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Lots 511 and 512 Rockingham Road, Kwinana Beach

Reconnaissance flora and vegetation survey and black cockatoo habitat assessment

Prepared for
Aurizon Operations Ltd
by Strategen

August 2019

strategen
ENVIRONMENTAL

Lots 511 and 512 Rockingham Road, Kwinana Beach

Reconnaissance flora and vegetation survey and black cockatoo habitat assessment

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August 2019

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Client: Aurizon Operations Ltd

Report Version	Revision No.	Purpose	Strategen author/reviewer	Submitted to Client	
				Form	Date
Preliminary Draft Report	A	Client review	R Chesney / T Sleigh / D Newsome	Electronic	7 June 2019
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Executive Summary

A flora, vegetation and black cockatoo habitat survey was conducted of the Survey Area on 15 May 2019. A total of 25.94 ha of the Survey Area was vegetated (39.6% of the Survey Area), comprising three native vegetation types.

Conservation significant vegetation (Threatened and Priority Ecological Communities) were present within the Survey Area, as follows:

- Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain (TEC; listed in July 2019 under EPBC Act)
- Tuart (*Eucalyptus gomphocephala*) woodlands of the Swan Coastal Plain (PEC; Priority 3)
- *Banksia* woodlands of the Swan Coastal Plain (PEC; Priority 3) (VT3).

VT3 comprises an isolated patch of *Banksia* woodland at the north of the Survey Area. While this area did not meet the criteria to form part of the Banksia Woodlands of the Swan Coastal Plain Threatened Ecological Community listed under the EPBC Act, it is likely to form part of the *Banksia* woodlands of the Swan Coastal Plain PEC (Priority 3).

There were no Threatened or Priority flora species were recorded, or likely to be found, within the Survey Area. Three Declared Pest plants as listed under the BAM Act (**Asparagus asparagoides*, **Zantedeschia aethiopica* and **Gomphocarphus fruticosus*) were recorded within the Survey Area.

All vegetation (25.94 ha) comprised potential foraging habitat ranging from Moderate to Very Poor quality for Carnaby's Black Cockatoo; however, no foraging habitat for other Black Cockatoo species was present.

A total of 319 significant trees (trees over 500 mm DBH), which have the potential to form breeding habitat for Carnaby's Black Cockatoo and Forest Red-tailed Black Cockatoo, were recorded within the Survey Area, of which 11 contained hollows of 10 cm in diameter or above.

An area of 0.003 ha is mapped as an ESA, associated with the buffer of a CCW (UFI 6389) situated in the adjacent property, which was mapped as VT1 and comprised remnant *Eucalyptus gomphocephala* trees over weedy grasses.

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1. Introduction

This report presents the findings of a reconnaissance flora and vegetation survey undertaken for Aurizon Operations Ltd.

1.1 Background

Aurizon Operations Ltd (Aurizon) is currently investigating development opportunities at Lots 511 and 512 Rockingham Road, Kwinana Beach (the Survey Area, Figure 1).

The proposed works may impact native vegetation and as such, a flora and vegetation survey was deemed necessary to determine the environmental values of the Survey Area.

1.2 Scope

The scope of this flora and vegetation survey was to undertake a desktop assessment and field assessment within the Survey Area (Figure 1).

The objectives were to:

- conduct a desktop survey for Threatened and Priority flora which have been identified as being present in or around the survey area
- collect and identify the vascular plant species present within the Survey Area
- search areas of suitable habitat for Threatened and/or Priority flora
- define and map the native vegetation communities present within the Survey Area
- map vegetation condition within the Survey Area
- provide recommendations on the local and regional significance of the vegetation communities
- prepare a report summarising the findings.

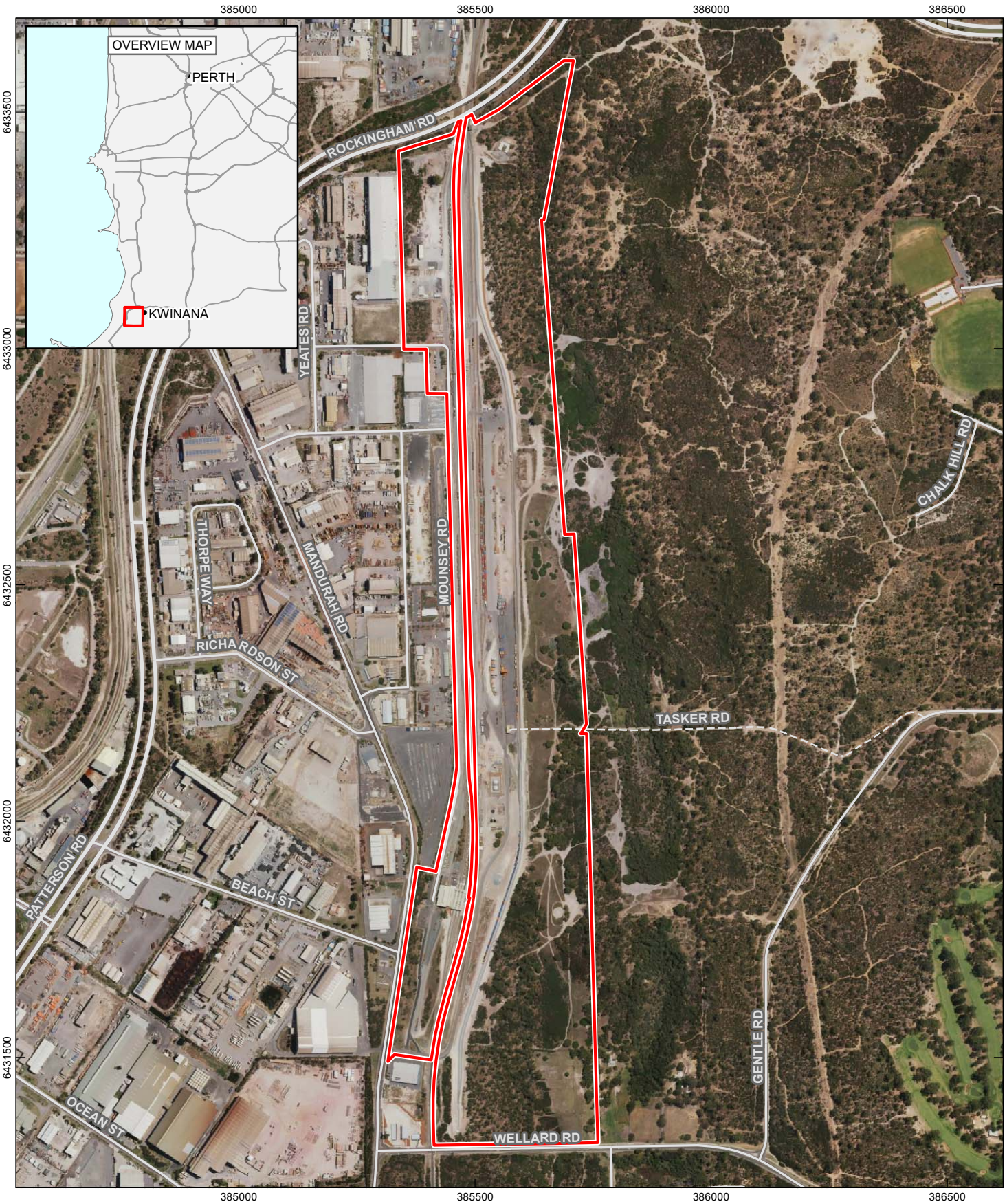

Figure 1: Survey Area

N

Scale 1:11,000 at A4

0 100 200 m

Coordinate System:
GDA 1994 MGA Zone 50

Date: 8/08/2019

Legend

- Lot 511 & 512 Rockingham Road
- Major road
- Minor road
- Track

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2. Context

2.1 Legislative context

Flora and fauna in WA are protected formally and informally by various legislative and non-legislative measures, which are as follows:

- *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) – Australian Government
- *Biodiversity Conservation Act 2016* (BC Act) – State
- *Environmental Protection Act 1986* (EP Act) – State
- *Biosecurity and Agriculture Management Act 2007* (BAM Act) – State.

Non-legislative measures:

- WA Department of Biodiversity, Conservation and Attractions (DBCA) Priority lists for flora, ecological communities and fauna
- Weeds of National Significance
- Recognition of locally significant populations by the DBCA.

A short description of each legislative measure is given below. Other definitions, including species conservation categories, are provided in Appendix 1.

2.1.1 EPBC Act

The EPBC Act aims to protect matters of national environmental significance, which are detailed in Appendix 1. Under the EPBC Act, the Commonwealth Department of the Environment and Energy (DEE) lists protected species and Threatened Ecological Communities (TECs) by criteria set out in the Act. Species are conservation significant if they are listed as Threatened (i.e. Critically Endangered, Endangered and Vulnerable) or Migratory.

Bird species protected as Migratory under the EPBC Act include those listed under international migratory bird agreements relating to the protection of birds which migrate between Australia and other countries, for which Australia has agreed. This includes the Japan-Australia Migratory Bird Agreement (JAMBA), the China-Australia Migratory Bird Agreement (CAMBA), the Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA) and the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention).

Some marine fauna or terrestrial fauna that use marine habitats are listed as Marine under the EPBC Act. These species are only considered conservation significant when a proposed development occurs in a Commonwealth marine area (i.e. any Commonwealth Waters or Commonwealth Marine Protected Area). Outside of such areas, the EPBC Act does not consider these species to be matters of national environmental significance so are not protected under the Act.

2.1.2 BC Act

DBCA lists taxa (flora and fauna) under the provisions of the BC Act as protected and are classified as according to their need for protection (see Appendix 1). The BC Act makes it an offence to 'take' threatened species without an appropriate licence. There are financial penalties for contravening the BC Act.

2.1.3 EP Act

Threatened flora, fauna (and significant habitat necessary for the maintenance of indigenous fauna) and Threatened Ecological Communities (TECs) are given special consideration in environmental impact assessments and have special status as Environmentally Sensitive Areas (ESAs) under the EP Act and the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*. Exemptions for a clearing permit do not apply in an ESA.

2.1.4 BAM Act

The BAM Act provides for management and control of listed organisms, including introduced flora species (weeds). Species listed as declared pests under the BAM Act are classified under three categories:

- C1 Exclusion: Pests assigned under this category are not established in Western Australia, and control measures are to be taken to prevent them entering and establishing in the State.
- C2 Eradication: Pests assigned under this category are present in Western Australia in low enough numbers or in sufficiently limited areas that their eradication is still a possibility.
- C3 Management: Pests assigned under this category are established in Western Australia, but it is feasible, or desirable, to manage them in order to limit their damage. Control measures can prevent a C3 pest from increasing in population size or density or moving from an area in which it is established into an area that is currently free of that pest.

Under the BAM Act, land managers are required to manage populations of declared pests as outlined under the relevant category.

2.2 Environmental setting

2.2.1 Soils and topography

The Survey Area is located within the Swan Coastal Plain 2 (SWA2 – Swan Coastal Plain subregion) of Western Australia (Mitchell et al. 2002). The Swan Coastal Plain comprises five major geomorphologic systems that lie parallel to the coast, namely (from west to east) the Quindalup Dunes, Spearwood Dunes, Bassendean Dunes, Pinjarra Plain and Ridge Hill Shelf (Churchward & McArthur 1980; Gibson *et al.* 1994). Each major system is composed of further subdivisions in the form of detailed geomorphologic units (Churchward & McArthur 1980; Semeniuk 1990; Gibson *et al.*1994). Beard (1990) describes the Swan Coastal Plain as a low-lying coastal plain, often swampy, with sandhills also containing dissected country rising to the duricrusted Dandaragan plateau on Mesozoic, mainly sandy, yellow soils.

Specifically, the Survey Area is located on the Quindalup Dunes landform unit (Churchward & McArthur 1980), and was characterised by sandy soils with occasional limestone outcropping.

2.2.2 Climate

The Kwinana Beach locality experiences a Mediterranean climate characterised by mild, wet winters and warm to hot, dry summers. The nearest Bureau of Meteorology (BoM) weather station at Garden Island HSF (Station No. 9256) provides average monthly climate statistics for the Kwinana Beach locality (Figure 2). Average annual rainfall recorded at Garden Island HSF since 2001 is 603.4 mm (BoM 2019). Rainfall may occur at any time of year; however, most occurs in winter in association with cold fronts from the southwest. Highest temperatures occur in February, with average monthly maximum reaching 28.2 °C while lowest temperatures occur in July, which has an average monthly minimum of 11.2°C (BoM 2019).

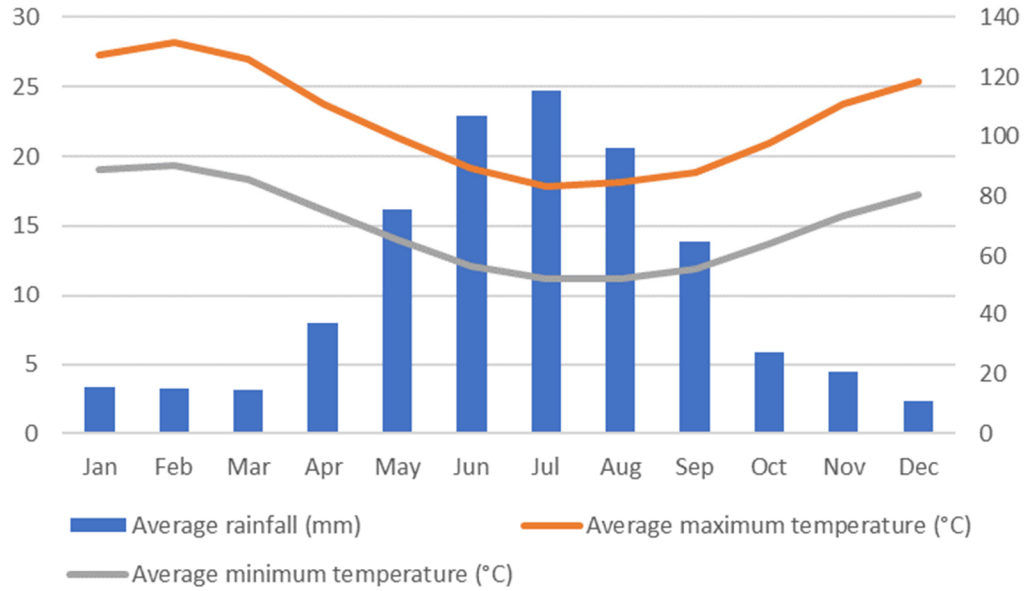

Figure 2: Mean monthly climatic data (temperature and rainfall) for Garden Island HSF

2.2.3 Hydrology

The Survey Area is located within the Southwest Catchment Division, in the Murray River drainage basin.

Mapping of the geomorphic wetlands of the Swan Coastal Plain (Figure 3) indicates no wetlands are present within the Survey Area. One Resource Enhancement Wetland (REW) and one Conservation Category Wetland (CCW) (UFI 6375 and UFI 6389 respectively) are mapped directly to the east of the eastern boundary of the Survey Area (Figure 3).

2.2.4 Conservation areas

There are two Bush Forever sites within 5 km of the Survey Area, including:

- Leda and adjacent bushland, Leda (Site 349) which shares a boundary along the eastern side of the Survey Area
- Lake Cooloongup, Lake Walyungup and adjacent bushland, Hillman to Port Kennedy (site 356), which is situated approximately 3 km to the south of the Survey Area.

The nearest DBCA managed land is directly to the south of the Survey Area, immediately to the south of Wellard Rd (Figure 3).

2.2.5 Environmentally sensitive areas

A defined wetland including a CCW and the area within 50 metres of the wetland is listed as an ESA under the EP Act. The southeast corner of the Survey Area contains 0.003 ha of an ESA associated with the buffer of the CCW (UFI 6389; Figure 3).

2.2.6 Land use

The primary land uses within the Swan Coastal Plain 2 subregion are agriculture, conservation, Unallocated Crown Land and Crown Reserves, urban, rural residential, forestry and infrastructure. Historically, the Survey Area has been utilised for railways and associated activities, informal recreation (trail biking) and potentially stock grazing. Surrounding land uses include Bush Forever site, farming and informal recreation.

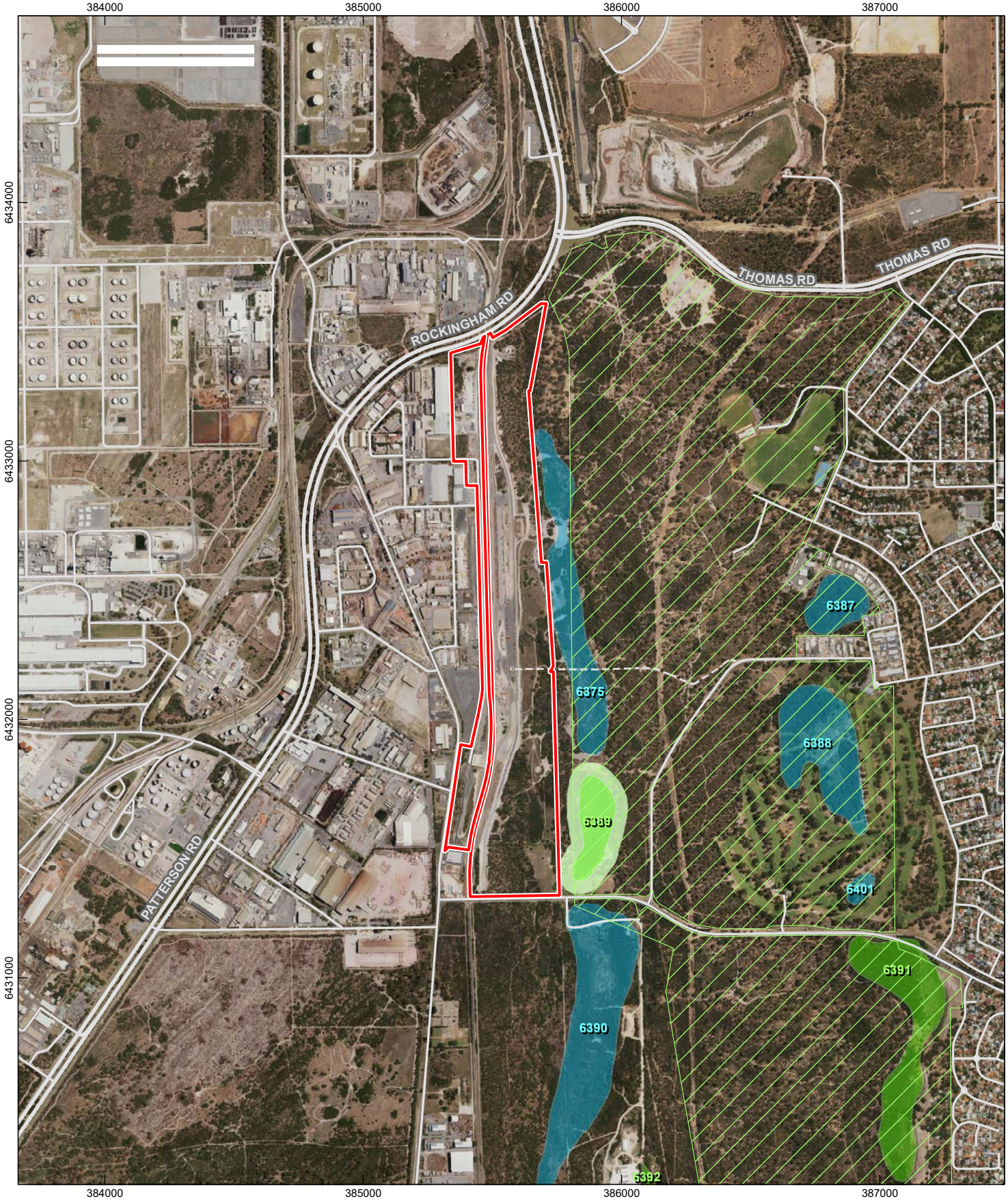

Figure 3: Wetlands, Bush Forever and conservation areas

N

Scale 1:20,000 at A4

0 250 500 m

Coordinate System:
GDA 1994 MGA Zone 50

Date: 8/08/2019

Legend

- Lot 511 & 512 Rockingham Road
- Bush Forever site (DOP)

Geomorphic Wetlands (DBCA)

- Conservation
- Resource Enhancement
- Conservation wetland UFI6389 50m buffer

- Major road
- Minor road
- Track

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2.2.7 Regional vegetation

Beard (1990) Botanical Subdistrict

The Survey Area occurs within the Drummond Botanical Subdistrict which is characterised by low *Banksia* woodlands on leached sands; *Melaleuca* swamps on poorly-drained depressions; and *Eucalyptus gomphocephala* (Tuart), *Eucalyptus marginata* (Jarrah) and *Corymbia calophylla* (Marri) woodlands on less leached soils (Beard 1990).

IBRA subregion

IBRA describes a system of 85 'biogeographic regions' (bioregions) and 403 subregions covering the entirety of the Australian continent (Thackway & Cresswell 1995). Bioregions are defined on the basis of climate, geology, landforms, vegetation and fauna.

The Survey Area occurs within the Swan Coastal Plain 2 IBRA subregion which is dominated by *Banksia* or Tuart on sandy soils, *Casuarina obesa* on outwash plains and paperbark (*Melaleuca*) in swampy areas (Mitchell et al. 2002).

Vegetation system association and System 6 mapping

Vegetation occurring within the region was initially mapped at a broad scale (1: 1 000 000) by Beard during the 1970s. This dataset formed the basis of several regional mapping systems, including the biogeographical region dataset (Interim Biogeographic Regionalisation for Australia) for Western Australia (DEE 2017), physiographic regions defined by Beard (1981), and System 6 Vegetation Complex mapping undertaken by Heddle et al. (1980).

The Survey Area comprises two Beard (1981) vegetation associations (Figure 4). Percentage remaining of each vegetation association is provided in Table 1 (GoWA 2019a).

Table 1: Beard (1981) vegetation associations within the Survey Area

Vegetation Association	Description	Percent remaining in IBRA Region
998	Medium woodland; tuart	36.25%
3048	Shrublands, scrub-heath on the Swan Coastal Plain	25.25%

Based on regional vegetation complex mapping (Heddle et al. 1980) the Survey Area comprises two vegetation complexes, (Table 2, Figure 4). Both have greater than 30% of their original extent remaining in the IBRA bioregion (GoWA 2019b).

Table 2: Heddle et al. (1980) vegetation complexes within the Survey Area

Vegetation Complex	Description	Percent remaining in IBRA Region
Cottesloe Central and South	Cottesloe Complex-Central and South supports heaths on the limestone outcrops which resemble those in the north. The deeper sands support a mosaic of a woodland of tuart and an open-forest of tuart-jarrah-marri. Although many of the understorey species described in Cottesloe-North are found in both areas, the distinctive dominance of tuart distinguishes the southern section (Heddle et al. 1980).	32.16%
Quindalup	Quindalup Complex is restricted to the coastal dunes and can be subdivided mainly into two alliances, strand and fore dune alliance and mobile and stable dune alliance. The vegetation differs in its physiognomy and species composition from one place to another because of the variations in the dune environment caused by edaphic and topographical factors and the degree of shelter from salt-laden winds (Heddle et al. 1980).	60.49%

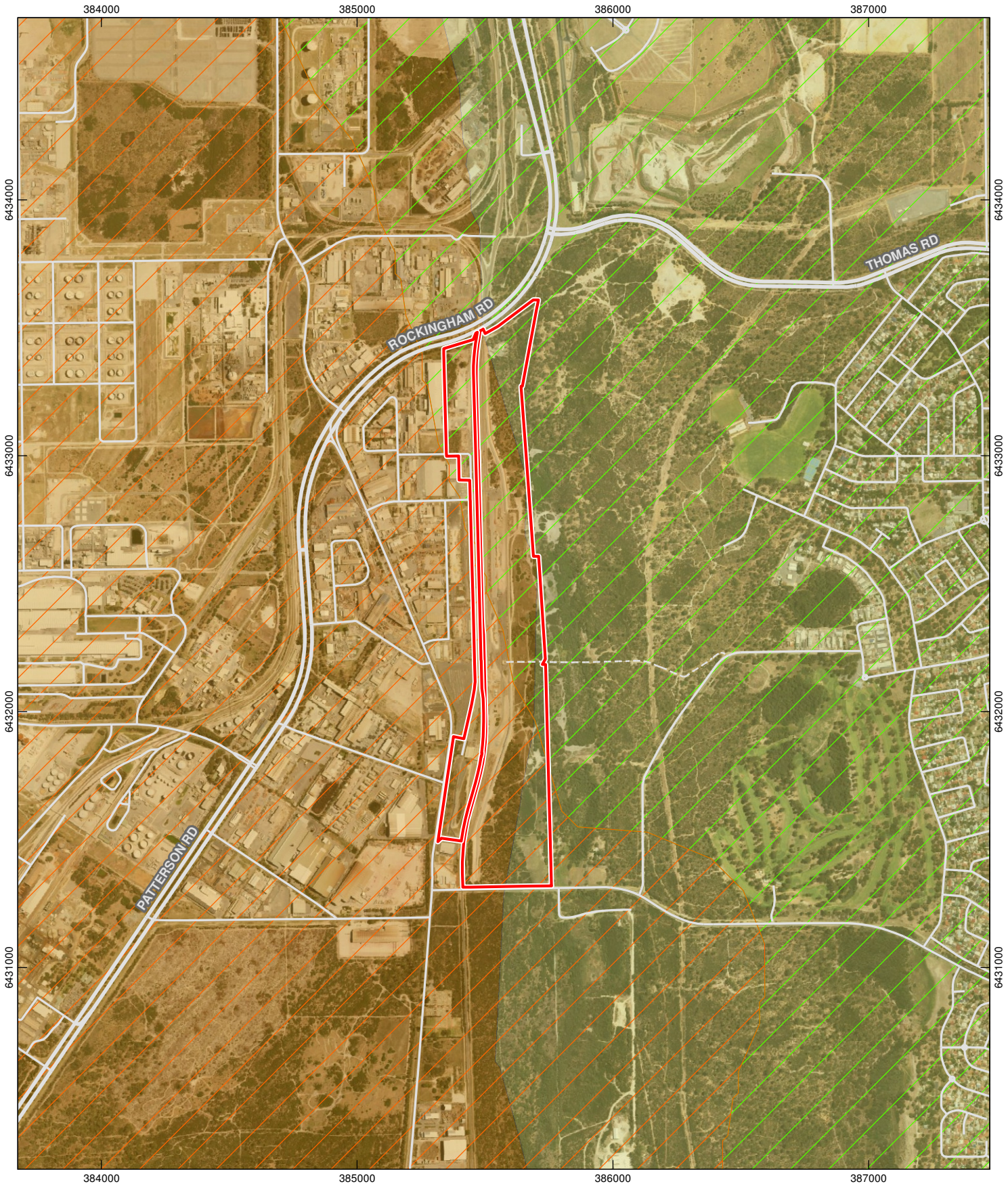

Figure 4: Regional vegetation

N

Scale 1:20,000 at A4

0 250 500 m

Coordinate System:
GDA 1994 MGA Zone 50

Date: 8/08/2019

Legend

- Lot 511 & 512 Rockingham Road

Vegetation complexes (Heddle, 1981 - DBCA)

- Cottesloe Complex-Central and South
- Quindalup Complex

Vegetation associations (Beard, 1981 - DPIRD)

- Rockingham 3048
- Spearwood 998
- Major road
- Minor road
- Track

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2.2.1 Black cockatoo habitat

Carnaby's Black-Cockatoos, listed as Endangered under the EPBC Act, feed on the seeds, nuts and flowers, of a variety of native and introduced plant species and insect larvae (DEE 2019b). Food plants generally occur within proteaceous genera such as *Banksia, Hakea* and *Grevillea*, though are known to forage on eucalypt species in woodland areas. Carnaby's black cockatoos have also adapted to feeding on exotic species such as pines and cape lilac and weeds such as wild radish and wild geranium (DEE 2019b). Carnaby's black cockatoos usually breed between July and December in the hollows of live or dead eucalypts; primarily in Salmon Gum and Wandoo, but also within Jarrah, Marri and other eucalypt species (Johnstone 2010a). Hollows are usually at least 2 m above ground, sometimes over 10 m and the depth of the hollow varies from 0.25 m to 6 m (DEE 2019b). Mapping of Carnaby's Black Cockatoo distribution (Johnstone and Kirkby undated) identifies the Survey Area as occurring within the range of the species.

Forest Red-tailed Black-Cockatoos, listed as Vulnerable under the EPBC Act, depend primarily on Marri and Jarrah trees for both foraging and nesting. The seeds of both eucalypts are the favoured food source of the birds and hollows within live or dead individual trees are utilised for nesting purposes (Johnstone 2010b). Breeding varies between years and occurs at times of Jarrah and Marri fruiting. These black cockatoos breed in woodland, forest or artificial nest boxes, but may also breed in former woodland or forest that has been reduced to isolated trees (DEE 2019b). Mapping of the Forest Red-tailed Black Cockatoo distribution (Johnstone and Kirkby undated) identifies the species as likely to occur in the Survey Area.

Baudin's Black-Cockatoos primarily occur in eucalypt forests and forage at all strata levels within the forests with a tendency to favour areas containing Marri (Johnstone and Kirkby 2008, DEE 2017b). Breeding generally occurs in the Jarrah, Marri and Karri forests of the southwest of Western Australia in areas averaging more than 750 mm of rainfall annually (DEE 2019b). As with the other two species of Threatened black cockatoos in Western Australia, breeding habitat also occurs in former woodland or forest that has been reduced to isolated trees (DEE 2019b). Mapping of the Baudin's Black-Cockatoos distribution (Johnstone and Kirkby undated) identifies the species as unlikely to occur in the Survey Area.

3. Methods

3.1 Desktop assessment

Database searches were undertaken to generate a list of vascular flora previously recorded within, and nearby the Survey Area with an emphasis on species of conservation significance (Table 3). Two database searches were conducted around a central coordinate (50H, 385647 mE, 6432507 mN). Search buffers differed due to the technical capabilities of individual databases as well as ecological features surrounding the project area relevant to different species groups.

Table 3: Database searches conducted for the desktop assessment

Custodian	Database	Taxonomic group	Reference	Buffer (km)
DEE	Protected Matters	Flora, Vegetation and Fauna	DEE 2019a	5
DBCA	NatureMap	Flora	DPaW 2007-	5

Reports that document regional flora, vegetation and fauna within the surrounds of the Survey Area were also reviewed prior to the field assessment.

3.2 Field assessment

3.2.1 Flora and vegetation

The field survey of Lot 511 was conducted by two ecologists from Strategen on 15 May 2019. Lot 512 was surveyed separately by one ecologist on 6 August 2019 (Table 4). The survey was conducted in accordance with guidelines provided in *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016).

Table 4: Personnel

Name	Role	Flora collection permit
Robyn Chesney Senior Ecologist	Planning, fieldwork, plant identification, data interpretation and report preparation (Lot 511, Lot 512)	FB62000123
Amy Dalton Ecologist	Planning, fieldwork, plant identification, data interpretation and report preparation (Lot 511)	SL012424

Five relevé sites were sampled across Lot 511. Relevés were sampled to characterise vegetation types and condition, and ensure appropriate representation of the flora and vegetation present. Indicative site locations were identified prior to commencement of the field survey using aerial photography, topographic maps and existing vegetation maps, to ensure that all broad vegetation types and landforms within the project area would be sampled.

At each relevé the following information was recorded:

- GPS co-ordinates (recorded in GDA94 UTM 50H)
- photograph of the vegetation
- vegetation condition
- brief vegetation description
- vascular flora taxa present (with average height and total percentage foliage cover of each taxon)
- topography (landform type and aspect)
- soil type and colour
- geology (type, size and cover of any rocks, stones, gravel or outcropping)

- average percentage cover of leaf litter and bare ground
- disturbance details including fire history (time since last fire), and physical disturbance including evidence of erosion, grazing and weed invasion.

A site walkover of Lot 512 was conducted separately. The following information was collected during the site walkover:

- species observed
- vegetation condition
- brief vegetation description
- photographs of the vegetation.

Any flora taxa observed opportunistically around survey sites or while traversing on foot within the Survey Area were also recorded. For any populations of taxa known to be conservation significant or introduced flora observed, a GPS location and a count of the individuals present, or percentage foliar cover for a given area, were recorded.

Prior to the survey, a list of conservation significant flora with the potential to occur within the project area was compiled. Field personnel familiarised themselves with photographs, reference samples and descriptions of these taxa before conducting the survey and once on the ground actively searched for them around quadrats, while traversing on foot within the project and in known locations or preferred habitat encountered in the field.

All plant specimens collected during the field surveys were identified using appropriate reference material or through comparisons with pressed specimens housed at the Western Australian Herbarium where necessary. Nomenclature of the species recorded is in accordance with Western Australian Herbarium (1998-).

Vegetation condition was recorded at all quadrats, and opportunistically within the project area during the field assessment where required. Vegetation condition was described using the vegetation condition scale for the South West Botanical Province (EPA 2016; **Error! Reference source not found.**). Vegetation condition polygon boundaries were developed using this information in conjunction with aerial photography interpretation, and were digitised as for vegetation type mapping polygon boundaries.

Table 5: Vegetation condition scale (EPA 2016)

Condition rating	Description
Pristine (1)	Pristine or nearly so, no obvious sign of disturbance or damage caused by human activities since European settlement
Excellent (2)	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species. Damage to trees caused by fire, the presence of non-aggressive weeds and occasional vehicle tracks.
Very Good (3)	Vegetation structure altered obvious signs of disturbance. Disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.
Good (4)	Vegetation structure significantly altered by obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. Disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback, grazing.
Degraded (5)	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. Disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds at high density, partial clearing, dieback and grazing.
Completely Degraded (6)	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.

Vegetation types were delineated using results of site observations. Aerial photography interpretation and field notes taken during the survey were then used to develop VT mapping polygon boundaries over the Survey Area. These polygon boundaries were then digitised using Geographic Information System (GIS) software.

VT descriptions (though floristic in origin) have been adapted from the National Vegetation Information System (NVIS) Australian Vegetation Attribute Manual Version 6.0 (ESCAVI 2003), a system of describing structural vegetation units (based on dominant taxa). This model follows nationally-agreed guidelines to describe and represent vegetation types, so that comparable and consistent data is produced nation-wide. For the purposes of this report, a VT is considered equivalent to a NVIS sub-association as described in ESCAVI (2003).

3.2.2 Black cockatoo habitat

The Survey Area was inspected on 15 May 2019 and 6 August 2019 by Strategen personnel with relevant experience as specified by the *EPBC Act Referral guidelines for three threatened black cockatoo species* (DSEWPaC 2012). The inspection included:

- a vegetation assessment to identify vegetation communities and potential black cockatoo foraging species
- a significant tree assessment to identify any trees with the potential to be utilised by black cockatoos for breeding.

Vegetation and foraging assessment

The Survey Area was traversed on foot to record any flora species with the potential to provide a food source for black cockatoos. Following the assessment, vegetation units defined as part of the flora and vegetation survey were assigned a foraging value based on the presence and quantity of potential food species and any evidence of foraging by black cockatoos.

Significant tree assessment

Significant trees are defined as trees of suitable species with a diameter at breast height (DBH) greater than 500 mm (> 300 mm for salmon gum and wandoo) (DSEWPaC 2012). Tree species considered to be potential breeding or roosting trees are outlined in Table 6. Trees with a DBH greater than 500 mm (or >300 mm for salmon gum and wandoo) are large enough to potentially contain hollows suitable for nesting black cockatoos, or have the potential to develop suitable hollows over the next 50 years. Trees of this size may also be large enough to provide roosting habitat (i.e. trees which provide a roost or rest area for the birds). The locations of such trees within the Survey Area were recorded using a Global Positioning System (GPS) device. In addition to the location and DBH, the species of each tree was also recorded.

Table 6: Black cockatoo potential breeding and roosting tree species (Groom 2011, DSEWPaC 2012)

Scientific name	Common name	Breeding	Roosting
Corymbia calophylla	Marri	Yes	Yes
Corymbia maculata	Spotted Gum		Yes
Eucalyptus accedens	Powderbark	Yes	
Eucalyptus camaldulensis	River Red Gum		Yes
Eucalyptus citriodora	Lemon Scented Gum		Yes
Eucalyptus diversicolor	Karri	Yes	
Eucalyptus globulus	Tasmania Blue Gum		Yes
Eucalyptus gomphocephala	Tuart	Yes	Yes
Eucalyptus grandis	Flooded Gum, Rose Gum		Yes
Eucalyptus longicornis	Red Morrell	Yes	
Eucalyptus loxophleba	York Gum	Yes	
Eucalyptus marginata	Jarrah	Yes	Yes
Eucalyptus megacarpa	Bullich	Yes	Yes

Scientific name	Common name	Breeding	Roosting
Eucalyptus occidentalis	Swamp Yate	Yes	
Eucalyptus patens	Blackbutt	Yes	Yes
Eucalyptus robusta	Swamp Mahogany		Yes
Eucalyptus rudis	Flooded Gum	Yes	Yes
Eucalyptus salmonophloia	Salmon Gum	Yes	
Eucalyptus salubris	Gimlet	Yes	
Eucalyptus wandoo	Wandoo	Yes	Yes
Pinus pinaster	Pinaster, Maritime Pine		Yes
Pinus radiata	Monterey, Radiata Pine		Yes

Tuart Woodlands and Forests of the Swan Coastal Plain

A patch of the Tuart Woodlands and Forests of the Swan Coastal Plain ecological community is a discrete and mostly continuous area of vegetation that meets the key diagnostic characteristics described in Table 12. Boundaries for a patch can extend beyond a site or property boundary, or potential area of impact for a proposed action and may include small areas without understorey vegetation, such as bare ground, as well as waterbodies or hardscape (e.g. roads, paths, car parks, or buildings) that do not significantly alter the overall function of the ecological community, as long as there are some parts of the canopy within 60 m of the outer edges of the canopies of adjacent Tuart trees. The patch boundary is 30 m beyond the outer canopy of the established Tuart trees (≥15 cm diameter at breast height [DBH]), including dead trees (stags) (TSSC 2019). If the patch is smaller than 2 ha and contains minimal native understorey (<50% native understorey and <4 native understorey species per 10x10m plot), it is not considered part of the TEC (TSSC 2019).

Mapping of the Tuart Woodlands of the Swan Coastal Plain TEC was based on mapping of significant trees (above) and vegetation types. As per requirements of the *Approved Conservation Advice (incorporating listing advice) for the Tuart (Eucalyptus gomphocephala) woodlands and forests of the Swan Coastal Plain ecological community* (TSSC 2019), a buffer of 30 m was applied to the canopy of large tuart trees recorded within the Survey Area. The boundary of this buffer represented the extent of potential patches, except where additional tuart woodland was present outside of the canopy buffers (i.e. smaller tuarts not individually recorded as part of the significant tree survey). In these instances, the TEC boundary was mapped along the boundary of the mapped vegetation types. Areas intersecting infrastructure, cleared areas and buildings on the outer extent of the potential patch were excluded.

For each individual potential patch, vegetation condition was averaged to give a single value, and using quadrat data, tree data and other on ground observations, an assessment against criteria was made for each patch to determine presence of absence of the TEC.

4. Results

4.1 Desktop assessment

4.1.1 Threatened and Priority flora

A total of eight flora taxa of conservation significance were identified by database searches (Table 7; Appendix 2). Of these, four species listed as Threatened under the BC Act, or the EPBC Act were identified. The remaining three flora taxa identified are priority listed flora species (Table 7).

The potential for these plants to occur within the Survey Area was assessed based on general habitat requirements and distribution (Table 7). One Threatened, and two Priority flora species were considered to have the potential to occur within the Survey Area:

- *Caladenia huegelii* (Threatened – Endangered [BC Act], Endangered [EPBC Act])
- *Dodonaea hackettiana* (P4)
- *Jacksonia sericea* (P4).

Table 7: Threatened and Priority flora potentially occurring within the Survey Area

Species	Conservation status		Description	Potential to occur
	BC Act	EPBC Act		
Caladenia huegelii	T (CR)	Endangered	A slender orchid from 30 to 50 cm tall. One or two striking flowers characterised by a greenish-cream lower petal with a maroon tip. Other petals are cream with red or pink suffusions. Habitat for this species occurs within well-drained, deep sandy soils in low mixed *Banksia*, *Allocasuarina* and Jarrah woodlands (Western Australian Herbarium 1998-, DEE 2019b).	**Possible** due to presence of preferred habitat.
Diuris micrantha	T (VU)	Vulnerable	A slender orchid to 60 cm tall. Yellow flowers with reddish-brown markings measuring 1.3 cm across. Habitat for this species occurs within clay-loam substrates in winter-wet depressions or swamps (Western Australian Herbarium 1998-).	**Unlikely** due to absence of preferred habitat.
Diuris purdiei	T (EN)	Endangered	A slender orchid to 0.35 m tall. Flowers are yellow and visible from September to October. Habitat for this species is grey-black sand substrates in winter-wet swamps which have high moisture (Western Australian Herbarium 1998-). *Diuris purdiei* occurs from Perth south to near the Whicher Range, within the Swan (Western Australia) Natural Resource Management Region. It grows on sand to sandy clay soils, in areas subject to winter inundation, and amongst native sedges and dense heath with scattered emergent *Melaleuca preissiana*, *Corymbia calophylla*, *E. marginata* and *Nuytsia floribunda* (DEE 2019b).	**Unlikely** due to absence of preferred habitat.
Dodonaea hackettiana	P4	NA	An erect shrub or tree, 100 to 500 cm tall. Flowers are yellow to green/red and occur mainly from July to October. Habitat for this species occurs in sand and outcropping limestone (Western Australian Herbarium 1998-).	**Possible** due to presence of preferred habitat.
Drakaea elastica	T (CR)	Endangered	A slender orchid to 30 cm tall with a prostrate, round to heart shaped leaf. Singular, bright green, glossy flower. The species grows on bare patches of sand within otherwise dense vegetation in low-lying areas alongside winter-wet swamps, typically in banksia (*Banksia menziesii*, *B. attenuata* and *B. ilicifolia*) woodland or spearwood (*Kunzea glabrescens*) thicket vegetation. *D. elastica* often occurs with other orchid species (DEE 2019b).	**Unlikely** due to absence of preferred habitat.
Jacksonia sericea	P4	NA	Low spreading shrub to 60 cm tall. Flowers are orange and visible December or January or February. Habitat for this species is calcareous and sandy soils (Western Australian Herbarium 1998-).	**Possible** due to presence of preferred habitat.
Pimelea calcicola	P3	NA	An erect to spreading shrub to 1 m tall. Flowers are pink and visible between September to November. Habitat for this species occurs in sand on coastal limestone ridges (Western Australian Herbarium 1998-).	**Unlikely** due to absence of preferred habitat.
Stylidium ireneae	P4	NA	A lax perennial herb, (0.06-) 0.1-0.28 m tall. Flowers are pink, occurring from October to December. Habitat for this species includes sandy loam soils within valleys near creek lines and woodland often with *Agonis* spp. (Western Australian Herbarium 1998-).	**Unlikely** due to absence of preferred habitat.

4.1.2 Threatened and Priority Ecological Communities

Based on site location, comparison of community descriptions and assessment against diagnostic criteria (DCBA 2018, TSSC 2016, TSSC 2019), two TECs listed under the EPBC Act, both of which are listed as PECs by DBCA, were considered to be potentially present within the Survey Area (Table 8).

Table 8: TECs and PECs identified within and near the Survey Area

Community	Conservation Status		Description
	EPBC Act	BC Act	
Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain	Critically Endangered	Priority 3	Occurs as woodlands or forests or other structural forms where the primary defining feature is the presence of *Eucalyptus gomphocephala* (Tuart) trees in the uppermost canopy layer. The ecological community includes the assemblage of plants, animals and other organisms that occur in association with Tuart.
Banksia woodlands of the Swan Coastal Plain	Endangered	Priority 3	Canopy is most commonly dominated or co-dominated by *Banksia attenuata* and/or *B. menziesii*. Other *Banksia* species that can dominate in the community are *B. prionotes* or *B. ilicifolia*. It typically occurs on well drained, low nutrient soils on sandplain landforms, particularly deep Bassendean and Spearwood sands and occasionally on Quindalup sands; it is also common on sandy colluvium and aeolian sands of the Ridge Hill Shelf, Whicher Scarp and Dandaragan Plateau and can occur in other less common scenarios.

4.1.3 Environmentally sensitive areas

The southeast corner of the Survey Area contains 0.003 ha of an ESA associated with the buffer of the CCW (UFI 6389). Limited vegetation was present within this area, comprising remnant *Eucalyptus gomphocephala* trees over weedy grasses (mapped as VT1).

4.2 Field survey

4.2.1 Native flora

A total of 13 native vascular plant taxa from 11 plant families were recorded from relevés within the Survey Area. The relatively low number of plant genera recorded reflects the disturbed nature of the Survey Area.

4.2.2 Conservation significant flora

No Threatened flora species as listed under section 178 of the EPBC Act or section 19(1) of the BC Act were recorded within the Survey Area. No priority flora species as listed by DBCA were recorded within the Survey Area.

4.2.3 Introduced (exotic) taxa

A total of 18 introduced (exotic) taxa were recorded within the Survey Area, as follows:

- **Arundo donax*
- **Agave americana*
- **Asparagus asparagoides*
- **Briza maxima*
- **Casuarina ?equisetifolia*
- **Cenchrus setaceus*
- **Cymbopogon citratus*
- **Euphorbia terracina*
- **Ficus carica*
- **Gomphocarpus fruticosus*
- **Lagurus ovatus*
- **Olea europea*
- **Orobanche minor*
- **Oxalis pes-caprae*
- **Poaceae sp.*
- **Scabiosa atropurpurea*
- **Schinus terebinthifolia*
- **Zantedeschia aethiopica.*

Three of these species, **Asparagus asparagoides, *Gomphocarpus fruticosus* and **Zantedeschia aethiopica,* are listed as Declared Plant species in Western Australia pursuant to section 22 of the *Biosecurity and Agriculture Management Act 2007* (BAM Act) according to the Western Australian Department of Agriculture and Food (DPIRD 2017).

Individual plants of **Gomphocarpus fruticosus* and **Asparagus asparagoides* were observed frequently throughout the entire Survey Area. **Zantedeschia aethiopica* was also observed throughout the entire Survey Area, with particular abundance noted in the northern section of the Survey Area, i.e. to the north of the pedestrian footbridge, where numerous individuals were observed sprouting through leaf litter.

4.2.4 Vegetation types

Three native vegetation types (VTs) were defined and mapped within the Survey Area (Figure 5) and are summarised in Table 9. Areas containing vegetation in parkland cleared or highly degraded state have not been counted as unique native VTs but have been included in Table 9 for area calculation purposes. The total area mapped within the Survey Area was 65.53 ha which includes any parkland cleared, highly degraded and fully cleared areas. The dominant native VT within the survey area was VT1 which can be broadly described as a woodland of *Eucalyptus gomphocephala* (tuart) over *Acacia rostellifera* and mixed introduced species.

Table 9: Vegetation types recorded within the Survey Area

Vegetation Type	Description	Area (ha) within project/Survey Area	% of Survey Area	Representative photograph
1	*Eucalyptus gomphocephala* mid woodland over *Acacia rostellifera* tall shrubland over mixed grassland and herbland of weedy species.	19.47	29.71	
2	*Acacia rostellifera* shrubland over herbland of introduced species.	6.15	9.39	

Vegetation Type	Description	Area (ha) within project/Survey Area	% of Survey Area	Representative photograph
3	Woodland of *Banksia grandis* and *Banksia attenuata* over shrubland of *Acacia rostellifera*, *Xanthorrhoea preissii* and *Macrozamia riedlei* over herbland of mixed native and introduced species.	0.32	0.49	
Cleared	Includes areas completely cleared for infrastructure, fire breaks and informal tracks, as well as highly degraded areas devoid of native vegetation or with only occasional native species.	39.59	60.42	
Total		**65.53**	**100**	

Figure 5: Vegetation type

N

Scale 1:11,000 at A4

0 100 200 m

Coordinate System:
GDA 1994 MGA Zone 50

Date: 8/08/2019

Legend

- Lot 511 & 512 Rockingham Road
- Major road
- Minor road
- Track

Vegetation type

- Cleared (39.59ha)
- VT1 (19.47ha)
- VT2 (6.15ha)
- VT3 (0.32ha)

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Vegetation condition

The Survey Area shows signs of having been degraded for a long period of time, in part due to its proximity to rail depot infrastructure. Unrestricted public access within the Survey Area including trail bike riding and rubbish dumping has resulted in informal trails and household and industrial waste throughout. Broken fencing between neighbouring farms to the east has potentially also allowed livestock within the Survey Area. Understorey species were almost completely absent from the majority of the Survey Area, with only occasional native species other than the upper stratum of *Eucalyptus gomphocephala* and mid stratum of *Acacia rostellifera* scrub. The only area with some intact understorey was VT3, on the north eastern boundary.

As a result of the heavy disturbance to vegetation within the Survey Area, vegetation condition ranged from Completely Degraded to Good (Keighery 1994; Figure 6). Table 10gives a numerical breakdown of the area occupied by each vegetation condition rating.

Table 10: Area (ha) covered by each vegetation condition category within the Survey Area

Vegetation Condition	Area (ha)	Percentage of the Survey Area*
Completely Degraded	39.59	60.42
Degraded	25.62	39.10
Good	0.32	0.49
Total	**65.53**	**100**

Figure 6: Vegetation condition

N

Scale 1:11,000 at A4

0 100 200 m

Coordinate System:
GDA 1994 MGA Zone 50

Date: 8/08/2019

Legend

- Lot 511 & 512 Rockingham Road
- Major road
- Minor road
- Track

Vegetation condition

- Good (0.32ha)
- Degraded (25.62ha)
- Completely degraded (39.59ha)

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4.2.5 Threatened and Priority Ecological Communities

Banksia woodlands of the Swan Coastal Plain TEC

While two *Banksia* species (*B. grandis* and *B. attenuata*) were recorded in VT3 and thus constituted Banksia woodland vegetation, vegetation condition within this vegetation type was rated as Good and covered less than 2 ha (0.32 ha). An assessment against key diagnostic criteria for the ecological community was undertaken to determine whether VT3 constituted the Banksia woodlands of the Swan Coastal Plain TEC (TSSC 2016). The assessment indicated VT3 did not form part of this TEC (Table 11).

While adjacent vegetation (to the east of the firebreak / track) contained similar vegetation, these adjacent patches were also small, fragmented and isolated and covered less than 2 ha in total. As such, Banksia woodlands of the Swan Coastal Plain TEC was not considered to be present within the Survey Area.

Table 11: Assessment of vegetation against key diagnostic criteria for Banksia Woodlands of the Swan Coastal Plain TEC

Key diagnostic criteria (TSSC 2016)	Banksia woodlands within the Survey Area
Location: Occurs in the Swan Coastal Plain or Jarrah Forest IBRA bioregions.	**Yes**. Banksia woodlands within the Survey Area occur on the Swan Coastal Plain.
Soils and landform: Occurs on: • well drained, low nutrient soils on sandplain landforms, particularly deep Bassendean and Spearwood sands and occasionally on Quindalup sands • sandy colluviums and aeolian sands of the Ridge Hill Shelf, Whicher Scarp and Dandaragan Plateau • transitional substrates and sandflats.	**Yes**. Banksia woodlands within the Survey Area occur on Quindalup sands.
Structure: Low woodland to forest with: • a distinctive upper sclerophyllous layer of low trees (occasionally large shrubs more than 2 m tall), typically dominated or co-dominated by one or more of the banksia species identified below • emergent trees of medium or tall (>10 m) height. *Eucalyptus* or *Allocasuarina* species may sometimes be present above the banksia canopy • an often highly species-rich understorey.	**Yes**. Banksia woodlands within the Survey Area display the structure characteristics described; however, the understorey contained only eight native species.
Composition: Contains at least one of the following species: • *Banksia attenuata* • *Banksia menziesii* • *Banksia prionotes* • *Banksia ilicifolia*.	**Yes**. Banksia woodlands within the Survey Area contain *Banksia attenuata*.
Condition (Keighery 1994): 'Pristine': no minimum patch size 'Excellent': 0.5 ha 'Very Good': 1 ha 'Good': 2 ha.	**No**. Banksia woodlands within the Survey Area were rated in Good condition and comprise 0.32 ha; as such, do not meet the condition thresholds required to constitute the TEC. While this patch is connected with a broader patch of Banksia woodlands directly to the east of the Survey Area in similar or poorer condition, this additional area is also relatively small, highly localised, fragmented and degraded, and does not bring the overall patch size to over 2 ha.

Banksia woodlands of the Swan Coastal Plain PEC

While the determination of the presence of a PEC is usually based on affinity of vegetation data with known Floristic Community Types (FCTs) as defined by Gibson et al. (1994), this was considered unnecessary as the level of degradation of vegetation within the Survey Area was such that insufficient species diversity was present to enable meaningful further analysis.

However, due to the presence of known dominant species of this PEC within VT3 (*Banksia attenuata*), and the lack of more stringent diagnostic criteria, the *Banksia* woodlands of the Swan Coastal Plain PEC should be considered to be present within VT3 (Figure 7).

Tuart woodlands and forests of the Swan Coastal Plain TEC

Given the location of the Survey Area, the Tuart (*Eucalyptus gomphocephala*) Woodlands and Forests of the Swan Coastal Plain TEC, listed under the EPBC Act on 4 July 2019, was considered to have the potential to occur. Given this, vegetation within the Survey Area was assessed against the diagnostic criteria in the *Approved Conservation Advice (incorporating listing advice) for the Tuart (Eucalyptus gomphocephala) woodlands and forests of the Swan Coastal Plain ecological community* (TSSC 2019, Table 12. Tuart woodlands are present within the Survey Area (Table 12, Figure 7), occurring across five separate patches (Figure 7); however, of the five patches, only two meet the diagnostic criteria (Table 13).

Table 12: Assessment of vegetation within the Survey Area against key diagnostic criteria for Tuart Woodlands of the Swan Coastal Plain TEC

Key diagnostic criteria (TSSC 2019)	Assessment of vegetation within the Survey Area
Location: Occurs in the Swan Coastal Plain Bioregion, Western Australia (IBRA v7. Department of the Environment 2012).	**Yes.** The Survey area is located within the Swan Coastal Plain Bioregion.
Soils and landform: Primarily occurs on the Spearwood and Quindalup dune systems, but can also occur on the Bassendean dunes and Pinjarra Plain. It can occur on the banks of rivers and wetlands.	**Yes.** The Survey area occurs on Spearwood and Quindalup dune systems.
Structure and composition: Defining features include: • the presence of at least two living established *Eucalyptus gomphocephala* (Tuart) trees in the uppermost canopy layer, although they may co-occur with trees of other species. • a gap of no more than 60 m between the outer edges of the canopies of adjacent Tuart trees. hese trees may occur either as single stemmed trees or as a mallee growth form. • woodland structure, or other structural forms such as forest, open forest, woodland, open woodland, and various mallee forms • an understorey of native plants which may include grasses, herbs and shrubs; though this is typically present, it is often modified by disturbance • other tree species may be present in the canopy or sub-canopy, commonly including: *Agonis flexuosa* (Peppermint) and *Banksia grandis* (Bull Banksia) (both in the southern part of the range), *Banksia attenuata* (Candlestick Banksia), *Eucalyptus marginata* (Jarrah); and less commonly, *Corymbia calophylla* (Marri), *Banksia menziesii* (Firewood Banksia) and *Banksia prionotes* (Acorn Banksia).	**Yes**. Vegetation within this patch occurs as a woodland to open woodland dominated by *Eucalyptus gomphocephala*.
Condition: All patches ≥5 ha are part of the nationally protected ecological community, regardless of their understorey condition.	**Yes.** Patches of 5 ha in size or greater are present within the Survey Area. A more detailed assessment of each patch is provided in Table 13.

Table 13: Assessment of Tuart Woodlands patches against condition thresholds

Criteria	Patch				
	1	2	3	4	5
Area (ha)	8.08 ha within Survey Area; patch extends beyond boundary of Survey Area	0.20 ha	13.28 ha within Survey Area; patch extends beyond boundary of Survey Area	1.18 ha	0.77 ha within Survey Area; patch extends beyond boundary of Survey Area
Native Species Richness per 0.01ha	5	1	7	2	1
Proportion of native understorey cover per 0.01 ha	77.6%	0%	51.8%	40%	0%
Density of large trees per 0.5ha	74.26	2.5	6.4	2.54	10.38
Condition (TSSC 2019)*	High	Poor	Moderate	High	Poor
Mean Vegetation Condition (EPA 2016)	Degraded	Degraded	Degraded	Degraded	Degraded
Result	**TEC present.** Patch >5 ha.	**TEC not present**. Patches under 2 ha with minimal native understorey (<50% native understorey and <4 native understorey species per 10x10m plot) are not considered part of the ecological community. This patch has no native understorey species.	**TEC present.** Patch >5 ha.	**TEC not present**. Patches under 2 ha with minimal native understorey (<50% native understorey and <4 native understorey species per 10x10m plot) are not considered part of the ecological community. While condition is rated as high based on percentage native understorey foliage cover, this patch has one native understorey species (*Acacia saligna*) and does not meet the size threshold to be included as the TEC.	**TEC not present**. Patches under 2 ha with minimal native understorey (<50% native understorey and <4 native understorey species per 10x10m plot) are not considered part of the ecological community. This patch has no native understorey species.

* Condition is based on criteria set out in Table 2 of *Approved Conservation Advice (incorporating listing advice) for the Tuart (Eucalyptus gomphocephala) woodlands and forests of the Swan Coastal Plain ecological community* (TSSC 2019)

Figure 7: Threatened and Priority Ecological Communities within the Survey Area

N

Scale 1:11,000 at A4

0 100 200 m

Coordinate System:
GDA 1994 MGA Zone 50

Date: 13/08/2019

Legend

- Lot 511 & 512 Rockingham Road

Threatened & Priority Ecological Community

- Tuart Woodland PEC
- Tuart Woodland PEC & TEC
- Banksia Woodland PEC

- Major road
- Minor road
- Track

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Tuart woodlands and forests of the Swan Coastal Plain PEC

As discussed above, the determination of the presence of a PEC is usually based on affinity of vegetation data with known Floristic Community Types (FCTs) as defined by Gibson et al. (1994). As only two species were present within the majority of VT1, insufficient species diversity is present to enable meaningful further analysis.

However, due to the presence of known dominant species of this PEC within VT1 (*Eucalyptus gomphocephala*), and the lack of more detailed diagnostic criteria, the *Tuart woodlands and forests of the Swan Coastal Plain PEC* should be considered to be present within all patches of Tuart woodlands within the Survey Area (Figure 7).

4.2.6 Black cockatoo habitat

A total of 319 significant trees were recorded within the Survey Area (largely *Eucalyptus gomphocephala*). Of these, 11 trees contained visible hollows of at least 10 cm diameter (Figure 8).

Habitat foraging quality of each vegetation type is shown in Table 15 and was determined using the scale described in Table 14.

Table 14: Definitions of black cockatoo foraging habitat quality

Foraging quality	Justification
Excellent	High density of species suitable for foraging by black cockatoos (i.e. foliage cover of suitable species >60%) and presence of food sources at several strata (i.e. canopy, midstorey and understorey).
Good	High density of species suitable for foraging by black cockatoos (i.e. foliage cover of suitable species >60%) but food sources only present at one or two strata (i.e. canopy and midstorey).
Moderate	Moderate foraging value density of species suitable for foraging by black cockatoos (i.e. foliage cover of suitable species 20-40%) and food sources only present at one or two strata (i.e. canopy and midstorey).
Poor	Low density of species suitable for foraging by black cockatoos (i.e. foliage cover of suitable species 10-20%) and presence of food sources at only one stratum (i.e. canopy).
Very poor	Very low density of species suitable for foraging by black cockatoos (i.e. foliage cover of suitable species <10%) and presence of food sources at only one stratum (i.e. canopy).
Nil	Cleared areas - no suitable vegetation present.

Baudin's Black Cockatoo was considered unlikely to be present as the Survey Area is beyond the range of its known distribution (Section 2.2.1, Johnstone and Kirkby undated); as such, foraging habitat quality has been assessed for only Carnaby's and Forest Red-tailed Black Cockatoo.

Table 15: Vegetation types and black cockatoo foraging species within the Survey Area

Vegetation type	Black cockatoo foraging species	Foraging quality	Area (ha)
VT1	CBC – *Eucalyptus gomphocephala* FRTBC – Nil	• Moderate (CBC) • Nil (FRTBC)	19.47
VT2	CBC – *Eucalyptus gomphocephala* FRTBC – Nil	• Very poor (CBC) • Nil (FRTBC)	6.15
VT3	CBC – *Banksia attenuata, Banksia grandis, Eucalyptus gomphocephala, Xanthorrhoea preissii* FRTBC – Nil.	• Moderate (CBC) • Nil (FRTBC)	0.32
C	CBC – Nil FRTBC – Nil	Nil	39.59
TOTAL			**65.53**

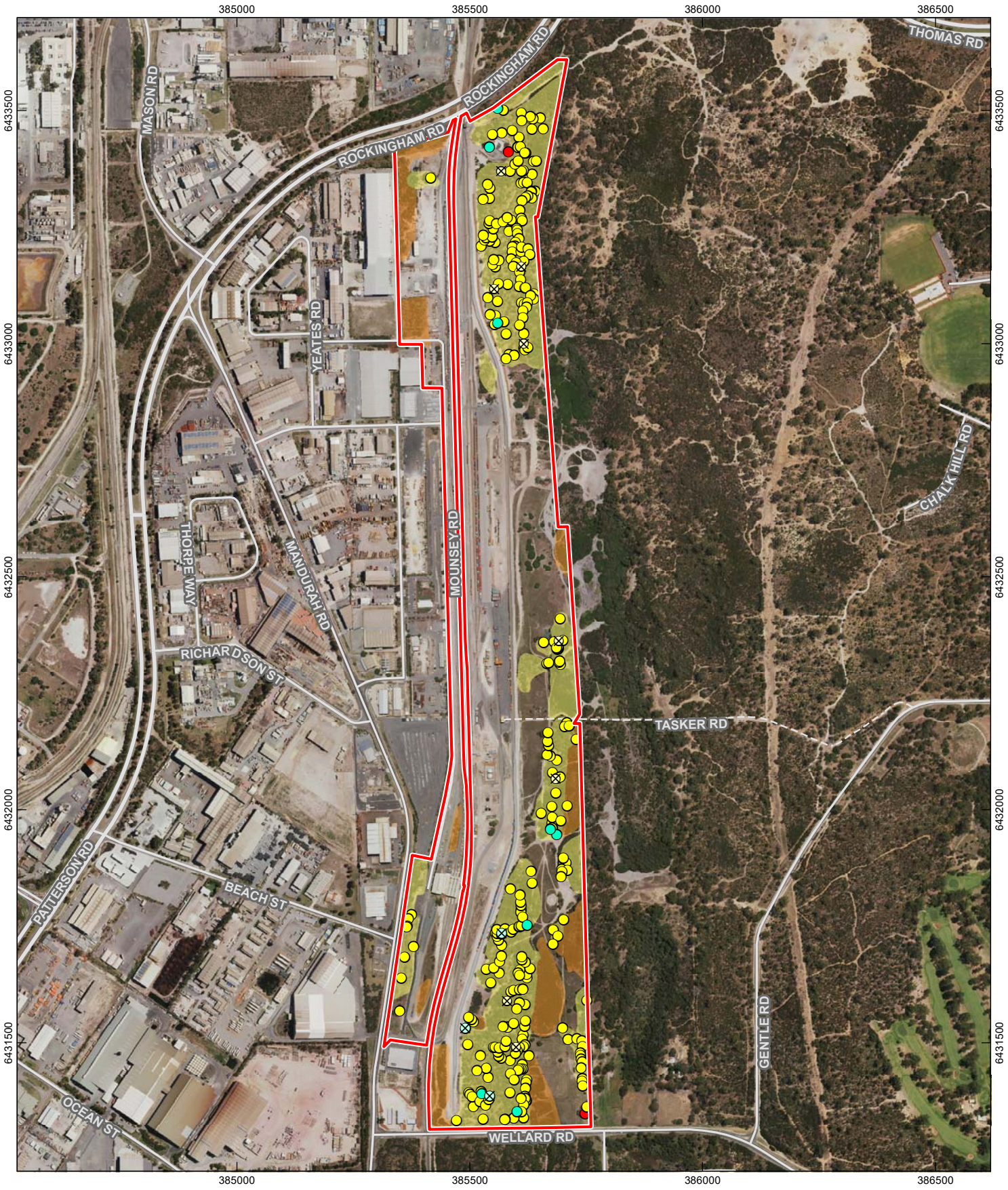

Figure 8: Black cockatoo habitat

N

Scale 1:11,000 at A4

0 100 200 m

Coordinate System:
GDA 1994 MGA Zone 50

Date: 8/08/2019

Lot 511 & 512 Rockingham Road

Potential foraging habitat
- Moderate (19.79ha)
- Very poor (6.15ha)

- Major road
- Minor road
- Track

Significant trees

Hollows present
- Eucalyptus gomphocephala
- Stag

No hollows present
- Eucalyptus gomphocephala
- Eucalyptus sp.,
- Stag

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5. Discussion

The Survey Area comprises a total of 25.94 ha vegetated with native flora species (39.6% of the Survey Area), comprising three native vegetation types. The Survey Area shows signs of having been degraded for a long period of time, in part due to its proximity to rail depot infrastructure. Unrestricted public access within the Survey Area including trail bike riding and rubbish dumping has resulted in informal trails and household and industrial waste throughout. Broken fencing between neighbouring farms to the east has potentially also allowed livestock within the Survey Area. Understorey species were almost completely absent from the majority of the Survey Area, with only occasional native species other than the canopy stratum of *Eucalyptus gomphocephala* and mid stratum of *Acacia rostellifera* scrub. The only area with some intact understorey was VT3, on the north eastern boundary.

5.1 Flora and vegetation

A desktop assessment based on general habitat requirements and distribution indicated one Threatened flora species, and two Priority flora species were considered to have the potential to occur within the Survey Area:

- *Caladenia huegelii* (Threatened [BC Act], Endangered [EPBC Act])
- *Dodonaea hackettiana* (P4)
- *Jacksonia sericea* (P4).

None of the above listed species, or any other Threatened species as listed under section 178 of the EPBC Act, section 19(1) of the BC Act or Priority flora species as listed by DBCA were recorded within the Survey Area. While optimal survey time for Threatened and Priority flora species is spring, both of the two Priority species with potential to occur are identifiable outside of spring based on vegetative characteristics (such as leaf morphology and growth habit). While *Caladenia huegelii* was considered to have the potential to occur based on distribution and broad habitat requirements, site observations indicated that the presence of this species would be highly unlikely due to heavy disturbance in the understorey from weeds, clearing, dumping of rubbish, trailbike riding and possible grazing in parts. This disturbance has contributed to an almost complete lack of understorey species, and of those understorey species present, a complete absence of small, herbaceous native species such as orchids. Weeds are known to affect recruitment of this species, and also result in increased grazing pressure from invertebrates and vertebrates (DEC 2008). Additionally, weeds can outcompete native species for soil moisture and nutrients needed by orchid species and their associated mycorrhizal fungi (DEC 2008).

A total of 18 introduced (exotic) taxa were recorded within the Survey Area. Of these, three are listed as Declared Plant species in Western Australia pursuant to section 22 of the *Biosecurity and Agriculture Management Act 2007* (BAM Act) according to the Western Australian Department of Agriculture and Food (DPIRD 2017), as follows:

- **Asparagus asparagoides*
- **Gomphocarpus fruticosus*
- **Zantedeschia aethiopica*.

All three species were abundant throughout the Survey Area.

Three native vegetation types (VTs) were defined and mapped within the Survey Area ranged from *Eucalyptus gomphocephala* mid woodland over *Acacia rostellifera* tall shrubland over mixed grassland and herbland of weedy species, to *Acacia rostellifera* shrubland over herbland of introduced species, with *Eucalyptus gomphocephala* as an infrequent emergent.

A small area was mapped as woodland of *Banksia grandis* and *Banksia attenuata* over shrubland of *Acacia rostellifera*, *Xanthorrhoea preissii* and *Macrozamia riedlei* over herbland of mixed native and introduced species.

Vegetation within the Survey Area was assessed against diagnostic criteria for Tuart Woodlands and Forests of the Swan Coastal Plain, an ecological community which has recently been listed as a TEC under the EPBC Act. Five patches of vegetation within the Survey Area met diagnostic criteria for this TEC; however, an assessment of each patch against more detailed diagnostic criteria (TSSC 2019) indicated that only two patches (Patches 1 and 3) formed part of the TEC.

While the determination of the presence of a PEC is usually based on affinity of vegetation data with known Floristic Community Types (FCTs) as defined by Gibson et al. (1994), this was considered unnecessary as the level of degradation of vegetation within the Survey Area is such that insufficient species diversity is present to enable meaningful further analysis. However, due to the presence of known dominant species of this PEC within VT1 (*Eucalyptus gomphocephala*), and the lack of more stringent diagnostic criteria, the *Tuart woodlands and forests of the Swan Coastal Plain PEC* should be considered to be present within all patches of tuart woodland.

Similarly, despite the fact that insufficient species diversity is present to enable meaningful further analysis, VT3 should be considered to form part of the Banksia woodlands of the Swan Coastal Plain PEC, due to the presence of known dominant species of this PEC (*Banksia attenuata*).

Vegetation condition across the Survey Area ranged from Completely Degraded to Good, with the majority (65.21 ha) in Degraded to Completely Degraded condition.

5.2 Fauna habitat

A total of 319 significant trees were recorded within the Survey Area (chiefly *Eucalyptus gomphocephala*). Of these, 11 trees contained visible hollows of at least 10 cm diameter. A detailed inspection of these hollows is likely to be required should clearing of these trees be required.

A total of 25.94 ha of potential foraging habitat for Carnaby's Black Cockatoo was recorded within VT1 – VT3. Based on density of suitable species present and presence of foraging species within each stratum, foraging habitat quality was rated as Moderate in VT1 and VT3 (a total of 19.79 ha) and Very Poor in VT2 (6.15 ha).

5.3 Environmentally sensitive areas

The southeast corner of the Survey Area contains 0.003 ha of an ESA associated with the buffer of the CCW (UFI 6389). Limited vegetation was present within this area, comprising remnant *Eucalyptus gomphocephala* trees over weedy grasses (mapped as VT1).

6. Conclusion

The key results and outcomes of the flora, vegetation and Black Cockatoo habitat survey were:

- a total of 25.94 ha of the Survey Area was vegetated with native flora species (39.6% of the Survey Area), comprising three native vegetation types
- vegetation within the Survey Area comprised conservation significant vegetation, as follows:
  - Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain (TEC)
  - Tuart (*Eucalyptus gomphocephala*) woodlands of the Swan Coastal Plain (PEC; Priority 3)
  - *Banksia* woodlands of the Swan Coastal Plain (VT3) (PEC; Priority 3)
- an isolated patch of *Banksia* woodland occurs at the north of the Survey Area is likely to form part of the *Banksia* woodlands of the Swan Coastal Plain PEC (Priority 3); however, due to the size, condition rating and lack of connectivity with other patches of Banksia woodland, this area did not meet the criteria to form part of the Banksia Woodlands of the Swan Coastal Plain Threatened Ecological Community listed under the EPBC Act
- no Threatened or Priority flora species were recorded, nor were considered likely to be found, within the Survey Area
- three Declared Pest plants as listed under the BAM Act (**Asparagus asparagoides*, **Zantedeschia aethiopica* and **Gomphocarphus fruticosus*) were recorded within the Survey Area
- 25.94 ha of potential foraging habitat ranging from Moderate to Very Poor quality for Carnaby's Black Cockatoo was mapped within the Survey area (39.6% of the Survey Area overall)
- no foraging habitat for other Black Cockatoo species was present within the Survey Area
- 319 significant trees (trees over 500 mm DBH), which have the potential to form breeding habitat for Carnaby's Black Cockatoo and Forest Red-tailed Black Cockatoo, were recorded within the Survey Area, of which 11 contained hollows of 10 cm in diameter or above
- 0.003 ha of an ESA associated with the buffer of a CCW (UFI 6389) situated in the adjacent property, which was mapped as VT1 and comprised remnant *Eucalyptus gomphocephala* trees over weedy grasses.

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Appendix 1
Conservation significant flora and ecological community definitions

Department of **Biodiversity, Conservation and Attractions**

GOVERNMENT OF WESTERN AUSTRALIA

CONSERVATION CODES

For Western Australian Flora and Fauna

Threatened, Extinct and Specially Protected fauna or flora[1] are species[2] which have been adequately searched for and are deemed to be, in the wild, threatened, extinct or in need of special protection, and have been gazetted as such.

The *Wildlife Conservation (Specially Protected Fauna) Notice 2018* and the *Wildlife Conservation (Rare Flora) Notice 2018* have been transitioned under regulations 170, 171 and 172 of the *Biodiversity Conservation Regulations 2018* to be the lists of Threatened, Extinct and Specially Protected species under Part 2 of the *Biodiversity Conservation Act 2016.*

Categories of Threatened, Extinct and Specially Protected fauna and flora are:

T Threatened species

Listed by order of the Minister as Threatened in the category of critically endangered, endangered or vulnerable under section 19(1), or is a rediscovered species to be regarded as threatened species under section 26(2) of the *Biodiversity Conservation Act 2016* (BC Act).

Threatened fauna is that subset of 'Specially Protected Fauna' listed under schedules 1 to 3 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for Threatened Fauna.

Threatened flora is that subset of 'Rare Flora' listed under schedules 1 to 3 of the *Wildlife Conservation (Rare Flora) Notice 2018* for Threatened Flora.

The assessment of the conservation status of these species is based on their national extent and ranked according to their level of threat using IUCN Red List categories and criteria as detailed below.

CR Critically endangered species

Threatened species considered to be "*facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with criteria set out in the ministerial guidelines*".

Listed as critically endangered under section 19(1)(a) of the BC Act in accordance with the criteria set out in section 20 and the ministerial guidelines. Published under schedule 1 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for critically endangered fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for critically endangered flora.

EN Endangered species

Threatened species considered to be "*facing a very high risk of extinction in the wild in the near future, as determined in accordance with criteria set out in the ministerial guidelines*".

Listed as endangered under section 19(1)(b) of the BC Act in accordance with the criteria set out in section 21 and the ministerial guidelines. Published under schedule 2 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for endangered fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for endangered flora.

VU Vulnerable species

Threatened species considered to be "*facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with criteria set out in the ministerial guidelines*".

Listed as vulnerable under section 19(1)(c) of the BC Act in accordance with the criteria set out in section 22 and the ministerial guidelines. Published under schedule 3 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for vulnerable fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for vulnerable flora.

Extinct species

Listed by order of the Minister as extinct under section 23(1) of the BC Act as extinct or extinct in the wild.

EX Extinct species

Species where "*there is no reasonable doubt that the last member of the species has died*", and listing is otherwise in accordance with the ministerial guidelines (section 24 of the BC Act).

Published as presumed extinct under schedule 4 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for extinct fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for extinct flora.

EW Extinct in the wild species

Species that *"is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; and it has not been recorded in its known habitat or expected habitat, at appropriate seasons, anywhere in its past range, despite surveys over a time frame appropriate to its life cycle and form*", and listing is otherwise in accordance with the ministerial guidelines (section 25 of the BC Act).

Currently there are no threatened fauna or threatened flora species listed as extinct in the wild. If listing of a species as extinct in the wild occurs, then a schedule will be added to the applicable notice.

Specially protected species

Listed by order of the Minister as specially protected under section 13(1) of the BC Act. Meeting one or more of the following categories: species of special conservation interest; migratory species; cetaceans; species subject to international agreement; or species otherwise in need of special protection.

Species that are listed as threatened species (critically endangered, endangered or vulnerable) or extinct species under the BC Act cannot also be listed as Specially Protected species.

MI Migratory species

Fauna that periodically or occasionally visit Australia or an external Territory or the exclusive economic zone; or the species is subject of an international agreement that relates to the protection of migratory species and that binds the Commonwealth; and listing is otherwise in accordance with the ministerial guidelines (section 15 of the BC Act).

Includes birds that are subject to an agreement between the government of Australia and the governments of Japan (JAMBA), China (CAMBA) and The Republic of Korea (ROKAMBA), and fauna subject to the *Convention on the Conservation of Migratory Species of Wild Animals* (Bonn Convention), an environmental treaty under the United Nations Environment Program. Migratory species listed under the BC Act are a subset of the migratory animals, that are known to visit Western Australia, protected under the international agreements or treaties, excluding species that are listed as Threatened species.

Published as migratory birds protected under an international agreement under schedule 5 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018*.

CD Species of special conservation interest (conservation dependent fauna)

Fauna of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened, and listing is otherwise in accordance with the ministerial guidelines (section 14 of the BC Act).

Published as conservation dependent fauna under schedule 6 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018*.

OS Other specially protected species

Fauna otherwise in need of special protection to ensure their conservation, and listing is otherwise in accordance with the ministerial guidelines (section 18 of the BC Act).

Published as other specially protected fauna under schedule 7 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018*.

P Priority species

Possibly threatened species that do not meet survey criteria, or are otherwise data deficient, are added to the Priority Fauna or Priority Flora Lists under Priorities 1, 2 or 3. These three categories are ranked in order of priority for survey and evaluation of conservation status so that consideration can be given to their declaration as threatened fauna or flora.

Species that are adequately known, are rare but not threatened, or meet criteria for near threatened, or that have been recently removed from the threatened species or other specially protected fauna lists for other than taxonomic reasons, are placed in Priority 4. These species require regular monitoring.

Assessment of Priority codes is based on the Western Australian distribution of the species, unless the distribution in WA is part of a contiguous population extending into adjacent States, as defined by the known spread of locations.

1 Priority 1: Poorly-known species

Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey.

2 Priority 2: Poorly-known species

Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey.

3 Priority 3: Poorly-known species

Species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Such species are in need of further survey.

4 Priority 4: Rare, Near Threatened and other species in need of monitoring

(a) Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection but could be if present circumstances change. These species are usually represented on conservation lands.
(b) Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for vulnerable but are not listed as Conservation Dependent.
(c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

[1] The definition of flora includes algae, fungi and lichens
[2]Species includes all taxa (plural of taxon - a classificatory group of any taxonomic rank, e.g. a family, genus, species or any infraspecific category i.e. subspecies or variety, or a distinct population).

Definition of Threatened Ecological Communities -EPBC Act

Critically endangered

An ecological community is facing an extremely high risk of extinction in the wild in the immediate future (indicative timeframe being the next 10 years).

Endangered

An ecological community is not critically endangered but is facing a very high risk of extinction in the wild in the near future (indicative timeframe being the next 20 years).

Vulnerable

An ecological community is not critically endangered or endangered, but is facing a high risk of extinction in the wild in the medium–term future (indicative timeframe being the next 50 years).

Appendix 2
Desktop assessment results (Parks and Wildlife 2007-, DEE 2019b)

NatureMap
Mapping Western Australia's biodiversity

NatureMap Species Report

Created By Guest user on 21/05/2019

Kingdom Plantae
Conservation Status Conservation Taxon (T, X, IA, S, P1-P5)
Current Names Only Yes
Core Datasets Only Yes
Method 'By Circle'
Centre 115° 47' 11" E,32° 14' 25" S
Buffer 5km

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
1.	12938	*Diuris micrantha*		T	
2.	4763	*Dodonaea hackettiana (Hackett's Hopbush)*		P4	
3.	4027	*Jacksonia sericea (Waldjumi)*		P4	
4.	5237	*Pimelea calcicola*		P3	
5.	17850	*Stylidium ireneae*		P4	

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

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

Australian Government
Department of the Environment and Energy

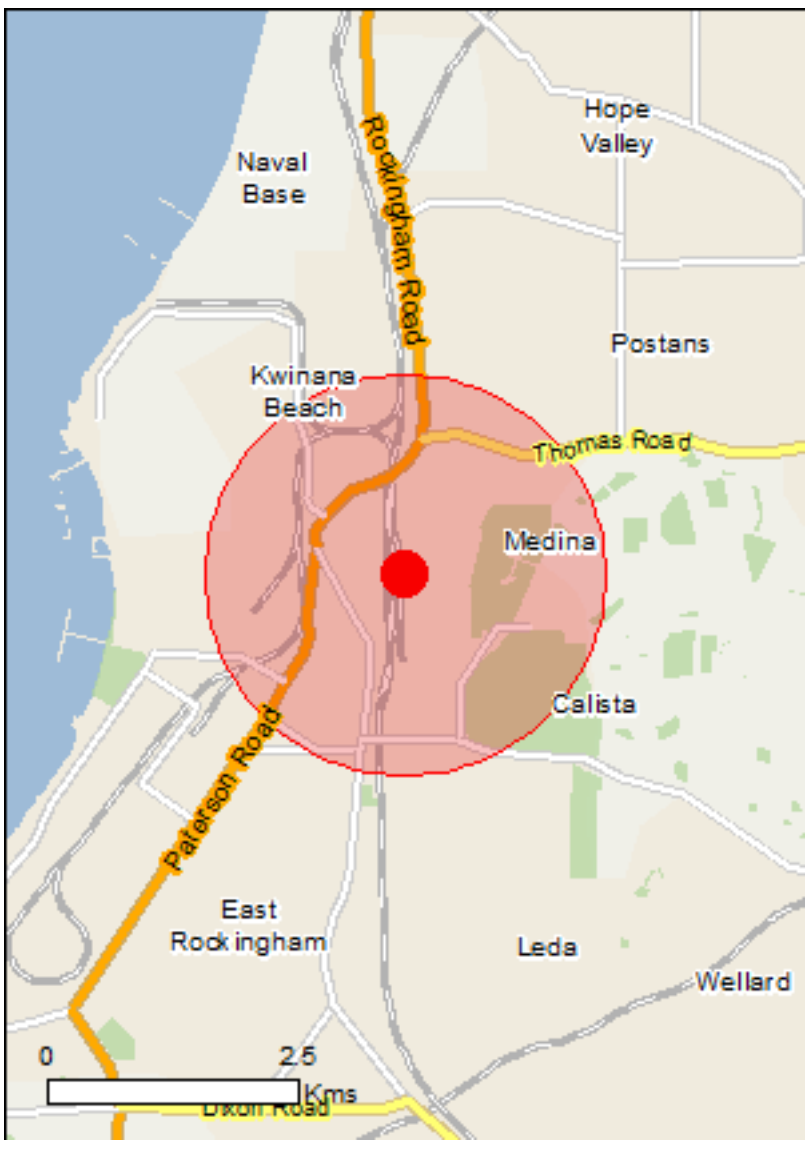
EPBC Act Protected Matters Report

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

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

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

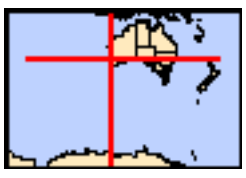
Report created: 21/05/19 15:19:07



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.

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:	2
Listed Threatened Species:	16
Listed Migratory Species:	13

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:	19
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

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

State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	36
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar) [Resource Information]

Name	Proximity
Forrestdale and thomsons lakes	Within 10km of Ramsar

Listed Threatened Ecological Communities [Resource Information]

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

Name	Status	Type of Presence
Banksia Woodlands of the Swan Coastal Plain ecological community	Endangered	Community may occur within area
Sedgelands in Holocene dune swales of the southern Swan Coastal Plain	Endangered	Community likely to occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calyptorhynchus banksii naso Forest Red-tailed Black-Cockatoo, Karrak [67034]	Vulnerable	Species or species habitat 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
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 likely 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
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat likely to occur within area
Rostratula australis Australian Painted-snipe, Australian Painted Snipe	Endangered	Species or species

Name	Status	Type of Presence
[77037]		habitat may occur within area
Mammals		
Dasyurus geoffroii		
Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat likely to occur within area
Pseudocheirus occidentalis		
Western Ringtail Possum, Ngwayir, Womp, Woder, Ngoor, Ngoolangit [25911]	Critically Endangered	Species or species habitat likely to occur within area
Plants		
Caladenia huegelii		
King Spider-orchid, Grand Spider-orchid, Rusty Spider-orchid [7309]	Endangered	Species or species habitat may 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 may 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

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		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardenna carneipes		
Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Species or species habitat likely to occur within area
Sterna dougallii		
Roseate Tern [817]		Foraging, feeding or related behaviour likely to 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 may occur within area
Calidris acuminata		
Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris canutus		
Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos		
Pectoral Sandpiper [858]		Species or species habitat may occur within area

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

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

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

Name
Commonwealth Land -

Listed Marine Species [Resource Information]

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

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat likely to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur

Name	Threatened	Type of Presence within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat likely to occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pachyptila turtur Fairy Prion [1066]		Species or species habitat likely to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat may occur within area
Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Species or species habitat likely to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat may occur within area
Sterna dougallii Roseate Tern [817]		Foraging, feeding or related behaviour likely to occur within area
Tringa nebularia 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 Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Passer montanus Eurasian Tree Sparrow [406]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Streptopelia senegalensis Laughing Turtle-dove, Laughing Dove [781]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Funambulus pennantii Northern Palm Squirrel, Five-striped Palm Squirrel [129]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus norvegicus Brown Rat, Norway Rat [83]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Asparagus 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

Name	Status	Type of Presence
		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 linifolia Flax-leaved Broom, Mediterranean Broom, Flax Broom [2800]		Species or species habitat likely to occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Lantana camara Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]		Species or species habitat likely to occur within area
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
Olea europaea Olive, Common Olive [9160]		Species or species habitat may occur within area
Opuntia spp. Prickly Pears [82753]		Species or species habitat likely to occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Salvinia molesta Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]		Species or species habitat likely to occur within area
Tamarix aphylla Athel Pine, Athel Tree, Tamarisk, Athel Tamarisk, Athel Tamarix, Desert Tamarisk, Flowering Cypress, Salt Cedar [16018]		Species or species habitat likely to occur within area
Reptiles		
Hemidactylus frenatus Asian House Gecko [1708]		Species or species habitat likely to occur within area

Caveat

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

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

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

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

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

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

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

- migratory and
- marine

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

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

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

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

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

Coordinates

-32.23663 115.78598

Acknowledgements

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

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

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

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

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Appendix 3
Native vascular plant taxa recorded from the Survey Area

Family	Species
Asparagaceae	*Acanthocarpus preissii*
Fabaceae	*Acacia rostellifera*
	Hardenbergia comptoniana
Hemerocallidaceae	*Dianella revoluta*
Myrtaceae	*Eucalyptus gomphocephala*
Phyllanthaceae	*Phyllanthus calycinus*
Polygonaceae	*Muehlenbeckia adpressa*
Proteaceae	*Banksia attenuata*
	Banksia grandis
Ranunculaceae	*Clematis linearifolia*
Rhamnaceae	*Spyridium globulosum*
Xanthorrhoeaceae	*Xanthorrhoea preissii*
Zamiaceae	*Macrozamia riedlei*