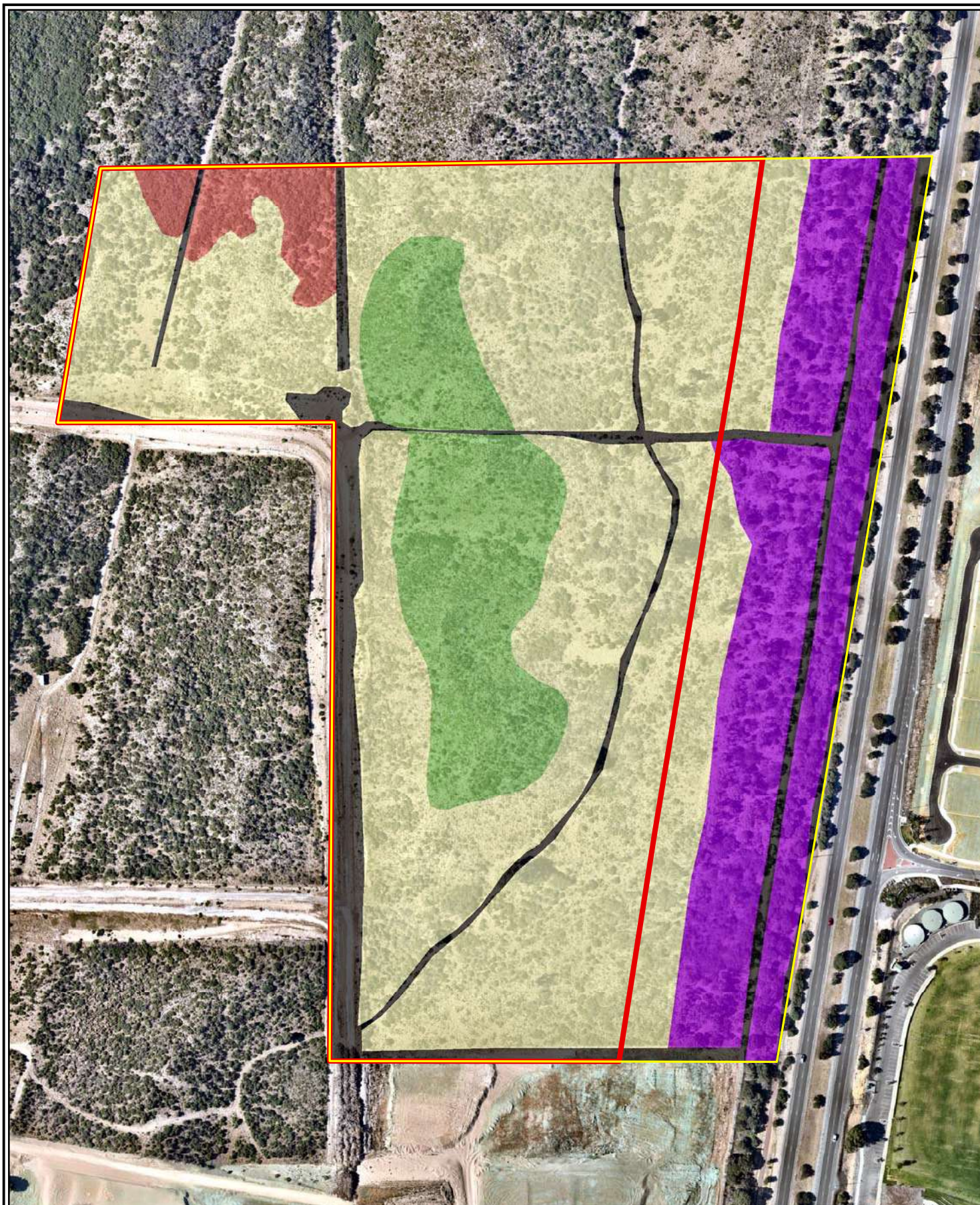
Table 2.4: Condition of Native Vegetation within the Application area

Vegetation Condition	Area (ha)	Percentage of Total Native Vegetation within Application area (%)
Good	3.79	26.09
Degraded	10.36	71.24
Completely Degraded	0.39	2.67
Total	14.54	100

2.5.2.4 Threatened and Priority Vegetation Communities

Strategen- JBS&G (2021) concluded that of the two TECs and two PECs with the potential to occur within the application area (Table 2.1), one TEC and two PECs were inferred to occur within the survey area. Following assessment against the key diagnostic criteria outlined by the Department of the Environment and Energy (DEE 2019), only the Priority 3 'Tuart Woodlands and Forests of the Swan Coastal Plain' ecological community (also listed as Threatened under the EPBC Act) was confirmed to occur within the survey area. A total of 1.81 ha of this PEC occurs within the application area (Figure 2.6).

Correct identification of Priority Ecological Communities requires a rigorous statistical analysis of multi-season quadrat data, which compares the data to reference sites. For the Swan Coastal Plain, reference sites are those recorded by Gibson et al. (1994) as a part of "*A Floristic Survey of the Southern Swan Coastal Plain*". Strategen-JBS&G's 2021 survey did not include a spring assessment of quadrats and did not remonitor Ecoscape's 2011 quadrats, so the data collected was not appropriate for statistical analysis.



Legend

Application area

Survey area

Vegetation type (area within Application area)

VT1 (0.64 ha)

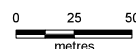
VT2 (11.04 ha)

VT3 (2.85 ha)

VT4 (0.004 ha)

Cleared (1.57 ha)

Scale 1:3,250 at A4



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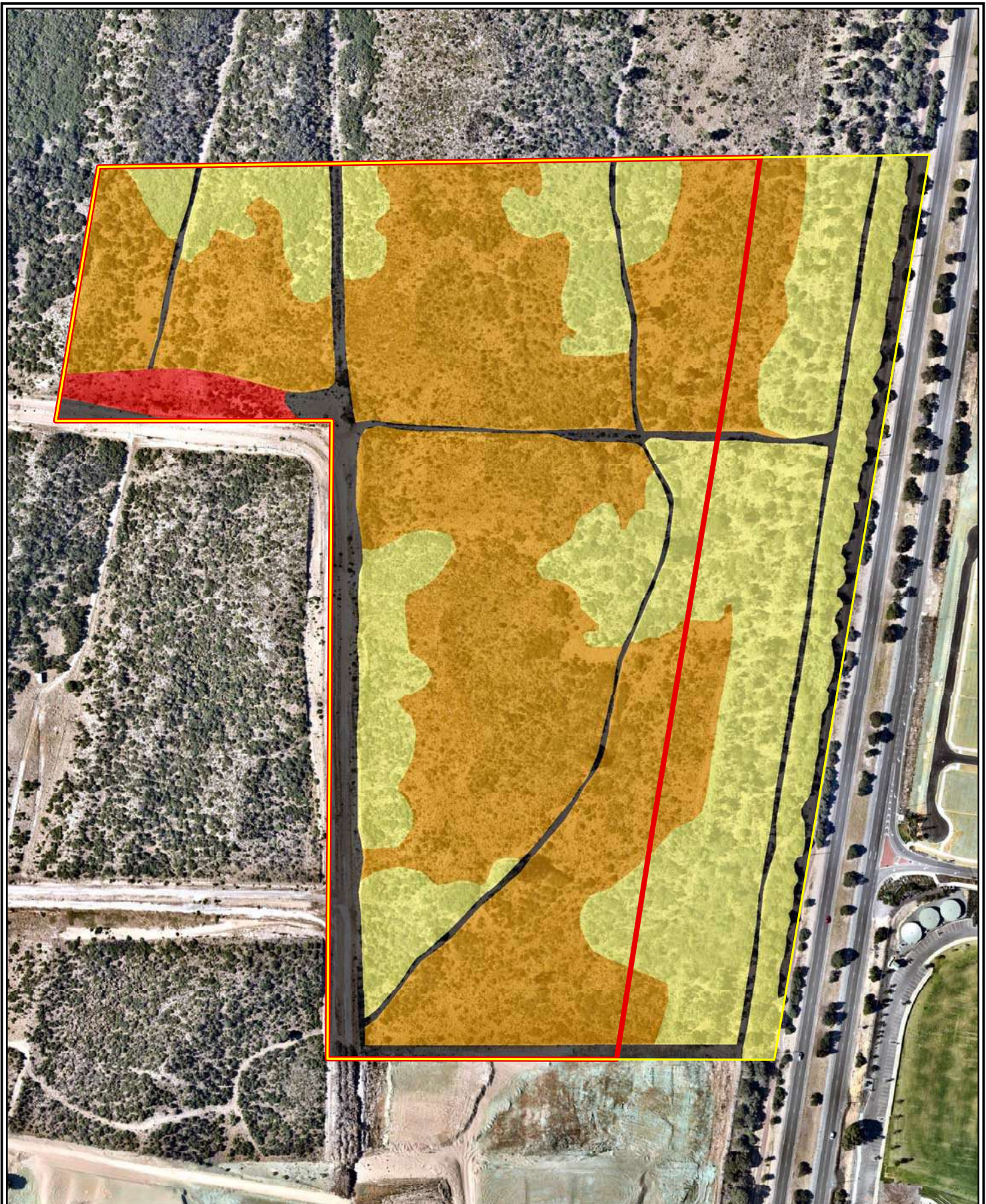
Checked By: HS

**Madora Bay
City of Mandurah**

VEGETATION TYPES

FIGURE 2.4





Legend

Application area

Survey area

Vegetation condition (area within Application area)

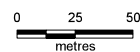
Good (3.79 ha)

Degraded (10.36 ha)

Completely degraded (0.39 ha)

Cleared (1.57 ha)

Scale 1:3,250 at A4



Coord. Sys. GDA2020 MGA Zone 50



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**Madora Bay
City of Mandurah**

VEGETATION CONDITION

FIGURE 2.5

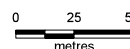




Legend

- Application area
- Survey area
- Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain ecological community (1.81 ha within Project area)
- *Jacksonia sericea* (Priority 4) (2 individuals within Project area)

Scale 1:3,250 at A4



Coord. Sys. GDA2020 MGA Zone 50



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Madora Bay
City of Mandurah

**CONSERVATION SIGNIFICANT
ECOLOGICAL COMMUNITIES AND FLORA**

FIGURE 2.6



2.6 Fauna

2.6.1 Desktop assessment

2.6.1.1 Threatened and Priority Fauna Species

A desktop assessment conducted by Ecoscape (2011) through the DEC Database, and an assessment using the Protected Matters Search Tool (PMST; 2021) found 16 non-marine conservation significant fauna species within a 10 km radius of the study area. These are identified in **Error! Reference source not found..**

Of the species listed within **Error! Reference source not found.**, the following are considered to potentially occur within the application area, based on an assessment of the likelihood of occurrence.

- Carnaby's Black Cockatoo - Endangered
- Forest Red-tailed Black Cockatoo - Vulnerable
- Baudin's Black Cockatoo - Endangered
- Quenda – Priority 4

Table 2.5: Conservation Significant Fauna within 10 km of the application area

Scientific name	Common name	Conservation status		Likelihood of occurrence
		EPBC Act	State/DEC	
<i>Bettongia penicillata</i> subsp. <i>ogilbyi</i>	Brush-tailed Bettong, Woylie	-	T - EN	Unlikely
<i>Dasyurus geoffroii</i>	Western Quoll, Chuditch	Vulnerable	T - VU	Unlikely
<i>Isoodon obesulus</i> subsp. <i>fusciventer</i>	Southern Brown Bandicoot, Quenda	-	P4	Possible
<i>Macropus Irma</i>	Western Brush Wallaby	-	P4	Unlikely
<i>Myrmecobius fasciatus</i>	Numbat, Walpuriti	Endangered	T - EN	Unlikely
<i>Calyptorhynchus banksii</i> subsp. <i>naso</i>	Forest Red-tailed Black-Cockatoo	Vulnerable	T - VU	Possible
<i>Calyptorhynchus baudinii</i>	Baudin's Black-Cockatoo	Endangered	T - EN	Possible
<i>Calyptorhynchus latirostris</i>	Carnaby's Cockatoo	Endangered	T - EN	Possible
<i>Charadrius rubicollis</i>	Hooded Plover	-	P4	Unlikely
<i>Falco peregrinus</i> subsp. <i>macropus</i>	Peregrine Falcon	-	S	Unlikely
<i>Numenius madagascariensis</i>	Eastern Curlew	-	P4	Unlikely
<i>Lerista lineata</i>	Perth Lined Lerista	-	P3	Unlikely
<i>Morelia spilota</i> subsp. <i>imbricata</i>	Carpet Python	-	P4	Unlikely
<i>Neelaps calonotos</i>	Black-striped Snake	-	P3	Unlikely
<i>Phascogale calura</i>	Red-tailed Phascogale	Vulnerable	T – VU	Unlikely
<i>Setonix brachyurus</i>	Quokka	Vulnerable	T - VU	Unlikely

2.6.2 Site assessment

Ecoscape (2011) did not record any conservation significant fauna species as part of a flora, vegetation and fauna survey undertaken in September 2011. It was noted at the time that there is potential for Black Cockatoo species, particularly Carnaby's Black Cockatoo (*Calyptrorhynchus latirostris*) and Forest Red-tailed Black Cockatoos (*Calyptrorhynchus banksii naso*) to utilise the wider Lot 101 area for foraging, and may not have been recorded during the survey given they typically only occupy a given area intermittently (Ecoscape 2011).

Strategen-JBS&G (2021) did not record any significant trees within the survey area. While the survey area contains *Eucalyptus gomphocephala* (which is a known breeding and roosting tree species for Black Cockatoos [DSEWPac 2012]), the trees had not reached a diameter at breast height (DBH) of 500 mm to provide suitable breeding habitat for Black Cockatoos.

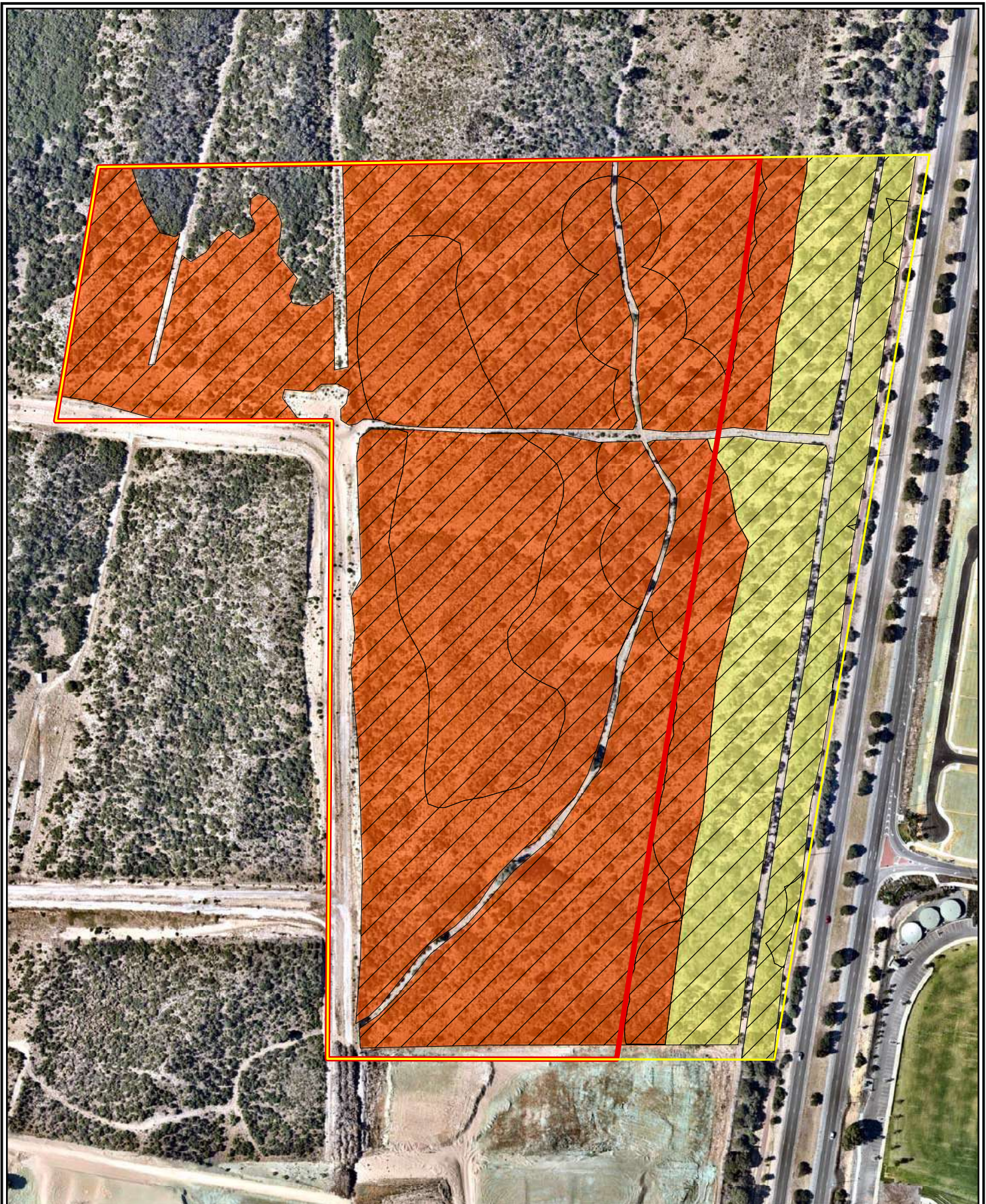
Vegetation within the survey area was assessed against the guidelines for valuing Black Cockatoo foraging habitat provided by Bamford Consulting Ecologists (BCE 2018). Based on this assessment, the survey area provides a maximum foraging value of 'Low to Moderate' for Carnaby's Black Cockatoo, 'Negligible to Low' for Baudin's Black Cockatoo, and no foraging value for Red-tailed Black Cockatoo (Strategen-JBS&G 2021). Foraging species within the application area for Baudin's and Carnaby's Black Cockatoos are detailed in Table 2.6. The amount and quality of potential foraging habitat within the application area is outlined in Table 2.7.

Table 2.6: Foraging Species and Quality within the application area

Black Cockatoo species	Vegetation type	Foraging species	Foraging quality
Carnaby's Cockatoo	VT1	Nil	Nil
	VT2	<i>Banksia dallanneyi</i> <i>Hakea prostrata</i> <i>Lupinus</i> sp.	Low
	VT3	<i>Acacia saligna</i> <i>Jacksonia furcellata</i>	Low
	VT4	<i>Banksia dallanneyi</i> <i>Eucalyptus gomphocephala</i> <i>Eucalyptus</i> sp. <i>Hakea prostrata</i> <i>Lupinus</i> sp.	Low to Moderate
Baudin's Cockatoo	VT1	Nil	Nil
	VT2	<i>Banksia dallanneyi</i> <i>Hakea prostrata</i>	Negligible to Low
	VT3	<i>Acacia saligna</i> <i>Jacksonia furcellata</i>	Negligible to Low
	VT4	<i>Banksia dallanneyi</i> <i>Hakea prostrata</i>	Negligible to Low

Table 2.7: Quality of Carnaby's and Baudin's Cockatoo Foraging Habitat within the application area

Black Cockatoo species	Foraging habitat quality	Area within application area (ha)	% of native vegetation within application area	% of total application area
Carnaby's Cockatoo	2 – Low	13.892	95.57	86.25
	3 – Low to moderate	0.004	0.03	0.02
Baudin's Cockatoo	1 – Negligible to low	13.896	95.60	86.27



Legend

Application area

Survey area

Baudin's Cockatoo foraging habitat quality (area within Application area)

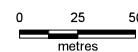
Negligible to low (13.986 ha)

Carnaby's Cockatoo foraging habitat quality (area within Application area)

Low (13.982 ha)

Low to moderate (0.004 ha)

Scale 1:3,250 at A4



Coord. Sys. GDA2020 MGA Zone 50



Job No: 59894

Client: Satterley Property Group

Version: A

Date: 17-Feb-2021

Drawn By: XXXXXXXXXX

Checked By: HS

**Madora Bay
City of Mandurah**

**CARNABY'S AND BAUDIN'S COCKATOO
FORAGING HABITAT QUALITY**

FIGURE 2.7



2.7 Conservation areas and ecological linkages

There are no Bush Forever sites within or adjacent to the clearing application area, or wider Lot 101. The closest Bush Forever site is site 395 (Paganoni Swamp and adjacent bushland, Karnup), which is located approximately 0.7 km to the north-east of the application area.

There are no mapped ecological linkages within the site. The closest ecological linkage (Link ID: 76) is located approximately 1.55 km east of the application area.

2.8 Social environment

2.8.1 Indigenous heritage

A review of the Aboriginal Heritage Inquiry System (AHIS) did not identify any places of registered Aboriginal Heritage within the proposed clearing area. The closest registered Aboriginal Heritage place is Madora Bay Foreshore Reserve - Bush Tucker Area (DAA 20780) which is located approximately 550m west of the proposed clearing area (Department of Planning, Lands and Heritage [DPLH], 2021a)

2.8.2 European heritage

Database searches indicate that no known European heritage is present within the proposed clearing area. The nearest registered European heritage site is Allandale Homestead located approximately 23 km south-south-west of the proposed clearing area (DPLH, 2021b).

3. Assessment against the EP Act clearing principles

There are ten clearing principles defined under Schedule 5 of the EP Act. These principles are considered prior to the decision being made to issue a clearing permit. The proposed clearing is anticipated to be likely at variance with principle (d), may be at variance with principles (a) and (b), unlikely to be at variance with principles (g), (i), and (j), and not at variance with principles (c), (e), (f), and (h). An assessment against these principles is presented below in Table 3.1.

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	In order to facilitate bulk earthworks associated with the construction of a primary school, the clearing of 14.54 ha of remnant vegetation will be required within a wider 16.11 area. This proposed clearing boundary has been strategically located to avoid the most significant native vegetation identified within the wider survey area. As shown in Figure 2.5, and Figure 2.6, vegetation of the greatest condition and with the greatest area of confirmed Priority Ecological Community, is located east of the proposed clearing boundary, west of Mandurah Road. As per the application of the mitigation hierarchy of risk management, the majority of impacts have been avoided by the proposed clearing application area, to the point where: 53% of vegetation in "Good" condition has been removed from the application area - Of the 7.4 ha of Tuart Woodland community within the survey area, only 1.81 ha has been included in the application area (24.5%) Of the vegetation remaining within the application area, the majority (73.91%) is in either a "Degraded" or "Completely Degraded" condition. Furthermore, a total of 18 introduced (exotic) taxa were identified in the wider survey area, including one species (<i>Gomphocarpus fruticosus</i>) which is currently listed as a Declared Plant species in Western Australia pursuant to section 22 of the <i>Biosecurity and Agriculture Management Act 2007</i>. Based on a review of the Ecoscape (2011) survey report, and observations made as part of the 2021 assessment (Appendix A), an additional three Priority Ecological Communities could potentially occur within the application area. These are: - Northern Spearwood shrublands and woodlands (Priority 3 PEC listed by DBCA) (Gibson et al.'s (1994) floristic community type SCP24) - Coastal shrublands on shallow sands, southern Swan Coastal Plain (Priority 3 PEC listed by DBCA) (Gibson et al.'s (1994) floristic community type SCP29a) - Acacia shrublands on taller dunes, southern Swan Coastal Plain (Priority 3 PEC listed by DBCA) (Gibson et al.'s (1994) floristic community type SCP29b).	Proposed clearing is unlikely to be at variance with this principle

Principle	Assessment	Conclusion
	Floristic Community Type analysis undertaken by Ecoscape in 2011 determined that, while vegetation types within Lot 101 may be analogous to these PECs, the reliability of the inferred floristic community types was considered to be low, based on the degradation and low species diversity within the study area. The conclusion was ultimately made that only vegetation in a "Good" condition within Lot 101 may be considered a Priority Ecological Community (Ecoscape 2011). Approximately 3.79 ha (26.09%) of "Good" condition vegetation is present within the application area, split across all four vegetation types (Strategen 2021). Based on the above, the 14.54 ha of native vegetation within the wider 16.11 ha area is not considered to be an area of high biological diversity, and as such the proposed clearing is unlikely 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	In order to facilitate bulk earthworks associated with the construction of a primary school, the clearing of 13.896 ha of Carnaby's and Baudin's Black Cockatoo foraging habitat within a wider 16.11 ha area. No black cockatoo significant trees, and no potentially suitable hollows were identified within the application area or wider survey area. The proposed clearing boundary has been strategically located to avoid the quality habitat for black cockatoos identified within the wider survey area. As shown in Figure 2.7, foraging habitat of the greatest quality is located east of the proposed clearing boundary, west of Mandurah Road. As per the application of the mitigation hierarchy of risk management, the majority of impacts have been avoided by the proposed clearing application area, to the point where only 0.004 ha (0.1%) of low to moderate quality habitat is present within the site. The remainder of foraging habitat present within the site is not considered to represent quality habitat i.e. Low quality (Carnaby's Black Cockatoo) or Negligible to Low quality (Baudin's Black Cockatoo). With reference to the black cockatoo habitat scoring system, Bamford Consulting Ecologists (from whom the methodology was originally developed) utilise a scoring system drawn from the Department of Environment and Energy (now Department of Agriculture Water and the Environment; DAWE) environmental offset calculator. The foraging value of vegetation depends upon the type, density and condition of trees and shrubs in an area, and can be influenced by the context such as the availability of foraging habitat nearby. The Bamford scoring system has been applied and accepted by State and Commonwealth environmental assessment processes of previous projects as a means for assessing black cockatoo habitat value. A foraging score out of six is provided for foraging habitat, allowing the assignment of an additional 4 points for site context (0-3) and species density (0-1) to achieve a score out of ten which can be readily used by the offset calculator. Bamford Consulting Ecologists only calculates a score out of ten for vegetation of at least Low to Moderate foraging value (vegetation characteristics score of ≥3) as vegetation with no, negligible or low foraging value is effectively assigned a context and species density scores of 0 because the context and species density are of little relevance if the vegetation does not support foraging by the birds.	The proposed clearing is not considered to be at variance with this principle.

Principle	Assessment	Conclusion
	The habitat identified by Bamford as negligible, a score of 0, 1 or 2, relate to areas that are highly disturbed such as paddocks or areas of former clearing that have limited regrowth and support immature foraging habitat or habitat of limited density. In the context of the application area, only 0.004 ha of foraging habitat with a quality score of at least 3 (Low to moderate; Carnaby's Cockatoo only) was identified. No foraging habitat with a score of at least 3 was identified for either Baudin's or Forest Red-tailed Black Cockatoo. In terms of other fauna, approximately 14.54 ha of potential habitat for Quenda is present within the proposed clearing area. Quenda are listed as a Priority 4 species. Priority 4 species are ranked with the lowest priority by the DBCA without being completely delisted. These species area considered to be adequately known, are rare but not threatened, or meet criteria for near threatened, or have been recently removed from the threatened species or other specially protected fauna lists for other than taxonomic reasons. Based on the above, the 14.54 ha of native vegetation is not considered to be significant habitat for fauna indigenous to Western Australia, and as such the proposed clearing is not considered 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	No flora species listed as Threatened under the BC Act or EPBC Act were identified within the application area or wider survey area. One Priority 4 species; <i>Jacksonia sericea</i>, was identified within the survey area. Two individuals of this species area located within the proposed application area. It is noted that P4 flora species are not afforded protection under State or Commonwealth legislation. However, this species is easily grown from seed and as such can readily be re-established within POS within the Seaside development if required. While the proposed construction timetable precludes seed collection from these plants, two populations are known to occur within 5 km of the site, and another two populations occur within 10 km of the site (DBCA n.d.). These are in addition to the <i>J. sericea</i> individual located outside of the clearing application area. Based on the above, the proposed clearing is not considered to be at variance with this principle.	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	No ecological communities listed as Threatened under State legislation have been identified within the clearing application area, or wider survey area. One Priority 3 Ecological Community (Tuart [<i>Eucalyptus gomphocephala</i>] Woodlands and Forests of the Swan Coastal Plain) is confirmed to be present within the application area and wider survey area. This ecological community is listed as Threatened under the federal EPBC Act. Approximately 1.81 ha of this community is proposed to be cleared. The Seaside Estate residential development was referred to then Department of Sustainability, Environment, Water, Population and Communities under the EPBC Act in July 2012, for impacts to Matters of National Environmental Significance (MNES). A referral decision was subsequently made on the 3 January 2013 that	The proposed clearing is not at variance with this principle.

Principle	Assessment	Conclusion
	the proposed action was not a controlled action. As such, approval is currently in place at a commonwealth level for the proposed clearing to occur. To estimate the impact of clearing on the 'Tuart (<i>Eucalyptus gomphocephala</i>) Woodlands and Forests of the Swan Coastal Plain ecological community within the local area, the area of the community within a 5 km radius was quantified based on the mapping by DBCA (2020) within the current extent of remnant vegetation (DPIRD 2020). Approximately 423.97 ha of this community is estimated to exist within 5 km of the application area, with the proposed clearing expected to reduce this amount by 0.43%. A total of 51.24% of this community within 5 km of the application area is currently conserved within DBCA managed reserves. Based on the above, the native vegetation within the clearing application area is not considered necessary for the maintenance of a threatened ecological community, and as such the proposed clearing is not considered to be at variance with this principle. According to DER (2014), as the Project will require the clearing of vegetation in which 1.81 ha of 'Tuart (<i>Eucalyptus gomphocephala</i>) Woodlands and Forests of the Swan Coastal Plain' TEC is present (Strategen-JBS&G 2021), the proposed clearing is likely 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 an area that has been extensively cleared	The application area contains 10.53 ha of native vegetation representative of the Cottesloe Complex – Central and South, of which 2.84 ha is in 'Good' condition and 7.69 ha is in 'Degraded' condition. The remaining 4.0 ha is comprised of the Quindalup Complex, of which 0.94 ha is in 'Good' condition, 2.67 ha is in 'Degraded' condition and 0.39 ha is in 'Completely Degraded' condition. In terms of biodiversity conservation targets, the National Objectives and Targets for Biodiversity Conservation 2001 – 2005 (Environment Australia 2001) aims to: • Prevent clearing of ecological communities with less than 30% of the original extent remaining • Recover ecological communities with less than 10% of the original extent remaining. These national targets are reflected in state government policy for Western Australia and generally, are used to guide planning and decision-making (WAPC 2010). However, in relation to bushland conservation within the Perth Metropolitan Region portion of the Swan Coastal Plain, which is recognised as a constrained area, State Planning Policy 2.8 – Bushland Policy for the Perth Metropolitan Region and Bush Forever seeks to protect a target of at least 10% of the original extent of each vegetation complex (WAPC 2010). Approximately 32.16% of the pre-European extent (45,299.61 ha) of the Cottesloe – Central and South Complex remains within the Swan Coastal Plain, while 47.50% and 37.75% remain within the Peel Region and City of Mandurah, respectively (GoWA 2019b). Approximately 60.49% of the pre-European extent (54,573.87 ha) of the Quindalup Complex remains within the Swan Coastal Plain, while 42.56% and 65.75% remain within the Peel Region and City of Mandurah, respectively (GoWA 2019b).	The proposed clearing is not at variance with this principle.

Principle	Assessment	Conclusion												
	Both of the vegetation complexes mapped within the site are currently above the 30% retention target. Given that the native vegetation within the application area is not representative of vegetation complexes that have been extensively cleared, and both are well above the 30% retention target, the proposed clearing is not 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 application area does not intersect any mapped wetlands, watercourses, or other bodies of water. Analysis of the Geomorphic Wetlands of the Swan Coastal Plain shapefiles (DBCA 2018) indicates that the nearest mapped wetland is located approximately 1.3 km east of the application area. Given that there are no surface waterbodies in the vicinity of the application area, the proposed clearing will not remove any native vegetation associated with a watercourse or wetland area. Therefore, proposed clearing is not at variance with this principle.	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 Department of Primary Industries and Regional Development (DPIRD) provides a series of soil degradation risk mapping at the sub-system level. The application area is located partly within the Quindalup South System described as ‘coastal dunes of the Swan Coastal Plain with calcareous deep sands and yellow sands (coastal scrub)’, and partly within the Spearwood System described as ‘sand dunes and plains, yellow deep sands, pale deep sands and yellow/brown shallow sands’ (DPIRD 2020). The table below summarises the maximum risk of soil degradation within the application area according to DPIRD (2020). <table><tr><th>Degradation Aspect</th><th>Risk Within Application area (DPIRD 2020)</th></tr><tr><td>Wind erosion</td><td>30-50% of map unit has high to extreme hazard</td></tr><tr><td>Waterlogging</td><td><3% of map unit has moderate to high risk</td></tr><tr><td>Water erosion</td><td>30-50% of map unit has high to extreme hazard</td></tr><tr><td>Salinity</td><td><3% of map unit has low to moderate hazard</td></tr><tr><td>Flood risk</td><td><3% of map unit has moderate to high hazard</td></tr></table> The greatest risk of land degradation within the application area is from wind and water erosion (DPIRD 2020). However, considering that bulk earthworks and the subsequent construction of a primary school will commence immediately following the clearing of vegetation, no appreciable land degradation is anticipated to occur. Furthermore, as part of the development design process, an Urban Water Management Plan will be prepared for the application area, which will stipulate construction requirements and management actions to minimise the risk of water-caused degradation.	Degradation Aspect	Risk Within Application area (DPIRD 2020)	Wind erosion	30-50% of map unit has high to extreme hazard	Waterlogging	<3% of map unit has moderate to high risk	Water erosion	30-50% of map unit has high to extreme hazard	Salinity	<3% of map unit has low to moderate hazard	Flood risk	<3% of map unit has moderate to high hazard	The proposed clearing is not at variance with this principle.
Degradation Aspect	Risk Within Application area (DPIRD 2020)													
Wind erosion	30-50% of map unit has high to extreme hazard													
Waterlogging	<3% of map unit has moderate to high risk													
Water erosion	30-50% of map unit has high to extreme hazard													
Salinity	<3% of map unit has low to moderate hazard													
Flood risk	<3% of map unit has moderate to high hazard													

Principle	Assessment	Conclusion
	It should also be noted that a significant portion of the application area has been subject to historic disturbance, with 76.50% of the area being assessed as in a 'Degraded' to 'Completely Degraded' or in an already cleared state (Appendix A). Based on the above, it is considered that the proposed clearing will not cause appreciative land degradation, and as such is not considered 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 nearest portion of land managed by DBCA is a Crown Freehold reserve located 1.4 km north east of the application area. The nearest Nature Reserve is located 3.4 km to the south east. Given that there are no conservation reserves in close proximity to the Application area, with the nearest located 1.4 km away, the proposed clearing of native vegetation will not impact on the environmental values of any nearby conservation area. As such, the proposed clearing is not considered to be at variance with this principle.	The proposed clearing is not 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 application area is not located in close proximity to any surface water bodies, with the nearest being a CCW 1.4 km east. Depth to groundwater across the application area ranges from approximately 7m to 17.5m (DWER 2021). Given the depth to groundwater, and that the area has a low risk of being affected by salinity and acidity (DPIRD 2020), the clearing of native vegetation within the application area is not likely to cause deterioration in the quality of surface or underground water. As such, the proposed clearing is not considered to be at variance with this principle.	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	Historical land use within the application area and wider Lot 101 has resulted in multiple sources of disturbance, including recreational vehicle use, partial clearing, historic cattle grazing and weed invasion. As a result, approximately 76.50% of the application area has been assessed as being in a 'Degraded' to 'Completely Degraded' condition, or in an already cleared state (Appendix A). In terms of flood risk, the risk within the application area is low, with less than 3% of the area being identified as having a moderate to high risk of flooding (DPIRD 2020),, Based on the historical disturbance within the application area and low risk of flooding, the proposed clearing and subsequent development is not likely to cause or exacerbate the risk of flooding beyond what is currently experienced. As such, the proposed clearing is not considered to be at variance with this principle.	The proposed clearing is not at variance with this principle.

4. Conclusion

As required by *Draft Operation Policy 2.4 – Planning for school sites* (WAPC 2020), Satterley are proposing to clear 14.54 ha of native vegetation within a 16.11 ha area, to facilitate the development of a proposed primary school.

Following an assessment of the required clearing against the ten clearing principles as presented in Table 3.1, it was determined that the action is either not, or unlikely to, be at variance with these principles.

Considering the deliberate positioning of the clearing application area to avoid the most significant vegetation, the predominately degraded condition of vegetation within the application area, and the low quality of habitat for conservation significant fauna, the proposed clearing is acceptable, and mitigation and management of all impacts associated with the action can be achieved through conditional approval of this clearing permit, and development application instruments.

5. 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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Appendix A Strategen-JBS&G (2021) Seaside Madora Bay Flora and Vegetation Survey

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