

Characteristic	Key Diagnostic Criteria	Patch 1	Patch 2	Patch 3
				Patch 1 meet criterion.
Conclusion		Patch 1 does not meet criterion.	Patch 2 does not meet criterion.	A total of 0.54 ha of Banksia Woodland of the SCP occurs within the Survey Area. See Figure 11.

FCT 21c (Low-lying *Banksia attenuata* woodland on shrublands) (P3)

One patch within VT02 is identified as most concordant with the 'Low-lying *Banksia attenuata* woodlands or shrublands' ('FCT 21c') community listed as Priority 3. This community type covered the exact area portions of the confirmed Banksia Woodland of the SCP TEC patch (0.54 ha) as well as portions of VT01, VT04 and VT06 (Figure 12). Totalling 3.79 ha of the PEC within the Survey Area.

This community is usually comprised of *Melaleuca preissiana*, *Banksia attenuata*, *B. menziesii*, *Regelia ciliata*, *Eucalyptus marginata* or *Corymbia calophylla*. Structurally, this community type may be either a woodland or occasionally shrubland. The community tends to occur on lower lying, wetter sites (DBCA, 2023b).



Figure 11: Banksia Woodland of the SCP Community within the Survey Area

0

20

40

60

80 m

N

SCALE

1:2,100

SHEET SIZE

A3 COLOUR

COORDINATE REFERENCE SYSTEM

GDA2020 / MGA zone 50

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Survey Area

Vegetation Condition

Good

No	Description	Drawn	Approved	Date
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NOTES:
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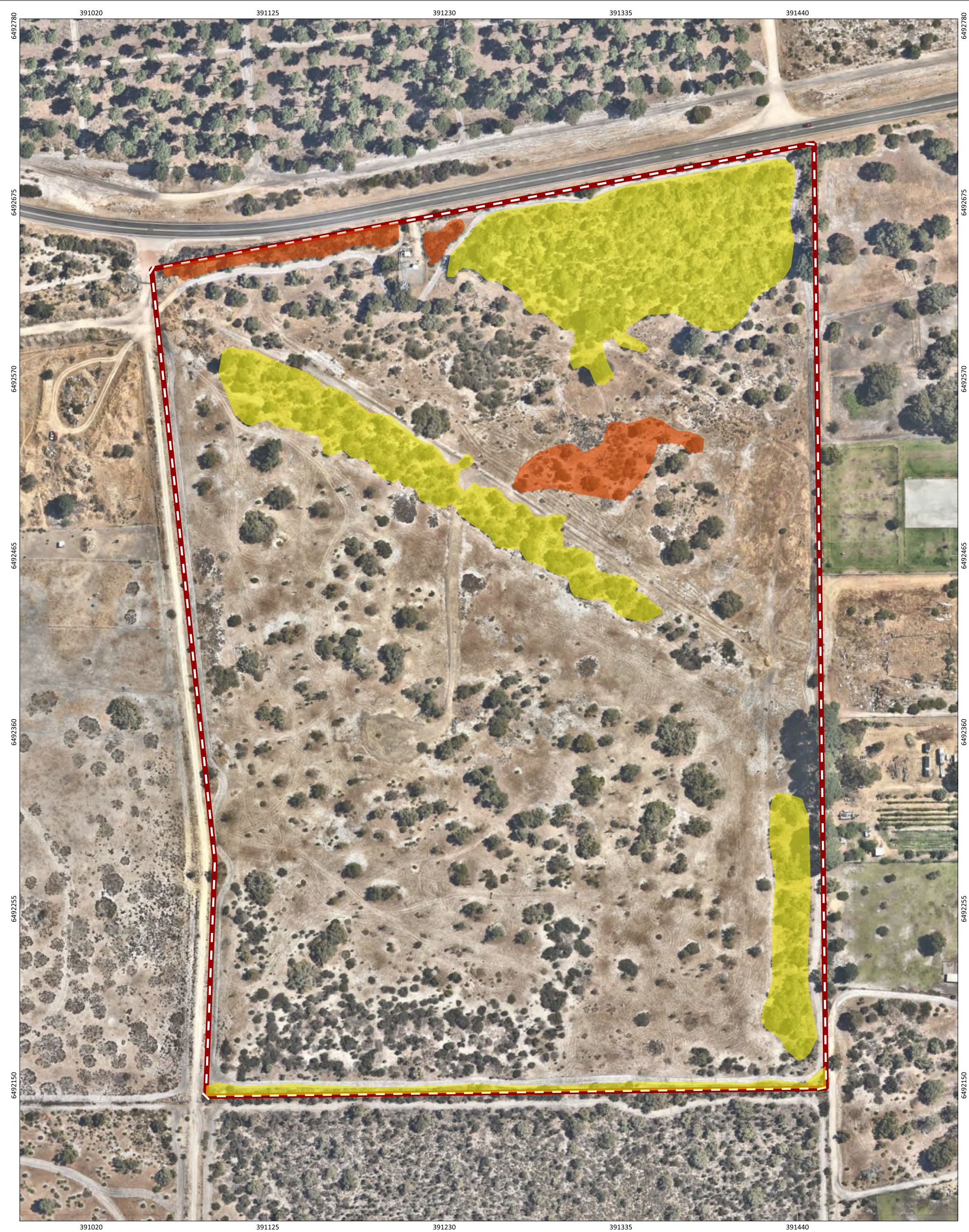


Figure 12: FCT 21c Priority Ecological Community within the Survey Area

0

20

40

60

80 m

N

SCALE

1:2,100

SHEET SIZE

A3 COLOUR

COORDINATE REFERENCE SYSTEM

GDA2020 / MGA zone 50

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Vegetation Condition

Degraded

Good

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Vegetation of Other Significance

As per the Flora and Vegetation Technical Guidance and EPA guidance, vegetation may be considered of significance for a range of reasons, other than a listing as a TEC or a PEC, including:

Pre-European vegetation extent being below a threshold level.

- Scarcity.
- Unusual species.
- Novel combinations of species.
- A role as a refuge.
- A role as a key habitat for threatened species or large populations representing a significant proportion of the local to regional total population of a species.
- A restricted distribution.

The Survey Area is within the mapped extent of the Bassendean Complex North and Pinjar Complex which contains key species as per the structural description in Heddle et. al (1980). The state-wide vegetation statistics as per GovWA (2017) report the current extent of both pre-European complexes within the Survey Area are above the national objective of 30 % targets for biodiversity conservation in Australia (Commonwealth of Australia, 2001).

No other reasons are present to consider the vegetation as of other significance.

4.4 Fauna Desktop Assessment

4.4.1 Fauna Assemblage

As per the scope of a basic fauna survey under the Technical Guidance (EPA, 2020) the primary objectives are to verify the overall adequacy of the desktop study, and to map and describe habitats, with a focus on habitat for conservation listed fauna.

A desktop assessment of the expected conservation significant fauna assemblage was undertaken through searches of DBCA database records and the Commonwealth PMST, shown in Figure 13. Results are summarised in 6. Appendix G.

Database searches identified 43 conservation listed fauna species that potentially occur, or habitat likely occurs within the Survey Area, comprising:

- Twenty-nine bird species.
- Six mammal species.
- One reptile species.
- Seven invertebrate species.

Species listed as Marine only under the EPBC Act that are mammals and reptiles (e.g. sharks, whales, turtles) have been excluded from the likelihood of occurrence list as there is no marine habitat present.

4.4.2 Fauna Likelihood of Occurrence

The likelihood of occurrence assessment for conservation listed fauna species found that:

- No species of conservation significance were previously recorded within the Survey Area.
- Three species had a high likelihood of occurrence.
- Four species had a medium likelihood of occurrence.
- Thirty-six species had a low likelihood of occurrence.

The three species that had a high likelihood of occurrence were:

- *Zanda latirostris* (Carnaby's black cockatoo) - Endangered (EN).
 - *Calyptorhynchus banksii naso* (Forest red-tailed black cockatoo) -Vulnerable (VU).
 - *Isodon fusciventer* (Quenda) - Priority four (P4).
-

The four species that had a medium likelihood of occurrence were:

- *Idiosoma sigillatum* (Swan Coastal Plain Shield-backed Trapdoor Spider) - P3.
- *Neelaps colonotos* (Black-striped Burrowing Snake) - P3
- *Notomacropus irma* (Western Brush Wallaby) - P4
- *Falco peregrinus* (Peregrine Falcon) - OS

The species assessed as low likelihood of occurrence are species that are locally extinct, have no recent records or for which no suitable habitat is present (e.g. wading birds). Species recorded or assessed as having a high or medium likelihood of occurrence are discussed in detail in Section 4.5.2.

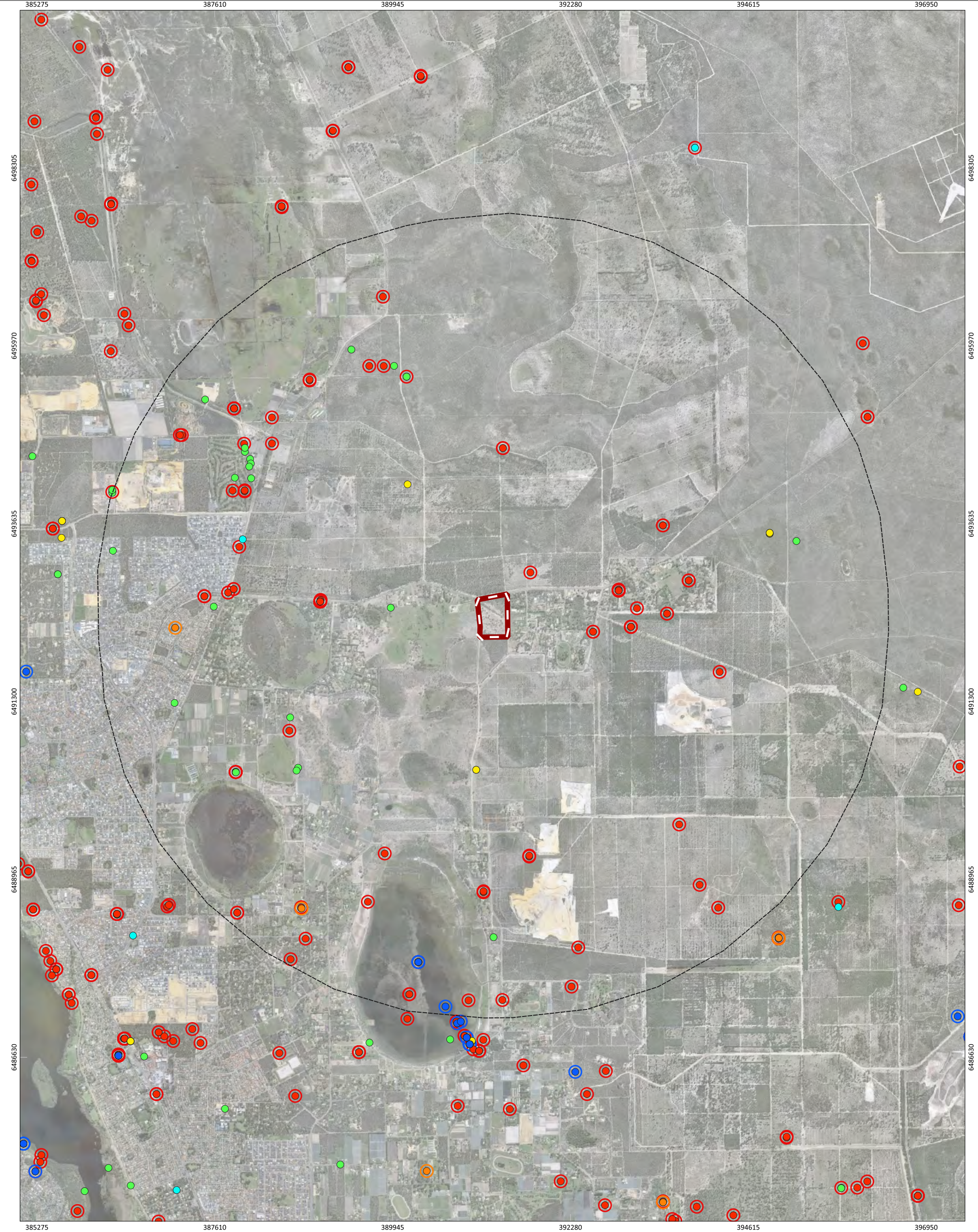


Figure 13: DBCA Database Search Results Fauna

0

0.8

1.6 km

N

SCALE

1:46,700

COORDINATE REFERENCE SYSTEM

GDA2020 / MGA zone 50

DATA SOURCE

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Survey Area

5km Buffer

EPBC Threatened Fauna Status

Endangered

Vulnerable

Migratory species

WA Threatened Fauna Status

Endangered

Vulnerable

Priority 3

Priority 4

Migratory species

Other specially protected species

No	Description	Drawn	Approved	Date
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4.5 Fauna Field Survey

4.5.1 Fauna Habitat Types

Six habitat types were recorded within the Survey Area. These broadly align with the mapped vegetation type boundaries, however are more diverse than the two vegetation types mapped. The fauna habitat types are described below in Table 20 and shown in Figure 14.

For possibly occurring conservation listed fauna species, habitat types are assessed as either core, supporting or non-significant habitat. As per Commonwealth Matters of National Environmental Significance – Significant Impact Guidelines 1.1 “core” habitat is defined as that critical to the survival of the species and considered to contain denning/ breeding sites, primary foraging areas and refuge from drought, fire and other stresses (DotE, 2013). “Supporting” habitat is defined as that which is likely used for foraging and dispersing/ connective purposes but is not essential habitat for the continuation of a local population. “Non-significant” habitat is that which would be used only very infrequently for foraging or dispersing.

Table 20: Fauna Habitat Type Description within the Survey Area.

Fauna Habitat Type	Habitat Description	Total Area, Proportion of the Survey Area (ha)	Representative Photo
FHT-01 Jarrah and Blackbutt woodlands	Open woodland of <i>Eucalyptus marginata</i> (Jarrah) and <i>Eucalyptus tottiana</i> (coastal Blackbutt), with scattered grasstrees and shrubs. The substrate is composed of light grey deep sandy soils.		
	No core habitat for any species.	0.87 ha	
	Supporting habitat for:	4.37 %	
	• Forest Red-tailed black cockatoo • Carnaby's black cockatoo • Quenda • Western brush wallaby • Peregrine falcon		
	Non-significant for all other species.		

Fauna Habitat Type	Habitat Description	Total Area, Proportion of the Survey Area (ha)	Representative Photo
FHT-02 Banksia Woodland	Open banksia woodlands (primarily <i>Banksia attenuata</i>, <i>Banksia menziesii</i> and <i>Banksia ilicifolia</i>). over dense native shrubland and herbaceous species. More degraded sections becoming sparse with open sandy patches, grass weeds, fallen branches and thin leaf litter layer as well as banksia death of approximately 5 %. The substrate was composed of deep grey sandy soils.		
	Core habitat for: • Quenda • Black striped burrowing snake • Western brush wallaby • SCP shield-backed trapdoor spider	3.60 ha 18.14 %	
	Supporting habitat for: • Carnaby's black cockatoo • Forest red-tailed black cockatoo • Peregrine falcon		
	Non-significant for all other conservation listed species.		

Fauna Habitat Type	Habitat Description	Total Area, Proportion of the Survey Area (ha)	Representative Photo
FHT-03 Scattered <i>Nuytsia florabunda</i> and <i>Banksia</i> sp	Scattered <i>Nuytsia florabunda</i> , <i>Banksia attenuata</i> and <i>Banksia illicifolia</i> over paddock with occasional grass trees. No intact understory. The substrate is composed of light grey sandy soils.		
	No core habitat for all species. Supporting habitat for: - Western brush wallaby - Peregrine falcon Non-significant for all other conservation listed species.	0.77 ha 3.88 %	
FHT-04 Adenanthos and <i>Kunzea</i> Shrubland	Patches of dense shrubland of <i>Adenanthos cygnorum</i> and <i>Kunzea glabrescens</i> with scattered grass trees. The substrate is composed of white to light-grey sandy soils. Core habitat for: - Quenda Supporting habitat for: - Black-striped burrowing snake - Western brush wallaby - Peregrine falcon - SCP shield-backed trapdoor spider Non-significant for all other conservation listed species.	2.57 ha 12.95 %	

Fauna Habitat Type	Habitat Description	Total Area, Proportion of the Survey Area (ha)	Representative Photo
FHT-05 Pines	Planted row of <i>Pine pinus</i>, with thin substrate of pine needles. The substrate is composed of light-grey sandy soils. No core habitat for all species. Supporting habitat for: • Carnaby's black cockatoo • Forest red-tailed black cockatoo Non-significant for all other conservation listed species.	0.04 ha 0.21 %	
BG-01 Cleared Paddock with scattered Nuytsia	Open paddock of short grassland, open patches of sand, occasional Nuytsia regrowth and weeds. Substrate of deep light grey sand. No core habitat for all conservation listed species. Supporting habitat for: • Peregrine falcon Non-significant for all other conservation listed species.	11.97 ha 60.45 %	



Fauna Habitat Type	Habitat Description	Total Area, Proportion of the Survey Area (ha)	Representative Photo
Total		19.82 ha 100 %	

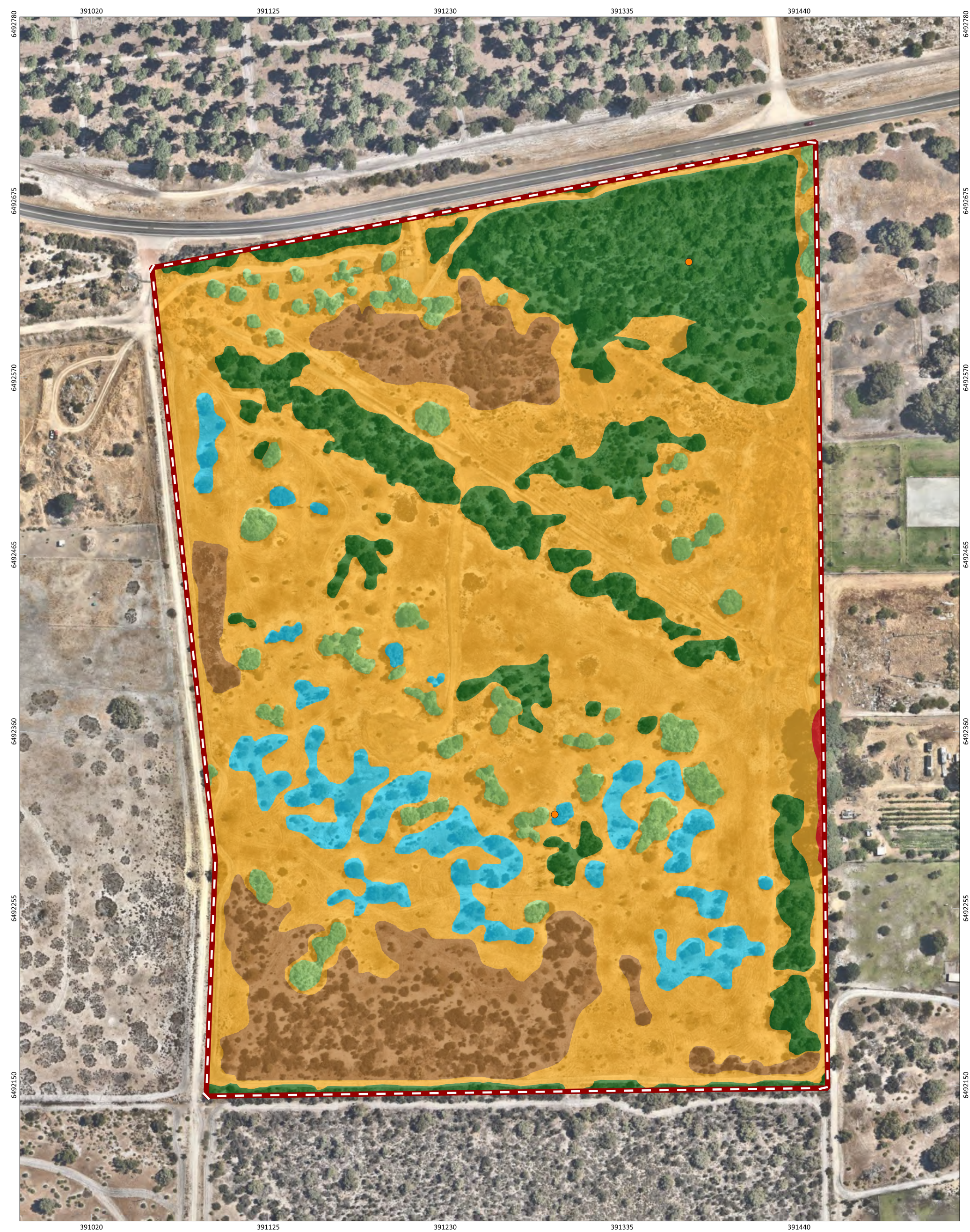


Figure 14: Fauna Habitat Types And Conservation Significant Fauna Observations

0

20

40

60

80 m

N

SCALE

1:2,100

SHEET SIZE

A3 COLOUR

COORDINATE REFERENCE SYSTEM

GDA2020 / MGA zone 50

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Survey Area

Fauna Habitat Type

BG-01 - Paddock with scattered Nuytsia/Banksia

FHT-01 - Jarrah and Blackbutt Woodland

FHT-02 - Banksia Woodland

FHT-03 - Scattered Nuytsia florabunda and Banksia

FHT-04 - Adenanthos/Kunzea Shrubland

FHT-05 - Pine Individuals

Fauna Observation

Zanda latirostris (EN)

No	Description	Drawn	Approved	Date
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4.5.2 Threatened and Priority Fauna

Foraging evidence of Carnaby's black cockatoos were observed in the form of chewed Banksia cones within the Survey Area. No other species of conservation significance were directly observed within the Survey Area.

Specific targeted assessments for black cockatoo species were undertaken and are presented in Sections 4.6.

Other fauna species of conservation significance which were recorded or assessed as having a high or medium likelihood of occurrence are discussed in the Table 21 below.

Table 21. Threatened and Priority Fauna

Scientific Name	Common Name	Habitat significance in Survey Area (ha)			Post Survey likelihood of occurrence	Habitat use and species description
		Core	Supporting	Non-significant		
<i>Calyptorhynchus banksii naso</i>	forest red-tailed black cockatoo	0	4.51	15.31	High	No foraging evidence for this species were observed within the Survey Area. The Survey Area is within known modelled distribution of this species. However, fauna habitat types FHT-01, FHT-02 and FHT-05 can be considered supporting habitat for this species as they contain species for foraging. DBCA Database search returned 10 records of this species within 10 km of the Survey Area in 20 years.
<i>Zanda latirostris</i>	Carnaby's cockatoo	0	4.51	15.31	High	Carnaby's black cockatoo foraging evidence from chewed Banksia cones was detected within the Survey Area. Fauna habitat types FHT-01, FHT-02 and FHT-05 can be considered supporting habitat for this species as they contain species for foraging. DBCA Database search returned 514 records of this species within 10 km of the Survey Area in 20 years.
<i>Isoodon fusciventer</i>	Quenda, southwestern brown bandicoot	6.17	0.87	12.78	High	Quendas are widely distributed in south-west WA and are associated with wetlands and fringing areas with dense cover of shrubs and sedges adjoining areas of woodland and grassland. Quenda will forage in open woodlands or grassland when adjacent to dense cover. No evidence of this species was recorded within the Survey Area however FHT-02 and FHT-04 constitutes as core habitat for this species due to dense understory available for tunnelling, whilst FHT-01 constitutes as supporting habitat due to connectivity and foraging availability. There is a high density of local records, DBCA Database search returned 160 records of this species within 10 km of the Survey Area in 20 years.
<i>Neelaps calonotos</i>	black-striped snake, black-striped burrowing snake	3.60	2.57	13.65	Medium	The black-striped burrowing snake is found under Banksia woodlands atop soft calcareous sand and to lesser extent, coastal heathlands and shrublands. This species is infrequently recorded in the SCP ranging from Lancelin to Port Denison but is limited to intact undisturbed habitats and large nature reserves (He., Forrest., 2021). This species feeds exclusively on small fossorial skinks, such as Aprasia and Lerista spp which are likely present within the Survey Area. Banksia woodland in FHT-02 constitutes as core habitat due to suitable habitat and substrate whilst FHT-04 constitutes as supporting habitat due to connectivity and foraging availability.

Scientific Name	Common Name	Habitat significance in Survey Area (ha)			Post Survey likelihood of occurrence	Habitat use and species description
		Core	Supporting	Non-significant		
<i>Notamacropus irma</i>	Western Brush Wallaby	3.60	4.21	12.01	Medium	This species prefers open forest or woodland, particularly open, seasonally wet flats with low grasses and open scrubby thickets. It is also found in some areas of mallee and heathland. This species has been observed 3 km north of the Survey Area, <20 years old. As the Survey area is relatively connected to large patches of remanent vegetation. Within the Survey Area, FHT-02 constitute as core habitat whilst FHT-01, FHT-03 and FHT-04 are considered supporting habitat due to connectivity that allows for movement.
<i>Falco peregrinus</i>	Peregrine Falcon	0	19.78	0.04	Medium	This species is an uncommon but wide-ranging raptor, occurring across most regions of Australia. It occupies an extremely diverse range of dryland habitats of Australia. The species typically nests on cliff ledges, shallow hollows in tall trees, or artificial structures such as building ledges and communication towers. Within the Survey Area, FHT-01 to FHT-04 and BG-01 can be considered supporting habitats to facilitate foraging.
<i>Idiosoma sigillatum</i>	Swan Coastal Plain shield-backed trapdoor spider	3.60	2.57	13.65	Medium	The species has a sandy substrate focused distribution from north of Shark Bay, through the northern Wheatbelt and the SCP. Burrows of this species usually occur in banksia woodland and heathland on sandy soils and are adorned with a typical 'moustache-like' arrangement of twig-lines. This species is known to be a short-range endemic that confine to small areas. Within the Survey Area, Banksia woodland in FHT-02 is considered core habitat with FHT-04 as supporting habitat.

4.6 Black Cockatoo Habitat Assessment

The Survey Area falls within the modelled distribution range for Carnaby's black cockatoo and the Forest Red-tailed black cockatoo (DAWE, 2022) but outside of distribution range for Baudin's black cockatoo.

During the field survey, no individuals were recorded landing in or using the Survey Area directly. There has been no previous record of Carnaby's black cockatoo or forest red-tailed black cockatoo from the DBCA database directly within the Survey Area.

Small amounts of scattered foraging evidence for black cockatoo species was detected within the Survey Area during the field survey, with foraged Banksia cones observed in fauna habitat FHT-02 (Banksia Woodland and scattered Banksia), see below in Plate 1 as well as Figure 14. Given the quantity of available records, it is considered highly likely that both species utilise the individual stands of marri trees in the Survey Area for foraging on occasion.

There are approximately 44 confirmed Carnaby's black cockatoo roosting sites within 10 km of the Survey Area (DBCA-064), with one roosting site buffer intersecting the Survey Area (DBCA-064) under site code WANMARR006, see Figure 15. The Survey Area does not intersect any other 1 km buffer of roosting sites.

Birdlife Australia data confirms there are three natural nest hollows and 14 artificial nest hollows located within the Joondalup ECU campus approximately 7 km west of the Survey Area.

Data from DBCA-054 dataset records shows one confirmed Carnaby's black cockatoo breeding areas (including buffer) are within 12 km of the Survey Area, with the closest being 7 km south-west in the ECU campus area (DBCA-054). No records of confirmed Carnaby's black cockatoo breeding areas are directly within the Survey Area.



Plate 1: Banksia cones foraged by Carnaby's black cockatoos

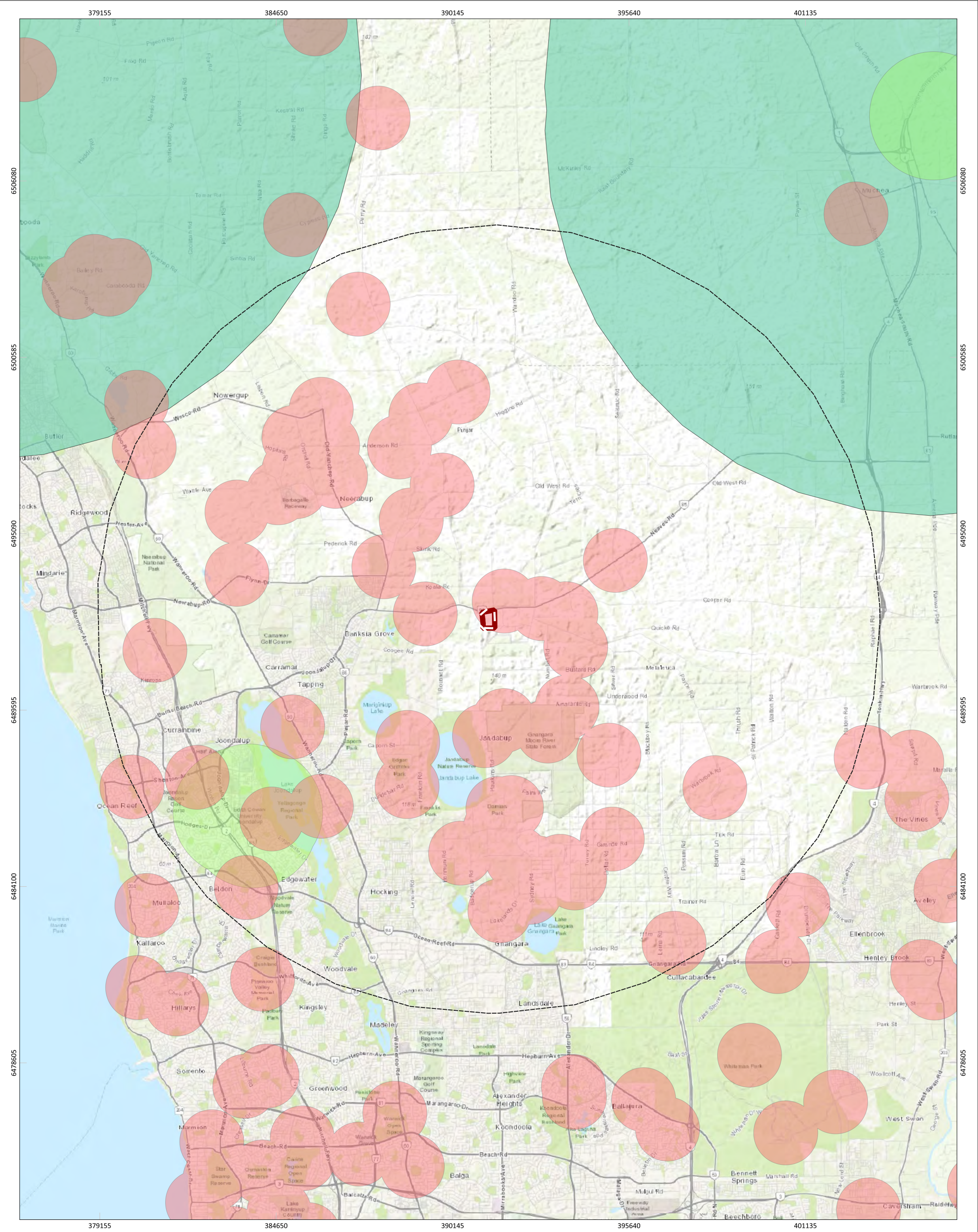


Figure 15: Known Black Cockatoo Roosting and Breeding Sites within 12 km Buffer

0

1

2

3

km

N

SCALE

1:109,900

SHEET SIZE

A3 COLOUR

COORDINATE REFERENCE SYSTEM

GDA2020 / MGA zone 50

DATA SOURCE

ESRI Topographic Map

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Survey Area

12km Buffer

Black Cockatoo Breeding Sites - Buffered (DBCA-063)

Black Cockatoo Roosting Sites - Buffered (DBCA-064)

Carnabys Cockatoo Confirmed Breeding Areas within the Swan Coastal Plain and Jarrah Forest IBRA Regions (DBCA-054)

No	Description	Drawn	Approved	Date
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4.6.1 Breeding Habitat Assessment

Breeding habitat is defined as that which contains known, suitable or potential nesting trees (DAWE, 2022). Breeding typically occurs in native eucalypt species particularly marri, jarrah, wandoo and tuart, however many species of eucalypt including non-endemic species may develop suitable hollows for breeding (DAWE, 2022). A summary of suitable nesting hollow characteristics for the three species is provided below in Table 22.

Table 22: Black Cockatoo Nesting Hollow Characteristics

Species	Carnaby's Black cockatoo	Forest Red-tailed Black cockatoo
Tree species and hollow characteristic	Nesting mainly in salmon gum, wandoo, tuart, jarrah, flooded gum, karri and marri. Utilise hollows from 10-65 cm diameter (average 26 cm) and >1 m deep	Nesting mainly in jarrah, marri, karri, wandoo, bullich, blackbutt and tuart Utilise hollow from 12-150 cm diameter (average 34 cm) and >1 m depth
Sources	DAWE, 2022, Saunders et al., 2014a, Saunders et al., 2014b.	DAWE, 2022, Johnstone et al., 2013.

A total of 45 potential breeding trees were recorded; most trees did not show signs of potential nesting hollow development (Class 5 tree) with only one tree possessing small unsuitable hollows (Class 4), as summarised within Table 23 and shown on Figure 16. See Appendix H for summary of tree location, species, DBH and tree health. No evidence of current or previous nesting behaviour such as chew marks at hollow entrance attributed to black cockatoos, or flushed individuals were recorded.

One tree (tree number 2) was assessed as possessing small hollows which are of an insufficient size to support nesting (<10 cm entrance); or which have an entrance of >10 cm but the internal dimensions are not suitable, or the hollow is not accessible (Class 4 trees).

Table 23: Summary of Potential Nest Trees and Future Nesting Trees Recorded

Bamford Class and DAWE (2022) Terminology	Class 1 Known Tree	Class 2 Nesting	Class 3 Suitable Nesting Tree	Class 4 Potential Nesting Tree	Class 5 Potential nesting tree	Totals (Trees)
Tree Species						
Jarrah	-	-	-		18	18
Blackbutt	-	-	-	1	26	27
Total (Bamford Class)	0	0	0	1	44	45



Figure 16: Black Cockatoo Breeding Habitat Within the Survey Area

0

20

40

60

80 m

N

SCALE

1:2,100

SHEET SIZE

A3 COLOUR

COORDINATE REFERENCE SYSTEM

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Survey Area

Blackbutt

Jarrah

Bamford Tree Class

4

5

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4.6.2 Foraging Habitat Assessment

Habitats within the Survey Area contained a proportion of suitable species that provide suitable foraging habitats for both black cockatoo species. These suitable fauna habitats for Forest Red-tailed black cockatoos were Jarrah/Blackbutt woodland in FHT-01 and Pines in FHT-05. Whilst Jarrah and Blackbutt woodland in FHT-01 and Banksia woodland in FHT-02 had high values for Carnaby's black cockatoos. The remainder of the Survey Area comprised of degraded areas, individual trees or bushland with low to no foraging habitat value.

The Commonwealth referral guidelines provide a foraging quality scoring tool to guide referral information (DAWE, 2022). The tool advises that if the Survey Area contains native vegetation used for foraging at any time by a black cockatoo species and is >1 ha in size, that it is considered at face value to be of very high quality and assigned a starting score of 10. The tool then allows for subtractions if attributes are present which reduce the functionality of the foraging habitat. The Commonwealth referral guidelines specify that the tool is to be applied once to the entire impact area even if there is more than one type of foraging habitat present. The calculated foraging habitat quality score is shown below in Table 24. Scores of 5-10 are identified as representing high value foraging habitat.

Table 24: Foraging Quality Scoring Tool (DAWE, 2022)

Attribute	Carnaby's Black cockatoo	Forest Red-tailed Black cockatoo
Starting score	10- Banksia woodland/scattered Eucalyptus.	10- Scattered Eucalyptus and pines
Foraging potential (-2 if no foraging evidence)	No change, foraging evidence recorded.	No change, foraging evidence recorded.
Connectivity (-2 if no other foraging habitat in 12km)	No change, other foraging habitat <12 km away	No change, other foraging habitat <12 km away
Proximity to breeding habitat (-2 if no breeding habitat in 12km)	No change, recorded breeding habitat within 12 km	No change, recorded breeding habitat within 12 km
Proximity to roosting (-1 if >20km from known night roost)	No change, known roosting site <20 km distant	No change, known roosting site <20 km distant
Impact from significant plant disease (-1 if >50% impact)	No change, impact from plant disease affecting <50 % of foraging plants	No change, impact from plant disease affecting <50 % of foraging plants
Total score	10	10

The Commonwealth referral guidance allows for the inclusion of additional information for foraging habitat which may be considered during an assessment, such as the extent and density of recognised foraging plants within a Survey Area. As an additional source of information, WEPL provides an assessment of foraging habitat quality using a more detailed scoring tool developed by DCCEEW (n.d.) referred to as the Habitat Quality Scoring Tool to produce a numerical foraging habitat score. The Habitat Quality Scoring Tool allows

for a score of 0 (none) to 7 (very high) for Site Condition. This is assessed based on density of known foraging species and health of vegetation. The 0-7 Site Condition score is applied to each mapped polygon of fauna habitat. The Habitat Quality Scoring Tool then applies a Site Context score out of three, this is applied only once to the whole Survey Area.

The Site Condition habitat quality score for each species, and the total area of that score present within the Survey Area are listed in Table 25 and shown in Figure 17 and Figure 18.

Table 25: Habitat Quality Scoring Tool - Site Condition Extent

Site Condition	Extent of Habitat (ha)	
	Carnaby's black cockatoo	Forest Red-tailed black cockatoo
7- Very High	3.74	0.41
6- High	-	-
5-Moderate-High	-	-
4-Moderate	1.00	-
3-Low-Moderate	-	3.60
2-Low	0.54	1.27
1-Negligible to Low	14.54	14.54
0-None	-	-
Total within Survey Area	19.82	19.82
Total Suitable Foraging Habitat	4.74	4.01

* Shaded cells are classified as not comprising suitable foraging habitat

The Habitat Quality Scoring Tool then requires the application of a Site Context score out of three (see Table 26) which is added to the Site Condition score for a final x/10 score. See Table 27 for final Habitat Quality Scoring Tool score. Note that habitat with a Site Condition starting score of 2 or less are extremely unlikely to be suitable habitat and do not have a Site Context score added.

Table 26: Habitat Quality Scoring Tool - Survey Area Context

Survey Area Context					
Proximity of the Survey Area in relation to other habitat	3	Site is within 6 km of known breeding site.	or	Site is within 12 km of other foraging resources with site condition of at least 3.	3
	2	Site is within 12 km of known breeding site.		Site is within 15 km of other foraging resources with site condition of at least 4.	
	1	Site is within 15 km of known breeding site.		Site is between 15 km and 20 km of other foraging resources with site condition of at least 5.	

Survey Area Context			
	0	Site is further than 15 km from known breeding site.	Site is further than 20 km from other foraging resources.
Totals			3

Table 27: Final Habitat Quality Scoring Tool Score

Survey Area Foraging Quality Scores	Extent of Habitat (ha)	
	Carnaby's black cockatoo (ha)	Forest Red-tail black cockatoo (ha)
10	3.74	0.41
9	-	
8	-	-
7	1.00	-
6		3.60
5	-	-
4	-	-
3	-	-
2	0.54	1.27
1	14.54	14.54
0	-	-
Total within Survey Area	19.82	19.82
Total Suitable Foraging Habitat	4.74	4.01

* Shaded cells are classified as not comprising suitable foraging habitat.

As per the Habitat Quality Scoring Tool areas with a site condition score of 2 or lower (shaded cells) are "extremely unlikely to be considered as suitable habitat". These areas are therefore classified as not comprising suitable foraging habitat in this assessment.

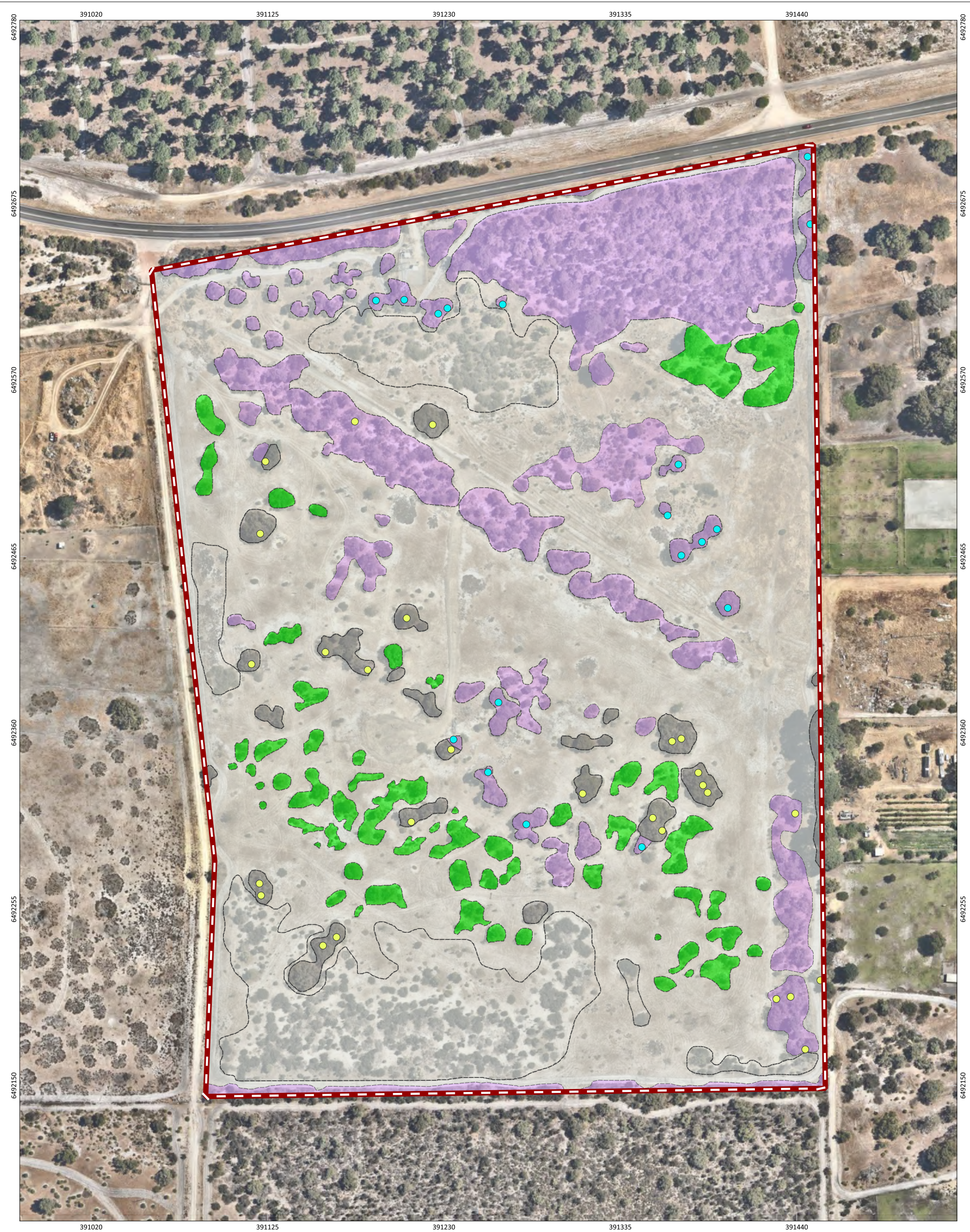


Figure 17: Carnaby’s Black Cockatoo Foraging Habitat within the Survey Area

0

20

40

60

80 m

↑

N

SCALE

1:2,100

SHEET SIZE

A3 COLOUR

COORDINATE REFERENCE SYSTEM

GDA2020 / MGA zone 50

DATA SOURCE

NEARMAPS

PROJECT/REPORT NAME

Biological Survey Technical Report
350 Neaves Road, Mariginiup

CLIENT

Parcel Property

PROJECT NUMBER

A25.264

VERSION

0

DRAWN BY / REVIEWED BY

SC/ZL

DATE

17/6/2026

Legend

Survey Area

●

Blackbutt

●

Jarrah

1

Final Site Condition Score
(Habitat Quality Score Tool)

2

7

10

No	Description	Drawn	Approved	Date
A	Original issue	SC	ZL	17/6/2026

NOTES:
Cadastral boundary (LGATE-002). Label corresponds to the vegetation association number.

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4.6.3 Regional Foraging Habitat Assessment

Analysis of the estimated foraging habitat extent within the local area was also undertaken to provide further context. The estimated extent of foraging habitat is calculated for a buffer of 12 km around and including the Survey Area. This buffer is selected as recommended in the Commonwealth referral guidelines due to black cockatoos mainly foraging within 12 km of their nest site during the breeding season and their reliance on this proximity of foraging resources to successfully raise chicks (DAWE, 2022).

Analysis considers Remnant Native Vegetation Extent mapping (DWER-141) and Vegetation Complexes- SCP and Southwest forest region (DBCA-046 and DBCA-047). See summary of regional vegetation complexes and extents in Table 28 and displayed in Figure 19.

Analysis indicates there is 18,365.69 ha of remnant native vegetation mapped within a 12 km buffer of the Survey Area. It is expected that the majority of this vegetation would contain suitable foraging species at the same or greater rate than that present within the Survey Area. Much of this regional remnant native vegetation are Bush Forever sites northeast of the Survey Area.

Within the Survey Area there is 4.74 ha of foraging habitat scoring between 3 (low to moderate) and 7 (very high) on the Habitat Quality Scoring Tool -Site Condition scale. This represents 0.026 % of the estimated regional habitat extent.

The habitat quality within the Survey Area is considered likely to be of equal or lesser quality than much of the regional foraging habitat, which includes high quality banksia woodlands of the Bassendean Complex North and Tuart, Jarrah and Marri woodlands of the Bassendean Complex Central and South.

Table 28: Regional Foraging Habitat Extent

Vegetation Complex	Remnant Extent (ha)
Bassendean Complex-Central and South	407.60
Bassendean Complex-North	10,441.15
Bassendean Complex-North Transition	1,534.90
Cottesloe Complex-Central and South	2,540.18
Herdsmen Complex	413.37
Karrakatta Complex-Central and South	1,052.59
Karrakatta Complex-North Transition	429.46
Pinjar Complex	1,399.88
Quindalup Complex	42.18
Yanga Complex	104.38
Total	18,365.69

4.6.4 Roosting Habitat Assessment

One roost site partially intersects the Survey Area (DBCA-064), namely WANMARR006, see Figure 15. The roost site central point is approximately 380 m north of the Survey Area boundary in the Gngangara pines plantations. No evidence or direct observation of roosting were recorded within the Survey Area during the survey period.

Night roosting locations are typically in proximity to foraging habitat (black cockatoos mainly foraging within 20 km of night roosts) and with access to water points <2 km from roosting location (DAWE, 2022). Any groups of tall trees, particularly large native eucalypts in proximity to water sources may provide night roosting habitat (DAWE, 2022). Within the Survey Area, fauna habitat types FHT-01 and FHT-05 are suitable to provides roosting habitat as they contain large trees. Access to permanent water was present at close distance from the Survey Area from Lake Adams approximately 2.5 km west of the Survey Area.

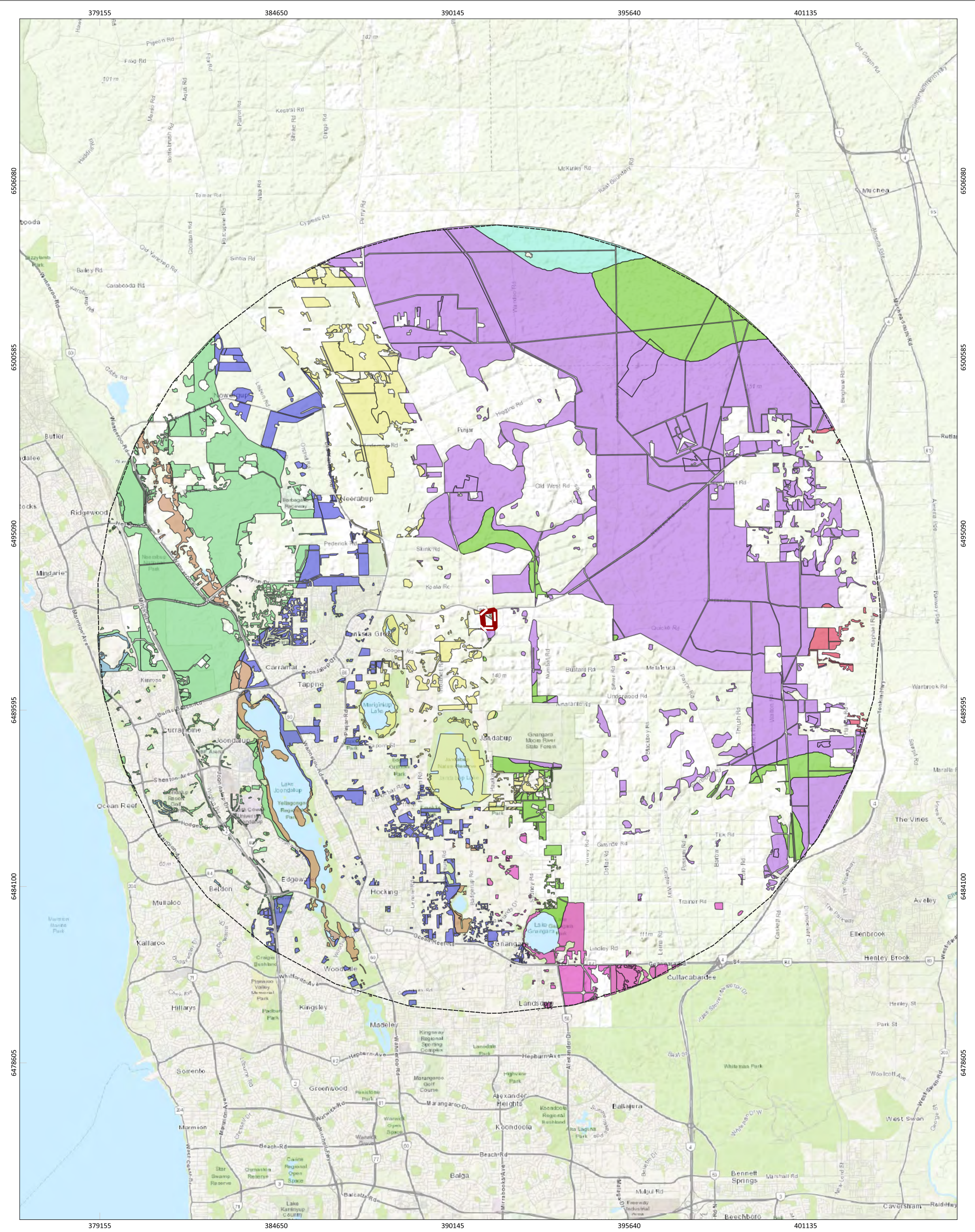


Figure 19: Black Cockatoo Foraging Habitat Extent within 12 km Buffer

0

1

2

3

km

N

SCALE

1:109,900

SHEET SIZE

A3 COLOUR

COORDINATE REFERENCE SYSTEM

GDA2020 / MGA zone 50

DATA SOURCE

ESRI Topographic Map

PROJECT/REPORT NAME

Biological Survey Technical Report
350 Neaves Road, Mariginiup

CLIENT

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VERSION

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DATE

28/4/2026

Legend

Survey Area

12km Buffer

Remnant Vegetation Complexes
(DWER-141 & DBCA-046/047)

Bassendean Complex-Central and South

Bassendean Complex-North

Bassendean Complex-North Transition

Cottesloe Complex-Central and South

Herdsmen Complex

Karrakatta Complex-Central and South

Karrakatta Complex-North Transition

Pinjar Complex

Quindalup Complex

Yanga Complex

No

Description

Drawn

Approved

Date

A

Original issue

SC

ZL

28/4/2026

NOTES:

Cadastral boundary (LGATE-002). Label corresponds to the vegetation association number.

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5. Discussion

5.1 Flora and Vegetation

5.1.1 Flora of Conservation Significance

No Threatened or Priority flora species were identified during the survey or have previously been recorded within the Survey Area. The post-survey likelihood of occurrence assessments found that all threatened or priority flora species had low likelihood of occurring.

Majority of the Survey Area was in Completely Degraded condition due to historical clearing and agricultural grazing.

5.1.2 Vegetation Significance

A total of six vegetation types were identified within the Survey Area. The majority of the vegetation types were relatively intact but fragmented with patches within VT01 (Banksia woodland) and VT02 (open Jarrah woodland with scattered Banksias) exhibiting moderate to high species diversity.

Out of five TECs and PECs that was identified by the desktop assessment as having a medium or high likelihood of occurrence, two communities were found present within the Survey Area.

The 'Banksia Woodlands of the Swan Coastal Plain' TEC was identified as present within the Survey Area, listed as Endangered under the EPBC Act and a Priority 3 PEC in WA. The four step process for identifying presence of the TEC outlined in the Conservation Advice was undertaken with results finding a total of 0.544 ha of banksia woodland aligned with the Banksia woodland TEC of the SCP within the Survey Area. At least 5 ha of the same connective TEC is directly south of the Survey Area.

The results of the Floristic Community Type assignment of Q01, Q02, Q04 and Q06 quadrats using the Gibson et. al. (1994), Keighery et. al (2012) dataset and nearest neighbour analysis all strongly confirmed FCT 21c was present within representative vegetation types of those quadrats within the Survey Area. The result for plot Q03 and Q05 was initially assigned FCTs other than FCT 21c, however, further analysis showed both mostly aligns with FCT 21c.

Therefore, the PEC "Low-lying *Banksia attenuata* woodland on shrubland" was also present within the Survey Area, listed as Priority 3 PEC in WA. A total of 3.79 ha of vegetation types VT01, VT04 and VT06 contained SCP 21c PEC within the Survey Area.

5.2 Fauna Habitat Significance

The three species that had a high likelihood of occurrence were:

- *Zanda latirostris* (Carnaby's black cockatoo) - Endangered (EN).

- *Calyptorhynchus banksii naso* (Forest red-tailed black cockatoo) -Vulnerable (VU).
- *Isoodon fusciventer* (Quenda) - Priority four (P4).

The four species that had a medium likelihood of occurrence were:

- *Idiosoma sigillatum* (Swan Coastal Plain Shield-backed Trapdoor Spider) - P3.
- *Neelaps colonotos* (Black-striped Burrowing Snake) - P3
- *Notamacropus irma* (Western Brush Wallaby) - P4
- *Falcon peregrinus* (Peregrine Falcon) - OS

Extent of core and supporting habitat present within the Survey Area by species is summarised in Table 29.

Table 29: Summary of Habitat Value

Species	Extent Core Habitat (ha)	Extent Supporting Habitat (ha)
<i>Calyptorhynchus banksia naso</i> (Forest Red-tailed black cockatoo)	-	4.51
<i>Zanda latirostris</i> (Carnaby's black cockatoo)	-	4.51
<i>Isoodon fusciventer</i> (Quenda)	6.17	0.87
<i>Neelaps colonotos</i> (black-striped burrowing snake)	3.6	2.57
<i>Notamacropus irma</i> (Western brush wallaby)	3.6	4.21
<i>Idiosoma sigillatum</i> (Swan Coastal Plain Shield-backed Trapdoor Spider)	3.6	2.57
<i>Falco peregrinus</i> (Peregrine falcon)	-	19.78

5.3 Black Cockatoos

The Survey Area falls within the modelled distribution and breeding range for Carnaby's black cockatoo and forest red-tailed black cockatoo (DAWE, 2022). The Survey Area is outside of modelled distribution for Baudin's black cockatoo (DAWE, 2022).

There are approximately 44 confirmed Carnaby's black cockatoo roosting sites within 10 km of the Survey Area (DBCA-064), with one roosting site buffer intersecting the Survey Area (DBCA-064) under site code WANMARR006. The Survey Area does not intersect any other 1 km buffer of roosting sites.

A total of 45 potential breeding trees were recorded; most trees did not show signs of potential nesting hollow development (Class 5 tree) with only one tree possessing small unsuitable hollows (Class 4).

Habitats within the Survey Area contained a proportion of suitable species that provide suitable foraging habitats for both black cockatoo species. These suitable fauna habitats for Forest Red-tailed black cockatoos

were Jarrah/Blackbutt woodland in FHT-01 and Pines in FHT-05. Whilst Jarrah and Blackbutt woodland in FHT-01 and Banksia woodland in FHT-02 had high values for Carnaby's black cockatoos. The remainder of the Survey Area comprised of degraded areas, individual trees or bushland with low to no foraging habitat value.

Foraging habitat quality was rated using the Commonwealth Habitat Quality Scoring Tool (DAWE, n.d.). As per the Habitat Quality Scoring Tool, areas with a site condition score of 2 or lower (low, negligible or none value) are "extremely unlikely to be considered as suitable habitat". These areas are therefore classified as not comprising suitable foraging habitat in this assessment. Foraging habitat quality extents within the Survey Area out of ten are:

- Carnaby's black cockatoo: 3.78 ha (10/10), 1 ha (7/10) and 15.08 ha (Low 2 to None 0). Total of 4.74 ha of suitable foraging habitat and 15.08 ha of unsuitable foraging habitat.
- Forest red-tailed black cockatoo: 0.41 ha (10/10), 3.6 ha (6/10), and 15.81 ha (Low 2 to None 0). Total of 4.01 ha of suitable foraging habitat and 15.81 ha of unsuitable foraging habitat.

Within the Survey Area, fauna habitat types FHT-01 and FHT-05 are suitable to provides roosting habitat as they contain large trees. Access to permanent water was present at close distance from the Survey Area from Lake Adams approximately 2.5 km west of the Survey Area.

6. References

- Atlas of Living Australia (ALA). (2026). Species: *Hylaeus (Sphaerhylaeus) globuliferus* (Woollybush Bee). Accessed on 17 January 2026 from <https://bie.ala.org.au/species/https://biodiversity.org.au/afd/taxa/8f93f25d-5a2a-4181-89e2-b030afd47d64#overview>.
- Beard, J. S. (1976). Vegetation Survey of Western Australia. Western Australia 1: 1 000 000 Vegetation Series. Design and cartography by Dept. of Geography, University of W.A.
- Bureau of Meteorology. (2007). About Climate Statistics. <http://www.bom.gov.au/climate/cdo/about/about-stats.shtml>.
- Bureau of Meteorology. (2025). Monthly Climate Data Statistics. www.bom.gov.au/climate/data.
- Commonwealth of Australia (2001) National Objectives and Targets for Biodiversity Conservation 2001-2005, Canberra.
- De Caceres, M., Font, X., Oliva, F. (2010). The management of vegetation classifications with fuzzy clustering. *Journal of Vegetation Science*. 21: 1138-1151, <https://doi.org/10.1111/j.1654-1103.2010.01211.x>
- Commonwealth of Australia. (2012) Interim Biogeographic Regionalisation for Australia, Version 7. Department of Sustainability, Environment, Water, Population and Communities.
- Department of Biodiversity Conservation and Attractions (DBCA). (2023). Methods for survey and identification of Western Australian threatened ecological communities.
- Department of Biodiversity Conservation and Attractions (DBCA). (2024a). Priority Ecological Communities for Western Australia version 35.
- Department of Biodiversity Conservation and Attractions (DBCA). (2024b). Threatened and Priority Fauna List – July 2025. Retrieved on 10 January 2026 from <https://www.dbca.wa.gov.au/management/threatened-species-and-communities>
- Department of Biodiversity Conservation and Attractions (DBCA). (2024c). Threatened and Priority Flora List – December 2025. Retrieved on 10 January 2026 from <https://www.dbca.wa.gov.au/management/threatened-species-and-communities>
- Department of Climate Change, Energy, the Environment and Water (DAWE). (2022). Referral Guidelines for 3 Threatened Black Cockatoo Species.
- Department of Climate Change, Energy, the Environment and Water (DCCEE). (2019). EPBC Referral Guidance – Banksia Woodlands of the Swan Coastal Plain ecological community.
- Centre for Invasive Species Solutions. (CISS) (2025). Weeds of National Significance. <https://weeds.org.au/>.
-

Department of Climate Change, Energy, the Environment and Water (DCCEEW). (2024) Species Profile and Threats Database. Retrieved on August 2025 from <http://www.environment.gov.au/cgi-bin/sprat/public>.

Department of Climate Change, Energy, the Environment and Water (DCCEEW). (n.d). Habitat Scoring System for WA black cockatoo foraging habitat V1.9.

Department of Climate Change, Energy, the Environment and Water (DCCEEW). (2025). Protected Matters Search Tool. Retrieved on 6 June 2025 from <https://pmst.environment.gov.au/>.

Department of the Environment (DotE). (2013). Matters of National Environmental Significance: Significant Impact Guidelines 1.1. Canberra, Australia.

Department of Environment and Conservation (DEC). (2011). Information Sheet 41/2011 Graceful Sun-Moth (*Synemon gratio*sa).

Department of Primary Industries and Regional Development (DPIRD). (2022). Declared Plants. <https://www.agric.wa.gov.au/organisms>.

Environmental Protection Authority (EPA). (2016). Technical Guidance - Flora and Vegetation surveys for Environmental Impact Assessment.

Environmental Protection Authority (EPA). (2020). Technical Guidance - Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment.

Glevan Consulting (Glevan). (2025). Phytophthora Dieback Occurrence Report for Hawkins Road - Prepared for Department of Planning, Lands and Heritage.

Government of Western Australia (2000b). Bush Forever Volume 2: Directory of Bush Forever Sites. Department of Environmental Protection. <https://www.wa.gov.au/system/files/2023-06/directory-of-bush-forever-sites-volume2.pdf>.

Government of Western Australia (GoWA). (2017). 2017 South West Vegetation Complex Statistics. Current as of October 2017. WA Department of Biodiversity, Conservation and Attractions, Perth, <https://catalogue.data.wa.gov.au/dataset/dbca>.

Government of Western Australia (GoWA). (2018). 2018 Statewide Vegetation Statistics - Full Report. <https://catalogue.data.wa.gov.au/dataset/dbca-statewide-vegetationstatistics/resource/b7bd60c2-bff6-4637-b213-ae4706412c7>.

Gibson, N., Keighery, B.J., Keighery, G.J., Burbidge, A.H. and Lyons, M.N. (1994) A Floristic survey of the southern Swan Coastal Plain. Unpublished Report for the Australian Heritage Commission prepared by Department of Conservation and Land Management and the Conservation Council of Western Australia {Inc.}.

Hedde, EM, Loneragan. OW and Havel JJ (1980). Vegetation Complexes of the Darling System, WA, in Atlas of Natural Resources, Darling System WA. Department of Conservation and Environment.

-
- He, Forrest. (2021). The Distribution of the Threatened Black-striped Burrowing Snake (*Neelaps Calonotos*) in the Perth Region, Western Australia. *Journal of the Royal Society of Western Australia*.
- Houston, T.F. (2018). A guide to native bees of Australia. CSIRO Publishing, Clayton South Victoria, 272p.
- Johnstone, R.E., Kirkby, T. & Sarti, K. (2013). The breeding biology of the Forest Red-tailed Black Cockatoo *Calyptorhynchus banksii naso* Gould in south-western Australia. I. Characteristics of nest trees and nest hollows.
- Maechler, M., Rousseeuw, P., Struyf, A., Hubert, M., Hornik, K.(2019). *cluster: Cluster Analysis Basics and Extensions*. R package version 2.1.0.
- Hussey, B. M. J & Weeds Society of Western Australia & Western Australia. Department of Agriculture and Food & Western Australia. Department of Environment and Conservation. (2007). *Western weeds : a guide to the weeds of Western Australia* / B.M.J. Hussey ... [et al.]. Victoria Park, W.A. : Weeds Society of Western Australia
- NVIS Technical Working Group. (2017). *Australian Vegetation Attribute Manual Version 7.0*. Commonwealth of Australia.
- Oksanen, J., Guillaume Blanchet, F., Friendly, M., Roeland Kindt, Legendre, P., McGlinn, D., Minchin, P.R., O'Hara, R. B., Simpson, G.L., Solymos, P., Stevens, M.H.H., Szoecs, E. and Wagner, H. (2020). *vegan: Community Ecology Package*. R package version 2.5-7. <https://CRAN.R-project.org/package=vegan>.
- Palmer, Russell, & Rose, A. & Debus, Stephen. (2019). Diet of the Peregrine Falcon *Falco peregrinus* in inland south-western Australia. *Australian Field Ornithology*. 36. 36-39. 10.20938/afo36036039.
- Rentz, D. C. F. (1993). *Tettigoniidae of Australia Volume 2: Austrosaginae, Zaprochilinae and Phasmodinae*. CSIRO Publishing, Australia.
- Saunders, D.A., Dawson, R., Doley, A., Lauri, J., Souef, A.I., Mawson, P.R., Warren, K. & White, N. (2014a). Nature conservation on agricultural land: a case study of the endangered Carnaby's Cockatoo *Calyptorhynchus latirostris* breeding at Koobabbie in the northern wheatbelt of Western Australia. *Nature Conservation* 9: 19–43 (2014) doi: 10.3897/natureconservation.9.8385 <http://natureconservation.pensoft.net>
- Saunders, D.A., Mawson, P.R. & Dawson, R. (2018b). Use of tree hollows by Carnaby's Cockatoo and the fate of large hollow-bearing trees at Coomallo Creek, Western Australia 1969–2013. *Biological Conservation* 177 (2014) 185–193
- Western Australian Herbarium (WAH). (20241998-). *FloraBase - The Western Australian Flora*. Perth, Australia. Retrieved on 5 September 2024 from <https://florabase.dpaw.wa.gov.au>.
- Western Australian Museum (WAM). (2025a).
-

Western Australian Museum (WAM). (2025a). Checklist of the Terrestrial Vertebrate Fauna of Western Australia. Retrieved on 22 January 2026 from <https://visit.museum.wa.gov.au/collections/terrestrial-zoology/checklist-terrestrial-vertebrate-fauna-WA>

Datasets

Department of Biodiversity Conservation and Attractions (DBCA). (2018). Vegetation Complexes-Swan Coastal Plain (DBCA-046). Retrieved on January 2026 from <https://catalogue.data.wa.gov.au/dataset/vegetation-complexes-swan-coastal-plain>.

Department of Biodiversity, Conservation and Attractions (DBCA). (2017). Ramsar Sites (DBCA-010). Retrieved on 1 February 2026 from <https://catalogue.data.wa.gov.au/dataset/ramsar-sites>

Department of Biodiversity, Conservation and Attractions (DBCA). (2018) Vegetation Complexes – South West Forest Region of Western Australia (DBCA-047). Accessed January 2026 from <https://catalogue.data.wa.gov.au/dataset/vegetation-complexes-swf-50k>.

Department of Biodiversity, Conservation and Attractions (DBCA). (2022). Geomorphic Wetlands, Swan Coastal Plain (DBCA-019). Retrieved January 2026 from <https://catalogue.data.wa.gov.au/dataset/geomorphic-wetlands-swan-coastal-plain>.

Department of Biodiversity, Conservation and Attractions (DBCA), (2018) Carnaby's Cockatoo Confirmed Breeding Areas within the Swan Coastal Plain and Jarrah Forest IBRA Regions (DBCA-054). Accessed January 2026 from <https://catalogue.data.wa.gov.au/dataset/carnabys-cockatoo-confirmed-breeding-areas>

Department of Biodiversity, Conservation and Attractions (DBCA). (2018) Carnaby's Cockatoo Confirmed Roost Sites (DBCA-050). Accessed January 2026 from <https://catalogue.data.wa.gov.au/dataset/black-cockatoo-roosting-sites-buffered>.

Department of Biodiversity, Conservation and Attractions (DBCA). (2019) Black Cockatoo Roosting Sites - Buffered (DBCA-064). Accessed on January 2026 from <https://catalogue.data.wa.gov.au/dataset/black-cockatoo-roosting-sites-buffered>.

Department of Biodiversity, Conservation and Attractions (DBCA). (2018). Carnabys Cockatoo Confirmed Breeding Areas within the Swan Coastal Plain and Jarrah Forest IBRA Region (DBCA-054). Accessed on January 2026 from <https://catalogue.data.wa.gov.au/dataset/carnabys-cockatoo-confirmed-breeding-areas>.

Department of Biodiversity Conservation and Attractions (DBCA). (2023). DBCA - Legislated Lands and Waters (DBCA-011). Retrieved on January 2026 from <https://catalogue.data.wa.gov.au/dataset/dbca-legislated-lands-and-waters>.

Department of Climate Change, Energy, the Environment and Water (DCCEEW). (2023). Directory of Important Wetlands (DBCA-045). Retrieved on January 2026 from <https://www.environment.gov.au/cgi-bin/wetlands/report.pl>.

Department of Primary Industries and Regional Development (DPIRD), 2020. Native Vegetation Extent (DPIRD-005) Accessed on January 2026 from <https://catalogue.data.wa.gov.au/dataset/native-vegetation-extent>.

Department of Primary Industries and Regional Development (DPIRD). (2017). Soil Landscape Mapping – Best Available (DPIRD-027). Accessed on January 2026 from <https://catalogue.data.wa.gov.au/dataset/soil-landscape-mapping-best-available>.

Department of Primary Industries and Regional Development (DPIRD). (2018). Soil Landscape Mapping - Systems (DPIRD-064) - GIS Dataset. Perth, Australia. Retrieved on January 2026 from <https://catalogue.data.wa.gov.au/dataset/soil-landscape-mapping-systems>.

Department of Primary Industries and Regional Development (DPIRD). (2019). Pre-European Vegetation (DPIRD-006). Accessed on January 2026 from <https://catalogue.data.wa.gov.au/dataset/pre-european-dpird-006>

Department of Water and Environmental Regulation (DWER). (2018). Hydrography, Linear (Hierarchy) (DWER-031). Retrieved on January 2026 from <https://catalogue.data.wa.gov.au/dataset/hydrography-linear-hierarchy>.

Department of Water and Environmental Regulation (DWER). (2022). Clearing Regulations - Environmentally Sensitive Areas (DWER-046) - GIS Dataset. Retrieved on January 2026 from <https://catalogue.data.wa.gov.au/dataset/clearing-regulations-environmentally-sensitive-areas-dwer-046>.

Department of Planning, Lands and Heritage (DPLH). (2019). Bush Forever Areas 2000 (DPLH-019). Retrieved on January 2026 from <https://catalogue.data.wa.gov.au/dataset/bush-forever-areas-2000-dop-071>.

Appendix A

Legislation

Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act aims to protect matters of national environmental significance (MNES). Under the EPBC Act, the Commonwealth Department of Climate Change, Energy and the Environment lists Threatened species and communities in categories determined by criteria set out in the EPBC Act.

Projects likely to cause a significant impact on MNES should be referred to the DCCEEW for assessment under the EPBC Act.

Biodiversity Conservation Act 2016

The Biodiversity Conservation Act 2016 aims to conserve and protect biodiversity and biodiversity components within the State and to promote ecologically sustainable use of biodiversity components in the State.

Environmental Protection Act 1986

Declared Rare Flora (DRF) 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. In addition, habitat necessary for the maintenance of indigenous fauna is considered in the clearing principles and assessed during consideration of applications for a clearing permit.

Biosecurity and Agricultural Management Act 2007

Plants may be 'Declared' by the Minister for Agriculture and Food under the BAM Act. The Western Australian Organism List contains information on the area(s) in which a plant is declared and the control and keeping categories to which it has been assigned in Western Australia. A declaration may apply to the whole State, to districts, individual properties or even to single paddocks. If a plant is 'Declared', landholders are obliged to control that plant on their properties.

Weeds of National Significance

The Australian Government along with the State and Territory governments has endorsed 32 WoNS. Four major criteria were used in determining WoNS:

- The invasiveness of a weed species.
- A weed's impacts.
- The potential for spread of a weed.
- Socio-economic and environmental values.

Each WoNS has a national strategy and a national coordinator, responsible for implementing the strategy. WoNS are regarded as the worst weeds in Australia because of their invasiveness, potential for spread, and economic and environmental impacts.

Department of Biodiversity, Conservation and Attractions Priority Lists

DBCA lists 'Priority' flora and fauna that have not been assigned statutory protection as "Threatened" under the BC Act and are under consideration for declaration as Threatened. Flora and fauna assessed as Priority 1-3 are considered to be in urgent need of further survey. Priority 4 flora requires monitoring every 5 -10 years.

DBCA maintains a list of Priority Ecological Communities (PECs) which identifies plant communities that require further investigation before possible nomination for TEC status. Once listed, a community becomes a PEC and, when endorsed by the WA Minister for Environment, becomes a TEC and protected as an ESA under Environmental Protection (Clearing of Native Vegetation) Regulations 2004.

Informal Recognition of Flora and Fauna

Certain populations or communities of flora and/or fauna may be of local significance or interest because of their patterns of distribution and abundance. For example, specific locations of flora and may be locally significant because they are range extensions to the previously known distribution, or are newly discovered taxa (and have the potential to be of more than local significance). In addition, many species are in decline as a result of threatening processes (land clearing, grazing, and changed fire regimes) and relict populations of such species assume local importance for DBCA. It is not uncommon for DBCA to make comment on these species of interest.

Appendix B

Definitions and Criteria

EPBC Act Categories for Flora, Fauna and Ecological Communities

Category	Threatened Species	Threatened Ecological Communities
Extinct	A native species is eligible to be included in the extinct category at a particular time if, at that time, there is no reasonable doubt that the last member of the species has died.	N/A.
Extinct in the wild	A native species is eligible to be included in the extinct in the wild category at a particular time if, at that time: (a) it is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or (b) it has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.	N/A.
Critically Endangered (CE)	A native species is eligible to be included in the critically endangered category at a particular time if, at that time, it is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.	An ecological community is eligible to be included in the critically endangered category at a particular time if, at that time, it is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.
Endangered (EN)	A native species is eligible to be included in the endangered category at a particular time if, at that time: (a) it is not critically endangered; and (b) it is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria.	An ecological community is eligible to be included in the endangered category at a particular time if, at that time: (a) it is not critically endangered; and (b) it is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria.
Vulnerable (VU)	A native species is eligible to be included in the vulnerable category at a particular time if, at that time: (a) it is not critically endangered or endangered; and (b) it is facing a high risk of extinction in the wild in the medium term future, as determined in accordance with the prescribed criteria.	An ecological community is eligible to be included in the vulnerable category at a particular time if, at that time: (a) it is not critically endangered or endangered; and (b) it is facing a high risk of extinction in the wild in the medium term future, as determined in accordance with the prescribed criteria.
Conservation Dependent	A native species is eligible to be included in the conservation dependent category at a particular time if, at that time: (a) the species is the focus of a specific conservation program the cessation of which would result in the species becoming vulnerable, endangered or critically endangered; or (b) the following subparagraphs are satisfied: (i) the species is a species of fish.	N/A.

Category	Threatened Species	Threatened Ecological Communities
	(ii) the species is the focus of a plan of management that provides for management actions necessary to stop the decline of, and support the recovery of, the species so that its chances of long-term survival in nature are maximised. (iii) the plan of management is in force under a law of the Commonwealth or of a State or Territory. (iv) cessation of the plan of management would adversely affect the conservation status of the species.	

Conservation Codes for Western Australian Flora and Fauna (DBCA)

Conservation Codes for Western Australian Flora and Fauna	
Threatened, Extinct and Specially Protected fauna or flora¹ are species² 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 International Union for Conservation of Nature (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

Conservation Codes for Western Australian Flora and Fauna

(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.
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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)

Conservation Codes for Western Australian Flora and 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.

Conservation Codes for Western Australian Flora and Fauna

- (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.

DBCA Definitions and Criteria for TECs and PECs

Criteria	Definition
Threatened Ecological Communities	
Presumed Totally Destroyed (PD)	An ecological community that has been adequately searched for but for which no representative occurrences have been located. The community has been found to be totally destroyed or so extensively modified throughout its range that no occurrence of it is likely to recover its species composition and/or structure in the foreseeable future. An ecological community will be listed as presumed totally destroyed if there are no recent records of the community being extant and either of the following applies (A or B): A. Records within the last 50 years have not been confirmed despite thorough searches of known or likely habitats or B. All occurrences recorded within the last 50 years have since been destroyed.
Critically Endangered (CR)	An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or that was originally of limited distribution and is facing severe modification or destruction throughout its range in the immediate future, or is already severely degraded throughout its range but capable of being substantially restored or rehabilitated. An ecological community will be listed as Critically Endangered when it has been adequately surveyed and is found to be facing an extremely high risk of total destruction in the immediate future. This will be determined on the basis of the best available information, by it meeting any one or more of the following criteria (A, B or C): A. The estimated geographic range, and/or total area occupied, and/or number of discrete occurrences since European settlement have been reduced by at least 90% and either or both of the following apply (i or ii): - geographic range, and/or total area occupied and/or number of discrete occurrences are continuing to decline such that total destruction of the community is imminent (within approximately 10 years). - modification throughout its range is continuing such that in the immediate future (within approximately 10 years) the community is unlikely to be capable of being substantially rehabilitated. B. Current distribution is limited, and one or more of the following apply (i, ii or iii): - geographic range and/or number of discrete occurrences, and/or area occupied is highly restricted and the community is currently subject to known threatening processes which are likely to result in total destruction throughout its range in the immediate future (within approximately 10 years). - there are very few occurrences, each of which is small and/or isolated and extremely vulnerable to known threatening processes.

Criteria	Definition
	iii. there may be many occurrences but total area is very small and each occurrence is small and/or isolated and extremely vulnerable to known threatening processes. C. The ecological community exists only as highly modified occurrences that may be capable of being rehabilitated if such work begins in the immediate future (within approximately 10 years). An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or was originally of limited distribution and is in danger of significant modification throughout its range or severe modification or destruction over most of its range in the near future. An ecological community will be listed as Endangered when it has been adequately surveyed and is not Critically Endangered but is facing a very high risk of total destruction in the near future. This will be determined on the basis of the best available information by it meeting any one or more of the following criteria (A, B, or C): A. The geographic range, and/or total area occupied, and/or number of discrete occurrences have been reduced by at least 70% since European settlement and either or both of the following apply (i or ii): i. the estimated geographic range, and/or total area occupied and/or number of discrete occurrences are continuing to decline such that total destruction of the community is likely in the short term future (within approximately 20 years). ii. modification throughout its range is continuing such that in the short term future (within approximately 20 years) the community is unlikely to be capable of being substantially restored or rehabilitated. B. Current distribution is limited, and one or more of the following apply (i, ii or iii): i. geographic range and/or number of discrete occurrences, and/or area occupied is highly restricted and the community is currently subject to known threatening processes which are likely to result in total destruction throughout its range in the short term future (within approximately 20 years). ii. there are few occurrences, each of which is small and/or isolated and all or most occurrences are very vulnerable to known threatening processes. iii. there may be many occurrences but total area is small and all or most occurrences are small and/or isolated and very vulnerable to known threatening processes. The ecological community exists only as very modified occurrences that may be capable of being substantially restored or rehabilitated if such work begins in the short-term future (within approximately 20 years).
Endangered (EN)	
	An ecological community that has been adequately surveyed and is found to be declining and/or has declined in distribution and/or condition and whose ultimate security has not yet been assured and/or a community that is still widespread but is believed likely to move into a category of higher threat in the near future if threatening processes continue or begin operating throughout its range. An ecological community will be listed as Vulnerable when it has been adequately surveyed and is not Critically Endangered or Endangered but is facing a high risk of total destruction or significant modification in the medium to long-term future. This will be determined on the basis of the best available information by it meeting any one or more of the following criteria (A, B or C): A. The ecological community exists largely as modified occurrences that are likely to be capable of being substantially restored or rehabilitated.
Vulnerable (VU)	

Criteria	Definition
	B. The ecological community may already be modified and would be vulnerable to threatening processes, is restricted in area and/or range and/or is only found at a few locations. C. The ecological community may be still widespread but is believed likely to move into a category of higher threat in the medium to long term future because of existing or impending threatening processes.

Priority Ecological Communities

Priority One	Poorly known ecological communities Ecological communities with apparently few, small occurrences, all or most not actively managed for conservation (e.g. within agricultural or pastoral lands, urban areas, active mineral leases) and for which current threats exist. Communities may be included if they are comparatively well-known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under immediate threat from known threatening processes across their range.
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Priority Two	Poorly known ecological communities Communities that are known from few small occurrences, all or most of which are actively managed for conservation (e.g. within national parks, conservation parks, nature reserves, state forest, unallocated Crown land, water reserves, etc.) and not under imminent threat of destruction or degradation. Communities may be included if they are comparatively well known from one or more localities, but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under threat from known threatening processes.
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Priority Three	Poorly known ecological communities i. Communities that are known from several to many occurrences, a significant number or area of which are not under threat of habitat destruction or degradation or. ii. Communities known from a few widespread occurrences, which are either large or within significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat, or. iii. Communities made up of large, and/or widespread occurrences, that may or may not be represented in the reserve system, but are under threat of modification across much of their range from processes such as grazing by domestic and/or feral stock, and inappropriate fire regimes. Communities may be included if they are comparatively well known from several localities, but do not meet adequacy of survey requirements and / or are not well defined, and known threatening processes exist that could affect them.
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Priority Four	Ecological communities that are adequately known, rare but not Threatened or meet criteria for Near Threatened, or that have been recently removed from the Threatened list. These communities require regular monitoring. i. Rare. Ecological communities known from few occurrences 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 communities are usually represented on conservation lands. ii. Near Threatened. Ecological communities that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable. iii. Ecological communities that have been removed from the list of Threatened communities during the past five years.
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Criteria	Definition
Priority Five	Conservation Dependent Ecological Communities Ecological Communities that are not Threatened but are subject to a specific conservation program, the cessation of which would result in the community becoming Threatened within five years.

Appendix C

Flora and Communities Likelihood of Occurrence

Flora Database Search Result and Likelihood of Occurrence (10 km Buffer)

Species	Conservation Status		Data source		Preferred Habitat	Flowering period	Pre-survey Likelihood of Occurrence	Justification	Post-survey Likelihood of Occurrence
	WA	EPBC	DBCA	PMST					
<i>Acacia benthamii</i>	P2		x		Sand. Typically on limestone breakaways.	Aug to Sep	Low	No breakaways present. Closest record <5 km from the Survey Area and >30 years ago.	Low. Not observed or recorded within the Survey Area.
<i>Andersonia gracilis</i>	VU	EN		x	White/grey sand, sandy clay, gravelly loam. Winter-wet areas, near swamps	Oct-Nov	Low	No DBCA records with 10km of the Survey Area. Geology and habitat not suitable.	Low. Not observed or recorded within the Survey Area.
<i>Anigozanthos humilis subsp. chrysanthus</i>	P4		x		Grey or yellow sand.	May to Jun or Aug to Nov	Low	Previously recorded in pine plantation 6 km south of the Survey Area. There are no associated habitats within the Survey Area.	Low. Not observed or recorded within the Survey Area.
<i>Anigozanthos viridis subsp. terraspectans</i>	VU	VU	x	x	Grey sand, clay loam. Winter-wet depressions.	Aug to Sep.	Low	Previous records >10km from the Survey Area. Geology and habitat not suitable.	Low. Not observed or recorded within the Survey Area.
<i>Austrostipa mundula</i>	P3		x		Sandy to clay loams and limestone in grassland, heathland, shrubland and mallee.	Oct-Nov	Low	Closest record <10 km from the Survey Area and >30 years ago.	Low. Not observed or recorded within the Survey Area.
<i>Baeckea sp. Limestone (N. Gibson & M.N. Lyons 1425)</i>	P1		x		Limestone and sand over limestone. Hills, ridges and limestone outcrops. In heath, Banksia and Eucalyptus woodlands.	Sep to Nov	Low	Preferred habitat potentially present, 6.5 km SW of the site. No limestone or habitat present within Survey Area.	Low. Not observed or recorded within the Survey Area.
<i>Banksia mimica</i>	VU	EN	x	x	White or grey sand over laterite, sandy loam.	Dec or Jan to Feb	Low	Previous records >10km from the Survey Area. Geology and habitat not suitable.	Low. Not observed or recorded within the Survey Area.

Species	Conservation Status		Data source		Preferred Habitat	Flowering period	Pre-survey Likelihood of Occurrence	Justification	Post-survey Likelihood of Occurrence
	WA	EPBC	DBCA	PMST					
<i>Caladenia huegelii</i>	CR	EN	x	x	Grey or brown sand, clay loam.	Sep to Oct	Medium	Nearest record is 2.8km north-east of the Survey Area in Banksia Woodland, some suitable habitat occurs within the Survey Area.	Low. Not observed or recorded within the Survey Area.
<i>Calectasia elegans</i>	CR	EN	x		White, grey or yellow sand, gravel.	Jun to Oct	Medium	Records 5 km from the Survey Area, are located within remnant bushlands of Banksia woodland. Some suitable habitat to occur within the Survey Area. Florabase point seems to within 2km east to Survey Area near Neaves Road.	Low. Not observed or recorded within the Survey Area.
<i>Chamelaucium lullfitzii</i>	VU		x	X	White or yellow sand, leaf litter. Plains, hilltops, crests and lower slopes of scarp, rises, road verges. Restricted to a very small area associated with the Gingin scarp, south of Gingin. Plants grow on white, grey, or yellow sands in low open banksia woodland.	Sep to Dec	Low	Preferred habitat potentially present, however closest record is >10 km from Survey Area.	Low. Not observed or recorded within the Survey Area.
<i>Conostylis bracteata</i>	P3		x		Sand, limestone. Consolidated sand dunes.	Aug to Sep	Low	Closest record <5 km from the Survey Area in remnant Banksia Woodland. Overall preferred habitat is not present.	Low. Not observed or recorded within the Survey Area.
<i>Cyathochaeta teretifolia</i>	P3		x		Grey sand, sandy clay. Swamps, creek edges.		High	Closest recorded about 2.5km NW of the Survey Area <30 years ago. Previous record is in	Low. Not observed or recorded within the Survey Area.

Species	Conservation Status		Data source		Preferred Habitat	Flowering period	Pre-survey Likelihood of Occurrence	Justification	Post-survey Likelihood of Occurrence
	WA	EPBC	DBCA	PMST					
								remnant bushland of similar vegetation that is present in the Survey Area.	
<i>Dampiera triloba</i>	P3		x		Loamy sand in low lying areas.	Aug to Dec	Low	Closest record <10 km from the Survey Area, however in vegetation not present within the Survey Area.	Low. Not observed or recorded within the Survey Area.
<i>Darwinia carnea</i>	CR	EN	x		Lateritic loam & gravel.	Oct to Dec	Low	Nearest record <5 km S of Survey Area from Lullfitz nursey.	Low. Not observed or recorded within the Survey Area.
<i>Darwinia foetida</i>	EN	CR	x	X	Grey-white sand on swampy, seasonally wet sites. Occurs on grey-black sandy rises in winter-damp to wet clay flats under Regelia inops– Kunzea recurva tall shrubland over Hypocalymma angustifolium low shrubland or low Melaleuca shrubland.	Oct to Nov	Low	Previous records >10km from the Survey Area. Geology and habitat not suitable.	Low. Not observed or recorded within the Survey Area.
<i>Darwinia macrostegia</i>	P4		x		Stony soils, peaty sand. Rocky hillsides, gullies	Dec or Jan to Feb	Low	Nearest record <5 km S of Survey Area from Lullfitz nursey.	Low. Not observed or recorded within the Survey Area.
<i>Darwinia meeboldii</i>	VU	VU	x		Peaty soils over quartzite. Hill slopes.	Aug to Nov	Low	Nearest record <5 km S of Survey Area from Lullfitz nursey.	Low. Not observed or recorded within the Survey Area.
<i>Darwinia oxylepis</i>	CR	EN	x		Stony, peaty sand. Rocky gullies.	Aug to Nov	Low	Nearest record <5 km S of Survey Area from Lullfitz nursey.	Low. Not observed or recorded within the Survey Area.

Species	Conservation Status		Data source		Preferred Habitat	Flowering period	Pre-survey Likelihood of Occurrence	Justification	Post-survey Likelihood of Occurrence
	WA	EPBC	DBCA	PMST					
<i>Diuris micrantha</i>	VU	VU	x	X	Brown loamy clay. Winter-wet swamps, in shallow water.	Sep to Oct	Low	Previous records >10km from the Survey Area. Geology and habitat not suitable.	Low. Not observed or recorded within the Survey Area.
<i>Diuris purdiei</i>	EN	EN	x	X	Winter-wet swamps.	Sep to Oct.	Low	Previous records >10km from the Survey Area. Geology and habitat not suitable.	Low. Not observed or recorded within the Survey Area.
<i>Drakaea elastica</i>	CR	EN	x	X	White or grey sand. Low-lying situations adjoining winter-wet swamps.	Oct-Nov	Low	Previous records >10 km from the Survey Area and the preferred habitat not present.	Low. Not observed or recorded within the Survey Area.
<i>Drakaea micrantha</i>	EN	VU	x	X	White-grey sand.	Sep to Oct	Low	Previous records >10km from the Survey Area. Geology and habitat not suitable.	Low. Not observed or recorded within the Survey Area.
<i>Drosera patens</i>	P1		x		Sandy soils. Margins of winter-wet depressions, swamps and lakes.	Dec or Feb	Low	Closest record is <10 km from the Survey Area, however preferred habitat is not present.	Low. Not observed or recorded within the Survey Area.
<i>Drosera x badgerupii</i>	P2		x		Grows in peaty sand or pure peat on the margins of swamps and lakes.		Low	Preferred habitat not present. Closest record 10 km east from site.	Low. Not observed or recorded within the Survey Area.
<i>Drosera x sidjamesii</i>	P1		x		Margins of swamps, lakes and winter-wet depressions in sandy soils.		Low	Closest recorded about 1.4 km N of the Survey Area, however >30 years ago. Additionally, the preferred habitat is not present.	Low. Not observed or recorded within the Survey Area.
<i>Eleocharis keigheryi</i>	VU	VU	X		Sandy loamy soils. Clay, sandy loam. Emergent in freshwater: creeks, claypans.	Aug to Nov	Low	Preferred habitat not present.	Low. Not observed or recorded within the Survey Area.

Species	Conservation Status		Data source		Preferred Habitat	Flowering period	Pre-survey Likelihood of Occurrence	Justification	Post-survey Likelihood of Occurrence
	WA	EPBC	DBCA	PMST					
<i>Eucalyptus argutifolia</i>	VU	VU	x	X	Shallow soils over limestone. Slopes or gullies of limestone ridges, outcrops.	Mar to Apr	Low	Preferred habitat not present. Closest record 6.4 km NW from site.	Low. Not observed or recorded within the Survey Area.
<i>Grevillea christineae</i>	EN	EN	x		Clay loam, sandy clay, often moist.	Aug to Sep	Low	Previous records >10 km from the Survey Area and the preferred habitat not present.	Low. Not observed or recorded within the Survey Area.
<i>Grevillea curviloba</i>	EN	EN	x		Grey sand, sandy loam. Winter-wet heath.	Aug to Oct	Low	One record is more than 8km southeast of the Survey Area. Unlikely to have suitable habitat within the Survey Area.	Low. Not observed or recorded within the Survey Area.
<i>Jacksonia sericea</i>	P4		x		Calcareous & sandy soils.	Sep to Oct	Low	Closest record is 5 km W of the Survey Area and <30 years old. Limestone or habitat not present within Survey Area.	Low. Not observed or recorded within the Survey Area.
<i>Macarthuria keigheryi</i>	EN	EN	x		Low-lying winter-wet damp, white or grey sand.	Sep-Dec or Feb-Mar	Low	Previous records >10km from the Survey Area. Geology and habitat not suitable.	Low. Not observed or recorded within the Survey Area.
<i>Marianthus paralius</i>	EN	EN	x	X	White sand over limestone. Low coastal cliffs.	Sep to Nov	Low	Previous records <10 km from the Survey Area, however preferred habitat is not present.	Low. Not observed or recorded within the Survey Area.
<i>Melaleuca sp. Wanneroo (G.J. Keighery 16705)</i>	EN	EN	x	X	Growing on very shallow soils over limestone 'caprock' on ridges	Late Nov to Late Dec	Low	Preferred habitat not present.	Low. Not observed or recorded within the Survey Area.

Species	Conservation Status		Data source		Preferred Habitat	Flowering period	Pre-survey Likelihood of Occurrence	Justification	Post-survey Likelihood of Occurrence
	WA	EPBC	DBCA	PMST					
<i>Paracaleana dixonii</i>	VU	EN		x	Grey sand over granite.	Oct to Dec or Jan	Low	No DBCA records with 10km of the Survey Area. Geology and habitat not suitable.	Low. Not observed or recorded within the Survey Area.
<i>Pimelea calcicola</i>	P3		x		Sand. Coastal limestone ridges.	Sep to Nov	Low	Closest record <5 km from the Survey Area, however the location in remnant bushland within Neeves swamp. This habitat is not present within the Survey Area.	Low. Not observed or recorded within the Survey Area.
<i>Pithocarpa corymbulosa</i>	P3		x		Gravelly or sandy loam. Amongst granite outcrops.	Jan to Apr	Low	Granite outcrop not present. Closest record <10 km from the Survey Area and >30 years ago.	Low. Not observed or recorded within the Survey Area.
<i>Poranthera moorokatta</i>	P2		x		White-grey sand.	Sep to Nov	Medium	Previously recorded 4.6km W of the Survey Area <30 years ago. Preferred habitat present, species distribution is likely more widespread than currently known.	Low. Not observed or recorded within the Survey Area.
<i>Sarcozona bicarinata</i>	P3		x		White sand.	Aug to Dec	Low	Closest record is 8.7 km S of the Survey Area. The record is >30 years old and was a single record. Preferred habitat is potentially present, however it is considered unlikely that the species will be.	Low. Not observed or recorded within the Survey Area.
<i>Schoenus griffinianus</i>	P4		x		White sand.	Oct to Dec	Low	Closest record <5 km from the Survey Area, however the record is >30 years old and is	Low. Not observed or recorded within the Survey Area.

Species	Conservation Status		Data source		Preferred Habitat	Flowering period	Pre-survey Likelihood of Occurrence	Justification	Post-survey Likelihood of Occurrence
	WA	EPBC	DBCA	PMST					
								located within in a conservation area.	
<i>Stenanthemum sublineare</i>	P2		x		Littered white sand. Coastal plain.	Oct to Dec	Low	Not a coastal plain, nearest record 3.6 km N of Survey Area.	Low. Not observed or recorded within the Survey Area.
<i>Stylidium longitubum</i>	P4		x		Sandy clay, clay. Seasonal wetlands.	Oct to Nov	Low	Previous records <10km from the Survey Area. Geology and habitat not suitable.	Low. Not observed or recorded within the Survey Area.
<i>Stylidium paludicola</i>	P3		x		Peaty sand over clay. Winter wet habitats. Marri and Melaleuca woodland, Melaleuca shrubland.	Oct to Dec	Low	Closest record <5 km from the Survey Area, however the preferred habitat is not present.	Low. Not observed or recorded within the Survey Area.
<i>Stylidium striatum</i>	P4		x		Brown clay loam over laterite. Hillslopes. Jarrah/Marri forest, Wandoo woodland.	Jul to Oct	Low	Previous records >10km from the Survey Area and >30 years ago. Geology and habitat not suitable.	Low. Not observed or recorded within the Survey Area.
<i>Styphelia filifolia</i>	P3		x		sandy soils of the coastal plain usually in Banksia or Jarrah woodland and in low-lying situations.	Mar to May	Low	Previous 2017 record of the species within the Survey Area has incorrect point coordinates. The actual record is near Pinjar PowerStation. Geology and habitat not suitable.	Low. Not observed or recorded within the Survey Area.
<i>Synaphea sp. Fairbridge Farm (D.Papenfus 696)</i>	CR	CR	x		Sandy with lateritic pebbles. Near winter-wet flats, in low woodland with weedy grasses.	Oct	Low	Previous records >10km from the Survey Area. Not recorded by appropriate survey during correct season	Low. Not observed or recorded within the Survey Area.

Species	Conservation Status		Data source		Preferred Habitat	Flowering period	Pre-survey Likelihood of Occurrence	Justification	Post-survey Likelihood of Occurrence
	WA	EPBC	DBCA	PMST					
<i>Thelymitra dedmaniarum</i>	CR	EN	x	X	Granite.	Nov to Dec or Jan	Low	Preferred habitat not present.	Low. Not observed or recorded within the Survey Area.
<i>Thelymitra variegata</i>	CR		x		Sandy clay, sand, laterite.	Jun to Sep	Low	Closest record was recorded at Lake Jandabup >30 years ago. Preferred habitat is not present within the Survey Area.	Low. Not observed or recorded within the Survey Area.
<i>Tripterococcus sp.</i> <i>Brachylobus</i> (A.S. George 14234)	P4		x		Occurs in grey, black or peaty sand winter-wet flats.		Low	Previous records <10km from the Survey Area. Geology and habitat not suitable.	Low. Not observed or recorded within the Survey Area.
<i>Utricularia oppositiflora</i>	P3		x		Inhabits shallow seasonal swamps and depressions, and creek-lines in moist heathland.	Jul to Oct	Low	Closest record was recorded at Lake Jandabup >30 years ago. Preferred habitat is not present within the Survey Area.	Low. Not observed or recorded within the Survey Area.

Ecological Communities Database Search and Likelihood of Occurrence (10 km Buffer)

Floristic Community Type/ Comm ID	Community Name	Data Status		Conservation Status		Pre-survey Likelihood of Occurrence	Pre-Survey Likelihood of Occurrence	Post-survey Likelihood of Occurrence
		DBCA	PMST	DBCA	EPBC			
Banksia WL SCP	Banksia Woodlands of the Swan Coastal Plain ecological community	x	x	P3	EN	High	The southern portion of the Survey Area is adjacent to gazetted TEC mapped by DBCA. Satellite imagery shows historically the Survey Area used to connected.	Recorded
SCP20a	Banksia attenuata woodlands over species rich dense shrublands	x		CR	*EN	High	Edge of mapped occurrence of community buffer is 530m north from Survey Area. Suitable soil association and pre-European vegetation associations within the Survey Area.	Low
SCP22	Banksia ilicifolia woodlands	x		P3	*EN	Medium	Edge of mapped occurrence of community buffer is 3.4km north from Survey Area. Suitable soil association and pre-European vegetation associations within the Survey Area.	Low
SCP23b	Swan Coastal Plain Banksia attenuata - Banksia menziesii woodlands	x		P3	*EN	Medium	Edge of mapped occurrence of community buffer is 4 km east of the Survey Area. Suitable soil association and pre-European vegetation association within the Survey Area.	Low
SCP21c	Low lying Banksia attenuata woodlands or shrublands	x		P3	*EN	Medium	Edge of mapped occurrence of community buffer is 3.3km east of the Survey Area. Suitable soil association as this community occupies wetter areas.	Recorded
Tuart woodlands	Tuart (Eucalyptus gomphocephala) woodlands and forests of the Swan Coastal Plain	x		P3	CR	Low	Edge of mapped occurrence of community buffer is <5 km from the Survey Area. This TEC have been found in the same soil association as present within the Survey Area, however not the primary occurrence.	Low
Mound Springs SCP	Communities of Tumulus Springs (Organic Mound Springs, Swan Coastal Plain)	x		CR	EN	Low	Unsuitable geology and soils within the Survey Area.	Low
SCP26a	Melaleuca huegelii - M. systema shrublands of limestone ridges	x		CR	CR	Low	Edge of mapped occurrence of community buffer is >5 km from the Survey Area and soil association does not match as that present within the Survey Area.	Low

Floristic Community Type/ Comm ID	Community Name	Data Status		Conservation Status		Pre-survey Likelihood of Occurrence	Pre-Survey Likelihood of Occurrence	Post-survey Likelihood of Occurrence
		DBCA	PMST	DBCA	EPBC			
SCP24	Northern Spearwood shrublands and woodlands	x		P3		Low	Not within known range of this PEC, with the known occurrence of the community buffer is 5.7 km west of the Survey Area. Soil association does not match with that present within the Survey Area.	Low
SCP10a	Shrublands on dry clay flats	x		EN	CR	Low	Edge of mapped occurrence of community buffer is >5 km from the Survey Area and soil association does not match as that present within the Survey Area.	Low
SCP25	Southern Eucalyptus gomphocephala-Agonis flexuosa woodlands	x		P3		Low	Edge of mapped occurrence of community buffer is >5 km from the Survey Area and soil association does not match as that present within the Survey Area.	Low
Empodisma peatlands	Empodisma peatlands of southwestern Australia		x		EN	Low	No occurrences indicated by DBCA within 10km. Appears in PMST search only. Unsuitable geology and soils within the Survey Area.	Low
Honeymyrtle shrubland	Honeymyrtle shrubland on limestone ridges of the Swan Coastal Plain Bioregion		x		CR	Low	No limestone within the Survey Area. No suitable soil associations.	Low

Appendix D

Quadrat Data Sheet

Quadrat or Releve Number: Q01		
Date: 09/10/25	Project Number: A25.264	
Collector: ZL/FO	Photo Number: JPEG_20251009021205460.jp	
Coordinates	Easting: 6492668.913	Northing: 391414.8838
Slope	Flat	
Aspect		
Position	Open depression	
Soil Texture	Sandy loam	
Soil Colour	Grey	
Rock Type		
Rock Cover		
Bare Ground	5-10%	
Litter	10-25%	
Surface Water		
Vegetation Condition	Good	
Weed Cover	18	
Disturbance	Grazing, road	
Fire Age Years		



NVIS:

Tall open forest of *Eucalyptus marginata* and *Banksia attenuata* over tall open shrubland of *Adenanthos cygnorum*, *Kunzea glabrescens* and *Xanthorrhoea preissii* over tall herbs of **Freesia alba x leichtlinii*, **Ehrharta brevifolia* and *Drosera erythrorhiza*.

Species	Naturalised	Conservation code	Height	% Cover
<i>Eucalyptus marginata</i>	0		8	35
<i>Banksia attenuata</i>	0		3	15
<i>Adenanthos cygnorum</i>	0		2	10
<i>Kunzea glabrescens</i>	0		2	5
<i>Xanthorrhoea preissii</i>	0		0.5	10
<i>Ehrharta brevifolia</i>	*		<0.2	1
<i>Drosera erythrorhiza</i>	0		<0.2	1
<i>Briza maxima</i>	*		<0.2	1
<i>Dasypogon bromeliifolius</i>	0		<0.2	1

Quadrat or Releve Number: Q01				
<i>Jacksonia floribunda</i>	0		1	1
<i>Freesia alba x leichtlinii</i>	*		0.1	30
<i>Phlebocarya ciliata</i>	0		<0.2	1
<i>Lomandra caespitosa</i>	0		<0.2	1
<i>Hibbertia vaginata</i>	0		<0.2	1
<i>Patersonia occidentalis</i>	0		<0.2	1
<i>Lepidosperma calcicola</i>	0		<0.2	1
<i>Lomandra sericea</i>	0		<0.2	1
<i>Ehrharta calycina</i>	*		<0.2	1
<i>Briza maxima</i>	*		<0.2	1
<i>Wahlenbergia capensis</i>	*		<0.2	1

Quadrat or Releve Number: Q02		
Date: 09/10/25	Project Number: A25.264	
Collector: ZL/FO	Photo Number: JPEG_20251009012024908.jp	
Coordinates	Easting: 6492651.171	Northing: 391287.3236
Slope	Gentle	
Aspect	S	
Position	Open depression	
Soil Texture	Sandy loam	
Soil Colour	Grey	
Rock Type		
Rock Cover		
Bare Ground	1-5%	
Litter	5-10%	
Surface Water		
Vegetation Condition	Good	
Weed Cover	10	
Disturbance	Grazing, road	
Fire Age Years		



NVIS:
Tall open forest of *Melaleuca preissiana*, *Banksia attenuata* and *Pinus radiata* over tall shrubland of *Adenanthos cygnorum*, *Xanthorrhoea preissii* and *Kunzea glabrescens* over mid open shrubland of *Kunzea glabrescens*, *Hypocalymma angustifolium* and *Hibbertia racemosa*.

Species	Naturalised	Conservation code	Height	% Cover
<i>Melaleuca preissiana</i>	0		3.5	30
<i>Banksia attenuata</i>	0		3.5	15
<i>Pinus radiata</i>	*		2.5	5
<i>Adenanthos cygnorum</i>	0		1.7	15
<i>Xanthorrhoea preissii</i>	0		1.3	20
<i>Kunzea glabrescens</i>	0		1.8	5
<i>Hypocalymma angustifolium</i>	0		1.5	1
<i>Hibbertia racemosa</i>	0		0.3	2
<i>Scholtzia involucrata</i>	0		0.2	1

Quadrat or Releve Number: Q02				
<i>Dianella revoluta</i>	0		0.5	1
<i>Dasypogon obliquifolius</i>	0		0.2	5
<i>Patersonia occidentalis</i>	0		0.2	2
<i>Gladiolus caryophyllaceus</i>	*		<0.2	1
<i>Freesia alba x leichtlinii</i>	*		<0.2	1
<i>Rhodanthe citrina</i>	0		<0.2	1
<i>Hypochaeris glabra</i>	*		<0.2	1
<i>Lyginia imberbis</i>	0		<0.2	1
<i>Briza maxima</i>	*		<0.2	1
<i>Lomandra sericea</i>	0		<0.2	1
<i>Ptilotus obovatus</i>	0		<0.2	1
<i>Asparagus asparagoides</i>	*		<0.2	1
<i>Ehrharta calycina</i>	*		<0.2	1
<i>Ehrharta longiflora</i>	*		<0.2	1
<i>Dampiera linearis</i>	0		<0.2	1
<i>Lepidosperma calcicola</i>	0		<0.2	1
<i>Levenhookia pusilla</i>	0		<0.2	1
<i>Ursinia anthemoides</i>	*		<0.2	1
<i>Chamaescilla corymbosa</i>	0		<0.2	1

Quadrat or Relevé Number: Q01		
Date: 09/10/25	Project Number: A25.264	
Collector: ZL/FO	Photo Number: JPEG_20251009021205460.jp	
Coordinates	Easting: 6492668.913	Northing: 391414.8838
Slope	Flat	
Aspect		
Position	Open depression	
Soil Texture	Sandy loam	
Soil Colour	Grey	
Rock Type		
Rock Cover		
Bare Ground	5-10%	
Litter	10-25%	
Surface Water		
Vegetation Condition	Good	
Weed Cover	18	
Disturbance	Grazing, road	
Fire Age Years		



NVIS:

Tall open forest of *Eucalyptus marginata* and *Banksia attenuata* over tall open shrubland of *Adenanthos cygnorum*, *Kunzea glabrescens* and *Xanthorrhoea preissii* over tall herbs of **Freesia alba x leichtlinii*, **Ehrharta brevifolia* and *Drosera erythrorhiza*.

Species	Naturalised	Conservation code	Height	% Cover
<i>Eucalyptus marginata</i>	0		8	35
<i>Banksia attenuata</i>	0		3	15
<i>Adenanthos cygnorum</i>	0		2	10
<i>Kunzea glabrescens</i>	0		2	5
<i>Xanthorrhoea preissii</i>	0		0.5	10
<i>Ehrharta brevifolia</i>	*		<0.2	1
<i>Drosera erythrorhiza</i>	0		<0.2	1
<i>Briza maxima</i>	*		<0.2	1
<i>Dasypogon bromeliifolius</i>	0		<0.2	1

Quadrat or Releve Number: Q01				
<i>Jacksonia floribunda</i>	0		1	1
<i>Freesia alba x leichtlinii</i>	*		0.1	30
<i>Phlebocarya ciliata</i>	0		<0.2	1
<i>Lomandra caespitosa</i>	0		<0.2	1
<i>Hibbertia vaginata</i>	0		<0.2	1
<i>Patersonia occidentalis</i>	0		<0.2	1
<i>Lepidosperma calcicola</i>	0		<0.2	1
<i>Lomandra sericea</i>	0		<0.2	1
<i>Ehrharta calycina</i>	*		<0.2	1
<i>Briza maxima</i>	*		<0.2	1
<i>Wahlenbergia capensis</i>	*		<0.2	1

Quadrat or Releve Number: Q02		
Date: 09/10/25	Project Number: A25.264	
Collector: ZL/FO	Photo Number: JPEG_20251009012024908.jp	
Coordinates	Easting: 6492651.171	Northing: 391287.3236
Slope	Gentle	
Aspect	S	
Position	Open depression	
Soil Texture	Sandy loam	
Soil Colour	Grey	
Rock Type		
Rock Cover		
Bare Ground	1-5%	
Litter	5-10%	
Surface Water		
Vegetation Condition	Good	
Weed Cover	10	
Disturbance	Grazing, road	
Fire Age Years		



NVIS:
Tall open forest of *Melaleuca preissiana*, *Banksia attenuata* and *Pinus radiata* over tall shrubland of *Adenanthos cygnorum*, *Xanthorrhoea preissii* and *Kunzea glabrescens* over mid open shrubland of *Kunzea glabrescens*, *Hypocalymma angustifolium* and *Hibbertia racemosa*.

Species	Naturalised	Conservation code	Height	% Cover
<i>Melaleuca preissiana</i>	0		3.5	30
<i>Banksia attenuata</i>	0		3.5	15
<i>Pinus radiata</i>	*		2.5	5
<i>Adenanthos cygnorum</i>	0		1.7	15
<i>Xanthorrhoea preissii</i>	0		1.3	20
<i>Kunzea glabrescens</i>	0		1.8	5
<i>Hypocalymma angustifolium</i>	0		1.5	1
<i>Hibbertia racemosa</i>	0		0.3	2
<i>Scholtzia involucrata</i>	0		0.2	1

Quadrat or Releve Number: Q02				
<i>Dianella revoluta</i>	0		0.5	1
<i>Dasypogon obliquifolius</i>	0		0.2	5
<i>Patersonia occidentalis</i>	0		0.2	2
<i>Gladiolus caryophyllaceus</i>	*		<0.2	1
<i>Freesia alba x leichtlinii</i>	*		<0.2	1
<i>Rhodanthe citrina</i>	0		<0.2	1
<i>Hypochaeris glabra</i>	*		<0.2	1
<i>Lyginia imberbis</i>	0		<0.2	1
<i>Briza maxima</i>	*		<0.2	1
<i>Lomandra sericea</i>	0		<0.2	1
<i>Ptilotus obovatus</i>	0		<0.2	1
<i>Asparagus asparagoides</i>	*		<0.2	1
<i>Ehrharta calycina</i>	*		<0.2	1
<i>Ehrharta longiflora</i>	*		<0.2	1
<i>Dampiera linearis</i>	0		<0.2	1
<i>Lepidosperma calcicola</i>	0		<0.2	1
<i>Levenhookia pusilla</i>	0		<0.2	1
<i>Ursinia anthemoides</i>	*		<0.2	1
<i>Chamaescilla corymbosa</i>	0		<0.2	1

Quadrat or Releve Number: Q03	
Date: 08/10/25	Project Number: A25.264
Collector: ZL/FO	Photo Number: JPEG_20251008062539090.jp
Coordinates	Easting: 6492625.465 Northing: 391372.110776453
Slope	Flat
Aspect	
Position	
Soil Texture	Sandy loam
Soil Colour	Pale Brown
Rock Type	
Rock Cover	
Bare Ground	10-25%
Litter	5-10%
Surface Water	
Vegetation Condition	Good
Weed Cover	10
Disturbance	Grazing
Fire Age Years	



NVIS:

Tall closed woodland of *Eucalyptus marginata* and *Melaleuca preissiana* over tall shrubland of *Adenanthos cygnorum* over mid shrubland of *Kunzea glabrescens*, *Jacksonia furcellata* and *Xanthorrhoea preissii*.

Species	Naturalised	Conservation code	Height	% Cover
<i>Eucalyptus marginata</i>	0		6	15
<i>Melaleuca preissiana</i>	0		4	10
<i>Adenanthos cygnorum</i>	0		2.2	20
<i>Kunzea glabrescens</i>	0		2	2
<i>Jacksonia furcellata</i>	0		1.2	3
<i>Xanthorrhoea preissii</i>	0		0.5	10
<i>Hypocalymma angustifolium</i>	0		0.1	4
<i>Lyginia imberbis</i>	0		0.4	3
<i>Dasypogon obliquifolius</i>	0		0.2	1
<i>Petrophile linearis</i>	0		0.3	3

Quadrat or Releve Number: Q03	
Date: 08/10/25	Project Number: A25.264
Collector: ZL/FO	Photo Number: JPEG_20251008062539090.jp
Coordinates	Easting: 6492625.465 Northing: 391372.110776453
Slope	Flat
Aspect	
Position	
Soil Texture	Sandy loam
Soil Colour	Pale Brown
Rock Type	
Rock Cover	
Bare Ground	10-25%
Litter	5-10%
Surface Water	
Vegetation Condition	Good
Weed Cover	10
Disturbance	Grazing
Fire Age Years	



NVIS:

Tall closed woodland of *Eucalyptus marginata* and *Melaleuca preissiana* over tall shrubland of *Adenanthos cygnorum* over mid shrubland of *Kunzea glabrescens*, *Jacksonia furcellata* and *Xanthorrhoea preissii*.

Species	Naturalised	Conservation code	Height	% Cover
<i>Eucalyptus marginata</i>	0		6	15
<i>Melaleuca preissiana</i>	0		4	10
<i>Adenanthos cygnorum</i>	0		2.2	20
<i>Kunzea glabrescens</i>	0		2	2
<i>Jacksonia furcellata</i>	0		1.2	3
<i>Xanthorrhoea preissii</i>	0		0.5	10
<i>Hypocalymma angustifolium</i>	0		0.1	4
<i>Lyginia imberbis</i>	0		0.4	3
<i>Dasypogon obliquifolius</i>	0		0.2	1
<i>Petrophile linearis</i>	0		0.3	3

Quadrat or Releve Number: Q03				
<i>Ehrharta calycina</i>	*		0.2	1
<i>Freesia alba x leichtlinii</i>	*		0.3	1
<i>Briza maxima</i>	*		0.1	2
<i>Gladiolus caryophyllaceus</i>	*		0.1	1
<i>Poranthera microphylla</i>	0		0.1	1
<i>Hibbertia racemosa</i>	0		0.2	1
<i>Stylidium repens</i>	0		0.1	1
<i>Phyllangium divergens</i>	0		0.1	1
<i>Daviesia physodes</i>	0		0.3	1
<i>Ficinia marginata</i>	*		0.1	1
<i>Aira cupaniana</i>	*		0.1	1
<i>Leucopogon polymorphus</i>	0		0.1	1

Quadrat or Releve Number: Q04	
Date: 09/10/25	Project Number: A25.264
Collector: ZL/FO	Photo Number: JPEG_20251008033054242.jp
Coordinates	Easting: 6492171.153 Northing: 391137.1909
Slope	Gentle
Aspect	W
Position	
Soil Texture	Sandy loam
Soil Colour	Grey
Rock Type	
Rock Cover	<1%
Bare Ground	10-25%
Litter	5-10%
Surface Water	
Vegetation Condition	Degraded
Weed Cover	30%
Disturbance	Grazing
Fire Age Years	



NVIS:
Tall shrubland of *Adenanthos cygnorum* over mid shrubland of *Kunzea glabrescens* and open hermland of *Pelargonium capitatum* and *Gladiolus caryophyllaceus* over low grassland of *Ehrharta calycina*, isolated herbs of *Ursinia anthemoides* and isolated shrubs of *Hibbertia racemosa*.

Species	Naturalised	Conservation code	Height	% Cover
<i>Adenanthos cygnorum</i>	0		2	40
<i>Kunzea glabrescens</i>	0		1.8	2
<i>Pelargonium capitatum</i>	*		1	2
<i>Gladiolus caryophyllaceus</i>	*		0.7	1
<i>Ehrharta calycina</i>	*		0.7	25
<i>Hibbertia racemosa</i>	0		0.2	1
<i>Ursinia anthemoides</i>	*		0.1	1
<i>Patersonia occidentalis</i>	0		0.2	1
<i>Hypochaeris glabra</i>	*		0.1	1
<i>Pentaschistis airoides</i>	*		0.1	1

Quadrat or Releve Number: Q04

<i>Scholtzia involucrata</i>	0	0.2	1
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<i>Crassula colorata</i>	0	0.1	1
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<i>Wahlenbergia capensis</i>	*	0.1	1
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Quadrat or Releve Number: Q05	
Date: 09/10/25	Project Number: A25.264
Collector: ZL/FO	Photo Number: JPEG_20251008042130446.jp
Coordinates	Easting: 6492181.828 Northing: 391230.6192
Slope	Gentle
Aspect	W
Position	
Soil Texture	Sandy loam
Soil Colour	Grey
Rock Type	
Rock Cover	<1%
Bare Ground	25-50%
Litter	1-5%
Surface Water	
Vegetation Condition	Degraded
Weed Cover	60
Disturbance	Grazing
Fire Age Years	



NVIS:
Tall closed shrubland of *Adenanthos cygnorum* with isolated trees of *Banksia menziesii* over mid grassland of **Briza maxima*, **Ehrharta calycina* and **Avena barbata*.

Species	Naturalised	Conservation code	Height	% Cover
<i>Adenanthos cygnorum</i>	0		2	30
<i>Banksia menziesii</i>	0		1	1
<i>Gladiolus caryophyllaceus</i>	*		1	1
<i>Ehrharta calycina</i>	*			1
<i>Avena barbata</i>	*			1
<i>Bromus diandrus</i>	*		0.5	1
<i>Briza maxima</i>	*		0.2	10
<i>Carpobrotus edulis</i>	*		0.1	1
<i>Ursinia anthemoides</i>	*		0.1	1
<i>Wahlenbergia capensis</i>	*		0.1	1

Quadrat or Releve Number: Q05				
<i>Haemodorum spicatum</i>	0		0.1	1
<i>Asparagus asparagoides</i>	*		0.1	1
<i>Hypochaeris glabra</i>	*		0.1	1
<i>Nuytsia floribunda</i>	0		0.1	1

Quadrat or Releve Number: Q06		
Date: 09/10/25	Project Number: A25.264	
Collector: ZL/FO	Photo Number: JPEG_20251008053227909.jp	
Coordinates	Easting: 6492210.577	Northing: 391426.2091
Slope	Flat	
Aspect		
Position		
Soil Texture	Sandy loam	
Soil Colour	Grey	
Rock Type		
Rock Cover	<1%	
Bare Ground	5-10%	
Litter	10-25%	
Surface Water		
Vegetation Condition	Good	NVIS: Tall closed woodland of <i>Eucalyptus tottiana</i>, <i>Banksia attenuata</i> and <i>Banksia menziesii</i> over mid open woodland of <i>Jacksonia furcellata</i>, <i>Acacia pulchella</i> var. <i>pulchella</i> and <i>Nuytsia floribunda</i> over low isolated shrubs of <i>Hypocalymma robustum</i> and isolated herbs of <i>Freesia alba x leichtlinii</i> and <i>Patersonia occidentalis</i>.
Weed Cover	30	
Disturbance	Grazing	
Fire Age Years		



Species	Naturalised	Conservation code	Height	% Cover
<i>Eucalyptus tottiana</i>	0		7	10
<i>Banksia attenuata</i>	0		1.5	7
<i>Banksia menziesii</i>	0		2.2	5
<i>Jacksonia furcellata</i>	0		0.5	3
<i>Nuytsia floribunda</i>	0		0.7	2
<i>Hypocalymma robustum</i>	0		0.5	2
<i>Freesia alba x leichtlinii</i>	*		0.1	7
<i>Patersonia occidentalis</i>	0		0.2	1
<i>Burchardia umbellata</i>	0		0.3	1
<i>Acacia pulchella</i> var. <i>pulchella</i>	M		0.2	2

Quadrat or Releve Number: Q06				
<i>Ehrharta calycina</i>	*		0.2	2
<i>Gladiolus caryophyllaceus</i>	*		<0.1	4
<i>Wahlenbergia capensis</i>	*		0.5	1
<i>Briza maxima</i>	*		05	4
<i>Ursinia anthemoides</i>	*			
<i>Haemodorum spicatum</i>	0			
<i>Gompholobium tomentosum</i>	0			
<i>Alexgeorgea nitens</i>	0			
<i>Burchardia congesta</i>	0			
<i>Desmocladius flexuosus</i>	0			

Quadrat or Releve Number: REL01		
Date: 09/10/25	Project Number: A25.264	
Collector: ZL/FO	Photo Number: JPEG_20251009034202342.jpg	
Coordinates	Easting: 6492481.771	Northing: 391284.435
Slope	Gentle	
Aspect		
Position	Lower slope	
Soil Texture	Sand	
Soil Colour	Pale grey	
Rock Type		
Rock Cover		
Bare Ground		
Litter	1-5%	
Surface Water		
Vegetation Condition	Good	
Weed Cover	10%	
Disturbance	grazing	
Fire Age Years	>10	



Species	Naturalised	Conservation code	Height	% Cover
<i>Banksia attenuata</i>	0			
<i>Banksia menziesii</i>	0			
<i>Beaufortia bracteosa</i>	0			
<i>Jacksonia furcellata</i>	0			
<i>Boronia purdieana</i> subsp. <i>purdieana</i>	0			
<i>Philothea spicata</i>	0			
<i>Macrozamia riedlei</i>	0			
<i>Gastrolobium linearifolium</i>	0			
<i>Stirlingia latifolia</i>	0			
<i>Jacksonia floribunda</i>	0			

Quadrat or Releve Number: REL01

Lyginia barbata 0

Carpobrotus edulis *

Burchardia umbellata 0

Freesia alba x leichtlinii *

Ehrharta calycina *

Leontodon rhagadioloides *

Quadrat or Releve Number: REL02		
Date: 09/10/25	Project Number: A25.264	
Collector: ZL/FO	Photo Number: JPEG_20251009035338190.jpg	
Coordinates	Easting: 6492380.079	Northing: 391268.3446
Slope	Flat	
Aspect		
Position		
Soil Texture	Sand	
Soil Colour	Pale grey	
Rock Type		
Rock Cover		
Bare Ground	1-5%	
Litter		
Surface Water		
Vegetation Condition	Completely Degraded	
Weed Cover		
Disturbance		
Fire Age Years		



Species	Naturalised	Conservation code	Height	% Cover
<i>Eucalyptus marginata</i>	0			
<i>Xanthorrhoea preissii</i>	0			
<i>Macrozamia riedlei</i>	0			
<i>Jacksonia floribunda</i>	0			
<i>Petrophile linearis</i>	0			
<i>Conostylis aculeata subsp. cygnorum</i>	0			
<i>Hibbertia hypericoides</i>	0			
<i>Freesia alba x leichtlinii</i>	*			
<i>Ehrharta calycina</i>	*			
<i>Erodium cicutarium</i>	*			
<i>Wahlenbergia capensis</i>	*			



Quadrat or Releve Number: REL02

Carpobrotus edulis

*

Ornithopus compressus

*

Quadrat or Releve Number: REL03	
Date:09/10/25	Project Number: A25.264
Collector: DR/ZL	Photo Number: JPEG_20251009030951844.jpg
Coordinates	Easting: 6492301.129 Northing: 391207.8446
Slope	Flat
Aspect	
Position	
Soil Texture	Sand
Soil Colour	Pale grey
Rock Type	
Rock Cover	
Bare Ground	1-5%
Litter	
Surface Water	
Vegetation Condition	Completely Degraded
Weed Cover	
Disturbance	
Fire Age Years	



Species	Naturalised	Conservation code	Height	% Cover
<i>Nuytsia floribunda</i>	0			
<i>Xanthorrhoea preissii</i>	0			
<i>Patersonia occidentalis</i>	0			
<i>Hypocalymma robustum</i>	0			
<i>Asparagus asparagoides</i>	*			
<i>Ehrharta calycina</i>	*			
<i>Ehrharta longiflora</i>	*			
<i>Hibbertia hypericoides</i>	0			
<i>Dianella revoluta</i>	0			
<i>Wahlenbergia capensis</i>	*			



Quadrat or Releve Number: REL03

Desmocladius flexuosus 0

<i>Conostephium pendulum</i>	0				
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Scholtzia involucrata 0

Appendix E

Site x Species Matrix

Family	Full Taxon	Naturalised	Conservation code	Q01	Q02	Q03	Q04	Q05	Q06	OPPO	REL01	REL02	REL03
Fabaceae	Acacia pulchella var. pulchella	M		0	0	0	0	0	1	0	0	0	0
Proteaceae	Adenanthos cygnorum	0		1	1	1	1	1	0	0	0	0	0
Poaceae	Aira cupaniana	*		0	0	1	0	0	0	0	0	0	0
Restionaceae	Alexgeorgea nitens	0		0	0	0	0	0	1	0	0	0	0
Casuarinaceae	Allocasuarina humilis	0		0	0	0	0	0	0	1	0	0	0
Asparagaceae	Asparagus asparagoides	*		0	1	0	0	1	0	0	0	0	1
Poaceae	Avena barbata	*		0	0	0	0	1	0	0	0	0	0
Proteaceae	Banksia attenuata	0		1	1	0	0	0	1	0	1	0	0
Proteaceae	Banksia menziesii	0		0	0	0	0	1	1	0	1	0	1
Myrtaceae	Beaufortia bracteosa	0		0	0	0	0	0	0	0	1	0	0
Rutaceae	Boronia purdieana subsp. purdieana	0		0	0	0	0	0	0	0	1	0	0
Poaceae	Briza maxima	*		1	1	1	0	1	1	0	0	0	0
Poaceae	Bromus diandrus	*		0	0	0	0	1	0	0	0	0	0
Colchicaceae	Burchardia congesta	0		0	0	0	0	0	1	0	0	0	0
Colchicaceae	Burchardia umbellata	0		0	0	0	0	0	1	0	1	0	0
Aizoaceae	Carpobrotus edulis	*		0	0	0	0	1	0	0	1	1	0
Hemerocallidaceae	Chamaescilla corymbosa	0		0	1	0	0	0	0	0	0	0	0
Ericaceae	Conostephium pendulum	0		0	0	0	0	0	0	0	0	0	1
Haemodoraceae	Conostylis aculeata subsp. cygnorum	0		0	0	0	0	0	0	0	0	1	0
Crassulaceae	Crassula colorata	0		0	0	0	1	0	0	0	0	0	0

Family	Full Taxon	Naturalised	Conservation code	Q01	Q02	Q03	Q04	Q05	Q06	OPPO	REL01	REL02	REL03
Goodeniaceae	Dampiera linearis	0		0	1	0	0	0	0	0	0	0	0
Dasypogonaceae	Dasypogon bromeliifolius	0		1	0	0	0	0	0	0	0	0	0
Dasypogonaceae	Dasypogon obliquifolius	0		0	1	1	0	0	0	0	0	0	0
Fabaceae	Daviesia physodes	0		0	0	1	0	0	0	0	0	0	0
Restionaceae	Desmocladus flexuosus	0		0	0	0	0	0	1	0	0	0	1
Hemerocallidaceae	Dianella revoluta	0		0	1	0	0	0	0	0	0	0	1
Droseraceae	Drosera erythrorhiza	0		1	0	0	0	0	0	0	0	0	0
Poaceae	Ehrharta brevifolia	*		1	0	0	0	0	0	0	0	0	0
Poaceae	Ehrharta calycina	*		1	1	1	1	1	1	0	1	1	1
Poaceae	Ehrharta longiflora	*		0	1	0	0	0	0	0	0	0	1
Geraniaceae	Erodium cicutarium	*		0	0	0	0	0	0	0	0	1	0
Myrtaceae	Eucalyptus marginata	0		1	0	1	0	0	0	0	0	1	0
Myrtaceae	Eucalyptus tottiana	0		0	0	0	0	0	1	0	0	0	1
Cyperaceae	Ficinia marginata	*		0	0	1	0	0	0	0	0	0	0
Iridaceae	Freesia alba x leichtlinii	*		1	1	1	0	0	1	0	1	1	0
Fabaceae	Gastrolobium linearifolium	0		0	0	0	0	0	0	0	1	0	0
Iridaceae	Gladiolus caryophyllaceus	*		0	1	1	1	1	1	0	0	0	0
Fabaceae	Gompholobium tomentosum	0		0	0	0	0	0	1	0	0	0	0
Haemodoraceae	Haemodorum spicatum	0		0	0	0	0	1	1	0	0	0	0
Dilleniaceae	Hibbertia hypericoides	0		0	0	0	0	0	0	1	0	1	1
Dilleniaceae	Hibbertia racemosa	0		0	1	1	1	0	0	0	0	0	0

Family	Full Taxon	Naturalised	Conservation code	Q01	Q02	Q03	Q04	Q05	Q06	OPPO	REL01	REL02	REL03
Dilleniaceae	Hibbertia vaginata	0		1	0	0	0	0	0	0	0	0	0
Myrtaceae	Hypocalymma angustifolium	0		0	1	1	0	0	0	0	0	0	0
Myrtaceae	Hypocalymma robustum	0		0	0	0	0	0	1	0	0	0	1
Asteraceae	Hypochaeris glabra	*		0	1	0	1	1	0	0	0	0	0
Fabaceae	Jacksonia floribunda	0		1	0	0	0	0	0	1	1	1	0
Fabaceae	Jacksonia furcellata	0		0	0	1	0	0	1	0	1	0	0
Myrtaceae	Kunzea glabrescens	0		1	1	1	1	0	0	0	0	0	0
Asteraceae	Leontodon rhagadioloides	*		0	0	0	0	0	0	0	1	0	0
Cyperaceae	Lepidosperma calcicola	0		1	1	0	0	0	0	0	0	0	0
Ericaceae	Leucopogon polymorphus	0		0	0	1	0	0	0	0	0	0	0
Stylidiaceae	Levenhookia pusilla	0		0	1	0	0	0	0	0	0	0	0
Asparagaceae	Lomandra caespitosa	0		1	0	0	0	0	0	0	0	0	0
Asparagaceae	Lomandra sericea	0		1	1	0	0	0	0	0	0	0	0
Anarthriaceae	Lyginia barbata	0		0	0	0	0	0	0	0	1	0	0
Anarthriaceae	Lyginia imberbis	0		0	1	1	0	0	0	0	0	0	0
Zamiaceae	Macrozamia riedlei	0		0	0	0	0	0	0	0	1	1	0
Myrtaceae	Melaleuca preissiana	0		0	1	1	0	0	0	0	0	0	0
Myrtaceae	Melaleuca seriata	0		0	0	0	0	0	0	1	0	0	0
Loranthaceae	Nuytsia floribunda	0		0	0	0	0	1	1	0	0	0	1
Fabaceae	Ornithopus compressus	*		0	0	0	0	0	0	0	0	1	0
Iridaceae	Patersonia occidentalis	0		1	1	0	1	0	1	0	0	0	1

Family	Full Taxon	Naturalised	Conservation code	Q01	Q02	Q03	Q04	Q05	Q06	OPPO	REL01	REL02	REL03
Geraniaceae	Pelargonium capitatum	*		0	0	0	1	0	0	0	0	0	0
Poaceae	Pentaschistis airoides	*		0	0	0	1	0	0	0	0	0	0
Proteaceae	Petrophile linearis	0		0	0	1	0	0	0	0	0	1	0
Rutaceae	Philotheca spicata	0		0	0	0	0	0	0	0	1	0	0
Haemodoraceae	Phlebocarya ciliata	0		1	0	0	0	0	0	0	0	0	0
Loganiaceae	Phyllangium divergens	0		0	0	1	0	0	0	0	0	0	0
Pinaceae	Pinus radiata	*		0	1	0	0	0	0	0	0	0	0
Phyllanthaceae	Poranthera microphylla	0		0	0	1	0	0	0	0	0	0	0
Amaranthaceae	Ptilotus obovatus	0		0	1	0	0	0	0	0	0	0	0
Asteraceae	Rhodanthe citrina	0		0	1	0	0	0	0	0	0	0	0
Myrtaceae	Scholtzia involucrata	0		0	1	0	1	0	0	0	0	0	1
Proteaceae	Stirlingia latifolia	0		0	0	0	0	0	0	1	1	0	0
Stylidiaceae	Stylidium repens	0		0	0	1	0	0	0	0	0	0	0
Asteraceae	Ursinia anthemoides	*		0	1	0	1	1	1	0	0	0	0
Campanulaceae	Wahlenbergia capensis	*		1	0	0	1	1	1	0	0	1	1
Xanthorrhoeaceae	Xanthorrhoea preissii	0		1	1	1	0	0	0	0	0	1	1

Appendix F

Floristic Analysis Report

14 April 2026

Zirui Lin
Environmental Consultant
Western Environmental
3/1209 Hay St
West Perth Western Australia 6005

Dear Zirui,

Plantecology Consulting was commissioned to undertake the numerical analysis and assignment of plot data to existing Floristic Community Types of the Swan Coastal Plain for a site in Neaves Rd, Mariginiup. The methods and results outlined below are based on the data as supplied on the 10th April 2026.

1 Introduction

The remnant vegetation of the southern Swan Coastal Plain (SCP) was surveyed by Gibson et al. (1994) to provide an understanding of the major floristic gradients across the region. The major plant communities (or FCTs) were defined by classifying the data according to the similarities in species composition between plots. When determining the FCT of a new record, a floristic analysis of species composition provides the most robust method that is consistent with the original classification. Presently, a single consistent method for the determination of FCTs for vegetation data in the Swan Coastal Plain is not available. Therefore, it is preferable to use multiple methods and compare the output for the most likely result. The methods used are those outlined in *Methods for Survey and Identification of Western Australian Threatened Ecological Communities* (DBCA 2024) being FCT assignment using the Gibson et al. (1994) and Keighery et al. (2012) datasets, and assignment by the minimum dissimilarity between the Neaves Rd plots and plots from the two regional datasets (nearest neighbour). All analyses described below were undertaken using R packages Cluster (Maechler et al 2019), Vegclust (De Cáceres et al. 2010) and Vegan (Oksanen et al. 2020).

2 Methods

2.1. Hierarchical Clustering Assignments

Hierarchical agglomerative clustering is the usual first stage in classifying vegetation data into community types. This involves calculating the similarity (or more often, the dissimilarity) between plots within the dataset and then sequentially fusing the plots into groups according to their similarity. This type of method was used in the analysis of the original Swan Coastal Plain dataset (Gibson et al. 1994) and to determine the conservation status of additional plots, data is often added to the original dataset and the analysis re-run (Environmental Protection Authority 2016). The direct use of the original dataset as the basis for assigning new plot data to the regional classification has some drawbacks, however. First, a hierarchical clustering only applies to the relationships between plots, and the relative distances between them, within that particular dataset. The addition of new data often alters the relative cophenetic distances and disrupts the clustering output. Second, as an unsupervised method, hierarchical clustering does not define rules for the membership of the defined groups, and so the addition of new plots requires the rebuilding of the entire hierarchy (De Cáceres and Wiser 2012).

The data for the Swan Coastal Plain regional survey (Gibson et al. 1994) and that of Keighery et al. (2012) was downloaded from the NatureMap website. The current Gibson et al. (1994) dataset has

been modified from that of the original survey with the removal of one site (OATES-1), resulting in a dataset of 508 plots. The Keighery et al. (2012) dataset is a compilation of data from a number of floristic studies and extended the Gibson et al. (1994) dataset. The composite dataset used in this analysis was that curated on the NatureMap website as of 2015. Notwithstanding the proviso in Keighery et al. (2012) that the composite dataset should not be used for FCT analyses, it can be useful when assigning new plot data that are potentially from FCT that were under-sampled in the Gibson et al. (1994) survey e.g. FCT 14 and FCT 18.

The species nomenclature of the datasets was updated to be consistent with current usage. Where original names could not be matched clearly to the updated usage, those taxa were removed from the analysis. Intraspecies ranks were raised to species level when no matching rank had been used in the original datasets. Taxa that could not be identified to species level in the Neaves Rd dataset were removed.

The new data from the Neaves Rd survey was added to both Swan Coastal Plain datasets one plot at a time and the new dataset was then analysed using the Bray-Curtis distance coefficient (or resemblance measure) and the flexible UPMGA linkage method ($\beta = -0.1$), which is that used in the PATN package and used for the original Gibson et al. (1994) analysis. Assignment of the Neaves Rd plots was to the nearest distinct group by inspection of the resulting dendrogram.

In practice, there is often less similarity between a new plot and the plots of the FCT to which it is assigned than between the original plots themselves. That is, new plots are usually most similar to fringing members of the original group.

2.2. Nearest Neighbour

The nearest neighbour assignment method uses the minimum Bray-Curtis distance between a new plot and a plot from the original dataset. The comparison of individual samples is seldom useful as new plots are rarely similar to diagnostic plots from the original FCT classification. More often, the nearest neighbour is a fringe member of a FCT and may not be a 'near' neighbour, which regularly leads to misclassifications. Assignments to the nearest group (as in the clustering methods described above) are more robust.

3 Results

The results of the cluster assignments for the Neaves Rd plots indicate that FCT 21c 'Low-lying *Banksia attenuata* woodlands or shrublands' is present within the site. When using the Gibson et al. (1994) dataset, all plots except Q03 were first assigned to a group comprising plots mostly from FCT 21c with a secondary fusion with a mixed group comprising plots from FCT 22 '*Banksia ilicifolia* woodlands'. The result for plot Q03 shows a fusion with a group mostly comprising FCT 11 'Wet forests and woodlands'.

When using the Keighery et al. (2012) dataset, assignments for all plots supported the results from the Gibson et al. (1994) analysis and assigned the plots to FCT 21c. Some similarity can be seen also to FCT 6 'Weed-dominated wetlands on heavy soils', which mostly seen in disturbed sites. Species richness for the Neaves Rd plots ranged from 13 to 27, which is well below the reported average of 40.5 for FCT 21c (Gibson et al. 1994).

The cross tabulation of the Bray Curtis dissimilarities between the Swan Coastal Plain and the Neaves Rd plots is shown on Table 1. The nearest neighbour for plots Q01, Q03 and Q06 was from FCT 21c, while that for plots Q02 and Q04 was from FCT 21a 'Central *Banksia attenuata* – *Eucalyptus marginata* woodlands'. Plot Q05 was assigned to FCT 4 '*Melaleuca preissiana* damplands'.

In determining probable FCTs for most of the Neaves Rd plots, most weight was given to assignments that were consistent between the Gibson et al. (1994) and Keighery et al. (2012) datasets. Therefore, it is most likely that most of the site supports stands of FCT 21c.

Table 1: Bray Curtis dissimilarity values for Neaves Rd and the closest Swan Coastal Plain plots

Swan Coastal Plain Plot (FCT)	Q01	Q02	Q03	Q04	Q05	Q06
AUSTRA_1_21a	0.718					
bold12_24				0.714	0.767	
bold13_24				0.708		
card11_6	0.714				0.730	
Cavs02_21a		0.705		0.702		
Cavs11_21a		0.688				
dian02_4		0.710	0.719		0.714	
ELE07_4			0.750			
ELE21_S09				0.730	0.737	
ELE33_4	0.714					
FL_5_21c						0.667
FL_6_21c				0.731		0.621
low01_21c	0.679					
MELA_5_22	0.684	0.692	0.733			
MOD0_2_21c		0.710	0.684			
MOD0_5_23a	0.701					
perth10_4		0.710	0.719			
pinj14_23a						0.653
SHENT_1_28						0.656
THOM_2_24					0.767	0.662
WIRR_2_23a						0.667
WOODV_2_28					0.767	
YAN_18_22			0.739			
YULE_1_23a				0.743		
Minimum dissimilarity	0.679	0.688	0.684	0.702	0.714	0.621

Table 2: Floristic Community Type assignment summary.

Plot	Assignment to Gibson et al. (1994)	Assignment to Keighery et al. (2012)	Nearest Neighbour	Probable FCT
Q01	21c	21c	21c	21c
Q02	21c	21c	21a	21c
Q03	11	21c	21c	21c
Q04	21c	21c	21a	21c
Q05	21c	21c	4	21c
Q06	21c	21c	21c	21c

4 Discussion

The results of the cluster assignments for the Neaves Rd plots indicate that FCT 21c is present within the site. This result is consistent with the presence of typical species for the type including *Banksia attenuata* and *Lomandra caespitosa*, as well as common species such as *Banksia menziesii*, *Burchardia congesta*, *Dasypogon bromeliifolius*, *Gompholobium tomentosum*, *Kunzea glabrescens*, *Patersonia occidentalis*, *Petrophile linearis*, *Scholtzia involucrata* and *Stylidium repens*.

The assignment of plot Q03 to FCT 11 when using the Gibson et al. (1994) dataset is unlikely to be correct. None of the typical species for the type were recorded and it is more likely that the assignment is due to the low species richness in the plot and the presence of a combination of some species more associated with wetlands such as *Melaleuca preissiana*, *Hypocalymma angustifolium* and *Ficinia marginata*. This result was not supported by the other methods.

FCT 21c is a Priority 3 PEC pursuant to State policy, and may be a part of the EPBC-listed TEC 'Banksia Woodlands of the Swan Coastal Plain' if other criteria such as condition and patch size are met.

5 Conclusion

In summary, the results of the numerical analyses indicate that most of the site supports FCT 21c 'Low-lying *Banksia attenuata* woodlands or shrublands', which is consistent with the species composition of the site.

Should you require any further information or have any other queries, please feel free to contact me.

Sincerely yours,



Dr. Shane Chalwell

Plantecology Consulting

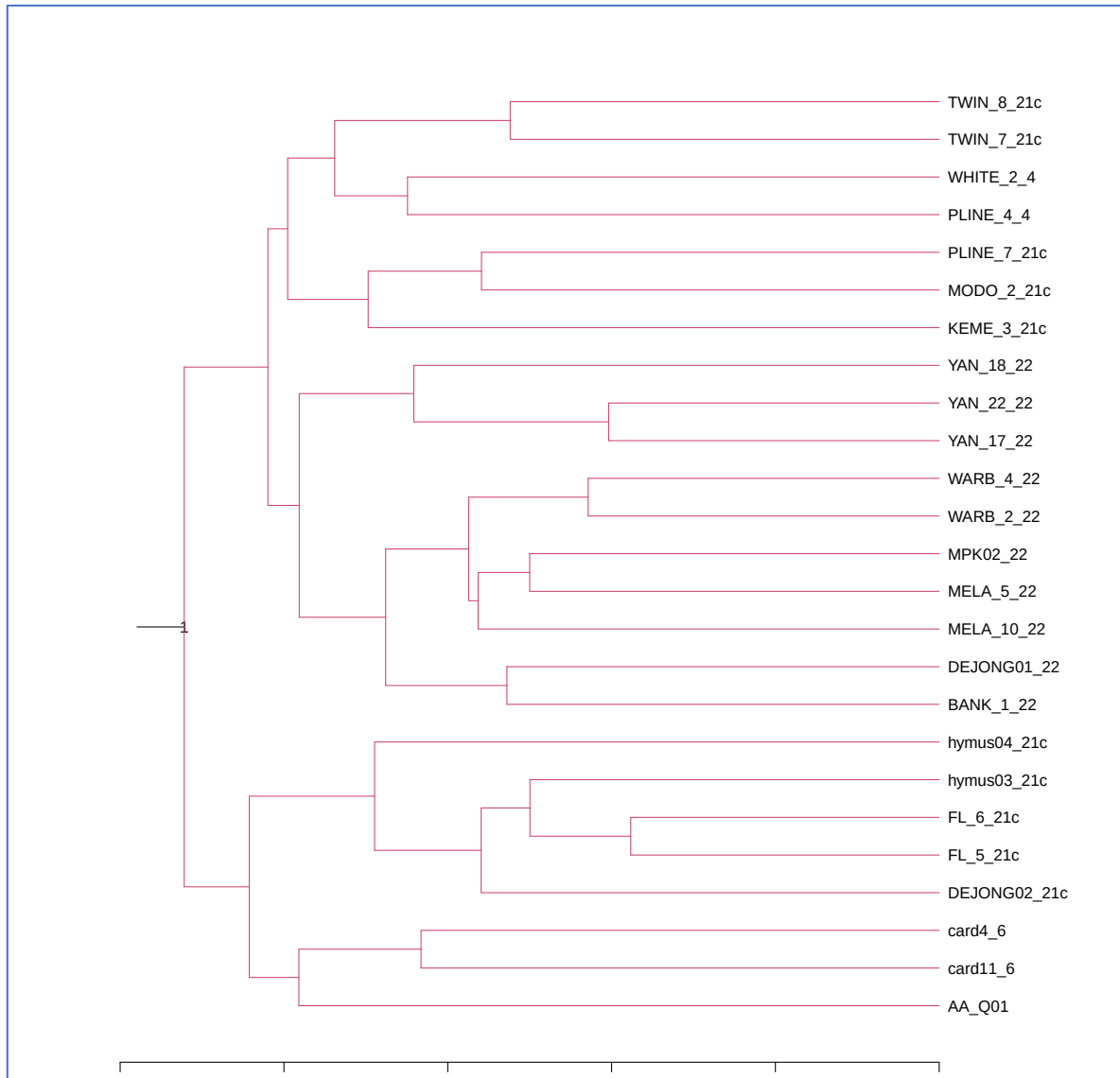


Figure 1: Partial dendrogram for the assignment of Plot Q01 to the Gibson et al. (1994) floristic community types.

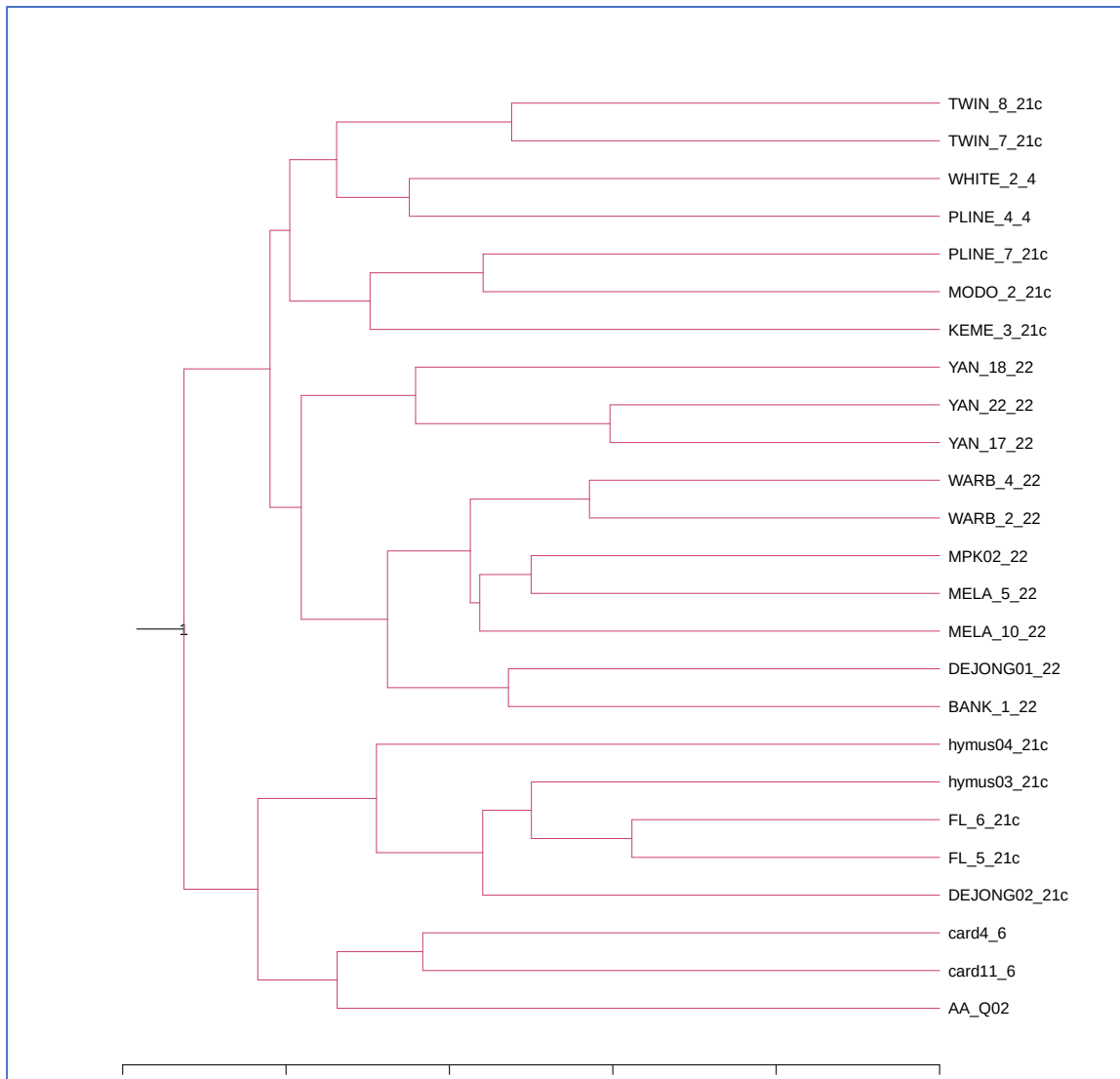


Figure 2: Partial dendrogram for the assignment of Plot Q02 to the Gibson et al. (1994) floristic community types.

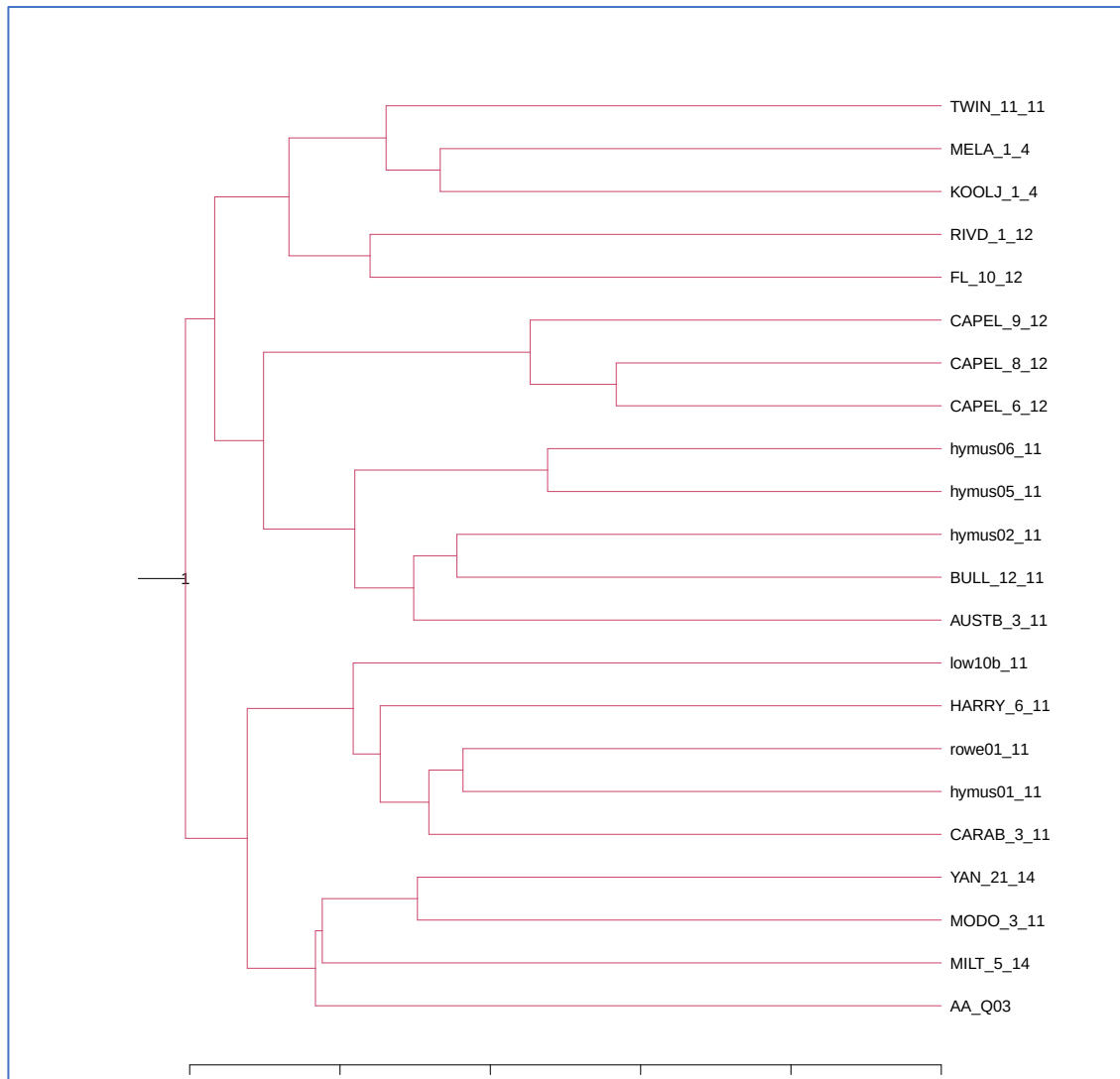


Figure 3: Partial dendrogram for the assignment of Plot Q03 to the Gibson et al. (1994) floristic community types.

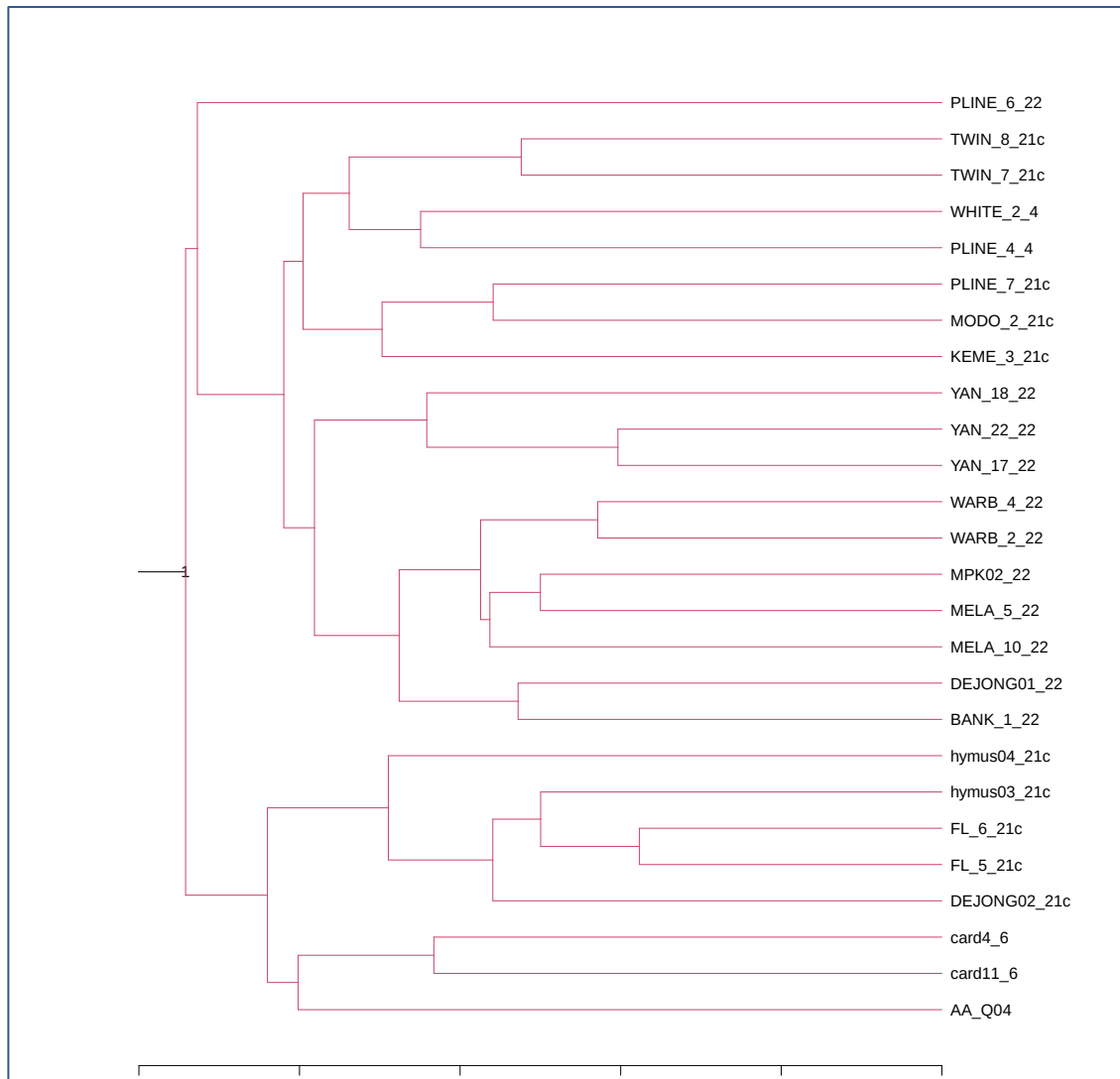


Figure 4: Partial dendrogram for the assignment of Plot Q04 to the Gibson et al. (1994) floristic community types.

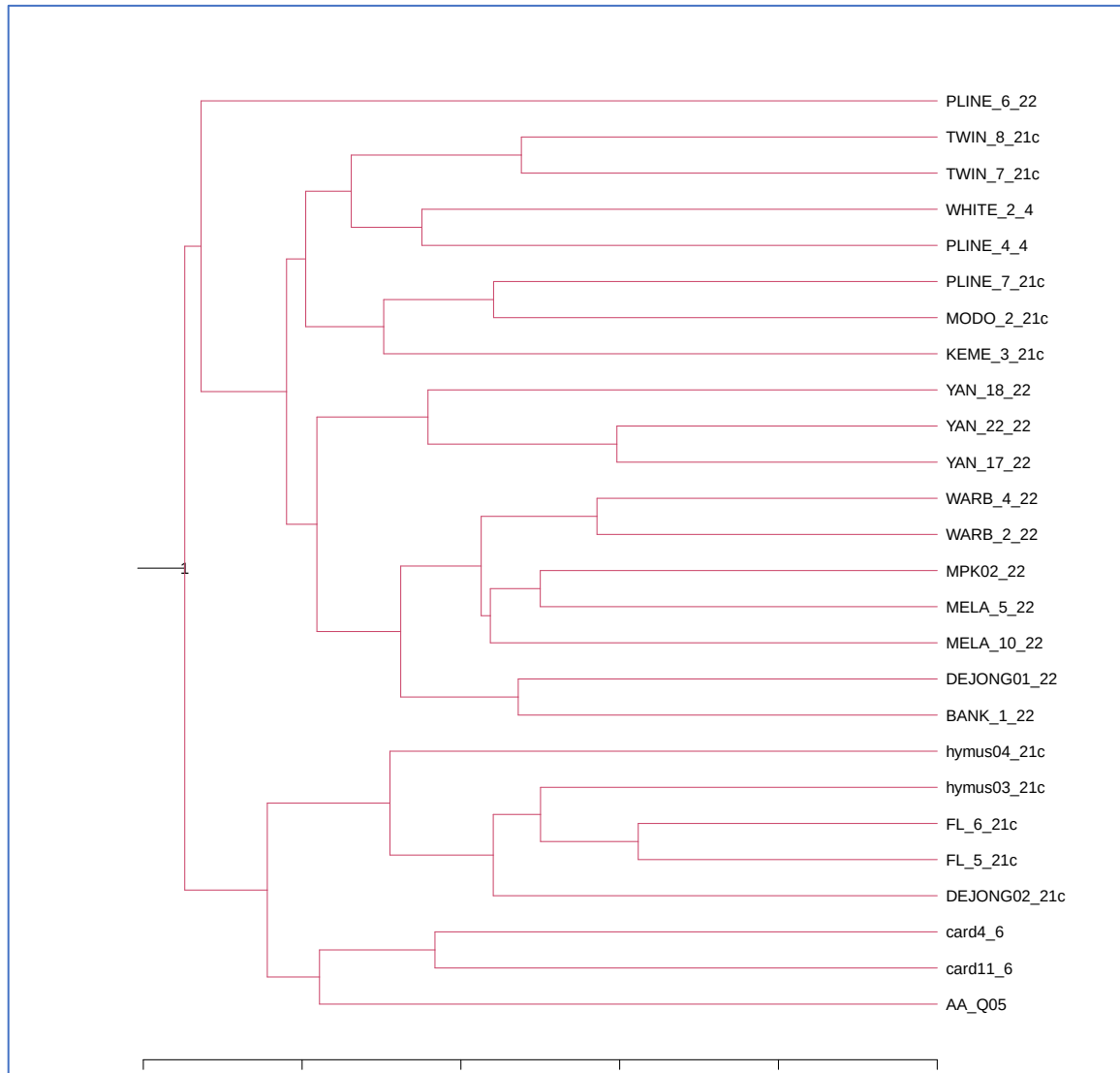


Figure 5: Partial dendrogram for the assignment of Plot Q05 to the Gibson et al. (1994) floristic community types.

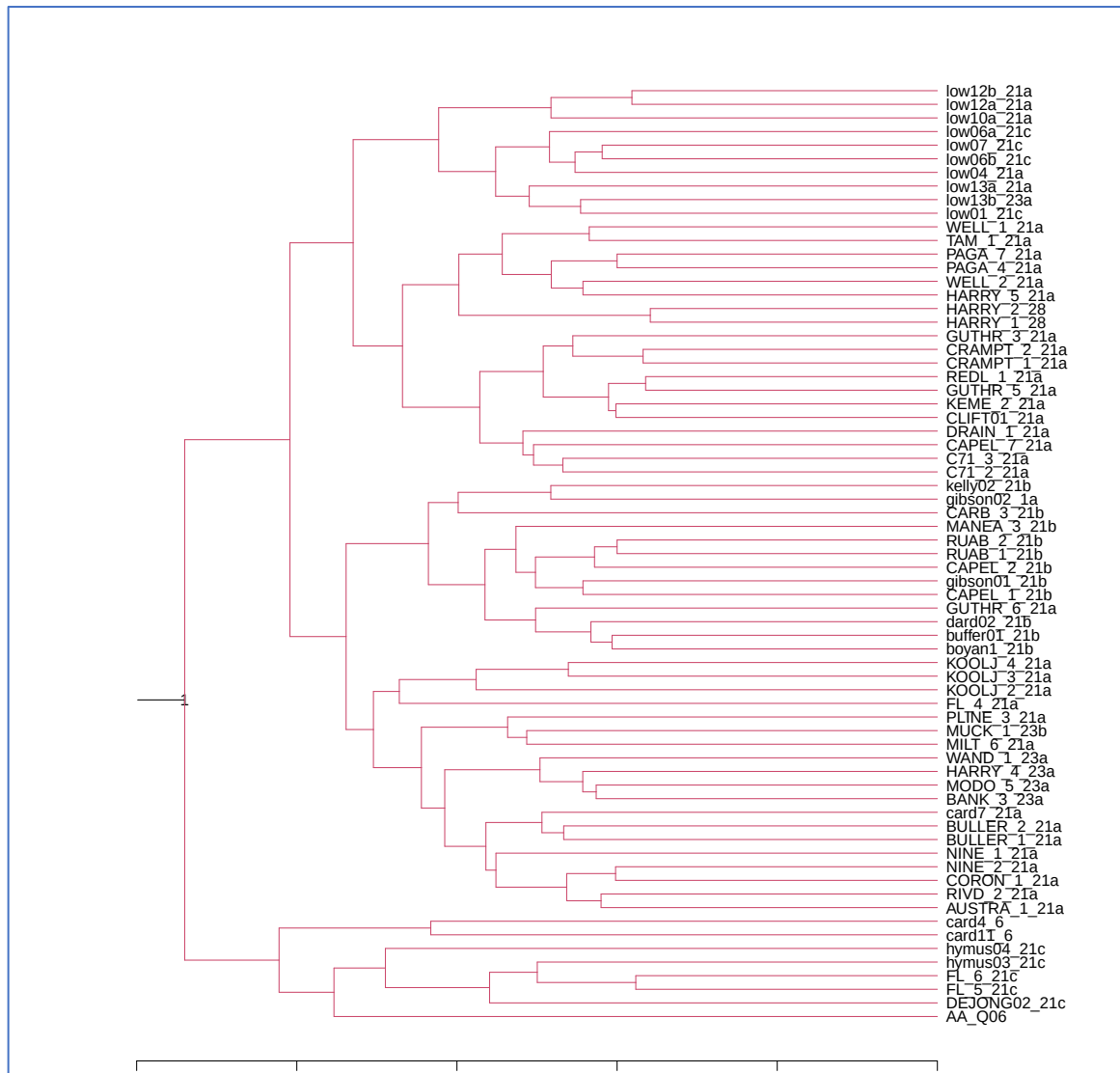


Figure 6: Partial dendrogram for the assignment of Plot Q06 to the Gibson et al. (1994) floristic community types.

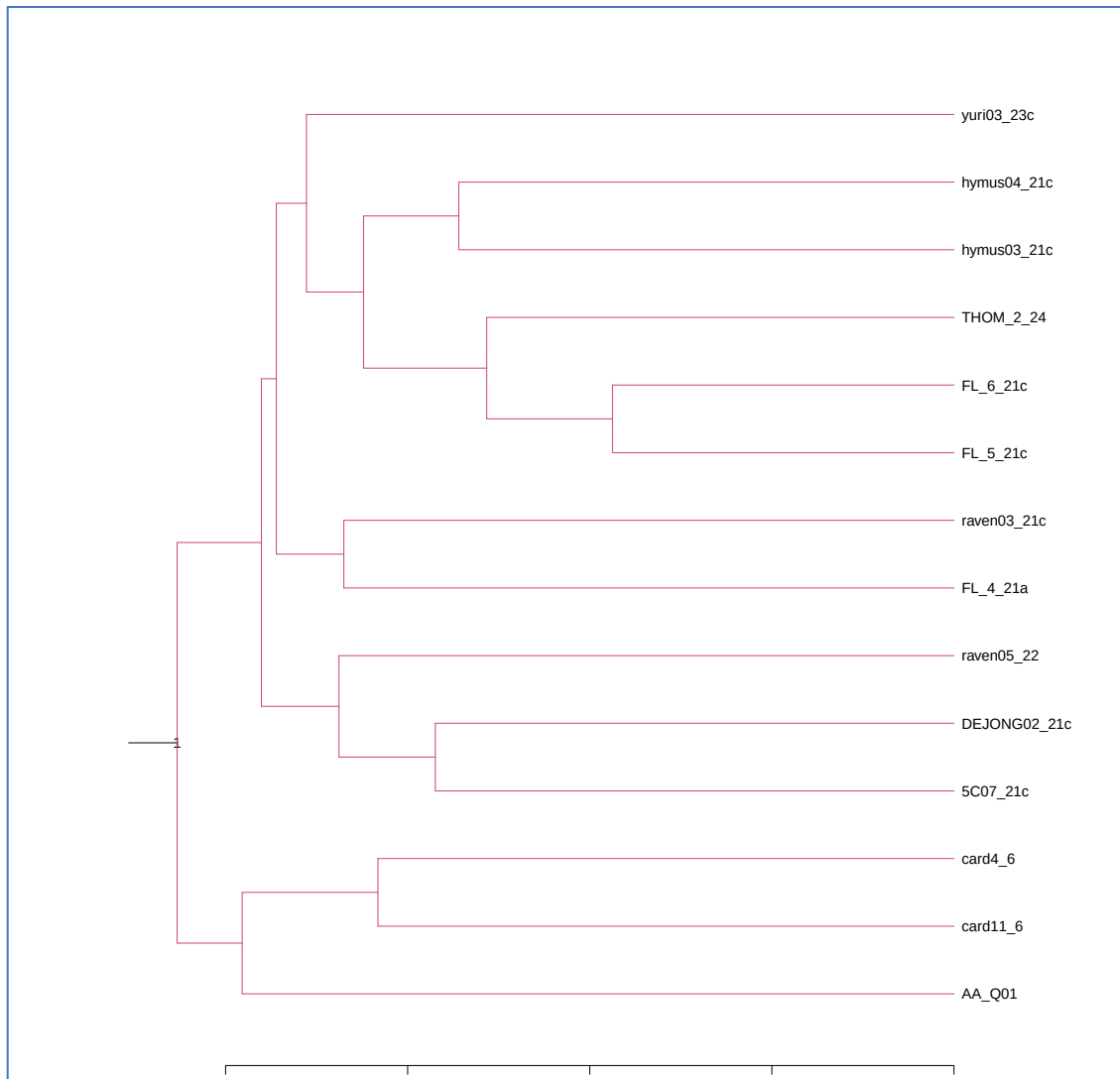


Figure 7: Partial dendrogram for the assignment of Plot Q01 to the Keighery et al. (2012) floristic community types.

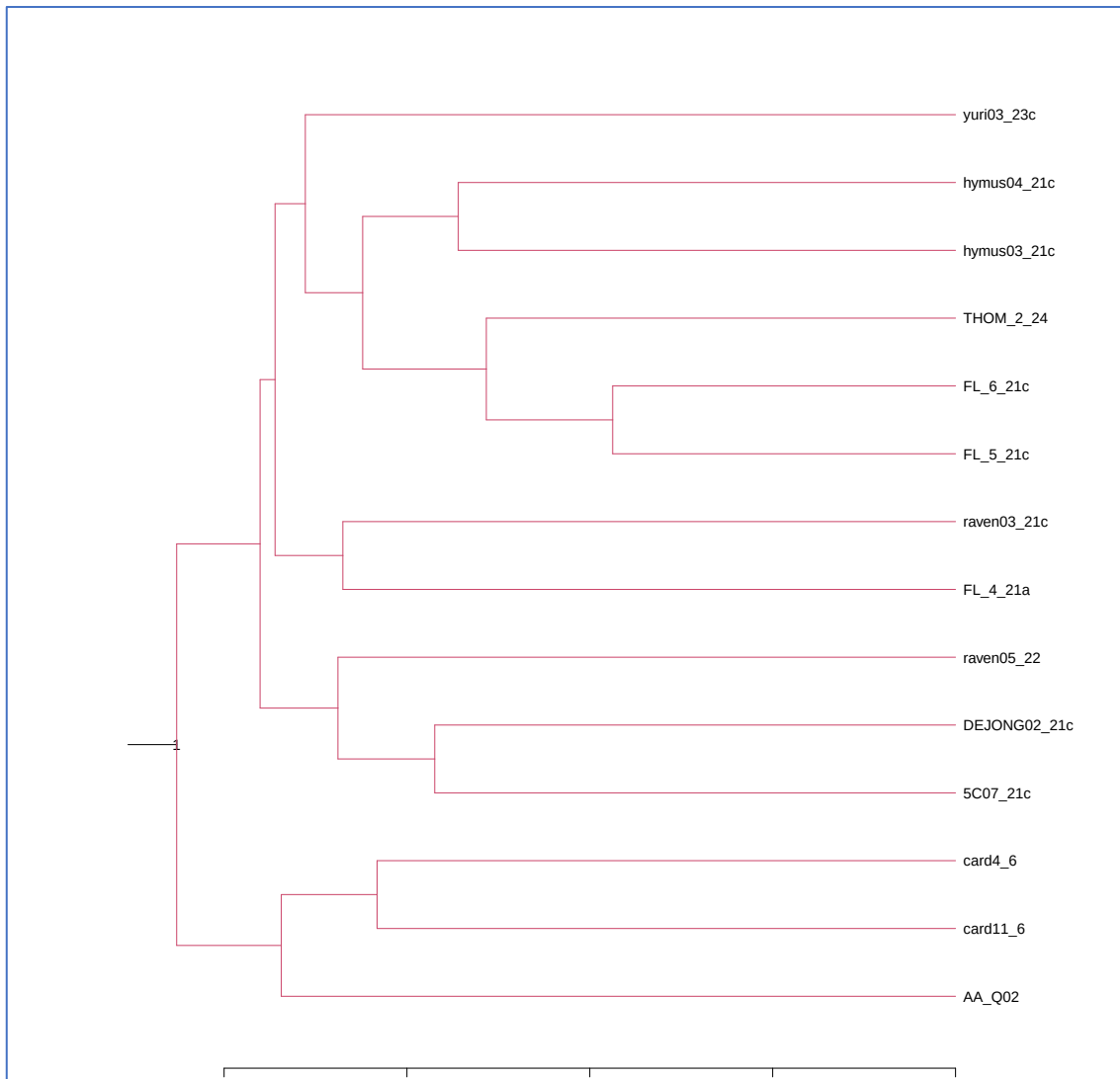


Figure 8: Partial dendrogram for the assignment of Plot Q02 to the Keighery et al. (2012) floristic community types.

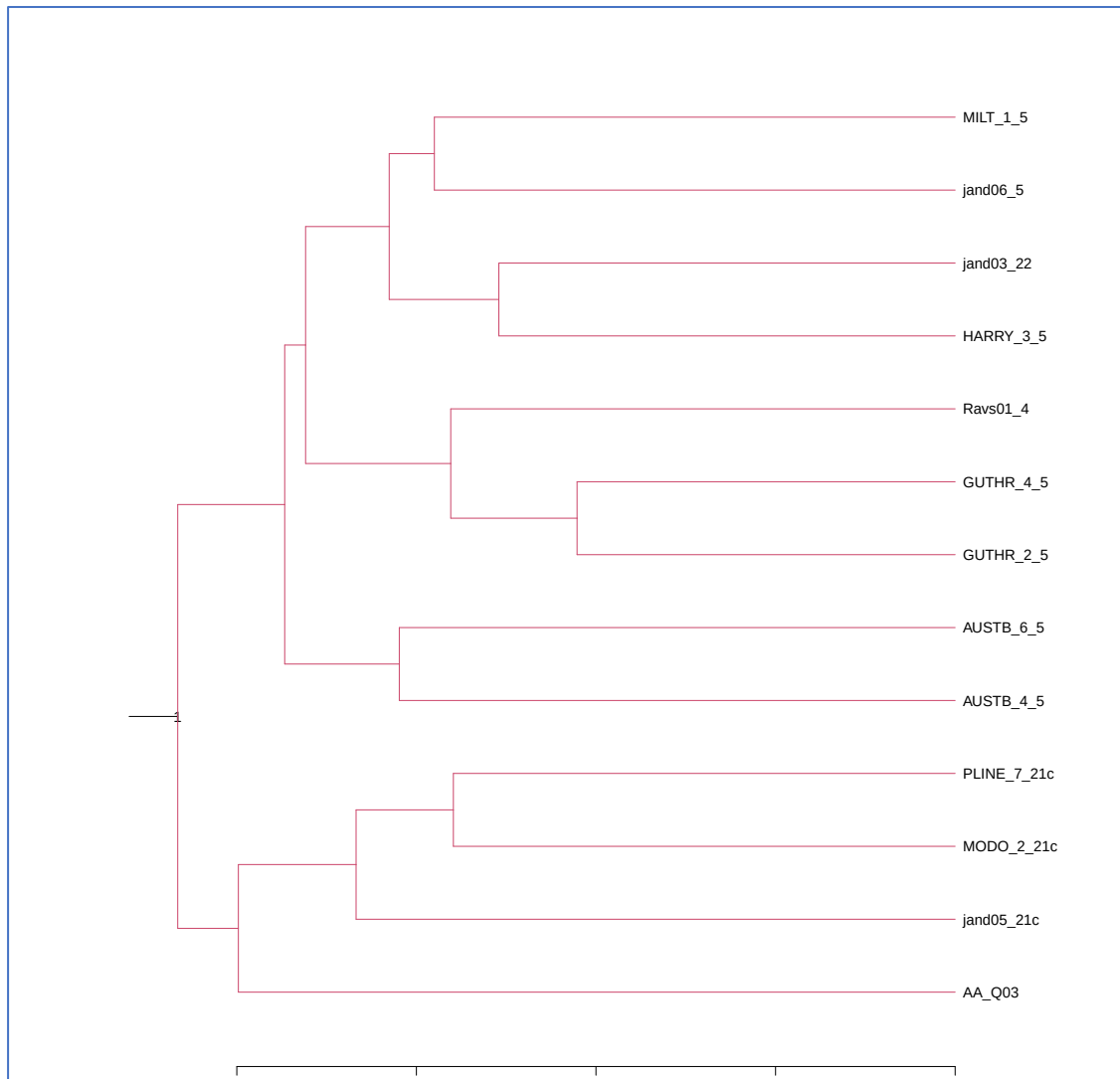


Figure 9: Partial dendrogram for the assignment of Plot Q03 to the Keighery et al. (2012) floristic community types.

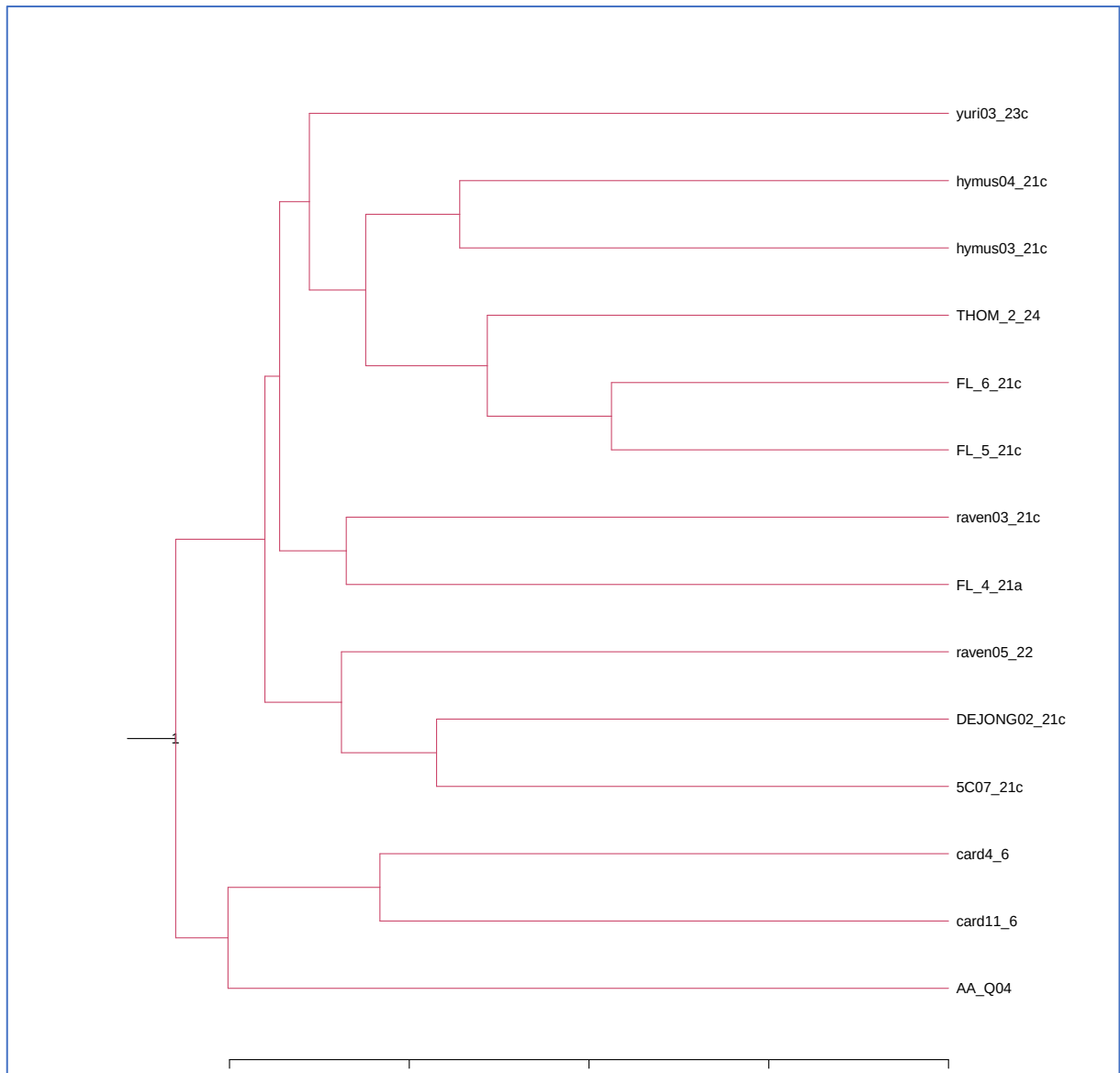


Figure 10: Partial dendrogram for the assignment of Plot Q04 to the Keighery et al. (2012) floristic community types.

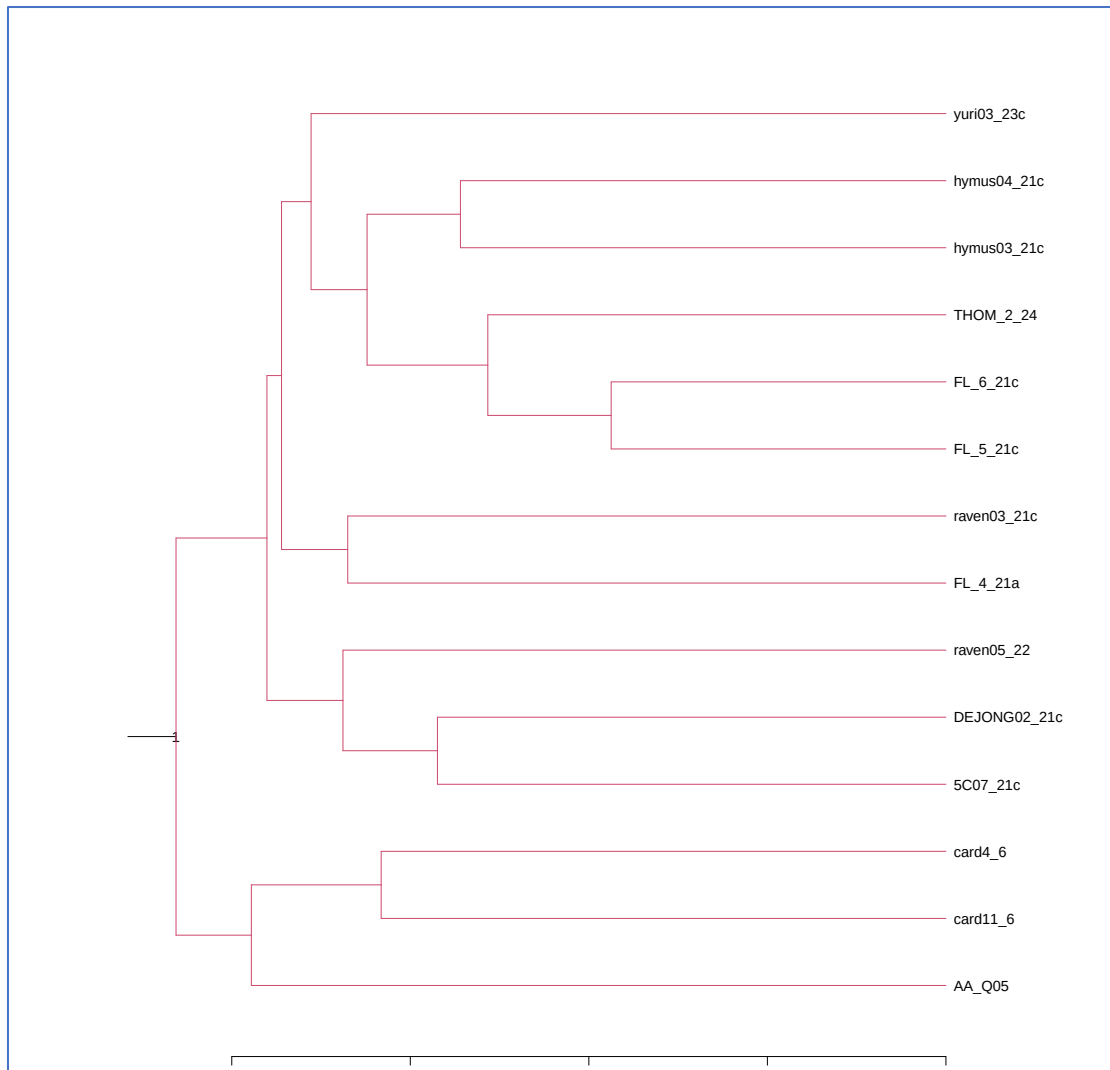


Figure 11: Partial dendrogram for the assignment of Plot Q05 to the Keighery et al. (2012) floristic community types.

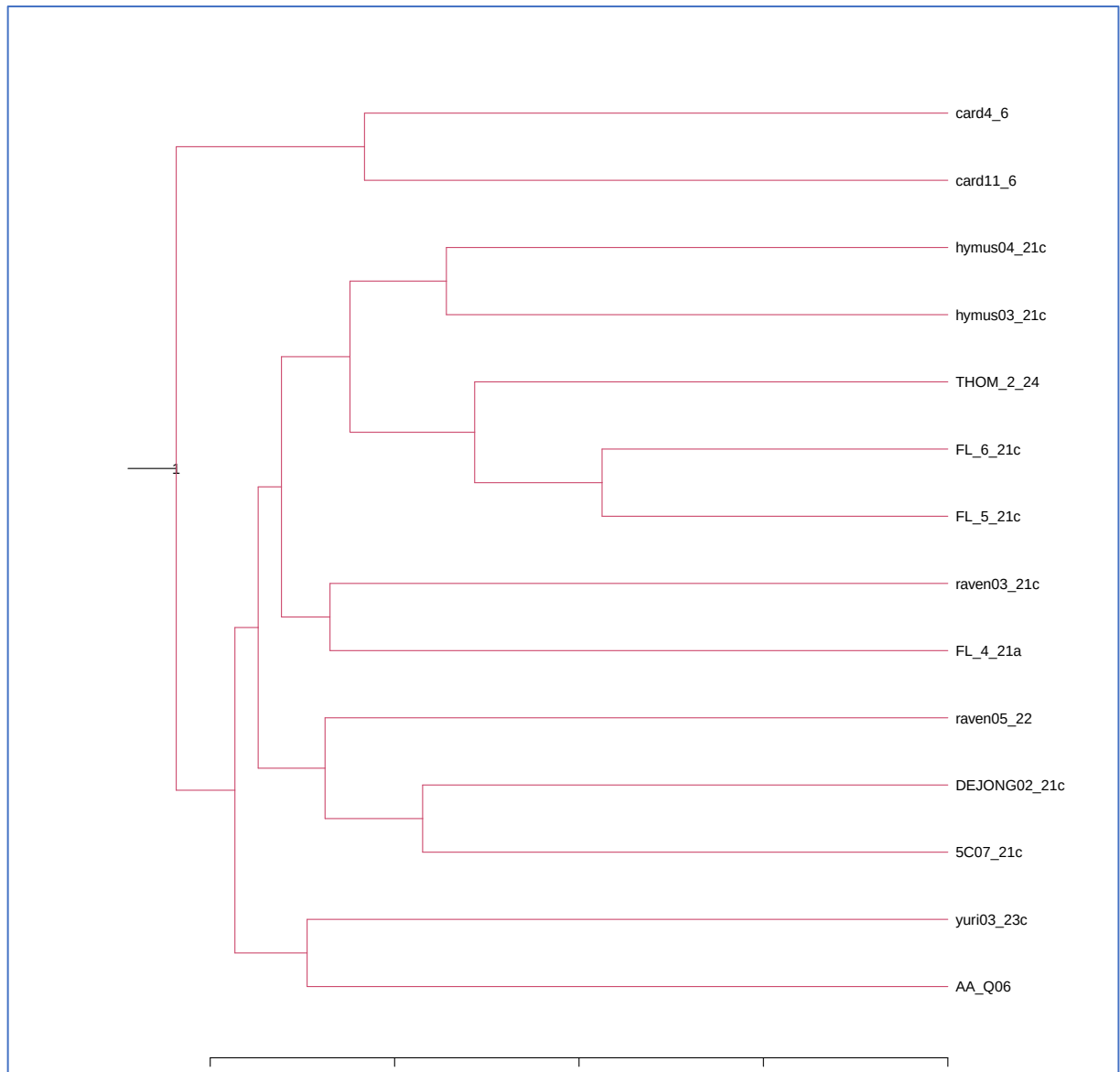


Figure 12: Partial dendrogram for the assignment of Plot Q06 to the Keighery et al. (2012) floristic community types.

6 References

- DBCA (2025) Methods for survey and identification of Western Australian threatened ecological communities, Department of Biodiversity, Conservation and Attractions, Western Australia.
- De Cáceres, M., Font, X., Oliva, F. (2010). *The management of vegetation classifications with fuzzy clustering*. Journal of Vegetation Science. 21: 1138-1151, <https://doi.org/10.1111/j.1654-1103.2010.01211.x>
- De Cáceres, M and Wiser, S.K. (2012) *Towards consistency in vegetation classification*, Journal of Vegetation Science, 23: 387-393.
- Environmental Protection Authority (2016) *Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment*, EPA, Western Australia
- Gibson, N, Keighery, BJ, Keighery, GJ, Burbidge, AH and Lyons, MN (1994), *A floristic survey of the southern Swan Coastal Plain*, Unpublished Report for the Australian Heritage Commission prepared by the Department of Conservation and Land Management and the Conservation Council of Western Australia (Inc), Perth.
- Government of Western Australia (2000) *Bush Forever*, Department of Environmental Protection, Perth
- Keighery, B., Keighery, G., Longman, V.M., and Clarke, K.A. (2012). Weed and native flora quadrat data compiled between 1990 – 1996 for the Southern Swan Coastal Plain. Data compiled for the Departments of Environmental Protection and Conservation and Land Management. Perth.
- Maechler, M., Rousseeuw, P., Struyf, A., Hubert, M., Hornik, K.(2019). *cluster: Cluster Analysis Basics and Extensions*. R package version 2.1.0.
- Oksanen, J., Guillaume Blanchet, F., Friendly, M., Roeland Kindt, Legendre, P., McGlinn, D., Minchin, P.R., O'Hara, R. B., Simpson, G.L., Solymos, P., Stevens, M.H.H., Szoecs, E. and Wagner, H. (2020). *vegan: Community Ecology Package*. R package version 2.5-7. <https://CRAN.R-project.org/package=vegan>

Appendix G

Fauna Database Search Results and Likelihood of Occurrence

Fauna Database Search Results and Likelihood of Occurrence(10 km)

Species	Common name	Conservation Status		Data Source		Habitat Description	Pre-survey LOOA	Post-survey LOOA
		WA	EPBC	DBCA	PMST			
<i>Apus pacificus</i>	Fork-tailed Swift	MI	MI	x		This species is exclusively aerial, flying from <1 m to >300 m above ground. In Australia, distribution mostly occur in various habitats from inland plains, dry or open habitats, riparian woodland, tea-tree swamps, low scrub, heathland, saltmarsh, over cliffs, beaches, islands and well out to sea, above foothills or in coastal areas, as well as urban areas and cities (DCCEEW, 2023c).	Low. Nearest record is 2.7km west of the Survey Area, <20 years old.	Low, not observed.
<i>Botaurus dubius</i>	Australian little bittern	P4		x		This species inhabits wetlands with dense emergent reed vegetation in freshwater, brackish and saline wetlands. They also reportedly inhabit small urban lakes, and small dense patches of vegetation such as cumbungi (<i>Typha orientalis</i>) along drains or canals (BirdLife 2019).	Low. No suitable habitat within Survey Area. Nearest DBCA record is 5.7km south near Jandabup Lake.	Low, not observed.
<i>Botaurus flavicollis australis</i> (southwest subpopulation)	Black bittern	P2		x		This species inhabits wetlands with dense emergent reed vegetation in freshwater, brackish and saline wetlands. They also reportedly inhabit small urban lakes, and small dense patches of vegetation such as cumbungi (<i>Typha orientalis</i>) along drains or canals (BirdLife 2019).	Low. No suitable habitat within Survey Area. One historical DBCA data point 7km south west near Lake Joondalup, >20 years old.	Low, not observed.
<i>Botaurus poiciloptilus</i>	Australasian Bittern	EN	EN	x	x	Occurs mainly in freshwater wetlands and, rarely, in estuaries or tidal wetlands. The species nests adjacent to relatively deep, densely vegetated freshwater swamps and pools, building its nests under dense cover over shallow water. The distribution in WA only occurs on the western coastal plain between Lancelin and Busselton, in the southern coastal region from Augusta to Albany.	Low. No suitable habitat within Survey Area. Nearest historical DBCA data point 4.8km south near Jandabup Lake, >20 years old.	Low, not observed.
<i>Calidris acuminata</i>	Sharp-tailed Sandpiper	MI	VU & MI		x	Muddy edges of shallow fresh or brackish wetlands with inundated emergent sedges, grass, saltmarsh or low vegetation. Including lagoons, swamps, pools near the coast, dams, waterholes, swamps, salt pans and hypersaline salt lakes inland. They use flooded paddocks, sedgeland, and ephemeral wetlands but leaves when dried.	Low. No suitable habitat within Survey Area. No DBCA data point within 10km.	Low, not observed.
<i>Calidris canutus</i>	Red Knot	EN	VU & MI		x	Intertidal mudflats, sandflats and sandy beaches of sheltered coasts, in estuaries, bays, inlets, lagoons and harbours; sometimes on sandy ocean beaches or shallow pools on exposed wave-cut rock platforms or coral reefs. They are occasionally seen on terrestrial saline wetlands near the coast, such as lakes, lagoons, pools and pans, and recorded on sewage ponds and saltworks, but rarely use freshwater swamps. They rarely use inland lakes or swamps. The species does not breed in Australia.	Low. No suitable habitat within Survey Area. No DBCA data point within 10km.	Low, not observed.
<i>Calidris ferruginea</i>	Curlew Sandpiper	CR	CR & MI	x	x	This species prefer habitats such as tidal mudflats, saltmarsh, salt fields, fresh, brackish or saline wetlands and sewerage ponds. Lagoons, mangroves,	Low. No suitable habitat within Survey Area. Nearest record is 6.4km west near Lake Joondalup, >20 years old.	Low, not observed.

Species	Common name	Conservation Status		Data Source		Habitat Description	Pre-survey LOOA	Post-survey LOOA
		WA	EPBC	DBCA	PMST			
						beaches, rocky shores, lakes, dams, floodwaters. This species breeds on offshore marine islands.		
<i>Calidris ruficollis</i>	Red-necked Stint	MI	MI	x		The Red-necked Stint is mostly found in coastal areas, including in sheltered inlets, bays, lagoons and estuaries with intertidal mudflats, often near spits, islets and banks and, sometimes, on protected sandy or coralline shores.	Low. No suitable habitat within Survey Area. Nearest record is 6.3km south west near Lake Joondalup.	Low, not observed.
<i>Calyptrorhynchus banksii naso</i>	Forest Red-tailed Black Cockatoo	VU	VU	x	x	Dense jarrah, karri (Eucalyptus diversicolor) and marri forests receiving more than 600 mm average rainfall annually (Saunders et al. 1985; Saunders & Ingram 1995; Chapman 2008), mainly in the hilly interior (Johnstone et al. 2013a). Although most records are in jarrah-marri forests, the subspecies has been observed in a range of other forest and woodland types, including blackbutt (E. patens), wandoo (E. wandoo), tuart (E. gomphocephala), Albany blackbutt (E. staeri), yate (E. cornuta) and flooded gum (E. rudis) (Abbott 1998a, 1998b). This subspecies is also now seen feeding in more open agricultural areas and in the Perth metropolitan area, where it will also breed (Lee et al. 2013; Chapman 2008)	High. Suitable foraging habitat within Survey Area. Nearest record is 750m southwest of the Survey Area, <10 years old.	High.
<i>Charadrius leschenaultii</i>	Greater Sand Plover	VU	VU & MI	x	x	The species is almost entirely coastal, inhabiting littoral and estuarine habitats. They mainly occur on sheltered sandy, shelly or muddy beaches with large intertidal mudflats or sandbanks, as well as sandy estuarine lagoons. The species does not breed in Australia.	Low. No suitable habitat within the Survey Area, nearest record is 6.4 km near lake Joondalup, <20 years old.	Low, not observed.
<i>Falco peregrinus</i>	Peregrine Falcon	OS	0	x		The Peregrine Falcon inhabits cliffs, gorges, timbered waterways, riverine environments, wetlands, plains and open woodlands. It also inhabits pylons, spires and buildings. Nesting habitat includes cliff edges or crevices, large tree hollows, other raptor or corvid nests and ledges of city buildings	Medium. Suitable habitat within Survey Area for hunting, multiple records within 10km. Nearest record is 750m north, >20 years old. Most recent record is 5.6km west near Lake Joondalup, <10 years old.	Medium.
<i>Gelochelidon nilotica</i>	Gull-billed Tern	MI	MI	x		The species is almost entirely coastal, inhabiting littoral and estuarine habitats. They mainly occur on sheltered sandy, shelly or muddy beaches with large intertidal mudflats or sandbanks, as well as sandy estuarine lagoons. The species does not breed in Australia.	Low. No suitable habitat within Survey Area, one historic DBCA point is 5.2km west near Lake Joondalup.	Low, not observed.
<i>Glareola maldivarum</i>	oriental pratincole	MI	MI	x		-	Low.	Low
<i>Leipoa ocellata</i>	Malleefowl	VU	VU		x	Semi-arid to arid shrublands and low woodlands, especially those dominated by mallee and/or acacias. A sandy substrate and abundance of leaf litter are required for breeding	Low. Locally extinct in the SCP.	Low. Locally extinct in the SCP.

Species	Common name	Conservation Status		Data Source		Habitat Description	Pre-survey LOOA	Post-survey LOOA
		WA	EPBC	DBCA	PMST			
<i>Limosa lapponica menzbieri</i>	Black-tailed Godwit	CR	EN		x	Coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays. It has also been recorded in coastal sewage farms and saltworks, saltlakes and brackish wetlands near coasts, sandy ocean beaches, rock platforms, and coral reef-flats (Higgins & Davies 1996)	Low. No suitable habitat within Survey Area, no DBCA point within 10km.	Low, not observed.
<i>Limosa limosa</i>	Black-tailed Godwit	MI	EN & MI	x		In Australia the Black-tailed Godwit has a primarily coastal habitat environment. The species is commonly found in sheltered bays, estuaries and lagoons with large intertidal mudflats or sandflats, or spits and banks of mud, sand or shell-grit; occasionally recorded on rocky coasts or coral islets. The use of habitat often depends on the stage of the tide. It is also found in shallow and sparsely vegetated, near-coastal, wetlands; such as saltmarsh, saltflats, river pools, swamps, lagoons and floodplains.	Low. No suitable habitat within Survey Area, no DBCA point within 10km.	Low, not observed.
<i>Numenius madagascariensis</i>	Eastern Curlew	CR	CR & MI		x	Intertidal mudflats and sandflats, often with beds of seagrass, on sheltered coasts, especially estuaries, mangrove swamps, bays, harbours and lagoons.	Low. No suitable habitat within Survey Area, no DBCA point within 10km.	Low, not observed.
<i>Oxyura australis</i>	Blue-billed Duck	P4		x		Found in the temperate wetlands of the south-east and south-west parts of the continent. Wholly aquatic, and is seldom seen on land.	Low. No suitable habitat within Survey Area, nearest DBCA point is 5.2km west near Lake Joondalup.	Low, not observed.
<i>Pandion haliaetus</i>	Osprey	MI	MI	x		Eastern Ospreys occur in littoral and coastal habitats and terrestrial wetlands of tropical and temperate Australia and offshore islands. They are mostly found in coastal areas but occasionally travel inland along major rivers, particularly in northern Australia (Johnstone & Storr 1998; Marchant & Higgins 1993; Olsen 1995). They require extensive areas of open fresh, brackish or saline water for foraging. Inhabits all coastal regions of Australia.	Low. No suitable habitat within Survey Area, nearest DBCA point is 5.7km west near Lake Joondalup.	Low, not observed.
<i>Plegadis falcinellus</i>	Glossy Ibis	MI	MI	x		Fresh water marshes at the edges of lakes and rivers, lagoons, flood-plains, wet meadows, swamps, reservoirs, sewage ponds, rice-fields and cultivated areas under irrigation.	Low. No suitable habitat within Survey Area. Nearest record is 5.2km west of the Survey Area, <20 years old.	Low, not observed.
<i>Rostratula australis</i>	Australian Painted Snipe	EN	EN		x	Shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans. They also use inundated or waterlogged grassland or saltmarsh, dams, rice crops, sewage farms and bore drains. T	Low. No suitable habitat within Survey Area. No DBCA data point within 10km.	Low, not observed.
<i>Sternula nereis nereis</i>	Fairy tern	VU	VU	x	x	Sheltered sandy beaches, spits and banks above the high tide line and below vegetation. The subspecies has been found in embayments of a variety of habitats including offshore, estuarine or lacustrine (lake) islands, wetlands and mainland coastline (Higgins & Davies 1996; Lindsey 1986a). The bird roosts on beaches at night (Higgins & Davies 1996).	Low. No suitable habitat within Survey Area. One historical record specimen >100 years old, 6.1km south west.	Low, not observed.

Species	Common name	Conservation Status		Data Source		Habitat Description	Pre-survey LOOA	Post-survey LOOA
		WA	EPBC	DBCAs	PMST			
<i>Thalasseus bergii</i>	Crested Tern	MI	MI	x		The species inhabits tropical and subtropical coastlines, foraging in the shallow waters of lagoons, coral reefs, estuaries, bays, harbours and inlets, along sandy, rocky, coral or muddy shores, on rocky outcrops in open sea, in mangrove swamps and also far out to sea on open water. It shows a preference for nesting on offshore islands, low-lying coral reefs, sandy or rocky coastal islets, coastal spits, lagoon mudflats and artificial islets in salt pans and sewage works within 3 km of the coast.	Low. No suitable habitat within Survey Area. Two historical records within 10km, >40 years old.	Low, not observed.
<i>Tringa glareola</i>	Wood Sandpiper	MI	MI	x		Well-vegetated, shallow, freshwater wetlands, such as swamps, billabongs, lakes, pools and waterholes. Occurs in all areas of national importance located in Western Australia.	Low. No suitable habitat within Survey Area. Nearest DBCA point is 4.7km south in Jandabup Lake.	Low, not observed.
<i>Tringa nebularia</i>	Common Greenshank	MI	EN & MI	x	x	Occurs in sheltered coastal habitats, typically with large mudflats and saltmarsh, mangroves or seagrass.	Low. No suitable habitat within Survey Area. Nearest DBCA point is 5.4km south in Jandabup Lake.	Low, not observed.
<i>Tringa stagnatilis</i>	Marsh Sandpiper	MI	MI	x		Coastal and inland wetlands throughout Australia	Low. No suitable habitat within Survey Area. Nearest record is 5.8km south in Lake Jandabup, <20 years old.	Low, not observed.
<i>Tyto novaehollandiae novaehollandiae</i>	masked owl (southwest)	P3		x		-	Low. No suitable habitat within Survey Area.	Low, not observed.
<i>Zanda baudinii</i>	Baudin's Black Cockatoo	EN	EN	x		Eucalypt forests, especially jarrah, marri and karri forest. The species is less frequently in woodlands of wandoo (E. wandoo), blackbutt (Eucalyptus patens), flooded gum (Eucalyptus rudis), yate (Eucalyptus cornuta), partly cleared farmlands and urban areas, including roadside trees and house gardens (Johnstone & Kirkby 2008). This cockatoo forages at all levels of the forest, from the canopy to the ground, often feeding in the understorey on proteaceous trees and shrubs, especially banksias, and in orchards (both in trees and on dropped or fallen fruit on the ground) (Johnstone & Kirkby 2008).	Low. Survey Area is outside of known distribution range. Four records of species near Lake Joondalup.	Low, not observed.
<i>Zanda latirostris</i>	Carnaby's Black Cockatoo	EN	EN	x	x	Uncleared or remnant native eucalypt woodlands, especially those that contain salmon gum and wandoo, and in shrubland or kwongan heathland dominated by hakea, dryandra, banksia and grevillea species. It also occurs in remnant patches of native vegetation on land otherwise cleared for agriculture (Saunders 1974b, 1979c, 1980, 1982, 1986). The species forages seasonally in pine plantations in areas that receive high rainfall, e.g. the Swan Coastal Plain (Davies 1966; Saunders 1974a; Sedgwick 1968, 1973) and around the Perth metropolitan area on both native and non-native plants, such as	High. Suitable foraging habitat within Survey Area. Three records are within the Survey Area, <20 years old. Total of 601 records within 10km of the Survey Area.	High

Species	Common name	Conservation Status		Data Source		Habitat Description	Pre-survey LOOA	Post-survey LOOA
		WA	EPBC	DBC	PMST			
						liquid amber. It also forages in forests containing marri, jarrah or karri (Nichols & Nichols 1984; Saunders 1980).		
<i>Austrosaga spinifer</i>	spiny katydid (Swan Coastal Plain)	P2	0	x		The species is known to hide in shrubs and sing at night (Rent 1993).	Low. Two historical records 6.3km north west of the Survey Area in Neerabup National Park.	Low.
<i>Hesperocolletes douglasi</i>	Douglas's Broad-headed Bee	CR	CR		x	The specific habitat requirements are unknown, therefore the habitat area, extent or abundance is unknown. However, last collection on the SCP was in almost pristine condition Banksia woodland.	Low. No suitable habitat within Survey Area.	Low, not observed.
<i>Hylaeus globuliferus</i>	woollybush bee	P3	0	x		Has a large range distribution across WA, associated with Adenanthos sp. and Banksia attenuata	Low. No suitable intact habitat within the Survey Area.	Low.
<i>Idiosoma sigillatum</i>	Swan Coastal Plain shield-backed trapdoor spider	P3	0	x		Typically inhabits clay soils whereas the arid Midwest populations are associated with rocky habitats, primarily in positions with increased moisture retention properties like gullies and drainage lines on southern facing slopes. Leaf litter and twigs are extremely important to the species as it provides material for the burrows, reduced soil moisture loss and increased prey availability. The species avoids areas of dense leaf litter as juveniles are unable to dig their initial hole in such areas. Areas of lower grazing pressure may support greater population abundance.	Medium. Suitable soil type and habitat within Survey Area. Nearest record is >7km west, >20 years old. This species has a large distribution on the SCP.	Medium.
<i>Leioproctus contrarius</i>	a short-tongued bee	P3	0	x		Associated with both Scaevola sp repens var. repens and Lechenaultia spp.	Low. No host species Scaevola repens was recorded within the Survey Area. There is only one historical record within 10km, approximately 1.2km north of the Survey Area.	Medium.
<i>Leioproctus douglasiellus</i>	a short-tongued bee	EN	CR		x	Associated with Goodenia filiformis and Anthotium junctiforme. L. douglasiellus is now thought to occur in three locations within the Perth metropolitan area ranging from Cannington to Forrestdale	Low. No host plant recorded within the Survey Area.	Low, not observed.
<i>Synemon gratiosa</i>	Graceful Sunmoth	P4	0	x		Coastal heathland on Quindalup dunes where it is restricted to secondary sand dunes due to the abundance of the preferred host plant Lomandra maritima. Banksia woodland on Spearwood and Bassendean dunes, where the second known host plant L. hermaphrodita is widespread.	Medium. Nearest record is 160m west of the Survey Area, <10 years old. Lomandra sp species were recorded within the Survey Area.	Medium.

Species	Common name	Conservation Status		Data Source		Habitat Description	Pre-survey LOOA	Post-survey LOOA
		WA	EPBC	DBC	PMST			
<i>Bettongia penicillata ogilbyi</i>	Woylie				x	Current habitat includes tall eucalypt forest and woodland, dense myrtaceous shrubland, kwongan (proteaceous) or mallee heath.	Low. Locally extinct in the SCP.	Low. Locally extinct in the SCP.
<i>Dasyurus geoffroii</i>	Chuditch	VU	VU		x	Forests, mallee shrublands, woodlands and desert. No records in SCP since 1930s, have been recorded in outer metro areas. Perth to South-west.	Low. Locally extinct in the SCP.	Low. Locally extinct in the SCP.
<i>Hydromys chrysogaster</i>	Water-rat	P4	0	x		Lives in burrows on low banks of rivers, lakes, wetlands, estuaries and even along the coast. Intact riparian vegetation and associated bank stability is critical to their survival.	Low. No wetlands within Survey Area. Nearest record is at Lake Joondalup.	Low. Not observed.
<i>Isodon fusciventer</i>	Quenda	P4	0	x		Scrubby, often swampy, vegetation with dense cover up to 1 m (3 ft 3 in) high, often feeds in adjacent forest and woodland that is burnt on a regular basis and in areas of pasture and cropland lying close to dense cover. Populations inhabiting Jarrah and Wandoo forests are usually associated with watercourses. Quenda will thrive in more open habitat subject to introduced predator control. On the Swan Coastal Plain, Quenda are often associated with wetlands	High. Nearest record is 150m south of the Survey Area, <10 years old. 88 records within 10km of the Survey Area.	High.
<i>Macroderma gigas</i>	Ghost Bat	VU	VU		x	The Ghost Bat is patchily distributed across the northern half of Australia. This species requires undisturbed roost sites which are often complex and contain multiple entrances; it has been known to utilise old abandoned mine shafts (Menkhurst & Knight 2017).	Low. Survey Area is outside of the distribution range.	Low.
<i>Notamacropus irma</i>	Western Brush Wallaby	P4	0	x		Open forest or woodland, particularly favouring open, seasonally wet flats with low grasses and open scrubby thickets. It is also found in some areas of mallee and heathland, and is uncommon in karri forest.	Medium. Some suitable habitat within Survey Area and connective bushland to the Survey Area. Nearest record is 2.7km north of the Survey Area, <20 years old.	Low.
<i>Neelaps calonotos</i>	black-striped snake, black-striped burrowing snake	P3		x		Banksia woodlands and sandy areas of the Perth region.	Medium. Nearest record is 2.4km south of the Survey Area, >20 years old.	Medium.

Appendix H

Black Cockatoo Potential Breeding Tree Data

Tree Number	Taxon Name	Class Bamford	DBH	Hollow Comments	Easting	Northing
1	Blackbutt	5	65		391445.1	6492171
2	Blackbutt	4	70	Small hollows not suitable for bc	391454.1	6492213
3	Blackbutt	5	60		391427.9	6492201
4	Blackbutt	5	60		391436.4	6492203
5	Jarrah	5	55		391448.1	6492663
6	Jarrah	5	90		391446.5	6492703
7	Jarrah	5	80		391399	6492434
8	Jarrah	5	65		391392.5	6492481
9	Jarrah	5	55		391383.6	6492474
10	Jarrah	5	75		391371.3	6492466
11	Jarrah	5	50		391363.1	6492489
12	Jarrah	5	55		391369.6	6492520
13	Jarrah	5	50		391265	6492615
14	Jarrah	5	50		391232.1	6492613
15	Jarrah	5	50		391226.6	6492609
16	Jarrah	5	50		391206.3	6492618
17	Jarrah	5	50		391189.5	6492617
18	Blackbutt	5	60		391177	6492545
19	Blackbutt	5	55		391223.3	6492543
20	Blackbutt	5	85		391207.8	6492428
21	Blackbutt	5	80		391123.7	6492521
22	Blackbutt	5	60		391120.6	6492478
23	Blackbutt	5	50		391115.4	6492401
24	Blackbutt	5	50		391159.4	6492408
25	Blackbutt	5	70		391184.6	6492397
26	Jarrah	5	55		391262.4	6492378
27	Jarrah	5	50		391235.7	6492356
28	Blackbutt	5	55		391234.3	6492350
29	Jarrah	5	50		391256.2	6492336
30	Jarrah	5	70		391279	6492305
31	Blackbutt	5	65		391312.6	6492324
32	Blackbutt	5	65		391354.3	6492309
33	Blackbutt	5	70		391359.9	6492302
34	Jarrah	5	50		391347.8	6492292
35	Blackbutt	5	80		391387	6492324

Tree Number	Taxon Name	Class Bamford	DBH	Hollow Comments	Easting	Northing
36	Blackbutt	5	90		391384.2	6492329
37	Blackbutt	5	70		391381.4	6492336
38	Blackbutt	5	60		391365.8	6492355
39	Blackbutt	5	60		391371.3	6492356
40	Blackbutt	5	55		391439.1	6492312
41	Blackbutt	5	50		391166	6492238
42	Blackbutt	5	50		391158	6492233
43	Blackbutt	5	60		391120.2	6492270
44	Blackbutt	5	50		391121.1	6492263
45	Blackbutt	5	50		391210.6	6492307

Appendix I

Foraging Habitat Quality Scoring Tool

(DAWE, n.d)

Habitat Scoring System for WA black cockatoo foraging habitat

This habitat scoring system describes elements indicative of suitable foraging habitat¹ for the three WA black cockatoo species (Carnaby's Black Cockatoo, Baudin's Black Cockatoo and the Forest Red-tailed Black Cockatoo) in WA. Its use must be supported by survey information and reporting, undertaken by suitably qualified and experienced ecologists.

Appropriate scores will best fit a description. Where all components of the 'detail' column description are not met, this must be specified, and justification provided for that score to be accepted by the Department.

For an offset site to be considered by the Department, the offset site must have a start score of 1 for each indicator (e.g., there must be a species stocking rate score of at least 1).

Indicator	Score	Detail		Impact site	Offset start quality	Without offset	With offset
Site Condition							
		Foraging value	Details				
Vegetation condition and structure. Habitat features	7	Very High	Carnaby’s Black Cockatoo				
			Native kwongan heath and shrubland (>30% projected foliage cover), banksia and eucalypt woodlands with >50% projected foliage cover. Low percentage (< 5%) of tree deaths².				
			Baudin’s Black Cockatoo				
			Marri-Jarrah Forest and woodlands with >50% projected foliage cover. Low percentage (< 5%) of tree deaths.				
			Forest Red-tailed Black Cockatoo				
			Marri-Jarrah-Karri Forest, other eucalypt woodlands, or allocasuarina woodlands, with >50% projected foliage cover. Low percentage (< 5%) of tree deaths.				
	6	High	Carnaby’s Black Cockatoo				
			Native kwongan heath and shrubland (>25% projected foliage cover), banksia and eucalypt woodlands with >40% projected foliage cover. Low percentage (< 10%) of tree deaths.				
			Baudin’s Black Cockatoo				
			Marri-Jarrah Forest and woodlands with >40% projected foliage cover. Low percentage (< 10%) of tree deaths.				
			Forest Red-tailed Black Cockatoo				
			Marri-Jarrah-Karri Forest, other eucalypt woodlands, or allocasuarina woodlands, with >40% projected foliage cover. Low percentage (< 10%) of tree deaths.				

¹ In some cases, an impact or offset site may contain or require both foraging and breeding habitat for one or more black cockatoos. Breeding habitat is species of trees known to support breeding within the range of the species which either have a suitable nest hollow or are of a suitable diameter at breast height (DBH) to develop a nest hollow. For most species of trees, suitable DBH is 500 mm. For salmon gum and wandoo, suitable DBH is 300 mm.

²No tree deaths indicate robustness of habitat, unlikely for the habitat to decline in the medium-term. Tree deaths may be owing to disease, water stress, fire, etc.

Vegetation condition and structure. Habitat features	5	Moderate to high	Carnaby's Black Cockatoo				
			Native kwongan heath and shrubland (>20% projected foliage cover), banksia and eucalypt woodlands with 30-40% projected foliage cover; OR > 60% projected foliage cover but veg. condition reduced due to tree deaths (up to 20%).				
			Baudin's Black Cockatoo				
			Marri-Jarrah Forest or woodlands with 30-40% projected foliage cover; OR > 60% projected foliage cover but veg. condition reduced due to tree deaths (up to 20%).				
			Forest Red-tailed Black Cockatoo				
			Marri-Jarrah-Karri Forest, other eucalypt woodlands, or allocasuarina woodlands, with 30-40% projected foliage cover; OR > 60% projected foliage cover but veg. condition reduced due to tree deaths (up to 20%).				
	4	Moderate	Carnaby's Black Cockatoo				
			Native kwongan heath and shrubland, banksia or eucalypt woodlands with 20-30% projected foliage cover. Moderate percentage of tree deaths (30-40%).				
			Baudin's Black Cockatoo				
			Marri-Jarrah Forest or woodlands with 20-30% projected foliage cover; OR Marri-Jarrah Forest with 40-60% projected foliage cover but vegetation condition reduced due to tree deaths (up to 30-40%).				
			Forest Red-tailed Black Cockatoo				
			Marri-Jarrah-Karri Forest, other eucalypt woodlands, or allocasuarina woodlands with: 20-30% projected foliage cover; OR 40-60% projected foliage cover but veg. condition reduced due to tree deaths (up to 30-40%).				
	3	Low to moderate	Carnaby's Black Cockatoo				
			Native kwongan heath and shrubland, banksia or eucalypt woodlands with 10-20% projected foliage cover.				
			Baudin's Black Cockatoo				
			Marri-Jarrah Forest or woodlands with 5-20% projected foliage cover.				
			Forest Red-tailed Black Cockatoo				
			Marri-Jarrah-Karri Forest, other eucalypt woodlands, or allocasuarina woodlands with 5-20% projected foliage cover.				
	2	Low	Carnaby's Black Cockatoo				
			Native kwongan heath and shrubland, banksia and eucalypt woodlands with <10% projected foliage cover; OR Paddocks and/or urban areas with scattered foraging trees such as banksias, marri.				
			Baudin's Black Cockatoo				
			Marri-Jarrah Forest or woodlands with 1-5% projected foliage cover; OR Paddocks and/or urban areas with scattered foraging trees such as banksia, hakea, dryandra.				

Vegetation condition and structure.			Forest Red-tailed Black Cockatoo				
			Marri-Jarrah-Karri Forest, other eucalypt woodlands, or allocasuarina woodlands with 1-5% projected foliage cover; OR Paddocks and/or urban areas with scattered food plants such as Cape Lilac, <i>Eucalyptus caesia</i> and <i>E. erythrocorys</i> .				
	1	Negligible to low	All species				
			Scattered specimens of known food plants but projected foliage cover of these is <2%. May include: paddocks or urban areas with scattered foraging trees.				
Habitat features	0	None	All species				
			No Proteaceae, eucalypts or other potential sources of food. May include bare ground or developed sites devoid of vegetation (e.g. infrastructure, roads, gravel pits).				
			Totals				

Site Context							
Proximity of the site in relation to other habitat.	3	Site is within 6km of known breeding site.	or	Site is within 12km of other foraging resources with site condition of at least 3.			
	2	Site is within 12km of known breeding site.	or	Site is within 15km of other foraging resources with site condition of at least 4.			
	1	Site is within 15km of known breeding site.	or	Site is between 15km and 20km of other foraging resources with site condition of at least 5.			
	0	Site is further than 15km from known breeding site.	or	Site is further than 20km from other foraging resources.			
Totals							

Final Totals								
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Indicator		Species Stocking Rate ³	Impact Site			Offset Site		
			CBC	BBC	FRT	CBC	BBC	FRT
Confirm presence/absence of species.	Yes	Species is seen or reported regularly and/or there is abundant foraging evidence, e.g. chewed nuts can be identified as this species. Regularly is when the species is seen at intervals of every few days or weeks for at least several months of the year.						
	No	Species is recorded or reported very infrequently and there is little or no foraging evidence.						

³ Species stocking rate is indicated by yes or no to confirm if any of the species is frequently present or not. If yes, the presence must be for the species being impacted by the proposal, not for a species that will not be impacted.

Legend	
	If the site scores between 0-2 (low to no value) for site condition, 0 for the site context score, or is No for species stocking rate, it is extremely unlikely to be considered as suitable habitat. This would not be appropriate to use as an offset site.

The metrics used to determine Site Condition, Site Context, and Species Stocking Rate were developed by the Department of Climate Change, Energy, the Environment, and Water in consultation with species experts in WA.

A standard habitat quality scoring system for a species allocates scores out of 3 for both site condition and site context, and out of 4 for species stocking rate. However, as black cockatoos are very mobile, this HQS uses a score out of 7 for site condition and a score out of 3 for site context. Site condition is considered the key factor in determining the quality of habitat for these black cockatoo species. Species stocking rate is considered only in terms of presence or absence of the species and does not add to the total score. Note that the species, or strong indicators of the species, must be present, consistent with the presence/usage description above, for an offset to be considered suitable.

