

Lot 400 Canning Rd, Carmel

Targeted Black-Cockatoo survey



Jarrah - Marri forest in the study area.

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1. Introduction

There is a proposal to clear some of the vegetation on Lot 400 Canning Rd, Carmel. In order to inform the footprint of the proposed clearing area, information on the significance of the study area to threatened black-cockatoos was required. On behalf of the landowners, Matiske Consulting Pty Ltd commissioned Western Wildlife to conduct a black-cockatoo survey of the study area. The aim of the survey was to search the study area for habitat that may be used by black-cockatoos for roosting, foraging or breeding.

2. Methods

Lot 400 Canning Rd, Carmel (the 'study area') was visited on the 13th and 18th January 2016, by Ms Jennifer Wilcox of Western Wildlife. The entire study area was walked, and assessed for the potential to support one or more of the following species:

- Forest Red-tailed Black-Cockatoo (*Calyptorhynchus banksii naso*)
- Carnaby's Black-Cockatoo (*Calyptorhynchus latirostris*)
- Baudin's Black-Cockatoo (*Calyptorhynchus baudinii*)

The study area was examined for the presence of vegetation types or plant species known to constitute black-cockatoo foraging habitat and any evidence of foraging such as chewed fruits or flowers. The boundaries of the foraging habitats and extent of historical disturbances such as heavy logging and a cattle yard, were determined using vegetation data provided by Matiske Consulting Pty Ltd.

The diameter at breast height (DBH) was recorded for all *Eucalyptus* and *Corymbia* tree species that had a DBH \geq 50cm. Trees with a DBH \geq 50cm are considered to have a high potential to have or develop hollows and support the breeding of black-cockatoos in the long term (DSEWPac 2012). Trees were also examined from the ground for the presence of existing hollows. Hollows were classified as 'large' if they had some potential to support black-cockatoo breeding and 'small' if considered too small for black-cockatoos, but of potential use by other bird species such as parrots and pardalotes. All trees identified were recorded with a GPS location. Any evidence of hollow use (e.g. chewing around the entrance of the hollow) was also recorded.

In addition, all other native vertebrate fauna encountered were recorded.

3. Background on black-cockatoo species

3.1 Forest Red-tailed Black-Cockatoo

The Forest Red-tailed Black-Cockatoo (*Calyptorhynchus banksii naso*) is listed under Schedule 1 (Vulnerable) of the *Western Australian Wildlife Conservation Act 1950* and as Vulnerable under the *Environment Protection and Biodiversity Conservation Act 1999*.

The Forest Red-tailed Black-Cockatoo is endemic to the southwest of Western Australia. It occurs in Jarrah, Marri and Karri forests between about Gingin to the north, Albany to the south, and east to Mt Helena, North Bannister and Rocky Gully (Johnstone and Storr 1998). This species also ranges irregularly onto the Swan Coastal Plain to feed on the seeds of the introduced Cape Lilac (*Melia azerdarach*). It is patchily distributed through its range (Johnstone and Storr 1998). The population size is estimated to be 15,000 birds (Johnstone and Kirkby 1999).

The Forest Red-tailed Black-Cockatoo inhabits the Jarrah, Marri and Karri forests of the southwest, where the annual rainfall is on average 600mm or more. It may also occur in other woodlands, including Tuart, Wandoo and Flooded Gum (*Eucalyptus rudis*). Groups of up to 50 birds roost in trees overnight, dispersing into smaller flocks when ranging out to forage during the day. Roosts may be on roadsides, paddocks or forested areas (Johnstone and Kirkby 1999).

Forest Red-tailed Black Cockatoos feed primarily on the seeds of Marri and Jarrah, but also feed on the seeds of Blackbutt (*Eucalyptus patens*), Forest Sheoak (*Allocasuarina fraseriana*), Snottygobble (*Persoonia longifolia*) and Cape Lilac (Johnstone and Storr 1998).

Unlike Carnaby's Black-Cockatoo, the Forest Red-tailed Black-Cockatoo does not undertake regular seasonal movements. Instead, this species exhibits irregular population fluctuations, perhaps as a response to food availability.

The Forest Red-tailed Black Cockatoo nests in hollows in Karri (*Eucalyptus diversicolor*), Marri, Jarrah, Bullich (*Eucalyptus megacarpa*) and Wandoo (*Eucalyptus wandoo*) (Johnstone and Storr 1998, DSEWPaC 2012). However, they have generally been found to prefer nesting in large (mean DBH of 90cm) Marri trees (Johnstone *et al.* 2013). Eggs are laid in October and November (Johnstone and Storr 1998).

The main threats to the Forest Red-tailed Black-Cockatoo include habitat loss, nest hollow shortage, Feral Honeybees, illegal shooting and fire (DSEWPaC 2016).

3.2 Carnaby's Black-Cockatoo

Carnaby's Black-Cockatoo (*Calyptorhynchus latirostris*) is listed under Schedule 1 (Endangered) of the *Western Australian Wildlife Conservation Act 1950* and as Endangered under the *Environment Protection and Biodiversity Conservation Act 1999*.

Carnaby's Black-Cockatoo is endemic to the southwest of Western Australia, occurring mostly in the wheatbelt but also on the Swan Coastal Plain and wetter southwest (Johnstone and Storr 1998). The population size is estimated to be 60,000 birds (Garnett and Crowley 2000).

Typically, Carnaby's Black-Cockatoo breeds in the wheatbelt region of Western Australia, nesting in large hollows in smooth-barked eucalypts such as the Salmon Gum (*Eucalyptus salmonophloia*) and Wandoo (*Eucalyptus wandoo*). However, it has started breeding in areas further west and south than its traditional breeding range, including areas in the Darling Range and on the Swan Coastal Plain (Johnstone *et al.* 2005, Johnstone *et al.* 2011). Breeding has been recorded from areas such as Baldy, Lake Clifton, Yanchep and near Bunbury, with these nests always in Tuart (*Eucalyptus gomphocephala*) (Johnstone *et al.* 2011). Eggs are laid from early July to mid-October (Johnstone and Storr 1998).

Some of the Carnaby's Black-Cockatoo population is resident (particularly in wetter areas) and some of the population moves west and south towards the coast after breeding (Johnstone and Storr 1998). Between February and September, large flocks of birds aggregate in feeding flocks on the northern Swan Coastal Plain (Johnstone *et al.* 2011). These birds are foraging mainly in heaths, *Banksia* woodlands and pine plantations, and can be in large numbers of up to 7,000 birds (Johnstone *et al.* 2011). On the southern Swan Coastal Plain flocks are smaller (200 – 1,200 birds) and these birds forage on vegetation over a wide area (Johnstone *et al.* 2011).

Vegetation on the Swan Coastal Plain and adjacent escarpment is an important resource, with 8,000 – 10,000 birds estimated to use the area during the non-breeding season (Burnham *et al.* 2010). Carnaby's Black-Cockatoo forage on the seeds of a range of plant species, but are particularly attracted to proteaceous heaths, *Banksia* and *Eucalyptus* woodlands and pine plantations (Johnstone and Storr 1998). On the Swan Coastal Plain, important food plants include *Banksia attenuata*, *B. menziesii*, *B. grandis*, *B. ilicifolia*, *B. sessilis*, *B. prionotes*, Marri (*Corymbia calophylla*) and Jarrah (*Eucalyptus marginata*) (Shah 2006). In breeding areas it is important to have sufficient foraging resources in close proximity to nest hollows.

Carnaby's Black-Cockatoo generally roosts in tall native or introduced eucalypts or pines in riparian habitats or near permanent water (DSEWPaC 2012, DSEWPaC 2016). Shah (2006) found that of 16 Carnaby's Black-Cockatoo roost sites she identified on the Swan Coastal Plain, all but one were in *Pinus* or *Eucalyptus* species. In 2010, it was similarly found that at 29 roosts for which the tree species were recorded were in *Pinus* or *Eucalyptus* species (Burnham *et al.* 2010).

The main threats to Carnaby's Black-Cockatoos are habitat loss, competition for nesting hollows, habitat degradation and illegal trade in eggs and nestlings (DSEWPaC 2012). Habitat loss is the primary cause of the decline of this species, with much of its wheatbelt habitat cleared or fragmented, and the clearing of heathland around breeding sites has reduced the foraging opportunities for birds raising young (Cale 2003). Within remnant wheatbelt woodlands there is little regeneration of eucalypts and the remaining hollows are deteriorating (Cale 2003). Carnaby's Black-Cockatoo may face competition for remaining hollows from other bird species and feral bees (*Apis mellifera*) (DSEWPaC 2012, Cale 2003).

3.3 Baudin's Black-Cockatoo

Baudin's Black-Cockatoo (*Calyptorhynchus baudinii*) is listed under Schedule 1 (Endangered) of the *Western Australian Wildlife Conservation Act 1950* and as Endangered under the *Environment Protection and Biodiversity Conservation Act 1999*.

Baudin's Black-Cockatoo is endemic to the southwest of Western Australia and is more common in the deep south-west (Johnstone and Storr 1998). The population size is estimated to be 15,000 birds (Johnstone and Kirkby 2008). Baudin's Black-Cockatoo has declined primarily due to persecution by orchardists and loss of habitat due to wildfires and vegetation clearance in their range (Johnstone and Storr 1998).

Baudin's Black-Cockatoos breed in forests of Karri, Marri and Jarrah in the deep southwest, where the annual rainfall is on average more than 750mm. Breeding occurs in late winter to spring (about August to November), using a large hollow in a eucalypt, generally in Karri, Marri or Wandoo (Johnstone and Storr 1998). The hollows used are usually 30 - 40cm in diameter and more than 30cm deep. Breeding occurs as far north as Lowden (near Donnybrook), with an isolated breeding record from Serpentine (Johnstone and Kirkby 2008).

Outside of the breeding season Baudin's Black-Cockatoo may gather into large foraging flocks. In the non-breeding season this species ranges more widely, foraging primarily in habitats that contain Marri, and their distribution is probably defined by where Marri trees occur.

Baudin's Black-Cockatoos feed mainly on the seeds of eucalypts, with the majority of their diet consisting of Marri seeds. They also feed on seeds from other plants (e.g. Jarrah, *Banksia*, *Hakea* or commercial orchard crops such as apples and pears) and take some invertebrate material by stripping bark from trees (Johnstone and Storr 1998, Johnstone *et al.*, 2005).

Roosting habitat is generally in the tallest trees in riparian habitats, near permanent water or in sheltered gullies (DSEWPaC 2016, Johnstone and Kirkby 2008).

4. Results and discussion

The study area is within the range of all three black-cockatoo species, according to distribution maps published by DSEWPaC (2012). Several other native fauna species were recorded during the site visit (Appendix 1). The Forest Red-tailed Black-Cockatoo was recorded during the site visit (Appendix 1). Carnaby's Black-Cockatoo was not recorded, but is likely to occur and Baudin's Black-Cockatoo is also likely to occur outside of the breeding season.

4.1 Black-cockatoo breeding habitat

The study area is within the known or predicted breeding range of both the Forest Red-tailed Black-Cockatoo and Carnaby's Black-Cockatoo (DSEWPaC 2012). Baudin's Black-Cockatoo does not breed in the area, breeding only as far north as Serpentine (Johnstone and Kirkby 2008).

In the study area, Carnaby's Black-Cockatoo potentially use Jarrah or Marri trees for breeding, and though they favour smooth-barked eucalypts, they potentially use any suitably-sized hollow (Johnstone and Storr 1998, DSEWPaC 2012). The Forest Red-tailed Black-Cockatoo favours hollows in large, old Marri trees, but may also use Jarrah on occasion (Johnstone and Storr 1998). Overall, 262 trees were identified that demonstrated a DBH \geq 50cm (Figure 1, Table 1) of which 105 were Jarrah and 157 Marri. Twenty-seven of these trees (10 Jarrah and 17 Marri) appeared to have at least one large existing hollow potentially suitable for black-cockatoos (Table 1). There were potential small hollows observed in 63 of the trees and the remaining 172 had a DBH of at least 50cm, but no visible hollows.

Ninety-two potential habitat trees are within the proposed clearing area (Table 1). Of these, over half are situated in areas of the property that were heavily logged in the past or in regrowth areas that were historically cleared for a cattle yard. The remaining 170 potential habitat trees identified are in bushland areas of the property that are to be retained.

Table 1. Potential habitat trees in the study area.

Tree type	Total mapped	Within 'proposed clearing' only	Within 'proposed clearing' & 'previous heavy logging'	Within 'proposed clearing', 'previous heavy logging' & 'previous cattle yard'	Total to be cleared
No visible hollow	172	22	18	12	52 (30%)
Small hollow/s	63	13	13	1	27 (43%)
Large hollow/s	27	7	5	1	13 (48%)
Total trees:	262	42	36	14	92 (35%)
Trees with a DBH \geq 1m <i>(note: this category contains trees from the above categories)</i>	37	6	4	2	12 (32%)

It should be noted that 'potential' hollows may not be very deep, or actually suitable for use by fauna, though this is not possible to ascertain from the ground. Conversely, some hollows are not visible from the ground, hence the approach of recording trees with a DBH of 50cm or more.

The presence of trees with a DBH of 50cm or more indicates that the study area is potential breeding habitat for both the Forest Red-tailed Black-Cockatoo and Carnaby's Black-Cockatoo. Both species potentially nest in the area currently, or may nest in the area in the future.

4.2 Black-cockatoo foraging habitat

Five main habitats were identified in the study area (Table 2). Of these, the cleared land is of no value to foraging cockatoos, and the area of planted trees is of low value, as it contains very occasional pines, but generally consists of closely planted Eastern States eucalypts (Plate 1). There is a small stand of planted pine trees (Plate 2) and pines are recognized as a high value foraging resource, despite not being native plant species. There was recent evidence of cockatoos foraging in the pines, most likely Forest Red-tailed Black-Cockatoos or Carnaby's Black-Cockatoos (Plate 3).

Table 2. Foraging value of habitats in the study area.

Habitat	Value for cockatoo foraging	Total area mapped (ha)	Proposed clearing (ha)	Breakdown of proposed clearing (ha)
Forest dominated by Jarrah and/or Marri	Moderate to High	17.85	8.55	1.43 - 'previous cattle yard', 'previous heavy logging' & 'proposed clearing'
				3.89 - 'previous heavy logging' & 'proposed clearing'
				3.23 - 'proposed clearing' only
Forest - dominated by Sheoak but also containing varying amounts of Jarrah and/or Marri.	Moderate to Low (Carnaby's Black-Cockatoo & Baudin's Black-Cockatoo)	11.05	8.25	2.40 - 'previous cattle yard', 'previous heavy logging' & 'proposed clearing'
	Moderate to High (Forest Red-tailed Black-Cockatoo)			1.33 - 'previous heavy logging' & 'proposed clearing'
	4.52 - 'proposed clearing' only			
Planted trees	Low to Nil	3.18	-	-
Pines	High	0.15	-	-
Cleared Land	Nil	10.34	-	-
Total:		42.57	16.8	



Plate 1. Planted trees, mainly exotic eucalypts with occasional pines.



Plate 2. Planted pines.



Plate 3. Pine cones in the study area, chewed by cockatoos.

Forests dominated by Jarrah and Marri have the highest value for foraging cockatoos, though the actual value varies widely across the study area. Jarrah and Marri forest in good condition with mature stands of trees are of the highest value on the site (Plate 4). Historically, large trees have been logged from the site, as evidenced by the large cut stumps that remain. Some areas are also regrowth after partial clearing for a cattle yard. Regrowth areas are typified by stands of small closely spaced Jarrah or Marri, and small trees produce less fruit for foraging cockatoos. Of the 8.55ha of this habitat in the proposed clearing area, over half (4.32ha) has historically been subjected to heavy logging and/or clearing for the cattle yard (Table 2). Tree deaths have also occurred in parts of the site, and the loss of trees has reduced foraging value in these areas, though they may still be used for roosting or breeding if suitable (Plate 5). Forest Red-tailed Black-Cockatoos were observed foraging in Marri trees during the site visit, and evidence of foraging was scattered throughout the study area (Plate 6).

Forests dominated by Forest Sheoak (Plate 7) have less abundant Jarrah and Marri, so provide only a low to moderate foraging value for Carnaby's or Baudin's Black-Cockatoo. Where the forest canopy consists almost entirely of Forest Sheoak, the foraging value for these species is low, grading to moderate where Marri and Jarrah are more abundant. As the Forest Red-tailed Black-Cockatoo forages on Forest Sheoak as well as Jarrah and Marri, areas this habitat potentially provides a moderate to high value foraging resource for this species. Of the 8.25ha of this habitat in the proposed clearing area, 45% (3.73ha) has historically been subjected to heavy logging and/or clearing for the cattle yard (Table 2).



Plate 4. Jarrah - Marri forest.



Plate 5. Forest with young trees and some tree death.



Plate 6. Marri fruits in the study area, chewed by cockatoos.



Plate 7. Forest, dominated by Forest Sheoak with less Jarrah or Marri.

4.3 Black-cockatoo roosting habitat

Black-cockatoos are known to roost in pines and tall eucalypts, often near riparian environments (DSEWPaC 2016, Shah 2006, Burnham *et al.* 2010). The study area includes scattered tall eucalypts and a small stand of pines, but no riparian environments.

Although no evidence of roosting by black-cockatoos (e.g. feathers, scats) was recorded during the site visit, it must be remembered that some black-cockatoos are seasonal migrants and may not be present in an area year-round. Birds may roost nearby when foraging in the area, then move on. If Carnaby's or Baudin's Black-Cockatoos roost in the study area, the most likely locations are in the very large eucalypts with a DBH greater than 1m (Figure 1) as these trees are generally taller than the rest of the canopy. The Forest Red-tailed Black-Cockatoo may roost in eucalypts on the edges of the cleared area, for which there are many potentially suitable locations.

It is unlikely that the study area is of particular significance for roosting black-cockatoos, though birds may roost there on occasion.

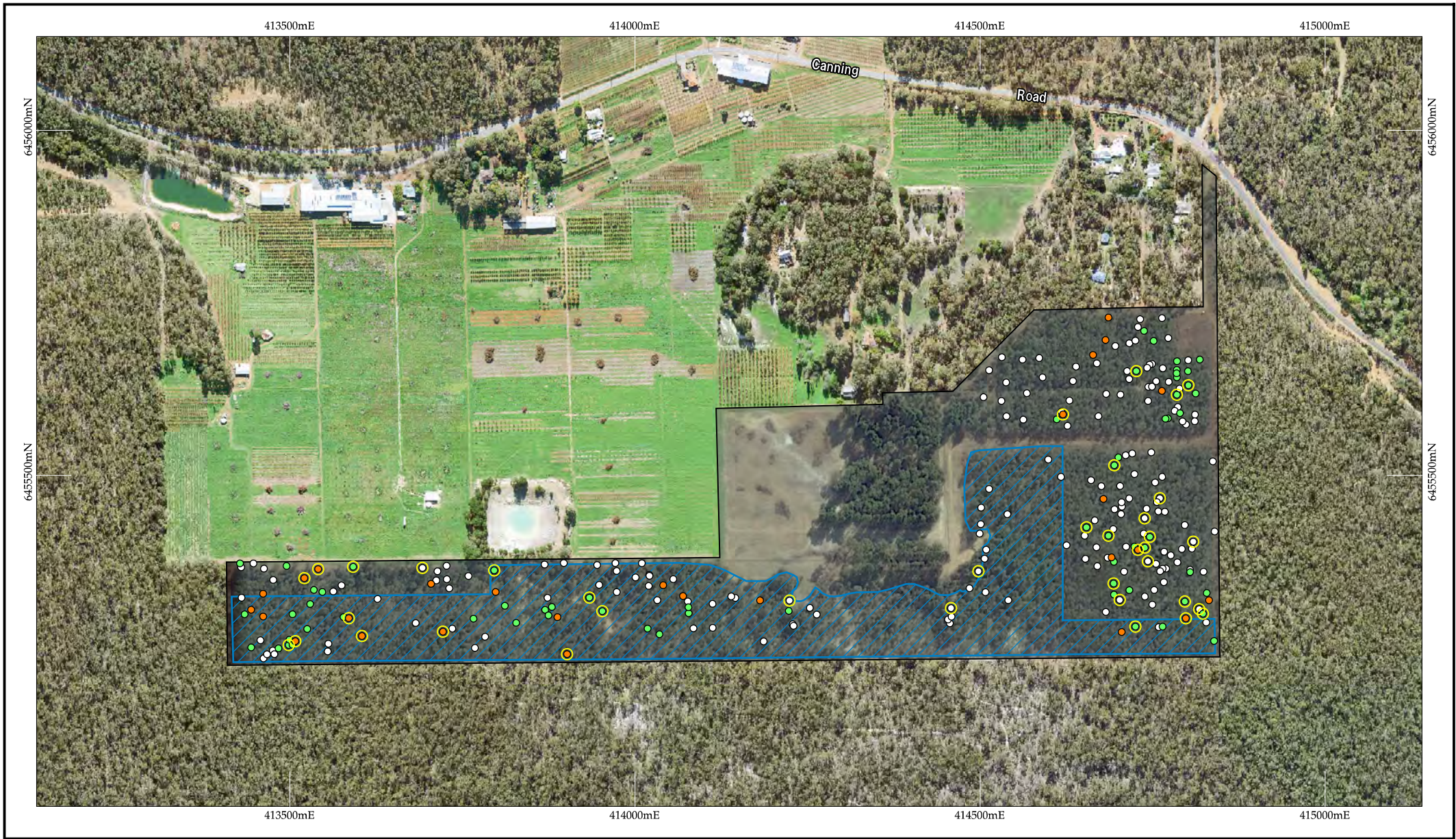
5. Summary

The Forest Red-tailed Black-Cockatoo, Carnaby's Black-Cockatoo and Baudin's Black-Cockatoo all potentially occur in the study area. The Forest Red-tailed Black-Cockatoo was recorded foraging on Marri in the study area during the site visit.

The study area represents potential breeding habitat for the Forest Red-tailed Black-Cockatoo and Carnaby's Black-Cockatoo, as it contains Jarrah and Marri trees with a DBH of 50cm or more. Across the site, 27 trees with large potential hollows were recorded of which 13 are within the proposed clearing area. No evidence of nesting was noted during the site visit, though nesting hollows are not always visible from a ground level inspection.

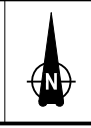
Areas of forest dominated by Jarrah and Marri provide moderate to high value foraging habitat for black-cockatoos. Forests dominated by Forest Sheoak contain less Jarrah and Marri and are of lower value, except to the Forest Red-tailed Black-Cockatoo, as this species also forages on the seeds of the Forest Sheoak. The foraging value of some forested areas has been negatively impacted by past land-uses including logging and clearing for a cattle yard, and current tree deaths. Although an introduced species, the small stand of pines also has high foraging value for cockatoos.

When present in the area, black-cockatoos may roost in the taller trees (often those with a DBH of 1m or more) or pines in the study area, or in the case of the Forest Red-tailed Black-Cockatoo, in trees along the edge of the cleared areas.



- Legend:**
- Proposed Clearing
 - Large Hollow/s
 - Small Hollow/s
 - No Visible Hollows
 - Large Trees with a DBH >1m

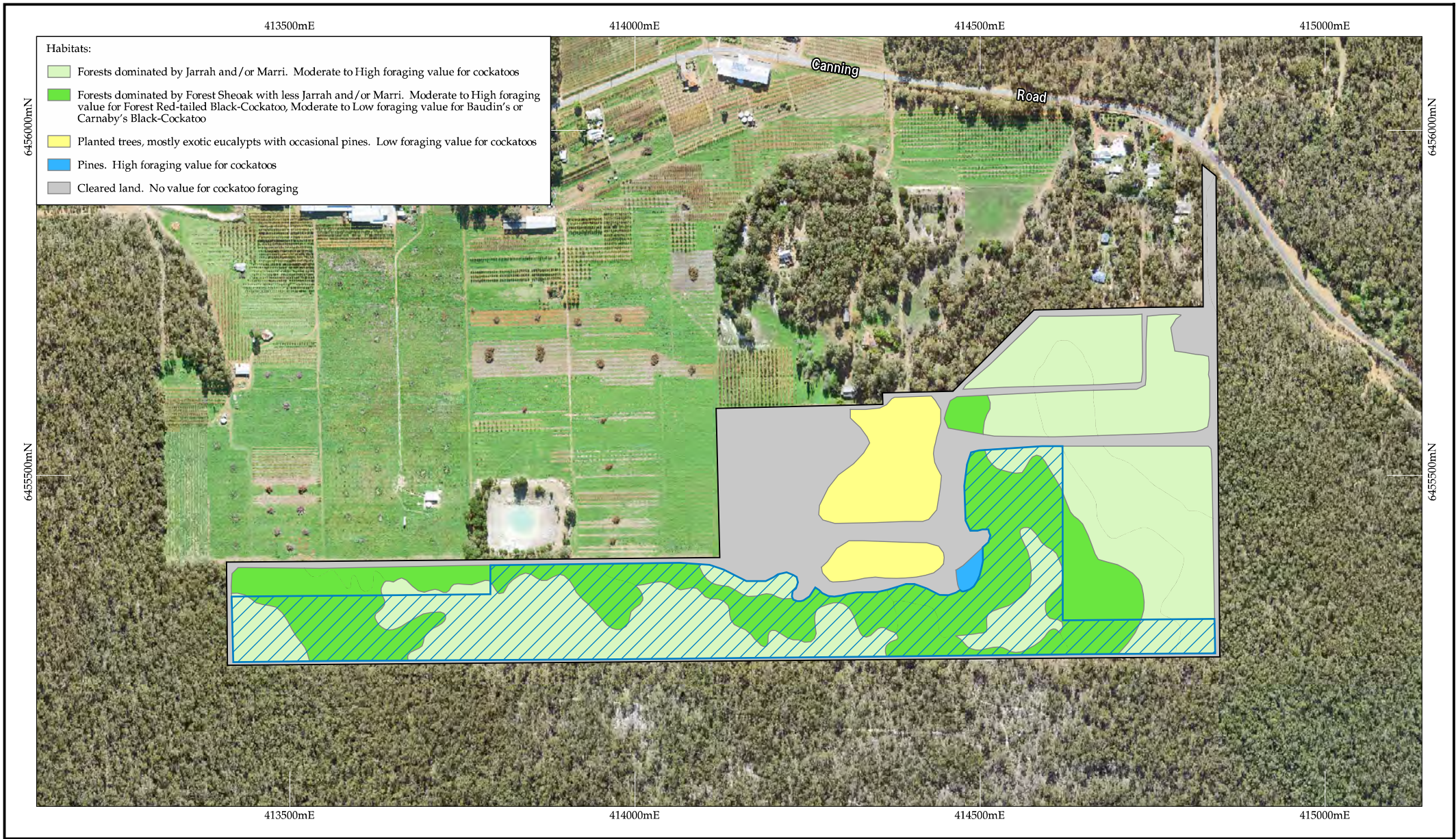
Notes:
 Imagery: Landgate 2015,
 Google, DigitalGlobe (2015)



0 100m
 Scale 1:7,500
 MGA94 (Zone 50)
 CAD Ref: g2325WW001.dgn
 Date: Jan 2016 | Rev: A | A4

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Lot 400, Canning Road, Carmel
Potential Cockatoo habitat trees



- Habitats:
- Forests dominated by Jarrah and/or Marri. Moderate to High foraging value for cockatoos
 - Forests dominated by Forest Sheoak with less Jarrah and/or Marri. Moderate to High foraging value for Forest Red-tailed Black-Cockatoo, Moderate to Low foraging value for Baudin's or Carnaby's Black-Cockatoo
 - Planted trees, mostly exotic eucalypts with occasional pines. Low foraging value for cockatoos
 - Pines. High foraging value for cockatoos
 - Cleared land. No value for cockatoo foraging

6456000mN

6456000mN

6455000mN

6455000mN

Legend:
 Proposed Clearing
 Notes:
 Imagery: Landgate 2015



0 100m
 Scale 1:7,500
 MGA94 (Zone 50)
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**Lot 400, Canning Road, Carmel
 Cockatoo foraging habitat**

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Appendix 1. Opportunistic records of fauna in the study area.

Species		Notes
BIRDS		
Australian Magpie	<i>Cracticus tibicen</i>	
Australian Ringneck	<i>Platycercus zonarius</i>	
Common Bronzewing	<i>Phaps chalcoptera</i>	
Forest Red-tailed Black-Cockatoo	<i>Calyptorhynchus banksii naso</i>	Schedule 1, Vulnerable, up to four birds foraging on Marri in the study area
Galah	<i>Eolophus roseicapilla</i>	Possibly nesting in hollow.
Grey Fantail	<i>Rhipidura fuliginosa</i>	
Inland Thornbill	<i>Acanthiza apicalis</i>	
Laughing Kookaburra	<i>Dacelo novaeguineae</i>	Introduced species
Rainbow Lorikeet	<i>Trichoglossus moluccanus</i>	Introduced species
Red-capped Parrot	<i>Platycercus spurius</i>	
Red Wattlebird	<i>Anthochaera carunculata</i>	
Rufous Whistler	<i>Pachycephala rufiventris</i>	
Scarlet Robin	<i>Petroica multicolor</i>	
Weebill	<i>Smicromnis brevirostris</i>	
Western Gerygone	<i>Gerygone fusca</i>	
Western Thornbill	<i>Acanthiza inornatus</i>	
Yellow-rumped Thornbill	<i>Acanthiza chrysorrhoa</i>	
MAMMALS		
Western Grey Kangaroo	<i>Macropus fuliginosus</i>	