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Black cockatoo habitat assessment for the Wattle Grove (South) MRS Rezoning Project

Hesperia on behalf of the Western Australian Planning Commission

July 2024

Final

Black cockatoo habitat assessment for the Wattle Grove (South) MRS Rezoning Project

Prepared for Hesperia on behalf of the Western Australian Planning Commission

Version history

Author/s	Reviewer/s	Version	Version number	Date submitted	Submitted to
Deon Loo and Anna Jacks	J. Clark	Draft for client comments	0.1	14-Mar-24	K. Choo (Coterra Environment)
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ACRONYMS AND ABBREVIATIONS

Abbreviations	Definition
BC Act	Biodiversity Conservation Act (WA)
CD	Species considered 'Conservation Dependent' and protected under the BC Act (WA)
CR	Species considered 'Critically Endangered' and protected under the EPBC or BC Acts
DBCA	Department of Biodiversity, Conservation and Attractions
DBH	Diameter at breast height
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DWER	Department of Water and Environmental Regulation
EN	Species considered 'Endangered' and protected under the EPBC or BC Acts
EPA	Environmental Protection Authority
EPBC Act	Environmental Protection and Biodiversity Conservation Act
FRTBC	Forest Red-tailed Black Cockatoo
Mig.	A migratory species protected under the EPBC or BC Acts
MRS	Metropolitan Region Scheme
NES	National Environmental Significance
OS	Species otherwise in need of special protection under the BC Act
PHT	Potential habitat tree
SP	Specially protected species under the BC Act
SQL	Structured Query Language
TEC	Threatened Ecological Community, protected under the EPBC and BC Acts
VU	Species considered 'Vulnerable' and protected under the EPBC or BC Acts
WA	Western Australia
WAPC	Western Australia Planning Commission

1 INTRODUCTION

The Wattle Grove (South) Metropolitan Regional Scheme (MRS) Amendment Project (the 'Project') involves the Western Australia Planning Commission (WAPC) plans to re-zone 126 ha of 'Rural' zoned land (77 lots) for residential purposes within Wattle Grove, under MRS Amendment 1388/57.

The Project has been investigated since at least 2019, with numerous consultants having undertaken biological surveys in that time. Phoenix was approached to review biological work done to date with respect to current Environmental Protection Authority (EPA) and Department of Climate Change, Energy, the Environment and Water (DCCEEW) guidelines. This report specifically provides technical assessment and advice in respect to the black cockatoo habitat assessment for the Project area, including the compliance and adequacy of historic biological surveys and any additional work required.

In order to obtain necessary approvals environmental impact assessment documentation is being prepared for the Project on behalf of the WAPC.

The Project lies within the Perth subregion of the Swan Coastal Plain bioregion.

1.1 BACKGROUND

Since 2019, multiple black cockatoo surveys have been completed for the (larger) Project:

- In spring of 2019 AECOM (2020) undertook biological surveys, including a Level 1 (equivalent to a Basic) fauna survey and a Targeted black cockatoo survey of a larger 340 ha area, which included the current Project area. The survey involved mapping fauna habitat, fauna observations, and recording of potential habitat trees (PHTs). The surveys of the larger area (noting that not all of these findings relate specifically to the Project area) recorded:
    - direct sightings foraging in the study area and multiple foraging evidence of Forest Red-Tailed Black Cockatoo (FRTBC) (*Calyptorhynchus banksii naso*; VU)
    - foraging evidence of Carnaby's Cockatoo (*Zanda latirostris*; EN)
    - 730 PHTs, including 17 trees with one or more hollows considered potentially suitable for breeding black cockatoos (27 hollows in total).
    - a total of 41.14 ha of very high and high-quality foraging habitat for Carnaby's Cockatoo and Baudin's Cockatoo, and 33.52 ha of very high and high-quality foraging habitat for the FRTBC.
- In February and August 2021, and May 2022, JBS&G (2023) conducted a black cockatoo habitat assessment within the current Wattle Grove (South) MRS Amendment (Project) Area. The results from this survey took into consideration AECOM (2020) survey data in addition to new survey data:
    - a total of 153 PHTs were recorded of which 3 had potentially suitable hollows
    - a total of 32.44 ha of vegetation both native and introduced, of varying quality suitable for foraging for all 3 black-cockatoo species.
- In January 2024, Phoenix undertook a review of the previous biological surveys to ensure they adhered to current State and Federal government guidelines for the species (Bamford 2020; DAWE 2022a, b; EPA 2019). In regards to black cockatoos both the AECOM (2020) and JBS&G (2023) surveys were found to be compliant with current guidelines for those species, however several items required re-analysis:
    - foraging habitat required re-scoring due to 2 components of the analysis being incorrectly interpreted (Site context and Species stocking rate)
    - inconsistencies between the reported number of PHTs reported (AECOM 2020; JBS&G 2023) and in the supplied spatial data, which resulted in uncertainty around the

correct number of PHTs and PHTs with possibly suitable hollows within the Wattle Grove (South) MRS Amendment Area.

The Department of Biodiversity, Conservation and Attractions (DBCA) Threatened fauna dataset (DBCA 2023) includes 32 monitored black cockatoo sites within 10 km of the study area. The maximum number of white-tailed black cockatoos (Carnaby's and Baudin's Cockatoo) sighted was 215 individuals located 7 km NE of the study area in 2017. The maximum number of FRTBC sighted in 2018 was 334 individuals at a site located 2.5 km west of the study area.

Black cockatoos utilise the Swan Coastal Plain mainly for foraging resources and breeding habitat in small patches of suitable habitat. Carnaby's Cockatoo primarily use vegetation dominated by *Banksia* spp. and Tuart (*Eucalyptus gomphocephala*) woodlands, as well as Marri (*Corymbia calophylla*), with Jarrah (*E. marginata*) in the east. An important focus for this region is the ongoing viability of foraging resources for black cockatoos, particularly Carnaby's Cockatoo (*Zanda latirostris*).

The Jarrah Forest, just east of the study area provides breeding habitat for all 3 black cockatoo species as well as providing key foraging and wintering areas for Baudin's Cockatoo (*Zanda baudinii*) and the FRTBC. Marri is a primary food resource for Baudin's Cockatoo and the FRTBC. Foraging areas associated with breeding are critical for all species (DAWE 2022b).

The results of Phoenix' re-assessment of foraging habitat value per the Bamford (2021) method is presented below in section 0.

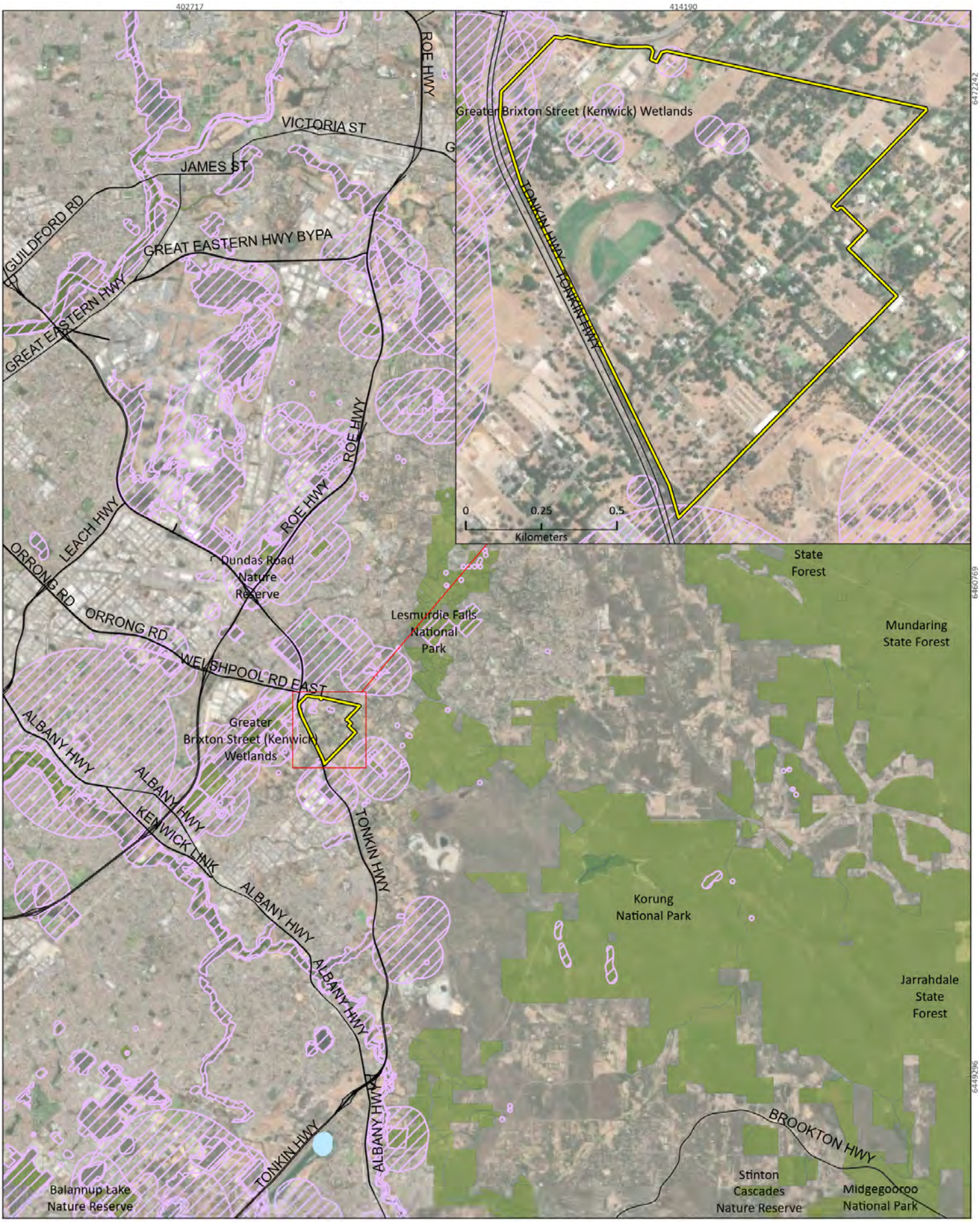
1.2 SCOPE OF WORK

The scope of work for the black cockatoo habitat assessment of the Project area was as follows:

- review habitat mapping with respect to consistency with the vegetation type and condition mapping and black cockatoo species foraging habitat
- review the potential habitat tree dataset
- undertake a hollow inspection, if required
- undertake black cockatoo species foraging habitat quality scoring per the "Bamford Method" (Bamford 2021).

1.3 PROJECT AREA

The Wattle Grove (South) MRS Amendment Area (the 'Project area') is located within Wattle Grove, approximately 15 km ESE from Perth, Western Australia (WA; Figure 1-1). The Project area is bound by Welshpool Road East and Crystal Brook Road to the north, and Tonkin Highway to the west.



Coterra Environment
Wattle grove MRS Rezoning

Project No	1633
Date	28/02/2024
Drawn by	JL
Map author	BK

0 2 4
Kilometers

1:113,600(at A4) GDA 1994 MGA Zone 50

- Study area
- Lakes
- DBCA managed land
- Environmentally Sensitive Areas

Figure 1-1

Project location and study area

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2 LEGISLATIVE CONTEXT

The protection of fauna in WA is principally governed by 3 acts:

- Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)
- State *Biodiversity Conservation Act 2016* (BC Act)
- State *Environmental Protection Act 1986* (EP Act).

2.1 COMMONWEALTH

The EPBC Act is administered by the Federal DCCEEW. The EPBC Act provides for the listing of Threatened fauna as matters of National Environmental Significance (NES). Under the EPBC Act, actions that have, or are likely to have, a significant impact on a matter of NES, require approval from the Australian Government Minister for the Environment through a formal referral process. Key threats and habitat critical to the survival of EPBC Act Threatened species are usually defined in the conservation advice and/or recovery plan for the species.

Conservation categories applicable to Threatened fauna species under the EPBC Act are as follows:

- Extinct (EX)[1] – there is no reasonable doubt that the last individual has died
- Extinct in the Wild (EW) – taxa known to survive only in captivity
- Critically Endangered (CR) – taxa facing an extremely high risk of extinction in the wild in the immediate future
- Endangered (EN) – taxa facing a very high risk of extinction in the wild in the near future
- Vulnerable (VU) – taxa facing a high risk of extinction in the wild in the medium-term
- Conservation Dependent (CD)[1] – taxa whose survival depends upon ongoing conservation measures; without these measures, a conservation dependent taxon would be classified as Vulnerable, Endangered or Critically Endangered.

2.2 STATE

2.2.1 Threatened and Priority species

In WA, the BC Act provides for the listing of Threatened fauna species (Government of Western Australia 2018a, b) in the following categories:

- Critically Endangered (CR) – species facing an extremely high risk of extinction in the wild in the immediate future[2]
- Endangered (EN) – species facing a very high risk of extinction in the wild in the near future[2]
- Vulnerable (VU) – species facing a high risk of extinction in the wild in the medium-term future[2].

Species may also be listed as specially protected (SP) under the BC Act in one or more of the following categories:

- species of special conservation interest (conservation dependent fauna, CD) – species with a naturally low population, restricted natural range, of special interest to science, or subject to or recovering from a significant population decline or reduction in natural range

[1] Species listed as Extinct and Conservation Dependent are not matters of NES and therefore do not trigger the EPBC Act.

[2] As determined in accordance with criteria set out in the ministerial guidelines.

- migratory species (Mig.), including birds subject to international agreement
- species otherwise in need of special protection (OS).

DBCA administers the BC Act and also maintains a non-statutory list of Priority fauna. Priority species are still considered to be of conservation significance – that is they may be Threatened – but cannot be considered for listing under the BC Act until there is adequate understanding of threat levels imposed on them. Species on the Priority fauna list are assigned to one of 4 Priority (P) categories, P1 (highest) – P4 (lowest), based on level of knowledge/concern.

2.2.2 Critical habitat

Under the BC Act, habitat is eligible for listing as critical habitat if it is critical to the survival of a Threatened species or a Threatened Ecological Community (TEC) and its listing is otherwise in accordance with the ministerial guidelines.

3 METHODS

This memo has been written with consideration of the following guidelines and guidance:

- Referral guideline for 3 WA threatened black cockatoo species Carnaby's Cockatoo (*Zanda latirostris*), Baudin's Cockatoo (*Zanda baudinii*) and the FRTBC (*Calyptorhynchus banksii naso*) (DAWE 2022b).
- Black cockatoos and development in South-West Western Australia (DAWE 2022a).
- Scoring System for the Assessment of Foraging Value of Vegetation for Black-Cockatoos (Bamford 2021).

3.1 BREEDING HABITAT ANALYSIS

Breeding habitat for black cockatoos consists of woodland or forest; however, they will also breed in areas of former woodland or forest habitats which consist of now fragmented patches of habitat and/or isolated trees. Breeding habitat is defined in DAWE (2022b) as "habitat that contains known, suitable or potential nesting trees."

A breeding tree is considered by DAWE (2022b) as any tree species where "suitable nest hollows" are present. Suitable nest hollows are only found in live trees with a diameter at breast height (DBH) of at least 500 mm. Trees suitable to develop a nest hollow in the future are 300-500 mm DBH. Note that many species of eucalypt may develop suitable hollows for breeding DAWE (2022b), however, All *E. todtiana* and introduced eucalypts were removed from the dataset on the basis the form, habit, and/or hollow forming properties of these species is generally unsuitable for black cockatoo nesting.

AECOM (2020) and JBS&G (2023) recorded trees with a DBH equal to or greater than 500 mm, including any hollow-bearing trees. The following information was recorded for each tree:

- tree species
- DBH (mm)
- number of hollows present
- hollow height (m) and orientation
- hollow suitability (e.g. size of entrance, condition of outside of the hollow)
- evidence of use.

After reviewing the previous reports (AECOM 2020; JBS&G 2023) and associated data provided it was determined that 7 PHT within the study area required re-inspection to confirm the precise location (as there were discrepancies with locations in the different datasets) and suitability of those hollows as nests for black cockatoos. In particular, 3 of these trees had been previously identified as having 'possibly suitable' hollows, however, no further investigation of these tree hollows was undertaken during or immediately after the previous biological surveys.

Subsequently, on 19 January 2024 Anna Jacks (Phoenix) and Steve Robertson (Activate Projects) inspected those 7 trees. After each tree was located, their position was again recorded using a GPS and the same data as recorded previous was re-collected. Binoculars were used to assess each hollow from ground-level and then inspected with a GoPro camera mounted on a pole to verify suitability, if necessary. The information collected during the survey was compared to the original descriptions to determine accuracy of initial recordings and any changes to tree and hollow condition since the original survey was noted.

3.2 ROOSTING HABITAT ANALYSIS

Roosting habitat within the Wattle Grove (South) MRS Amendment Area was determined using trees known as roosting for any of the black cockatoo species and the habitat types containing these trees:

- Carnaby's Roosting habitat is found in any tall trees near or in riparian environments or permanent water sources. These trees include Flat-topped Yate, Salmon Gum, Wandoo, Marri, Karri, Blackbutt, Tuart, introduced eucalypts and introduced pines.
- RFTBC favour tall trees such as Jarrah, Marri, Blackbutt, Tuart and introduced eucalypt trees or large trees on the edge of forests. The pine plantations between Mandurah, Bunbury and north of the Perth metropolitan area can provide foraging and night roosting habitat in the Swan Coastal Plain.
- Baudin's Cockatoo also prefer to be near riparian environments or other permanent water sources. Any tall trees may provide roosting habitat for Baudin's Cockatoo, but particularly Jarrah, Flooded Gum, Blackbutt, Tuart and introduced eucalypts such as Blue Gum (*E. globulus*) and Lemon Scented Gum (*Corymbia citriodora*) (DAWE 2022b). Suitable roosting habitat has to also be within 20 km of foraging habitat (DAWE 2022a).

3.3 FORAGING HABITAT ANALYSIS

The foraging value of each habitat type within the Wattle Grove (South) MRS Amendment Area was assessed for each black cockatoo species using the HQS methodology developed by Bamford Consulting Ecologists (Appendix 1). The scoring system provides a numerical value that reflects the significance of vegetation as foraging habitat for black cockatoos and this numerical value is designed to provide the information needed by DCCEEW, Department of Water and Environmental Regulation (DWER) and the EPA to assess impact significance and offset requirements.

The foraging value of the vegetation is dependent on the type, density and condition of vegetation in an area and is determined by factors such as foraging habitats near it.

Calculating the total score (out of 10) requires these following steps:

A. Site condition. Finding out a score out of 6 for the vegetation composition, condition, and structure; plus
B. Site context. Find out a score out of 3 for the context of the site; plus
C. Species stocking rate. Determining a score out of one for species density.
D. Determining the total score out of 10, which may require moderation for context and species density with respect to the site condition (vegetation) score. Moderation also includes consideration of pine plantations as a special case for foraging value.

Site condition was determined using existing vegetation mapping and compiling all the relevé and quadrat species-level spatial data and imported it into Phoenix' biological database, along with the supplied vegetation type spatial dataset. Using spatial Structured Query Language (SQL) we then used a series of stored routines to:

- gather the array of foraging species present within each sample plot for each cockatoo species, their respective cover (%) and height (cm) values, and the total number foraging species.
- intersect species records with vegetation type and vegetation condition.
- output a polygon dataset containing the above information.

4 RESULTS

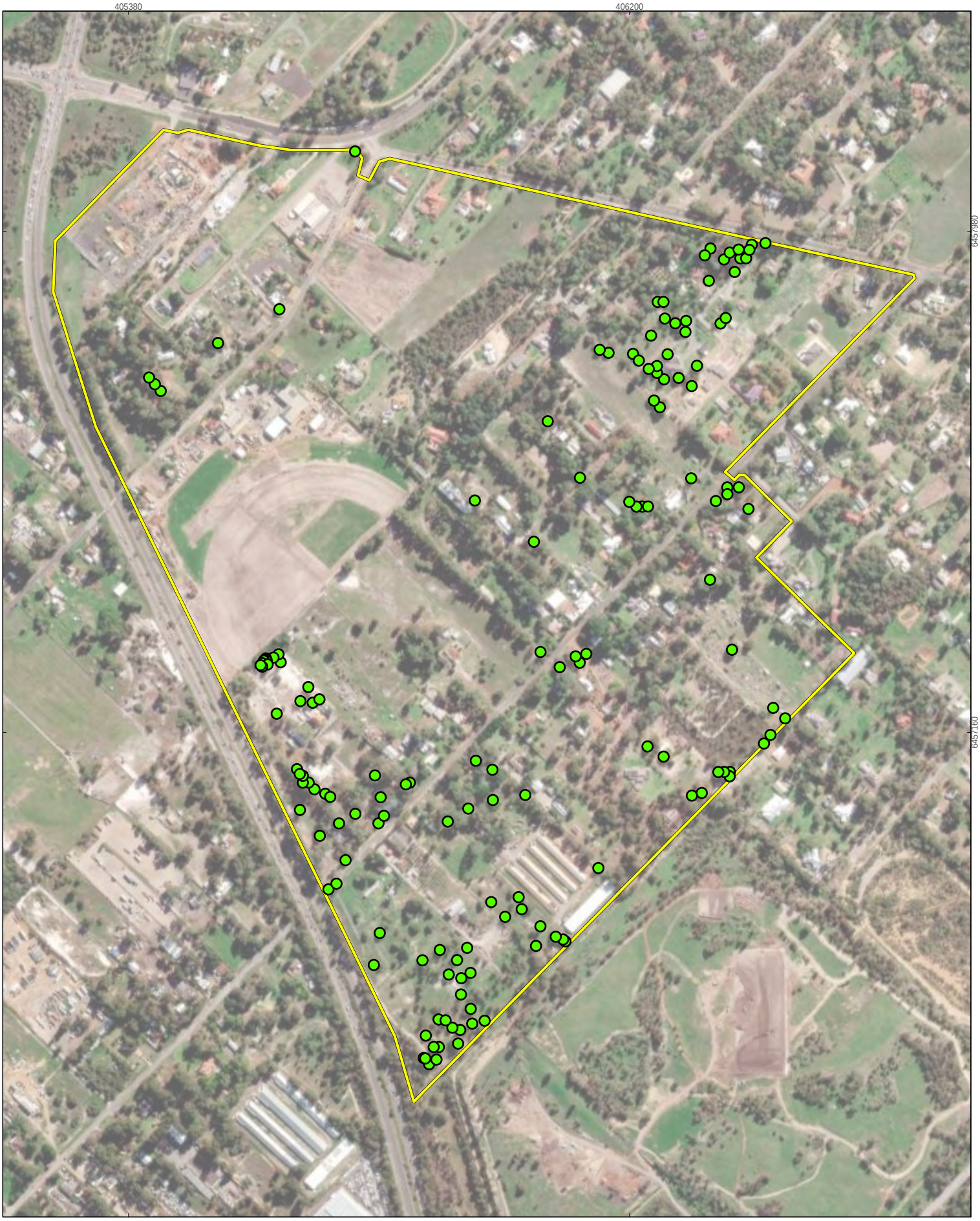
4.1 BREEDING HABITAT ANALYSIS

A total of 153 PHTs occur within the Wattle Grove (South) MRS Amendment Area Figure 4-1; Appendix 2). These consist of native WA trees known to support breeding, that is, Jarrah, Marri, Tuart, Flooded Gums and stag trees. The majority of trees are scattered in areas of degraded habitat or cleared land/paddocks.

As above, a total of 7 trees identified previously (DAWE 2022b; JBS&G 2023) as having possibly suitable breeding hollows were inspected again on 19 January 2024 by Phoenix (Figure 4-2), and the following was observed (Table 4-1):

- Two records are considered to be erroneous and were removed from the dataset (NewID = 0).
- Habitat tree 417 is no longer present; given its age and comments at the time of the original inspection, it is assumed that this tree had further deteriorated and been removed.
- Habitat tree 482 was in poor condition and no longer contained suitable hollows.
- The remaining 3 trees (438, 491, 561) contained unsuitable hollows (too small and/or inhabited by bees).
- Tree 491 appears to be regularly visited with both preening and old and new foraging evidence present; but it is not a breeding tree.

As a result, Phoenix has confirmed that no breeding trees occur within the Wattle Grove (South) MRS Amendment Area.



Coterra Environment
Wa t le Grove MRS Re-zoning

Project No	1633
Date	14/03/2024
Drawn by	AJ
Map author	AJ

0 140 280
Metres

1:8,000 (at A4) GCS WGS 1984

Wa t le Grove (South) MRS Amendment Area

Poten t al habitat trees

Figure 4-1

Poten t al habitat trees in the Wa t le Grove (South) MRS Amendment Area

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Table 4-1 Potential habitat trees with hollows within the Wattle Grove (South) MRS Amendment Area re-assessed in January 2024

NewID / Tree ID	Latitude	Longitude	Species	DBH (mm)	AECOM (2019) hollow comments and determination		Phoenix (2024) hollow comments and determination	
417	116.0034	-32.0213	Jarrah	1,100	very stressed, dead old	Possibly suitable	A stand of 3 young Jarrah present at this location. None contain hollows. No very old Jarrah were near this location, assumed no longer present (Figure 4-3).	Not no longer present
438	116.0037	-32.0211	Jarrah	1,300	healthy	Possibly suitable	Hollow in fork of tree at about 5 m (Figure 4-4). Opening and inside is too narrow (Figure 4-5).	Not suitable
482	116.0024	-32.0212	Stag	600	Hollow 1: 15x20 cm, west facing, vertical on trunk, 6 m above ground, no evidence of use. Hollow 2: 30x30 cm entrance, facing upward/vertical on spout, 7 m above ground	Possibly suitable	Tree now very degraded and does not contain any suitable hollows (Figure 4-6). Two adjacent alive trees did not contain any hollows.	Not suitable
491	116.0036	-32.0213	Jarrah	1,200	Tree split into 2. Hollow 1: East facing branch, 8 m above ground, 10x40 cm, tree utilised by Lorikeets. Hollow 2: West facing branch, 6 m above ground, 15x50 cm, at 45 degrees. Hollow 3: South facing branch, 7 m above ground, 15x20 cm, at 45 degrees.	Possibly suitable	Tree split in 2 with 4 potential hollows (Figure 4-7): • Hollow 1 western branch is not hollow inside (Figure 4-8) • Hollow 2 in northwestern branch is too small inside (Figure 4-9). Evidence of nesting from other species such as galahs (scarring below hollow) • Hollow 3 in northwestern branch is occupied by bees • Hollow 4 is too narrow inside. Abundant new to old foraging on Jarrah nuts and at least 4 preened black cockatoo feathers under tree (Figure 4-10).	Not suitable

NewID / Tree ID	Latitude	Longitude	Species	DBH (mm)	AECOM (2019) hollow comments and determination		Phoenix (2024) hollow comments and determination	
561	116.0088	-32.0108	Jarrah	900	Hollow 1: West facing branch, 11 m above ground, 50x10 cm, 45 degrees, unable to assess chamber size, hollow occupied by Galahs Hollow 2: North-west facing branch, 10 m above ground, 10x100 cm, 45 degrees, old evidence of use, occupied by bees.	Possibly suitable	Tree viewed from road as no access to property. Several hollows were noticed, however one had bees and the others were too small, but had evidence of scarring indicating possible use by other species, e.g. the Australian Ringneck present in tree at the time of survey. Female Carnaby's Cockatoo perched in adjacent planted eucalypt.	Not suitable
0 (north)	116.0088	-32.0108	Jarrah	0	Hollow 1: West facing branch hollow, 11 m above ground, 50x10 cm entrance at 45 degrees, unable to assess chamber size, hollow occupied by pink and grey galahs Hollow 2: North-west facing branch hollow 10 m above ground, 10x100 cm entrance at 45 degrees.	Possibly suitable	Given there is no tree ID, the description is very similar to habitat tree 561 (a Marri tree with no suitable hollows) and the point is 2 m away, it is assumed this is a duplicate.	Not suitable
0 (south)	116.0023	-32.0212	Stag	0	Hollow 1: 15x20 cm entrance, west facing hollow, vertical on trunk, 6 m above ground, unable to assess depth, no evidence of use Hollow 2: 30x30 cm entrance, facing upward/vertical on spout, 7 m above ground.	Possibly suitable	The tree at this point location was an *Allocasuarina*. No other trees nearby. Given there is no "NewID" for this record, this is likely to represent a data error. No habitat tree present.	Not suitable

405445 405980 406515

6458045

6457510

6456975

6456440

0 482 438 417 491

0 50 100 m

561 0

0 20 40 m

PERTH

Coterra

Wattle Grove MRS Amendment

Project No	1633
Date	19 Jan 2024
Drawn by	AJ
Map author	AJ

0 125 250

Metres

1:5,380 (at A3) GDA 1994 MGA Zone 50

Potential habitat trees

Wattle Grove MRS Amendment Area

Figure 4-2

Potential habitat trees re-assessed by Phoenix in 2024

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Figure 4-3 Trees at location of habitat tree 417

Figure 4-4 Habitat tree 438

Figure 4-5 Hollow of habitat tree 438

Figure 4-6 Habitat tree 482

Figure 4-7 Habitat tree 491

Figure 4-8 Hollow 1 in habitat tree 491

Figure 4-9 Hollow 2 in habitat tree 491

Figure 4-10 Foraging evidence and black cockatoo feathers underneath habitat tree 491

4.2 ROOSTING HABITAT ANALYSIS

There are 50 confirmed roosting sites (23 FRT roosting sites, 7 White-tailed sp. roosting sites, 20 White-tailed and FRT roosting sites) and 10 unconfirmed roosting sites within 12 km of the study area (Figure 4-11) (Birdlife 2024).

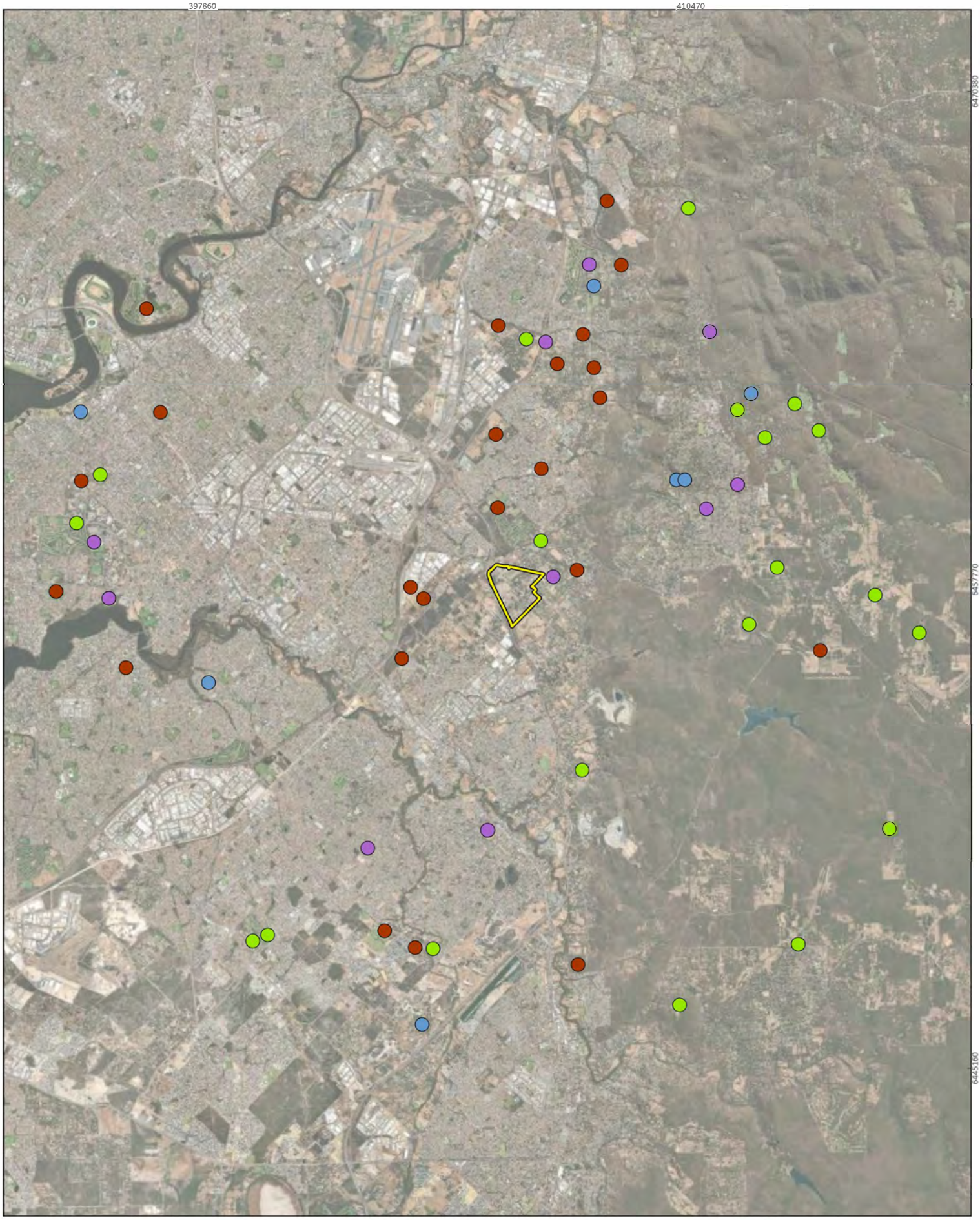
The nearest roosting site to the study area is an unconfirmed roosting site located 250 m east of the study area (KALWATR001). An unconfirmed roosting site is where roosting black-cockatoos have been reported but have not had a positive count recorded (≥1 bird) during any GCC; these sites may be used at other times of year or may have only recently been added to the GCC database (Birdlife 2024).

The nearest FRT and white-tailed sp. roosting site is 825 m north of the study area (KALWATR003) recorded 21 and 28 individuals in 2021 and 2023 respectively during the Great cocky Count census.

The confirmed site (KALWATR002), recorded 850 m east of the study area supports FRTBC roosting of up to 150 individuals (Great Cocky Count Census 2016, 2018), with lower numbers recorded in subsequent years (23, 87, 0, and 37)

The unconfirmed roosting site (KALWATR001) is just 350 m east of the study area (DBCA 2023).

The habitat assessment undertaken by (AECOM 2020) determined that 29.8 ha of suitable roosting habitat was present, consisting of remnant native vegetation, planted gardens and scattered trees (Figure 4-1). Numerous surveys have been undertaken for this Project since 2019, and numerous sites in close proximity are part of annual black cockatoo monitoring, and to date no roosting sites for black cockatoo species have been identified within the study area. So while there may be habitat considered suitable for roosting, it does not appear to have been used as such for almost the last decade.



Hesperia Projects Pty Ltd
Wattle Grove Metropolitan Region Scheme

Project No	1647
Date	11/07/2024
Drawn by	JL
Map author	AJ

0 1.5 3
Kilometers

1:126,100 (at A4) GDA 1994 MGA Zone 50

Study area

Site category

- FRT - roost site
- WT - roost site
- WT and FRT roost site
- unconfirmed roost site

Figure 4-11

Roosting locations within 12 km of the study area (Birdlife 2024)

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4.3 FORAGING HABITAT ANALYSIS

Foraging habitat scores have been calculated per the methods presented in Bamford (2021) (Table 4-2, Table 4-3, Table 4-4).

4.3.1 Site context

Site context was allocated a '3' to all species in being that:

- Carnaby's cockatoo: local breeding is also known and 32.9% of native vegetation remains within 15km of the Amendment Area
- Baudin's cockatoo: no local breeding is known or likely, but 32.9% of native vegetation remains within 15km of the Amendment Area
- FRTBC: no local breeding is known or likely, but 32.9% of native vegetation remains within 15km of the Amendment Area.

4.3.2 Species stocking rate

Species stocking rate was given '1' for Carnaby's Cockatoo and FRTBC and '0' for Baudin's Cockatoo:

- Carnaby's Cockatoo: stocking rate = 1, observed feeding and multiple recent and historic evidence of feeding activity were recorded (i.e. AECOM 2020; DBCA 2023; JBS&G 2023 and here).
- Baudin's Cockatoo: stocking rate = 0, as no feeding was directly observed, nor was recent or historical evidence found and desktop records are also absent within 15km of the Amendment Area .
- FRTBC: stocking rate = 1 as observed feeding and multiple recent and historic evidence of feeding activity have been recorded (i.e. AECOM 2020; DBCA 2023; JBS&G 2023 and here).

4.3.3 Site condition

Per Bamford (2021) "site condition" is scored out of 6 and is the biggest factor in the overall score. Site condition varied between vegetation types and between species of black cockatoo, with higher scores being attributed to those vegetation units/habitats with a higher density of foraging species.

4.3.4 Moderation

Moderation has been applied to parts of the habitat polygons that did not record a known forage species (native or introduced).

4.3.5 Site score

The results for the black cockatoo foraging habitat analysis are summarised below, per vegetation type (Table 4-2; Table 4-3; Table 4-4), per relative score (Table 4-5; Table 4-6) and shown visually in Figure 4-12 (Carnaby's Cockatoo), Figure 4-13 (Baudin's Cockatoo) and Figure 4-14 (FRTBC).

Table 4-2 Site score for Carnaby's Cockatoo

Veg. type/ Site score with justification	2	3	5	6	8	Total
BaEpPf				**0.82**	**3.41**	**4.23**
32.9% native veg. remaining (within 15km). Local breeding confirmed (within 12km).					3.41	3.41
32.9% native veg. remaining (within 15km). Some foraging species present, but moderated down due to degraded condition.				0.82		0.82
BmXpEc					**0.29**	**0.29**
32.9% native veg. remaining (within 15km). Local breeding confirmed (within 12km).					0.29	0.29
32.9% native veg. remaining (within 15km). Some foraging species present, but moderated down due to degraded condition.				0.13		0.13
Cleared	**91.23**					**91.23**
32.9% native veg. remaining (within 15km). But no foraging species present; 32.9% native veg. remaining (within 15km). Local breeding confirmed (within 12km).	91.23					91.23
EmMpLp	**0.08**				**0.05**	**0.13**
32.9% native veg. remaining (within 15km). But no foraging species present.	0.08					0.08
32.9% native veg. remaining (within 15km). Local breeding confirmed (within 12km).					0.05	0.05
Planted	**2.80**					**2.80**
32.9% native veg. remaining (within 15km). But no foraging species present.	2.80					2.80
Trees	**20.43**	**5.84**	**0.59**	**0.05**		**26.91**
32.9% native veg. remaining (within 15km). But no foraging species present; moderated down due to degraded condition.	20.43					20.43
32.9% native veg. remaining (within 15km). Local breeding confirmed (within 12km).			0.59			0.59
32.9% native veg. remaining (within 15km). Some foraging species present, but moderated down due to degraded condition.		5.84		0.05		5.89
Total	**114.54**	**5.84**	**0.59**	**0.87**	**3.75**	**125.59**

Table 4-3 Site score for Baudin's Cockatoo

Veg. type/ site score with justification	2	3	5	7	Total
BaEpPf	**0.82**		**1.34**	**2.08**	**4.24**
32.9% native veg. remaining (within 15km). Foraging species present.			1.34		1.34
32.9% native veg. remaining (within 15km). Foraging species present. Moderated down due to degraded condition.	0.82				0.82
32.9% native veg. remaining (within 15km). Multiple foraging species present, veg in good or better condition.				2.08	2.08
BmXpEc				**0.29**	**0.29**
32.9% native veg. remaining (within 15km). Multiple foraging species present, veg in good or better condition.				0.29	0.29
Cleared	**91.23**				**91.23**
32.9% native veg. remaining (within 15km). Foraging species present. Moderated down due to degraded condition.	91.23				91.23
EmMpLp	**0.08**			**0.05**	**0.13**
32.9% native veg. remaining (within 15km). Foraging species present. Moderated down due to degraded condition.	0.08				0.08
32.9% native veg. remaining (within 15km). Multiple foraging species present, veg in good or better condition.				0.05	0.05
Planted	**2.80**				**2.80**
32.9% native veg. remaining (within 15km).	2.80				2.80
Trees	**21.63**	**4.48**	**0.81**		**26.92**
32.9% native veg. remaining (within 15km). Moderated down due to degraded condition.	21.06				20.66
32.9% native veg. remaining (within 15km). Foraging species present. Moderated down due to degraded condition.	0.57	4.48	0.81		6.25
Total	**116.55**	**4.48**	**2.14**	**2.41**	**125.59**

Table 4-4 Site score for FRTBC

Veg. type/ site score with justification	2	3	7	8	Total
BaEpPf		**0.82**		**3.41**	**4.23**
32.9% native veg. remaining				2.42	2.42
32.9% native veg. remaining (within 15km). But Moderated down due to clearing, despite foraging species present.		0.82			0.82
32.9% native veg. remaining (within 15km). No foraging species present.				0.99	0.99
BmXpEc			**0.05**	**0.24**	**0.29**
32.9% native veg. remaining (within 15km)			0.05	0.24	0.29
Cleared	**91.23**				**91.23**
32.9% native veg. remaining (within 15km). But Moderated down due to clearing, despite foraging species present.	84.45				84.45
32.9% native veg. remaining (within 15km). But Moderated down due to clearing.	0.13				0.13
32.9% native veg. remaining (within 15km). No foraging species present. Moderated down due to condition.	6.64				6.64
EmMpLp		**0.08**		**0.05**	**0.13**
32.9% native veg. remaining (within 15km)				0.05	0.05
32.9% native veg. remaining (within 15km). But Moderated down due to clearing, despite foraging species present.		0.08			0.08
Planted	**2.80**				**2.80**
32.9% native veg. remaining (within 15km). No foraging species present. Moderated down due to condition.	2.80				2.80
Trees	**20.61**	**6.30**			**26.91**
32.9% native veg. remaining (within 15km). But Moderated down due to clearing, despite foraging species present.		6.30			6.30
32.9% native veg. remaining (within 15km). No foraging species present. Moderated down due to condition.	20.61				20.61
Total	**114.63**	**7.20**	**0.05**	**3.70**	**125.59**

Overall, the majority of the Project Area has low value foraging habitat for Carnaby's Cockatoo (120.38 ha; 95.86%), Baudin's Cockatoo (121.03 ha; 96.37%) and FRTBC (121.84 ha; 97.02%) as the area is comprised largely of cleared areas and degraded remnant vegetation (Table 4-6). A small proportion of the study area consists of high value foraging habitat for Carnaby's Cockatoo (3.75 ha; 2.99%), Baudin's Cockatoo (2.413 ha; 1.92%) and FRTBC (3.75 ha; 2.99%).

Table 4-5 Black cockatoo foraging habitat value per Bamford 2021 scoring method. Low value habitat (1-3) is in green, Moderate value habitat (4-6) is in yellow, High value habitat (7-10) is in Red.

Veg. type	Relative rating	Carnaby's Cockatoo		Baudin's Cockatoo		FRTBC	
		Score	Sum area (ha)	Score	Sum area (ha)	Score	Sum area (ha)
BaEpPf	Low			2	0.822	3	0.822
	Med.	6	0.82	5	1.337		
	High	8	3.41	7	2.075	8	3.412
BmXpEc	High			7	0.29	7	0.051
		8	0.29	-	-	8	0.239
Cleared	Low	2	91.229	2	91.229	2	91.229
EmMpLp	Low	2	0.079	3	0.079	3	0.079
	High	8	0.048	7	0.048	8	0.048
Planted	Low	2	2.80	3	2.796	2	2.796
Trees	Low	2	20.43	2	21.627	2	20.609
		3	5.84	3	4.476	3	6.3
	Med.	5	0.59	5	0.806	-	-
		6	0.05	-	-	-	-
Total area (ha)			**125.59**		**125.59**		**125.59**

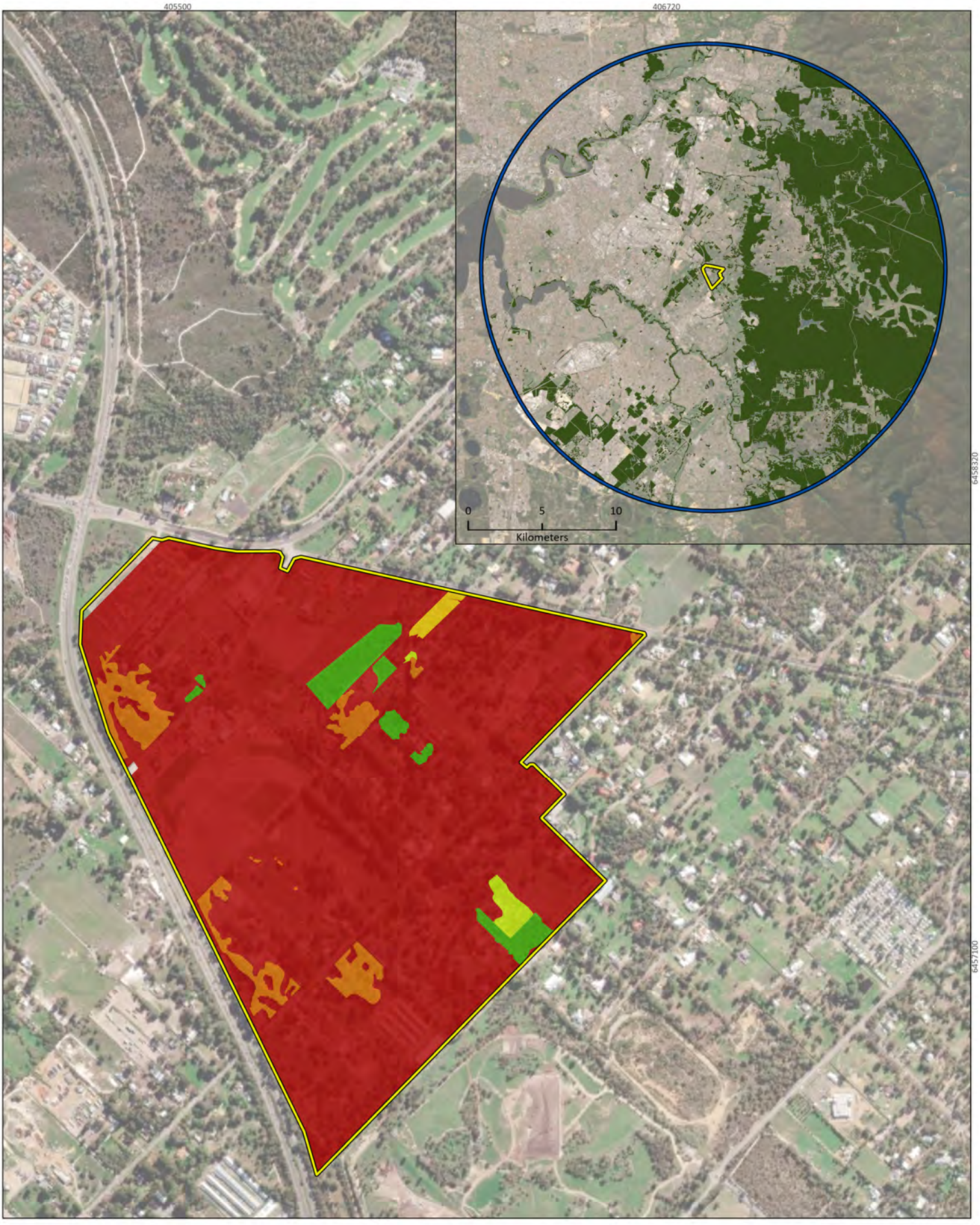
Table 4-6 Summary of foraging habitat scores and species

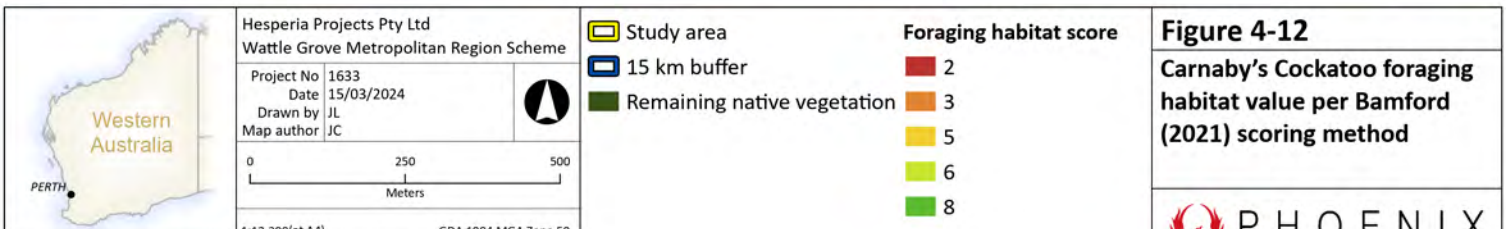
Habitat value/Score		Carnaby's Cockatoo	Baudin's Cockatoo	FRTBC
Low	2	114.5	113.68	114.63
	3	5.8	7.35	7.20
Subtotal		**120.38**	**121.03**	**121.84**
Med.	5	0.59	2.14	0
	6	0.87	0	0
Subtotal		**1.46**	**2.14**	**0.00**
High	7	0	2.41	0.05
	8	3.75	0	3.69
Subtotal		**3.75**	**2.413**	**3.75**
Total		**125.585**	**125.585**	**125.585**

It is also worth noting that 'local' native remnant vegetation (within 15km of the Amendment Area) is comprised of thousands of small, fragmented remnants (to the north, south and west), and a handful of very large, connected remnants to the east (comprising National Park, Nature Reserve, Conservation Park and Conservation Covenanted land) that dramatically impact the summary statistics (Table 4-7), e.g. the mean size of remnants is 10.1 ha, but the median size is just 0.8 ha.

Table 4-7 Summary statistics for remnant vegetation within 15 km of the study area

Statistic	Result
Count	2,543.0
Min.	0.0
Max.	4,689.5
Range	4,689.5
Sum	25,632.5
Mean	10.1
Median	0.8
Std.dev.	116.8
q1	0.3
q3	2.3





Hesperia Projects Pty Ltd
Wattle Grove Metropolitan Region Scheme

Project No	1633
Date	15/03/2024
Drawn by	JL
Map author	JC

0 250 500
Meters

1:12,200(at A4) GDA 1994 MGA Zone 50

- Study area
- 15 km buffer
- Remaining native vegetation

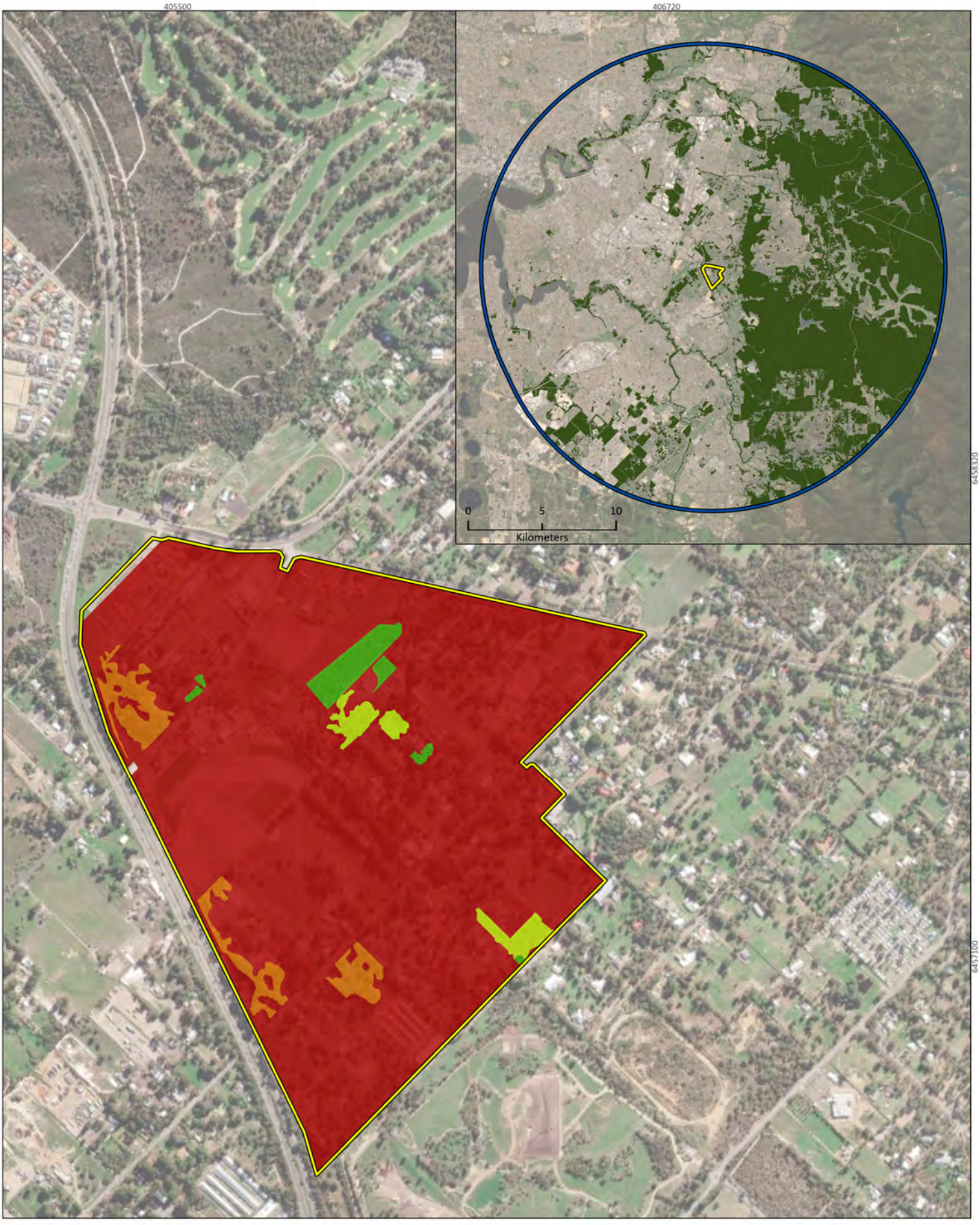
Foraging habitat score

- 2
- 3
- 5
- 6
- 8

Figure 4-12

Carnaby's Cockatoo foraging habitat value per Bamford (2021) scoring method

PHOENIX ENVIRONMENTAL SCIENCES



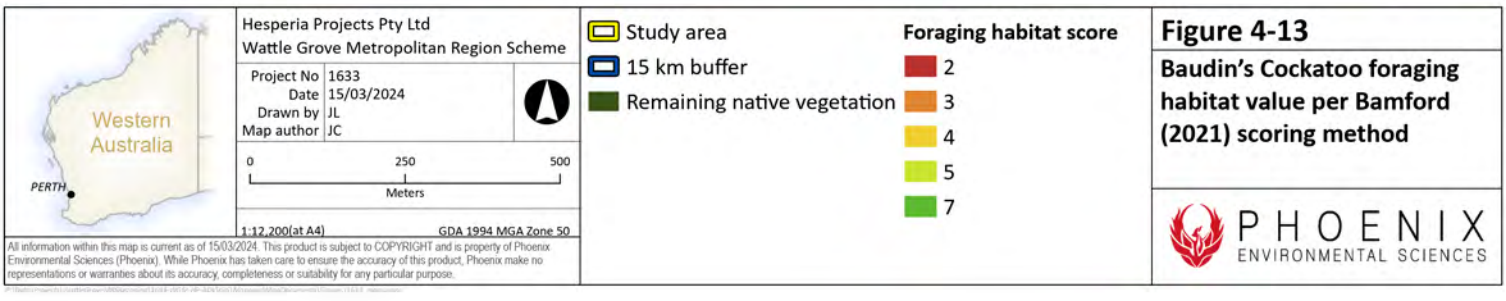


Figure 4-13

Baudin's Cockatoo foraging habitat value per Bamford (2021) scoring method

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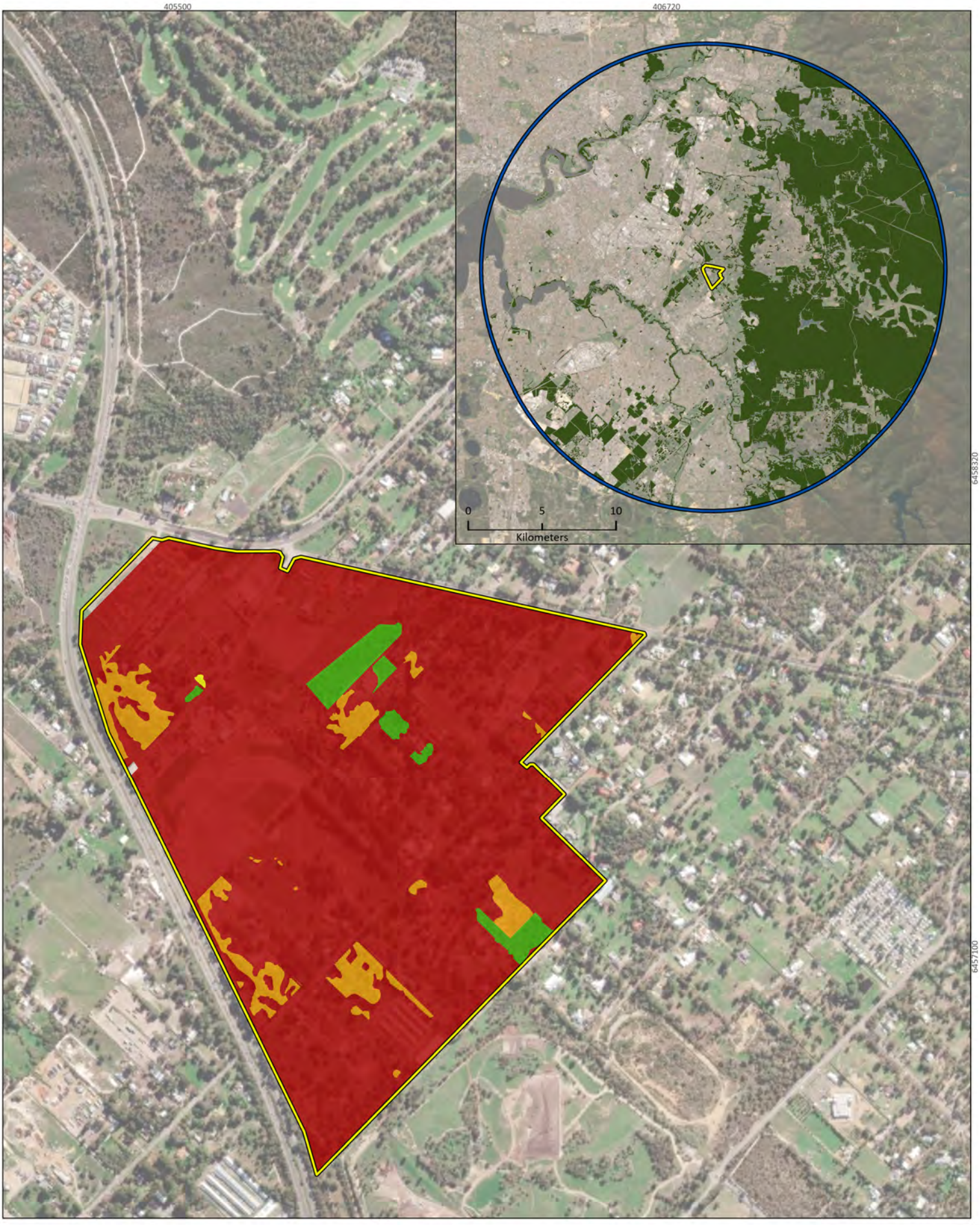

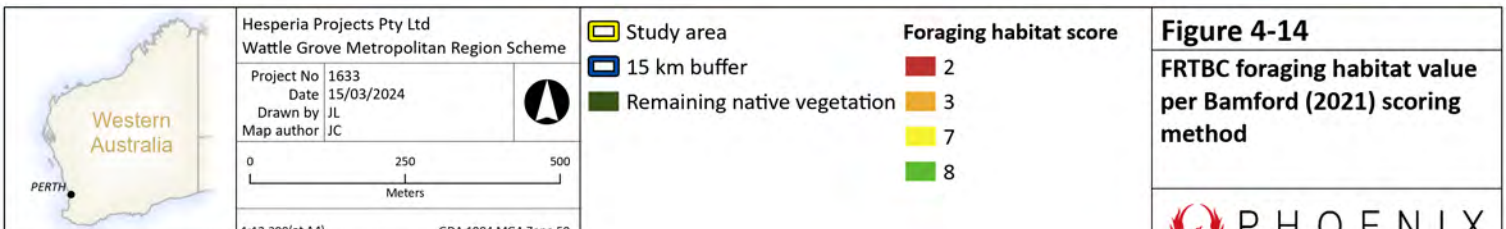

Hesperia Projects Pty Ltd
Wattle Grove Metropolitan Region Scheme

Project No	1633
Date	15/03/2024
Drawn by	JL
Map author	JC

0 250 500
Meters

1:12,200(at A4) GDA 1994 MGA Zone 50

Study area
15 km buffer
Remaining native vegetation

Foraging habitat score
2
3
7
8

Figure 4-14

FRTBC foraging habitat value per Bamford (2021) scoring method

PHOENIX ENVIRONMENTAL SCIENCES

5 DISCUSSION AND CONCLUSION

DAWE's (2022b) objective for black cockatoos is to promote avoidance and mitigation of impacts. Black cockatoos have been and may continue to be impacted through various mechanisms, of which are essentially related to the loss or degradation of breeding habitat (in the form of hollow-bearing trees), roosting habitat (suitable trees in proximity to water, breeding trees and foraging habitat) and foraging habitat (food resources).

In terms of breeding habitat, none of the PHTs in the study area are suitable for black cockatoo nesting. All hollows are either too degraded, too small or too young to contain suitable hollows at present, as per the inspection undertaken for this report which further ground-truthed using a pole camera, 7 hollow-containing trees identified previously (AECOM 2020; JBS&G 2023). Hollows can take hundreds of years to develop, therefore, a lack of suitable hollows today does not necessarily downgrade the value of breeding habitat. Trees with hollows today are the "foundation of life for future generations of black cockatoos" (DAWE 2022a). In this case the study area contains a small area of high-quality foraging habitat and extensive areas of high-quality foraging habitat is found nearby to the east, there are water sources and roosting sites in close proximity. Thus, the study area could be considered high-quality 'future breeding habitat'. However, the study area comprises semi-rural residential land that is heavily developed, and in only the last 3 years numerous PHTs have been lost due to age and condition. In the context of the current land use, it is considered highly unlikely that the current crop of trees will still be standing in 50-100 years, when they may begin to offer the larger hollows needed for breeding, regardless of the current proposed scheme amendment change.

Similarly for roosting habitat, the currently standing trees do present potential habitat in the form of planted trees, scattered native trees and remnant eucalypt woodland, but has been found to be of largely of low value. In the absence of the proposed scheme amendment roosting cannot be ruled out as there is one confirmed and one unconfirmed roosting location within 1km of the Project area, and foraging evidence over a number of years tells us that Carnaby's Cockatoo and FRTBC are using this area regularly. However, over the last decade local black cockatoo monitoring and the surveys completed for this Project (AECOM 2020; JBS&G 2023) have failed to identified any evidence of roosting in this Project area, and, the nearby roosting sites are in riparian vegetation which does not occur in the Project area.

The value of the Project area to black cockatoos is therefore primarily as foraging habitat. Evidence of Carnaby's Cockatoo and FRTBC foraging has been recorded on all 3 surveys (AECOM 2020; JBS&G 2023 and in this survey) in the form of clipped branches and chewed nuts, as well as by direct sighting. Baudin's Cockatoo however is considered far less likely to occur. It may occur on occasion as vagrants from the Perth foothills, and records further west onto the Swan Coastal Plain are known (Bamford 2019), however no sightings or evidence have been recorded during the surveys completed to date (AECOM 2020; JBS&G 2023) or by inspection of the most relevant databases (DBCA 2023).

According to the calculations per the Bamford (2021) methods 4% of the study area is considered medium-high quality foraging habitat, and 96% is low value habitat. Given all of the above, it is entirely appropriate that the approximately 3.75 ha (3%) of high-quality TEC remnant vegetation present be retained to support local breeding, roosting and foraging for Carnaby's Cockatoo and FRTBC. With the remainder offering little value to those species.

The foraging habitat scores obtained using BCE's black cockatoo foraging habitat scoring method were lower than those used by AECOM in 2020. The reasons for this pertain to a more accurate depiction of foraging value used in the current scoring system. The factors used in the DCCEEW scoring tool include foraging potential, connectivity, proximity to breeding, proximity to roosting and plant disease, and since all of these factors favour the site, a larger area was considered Very high and High value for all 3 species of black cockatoo, when in reality, the abundance of forage species is minimal for both high quality forage species such as Marri, *Banksia* and Pine (predominantly < 10 % foliage cover), and also for lower quality forage species such as small fruited eucalypts and introduced fruit

trees. BCEs method also takes into account actual foraging observations, as well as predicted distribution.

There are no recent records of fire at the time of the vegetation survey so this is not likely to have impacted forage species coverage scores. The presence of weeds and introduced forage species does indicate low value forage habitat due to their sparse coverage and/or poor quality food source and poor accessibility, compared to native forage species which are generally higher quality and in higher abundance when in native remnant patches.

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Appendix 1 Scoring system for the assessment of foraging value of vegetation for black cockatoos (Bamford 2021)

Total score (out of 10) comprises:

- A score out of 6 for the vegetation composition, condition and structure, plus
- A score out of 3 for the context of the site, plus
- A score out of one for species density.

These are described in detail below.

A. Vegetation composition, condition and structure scoring

Site score	Description of vegetation values		
	Carnaby's Black-Cockatoo	**Baudin's Black-Cockatoo**	**FRTBC**
0	No foraging value. No Proteaceae, eucalypts or other potential sources of food. Examples: • Water bodies (e.g. salt lakes, dams, rivers) • Bare ground • Developed sites devoid of vegetation (e.g. infrastructure, roads, gravel pits).	No foraging value. No eucalypts or other potential sources of food. Examples: • Water bodies (e.g. dams, rivers) • Bare ground • Developed sites devoid of vegetation (e.g. infrastructure, roads, gravel pits).	No foraging value. No eucalypts or other potential sources of food. Examples: • Water bodies (e.g. dams, rivers) • Bare ground • Developed sites devoid of vegetation (e.g. infrastructure, roads, gravel pits).
1	Negligible to low foraging value. Examples: • Scattered specimens of known food plants but projected foliage cover of these is < 2%. This could include urban areas with scattered foraging trees • Paddocks that are partly vegetated with melons or other known food-source weeds (e.g. Erodium spp.) that represent a short-term and/or seasonal food-source • Blue Gum plantations (foraging by Carnaby's Cockatoos has been reported but appears to be unusual).	Negligible to low foraging value. Scattered specimens of known food plants but projected foliage cover of these < 1%. This could include urban areas with scattered foraging trees.	Negligible to low foraging value. Scattered specimens of known food plants but projected foliage cover of these < 1%. Could include urban areas with scattered foraging trees.

Site score	Description of vegetation values		
	Carnaby's Black-Cockatoo	**Baudin's Black-Cockatoo**	**FRTBC**
2	Low foraging value. Examples: • Shrubland in which species of foraging value, such as shrubby banksias, have < 10% projected foliage cover • Woodland with tree banksias 2-5% projected foliage cover • Woodland with tree banksias (of key species *B.attenuata* and *B. menziesii*) with <10%projected foliage cover but vegetation condition reduced due to weed invasion and/or some tree deaths • Open eucalypt woodland/mallee of small-fruited species • Paddocks that are densely vegetated with melons or other known food-source weeds (e.g. Erodium spp.) that represent a short-term and/or seasonal food-source.	Low foraging value. Examples: • Woodland with scattered specimens of known food plants (e.g. Marri and Jarrah) 1-5% projected foliage cover • Marri-Jarrah Woodland with <10% projected foliage cover but vegetation condition reduced due to weed invasion and/or some tree deaths • Parkland-cleared Eucalypt Woodland/Forest with known food plants <10% projected foliage cover (poor long-term viability without management) • Younger areas of (managed) revegetation with known food plants <10% projected foliage cover (establishing food sources with good long-term viability) • Urban areas with scattered foraging trees.	Low foraging value. Examples: • Woodland with scattered specimens of known food plants (e.g. Marri, Jarrah) 1-5%projected foliage cover • Marri-Jarrah Woodland with <10% projected foliage cover but vegetation condition reduced due to weed invasion and/or some tree deaths • Sheoak Woodland with <10% projected foliage cover • Parkland-cleared Eucalypt Woodland/Forest with known food plants <10% projected foliage cover (poor long-term viability without management) • Younger areas of (managed) revegetation with known food plants <10% projected foliage cover (establishing food sources with good long-term viability) • Urban areas with scattered food plants such as Cape Lilac, Eucalyptus caesia and E. erythrocorys.

Site score	Description of vegetation values		
	Carnaby's Black-Cockatoo	**Baudin's Black-Cockatoo**	**FRTBC**
3	Low to Moderate foraging value. Examples: • Shrubland in which species of foraging value, such as shrubby banksias, have 10-20% projected foliage cover • Woodland with tree banksias 5-20% projected foliage cover • Woodland with tree Banksia (of key species *B. attenuata* and *B. menziesii*) with 10-40%projected foliage cover but vegetation condition reduced due to weed invasion and/or some tree deaths • Eucalypt Woodland/Mallee of small-fruited species • Eucalypt Woodland with Marri < 10% projected foliage cover.	Low to Moderate foraging value. Examples: • Eucalypt Woodland with known food plants (especially Marri) 5-20% projected foliage cover • Marri-Jarrah Woodland with 10-40% projected foliage cover but vegetation condition reduced due to weed invasion and/or some tree deaths • Parkland-cleared Eucalypt Woodland/Forest with known food plants 10-40% projected foliage cover (poor long-term viability without management) • Younger areas of (managed) revegetation with known food plants 10-40% projected foliage cover (establishing food sources with good long-term viability).	Low to Moderate foraging value. Examples: • Eucalypt Woodland with known food plants (especially Marri and Jarrah) 5-20% projected foliage cover • Marri-Jarrah Woodland with 10-40%projected foliage cover but vegetation condition reduced due to weed invasion and/or some tree d • Sheoak Forest with 10-40% projected foliage cover • Parkland-cleared Eucalypt Woodland/Forest with known food plants 10-40% projected foliage cover (poor long-term viability without management) • Younger areas of (managed) revegetation with known food plants 10-40% projected foliage cover (establishing food sources with good long-term viability).
4	Moderate foraging value. Examples: • Woodland/low forest with tree banksias (of key species *B. attenuata* and *B. menziesii*) 20-40% projected foliage cover • Woodland/low forest with tree banksias (of key species *B. attenuata* and *B. menziesii*) with 40-60% projected foliage cover but vegetation condition reduced due to weed invasion and/or some tree deaths • Kwongan/ Shrubland in which species of foraging value, such as shrubby banksias, have 20-40% projected foliage cover • Eucalypt Woodland/Forest with Marri 20–40% projected foliage cover.	Moderate foraging value. Examples: • Marri-Jarrah Woodland/Forest with 20-40% projected foliage cover • Marri-Jarrah Forest with 40-60% projected foliage cover but vegetation condition reduced due to weed invasion and/or some tree deaths • Parkland-cleared Eucalypt Woodland/Forest with known food plants 40-60% projected foliage cover (poor long-term viability without management) • Younger areas of (managed) revegetation with known food plants 40-60% projected foliage cover (establishing food sources with good long-term viability) • Orchards with highly desirable food sources (e.g. apples, pears, some stone fruits).	Moderate foraging value. Examples: • Marri-Jarrah Woodland/Forest with 20-40% projected foliage cover • Marri-Jarrah Forest with 40-60% projected foliage cover but vegetation condition reduced due to weed invasion and/or some tree deaths • Sheoak Forest with 40-60% projected foliage cover • Parkland-cleared Eucalypt Woodland/Forest with known food plants 40-60% projected foliage cover (poor long-term viability without management) • Younger areas of (managed) revegetation with known food plants 40-60% projected foliage cover (establishing food sources with good long-term viability).

Site score	Description of vegetation values		
	Carnaby's Black-Cockatoo	**Baudin's Black-Cockatoo**	**FRTBC**
5	Moderate to High foraging value. Examples: • Banksia Forest with 40-60% projected foliage cover • Banksia Forest with > 60% projected foliage cover but vegetation condition reduced due to weed invasion and/or some tree deaths • Kwongan/ Shrubland in which species of foraging value, such as shrubby banksias, have 40-60% projected foliage cover • Marri-Jarrah Forest with 40-60% projected foliage cover and vegetation condition good with low weed invasion and/or low tree deaths (indicating it is robust and unlikely to decline in the medium-term) • Pine plantations with trees more than 10 years old.	Moderate to High foraging value. Examples: • Marri-Jarrah Forest with 40-60% projected foliage cover • Marri-Jarrah Forest with > 60% projected foliage cover but vegetation condition reduced due to weed invasion and/or some tree deaths • Parkland-cleared Eucalypt Woodland/Forest with known food plants >60% projected foliage cover (poor long-term viability without management) • Younger areas of (managed) revegetation with known food plants >60% projected foliage cover (establishing food sources with good long-term viability).	Moderate to High foraging value. Examples: • Marri-Jarrah Forest with 40-60% projected foliage cover • Marri-Jarrah Forest with > 60% projected foliage cover but vegetation condition reduced due to weed invasion and/or some tree deaths • Sheoak Forest with > 60% projected foliage cover • Parkland-cleared Eucalypt Woodland/Forest with known food plants >60% projected foliage cover (poor long-term viability without management) • Younger areas of (managed) revegetation with known food plants >60% projected foliage cover (establishing food sources with good long-term viability).
6	High foraging value. Example: • Banksia Forest with > 60% projected foliage cover and vegetation condition good with low weed invasion and/or low tree deaths (indicating it is robust and unlikely to decline in the medium-term) • Kwongan/ Shrubland in which species of foraging value, such as shrubby banksias, have >60% projected foliage cover • Marri-Jarrah Forest with > 60% projected foliage cover and vegetation condition good with low weed invasion and/or low tree deaths (indicating it is robust and unlikely to decline in the medium-term).	High foraging value. Example: • Marri-Jarrah Forest with > 60% projected foliage cover and vegetation condition good with low weed invasion and/or low tree deaths (indicating it is robust and unlikely to decline in the medium-term).	High foraging value. Example: • Marri-Jarrah Forest with > 60% projected foliage cover and vegetation condition good with low weed invasion and/or low tree deaths (indicating it is robust and unlikely to decline in the medium-term).

Vegetation structural class terminology follows Keighery (1994).

B. Site context.

The maximum score is given in situations where foraging habitat is supporting breeding birds. It can also be given in fragmented landscapes where there is little foraging habitat remaining and thus what is left has a high contextual value. The site context score is species specific as it depends upon factors such as the vegetation type and extent, and the presence of breeding birds, and the following table, developed by Bamford consulting in conjunction with DCCEEW, provides a *guide* to the assignation of site context scores (note that 'local area' is defined as within a 15 km radius of the centre point of the study site):

Site context score	Percentage of the existing native vegetation within the 'local' area that the study site represents	
	'Local' breeding known/likely	**'Local' breeding unlikely**
3	> 5%	> 10%
2	1– 5%	5–10%
1	0.1–1%	0.1–5%
0	< 0.1%	< 0.1%

C. Species density.

Assignation of the species density score (0 or 1) is based upon the black-cockatoo species being either abundant or not abundant, and is species specific. A score of 1 is used where the species is seen or reported regularly and/or there is abundant foraging evidence. Regularly is when the species is seen at intervals of every few days or weeks for at least several months of the year. A score of 0 is used when the species is recorded or reported very infrequently and there is little or no foraging evidence.

D. Moderation of scores.

The context and species density scores need to be moderated based on the vegetation condition score to prevent vegetation of little or no foraging value receiving an excessive score out of 10. For example, a habitat with no black cockatoo foraging value (such as a wetland) may receive a foraging score as high as 4 out of 10 if it occurs in an area where the species breed (context score of 3) and are abundant (context score of 1). Black cockatoos would only be present in habitat with foraging value, so applying the context and species scores to vegetation that received a low condition score would not give an accurate reflection of their foraging value.

The moderation approach is outlined below, where context and species density scores of zero are given to sites with a condition score of 3 or less.

Vegetation composition, condition and structure score	Context score	Species density score
3-6 (low/moderate to high value)	Assessed as per B above	Assessed as per C above
0-2 (no to low value)	0	0

Appendix 2 Potential habitat trees within the study area

Tree code	Species	Tree height	DBH (cm)	# of possible hollows	suitable hollows	condition	Author	Latitude	Longitude	Comment
	C. calophylla	17	52	0	No		AECOM, 2020	-32.0106	116.0092	
	C. calophylla	25	53	0	No		AECOM, 2020	-32.00919	116.0021	
	C. calophylla	18	70	0	No		AECOM, 2020	-32.02267	116.0032	
	C. calophylla	17	70	0	No		AECOM, 2020	-32.012	115.9997	
358	*C. calophylla*	0	60	0	No	healthy	JBS&G, 2021	-32.02258	116.0031	
215	*C. calophylla*	0	55	0	No	stressed	JBS&G, 2021	-32.01929	116.0014	
359	*C. calophylla*	0	55	0	No	healthy	JBS&G, 2021	-32.02261	116.0034	
360	*C. calophylla*	0	65	0	No	healthy	JBS&G, 2021	-32.02259	116.0032	
372	*C. calophylla*	0	70	0	No	healthy	JBS&G, 2021	-32.02242	116.0034	
374	*C. calophylla*	0	60	0	No	healthy	JBS&G, 2021	-32.02237	116.0037	
1221	*C. calophylla*	0	0	0	No	slightly stressed	JBS&G, 2022	-32.0173	116.0011	
1222	*C. calophylla*	0	0	0	No	slightly stressed	JBS&G, 2022	-32.01732	116.0013	
1223	*C. calophylla*	0	0	0	No	healthy	JBS&G, 2022	-32.01727	116.0014	
1226	*C. calophylla*	0	0	0	No	stressed	JBS&G, 2022	-32.01672	116.0007	
1227	*C. calophylla*	0	0	0	No	healthy	JBS&G, 2022	-32.0166	116.0007	
1228	*C. calophylla*	0	0	0	No	healthy	JBS&G, 2022	-32.01665	116.0006	
1229	*C. calophylla*	0	0	0	No	slightly stressed	JBS&G, 2022	-32.01666	116.0005	
1230	*C. calophylla*	0	0	0	No	slightly stressed	JBS&G, 2022	-32.01668	116.0005	
1231	*C. calophylla*	0	0	0	No	healthy, slightly stressed	JBS&G, 2022	-32.0167	116.0005	
1232	*C. calophylla*	0	0	0	No	healthy	JBS&G, 2022	-32.0167	116.0004	
1233	*C. calophylla*	0	0	0	No	slightly stressed, healthy	JBS&G, 2022	-32.01673	116.0004	
1234	*C. calophylla*	0	0	0	No	stressed	JBS&G, 2022	-32.01675	116.0005	
1235	*C. calophylla*	0	0	0	No	stressed	JBS&G, 2022	-32.01678	116.0004	
1236	*C. calophylla*	0	0	0	No	slightly stressed	JBS&G, 2022	-32.01676	116.0004	
	E. gomphocephala	25	70	0	No		AECOM, 2020	-32.01911	116.0024	
	E. gomphocephala	25	100	0	No		AECOM, 2020	-32.0182	116.0041	
	E. gomphocephala	22	60	0	No		AECOM, 2020	-32.019	116.0025	
	E. gomphocephala	18	60	0	No		AECOM, 2020	-32.0186	116.0013	
	E. gomphocephala	20	65	0	No		AECOM, 2020	-32.0185	116.0012	DBH measured above fork
	E. gomphocephala	20	100	0	No		AECOM, 2020	-32.0185	116.0011	
	E. gomphocephala	22	130	0	No		AECOM, 2020	-32.0184	116.0011	
	E. gomphocephala	22	65	0	No		AECOM, 2020	-32.0183	116.001	
	E. gomphocephala	25	120	0	No		AECOM, 2020	-32.0127	115.9987	
	E. gomphocephala	20	100	0	No		AECOM, 2020	-32.0126	115.9986	
	E. gomphocephala	25	75	0	No		AECOM, 2020	-32.0125	115.9985	
151	*E. gomphocephala*	0	60	0	No	healthy	JBS&G, 2021	-32.01867	116.0015	
153	*E. gomphocephala*	0	60	0	No	healthy	JBS&G, 2021	-32.01871	116.0016	

Tree code	Species	Tree height	DBH (cm)	# of possible hollows	suitable hollows	condition	Author	Latitude	Longitude	Comment
179	*E. gomphocephala*	0	50	0	No	slightly stressed	JBS&G, 2021	-32.01897	116.002	
1	*E. gomphocephala*	0	50	0	No	healthy	JBS&G, 2021	-32.01851	116.003	
2	*E. gomphocephala*	0	100	0	No	healthy	JBS&G, 2021	-32.01854	116.0029	
21	*E. gomphocephala*	0	60	0	No	healthy	JBS&G, 2021	-32.0184	116.0024	
25	*E. gomphocephala*	0	65	0	No	slightly stressed	JBS&G, 2021	-32.01873	116.0024	
1143	*E. gomphocephala*	0	70	0	No		JBS&G, 2021	-32.01871	116.005	
1158	*E. gomphocephala*	0	100	0	No		JBS&G, 2021	-32.01834	116.0044	
230	*E. gomphocephala*	0	50	0	No	slightly stressed	JBS&G, 2021	-32.0189	116.001	
404	*E. gomphocephala*	0	55	0	No	very stressed	JBS&G, 2021	-32.02096	116.0039	
1060	*E. gomphocephala*	0	100	0	No		JBS&G, 2021	-32.01878	116.0044	
Road Reserve	*E. gomphocephala*	0	70	0	No		JBS&G, 2021	-32.02	116.0017	
	E. marginata	15	100	0	No		AECOM, 2020	-32.0142	116.0085	
	E. marginata	17	60	0	No		AECOM, 2020	-32.0144	116.0083	
	E. marginata	12	51	0	No		AECOM, 2020	-32.01447	116.007	
	E. marginata	16	52	0	No		AECOM, 2020	-32.01447	116.0069	
	E. marginata	15	55	0	No		AECOM, 2020	-32.01404	116.0059	
	E. marginata	15	55	0	No		AECOM, 2020	-32.02073	116.0024	
	E. marginata	18	80	0	No		AECOM, 2020	-32.02217	116.0038	
	E. marginata	18	60	0	No		AECOM, 2020	-32.02201	116.0034	
	E. marginata	14	90	0	No		AECOM, 2020	-32.02186	116.004	
	E. marginata	14	55	0	No		AECOM, 2020	-32.02135	116.0036	Hollow checked by Phoenix Jan 2024, not suitable
	E. marginata	16	65	0	No		AECOM, 2020	-32.02099	116.0034	
	E. marginata	15	60	0	No		AECOM, 2020	-32.0144	116.0068	
	E. marginata	18	110	0	No		AECOM, 2020	-32.01447	116.0071	
	E. marginata	10	70	0	No		AECOM, 2020	-32.01799	116.0091	
	E. marginata	10	80	0	No		AECOM, 2020	-32.01786	116.0092	
	E. marginata	13	60	0	No		AECOM, 2020	-32.01846	116.0085	
	E. marginata	13	60	0	No		AECOM, 2020	-32.0184	116.0085	
	E. marginata	12	55	0	No		AECOM, 2020	-32.01846	116.0085	
	E. marginata	14	65	0	No		AECOM, 2020	-32.0184	116.0084	
	E. marginata	12	55	0	No		AECOM, 2020	-32.0184	116.0083	Two trunks on tree
	E. marginata	17	80	0	No		AECOM, 2020	-32.0124	116.008	
	E. marginata	15	65	0	No		AECOM, 2020	-32.01258	116.0077	Tree has multiple large trunks
	E. marginata	18	80	0	No		AECOM, 2020	-32.01301	116.0073	
	E. marginata	15	75	0	No		AECOM, 2020	-32.01291	116.0072	
	E. marginata	17	62	0	No		AECOM, 2020	-32.0126	116.0074	
	E. marginata	10	52	0	No		AECOM, 2020	-32.01115	116.0082	
	E. marginata	15	75	0	No		AECOM, 2020	-32.0117	116.0074	
	E. marginata	18	85	0	No		AECOM, 2020	-32.01177	116.0076	
	E. marginata	15	60	0	No		AECOM, 2020	-32.01195	116.0072	Multiple trunks on tree

Tree code	Species	Tree height	DBH (cm)	# of possible hollows	suitable hollows	condition	Author	Latitude	Longitude	Comment
	E. marginata	16	75	0	No		AECOM, 2020	-32.01222	116.0069	
	E. marginata	12	51	0	No		AECOM, 2020	-32.01232	116.007	
	E. marginata	18	70	0	No		AECOM, 2020	-32.0122	116.0065	
	E. marginata	16	60	0	No		AECOM, 2020	-32.01215	116.0063	
	E. marginata	16	90	0	No		AECOM, 2020	-32.01145	116.0073	
	E. marginata	16	65	0	No		AECOM, 2020	-32.01145	116.0074	
	E. marginata	18	70	0	No		AECOM, 2020	-32.01084	116.0085	
	E. marginata	10	56	0	No		AECOM, 2020	-32.01102	116.0087	
	E. marginata	14	53	0	No		AECOM, 2020	-32.01178	116.0084	
	E. marginata	15	60	0	No		AECOM, 2020	-32.0127	116.0079	
	E. marginata	18	70	0	No		AECOM, 2020	-32.01151	116.0008	
	E. marginata	14	52	0	No		AECOM, 2020	-32.0143	116.0085	
	E. marginata	10	55	0	No		AECOM, 2020	-32.0142	116.0087	
	E. marginata	20	70	0	No		AECOM, 2020	-32.01452	116.0089	Two trunks
	E. marginata	16	60	0	No		AECOM, 2020	-32.01406	116.0079	
	E. marginata	8	55	0	No		AECOM, 2020	-32.0132	116.0054	
	E. marginata	12	55	0	No		AECOM, 2020	-32.0117	116.0085	Multiple trunks
	E. marginata	22	110	0	No		AECOM, 2020	-32.01074	116.0086	
	E. marginata	20	90	2	No		AECOM, 2020	-32.01082	116.0088	Hollow 1: West facing branch hollow, 11 m above ground, 50x10 cm entrance at 45 degrees, unable to assess chamber size, hollow occupied by pink and grey galahs Hollow 2: North-west facing branch hollow 10 m above ground, 10x100 cm entrance at 45 degrees, Hollow checked by Phoenix Jan 2024, not suitable
	E. marginata	14	60	0	No		AECOM, 2020	-32.01082	116.0089	
	E. marginata	15	55	0	No		AECOM, 2020	-32.01062	116.009	
	E. marginata	14	90	0	No		AECOM, 2020	-32.0107	116.0089	
	E. marginata	16	110	0	No		AECOM, 2020	-32.01069	116.0087	
	E. marginata	14	65	0	No		AECOM, 2020	-32.01067	116.0082	
	E. marginata	18	110	0	No		AECOM, 2020	-32.01077	116.0081	
	E. marginata	14	50	0	No		AECOM, 2020	-32.0125	116.0073	
	E. marginata	18	50	0	No		AECOM, 2020	-32.0124	116.0073	
	E. marginata	14	80	0	No		AECOM, 2020	-32.01174	116.0078	
	E. marginata	17	52	0	No		AECOM, 2020	-32.0119	116.0078	
	E. marginata	16	52	0	No		AECOM, 2020	-32.01223	116.0075	
	E. marginata	18	60	0	No		AECOM, 2020	-32.01244	116.0072	
1113	*E. marginata*	0	60	0	No		JBS&G, 2021	-32.0198	116.0062	
1033	*E. marginata*	0	60	0	No		JBS&G, 2021	-32.01871	116.008	

Tree code	Species	Tree height	DBH (cm)	# of possible hollows	suitable hollows	condition	Author	Latitude	Longitude	Comment
1038	*E. marginata*	0	60	0	No		JBS&G, 2021	-32.01664	116.006	
1039	*E. marginata*	0	70	0	No		JBS&G, 2021	-32.01677	116.0059	
1187	*E. marginata*	0	90	0	No	very stressed	JBS&G, 2021	-32.02094	116.0051	
1180	*E. marginata*	0	50	0	No		JBS&G, 2021	-32.02029	116.0043	
1181	*E. marginata*	0	50	0	No		JBS&G, 2021	-32.02051	116.0046	
1197	*E. marginata*	0	60	0	No		JBS&G, 2021	-32.02088	116.0056	
1198	*E. marginata*	0	70	0	No		JBS&G, 2021	-32.02085	116.0056	
1199	*E. marginata*	0	50	0	No		JBS&G, 2021	-32.02081	116.0055	
1202	*E. marginata*	0	60	0	No		JBS&G, 2021	-32.02065	116.0052	
1210	*E. marginata*	0	50	0	No		JBS&G, 2021	-32.0204	116.0049	
1211	*E. marginata*	0	50	0	No		JBS&G, 2021	-32.02022	116.0048	
378	*E. marginata*	0	50	0	No	healthy	JBS&G, 2021	-32.02208	116.004	
385	*E. marginata*	0	80	0	No	healthy	JBS&G, 2021	-32.02214	116.0037	
393	*E. marginata*	0	60	0	No	very stressed	JBS&G, 2021	-32.02203	116.0035	
361	*E. marginata*	0	60	0	No	healthy	JBS&G, 2021	-32.02242	116.0033	
414	*E. marginata*	0	50	0	No	healthy	JBS&G, 2021	-32.02114	116.0031	
418	*E. marginata*	0	60	0	No	slightly stressed	JBS&G, 2021	-32.02141	116.0038	
399	*E. marginata*	0	50	0	No	healthy	JBS&G, 2021	-32.02225	116.0032	
403	*E. marginata*	0	50	0	No	slightly stressed	JBS&G, 2021	-32.02204	116.0042	
435	*E. marginata*	0	50	0	No	healthy	JBS&G, 2021	-32.02133	116.004	
525	*E. marginata*	0	80	0	No		JBS&G, 2021	-32.01436	116.0041	
421	*E. marginata*	0	55	0	No	slightly stressed	JBS&G, 2021	-32.02165	116.0038	
438	*E. marginata*	0	130	0	No	healthy	JBS&G, 2021	-32.02114	116.0037	checked by Phoenix 2024, not suitable
829	*E. marginata*	0	60	0	No	healthy	JBS&G, 2021	-32.01556	116.0082	
988	*E. marginata*	0	60	0	No		JBS&G, 2021	-32.01667	116.0058	
797	*E. marginata*	0	90	0	No	healthy	JBS&G, 2021	-32.01746	116.0093	
798	*E. marginata*	0	55	0	No	healthy	JBS&G, 2021	-32.01762	116.0095	
799	*E. marginata*	0	60	0	No	healthy	JBS&G, 2021	-32.0166	116.0086	
1013	*E. marginata*	0	50	0	No		JBS&G, 2021	-32.01801	116.0071	
1028	*E. marginata*	0	70	0	No		JBS&G, 2021	-32.01874	116.0078	
1021	*E. marginata*	0	60	0	No		JBS&G, 2021	-32.01817	116.0074	
989	*E. patens*	0	60	0	No		JBS&G, 2021	-32.01683	116.0056	
1057	*E. patens*	0	60	0	No		JBS&G, 2021	-32.01891	116.004	
1171	*E. patens*	0	50	0	No		JBS&G, 2021	-32.01909	116.0036	
	E. rudis	8	0	0	No		AECOM, 2020	-32.01965	116.0018	Hollow 2: 30x30 cm entrance, facing upward/vertical on spout, 7 m above ground
846	*E. rudis*	0	50	0	No		JBS&G, 2021	-32.01498	116.0051	
46	*E. rudis*	0	60	0	No	healthy, slightly stressed	JBS&G, 2021	-32.01748	116.0007	
110	*E. rudis*	0	50	0	No	slightly stressed	JBS&G, 2021	-32.01837	116.001	
306	*E. rudis*	0	50	0	No	stressed	JBS&G, 2021	-32.0166	116.0052	

Tree code	Species	Tree height	DBH (cm)	# of possible hollows	suitable hollows	condition	Author	Latitude	Longitude	Comment
	E. rudis	0	60	0	No	healthy	JBS&G, 2021	-32.01911	116.0017	
	Introduced sp.	12	52	0	No		AECOM, 2020	-32.02008	116.0015	
1225	Introduced sp.	0	0	0	No		JBS&G, 2022	-32.01709	116.0012	
	Stag	12	60	2	No		JBS&G, 2022	-32.0212	116.0023	Hollow 1: 15x20 cm entrance, west facing hollow, vertical on trunk, 6 m above ground, unable to assess depth, no evidence of use Hollow checked by Phoenix Jan 2024, not suitable