



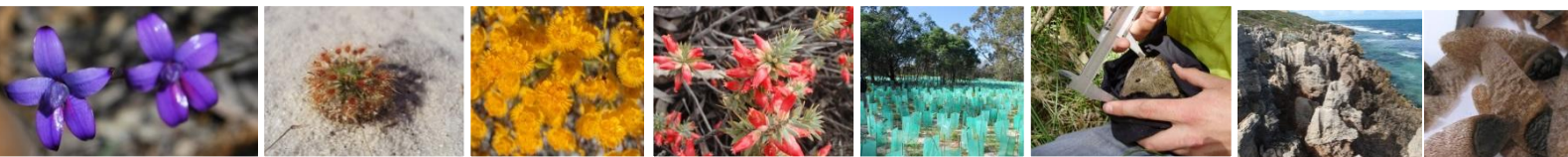
Natural Area  
CONSULTING MANAGEMENT SERVICES

**City of Busselton**

# **Flora, Vegetation and Fauna Survey Busselton Airport Development**

**Version 1 – 16 March 2016**

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<b>Document Title</b>	2016 02 05 COBS REPT Flora and Vegetation Survey Report, Busselton Airport Development V1				
<b>Location</b>	\\10.0.0.210\DropBox\Drop Box\Client Folders - NAC\City of Busselton\RFT 0814 - L1 Flora and Vegetation Survey\Reports				
<b>Draft/ Version No.</b>	<b>Date</b>	<b>Changes</b>	<b>Prepared by</b>	<b>Approved by</b>	<b>Status</b>
D1	24 February 2016	New document	SH	LS	Draft for client review
V1	16 March 2016	Incorporation of client comments	SB	LS	Final

## Executive Summary

The City of Busselton contracted Natural Area Consulting Management Services to undertake a flora and vegetation survey, along with a habitat assessment within certain portions of the Busselton Regional Airport site and nearby locations. The five survey areas are located approximately 6.3 km south-east of the Busselton Town Centre and cover approximately 41.1 ha. Survey outcomes provide baseline data of flora, ecological communities, and threatened fauna habitat present that will assist with the environmental approval process associated with the proposed development of the Busselton Regional Airport. No further surveys are recommended due to the degraded nature of the survey sites and the likelihood that threatened and priority *Verticordia* species would have been flowering when the site assessment was undertaken.

The flora and vegetation survey within the Busselton Regional Airport assessment sites confirmed:

- a total of 63 flora species from 24 families, of which 22 are monocotyledons and 41 are dicotyledons
- a total of 30 (47.6%) introduced flora (weed) species
- no threatened flora species within the survey areas although 3 species have been previously recorded within the Busselton Regional Airport property, with the closest being *Verticordia plumosa* var. *vassensis* occurring approximately 36 m from area 5
- no threatened ecological communities with the closest being 1800 m to the north-west of the site
- the habitat on site was not considered suitable for the Western Ringtail Possum, which is listed as threatened under the *Wildlife Conservation Act 1950* (WA) and vulnerable under the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth)
- no breeding habitat or nesting hollows were present on site for black cockatoos listed as Threatened under the *Wildlife Conservation Act 1950* (WA) and the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth).

The *Corymbia calophylla* (Marri) Woodland that is a preferred foraging species for threatened black cockatoo species covered approximately 4.6 ha of the site in areas 4 and 5. No signs of feeding in these areas were recorded and there were few mature Marri trees present, with most having reduced canopy cover and low amounts of nuts presenting. The feeding habitat was in poor condition and in isolated pockets along road verges and within farming paddocks. A small number of mature Tuart and Marri were present in areas 2 and 3, with no obvious hollows or signs of use by black cockatoos. On that basis, the likelihood of the sites being used by black cockatoos as a feeding source is low.

Referral to the Commonwealth Department of the Environment is required where significant impacts to matters of national environmental significance, such as the presence of endangered species and ecological communities. Due to the degraded and isolated nature of the foraging habitat and the lack of signs of foraging recorded, the impacts of the proposed development is not considered to be significant; therefore, a referral to the Department of the environment is not warranted. However, a pre-referral meeting with the Perth Office of the Department can be undertaken to confirm this.

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## 1.0 Introduction

The City of Busselton commissioned Natural Area Consulting Management Services (Natural Area) to carry out a level 1 flora and vegetation survey and a fauna habitat assessment to support environmental approvals processes associated with the upgrade development of the Busselton Regional Airport. The site is located within the Busselton Regional Airport and nearby properties off Vasse Highway, in the suburb of Yalyalup within the City of Busselton. The survey site is split into five survey areas and is located approximately 6.3 km south east of the Busselton Town Centre, and covers 41.4 ha (Figure 1). These areas include:

- Location 1, approx. 8.85 ha, Lot 3819 Bussell Hwy
- Location 2, approx. 14.71 ha, Lot 9001 Neville Hyder Drive
- Location 3, approx. 0.37 ha, Lot 1 Vasse Hwy
- Location 4, approx. 4.27 ha, Lot 51 Acton Park Road and Lot 57 Vasse Hwy
- Location 5, approx. 8.05 ha, Lot 591 Acton Park Road.

The on-ground flora survey activities were carried out by Natural Area botanist Sharon Hynes assisted by Taryn Brebner on the 4<sup>th</sup> of February 2016.

This report outlines:


- the site location
- description of the existing environment
- survey aims and objectives
- methodology
- survey results
- implications of results.

### 1.1 Scope of Works

Natural Area's scope of works associated with the survey included the following:

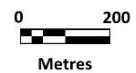
- undertake searches of various State and Federal databases to identify the likely presence of flora species, including any declared rare or priority flora species, along with any threatened or priority ecological communities
- identify the flora species on site including native and introduced species
- assess vegetation type and condition
- review the presence of threatened or priority ecological communities
- undertake habitat assessment for Black Cockatoos listed as threatened under the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth) and the *Wildlife Conservation Act 1950* (WA)
- undertake habitat assessment for the Western Ringtail Possum, which is listed as Threatened under the *Wildlife Conservation Act 1950* and Vulnerable under the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth)
- document results.



 **Figure 1:**  
**Site location and survey areas, Busselton Airport assessment site, Yalyalup**



Client: City of Busselton  
 Project: Flora and Vegetation Survey Report, Busselton Airport Development  
 Image Source: Nearthmap, 2016  
 Prepared by: Sharon Hynes  
 Datum: GDA 94, Zone 50



## 2.0 Site Characteristics

The flora, vegetation and fauna found at a particular location are directly influenced by several key factors, including:

- climate
- soils
- topography
- disturbance processes, such as land clearing.

### 2.1 Regional Context

According to Interim Biogeographical Regionalisation of Australia (IBRA) descriptions, Busselton 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 City of Busselton situated in the latter.

### 2.2 Climate

The climate experienced in the area is Mediterranean, with dry, hot summers and cool, wet winters.

According to the Bureau of Meteorology (Busselton Aero, Station ID: 009603, 2016):

- average rainfall is 660.5 mm pa, with the majority falling between May and August
- average maximum temperature ranges from 16.8 °C in winter to 30.3 °C in summer, with the highest recorded maximum being 41 °C
- average minimum temperatures range from 6.8 °C in winter to 14.7 °C in summer, with the lowest recorded minimum being -1 °C
- predominant wind directions include north-westerly or southerly sea breezes during summer months, with an average wind speed of 21.3 km/h and gusts of more than 100 km/h.

### 2.3 Soil Type

Five soil types are present within the Busselton Regional Airport assessment site, which included Bassendean soils and Abba flats formations (Department of Agriculture and Food, 2016a). Soil types are described in Table 1 and shown in Figure 2.

**Table 1:** Soil type descriptions

Map Unit	Name	Description
212BsGCd2	Bassendean Golf Course Deep Sandy Rises Phase	Dunes on Quaternary aeolian deposits and alluvium in the southern Swan Coastal Plain between the Ludlow River and Jindong, consisting of pale deep sands.
212BsX_MINE	Bassendean unmapped Land, Mine Phase	Sand mines on Quaternary aeolian and alluvial deposits in the Bassendean Dunes, disturbed land.
213AbAB1	Abba Flats Phase	Plain consisting of very low rises on Quaternary alluvium in the southern Swan Coastal Plain between the Capel River and Dunsborough, pale sandy earths, semi-wet soils and pale deep sands with some grey deep sandy duplexes.



Map Unit	Name	Description
213AbABw	Abba Wet Flats Phase	Poorly drained flats and depressions on Quaternary alluvium in the southern Swan Coastal Plain between the Capel River and Dunsborough, wet and semi-wet soils with pale sandy earths and pale deep sands.
213AbABwy	Abba Very Wet Saline Flats Phase	Depressions susceptible to salinity on Quaternary alluvium in the southern Swan Coastal Plain inland from Busselton on Ludlow, wet and semi-wet soils, saline wet soils and alkaline grey shallow sandy duplexes.

## 2.4 Topography

The contours ranged from 14 - 18 m Australian Height Datum (AHD) within the Busselton Regional Airport and surrounding areas, with the five survey areas situated in relatively flat and low lying areas at approximately 15 m AHD (Figure 3) (Department of Agriculture and Food, 2016).

## 2.5 Hydrology

The majority of the assessment site is categorised as multiple use wetlands (Landgate, 2016), with areas 1 – 4 becoming inundated during the wetter months.

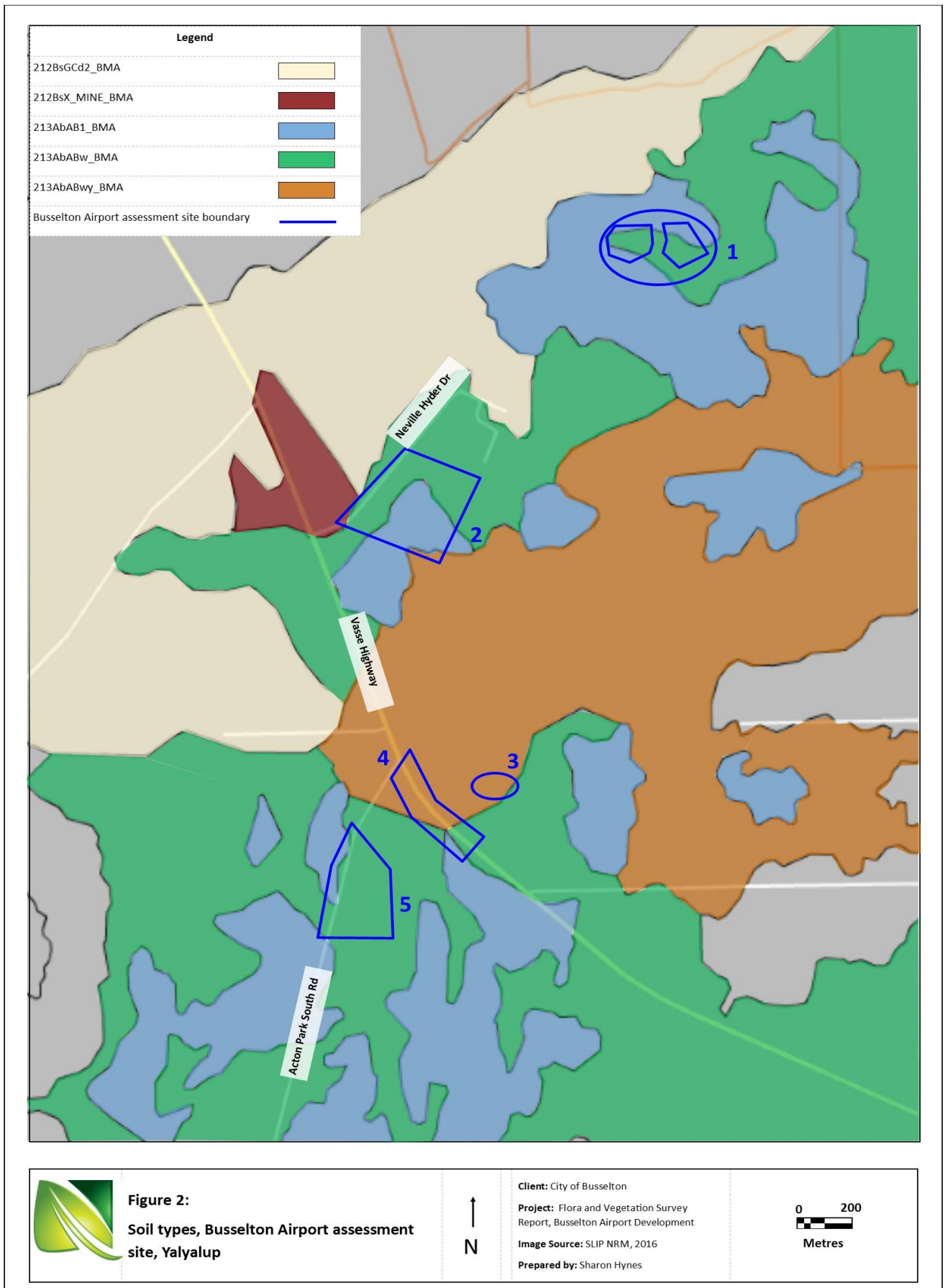
## 2.6 Vegetation Complex

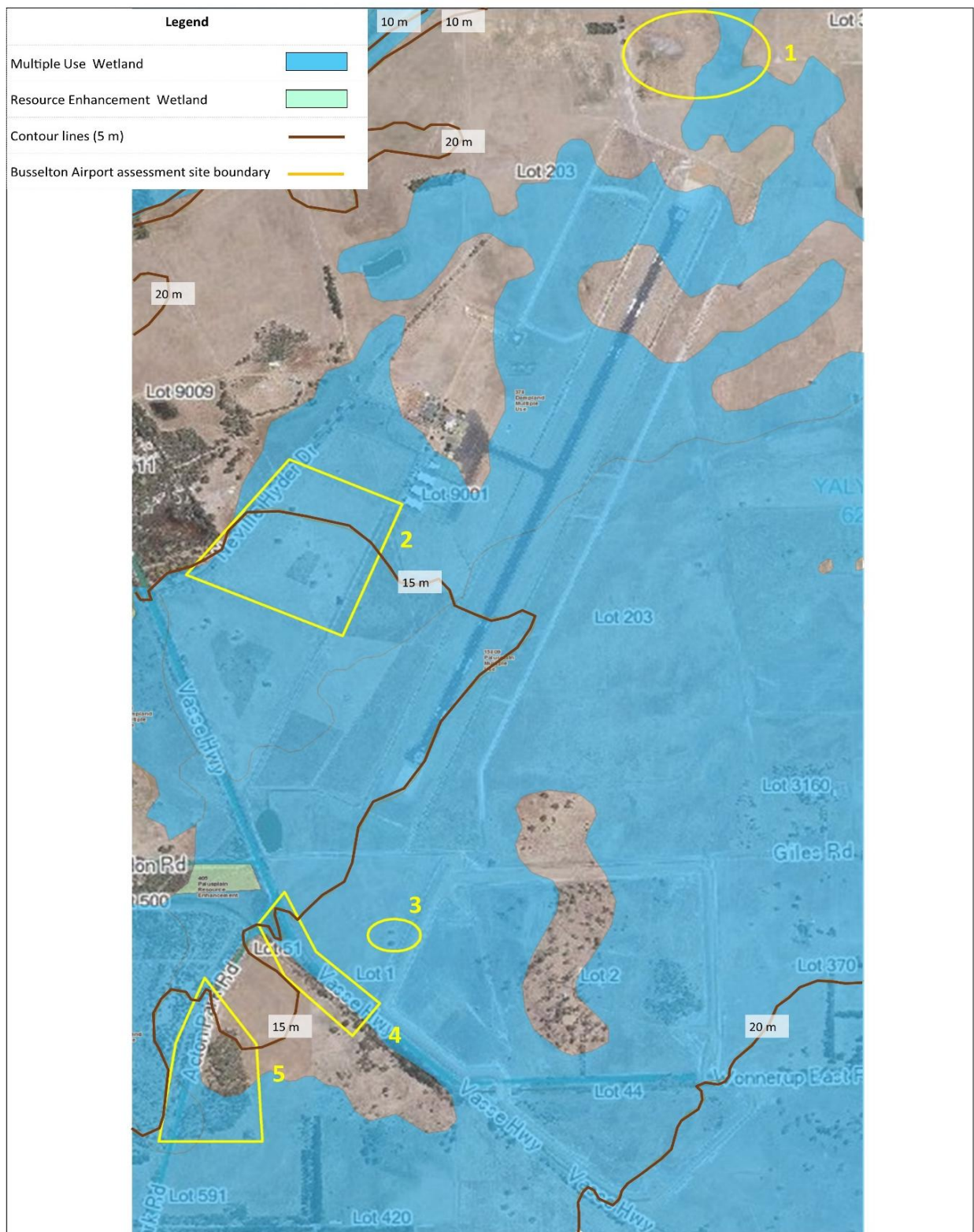
The site is located within the Abba Complex, which is typically associated with Marri, Jarrah and Banksia open forest or Marri Woodland. Common species included in this vegetation complex include *Melaleuca preissiana*, *M. raphiophylla*, *Nuytsia floribunda*, *Kingia australis*, *Persoonia longifolia*, *Banksia grandis*, *Regelia ciliata*, *Beaufortia sparsa*, *Leptospermum ellipticum*, *Hakea varia*, *Acacia saligna*, *Astartea fascicularis*, *Viminaria juncea* and *Agonis juniperina* (Hedde, Loneragan and Havel, 1980).

## 2.7 Florist Community Types

A review of *A Floristic Survey of the Southern Swan Coastal Plain* (Gibson *et al.*, 1994) and the descriptions of floristic community types (FCTs) within the area suggest the following FCTs could potentially occur within the site:

- FCT 1b – Southern *Corymbia calophylla* Woodlands on heavy soils
- FCT 2 – Southern wet shrublands
- FCT 7 – Herb rich saline shrublands in clay pans

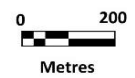




**Figure 3:**  
Wetlands and contours, Busselton Airport assessment site, Yalyalup



Client: City of Busselton  
 Project: Flora and Vegetation Survey Report, Busselton Airport Development  
 Image Source: WA Atlas, 2016  
 Prepared by: Sharon Hynes  
 Datum: GDA 94, Zone 50



## 3.0 Flora, Vegetation and Fauna Habitat Survey Methodology

### 3.1 Objectives

The major objective of the flora and vegetation survey was to reconfirm the flora and vegetation values at the site and use the outcomes to assist with planning and associated development approvals processes.

### 3.2 Desktop and Literature Review

The flora and vegetation survey was carried out in accordance with *EPA Guidance Statement 51 – Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia* (Environmental Protection Authority, 2004), and included a desktop review of literature and databases.

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

- 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 used to gather the above information:

- NatureMap (DPaW, 2016d)
- Protected Matters Search Tool (Department of Environment (DotE), 2016b (Cwlth))
- Threatened (Declared Rare) and Priority Flora Database (DPaW, 2016c)
- Western Australian Herbarium Specimen Database (DPaW, 2016c)
- Threatened and Priority Flora List (DPaW, 2016c)
- FloraBase (DPaW, 2016b).

The NatureMap and Protected Matters Search Tool reports included the site and a 2 km buffer.

### 3.3 On-ground Methodology

Natural Area Botanists Sharon Hynes and Taryn Brebner traversed the site on foot on the 4<sup>th</sup> of February 2016, with data recorded including:

- identification of flora species present by walking the site, including targeting declared rare and priority species
- confirm vegetation type by installing nine 10 m x 10 m quadrats, nine were installed in areas 1 – 4, with none in area 5 due to access restrictions (Figure 4)
- assessment of vegetation condition
- using GPS to map significant species and boundaries of differing vegetation types and condition
- habitat assessment for threatened black cockatoos and the Western Ringtail Possum listed under the *Wildlife Conservation Act 1950* (WA) and the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth)
- key data recorded using a Trimble GPS unit.

The following were recorded for each quadrat:

- GPS location

- aspect
- habitat and vegetation description
- soil type and colour
- drainage
- native and introduced flora species present
- percentage foliar cover
- height of each species.

### 3.3.1 Flora Species

Flora species were recorded on observation within each quadrat and across the site, with the list of potential declared rare or priority flora species used to guide targeted searches for those species. The species list includes native and introduced species. Samples were collected or photographs taken of unfamiliar species to enable later identification.

### 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, middle and understorey species. A description of the various structural classes is provided in Table 2.

**Table 2:** Vegetation structural classes

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

(Source: Government of Western Australia, 2000)

### 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 3 provides a description of the rating scale.

**Table 3:** 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 Habitat Assessment

Assessment of the vegetation on site was undertaken to determine the potential for threatened black cockatoos and the Western Ringtail Possum within the five assessment areas. This included:

- identifying and recording the GPS location of any hollows suitable to be used as nesting hollows for threatened black cockatoos,
- identifying and recording any vegetation that is a preferred food sources of the threatened black cockatoos
- identifying and recording any sightings, dreys and scats of the threatened Western Ringtail Possum.

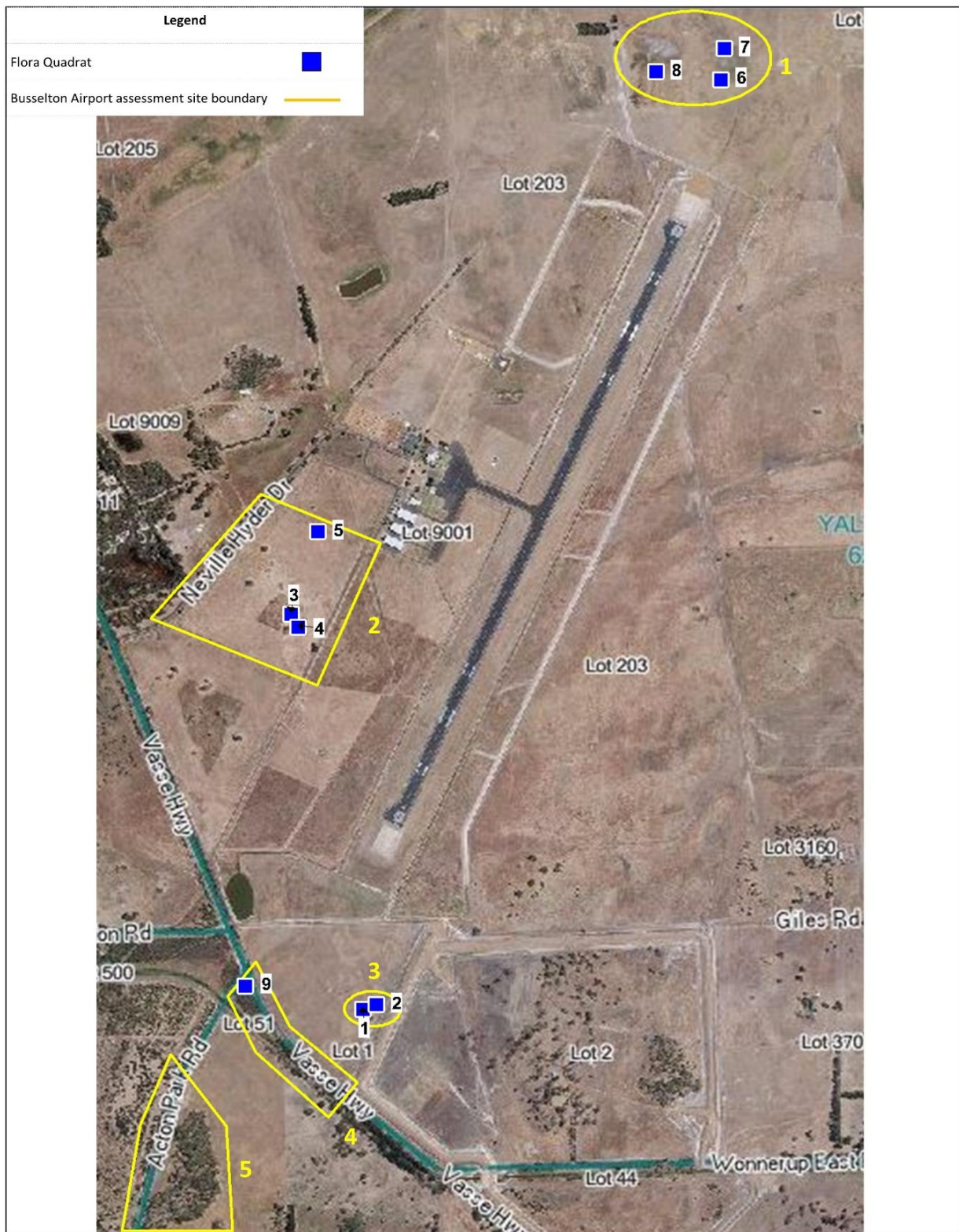
### 3.5 Limitations

Due to the timing of the proposed development requirements the surveys were not carried out at the optimum time for the south-west of Western Australia, however due to the degraded nature of the site and the lack on remnant native vegetation this was not considered a significant limitation. A number of limitations associated with both desktop and on-site flora surveys remain. These include:

- database searches only provide an indication of what flora species may be present, with on ground surveys required to confirm those actually present

- databases are reliant on information submitted via various reporting mechanisms, so all records of a particular flora species or ecological community within 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, and not all species flower every year
- access to areas 4 and 5 was limited with field surveys being undertaken from the nearest gazetted roadsides, restricting the ability to appropriately identify flora species and vegetation community types in these areas
- variations in outcomes with other surveys include the judgements applied at the time of the assessment and natural variation at the time each survey was carried out.

Despite the various survey limitations and the timing of the survey not occurring during the optimum time for the south-west of Western Australia, Natural Area estimates that 85 – 95% of species at the site were recorded.



	<p><b>Figure 4:</b> Flora quadrat locations, Busselton Airport assessment site, Yalyalup</p>		<p>Client: City of Busselton Project: Flora and Vegetation Survey Report, Busselton Airport Development Image Source: Nearmap, 2016 Prepared by: Sharon Hynes Datum: GDA 94, Zone 50</p>	
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## 4.0 Flora, Vegetation and Fauna Habitat Survey Results

### 4.1 Desktop Survey Results

#### 4.1.1 Flora Species

NatureMap (DPaW, 2016d) indicates the potential for 70 dicotyledons (2 introduced species), 1 gymnosperm and 15 monocotyledons (no introduced species) (Appendix 1) to occur within the site and nearby areas within a 2 km buffer.

#### 4.1.2 Significant Flora

The Department of Parks and Wildlife (DPaW) threatened and priority flora and herbarium databases (DPaW 2016c), NatureMap, and the Protected Matters Search Tool (Cwlth) (Department of the Environment, 2016) (Appendix 2) identified the potential for 26 significant flora species in or near to the site, of which 16 had a greater likelihood of being present based on the habitat types present (Table 4). Details of each including descriptions and flowering times are provided in Appendix 3, with a description of the conservation codes provided in Appendix 4.

A review of the DPaW threatened and priority database indicated no significant flora species within the survey areas but three were recorded nearby. These were *Verticordia plumosa* var. *vassensis*, *Verticordia plumosa* var. *ananeotes* and *Grevillea brachystylis* subsp. *brachystylis*. The locations of each are shown in Figure 5.

**Table 4:** listed threatened and priority species for the Busselton Airport assessment site

Species Name	Conservation Code (WA)	Conservation Code (Cwlth)	Likelihood to occur on site
<i>Andersonia gracilis</i>	T	EN	Habitat and soil types suitable
<i>Amperea micrantha</i>	P2		Soil types suitable
<i>Banksia nivea</i> subsp. <i>uliginosa</i>	T	EN	Habitat and soils unsuitable
<i>Banksia squarrosa</i> subsp. <i>argillacea</i>	T	VU	Habitat and soil types suitable
<i>Brachyscias verecundus</i>	T	CR	Habitat and soil types unsuitable
<i>Caladenia huegelii</i>	T	EN	Habitat and soil types suitable
<i>Chamelaucium</i> sp. S coastal plain (R.D.Royce 4872)	T	VU	No available information
<i>Chamelaucium</i> sp. Yoongarillup (G.J. Keighery 3635)	P4		No available information
<i>Chordifex gracilior</i>	P3		Habitat and soil types unsuitable
<i>Darwinia foetida</i>	T	CR	Habitat and soil types suitable
<i>Darwinia whicherensis</i>	T	EN	Habitat and soil types unsuitable
<i>Diuris micrantha</i>	T	VU	Soil types are suitable
<i>Drakaea elastica</i>	T	EN	Habitat and soil types suitable

Species Name	Conservation Code (WA)	Conservation Code (Cwlth)	Likelihood to occur on site
<i>Drakaea micrantha</i>	T	VU	Habitat and soil types suitable
<i>Gastrolobium papilio</i>	T	EN	Soil types are unsuitable
<i>Grevillea brachystylis</i> subsp. <i>brachystylis</i>	P3		Habitat and soil types suitable
<i>Grevillea bronwenae</i>	P3		Habitat and soil types unsuitable
<i>Isopogon formosus</i> subsp. <i>dasylepis</i>	P3		Habitat and soil types suitable
<i>Jacksonia gracillima</i>	P3		Habitat and soil types suitable
<i>Lambertia echinata</i> subsp. <i>occidentalis</i>	T	EN	Habitat and soil types unsuitable
<i>Leptomeria furtiva</i>	P2		Soils unsuitable
<i>Petrophile latericola</i>	T	EN	Soils unsuitable
<i>Synaphea hians</i>	P3		Habitat unsuitable
<i>Verticordia attenuata</i>	P3		Habitat and soil types suitable
<i>Verticordia plumosa</i> var. <i>ananeotes</i>	T	EN	Habitat and soil types suitable
<i>Verticordia plumosa</i> var. <i>vassensis</i>	T	EN	Habitat and soil types suitable

#### 4.1.3 Threatened or Priority Ecological Communities

A review of the DPaWs threatened and priority ecological community's database indicated there were no significant communities within the survey areas. However, the Priority 1 ecological community – *Eucalyptus rudis*, *Corymbia calophylla* and *Agonis flexuosa* Low Forest has been recorded approximately 1800 m north-west of the site in two separate locations.

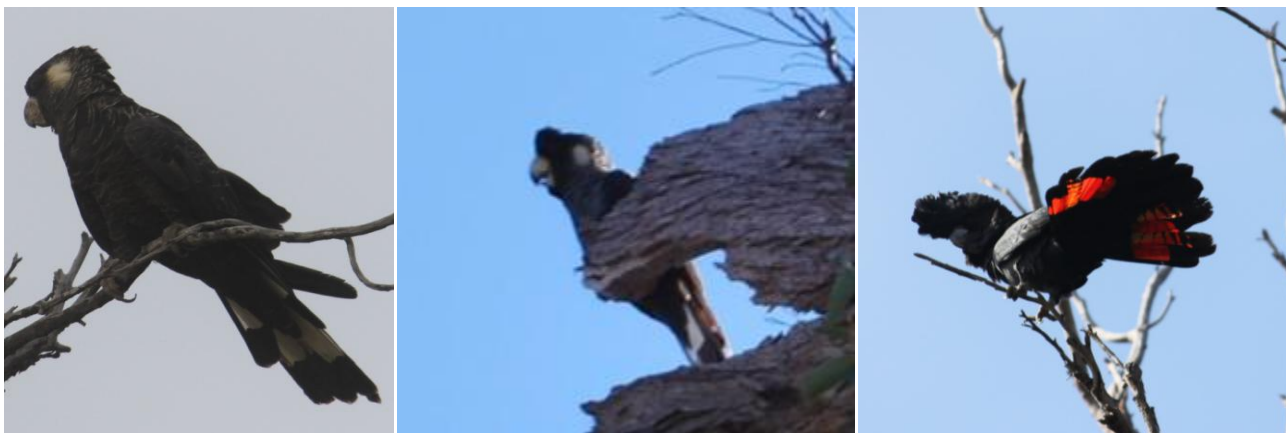
#### 4.1.4 Black Cockatoos

NatureMap (2016) and Protected Matters Search Tool (2016) indicated that the Carnaby's Cockatoo (*Calyptorhynchus latirostris*), Baudin's Cockatoo (*Calyptorhynchus baudinii*) and Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*) could potentially occur in the area (Figure 5).

The Carnaby's Cockatoo is a large iconic Western Australian bird that utilises the Swan Coastal Plain in the winter as feeding grounds. The most important foraging species used by the Cockatoo include the *Banksia*, *Hakea* and *Grevillea*, along with non-native pine plantations. Birds migrate to the Wheatbelt in the spring to reproduce (Department of Environment, 2016d). The Carnaby's Cockatoo is listed as Endangered under the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth) and Threatened under the *Wildlife Conservation Act 1950* (WA), with the decline of this species primarily due to habitat fragmentation (Department of Environment, 2016d).

The Forest Red-tailed Black-Cockatoo and Baudin's Cockatoo are listed as Vulnerable under the *EPBC Act 1999* (Cwlth) with the major threats identified as habitat loss, nest hollow shortage, injury or death from the European Honeybee (*Apis mellifera*), illegal shooting and fire. The main habitat for both species is *Eucalyptus*

forest particularly Jarrah and Marri both of which are present on site, with Marri being their preferred food source, which is present in the north west of the site (Department of Environment, 2016d).

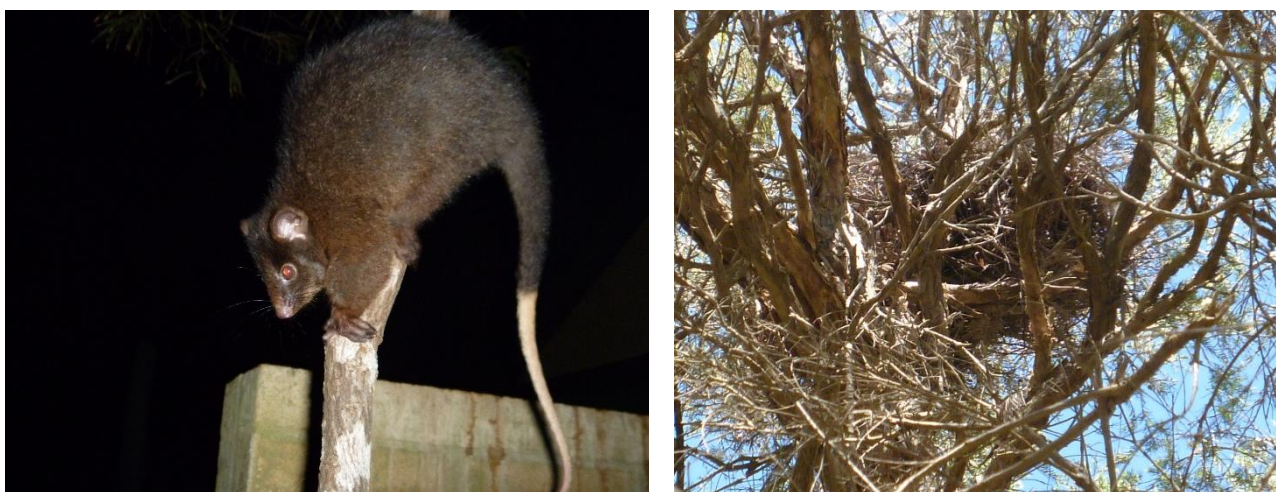


**Figure 5:** Threatened black cockatoos: Carnaby's Cockatoo (left), Baudin's Cockatoo (centre), Forest Red-tailed Black Cockatoo (right)

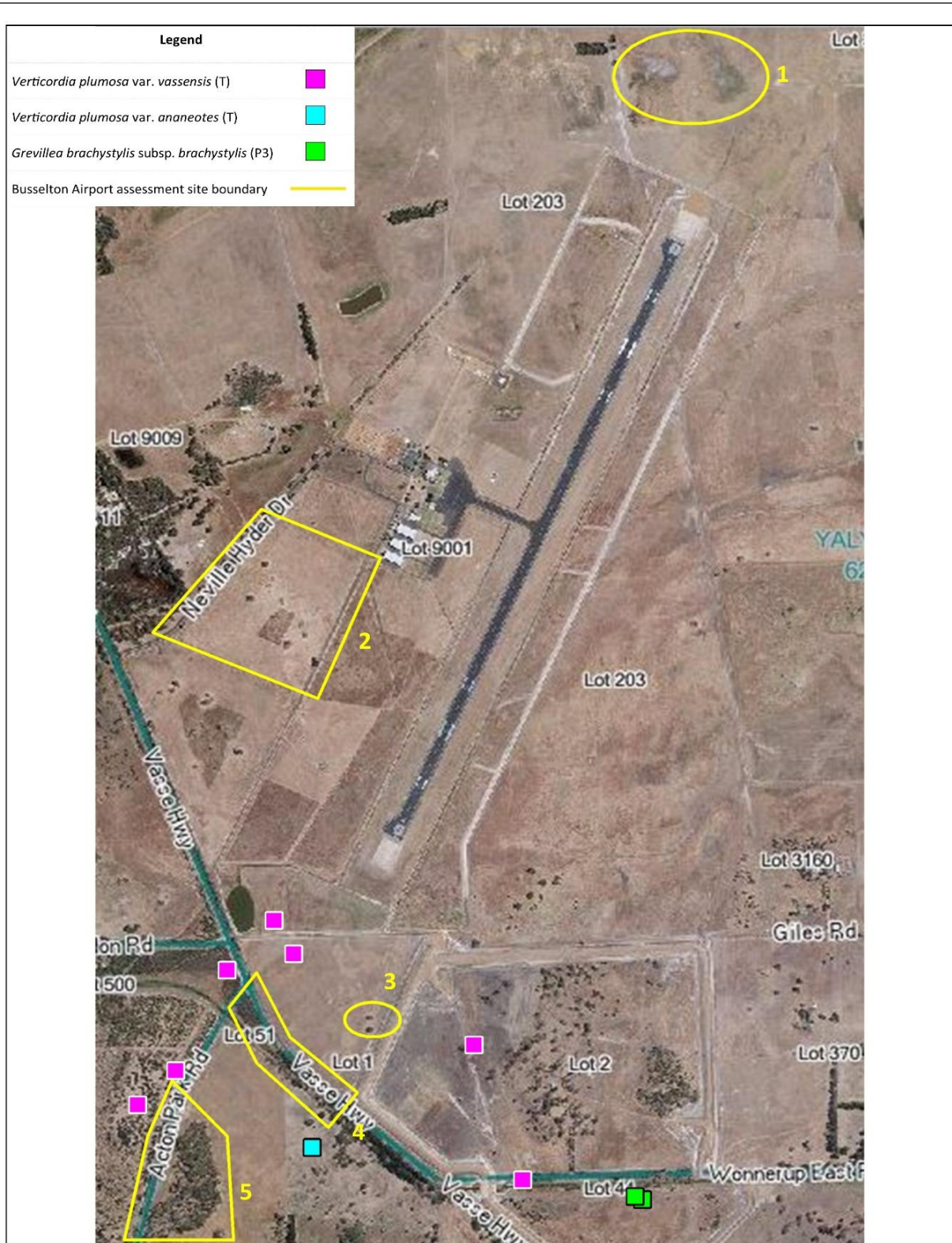
#### 4.1.5 Western Ringtail Possum (*Pseudocheirus occidentalis*)

NatureMap (2016) and Protected Matters Search Tool (2016) indicated that the Western Ringtail Possum (*Pseudocheirus occidentalis*) could potentially occur in the area. The Western Ringtail Possum is listed as threatened under the *Wildlife Conservation Act 1950* (WA) and Vulnerable under the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth).

The Western Ringtail Possum (Figure 6) is only found in the south-west of Western Australia from Mandurah down to Albany. The preferred habitat of this species is Eucalypt and particularly *Agonis flexuosa* (Peppermint Tree) forests with dense foliage cover providing shade, connected tree canopies and drinking water sources nearby. The Western Ringtail Possum are nocturnal and nest in leafy nests called a drey created in branches or hollows of mature trees (Figure 6) (Department of the Environment, 2016d).



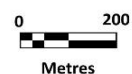
**Figure 6:** Threatened possum: Western Ringtail Possum (*Pseudocheirus occidentalis*) (left); possum drey in a mature *Agonis flexuosa* (Peppermint Tree)



**Figure 7:**  
**Significant flora locations, Busselton  
 Airport assessment site, Yalyalup**



Client: City of Busselton  
 Project: Flora and Vegetation Survey  
 Report, Busselton Airport Development  
 Image Source: Nearmap, 2016  
 Prepared by: Sharon Hynes  
 Datum: GDA 94, Zone 50



## 4.2 Field Survey Results

### 4.2.1 Flora Composition

A total of 63 flora species were recorded from 24 families within the survey boundary, of which:

- 22 were monocotyledons (10 native species, 12 introduced species)
- 41 were dicotyledons (23 native species, 18 introduced species).

A list of all species observed is provided in Appendix 5, with quadrat data in Appendix 4. Examples of native species observed are provided in Figure 8.

**Figure 8:** Examples of native flora species



*Corymbia calophylla*  
(Marri)



*Juncus pallidus*  
(Pale Rush)



*Adenanthos meisneri*



*Kingia australis*  
(Kingia)



*Cassytha glabella*  
(Tangled Dodder Laurel)



*Stenotalis ramosissima*



*Viminaria juncea*  
(Swishbush)



*Agonis flexuosa*  
(Peppermint Tree)



*Verticordia densiflora*  
(Compacted Featherflower)

### 4.2.2 Significant Flora

No threatened or priority flora species were recorded within the survey areas during the 2016 field survey. The closest declared rare flora species *Verticordia plumosa* var. *vassensis* was found nearby areas 4 and 5, with the closest plant a minimum of 36 m from area 5 (Figure 7).

### 4.2.3 Introduced Flora

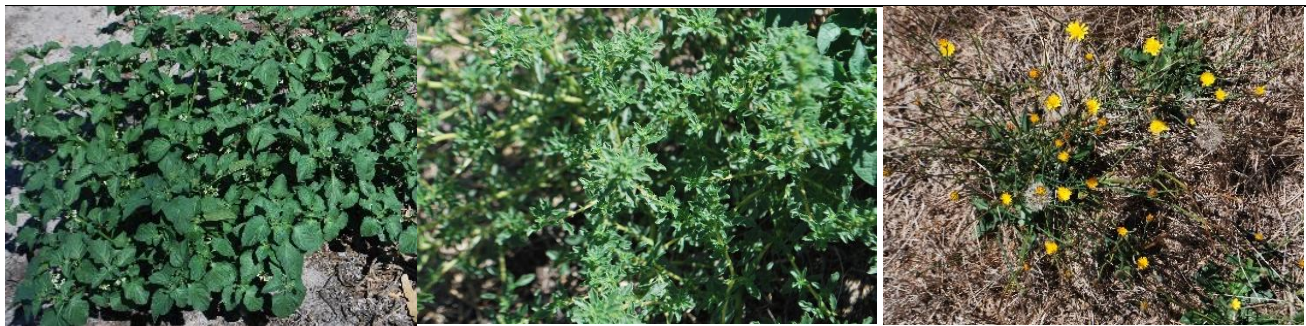
Of the 63 species recorded, 30 (47.6%) were introduced plants. No weeds of national significance (WoNS) were recorded. Weed species recorded were listed on the Western Australian Organism List (WAOL) as Permitted (S11) declared pests under the *Biosecurity and Agriculture Management Act 2007* (WA), which does not require management or control of the organism (Department of Agriculture and Food WA, 2016b). Introduced flora species are indicated with an asterisk (\*).

Two species are listed as having a medium or high control priority on the Department of Parks and Wildlife’s Weed Prioritisation Process for the Swan Coastal Plain (2015):

- *Lupinus cosentinii* (H) – Blue Lupin
- *Watsonia meriana* var. *meriana* (H) - Watsonia

Examples of introduced flora species are shown in Figure 9.

**Figure 9:** Examples of introduced flora species



\*Black Berry Nightshade  
(*Solanum nigrum*)

\*Tumbleweed  
(*Amaranthus albus*)

\*Flatweed  
(*Hypochaeris radicata*)



\*Annual Veldt Grass  
(*Ehrharta longiflora*)

\*Pie Melon  
(*Citrullus lanatus*)

\*Paterson’s Curse  
(*Echium plantagineum*)



\*Hastate Orache  
(*Atriplex prostrata*)




\*Watsonia  
(*Watsonia meriana* var. *meriana*)





\*Mindiyed  
(*Melaleuca nesophila*)

#### 4.2.4 Vegetation Types


Eight vegetation types were identified within the sites, with *Hypochaeris radicata* Herbland covering the majority. Vegetation types are described in Table 5 with locations of each shown in Figure 8.

**Table 5:** Vegetation types within the Southern Link Road assessment sites

Vegetation Type	Description	Photograph	Survey Area
* <i>Cenchrus</i> and * <i>Cynodon</i> Grassland	* <i>Cenchrus clandestinus</i> and * <i>Cynodon dactylon</i> Grassland, with scattered mixed weedy herbs and grasses; scattered <i>Eucalyptus gomphocephala</i> is present in area 3		1, 2 and 3
<i>Corymbia calophylla</i> Woodland	<i>Corymbia calophylla</i> Woodland over <i>Xanthorrhoea preissii</i> and mixed shrubs, and weedy herbs and grasses		4 and 5
* <i>Hypochaeris radicata</i> Herbland	* <i>Hypochaeris radicata</i> Herbland with * <i>Bromus catharticus</i> and scattered weedy herbs		1, 2 and 3

Vegetation Type	Description	Photograph	Survey Area
<i>Juncus pallidus</i> Open Sedgeland	Open Sedgeland of <i>Juncus pallidus</i> over * <i>Cynodon dactylon</i> and * <i>Cenchrus clandestinus</i> grassland with mixed weedy herbs		1
Mixed Open Woodland	Mixed Open Woodland of <i>Eucalyptus gomphocephala</i> , <i>Agonis flexuosa</i> , <i>Melaleuca raphiophylla</i> , <i>M. viminea</i> and * <i>M. nesophila</i> over a weedy grassland of * <i>Cynodon dactylon</i> ; scattered <i>Corymbia calophylla</i> present		2
Mixed Woodland	Mixed Woodland of planted * <i>Eucalyptus</i> sp. (Eastern states), * <i>Allocasuarina</i> sp., <i>Melaleuca preissiana</i> over a weedy grassland of * <i>Cynodon dactylon</i>		5
<i>Melaleuca osullivanii</i> Open Woodland	Open Woodland of <i>Melaleuca osullivanii</i> over <i>Kunzea micrantha</i> and mixed shrubs, and a sedgeland of <i>Baumea juncea</i> and * <i>Watsonia meriana</i> var. <i>meriana</i> ; <i>Viminaria juncea</i> , <i>Adenanthos meisneri</i> and <i>Kingia australis</i> is also associated with this vegetation type		4



Vegetation Type	Description	Photograph	Survey Area
* <i>Solanum nigrum</i> Open Herbland	Open Herbland of * <i>Solanum nigrum</i> with scattered weedy herb and grasses		1 and 2

#### 4.2.5 Vegetation Condition

The vegetation condition within the survey boundary ranged from Completely Degraded to Very Good, with the majority of the site (78.3%) recorded as Completely Degraded (Table 6, Figure 9).

**Table 6:** Vegetation condition

Vegetation Condition	Excellent	Very Good	Good	Degraded	Completely Degraded	Totals
Area (ha)	0	0.3	2.1	5.9	30.1	38.4
Area (%)	0	0.8	5.4	15.5	78.3	100

#### 4.2.6 Floristic Community Types

Due to the degraded nature of the site and the lack of native flora species and intact vegetation communities, it was difficult to determine if any of the floristic community types indicated by the desktop survey were present on site.

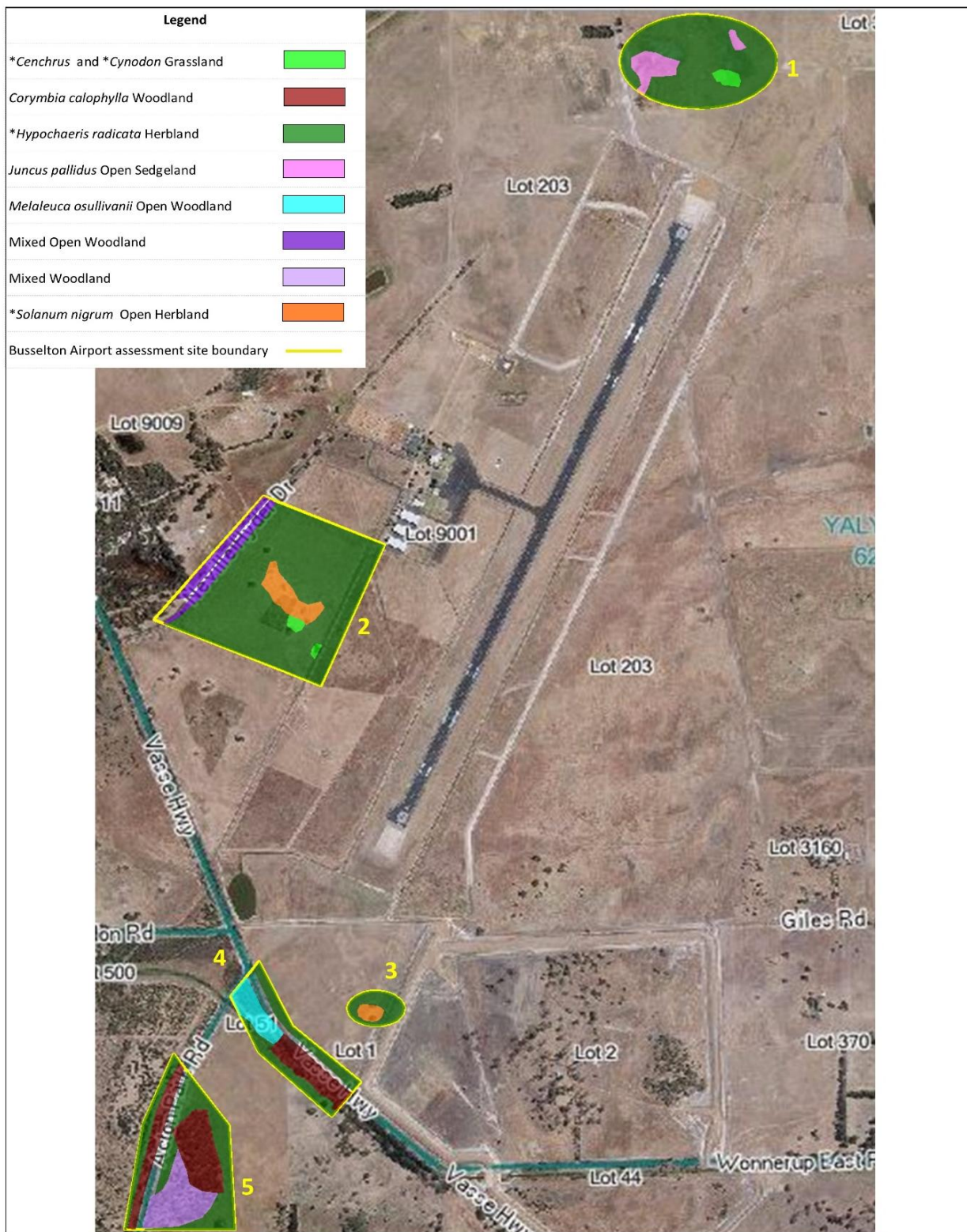
#### 4.2.7 Black Cockatoos

No black cockatoos were observed on site during field assessment activities. The preferred habitat and food sources of the Baudin's Cockatoo (*Calyptorhynchus baudinii*) and Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*) were present on site, with *Corymbia calophylla* (Marri) Woodlands (4.6 ha) occurring in survey areas 4 and 5 (Figure 8) and scattered Marri and Tuart (*Eucalyptus gomphocephala*) in areas 2 and 3. This food resource was in poor condition and with sparse trees along the road reserves and younger trees in an isolated patch within area 5. No signs of foraging by threatened black cockatoos was observed in any of the areas present, with the Marri trees having a low amount of nuts present and the Tuart showing declines in their canopy.

No nesting hollows were recorded in any of the survey areas. Some small superficial holes were just starting to form in what could potentially be hollows in the future but were not yet large enough for birds to nest in. One open stick nest was recorded in survey area two, which was most likely an Australian Raven (*Corvus coronoides*) or an Australian Magpie (*Cracticus tibicen*) nest.

#### **4.2.8 Western Ringtail Possum**

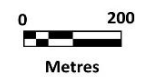
No habitat for the Western Ringtail Possum was recorded within the site and the *Agonis flexuosa* and *Corymbia calophylla* trees present showed no evidence of dreys or hollows suitable for the species and no scats present. The *Corymbia calophylla* Woodland present on site was isolated and did not have a dense canopy cover as it was quite degraded vegetation, thus it was not considered suitable habitat for the Western Ringtail Possum.

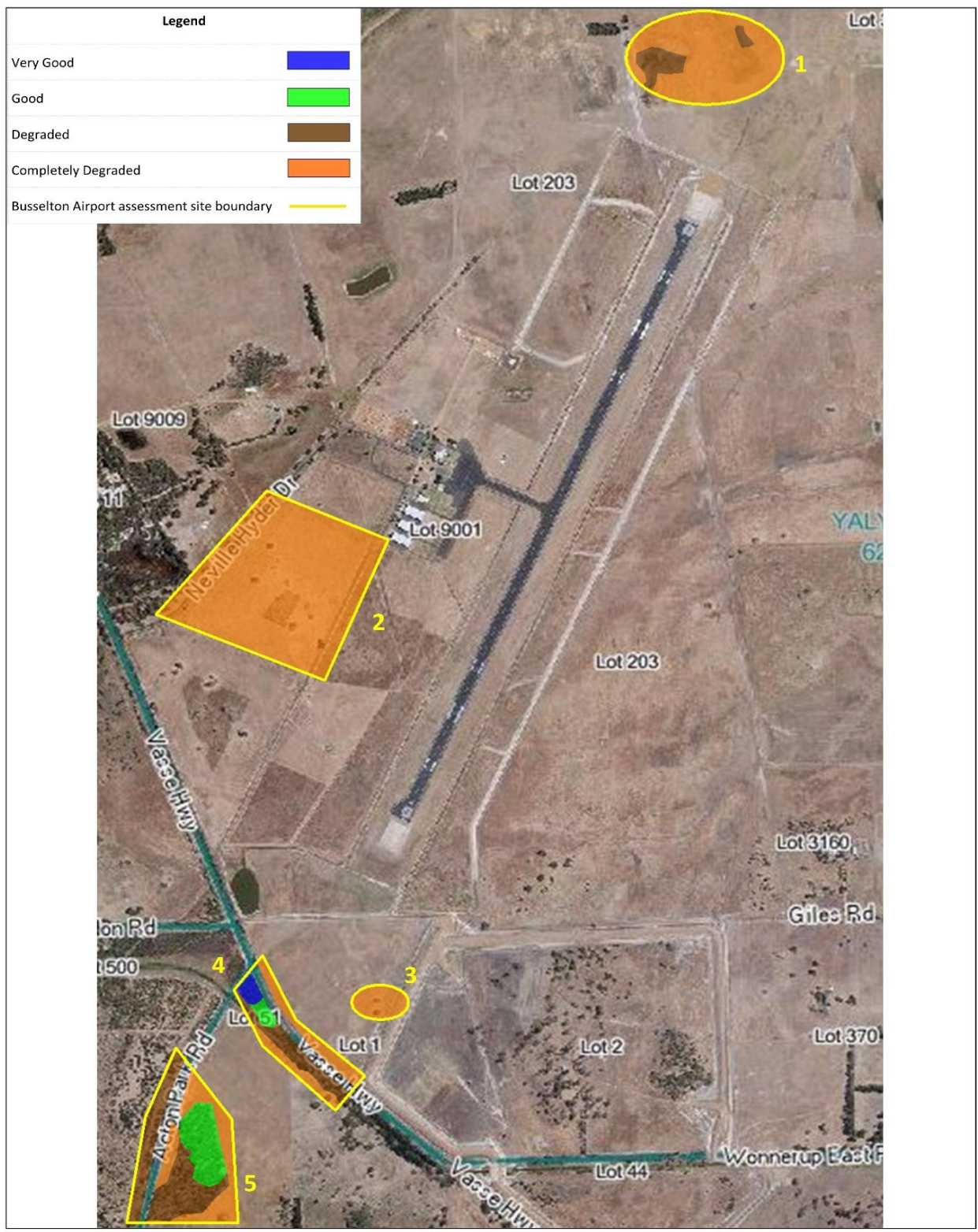


**Figure 10:**  
Vegetation types, Busselton Airport assessment site, Yalyalup



Client: City of Busselton  
 Project: Flora and Vegetation Survey Report, Busselton Airport Development  
 Image Source: Nearmap, 2016  
 Prepared by: Sharon Hynes  
 Datum: GDA 94, Zone 50





	<p><b>Figure 11:</b> Vegetation condition, Busselton Airport assessment site, Yalyalup</p>		<p>Client: City of Busselton Project: Flora and Vegetation Survey Report, Busselton Airport Development Image Source: Nearmap, 2016 Prepared by: Sharon Hynes Datum: GDA 94, Zone 50</p>	
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## 5.0 Conclusions

A total of 63 flora species from 24 families were recorded during the survey, including 33 native and 30 weed species. No threatened or priority flora species were recorded within the survey areas, although DPaW database searches indicate three significant flora species being previously found nearby. No further surveys are recommended due to the degraded nature of the survey sites and the likelihood that threatened and priority *Verticordia* species would have been flowering when the site assessment was undertaken. No threatened or priority ecological communities were located within the survey areas, with the Priority 1 community - *Eucalyptus rudis*, *Corymbia calophylla* and *Agonis flexuosa* Low Forest found approximately 1800 m north-west of the site.

Eight vegetation types were described, with the most common being \**Hypochaeris radicata* Herbland. The majority of the site had little to no native vegetation and was considered Completely Degraded with scattered trees and a grassy understorey. Areas 4 and 5 that had remaining native vegetation vary in vegetation condition from Degraded to Very Good, with the majority in Good and Degraded condition.

A high diversity of weeds (47.6%) were recorded, with the majority being Poaceae (grass) species. No weeds of national significance were recorded (Weeds Australia, 2014). No species requiring management under the *Biosecurity and Agricultural Management Act 2007* were recorded (Department of Agriculture and Food, 2016).

No Western Ringtail Possum (*Pseudocheirus occidentalis*) habitat in the form of dreys or scats were observed during the 2016 survey activities. No nesting hollows of threatened black cockatoos were located within the survey areas. The preferred habitat and food sources of the Baudin's Cockatoo (*Calyptorhynchus baudinii*) and Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*) was primarily found with 4.6 ha of *Corymbia calophylla* (Marri) Woodland present on site, with the occasional Marri and Tuart found in areas 2 and 3. However, the Marri trees present were either sparse trees on the road verges or and were younger growth trees isolated from nearby vegetation, with small tree canopy's, low amounts of nuts presenting and in poor condition, suggesting the likelihood of use by the cockatoos is very low.

### 5.1 Referral to Department of the Environment (Commonwealth)

Referral to the Department of the Environment by a proponent is voluntary, but required by law where impacts to matters of national environmental significance (MNES) – in this case, impacts to threatened flora and fauna species, namely the three black cockatoos, the Western Ringtail Possum and the *Verticordia plumosa* var. *vassensis*. Impacts to each are unlikely to be significant due to the degraded nature of the site and no secondary evidence of their presence, such as dreys and scats (possum), and eaten nuts (cockatoos). As the survey areas includes approximately 4.6 ha of threatened black cockatoo feeding habitat in poor condition in area 4 and less than 10 trees in area 2 (few mature trees, the isolated nature of the vegetation, and low amounts of nuts presenting), it is unlikely that the impacts could be considered significant under the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth) by the Department of the Environment (Table 7).

After reviewing the black cockatoo referral guidelines (SEWPaC, 2012) it is recommended that a pre-referral meeting with departmental representatives in Perth be arranged to discuss the project findings, enabling more detailed advice to be given. Reasons for the recommendation are provided in Table 7. If the decision is made not to refer, reasons for not doing so will need to be documented.

If the outcomes of that discussion suggest referral to the DotE is recommended, then assessment of the clearing activities can be undertaken through the bilateral agreement between the State of Western Australia and the Commonwealth. This would involve referring the clearing application to the DotE in the first instance, where it will be reviewed a decision made as to whether or not it is considered to be a controlled action. If the Commonwealth considers the activity to be a controlled action, the application will then be referred to the Department of the Environment Regulation, who will undertake the assessment of the permit and impose any required conditions. If the proposal is not considered to be a controlled action by the DotE, then the clearing permit will be submitted to the DER as per their normal referral process for assessment and approval.

Note also that the Department of the Environment now works on a cost-recovery basis in relation to referrals, with costs based on the complexity of the matter under consideration; a minimum cost of \$5,000.00 can be expected.

**Table 7:** Black Cockatoo referral guidelines and relevance to the site

<b>Referral Guidelines</b>	<b>Relevance to Busselton Airport assessment site</b>
<b>High risk of significant impacts: referral recommended</b>	
Clearing of any known nesting tree.	None noted during assessment activities
Clearing or degradation of any part of a vegetation community known to contain breeding habitat.	No, as per WALGA Environmental Planning Tool (2016); however, the area was listed as a potential nesting site
Clearing of more than 1 ha of quality foraging habitat	No, vegetation on site that is known preferred foraging species totalled approximately 4.6 ha in size (area 4) and less than 10 trees in area 2, and included Marri trees. However, the vegetation was in poor condition, with few mature trees present and low amounts of nuts presenting; no signs of foraging by black cockatoos was observed during site assessment activities.
Clearing or degradation (including pruning the top canopy) of a known night roosting site.	No known roosting tree in the area
Creating a gap of greater than 4 km between patches of black cockatoo habitat (breeding, foraging or roosting).	Not applicable
<b>Uncertainty: referral recommended or contact the department</b>	
Degradation (such as through altered hydrology or fire regimes) of more than 1 ha of foraging habitat. Significance will depend on the level and extent of degradation and the quality of the habitat.	Potential loss of approximately 4.6 ha of poor quality Marri Woodland, in isolated pockets of vegetation

Referral Guidelines	Relevance to Busselton Airport assessment site
Clearing or disturbance in areas surrounding black cockatoo breeding, foraging or night roosting habitat that has the potential to degrade habitat through introduction of invasive species, edge effects, hydrological changes, increased human visitation or fire.	Not applicable
Actions that do not directly affect the listed species but that have the potential for indirect impacts such as increasing competitors for nest hollows.	Not applicable
Actions with the potential to introduce known plant diseases such as <i>Phytophthora</i> spp. to an area where the pathogen was not previously known.	Not applicable
<b>Low risk of significant impacts: referral may not be required</b>	
Actions that do not affect black cockatoo habitat or individuals.	Not applicable
Actions whose impacts occur outside the modelled distribution of the three black cockatoos.	Not applicable

(Source: SEWPaC, 2012)

## 5.2 Potential Approval Conditions

If the Department of the Environment Regulation and/or the Department of the Environment consider the development to have significant impacts on black cockatoos, the Western Ringtail Possum or nearby significant flora, approval conditions may include the requirement for revegetation within the broader site, and/or an offset site. A revegetation plan and annual monitoring and reporting of success may be required for nominated rehabilitation and/or offset site(s).

## 6.0 References

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DPaW – see Department of Parks and Wildlife

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*Wildlife Conservation Act 1950* (WA)

## **Appendix 1: NatureMap Report**

# NatureMap Species Report

Created By Guest user on 28/01/2016

Current Names Only Yes  
Core Datasets Only Yes  
Method 'By Circle'  
Centre 115°23' 39" E,33°41' 21" S  
Buffer 2km  
Group By Species Group

Species Group	Species	Records
Bird	26	42
Dicotyledon	70	114
Fungus	1	1
Mammal	1	1
Monocotyledon	15	17
<b>TOTAL</b>	<b>113</b>	<b>175</b>

Name ID	Species Name	Naturalised	Conservation Code	<sup>1</sup> Endemic To Query Area
<b>Bird</b>				
1.	24261 <i>Acanthiza chrysorrhoa</i> (Yellow-rumped Thornbill)			
2.	25536 <i>Accipiter fasciatus</i> (Brown Goshawk)			
3.	24312 <i>Anas gracilis</i> (Grey Teal)			
4.	24316 <i>Anas superciliosa</i> (Pacific Black Duck)			
5.	24353 <i>Artamus cyanopterus</i> (Dusky Woodswallow)			
6.	<i>Barnardius zonarius</i>			
7.	24319 <i>Biziura lobata</i> (Musk Duck)			
8.	25592 <i>Corvus coronoides</i> (Australian Raven)			
9.	25595 <i>Cracticus tibicen</i> (Australian Magpie)			
10.	25596 <i>Cracticus torquatus</i> (Grey Butcherbird)			
11.	30901 <i>Dacelo novaeguineae</i> (Laughing Kookaburra)	Y		
12.	25607 <i>Dicaeum hirundinaceum</i> (Mistletoebird)			
13.	<i>Egretta novaehollandiae</i>			
14.	25727 <i>Fulica atra</i> (Eurasian Coot)			
15.	25530 <i>Gerygone fusca</i> (Western Gerygone)			
16.	25661 <i>Lichmera indistincta</i> (Brown Honeyeater)			
17.	25654 <i>Malurus splendens</i> (Splendid Fairy-wren)			
18.	<i>Microcarbo melanoleucos</i>			
19.	25679 <i>Pachycephala pectoralis</i> (Golden Whistler)			
20.	25680 <i>Pachycephala rufiventris</i> (Rufous Whistler)			
21.	25682 <i>Pardalotus striatus</i> (Striated Pardalote)			
22.	24841 <i>Platalea flavipes</i> (Yellow-billed Spoonbill)			
23.	24331 <i>Tadorna tadornoides</i> (Australian Shelduck, Mountain Duck)			
24.	24845 <i>Threskiornis spinicollis</i> (Straw-necked Ibis)			
25.	25549 <i>Todiramphus sanctus</i> (Sacred Kingfisher)			
26.	25765 <i>Zosterops lateralis</i> (Grey-breasted White-eye, Silvereye)			
<b>Dicotyledon</b>				
27.	3331 <i>Acacia extensa</i> (Wiry Wattle)			
28.	15483 <i>Acacia pulchella</i> var. <i>pulchella</i>			
29.	14970 <i>Adenanthos barbiger</i>			
30.	1790 <i>Adenanthos meisneri</i>			
31.	28281 <i>Adenanthos</i> sp. <i>Whicher Range</i> (G.J. Keighery 9736)			
32.	17653 <i>Boronia crenulata</i> subsp. <i>pubescens</i>			
33.	4417 <i>Boronia dichotoma</i>			
34.	14396 <i>Bossiaea aquifolium</i> subsp. <i>aquifolium</i>			
35.	3714 <i>Bossiaea ornata</i> (Broad Leaved Brown Pea)			
36.	6543 <i>Cicendia filiformis</i> (Slender Cicendia)	Y		
37.	2929 <i>Clematis pubescens</i> (Common Clematis)			
38.	4564 <i>Comesperma virgatum</i> (Milkwort)			
39.	16875 <i>Conospermum caeruleum</i> subsp. <i>debile</i>			
40.	7452 <i>Dampiera leptoclada</i> (Slender-shooted Dampiera)			

Name ID	Species Name	Naturalised	Conservation Code	<sup>1</sup> Endemic To Query Area
41.	7454 <i>Dampiera linearis</i> (Common Dampiera)			
42.	3816 <i>Daviesia incrassata</i>			
43.	3832 <i>Daviesia physodes</i>			
44.	<i>Daviesia</i> sp.			
45.	3118 <i>Drosera pallida</i> (Pale Rainbow)			
46.	10907 <i>Exocarpos odoratus</i> (Scented Ballart)			
47.	3948 <i>Gompholobium capitatum</i>			
48.	3953 <i>Gompholobium ovatum</i>			
49.	14011 <i>Grevillea brachystylis</i> subsp. <i>brachystylis</i>		P3	
50.	12219 <i>Grevillea bronwenae</i>		P3	
51.	2112 <i>Grevillea trifida</i>			
52.	12824 <i>Grevillea vestita</i> subsp. <i>vestita</i>			
53.	2128 <i>Hakea amplexicaulis</i> (Prickly Hakea)			
54.	6839 <i>Hemiandra pungens</i> (Snakebush)			
55.	41020 <i>Hemiphora bartlingii</i> (Woolly Dragon)			
56.	5135 <i>Hibbertia hypericoides</i> (Yellow Buttercups)			
57.	<i>Hibbertia</i> sp. Bankstown (R.T.Miller & C.P.Gibson s.n. 18/10/06)			
58.	3964 <i>Hovea chorizemifolia</i> (Holly-leaved Hovea)			
59.	3965 <i>Hovea elliptica</i> (Tree Hovea)			
60.	5825 <i>Hypocalymma robustum</i> (Swan River Myrtle)			
61.	7396 <i>Isotoma hypocrateriformis</i> (Woodbridge Poison)			
62.	4017 <i>Jacksonia horrida</i>			
63.	4036 <i>Kennedia carinata</i>			
64.	37940 <i>Kennedia coccinea</i> subsp. <i>coccinea</i>			
65.	5835 <i>Kunzea micrantha</i>			
66.	17508 <i>Kunzea micrantha</i> subsp. <i>oligandra</i>			
67.	7568 <i>Lechenaultia biloba</i> (Blue Leschenaultia)			
68.	<i>Leucopogon</i> sp.			
69.	6454 <i>Leucopogon verticillatus</i> (Tassel Flower)			
70.	13128 <i>Logania serpyllifolia</i> subsp. <i>angustifolia</i>			
71.	6456 <i>Lysinema ciliatum</i> (Curry Flower)			
72.	34736 <i>Lysinema pentapetalum</i>			
73.	18394 <i>Melaleuca parviceps</i>			
74.	5980 <i>Melaleuca thymoides</i>			
75.	13280 <i>Melaleuca viminea</i> subsp. <i>viminea</i>			
76.	16478 <i>Pericalymma ellipticum</i> var. <i>floridum</i>			
77.	2309 <i>Petrophile serruriae</i>			
78.	6259 <i>Platysace tenuissima</i>			
79.	4524 <i>Platytheca galioides</i>			
80.	4180 <i>Pultenaea radiata</i>			
81.	2932 <i>Ranunculus colonorum</i> (Common Buttercup)			
82.	7022 <i>Solanum nigrum</i> (Black Berry Nightshade)	Y		
83.	31931 <i>Sphenotoma capitata</i>			
84.	<i>Sphenotoma</i> sp.			
85.	7684 <i>Stylidium amoenum</i> (Lovely Triggerplant)			
86.	16769 <i>Synaphea hians</i>		P3	
87.	16864 <i>Synaphea petiolaris</i> subsp. <i>petiolaris</i>			
88.	16863 <i>Synaphea petiolaris</i> subsp. <i>triloba</i>			
89.	15535 <i>Synaphea whicherensis</i>			
90.	4535 <i>Tetratheca hirsuta</i> (Black Eyed Susan)			
91.	5084 <i>Thomasia grandiflora</i> (Large Flowered Thomasia)			
92.	12392 <i>Verticordia attenuata</i>		P3	
93.	12411 <i>Verticordia densiflora</i> var. <i>cespitosa</i>			
94.	15432 <i>Verticordia densiflora</i> var. <i>densiflora</i>			
95.	12448 <i>Verticordia plumosa</i> var. <i>ananeotes</i>		T	
96.	12453 <i>Verticordia plumosa</i> var. <i>vassensis</i>		T	
<b>Fungus</b>				
97.	<i>Phytophthora cinnamomi</i>			
<b>Mammal</b>				
98.	24153 <i>Isodon obesulus</i> subsp. <i>fusciventer</i> (Quenda, Southern Brown Bandicoot)		P5	
<b>Monocotyledon</b>				
99.	23474 <i>Agrostocrinum hirsutum</i>			
100.	1062 <i>Anarthria prolifera</i>			
101.	1605 <i>Caladenia marginata</i> (White Fairy Orchid)			
102.	1065 <i>Chaetanthus leptocarpoides</i>			
103.	11597 <i>Conostylis setigera</i> subsp. <i>setigera</i>			
104.	1219 <i>Dasyopogon hookeri</i> (Pineapple Bush)			
105.	1639 <i>Drakaea elastica</i> (Glossy-leaved Hammer Orchid)		T	
106.	1070 <i>Hypolaena exsulca</i>			

Name ID	Species Name	Naturalised	Conservation Code	<sup>1</sup> Endemic To Query Area
107.	1297 <i>Johnsonia lupulina</i> (Hooded Lily)			
108.	1304 <i>Laxmannia minor</i>			
109.	1229 <i>Lomandra integra</i>			
110.	1234 <i>Lomandra nigricans</i>			
111.	1092 <i>Loxocarya cinerea</i>			
112.	11550 <i>Patersonia umbrosa</i> var. <i>xanthina</i> (Yellow Flags)			
113.	20731 <i>Thelymitra vulgaris</i>			

**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

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

## **Appendix 2: Protected Matters Search Tool Report**



# EPBC Act Protected Matters Report

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

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: 28/01/16 14:34:20

[Summary](#)

[Details](#)

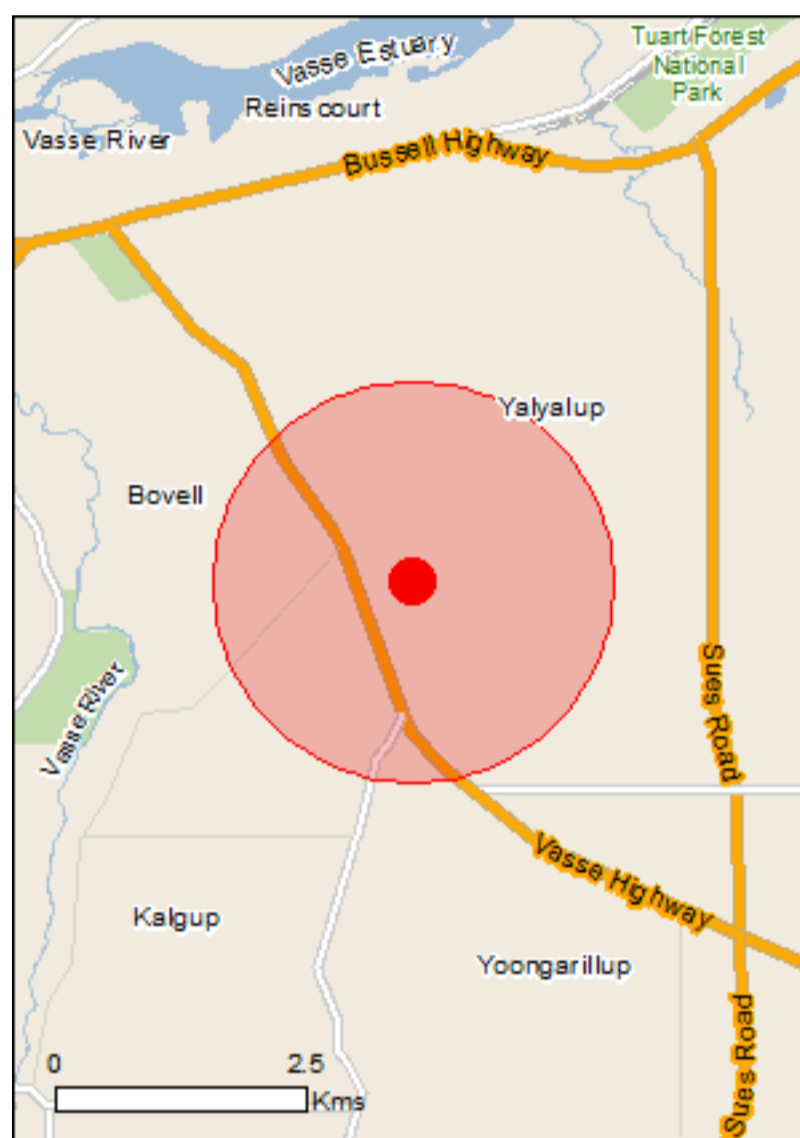
[Matters of NES](#)

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

[Extra Information](#)

[Caveat](#)

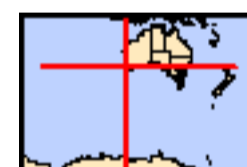
[Acknowledgements](#)



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

[Coordinates](#)

Buffer: 2.0Km



# Summary

## Matters of National Environmental Significance

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

<a href="#">World Heritage Properties:</a>	None
<a href="#">National Heritage Places:</a>	None
<a href="#">Wetlands of International Importance:</a>	1
<a href="#">Great Barrier Reef Marine Park:</a>	None
<a href="#">Commonwealth Marine Area:</a>	None
<a href="#">Listed Threatened Ecological Communities:</a>	None
<a href="#">Listed Threatened Species:</a>	20
<a href="#">Listed Migratory Species:</a>	7

## 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.

<a href="#">Commonwealth Land:</a>	None
<a href="#">Commonwealth Heritage Places:</a>	None
<a href="#">Listed Marine Species:</a>	8
<a href="#">Whales and Other Cetaceans:</a>	None
<a href="#">Critical Habitats:</a>	None
<a href="#">Commonwealth Reserves Terrestrial:</a>	None
<a href="#">Commonwealth Reserves Marine:</a>	None

## Extra Information

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

<a href="#">State and Territory Reserves:</a>	None
<a href="#">Regional Forest Agreements:</a>	None
<a href="#">Invasive Species:</a>	24
<a href="#">Nationally Important Wetlands:</a>	None
<a href="#">Key Ecological Features (Marine)</a>	None



# Details

## Matters of National Environmental Significance

Wetlands of International Importance (Ramsar)	[ Resource Information ]
Name	Proximity
<a href="#">Vasse-wonnerup system</a>	Within 10km of Ramsar

## Listed Threatened Species [ Resource Information ]

Name	Status	Type of Presence
------	--------	------------------

Birds		
<a href="#">Calyptorhynchus banksii naso</a> Forest Red-tailed Black-Cockatoo, Karrak [67034]	Vulnerable	Species or species habitat may occur within area

<a href="#">Calyptorhynchus baudinii</a> Baudin's Black-Cockatoo, Long-billed Black-Cockatoo [769]	Vulnerable	Breeding known to occur within area
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<a href="#">Calyptorhynchus latirostris</a> Carnaby's Black-Cockatoo, Short-billed Black-Cockatoo [59523]	Endangered	Breeding likely to occur within area
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Mammals		
<a href="#">Dasyurus geoffroi</a> Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat known to occur within area

<a href="#">Pseudocheirus occidentalis</a> Western Ringtail Possum, Ngwayir [25911]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
--	------------	--

Plants		
<a href="#">Andersonia gracilis</a> Slender Andersonia [14470]	Endangered	Species or species habitat may occur within area

<a href="#">Banksia nivea subsp. uliginosa</a> Swamp Honeypot [82766]	Endangered	Species or species habitat likely to occur within area
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<a href="#">Banksia squarrosa subsp. argillacea</a> Whicher Range Dryandra [82769]	Vulnerable	Species or species habitat likely to occur within area
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<a href="#">Brachyscias verecundus</a> Ironstone Brachyscias [81321]	Critically Endangered	Species or species habitat may occur within area
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<a href="#">Caladenia huegelii</a> King Spider-orchid, Grand Spider-orchid, Rusty Spider-orchid [7309]	Endangered	Species or species habitat likely to occur within area
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<a href="#">Chamelaucium sp. S coastal plain (R.D.Royce 4872)</a> Royce's Waxflower [87814]	Vulnerable	Species or species habitat likely to occur within area
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<a href="#">Darwinia foetida</a> Muceha Bell [83190]	Critically Endangered	Species or species habitat likely to occur within area
---	-----------------------	--

Name	Status	Type of Presence
<a href="#">Darwinia whicherensis</a> Abba Bell [83193]	Endangered	Species or species habitat may occur within area
<a href="#">Diuris micrantha</a> Dwarf Bee-orchid [55082]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Drakaea elastica</a> Glossy-leaved Hammer-orchid, Praying Virgin [16753]	Endangered	Species or species habitat known to occur within area
<a href="#">Drakaea micrantha</a> Dwarf Hammer-orchid [56755]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Gastrolobium papilio</a> Butterfly-leaved Gastrolobium [78415]	Endangered	Species or species habitat may occur within area
<a href="#">Lambertia echinata subsp. occidentalis</a> Western Prickly Honeysuckle [64528]	Endangered	Species or species habitat may occur within area
<a href="#">Petrophile latericola</a> Laterite Petrophile [64532]	Endangered	Species or species habitat likely to occur within area
<a href="#">Verticordia plumosa var. vassensis</a> Vasse Featherflower [55804]	Endangered	Species or species habitat known to 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
<b>Migratory Marine Birds</b>		
<a href="#">Apus pacificus</a> Fork-tailed Swift [678]		Species or species habitat likely to occur within area
<b>Migratory Terrestrial Species</b>		
<a href="#">Merops ornatus</a> Rainbow Bee-eater [670]		Species or species habitat may occur within area
<a href="#">Motacilla cinerea</a> Grey Wagtail [642]		Species or species habitat may occur within area
<b>Migratory Wetlands Species</b>		
<a href="#">Ardea alba</a> Great Egret, White Egret [59541]		Breeding known to occur within area
<a href="#">Ardea ibis</a> Cattle Egret [59542]		Species or species habitat may occur within area
<a href="#">Pandion haliaetus</a> Osprey [952]		Species or species habitat may occur within area
<a href="#">Tringa nebularia</a> Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

## Other Matters Protected by the EPBC Act

### 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
<b>Birds</b>		
<a href="#">Apus pacificus</a> Fork-tailed Swift [678]		Species or species habitat likely to occur within area
<a href="#">Ardea alba</a> Great Egret, White Egret [59541]		Breeding known to occur within area
<a href="#">Ardea ibis</a> Cattle Egret [59542]		Species or species habitat may occur within area
<a href="#">Haliaeetus leucogaster</a> White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
<a href="#">Merops ornatus</a> Rainbow Bee-eater [670]		Species or species habitat may occur within area
<a href="#">Motacilla cinerea</a> Grey Wagtail [642]		Species or species habitat may occur within area
<a href="#">Pandion haliaetus</a> Osprey [952]		Species or species habitat may occur within area
<a href="#">Tringa nebularia</a> Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

## Extra Information

### Invasive Species [\[ Resource Information \]](#)

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

Name	Status	Type of Presence
<b>Birds</b>		
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

Name	Status	Type of Presence within area
Streptopelia senegalensis Laughing Turtle-dove, Laughing Dove [781]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
<b>Mammals</b>		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
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
<b>Plants</b>		
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Brachiaria mutica Para Grass [5879]		Species or species habitat may occur within area
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		Species or species habitat may occur within area
Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]		Species or species habitat may occur within area
Chrysanthemoides monilifera subsp. monilifera Boneseed [16905]		Species or species habitat likely to occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species

Name	Status	Type of Presence
<p>Olea europaea Olive, Common Olive [9160]</p>		<p>habitat likely to occur within area</p> <p>Species or species habitat may occur within area</p>
<p>Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]</p>		<p>Species or species habitat may occur within area</p>
<p>Rubus fruticosus aggregate Blackberry, European Blackberry [68406]</p>		<p>Species or species habitat likely to occur within area</p>
<p>Tamarix aphylla Athel Pine, Athel Tree, Tamarisk, Athel Tamarisk, Athel Tamarix, Desert Tamarisk, Flowering Cypress, Salt Cedar [16018]</p>		<p>Species or species habitat likely to occur within area</p>

# 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.

For species where the distributions are well known, maps are digitised from sources such as recovery plans and detailed habitat studies. Where appropriate, core breeding, foraging and roosting areas are indicated under 'type of presence'. For species whose distributions are less well known, point locations are collated from government wildlife authorities, museums, and non-government organisations; bioclimatic distribution models are generated and these validated by experts. In some cases, the distribution maps are based solely on expert knowledge.

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

-33.68818 115.3947

# Acknowledgements


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

- [-Office of Environment and Heritage, New South Wales](#)
- [-Department of Environment and Primary Industries, Victoria](#)
- [-Department of Primary Industries, Parks, Water and Environment, Tasmania](#)
- [-Department of Environment, Water and Natural Resources, South Australia](#)
- [-Parks and Wildlife Commission NT, Northern Territory Government](#)
- [-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, Atherton and Canberra](#)
- [-University of New England](#)
- [-Ocean Biogeographic Information System](#)
- [-Australian Government, Department of Defence Forestry Corporation, NSW](#)
- [-Geoscience Australia](#)
- [-CSIRO](#)
- 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.


### Appendix 3: Potential Priority and Threatened Flora



Picture	Common Name	Description	Flowering Period	Habitat Type	Cons Code	Likelihood (Y/N)	Natural Area comment
 <p><i>Andersonia gracilis</i> Photos: K. Atkins &amp; M. Hislop</p>	Slender Andersonia	Slender erect or open straggly shrub, 0.1 – 0.5 m high. White pink purple.	September to November	Winter – wet areas, near swamps. White/grey sand, sandy clay, gravelly loam.	T, EN	Y	Habitat and soil type is suitable
<i>Amperea micrantha</i>		Low, spreading, bushy perennial, herb, 0.1-0.3 m high. Fl. brown	October to November	Sandy soils	P2	Y	Soil types suitable






Picture	Common Name	Description	Flowering Period	Habitat Type	Cons Code	Likelihood (Y/N)	Natural Area comment
 <p data-bbox="190 805 884 842"><i>Banksia nivea</i> subsp. <i>uliginosa</i> Photos: J.A. Cochrane &amp; M. Pieroni</p>		Dense, erect, non-lignotuberous shrub, 0.2-1.5 m high. Fl. yellow-brown	August to September	Sandy clay, gravel	T, EN	N	Habitat and soils unsuitable
 <p data-bbox="190 1332 884 1367"><i>Banksia squarrosa</i> subsp. <i>argillacea</i> Photos: M. Pieroni</p>		Erect, open, non-lignotuberous shrub, 1.2-4 m high. Fl. yellow	June to November	Winter-wet flats, clay flats.	T, VU	Y	Habitat and soil types suitable


Picture	Common Name	Description	Flowering Period	Habitat Type	Cons Code	Likelihood (Y/N)	Natural Area comment
<i>Brachyscias verecundus</i>		Annual (or ephemeral), herb, 0.012-0.022 m high, entirely glabrous. Fl. white/cream		In a moss sward. On a granite outcrop.	T, CR	N	Habitat and soil types unsuitable
 <p><i>Caladenia huegelii</i> Photos: I. &amp; M. Greeve &amp; J.L. Robson</p>	Grand Spider Orchid	Tuberous, perennial herb, 0.25 – 0.6m high. Green, cream and red flowers.	September to October.	Grey or brown sand, clay loam.	T, EN	Y	Habitat and soils are suitable for the species
<i>Chamelaucium sp. S coastal plain (R.D.Royce 4872)</i>					T, VU	Unknown	No available information on habitat
<i>Chamelaucium sp. Yoongarillup (G.J. Keighery 3635)</i>					P4	Unknown	No available information on habitat



Picture	Common Name	Description	Flowering Period	Habitat Type	Cons Code	Likelihood (Y/N)	Natural Area comment
<i>Chordifex gracilior</i>		Rhizomatous, erect perennial, herb, 0.3-0.5 m high. Fl. brown	September to December	Peaty sand. Swamps	P3	N	Habitat and soil types unsuitable
<i>Darwinia foetida</i>	Muchea Bell				T, CR		Habitat and soil types suitable
<i>Darwinia whicherensis</i>					T, EN		Habitat and soil types unsuitable
 <p><i>Diuris micrantha</i> Photos: A.P. Brown, I. &amp; M. Greeve &amp; B. Jackson</p>	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	T, VU	Y	Soil types are suitable

Picture	Common Name	Description	Flowering Period	Habitat Type	Cons Code	Likelihood (Y/N)	Natural Area comment
 <p data-bbox="190 790 884 836"><i>Drakaea elastica</i> Photos: A. Brown &amp; S.D. Hopper</p>	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	T, EN	Y	Habitat and soil types suitable
 <p data-bbox="190 1332 884 1362"><i>Drakaea micrantha</i> Photos: S.D. Hopper, A.P.Brown &amp; I. &amp; M. Greeve</p>	Dwarf Hammer Orchid	Tuberous, perennial, herb, 0.15-0.3 m high. Fl. red & yellow	September to October.	White-grey sand	T, VU	Y	Habitat and soil types suitable



Picture	Common Name	Description	Flowering Period	Habitat Type	Cons Code	Likelihood (Y/N)	Natural Area comment
 <p><i>Gastrolobium papilio</i> Photos: G.J. Keighery &amp; D. Papenfus</p>		Tangled, clumped shrub, to 1.5 m high. Fl. cream-red	October to December	Sandy clay over ironstone and laterite. Flat plains	T, EN	N	Soil types are unsuitable
<p><i>Grevillea brachystylis</i> subsp. <i>brachystylis</i></p>		Much-branched, prostrate or decumbent, non-lignotuberous shrub, 0.2-0.5 m high, to 3 m wide. Fl. red	August to November	Black sand, sandy clay. Swampy situations	P3	Y	Habitat and soil types are suitable
<p><i>Grevillea bronwenae</i></p>		Slender, erect shrub, 0.5-1.6 m high. Fl. red	June to December	Grey sand over laterite, lateritic loam. Hillslopes	P3	N	Habitat and soil types unsuitable

Picture	Common Name	Description	Flowering Period	Habitat Type	Cons Code	Likelihood (Y/N)	Natural Area comment
 <p data-bbox="190 805 884 842"><i>Isopogon formosus</i> subsp. <i>dasylepis</i> Photos: J.A. Cochrane &amp; J. Stevens</p>		Low, bushy or slender, upright, non-lignotuberous shrub, 0.2-2 m high. Fl. pink-purple/red	June to December	Sand, sandy clay, gravelly sandy soils over laterite. Often swampy areas	P3	Y	Habitat and soil types suitable
 <p data-bbox="190 1332 884 1366"><i>Jacksonia gracillima</i> Photos: R. Davis</p>		Shrub, flowers orange	October to November	Grey brown and well drained soils	P3	Y	Habitat and soil types suitable

Picture	Common Name	Description	Flowering Period	Habitat Type	Cons Code	Likelihood (Y/N)	Natural Area comment
 <p data-bbox="190 810 887 847"><i>Lambertia echinata</i> subsp. <i>occidentalis</i> Photos: A.P. Brown &amp; J.A. Cochrane</p>		Prickly, much-branched, non-lignotuberous shrub, to 3 m high. Fl. yellow	February or April or December	White sandy soils over laterite, orange/brown-red clay over ironstone. Flats to foothills, winter-wet sites	T, EN	N	Habitat and soil types unsuitable
<i>Leptomeria furtiva</i>		Lax, sprawling shrub, 0.2-0.45 m high. Fl. orange-brown	August to October	Grey or black peaty sand. Winter-wet flats	P2	N	Soils unsuitable

Picture	Common Name	Description	Flowering Period	Habitat Type	Cons Code	Likelihood (Y/N)	Natural Area comment
 <p data-bbox="190 810 884 847"><i>Petrophile latericola</i> ms Photos: A.P. Brown &amp; J.A. Cochrane</p>		Multi-stemmed shrub, 0.4-1.5 m high. Fl. yellow	Nov	Red lateritic clay. Winter-wet flats	T, EN	N	Soils unsuitable
 <p data-bbox="190 1337 884 1372"><i>Synaphea hians</i> Photos: R. Butcher</p>		Prostrate or decumbent shrub, 0.15-0.6 m high, to 1 m wide. Fl. yellow	Jul or Sep to Nov.	Sandy soils. Rises	P3	N	Habitat unsuitable, as there are no rises within the site.



Picture	Common Name	Description	Flowering Period	Habitat Type	Cons Code	Likelihood (Y/N)	Natural Area comment
<i>Verticordia attenuata</i>		Shrub, 0.4-1 m high. Fl. pink	Dec or Jan to May.	White or grey sand. Winter-wet depressions	P3	Y	Habitat and soil types suitable
 <p data-bbox="197 885 884 919"><i>Verticordia plumosa</i> var. <i>ananeotes</i> Photos: E.A. George &amp; D. Papenfus</p>		Erect, sparsely branched shrub, 0.3-0.5 m high. Fl. pink-purple/white	Nov to Dec	Sandy loam. Seasonally inundated plains.	T, EN	Y	Habitat and soil types suitable
 <p data-bbox="197 1361 884 1391"><i>Verticordia plumosa</i> var. <i>vassensis</i> Photos: E.A. George</p>		Shrub, 0.3-1 m high. Fl. pink,	Sep to Dec or Jan to Feb	White/grey sand. Winter-wet flats.	T, EN	Y	Habitat and soil types suitable

## 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 <i>Wildlife Conservation Act 1950</i> )
X	Presumed Extinct	Flora or fauna that is presumed to be extinct in the wild (Schedule 2 of the <i>Wildlife Conservation Act 1950</i> )
IA	International Agreement	Birds protected under international agreement (Schedule 3 of the <i>Wildlife Conservation Act 1950</i> )
S	Specially Protected	Other specially protected fauna (Schedule 4 of the <i>Wildlife Conservation Act 1950</i> )
<i>Schedule 1 species are ranked by DPaW according to their level of threat using IUCN Red List criteria</i>		
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
<i>Species that have not been adequately surveyed for listing under Schedule 1 or 2 of the Wildlife Protection Act</i>		
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.
5	Priority Five	Conservation dependent species that are not threatened but are subject to a specific conservation program, the cessation of which would result in them becoming threatened within five years.

(Source: Department of Parks and Wildlife, 2016a)

## Commonwealth

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

(Source: Department of the Environment, 2016a)

## Appendix 5: Flora Species List

### Legend:

\* = Introduced species

FloraBase (2016) was utilised to identify unknown species.

Family	Species Name	Common Name
<b>Monocotyledons (Liliopsida)</b>		
Cyperaceae	<i>Baumea juncea</i>	Bare Twigrush
	* <i>Cyperus eragrostis</i>	Umbrella Sedge
	<i>Mesomelaena tetragona</i>	Semaphore Sedge
	<i>Schoenus</i> sp.	
Dasyopogonaceae	<i>Kingia australis</i>	Kingia
Haemodoraceae	<i>Conostylis aculeata</i>	Prickly Conostylis
Iridaceae	* <i>Watsonia meriana</i> var. <i>meriana</i>	
Juncaceae	* <i>Juncus articulatus</i>	Small Rush
	<i>Juncus pallidus</i>	Pale Rush
	<i>Juncus subsecundus</i>	Finger Rush
Poaceae	* <i>Alopecurus geniculatus</i>	Marsh Foxtail
	* <i>Avena barbata</i>	Bearded Oat
	* <i>Briza maxima</i>	Blowfly Grass
	* <i>Bromus catharticus</i>	Prairie Grass
	* <i>Cenchrus clandestinus</i>	Kikuyu
	* <i>Cynodon dactylon</i>	Couch Grass
	* <i>Digitaria sanguinalis</i>	Crab Grass
	* <i>Ehrharta longiflora</i>	Annual Veldt Grass
	* <i>Eragrostis curvula</i>	African Lovegrass
Restionaceae	<i>Desmocladius castaneus</i>	
	<i>Stenotalis ramosissima</i>	
Xanthorrhoeaceae	<i>Xanthorrhoea preissii</i>	Grass Tree, Balga
<b>Dicotyledons (Magnoliopsida)</b>		
Amaranthaceae	* <i>Amaranthus albus</i>	Tumbleweed
Asteraceae	* <i>Conyza</i> sp.	Fleabane
	* <i>Cotula coronopifolia</i>	Waterbuttons
	* <i>Hypochaeris radicata</i>	Flat Weed

Family	Species Name	Common Name
Boraginaceae	* <i>Echium plantagineum</i>	Paterson's Curse
Caryophyllaceae	* <i>Corrigiola littoralis</i>	Strapwort
Casuarinaceae	<i>Allocasuarina humilis</i>	Dwarf Sheoak
	<i>Allocasuarina</i> sp.	
Chenopodiaceae	* <i>Atriplex prostrata</i>	Hastate Orache
Cucurbitaceae	* <i>Citrullus lanatus</i>	Pie Melon
Fabaceae	<i>Acacia saligna</i>	Orange Wattle
	<i>Jacksonia furcellata</i>	Grey Stinkwood
	* <i>Lupinus cosentinii</i>	Blue Lupin
	* <i>Trifolium hirtum</i>	Rose Clover
	<i>Viminaria juncea</i>	Swishbush
Lauraceae	<i>Cassytha glabella</i>	Tangled Dodder Laurel
Lythraceae	* <i>Lythrum hyssopifolia</i>	Lesser Loosestrife
Myrtaceae	<i>Agonis flexuosa</i>	Peppermint Tree
	<i>Astartea scoparia</i>	
	<i>Corymbia calophylla</i>	Marri
	<i>Eucalyptus gomphocephala</i>	Tuart
	* <i>Eucalyptus</i> sp.	
	<i>Kunzea micrantha</i>	
	* <i>Melaleuca nesophila</i>	Mindiyed
	<i>Melaleuca osullivanii</i>	
	<i>Melaleuca preissiana</i>	Moonah
	<i>Melaleuca raphiophylla</i>	Swamp Paperbark
	<i>Melaleuca viminea</i>	Mohan
	<i>Pericalymma ellipticum</i>	Swamp Teatree
	<i>Regelia ciliata</i>	
	<i>Verticordia densiflora</i>	Compacted Featherflower
Oxalidaceae	* <i>Oxalis purpurea</i>	Largeflower Wood Sorrel
Polygalaceae	<i>Comesperma virgatum</i>	Milkwort
Polygonaceae	* <i>Acetosella vulgaris</i>	Sheep's Sorrel
	* <i>Polygonum arenastrum</i>	Sand Wireweed
	* <i>Rumex crispus</i>	Curled Dock

<b>Family</b>	<b>Species Name</b>	<b>Common Name</b>
Proteaceae	<i>Adenanthos meisneri</i>	
	<i>Hakea marginata</i>	
	<i>Hakea ruscifolia</i>	Candle Hakea
	<i>Hakea varia</i>	Variable-leaved Hakea
Solanaceae	* <i>Solanum nigrum</i>	Black Berry Nightshade

## Appendix 6: Quadrat Data Busselton Airport

Quadrat No.: 1  
 Survey Date: 04/02/2016  
 Personnel: Sharon Hynes, Taryn Brebner  
 GPS E: 351421.2  
 Coordinates: N: 6270024.26  
 Location: Busselton Regional Airport, Area 3  
 Aspect: None  
 Soil: Grey sand  
 Bare Ground: 75%  
 Condition: Completely Degraded  
 Drainage: Moderate  
 Notes:



Native Species	Cover %	Height (m)	Invasive Species	Cover %	Height (m)
<i>Eucalyptus gomphocephala</i>	3.0	8	* <i>Amaranthus albus</i>	1.0	0.5
			* <i>Citrullus lanatus</i>	0.5	<0.5
			* <i>Polygonum arenastrum</i>	1.0	<0.5
			* <i>Solanum nigrum</i>	23.0	0.5

Quadrat No.: 2  
 Survey Date: 04/02/2016  
 Personnel: Sharon Hynes, Taryn Brebner  
 GPS E: 351458.07  
 Coordinates: N: 6270039.6  
 Location: Busselton Regional Airport, Area 3  
 Aspect: None  
 Soil: Grey sand  
 Bare Ground: 1%  
 Condition: Completely Degraded  
 Drainage: Moderate  
 Notes:



Native Species	Cover %	Height (m)	Invasive Species	Cover %	Height (m)
			* <i>Bromus catharticus</i>	20	<0.5
			* <i>Citrullus lanatus</i>	0.1	<0.5
			* <i>Hypochaeris radicata</i>	79	<0.5
			* <i>Oxalis purpurea</i>	0.1	<0.5



Quadrat No.: 3  
 Survey Date: 04/02/2016  
 Personnel: Sharon Hynes, Taryn Brebner  
 GPS E: 351234.2  
 Coordinates: N: 6271100.55  
 Location: Busselton Regional Airport, Area 2  
 Aspect: None  
 Soil: Grey Sand  
 Bare Ground: 74%  
 Condition: Completely Degraded  
 Drainage: Well  
 Notes:



Native Species	Cover %	Height (m)	Invasive Species	Cover %	Height (m)
			* <i>Acetosella vulgaris</i>	0.5	<0.5
			* <i>Avena barbata</i>	1	0.5
			* <i>Citrullus lanatus</i>	1	<0.5
			* <i>Ehrharta longiflora</i>	2	<0.5
			* <i>Lupinus cosentinii</i>	0.5	<0.5
			* <i>Oxalis purpurea</i>	1	<0.5
			* <i>Solanum nigrum</i>	20	0.5

Quadrat No.: 4  
 Survey Date: 04/02/2016  
 Personnel: Sharon Hynes, Taryn Brebner  
 GPS E:  
 Coordinates: N:  
 Location: Busselton Regional Airport, Area 2  
 Aspect: None  
 Soil: Grey sand  
 Bare Ground: 0%  
 Condition: Completely Degraded  
 Drainage: Well  
 Notes:



Native Species	Cover %	Height (m)	Invasive Species	Cover %	Height (m)
			* <i>Cenchrus clandestinus</i>	30	<0.5
			* <i>Cynodon dactylon</i>	70	<0.5

Quadrat No.: 5  
 Survey Date: 04/02/2016  
 Personnel: Sharon Hynes, Taryn Brebner  
 GPS E: 351304.29  
 Coordinates: N: 6271324.21  
 Location: Busselton Regional Airport, Area 2  
 Aspect: None  
 Soil: Grey sand  
 Bare Ground: 1%  
 Condition: Completely Degraded  
 Drainage: Moderate  
 Notes:



Native Species	Cover %	Height (m)	Invasive Species	Cover %	Height (m)
			* <i>Hypochaeris radicata</i>	40	<0.5

Quadrat No.: 6  
 Survey Date: 04/02/2016  
 Personnel: Sharon Hynes, Taryn Brebner  
 GPS E: 352373.3  
 Coordinates: N: 6272561.82  
 Location: Busselton Regional Airport, Area 1  
 Aspect: None  
 Soil: Brown clayey loam  
 Bare Ground: 1%  
 Condition: Completely Degraded  
 Drainage: Poor  
 Notes:



Native Species	Cover %	Height (m)	Invasive Species	Cover %	Height (m)
			* <i>Cenchrus clandestinus</i>	60	<0.5
			* <i>Cynodon dactylon</i>	25	<0.5
			* <i>Hypochaeris radicata</i>	2	<0.5
			* <i>Lythrum hyssopifolia</i>	0.1	<0.5
			* <i>Trifolium hirtum</i>	15	<0.5

Quadrat No.: 7  
 Survey Date: 04/02/2016  
 Personnel: Sharon Hynes, Taryn Brebner  
 GPS E: 352384.89  
 Coordinates: N: 6272640.68  
 Location: Busselton Regional Airport, Area 1  
 Aspect: South-west  
 Soil: Brown loam  
 Bare Ground: 0%  
 Condition: Degraded  
 Drainage: Poor  
 Notes:



Native Species	Cover %	Height (m)	Invasive Species	Cover %	Height (m)
<i>Juncus pallidus</i>	5	1	* <i>Alopecurus geniculatus</i>	0.5	<0.5
<i>Juncus subsecundus</i>	0.5	0.8	* <i>Cenchrus clandestinus</i>	85	<0.5
			* <i>Hypochaeris radicata</i>	0.5	<0.5
			* <i>Lythrum hyssopifolia</i>	0.1	<0.5
			* <i>Trifolium hirtum</i>	3	<0.5

Quadrat No.: 8  
 Survey Date: 04/02/2016  
 Personnel: Sharon Hynes, Taryn Brebner  
 GPS E: 352200.8  
 Coordinates: N: 6272582.2  
 Location: Busselton Regional Airport, Area 1  
 Aspect: North-east  
 Soil: Brown loam  
 Bare Ground: 1%  
 Condition: Degraded  
 Drainage: Poor  
 Notes:



Native Species	Cover %	Height (m)	Invasive Species	Cover %	Height (m)
<i>Juncus pallidus</i>	30	2	* <i>Cenchrus clandestinus</i>	40	<0.5
			* <i>Cynodon dactylon</i>	30	<0.2
			* <i>Hypochaeris radicata</i>	0.5	<0.5
			* <i>Oxalis purpurea</i>	0.5	<0.5

Quadrat No.: 9  
 Survey Date: 04/02/2016  
 Personnel: Sharon Hynes, Taryn  
 Brebner  
 GPS E: 351111.0  
 Coordinates: N: 6270087.1  
 Location: Busselton Regional  
 Airport, Area 4  
 Aspect: South  
 Soil: Grey sand  
 Bare Ground: 3%  
 Condition: Very Good  
 Drainage: Poor  
 Notes:



Native Species	Cover %	Height (m)	Invasive Species	Cover %	Height (m)
<i>Baumea juncea</i>	50	0.5	* <i>Cynodon dactylon</i>	3	<0.5
<i>Kunzea micrantha</i>	2	1.3	* <i>Watsonia meriana</i> var. <i>meriana</i>	5	1.5
<i>Melaleuca osullivanii</i>	3	<10			
<i>Schoenus</i> sp.	0.5	0.5			
<i>Stenotalis ramosissima</i>	0.5	0.5			
<i>Verticordia densiflora</i>	0.5	0.5			