Natural Area Holdings Pty Ltd
Whadjuk Country
57 Boulder Road
Malaga WA 6090

5 November 2021

Dear Kristen

RE: BASIC FAUNA SURVEY PRESTON BEACH ADDENDUM

Please find enclosed the basic fauna survey addendum for the report prepared by Natural Area Consulting Management Services (Natural Area) in 2018 *Level 2 Flora and Vegetation Survey, Level 1 Fauna Survey – Preston Beach*. This addendum is to address the request for additional information by the Department of Water and Environmental Regulation (DWER) for the purpose of a clearing permit application assessment. DWER have requested additional information for the fauna survey methodology and maps of the fauna habitat observed on site. The fauna habitat observed on site was poor to moderate value, as majority of the site was affected by previous clearing, or on the fringe of vegetated areas along a road and has been impacted by previous road widening activities and mineral extraction in the north. The proposed clearing area was not considered significant habitat for black cockatoos or Western Ringtail Possums, although it may provide transient foraging and allow movement for these species to higher value habitat adjacent.

Regards

Sharon Hynes
Environmental Consultant (Ecologist)

Desktop Fauna Survey

A desktop fauna survey was undertaken to determine:

- threatened or priority fauna that have the potential to occur in the area
- threatened or fauna habitat that may be present on site.

Desktop and literature review for the fauna survey included:

The following databases were accessed to obtain relevant information:

- NatureMap (Natural Area, 2018) to determine conservation significant fauna listed under the Biodiversity Conservation Act 2016 (WA) that may potentially occur on site
- Protected Matters Search Tool (Cwlth) (Natural Area, 2018) to determine potential fauna listed under the Environmental Protection and Biodiversity Conservation Act 1999 (Cth) that may potentially occur on site
- WALGA Environmental Planning Tool (Natural Area, 2018) to determine the if the area is a confirmed breeding, roosting or nesting area for threatened black cockatoos.

On-ground Methodology

The entire proposed clearing area was traverse over two days from the 20-21 November 2017, to determine:

- Any potential habitat trees and potential black cockatoo hollows present.
- Record any fauna species observed, calls herd, or signs of their presence in the form of scats, tracks, burrows, nests.
- Any potential Western Ringtail Possum Dreys within *Agonis flexuosa* trees.

Fauna Habitat

No cockatoo habitat trees with a diameter at breast height (DBH) >500 mm were recorded within the proposed clearing alignment. The *Eucalyptus gomphocephala*, *Eucalyptus marginata* and *Eucalyptus decipiens* present did not have any hollows present and minimal food sources for black cockatoos.

Overall, the fauna habitat within the survey area was of low to moderate value, with majority of the area affect by previous clearing due to road widening or other mineral extraction, and it was noted that Lot 1002 had been impacted by grazing. The fauna habitat can be split up by vegetation types present on site (Figures 1 and 2) including:

- Banksia Jarrah Woodland – this was low quality as it was impacted by edge effects being on the side of the existing road with better quality habitat adjacent, although it may provide minimal foraging habitat for black cockatoos, would likely be utilised for transient foraging.
- *Eucalyptus decipiens* Woodland – low quality with minimal foraging habitat for black cockatoos affected by edge effects on the road verge, would likely be utilised for transient foraging.
- Tuart and Peppermint Woodland – low value habitat with no trees in the clearing area class as habitat trees with a DBH >500 mm, would likely be utilised for transient foraging for black cockatoos and Western Ringtail Possums.
- Coastal Shrubland - moderate value habitat as there was a higher coverage of middle storey species may provide habitat for small mammals, reptiles and amphibians.

- Grasstree Shrubland - low quality highly degraded, low diversity and cover of shrubs and herbs present, affected by previous clearing may provide shelter for small mammals, reptiles and amphibians.
- *Trachyandra* Herbland – nil to low value with only sparse weedy herbs and grasses present and no real cover for fauna species.

Overall, the fauna habitat in the survey area was good for birds but had much less cover available in middle and overstorey for mammal and reptile species to remain permanently. Although transient feeding and movement of animals to higher quality surrounding fauna habitat is still supported by the vegetation present. Clearing of the road alignment and the quarry area would not be considered a significant impact to the ecological linkages to surrounding areas from the site as it is already degraded and has been impacted by previous clearing and land uses.

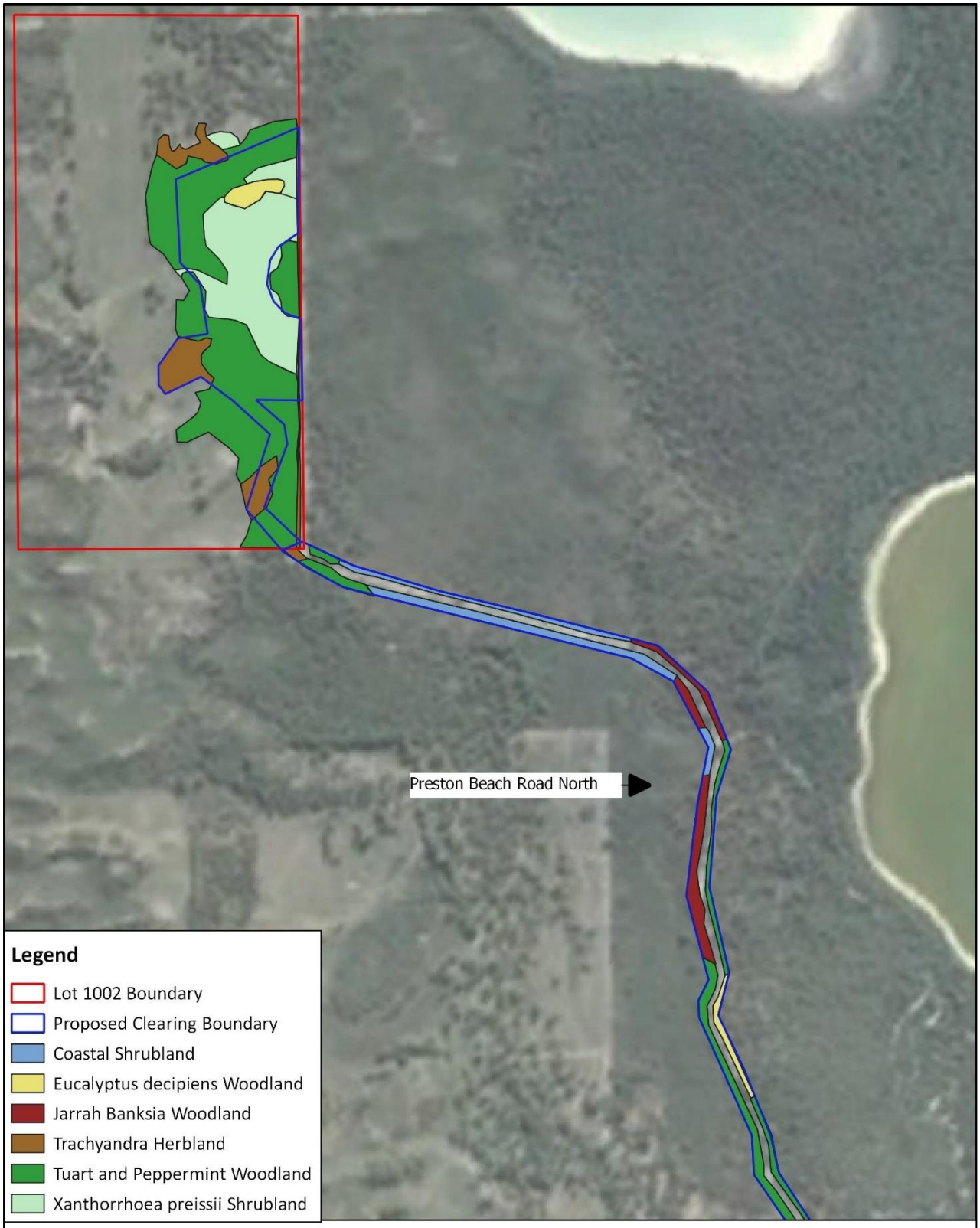

Figure 1:
Fauna Habitat
Preston Beach (North)

Figure 2:
Fauna Habitat
Preston Beach (South)

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References

Natural Area Consulting Management Services (Natural Area). (2018). Level 2 Flora and Vegetation Survey, Level 1 Fauna Survey Preston Beach, unpublished report prepared for Doyle Lime.

Natural Area
CONSULTING MANAGEMENT SERVICES

Doyle Lime

Level 2 Flora and Level 1 Fauna Survey, Lot 1002 and a Portion of Preston Beach Road North

14 October 2019

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Draft/ Version No.	Date	Changes	Prepared by	Approved by	Status
D1	March 2018	New document	SH/HT	SB	Draft
V1	12 September 2018	Finalised	HT	LS	Superseded
V2	28 September 2018	Additional information	SH	LS	Superseded
V3	14 October 2019	Update ES, S5.2	SH	SB	Final

Executive Summary

Natural Area Consulting Management Services was contracted by Landform Research on behalf of Doyle Lime to carry out a level 2 flora and vegetation survey and a level 1 fauna survey within Lot 1002 Preston Beach Road North and a portion of vegetation adjacent Preston Beach Road North. The survey results are required to inform the environmental approvals process associated with use of Lot 1002 for limestone mining and the widening of Preston Beach Road North to enable access to and from the site.

The scope of works included

- a desktop review of conservation significant fauna, flora and ecological communities
- determining flora and fauna species present, including a targeted search for conservation significant flora and fauna (including habitat)
- assessing vegetation type and condition
- reporting outcomes.

The survey confirmed:

- 109 flora species, 82 of which were native species
- Six vegetation types
    - two of which are classified as Priority 3 under the *Wildlife Conservation Act 1950* (WA)
    - one of which is classified as a Threatened Ecological Community under the *EPBC Act 1999* (Cwlth), although not at a size which would trigger the Act
- a high similarity between quadrats and a low similarity to quadrats from other datasets, which could be due to survey timing
- vegetation condition ranging from Completely Degraded to Very Good, with the majority of the site (79%) in Completely Degraded or Degraded Condition
- 18 species of fauna noted, with the endangered Carnaby's Black Cockatoo observed flying over the site; no tree hollows or evidence of feeding was noted; there was also no evidence of the Western Ringtail Possum within the survey boundary.

An assessment of the ten Clearing Principles indicate that the proposed clearing area is not likely to be at variance any of the Principles however:

- Tuart Woodlands are classified as a Priority 3 ecological community under the Wildlife Conservation Act 1950 (WA); discussions with the DBCA to discuss the most appropriate mechanism(s) to preserve as much of this vegetation type as practicable is recommended along Preston Beach Road North
- Tuart Woodlands have been nominated to be classified as a threatened ecological community (TEC), with the minster's decision expected in 2018; referral to the EPBC act will be required if the community is classified as a TEC before works commence unless the widening of the road is less than the area surveyed during 2017
- Carnaby's Cockatoo may utilise tall Tuart trees for roosting; clearing should not impact these trees where practicable
- a Conservation Category Wetland Preston Lake is located approximately 50 m from the proposed clearing area along Preston Beach North Road, clearing on the opposite side of the road should occur if possible to maximise distance between the clearing area and wetland.

Contents

1.0 Introduction

Natural Area Consulting Management Services (Natural Area) was contracted by Landform Research on behalf of Doyle Lime to carry out a level 2 flora and vegetation survey and a level 1 fauna survey within Lot 1002 Preston Beach Road North and a portion of Preston Beach Road North (Figure 1) within the Shire of Waroona. The survey results are required to inform the environmental approvals process associated with the use of Lot 1002 for limestone mining and the widening of Preston Beach Road North to enable access to and from the site.

1.1 Scope of Works

Natural Area's scope of works included:

- undertaking a desktop review of documents available from publicly available databases
- determining flora species present including targeted searches for threatened and priority species
- assessing vegetation type and condition
- recording fauna species noted during the site assessment
- reporting outcomes.

Figure 1: Site Location Preston Beach

Client: Doyle Lime
Project: Flora and Fauna Survey 2017, Preston Beach
Image Source: Nearmap 2018
Prepared by: Harley Taylor 2018
Datum: GDA 94, Zone 50

2.0 Site Characteristics

The flora and vegetation found in a locality are directly influenced by several key factors, including:

- climate
- soil type
- topography
- disturbance processes, such as land clearing and weed invasion.

2.1 Regional Context

According to Interim Biogeographical Regionalisation of Australia (IBRA) descriptions, Perth is located within the Swan Coastal Plain region. The Swan Coastal Plain comprises two major divisions, the Swan Coastal Plain 1 – Dandaragan Plateau and Swan Coastal Plain 2 – Perth Coastal Plain (Mitchell, Williams and Desmond, 2002), with the survey site situated in the latter. This subregion is broadly characterised as including areas of Jarrah and Banksia woodlands on sandy soils in a series of sand dunes, along with wetland areas, often within the interdunal swales (Mitchell, Williams and Desmond, 2002).

2.2 Climate

The climate experienced in the area is Mediterranean, with hot, dry summers and cool, wet winters. According to the Bureau of Meteorology (Bunbury, Station ID 009965, 2018):

- average rainfall is 726.1 mm pa, with the majority falling between May and August
- average maximum temperature ranges from 17.2 ^{o}C in winter to 30.1 ^{o}C in summer, with the highest recorded maximum being 40.8 ^{o}C
- average minimum temperatures range from 7.0 ^{o}C in winter to 15.9 ^{o}C in summer, with the lowest recorded minimum being -3.0 ^{o}C
- predominant wind directions include morning easterlies and westerly sea breezes during summer months, with an average wind speed of 20.2 km/h and gusts of more than 100 km/h.

2.3 Soil Type

According to the NR Info Portal maintained by the Department of Primary Industries and Regional Development WA (2018), nine soil types are associated with the survey site itself. The soil types are a reflection of the transition between the Quindalup dune system to the west and the Spearwood dune system to the east, with the Vasse soil system present in areas close to the lakes.

Table 1: Soil types

Map Unit	Name	Description	Lot 1002	Access Road
211Qu_Qd	Quindalup South Qd Phase	Small gently undulating plains (deflation basins) enclosed by discrete parabolic dunes with moderately deep to very deep calcareous sands over limestone.	X	
211Qu_Qp2	Quindalup South Qp2 Phase	Long walled discrete parabolic dunes with moderate to steep slopes and uniform calcareous sands showing variable depths of surface darkening.	X	
211Sp_S1a	Spearwood S1a Phase	Dune ridges with shallow to moderately deep siliceous yellow-brown sands, very common limestone outcrop and slopes up to 15%.	X	X
211Sp_S1c	Spearwood S1c Phase	Dune ridges with deep bleached grey sands with yellow-brown subsoils and slopes up to 15%.		X
211Sp_S2b	Spearwood S2b Phase	Lower slopes (1-5%) of dune ridge with shallow to deep siliceous yellow-brown sands and common limestone outcrop.	X	X
211Sp_S4a	Spearwood S4a Phase	Flat to gently undulating sandplain with deep, pale and sometimes bleached, sands with yellow-brown subsoils.	X	
211Sp_S4b	Spearwood S4b Phase	Flat to gently undulating sandplain with shallow to moderately deep siliceous yellow-brown and grey-brown sands with minor limestone outcrops	X	X
211Va_V4	Vasse V4 Phase	Low level storm beach ridges and terraces with shallow to moderately deep uniform, alkaline black sandy loams to loams overlaying unconsolidated shell beds or clayey marl		X
211Va_V6	Vasse V6 Phase	Upper level sandy terrace and gently undulating beach ridges with deep grey or bleached pale brown siliceous sands overlaying soft shelly limestone		X

Source: DPIRD (2018)

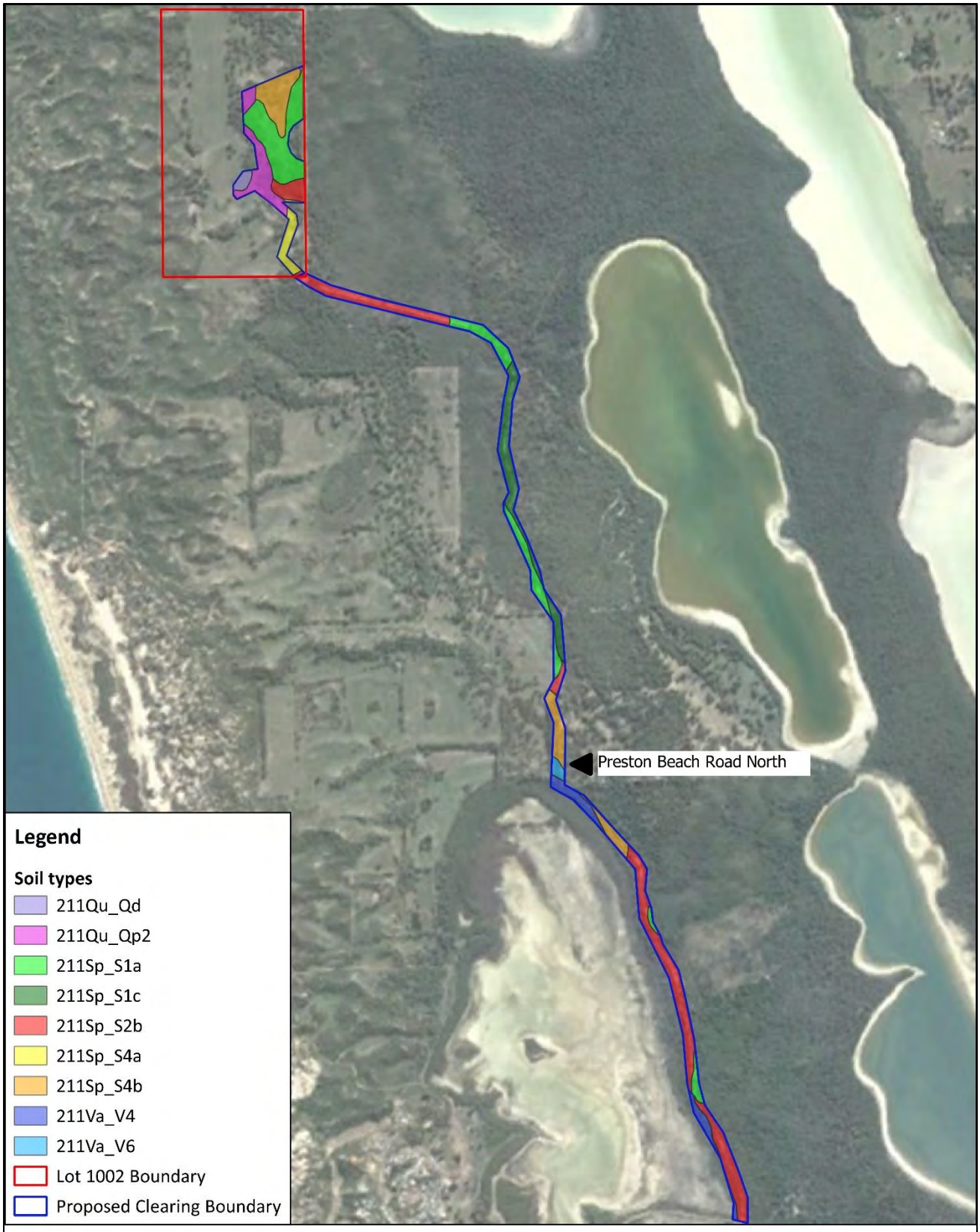

Figure 2: Soil Types Preston Beach

2.4 Topography

Lot 1002 is located within an interdunal swale, so is largely flat at 10 m AHD, with the land rising east and west of the site to 20 m AHD.

2.5 Vegetation Complex

A review of the WALGA Environmental Planning Tool (2018) indicated that four vegetation complexes were located within survey area.

Table 2: Vegetation complexes

Name	Description
Quindalup Complex	This coastal dune complex supports variable vegetation differing in both species composition and physiognomy due to changing dune environment. The complex is subdivided into two alliances, with the stable dune alliance found within the area. This alliance contains *Lepidosperma gladiatum*, *Olearia axillaris* and *Spyridium globulosum*.
Yoongarillup Complex	Dominated by tuart woodlands with *Agonis flexuosa* in the second storey. This tuart woodland can be replaced by an open-forest of tuart-jarrah-marri on more restricted patches. Understorey species include *Banksia attenuata*, *Macrozamia riedlei* and *Hibbertia hypericoides*.
Vasse Complex	This complex supports mixed vegetation of *Melaleuca* spp. Closed-scrub, fringing woodland of *Eucalyptus rudis* and *Melaleuca* spp., and open-forest of tuart-jarrah-marri. The actual location of vegetation types appears to be determined by periods of flooding, drainage and depth of the sand. Other species include *Melaleuca rhaphiophylla*, *M. preissiana* and *Acacia saligna*.
Cottesloe Complex-Central and South	Dominated by the tuart woodlands or the tuart-jarrah-marri open-forests on the deeper sands, but also closed-heath on the limestone outcrops can be found. Other species include *Melaleuca huegelii*.

Source: WALGA (2018)

3.0 Flora and Vegetation Survey Methodology

3.1 Objectives

The objective of the survey was to collect sufficient data to adequately inform a clearing application for the proposed clearing area within Lot 1002 and the widening of Preston Beach Road North to enable easy access to and from the site. This included undertaking a desktop review, determining flora species present, assessing vegetation type and condition, and recording fauna species noted during assessment.

3.2 Desktop and Literature Review

The desktop flora and vegetation survey was undertaken to determine the:

- likely native and non-native flora species present
- current extent of native vegetation
- general floristic community types
- likely presence of threatened or priority flora species
- likely presence of any threatened or priority ecological communities.

The following databases were accessed to obtain relevant information:

- NatureMap (Department of Biodiversity, Conservation and Attractions, 2017a) (Appendix 1)
- Protected Matters Search Tool (Department of the Environment and Energy (DoEE), 2017a) (Cwlth) (Appendix 2)
- FloraBase (Department of Biodiversity, Conservation and Attractions, 2018b)
- Threatened and priority flora and ecological community database searches (Department of Biodiversity, Conservation and Attractions, 2018).

Due to the low survey intensity of regional areas a 7 km buffer around the site was used to ensure all potentially occurring species were captured. Summary sheets of threatened flora potentially occurring in the area were created for quick reference in the field (Appendix 3).

3.3 On-ground Methodology

Natural Area Botanists Sharon Hynes and Julie Chapman traversed the site on foot over two days between 20 – 21 November 2017, with key data recorded using a handheld Trimble GPS unit including:

- identification of flora species present by walking the sites, including targeting declared rare and priority species indicated as potentially present
- confirming vegetation type using four 10 m x 10 m quadrats (PB) and 12 20 x 5 quadrats (PBT) installed across the sites. Longer quadrats were used due to the shape of the site (Figure 2)
- the assessment of vegetation condition
- using a GPS to map significant species and boundaries of differing vegetation types and condition
- the presence of any further threatened or priority listed flora species and/or ecological communities listed under the *Biodiversity and Conservation Act 2016* (WA) and/or the *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth).

The following were recorded for each quadrat:

- location
- vegetation description

- aspect
- habitat
- soil type and colour
- inundation
- leaf litter depth (cm) and cover (%)
- evidence of disturbance, including fire
- height of species
- species abundance
- percentage foliar cover of each species.

The flora and vegetation survey was carried out in accordance with *Technical Guidance- Flora and Vegetation Surveys for Environmental Impact Assessment* (Environmental Protection Authority, 2016). Samples were collected, or photographs taken of unfamiliar species to enable later identification.

3.3.1 Flora Species

Flora species were recorded on observation within each quadrat and when the remainder of the site was traversed, with the list of potential declared rare or priority flora species used to guide targeted searches for those species (Appendix 3).

3.3.2 Vegetation Type

The vegetation type was determined using the structural classes described in *Bush Forever Volume 2* (Government of Western Australia, 2000), and records dominant over storey, middle and understory species (Table 3).

Table 3: Vegetation structural classes

Life Form/Height Class	Canopy Percentage Cover			
	100 – 70%	**70 – 30%**	**30 – 10%**	**10 – 2 %**
Trees over 30 m	Tall closed forest	Tall open forest	Tall woodland	Tall open woodland
Trees 10 – 30 m	Closed forest	Open forest	Woodland	Open woodland
Trees under 10 m	Low closed forest	Low open forest	Low woodland	Low open woodland
Tree Mallee	Closed tree mallee	Tree mallee	Open tree mallee	Very open tree mallee
Shrub Mallee	Closed shrub mallee	Shrub mallee	Open shrub mallee	Very open shrub mallee
Shrubs over 2 m	Closed tall scrub	Tall open scrub	Tall shrubland	Tall open shrubland
Shrubs 1 – 2 m	Closed heath	Open heath	Shrubland	Open shrubland
Shrubs under 1 m	Closed low heath	Open low heath	Low shrubland	Low open shrubland
Grasses	Closed grassland	Grassland	Open grassland	Very open grassland
Herbs	Closed herbland	Herbland	Open herbland	Very open herbland
Sedges	Closed sedgeland	Sedgeland	Open sedgeland	Very open sedgeland

(Source: Government of Western Australia, 2000)

Statistical analysis using PRIMER was undertaken to proof the vegetation types assigned during the field visit. Abundance matrices were created, and a square root transformation assigned to prevent data skew from species with a high abundance. Resemblance matrices were created using the transformed data and a cluster analysis performed to visualise the similarities between quadrats. Quadrats that were more than 30% similar were classified as the same vegetation type.

Quadrats were also compared to the Gibson *et al.* dataset (1994) from *A Floristic Survey of the Southern Swan Coastal Plain* to assign comparable vegetation types. A Present/absent (PA) matrix was created for the Preston Beach quadrat data collected and the Gibson *et al*. (1994) dataset. Taxa names from Gibson *et al.* (1994) that were no longer current were updated to match current taxa names from the data collected. The P/A matrices were inputted into the statistical analysis package PRIMER (version 7) and resemblance matrices were created to determine the similarities in species composition between quadrats.

3.3.3 Vegetation Condition

Vegetation condition was assessed using the rating scale attributed to Keighery in *Bush Forever Volume 2* (Government of Western Australia, 2000). A Trimble GPS unit was used to differentiate the locations of the vegetation condition across the site and assist with mapping outcomes (Table 4).

Table 4: Vegetation condition ratings

Category		Description
1	Pristine	Pristine or nearly so, no obvious signs of disturbance.
2	Excellent	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species.
3	Very Good	Vegetation structure altered, obvious signs of disturbance. For example, disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.
4	Good	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. For example, disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and grazing.
5	Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. For example, disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.
6	Completely Degraded	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees or shrubs.

(Source: Government of Western Australia, 2000)

3.4 Limitations

The survey was carried out towards the end of the spring flora season, with annuals and geophytes potentially senescing and unable to be identified. Other limitations include:

- database searches only provide an indication of what flora species may be present, with on ground surveys required to confirm those present
- the differing databases are reliant on information submitted via various reporting mechanisms, so all records of a flora species or ecological community in a specified area may not be complete
- on-ground surveys indicate species present at the time of the assessment, with species flowering at different times are not always able to be identified
- not all species flower every year

Despite these limitations, Natural Area believes 80 – 90% of flora species were identified.

Figure 3:
Flora Quadrat Locations
Preston Beach

Client: Doyle Lime
Project: Flora and Fauna Survey 2017, Preston Beach
Image Source: Nearmap 2018
Prepared by: Harley Taylor 2018
Datum: GDA 94, Zone 50

4.0 Survey Results

4.1 Desktop Survey Results

4.1.1 Flora Species

NatureMap (DBCA 2017a) indicated the potential 203 dicotyledons (158 native and 45 introduced species), 78 monocotyledons (61 native and 17 introduced species) and one native Gymnosperm (*Macrozamia riedlei*) within a 7 km radius of the site (Appendix 1).

4.1.2 Significant Flora

A review of NatureMap indicated nine priority and one threatened flora species listed under the *Wildlife Conservation Act* 1950 (WA) as potentially occurring within 7 km of the site. A review of Protected Matters Search Tool (PMST) (Department of the Environment and Energy, 2017) indicated two vulnerable, five endangered, and one critically endangered flora species listed as matters of national environmental significance (MNES) under the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth), as potentially occurring, or having habitat occurring within 7 km of the site (Table 5; Appendix 2). The summary sheet of threatened flora and their likelihood of occurrence within the reserve is provided in Appendix 3 and a description of the various conservation codes in Appendix 4. A search of the DBCA threatened and priority flora database indicated 11 priority species have been previously recorded in the area including two species, *Hakea oligoneura* and *Hibbertia spicata* sp. *leptotheca*, which has been recorded 25 metres east from Lot 1002, and *Pimelea calcicola* and *Stylidium maritimum* which has been recorded 600 m to the east on Lake Pollard shoreline. Of the 21 conservation significant species listed, 13 were identified as having the potential to occur within the sites due to soil condition and species distribution; these are highlighted in Table 5.

Table 5: Significant flora listed by NatureMap, PMST, and DBCA database search

Scientific Name	Common Name	Cons Code	Nature -Map	PMST	DBCA
Andersonia gracilis	Slender Andersonia	EN		X	
Banksia nivea subsp. *uliginosa*	Swamp Honeypot	EN		X	
Caladenia huegelii	King Spider-Orchid	EN		X	
Carex tereticaulis		P3	X		
Conostylis pauciflora subsp. *pauciflora*		P4			X
Diuris micrantha	Dwarf Bee-orchid	VU		X	
Diuris purdiei	Purdie's Donkey Orchid	EN		X	
Drakaea elastica	Gloss-leafed Hammer-Orchid	EN		X	
Drakaea micrantha	Dwarf Hammer-Orchid	VU		X	
Eucalyptus argutifolia	Wabling Hill Mallee	T	X		X
Galium leptogonium		P3			X
Hakea oligoneura		P4	X		X

Scientific Name	Common Name	Cons Code	Nature -Map	PMST	DBCA
Haloragis scoparia		P1	X		X
Hibbertia spicata sp. *Leptotheca*		P3	X		X
Hydrocotyle sp. *Hamelinensis*		P2	X		X
Lasiopetalum membranaceum		P3	X		X
Pimelea calcicola		P3	X		X
Sphaerolobium calcicola		P3	X		X
Stylidium maritimum		P3	X		X
Synaphea sp. Fairbridge Farm	Selena's Synaphea	CR		X	
Synaphea stenoloba	Dwellingup Synaphea	EN		X	

4.1.3 Significant Fauna

A total of 75 conservation significant fauna were indicated to potentially occur on site, including threatened and priority species, and species otherwise protected under legislation and international agreements. NatureMap identified 32 conservation significant fauna species including one invertebrate, two reptiles, four mammal species, and 25 bird species. The PMST report outlined 64 species, 62 of which were birds. The DBCA database had records of 23 species in the local area, with five species recorded within the proposed clearing area (Table 6). The majority of the DBCA records of conservation significant fauna are from the surrounding wetland areas.

A review of the WALGA Environmental Planning Tool (2018) indicates the local area is a confirmed breeding and roosting area for Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*). Potential feeding areas are also located within the proposed clearing area and were assessed on site to determine if there is any evidence the site is being used for feeding, breeding and/or roosting.

Table 6: Conservation significant fauna species that may be present in the area. Highlighted species have been recorded within the proposed clearing area.

Scientific Name	Common Name	Cons Code	Nature -Map	PMST	DBCA
Birds					
Actitis hypoleucos	Common Sandpiper	IA	X	X	
Anous stolidus	Common Noddy	IA		X	
Anous tenuirostris melanops	Australian Lesser Noddy	VU		X	
Apus pacificus	Fork-tailed Swift	IA		X	
Ardea alba	Great Egret	IA		X	
Ardea ibis	Cattle Egret	IA		X	
Arenaria interpres	Ruddy Turnstone	IA	X	X	X
Botaurus poiciloptilus	Australasian Bittern	EN		X	
Calidris acuminata	Sharp-tailed Sandpiper	IA	X	X	X
Calidris alba	Sanderling	IA	X	X	X
Calidris canutus	Red Knot	EN		X	
Calidris ferruginea	Curlew Sandpiper	IA/CE	X	X	X
Calidris melanotos	Pectoral Sandpiper	IA		X	
Calidris ruficollis	Red-necked Stink	IA	X	X	X
Calidris subminuta	Long-toed Stint	IA	X	X	
Calidris tenuirostris	Great Knot	T/CE	X	X	X
Calyptorhynchus banksii naso	Forrest Red-tailed Black-Cockatoo	T/VU	X	X	
Calyptorhynchus baudinii	Baudin's Cockatoo	T/VU	X	X	X
Calyptorhynchus latirostris	Carnaby's Cockatoo	T/EN	X	X	X
Catharacta skua	Great Skua	IA		X	
Charadrius leschenaultii	Greater Sand Plover	VU	X	X	X
Charadrius mongolus	Lesser Sand Plover	IA/EN	X	X	
Diomedea amsterdamensis	Amsterdam Albatross	IA/EN		X	

Scientific Name	Common Name	Cons Code	Nature -Map	PMST	DBCA
Birds					
Diomedea dabbenena	Tristan Albatross	EN		X	
Diomedea epomophora	Southern Royal Albatross	IA/VU		X	
Diomedea exulans	Wandering Albatross	IA/VU		X	
Diomedea sanfordi	Northern Royal Albatross	EN		X	
Gallinago megala	Swinhoe's Snipe	IA		X	
Gallinago stenura	Pin-tailed Snipe	IA		X	
Gelochelidon nilotica	Gull-billed Tern	IA		X	
Halobaena caerulea	Blue Petrel	VU		X	
Hydrophone caspia	Caspian Tern	IA		X	
Leipoa ocellata	Malleefowl	VU		X	
Limosa falcinellus	Broad-billed Sandpiper	IA		X	
Limosa lapponica baueri	Bar-tailed Godwit	IA/VU		X	
Limosa lapponica menzbieri	Northern Siberian Bar-tailed Godwit	CE		X	
Limosa limosa	Black-tailed Godwit	IA		X	
Macronectes giganteus	Southern Giant-Petrel	IA/EN	X	X	
Macronectes halli	Northern Giant Petrel	VU		X	
Merops ornatus	Rainbow Bee-eater	IA	X		X
Motacilla cinerea	Grey Wagtail	IA		X	
Numenius madagascariensis	Eastern Curlew	IA/CE	X	X	X
Numenius minutus	Little Curlew	IA	X	X	
Numenius phaeopus	Whimbrel	IA		X	X
Oceanites oceanicus	Wilson's Storm Petrel	IA	X		X
Onychoprion anaethetus	Bridled Tern	IA		X	
Oxyura australis	Blue-billed Duck	P4	X		
Pandion haliaetus	Osprey	IA		X	
Pachyptila turtur subantarctica	Fairy Prion	VU		X	
Philomachus pugnax	Ruff	IA		X	
Phoebetria fusca	Sooty Albatross	IA/VU		X	
Pluvialis fulva	Pacific Golden Plover	IA	X	X	X
Pluvialis squatarola	Grey Plover	IA	X		X
Puffinus carneipes	Flesh-footed Shearwater	IA		X	
Rostratula australis	Australian Painted Snipe	EN		X	
Sternula nereis nereis	Australian Fairy Tern	VU		X	
Thalassarche chlororhynchos	Atlantic Yellow-nosed Albatross	IA/VU	X	X	X
Thalassarche cauta cauta	Shy Albatross	IA/VU		X	
Thalassarche cauta steadi	White-capped Albatross	VU		X	
Thalassarche impavida	Campbell Albatross	VU		X	
Thalassarche melanophris	Black-browed Albatross	IA/VU		X	
Thinornis rubricollis	Hooded plover	P4	X		X

Scientific Name	Common Name	Cons Code	Nature -Map	PMST	DBCA
Birds					
Tringa brevipes	Grey-tailed Tattler	IA	X	X	
Tringa glareola	Wood Sandpiper	IA		X	
Tringa nebularia	Common Greenshank	IA	X	X	X
Tringa stagnatilis	Marsh Sandpiper	IA		X	
Tringa totanus	Common Redshank	IA		X	
Invertebrates					
Synemon gratiosa	Graceful Sunmoth	P4	X		X
Mammals					
Dasyurus geoffroii	Western Quoll	T/VU	X	X	X
Isoodon obesulus fusciventer	Southern Brown Bandicoot	P4	X		X
Macropus irma	Western Brush Wallaby	P4	X		
Phascogale tapoatafa wambenger	South-western Brush-tailed Phascogale	CD			X
Pseudocheirus occidentalis	Western Ringtail Possum	T/VU	X	X	
Reptiles					
Ctenotus ora	Coastal Plains Skink	P3	X		X
Lerista lineata	Lined Skink	P3	X		

4.1.4 Threatened Ecological Communities

A review of the PMST (2017) report indicated the potential for three threatened ecological communities to occur within the survey area:

- Banksia Woodland of the Swan Coastal Plain – Endangered
- Sedgelands in Holocene dune swales of the southern Swan Coastal Plains – Endangered
- Thrombolite (microbialite) Community of a Coastal Brackish Lake (Lake Clifton) – Critically Endangered.

A review of the DBCA database search outlined four conservation significant ecosystems in the local area:

- Coastal Shrublands on Shallow Sands (SCP29a) – Priority 3 located ~ 1000 m west of the south end of Preston Beach Road North.
- Acacia Shrublands on Taller Dunes (SCP29b) – Priority 3 located ~ 800 m west of the proposed clearing area within Lot 1002.
- Sedgelands in the Holocene Dune Swales of the Southern Swan Coastal Plains (SCP19a) – Critically Endangered located ~ 1250 m west of the south end of Preston Beach Road North.
- Stromatolite like freshwater microbialite community of coastal brackish lakes (Clifton Lake) – Critically Endangered. The 5 km buffer encompasses all of the proposed clearing area.

A review of NationalMap indicated the presence of conservation category geomorphic wetlands in the local area:

- Lake Preston – >50 m from the proposed clearing area along Preston Beach North Road
- Martin's Tank Lake – ~300 m from the proposed clearing area along Preston Beach North Road
- Lake Pollard – ~600 m from the Lot 1002 clearing area
- Lake Yalgorup – ~ 800 m from the proposed clearing area along Preston Beach North Road

4.2 Field Survey Results

4.2.1 Flora Composition

Over the two sites a total of 109 flora species were recorded from 45 families, including 82 native and 27 introduced (weed) species. Of the flora species recorded, there was one Cycad (Cycadopsida), 27 Monocotyledons (Liliopsida) and 81 Dicotyledons (Magnoliopsida). Of these species 81 were recorded within quadrats and 28 were recorded whilst traversing the site. Examples of native flora recorded during the survey are provided in Figure 6. The flora list is provided in Appendix 5 and the quadrat data in Appendix 6.

4.2.2 Significant Flora

No evidence of significant flora was found during the survey.

Thysanotus arenarius (Fringe Lily)

Gompholobium confertum

Tricoryne elatior (Yellow Autumn Lily)

Melaleuca huegelii (Chenille Honeymyrtle)

Thomasia triphylla

Tripterococcus brunonis (Winged Stackhousia)

Figure 4: Examples of native flora

**Centaurium erythraea* (Common Centaury)

**Parentucellia latifolia* (Common Bartsia)

**Trachyandra divaricata*

Figure 5: Examples of introduced flora

4.2.3 Vegetation Type

Six vegetation types were determined during the field survey, with the dominate vegetation type Tuart and Peppermint Woodland which comprised 44.9%, or 16.8 ha of the area surveyed (Figure 6 and 7; Table 7). All other vegetation types occurred in small patches, with the total area of these vegetation types between 1.8 and 7.9 ha (Table 7).

Table 7: Vegetation type information

Vegetation Type	Description	Size	Photograph
Banksia Jarrah Woodland	*Banksia attenuata* and *Eucalyptus marginata* Woodland over *Xanthorrhoea preissii* shrubland and a weedy understory of *Trachyandra divaricata*	1.8 ha	
Eucalyptus decipiens Woodland	*Eucalyptus decipiens* Woodland over *Xanthorrhoea preissii* shrubland	6 ha	

Vegetation Type	Description	Size	Photograph
Tuart and Peppermint Woodland	*Eucalyptus gomphocephala* and *Agonis flexuosa* Woodland over *Spyridium globulosum* or *Xanthorrhoea preissii* shrubland	16.8 ha	
Coastal Shrubland	Shrubland of *Acacia cyclops*, *Melaleuca systena, Hibbertia racemosa* and *Spyridium globulosum* over a weedy understorey of *Trachyandra divaricata*	2.5 ha	
Grasstree Shrubland	Shrubland of *Xanthorrhoea preissii*, *Melaleuca systena* and *Banksia dallanneyi* over *Lepidosperma gladiatum* in the herb layer	7.6 ha	

Vegetation Type	Description	Size	Photograph
Trachyandra Herbland	herb layer of *Trachyandra divaricata, Euphorbia peplus*, *Crassula glomerata and Lysimachia arvensis*; *Eucalyptus gomphocephala* and *Agonis flexuosa* are associated with this vegetation type but comprise less than 2% of the canopy	2.7 ha	

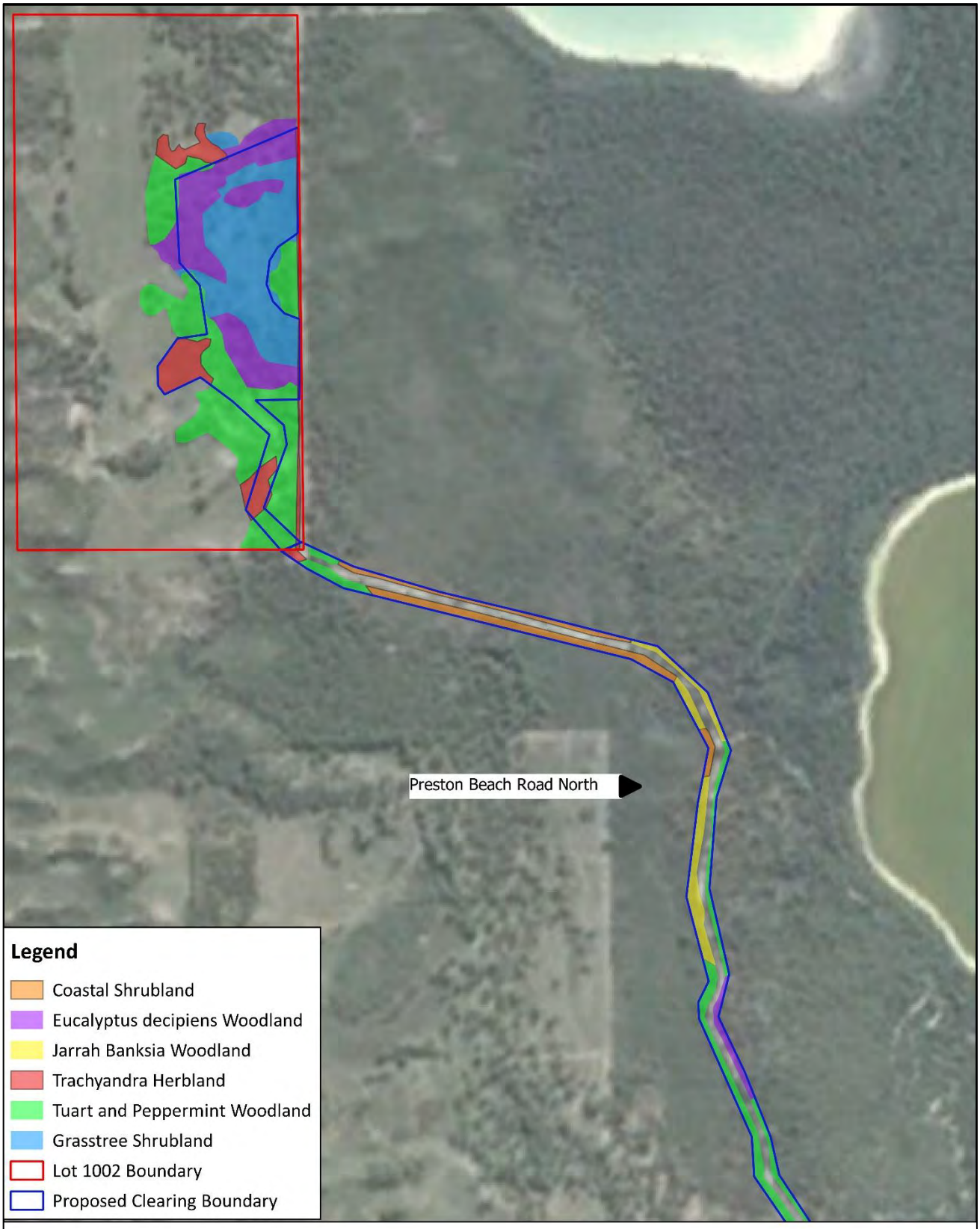

Figure 6: Vegetation Types Preston Beach (North)

Figure 7: Vegetation Types Preston Beach (South)

4.2.4 Vegetation Type Analysis

An analysis of the species composition of the quadrats indicates six different community types, based on a 30% similarity of species composition and abundance (Figure 8). A similarity of 30% was used as it was deemed to be a good representation of different community types for the data collected. Coastal Heath and Trachyandra Herbland have 39% species similarity and were therefore classified as one vegetation community in this analysis. Additionally, one quadrat, PBT11, which was classified as a tuart and peppermint woodland had a 23.5% similarity to other quadrats classified as the same vegetation type in the field assessment and was classified as a different vegetation type.

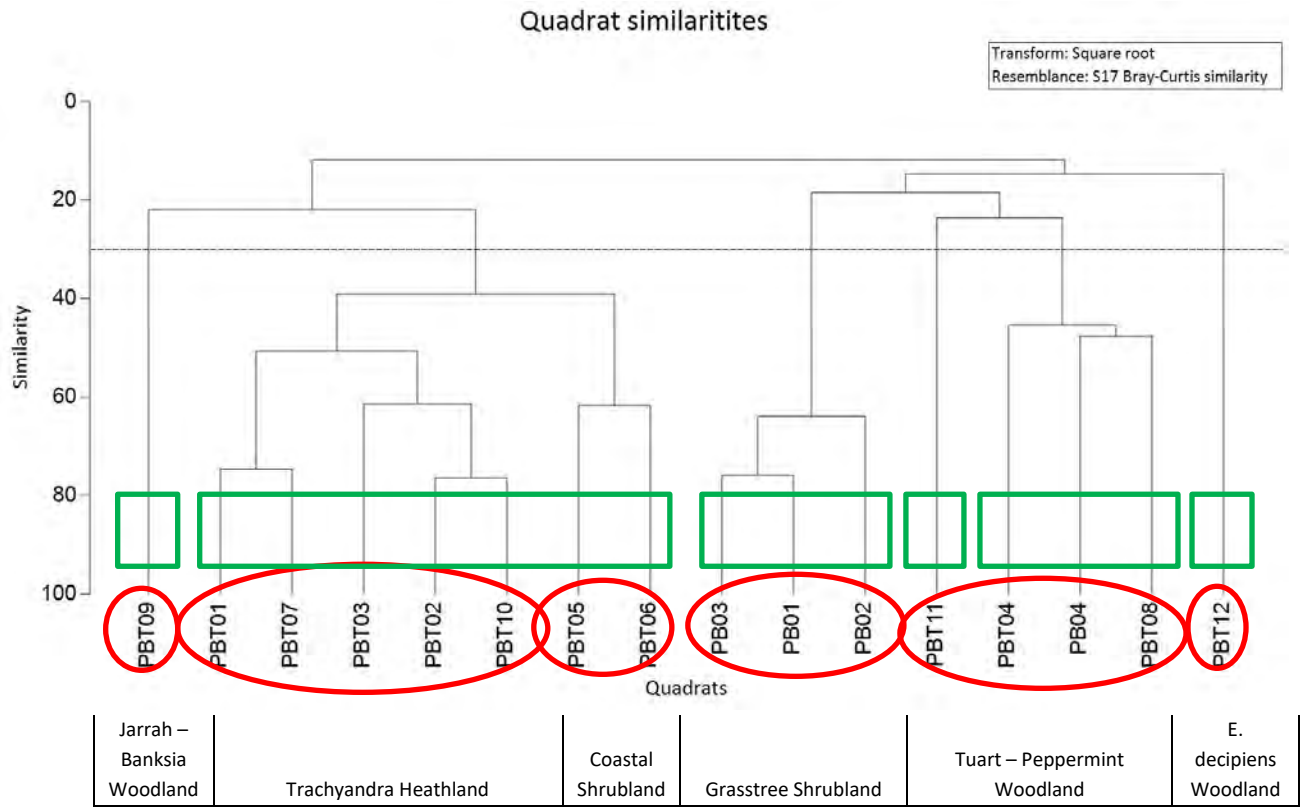

Figure 8: Similarities between quadrats – red circles indicate vegetation types assigned during field visit, green squares indicate vegetation types assigned based on grouping by 30% similarity in species composition and abundance.

The quadrats were also compared to the Floristic communities of the Swan Coastal Plain as outlined by Gibson *et al.* (1999). As data from this survey was presence/absence data rather than abundance, and the data collected at Preston Beach was transformed appropriately. There was a low similarity between the Preston Beach quadrats and quadrats from the Gibson dataset, with similarities ranging from 21 – 38%, and a mean of 26% (Table 8). Similarity of Preston Beach quadrats between each other was higher and ranged from 33 and 83%, (Appendix 7). The most similar quadrats from the Gibson dataset occurred in four vegetation community types:

- 24 – Northern Spearwood Shrubland
- 28 – Spearwood *Banksia attenuata* or *Banksia attenuata – Eucalyptus* woodlands
- 30a – *Callitris preissii* (or *Melaleuca lanceolata*) forests and woodlands
- 30c – Other mallees or scrubs (Figure 9; Table 8).

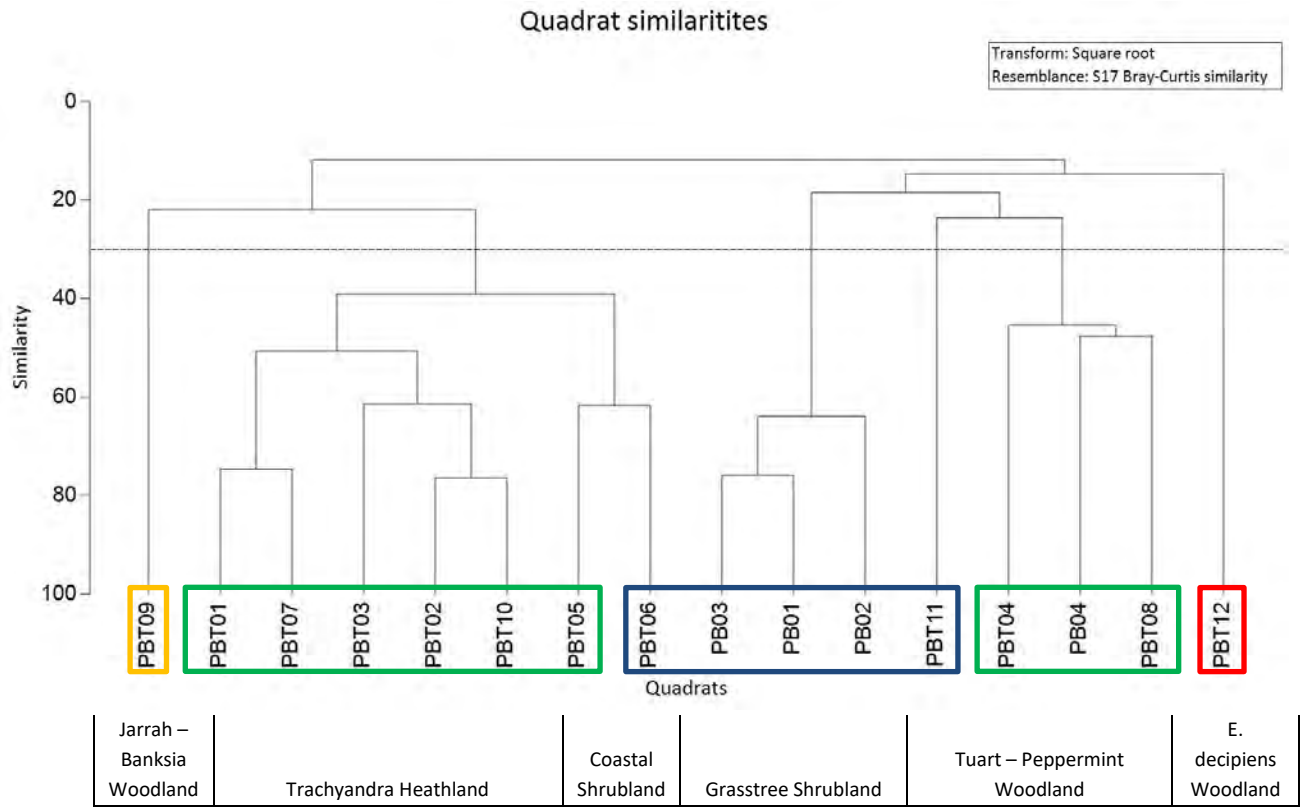

Figure 9: Classification of vegetation types based on analysis between Gibson *et al.* dataset and data collected: Yellow = SCP28, Green = SCP30a, Blue = SCP24, Red = SCP30c

Table 8: Gibson *et al.* quadrats that were most similar to quadrats within the Preston beach survey

Quadrat	Gibson quadrat	Similarity (%)	Community type associated with the Gibson quadrat
PBT1	WOODP-1	21	30a – *Callitris preissii* (or *Melaleuca lanceolata*) forests and woodlands
PBT2	WOODP-1	21	30a – *Callitris preissii* (or *Melaleuca lanceolata*) forests and woodlands
PBT3	WOODP-2	23	30a – *Callitris preissii* (or *Melaleuca lanceolata*) forests and woodlands
PBT4	GARDEN-1	34	30a – *Callitris preissii* (or *Melaleuca lanceolata*) forests and woodlands
PBT5	WOODP-2	23	30a – *Callitris preissii* (or *Melaleuca lanceolata*) forests and woodlands
PBT6	MTB-4	24	24 – Northern Spearwood shrublands and woodlands
PBT7	WOODP-1	22	30a – *Callitris preissii* (or *Melaleuca lanceolata*) forests and woodlands
PBT8	PEPGRV-2	36	30a – *Callitris preissii* (or *Melaleuca lanceolata*) forests and woodlands
PBT9	WOODV-2	24	28 – Spearwood *Banksia attenuata* or *Banksia attenuata* – *Eucalyptus* woodlands
PBT10	WOODP-1	22	30a – *Callitris preissii* (or *Melaleuca lanceolata*) forests and woodlands
PBT11	Cool 03	27	24 – Northern Spearwood shrublands and woodlands
PBT12	MHENRY-2	29	30c – Other mallees or scrubs
PB1	BOLD-3	23	24 – Northern Spearwood shrublands and woodlands
PB2	Cool 2	24	24 – Northern Spearwood shrublands and woodlands
PB3	Cool 2	26	24 – Northern Spearwood shrublands and woodlands
PB4	WOODP-1	38	30a – *Callitris preissii* (or *Melaleuca lanceolata*) forests and woodlands

4.2.5 Vegetation Condition

Vegetation condition ranged from Completely Degraded to Very Good (Table 9, Figure 10). The majority of the site was classified as Degraded or Completely Degraded (79%) with areas along Preston Beach Road North recording areas classified as Very Good.

Table 9: Vegetation condition

Vegetation Condition	Very Good	Good	Degraded	Completely Degraded	Total
Area (ha)	2.2	7.6	18.2	20.2	48.2
Area (%)	5	16	37	42	100

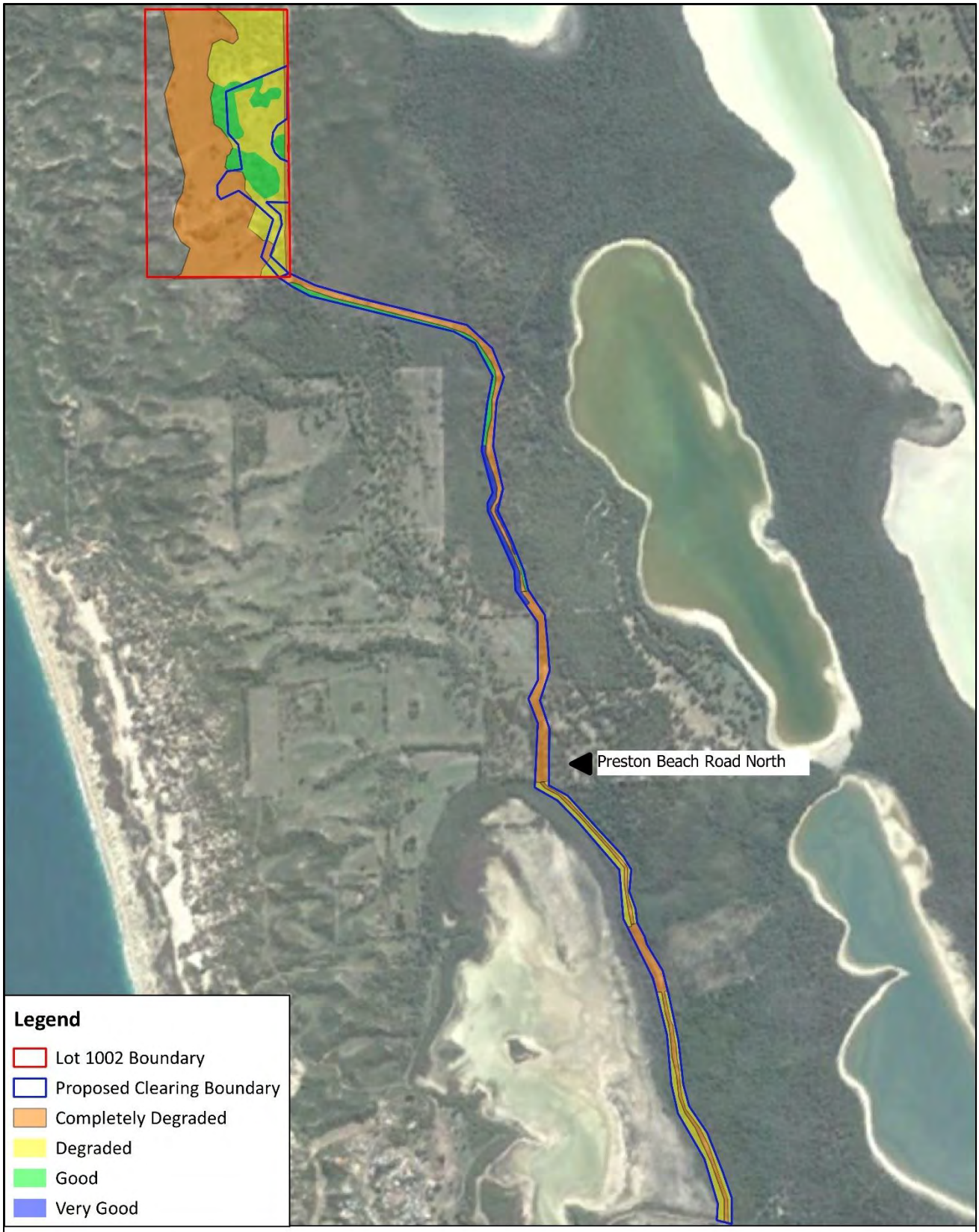

Figure 10: Vegetation Condition Preston Beach

4.2.6 Fauna

A total of 18 species of fauna were recorded opportunistically during the survey period (Figure 11). Of these six arthropods (insects and spiders), five birds, two mammals, and five reptile species were recorded; 14 of these species visually observed, scats/tracks of three species recorded and the call of one bird identified (Table 10).

One species sighted during the survey, Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*), is listed as Endangered under the EPBC Act (1999). The individual was flying over the proposed clearing area; no roosting or foraging was observed. Carnaby's Cockatoo is known to forage on Banksia Woodlands, there was a very small area of this vegetation community noted during the survey (Figure 7). Black Cockatoos are also known to forage on eucalyptus nuts although no evidence of feeding was noted within the survey area. There were some larger Tuart trees within Lot 1002 that may be used as roosting trees for Black Cockatoos, however no appropriate hollows for potential breeding were noted during the site assessment.

Table 10: Species recorded during the site visit

Common Name	Scientific Name	Type	Evidence
Bobtail	*Tiliqua rugosa rugosa*	Reptile	observed
Brown Butterfly	*Nymphalidae* (Family)	Arthropod	observed
Brown Honeyeater	*Lichmera indistincta*	Bird	observed
Carnaby's Black-Cockatoo	*Calyptorhynchus latirostris*	Bird	observed
Common Dwarf Skink	*Menetia greyii*	Reptile	observed
Emu	*Dromaius novaehollandiae*	Bird	scats
European Honey Bee	*Apis mellifera*	Arthropod	observed
Garden Orb-weaver	*Eriophora biapicata*	Arthropod	observed
Golden Whistler	*Pachycephala pectoralis*	Bird	calls
Heath Monitor	*Varanus rosenbergi*	Reptile	observed
Kangaroo Tick	*Amblyomma triguttatum triguttatum*	Arthropod	observed
King's Skink	*Egernia kingii*	Reptile	observed
Laughing Kookaburra	*Dacelo novaeguineae*	Bird	observed
Long-jawed Spider	*Tetragnathidae* (Family)	Arthropod	observed
March Fly	Tabanidae (Family)	Arthropod	observed
Rabbit	*Oryctolagus cuniculus*	Mammal	scats
Snake-eyed Skink	*Cryptoblepharus buchananii*	Reptile	observed
Western Grey Kangaroo	*Macropus fuliginosus*	Mammal	scats/tracks

Bobtail (*Tiliqua rugosa rugosa*)

Emu (*Dromaius novaehollandiae*) scat

Long-jawed spider (Tetragnathidae)

Garden Orb-weaver (*Eriophora biapicata*)

Brown Butterfly (Nymphalidae)

Heath Monitor (*Varanus rosenbergi*)

Figure 11: Example of fauna or evidence of fauna observed

5.0 Implication of Results

5.1 Flora and Vegetation

The survey recorded 109 flora species 27 of which were introduced (25%) species. Evidence of 18 fauna species was noted including one endangered species, Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*). The majority of vegetation on site was in Completely Degraded or Degraded condition.

The poor vegetation condition throughout the proposed clearing area may be due to several factors:

- a significant proportion of the site was located on the roadside, which has a history of disturbance and edge effects impacting the species composition and therefore vegetation condition
- there has been historical clearing, limestone mining, and grazing within Lot 1002 which has impacted vegetation condition.

Due to the relatively late timing of the survey (November) comparison to other datasets, such as the Gibson *et al.* (1999), may not be an accurate representation of the community type the quadrats most align with. As only presence/absence data is available for the Gibson dataset comparison was undertaken, which gives equal weighting to low density species, such as annual herbs, and dominant species. Annual herbs and geophytes may have senesced by late November, leading to a different species composition than in September/October when flora surveys are more typically undertaken. Similarly, species that are typically dominant in these community types can be missing and the quadrats still classed as that community type. For example, although nine of the 15 quadrats were classified as *Callitris preissii* (or *Melaleuca lanceolata*) forests and woodlands, none of these quadrats contained *Callitris preissii* or *Melaleuca lanceolata*. The quadrats recorded at Preston Beach did not have the dominant species needed to classify it as this vegetation type, however there are similarities in understory species to this community type and was classified accordingly.

5.2 Conservation Significant Fauna

5.2.1 Carnaby's Cockatoo

Of the 18 species of fauna observed, one is classified as conservation significant. A Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*) was sighted flying over the proposed clearing area. No evidence of feeding, roosting or nesting was noted, although several large tuart trees within Lot 1002 were noted as suitable for roosting.

The native vegetation extent remaining within the coastal region of the Shire of Waroona is high, with >40% of the vegetation type within the prosed clearing area uncleared (WALGA 2018). A large proportion of adjacent land is state or national parks that provide habitat for the threatened black cockatoos. Based on the small area of poor quality Tuart Woodland the clearing of the proposed area is not likely to have a significant impact on the Carnaby's Cockatoo population. Large tuart trees that provide potential roosting habitat for the Carnaby's Cockatoo should be retained where practicable.

5.2.2 Western Ringtail Possum

No evidence of the Western Ringtail Possum (*Pseudocheirus occidentalis*), either as a direct sighting or of indicators of its presence in the form of tracks, scats or dreys, was noted within the survey site boundary.

5.3 Threatened Ecological Communities

Nine quadrats were classified as *Callitris preissii* (or *Melaleuca lanceolata*) forests and woodlands when compared to the Gibson *et al.* (1999) dataset, which is classified as Vulnerable under the *Wildlife Conservation Act* (1950). These quadrats have similarities in species composition to this community, with coastal native species such as *Spyridium globulosum, Acanthocarpus preissii* and weed species such as *Trachyandra divaricata*. However, none of these quadrats contain either *C. preissii* or *M. lanceolata*, which are the defining characteristic of this community type, and therefore cannot be classified as this community type, and do not fall under legislative protection.

One quadrat was classified as a Banksia Jarrah Woodland in the field, and the comparison to the Gibson *et al.* dataset confirmed that the most similar community is SCP28 - Spearwood *Banksia attenuata* or *Banksia attenuata – Eucalyptus* woodlands. SCP28 community type falls into the Banksia Woodland of the Swan Coastal Plain, a community type classified as Priority 3 by the W.A. Government and Endangered under the EPBC Act 1999. However, the minimum patch size for national legislative protection is 2 ha for an area in Good condition, with the area of Banksia Woodland proposed to be cleared 1.8 ha. Therefore, the area is not protected under the EPBC Act 1999.

Tuart Woodlands of the Swan Coastal Plain is classified as a Priority 3 ecological community under the *Wildlife Conservation Act* 1950 (WA). With a large portion of the site (44.9%) comprising of Tuart and Peppermint Woodland. Tuart Woodlands has also been nominated to be considered a threatened ecological community by the Department of the Environment and Energy (DoEE) (Cwlth) in 2016, with the Minister's decision due in 2018. At the time of the report no decision had been reached. All patches of the Tuart woodland within the proposed quarry area are less than 0.5 ha and do not exceed the condition classes and patch size of 1 ha and will not require referral. This vegetation type is also present and dominant in the adjacent Yalgorup National Park.

One patch of Tuart Woodland on Preston Beach Road North that exceeds the 1 ha size limit at 1.3 ha for Very Good condition vegetation, however this area is to be cleared for widening of the road and it is unlikely that the patch surveyed would be cleared entirely. As the decision on listing under the EPBC is pending, it is possible that the listing decision is made prior to environmental approvals and other works being complete, meaning that referral to the DoEE may be required. If this community is listed by the time the application is being reviewed the exact clearing envelope for the road widening would need to be quantified, to determine if the area of Very Good Tuart Woodland exceeds the requirements for referral. It is recommended that extraction activities are minimised where practicable to do so in this vegetation type. Furthermore, it is also recommended that discussions occur with the relevant regulatory agencies to discuss the most appropriate mechanism(s) to preserve as much of this vegetation type as practicable.

The proposed clearing area falls within the 5 km buffer zone for the Clifton Lake Critically Endangered ecological community, stromatolite like freshwater microbialite community of coastal brackish lakes. The survey area occurs a minimum of 1,500 m from Lake Clifton itself, however three brackish lake occur closer, Lake Preston (>50 m from the proposed clearing area along Preston Beach North Road), Martin's Tank Lake (~300 m from the proposed clearing area along Preston Beach North Road), and Lake Pollard (~600 m from the Lot 1002 clearing area). These lakes are also classified as conservation category wetlands, however due to the distance from these ecological communities it is not likely that clearing will have an impact on this

threatened ecological community. Clearing of the west side of Preston Beach Road North near southern portion of the proposed clearing area should be minimised where possible due to its relatively close proximity to Lake Preston.

5.4 Clearing Principle Assessment

Clearing Principle		Assessment
Native vegetation should not be cleared if:		
a)	it comprises a high level of biological diversity	For the area surveyed, the species diversity was low, with 82 native species found over the ~48 ha of vegetation. There was no evidence of conservation significant flora or threatened ecological communities. Clearing not likely to be at variance to this Principle.
b)	it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia	May contain habitat for Carnaby's Black Cockatoo, but habitat is very poor compared to surrounding areas. Clearing not likely to be at variance to this Principle.
c)	it includes, or is necessary for the continued existence of, rare flora	No conservation significant flora was observed during the site visit. Clearing not likely to be at variance to this Principle.
d)	it comprises the whole or a part of, or is necessary for the maintenance of a threatened ecological community	Proposed clearing area is a sufficient distance from Lake Clifton stromatolite community and the area of Banksia Woodland to be cleared does not trigger the EPBC Act. If Tuart Woodlands nomination as a TEC is accepted than clearing may be at variance to this Principle.
e)	it is significant as a remnant of native vegetation in an area that has been extensively cleared	Vegetation condition of proposed clearing area was in a degraded condition, with vegetation in better condition in remnant vegetation nearby. Clearing not likely to be at variance to this Principle.
f)	it is growing in, or in association with, an environment associated with a watercourse or wetland	Proposed clearing area located >50 m from brackish lakes. None of the vegetation types were associated with wetlands or watercourses and it is not riparian vegetation. Clearing not likely to be at variance to this Principle.
g)	the clearing of the vegetation is likely to cause appreciable land degradation	As previous land uses included grazing and limestone mining, vegetation condition is mainly in a degraded condition. No watercourses or wetland areas are present, and the area to be cleared is limited, meaning that there is little potential for water or wind erosion. Clearing not likely to be at variance to this Principle.
h)	the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area	As the area within lot 1002 has previously undergone clearing, grazing and mining, the proposed clearing is not likely to impact adjacent vegetation further afield. Road widening is not likely to have an appreciable impact on vegetation.

Clearing Principle		Assessment
		Clearing not likely to be at variance to this Principle.
i)	the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water	There is a minimum of 50 m between the edge of wetlands to proposed clearing areas and thus are unlikely to be impacted by clearing. Clearing not likely to be at variance to this Principle.
j)	the clearing of the vegetation is likely to cause, or exacerbate, the incidence or intensity of flooding.	The proposed clearing area is within a low-lying area, with coastal lakes located nearby. Due to the location in the landscape, extent of clearing, and vegetation type to be cleared it is unlikely that clearing will have an impact on flooding incidents. Clearing not likely to be at variance to this Principle.

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Appendix 1: NatureMap Report

NatureMap
Mapping Western Australia's biodiversity

NatureMap Species Report

Created By Guest user on 11/10/2017

Current Names Only	Yes
Core Datasets Only	Yes
Method	'By Circle'
Centre	115° 39' 02" E,32° 49' 43" S
Buffer	7km
Group By	Species Group

Species Group	Species	Records
Alga	2	2
Amphibian	4	55
Bird	132	3476
Bryopsid (Moss)	1	1
Dicotyledon	203	351
Fish	4	4
Fungus	2	3
Gymnosperm	1	1
Invertebrate	11	67
Mammal	11	39
Monocotyledon	78	113
Reptile	19	51
Slime Mould	1	1
TOTAL	**469**	**4164**

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Alga					
1.		*Cladophora rhizoclonioidea*			
2.	27331	*Thuretia quercifolia*			
Amphibian					
3.	25400	*Crinia insignifera (Squelching Froglet)*			
4.	25415	*Limnodynastes dorsalis (Western Banjo Frog)*			
5.	25378	*Litoria adelaidensis (Slender Tree Frog)*			
6.	25388	*Litoria moorei (Motorbike Frog)*			
Bird					
7.	24260	*Acanthiza apicalis (Broad-tailed Thornbill, Inland Thornbill)*			
8.	24261	*Acanthiza chrysorrhoa (Yellow-rumped Thornbill)*			
9.	24262	*Acanthiza inornata (Western Thornbill)*			
10.	24560	*Acanthorhynchus superciliosus (Western Spinebill)*			
11.	25535	*Accipiter cirrocephalus (Collared Sparrowhawk)*			
12.	25536	*Accipiter fasciatus (Brown Goshawk)*			
13.	25755	*Acrocephalus australis (Australian Reed Warbler)*			
14.	41323	*Actitis hypoleucos (Common Sandpiper)*		IA	
15.	25544	*Aegotheles cristatus (Australian Owlet-nightjar)*			
16.	24310	*Anas castanea (Chestnut Teal)*			
17.	24312	*Anas gracilis (Grey Teal)*			
18.	24315	*Anas rhynchotis (Australasian Shoveler)*			
19.	24316	*Anas superciliosa (Pacific Black Duck)*			
20.	24561	*Anthochaera carunculata (Red Wattlebird)*			
21.	24562	*Anthochaera lunulata (Western Little Wattlebird)*			
22.	24285	*Aquila audax (Wedge-tailed Eagle)*			
23.	24340	*Ardea novaehollandiae (White-faced Heron)*			
24.	24341	*Ardea pacifica (White-necked Heron)*			
25.	25736	*Arenaria interpres (Ruddy Turnstone)*		IA	
26.	25566	*Artamus cinereus (Black-faced Woodswallow)*			
27.	24353	*Artamus cyanopterus (Dusky Woodswallow)*			
28.	24318	*Aythya australis (Hardhead)*			
29.		*Barnardius zonarius*			
30.	24319	*Biziura lobata (Musk Duck)*			
31.	25598	*Cacomantis flabelliformis (Fan-tailed Cuckoo)*			
32.	42307	*Cacomantis pallidus (Pallid Cuckoo)*			
33.	24779	*Calidris acuminata (Sharp-tailed Sandpiper)*		IA	

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
34.	24780	*Calidris alba (Sanderling)*		IA	
35.	24784	*Calidris ferruginea (Curlew Sandpiper)*		T	
36.	24788	*Calidris ruficollis (Red-necked Stint)*		IA	
37.	24790	*Calidris tenuirostris (Great Knot)*		T	
38.	24731	*Calyptorhynchus banksii subsp. naso (Forest Red-tailed Black-Cockatoo)*		T	
39.	24733	*Calyptorhynchus baudinii (Baudin's Cockatoo (long-billed black-cockatoo), Baudin's Cockatoo)*		T	
40.	24734	*Calyptorhynchus latirostris (Carnaby's Cockatoo (short-billed black-cockatoo), Carnaby's Cockatoo)*		T	
41.	48400	*Calyptorhynchus sp. (white-tailed black cockatoo)*		T	
42.	25575	*Charadrius leschenaultii (Greater Sand Plover)*		IA	
43.	24377	*Charadrius ruficapillus (Red-capped Plover)*			
44.	24321	*Chenonetta jubata (Australian Wood Duck, Wood Duck)*			
45.		*Chroicocephalus novaehollandiae*			
46.	24288	*Circus approximans (Swamp Harrier)*			
47.	24774	*Cladorhynchus leucocephalus (Banded Stilt)*			
48.	25675	*Colluricincla harmonica (Grey Shrike-thrush)*			
49.	25568	*Coracina novaehollandiae (Black-faced Cuckoo-shrike)*			
50.	25592	*Corvus coronoides (Australian Raven)*			
51.	25701	*Coturnix ypsilophora (Brown Quail)*			
52.	25595	*Cracticus tibicen (Australian Magpie)*			
53.	25596	*Cracticus torquatus (Grey Butcherbird)*			
54.	24322	*Cygnus atratus (Black Swan)*			
55.	30901	*Dacelo novaeguineae (Laughing Kookaburra)*	Y		
56.	25673	*Daphoenositta chrysoptera (Varied Sittella)*			
57.	24470	*Dromaius novaehollandiae (Emu)*			
58.		*Egretta novaehollandiae*			
59.	47937	*Elseyornis melanops (Black-fronted Dotterel)*			
60.		*Eolophus roseicapillus*			
61.	24567	*Epthianura albifrons (White-fronted Chat)*			
62.	24379	*Erythrogonys cinctus (Red-kneed Dotterel)*			
63.	24368	*Eurostopodus argus (Spotted Nightjar)*			
64.	25622	*Falco cenchroides (Australian Kestrel, Nankeen Kestrel)*			
65.	25727	*Fulica atra (Eurasian Coot)*			
66.	24761	*Fulica atra subsp. australis (Eurasian Coot)*			
67.	24763	*Gallinula tenebrosa subsp. tenebrosa (Dusky Moorhen)*			
68.	47954	*Gelochelidon nilotica (Gull-billed Tern)*		IA	
69.	25530	*Gerygone fusca (Western Gerygone)*			
70.	24443	*Grallina cyanoleuca (Magpie-lark)*			
71.	24295	*Haliastur sphenurus (Whistling Kite)*			
72.	47965	*Hieraaetus morphnoides (Little Eagle)*			
73.	25734	*Himantopus himantopus (Black-winged Stilt)*			
74.	24491	*Hirundo neoxena (Welcome Swallow)*			
75.		*Hydroprogne caspia*			
76.	24511	*Larus novaehollandiae subsp. novaehollandiae (Silver Gull)*			
77.	25638	*Larus pacificus (Pacific Gull)*			
78.	25661	*Lichmera indistincta (Brown Honeyeater)*			
79.		*Lophoictinia isura*			
80.	24690	*Macronectes giganteus (Southern Giant Petrel)*		IA	
81.	24326	*Malacorhynchus membranaceus (Pink-eared Duck)*			
82.	25654	*Malurus splendens (Splendid Fairy-wren)*			
83.	25758	*Megalurus gramineus (Little Grassbird)*			
84.	24598	*Merops ornatus (Rainbow Bee-eater)*		IA	
85.		*Microcarbo melanoleucos*			
86.	24738	*Neophema elegans (Elegant Parrot)*			
87.	24798	*Numenius madagascariensis (Eastern Curlew)*		T	
88.	25742	*Numenius phaeopus (Whimbrel)*		IA	
89.	24497	*Oceanites oceanicus (Wilson's Storm Petrel)*		IA	
90.	24407	*Ocyphaps lophotes (Crested Pigeon)*			
91.	24328	*Oxyura australis (Blue-billed Duck)*		P4	
92.	25680	*Pachycephala rufiventris (Rufous Whistler)*			
93.	24692	*Pachyptila belcheri (Slender-billed Prion)*			
94.	24693	*Pachyptila desolata (Antarctic Prion)*			
95.	25707	*Pachyptila salvini (Salvin's Prion)*			
96.	25681	*Pardalotus punctatus (Spotted Pardalote)*			
97.	25682	*Pardalotus striatus (Striated Pardalote)*			
98.	24648	*Pelecanus conspicillatus (Australian Pelican)*			
99.	48060	*Petrochelidon ariel (Fairy Martin)*			
100.	48061	*Petrochelidon nigricans (Tree Martin)*			
101.	48066	*Petroica boodang (Scarlet Robin)*			

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102.	24659	*Petroica goodenovii (Red-capped Robin)*			
103.	25697	*Phalacrocorax carbo (Great Cormorant)*			
104.	25698	*Phalacrocorax melanoleucos (Little Pied Cormorant)*			
105.	24667	*Phalacrocorax sulcirostris (Little Black Cormorant)*			
106.	25699	*Phalacrocorax varius (Pied Cormorant)*			
107.	24409	*Phaps chalcoptera (Common Bronzewing)*			
108.	25587	*Phaps elegans (Brush Bronzewing)*			
109.	48071	*Phylidonyris niger (White-cheeked Honeyeater)*			
110.	24596	*Phylidonyris novaehollandiae (New Holland Honeyeater)*			
111.	24841	*Platalea flavipes (Yellow-billed Spoonbill)*			
112.	24382	*Pluvialis fulva (Pacific Golden Plover)*		IA	
113.	24383	*Pluvialis squatarola (Grey Plover)*		IA	
114.	25703	*Podargus strigoides (Tawny Frogmouth)*			
115.	24679	*Podargus strigoides subsp. brachypterus (Tawny Frogmouth)*			
116.	25704	*Podiceps cristatus (Great Crested Grebe)*			
117.	24681	*Poliocephalus poliocephalus (Hoary-headed Grebe)*			
118.	25722	*Polytelis anthopeplus (Regent Parrot)*			
119.	24767	*Porphyrio porphyrio subsp. bellus (Purple Swamphen)*			
120.	24771	*Porzana tabuensis (Spotless Crake)*			
121.		*Purpureicephalus spurius*			
122.	24776	*Recurvirostra novaehollandiae (Red-necked Avocet)*			
123.	48096	*Rhipidura albiscapa (Grey Fantail)*			
124.	25614	*Rhipidura leucophrys (Willie Wagtail)*			
125.	25534	*Sericornis frontalis (White-browed Scrubwren)*			
126.	30948	*Smicrornis brevirostris (Weebill)*			
127.	25705	*Tachybaptus novaehollandiae (Australasian Grebe, Black-throated Grebe)*			
128.	24682	*Tachybaptus novaehollandiae subsp. novaehollandiae (Australasian Grebe, Black-throated Grebe)*			
129.	24331	*Tadorna tadornoides (Australian Shelduck, Mountain Duck)*			
130.	34007	*Thalassarche chlororhynchos (Atlantic Yellow-nosed Albatross)*		T	
131.		*Thalasseus bergii*			
132.	48135	*Thinornis rubricollis (Hooded Plover, Hooded Dotterel)*		P4	
133.	24845	*Threskiornis spinicollis (Straw-necked Ibis)*			
134.	25549	*Todiramphus sanctus (Sacred Kingfisher)*			
135.	24803	*Tringa brevipes (Grey-tailed Tattler)*		IA	
136.	24808	*Tringa nebularia (Common Greenshank, greenshank)*		IA	
137.	24386	*Vanellus tricolor (Banded Lapwing)*			
138.	25765	*Zosterops lateralis (Grey-breasted White-eye, Silvereye)*			
Bryopsid (Moss)					
139.	32315	*Barbula calycina*			
Dicotyledon					
140.	3262	*Acacia cochlearis (Rigid Wattle)*			
141.	3374	*Acacia huegelii*			
142.	3409	*Acacia lasiocarpa (Panjang)*			
143.	3502	*Acacia pulchella (Prickly Moses)*			
144.	15483	*Acacia pulchella var. pulchella*			
145.	3525	*Acacia rostellifera (Summer-scented Wattle)*			
146.	3527	*Acacia saligna (Orange Wattle, Kudjong)*			
147.	30036	*Acacia saligna subsp. stolonifera*			
148.	3584	*Acacia truncata*			
149.	3602	*Acacia willdenowiana (Grass Wattle)*			
150.	4582	*Adriana quadripartita (Bitter Bush)*			
151.	5316	*Agonis flexuosa (Peppermint, Wonil)*			
152.	1728	*Allocasuarina fraseriana (Sheoak, Kondil)*			
153.	7833	*Angianthus preissianus*			
154.	11725	*Anthocercis ilicifolia subsp. ilicifolia*			
155.	7838	*Arctotheca calendula (Cape Weed, African Marigold)*	Y		
156.	7851	*Asteridea pulverulenta (Common Bristle Daisy)*			
157.	6323	*Astroloma ciliatum (Candle Cranberry)*			
158.	6331	*Astroloma microcalyx (Native Cranberry)*			
159.	1800	*Banksia attenuata (Slender Banksia, Piara)*			
160.	32580	*Banksia dallanneyi var. dallanneyi*			
161.	1822	*Banksia ilicifolia (Holly-leaved Banksia)*			
162.	32077	*Banksia sessilis var. cygnorum*			
163.	15037	*Bartsia trixago*	Y		
164.	3165	*Billardiera variifolia*			
165.	3710	*Bossiaea eriocarpa (Common Brown Pea)*			
166.	7878	*Brachyscome iberidifolia*			
167.	2845	*Calandrinia brevipedata (Short-stalked Purslane)*			

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168.	2854	*Calandrinia granulifera (Pygmy Purslane)*			
169.	7909	*Carduus pycnocephalus (Slender Thistle)*	Y		
170.	2796	*Carpobrotus modestus (Inland Pigface)*			
171.	2951	*Cassytha flava (Dodder Laurel)*			
172.	2952	*Cassytha glabella (Tangled Dodder Laurel)*			
173.	11799	*Cassytha racemosa forma racemosa*			
174.	7916	*Centaurea melitensis (Maltese Cockspur, Malta Thistle)*	Y		
175.	7918	*Centipeda cunninghamii (Common Sneezewood, Gukwonderuk, Old Man Weed)*			
176.	7366	*Centranthus macrosiphon*	Y		
177.	2889	*Cerastium glomeratum (Mouse Ear Chickweed)*	Y		
178.	2491	*Chenopodium macrospermum*	Y		
179.	2494	*Chenopodium murale (Nettle-leaf Goosefoot)*	Y		
180.	10804	*Clematis linearifolia*			
181.	4564	*Comesperma virgatum (Milkwort)*			
182.	1885	*Conospermum triplinervium (Tree Smokebush)*			
183.	6348	*Conostephium pendulum (Pearl Flower)*			
184.	6349	*Conostephium preissii*			
185.	42009	*Craspedia sp. Yalgorup National Park (G.J. Keighery 14449)*			
186.	3137	*Crassula colorata (Dense Stonecrop)*			
187.	3140	*Crassula glomerata*	Y		
188.	4802	*Cryptandra mutila*			
189.	7454	*Dampiera linearis (Common Dampiera)*			
190.	7484	*Dampiera trigona (Angled-stem Dampiera)*			
191.	6218	*Daucus glochidiatus (Australian Carrot)*			
192.	18541	*Diplopeltis huegelii subsp. huegelii*			
193.	7054	*Dischisma arenarium*	Y		
194.	7961	*Dittrichia graveolens (Stinkwort)*	Y		
195.	4754	*Dodonaea aptera (Coast Hop-bush)*			
196.	3095	*Drosera erythrorhiza (Red Ink Sundew)*			
197.	3118	*Drosera pallida (Pale Rainbow)*			
198.	3131	*Drosera stolonifera (Leafy Sundew)*			
199.	4332	*Erodium botrys (Long Storksbill)*	Y		
200.	4333	*Erodium cicutarium (Common Storksbill)*	Y		
201.	13091	*Eucalyptus argutifolia (Wabling Hill Mallee)*		T	
202.	5615	*Eucalyptus decipiens (Limestone Marlock, Moit)*			
203.	5649	*Eucalyptus foecunda (Narrow-leaved Red Mallee)*			
204.	5659	*Eucalyptus gomphocephala (Tuart, Duart)*			
205.	5708	*Eucalyptus marginata (Jarrah, Djara)*			
206.	13541	*Eucalyptus petrensis*			
207.	5763	*Eucalyptus rudis (Flooded Gum, Kulurda)*			
208.	4648	*Euphorbia terracina (Geraldton Carnation Weed)*	Y		
209.	10765	*Exocarpos sparteus (Broom Ballart, Djuk)*			
210.	7323	*Galium murale (Small Goosegrass)*	Y		
211.	4339	*Geranium molle (Dove's Foot Cranesbill)*	Y		
212.	4340	*Geranium retrorsum*			
213.	6587	*Gomphocarpus fruticosus (Narrowleaf Cottonbush)*	Y		
214.	10909	*Gompholobium confertum*			
215.	11083	*Gompholobium scabrum*			
216.	3957	*Gompholobium tomentosum (Hairy Yellow Pea)*			
217.	15839	*Grevillea preissii subsp. preissii*			
218.	35502	*Hakea oligoneura*		P4	
219.	2197	*Hakea prostrata (Harsh Hakea)*			
220.	2203	*Hakea ruscifolia (Candle Hakea)*			
221.	2214	*Hakea trifurcata (Two-leaf Hakea)*			
222.	6178	*Haloragis scoparia*		P1	
223.	3961	*Hardenbergia comptoniana (Native Wisteria)*			
224.	3016	*Heliophila pusilla*	Y		
225.	16933	*Hemiandra glabra*			
226.	6839	*Hemiandra pungens (Snakebush)*			
227.	38320	*Hemiandra sp. Jurien (B.J. Conn & M.E. Tozer BJC 3885)*			
228.	5135	*Hibbertia hypericoides (Yellow Buttercups)*			
229.	5162	*Hibbertia racemosa (Stalked Guinea Flower)*			
230.	11461	*Hibbertia spicata subsp. leptotheca*		P3	
231.	5176	*Hibbertia vaginata*			
232.	9051	*Homalanthus novo-guineensis*			
233.	6222	*Homalosciadium homalocarpum*			
234.	12859	*Hovea trisperma var. trisperma*			
235.	5216	*Hybanthus calycinus (Wild Violet)*			
236.	6226	*Hydrocotyle callicarpa (Small Pennywort)*			
237.	6229	*Hydrocotyle diantha*			

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238.	6232	*Hydrocotyle hispidula*			
239.	6234	*Hydrocotyle medicaginoides (Trefoil Pennywort)*			
240.	6236	*Hydrocotyle pilifera*			
241.	6240	*Hydrocotyle scutellifera*			
242.	41802	*Hydrocotyle sp. Hamelinensis (G.J. Keighery s.n. PERTH 02391325)*		P2	
243.	6241	*Hydrocotyle tetragonocarpa*			
244.	5825	*Hypocalymma robustum (Swan River Myrtle)*			
245.	8086	*Hypochaeris glabra (Smooth Catsear)*	Y		
246.	7396	*Isotoma hypocrateriformis (Woodbridge Poison)*			
247.	3992	*Isotropis cuneifolia (Granny Bonnets)*			
248.	4012	*Jacksonia furcellata (Grey Stinkwood)*			
249.	4017	*Jacksonia horrida*			
250.	4029	*Jacksonia sternbergiana (Stinkwood, Kapur)*			
251.	37960	*Kennedia coccinea subsp. calcaria*			
252.	4044	*Kennedia prostrata (Scarlet Runner)*			
253.	5038	*Lasiopetalum membranaceum*		P3	
254.	44490	*Leontodon rhagadioloides*	Y		
255.	2342	*Leptomeria cunninghamii*			
256.	5850	*Leptospermum laevigatum (Coast Teatree)*	Y		
257.	6427	*Leucopogon parviflorus (Coast Beard-heath)*			
258.	6436	*Leucopogon propinquus*			
259.	7408	*Lobelia tenuior (Slender Lobelia)*			
260.	6515	*Logania vaginalis (White Spray)*			
261.	4066	*Lupinus cosentinii*	Y		
262.	36375	*Lysimachia arvensis (Pimpernel)*	Y		
263.	34676	*Meionectes brownii (Swamp Raspwort)*			
264.	5920	*Melaleuca huegelii (Chenille Honeymyrtle)*			
265.	5922	*Melaleuca lanceolata (Rottnest Teatree, Moonah)*			
266.	18598	*Melaleuca systena*			
267.	5980	*Melaleuca thymoides*			
268.	5987	*Melaleuca viminea (Mohan)*			
269.	4516	*Melia azedarach (White Cedar)*			
270.	4084	*Melilotus albus*	Y		
271.	4085	*Melilotus indicus*	Y		
272.	6883	*Mentha pulegium (Pennyroyal)*	Y		
273.	8105	*Millotia myosotidifolia*			
274.	8106	*Millotia tenuifolia (Soft Millotia)*			
275.	7289	*Myoporum caprarioides (Slender Myoporum)*			
276.	8127	*Olearia axillaris (Coastal Daisybush)*			
277.	8149	*Olearia rudis (Rough Daisybush)*			
278.	7348	*Opercularia hispidula (Hispid Stinkweed)*			
279.	18255	*Opercularia vaginata (Dog Weed)*			
280.	36177	*Ornduffia albiflora*			
281.	4113	*Ornithopus compressus (Yellow Serradella)*	Y		
282.	4355	*Oxalis perennans*			
283.	4356	*Oxalis pes-caprae (Soursob)*	Y		
284.	7089	*Parentucellia latifolia (Common Bartsia)*	Y		
285.	7090	*Parentucellia viscosa (Sticky Bartsia)*	Y		
286.	1762	*Parietaria debilis (Pellitory)*			
287.	4343	*Pelargonium capitatum (Rose Pelargonium)*	Y		
288.	4346	*Pelargonium littorale*			
289.	11020	*Persicaria hydropiper*			
290.	2273	*Persoonia saccata (Snottygobble)*			
291.	2299	*Petrophile linearis (Pixie Mops)*			
292.	19825	*Petrorhagia dubia*	Y		
293.	4675	*Phyllanthus calycinus (False Boronia)*			
294.	2793	*Phytolacca octandra (Red Ink Plant)*	Y		
295.	5237	*Pimelea calcicola*		P3	
296.	7303	*Plantago lanceolata (Ribwort Plantain)*	Y		
297.	8177	*Podolepis lessonii*			
298.	8182	*Podotheca angustifolia (Sticky Longheads)*			
299.	8188	*Pogonolepis stricta*			
300.	4691	*Poranthera microphylla (Small Poranthera)*			
301.	8195	*Quinetia urvillei*			
302.	2932	*Ranunculus colonorum (Common Buttercup)*			
303.	2935	*Ranunculus pumilio (Smallflower Buttercup)*			
304.	19183	*Retama raetam*	Y		
305.	18547	*Rhadinothamnus anceps*			
306.	11341	*Rhagodia baccata subsp. baccata*			
307.	13300	*Rhodanthe citrina*			

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308.	2906	*Sagina apetala (Annual Pearlwort)*	Y		
309.	6483	*Samolus junceus*			
310.	7595	*Scaevola anchusifolia*			
311.	7606	*Scaevola crassifolia (Thick-leaved Fan-flower)*			
312.	13152	*Scaevola thesioides subsp. thesioides*			
313.	20161	*Senecio pinnatifolius*			
314.	7362	*Sherardia arvensis (Field Madder)*	Y		
315.	2909	*Silene gallica (French Catchfly)*	Y		
316.	15972	*Silene gallica var. gallica*	Y		
317.	7022	*Solanum nigrum (Black Berry Nightshade)*	Y		
318.	8231	*Sonchus oleraceus (Common Sowthistle)*	Y		
319.	20348	*Sphaerolobium calcicola*		P3	
320.	4828	*Spyridium globulosum (Basket Bush)*			
321.	2918	*Stellaria media (Chickweed)*	Y		
322.	19403	*Stenopetalum gracile*			
323.	7696	*Stylidium calcaratum (Book Triggerplant)*			
324.	7699	*Stylidium carnosum (Fleshy-leaved Triggerplant)*			
325.	7745	*Stylidium junceum (Reed Triggerplant)*			
326.	13127	*Stylidium maritimum*		P3	
327.	7774	*Stylidium piliferum (Common Butterfly Triggerplant)*			
328.	7798	*Stylidium schoenoides (Cow Kicks)*			
329.	4256	*Templetonia retusa (Cockies Tongues)*			
330.	2791	*Tersonia cyathiflora (Button Creeper)*			
331.	5105	*Thomasia triphylla*			
332.	2644	*Threlkeldia diffusa (Coast Bonefruit)*			
333.	6266	*Trachymene coerulea (Blue Lace Flower)*			
334.	19041	*Trachymene coerulea subsp. coerulea*			
335.	6280	*Trachymene pilosa (Native Parsnip)*			
336.	4383	*Tribulus terrestris (Caltrop)*	Y		
337.	4292	*Trifolium campestre (Hop Clover)*	Y		
338.	11665	*Trymalium ledifolium var. ledifolium*			
339.	8255	*Ursinia anthemoides (Ursinia)*	Y		
340.	7109	*Veronica calycina (Cup Speedwell)*			
341.	7389	*Wahlenbergia preissii*			
342.	6289	*Xanthosia huegelii*			
Fish					
343.		*Cynoglossus broadhursti*			
344.		*Eubalichthys caeruleoguttatus*			
345.		*Pegasus volitans*			
346.		*Pseudogobius olorum*			
Fungus					
347.		*Peziza austrogeaster*			
348.		*Punctularia strigosozonata*			
Gymnosperm					
349.	85	*Macrozamia riedlei (Zamia, Djiridji)*			
Invertebrate					
350.		*Aname mainae*			
351.		*Artoria linnaei*			
352.		*Calamoecia clitellata*			
353.		*Candonopsis tenuis*			
354.		*Cypretta baylyi*			
355.		*Cyprideis australiensis*			
356.		*Ethmostigmus rubripes*			
357.		*Leptocythere sp. 385*			Y
358.		*Mytilocypris mytiloides*			
359.		*Nicodamus mainae*			
360.	33992	*Synemon gratiosa (Graceful Sunmoth)*		P4	
Mammal					
361.	24086	*Cercartetus concinnus (Western Pygmy-possum, Mundarda)*			
362.	24186	*Chalinolobus gouldii (Gould's Wattled Bat)*			
363.	24092	*Dasyurus geoffroii (Chuditch, Western Quoll)*		T	
364.	25478	*Isoodon obesulus (Southern Brown Bandicoot)*		P4	
365.	24153	*Isoodon obesulus subsp. fusciventer (Quenda, Southern Brown Bandicoot)*		P4	
366.	24133	*Macropus irma (Western Brush Wallaby)*		P4	
367.	24042	*Mustela putorius (European Polecat, Ferret)*	Y		
368.	24194	*Nyctophilus geoffroyi (Lesser Long-eared Bat)*			
369.	24166	*Pseudocheirus occidentalis (Western Ringtail Possum, ngwayir)*		T	
370.	24158	*Trichosurus vulpecula subsp. vulpecula (Common Brushtail Possum)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
371.	24206	*Vespadelus regulus (Southern Forest Bat)*			

Monocotyledon

372.	1208	*Acanthocarpus preissii*			
373.	184	*Aira caryophyllea (Silvery Hairgrass)*	Y		
374.	185	*Aira cupaniana (Silvery Hairgrass)*	Y		
375.	154	*Alisma lanceolatum (Water Plantain)*	Y		
376.	1378	*Allium triquetrum (Three-cornered Garlic)*	Y		
377.	1409	*Anigozanthos humilis (Catspaw)*			
378.	231	*Avellinia michelii*	Y		
379.	233	*Avena barbata (Bearded Oat)*	Y		
380.	1272	*Borya scirpoidea*			
381.	244	*Briza maxima (Blowfly Grass)*	Y		
382.	249	*Bromus diandrus (Great Brome)*	Y		
383.	1366	*Bulbine semibarbata (Leek Lily)*			
384.	1276	*Caesia micrantha (Pale Grass Lily)*			
385.	15330	*Caladenia arenicola*			
386.	1592	*Caladenia flava (Cowslip Orchid)*			
387.	15352	*Caladenia georgei*			
388.	15354	*Caladenia hirta subsp. hirta*			
389.	1599	*Caladenia latifolia (Pink Fairy Orchid)*			
390.	17760	*Caladenia nobilis*			
391.	17589	*Caladenia occidentalis*			
392.	18026	*Caladenia pendens subsp. pendens*			
393.	1612	*Caladenia radiata (Ray Spider Orchid)*			
394.	18019	*Caladenia vulgata*			
395.	759	*Carex tereticaulis*		P3	
396.	1125	*Centrolepis drummondiana*			
397.	1280	*Chamaescilla corymbosa (Blue Squill)*			
398.	1418	*Conostylis aculeata (Prickly Conostylis)*			
399.	1427	*Conostylis candicans (Grey Cottonhead)*			
400.	12027	*Conostylis candicans subsp. calcicola*			
401.	11438	*Conostylis candicans subsp. candicans*			
402.	1436	*Conostylis juncea*			
403.	1624	*Corybas despectans*			
404.	12945	*Corybas recurvus*			
405.	10916	*Cyrtostylis huegelii*			
406.	1640	*Drakaea glyptodon (King-in-his-carriage)*			
407.	11156	*Drakaea livida*			
408.	349	*Ehrharta longiflora (Annual Veldt Grass)*	Y		
409.	1643	*Elythranthera brunonis (Purple Enamel Orchid)*			
410.	1646	*Eriochilus dilatatus (White Bunny Orchid)*			
411.	18392	*Freesia alba x leichtlinii*	Y		
412.	907	*Gahnia trifida (Coast Saw-sedge)*			
413.	445	*Holcus setiger (Annual Fog)*	Y		
414.	20199	*Isolepis cernua var. cernua*			
415.	917	*Isolepis marginata (Coarse Club-rush)*			
416.	467	*Lagurus ovatus (Hare's Tail Grass)*	Y		
417.	925	*Lepidosperma angustatum*			
418.	932	*Lepidosperma effusum (Spreading Sword-sedge)*			
419.	937	*Lepidosperma longitudinale (Pithy Sword-sedge)*			
420.	15418	*Leptoceras menziesii*			
421.	476	*Lolium perenne (Perennial Ryegrass)*	Y		
422.	478	*Lolium rigidum (Wimmera Ryegrass)*	Y		
423.	1223	*Lomandra caespitosa (Tufted Mat Rush)*			
424.	1228	*Lomandra hermaphrodita*			
425.	1231	*Lomandra maritima*			
426.	1234	*Lomandra nigricans*			
427.	1243	*Lomandra sericea (Silky Mat Rush)*			
428.	1198	*Luzula meridionalis (Field Woodrush)*			
429.	1097	*Lyginia barbata*			
430.	485	*Microlaena stipoides (Weeping Grass)*			
431.	1381	*Nothoscordum gracile*	Y		
432.	1478	*Phlebocarya ciliata*			
433.	573	*Poa drummondiana (Knotted Poa)*			
434.	578	*Poa porphyroclados*			
435.	1676	*Prasophyllum hians (Yawning Leek Orchid)*			
436.		*Pterostylis aff. nana*			
437.	44527	*Pterostylis erubescens*			
438.	1698	*Pterostylis vittata (Banded Greenhood)*			
439.	10970	*Rostraria cristata*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
			Y		
440.	115	*Ruppia megacarpa*			
441.	982	*Schoenus clandestinus*			
442.	992	*Schoenus grandiflorus (Large Flowered Bogrush)*			
443.	1312	*Sowerbaea laxiflora (Purple Tassels)*			
444.	1319	*Thysanotus arenarius*			
445.	1361	*Tricoryne elatior (Yellow Autumn Lily)*			
446.	152	*Triglochin trichophora*			
447.	724	*Vulpia myuros (Rat's Tail Fescue)*	Y		
448.		*Vulpia sp.*			
449.	1398	*Wurmbea monantha*			

Reptile

450.	42368	*Acritoscincus trilineatus (Western Three-lined Skink)*			
451.	24980	*Christinus marmoratus (Marbled Gecko)*			
452.	25027	*Ctenotus australis*			
453.	25047	*Ctenotus impar*			
454.	41641	*Ctenotus ora (Coastal Plains Skink)*		P3	
455.	24999	*Delma grayii*			
456.	25096	*Egernia kingii (King's Skink)*			
457.	25100	*Egernia napoleonis*			
458.	25119	*Hemiergis quadrilineata*			
459.	43384	*Hydrophis platurus (Yellow-bellied Seasnake)*			
460.	25131	*Lerista distinguenda*			
461.	25147	*Lerista lineata (Perth Slider, Lined Skink)*		P3	
462.	25148	*Lerista lineopunctulata*			
463.	25005	*Lialis burtonis*			
464.	25184	*Menetia greyii*			
465.	25191	*Morethia lineoocellata*			
466.	24907	*Pogona minor subsp. minor (Dwarf Bearded Dragon)*			
467.	25266	*Simoselaps bertholdi (Jan's Banded Snake)*			
468.	24942	*Strophurus spinigerus subsp. spinigerus*			

Slime Mould

469.	39097	*Trichia decipiens*			

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

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

Appendix 2: Protected Matter Search Tool Report

Australian Government
Department of the Environment and Energy

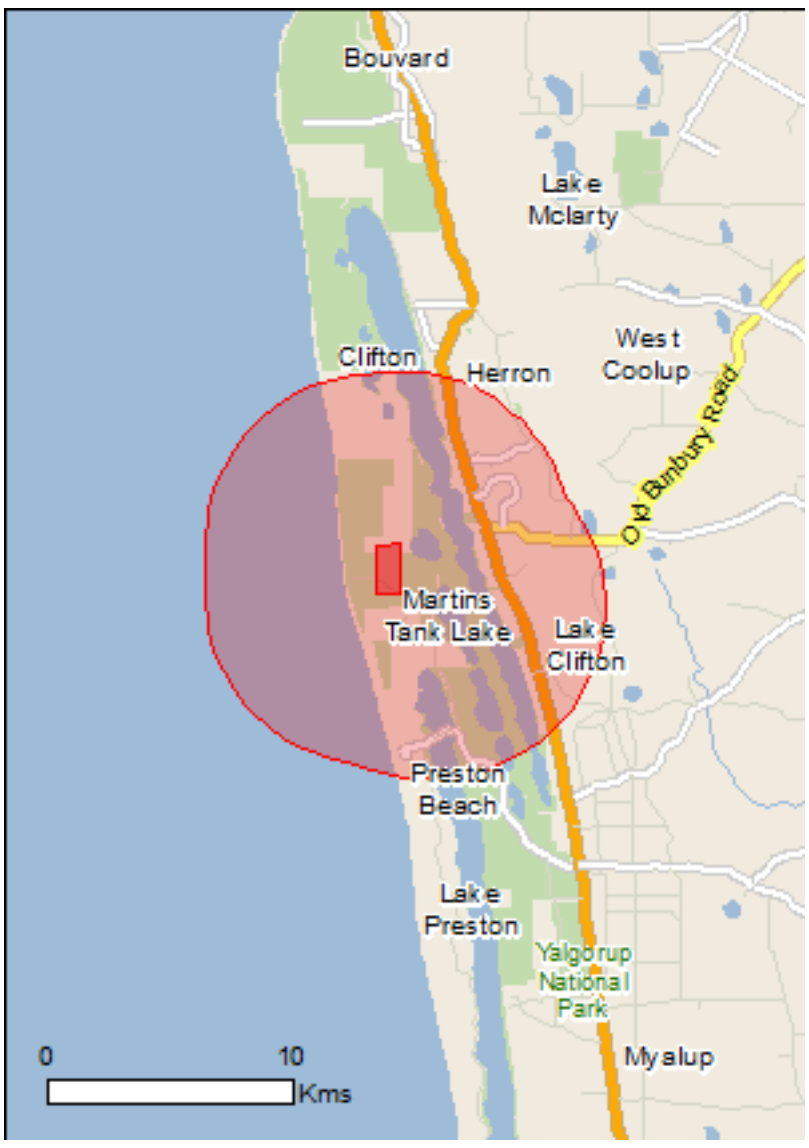
EPBC Act Protected Matters Report

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

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

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

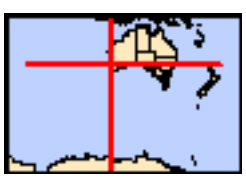
Report created: 11/10/17 15:24:18



This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2010

Coordinates

Buffer: 7.0Km



Summary

Matters of National Environmental Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	1
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	3
Listed Threatened Species:	54
Listed Migratory Species:	58

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Land:	1
Commonwealth Heritage Places:	None
Listed Marine Species:	93
Whales and Other Cetaceans:	13
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Commonwealth Reserves Marine:	None

Extra Information

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

State and Territory Reserves:	3
Regional Forest Agreements:	None
Invasive Species:	22
Nationally Important Wetlands:	2
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar) [Resource Information]

Name	Proximity
Peel-yalgorup system	Within Ramsar site

Listed Threatened Ecological Communities [Resource Information]

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

Name	Status	Type of Presence
Banksia Woodlands of the Swan Coastal Plain ecological community	Endangered	Community likely to occur within area
Sedgelands in Holocene dune swales of the southern Swan Coastal Plain	Endangered	Community likely to occur within area
Thrombolite (microbialite) Community of a Coastal Brackish Lake (Lake Clifton)	Critically Endangered	Community known to occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Anous tenuirostris melanops Australian Lesser Noddy [26000]	Vulnerable	Species or species habitat may occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat may occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Roosting known to occur within area
Calyptorhynchus banksii naso Forest Red-tailed Black-Cockatoo, Karrak [67034]	Vulnerable	Species or species habitat known to occur within area
Calyptorhynchus baudinii Baudin's Cockatoo, Long-billed Black-Cockatoo [769]	Vulnerable	Species or species habitat known to occur within area
Calyptorhynchus latirostris Carnaby's Cockatoo, Short-billed Black-Cockatoo [59523]	Endangered	Species or species habitat known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Roosting known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur

Name	Status	Type of Presence
		within area
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area
Diomedea dabbenena Tristan Albatross [66471]	Endangered	Species or species habitat may occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat likely to occur within area
Limosa lapponica baueri Bar-tailed Godwit (baueri), Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat known to occur within area
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Bar-tailed Godwit (menzbieri) [86432]	Critically Endangered	Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat likely to occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Foraging, feeding or related behaviour may occur within area

Name	Status	Type of Presence
Thalassarche cauta cauta		
Shy Albatross, Tasmanian Shy Albatross [82345]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche cauta steadi		
White-capped Albatross [82344]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida		
Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris		
Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Mammals		
Balaenoptera musculus		
Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Dasyurus geoffroii		
Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat known to occur within area
Eubalaena australis		
Southern Right Whale [40]	Endangered	Breeding known to occur within area
Megaptera novaeangliae		
Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Neophoca cinerea		
Australian Sea-lion, Australian Sea Lion [22]	Vulnerable	Species or species habitat may occur within area
Pseudocheirus occidentalis		
Western Ringtail Possum, Ngwayir, Womp, Woder, Ngoor, Ngoolangit [25911]	Vulnerable	Species or species habitat likely to occur within area
Plants		
Andersonia gracilis		
Slender Andersonia [14470]	Endangered	Species or species habitat may occur within area
Banksia nivea subsp. uliginosa		
Swamp Honeypot [82766]	Endangered	Species or species habitat may occur within area
Caladenia huegelii		
King Spider-orchid, Grand Spider-orchid, Rusty Spider-orchid [7309]	Endangered	Species or species habitat known to occur within area
Diuris micrantha		
Dwarf Bee-orchid [55082]	Vulnerable	Species or species habitat known to occur within area
Diuris purdiei		
Purdie's Donkey-orchid [12950]	Endangered	Species or species habitat likely to occur within area
Drakaea elastica		
Glossy-leafed Hammer Orchid, Glossy-leaved Hammer Orchid, Warty Hammer Orchid [16753]	Endangered	Species or species habitat likely to occur within area
Drakaea micrantha		
Dwarf Hammer-orchid [56755]	Vulnerable	Species or species habitat likely to occur within area
Synaphea sp. Fairbridge Farm (D. Papenfus 696)		
Selena's Synaphea [82881]	Critically Endangered	Species or species habitat likely to occur within area

Name	Status	Type of Presence
Synaphea stenoloba		
Dwellingup Synaphea [66311]	Endangered	Species or species habitat may occur within area
Reptiles		
Caretta caretta		
Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas		
Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea		
Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Natator depressus		
Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Sharks		
Carcharias taurus (west coast population)		
Grey Nurse Shark (west coast population) [68752]	Vulnerable	Species or species habitat likely to occur within area
Carcharodon carcharias		
White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus		
Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species [Resource Information]

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

Name	Threatened	Type of Presence
Migratory Marine Birds		
Anous stolidus		
Common Noddy [825]		Species or species habitat may occur within area
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardenna carneipes		
Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Foraging, feeding or related behaviour likely to occur within area
Diomedea amsterdamensis		
Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area
Diomedea epomophora		
Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans		
Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Hydroprogne caspia		
Caspian Tern [808]		Foraging, feeding or related behaviour known to occur within area
Macronectes giganteus		
Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area

Name	Threatened	Type of Presence
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Onychoprion anaethetus Bridled Tern [82845]		Foraging, feeding or related behaviour likely to occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta Tasmanian Shy Albatross [89224]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Migratory Marine Species		
Balaena glacialis australis Southern Right Whale [75529]	Endangered*	Breeding known to occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Caperea marginata Pygmy Right Whale [39]		Species or species habitat may occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat may occur within area
Manta alfredi Reef Manta Ray, Coastal Manta Ray, Inshore Manta Ray, Prince Alfred's Ray, Resident Manta Ray [84994]		Species or species habitat likely to occur within area
Manta birostris Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995]		Species or species habitat likely to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area

Name	Threatened	Type of Presence
Natator depressus Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
Migratory Terrestrial Species		
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Arenaria interpres Ruddy Turnstone [872]		Roosting known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Roosting known to occur within area
Calidris alba Sanderling [875]		Roosting known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat likely to occur within area
Calidris ruficollis Red-necked Stint [860]		Roosting known to occur within area
Calidris subminuta Long-toed Stint [861]		Roosting known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Roosting known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Roosting known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area
Gallinago megala Swinhoe's Snipe [864]		Roosting likely to occur within area
Gallinago stenura Pin-tailed Snipe [841]		Roosting likely to occur within area
Limicola falcinellus Broad-billed Sandpiper [842]		Roosting known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area

Name	Threatened	Type of Presence
Limosa limosa Black-tailed Godwit [845]		Roosting known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Numenius minutus Little Curlew, Little Whimbrel [848]		Roosting likely to occur within area
Numenius phaeopus Whimbrel [849]		Roosting known to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat likely to occur within area
Philomachus pugnax Ruff (Reeve) [850]		Roosting known to occur within area
Pluvialis fulva Pacific Golden Plover [25545]		Roosting known to occur within area
Tringa brevipes Grey-tailed Tattler [851]		Roosting known to occur within area
Tringa glareola Wood Sandpiper [829]		Roosting known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Roosting known to occur within area
Tringa totanus Common Redshank, Redshank [835]		Roosting known to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

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

Name
Commonwealth Land -

Listed Marine Species [Resource Information]

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

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Anous stolidus Common Noddy [825]		Species or species habitat may occur within area
Anous tenuirostris melanops Australian Lesser Noddy [26000]	Vulnerable	Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur

Name	Threatened	Type of Presence
		within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat likely to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Arenaria interpres Ruddy Turnstone [872]		Roosting known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Roosting known to occur within area
Calidris alba Sanderling [875]		Roosting known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat likely to occur within area
Calidris ruficollis Red-necked Stint [860]		Roosting known to occur within area
Calidris subminuta Long-toed Stint [861]		Roosting known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Roosting known to occur within area
Catharacta skua Great Skua [59472]		Species or species habitat may occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Roosting known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area
Charadrius ruficapillus Red-capped Plover [881]		Roosting known to occur within area
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area
Diomedea dabbenena Tristan Albatross [66471]	Endangered	Species or species habitat may occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area

Name	Threatened	Type of Presence
Gallinago megala Swinhoe's Snipe [864]		Roosting likely to occur within area
Gallinago stenura Pin-tailed Snipe [841]		Roosting likely to occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area
Heteroscelus brevipes Grey-tailed Tattler [59311]		Roosting known to occur within area
Himantopus himantopus Black-winged Stilt [870]		Roosting known to occur within area
Limicola falcinellus Broad-billed Sandpiper [842]		Roosting known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Limosa limosa Black-tailed Godwit [845]		Roosting known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Numenius minutus Little Curlew, Little Whimbrel [848]		Roosting likely to occur within area
Numenius phaeopus Whimbrel [849]		Roosting known to occur within area
Pachyptila turtur Fairy Prion [1066]		Species or species habitat likely to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat likely to occur within area
Philomachus pugnax Ruff (Reeve) [850]		Roosting known to occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area

Name	Threatened	Type of Presence
Pluvialis fulva Pacific Golden Plover [25545]		Roosting known to occur within area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area
Puffinus assimilis Little Shearwater [59363]		Foraging, feeding or related behaviour known to occur within area
Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Foraging, feeding or related behaviour likely to occur within area
Recurvirostra novaehollandiae Red-necked Avocet [871]		Roosting known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area
Sterna anaethetus Bridled Tern [814]		Foraging, feeding or related behaviour likely to occur within area
Sterna caspia Caspian Tern [59467]		Foraging, feeding or related behaviour known to occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Foraging, feeding or related behaviour may occur within area
Thalassarche cauta Tasmanian Shy Albatross [89224]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thinornis rubricollis Hooded Plover [59510]		Breeding known to occur within area
Tringa glareola Wood Sandpiper [829]		Roosting known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Roosting known to occur within area
Tringa totanus Common Redshank, Redshank [835]		Roosting known to occur within area
Fish		
Acentronura australe Southern Pygmy Pipehorse [66185]		Species or species habitat may occur within area
Campichthys galei Gale's Pipefish [66191]		Species or species

Name	Threatened	Type of Presence
		habitat may occur within area
Heraldia nocturna Upside-down Pipefish, Eastern Upside-down Pipefish, Eastern Upside-down Pipefish [66227]		Species or species habitat may occur within area
Hippocampus angustus Western Spiny Seahorse, Narrow-bellied Seahorse [66234]		Species or species habitat may occur within area
Hippocampus breviceps Short-head Seahorse, Short-snouted Seahorse [66235]		Species or species habitat may occur within area
Hippocampus subelongatus West Australian Seahorse [66722]		Species or species habitat may occur within area
Histiogamphelus cristatus Rhino Pipefish, Macleay's Crested Pipefish, Ring-back Pipefish [66243]		Species or species habitat may occur within area
Lissocampus caudalis Australian Smooth Pipefish, Smooth Pipefish [66249]		Species or species habitat may occur within area
Lissocampus fatiloquus Prophet's Pipefish [66250]		Species or species habitat may occur within area
Lissocampus runa Javelin Pipefish [66251]		Species or species habitat may occur within area
Maroubra perserrata Sawtooth Pipefish [66252]		Species or species habitat may occur within area
Mitotichthys meraculus Western Crested Pipefish [66259]		Species or species habitat may occur within area
Nannocampus subosseus Bonyhead Pipefish, Bony-headed Pipefish [66264]		Species or species habitat may occur within area
Phycodurus eques Leafy Seadragon [66267]		Species or species habitat may occur within area
Phyllopteryx taeniolatus Common Seadragon, Weedy Seadragon [66268]		Species or species habitat may occur within area
Pugnaso curtirostris Pugnose Pipefish, Pug-nosed Pipefish [66269]		Species or species habitat may occur within area
Solegnathus lettiensis Gunther's Pipehorse, Indonesian Pipefish [66273]		Species or species habitat may occur within area
Stigmatopora argus Spotted Pipefish, Gulf Pipefish, Peacock Pipefish [66276]		Species or species habitat may occur within area
Stigmatopora nigra Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area
Stigmatopora olivacea a pipefish [74966]		Species or species habitat may occur within

Name	Threatened	Type of Presence
		area
Urocampus carinirostris		
Hairy Pipefish [66282]		Species or species habitat may occur within area
Vanacampus margaritifer		
Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area
Vanacampus phillipi		
Port Phillip Pipefish [66284]		Species or species habitat may occur within area
Vanacampus poecilolaemus		
Longsnout Pipefish, Australian Long-snout Pipefish, Long-snouted Pipefish [66285]		Species or species habitat may occur within area
Mammals		
Arctocephalus forsteri		
Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat may occur within area
Neophoca cinerea		
Australian Sea-lion, Australian Sea Lion [22]	Vulnerable	Species or species habitat may occur within area
Reptiles		
Caretta caretta		
Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas		
Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea		
Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Disteira kingii		
Spectacled Seasnake [1123]		Species or species habitat may occur within area
Natator depressus		
Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area

Whales and other Cetaceans		[Resource Information]
Name	Status	Type of Presence
Mammals		
Balaenoptera acutorostrata		
Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera edeni		
Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus		
Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Caperea marginata		
Pygmy Right Whale [39]		Species or species habitat may occur within area
Delphinus delphis		
Common Dophin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area

Name	Status	Type of Presence
Eubalaena australis Southern Right Whale [40]	Endangered	Breeding known to occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area

Extra Information

State and Territory Reserves [Resource Information]

Name	State
Kooljerrenup	WA
Unnamed WA41160	WA
Yalgorup	WA

Invasive Species [Resource Information]

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

Name	Status	Type of Presence
Birds		
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Passer montanus Eurasian Tree Sparrow [406]		Species or species habitat likely to occur

Name	Status	Type of Presence
		within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Streptopelia senegalensis Laughing Turtle-dove, Laughing Dove [781]		Species or species habitat likely to occur within area
Mammals		
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Brachiaria mutica Para Grass [5879]		Species or species habitat may occur within area
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		Species or species habitat may occur within area
Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]		Species or species habitat may occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Lantana camara Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]		Species or species habitat likely to occur within area
Olea europaea Olive, Common Olive [9160]		Species or species habitat may occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area

Name	Status	Type of Presence
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area

Nationally Important Wetlands [Resource Information]

Name	State
Peel-Harvey Estuary	WA
Yalgorup Lakes System	WA

Caveat

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

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

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

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

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

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

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

- migratory and
- marine

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

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

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

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

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

Coordinates

-32.819594 115.646015,-32.818981 115.652495,-32.833983 115.652624,-32.836651 115.662109,-32.838743 115.664855,-32.839031 115.661765,-32.837156 115.659062,-32.835065 115.651036,-32.834884 115.643869,-32.819738 115.643784,-32.819738 115.643784,-32.819594 115.646015

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

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

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

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

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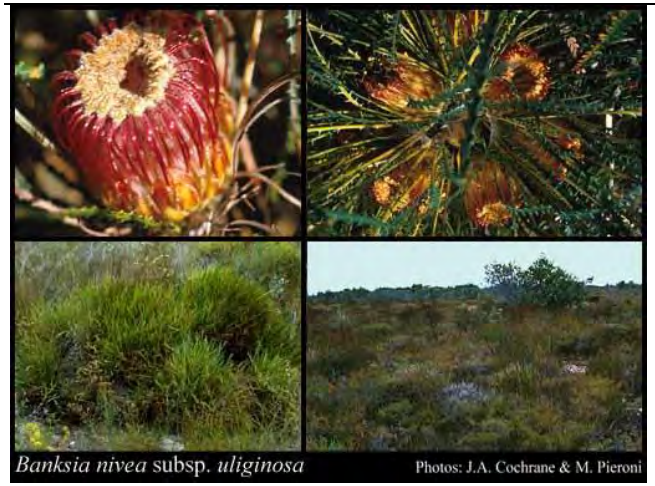
Appendix 3: Potential Priority and Threatened Flora

Picture	Common Name	Description	Flowering Period	Habitat Type	Cons Code	Likelihood (Y/N)	Comment
	Slender Andersonia	Slender erect or open straggly shrub, 0.1-0.5 (-1) m high Fl. white-pink-purple	September to November	White/grey sand, sandy clay, gravelly loam Winter-wet areas, near swamps	En	N	Wet areas likely too saline. Not recorded south of Perth (Gosnells).
	Swamp Honeypot	Dense, erect, non-lignotuberous shrub, 0.2-1.5 m high Fl. yellow-brown	August to September	Sandy clay, gravel	En	N	Gravel not likely at site, although sandy clay may be present. Not recorded north of Busselton.

Picture	Common Name	Description	Flowering Period	Habitat Type	Cons Code	Likelihood (Y/N)	Comment
	Grand Spider Orchid	Tuberous, perennial, herb, 0.25-0.6 m high Fl. green & cream & red	September to October	Grey or brown sand, clay loam	En	Y	Within range. Soil type suitable.
Carex tereticaulis		Monoecious, rhizomatous, tufted perennial, grass-like or herb, 0.7 m high Fl. brown	September to October	Black peaty sand	P3	N	Soil type not suitable.
Conostylis pauciflora* subsp. *pauciflora		Rhizomatous, stoloniferous perennial, grass-like or herb, 0.1-0.35 m high. Fl. yellow	August to October	Grey sand, Limestone, Hillslopes, consolidated dunes	P4	Y	Recorded in the area (DBCA search)

Picture	Common Name	Description	Flowering Period	Habitat Type	Cons Code	Likelihood (Y/N)	Comment
	Dwarf Bee-orchid	Tuberous, perennial, herb, 0.3-0.6 m high Fl. yellow & brown	September to October	Brown loamy clay. Winter-wet swamps, in shallow water	Vu	N	Wetter areas likely too saline.
	Purdie's Donkey Orchid	Tuberous, perennial, herb, 0.15-0.35 m high Fl. yellow	September to October	Grey-black sand, moist. Winter-wet swamps	En	N	Not recorded south of Serpentine-Jarrahdale Wetter areas likely too saline.

Picture	Common Name	Description	Flowering Period	Habitat Type	Cons Code	Likelihood (Y/N)	Comment
	Glossy-leaved Hammer Orchid	Tuberous, perennial, herb, 0.12-0.3 m high Fl. red & green & yellow	October to November	White or grey sand. Low-lying situations adjoining winter-wet swamps	En	Y	Soil type suitable. Within range.
	Dwarf Hammer Orchid	Tuberous, perennial, herb, 0.15-0.3 m high Fl. red & yellow	September to October	White-grey sand	Vu	Y	Soil type suitable. Within range.

Picture	Common Name	Description	Flowering Period	Habitat Type	Cons Code	Likelihood (Y/N)	Comment
	Wabling Hill Mallee	1.5-4 m high, bark smooth Fl. white	March to April	Shallow soils over limestone. Slopes or gullies of limestone ridges, outcrops	T	N	Soil type suitable. Recorded in the area (DBCA search)
Galium leptogonium	Rock Bestraw	Perennial forb, to 30 cm tall, Fl green, white			P3	Y	Recorded in the area (DBCA search)
Hakea oligoneura		Shrubs, 0 m high, Fl. white	September		P4	Y	Recorded in the area (DBCA search)
Haloragis scoparia		Perennial, herb, 0.3-0.6 m high			P1	Y	Recorded in the area (DBCA search)
Hibbertia spicata* subsp. *leptotheca		Erect or spreading shrub, 0.2-0.5 m high Fl. yellow	July to October	Sand. Near-coastal limestone ridges, outcrops & cliffs	P3	Y	Recorded in the area (DBCA search)

Picture	Common Name	Description	Flowering Period	Habitat Type	Cons Code	Likelihood (Y/N)	Comment
Hydrocotyle* sp. *hamelinensis					P2		Recorded in the area (DBCA search)
Lasiopetalum membranaceum		Multi-stemmed shrub, 0.2-1 m high. Fl. pink-blue-purple	September to December	Sand over limestone	P3		Recorded in the area (DBCA search)
		Erect to spreading shrub, 0.2-1 m high Fl. pink	September to November	Sand. Coastal limestone ridges	P3		Recorded in the area (DBCA search)
		Slender, multi-stemmed, scandent or erect shrub, to 1.5 m high Fl. orange-red	June or September to November	White-grey-brown sand, sandy clay over limestone, black peaty sandy clay. Tall dunes, winter-wet flats, interdunal swamps, low-lying areas	P3		Recorded in the area (DBCA search)

Picture	Common Name	Description	Flowering Period	Habitat Type	Cons Code	Likelihood (Y/N)	Comment
		Caespitose perennial, herb, 0.3-0.7 m high Fl. white/purple	September to November	Sand over limestone. Dune slopes and flats. Coastal heath and shrubland, open Banksia woodland	P3		Recorded in the area (DBCA search)
	Selena's Synaphea	Dense, clumped shrub, to 0.3 m high, to 0.4 m wide Fl. yellow	October	Sandy with lateritic pebbles. Near winter-wet flats, in low woodland with weedy grasses	CE	N	Soil type not suitable.

Picture	Common Name	Description	Flowering Period	Habitat Type	Cons Code	Likelihood (Y/N)	Comment
	Dwellingup Synaphea	Caespitose shrub, 0.3-0.45 m high Fl. yellow	August to October	Sandy or sandy clay soils. Winter-wet flats, granite	En	N	Soil type not suitable.

Source: Department of Parks and Wildlife, 2017b

Appendix 4: Conservation Codes

Western Australia

Conservation Code	Name	Description
T	Threatened	Flora or fauna that is rare or likely to become extinct (Schedule 1 of the *Wildlife Conservation Act* 1950)
X	Presumed Extinct	Flora or fauna that is presumed to be extinct in the wild (Schedule 2 of the *Wildlife Conservation Act* 1950)
IA	International Agreement	Birds protected under international agreement (Schedule 3 of the *Wildlife Conservation Act* 1950)
S	Specially Protected	Other specially protected fauna (Schedule 4 of the *Wildlife Conservation Act* 1950)
Schedule 1 species are ranked by DBCA according to their level of threat using IUCN Red List criteria		
CR	Critically endangered	Species considered to be facing an extremely high risk of extinction within the wild
EN	Endangered	Species considered to be facing a very high risk of extinction within the wild
VU	Vulnerable	Species considered to be facing a high risk of extinction in the wild
Species that have not been adequately surveyed for listing under Schedule 1 or 2 of the Wildlife Protection Act		
1	Priority One	Poorly known species – known from one or a few collections or sight records (generally <5), on all lands not managed for conservation, such as road verges, urban areas, farmland, active mineral lease and under threat of habitat destruction or degradation.
2	Priority Two	Poorly known species – known from one or a few collections or sight records, some of which are on lands not under imminent threat of habitat destruction or degradation, such as national parks, conservation parks, nature reserves, State forest, vacant Crown land, water reserves and similar.
3	Priority Three	Poorly known species – known collections or sight records from several localities not under imminent threat, or from few but widespread localities with either large size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat.
4	Priority Four	Rare or near threatened and other species in need of monitoring.

(Source: Department of Biodiversity, Conservation and Attractions, 2018)

Commonwealth

Category	Description
Critically Endangered	Species facing an extremely high risk of extinction in the wild in the immediate future
Endangered	Species facing a very high risk of extinction in the wild in the near future
Vulnerable	Species facing a high risk of extinction in the wild in the medium term

(Source: Department of the Environment and Energy, 2018)

Appendix 5: Flora Species List

Sorted by species

Family	Species Name	Common Name
	Non-native species	
Poaceae	**Briza maxima*	Blowfly Grass
Poaceae	**Briza minor*	Shivery Grass
Poaceae	**Bromus diandrus*	Great Brome
Asteraceae	**Centaurea melitensis*	Maltese Cockspur
Gentianaceae	**Centaurium erythraea*	Common Centaury
Gentianaceae	**Centaurium tenuiflorum*	Centaury
Crassulaceae	**Crassula glomerata*	
Convolvulaceae	**Cuscuta epithymum*	Lesser Dodder
Scrophulariaceae	**Dischisma arenarium*	
Poaceae	**Ehrharta longiflora*	Annual Veldt Grass
Euphorbiaceae	**Euphorbia peplus*	Petty Spurge
Euphorbiaceae	**Euphorbia terracina*	Geraldton Carnation Weed
Apocynaceae	**Gomphocarpus fruticosus*	Narrowleaf Cottonbush
Asteraceae	**Hypochaeris radicata*	Flat Weed
Poaceae	**Lagurus ovatus*	Hare's Tail Grass
Poaceae	**Lolium rigidum*	Wimmera Ryegrass
Fabaceae	**Lotus subbiflorus*	Hairy Bird's-foot Trefoil,
Fabaceae	**Lupinus cosentinii*	
Primulaceae	**Lysimachia arvensis*	Pimpernel
Fabaceae	**Melilotus indicus*	King Island Clover
Iridaceae	**Moraea flaccida*	One-leaf Cape Tulip
Orobanchaceae	**Parentucellia latifolia*	Common Bartsia
Caryophyllaceae	**Petrorhagia dubia*	Pink Violet
Solanaceae	**Solanum nigrum*	Black Berry Nightshade
Asteraceae	**Sonchus oleraceus*	Common Sowthistle
Asphodelaceae	**Trachyandra divaricata*	
Fabaceae	**Trifolium campestre*	Hop Clover
	Native species	
Fabaceae	*Acacia applanata*	
Fabaceae	*Acacia cyclops*	Coastal Wattle
Fabaceae	*Acacia pulchella* var. *pulchella*	Prickly Moses
Fabaceae	*Acacia rostellifera*	Summer-scented Wattle
Fabaceae	*Acacia saligna*	Orange Wattle
Fabaceae	*Acacia truncata*	
Asparagaceae	*Acanthocarpus preissii*	
Myrtaceae	*Agonis flexuosa*	Peppermint
Loranthaceae	*Amyema miquelii*	Stalked Mistletoe
Solanaceae	*Anthocercis ilicifolia*	

Family	Species Name	Common Name
Poaceae	*Austrostipa campylachne*	
Poaceae	*Austrostipa flavescens*	Coast Speargrass
Proteaceae	*Banksia attenuata*	Slender Banksia
Proteaceae	*Banksia dallanneyi*	Couch Honeypot
Proteaceae	*Banksia sessilis var. cygnorum*	Parrot Bush
Proteaceae	*Banksia sessilis*	Parrot Bush
Cyperaceae	*Baumea juncea*	Bare Twigrush
Aizoaceae	*Carpobrotus virescens*	Coastal Pigface
Lauraceae	*Cassytha glabella*	Tangled Dodder Laurel/Slender Devil's Twine
Lauraceae	*Cassytha racemosa*	Dodder Laurel
Ranunculaceae	*Clematis linearifolia*	
Ranunculaceae	*Clematis pubescens*	Common Clematis
Polygalaceae	*Comesperma confertum*	
Haemodoraceae	*Conostylis setigera*	Bristly Cottonhead
Crassulaceae	*Crassula colorata*	Dense Stonecrop
Apiaceae	*Daucus glochidiatus*	Australian Carrot
Fabaceae	*Daviesia divaricata*	Marno
Restionaceae	*Desmocladus fasciculatus*	
Restionaceae	*Desmocladus flexuosus*	
Hemerocallidaceae	*Dianella revoluta*	Blueberry Lily
Sapindaceae	*Diplopeltis huegelii*	
Sapindaceae	*Dodonaea aptera*	Coast Hop-bush
Myrtaceae	*Eucalyptus decipiens*	
Myrtaceae	*Eucalyptus gomphocephala*	Tuart
Myrtaceae	*Eucalyptus marginata*	Jarrah
Myrtaceae	*Eucalyptus petrensis*	Limestone Mallee
Myrtaceae	*Eucalyptus* sp	
Santalaceae	*Exocarpos sparteus*	Broom Ballart
Cyperaceae	*Gahnia trifida*	Coast Saw-sedge
Fabaceae	*Gompholobium tomentosum*	Hairy Yellow Pea
Proteaceae	*Hakea prostrata*	Harsh Hakea
Proteaceae	*Hakea ruscifolia*	Candle Hakea
Fabaceae	*Hardenbergia comptoniana*	Native Wisteria
Lamiaceae	*Hemiandra pungens*	Snakebush
Dilleniaceae	*Hibbertia cuneiformis*	Cutleaf Hibbertia
Dilleniaceae	*Hibbertia hypericoides*	Yellow Buttercups
Dilleniaceae	*Hibbertia racemosa*	Stalked Guinea Flower
Fabaceae	*Jacksonia furcellata*	Grey Stinkwood
Fabaceae	*Jacksonia sternbergiana*	Stinkwood
Cyperaceae	*Lepidosperma gladiatum*	Coast Sword-sedge
Cyperaceae	*Lepidosperma longitudinale*	Pithy Sword-sedge
Cyperaceae	*Lepidosperma squamatum*	

Family	Species Name	Common Name
Ericaceae	*Leucopogon parviflorus*	Coast Beard-heath
Campanulaceae	*Lobelia tenuior*	Slender Lobelia
Loganiaceae	*Logania vaginalis*	White Spray
Asparagaceae	*Lomandra caespitosa*	Tufted Mat-rush
Asparagaceae	*Lomandra hermaphrodita*	
Asparagaceae	*Lomandra maritima*	Maritime Mat-rush
Asparagaceae	*Lomandra purpurea*	Purple Mat-rush
Asparagaceae	*Lomandra suaveolens*	
Zamiaceae	*Macrozamia riedlei*	Zamia
Myrtaceae	*Melaleuca huegelii*	Chenille Honeymyrtle
Myrtaceae	*Melaleuca systena*	Coastal Honeymyrtle
Polygonaceae	*Muehlenbeckia adpressa*	Climbing Lignum
Loranthaceae	*Nuytsia floribunda*	Christmas Tree
Asteraceae	*Olearia axillaris*	Coastal Daisybush
Asteraceae	*Olearia rudis*	Rough Daisybush
Geraniaceae	*Pelargonium littorale*	
Phyllanthaceae	*Phyllanthus calycinus*	False Boronia
Thymelaeaceae	*Pimelea rosea*	Rose Banjine
Santalaceae	*Santalum acuminatum*	Quandong
Asteraceae	*Senecio pinnatifolius*	Dune/Coastal Groundsel
Rhamnaceae	*Spyridium globulosum*	Basket Bush
Stylidiaceae	*Stylidium schoenoides*	Cow Kicks
Fabaceae	*Templetonia retusa*	Cockies Tongues
Gyrostemonaceae	*Tersonia cyathiflora*	Button Creeper
Malvaceae	*Thomasia triphylla*	
Asparagaceae	*Thysanotus arenarius*	
Apiaceae	*Trachymene coerulea*	Blue Lace Flower
Hemerocallidaceae	*Tricoryne elatior*	Yellow Autumn Lily
Xanthorrhoeaceae	*Xanthorrhoea preissii*	Balga/Grass Tree
Apiaceae	*Xanthosia huegelii*	Heath Xanthosia

Appendix 6: Quadrat Data

Quadrat No.: PB01
Survey Date: 20/11/17
Personnel: SH JC
Latitude: -32.82853
Longitude: 115.65082
Location:
Topography: Dune swale
Aspect: W
Slope: 1-3%
Soil: Loamy sand, brown
Rock: 7% Limestone
Leaf Litter:
Bare Ground: 5%
Drainage: Well
Condition: Degraded

Notes: Grasstree Shrubland

Native Species	%	Height (m)	Invasive Species	%	Height (m)
Acacia applanata	0.5	<0.5	**Bromus diandrus*	0.1	<0.5
Acacia pulchella var. pulchella	0.1	<0.5	**Lolium rigidum*	0.1	<0.5
Banksia dallanneyi	0.5	<0.5	**Lotus subbiflorus*	0.1	<0.5
Desmocladus flexuosus	0.5	0.5	**Lysimachia arvensis*	0.1	<0.5
Lepidosperma longitudinale	1.0	<0.5	**Trachyandra divaricata*	0.5	<0.5
Melaleuca systena	5.0	1	**Trifolium campestre*	0.1	<0.5
Xanthorrhoea preissii	75.0	1.8			

Quadrat No.: PB02
Survey Date: 20/11/17
Personnel: SH JC
Latitude: -32.82770
Longitude: 115.65082
Location:
Topography: Dune swale
Aspect: None
Slope: 0%
Soil: Loamy sand, brown
Rock: 2% limestone
Leaf Litter:
Bare Ground: 25%
Drainage: Well
Condition: Degraded

Notes: Grasstree Shrubland

Native Species	%	Height (m)	Invasive Species	%	Height (m)
Crassula colorata	0.1	<0.5	**Briza minor*	0.1	<0.5
Lepidosperma squamatum	0.1	0.5	**Crassula glomerate*	0.1	<0.5
Melaleuca systena	2	1	**Lagurus ovatus*	0.1	<0.5
Xanthorrhoea preissii	50	1.8	**Petrorhagia dubia*	0.1	<0.5
			**Trachyandra divaricate*	1	<0.5
			**Trifolium campestre*	0.1	<0.5

Quadrat No.: PB03
Survey Date: 20/11/17
Personnel: SH JC
Latitude: -32.82646
Longitude: 115.65095
Location:
Topography: Mid-slope
Aspect: W
Slope: 1-3%
Soil: Loamy sand, brown
Rock: 8% limestone
Leaf Litter:
Bare Ground: 5%
Drainage: Well
Condition: Good

Notes: *Xanthorrhoea preissii* shrubland

Native Species	%	Height (m)	Invasive Species	%	Height (m)
Acacia pulchella var. pulchella	2	0.5	**Centaurium tenuiflorum*	0.1	<0.5
Banksia dallanneyi	1	<0.5	**Lotus subbiflorus*	0.1	<0.5
Desmocladus flexuosus	0.3	<0.5	**Lupinus cosentinii*	0.1	<0.5
Hibbertia racemosa	0.3	<0.5	**Lysimachia arvensis*	0.1	<0.5
Leucopogon parviflorus	0.5	0.5	**Trachyandra divaricate*	1	<0.5
Lomandra maritima	0.3	0.5	**Trifolium campestre*	0.1	<0.5
Melaleuca systena	15	1			
Tricoryne elatior	0.5	1			
Xanthorrhoea preissii	75	1.8			

Quadrat No.: PB04
Survey Date: 20/11/17
Personnel: SH JC
Latitude: -32.82831
Longitude: 115.65152
Location:
Topography: Mid-slope
Aspect: None
Slope: 0%
Soil: Loam, brown
Rock: 2% limestone
Leaf Litter:
Bare Ground: 5%
Drainage: Well
Condition: Degraded

Notes: *Eucalyptus gomphocephala* and Peppermint woodland

Native Species	%	Height (m)	Invasive Species	%	Height (m)
Agonis flexuosa	25	<10	**Ehrharta longiflora*	0.1	<0.5
Eucalyptus gomphocephala	70	10-30m	**Euphorbia peplus*	0.5	<0.5
Leucopogon parviflorus	0.5	<0.5	**Lysimachia arvensis*	0.1	<0.5
Pelargonium littorale	0.1	<0.5	**Petrorhagia dubia*	0.1	<0.5
Spyridium globulosum	0.1	<0.5	**Sonchus oleraceus*	0.1	<0.5
Xanthorrhoea preissii	60	1.5	**Trachyandra divaricata*	0.1	<0.5
			**Trifolium campestre*	1	<0.5

Quadrat No.: PBT1
Survey Date: 20/11/17
Personnel: SH JC
Latitude: -32.82946
Longitude: 115.65173
Location:
Topography: Mid-slope
Aspect: S
Slope: 1-3%
Soil: Sandy loam, brown
Rock: 10% limestone
Leaf Litter:
Bare Ground: 60%
Drainage: Well
Condition: Completely degraded
Notes: *Trachyandra* herbland

Native Species	%	Height (m)	Invasive Species	%	Height (m)
Pelargonium littorale	0.1	<0.5	**Crassula glomerata*	10	<0.5
			**Euphorbia peplus*	1	<0.5
			**Lotus subbiflorus*	0.1	<0.5
			**Lysimachia arvensis*	0.1	<0.5
			**Trachyandra divaricata*	25	<0.5
			**Crassula glomerata*	10	<0.5

Quadrat No.: PBT2
Survey Date: 20/11/17
Personnel: SH JC
Latitude: -32.83173
Longitude: 115.65184
Location:
Topography: Mid-slope
Aspect: S
Slope: 1-3%
Soil: Sandy loam, brown
Rock: 5% limestone
Leaf Litter:
Bare Ground: 20%
Drainage: Well
Condition: Completely degraded
Notes: *Trachyandra* herbland

Native Species	%	Height (m)	Invasive Species	%	Height (m)
Eucalyptus decipiens	1	1.5	**Trachyandra divaricata*	80	<0.5
Pelargonium littorale	0.1	<0.5	**Crassula glomerata*	0.1	<0.5
			**Euphorbia peplus*	0.1	<0.5
			**Lysimachia arvensis*	0.1	<0.5

Quadrat No.: PBT3
Survey Date: 20/11/17
Personnel: SH JC
Latitude: 115.65183
Longitude: -32.83316
Location:
Topography: Plain
Aspect: None
Slope: 0%
Soil: Sandy loam, brown
Rock: 20% limestone
Leaf Litter:
Bare Ground: 10%
Drainage: Well
Condition:
Notes: *Trachyandra* herbland

Native Species	%	Height (m)	Invasive Species	%	Height (m)
Agonis flexuosa	3	0.5	**Trachyandra divaricata*	50	<0.5
Eucalyptus gomphocephala	1	2	**Euphorbia peplus*	0.1	<0.5
Logania vaginalis	5	3	**Lysimachia arvensis*	0.1	<0.5
Melaleuca huegelii	1	0.5			

Quadrat No.: PBT4
Survey Date: 20/11/17
Personnel: SH JC
Latitude: -32.83569
Longitude: 115.65254
Location:
Topography: Plain
Aspect: None
Slope: 0%
Soil: Loamy sand, brown
Rock: 0%
Gravel 0%
Leaf Litter:
Bare Ground: 20%
Drainage: Well
Condition: Good
Notes: *Eucalyptus gomphocephala* woodland

Native Species	%	Height (m)	Invasive Species	%	Height (m)
Austrostipa flavescens	0.5	0.5	**Lysimachia arvensis*	0.1	<0.5
Desmocladus fasciculatus	0.2	<0.5	**Solanum nigrum*	0.1	<0.5
Dianella revoluta	0.2	<0.5	**Trachyandra divaricata*	0.1	<0.5
Diplopeltis huegelii	0.5	<0.5			
Thysanotus arenarius	0.1	<0.5			
Trachymene coerulea	3	<0.5			
Tricoryne elatior	0.3	<0.5			
Xanthorrhoea preissii	5	1.5			

Quadrat No.: PBT5
Survey Date: 20/11/17
Personnel: SH JC
Latitude: -32.83602
Longitude: 115.65428
Location:
Topography: Plain
Aspect: None
Slope: 0%
Soil: Sand, brown
Rock: 5% limestone
Leaf Litter:
Bare Ground: 3%
Drainage: Well
Condition: Good
Notes: Coastal shrubland

Native Species	%	Height (m)	Invasive Species	%	Height (m)
Acacia cyclops	2	1.5	**Cuscuta epithymum*	0.1	<0.5
Carpobrotus virescens	0.5	<0.5	**Euphorbia peplus*	0.1	<0.5
Exocarpos sparteus	0.5	0.5	**Lysimachia arvensis*	0.1	<0.5
Hibbertia racemosa	4	<0.5	**Moraea flaccida*	0.1	<0.5
Leucopogon parviflorus	1	<0.5	**Trachyandra divaricata*	50	<0.5
Melaleuca systena	5	1			
Spyridium globulosum	0.1	<0.5			
Tersonia cyathiflora	0.5	<0.5			
Trachymene coerulea	0.5	<0.5			
Tricoryne elatior	0.3	<0.5			

Quadrat No.: PBT6
Survey Date: 20/11/17
Personnel: SH JC
Latitude: -32.83630
Longitude: 115.65771
Location:
Topography: Plain
Aspect: None
Slope: 0%
Soil: Sand, brown
Rock: 2% limestone
Gravel: 0%
Leaf Litter:
Bare Ground: 4%
Drainage: Well
Condition: Good
Notes: Coastal shrubland

Native Species	%	Height (m)	Invasive Species	%	Height (m)
Acacia cyclops	10	3	**Cuscuta epithymum*	0.1	<0.5
Eucalyptus gomphocephala	5	>10	**Euphorbia peplus*	0.1	<0.5
Hakea prostrata	1	<0.5	**Parentucellia latifolia*	0.1	<0.5
Hibbertia cuneiformis	0.1	<0.5	**Trachyandra divaricata*	50	<0.5
Hibbertia racemosa	2	<0.5			
Leucopogon parviflorus	1	0.5			
Melaleuca systena	30	1			
Olearia axillaris	0.1	<0.5			
Pimelea rosea	0.5	<0.5			
Spyridium globulosum	10	1			
Trachymene coerulea	1	<0.5			
Xanthorrhoea preissii	2	1			

Quadrat No.: PBT7
Survey Date: 20/11/17
Personnel: SH JC
Latitude: -32.83948
Longitude: 115.66296
Location:
Topography: Plain
Aspect: None
Slope: 0%
Soil: Loamy sand, grey
Rock: 10% limestone
Leaf Litter:
Bare Ground:
Drainage: Well
Condition: Degraded
Notes:

Native Species	%	Height (m)	Invasive Species	%	Height (m)
Phyllanthus calycinus	5	<0.5	**Centaurea melitensis*	0.5	<0.5
			**Crassula glomerata*	10	<0.5
			**Euphorbia peplus*	4	<0.5
			**Trachyandra divaricata*	40	<0.5

Quadrat No.: PBT8
Survey Date: 20/11/17
Personnel: SH JC
Latitude: -32.85880
Longitude: 115.66688
Location:
Topography: Plain
Aspect: None
Slope: 0%
Soil: Sand, grey
Rock: 0
Gravel: 0%
Leaf Litter:
Bare Ground: 90%
Drainage: Well
Condition: Degraded
Notes: *Eucalyptus gomphocephala* and Peppermint Woodland

Native Species	%	Height (m)	Invasive Species	%	Height (m)
Agonis flexuosa	30	<10	**Briza maxima*	0.1	<0.5
Austrostipa flavescens	0.1	0.5	**Centaurium erythraea*	0.1	<0.5
Eucalyptus gomphocephala	30	10-30m	**Hypochaeris radicata*	0.1	<0.5
Hardenbergia comptoniana	0.1	<0.5	**Petrorhagia dubia*	0.1	<0.5
Lobelia tenuior	0.2	<0.5			
Logania vaginalis	1	1.5			
Lomandra hermaphrodita	0.1	<0.5			
Santalum acuminatum	0.1	1.5			
Spyridium globulosum	20	3.5			
Templetonia retusa	1	0.5			
Tricoryne elatior	0.2	<0.5			

Quadrat No.: PBT9
Survey Date: 21/11/17
Personnel: SH JC
Latitude: -32.84224
Longitude: 115.66215
Location:
Topography: Plain
Aspect: W
Slope: 1-3%
Soil: Sandy loam, brown
Rock: 0
Gravel: 0%
Leaf Litter:
Bare Ground: 10%
Drainage: Well
Condition: Good
Notes: Banksia and Jarrah woodland

Native Species	%	Height (m)	Invasive Species	%	Height (m)
Banksia attenuata	20	7	**Centaurea melitensis*	0.1	<0.5
Banksia sessilis var. cygnorum	25	5	**Euphorbia peplus*	0.1	<0.5
Daucus glochidiatus	0.1	<0.5	**Lysimachia arvensis*	0.1	<0.5
Eucalyptus marginata	50	6	**Trachyandra divaricata*	15	<0.5
Hibbertia cuneiformis	1	1			
Hibbertia hypericoides	0.5	0.5			
Lomandra hermaphrodita	0.5	<0.5			
Macrozamia riedlei	0.5	1.5			
Xanthorrhoea preissii	4	1			

Quadrat No.: PBT10
Survey Date: 21/11/17
Personnel: SH JC
Latitude: 115.66505
Longitude: -32.85273
Location:
Topography:
Aspect: S
Slope: 1-3%
Soil: Loamy sand, brown
Rock: 2% limestone
Gravel: 0%
Leaf Litter:
Bare Ground: 2%
Drainage: Well
Condition: Completely degraded
Notes: *Trachyandra* herbland

Native Species	%	Height (m)	Invasive Species	%	Height (m)
Melaleuca huegelli	10	4	**Bromus diandrus*	0.1	<0.5
			**Crassula glomerata*	0.1	<0.5
			**Euphorbia peplus*	0.1	<0.5
			**Trachyandra divaricata*	95	<0.5

Quadrat No.: PBT11
Survey Date: 21/11/17
Personnel: SH JC
Latitude: -32.86818
Longitude: 115.67153
Location:
Topography:
Aspect: None
Slope: 0%
Soil: Sand, brown
Rock: 0
Gravel: 0%
Leaf Litter:
Bare Ground: 95%
Drainage: Well
Condition: Degraded
Notes: *Eucalyptus gomphocephala* and Peppermint woodland

Native Species	%	Height (m)	Invasive Species	%	Height (m)
Acacia cyclops	10	6	**Centaurium erythraea*	0.1	<0.5
Agonis flexuosa	5	4	**Crassula glomerata*	0.1	<0.5
Gompholobium tomentosum	2	<0.5	**Cuscuta epithymum*	0.1	<0.5
Hardenbergia comptoniana	0.1	<0.5	**Dischisma arenarium*	0.1	<0.5
Spyridium globulosum	70	3.5	**Petrorhagia dubia*	0.1	<0.5
			**Trachyandra divaricata*	2	<0.5

Quadrat No.: PBT12
Survey Date: 21/11/17
Personnel: SH JC
Latitude: -32.84513
Longitude: 115.66269
Location:
Topography: Ridge top
Aspect: S
Slope: 1-3%
Soil: Sand, brown
Rock: 0
Gravel: 0%
Leaf Litter:
Bare Ground: 30%
Drainage: Well
Condition:
Notes: *Eucalyptus decipiens* woodland

Native Species	%	Height (m)	Invasive Species	%	Height (m)
Acacia cyclops	0.1	<0.5	**Briza maxima*	0.1	<0.5
Acacia pulchella var. pulchella	0.3	<0.5	**Trachyandra divaricata*	3	<0.5
Austrostipa campylachne	0.1	1.5			
Comesperma confertum	0.5	0.5			
Conostylis setigera	0.2	<0.5			
Desmocladus flexuosus	0.1	<0.5			
Dianella revoluta	0.1	<0.5			
Eucalyptus decipiens	95	12			
Hardenbergia comptoniana	0.1	<0.5			
Hemiandra pungens	0.1	<0.5			
Hibbertia cuneiformis	0.1	<0.5			
Hibbertia hypericoides	0.5	<0.5			
Hibbertia racemosa	2	<0.5			
Lomandra caespitosa	0.5	<0.5			
Lomandra purpurea	1	0.5			
Lomandra suaveolens	0.5	<0.5			
Macrozamia riedlei	1	0.5			
Olearia axillaris	0.1	<0.5			
Olearia rudis	0.1	<0.5			
Phyllanthus calycinus	0.5	<0.5			
Pimelea rosea	0.1	<0.5			
Spyridium globulosum	0.5	<0.5			

Templetonia retusa	1	1
Tricoryne elatior	0.1	<0.5
Xanthorrhoea preissii	5	1
Xanthosia huegelii	0.3	<0.5

Appendix 7: Gibson *et al.* (1994) Similar Sites

Preston Beach quadrats compared to quadrats from the Gibson *et al.* 1999 dataset. Presence/absence matrices were inputted into statistical analysis software PRIMER, and Bray-Curtis resemblance matrix created to determine similarities between quadrats. The 10 – 12 most similar quadrats are presented, with the most similar Gibson quadrat highlighted.

PBT01		PBT02		PBT03		PBT04		PBT05		PBT06		PBT07		PBT08	
Quadrat	Sim (%)	Quadrat	Sim (%)	Quadrat	Sim (%)	Quadrat	Sim (%)	Quadrat	Sim (%)	Quadrat	Sim (%)	Quadrat	Sim (%)	Quadrat	Sim (%)
PBT02	83.33	PBT01	83.33	PBT10	50.00	PBT05	41.38	PBT06	58.06	PBT05	58.06	PBT10	60.00	PBT11	38.46
PBT07	54.55	PBT07	54.55	PB04	50.00	PBT06	40.00	PBT04	41.38	PB04	41.38	PBT02	54.55	PEPGRV-2	35.90
PBT10	54.55	PBT10	54.55	PBT02	46.15	PB04	37.04	PB03	40.00	PBT04	40.00	PBT01	54.55	PB04	28.57
PBT03	46.15	PBT03	46.15	PBT01	46.15	PB03	34.48	PB04	35.71	PBT12	36.36	PBT09	33.33	PBT04	27.59
PB04	42.11	PB04	42.11	PBT07	33.33	GARDEN-1	34.29	PBT11	30.77	PB03	32.26	PBT03	33.33	PBT03	27.27
PB01	31.58	PBT09	31.58	PBT09	30.00	WOODP-2	33.33	PBT02	28.57	PBT11	29.63	PB02	26.67	LESCH-5	26.67
PBT09	31.58	PBT05	28.57	PBT04	28.57	PB01	29.63	PBT01	28.57	PBT09	27.59	PBT11	25.00	PEPB-1	26.42
PB03	28.57	PB02	25.00	PBT05	27.27	PBT03	28.57	PBT03	27.27	PBT03	26.09	PB04	22.22	CHIDPT-1	24.49
PBT05	28.57	PBT11	23.53	PBT08	27.27	PBT08	27.59	MTB-4	24.39	MTB-4	23.81	WOODP-1	22.22	LESCH-4	24.00
PB02	25.00	PB01	21.05	PBT06	26.09	PEPGRV-2	26.32	WOODP-2	23.26	LESCH-4	23.53	PBT10	20.00	PBT12	23.26
PBT11	23.53	WOODP-1	21.05	WOODP-2	22.86										
WOODP-1	21.05														

PBT09		**PBT10**		**PBT11**		**PBT12**		**PB01**		**PB02**		**PB03**		**PB04**	
Quadrat	Sim (%)	**Quadrat**	Sim (%)	**Quadrat**	Sim (%)	**Quadrat**	Sim (%)	**Quadrat**	Sim (%)	**Quadrat**	Sim (%)	**Quadrat**	Sim (%)	**Quadrat**	Sim (%)
PBT07	33.33	PBT07	60.00	PBT08	38.46	PBT06	36.36	PB03	64.29	PB01	34.78	PB01	64.29	PBT03	50.00
PBT02	31.58	PBT02	54.55	PB04	33.33	MHENRY -2	29.03	PB02	34.78	PB03	32.00	PBT05	40.00	PBT01	42.11
PBT01	31.58	PBT01	54.55	PBT05	30.77	PB03	27.91	PBT01	31.58	PBT10	26.67	PB04	35.71	PBT02	42.11
PB04	30.77	PBT03	50.00	PBT06	29.63	NEER-3	27.40	PB04	30.77	PBT07	26.67	PBT04	34.48	PBT06	41.38
PBT03	30.00	PB02	26.67	cool 03	27.03	WHILL-4	26.87	PBT04	29.63	PB04	26.09	PBT06	32.26	WOODP -1	38.46
PBT06	27.59	PBT11	25.00	PBT10	25.00	CRAMPT -1	26.51	PBT09	23.08	PBT01	25.00	PB02	32.00	PBT04	37.04
PBT12	24.39	PBT09	22.22	PBT07	25.00	KERO-2	25.35	BOLD-3	22.58	PBT04	25.00	PBT01	28.57	MTB-4	35.90
WOODV -2	23.73	PB04	22.22	PBT02	23.53	YAN-3	25.00	PBT10	22.22	PBT02	25.00	PBT12	27.91	PB03	35.71
NEER-21	23.53	PB01	22.22	PBT01	23.53	WABL-3	25.00	PBT05	21.43	cool 02	23.81	cool 02	25.53	PBT05	35.71
PB01	23.08	WOODP -1	22.22	cool 02	23.26	PBT09	24.39	PBT02	21.05	PBT06	23.08	YALG-5	24.56	WOODP -2	34.15