

# Targeted Fauna Survey: Black Cockatoo and Western Ringtail Possum (Diurnal)

2774 Caves Road, Yallingup

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**Common terms/acronyms**

BC Act	WA <i>Biodiversity Conservation Act 2016</i>
DCCEEW	Federal Department of Climate Change, Energy, the Environment and Water
DBCA	WA Department of Biodiversity, Conservation and Attractions
DBH	Diameter at Breast Height in centimetres
DWER	WA Department of Water and Environmental Regulation
EP Act	WA <i>Environmental Protection Act 1986</i>
EPBC Act	Federal <i>Environment Protection and Biodiversity Conservation Act 1999</i>
FRTBC	Forest Red-tailed Black Cockatoo
Locality / Study area	A 12 km buffer around the Survey area
Project	The proposed action
Survey area	SW499 2774 Caves Road, Yallingup
Suitable DBH tree	Tree of a suitable species and size to develop large hollows (>50cm DBH most trees in the Southwest or >75cm for Karri or 30cm for Wheatbelt species).
WA	Western Australia
WRP	Western ringtail possum

# 1 Introduction

## 1.1 Background and scope

Accendo Australia was engaged by Cape Sands Pty Ltd to provide environmental assessment and approvals for a proposed sand extraction pit at 2774 Caves Road, Yallingup within the City of Busselton (Appendix A, Figure 1). The proposed pit includes a circa 9.09 hectare (ha) footprint with a buffer, totalling a 12.02 ha survey area (Appendix A, Figure 2). The survey area includes 0.80 ha of paddock trees with the remaining 11.02 ha consisting of cleared pasture.

A targeted black cockatoo<sup>1</sup> and western ringtail possum (WRP) (*Pseudocheirus occidentalis*) survey required to identify black cockatoo and WRP habitat values and inform the environmental assessment and approvals documentation. The assessment included a desktop review and field survey in line with relevant State and Commonwealth guidelines.

## 1.2 Regulatory context

Key environmental legislation relevant to the survey is outlined in Table 1-1.

**Table 1-1 Environmental legislation that may be relevant to the Project**

Legislation	Responsible Government Department	Aspect
<i>Federal Environment Protection and Biodiversity Conservation Act 1999</i> (EPBC Act)	Federal Department of Climate Change, Energy, the Environment and Water (DCCEEW)	Matters of National Environmental Significance including threatened fauna and environmental offsets.
<i>Biodiversity Conservation Act 2016</i> (BC Act)	WA Department of Biodiversity, Conservation and Attractions (DBCA)	Threatened species habitats, threatening processes, environmental pests and weeds.
<i>Environmental Protection Act 1986</i> (EP Act)	Environmental Protection Authority or Department of Water and Environmental Regulation (DWER)	Environmental impact assessment and management and offsets.

<sup>1</sup> Black cockatoos collectively refers to

- Forest Red-tailed Black-Cockatoo (*Calyptorhynchus banksii subsp. naso*) (Vulnerable)
- Baudin's Cockatoo (*Zanda baudinii*) (Endangered)
- Carnaby's Black Cockatoo (*Zanda latirostris*) (Endangered)

Fauna in WA may be afforded protection under the WA BC Act and/or federal EPBC Act. All three black cockatoo species targeted in this survey are listed under the BC and EPBC Acts as:

- EN: Endangered species (Baudin's cockatoo and Carnaby's cockatoo)
- VU: Vulnerable species (FRTBC)

WRP are listed as Critically Endangered under both Acts.

### 1.2.1 Guidelines

The survey methodologies were developed with consideration of:

- Environmental Protection Authority (2020) Technical Guidance – Terrestrial Guidance for Fauna Surveys for Environmental Impact Assessment. Perth, Western Australia.
- Commonwealth Matters of National Environmental Significance – *Significant impact guidelines 1.1 Environmental Protection and Biodiversity Conservation Act 1999*, Department of the Environment, Water, Heritage and the Arts (DEWHA)', (2009).
- Commonwealth *EPBC Act referral guidelines for three threatened black cockatoo species: Carnaby's cockatoo (endangered), Zanda latirostris, Baudin's cockatoo (vulnerable), Zanda baudinii, and Forest red-tailed black cockatoo (vulnerable) Calyptorhynchus banksii naso* (SEWPaC 2012).
- Commonwealth *Referral guideline for 3 WA threatened black cockatoo species Carnaby's Cockatoo (Zanda latirostris), Baudin's Cockatoo (Zanda baudinii) and the Forest Red-tailed Black-cockatoo (Calyptorhynchus banksii naso)* Department of Agriculture, Water and the Environment (2022).

## 2 Methods

### 2.1 Desktop review

A desktop review was completed prior to the field survey and included the following:

- Review of relevant literature on black cockatoos and WRP, such as recovery plans, journal articles and other publications.
- Review of relevant mapping and spatial datasets, such as:
  - Atlas of Living Australia database (ALA 2024),
  - BirdLife Australia's Atlas and Birddata datasets (Birdlife Australia, 2024),
  - Protected Matters Database (DCCEEW 2024),
  - Danjoo Biodiversity Data Repository (DBCA 2024), and
  - Naturemap (DBCA 2021).

## 2.2 Field survey

### 2.2.1 Survey area

The 'survey area' included a 12.02 ha portion of the total 152 ha lot area of 2774 Caves Road, including the proposed sand extraction footprint plus a buffer. The survey area consisted of paddock trees and cleared pasture.

### 2.2.2 Site reconnaissance

Field surveys consisted of a diurnal site visit on the 6<sup>th</sup> February 2024 by SW Environmental Principal, Shane Priddle, and an assistant, Greg Overton. The field surveys were undertaken to validate the desktop review and ground truth fauna habitat. Evidence of target fauna (e.g. feed residue, scat, breeding evidence, roosts etc) and actual sightings were also noted. Survey methodology for black cockatoos and WRP are described below.

### 2.2.3 Black cockatoo survey methodology

The field survey methodology was based on the Commonwealth referral guidelines for black cockatoos (Commonwealth of Australia 2017, SEWPaC 2012) and black cockatoo species profiles provided in the desktop review (Section 3.2). The species profiles are based on literature review and consultation with Tony Kirby, a recognised black cockatoo expert. Black cockatoo habitat surveys included:

- **Foraging habitat assessment:** The quality of potential black cockatoo foraging habitat was based on structural vegetation mapping, with presence or absence of feed residue noted<sup>2</sup>. Paddock trees (particularly Jarrah Marri) are considered higher quality than individual trees in forest areas due to potential to have relatively higher yield and higher relative importance in partially cleared areas.
- **Roosting habitat survey:** Direct and indirect evidence of black cockatoo roosts were noted.
- **Suitable DBH tree and hollow survey:** DBH refers to Diameter at Breast Height, described below. A ground based assessment of each tree was made using binoculars. Trees were mapped by GPS (~2 m accuracy), with notes made on tree species, DBH size class, and distance of the tree from the edge of seal. The number of hollows, aperture size, angle, height, breeding suitability, evidence of use were also recorded. Criteria included:
  - *Tree with suitable DBH without hollows* – describes trees with a 50 centimetre (cm) DBH (or 75 cm for Karri) that do not have hollows.

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<sup>2</sup> There are a number of accepted methods of calculating foraging habitat quality (for example method by Bamford Consulting Ecologists; DAWE, 2022; DEE 2017; and SEWPaC, 2012). This assessment uses the SEWPAC (2012) method with a consideration of site context and is considered the most suitable method for assessment within the Southwest.

- *Tree with suitable DBH with unsuitable hollow* – describes trees with a 50 cm DBH (or 30 cm for Wandoo, 75 cm for Karri) that have hollows that are not suitable due to the size of its entry, internal dimensions, height off ground or angle.
- *Tree with potentially suitable size hollow with no signs of use.*
- *Tree with suitable size hollow with no signs of use.*
- *Tree with potentially suitable size hollow with signs of use.*
- *Tree with suitable size hollow with signs of use.*
- *Known nesting tree.*

Suitability of the hollow for black cockatoo breeding considered orientation, access, chamber size, and use by other animals. Confirmed / not confirmed indicates whether closer inspection has been carried out by drone or pole camera.

Twelve kilometres (km) is referenced as a nominal distance in considering wider local vegetation and habitat values being the maximum that black cockatoos travel from their nesting site to forage (Commonwealth of Australia 2017).

#### 2.2.4 *Western ringtail possum survey methodology*

WRP targeted surveys included a diurnal survey only. The diurnal survey included general habitat assessment and WRP scat searches broadly over the site at the base of trees, on fallen timber and areas of bare ground. The presence or absence of dreys and hollows was also noted. Photos were taken within all habitat types.

#### 2.2.5 *Animal ethics*

The survey conformed to Section 4 of the *Australian code of practice for the care and use of animals for scientific purposes* (National Health and Medical Research Council 2004). No animals were captured or collected during the survey. Surveys were also carried out under Scientific Use License *Animal Welfare Act 2002* Licence to use animals for scientific purposes: Licence No: U285/ 2022-2024 and Wildlife Animal Ethics Committee (WAEC) Permit: WAEC 22-08-88.



## 2.3 Limitations

In accordance with *Technical Guidance* (EPA 2020) potential survey limitations are identified below.

**Table 2-1 Limitations of survey adequacy and accuracy**

Aspect	Constraint	Comment
<i>Competency / experience</i>	No	Shane Priddle (Ba Sci; Certified Environmental Practitioner No.310) has over 20 years' experience conducting black cockatoo and WRP surveys throughout NSW and WA. He is suitably qualified and experienced.
<i>Scope</i>	No	The targeted fauna survey scope is adequate to provide information to support assessment in relation to black cockatoos and WRP. Additional WRP individuals may have been identified in nocturnal surveys, however habitat suitability was still noted.
<i>Adequacy of the survey intensity and proportion of survey achieved</i>	No	Suitable survey effort has been adopted to identify black cockatoo and WRP habitat values associated with the survey area. A precautionary approach has been adopted.
<i>The proportion of the task achieved and further work</i>	No	The surveys were completed adequately, to a sufficient level with respect to the scope.
<i>Timing/weather/season</i>	Negligible	The surveys were completed in suitable weather in early summer. Timing may not have identified current breeding cockatoos (white tailed black cockatoos breed in spring and early summer and FRTBC can breed at different times and between years), however, the assessment was based on hollow suitability for breeding.
<i>Disturbances</i>	No	There were no disturbances that affected the survey.
<i>Intensity</i>	No	The survey effort was adequate to meet the project scope.
<i>Completeness</i>	No	All of the survey area was surveyed.
<i>Resources</i>	No	The surveys were completed adequately.
<i>Access problems</i>	No	The site was within private property and accessible.
<i>Identification of hollows</i>	Low	<p>Ground counts of hollows are subjective. Some hollows may be missed, obscured, particularly hollows in branches and vertical hollows. Known limitations inherent in the survey of hollows include bias with surveyors, times, differing familiarity with tree types, levels of expertise, survey conditions such as weather and time of day, and survey technique (Gorrod &amp; Keith 2008, Rayner et al. 2011).</p> <p>As well as providing inaccurate counts of hollow abundance, ground surveys provide incomplete or inaccurate information on hollow dimensions and use of hollows by fauna (Koch 2008). Generally, ground-based surveys lead to overestimation of hollows (Rayner et al. 2011, Author pers obs.). This limitation was reduced by checking hollows with a pole camera and drone for suitability where possible.</p> <p>Hollows change over time. There is a low risk that black cockatoos may be breed in a hollow where evidence was not visible or hollow characteristics were atypical. Not all cockatoo hollows show evidenced. Some animals such a little corella or Galah may use black cockatoo hollows at other times of the year or between years. The ecologist who undertook the survey has extensive experience in the identification and assessment of hollows in the southwest and is considered competent in relation to this skill.</p>

## 3 Desktop review

The survey area falls within the modelled distribution for of all three black cockatoo species (breeding for Baudins and FRTBC and edge of the breeding range for Carnaby's cockatoo) (SEWPAC 2012), and within the Cape to Capes subregion of the Swan Coastal Plain Management Zone of the Western Ringtail Possum Recovery Plan (Department of Parks and Wildlife 2017). There are scattered records for all three black cockatoo species and WRP locally from the database searches (ALA 2024) (Birdlife Australia, 2024) (DBCA 2024). Species profiles are provided below for further context.

### 3.1 Black cockatoo species profiles

#### **Baudin's cockatoo (*Zanda baudinii*)**

EN (EPBC Act), EN (BC Act)

Baudin's cockatoo is a large, iconic forest cockatoo endemic to the south west corner of WA. The species is likely to breed locally (SEWPac 2012). It has suffered a substantial decline in number in the past 50 years. Direct causes of this decline include large numbers shot by orchardists, fragmentation of habitat and the impact of hollow competitors (Johnstone and Kirkby 2008). Depending on their region of origin, Baudin's cockatoo is a resident, a post nuptial nomad or migrant with the bulk of the population vacating the coldest parts of their range (i.e. the Karri forest block) in the autumn and migrating northwards during the non-breeding season. Small numbers also appear resident in a few places including Leeuwin – Naturaliste Ridge and Manjimup (Johnstone and Kirkby 2008). Flock sizes vary from small family groups to large aggregations at roosting sites. Breeding mainly takes place in forested areas from August to November (egg laying dates) (Tony Kirkby pers comm).

In the non-breeding season, Baudin's cockatoo is mainly an inhabitant of Jarrah Marri Forest but is also frequently seen in farmland and orchards. It feeds on a variety of foods including nectar and seeds from hakeas and banksia spp. Also apples, persimmons, and macadamias. Overall, its main food is Marri from which it takes seeds, grubs, and nectar. Its long bill is adapted to removing seeds from Marri fruit capsules.

Roost sites are usually in smooth barked eucalypts (occasionally rough barked eucalypts, i.e. Marri, Jarrah and Blackbutt) including Wandoo, Flooded Gum, Bullich and smooth barked exotic eucalypts including plantations (Johnstone and Kirkby 2008).

#### **Carnaby's cockatoo (*Zanda latirostris*)**

EN (EPBC Act), EN (BC Act)

The species has been recorded locally but is mapped as being in its non-breeding range (SEWPac 2012) (SLIP 2021). It is a postnuptial nomad, tending to move west after breeding. Carnaby's cockatoo mainly occurs in or near eucalypt woodlands, especially those dominated by Wandoo or Salmon Gum, and sometimes reported in forests of Marri, Jarrah, Karri and Tuart. Nesting hollows may be located anywhere over two metres from ground, mainly in the Wheatbelt but increasingly on the west coast (Cale 2003, SPRAT 2019, WA Museum 2010).

It is known to forage in native shrubland, kwongan heathland and woodland dominated by proteaceous plant species such as Banksia spp. Hakea spp. and Grevillea spp. It forages in pine plantations, eucalypt woodland and forest that contains foraging species, individual trees and small stands of these species (SEWPAC 2012).

This species is currently expanding its breeding range westward and south into the Jarrah Marri Forests of the Darling Scarp and into the Tuart forests of the Swan Coastal Plain. This may be due to climate change. Breeding occurs mainly from early July to mid-December. Breeding success is largely dependent on suitable feeding

habitat adjacent to the nest site to provide the necessary food for the survival of the chick, for example adjacent pine forest or remnant vegetation (Johnstone and Kirkby, Undated). Carnaby's cockatoo is also known to breed in Karri Forest at Porongurup, Walpole, Albany, Denmark and Mount Manypeaks.

Carnaby's cockatoos are known to roost in Jarrah, Marri, Blackbutt, Bullich, exotic eucalypt species and pines.

### **Forest Red-tailed Black Cockatoo (FRTBC) (*Calyptorhynchus banksii naso*)**

VU (EPBC Act), VU (BC Act)

The FRTBC is a large, iconic forest cockatoo, endemic to the south-west corner of Western Australia. The species may breed locally (SEWPaC 2012).

Formerly common, but now rare to uncommon and patchily distributed, it has disappeared from about 30% of its former range. It has suffered a marked decline in numbers over the past 60 years. The main reasons for this decline include the destruction and fragmentation of habitat (especially Jarrah Marri Forest), the apparent decline in Marri along the eastern side of the Darling Scarp, logging, the impact of hollow competitors, fire and possibly climate change (Johnstone, Kirkby and Sarti 2013a, b). FRTBC occurs throughout the Jarrah Marri Karri forested areas but in recent years has been foraging out on to the Swan Coastal Plain feeding on the seeds of Cape Lilac. Group sizes vary from small family groups and pairs to larger gatherings at roost sites.

FRTBC nest in hollows Jarrah, Marri, Blackbutt, Bullich and Wandoo. Hollows have been recorded from 6.5 – 33 m above ground (Johnstone Kirkby and Sarti 2015). FRTBC have been recorded breeding in all months but with peaks in Spring and Autumn. There are also years when very little if any breeding takes place i.e. 2008 and 2009 (Johnstone and Kirkby unpublished data).

FRTBC feed mainly on the seeds of Jarrah and Marri but also Blackbutt, Albany Blackbutt, Sheoak, Snottygobble and introduced native and non-native species such as Lemon-scented Gum, Spotted Gum and Cape Lilac (SPRAT 2019).

FRTBC are known to roost in Jarrah, Marri, Blackbutt, Bullich and introduced eucalypt species.

## 3.2 Black cockatoo breeding requirements

All three black cockatoos rely on large hollows for breeding, typically >20 cm in diameter, which take many years to form. The onset of hollow formation is dependent on damage to the tree, from fire, animals (vertebrates or invertebrates), or dropping branches. Young and healthy trees can quickly heal after damage and subsequently trees less than 100 years old are unlikely to contain hollows (Koch 2009).

For nesting, black cockatoos show a preference for (SW Environmental and Kirkby 2019):

- Large senescing trees,
- Hollows not angled more than 45 degrees from vertical,
- Entrances of at least 12 cm but usually much larger (20-30 cm),
- Deep or well sheltered hollows in main trunk or large branches which are able to provide a floor space of at least 30 cm diameter or more.

All three species of black cockatoo are of similar size and utilise similar types of hollows when breeding. The actual species of tree is probably unimportant to each individual species, for example Carnaby's cockatoo use Marri in the Marri Forest and Wandoo when in the Wheatbelt. All three species are known to use the same individual hollows when not occupied in the breeding season by another black cockatoo species (Kirkby pers comm, 2019). Suitable hollows may be used interchangeably with other medium

sized parrots such as Corellas and Galah. Marri and Jarrah trees are considered by Commonwealth of Australia (2012, 2017) to be large enough to develop hollows once they are >50 cm DBH. Wheatbelt species such as Wandoo and Salmon Gum may develop hollows at 30 cm DBH.

Hollows suitable for use by black cockatoos are usually in trees at least 120 years old and usually much older. Supporting literature includes suitable breeding hollows in

- Trees over 150 years old (Koch 2009),
- Marri trees of a mean age of about 200 years and Jarrah 300 years, with an average tree age being inhabited at 400 for marri and 500 years old for Jarrah (Inions et al. 1989),
- Marri trees aged between 140 and 410 years of age (Johnstone et al 2015),
- Jarrah trees aged between 120 and 150 years (Whitford et al 2013),
- Marri trees aged around 450 years, used by the medium sized Long-billed Corella (smaller than black cockatoos) (Mawson et al. 1994), and
- Jarrah tree over 1000 years (as stags) (Wayne 2005).

While breeding, black cockatoos will generally forage within a 6–12 km radius of their nesting site. Following breeding, birds assemble into flocks and move through the landscape searching for food, usually foraging within 6 kms of a night roost (Commonwealth of Australia 2012). Black cockatoos rely on access to watering points in selecting night roost sites, with roost sites usually within 2 kms of a watering point where they often drink in the afternoon following daytime feeding (DCCEEW 2022). There are approximately 7 farm dams north of the site, within 2 kms with the closest being about 500m to the north. The nearest recorded roost site is over 3.5 km north of the survey area (SLIP 2024).

### 3.3 Western ringtail possum species profile

#### Western ringtail possum (WRP) (*Pseudocheirus occidentalis*)

CE (EPBC Act), CE (BC Act)

WRP populations mostly inhabit Peppermint and Peppermint-Tuart associations from Bunbury to Albany. The highest densities of WRP occur in the Swan Coastal Plain and South Coast (Biota 2019; Shedley et al. 2014). Peppermint leaves form the basis of the WRP diet in coastal areas, but when unavailable, the dominant myrtaceous species are preferred. In the inland forest, Jarrah and Marri are the main food source. Garden plant varieties are also exploited in urban areas. WRP also feed on new shoots, flowers, leaves and/or fruiting bodies from a range of flora including *Nuytsia floribunda*, *Acacia saligna*, *Hardenbergia comptoniana*, *Allocasuarina fraseriana*, *E. gomphocephala*, *E. rudis*, *Melaleuca viminea*, *M. cuticularis*, *M. raphiophylla*, *Kunzea glabrescens* and *Xylomelum occidentale* (Shedley and Williams 2014).

WRP use a range of nest and shelter sites to avoid predators and exposure to the weather. Dreys are constructed in the canopy if hollows are not available. Adequate nest and shelter sites are necessary components of good quality habitat (Jones 1994, Shedley and Williams 2014).

Fox predation is one of the main threats and causes of mortality to WRP (Wayne 2005) along with the loss and fragmentation of native vegetation. This is due to their high dependence on midstorey and overstorey vegetation for food, shelter and protection from predators.

In the Jarrah Marri forests, for example around Margaret River, the highest relative abundance occurs in areas with limited anthropogenic disturbance (unlogged or lightly logged, and a low intensity and low frequency fire history), that are intensively fox-baited and have low indices of fragmentation (DPaW 2014).

The survey area is outside of the three habitat categories mapped by the Australian Government for WRP in the southern Swan Coastal Plain (DEWHA, 2009).

Biota (2020) undertook a regional survey of WRP using density sampling which estimated a combined number of over 20,000 WRP within the areas surveyed, from three regional populations. The surveys targeted over 113,340 ha over 45 sites on the Swan Coastal Plain and identified 3,675 individual WRP. The Caves Road survey area falls within the Cape to Cape subpopulation of the Swan Coastal Plain management zone in Biota (2020). Population estimates within the survey areas included the Swan Coastal Plain management zone at 9,270 individuals, the Southern Forest management zone at 7,500 individuals and the South Coast management zone at 3,340 WRP. Within the Cape to Cape subpopulation, 627 unique western ringtail possum were recorded at a rate of 3.95 individuals per km. The nearest survey area was Yelverton NP block located approximately six kilometres east of the survey area, which had an individual encounter rate 2.82 WRP / km. Based on the location of the survey area, WRP may occur at similar densities (0-1.5 km) if habitat was suitable, and they were to occur.

### 3.4 Habitat in a local context

In a local context, there are significant areas of native vegetation remaining within 6 to 12 kms of the project (the distances travelled by foraging black cockatoos). Many of the vegetation types in these areas include Jarrah and Marri trees as key structural components providing potential black cockatoo foraging resources at certain times of the year and potential breeding habitat. Sixty-five percent of lands within 6 kms of the project are mapped as native vegetation and nearly 77 % of land within 12 km (SLIP 2024). A smaller proportion are reserved, with approximately 24 % within 6 kms and 17 % within 12 kms being DBCA reserved land mostly associated with the coastal Leeuwin-Naturaliste National Park (refer to Appendix A, Figure 3).

**Table 3-1 Areas of DBCA reserves and native vegetation remaining within the foraging distances (6-12 km) from the survey area (SLIP 2024)**

Foraging range	Total area (ha)	Reserved (DBCA) %, Area (ha)	Native vegetation remaining %, Area (ha)
<b>6 km</b>	8,185	24.1 % (1,973)	76.9 % (6,295)
<b>12 km</b>	26,300	17.3 % (4,563)	65.7 % (17,290)

There are no Important Bird Areas (IBAs) defined by Birdlife International as conservation priorities, near the survey area (Birdlife International, 2020). The closest, the Busselton Wetlands IBA, is located approximately 25 kms east of the site and supports large populations of migratory wetland birds.



## 4 Results and discussion

### 4.1 General habitat characteristics

The survey area included isolated Jarrah (*Eucalyptus marginata*), Marri (*Corymbia calophylla*) and Peppermint (*Agonis flexuosa*) paddock trees, and a small, treed edge (same species) of a patch along an ephemeral unnamed degraded drainage line. The survey area formed a small part of a larger grazed farm lot (grazed by sheep at the time of the survey). Midstorey and understorey vegetation within the survey area was non-existent due to grazing, apart from the planted area. Jarrah and Marri may develop hollows suitable for black cockatoo breeding and are generally considered quality black cockatoo foraging habitat. Peppermint trees are not considered high quality black cockatoo habitat but may provide WRP habitat along with the Jarrah and Marri trees. The cleared and grazed areas have no habitat value for WRP or black cockatoos.

Habitat types within the 12.02 ha survey area are summarised below (Appendix A, Figure 4):

- **Jarrah Marri woodland or paddock trees (0.71 ha)** - Photo 1 and 2. High quality black cockatoo foraging habitat and potential breeding habitat. Potential WRP habitat.
- **Peppermint trees and patches (0.08 ha)**. Photo 4 and 5. Potential WRP habitat. Limited or no black cockatoo habitat value.
- **Cleared (11.41 ha)** No black cockatoo or WRP habitat value.



Photo 1 Jarrah and marri paddock trees.



**Photo 2 Cleared paddock and Peppermint paddock trees with the degraded drainage line in the background**

## 4.2 Suitable DBH trees and hollows

Trees across the survey area were mostly Marri with some Jarrah (30 of the 38 trees), generally large and old enough to develop large hollows, including those required by black cockatoos for breeding. More than half (22 of 38) the Jarrah and Marri trees had a DBH of over 100 cm (Appendix A, Figure 4). Most of the Marri were suffering from canker dieback. Canker in some cases appeared severe and had affected the ability for many of the trees to develop hollows, with branches having died back, rotting or fallen before large hollows had developed. It is estimated that upwards of 95% of hollows utilised by black cockatoos in the Jarrah Marri vegetation are in large Marri rather than Jarrah hollows (Johnstone et al 2013a) (SW Environmental and Kirkby 2019). The list of Suitable DBH trees are provided in Appendix B. Approximately 7 Peppermint trees or smaller clumps of Peppermints also occur within the survey.

Thirty-one trees (six Jarrah and 25 Marri) were of a suitable DBH but did not contain observable hollows. Seven trees contained hollows with apertures greater than 10 cm diameter (five Marri and two Jarrah). Of those, only one tree contained a hollow with potential to be used by black cockatoos (Marri ID 8) with the others having attributes that would make the hollow unsuitable (not deep enough, incorrect angle, entry blocked, contained bees, internal dimensions not suitable etc).

Tree ID 8 contained a knot hollow with signs of use, including heavy chewing around the rim, consistent with Galah. Given the presence of Galah it is unlikely that it is an active black cockatoo hollow. Although suitable hollows can be used interchangeably by black cockatoos, Galahs and Corellas over different seasons, and the hollow in Marri ID8 is technically suitable based on broad characteristics, it is not a good candidate for black cockatoo breeding – low hollow height, hollow only marginally large enough and the branch would only just thick enough to contain a suitable cavity if the hollow was extremely well developed. As such black cockatoos are considered unlikely to be breeding within the survey area.

## 4.3 Black cockatoo foraging

Feed residue (chewed Marri and Jarrah nuts) from all three black cockatoos was found throughout the survey area, with Baudin's cockatoo most common (Marri nuts). The Jarrah Marri paddock trees (0.71 ha) are considered to be high quality foraging habitat. Cleared areas and Peppermint trees have either no or low quality foraging habitat potential. Three FRTBC (two females and a male) were observed foraging within a paddock tree within the eastern edge of the survey area.

## 4.4 Roosts

There were no night roosts observed within the survey area.

## 4.5 WRP results

The diurnal survey detected low densities of WRP scats from fringe of the drainage line vegetation within the vicinity of Tree ID 21-25. There were no dreys observed through the survey area. The paddock trees within the survey area are considered low habitat quality for WRP due to the animal's susceptibility to foxes and unlikely to be being used by WRP.

A South-Western Brush-tailed Phascogale (*Phascogale tapoatafa wambenger*) (CD) was observed in Jarrah ID 36.

# 5 Conclusions and Recommendations

A summary of the black cockatoo and WRP habitat values are provided below:

- Three habitat types occur within the 12.02 ha survey area:
  - Jarrah Marri woodland or paddock trees (0.71 ha). High quality black cockatoo foraging habitat and potential breeding habitat. Potential WRP habitat.
  - Peppermint trees and patches (0.08 ha). Potential WRP habitat. Limited or no black cockatoo habitat value.
  - Cleared (11.41 ha) No black cockatoo or WRP habitat value.
- All three black cockatoo species may occur locally, though Baudin's and FRTBC cockatoo would be most likely to be foraging within the survey area. Three FRTBC were recorded during the survey.
- Thirty-one trees were of a suitable DBH but did not contain observable hollows. Seven trees contained hollows with apertures greater than 10 cm diameter. One tree contained a hollow with potential to be used by black cockatoos (Marri ID 8) with sign of use consistent with Galah. Black cockatoos are unlikely to be breeding within the survey area.
- Black cockatoo feed residue from all three black cockatoos was found throughout the survey area, with Baudin's cockatoo most common. The Jarrah Marri paddock trees (0.71



ha) are considered to be high quality foraging habitat. Cleared areas and Peppermint trees have either no or low quality foraging habitat value.

- There were no black cockatoo night roosts observed within the survey area.
- Low densities of WRP scats were detected in the fringe of the drainage line vegetation within the vicinity of Tree ID 21-25. The paddock trees within the survey area are considered low habitat quality for WRP.

The following recommendations however should be considered:

- Clearing should be minimised in areas of native vegetation.
- Large trees, particularly those with hollows (weighted in order of black cockatoo breeding suitability for conservation value), should be retained.
- Clearing should be avoided during the spring breeding period (September to January included).
- Impacts to WRP are likely to be low within the survey area due to the low densities within the site. Impacts to drainage line vegetation should be minimised where possible.
- Final impact footprints should be checked against the significant impact criteria for black cockatoos and WRP and other matters of NES to determine the need to refer the project to DCCEE.
- An authorised fauna spotter should be present during any clearing to manage fauna particularly threatened species or hollow dependant fauna.
- Opportunities to enhance fauna habitat (black cockatoo, WRP and Phascogale) that could be considered during any mine site rehabilitation could include fencing off any vegetation to be retained, cease grazing, and revegetate or infill plant those areas to allow regeneration of native vegetation, particularly along the drainage line.

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## Appendix A    Figures

**Figure 1 Location map**

**Figure 2 Survey area**

**Figure 3 Vegetation remaining within 6 and 12 km of the survey area**

**Figure 4 Habitat types and DBH trees**



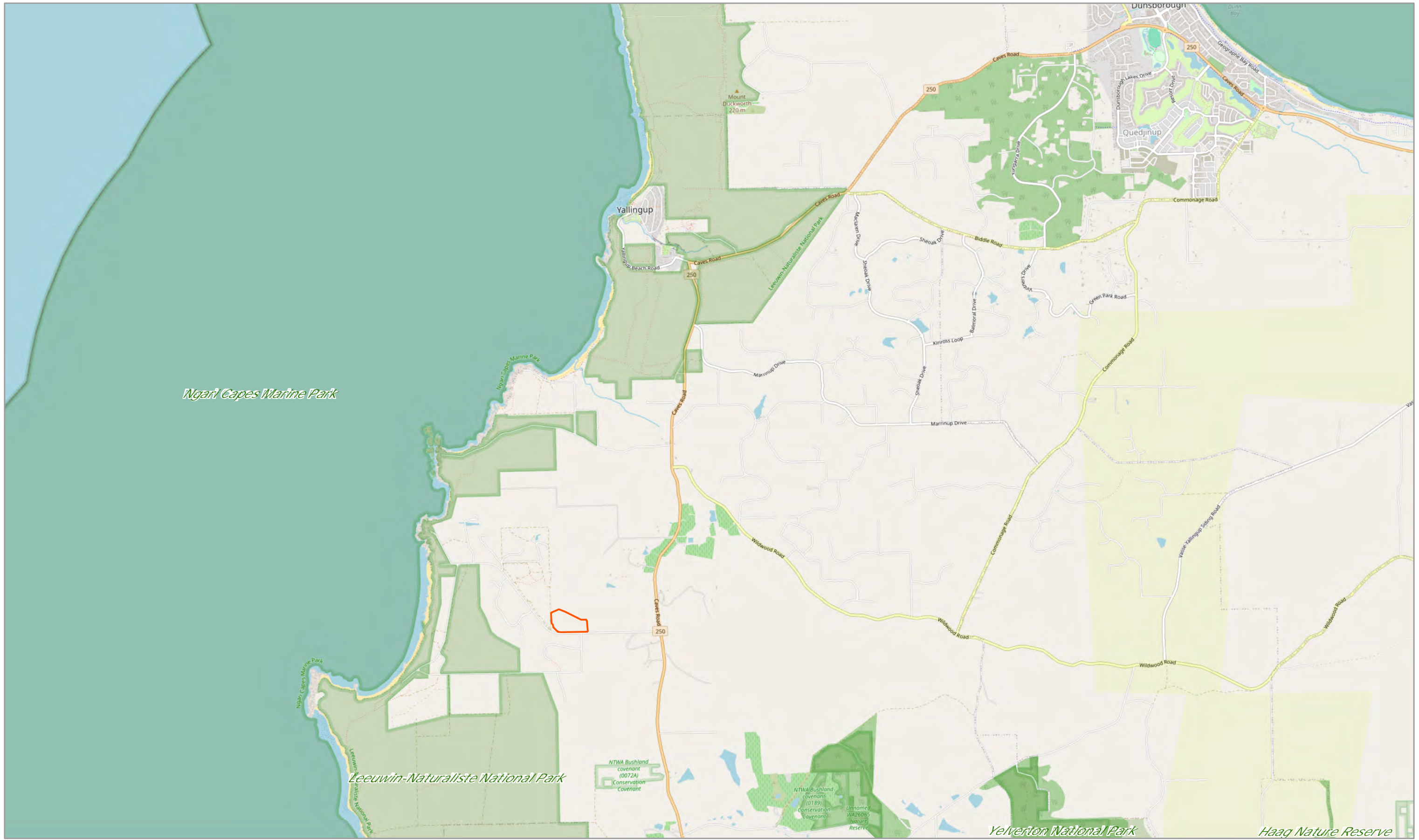


FIGURE 1 LOCATION MAP

2774 CAVES ROAD, YALLINGUP

- Survey area
- DBCA managed land



A3 @ 1:50000

0 250 500 1,000 m

GRID: GDA zone 50





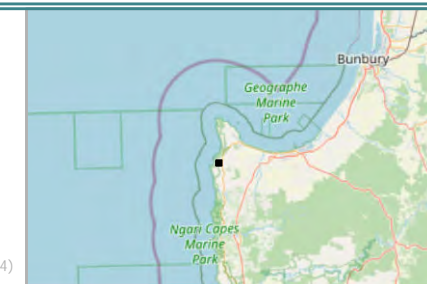
FIGURE 2 SURVEY AREA

2774 CAVES ROAD, YALLINGUP

- Survey area
- Road
- Proposed pit area

Ref: SW499 10.5  
Date: 4/06/2024 Author: SP

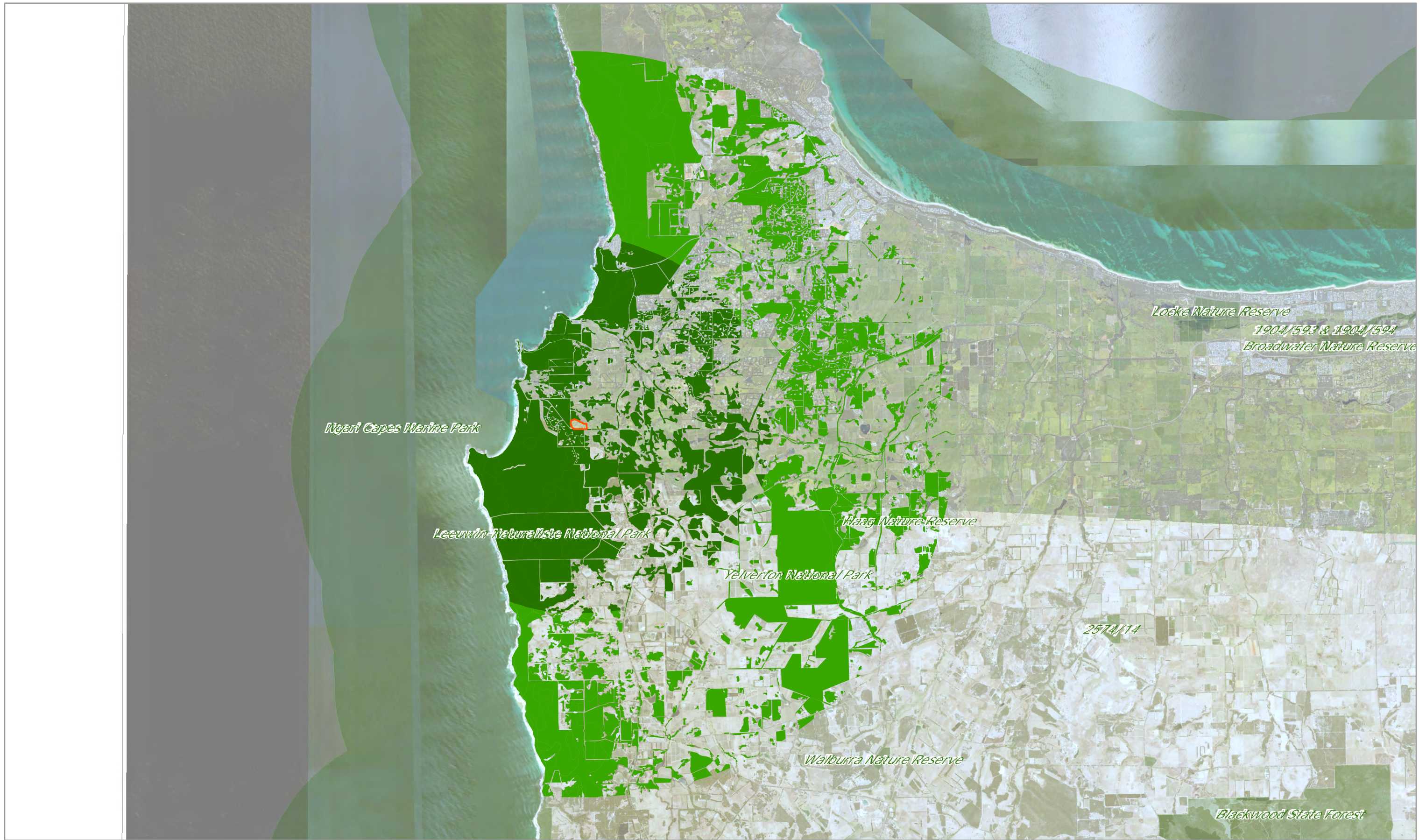
Source: Base map © Esri and its data suppliers. SLIP Landgate (2024)



A3 @ 1:1800  
0 10 20 40 m  
GRID: GDA zone 50



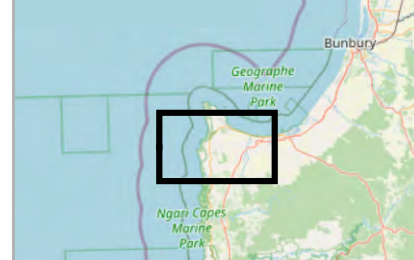




**FIGURE 3 VEGETATION REMAINING WITHIN 6 AND 12 KM OF THE SURVEY AREA**

2774 CAVES ROAD, YALLINGUP


- Survey area
- Native vegetation remaining within 6 km of the survey area (SLIP 2024)
- Native vegetation remaining within 12 km of the survey area (SLIP 2024)
- DBCA managed land




A3 @ 1:115000

0 0.5 1 2 km

GRID: GDA zone 50





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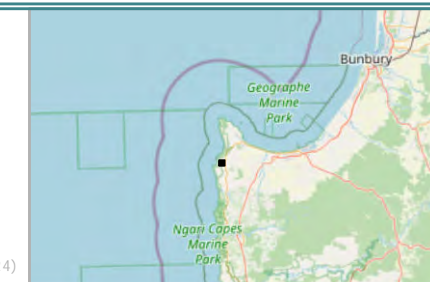
**FIGURE 4 HABITAT TYPES AND DBH TREES**

2774 CAVES ROAD, YALLINGUP

Ref: SW499 10.5  
Date: 4/06/2024 Author: SP

- |   |   |
|---|---|
| <ul style="list-style-type: none"> <li>● Potentially suitable signs of use</li> <li>⊙ Suitable DBH unsuitable hollows</li> <li>● Suitable DBH no hollows</li> <li>▭ Survey area</li> <li>— Road</li> <li>▭ Proposed pit area</li> </ul> | <ul style="list-style-type: none"> <li>■ Jarrah</li> <li>■ Marri</li> <li>■ Peppermint</li> <li>■ Western sheoak</li> </ul> |
|---|---|

Source: Base map © Esri and its data suppliers. SLIP Landgate (2024)



A3 @ 1:1800  
0 10 20 40 m  
GRID: GDA zone 50





# Appendix B    DBH trees and hollow assessment

Tree ID	Easting	Northing	Habitat	dbh (cm)	Comments	Hollows	h1 size	h1 type	h1 height	h1 note	h2 size	h2 type	h2 height	h2 note
1	316192	6270100	Marri	140	Suitable DBH unsuitable hollows	1	to 10cm	Spout angle NOT suitable	10 15m	Aperture too small, No evidence of use				
2	316172	6270129	Marri	113	Suitable DBH no hollows									
3	316165	6270126	Marri	96	Suitable DBH no hollows									
4	316110	6270137	Marri	134	Suitable DBH no hollows									
5	316108	6270117	Jarrah	90	Suitable DBH no hollows									
6	316155	6270069	Marri	98	Suitable DBH unsuitable hollows	1	15 20cm	Spout angle NOT suitable	to 10m	No evidence of use				
7	316084	6270132	Marri	118	Suitable DBH no hollows									
8	316069	6270144	Marri	111	Potentially suitable signs - Galah	2	10 15cm	Knot angle suitable	to 10m	Chews fresh, other	to 10cm	Knot angle suitable	to 10m	Aperture too small, Chews fresh
9	315999	6270142	Marri	119	Suitable DBH no hollows									
10	315987	6270092	Jarrah	87	Suitable DBH no hollows									
11	315971	6270069	Marri	109	Suitable DBH no hollows									
12	315844	6270123	Marri	115	Suitable DBH no hollows									
13	315862	6270167	Jarrah	85	Suitable DBH unsuitable hollows	1	to 10cm	Spout angle suitable	to 10m	Aperture too small, No evidence of use				
14	315854	6270177	Marri	77	Suitable DBH no hollows									
15	315893	6270202	Marri	128	Suitable DBH no hollows									
16	315885	6270204	Marri	129	Suitable DBH no hollows									
17	315933	6270237	Marri	102	Suitable DBH no hollows									
18	315925	6270232	Marri	123	Suitable DBH no hollows									
19	315971	6270276	Marri	117	Suitable DBH no hollows									
20	315959	6270305	Jarrah	59	Suitable DBH no hollows									
21	315982	6270313	Marri	104	Suitable DBH no hollows									
22	315984	6270309	Marri	106	Suitable DBH no hollows									
23	316008	6270306	Marri	87	Suitable DBH no hollows									
24	316012	6270307	Marri	57	Suitable DBH no hollows									
25	316020	6270305	Marri	76	Suitable DBH no hollows									
26	316040	6270264	Marri	103	Suitable DBH no hollows									
27	316025	6270273	Marri	103	Suitable DBH no hollows									
28	316003	6270284	Marri	122	Suitable DBH no hollows									
29	315907	6270277	Marri	120	Suitable DBH no hollows									
30	315893	6270279	Marri	106	Suitable DBH no hollows									
31	315847	6270330	Jarrah	76	Suitable DBH no hollows									
32	315842	6270293	Jarrah	76	Suitable DBH no hollows									
33	315823	6270252	Marri	124	Suitable DBH unsuitable hollows									
34	315806	6270364	Marri	97	Suitable DBH no hollows									
35	315799	6270339	Jarrah	59	Suitable DBH no hollows									
36	315767	6270323	Jarrah	82	Suitable DBH unsuitable hollows - Phascogale	2	to 10cm	Spout angle NOT suitable	to 10m	Aperture too small	to 10cm	Knot angle suitable	10 15m	Aperture too small
37	315761	6270258	Marri	90	Suitable DBH unsuitable hollows - Galah likely	2	10 15cm	Spout angle suitable	to 10m	Chews old, Aperture too small	10 15cm	Spout angle suitable	to 10m	No evidence of use, Aperture too small