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Lot 310 and Lot 300 Neames Road, Mogumber - Targeted Black cockatoo habitat assessment

1. Background

This technical memorandum has been produced to support the development of Lots 2 and 10 Rowley Road, Mandogalup (the Survey Area).

2. Scope

The scope of work to be undertaken is as follows:

- Undertake a targeted Black Cockatoo habitat assessment
- prepare a report detailing the findings of the above.

3. Methods

The survey and analysis reported here have been conducted with strong reference to both the existing guidelines (DSEWPaC 2012) as well as the recently revised draft guidelines (DEE 2017). In addition, survey methodology followed the recommendations listed on the DAWE's Species Profile and Threats Database (DAWE 2020b).

Ecological values for black-cockatoos within the site were based on the definitions of breeding, foraging and roosting habitat as per the EPBC Act referral guidelines for black-cockatoos (DSEWPaC 2012), with foraging and nesting values assessed using systems developed by Bamford Consulting.

It should be noted that the only threatened species of black-cockatoo likely to occur within the project area is Carnaby's Black-Cockatoo (*Calyptorhynchus latirostris*).

Foraging habitat assessment

A foraging habitat assessment was conducted across the site by inspecting the vegetation and reviewing vegetation descriptions, and calculating a foraging score as outlined in Attachment A. The foraging score 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 sort of information needed by the Federal Department of Agriculture, Water and the Environment (DAWE) to assess impact significance and offset requirements. The foraging value of the vegetation depends upon the type, density and condition of trees and shrubs in an area, and can be influenced by the context such as the availability of foraging habitat nearby. The Bamford (2018) scoring system for value of foraging habitat has three components as detailed in Attachment A. These three components are drawn from the DAWE offset calculator but with the scoring approach developed by Bamford:

- A score out of six for the vegetation composition, condition and structure.
- A score out of three for the context of the site.

- A score out of one for species density.

Breeding habitat assessment

Vegetation containing potential breeding trees was traversed and all trees with a diameter at breast height (DBH) of greater than 500 mm were recorded by GPS. Notes on tree structural formation and hollows were made for any trees greater than 500 mm DBH.

Roosting habitat assessment

Vegetation was assessed for roosting habitat potential based on tree species present and on the occurrence of local confirmed or potential roosting sites (based upon records from the Great Cocky Count (Peck et al. 2016; DBCA 2020).

4. Results and Discussion

Foraging Habitat

There was approximately 317 ha of habitat with a foraging value of moderate to high recorded within the Survey area (Figure 1). Foraging species dominant within the Survey area were, *Eucalyptus marginata*, *Banksia attenuata, Banksia menziesii*, and *Xanthorrhoea preissii*. For the purposes of this assessment, habitat with foraging value less than moderate has not been considered.

Based on the composition, structure and condition of the vegetation assessed, the foraging habitat identified within the Survey area was classified as moderate to high foraging value. Using the scoring system developed by Bamford (2018), adding in site context and species presence, this habitat rates as a quality of 7 out of a maximum score of 10.

Potential breeding habitat

Twenty-six trees suitable for black cockatoos were identified in the survey area, including 25 *Eucalyptus marginata* (Jarrah), and one *Corymbia calophylla* (Marri). Observations indicated two trees contained hollows of a size and orientation suitable for nesting by black cockatoo species. The locations of the potential breeding trees are displayed in Figure 1 and Table 1.

Table 1: Potential breeding trees

Tree No.	Latitude	Longitude	Taxa	DBH (cm)	Suitable hollows
1	-31.07719793	115.9984558	*Eucalyptus marginata*	60	no
2	-31.0771854	115.997448	*Eucalyptus marginata*	50	no
3	-31.07711121	115.9987204	*Eucalyptus marginata*	75	no
4	-31.07701559	115.9984196	*Eucalyptus marginata*	80	no
5	-31.0769846	115.9971192	*Eucalyptus marginata*	75	no
6	-31.07694782	115.9984951	*Eucalyptus marginata*	50	no
7	-31.0769462	115.9987628	*Eucalyptus marginata*	60	no
8	-31.076841	115.9985806	*Eucalyptus marginata*	110	yes
9	-31.0768178	115.9980073	*Eucalyptus marginata*	75	no
10	-31.07674623	115.9992015	*Eucalyptus marginata*	90	no
11	-31.0767413	115.9977458	*Eucalyptus marginata*	50	no
12	-31.0767297	115.9971914	*Eucalyptus marginata*	65	no
13	-31.0766568	115.9979059	*Eucalyptus marginata*	75	no
14	-31.0766354	115.9973477	*Eucalyptus marginata*	70	no
15	-31.0766266	115.998044	*Eucalyptus marginata*	65	no
16	-31.07661041	115.9972784	*Eucalyptus marginata*	90	no
17	-31.0764047	115.9992402	*Eucalyptus marginata*	60	no
18	-31.07627702	115.9992313	*Eucalyptus marginata*	50	no
19	-31.07619001	115.9985065	*Eucalyptus marginata*	80	no

Tree No.	Latitude	Longitude	Taxa	DBH (cm)	Suitable hollows
20	-31.0761768	115.9977964	*Eucalyptus marginata*	85	no
21	-31.07617565	115.9983925	*Eucalyptus marginata*	90	no
22	-31.0761597	115.9979079	*Eucalyptus marginata*	50	no
23	-31.07614148	115.9986768	*Eucalyptus marginata*	200	yes
24	-31.07613631	115.9981092	*Eucalyptus marginata*	90	no
25	-31.07609841	115.9981997	*Eucalyptus marginata*	90	no
26	-31.06102342	116.011083	*Corymbia calophylla*	100	no

Black Cockatoos breed in large hollow-bearing trees, generally within woodlands or forests (Johnstone et al. 2011). The size of the tree can be a useful indication of the hollow-bearing potential of the tree. Trees of suitable DBH are potentially important for maintaining breeding in the long-term, through maintaining the integrity of the habitat and allowing trees to provide future nest hollows. Maintaining the long-term supply of trees of a size to provide suitable nest hollows is particularly important in woodland stands that are known to support Black Cockatoo breeding (DSEWPaC 2012).

The Black Cockatoo habitat assessment revealed that the survey area contains *Eucalyptus marginata* (Jarrah), and *Corymbia calophylla* (Marri) which have reached a size that are potential future hollow bearing trees, therefore potential breeding trees (i.e. >500 mm) according to both the current EPBC Act Black Cockatoo referral guidelines. In total, 26 trees were recorded which met the criteria to be classed as a potential breeding tree. This suggests that these trees may develop hollows and have the potential to be use for breeding in the future. To be suitable for Black Cockatoos, the hollow entrances need to be greater than 120 mm diameter. Observations indicated two trees contained hollows of a size and orientation suitable for nesting by black cockatoo species (Plate 1 and Plate 2). The depth of both hollows was not able to be confirmed by on-ground observations.

Roosting Habitat

Twenty-six trees suitable for black cockatoo roosting were identified in the survey area, including 25 *Eucalyptus marginata*, and one *Corymbia calophylla*. The nearest water source is 3 km east of the identified roosting habitat. Given preferred roosts are generally located within 2km of a water resource, and the presence of roosting habitat adjacent to permanent water sources nearby, the potential roosting trees within the Survey area are unlikely to be used preferentially.

Summary

The key results from the Black cockatoo habitat survey were:

- 317
-
    - two potentially suitable hollows.

References

DAWE. (2020). *Calyptorhynchus latirostris* in Species Profile and Threats Database. Department of Agriculture, Water and the Environment. Available from: http://www.environment.gov.au/sprat

DBCA. (2020). Black Cockatoo Roosting Sites - Buffered (DBCA-064). Department of Biodiversity, Conservation and Attractions. https://catalogue.data.wa.gov.au/dataset/black-cockatoo-roosting-sites-buffered

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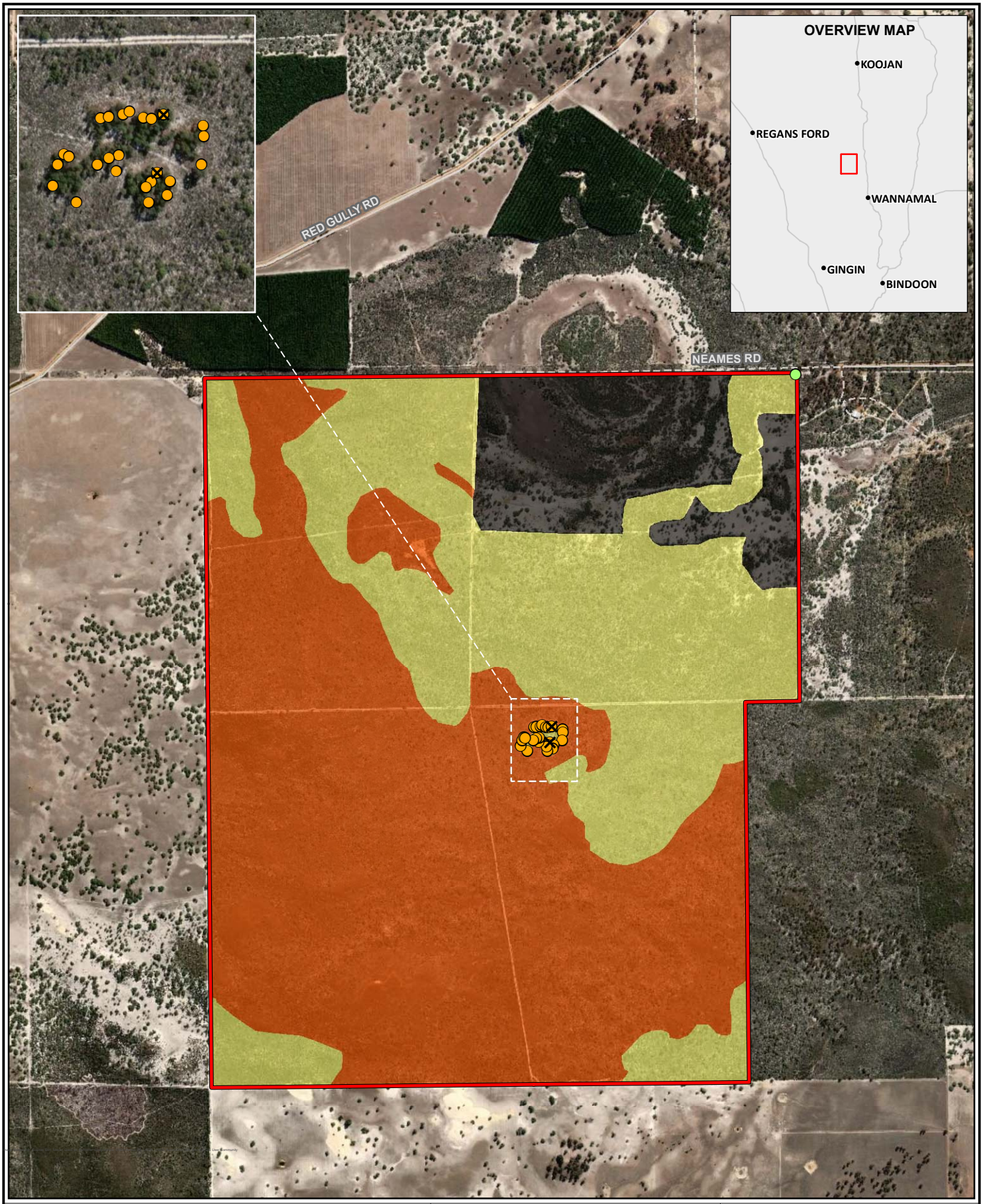
Peck, A., Barrett, G. and Williams, M. (2016). The 2016 Great Cocky Count: A community-based survey for Carnaby's Black-Cockatoo (Calyptorhynchus latirostris) and Forest Red-tailed Black Cockatoo (Calyptorhynchus banksii naso). BirdLife Australia and Department of Parks and Wildlife, Perth, Western Australia.



Legend:

- Survey area
- Fauna habitat
  - Nil
  - Low
  - Moderate
- Habitat trees
  - *Corymbia calophylla*
  - *Eucalyptus marginata*
- Suitable hollows
- Minor road
- Track

Scale 1:24,000 at A4

0 250 500 metres

Coord. Sys. GDA 1994 MGA Zone 50

Job No: 56799

Client: Qube

Version: A | Date: 10-Nov-2020

Drawn By: cthatcher | Checked By: TS

Lot 310 and Lot 300 Neames Road Mogumber, WA

BLACK COCKATOO HABITAT

FIGURE 1

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Plate 1: Potential suitable hollow

Plate 2: Potential suitable hollow

Attachment A: Habitat scoring system (Bamford 2018)

Application of the Offset Assessment Guide (offsets guide) developed by the federal environment department for assessing black-cockatoo foraging habitat requires the calculation of a score out of 10. The following system has been developed by Bamford Consulting to provide an objective scoring system that is practical and can be used by trained field zoologists with experience in the environments frequented by the species.

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

a. Determining a score out of six for the vegetation composition, condition and structure; plus

b. Determining a score out of three for the context of the site; plus

c. 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 vegetation composition.

Calculation of scores and the moderation process are described in detail below.

Vegetation composition, condition and structure scoring

Site Score	Description of Vegetation Values		
	Carnaby's Black-Cockatoo	Baudin's Black-Cockatoo	Forest Red-tailed Black-Cockatoo
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 Black-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.
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; 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; Urban areas with scattered foraging trees.	Low foraging value. Examples: Woodland with scattered specimens of known food plants (e.g. Marri, Jarrah or Sheoak) 1-5% projected foliage cover; Urban areas with scattered food plants such as Cape Lilac, *Eucalyptus caesia* and *E. erythrocorys*.

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; 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; 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; 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/forest with tree banksias 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. Eucalypt Woodland/Forest with diverse, healthy understorey and known food trees (especially Marri) 10-20% projected foliage cover. 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.
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; 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.	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.
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).	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).

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 DEE, 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%	1 - 5%
0	< 0.1%	< 0.1%

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.

Note that context and species density scores are affected by the vegetation score and this is discussed below.

Moderation of scores for the calculation of a value out of 10.

The foraging value score 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 the Federal Department of the Environment and Energy (DoEE) to assess impact significance and offset requirements. The foraging value of the vegetation depends upon the type, density and condition of trees and shrubs in an area, and can be influenced by the context such as the availability of foraging habitat nearby. The BCE scoring system for value of foraging habitat has three components as detailed above. These three components are drawn from the DoEE offsets guide but the scoring approach was developed by Bamford Consulting Ecologists.

a. A score out of six for the vegetation composition, condition and structure
b. a score out of three for the context of the site
c. a score out of one for species density.

Foraging value can thus be assigned a score out of six, based upon site vegetation characteristics, or a score out of 10 if context and species density are considered. Assigning a score out of 10 represents step D and may require moderation rather than simple addition.

The score out of six for vegetation characteristics and value can be compared across a site, while a score out of 10 is the overall foraging value and is used for the purposes of aiding offset calculations. The calculation out of 10 requires the vegetation characteristics (out of 6) to be combined with the scores given for context and species density. It is considered that the context and density scores are not independent of vegetation characteristics; otherwise habitat of absolutely no value for black-cockatoo foraging (such as concrete or a wetland) could get a foraging score out of 10 as high as 4 if it occurred in an area where the species breed (context score of 3) and are abundant (species density score of 1). Similarly, vegetation of negligible or low characteristics which could not support black-cockatoos could be assigned a score as high as 6 out of 10. In that case, the score of 6 would be more a reflection of nearby vegetation of high characteristics than of the foraging value of the negligible to low scoring vegetation. The Black-Cockatoos would only be present because of vegetation of high characteristics, so applying the context and species density scores to vegetation of low characteristics would not give a true reflection of their foraging value.

For this reason, the context and species density scores need to be moderated for the vegetation characteristic score to prevent vegetation of little or no foraging value receiving an excessive score out of 10. A simple approach is assigning a context and species density score of zero to with a characteristic score of low (2), negligible (1) or none (0), on the basis that birds will not use such areas unless they are adjacent to at least low-moderate quality foraging habitat ($\geq$3). The approach to calculating a score out of 10 can be summarised as follows.

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