

Targeted Black Cockatoo Breeding Habitat Assessment

Proposed Brooking Road Extension, Parkerville

Project No: EP20-134(02)

**Prepared for Shire of Mundaring
March 2021**

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Executive Summary

The Shire of Mundaring engaged Emerge Associates to conduct a 'targeted' breeding habitat survey for threatened species of black cockatoo within the proposed extension area of Brooking Road in Parkerville (referred to herein as the 'site').

As part of the assessment a field survey was undertaken on 5 November 2020 to determine the presence of black cockatoo breeding habitat.

Outcomes of the survey include the following:

- The site occurs within the modelled distribution of all three black cockatoos and within the breeding range of Carnaby's cockatoo and forest red-tailed black cockatoo. Baudin's cockatoo is not known to breed within the area.
- A total of 63 habitat trees were recorded in the site of which none contain hollows suitable for breeding by black cockatoos. Therefore, the site is currently not considered to provide suitable breeding habitat for black cockatoos.

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Black Cockatoo Habitat Tree Data

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Abbreviation Tables

Table A1: Abbreviations – Organisations

Organisations	
EPA	Environmental Protection Authority
WAM	Western Australian Museum

Table A2: Abbreviations – General terms

General terms	
EN	Endangered
VU	Vulnerable

Table A3: Abbreviations – Legislation

Legislation	
BC Act	<i>Biodiversity Conservation Act 2016</i>
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>

Table A4: Abbreviations – units of measurement

Units of measurement	
DBH	Diameter at breast height
cm	Centimetre
ha	Hectare
km	Kilometre

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1 Introduction

1.1 Project background

Emerge Associates (Emerge) were engaged by the Shire of Mundaring to characterise the breeding habitat values for threatened species of black cockatoo within the proposed extension area of Brooking Road in Parkerville. The site boundary for the assessment comprises the unconstructed road reserve corridor of Brooking Road and adjacent parts of Richardson Road, Falls Road, Victoria Road and Owen Road, as shown in **Figure 1**. The site is located approximately 26 kilometres (km) north east of the Perth Central Business District within the Shire of Mundaring.

The site is approximately 3.19 hectares (ha) in size and is bound by Richardson Road to the north, Falls Road, Victoria Road and Brooking Road to the south and rural residential land to all other sides.

1.2 Purpose and scope of work

The scope of work was specifically to conduct a 'targeted' black cockatoo breeding habitat survey with reference to the Environmental Protection Authority's (EPA's) technical guidance (EPA 2020) and the *Environment Protection and Biodiversity Conservation Act* black cockatoo referral guidelines (DSEWPac 2012b).

As part of this scope of work, the following tasks were undertaken:

- A background review of relevant information pertaining to black cockatoos.
- Field survey to identify potential breeding habitat for black cockatoos.
- Mapping of potential black cockatoo breeding habitat.
- Documentation of the survey methodology and results into a report.

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2 Background

2.1 Threatened fauna

Certain fauna taxa that are considered to be rare or under threat warrant special protection under Commonwealth and/or State legislation. At a Commonwealth level, fauna taxa may be listed as 'threatened' under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Any action likely to have a significant impact on a taxon listed under the EPBC Act requires Ministerial approval.

In Western Australia fauna species may also be classed as 'threatened' under the *Biodiversity Conservation Act 2016* (BC Act). It is an offence to 'take' or 'disturb' threatened fauna without Ministerial approval.

Threatened fauna species listed under the EPBC Act and/or BC Act are assigned a conservation status according to attributes such as population size and geographic distribution. Further information on threatened species and their categories is provided in **Appendix A**.

2.2 Black cockatoos

Three threatened species of black cockatoo occur in the south-west of WA (referred to herein collectively as 'black cockatoos'):

- *Calyptorhynchus latirostris* (Carnaby's cockatoo) which is listed as 'endangered' under the EPBC Act and the BC Act.
- *Calyptorhynchus baudinii* (Baudin's cockatoo) which is listed as 'endangered' under the EPBC Act and the BC Act.
- *Calyptorhynchus banksii naso* (forest red-tailed black cockatoo) which is listed as 'vulnerable' under the EPBC Act and the BC Act.

Black cockatoos nest in hollows that form in trees which are usually more than ~200 years old. 'Breeding habitat' is comprised of 'habitat trees' which are trees of a species known to support black cockatoo breeding and which either have a suitably large enough nest hollow or have a large enough diameter at breast height (DBH) to indicate that a suitable nest hollow could develop in time (DSEWPac 2012a). A minimum DBH for a habitat tree is defined as ≥ 50 centimetres (cm) for most tree species used by black cockatoos and ≥ 30 cm for *Eucalyptus wandoo* (wandoo) and *Eucalyptus salmonophloia* (salmon gum) (DSEWPac 2012a). Breeding habitat is also generally expected to be located within 7 km of food and water resources (Saunders 1990).

Broad-scale maps are available for the modelled distribution of Baudin's cockatoo, Carnaby's cockatoo and forest red-tailed black cockatoo (DoEE 2016a, c, b). The modelled distribution maps also include 'known breeding areas' and 'predicted breeding range' for Baudin's cockatoo and 'breeding range' and 'non-breeding range' for Carnaby's cockatoo. No breeding range modelling is available for forest red-tailed black cockatoo but the species is known to breed mainly in the jarrah forest region (DBCA 2017) and in small populations on the Swan Coastal Plain within the Baldivis, Stake Hill, Lake McLarty and Capel area and increasingly in the Perth metropolitan area (DAWE 2020).

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Each black cockatoo species has a defined breeding season, with Baudin's cockatoo breeding from August/September to February/March and Carnaby's cockatoo breeding from July/August to January/February (DSEWPaC 2012b). Forest red-tailed black cockatoo breeds in October/November but may breed in March/April if there is good autumn rainfall (DSEWPaC 2012b). There is also evidence that forest red-tail black cockatoos breed throughout the year, with peaks in April – June and August – October (Johnstone *et al.* 2013).

A review of the broad-scale maps identified that the site falls within the modelled distribution of all three species of black cockatoo (DoEE 2016b, a, c). The site also lies within the breeding range of Carnaby's cockatoo and forest red-tailed black cockatoo. The site is not located within the known or predicted breeding range of Baudin's cockatoo (DoEE 2016a).

2.3 Previous surveys

No previous targeted black cockatoo surveys are known to have been undertaken over the site.

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3 Methods

3.1 Field survey

Two ecologists and one botanist from Emerge visited the site on 11 November 2020 during the day to conduct the targeted black cockatoo breeding habitat survey.

Transects were traversed across the site and the presence of black cockatoos within or near the site was noted. Active searches for secondary evidence of breeding such as chew marks, branch clippings, droppings, moulted feathers were conducted.

Black cockatoo habitat trees were recorded within the site. A 'habitat tree' was defined as a native eucalypt that is typically known to support black cockatoo breeding such as marri, jarrah, blackbutt, tuart, wandoo, salmon gum or to a lesser extent flooded gum, with a DBH ≥ 50 cm or DBH ≥ 30 cm for wandoo or salmon gum. As any tree that has a suitable hollow may provide breeding habitat for black cockatoos, other tree species were also considered to be habitat trees if they contained a suitable hollow.

To be suitable for use as breeding habitat by black cockatoos it was considered a hollow must:

- have an entrance opening of at least 10 cm but preferably 20-30 cm (Saunders *et al.* 1982; Groom 2010; Johnstone *et al.* 2013) (Groom 2010; Saunders *et al.* 1982; Johnstone *et al.* 2013)
- be located at least 3 m from the ground (Saunders 1979b; Johnstone and Storr 1998; Groom 2010; Saunders 2014)
- be located in a trunk or branch that is generally large enough to contain a hollow that has a floor diameter of at least 40 cm and depth of 50-200 cm such that it could house an adult black cockatoo and nestlings (Saunders 1979a; Johnstone and Storr 1998; Saunders 2014; DPaW 2015)
- have vertical or near vertical orientation (Johnstone and Kirkby 2008; Johnstone *et al.* 2013).

Occasionally, native eucalypts were encountered that met DBH requirements but did not contain a trunk/branch of a sufficient size to support a hollow suitable for use by black cockatoos. For example, the tree may have been less than 3 m tall or had a trunk that forked between 1.3 m and 3 m in height and after the fork no limbs had a diameter such that they could contain a suitable hollow. These trees were not recorded as habitat trees as the likelihood they would ever form a suitable hollow was low.

Habitat trees were individually identified and the attributes outlined in **Table 1** were recorded for each tree.

Table 1: Attributes recorded for each habitat tree in the site

Attribute	Description
GPS location	The location of each habitat tree was recorded using a handheld GPS unit
Tree species	Species and common name were identified
Diameter at breast height (DBH) (cm)	DBH was measured at breast height (1.3 metres) using a diameter tape
Hollows potentially suitable for breeding by a black cockatoo	Number of hollows potentially suitable for breeding by a black cockatoo (assessed from ground level only)

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Hollows that appeared potentially suitable for use by a black cockatoo from the ground were further inspected using a drone and/or a pole-mounted camera. During the hollow inspection the internal dimensions of the hollow were confirmed if possible and an assessment was made for signs of use such as chew marks around the hollow entrance, nesting material, feathers or the presence of birds within the hollow.

All recorded habitat trees were assigned to a category listed in **Table 2**.

Table 2: Habitat tree categories

Category	Specifications
Nest	The tree contains a hollow used by black cockatoos for breeding as confirmed by records of black cockatoos, their eggs or fledglings or other evidence of recent nesting activity by black cockatoos
Potential nest	The tree contains one or more hollows that are suitable for use by black cockatoos as breeding habitat as confirmed by internal hollow inspection [^] and evidence of use by an unidentified bird such as feathers, chew marks or nest material has been recorded within a hollow
Suitable hollow(s)	The tree contains one or more hollows that are suitable for use by black cockatoos as breeding habitat as confirmed by internal hollow inspection [^]
Potentially suitable hollow(s)	The tree contains or is suspected to contain one or more hollows that have the potential to be suitable for use by black cockatoos when either viewed from the ground or following an internal hollow inspection that was inconclusive [^]
No suitable hollow(s)	The tree does not contain hollow(s) that have the potential to be suitable for use by black cockatoos when viewed from the ground <u>or</u> contains hollows that were determined to be unsuitable for use by black cockatoos by internal inspection [^]

[^]Hollow determined to be suitable for use as breeding habitat by black cockatoos as listed above in **Section 3.1.1**.

3.2 Data analysis, presentation and mapping

Habitat trees were classified according to the scheme outlined in **Table 2** and mapped on aerial imagery. A complete summary of the recorded attributes of habitat trees was compiled in a tabular format.

3.3 Nomenclature and sources of information

Taxonomy and nomenclature of scientific and common names for fauna species follow the *Western Australian Museum (WAM) Checklist of the Terrestrial Vertebrate Fauna of Western Australia* (WAM 2020). Where common names were not provided by Western Australian Museum (2019); (WAM 2020), these have been derived from other sources.

3.4 Survey limitations

It is important to note the specific constraints imposed on surveys and the degree to which these may have limited survey outcomes. An evaluation of the survey methodology against standard constraints outlined in the EPA's document *Technical Guidance – Terrestrial vertebrate fauna surveys for environmental impact assessment* (EPA 2020) is provided in **Table 3**.

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Table 3: Evaluation of survey methodology against standard constraints outlined in the EPA's Technical Guidance – Terrestrial vertebrate fauna surveys for environmental impact assessment (EPA 2020)

Constraint	Degree of limitation	Details
Level of survey	No limitation	A targeted black cockatoo breeding habitat survey was undertaken. The level of survey and survey effort are considered adequate to assess the black cockatoo breeding habitat values within the site.
Scope	No limitation	The survey focused on black cockatoo breeding habitat within the site.
Proportion of fauna identified, recorded and/or collected.	No limitation	The survey focused on identifying breeding habitat for species of black cockatoo rather than identifying fauna species.
Sources of information e.g. previously available information (whether historic or recent) as distinct from new data.	Minor limitation	All information required to assess breeding habitat within the site were available. Taxonomy and nomenclature of scientific and common names for fauna species follow the <i>Western Australian Museum (WAM) Checklist of the Terrestrial Vertebrate Fauna of Western Australia</i> (WAM 2020). This is contrary to the recent EPA (2020) advice to follow the Australian Faunal Directory (DAWE 2020b) nomenclature for birds.
The proportion of the task achieved and further work which might be needed.	No limitation	The targeted black cockatoo breeding habitat assessment was achieved in its entirety.
Experience level of personnel	No limitation	This fauna assessment was undertaken by qualified and experienced ecologists with between three and ten years of experience in conducting environmental assessments in Western Australia.
Suitability of timing, weather and season	No limitation	The survey was undertaken within the main breeding season for all three species of black cockatoo (refer to Section 2.2)
Completeness	No limitation	The field survey and targeted black cockatoo breeding habitat assessment was completed comprehensively.
Spatial coverage and access	No limitation	Site coverage was comprehensive (track logged).
	No limitation	All parts of the site could be accessed as required.
Survey intensity	No limitation	The intensity of the survey was adequate given the size of the site.
Influence of disturbance	No limitation	The majority of the site is modified due to historical disturbance. However, no recent disturbance was noted that may have affected outcomes of the survey.
Adequacy of resources	No limitation	All resources required to perform the targeted black cockatoo breeding habitat assessment were available.

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4 Results

4.1 Species inventory

Forest red-tailed black cockatoos were observed foraging within the site and abundant foraging debris attributed to this species was also noted throughout the site. No direct or indirect evidence of Carnaby's cockatoo or Baudin's cockatoos was recorded within the site.

4.2 Breeding habitat

A total of 63 black cockatoo habitat trees were recorded within the site as shown in **Figure 2**.

The habitat trees comprised 46 *Corymbia calophylla* (marri), 1 *Eucalyptus marginata* (jarrah), 1 *Eucalyptus patens* (blackbutt), 11 *Eucalyptus rudis* (flooded gum), 2 *Eucalyptus wandoo* (wandoo) and 2 stags (dead trees).

None of the habitat trees recorded in the site contained hollows that were considered suitable or potentially suitable for nesting by black cockatoos. No evidence suggesting that breeding by black cockatoos occurs in the site was observed.

A summary of the habitat trees recorded within the site is provided in **Table 4** and an inventory in **Appendix B**.

Table 4: Habitat trees recorded within the site

Category	No. trees	No. suitable hollows
Confirmed nest	0	-
Potential nest	0	-
Suitable hollow(s)	0	-
Potentially suitable hollow(s)	0	-
No suitable hollow(s)	63	0
Total	63	0

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5 Discussion

The site occurs within the breeding range of Carnaby's cockatoo and forest red-tailed black cockatoo and any suitably sized tree hollows within this range may provide potential breeding habitat for these species. Breeding by Baudin's cockatoo is not known to occur in the area.

The site supports a total of 63 habitat trees, of which none contained hollows that are suitable for breeding by black cockatoos. Therefore, the site is currently not considered to provide breeding habitat for any of the three species of black cockatoo.

The trees within the site have the potential to form suitable hollows in the future but it will likely take many years for hollows to form that are suitable for use by black cockatoos.

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6 Conclusions

The site occurs within the modelled distribution of all three species of black cockatoo and within the breeding range of Carnaby's cockatoo and forest red-tailed black cockatoo. Baudin's cockatoo is not known to breed within the area.

A total of 63 habitat trees were recorded in the site of which none contain hollows suitable for breeding by black cockatoos. Therefore, the site is currently not considered to provide suitable breeding habitat for black cockatoos.

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References

7.1 General references

- department of biodiversity Conservation and Attractions (DBCA) 2017, *Fauna Profile - Forest red-tailed black cockatoo *Calyptorhynchus banksii naso**, Perth, Western Australia.
- Department of Environment and Energy (DoEE) 2016a, *Modelled distribution for Baudin's Cockatoo (*Calyptorhynchus baudinii*)*, Canberra.
- Department of the Environment and Energy (DoEE) 2016b, *Modelled distribution for Carnaby's Cockatoo (*Calyptorhynchus latirostris*)*, Canberra.
- Department of Environment and Energy (DoEE) 2016c, *Modelled distribution for Forest Red-tailed Black-Cockatoo (*Calyptorhynchus banksii naso*)*, Canberra.
- Department of Parks and Wildlife (DPaW) 2015, *How to design and place artificial hollows for Carnaby's cockatoo*, Perth.
- Department of Sustainability Environment Water Populations and Communities (DSEWPaC) 2012a, *EPBC Act referral guidelines for three threatened black cockatoo species: Carnaby's cockatoo (endangered) *Calyptorhynchus latirostris*, Baudin's cockatoo (vulnerable) *Calyptorhynchus baudinii* and Forest red-tailed black cockatoo (vulnerable) *Calyptorhynchus banksii naso**, Commonwealth of Australia, Canberra.
- Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) 2012b, *EPBC Act referral guidelines for three threatened black cockatoo species: Carnaby's cockatoo (endangered) *Calyptorhynchus latirostris*, Baudin's cockatoo (vulnerable) *Calyptorhynchus baudinii*, Forest red-tailed black cockatoo (vulnerable) *Calyptorhynchus banksii naso**, Commonwealth of Australia, Canberra.
- Environmental Protection Authority (EPA) 2020, *Technical Guidance - Terrestrial vertebrate fauna surveys for environmental impact assessment*, Joondalup, Western Australia.
- Groom, C. 2010, *Artificial Hollows for Carnaby's Black Cockatoo: An investigation of the placement, use, monitoring and maintenance requirements of artificial hollows for Carnaby's black cockatoo*, Department of Environment and Conservation, Perth.
- Johnstone, R., Kirby, T. and 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*, Pacific Conservation Biology, 19(2): 121-142.
- Johnstone, R. E. and Kirkby, T. 2008, *Distribution, status, social organisation, movements and conservation of Baudin's Cockatoo (*Calyptorhynchus baudinii*) in South-west Western Australia*, Records of the Western Australian Museum, 25: 107-118.
- Johnstone, R. E. and Storr, G. M. 1998, *Handbook of Western Australian Birds. Volume 1 - Non-Passerines (Emu to Dollarbird)*, Western Australian Museum, Perth.
- Saunders, D. A. 1979a, *The Availability of Tree Hollows for Use as Nest Sites by White-tailed Black Cockatoos*, Australian Wildlife Research, 6: 205-216.
- Saunders, D. A. 1979b, *Distribution and taxonomy of the white-tailed and yellow-tailed Black-Cockatoos *Calyptorhynchus* spp.*, Emu, 79(215-227).
- Saunders, D. A. 1990, *Problems of Survival in an Extensively Cultivated Landscape: the case of Carnaby's Cockatoo *Calyptorhynchus funereus latirostris**, Biological Conservation, 54: 277-290.

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- Saunders, D. A., Mawson, P.R., Dawson, R. 2014, *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: 185-193.
- Saunders, D. A., Smith, G. T. and Rowley, I. 1982, *The availability and dimensions of Tree Hollows that Provide Nest Sites for Cockatoos (Psittaciformes) in Western Australia*, Australian Wildlife Research, 9: 541-556.
- Western Australian Museum (WAM) 2020, *WA Museum Checklist of the Terrestrial Vertebrate Fauna of Western Australia*, Perth, Western Australia.
- Western Australian Museum 2019, *WA Museum Checklist of the Terrestrial Vertebrate Fauna of Western Australia*, Perth, Western Australia.

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Figures



Figure 1: Site Location

Figure 2: Black Cockatoo Habitat Trees

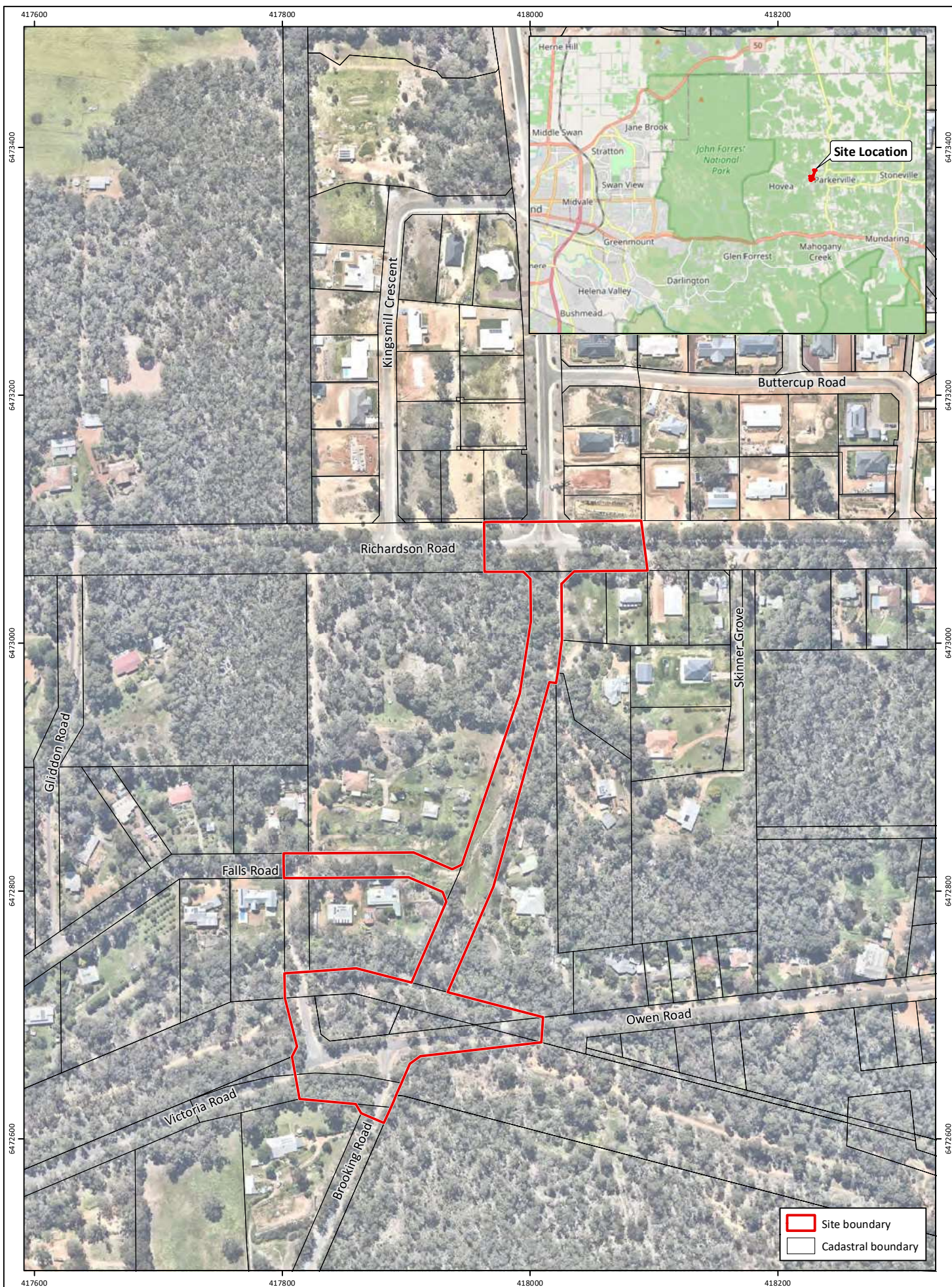


Figure 1: Site Location

Project: Targeted Black Cockatoo Breeding Habitat Assessment
Proposed Brooking Road Extension, Parkerville

Client: Shire of Mundaring

Plan Number: EP20-134(02)--F01
Drawn: GAR
Date: 10/03/2021
Checked: MS
Approved: RAW
Date: 12/03/2021



0 50 100
Metres
Scale: 1:4,000@A4
GDA 1994 MGA Zone 50



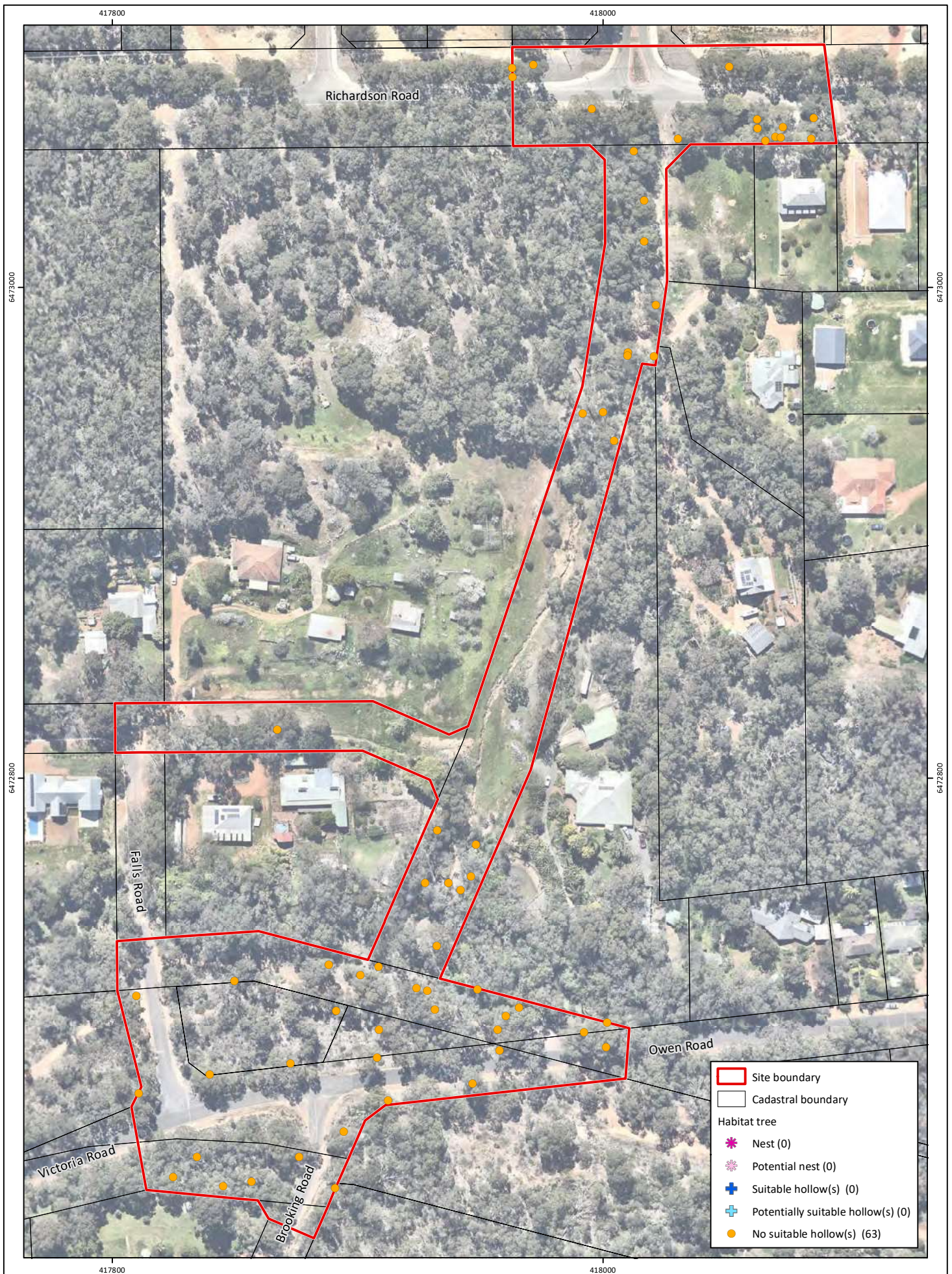


Figure 2: Black Cockatoo Habitat Trees

Project: Targeted Black Cockatoo Breeding Habitat Assessment
Proposed Brooking Road Extension, Parkerville

Client: Shire of Mundaring

Plan Number: EP20-134(02)--F02
Drawn: GAR
Date: 10/03/2021
Checked: MS
Approved: RAW
Date: 12/03/2021



0 25 50
Metres
Scale: 1:2,000@A4
GDA 1994 MGA Zone 50



Appendix A

Additional Information



Additional Background Information



Conservation Significant Fauna

Threatened and priority fauna

Fauna species considered rare or under threat warrant special protection under Commonwealth and/or State legislation. At the Commonwealth level, fauna species can be listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) as 'threatened', 'migratory' or 'marine' as described in **Table 1**.

Migratory species comprise birds recognised under international treaties including:

- *Japan Australia Migratory Bird Agreement 1981* (JAMBA)
- *China Australia Migratory Bird Agreement 1998* (CAMBA)
- *Republic of Korea-Australia Migratory Bird Agreement 2007* (ROKAMBA)
- *Bonn Convention 1979* (The Convention on the Conservation of Migratory Species of Wild Animals).

Fauna species listed as threatened and migratory are protected in Australia as 'matters of national environmental significance' (MNES) under the EPBC Act.

Table 1: Definitions of conservation significant fauna species pursuant to the EPBC Act

Conservation Code	Category
X	Threatened Fauna –Extinct There is no reasonable doubt that the last member of the species has died.
EW [#]	Threatened Fauna –Extinct in the Wild Taxa which are known only to survive in cultivation, captivity or as a naturalised population outside its past range, or taxa which have not been recorded in its known and/or expected habitat despite appropriate exhaustive surveys.
CR [#]	Threatened Fauna – Critically Endangered Taxa which are considered to be facing an extremely high risk of extinction in the wild.
EN [#]	Threatened Fauna – Endangered Taxa which are considered to be facing a very high risk of extinction in the wild.
VU [#]	Threatened Fauna – Vulnerable Taxa which are considered to be facing a high risk of extinction in the wild.
Migratory [#]	Migratory Fauna All migratory species that are: (i) native species; and (ii) from time to time included in the appendices to the Bonn Convention; and (b) all migratory species from time to time included in annexes established under JAMBA, CAMBA and ROKAMBA; and All native species from time to time identified in a list established under, or an instrument made under, an international agreement approved by the Minister.
Ma	Marine Fauna Species in the list established under s248 of the EPBC Act

[#]matters of national environmental significance (MNES) under the EPBC Act

Additional Background Information



In Western Australia, fauna taxa may be classed as ‘threatened’, ‘extinct’, or ‘specially protected’ under the *Biodiversity Conservation Act 2016* (BC Act), which is enforced by Department of Biodiversity Conservation and Attractions (DBCA) (DBCA 2019). The definitions of these categories are provided in **Table 2**.

Table 2: Definitions of specially protected fauna schedules under the BC Act (DBCA 2019)

Category	Conservation Code	Definition
Threatened	CR	Critically endangered Threatened species considered to be facing an extremely high risk of extinction in the wild in the immediate future.
	EN	Endangered Threatened species considered to be facing a very high risk of extinction in the wild in the near future.
	VU	Vulnerable Threatened species considered to be facing a high risk of extinction in the wild in the medium-term future.
Extinct	EX	Extinct Species where there is no reasonable doubt that the last member of the species has died.
	EW	Extinct in the wild 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. Note that no species are currently listed as EW.
Specially protected	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 Includes birds that subject to an agreement between the government of Australia and the governments of Japan (JAMBA), China (CAMBA) and The Republic of Korea (ROKAMBA), and the Bonn Convention, relating to the protection of migratory birds.
	CD	Species of special conservation interest (conservation dependent fauna) Fauna of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened.
	OS	Other specially protected species Fauna otherwise in need of special protection to ensure their conservation.

Additional Background Information

Fauna species that may be threatened or near threatened but lack sufficient information to be legislatively listed may be added to the DBCA's *Priority Fauna List* (DBCA 2018). Species listed under priorities 1-3 comprise possible threatened species that do not meet survey criteria or are otherwise data deficient. Species listed under priority 4 are those 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 (DBCA 2019).

Priority fauna species are considered during State approval processes. Priority fauna categories and definitions are listed in **Table 3** (DBCA 2019).

Table 3: Definitions of priority fauna categories on DBCA's Priority Fauna List (DBCA 2019)

Conservation Code	Category
P1	<p>Priority 1 – Poorly known</p> <p>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.</p>
P2	<p>Priority 2 – Poorly known</p> <p>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.</p>
P3	<p>Priority 3 – Poorly known</p> <p>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.</p>
P4	<p>(a) Priority 4 – Rare species</p> <p>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.</p> <p>(b) Priority 4 – Near Threatened</p> <p>Species that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable.</p> <p>(c) Priority 4 – Other</p> <p>Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.</p>

Additional Background Information

Pest fauna

A number of legislative and policy documents exist in relation to pest fauna management at state and national levels. The *Biosecurity and Agriculture Management Act 2007* (BAM Act) is the principle legislation guiding pest fauna management in Western Australia and lists declared pest species.

Declared Pests

Part 2.3.23 of the BAM Act requires a person must not; “a) keep, breed or cultivate the declared pest; b) keep, breed or cultivate an animal, plant or other thing that is infected or infested with the declared pest; c) release into the environment the declared pest, or an animal, plant or other thing that is infected or infested with the declared pest; or d) intentionally infect or infest, or expose to infection or infestation, a plant, animal or other thing with a declared pest”.

Under the BAM Act, all declared pests are assigned a legal status, as described in **Table 4**. Species assigned to the ‘declared pest, prohibited - s12’ category are placed in one of three control categories, as described in **Table 5**.

The *Biosecurity and Agriculture Management Regulations 2013* specify keeping categories for species assigned to the ‘declared pest - s22(2)’ category, which relate to the purposes of which species can be kept, as well as the entities that can keep them. The categories are described in **Table 6**.

The Western Australian Organism List (WAOL) provides the status of organisms which have been categorised under the BAM Act (DAFWA 2016).

Table 4: Legal status of declared pest species listed under the BAM Act (DAFWA 2016)

Category	Description
Declared Pest Prohibited - s12	May only be imported and kept subject to permits. Permit conditions applicable to some species may only be appropriate or available to research organisations or similarly secure institutions.
Declared Pest s22(2)	Must satisfy any applicable import requirements when imported, and may be subject to an import permit if they are potential carriers of high-risk organisms. They may also be subject to control and keeping requirements once within Western Australia

Table 5: Control categories of declared pest species listed under the BAM Act (DAFWA 2016)

Category	Description
C1	Exclusion Not established in Western Australia and control measures are to be taken, including border checks, in order to prevent them entering and establishing in the State.
C2	Eradication Present in Western Australia in low enough numbers or in sufficiently limited areas that their eradication is still a possibility.
C3	Management Established in Western Australia but it is feasible, or desirable, to manage them in order to limit their damage. Control measures can prevent a C3 pest from increasing in population size or density or moving from an area in which it is established into an area which currently is free of that pest.

Additional Background Information



Table 6: Keeping categories of declared pest species listed under the BAM Act (DAFWA 2016)

Category	Description
Prohibited	Can only be kept under a permit for public display and education purposes, and/or genuine scientific research, by entities approved by the state authority.
Exempt	No permit or conditions are required for keeping.
Restricted	Organisms which, relative to other species, have a low risk of becoming a problem for the environment, primary industry or public safety and can be kept under a permit by private individuals.

References

General references

Department of Biodiversity, Conservation and Attractions (DBCA) 2018, *Threatened and Priority Fauna List 15 February 2018*, Perth.

Department of Biodiversity Conservation and Attractions (DBCA) 2019, *Conservation Codes for Western Australian Flora and Fauna - last updated 3 January 2019*.

Appendix B

Black Cockatoo Habitat Tree Data



ID No.	Eastings	Northing	DBH (cm)	Species	Category	Notes
104	417907.82	6472686.40	63	<i>Corymbia calophylla</i>	No suitable hollow(s)	
105	417957.74	6472689.02	57	<i>Eucalyptus rudis</i>	No suitable hollow(s)	
109	417824.97	6472637.85	55	Stag	No suitable hollow(s)	
112	417946.11	6472760.20	52	<i>Eucalyptus rudis</i>	No suitable hollow(s)	
113	417932.34	6472778.83	84	<i>Eucalyptus rudis</i>	No suitable hollow(s)	
1752	417809.81	6472711.33	51	<i>Corymbia calophylla</i>	No suitable hollow(s)	
1753	417810.51	6472671.77	50	<i>Corymbia calophylla</i>	No suitable hollow(s)	
1754	417839.77	6472679.43	68	<i>Corymbia calophylla</i>	No suitable hollow(s)	
1755	417872.65	6472684.01	87	<i>Corymbia calophylla</i>	No suitable hollow(s)	
1756	417891.30	6472705.34	57	<i>Corymbia calophylla</i>	No suitable hollow(s)	
1757	417908.68	6472697.60	75	<i>Corymbia calophylla</i>	No suitable hollow(s)	
1758	417956.92	6472697.66	73	<i>Corymbia calophylla</i>	No suitable hollow(s)	
1759	417834.65	6472645.80	100	<i>Corymbia calophylla</i>	No suitable hollow(s)	
1760	417845.24	6472634.13	70	<i>Corymbia calophylla</i>	No suitable hollow(s)	
1761	417932.24	6472731.71	54	<i>Eucalyptus rudis</i>	No suitable hollow(s)	
1762	417867.21	6472819.99	68	<i>Eucalyptus rudis</i>	No suitable hollow(s)	
1763	418010.14	6472973.44	56	<i>Corymbia calophylla</i>	No suitable hollow(s)	
1764	418009.87	6472972.11	64	<i>Eucalyptus patens</i>	No suitable hollow(s)	
1766	418004.57	6472937.59	68	<i>Corymbia calophylla</i>	No suitable hollow(s)	
1767	418012.42	6473055.49	108	<i>Corymbia calophylla</i>	No suitable hollow(s)	
1768	417995.35	6473072.65	63	<i>Corymbia calophylla</i>	No suitable hollow(s)	
1769	417971.47	6473090.53	57	<i>Corymbia calophylla</i>	No suitable hollow(s)	
3859	417849.87	6472717.53	65	<i>Eucalyptus rudis</i>	No suitable hollow(s)	
3860	417888.32	6472724.16	83	<i>Corymbia calophylla</i>	No suitable hollow(s)	
3861	417901.12	6472719.82	52	<i>Corymbia calophylla</i>	No suitable hollow(s)	
3862	417908.47	6472723.32	82	<i>Corymbia calophylla</i>	No suitable hollow(s)	
3863	417923.96	6472714.58	71	<i>Eucalyptus wandoo</i>	No suitable hollow(s)	
3864	417928.41	6472713.39	59	<i>Eucalyptus wandoo</i>	No suitable hollow(s)	
3865	417931.41	6472705.88	68	<i>Corymbia calophylla</i>	No suitable hollow(s)	
3866	417948.84	6472714.00	61	<i>Eucalyptus rudis</i>	No suitable hollow(s)	
3867	417960.37	6472703.34	55	<i>Corymbia calophylla</i>	No suitable hollow(s)	
3868	417965.74	6472706.60	84	<i>Corymbia calophylla</i>	No suitable hollow(s)	
3870	417992.11	6472696.50	54	<i>Corymbia calophylla</i>	No suitable hollow(s)	
3871	418001.15	6472690.47	50	<i>Corymbia calophylla</i>	No suitable hollow(s)	

ID No.	Eastings	Northing	DBH (cm)	Species	Category	Notes
3872	418001.66	6472700.50	58	<i>Corymbia calophylla</i>	No suitable hollow(s)	
3874	417946.88	6472675.63	53	<i>Corymbia calophylla</i>	No suitable hollow(s)	
3875	417912.41	6472668.70	56	<i>Corymbia calophylla</i>	No suitable hollow(s)	
3876	417894.35	6472656.03	59	<i>Corymbia calophylla</i>	No suitable hollow(s)	
3877	417890.74	6472632.97	60	<i>Eucalyptus marginata</i>	No suitable hollow(s)	
3878	417876.27	6472645.69	53	<i>Corymbia calophylla</i>	No suitable hollow(s)	
3879	417856.67	6472635.66	73	Stag	No suitable hollow(s)	
3880	417927.49	6472757.50	70	<i>Eucalyptus rudis</i>	No suitable hollow(s)	
3881	417937.05	6472757.58	85	<i>Eucalyptus rudis</i>	No suitable hollow(s)	
3882	417941.89	6472754.63	67	<i>Eucalyptus rudis</i>	No suitable hollow(s)	
3883	417948.09	6472772.97	64	<i>Eucalyptus rudis</i>	No suitable hollow(s)	
3884	418020.56	6472971.97	68	<i>Corymbia calophylla</i>	No suitable hollow(s)	
3885	418000.03	6472949.31	71	<i>Corymbia calophylla</i>	No suitable hollow(s)	
3886	417991.71	6472948.68	56	<i>Corymbia calophylla</i>	No suitable hollow(s)	
3887	418021.44	6472992.71	98	<i>Corymbia calophylla</i>	No suitable hollow(s)	
3888	418016.69	6473018.83	87	<i>Corymbia calophylla</i>	No suitable hollow(s)	
3889	418016.65	6473035.35	59	<i>Corymbia calophylla</i>	No suitable hollow(s)	
3890	418030.35	6473060.62	59	<i>Corymbia calophylla</i>	No suitable hollow(s)	
3891	418066.12	6473059.80	70	<i>Corymbia calophylla</i>	No suitable hollow(s)	
3892	418062.86	6473064.87	50	<i>Corymbia calophylla</i>	No suitable hollow(s)	
3893	418062.73	6473068.64	58	<i>Corymbia calophylla</i>	No suitable hollow(s)	
3894	418070.27	6473061.27	52	<i>Corymbia calophylla</i>	No suitable hollow(s)	
3895	418072.44	6473061.18	55	<i>Corymbia calophylla</i>	No suitable hollow(s)	
3896	418073.17	6473065.29	58	<i>Corymbia calophylla</i>	No suitable hollow(s)	
3897	418084.74	6473060.50	60	<i>Corymbia calophylla</i>	No suitable hollow(s)	
3898	418085.81	6473068.94	50	<i>Corymbia calophylla</i>	No suitable hollow(s)	
3899	418051.40	6473089.94	53	<i>Corymbia calophylla</i>	No suitable hollow(s)	
3900	417962.99	6473085.69	51	<i>Corymbia calophylla</i>	No suitable hollow(s)	
119	417960.69	6473089.00	64	<i>Corymbia calophylla</i>	No suitable hollow(s)	