

Tree Hollow Assessment for Cockatoos at Battler, King Brown, Marda and Golden Orb



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Front cover: A pair of Galahs (*Eolophus roseicapillus*) near a nest hollow

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Figure

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EXECUTIVE SUMMARY

Southern Cross Goldfields Ltd is seeking to develop its gold mining operations at Battler, King Brown, Golden Orb and Marda. The Battler project area is approximately 14km south-south east of Southern Cross, while King Brown, Golden Orb and Marda operations are approximately 126km, 113km and 115km respectively, north of Southern Cross. Officers in the Environmental Management Branch of the Department of Environment and Conservation (DEC) requested that a survey be undertaken to verify that the Battler project area was not being used as a breeding site for Carnaby's Black Cockatoo and that the Marda, Golden Orb and King Brown project areas were not being used as breeding sites for Major Mitchell's Cockatoo. Although not requested by DEC, Terrestrial Ecosystems searched for nesting Western Rosellas concurrently with the survey for Carnaby's Black Cockatoo in the Battler project area.

A survey of trees in the vicinity of the Battler, King Brown, Golden Orb and Marda project areas recorded numerous trees that contained hollows that would be suitable nesting sites for cockatoos. However, the survey found no evidence that any of the project areas are currently being used as nesting sites for Carnaby's Black Cockatoo or Major Mitchell's Cockatoo.

Clearing vegetation in the Battler, King Brown, Golden Orb and Marda project areas is highly unlikely to disturb breeding activity or significantly reduce the foraging area for Carnaby's Black Cockatoo or Major Mitchell's Cockatoo.

1 INTRODUCTION

1.1 Background

Southern Cross Goldfields Ltd is seeking to develop its gold mining operations at Battler, King Brown, Golden Orb and Marda. The Battler project area is approximately 14km south-south east of Southern Cross, while King Brown, Golden Orb and Marda operations are approximately 126km, 113km and 115km respectively, north of Southern Cross (Figure 1). The development of new mining activity at Battler, King Brown, Golden Orb and Marda will require the clearing of some additional vegetation and the construction of mining infrastructure. A Level 1 fauna assessment for King Brown, Battler and Marda indicated that the Battler project area was on the eastern fringe of Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*) geographic distribution (Johnstone and Storr 1998) and that the Marda and King Brown project areas were within the known geographic distribution of Major Mitchell's Cockatoo (*Lophochroa leadbeateri*).

Officers in the Environmental Management Branch of the Department of Environment and Conservation (DEC) requested that a survey be undertaken to verify that the Battler project was not being used as a breeding site for Carnaby's Black Cockatoo and that the Marda, Golden Orb and King Brown project areas were not being used as a breeding site for Major Mitchell's Cockatoo. Although not requested by DEC, Terrestrial Ecosystems searched for nesting Western Rosellas concurrently with the survey for Carnaby's Black Cockatoo in the Battler project area.

1.2 Species biology and ecology

Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*) – Schedule 1 under the *Wildlife Conservation Act 1950* and Endangered under the *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act 1999)*

Carnaby's (or Short-billed) Cockatoo (*Calyptorhynchus latirostris*) is a large, pied, cockatoo. Cockatoos (family Psittacidae) are a distinctive group within the Psittaciformes. Their size (most adult Carnaby's Cockatoo have a body mass greater than 500g and length greater than 50cm; Johnstone and Storr 1998), gregarious nature, distinctive calls and perky habits, makes this family a ubiquitous part of the Australian landscape. Garnett *et al.* (2011) and the DSEWPac (2011) reported Carnaby's Black Cockatoo inhabits the south-west of Western Australia, from Kalbarri to as east on the south coast as Esperance. It breeds inland and moves to the coastal areas when chicks have fledged (Saunders *et al.* 1985). Carnaby's Black Cockatoos are highly gregarious, usually seen in trios, small parties or large flocks (up to 5000 birds; Perry 1948). These flocks usually contain males, females and immature birds. Male Carnaby's Black Cockatoos can be identified by having a black bill and red eye-ring, where as females have a light grey bill and a grey eye-ring (Higgins 1999, Cale 2003). Furthermore, the pale patch on the ear-coverts is slightly bigger and paler on females than males, and the pale fringes of leading underwing-coverts and feathers of the under body are usually broader on females (Higgins 1999). Juveniles are very similar to adult females and best distinguished by continuous harsh rasping calls begging for food (Higgins 1999). By their second year, immature males differ from juveniles and adults by having a bicoloured bill (some dark on the upper mandible, pale lower mandible; Higgins 1999). Carnaby's Black Cockatoos are a long-lived species, with a reproductive life estimated to be 15 years (Cale 2003). Garnett *et al.* (2011) estimated there were between 10,000 and 60,000 birds in the population.

In some locations, breeding populations have decreased or become locally extinct (Saunders 1986, Saunders and Ingram 1987). For example, in the Coomallo Creek area north of Perth, Black Cockatoos laid 74 clutches in 1973, 75 in 1974, 82 in 1975 but only 20 in 1994 and 19 in 1996 (Saunders and Ingram 1987). Saunders (1986) reported finding 13 nests at Manmanning in 1969 but by 1977, the species had stopped breeding in the area. Saunders (1990) reported failed nestings due to predation by a cat, galahs broke Carnaby's Black Cockatoo eggs and took over nests, while other adult birds were killed by vehicles and Wedge-tailed Eagles (*Aquila audax*).

Carnaby's Black Cockatoos are partly migratory and partly sedentary (Higgins 1999). In the drier regions of their geographic range where most of the native vegetation has been cleared (e.g. wheatbelt), Carnaby's Black Cockatoos are postnuptial migrants (Saunders 1980, Saunders and Ingram 1995). After breeding, individuals in these areas migrate to feed in higher rainfall areas including the Swan Coastal Plain, and to a lesser extent, forests dominated by Jarrah (*E. marginata*), Marri (*C. calophylla*) and Karri (*E. diversicolor*; Saunders 1980). Saunders (1980) recorded non-breeding cockatoos at Coomallo Creek foraging within a

50km radius of their breeding area, whereas cockatoos at Manmanning moved a much greater distance to the coastal plain during their non-breeding season. These data suggest that Carnaby's Black Cockatoo move from areas where there is little food to southern and western coastal areas where food is presumably more plentiful during summer and autumn (Davies 1966, Saunders 1980).

Carnaby's Black Cockatoo breed between July and November mostly in eucalypt woodlands (Saunders 1980, 1986). Carnaby's Black Cockatoo nest in tree hollows that are created by fire, fungi, termites or old age, with hollows between 2.5 and 12m above the ground (Saunders 1979, Higgins 1999). Breeding hollows are large, ranging from 10 to over 250cm in depth (Higgins 1999). These hollows are usually in live or dead smooth-barked Salmon Gum (*Eucalyptus salmonophloia*) or Wandoo (*Eucalyptus wandoo*). However, Carnaby's Black Cockatoo will also nest in Red Morrell (*E. longicornis*), York Gum (*E. loxophleba*), Tuart (*E. gomphocephala*), Flooded Gum (*E. rudis*), Gimlet (*E. salubris*), Swamp Yate (*E. occidentalis*) and Marri (*Corymbia calophylla*; Higgins 1999, Cale 2003). When breeding, they most often forage in the surrounding shrub land and kwongan heath (Higgins 1999). Adults return to the same breeding area each year (Saunders 1977) and some use the same tree hollow for many years in succession to raise their chicks, others shift their nests among a number of trees in the same area (Saunders and Ingram 1998).

Eggs are laid on a mat of wood chips chewed from the sides of the hollow. Clutches are 1-2, but most often only one chick is raised. Incubation takes 29 days and only the female incubates and broods (Johnstone and Kirkby 2011). Initially the female will return to the nest mid-morning to feed the chick, but after about 2-3 weeks both parents leave in the early morning and return late evening. Young remain with their parents until the parents return to the breeding area in the following year (Saunders 1980). Immature birds probably do not move into the breeding areas until they are ready to breed, although little is known of the movements of immature Carnaby's Black Cockatoo until they are ready to breed (Saunders 1977).

The breeding success of Carnaby's Black Cockatoo is believed to be strongly influenced by the availability of food at breeding sites (Saunders *et al.* 1985). Saunders (1977) found that birds that foraged within one or two kilometres from nesting sites had greater fledgling success than those from populations that had to travel up to four kilometres to obtain food. In a study that monitored Carnaby's Black Cockatoos breeding over 25 years at Coomallo Creek, Saunders and Ingram (1998) showed that the number of breeding attempts halved by the end of the study. During this period, native vegetation cover was reduced from 90% in 1959 to 25% in 1996. Their study revealed that although there was a surplus of trees with hollows of sufficient sizes, clearing of adjacent foraging habitat had adversely impacted on the success of breeding birds. Therefore, breeding sites typically have nearby areas of scrub and heath where birds forage on seeds and flowers of numerous trees and shrubs including *Banksia*, *Hakea*, *Dryandra*, *Grevillea* and *Callistemon* spp. (Robinson 1965, Saunders 1980, Higgins 1999). Unlike other cockatoo species, Carnaby's Black Cockatoo will not utilise cereal crops (Saunders *et al.* 1985), but will feed on *Erodium* seed (Saunders 1980).

Saunders (1980) reported that Carnaby's Black Cockatoo at Coomallo Creek (breeding area) foraged mostly on native plants, with the only exception being *Erodium* sp.. Higgins (1999) reported the habitat of Carnaby's Black Cockatoo was uncleared or remnant woodlands dominated by *Eucalyptus*, particularly Wandoo (*E. wandoo*) and Salmon Gum (*E. salmonophloia*) and often in shrub land or kwongan heath land dominated by *Hakea*, *Dryandra*, *Banksia* and *Grevillea* and seasonally in *Pinus* plantations and less often in Marri (*C. calophylla*), Karri (*E. diversicolor*) or Jarrah (*E. marginata*). Reported foraging and roosting trees from these two sources plus those in Johnstone and Storr (1998), the Department of Environment and Conservation's *Plants used by Carnaby's Black Cockatoo* (www.dec.wa.gov.au/content/view/5983/2006/) and the list of foraging and nesting plants presented on the WA Birds Australia web site (<http://www.birdsaustralia.com.au/images/stories/current-projects/cbc/cbc-native-plants.pdf>) are presented in Table 1.

Table 1. Plants used by Carnaby's Black Cockatoo for foraging and nesting.

Genus	Species	Common Name	Part eaten
<i>Acacia</i>	<i>baileyana</i>	Cootamundra Wattle	
<i>Acacia</i>	<i>pentadenia</i>	Karri Wattle	
<i>Acacia</i>	<i>saligna</i>	Orange Wattle	Bark
<i>Agonis</i>	<i>flexuosa</i>	Peppermint tree	bark, grubs
<i>Araucaria</i>	<i>heterophylla</i>	Norfolk Island Pine	
<i>Banksia</i>	<i>ashbyi</i>	Ashby's Banksia	flowers, seeds
<i>Banksia</i>	<i>attenuata</i>	Slender Banksia	flower, seed
<i>Banksia</i>	<i>baxteri</i>	Baxter's Banksia	
<i>Banksia</i>	<i>carlinoides</i>		
<i>Banksia</i>	<i>coccinea</i>	Scarlet Banksia	

Genus	Species	Common Name	Part eaten
<i>Banksia</i>	<i>dallanneyi</i>	Couch Honeypot Dryandra	
<i>Banksia</i>	<i>ericifolia</i>	Heath-leaved Banksia	
<i>Banksia</i>	<i>fraseri</i>		
<i>Banksia</i>	<i>gardneri</i>	Prostrate Banksia	
<i>Banksia</i>	<i>grandis</i>	Bull Banksia	flower, seed
<i>Banksia</i>	<i>hookeriana</i>	Hooker's Banksia	
<i>Banksia</i>	<i>ilicifolia</i>	Holly Banksia	fruit, cones
<i>Banksia</i>	<i>kip pistiana</i>		
<i>Banksia</i>	<i>leptophylla</i>		
<i>Banksia</i>	<i>littoralis</i>	Swamp Banksia	flower, seed
<i>Banksia</i>	<i>menziesii</i>	Firewood/Menzies Banksia	flowers, seeds
<i>Banksia</i>	<i>mucronulata</i>		
<i>Banksia</i>	<i>nivea</i>		
<i>Banksia</i>	<i>nobilis</i>		
<i>Banksia</i>	<i>praemorsa</i>	Cut-leaf Banksia	
<i>Banksia</i>	<i>prionotes</i>	Acorn Banksia	cones
<i>Banksia</i>	<i>quercifolia</i>	Oak-leaved Banksia	
<i>Banksia</i>	<i>sessilis</i>	Parrot Bush	
<i>Banksia</i>	<i>speciosa</i>	Showy Banksia	flower, seed
<i>Banksia</i>	<i>squarrosa</i>	Pingle	
<i>Banksia</i>	<i>tricuspis</i>	Lesuesur Banksia	flowers, seeds
<i>Banksia</i>	<i>undata</i>	Urchin	
<i>Banksia</i>	<i>verticillata</i>	Granite Banksia	flower, seed
<i>Brassia</i>	<i>actinophella</i>	Octopus tree	flowers
<i>Brassica</i>	<i>campestris</i>	Canola, Rape	
<i>Callistemon</i>	<i>sviminalis</i>	Bottle Brush	nectar, seed
<i>Callistemon</i>	<i>viminalis</i>	Captain Cook Bottlebrush	
<i>Carya</i>	<i>illnoinensis</i>	Pecan	
<i>Casuarina</i>	<i>cunninghamiana</i>	River Sheoak	
<i>Citrullus</i>	<i>lanatus</i>	Pie or Afghan Melon	
<i>Corymbia</i>	<i>calophylla</i>	Marri/Redgum	flower, seed
<i>Corymbia</i>	<i>ficifolia</i>	Red Flowering Gum	
<i>Corymbia</i>	<i>haematoxylon</i>	Mountain Marri	
<i>Corymbia</i>	<i>macula</i>	Spotted Gum	
<i>Darwinia</i>	<i>citriodora</i>	Lemon-scented Darwinia	
<i>Diospyros</i>	sp.	Sweet Persimmon	
<i>Dryandra</i>	<i>affincircioides</i>		seeds
<i>Dryandra</i>	<i>fraseri</i>		flowers, seeds
<i>Dryandra</i>	<i>mucronulata</i>		seeds
<i>Dryandra</i>	<i>nivea</i>	Couch Honeypot	flowers, seeds
<i>Dryandra</i>	<i>nobilis</i>	Golden Dryandra	seeds
<i>Dryandra</i>	<i>praemorsa</i>	Urchin Dryandra	flowers, seeds
<i>Dryandra</i>	<i>sessilis</i>	Parrot Bush	flower, seed
<i>Dryandra</i>	<i>speciosa</i>	Shaggy Dryandra	flower, seed
<i>Emex</i>	<i>australis</i>	Doublegee	seeds
<i>Eremophila</i>	<i>glabbera</i>		flower
<i>Eremophila</i>	<i>glabra</i>	Tarbush	
<i>Erodium</i>	<i>aureum</i>	Corkscrew Grass or Storksbill	seeds
<i>Erodium</i>	<i>botrys</i>	Corkscrew Grass or Storksbill	
<i>Eucalyptus</i>	<i>caesia</i>	Silver Princess	
<i>Eucalyptus</i>	<i>camaldulensis</i>	River Red Gum	
<i>Eucalyptus</i>	<i>citriodora</i>	Lemon Scented Gum	
<i>Eucalyptus</i>	<i>diversicolor</i>	Karri	seeds
<i>Eucalyptus</i>	<i>globulus</i>	Tasmanian Blue Gum	
<i>Eucalyptus</i>	<i>gomphocephala</i>	Tuart	flower, seed
<i>Eucalyptus</i>	<i>grandis</i>	Flooded Gum	
<i>Eucalyptus</i>	<i>longicornis</i>	Red Morrell	nesting

Genus	Species	Common Name	Part eaten
<i>Eucalyptus</i>	<i>loxophleba</i>	York Gum	nesting
<i>Eucalyptus</i>	<i>marginata</i>	Jarrah	seeds
<i>Eucalyptus</i>	<i>occidentalis</i>	Swamp Yate	nesting
<i>Eucalyptus</i>	<i>patens</i>	Blackbutt	
<i>Eucalyptus</i>	<i>pleurocarpa</i>	Tallerack	
<i>Eucalyptus</i>	<i>preissiana</i>	Bell-fruited Mallee	
<i>Eucalyptus</i>	<i>robusta</i>	Swamp Mahogany	
<i>Eucalyptus</i>	<i>rudis</i>	Flooded Gum	
<i>Eucalyptus</i>	<i>salmonophioia</i>	Salmon Gum	nesting
<i>Eucalyptus</i>	<i>salubris</i>	Gimlet	
<i>Eucalyptus</i>	<i>tetragona</i>	Tallerack	seeds
<i>Eucalyptus</i>	<i>totiana</i>	Coastal Blackbutt, Prickly Bark	seeds
<i>Eucalyptus</i>	<i>wandoo</i>	Wandoo	nesting
<i>Grevillea</i>	<i>apiciloba</i>	Black Toothbrushes	flower, seed
<i>Grevillea</i>	<i>armigera</i>	Prickly Toothbrush	flowers, seeds
<i>Grevillea</i>	<i>bipinnatifida</i>	Fuschia Grevillea	
<i>Grevillea</i>	<i>hookeriana</i>	Black Toothbrush	seeds
<i>Grevillea</i>	<i>paniculata</i>	Kerosene Bush	seeds
<i>Grevillea</i>	<i>paradoxa</i>	Bottlebrush Grevillea	seeds
<i>Grevillea</i>	<i>petrophiloides</i>	Pink Poker	seeds
<i>Grevillea</i>	<i>robusta</i>	Silky Oak	
<i>Hakea</i>	<i>auriculata</i>		seeds
<i>Hakea</i>	<i>candolleana</i>		
<i>Hakea</i>	<i>circumalata</i>	Coastal Hakea	seeds
<i>Hakea</i>	<i>commutata</i>		
<i>Hakea</i>	<i>conchifolia</i>		
<i>Hakea</i>	<i>conchifolia</i>	Shell-leaved Hakea	seeds
<i>Hakea</i>	<i>costata</i>	Ribbed Hakea	
<i>Hakea</i>	<i>crassifolia</i>	Thick Leaved Hakea	seeds
<i>Hakea</i>	<i>cristata</i>	Snail Hakea	
<i>Hakea</i>	<i>cucullata</i>	Snail Hakea	
<i>Hakea</i>	<i>cyclocarpa</i>		seeds
<i>Hakea</i>	<i>eneabba</i>		
<i>Hakea</i>	<i>erinacea</i>	Hedgehog Hakea	
<i>Hakea</i>	<i>falcata</i>		seeds
<i>Hakea</i>	<i>flabellifolia</i>	Fan-leaved Hakea	
<i>Hakea</i>	<i>gilbertii</i>		seeds
<i>Hakea</i>	<i>incrassata</i>	Golfball or Marble Hakea	seeds
<i>Hakea</i>	<i>lasiantha</i>	Woolly Flowered Hakea	
<i>Hakea</i>	<i>lasianthoides</i>		
<i>Hakea</i>	<i>laurina</i>	Pincushion	seeds
<i>Hakea</i>	<i>lissocarpha</i>	Honeybrush	seeds
<i>Hakea</i>	<i>megalosperma</i>	Lesueur Hakea	
<i>Hakea</i>	<i>multilineata</i>	Grass Leaf Hakea	seeds
<i>Hakea</i>	<i>obliqua</i>	Needles and Corks	seeds
<i>Hakea</i>	<i>oleifolia</i>	Dungyn or Olive-leaved Hakea	
<i>Hakea</i>	<i>pandanocarpa</i>	Thick-leaved Hakea	
<i>Hakea</i>	<i>petiolaris</i>		
<i>Hakea</i>	<i>polyanthema</i>		
<i>Hakea</i>	<i>preissi</i>		
<i>Hakea</i>	<i>prostrata</i>	Harsh Hakea	seeds
<i>Hakea</i>	<i>psilorrhyncha</i>		
<i>Hakea</i>	<i>ruscifolia</i>	Candle Hakea	seeds
<i>Hakea</i>	<i>scoparia</i>		seeds
<i>Hakea</i>	<i>smlacifolia</i>		
<i>Hakea</i>	<i>spathulata</i>		
<i>Hakea</i>	<i>stenocarpa</i>	Narrow-fruited Hakea	

Genus	Species	Common Name	Part eaten
<i>Hakea</i>	<i>sulcata</i>	Furrowed Hakea	seeds
<i>Hakea</i>	<i>trifurcata</i>	Two leaved Hakea	seeds
<i>Hakea</i>	<i>undulata</i>	Wavy leaved Hakea	seeds
<i>Hakea</i>	<i>varia</i>	Variable leaved Hakea	seeds
<i>Helianthus</i>	<i>annuus</i>	Sunflower	
<i>Hibiscus</i>	<i>sp.</i>		
<i>Isopogon</i>	<i>scabriusculus</i>		seeds
<i>Jacaranda</i>	<i>mimosifolia</i>	Jacaranda	
<i>Jacksonia</i>	<i>furcellata</i>	Grey Stinkwood	
<i>Lambertia</i>	<i>inermis</i>	Chittick	nectar
<i>Lambertia</i>	<i>multiflora</i>		flower, seed
<i>Liquidamber</i>	<i>styraciflua</i>	Liquid Amber	
<i>Lupinus</i>	<i>sp.</i>	Lupin	
<i>Macadamia</i>	<i>integrifolia</i>	Macadamia	
<i>Malus</i>	<i>domestica</i>	Apple	
<i>Melaleuca</i>	<i>leuropoma</i>		
<i>Melia</i>	<i>azedarach</i>	Cape Lilac	
<i>Mesomeleana</i>	<i>sp.</i>		
<i>Pinus</i>	<i>canariensis</i>	Canary Island Pine	
<i>Pinus</i>	<i>caribea</i>	Caribbean Pine	
<i>Pinus</i>	<i>pinaster</i>	Pinaster or Maritime Pine	seeds
<i>Pinus</i>	<i>radiata</i>	Radiata Pine	seeds
<i>Protea</i>	<i>repens</i>		
<i>Prunus</i>	<i>amygdalus</i>	Almond Tree	
<i>Prunus</i>	<i>dulices</i>		seeds
<i>Raphanus</i>	<i>raphanistrum</i>	Wild Radish	
<i>Tipuana</i>	<i>tipu</i>	Tipu or Rosewood Tree	
<i>Xanthorrhoea</i>	<i>preissii</i>	Grass Tree	

It is evident from Table 1 that Carnaby's Black Cockatoo feeds on a substantial variety of shrubs and plants, and clearing small areas are unlikely to significantly affect this species unless it is adjacent to a known nesting site. The most significant potential impact on this species would be the removal of trees that contain nests with eggs or chicks. However, clearing foraging trees within 2-4km of a known nesting site could also significantly impact on this species.

Johnstone and Storr (1998) indicated that the Battler site was about the eastern boundary of Carnaby's Black Cockatoo, although Davies (1966) reported Carnaby's Black Cockatoo as far east as Norseman, but this was a rare occurrence and given the recently reported reduction in the population, it is unlikely to be regularly seen this far east. More recently, the draft Commonwealth Government referral guidelines for the three threatened Black Cockatoos in Western Australia (Department of Sustainability Environment Water Population and Communities 2011) indicated that Carnaby's Black Cockatoo no longer is found around Southern Cross. So based on this new information, it is highly unlikely that they would be found nesting on the Battler project area.

Major Mitchell's Cockatoo (*Lophochroa leadbeateri*) – Schedule 4 under the *Wildlife Conservation Act 1950*

Major Mitchell's Cockatoo has a geographic distribution that borders on the boundary of the wheat belt north of Southern Cross and extends to north of Geraldton. There are records of Major Mitchell's Cockatoo throughout much of inland Western Australia as far north as Broome (Rowley and Chapman 1991). More recently, Johnstone and Storr (1998) indicated the southernmost geographical distribution of Major Mitchell's Cockatoo in the vicinity of the wheat belt, included a crescent shaped area just north of Southern Cross to include Lake Moore and Lake Barlee. Major Mitchell's Cockatoo is frequently seen on the northern outskirts of Southern Cross. This distribution includes the King Brown, Golden Orb and Marda project areas.

Major Mitchell's Cockatoo forages on a wide variety of plants, but in the vicinity of the wheat belt, wheat (*Triticum aestivum*), double-gees (*Emex australis*) and pie-melons (*Citrullus lanatus*) are its main food

items, although it was reported also eating flowers, fruit and roots from a number of other plants (Table 2) and a variety of grubs (Rowley and Chapman 1991).

Table 2. Plants eaten by Major Mitchell's Cockatoo (taken from Rowley and Chapman 1991)

Genus	Species	Part eaten
<i>Callitris</i>	<i>glaucophylla</i>	fruit
<i>Avena</i>	<i>sativa</i>	fruit
<i>Bromus</i>	spp.	flower
<i>Hordeum</i>	spp.	flower
<i>Triticum</i>	<i>aestivum</i>	fruit
<i>Borya</i>	<i>constricta</i>	root
<i>Casuarina</i>	<i>cristata</i>	fruit
<i>Grevillea</i>	<i>eribotrya</i>	fruit
<i>Grevillea</i>	<i>paniculata</i>	fruit
<i>Grevillea</i>	spp.	fruit
<i>Hakea</i>	<i>fransicana</i>	fruit
<i>Hakea</i>	<i>preissii</i>	fruit
<i>Exocarpus</i>	<i>aphyllus</i>	fruit
<i>Santalum</i>	<i>acuminatum</i>	fruit
<i>Santalum</i>	<i>spicatum</i>	fruit, stem
<i>Emex</i>	<i>australis</i>	root, flower, fruit
<i>Atriplex</i>	<i>nummularia</i>	flower
<i>Maireana</i>	spp.	fruit
<i>Codonocarpus</i>	<i>cotinifolius</i>	fruit, grubs,
<i>Brassica</i>	<i>tournefortii</i>	root
<i>Pittosporum</i>	<i>phylliraeoides</i>	fruit
<i>Acacia</i>	<i>acuminata</i>	grubs, fruit
<i>Acacia</i>	<i>tetragonophylla</i>	fruit
<i>Brachychiton</i>	<i>diversifolius</i>	
<i>Eucalyptus</i>	spp.	grubs
<i>Eremophila</i>	<i>oppositifolia</i>	flowers and fruit
<i>Citrullus</i>	<i>lanatus</i>	fruit
<i>Cucumis</i>	<i>myriocarpus</i>	fruit

Rowley and Chapman (1991) reported mean horizontal diameter of nest hollow entrances as 177mm (85-470), mean vertical diameter of nest hollow entrances as 156mm (70-400), mean depth of nest hollows as 660mm (330 -1200) and mean height of the entrance to a nest hollow above the ground was 11.32m (8.2-18.5). In August, breeding pairs begin regularly revisiting their fledge territories. The breeding season is late August and early September (Rowley and Chapman 1991). All 61 nests recorded by Rowley and Chapman (1991) were in Salmon Gums (*E. salmonophloia*), and these nest entrances faced no particular direction.

Importantly, Major Mitchell's Cockatoo do not nest near others of the same species. Rowley and Chapman (1991) reported a minimum distance of 1km between nests with a mean of 2.7km. Mean clutch size is 3.3 but ranged from 1 to 8 eggs. Incubation takes 23-24 days, a task mostly undertaken by the female with help from the male (Rowley and Chapman 1991). Both parents feed, brood and preen the nestlings. Once eggs have hatched the male was the predominant daytime brooder with the female taking over at night.

Major Mitchell's Cockatoos form a monogamous relationship that persists throughout the year and from year-to-year, unless one partner dies. Large flocks of Major Mitchell's Cockatoo are rare. Most often a flock consists of 10-15 birds that will range over an area of about 300km² (Rowley and Chapman 1991). Rowley and Chapman (1991) reported the main cause of nestling mortality apart from spring storms and robbing appeared to be dry hot early summers when birds died of dehydration. Once fledged, predation by raptors was significant and also collision with vehicles. Survival of immature birds was less than that of adults (Smith and Rowley 1995)

The most significant potential impact on this species would be the removal of trees that contained nests with eggs or chicks.

Western Rosella (*Platycercus icterotis xanthogenys*) - Schedule 1 species under the *Wildlife Conservation Act 1950*

The Western Rosella nests in tree hollows. Nest hollow entrance sizes are generally smaller than for the two cockatoos discussed above, being 48-105mm wide and with a depth of 0.35-1.5m (Johnstone and Storr 1998). Nests can be from 2-25m above the ground and they appear to prefer Marri, Wandoo, York Gum, Flooded Gum and Salmon Gum. Eggs are laid from August to November, with clutches of 5-8. Incubation takes 23-25 days, with only the female incubating eggs and brooding the chicks (Johnstone and Storr 1998). The geographic distribution of Western Rosella includes the Battler site.

Terrestrial Ecosystems searched for nesting Western Rosellas concurrently with the survey for Carnaby's Black Cockatoo in the Battler project area.

1.3 Project objectives and scope of works

The purpose of this assessment was to report on the potential impact that vegetation clearing and development of mining infrastructure might have on Carnaby's Black Cockatoo and Major Mitchell's Cockatoo.

Terrestrial Ecosystems was commissioned by Southern Cross Goldfields Ltd to undertake a survey of the trees to determine whether Carnaby's Black Cockatoo were nesting in the Battler project area and Major Mitchell's Cockatoo were nesting in King Brown, Golden Orb and Marda project areas. In addition, Terrestrial Ecosystems was to assess the suitability of areas adjacent to the four project areas for providing feeding and nesting opportunities for either Carnaby's Black Cockatoo or Major Mitchell's Cockatoo. The presence of Carnaby's Black Cockatoo and Major Mitchell's Cockatoo in or near the project areas would also be recorded. If these cockatoos were seen they were to be observed and followed to determine whether they were breeding in the area or simply moving through the area foraging as they went.

2 METHODOLOGY

Trees within the vicinity of each of these impact areas were assessed in early September 2011. The September survey period was selected as it was when birds would most probably be sitting on eggs, and therefore their presence observed. All trees that contained hollows were closely inspected, although none were climbed. For Carnaby's Black Cockatoo, Galahs (*Eolophus roseicapillus*) and Major Mitchell's Cockatoo, knocking on a tree that contains a nest with one or both parents present is normally sufficient for an adult bird to poke its head out of the hollow, thereby identifying the presence of a breeding pair with a nest.

A tree hollow entrance and depth need to be of minimum dimensions before it will be utilised by Carnaby's Black Cockatoo and Major Mitchell's Cockatoo. Rowley and Chapman (1991) provided evidence that Galahs and Major Mitchell's Cockatoo prefer similar hollows, and there are examples of Major Mitchell's Cockatoo evicting Galahs from a hollow and successfully incubating Galah eggs and raising the chicks. As none of the trees were climbed it was not possible to determine whether the hollow was wide enough or deep enough to be suitable for a nesting site.

Trees with hollow entrances that may be suitable for nesting sites for Carnaby's Black Cockatoo at Battler or for Major Mitchell's Cockatoos at King Brown, Golden Orb or Marda had their hollow entrance dimensions, the height of the hollow, the height of the tree and the diameter of the tree trunk at breast height estimated and recorded, so that the density of large trees and those with hollows could be determined. The location of all trees inspected with suitable hollows was recorded with a GPS.

It was proposed that all Carnaby's Black Cockatoo and Major Mitchell's Cockatoo that were seen within a 4km radius of a project area would be followed to determine whether they were nesting, or just foraging and moving through the general area. The area around each of the proposed mines sites was assessed to determine whether the habitat in the project area was available in adjacent areas and whether the trees in the adjacent areas contained a similar number of hollows that were suitable for either Carnaby's Black Cockatoo or Major Mitchell's Cockatoo.

The survey was undertaken by a team of experienced ecologists lead by Dr Scott Thompson.

2.1 Limitations

The EPA Guidance for Assessment of Environmental Factors: Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia, No. 56 (EPA 2004) suggested that fauna surveys may be limited by many variables. Limitations associated with each of these variables are assessed in Table 3.

Table 3. Survey constraints and limitations
 Negligible – less than 20%; Moderate – 20-60%

Possible limitations	Constraint	Comment
Competency and experience of the consultants carrying out the survey	No	The scientists who lead the field investigations and prepared this report have appropriate training and experience in conducting fauna surveys.
Scope	No	The scope of the project was adequate for the data to enable the project objectives to be achieved.
Proportion of fauna identified, recorded and/or collected	No	The survey located and recorded all trees containing suitable nesting hollows for Carnaby's Black Cockatoo at Battler and Major Mitchell's Cockatoos at King Brown, Golden Orb and Marda.
Sources of information	No	Information was available on nesting hollow dimensions for both Carnaby's Black Cockatoo and Major Mitchell's Cockatoo.
Proportion of the task achieved	No	All potential impact areas were surveyed.
Timing/weather/season/cycle	No	The survey was undertaken during the breeding season for Carnaby's Black Cockatoo and Major Mitchell's Cockatoo. The weather and conditions were suitable for a survey of this nature.
Disturbances which affected results of the survey	No	Not applicable.
Intensity of survey effort	No	The survey located and recorded all trees containing suitable nesting hollows for Carnaby's Black Cockatoo at Battler and Major Mitchell's Cockatoo at King Brown, Golden Orb and Marda.
Resources	No	Adequate resources were available.
Remoteness and/or access problems	No	Access was available either by ATV or on foot.
Availability of contextual information on the region	No	Recent draft referral guidelines on Carnaby's Black Cockatoo and other published reports, and the report of a seven year investigation into Major Mitchell's Cockatoo provide adequate contextual information for this assessment.

3 RESULTS

To provide an indication of the density of trees with a hollow that was potentially suitable for use as a nesting hole, the area searched and number of trees recorded for each site is shown in Table 4. The location of all trees inspected that contained hollows with suitable entrance dimensions for Carnaby's Black Cockatoo at Battler and Major Mitchell's Cockatoos at King Brown, Golden Orb and Marda were recorded in Appendices A-D.

Table 4. Number of trees with a hollow that was potentially suitable for use as a nesting hole for cockatoos in each surveyed area

Site	Area (ha)	Number of trees
Battler	57	136
Golden Orb	115	144
King Brown	17	86
Marda	210	271

No Carnaby's Black Cockatoos were seen flying near the Battler project area. No Major Mitchell's Cockatoos were seen flying or nesting near the King Brown, Golden Orb and Marda project areas. Galahs were recorded nesting in numerous trees (Appendices A-D). Major Mitchell's Cockatoos were however, recorded in the broader region indicating that the time of year was suitable for surveys. Numerous trees had the bark stripped away from around a hollow, which is often done by cockatoos and galahs on nest trees.

All project areas contained similar habitat in adjacent areas, i.e. trees with suitable nesting hollows were as abundant as were healthy trees that were flowering and in fruit. There was no evidence (e.g. no birds were seen or heard) to indicate Carnaby's Black Cockatoo or Major Mitchell's Cockatoos were nesting in areas adjacent to the project area.

No Western Rosellas were seen at any of the four surveyed sites.

4 DISCUSSION

4.1.1 Battler

Fauna habitat in the previously mined Battler project area has been extensively disturbed, and this area is of little ecological value. Areas adjacent to the proposed mining area have also been disturbed (e.g. trail bike riding, deposition of rubbish) and have reduced ecological value. However, much of the area is in good condition and is likely to support an avian fauna assemblage that is similar to that which existed in the bioregion prior to the general area being disturbed by farming and mining (Plates 1a and 1b).



Plate 1a - Eucalypt woodland over an understorey of chenopods



Plate 1b - Eucalypt woodland over an understorey of chenopods

The Battler project area is in a linear belt of remnant vegetation that runs along the eastern side of the Southern Cross to Marvel Loch Road. This remnant is approximately 25km by 3.5km. There is evidence of mining activity in the northern section, east of the Battler project area, along the south-eastern border and in the southern section. The relatively undisturbed areas of good avian fauna habitat in the Battler project area are plentiful in adjacent areas. An investigation of the availability of trees with suitable nesting hollows indicated that the relative abundance in adjacent area was similar to that in the project area.

There was no evidence of Carnaby's Black Cockatoo or Western Rosellas breeding or having bred in this area. No white-tailed Black Cockatoos were seen during the survey of the area. The most recent geographical distribution maps provided by the Commonwealth Department of Sustainability, Environment, Water, Population and Communities (2011) indicated that the breeding area for Carnaby's Black Cockatoo extends east to just past Northam to approximately Meckering. It is therefore highly unlikely that clearing of vegetation in the Battler project area will have a significant impact on the breeding of Carnaby's Black Cockatoos.

4.1.2 King Brown

The assessed area was in good condition and is likely to support a relatively undisturbed natural avian fauna assemblage (Plates 2a and 2b). The relatively flat undisturbed areas of good avian fauna habitat in the King Brown project area are plentiful in adjacent areas, as are hollows in trees. The habitat on the stony hill that is vegetated with shrubs and small trees, that does not contain trees with hollows suitable for cockatoo nesting sites, is also present outside the King Brown project area. As a consequence, the King Brown project area is not a high value avian fauna habitat.



Plate 2a. Open mixed woodland over scattered shrubs on a clay substrate and some leaf litter



Plate 2b - Eucalypt woodlands over an understorey of chenopods

There was no evidence that Major Mitchell's Cockatoo is breeding in this area. Rowley and Chapman (1991) reported that Major Mitchell's Cockatoo do not nest near others of the same species, and their data indicated the minimum distance between nests was 1km with a mean of 2.7km. Given the relatively small size of the impact area, it is highly unlikely that clearing of trees with hollows is likely to have a significant impact on this species.

4.1.3 Golden Orb

The assessed area is Eucalypt woodland with an understorey of chenopods or moderately dense Acacia shrub land with leaf litter under the shrubs (Plates 3a and 3b). The central area has been heavily disturbed by earlier mining activity. There are numerous mature eucalypts that appear to contain hollows that could potentially be used as nesting sites for Major Mitchell's Cockatoo. The eastern alignment for the proposed access road contains fewer large trees and more dense shrubs.

There was no evidence that Major Mitchell's Cockatoo is breeding in this area, however, on an earlier visit to this area, Major Mitchell's Cockatoo were seen about 4km north of this site and Rapallo staff reported five Major Mitchell's Cockatoo feeding in the project area during a short-range endemic invertebrate (SRE) survey in September 2011. Rowley and Chapman (1991) reported that Major Mitchell's Cockatoo do not nest near others of the same species, and their data indicated the minimum distance between nests was 1km with a mean of 2.7km. Given the relatively small size of the impact area, it is highly unlikely that clearing of trees with hollows is likely to have a significant impact on this species.



Plate 3a. Open Eucalypt woodland over scattered chenopods



Plate 3b. Moderately dense Acacia shrub land

4.1.4 Marda

Earlier mining activity is evident in numerous locations in the project area. In some cases, the impact is limited and localised, while in other areas it was on a larger scale. Exploration grid lines were also evident in many areas, but these seem to have had minimal impact on the habitat from an avian fauna perspective. Most

of the remaining area was in good condition and is likely to support a relatively undisturbed natural avian fauna assemblage.

The proposed Marda pits and waste dumps are located on flat or gently undulating terrain that is vegetated with open woodland (Plates 4a and 4b). Avian fauna habitat in the proposed disturbance areas are similar to that in the adjacent areas, and, as a consequence, the avian fauna assemblage in the project area is also likely to be similar to that in adjacent areas.



Plate 4a. Open Eucalypt woodland over scattered chenopods and a lot of bare ground



Plate 4b. Open Eucalypt woodland over scattered chenopods and a lot of bare ground

There was no evidence that Major Mitchell's Cockatoo is breeding in this area. No Major Mitchell's Cockatoo were seen during the survey, but they were seen approximately 8km to the south of the project area during another site visit and Rapallo staff reported a single Major Mitchell's Cockatoo feeding in the project area during a SRE survey in September 2011. Rowley and Chapman (1991) reported that Major Mitchell's Cockatoo do not nest near others of the same species, and their data indicated the minimum distance between nests was 1km with a mean of 2.7km. Given the size of the impact area, it is highly unlikely that clearing of trees with hollows is likely to have a significant impact on this species.

Terrestrial Ecosystems survey of adjacent areas indicated that there were many areas that contained similar vegetation and trees with hollows that would be suitable for Major Mitchell's Cockatoo.

5 CONCLUSION

The survey of trees in the vicinity of the Battler, King Brown, Golden Orb and Marda project areas recorded numerous trees that contained hollows that would be suitable nesting sites for cockatoos. A survey of adjacent areas, in all cases found similar habitat and many trees with hollows that could provide suitable nesting sites for cockatoos. No Carnaby's Black Cockatoo or Major Mitchell's Cockatoo were observed in or near the project areas during the survey. However, Major Mitchell's Cockatoo have been seen on previous visits to the area approximately 4km north of Golden Orb and 8km south of Marda, so they forage in the general area. The survey found no evidence that any of the project areas are currently being used as nesting sites for Carnaby's Black Cockatoo or Major Mitchell's Cockatoo.

Clearing of the vegetation in any of the project areas would not impact on any ecological corridors, or significantly reduce the number of trees containing hollows that might be used as nesting sites in the bioregion. From the perspective of potential impacts on Carnaby's Black Cockatoo or Major Mitchell's Cockatoo from clearing the vegetation in Battler, King Brown, Golden Orb and Marda project areas, it is highly unlikely that that this will disturb breeding or significantly reduce the foraging areas available to these species.

No Western Rosellas were observed in any project area and are unlikely to rely on the projects areas for survival.

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Appendix A
Trees with hollows that could provide a
suitable nesting site for Carnaby's Black
Cockatoo around the Battler site
Tree hollow assessment – Battler Project

Latitude	Longitude	Tree status	Tree Height (m)	Hollow height in tree (m)	Hollow entrance height (mm)	Hollow entrance width (mm)	Trunk diameter at breast height (mm)	Hollow opening orientation	Orientation of hollow in the tree	Comment
-31.3488	119.3904	Dead	23	5	200	200	500	Vertical	Vertical	
-31.3497	119.3900	Dead	14	10	180	180	350	Sloping	Vertical	
-31.3473	119.3857	Dead	15	14	300	300	450	Vertical	Vertical	
-31.3444	119.3853	Dead	8	8	180	180	300	Vertical	Vertical	
-31.3445	119.3855	Dead	7	7	200	200	600	Vertical	Vertical	
-31.3495	119.3873	Dead	8	6	300	300	500	Horizontal	Sloping	
-31.3458	119.3885	Dead	12	11	250	250	400	Vertical	Vertical	
-31.3439	119.3891	Dead	14	13	350	250	300	Horizontal	Vertical	
-31.3490	119.3908	Dead	20	10	250	250	600	Sloping	Sloping	
-31.3494	119.3908	Dead	20	8	100	100	500	Sloping	Vertical	
-31.3494	119.3906	Dead	20	8	100	100	500	Sloping	Vertical	
-31.3465	119.3859	Dead	18	12	100	100	600	Vertical	Vertical	
-31.3459	119.3854	Dead	24	22	300	150	700	Vertical	Vertical	
-31.3462	119.3855	Dead	18	8	500	500	900	Horizontal	Vertical	
-31.3475	119.3871	Dead	12	5	150	150	400	Horizontal	Vertical	
-31.3429	119.3867	Dead	15	4	200	200	400	Vertical	Sloping	
-31.3438	119.3874	Dead	15	10	200	200	500	Horizontal	Vertical	
-31.3445	119.3877	Dead	12	5	150	100	300	Vertical	Vertical	
-31.3485	119.3898	Dead	14	6	180	180	400	Horizontal	Vertical	
-31.3482	119.3906	Alive	15	9	150	150	500	Vertical	Vertical	
-31.3489	119.3904	Alive	12	10	100	100	400	Vertical	Vertical	
-31.3493	119.3903	Alive	22	17	150	150	750	Sloping	Vertical	
-31.3501	119.3901	Alive	30	13	200	200	500	Horizontal	Vertical	
-31.3500	119.3902	Alive	18	14	300	300	1200	Vertical	Vertical	
-31.3505	119.3894	Alive	14	1.5	200	150	400	Horizontal	Sloping	
-31.3507	119.3893	Alive	15	12	200	200	600	Sloping	Vertical	
-31.3506	119.3891	Alive	20	8	150	150	300	Sloping	Sloping	
-31.3510	119.3884	Alive	22	12	200	200	600	Vertical	Vertical	Galahs nesting
-31.3496	119.3869	Alive	16	10	300	300	550	Vertical	Vertical	
-31.3497	119.3870	Alive	16	10	300	300	600	Vertical	Vertical	
-31.3496	119.3869	Alive	18	10	350	350	700	Vertical	Vertical	

Latitude	Longitude	Tree status	Tree Height (m)	Hollow height in tree (m)	Hollow entrance height (mm)	Hollow entrance width (mm)	Trunk diameter at breast height (mm)	Hollow opening orientation	Orientation of hollow in the tree	Comment
-31.3490	119.3868	Alive	16	10	150	150	450	Vertical	Vertical	
-31.3491	119.3868	Alive	25	18	50	150	700	Vertical	Vertical	
-31.3489	119.3868	Alive	12	7	450	180	300	Horizontal	Vertical	
-31.3481	119.3865	Alive	22	14	350	200	450	Vertical	Vertical	
-31.3479	119.3865	Alive	15	8	450	180	450	Horizontal	Vertical	
-31.3476	119.3863	Alive	25	12	200	250	750	Vertical	Vertical	
-31.3477	119.3860	Alive	25	6	300	120	900	Sloping	Vertical	
-31.3470	119.3857	Alive	18	8	300	250	450	Vertical	Vertical	
-31.3461	119.3862	Alive	15	10	250	250	500	Vertical	Vertical	
-31.3460	119.3863	Alive	25	15	150	150	450	Sloping	Vertical	
-31.3455	119.3859	Alive	15	8	150	150	400	Vertical	Vertical	
-31.3454	119.3858	Alive	15	6	200	200	450	Horizontal	Sloping	
-31.3450	119.3856	Alive	15	8	300	300	650	Vertical	Vertical	
-31.3445	119.3854	Alive	20	8	180	180	800	Vertical	Vertical	
-31.3441	119.3855	Alive	20	4	350	350	600	Horizontal	Sloping	
-31.3441	119.3851	Alive	25	12	300	200	500	Horizontal	Vertical	
-31.3436	119.3854	Alive	30	5	200	200	450	Sloping	Vertical	
-31.3436	119.3853	Alive	20	8	300	300	600	Vertical	Vertical	
-31.3434	119.3853	Alive	20	6	450	200	750	Sloping	Vertical	
-31.3444	119.3860	Alive	25	12	200	200	700	Sloping	Vertical	
-31.3446	119.3859	Alive	25	12	300	300	600	Horizontal	Vertical	
-31.3451	119.3862	Alive	30	16	150	150	600	Sloping	Vertical	
-31.3454	119.3864	Alive	15	8	300	300	600	Vertical	Vertical	
-31.3461	119.3865	Alive	20	8	200	200	600	Vertical	Vertical	
-31.3459	119.3867	Alive	20	9	300	300	600	Sloping	Sloping	
-31.3464	119.3867	Alive	16	6	250	250	600	Vertical	Vertical	
-31.3468	119.3865	Alive	18	14	200	200	750	Vertical	Vertical	
-31.3473	119.3868	Alive	20	10	300	200	500	Sloping	Vertical	
-31.3489	119.3872	Alive	20	12	180	180	750	Horizontal	Vertical	Galahs nesting
-31.3489	119.3875	Alive	20	8	200	200	1200	Horizontal	Sloping	
-31.3490	119.3877	Alive	15	10	200	200	750	Horizontal	Sloping	
-31.3496	119.3879	Alive	30	15	250	250	600	Vertical	Vertical	

Latitude	Longitude	Tree status	Tree Height (m)	Hollow height in tree (m)	Hollow entrance height (mm)	Hollow entrance width (mm)	Trunk diameter at breast height (mm)	Hollow opening orientation	Orientation of hollow in the tree	Comment
-31.3497	119.3880	Alive	25	18	200	200	600	Vertical	Vertical	
-31.3483	119.3883	Alive	18	8	150	150	400	Vertical	Vertical	
-31.3451	119.3872	Alive	25	12	200	200	700	Sloping	Vertical	
-31.3430	119.3867	Alive	25	12	200	200	500	Vertical	Vertical	
-31.3429	119.3865	Alive	25	16	250	250	600	Sloping	Vertical	
-31.3435	119.3871	Alive	20	16	250	250	500	Vertical	Vertical	
-31.3434	119.3872	Alive	25	12	250	250	450	Sloping	Sloping	
-31.3449	119.3872	Alive	20	8	200	200	500	Vertical	Vertical	
-31.3449	119.3874	Alive	20	18	200	200	600	Vertical	Vertical	
-31.3471	119.3882	Alive	25	18	200	200	800	Sloping	Vertical	Galahs nesting
-31.3481	119.3887	Alive	25	15	200	200	600	Vertical	Vertical	
-31.3483	119.3901	Alive	25	10	250	250	450	Vertical	Vertical	
-31.3483	119.3903	Alive	12	6	250	250	500	Vertical	Vertical	
-31.3444	119.3889	Alive	12	10	250	250	300	Sloping	Vertical	
-31.3442	119.3892	Alive	18	18	200	200	450	Vertical	Vertical	
-31.3446	119.3895	Alive	30	15	250	250	600	Vertical	Vertical	
-31.3445	119.3897	Alive	30	25	300	300	500	Horizontal	Vertical	
-31.3454	119.3897	Alive	25	12	150	150	400	Sloping	Sloping	
-31.3453	119.3904	Alive	25	12	200	200	500	Horizontal	Sloping	
-31.3455	119.3913	Alive	25	12	200	200	400	Sloping	Sloping	
-31.3460	119.3915	Alive	25	10	350	300	500	Horizontal	Sloping	
-31.3482	119.3919	Alive	20	12	180	180	750	Vertical	Vertical	
-31.3484	119.3917	Alive	25	14	250	300	600	Vertical	Vertical	
-31.3487	119.3915	Alive	30	18	300	300	600	Vertical	Vertical	
-31.3488	119.3913	Alive	25	6	400	300	600	Sloping	Vertical	
-31.3492	119.3919	Alive	18	4	450	300	650	Sloping	Vertical	
-31.3496	119.3921	Alive	20	8	300	300	300	Vertical	Vertical	
-31.3496	119.3921	Alive	20	8	300	300	300	Sloping	Sloping	
-31.3499	119.3923	Alive	20	9	200	200	300	Sloping	Sloping	
-31.3501	119.3931	Alive	20	20	300	300	550	Vertical	Vertical	
-31.3503	119.3936	Alive	15	12	350	350	500	Vertical	Vertical	
-31.3508	119.3896	Alive	15	10	100	100	700	Sloping	Vertical	

Latitude	Longitude	Tree status	Tree Height (m)	Hollow height in tree (m)	Hollow entrance height (mm)	Hollow entrance width (mm)	Trunk diameter at breast height (mm)	Hollow opening orientation	Orientation of hollow in the tree	Comment
-31.3511	119.3884	Alive	25	13	250	100	500	Vertical	Vertical	
-31.3503	119.3873	Alive	8	3	600	200	400	Vertical	Vertical	
-31.3503	119.3872	Alive	12	7	250	200	450	Sloping	Sloping	
-31.3487	119.3864	Alive	16	8	150	150	800	Horizontal	Vertical	
-31.3485	119.3863	Alive	15	13	600	200	650	Sloping	Sloping	
-31.3480	119.3862	Alive	14	8	400	220	500	Sloping	Sloping	
-31.3473	119.3856	Alive	14	8	600	200	900	Vertical	Vertical	
-31.3461	119.3854	Alive	25	9	400	300	600	Sloping	Vertical	
-31.3452	119.3852	Alive	18	10	150	600	600	Sloping	Sloping	
-31.3450	119.3851	Alive	15	8	180	180	300	Horizontal	Vertical	
-31.3444	119.3849	Alive	18	4	200	200	600	Sloping	Vertical	
-31.3440	119.3847	Alive	25	12	250	150	600	Vertical	Vertical	
-31.3444	119.3861	Alive	14	12	300	200	350	Sloping	Vertical	
-31.3448	119.3865	Alive	18	9	200	200	550	Horizontal	Vertical	
-31.3451	119.3866	Alive	20	7	900	300	600	Vertical	Vertical	
-31.3455	119.3868	Alive	15	9	150	150	400	Horizontal	Sloping	
-31.3456	119.3868	Alive	18	10	200	150	600	Vertical	Vertical	
-31.3456	119.3868	Alive	18	10	200	150	600	Vertical	Vertical	
-31.3470	119.3868	Alive	15	13	200	200	900	Horizontal	Vertical	
-31.3471	119.3869	Alive	13	7	300	150	400	Sloping	Sloping	
-31.3487	119.3877	Alive	13	10	200	200	450	Sloping	Vertical	
-31.3495	119.3881	Alive	20	7	150	100	450	Vertical	Vertical	
-31.3468	119.3875	Alive	11	10	200	200	400	Horizontal	Vertical	
-31.3432	119.3872	Alive	15	12	250	250	450	Sloping	Horizontal	
-31.3469	119.3886	Alive	20	15	100	100	650	Vertical	Vertical	
-31.3481	119.3890	Alive	16	6	180	180	300	Horizontal	Vertical	
-31.3489	119.3898	Alive	15	9	300	250	550	Sloping	Horizontal	
-31.3483	119.3899	Alive	11	6	200	200	400	Horizontal	Sloping	
-31.3443	119.3882	Alive	25	20	400	200	450	Vertical	Vertical	
-31.3433	119.3876	Alive	16	12	250	250	350	Sloping	Vertical	
-31.3434	119.3886	Alive	26	20	150	150	500	Vertical	Horizontal	
-31.3448	119.3898	Alive	22	18	200	200	550	Horizontal	Vertical	

Latitude	Longitude	Tree status	Tree Height (m)	Hollow height in tree (m)	Hollow entrance height (mm)	Hollow entrance width (mm)	Trunk diameter at breast height (mm)	Hollow opening orientation	Orientation of hollow in the tree	Comment
-31.3454	119.3899	Alive	15	10	150	150	250	Horizontal	Vertical	
-31.3453	119.3915	Alive	10	3	250	150	300	Sloping	Vertical	
-31.3481	119.3920	Alive	24	15	150	150	800	Vertical	Sloping	
-31.3484	119.3915	Alive	14	9	800	250	600	Vertical	Vertical	
-31.3493	119.3923	Alive	14	8	220	220	800	Vertical	Horizontal	
-31.3497	119.3926	Alive	10	8	250	250	350	Horizontal	Vertical	
-31.3498	119.3928	Alive	14	9	150	150	300	Horizontal	Vertical	
-31.3499	119.3934	Alive	18	4	300	250	750	Vertical	Sloping	
-31.3491	119.3911	Alive	14	12	150	150	300	Sloping	Vertical	

Appendix B
Trees with hollows that could provide a
suitable nesting site for Major Mitchell's
Cockatoo around the King Brown site
Tree hollow assessment – King Brown Project

Latitude	Longitude	Tree status	Tree Height (m)	Hollow height in tree (m)	Hollow entrance height (mm)	Hollow entrance width (mm)	Trunk diameter at breast height (mm)	Hollow opening orientation	Orientation of hollow in the tree	Comment
-31.3488	119.3904	Alive	16	10	150	100	450	Vertical	Vertical	Galahs nesting
-31.3497	119.3900	Alive	18	10	800	100	450	Sloping	Sloping	
-31.3473	119.3857	Alive	23	10	200	200	500	Horizontal	Sloping	
-31.3444	119.3853	Alive	20	12	200	200	850	Sloping	Sloping	
-31.3445	119.3855	Alive	12	7	150	150	300	Vertical	Horizontal	
-31.3495	119.3873	Alive	7	3	200	200	300	Horizontal	Vertical	
-31.3458	119.3885	Alive	10	3	250	200	300	Vertical	Vertical	
-31.3439	119.3891	Alive	5	3	200	200	500	Vertical	Sloping	
-31.3490	119.3908	Alive	13	8	250	250	600	Sloping	Vertical	
-31.3494	119.3908	Alive	6	3	125	125	300	Vertical	Sloping	
-31.3494	119.3906	Alive	12	10	150	150	300	Horizontal	Sloping	
-31.3465	119.3859	Alive	12	10	100	100	400	Horizontal	Vertical	
-31.3459	119.3854	Alive	6	4	100	100	300	Vertical	Sloping	
-31.3462	119.3855	Alive	25	12	150	150	600	Vertical	Vertical	
-31.3475	119.3871	Alive	9	5	200	200	450	Horizontal	Vertical	
-31.3429	119.3867	Alive	10	4	150	150	300	Vertical	Vertical	
-31.3438	119.3874	Alive	8	4	200	200	500	Horizontal	Vertical	
-31.3445	119.3877	Alive	10	4	200	200	600	Sloping	Sloping	
-31.3485	119.3898	Alive	19	11	200	200	500	Vertical	Vertical	
-31.3482	119.3906	Alive	12	6	200	200	500	Sloping	Sloping	
-31.3489	119.3904	Alive	12	6	180	180	500	Vertical	Vertical	
-31.3493	119.3903	Alive	11	6	150	150	450	Vertical	Sloping	
-31.3501	119.3901	Alive	12	10	300	200	300	Sloping	Vertical	
-31.3500	119.3902	Alive	14	3	300	150	400	Vertical	Vertical	
-31.3505	119.3894	Dead	9	9	400	400	400	Vertical	Vertical	
-31.3507	119.3893	Dead	25	16	300	300	500	Vertical	Sloping	
-31.3506	119.3891	Dead	25	20	30	300	600	Horizontal	Vertical	
-31.3510	119.3884	Dead	25	9	300	300	600	Vertical	Vertical	
-31.3496	119.3869	Alive	12	10	200	200	1000	Vertical	Vertical	
-31.3497	119.3870	Alive	12	5	120	120	300	Sloping	Sloping	
-31.3496	119.3869	Alive	20	10	100	100	400	Vertical	Vertical	
-31.3490	119.3868	Alive	20	10	100	100	500	Vertical	Vertical	

Latitude	Longitude	Tree status	Tree Height (m)	Hollow height in tree (m)	Hollow entrance height (mm)	Hollow entrance width (mm)	Trunk diameter at breast height (mm)	Hollow opening orientation	Orientation of hollow in the tree	Comment
-31.3491	119.3868	Alive	20	9	150	150	500	Horizontal	Vertical	
-31.3489	119.3868	Alive	30	15	200	200	750	Sloping	Sloping	
-31.3481	119.3865	Alive	15	10	200	200	650	Horizontal	Sloping	
-31.3479	119.3865	Alive	15	10	150	150	600	Vertical	Sloping	
-31.3476	119.3863	Alive	12	6	250	250	400	Sloping	Sloping	
-31.3477	119.3860	Alive	22	16	200	200	600	Vertical	Sloping	
-31.3470	119.3857	Alive	22	10	250	250	500	Vertical	Vertical	
-31.3461	119.3862	Alive	20	7	300	100	500	Vertical	Sloping	
-31.3460	119.3863	Alive	20	8	250	250	600	Vertical	Sloping	
-31.3455	119.3859	Alive	30	15	200	200	600	Vertical	Sloping	
-31.3454	119.3858	Alive	25	8	200	200	600	Vertical	Sloping	
-31.3450	119.3856	Alive	20	15	150	150	500	Horizontal	Sloping	
-31.3445	119.3854	Alive	20	14	250	250	600	Vertical	Vertical	Galahs nesting
-31.3441	119.3855	Alive	20	9	150	150	600	Vertical	Sloping	
-31.3441	119.3851	Alive	18	10	300	300	1500	Vertical	Vertical	
-31.3436	119.3854	Alive	15	9	180	180	500	Vertical	Vertical	
-31.3436	119.3853	Alive	10	5	100	100	500	Sloping	Sloping	
-31.3434	119.3853	Alive	12	11	250	250	450	Vertical	Vertical	
-31.3444	119.3860	Alive	18	8	250	250	500	Vertical	Vertical	
-31.3446	119.3859	Alive	15	8	250	250	400	Vertical	Vertical	
-31.3451	119.3862	Alive	20	16	250	250	600	Vertical	Vertical	Galahs nesting
-31.3454	119.3864	Alive	12	8	250	250	500	Vertical	Vertical	Galahs nesting
-31.3461	119.3865	Alive	25	10	200	200	600	Vertical	Vertical	
-31.3459	119.3867	Alive	30	20	250	300	1200	Sloping	Sloping	
-31.3464	119.3867	Alive	20	8	400	300	500	Vertical	Sloping	
-31.3468	119.3865	Alive	12	6	350	350	450	Sloping	Sloping	
-31.3473	119.3868	Alive	15	6	150	150	300	Vertical	Vertical	
-31.3489	119.3872	Alive	20	9	300	300	1500	Sloping	Sloping	
-31.3489	119.3875	Alive	30	14	300	300	1100	Sloping	Vertical	
-31.3490	119.3877	Alive	20	8	250	250	1000	Sloping	Sloping	
-31.3496	119.3879	Alive	15	2	300	250	500	Sloping	Sloping	
-31.3497	119.3880	Alive	15	8	200	200	350	Vertical	Vertical	

Latitude	Longitude	Tree status	Tree Height (m)	Hollow height in tree (m)	Hollow entrance height (mm)	Hollow entrance width (mm)	Trunk diameter at breast height (mm)	Hollow opening orientation	Orientation of hollow in the tree	Comment
-31.3483	119.3883	Alive	15	8	250	250	900	Horizontal	Sloping	
-31.3451	119.3872	Alive	18	8	350	350	1000	Vertical	Vertical	
-31.3430	119.3867	Alive	30	15	500	450	1800	Vertical	Vertical	
-31.3429	119.3865	Alive	15	6	250	250	500	Vertical	Sloping	
-31.3435	119.3871	Alive	15	8	400	450	600	Vertical	Vertical	
-31.3434	119.3872	Alive	20	9	450	450	900	Vertical	Vertical	
-31.3449	119.3872	Alive	20	15	400	400	750	Vertical	Vertical	
-31.3449	119.3874	Alive	20	15	250	250	450	Vertical	Vertical	
-31.3471	119.3882	Alive	15	6	200	200	550	Vertical	Vertical	
-31.3481	119.3887	Alive	15	8	250	250	600	Vertical	Vertical	
-31.3483	119.3901	Alive	15	9	150	150	450	Sloping	Vertical	
-31.3483	119.3903	Alive	15	9	300	350	800	Vertical	Vertical	
-31.3444	119.3889	Alive	20	8	300	300	550	Vertical	Vertical	
-31.3442	119.3892	Alive	15	7	500	500	850	Vertical	Vertical	
-31.3446	119.3895	Alive	20	9	300	300	500	Sloping	Sloping	
-31.3445	119.3897	Alive	10	9	300	300	1000	Vertical	Vertical	
-31.3454	119.3897	Alive	15	8	250	250	600	Vertical	Vertical	
-31.3453	119.3904	Alive	10	5	250	250	500	Horizontal	Vertical	
-31.3455	119.3913	Alive	12	9	250	250	700	Horizontal	Sloping	
-31.3460	119.3915	Alive	13	7	250	250	650	Horizontal	Sloping	
-31.3482	119.3919	Alive	15	5	200	200	700	Vertical	Vertical	
-31.3484	119.3917	Alive	15	4	150	150	400	Horizontal	Sloping	

Appendix C
Trees with hollows that could provide a
suitable nesting site for Major Mitchell's
Cockatoo around the Golden Orb site
Tree hollow assessment – Golden Orb

Latitude	Longitude	Tree status	Tree Height (m)	Hollow height in tree (m)	Hollow entrance height (mm)	Hollow entrance width (mm)	Trunk diameter at breast height (mm)	Hollow opening orientation	Orientation of hollow in the tree	Comment
-30.28188	119.18231	Dead	10	6	250	75	300	Horizontal	Vertical	
-30.28213	119.18192	Dead	8	5	200	200	300	Vertical	Vertical	
-30.28065	119.18197	Dead	11	5	250	200	400	Vertical	Vertical	
-30.28274	119.17938	Dead	10	7	200	200	300	Horizontal	Vertical	
-30.28406	119.18145	Alive	15	8	120	120	650	Horizontal	Sloping	
-30.28269	119.18204	Alive	15	8	200	200	450	Vertical	Vertical	
-30.28152	119.18241	Alive	15	7	150	150	400	Horizontal	Sloping	
-30.28135	119.18229	Alive	12	10	150	150	500	Horizontal	Sloping	
-30.28135	119.18216	Alive	8	4	300	300	600	Vertical	Vertical	
-30.28126	119.18233	Alive	15	7	300	300	600	Horizontal	Horizontal	
-30.28127	119.18241	Alive	14	12	300	300	500	Vertical	Vertical	
-30.28054	119.18236	Alive	15	8	250	250	1200	Vertical	Vertical	
-30.27833	119.18261	Alive	15	7	250	250	1200	Vertical	Vertical	
-30.27842	119.18169	Alive	15	6	150	150	600	Horizontal	Sloping	
-30.27982	119.18098	Alive	15	12	300	300	600	Vertical	Vertical	
-30.27988	119.18153	Alive	15	8	350	300	300	Vertical	Vertical	
-30.28007	119.18144	Alive	12	2	300	250	350	Sloping	Vertical	
-30.28128	119.18095	Alive	15	6	150	150	450	Horizontal	Sloping	
-30.28258	119.18052	Alive	15	8	300	300	600	Vertical	Vertical	
-30.28276	119.18031	Alive	12	5	300	300	600	Vertical	Vertical	
-30.28293	119.18030	Alive	15	4	200	200	600	Sloping	Sloping	
-30.28293	119.18028	Alive	17	4	200	200	600	Sloping	Sloping	
-30.28339	119.18018	Alive	15	4	200	200	450	Horizontal	Sloping	
-30.28207	119.17977	Alive	15	7	450	250	550	Vertical	Vertical	
-30.28005	119.18021	Alive	15	14	300	300	550	Vertical	Vertical	
-30.27949	119.18060	Alive	14	10	300	300	600	Vertical	Vertical	
-30.27906	119.18055	Alive	25	16	300	300	600	Horizontal	Sloping	
-30.27883	119.18050	Alive	25	8	450	450	600	Vertical	Vertical	
-30.27805	119.18047	Alive	25	12	400	400	550	Vertical	Vertical	
-30.27775	119.18043	Alive	25	16	400	400	750	Vertical	Vertical	
-30.27732	119.18050	Alive	25	10	300	300	700	Vertical	Vertical	
-30.27675	119.18020	Alive	25	10	300	300	750	Vertical	Vertical	

Latitude	Longitude	Tree status	Tree Height (m)	Hollow height in tree (m)	Hollow entrance height (mm)	Hollow entrance width (mm)	Trunk diameter at breast height (mm)	Hollow opening orientation	Orientation of hollow in the tree	Comment
-30.27703	119.17979	Alive	25	10	600	200	350	Horizontal	Vertical	
-30.27704	119.17978	Alive	25	10	250	200	350	Sloping	Vertical	
-30.27760	119.17953	Alive	18	10	200	200	350	Sloping	Sloping	
-30.27786	119.17937	Alive	30	16	300	300	900	Vertical	Vertical	
-30.28128	119.17807	Alive	15	8	250	250	450	Vertical	Vertical	
-30.27877	119.17840	Alive	12	6	250	250	450	Vertical	Vertical	
-30.27779	119.17864	Alive	25	18	450	450	600	Vertical	Vertical	
-30.27725	119.17885	Alive	15	7	250	250	600	Vertical	Vertical	
-30.27686	119.17747	Alive	25	16	300	300	600	Vertical	Vertical	
-30.27687	119.17740	Alive	25	16	300	300	600	Vertical	Vertical	
-30.27698	119.17738	Alive	25	18	300	300	500	Vertical	Vertical	
-30.27688	119.17762	Alive	25	10	300	300	800	Vertical	Vertical	
-30.27736	119.17743	Alive	30	15	400	400	1000	Vertical	Vertical	
-30.27802	119.17720	Alive	18	7	300	300	600	Horizontal	Sloping	
-30.28036	119.17677	Alive	18	8	250	250	450	Sloping	Vertical	
-30.28310	119.17672	Alive	25	12	450	450	750	Vertical	Vertical	
-30.28027	119.17572	Alive	18	10	300	300	500	Vertical	Vertical	
-30.28407	119.18160	Alive	12	5	300	300	500	Vertical	Vertical	
-30.28380	119.18188	Alive	15	6	300	300	500	Vertical	Vertical	
-30.28330	119.18208	Alive	15	6	300	300	500	Vertical	Vertical	
-30.28241	119.18251	Alive	15	6	300	250	700	Vertical	Vertical	
-30.28070	119.18409	Alive	20	9	400	400	600	Sloping	Sloping	
-30.28169	119.18415	Alive	20	10	300	300	550	Vertical	Vertical	
-30.28209	119.18408	Alive	20	8	300	300	550	Sloping	Sloping	
-30.28463	119.18425	Alive	20	8	250	250	550	Vertical	Vertical	
-30.28396	119.18440	Alive	20	6	250	250	550	Vertical	Sloping	
-30.28453	119.18596	Alive	25	10	300	300	700	Vertical	Vertical	
-30.28518	119.18607	Alive	14	6	300	450	700	Vertical	Sloping	
-30.28608	119.18595	Alive	15	6	450	300	700	Sloping	Sloping	
-30.28655	119.18650	Alive	18	6	450	300	750	Sloping	Vertical	
-30.28613	119.19003	Alive	20	12	300	300	750	Vertical	Sloping	
-30.28715	119.19227	Alive	20	12	300	300	1200	Vertical	Vertical	

Latitude	Longitude	Tree status	Tree Height (m)	Hollow height in tree (m)	Hollow entrance height (mm)	Hollow entrance width (mm)	Trunk diameter at breast height (mm)	Hollow opening orientation	Orientation of hollow in the tree	Comment
-30.29262	119.20317	Alive	12	12	200	250	1200	Sloping	Sloping	
-30.29309	119.20489	Alive	20	10	300	350	600	Vertical	Sloping	
-30.29452	119.20726	Alive	14	5	250	250	300	Vertical	Vertical	
-30.29598	119.20950	Alive	25	8	350	350	600	Vertical	Vertical	
-30.29600	119.20944	Alive	25	15	350	350	600	Vertical	Vertical	
-30.29646	119.20956	Alive	25	12	350	350	650	Vertical	Vertical	
-30.29665	119.20955	Alive	25	12	400	400	550	Vertical	Vertical	
-30.29663	119.20939	Alive	15	12	350	350	400	Vertical	Vertical	
-30.29668	119.20934	Alive	25	8	350	350	400	Vertical	Vertical	
-30.29412	119.20511	Alive	25	14	350	350	900	Vertical	Vertical	
-30.29409	119.20498	Alive	20	6	250	250	900	Vertical	Vertical	
-30.28688	119.18820	Alive	14	8	250	250	500	Horizontal	Sloping	
-30.28697	119.18820	Alive	12	8	300	300	600	Vertical	Vertical	
-30.28280	119.18161	Alive	11	6	150	150	300	Sloping	Sloping	
-30.28285	119.18156	Alive	10	9	150	150	300	Horizontal	Vertical	
-30.28230	119.18187	Alive	7	3	150	100	400	Sloping	Sloping	
-30.28212	119.18193	Alive	10	7	150	150	400	Sloping	Sloping	
-30.28072	119.18199	Alive	11	4	300	250	350	Vertical	Vertical	
-30.27988	119.18223	Alive	8	5	150	150	300	Vertical	Vertical	
-30.27836	119.18190	Alive	17	7	250	250	600	Vertical	Vertical	
-30.27861	119.18144	Alive	18	10	200	200	450	Horizontal	Vertical	
-30.28001	119.18172	Alive	10	3	100	100	250	Sloping	Vertical	
-30.28078	119.18162	Alive	10	2	150	150	400	Sloping	Vertical	
-30.28116	119.18122	Alive	10	4	100	100	450	Sloping	Vertical	
-30.28193	119.18138	Alive	8	7	100	100	450	Vertical	Vertical	
-30.28359	119.17939	Alive	11	4	150	100	400	Sloping	Sloping	
-30.28156	119.17949	Alive	10	5	180	180	400	Vertical	Sloping	
-30.27930	119.18006	Alive	20	9	250	200	550	Vertical	Sloping	
-30.27838	119.18005	Alive	20	7	175	125	600	Vertical	Vertical	
-30.27790	119.18017	Alive	20	8	150	150	350	Sloping	Sloping	
-30.27736	119.18030	Alive	25	12	150	150	500	Vertical	Vertical	
-30.27680	119.18024	Alive	18	10	100	1100	600	Sloping	Vertical	

Latitude	Longitude	Tree status	Tree Height (m)	Hollow height in tree (m)	Hollow entrance height (mm)	Hollow entrance width (mm)	Trunk diameter at breast height (mm)	Hollow opening orientation	Orientation of hollow in the tree	Comment
-30.27771	119.17975	Alive	30	13	125	125	450	Horizontal	Vertical	
-30.27782	119.17945	Alive	20	14	200	200	300	Horizontal	Vertical	
-30.28073	119.17905	Alive	12	4	250	250	500	Horizontal	Vertical	
-30.28100	119.17902	Alive	10	4	100	100	400	Sloping	Vertical	
-30.28201	119.17755	Alive	13	7	150	150	420	Vertical	Vertical	
-30.28177	119.17768	Alive	10	7	100	100	400	Vertical	Vertical	
-30.27763	119.17819	Alive	16	8	150	150	400	Vertical	Sloping	
-30.27649	119.17875	Alive	10	4	200	200	300	Sloping	Sloping	
-30.27702	119.17788	Alive	18	9	150	150	450	Vertical	Sloping	
-30.27718	119.17775	Alive	16	8	100	100	300	Vertical	Vertical	
-30.27976	119.17720	Alive	12	5	180	150	650	Vertical	Vertical	
-30.28033	119.17714	Alive	10	4	100	100	300	Vertical	Sloping	
-30.28028	119.17702	Alive	8	4	200	150	450	Vertical	Vertical	
-30.28095	119.17713	Alive	10	4	200	200	400	Vertical	Vertical	
-30.28243	119.17728	Alive	35	20	200	200	700	Sloping	Sloping	
-30.28308	119.17678	Alive	15	10	150	150	400	Vertical	Vertical	
-30.28044	119.17536	Alive	12	6	150	150	400	Horizontal	Vertical	
-30.28022	119.17506	Alive	14	6	180	150	400	Vertical	Sloping	
-30.28168	119.17469	Alive	18	10	200	200	400	Horizontal	Vertical	
-30.28169	119.17346	Alive	10	3	250	250	450	Horizontal	Vertical	
-30.28386	119.18198	Alive	11	7	200	100	300	Vertical	Sloping	
-30.28338	119.18224	Alive	13	4	280	200	400	Vertical	Vertical	
-30.28265	119.18283	Alive	10	4	150	150	250	Vertical	Horizontal	
-30.28220	119.18283	Alive	8	3	100	100	500	Vertical	Horizontal	
-30.28116	119.18267	Alive	12	6	125	125	300	Sloping	Sloping	
-30.28141	119.18399	Alive	15	6	200	80	300	Vertical	Vertical	
-30.28192	119.18384	Alive	10	5	100	100	400	Vertical	Sloping	
-30.28462	119.18319	Alive	18	9	250	250	700	Vertical	Vertical	
-30.28377	119.18465	Alive	10	5	100	100	300	Vertical	Vertical	
-30.28446	119.18545	Alive	10	3	150	150	300	Vertical	Vertical	
-30.28557	119.18573	Alive	12	3	150	100	350	Vertical	Sloping	
-30.28658	119.18562	Alive	18	7	150	150	500	Vertical	Vertical	

Latitude	Longitude	Tree status	Tree Height (m)	Hollow height in tree (m)	Hollow entrance height (mm)	Hollow entrance width (mm)	Trunk diameter at breast height (mm)	Hollow opening orientation	Orientation of hollow in the tree	Comment
-30.28588	119.18890	Alive	9	7	150	100	800	Vertical	Vertical	
-30.28595	119.18912	Alive	10	4	200	200	450	Vertical	Vertical	
-30.28712	119.19052	Alive	15	7	125	125	450	Vertical	Sloping	
-30.28742	119.19161	Alive	10	3	200	100	400	Vertical	Vertical	
-30.28856	119.19419	Alive	13	8	100	100	400	Sloping	Vertical	
-30.28886	119.19470	Alive	12	6	150	150	400	Sloping	Vertical	
-30.29128	119.20058	Alive	15	6	200	150	500	Vertical	Sloping	
-30.29314	119.20369	Alive	15	7	175	175	300	Horizontal	Vertical	
-30.29458	119.20716	Alive	14	4	150	150	300	Horizontal	Vertical	
-30.29572	119.20919	Alive	24	10	150	150	550	Horizontal	Vertical	
-30.29652	119.20931	Alive	23	8	250	250	600	Horizontal	Vertical	
-30.29614	119.20876	Alive	14	8	125	125	600	Vertical	Sloping	
-30.29446	119.20611	Alive	14	6	200	200	400	Horizontal	Vertical	
-30.29423	119.20566	Alive	14	4	200	200	450	Sloping	Vertical	
-30.29349	119.20461	Alive	17	6	250	250	500	Vertical	Vertical	
-30.28639	119.18763	Alive	8	6	100	100	350	Vertical	Vertical	

Appendix D
Trees with hollows that could provide a
suitable nesting site for Major Mitchell's
Cockatoo around the Marda site
Tree hollow assessment – Marda Project

Latitude	Longitude	Tree status	Tree Height (m)	Hollow height in tree (m)	Hollow entrance height (mm)	Hollow entrance width (mm)	Trunk diameter at breast height (mm)	Hollow opening orientation	Orientation of hollow in the tree	Comment
-30.21231	119.25958	Dead	16	16	150	150	300	Vertical	Vertical	
-30.19598	119.27225	Dead	15	10	300	300	800	Vertical	Vertical	
-30.19623	119.26470	Dead	25	18	200	250	750	Sloping	Vertical	
-30.19512	119.26582	Dead	25	12	300	300	750	Sloping	Vertical	
-30.19460	119.26582	Dead	18	10	300	300	750	Sloping	Sloping	
-30.19567	119.26375	Dead	25	18	300	300	650	Sloping	Vertical	
-30.19519	119.25994	Dead	20	16	300	300	500	Vertical	Vertical	
-30.19621	119.26633	Dead	10	4	200	100	400	Vertical	Vertical	
-30.19767	119.27585	Dead	8	6	200	150	400	Vertical	Vertical	
-30.19976	119.28097	Dead	30	10	175	150	750	Vertical	Vertical	
-30.20636	119.25606	Alive	15	8	300	300	500	Vertical	Vertical	
-30.20645	119.25604	Alive	15	6	300	300	500	Vertical	Vertical	
-30.20648	119.25605	Alive	15	12	400	400	650	Vertical	Vertical	
-30.20643	119.25616	Alive	15	10	250	250	650	Horizontal	Vertical	
-30.20856	119.25506	Alive	30	10	300	300	650	Sloping	Sloping	
-30.20897	119.25475	Alive	30	12	500	300	650	Horizontal	Vertical	
-30.21000	119.25437	Alive	12	8	300	300	650	Sloping	Sloping	
-30.21024	119.25460	Alive	30	15	400	400	650	Vertical	Vertical	
-30.21073	119.25416	Alive	40	25	400	400	1000	Vertical	Vertical	
-30.21126	119.25368	Alive	20	12	400	400	1200	Vertical	Vertical	
-30.21128	119.25366	Alive	20	12	400	400	1200	Vertical	Vertical	
-30.20997	119.25528	Alive	30	12	400	400	1200	Vertical	Vertical	
-30.20782	119.25735	Alive	25	8	450	450	700	Vertical	Vertical	
-30.20753	119.25735	Alive	30	16	450	450	1200	Vertical	Vertical	
-30.20734	119.25779	Alive	20	8	200	200	800	Vertical	Vertical	
-30.20711	119.25788	Alive	15	8	400	400	900	Vertical	Vertical	
-30.20661	119.25791	Alive	18	8	400	400	900	Sloping	Sloping	
-30.20640	119.25923	Alive	30	15	150	150	900	Sloping	Sloping	
-30.20702	119.25871	Alive	30	8	400	500	900	Vertical	Vertical	
-30.20707	119.25837	Alive	30	12	250	250	1000	Sloping	Sloping	
-30.20839	119.25870	Alive	20	12	150	150	1000	Vertical	Vertical	
-30.20856	119.25810	Alive	30	8	150	150	1000	Sloping	Sloping	

Latitude	Longitude	Tree status	Tree Height (m)	Hollow height in tree (m)	Hollow entrance height (mm)	Hollow entrance width (mm)	Trunk diameter at breast height (mm)	Hollow opening orientation	Orientation of hollow in the tree	Comment
-30.21056	119.25598	Alive	30	15	150	150	1000	Sloping	Vertical	
-30.21256	119.25765	Alive	25	18	350	400	1000	Vertical	Vertical	Galahs nesting
-30.21252	119.25754	Alive	25	8	400	400	1000	Vertical	Vertical	
-30.21262	119.25760	Alive	20	6	400	400	900	Vertical	Vertical	
-30.21261	119.25765	Alive	25	8	400	400	1100	Vertical	Vertical	
-30.21145	119.25908	Alive	30	16	500	350	1000	Vertical	Vertical	
-30.21209	119.25907	Alive	30	18	250	250	900	Sloping	Vertical	
-30.20945	119.26019	Alive	28	12	300	300	1000	Sloping	Vertical	
-30.20929	119.26047	Alive	15	10	300	300	1200	Vertical	Vertical	
-30.20933	119.26068	Alive	15	10	150	200	1200	Vertical	Vertical	
-30.20933	119.26082	Alive	15	4	400	400	800	Vertical	Vertical	
-30.20623	119.26059	Alive	30	14	300	300	750	Sloping	Vertical	
-30.20639	119.26052	Alive	30	18	300	300	700	Sloping	Vertical	
-30.20636	119.26031	Alive	16	12	450	450	800	Vertical	Vertical	
-30.20620	119.26167	Alive	25	18	450	450	800	Sloping	Vertical	
-30.20616	119.26224	Alive	25	18	400	400	900	Sloping	Vertical	
-30.20627	119.26218	Alive	25	18	400	400	900	Sloping	Vertical	
-30.20598	119.26144	Alive	30	18	400	400	900	Sloping	Vertical	
-30.20030	119.26797	Alive	10	4	300	300	700	Sloping	Horizontal	
-30.20010	119.26831	Alive	10	4	300	300	700	Sloping	Sloping	
-30.19995	119.26844	Alive	18	12	250	250	450	Vertical	Vertical	
-30.19976	119.26869	Alive	25	12	300	300	450	Sloping	Vertical	
-30.19921	119.26927	Alive	20	18	300	300	700	Vertical	Vertical	
-30.19717	119.27177	Alive	20	14	300	300	600	Sloping	Vertical	
-30.19644	119.27237	Alive	22	11	450	300	800	Vertical	Vertical	
-30.19599	119.27219	Alive	25	18	400	400	900	Vertical	Vertical	
-30.19656	119.27043	Alive	25	14	400	400	1600	Vertical	Vertical	
-30.19675	119.27002	Alive	25	14	400	400	900	Vertical	Vertical	
-30.19844	119.26824	Alive	25	8	500	450	1200	Vertical	Vertical	
-30.19846	119.26818	Alive	25	10	500	450	1200	Vertical	Vertical	
-30.19883	119.26764	Alive	25	12	150	150	800	Vertical	Vertical	
-30.19913	119.26750	Alive	30	18	300	300	1200	Vertical	Vertical	

Latitude	Longitude	Tree status	Tree Height (m)	Hollow height in tree (m)	Hollow entrance height (mm)	Hollow entrance width (mm)	Trunk diameter at breast height (mm)	Hollow opening orientation	Orientation of hollow in the tree	Comment
-30.19984	119.26683	Alive	25	14	300	300	750	Vertical	Vertical	
-30.20116	119.26622	Alive	30	20	300	300	750	Vertical	Vertical	
-30.20116	119.26628	Alive	30	8	300	300	800	Vertical	Vertical	
-30.20109	119.26668	Alive	30	16	300	300	800	Sloping	Vertical	
-30.20089	119.26573	Alive	20	12	300	300	850	Vertical	Vertical	
-30.19977	119.26532	Alive	20	14	400	300	1000	Vertical	Vertical	
-30.19752	119.26657	Alive	20	10	300	300	700	Vertical	Vertical	
-30.19653	119.26681	Alive	15	5	300	300	700	Vertical	Vertical	
-30.19695	119.26619	Alive	20	5	500	250	750	Vertical	Vertical	
-30.19844	119.26522	Alive	25	9	300	300	750	Sloping	Vertical	
-30.19753	119.26392	Alive	30	13	200	250	1100	Vertical	Vertical	
-30.19782	119.26261	Alive	25	18	400	400	900	Vertical	Vertical	
-30.19652	119.26231	Alive	25	16	300	300	900	Vertical	Vertical	
-30.19543	119.26303	Alive	25	6	300	300	750	Sloping	Vertical	
-30.19421	119.26330	Alive	25	14	150	150	750	Sloping	Vertical	
-30.19457	119.26141	Alive	20	14	50	500	900	Vertical	Vertical	
-30.19337	119.26119	Alive	20	14	300	200	700	Vertical	Vertical	
-30.19375	119.26025	Alive	16	7	300	300	500	Vertical	Vertical	
-30.19395	119.25968	Alive	25	12	400	400	1100	Vertical	Vertical	
-30.19412	119.25963	Alive	25	12	400	400	900	Sloping	Vertical	
-30.19378	119.25797	Alive	30	10	500	300	900	Horizontal	Vertical	
-30.19193	119.25962	Alive	25	18	300	300	700	Vertical	Vertical	
-30.19193	119.25957	Alive	25	10	300	350	800	Vertical	Vertical	
-30.19208	119.25903	Alive	18	10	250	250	800	Vertical	Vertical	
-30.19234	119.25859	Alive	18	10	400	400	900	Vertical	Vertical	
-30.19304	119.25785	Alive	25	12	400	400	1100	Sloping	Vertical	
-30.19311	119.25777	Alive	25	10	400	400	1200	Horizontal	Vertical	
-30.19330	119.25719	Alive	20	10	450	450	1200	Horizontal	Sloping	
-30.19135	119.25756	Alive	20	6	350	350	800	Sloping	Sloping	
-30.19153	119.25767	Alive	20	8	500	450	900	Vertical	Vertical	
-30.19066	119.25750	Alive	25	12	300	300	800	Sloping	Sloping	
-30.19191	119.25323	Alive	20	10	300	300	800	Vertical	Vertical	

Latitude	Longitude	Tree status	Tree Height (m)	Hollow height in tree (m)	Hollow entrance height (mm)	Hollow entrance width (mm)	Trunk diameter at breast height (mm)	Hollow opening orientation	Orientation of hollow in the tree	Comment
-30.19121	119.25462	Alive	16	8	150	150	600	Sloping	Vertical	
-30.20050	119.26910	Alive	12	6	150	150	600	Sloping	Sloping	
-30.20030	119.26939	Alive	14	10	150	150	750	Vertical	Vertical	
-30.19991	119.26961	Alive	5	5	150	150	250	Vertical	Vertical	
-30.19937	119.26985	Alive	8	4	300	150	250	Vertical	Vertical	
-30.19931	119.26998	Alive	20	8	400	400	600	Sloping	Vertical	
-30.19951	119.27028	Alive	20	10	400	300	600	Sloping	Vertical	
-30.19944	119.27019	Alive	15	7	250	250	600	Vertical	Vertical	
-30.19911	119.27025	Alive	20	9	300	300	750	Vertical	Vertical	
-30.19881	119.27071	Alive	15	9	300	300	750	Sloping	Vertical	
-30.19836	119.27103	Alive	30	16	300	300	900	Horizontal	Sloping	
-30.19767	119.27218	Alive	30	10	400	400	900	Sloping	Vertical	
-30.19742	119.27251	Alive	30	15	200	200	800	Vertical	Vertical	
-30.19712	119.27407	Alive	25	10	400	350	750	Vertical	Vertical	
-30.19734	119.27429	Alive	25	8	400	350	800	Sloping	Vertical	
-30.19735	119.27428	Alive	25	8	250	250	800	Sloping	Vertical	
-30.19768	119.27388	Alive	25	10	150	150	800	Sloping	Sloping	
-30.19795	119.27363	Alive	25	12	300	250	900	Vertical	Vertical	
-30.19912	119.27255	Alive	25	15	300	250	900	Vertical	Vertical	
-30.19910	119.27209	Alive	25	15	250	250	750	Horizontal	Sloping	
-30.19941	119.27199	Alive	25	10	200	200	750	Vertical	Vertical	
-30.19942	119.27170	Alive	30	10	300	300	1200	Sloping	Sloping	
-30.19951	119.27164	Alive	30	14	350	300	900	Vertical	Vertical	
-30.20127	119.27074	Alive	15	7	200	180	800	Horizontal	Vertical	
-30.20070	119.27102	Alive	20	10	250	200	700	Sloping	Vertical	
-30.20007	119.27153	Alive	20	10	300	300	900	Vertical	Vertical	
-30.20002	119.27222	Alive	25	12	300	300	900	Sloping	Sloping	
-30.20000	119.27218	Alive	20	12	300	300	750	Vertical	Vertical	
-30.19942	119.27265	Alive	20	12	300	300	750	Vertical	Vertical	
-30.19836	119.27427	Alive	20	8	300	300	1100	Vertical	Vertical	
-30.19805	119.27437	Alive	20	12	300	300	900	Vertical	Vertical	
-30.19777	119.27485	Alive	20	12	500	500	900	Vertical	Vertical	

Latitude	Longitude	Tree status	Tree Height (m)	Hollow height in tree (m)	Hollow entrance height (mm)	Hollow entrance width (mm)	Trunk diameter at breast height (mm)	Hollow opening orientation	Orientation of hollow in the tree	Comment
-30.19723	119.27554	Alive	20	18	500	500	900	Vertical	Vertical	
-30.19710	119.27573	Alive	16	6	300	200	800	Vertical	Vertical	
-30.19715	119.27590	Alive	18	12	250	250	800	Sloping	Vertical	
-30.19717	119.27602	Alive	18	6	250	200	450	Sloping	Vertical	
-30.19749	119.27730	Alive	22	18	500	500	1100	Vertical	Vertical	
-30.19747	119.27719	Alive	22	14	300	200	850	Vertical	Vertical	
-30.19773	119.27670	Alive	22	8	300	300	1000	Vertical	Vertical	
-30.19775	119.27649	Alive	20	10	300	300	1000	Vertical	Vertical	
-30.19789	119.27609	Alive	20	10	300	300	1000	Vertical	Vertical	
-30.19790	119.27610	Alive	20	10	300	250	900	Sloping	Vertical	
-30.19784	119.27613	Alive	20	10	250	250	1000	Sloping	Sloping	
-30.19798	119.27571	Alive	20	18	250	250	900	Sloping	Vertical	
-30.19887	119.27486	Alive	30	18	350	300	900	Sloping	Vertical	
-30.19886	119.27486	Alive	20	14	300	300	700	Vertical	Vertical	
-30.19961	119.27402	Alive	18	16	300	300	600	Vertical	Vertical	
-30.20223	119.27142	Alive	15	8	300	300	900	Vertical	Vertical	
-30.20228	119.27147	Alive	15	8	300	300	900	Vertical	Vertical	
-30.19968	119.27441	Alive	15	6	300	250	650	Sloping	Vertical	
-30.19972	119.27475	Alive	15	6	150	150	600	Sloping	Vertical	
-30.19875	119.27557	Alive	25	18	400	400	900	Sloping	Vertical	
-30.19855	119.27581	Alive	25	18	400	400	900	Sloping	Vertical	
-30.19827	119.27601	Alive	25	18	350	350	850	Sloping	Vertical	
-30.19724	119.27817	Alive	20	14	350	350	850	Vertical	Vertical	
-30.19747	119.27887	Alive	25	10	500	500	1000	Sloping	Vertical	
-30.19757	119.27891	Alive	20	12	300	300	900	Sloping	Vertical	
-30.19803	119.27796	Alive	15	8	300	250	800	Vertical	Vertical	
-30.19817	119.27792	Alive	15	8	350	300	900	Vertical	Vertical	
-30.19811	119.27780	Alive	20	9	450	500	1000	Sloping	Vertical	
-30.19916	119.27641	Alive	20	18	450	400	1000	Sloping	Vertical	
-30.20001	119.27626	Alive	25	15	350	300	1100	Horizontal	Sloping	
-30.20049	119.27595	Alive	25	15	200	200	900	Sloping	Vertical	
-30.19959	119.27780	Alive	25	10	450	450	900	Sloping	Vertical	

Latitude	Longitude	Tree status	Tree Height (m)	Hollow height in tree (m)	Hollow entrance height (mm)	Hollow entrance width (mm)	Trunk diameter at breast height (mm)	Hollow opening orientation	Orientation of hollow in the tree	Comment
-30.19976	119.27962	Alive	30	18	600	350	900	Vertical	Vertical	
-30.20002	119.27888	Alive	30	16	350	350	1200	Vertical	Vertical	
-30.20032	119.27877	Alive	20	9	250	250	800	Sloping	Vertical	
-30.20243	119.27632	Alive	18	16	350	350	1100	Vertical	Vertical	
-30.20264	119.27682	Alive	25	8	300	300	900	Sloping	Vertical	
-30.20026	119.28050	Alive	25	12	300	300	900	Sloping	Vertical	
-30.20008	119.28056	Alive	17	16	400	400	900	Vertical	Vertical	
-30.20315	119.28135	Alive	12	5	350	350	900	Vertical	Vertical	
-30.20655	119.25614	Alive	27	10	250	250	400	Sloping	Sloping	
-30.20903	119.25518	Alive	27	10	100	100	400	Vertical	Horizontal	
-30.20962	119.25520	Alive	28	10	200	200	700	Vertical	Sloping	
-30.20984	119.25491	Alive	23	18	200	200	550	Horizontal	Sloping	
-30.20880	119.25648	Alive	18	9	175	175	500	Horizontal	Vertical	
-30.20773	119.25667	Alive	14	7	150	150	550	Vertical	Horizontal	
-30.20714	119.25726	Alive	18	9	150	100	500	Vertical	Vertical	
-30.20606	119.25776	Alive	17	9	150	100	650	Vertical	Vertical	
-30.20486	119.25778	Alive	10	5	800	100	350	Vertical	Vertical	
-30.20387	119.25948	Alive	20	12	200	200	400	Horizontal	Vertical	
-30.20651	119.25970	Alive	20	9	250	250	700	Vertical	Sloping	
-30.20862	119.25886	Alive	10	3	200	200	300	Vertical	Sloping	
-30.21205	119.25703	Alive	20	9	200	200	750	Vertical	Sloping	
-30.21200	119.25752	Alive	20	8	175	175	400	Vertical	Sloping	
-30.21232	119.25805	Alive	16	9	100	100	350	Vertical	Vertical	
-30.21210	119.25855	Alive	24	10	150	150	500	Vertical	Vertical	
-30.20805	119.26057	Alive	22	10	100	100	550	Vertical	Vertical	
-30.20730	119.26033	Alive	22	7	150	150	1000	Horizontal	Vertical	
-30.20729	119.25978	Alive	24	13	100	100	900	Vertical	Sloping	
-30.20564	119.26039	Alive	25	10	150	150	600	Vertical	Sloping	
-30.20088	119.26709	Alive	17	9	150	150	700	Vertical	Vertical	
-30.19977	119.26822	Alive	17	10	150	150	3500	Sloping	Sloping	
-30.19825	119.26849	Alive	20	10	280	250	850	Sloping	Sloping	
-30.19792	119.26927	Alive	17	7	125	125	500	Vertical	Vertical	

Latitude	Longitude	Tree status	Tree Height (m)	Hollow height in tree (m)	Hollow entrance height (mm)	Hollow entrance width (mm)	Trunk diameter at breast height (mm)	Hollow opening orientation	Orientation of hollow in the tree	Comment
-30.19709	119.26921	Alive	18	8	250	250	650	Horizontal	Vertical	
-30.19713	119.26876	Alive	13	12	150	150	450	Vertical	Vertical	
-30.19583	119.26969	Alive	20	7	250	125	550	Vertical	Vertical	
-30.19572	119.27125	Alive	15	7	250	250	700	Vertical	Sloping	
-30.19586	119.27071	Alive	17	10	200	150	450	Horizontal	Sloping	
-30.19780	119.26838	Alive	16	10	200	200	500	Sloping	Vertical	
-30.19882	119.26667	Alive	22	12	200	200	650	Vertical	Horizontal	
-30.20085	119.26593	Alive	16	4	250	125	700	Vertical	Vertical	
-30.19897	119.26583	Alive	22	12	200	200	400	Horizontal	Vertical	
-30.19696	119.26804	Alive	12	7	125	125	600	Vertical	Vertical	
-30.19910	119.26347	Alive	16	11	150	150	500	Sloping	Sloping	
-30.19811	119.26445	Alive	10	4	75	75	500	Vertical	Vertical	
-30.19498	119.26603	Alive	16	7	200	200	450	Sloping	Sloping	
-30.19494	119.26617	Alive	16	8	200	150	300	Vertical	Sloping	
-30.19563	119.26350	Alive	23	10	200	200	700	Vertical	Sloping	Galahs nesting
-30.19701	119.26236	Alive	24	7	180	150	450	Vertical	Vertical	
-30.19678	119.26243	Alive	20	12	200	200	500	Vertical	Sloping	
-30.19447	119.26346	Alive	20	12	250	250	850	Vertical	Sloping	
-30.19443	119.26157	Alive	13	6	500	400	700	Vertical	Vertical	
-30.19622	119.26007	Alive	25	7	100	100	550	Vertical	Vertical	
-30.19533	119.26011	Alive	20	9	300	150	650	Vertical	Vertical	
-30.19518	119.26063	Alive	10	4	200	100	300	Vertical	Vertical	
-30.19454	119.26079	Alive	18	12	150	150	450	Vertical	Sloping	
-30.19335	119.25999	Alive	18	12	150	150	450	Vertical	Vertical	
-30.19374	119.25963	Alive	20	4	150	150	650	Vertical	Sloping	
-30.19410	119.25824	Alive	25	9	150	150	650	Vertical	Sloping	
-30.19396	119.25831	Alive	16	10	150	150	700	Sloping	Sloping	
-30.19308	119.25971	Alive	17	8	350	250	500	Vertical	Vertical	
-30.19212	119.25807	Alive	13	9	180	180	800	Vertical	Sloping	
-30.19289	119.25747	Alive	17	4	180	180	1000	Vertical	Horizontal	
-30.19179	119.25788	Alive	22	17	150	150	500	Vertical	Sloping	
-30.19149	119.25831	Alive	18	12	250	250	400	Sloping	Sloping	

Latitude	Longitude	Tree status	Tree Height (m)	Hollow height in tree (m)	Hollow entrance height (mm)	Hollow entrance width (mm)	Trunk diameter at breast height (mm)	Hollow opening orientation	Orientation of hollow in the tree	Comment
-30.19193	119.25486	Alive	13	4	350	250	800	Vertical	Sloping	
-30.19198	119.25442	Alive	16	8	200	200	350	Vertical	Sloping	
-30.19143	119.25491	Alive	12	5	250	250	300	Vertical	Sloping	
-30.20151	119.26829	Alive	12	5	300	150	350	Vertical	Sloping	
-30.20120	119.26865	Alive	14	6	200	200	450	Vertical	Sloping	
-30.20093	119.26928	Alive	12	6	300	150	450	Vertical	Vertical	
-30.20061	119.26968	Alive	10	3	200	125	300	Vertical	Vertical	
-30.19994	119.27016	Alive	22	15	150	150	400	Vertical	Vertical	
-30.19962	119.27100	Alive	10	4	200	100	400	Vertical	Vertical	
-30.19846	119.27177	Alive	25	15	200	20000	1200	Sloping	Sloping	
-30.19753	119.27274	Alive	22	12	200	200	600	Sloping	Sloping	
-30.19725	119.27302	Alive	25	18	180	180	600	Vertical	Sloping	
-30.19709	119.27389	Alive	16	7	200	200	800	Sloping	Sloping	
-30.19852	119.27221	Alive	13	6	250	250	500	Sloping	Sloping	
-30.19920	119.27144	Alive	27	18	200	100	450	Vertical	Vertical	
-30.20028	119.27098	Alive	10	4	200	200	350	Vertical	Horizontal	
-30.20112	119.27106	Alive	10	5	100	100	500	Sloping	Vertical	
-30.20014	119.27184	Alive	10	5	200	200	300	Vertical	Sloping	
-30.19945	119.27282	Alive	18	10	175	175	450	Sloping	Vertical	
-30.19859	119.27454	Alive	24	9	200	100	450	Vertical	Vertical	
-30.19786	119.27511	Alive	12	6	150	150	600	Vertical	Sloping	
-30.19727	119.27589	Alive	20	13	200	150	350	Vertical	Vertical	
-30.19704	119.27693	Alive	12	8	200	200	350	Vertical	Vertical	
-30.19743	119.27637	Alive	22	12	150	150	500	Vertical	Vertical	
-30.19749	119.27626	Alive	16	9	100	100	500	Vertical	Vertical	
-30.19852	119.27480	Alive	9	6	200	200	450	Sloping	Sloping	
-30.19944	119.27387	Alive	22	10	225	175	650	Vertical	Sloping	
-30.20058	119.27318	Alive	12	6	150	150	450	Vertical	Vertical	
-30.19989	119.27504	Alive	10	5	150	125	450	Vertical	Sloping	
-30.19901	119.27619	Alive	20	13	175	125	350	Vertical	Vertical	
-30.19856	119.27612	Alive	18	11	200	200	900	Vertical	Sloping	
-30.19815	119.27681	Alive	20	10	125	125	500	Vertical	Vertical	

Latitude	Longitude	Tree status	Tree Height (m)	Hollow height in tree (m)	Hollow entrance height (mm)	Hollow entrance width (mm)	Trunk diameter at breast height (mm)	Hollow opening orientation	Orientation of hollow in the tree	Comment
-30.19745	119.27834	Alive	10	6	150	125	1300	Vertical	Vertical	
-30.19754	119.27819	Alive	10	6	150	150	500	Vertical	Sloping	
-30.19780	119.27807	Alive	25	14	150	150	500	Vertical	Sloping	
-30.19829	119.27694	Alive	25	12	150	150	400	Sloping	Sloping	
-30.19967	119.27598	Alive	17	14	275	225	800	Vertical	Vertical	
-30.20119	119.27748	Alive	12	4	150	150	400	Vertical	Sloping	
-30.20013	119.27802	Alive	13	7	150	150	400	Vertical	Sloping	
-30.19988	119.27817	Alive	18	6	125	125	400	Vertical	Horizontal	
-30.19960	119.27921	Alive	16	12	150	125	550	Vertical	Vertical	
-30.19959	119.27913	Alive	18	12	250	250	450	Vertical	Sloping	
-30.19966	119.27916	Alive	18	12	250	250	500	Vertical	Sloping	
-30.20193	119.27564	Alive	10	5	175	125	350	Vertical	Vertical	
-30.20262	119.27526	Alive	10	3	200	175	550	Vertical	Vertical	
-30.20273	119.27740	Alive	10	4	250	100	350	Sloping	Sloping	
-30.20201	119.27978	Alive	8	3	200	100	400	Vertical	Vertical	