GOVERNMENT OF
WESTERN AUSTRALIA

# CLEARING PERMIT

*Granted under section 51E of the Environmental Protection Act 1986*

## PERMIT DETAILS

Area Permit Number: CPS 9340/1
File Number: DWEVT8168
Duration of Permit: From 24 October 2022 to 24 October 2034

## PERMIT HOLDER

Shire of Serpentine Jarrahdale

## LAND ON WHICH CLEARING IS TO BE DONE

Kingsbury Drive Road Reserve (PINs: 1217000, 1217001 and 1217002), Serpentine

## AUTHORISED ACTIVITY

The permit holder must not clear more than 2.12 hectares of *native vegetation* within the area cross-hatched yellow in Figures 1 - 6 of Schedule 1.

## CONDITIONS

**1. Period during which clearing is authorized**

The permit holder must not clear any *native vegetation* after 24 October 2024.

**2. Avoid, minimise, and reduce impacts and extent of clearing**

In determining the *native vegetation* authorised to be cleared under this permit, the permit holder must apply the following principles, set out in descending order of preference:

(a) avoid the clearing of *native vegetation*;
(b) minimise the amount of *native vegetation* to be cleared; and
(c) reduce the impact of clearing on any environmental value.

**3. Weed and dieback management**

When undertaking any clearing authorised under this permit, the permit holder must take the following measures to minimise the risk of introduction and spread of *weeds* and *dieback*:

(a) clean earth-moving machinery of soil and vegetation prior to entering and leaving the area to be cleared;
(b) ensure that no known *dieback* or *weed*-affected soil, *mulch, fill*, or other material is brought into the area to be cleared; and
(c) restrict the movement of machines and other vehicles to the limits of the areas to be cleared.

**4. Directional clearing**

The permit holder must conduct clearing activities in a slow, progressive manner from the road reserve towards adjacent *native vegetation*, to allow fauna to move into adjacent *native vegetation* ahead of the clearing activity.

**5. Fauna Management – no clearing of identified black cockatoo nesting trees.**

The permit holder must avoid clearing *suitable black cockatoo habitat tree/s* identified in the '*Black Cockatoo Habitat Tree Survey – Part Kingsbury Drive, Keysbrook'* written by Emerge Associates on 9 December 2021 at the following locations recorded on a Global Positioning System (GPS) unit set to Geocentric Datum Australia 1994 (GDA94):

(a) Easting: 410427.37, Northing: 6411819.90; and
(b) Easting: 410719.36, Northing: 6411390.70;

**6. Fauna Management – artificial black cockatoo nest hollows**

(a) Prior to clearing a *suitable black cockatoo habitat tree* identified in the '*Black Cockatoo Habitat Tree Survey – Part Kingsbury Drive, Keysbrook'* written by Emerge Associates on 9 December 2021, the permit holder must install one artificial black cockatoo nest hollow.
(b) the artificial black cockatoo nesting hollow required by condition 5(a) must be installed prior to commencement of any clearing activities otherwise authorised under this permit;
(c) The artificial black cockatoo nest hollow(s) required by condition 5(a) of this permit must:
    (i) be installed within the area cross-hatched red on Figure 7 of Schedule 1;
    (ii) be designed and placed in accordance with the specifications detailed in Schedule 2;
    (iii) be monitored and maintained in accordance with the specifications detailed in Schedule 3, for a period of at least ten years
    (iv) the location of the artificial nesting hollow is to be provided to the *CEO* within two months of installation..

**7. Fauna Management – inspection of black cockatoo nest hollow**

(a) Within 48 hours of undertaking any clearing of the *suitable black cockatoo habitat tree* identified in the '*Black Cockatoo Habitat Tree Survey – Part Kingsbury Drive, Keysbrook'* written by Emerge Associates on 9 December 2021 authorised under this permit within the area cross-hatched yellow in Figures 1 - 6 of Schedule 1, the permit holder must engage a *fauna specialist* to inspect the tree by a fauna specialist for evidence of current breeding use by *black cockatoo species*.
(b) Where the *black cockatoo habitat tree* in condition 7(a) is identified with evidence of current breeding use by *black cockatoo species*, and clearing of that tree cannot be avoided, that tree must be monitored by a *fauna specialist* to determine when it is no longer in use for that breeding season.
(c) Clearing of the *black cockatoo habitat tree* in condition 7(a) must only be cleared when not in use by *black cockatoo species.*
(d) Within two months of clearing authorised under this permit, the permit holder must provide the results of the fauna survey in a report to the *CEO* including the methodology used and whether the *black cockatoo habitat tree* identified shows current or no use by *black cockatoo species.*

**8. Fauna Management – mitigation planting**

The permit holder must within 24 months of undertaking clearing authorised under this permit:

(a) undertake the *planting* of 500 seedlings of *local provenance* representing *black cockatoo foraging habitat* within the area cross-hatched red on Figure 7 of Schedule 1;

(b) ensure planting is undertaken at the *optimal time*;

(c) the permit holder must within 24 months of *planting* the 500 seedlings of *local provenance* in accordance with condition 8(a) of this permit;

(i) engage an *environmental specialist* to make a determination that at least 450 seedlings will survive; and

(ii) if the determination made by the *environmental specialist* under condition 8(c)(i) that at least 450 seedlings will not survive, the permit holder must plant additional native seedlings that will result in at least 450 *black cockatoo foraging habitat* seedlings persisting within the area cross-hatched red on Figure 7 of Schedule 1.

(d) where additional planting of native seedlings is undertaken in accordance with condition 8(c)(ii), the permit holder must repeat the activities required by condition 8(b) and 8(c) of this permit.

**9. Flora management**

The permit holder must demarcate all threatened flora including a five metre buffer that have been identified in the document '*Targeted Flora Survey – Part Kingsbury Drive, Keysbrook'* written by Emerge Associates on 9 December 2021.

**10. Records that must be kept**

The permit holder must maintain records relating to the listed relevant matters in accordance with the specifications detailed in Table 1.

**Table 1: Records that must be kept**

| No. | Relevant matter | Specifications |
|---|---|---|
| 1. | In relation to the authorised clearing activities generally | (a) the species composition, structure, and density of the cleared area;<br>(b) the location where the clearing occurred, recorded using a Global Positioning System (GPS) unit set to Geocentric Datum Australia 1994 (GDA94), expressing the geographical coordinates in Eastings and Northings;<br>(c) the date that the area was cleared;<br>(d) the size of the area cleared (in hectares);<br>(e) actions taken to avoid, minimise, and reduce the impacts and extent of clearing in accordance with condition 2;<br>(f) actions taken to minimise the risk of the introduction and spread of *weeds* and *dieback* in accordance with condition 3;<br>(g) actions taken to undertake directional clearing in accordance with condition 4; and<br>(h) actions taken to demarcate threatened flora in accordance with condition 9. |
| 2. | In relation to fauna management pursuant to conditions 5 – 8 | (a) actions taken to avoid clearing *suitable black cockatoo habitat tree*/s in accordance with condition 5; |

| No. | Relevant matter | Specifications |
|---|---|---|
| | | (b) the time and date that the suitable *black cockatoo habitat tree* was cleared;<br>(b) the date and location the artificial nesting hollow was installed, recorded using a Global Positioning System (GPS) unit set to Geocentric Datum Australia 1994 (GDA94/2020), expressing the geographical coordinates in Eastings and Northings in accordance with condition 6;<br>(c) actions taken in order to monitor and maintain the installed artificial nest hollow in accordance with condition 6;<br>(d) actions taken to confirm that the suitable *black cockatoo habitat tree* was not in use in accordance with condition 7;<br>(e) actions taken to undertake planting of 500 seedlings in accordance with condition 8; and<br>(f) species list of seedlings planted in accordance with condition 8. |

**11. Reporting**

The permit holder must provide to the *CEO* the records required under condition 10 of this permit when requested by the *CEO*.

## DEFINITIONS

In this permit, the terms in Table have the meanings defined.

**Table 2: Definitions**

| Term | Definition |
|---|---|
| Black cockatoo foraging habitat | species described as foraging species for black cockatoos in The Department of Agriculture, Water and the Environment's '*Referral guideline for 3 WA threatened black cockatoo species: Carnaby's Cockatoo, Baudin's Cockatoo and the Forest Red-tailed Black cockatoo'* |
| CEO | Chief Executive Officer of the department responsible for the administration of the clearing provisions under the *Environmental Protection Act 1986*. |
| clearing | has the meaning given under section 3(1) of the EP Act. |
| condition | a condition to which this clearing permit is subject under section 51H of the EP Act. |
| dieback | means the effect of *Phytophthora* species on native vegetation. |
| department | means the department established under section 35 of the *Public Sector Management Act 1994* (WA) and designated as responsible for the administration of the EP Act, which includes Part V Division 3. |
| EP Act | *Environmental Protection Act 1986* (WA) |
| fill | means material used to increase the ground level, or to fill a depression |
| local provenance | means native vegetation seeds and propagating material from natural sources within 50 kilometres and the same Interim Biogeographic Regionalisation for Australia (IBRA) subregion of the area cleared. |
| mulch | means the use of organic matter, wood chips or rocks to slow the movement of water across the soil surface and to reduce evaporation. |

| Term | Definition |
|---|---|
| native vegetation | has the meaning given under section 3(1) and section 51A of the EP Act. |
| optimal time | . |
| planting | means the re-establishment of vegetation by creating favourable soil conditions and planting seedlings of the desired species; |
| suitable black cockatoo habitat tree | means trees that have a diameter, measured at 1.5 metres from the base of the tree, of 50 centimetres or greater (or 30 centimetres or greater for *Eucalyptus salmonophloia* or *Eucalyptus wandoo*) that contains hollows suitable for breeding by Carnaby's cockatoo (*Calyptorhynchus latirostris*), Baudin's cockatoo (*Calyptorynchus baudinii*) or forest red-tailed black cockatoo (*Calyptorhynchus banksii naso*); |
| threatened flora | means a threatened flora as defined in:<br>(a) the *Biodiversity Conservation Act 2016* section 5(1); or<br>(b) the Commonwealth Environment Act section 528. |
| weeds | means any plant –<br>(a) that is a declared pest under section 22 of the *Biosecurity and Agriculture Management Act 2007*; or<br>(b) published in a Department of Biodiversity, Conservation and Attractions species-led ecological impact and invasiveness ranking summary, regardless of ranking; or<br>(c) not indigenous to the area concerned. |

**END OF CONDITIONS**

**Mathew Gannaway**
**A/SENIOR MANAGER**
NATIVE VEGETATION REGULATION

*Officer delegated under Section 20*
*of the Environmental Protection Act 1986*

29 September 2022

# SCHEDULE 1

The boundary of the area authorised to be cleared is shown in the map below (


**Figure 1**s 1-6.).


**Figure 1: Map of the boundary of the area within which clearing may occur**

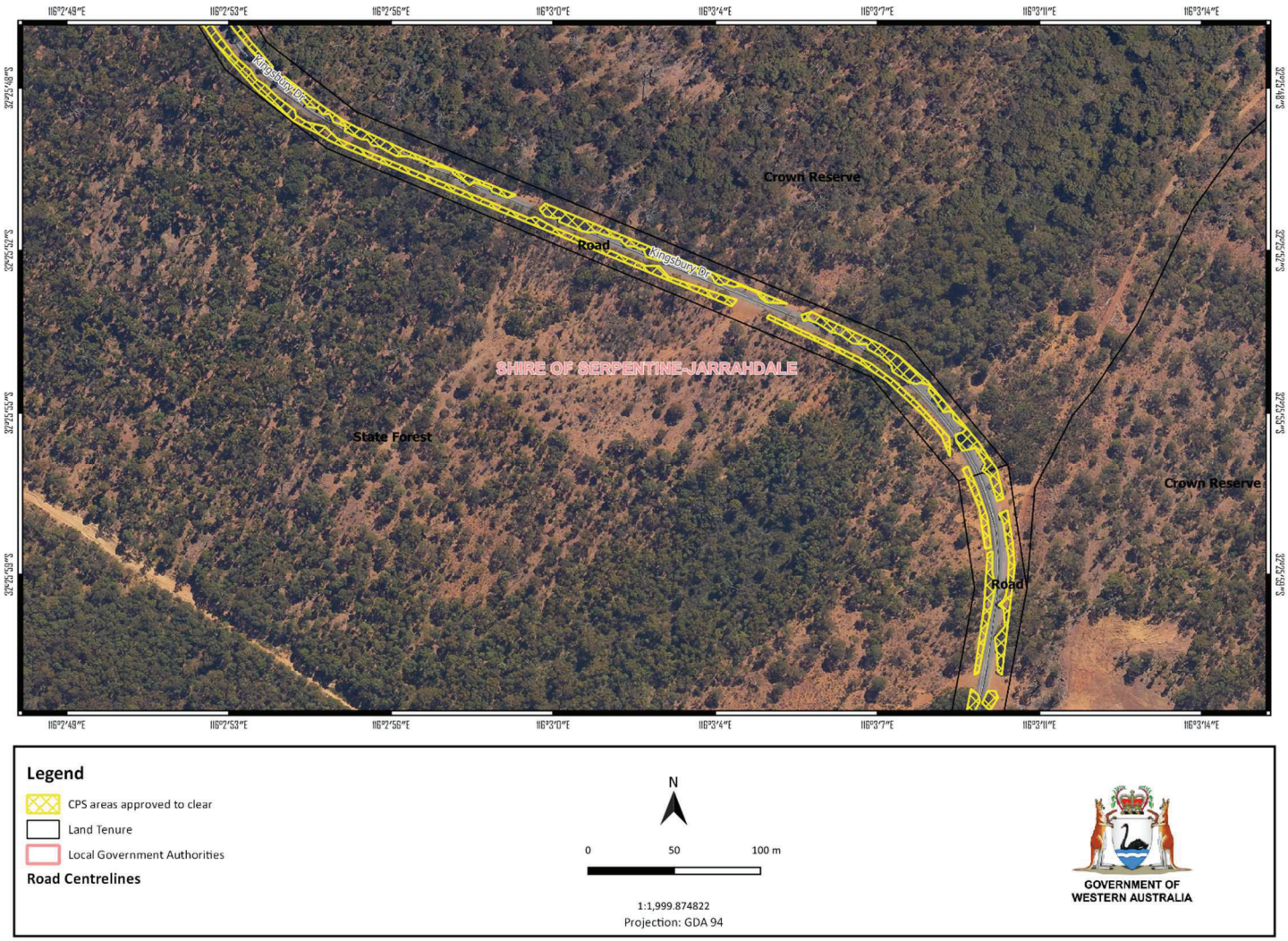


**Figure 2: Map of the boundary of the area within which clearing may occur**


**Figure 3: Map of the boundary of the area within which clearing may occur**


**Figure 4: Map of the boundary of the area within which clearing may occur**


**Figure 5: Map of the boundary of the area within which clearing may occur**


**Figure 6: Map of the boundary of the area within which clearing may occur**

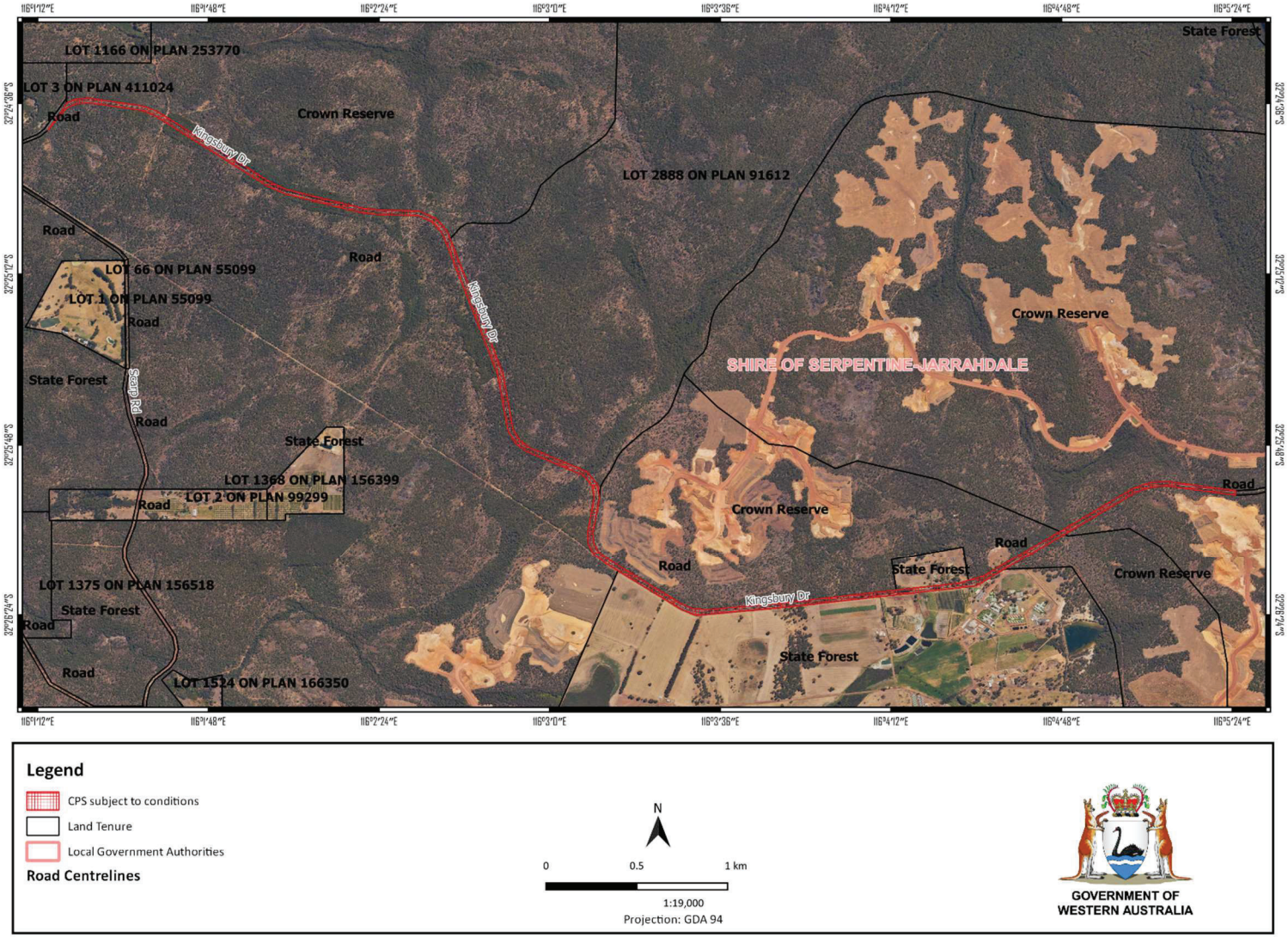


**Figure 7: Map of the boundary of the area within which an artificial nesting hollow can be installed in accordance with condition 5 and rehabilitation to occur in accordance with condition 8.**

# SCHEDULE 2

**How to design and place artificial hollows for Carnaby's Cockatoo**

Department of Parks and Wildlife

Fauna notes

*Artificial hollows for Carnaby's cockatoo*

birdlife AUSTRALIA

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## How to design and place artificial hollows for Carnaby's cockatoo

Artificial hollows can be used to help conserve the threatened Carnaby's cockatoo by enabling the cockatoos to breed in areas where natural hollows are limited.

A wide variety of artificial hollow designs have been used with mixed success. Evidence suggests that, while the hollow must meet some basic requirements, other factors such as proximity to existing breeding areas may be more important in determining the success of artificial hollows. Before using this information sheet to construct or install an artificial hollow, you should refer to the criteria listed in the separate information sheet; *When to use artificial hollows for Carnaby's cockatoo*.

This information sheet contains broad guidelines for the design and placement of artificial hollows for Carnaby's cockatoo.

Below are three examples of successful artificial hollows used by Carnaby's cockatoo for nesting. Artificial hollows made from a natural log with cut side entrance (left), white industrial pipe with top entrance (centre) and natural log with natural side entrance (right).

*Photos by Christine Groom (left and right) and Rick Dawson (centre)*

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## Walls

The walls of the artificial hollow need to be constructed from a material that is;

- Durable enough to withstand exposure to elements for an extended period of time (i.e. 20+ years).
- Able to simulate the thermal properties of a natural tree hollow.
- Not less than 380 mm in internal diameter.
- Preferably 1.2 m deep overall and 1m deep to top of substrate/nesting material.

Successful artificial hollows have been constructed from sections of salvaged natural hollow, black and white industrial pipe. When using non-natural materials care must be taken to ensure there are no toxic residues and that the materials are safe to ingest.

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## Base

The base of the artificial hollow must be;

- Able to support the adult and nestling(s).
- Durable enough to last the life of the nest.
- Free draining.
- At least 380 mm in diameter.
- Covered with 200 mm of sterile, dry, free draining material such as charcoal, hardwood woodchips or wood debris.

  ***Do not use:***

  - Saw dust or fibre products that will retain moisture.

Example materials that could be used for artificial hollow bases include heavy duty stainless steel, galvanised or treated metal (e.g. Zincalume ®), thick hardwood timber slab or marine ply (not chipboard or MDF). The base material must be cut to size to fit internally with sharp or rough edges ground away or curled inwards and fixed securely to the walls.

Carnaby's cockatoo eggs in an artificial hollow.
*Photo by Rick Dawson*

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## Entrance

The entrance of the artificial hollow must;

- Have a diameter of at least 270 mm).
- Preferably be top entry which will minimise use by non-target species.

Top entry hollows are unattractive to nest competitors such as feral bees, galahs and corellas. Side entry hollows have been successful in areas where feral bees are not a problem and where galahs and corellas are deterred.

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### *Ladder*

For artificial hollows made of non-natural materials, or of processed boards, it is necessary to provide a ladder to enable the birds to climb in and out of the hollow easily.

The ladder must be;

- Securely mounted to the inside of the hollow.
- Made from an open heavy wire mesh such as WeldMesh™ with mesh size of 30 - 50 mm, or heavy chain.

  ***Do not use:***

  - A material that the birds can chew.
  - Galvanized because the birds may grip or chew the ladder and ingest harmful compounds.

If using mesh for the ladder, the width will depend on the curvature of the nest walls. A minimum width of about 60 - 100 mm is recommended.

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### *Sacrificial chewing posts*

For artificial hollows made of non-natural materials, or of processed boards, it is necessary to provide sacrificial chewing posts. The birds chew material to prepare a dry base on which to lay their egg(s).

The sacrificial chewing posts must:

- Be made of untreated hardwood such as jarrah, marri or wandoo
- Be thick enough to satisfy the birds' needs between maintenance visits.
- Extend beyond the top of the hollow as an aid to see whether the nest is being used.
- Be placed on the inside of the hollow.
- Be attached in such a way that they are easy to replace e.g. hook over the top of hollow or can slide in/out of a pair of U bolts fitted to the side of the hollow.

It is recommended that at least two posts are provided. Posts 70 x 50 mm have been used, but require replacing at least every second breeding season when the nest is active. Birds do vary in their chewing habits and therefore the frequency at which the chewing posts require replacement will also vary.

Bottom of an artificial hollow showing ladder that is fixed to the wall and a chewed sacrificial post which is 200 mm from the floor.

*Photo by Rick Dawson*

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### *Mountings*

The artificial hollows must be mounted such that:

- The fixings used will last the duration of the nest e.g. galvanized bracket or chain fixed with galvanized coach screws.
- It is secured by more than one anchor for security and stability.
- It is positioned vertically or near vertically.

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## Placement

Sites should be chosen within current breeding areas and where they can be monitored, but preferably not conspicuous to the general public. It is important that artificial hollows are placed where they will be accessible for future monitoring and maintenance. For more detail refer to the separate information sheet; *When to use artificial hollows for Carnaby's cockatoo*.

The height at which artificial hollows should be placed is variable. The average height of natural hollows in dominant tree species in the area is a good guide. Natural hollows used by Carnaby's cockatoos have been recorded as low as 2 m above the ground. If located on private property the hollows can be placed lower to the ground so they are accessible by ladder or a rope and pulley system can be used. Where public access is possible artificial hollows should be placed at least 7 m high (i.e. higher than most ladders) and on the side of the tree away from public view to reduce the chance of interference or poaching.

Carnaby's cockatoo show no preference for aspect of natural hollows, however, it may still be beneficial to place artificial hollows facing away from prevailing weather and where they receive the most shade and protection.

Artificial hollows to be placed in trees require:

- Accessibility of the tree for a vehicle, elevated work platform or cherry picker.
- A section of trunk 2-3 m long suitable for attaching the hollow

If necessary, artificial hollows may be placed on poles, but this may result in excessive exposure to sun during very hot weather. When erected on poles there should be*

- A hinge at the bottom of the pole that can be secured when the pole is in the upright position.
- Access for a vehicle to assist raising the pole.

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## Safety

Care needs to be taken when placing artificial hollows to ensure safety is considered at all times. Artificial hollows are heavy and require lifting and manoeuvring into position up to 7 m above the ground.

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## Maintenance and monitoring

Once artificial hollows have been placed they require monitoring and maintenance to ensure they continue to be useful for nesting by Carnaby's cockatoo. It is important to monitor artificial hollows to determine use by Carnaby's cockatoo, other native species as well as pest species. By undertaking monitoring the success of the design and placement of artificial hollows can be determined and areas for improvement identified for future placement of artificial hollows.

Monitoring can also assess whether any maintenance is required. Without regular maintenance artificial hollows are unlikely to achieve their objective (that is, they will fail to provide nesting opportunities for threatened cockatoos). Therefore it is important to continue a regime of regular maintenance while the artificial hollow is required. It may be several (to many) decades until a natural replacement hollow is available.

For further advice on monitoring and maintenance of artificial hollows please refer to the separate information sheet; *How to monitor and maintain artificial hollows for Carnaby's cockatoo*.

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Carnaby's cockatoo female prospecting an artificial hollow.
*Photo by Rick Dawson*

Example fixing for artificial hollow
*Photo by Christine Groom*

***Acknowledgements***

This information sheet is a joint initiative of Birdlife Australia, the Western Australian Museum and the Department of Parks and Wildlife. Many individuals have contributed to its preparation. Special acknowledgement is made for the contributions of Ron Johnstone from the WA Museum, Alan Elliott from the Serpentine-Jarrahdale Land care Centre and Denis Saunders. This updated version was compiled by Rick Dawson Department of Parks and Wildlife).

***Other information sheets in the series: Artificial hollows for Carnaby's cockatoo***

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- *How to monitor and maintain artificial hollows for Carnaby's cockatoo*

Information sheets available on the *Saving Carnaby's cockatoo* webpage:
http://www.dpaw.wa.gov.au/plants-and-animals/threatened-species-and-communities/threatened-animals/208-saving-carnaby-s-cockatoo

**Further Information** **Last updated 28/04/2015**

Contact fauna@dpaw.wa.gov.au or your local office of the Department of Parks and Wildlife

See the department's website for the latest information: www.dpaw.wa.gov.au

# SCHEDULE 3

**How to monitor and maintain artificial hollows for Carnaby's Cockatoo**

Department of Parks and Wildlife

Fauna notes

*Artificial hollows for Carnaby's cockatoo*

birdlife AUSTRALIA

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## How to monitor and maintain artificial hollows for Carnaby's cockatoo

It is important to monitor and maintain artificial hollows after they have been erected. Monitoring ensures that the effectiveness of the artificial hollow can be determined. It also means that problems with pest species or any maintenance requirements can be identified and resolved.

Without regular maintenance, artificial hollows are likely to fail to achieve their objective (that is, they will fail to provide nesting opportunities for threatened cockatoos). Therefore it is important to continue a regime of regular maintenance while the artificial hollow is required. It may be several (to many) decades until a natural replacement hollow is available.

Monitoring should be undertaken in order to detect:

- Use by Carnaby's cockatoo
- Maintenance requirements
- Use by other native species
- Use by pest species (e.g. feral bees, galahs, corellas etc.)

Carnaby's cockatoo female prospecting an artificial hollow.
*Photo by Rick Dawson*

### *How do I monitor artificial hollows?*

Before undertaking monitoring of artificial hollows for Carnaby's cockatoo it is recommended that you seek advice from BirdLife Australia, the WA Museum or the Department of Parks and Wildlife. It is also important to contact Parks and Wildlife, Wildlife Licensing Section, to determine if a scientific licence is required (wildlifelicensing@dpaw.wa.gov.au).

Monitoring artificial hollows requires keen observation and naturalist skills. It is often not possible to observe evidence of breeding directly (i.e. nestlings or eggs) and inferences must be made based on observation. There are many techniques available to monitor artificial hollows. A combination of several is likely to achieve the best results.

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### *Looking for signs of use*

Cobwebs covering the entrance to the hollow will indicate that the hollow has not been used recently. This would also apply to other light debris that may have fallen to cover the opening partially. Signs of recent use or interest in the hollow include evidence of chewing.

### *Observing parent behaviour around the hollow*

The behaviour of parent birds around a hollow will indicate an approximate age of young in the nest.

| Parent behaviour | Approximate age/stage of young |
|---|---|
| Prospecting for hollow | Unborn |
| Male only seen out of hollow | Egg or very young nestling (< 3 - 4 weeks) |
| Both parents seen entering/exiting the hollow | Nestling(s) have hatched (> 3 - 4 weeks) |

### *Observing feeding flocks*

Flocks of all male birds indicate that the females are incubating eggs. When flocks are mixed it suggests the birds have either not laid yet or that the nestlings have hatched and no longer require brooding (approximately 3 - 4 weeks old).

### *Tapping*

When females are sitting on eggs they will usually respond to tapping at the base of their tree (or pole) by appearing at the entrance or flying from the hollow opening. This is not a guarantee of breeding activity, but an indication that it is possibly occurring in the hollow.

### *Observing insect activity around nest*

The faecal matter produced by nestlings in a nest attracts insects, especially flies and ants. The type and number of these insects will help indicate how old any nestlings present may be. Factors such as temperature and humidity will also affect insect activity and so observations of insect activity should only be used as supporting evidence for other indications of age/use. Blowflies around a nest usually indicate that a death has occurred.

### *Listening for nestlings*

With experience it is possible to determine if one or two nestlings are present and a broad estimate of age based on the type and loudness of noises they make.

### Looking inside the nest

This can be achieved either with the aid of a telescopic pole and camera or mirror, or with the use of a ladder or other climbing equipment. This method can obtain the most detailed monitoring information for artificial hollows. However it is also the most time consuming and difficult to organise. Special equipment is likely to be needed depending on the height and positioning of artificial hollows. There are also safety issues associated with ladder or rope climbing options to reach nests to undertake observations.

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### How often should I monitor artificial hollows?

The minimum frequency of monitoring and the techniques used will be determined by the aims of the monitoring and the resources available. It is important to limit disturbance to breeding birds and this should be considered when determining the techniques used and frequency.

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### How do I maintain artificial hollows?

Artificial hollows require maintenance to ensure they continue to have the greatest chance of them being used by Carnaby's cockatoos. Periodic maintenance checks should be undertaken at least every two years, preferably annually. These checks should be undertaken prior to the breeding season which is between July and January with breeding occurring later in this period in southern areas. It is important to maintain a regime of regular maintenance as long as the artificial hollow is required. It may take several (to many) decades until a natural replacement hollow is available.

Maintenance checks should assess the following as a minimum:

- Condition of chewing posts (if present)
- Condition of attachment points
- Condition of hollow bases
- Stability of tree or pole used to mount the artificial hollow

Artificial hollow base needing repair.
*Photo by Christine Groom*

### Repairing hollows

Any problems identified during maintenance checks should be addressed, and any repairs required done, as soon as possible. If breeding is currently occurring, maintenance may need to be delayed if it is likely to disturb the parents or nestling. Likely maintenance needs include replacement of chewing posts (frequently) or nest bases (occasionally) and repairing of any cracks (infrequently). Maintenance concerns regarding the security of attachment points or the stability of the tree or pole should be addressed as a priority for safety reasons.

For artificial hollows known to be used, spare chewing posts should be taken into the field when undertaking maintenance checks.

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## Monitoring of artificial hollows:

| Monitoring aim | Frequency of visits | Monitoring techniques |
|---|---|---|
| **To determine possible use by Carnaby's cockatoo** | At least once during peak breeding season (i.e. between September and December) | • Observing behaviour of adults around hollow<br>• Tapping to see if female will flush from hollow (best undertaken between 10am and 3pm when females most likely to be sitting)<br>• Listening for nestlings<br>• Looking for evidence of chewing<br>• Looking inside nest |
| **To confirm use by Carnaby's cockatoo** | At least two visits during peak breeding season (i.e. between September and December) | To observe at least two of the following:<br>• Breeding behaviour of adults around hollow or evidence of chewing<br>• Female flushed from hollow<br>• Noises from nestlings in hollow<br>Or to observe:<br>• Nestlings or eggs in nest |
| **To determine nesting success by Carnaby's cockatoo** | The more visits, the better. Preferably fortnightly visits between July and December. As a minimum, at least 3 visits spread throughout breeding season. | • Looking inside nest to observe eggs or nestlings. |
| **To determine use by any species** | As often as possible. | • Inspection from ground as a minimum.<br>• Looking inside nest for detailed observations. |
| **To determine maintenance requirements** | At least every two years and preferably annually if hollow fitted with sacrificial chewing posts, can be longer if without. | • A basic maintenance check can be undertaken from the ground. A ladder or elevated work platform will be required for a comprehensive check and to replace sacrificial chewing posts |

## Acknowledgements

This information sheet is a joint initiative of Birdlife Australia, the Western Australian Museum and the Department of Parks and Wildlife. Many individuals have contributed to its preparation. The updated version was compiled by Rick Dawson (Department of Parks and Wildlife) with assistance from Denis Saunders.

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**Further Information** **Last updated 28/04/2015**

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See the department's website for the latest information: www.dpaw.wa.gov.au

Government of Western Australia
Department of Water and Environmental Regulation

# Clearing Permit Decision Report

## 1 Application details and outcome

### 1.1. Permit application details

| | |
|---|---|
| **Permit number:** | CPS 9340/1 |
| **Permit type:** | Area permit |
| **Applicant name:** | Shire of Serpentine Jarrahdale |
| **Application received:** | 24 June 2021 |
| **Application area:** | 2.12 hectares of native vegetation |
| **Purpose of clearing:** | Road construction and upgrades |
| **Method of clearing:** | Mechanical |
| **Property:** | Kingsbury Drive Road Reserves (PINs 1217000, 1217001 and 1217002) |
| **Location (LGA area/s):** | Shire of Serpentine Jarrahdale |
| **Localities (suburb/s):** | Keysbrook and Serpentine |

### 1.2. Description of clearing activities

The vegetation proposed to be cleared includes sections of Kingsbury Drive road reserve along approximately a 3.2 kilometre (km) stretch. The application is to clear 2.12 hectares of native vegetation for road upgrades, including widening and sealing of the road shoulder to make the road safer (see Figure 1-6, Section 1.5). The applicant will prioritise pruning to removal when possible (Shire of Serpentine Jarrahdale, 2021).

### 1.3. Decision on application

| | |
|---|---|
| **Decision:** | Granted |
| **Decision date:** | 29 September 2022 |
| **Decision area:** | 2.12 hectares of native vegetation, as depicted in Section 1.5, below. |

### 1.4. Reasons for decision

This clearing permit application was submitted, accepted, assessed, and determined in accordance with sections 51E and 51O of the *Environmental Protection Act 1986* (EP Act). The Department of Water and Environmental Regulation (DWER) advertised the application for 21 days and no submissions were received.

In making this decision, the Delegated Officer had regard for the site characteristics (see Appendix B), relevant datasets (see Appendix F.1. ), the findings of a targeted flora and fauna survey (see Appendix E), the clearing principles set out in Schedule 5 of the EP Act (see Appendix C), relevant planning instruments and any other matters considered relevant to the assessment (see Section 3). The Delegated Officer also took into consideration that the proposed clearing is for upgrading and sealing the road shoulder to improve road safety.

The assessment identified that the proposed clearing will result in:

- The loss of native vegetation that contains suitable foraging and breeding habitat for, *Zanda latirostris* previously *Calyptorhynchus latirostris* (Carnaby's cockatoo), *Zanda Calyptorhynchus* previously

*Calyptorhynchus baudinii* (Baudin's cockatoo) and *Calyptorhynchus banksii* subsp. *naso* (Forest red-tailed cockatoo); and

- Indirect impacts to adjacent threatened flora *Verticordia plumosa* var. *ananeotes* and adjacent vegetation including conservation areas.

The Delegated Officer considered that the loss of foraging habitat within the application area was not significant due to the limited extent of the clearing spread over a larger area and the adjacent conservation estate that provides abundant foraging resources. The applicant has confirmed that they will install an artificial hollow within Kingsbury Road reserve to mitigate impacts of clearing a tree with a suitably sized hollow (Shire of Serpentine Jarrahdale, 2022a). The applicant was able to avoid two trees that contained suitably sized hollows. To mitigate impacts to the removal of black cockatoo foraging habitat, the applicant has committed to planting 500 seedlings comprising black cockatoo foraging habitat within Kingsbury Drive road reserve. Terrestrial fauna individuals may be present at the time of clearing, however fauna management practices will help mitigate this risk. Weed and dieback management will mitigate impacts to adjacent vegetation, including conservation estate and threatened flora. Demarcation of the nearby threatened flora will ensure that the species is not accidently impacted as a result of the clearing activities.

After consideration of the available information, the Delegated Officer decided to grant a clearing permit subject to the following requirements conditioned on the clearing permit, to manage and address the impacts of clearing:

- Avoid clearing two identified black cockatoo breeding trees with suitable sized hollows;
- Install one artificial breeding hollow to mitigate the impacts of clearing one black cockatoo habitat tree with a suitable size hollow;
- Inspection of suitably sized hollow ahead of clearing activity;
- Plant 500 seedlings comprising of black cockatoo foraging habitat within Kingsbury Drive road reserve
- Undertake slow, progressive clearing towards adjacent native vegetation, allowing terrestrial fauna to move into adjacent habitat ahead of the clearing activity;
- Demarcate all threatened flora including a five metre buffer; and
- Take hygiene steps to minimise the risk of the introduction and spread of weeds and dieback.

## 1.5. Site map


Figure 1 Map of the application area, Plan A. The areas crosshatched yellow indicate the areas authorised to be cleared under the granted clearing permit.

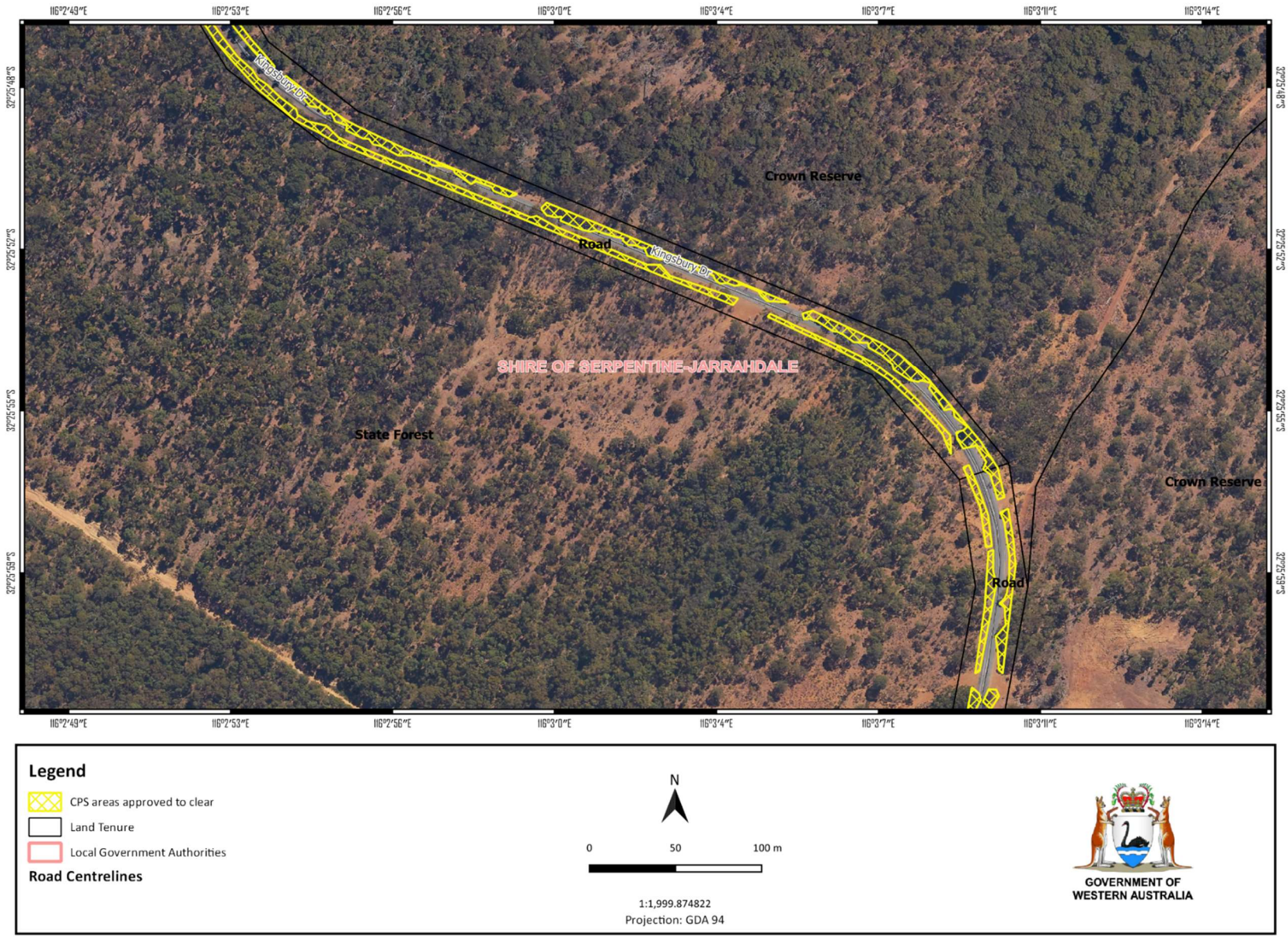


Figure 2 Map of the application area, Plan B. The areas crosshatched yellow indicate the areas authorised to be cleared under the granted clearing permit.

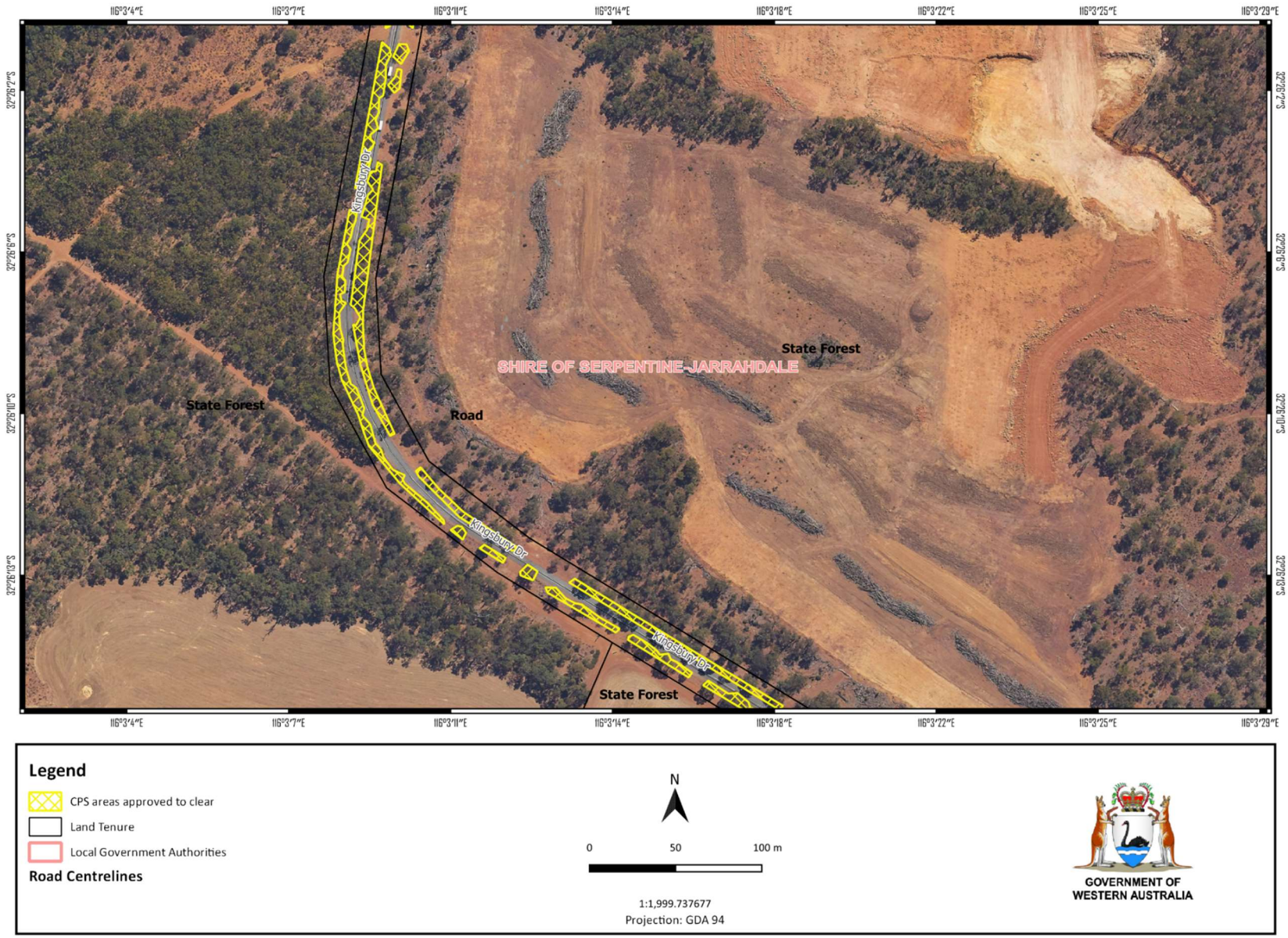


Figure 3 Map of the application area, Plan C. The areas crosshatched yellow indicate the areas authorised to be cleared under the granted clearing permit.


Figure 4 Map of the application area, Plan D. The areas crosshatched yellow indicate the areas authorised to be cleared under the granted clearing permit.


Figure 5 Map of the application area, Plan E. The areas crosshatched yellow indicate the areas authorised to be cleared under the granted clearing permit.


Figure 6 Map of the application area, Plan F. The areas crosshatched yellow indicate the areas authorised to be cleared under the granted clearing permit.

## 2 Legislative context

The clearing of native vegetation in Western Australia is regulated under the EP Act and the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* (Clearing Regulations).

In addition to the matters considered in accordance with section 51O of the EP Act (see Section 1.4), the Delegated Officer has also had regard to the objects and principles under section 4A of the EP Act, particularly:

- the precautionary principle
- the principle of intergenerational equity
- the principle of the conservation of biological diversity and ecological integrity.

Other legislation of relevance for this assessment include:

- *Biodiversity Conservation Act 2016* (WA) (BC Act)
- *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act)
- *Rights in Water and Irrigation Act 1914* (RiWI Act)

Relevant policies considered during the assessment include:

- *Environmental Offsets Policy* (2011)

The key guidance documents which inform this assessment are:

- *A guide to the assessment of applications to clear native vegetation* (DER, December 2014)
- *Procedure: Native vegetation clearing permits* (DWER, October 2019)
- *Environmental Offsets Guidelines* (August 2014)
- Technical guidance – *Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA, 2016)
- Technical guidance – *Terrestrial Fauna Surveys for Environmental Impact Assessment* (EPA, 2016)

## 3 Detailed assessment of application

### 3.1. Avoidance and mitigation measures

The applicant advised that only the plants/trees that are too close to the road upgrade and table drain will be removed. The applicant will prioritise pruning to removal when possible (Shire of Serpentine Jarrahdale, 2021a).

The applicant has committed to avoiding two black cockatoo habitat trees that have been identified as containing suitable sized hollows for breeding by black cockatoo species. One black cockatoo habitat tree with a suitable size hollow is required to be cleared and the applicant has confirmed that they will install an artificial hollow within Kingsbury Road reserve to mitigate impacts of clearing this tree (Shire of Serpentine Jarrahdale, 2022a). To mitigate impacts to the removal of black cockatoo foraging habitat the applicant has committed to planting 500 seedlings comprising black cockatoo foraging habitat within Kingsbury Drive road reserve (Shire of Serpentine Jarrahdale, 2022c).

The applicant has advised that it will demarcate and create a five metre protection zone surrounding the threatened flora species identified adjacent to the application area. The applicant will physically show all contactors onsite the location of this threatened flora species to ensure no direct impacts as a result of the proposed clearing occurs (Shire of Serpentine Jarrahdale, 2021c).

The Delegated Officer was satisfied that the applicant has made a reasonable effort to avoid and minimise potential impacts of the proposed clearing on environmental values.

### 3.2. Assessment of impacts on environmental values

In assessing the application, the Delegated Officer has had regard for the site characteristics (see Appendix B) and the extent to which the impacts of the proposed clearing present a risk to biological, conservation, or land and water resource values.

The assessment against the clearing principles (see Appendix C) identified that the impacts of the proposed clearing may present a risk to biodiversity, fauna, and conservation areas. The consideration of these impacts, and the extent to which they can be managed through conditions applied in line with sections 51H and 51I of the EP Act, is set out below.

#### *3.2.1.1. Biological values (biodiversity and threatened flora) - Clearing Principles (a and c)*

Assessment

According to available datasets 25 priority flora and 15 threatened flora were recorded in the local area, as indicated in Appendix A-3. One priority flora *Pimelea rara* (P4) has been recorded within 300 meters of the application area.

An appropriately timed targeted flora survey was undertaken within the application area in November 2021 (Emerge, 2021a). The application area was traversed on foot and the vegetation was searched for threatened and priority flora with a particular focus on *Pimelea rara.* No threatened or priority flora species were recorded within the application area (Emerge, 2021a). A single individual of *Verticordia plumosa* var. *ananeotes* which is listed as threatened under the EPBC Act and the BC Act was recorded immediately adjacent to the south-western portion of the site. No additional individuals of *Verticordia plumosa* var. *ananeotes* or any other threatened or priority flora species were recorded adjacent to the site.

*Verticordia plumosa* var. *ananeotes* is known from three populations over a range of 30 km in the Busselton area. It has also been noted at Serpentine, 'Murray District' where it was recorded in open Jarrah woodland. The variety is abundant in a reserve south of Busselton, growing on low-lying sandy or clay soils in association with *Corymbia calophylla* (marri), *Kingia, Xanthorrhoea*, *Stirlingia, Isopogon*, sedges, *Conostylis* ssp., *Melaleuca* spp. and *Adenanthos* spp (Taylor et al., 2008). The species distribution is severely fragmented as known populations are located in isolated non-contiguous pockets of remnant vegetation (Taylor et al., 2008). The clearing of this individual is likely to have an impact on the environmental values of this species. Furthermore, no threatened flora may be taken unless an authorisation from the Minister for Environment under section 40 of the BC Act is obtained.

To ensure no direct impacts to this species occurs, the applicant has advised that identified threatened flora will be demarcated onsite including a 5 metre buffer. Contractors will physically be shown the location of this individual prior to commencing works (Shire of Serpentine and Jarrahdale, 2021c).

From photographs provided by the applicant (Shire of Serpentine Jarradale, 2021b) and targeted surveys (Emerge, 2021a; 2021b) the vegetation proposed to be cleared is in a completely degraded to degraded (Keighery, 1994) condition located adjacent to and impacted by the existing road reserve. Given the condition and the vegetation present within the application area, the vegetation is not likely to represent a priority or threatened ecological community or comprise a high level of biodiversity.

Conclusion

No threatened or priority flora species were recorded within the application area (Emerge, 2021a). The proposed clearing may indirectly impact the adjacent individual threatened flora species *Verticordia plumosa* var. *ananeotes* during clearing activities including through the spread of weed and dieback.

Conditions

To address the above impacts, the following management measures will be required as conditions on the clearing permit:

- The applicant will be required to implement weed and dieback management measures to mitigate impacts to adjacent vegetation.
- The applicant will be required to demarcate the adjacent threatened flora species and contractors will be shown the location of the threatened flora species prior to clearing.

### *3.2.2. Biological values (fauna) - Clearing Principle (b)*

Assessment

According to available databases, there are 14 records of fauna of conservation significance within the local area being: chuditch (*Dasyurus geoffroii*), quenda (*Isoodon fusciventer*), Dell's skink (*Ctenotus delli*), Carnaby's cockatoo, Baudin's cockatoo, forest red-tailed black cockatoo, western false pipistrelle (*Falsistrellus mackenziei*), brush-tailed phascogale (*Phascogale tapoatafa*), numbat (*Myrmecobius fasciatus*), quokka (*Setonix brachyurus*), western brush wallaby (*Notamacropus irma*), woylie (*Bettongia penicillata ogilbyi*), masked owl (*Tyto novaehollandiae*) and peregrine falcon (*Falco peregrinus*).

**Black Cockatoo**

According to available datasets, Carnaby's cockatoo, Baudin's cockatoo and Forest red-tailed black cockatoo have been recorded within 1.7 and three kilometres from the application area respectively.

Based on available datasets, approximately 90 per cent of the native vegetation in the local area, is mapped as black cockatoo feeding habitat. According to the black cockatoo habitat tree survey undertaken, the application area includes *Corymbia calophylla* (marri), *Eucalyptus marginata* (jarrah) and *Eucalyptus patens* (blackbutt) trees (Emerge, 2021b) that would provide foraging habitat for black cockatoos.

Black cockatoos will mainly forage in areas up to 12 km from their nest, located in a known nesting tree during the breeding season. They rely on this proximity of foraging resources to known nesting trees to successfully raise chicks. During the non-breeding period, black cockatoos will mainly forage in areas up to 20 km from known night roosting habitat (DAWE, 2022). There are 11 known breeding trees within 12 kilometres of the application area, the closest being recorded approximately 3.4 km from the application area. Two of the known breeding trees are located within conservation reserves. One hundred and five roost sites have been mapped within 20 kilometres of the application area, the closest being approximately 2.5 km from the application area. Approximately 14 of these roost sites are located within conservation reserves.

Given the linear and narrow extent of the clearing, that vegetation will remain within the road reserve and that the application is located adjacent to Jarrahdale State Forest and Serpentine National Park (with 63% remnant native vegetation cover remaining), it is unlikely to significantly impact foraging and roosting habitat for black cockatoo species utilising the roosts in the local area. To mitigate the loss of black cockatoo foraging habitat, the applicant has committed to planting 500 seedlings comprising of suitable black cockatoo foraging species.

Suitable breeding habitat for black cockatoo include trees which either have a suitable nest hollow, or of a suitable diameter at breast height (DBH) to develop a nest hollow. For most tree species, including jarrah and marri trees, a DBH of at least 500 millimetres is required to develop hollows of suitable size for use by black cockatoo (DAWE, 2022).

A black cockatoo habitat tree survey was undertaken within the application area on 30 November 2021. A total of 69 black cockatoo habitat trees were recorded within the site as shown in Figures 7-9. The habitat trees comprised of 32 *Corymbia calophylla* (marri), 35 *Eucalyptus marginata* (jarrah), three *Eucalyptus patens* (blackbutt) and two stag (dead) trees. Of the 69 habitat trees recorded within the application area, three contain hollows that are potentially suitable for breeding by black cockatoos as observed from ground. No signs of use of these hollows by black cockatoos such as chew mark, scats or feathers were observed during the survey (Emerge, 2021b). The applicant has advised that it will avoid two of the habitat trees with hollows identified. To mitigate the impacts of clearing one habitat tree with a suitable sized hollow, the applicant has committed to installing an artificial hollow within the adjacent road reserve.

Fauna recorded in the local area, such as, the south-western brush-tailed phascogale, Chuditch and western ringtail possum, and western false pipistrelle, may range through the application area as they forage. The trees identified with hollows may provide breeding habitat for the south western brush tailed phascogale or western ringtail possum. However, given no signs of use were identified (Emerge, 2021a) within hollows identified, the proximity to the road and that suitable habitat in better condition is located adjacent to the proposed clearing area, the application area is unlikely to contain significant breeding habitat for arboreal species.

The application area intersects part of a mapped Perth regional ecological linkage. The proposed clearing may also impact habitat for ground dwelling conservation significant fauna, such as quenda, quokka, Dell's skink and western brush wallaby as it is possible the home range of the above species could include the application area. Given the extent of the clearing, the degraded nature of the vegetation, and the availability of more extensive, higher quality vegetation within the local area, the proposed clearing is unlikely to significantly impact the function of a regional linkage and available habitat for the above species.

The peregrine falcon's habitat is widespread and varied and significant habitat for this species is not likely to be located within the application area. The numbat has a restricted distribution and is only known from two subpopulations in Dryandra and Perup and a number of introduced locations (Threatened Species Scientific Committee, 2018). Woylie are only know from two small areas in Upper Warren and Dryandra (DEC, 2012). The application area is not within the known range of the masked owl. Therefore, these species are not likely to be present within the application area.

Conclusion

Based on the above assessment, given the proximity of the application area to the existing road and the availability of suitable habitat in better condition with the adjacent vegetation, the proposed clearing will not result in a significant loss of habitat for the above fauna species. The applicant has confirmed that they will install an artificial hollow within Kingsbury Road reserve to mitigate impacts of clearing a tree with a suitably sized hollow. To mitigate impacts to the removal of black cockatoo foraging habitat, the applicant has committed to planting 500 seedlings comprising black cockatoo foraging habitat within Kingsbury Drive road reserve.

The potential direct impact to fauna present at the time of clearing may be managed by the implementation of fauna management conditions. Weed and dieback management will also assist in ensuring that the adjacent fauna habitat is not impacted by the proposed clearing.

Conditions

To address the above impacts, the following management measures will be required as conditions on the clearing permit.

- Requiring the permit holder to conduct directional clearing to allow terrestrial fauna to move into adjacent habitat ahead of the clearing activity.
- Avoid two black cockatoo habitat trees with suitable size breeding hollows.
- Inspection of suitably sized hollow ahead of clearing activity.
- Install an artificial breeding hollow within Kingsbury Drive road reserve to mitigate impacts of clearing one habitat tree with a suitable size black cockatoo breeding hollow.
- Implement weed and dieback management measures to mitigate impacts to adjacent vegetation.

#### *3.2.3. Conservation areas - Clearing Principle (h)*

Assessment

The application area transects the Jarrahdale State Forest and Serpentine National Park. These conservation areas comprise approximately 70 per-cent of the local area.

The proposed clearing occurs within the road reserve and therefore no direct clearing of these conservation areas is proposed. Given the close proximity of the conservation areas to the application area, the proposed clearing may indirectly impact adjacent vegetation including within the conservation areas through the spread of weeds and dieback.

A mapped Perth Regional Ecological Linkage intersects the application area from north to south. The proposed clearing will not sever an ecological linkage and no impact of fauna movement across the landscape and between conservation areas is expected.

Given the long linear nature of the proposed clearing within an area that has previously been impacted by the existing road, the clearing is unlikely to have any significant impact to the conservation value of the adjacent conservation area.

Conclusion
Based on the above assessment, the proposed clearing may result in an indirect impact on the adjacent conservation areas through the spread of weeds and dieback.

Conditions
To address the above impacts, the following management measures will be required as conditions on the clearing permit:

- Avoid, minimise, and reduce impacts and extent of clearing
- Weed and dieback management

### 3.3. Relevant planning instruments and other matters

Other relevant authorisations required for the proposed land use include:

- Permit to interfere with bed and banks under the RiWI Act.
- The taking of threatened fauna or flora requires authorisation from the Minister for Environment under section 40 of the BC Act

A permit to interfere with bed and banks under the RiWI Act will be required if the applicant intends on impacting a minor watercourse that intersects the application area. An application has not been made by the applicant to date with clearing occurring within this are minimal.

No Aboriginal sites of significance have been mapped within the application area. It is the permit holder's responsibility to comply with the *Aboriginal Heritage Act 1972* (WA) and ensure that no Aboriginal Sites of Significance are damaged through the clearing process.

**End**

## Appendix A. Additional information provided by applicant

| Summary of comments | Consideration of comment |
|---|---|
| Potential conservation significant black cockatoo breeding habitat located within the application area | Black cockatoo habitat assessment provided (Emerge, 2021b) |
| Potential habitat for threatened and priority flora identified within the application area | Targeted flora survey provided (Emerge, 2021a) |
| Three black cockatoo habitat trees identified with potentially suitable sized hollows | The applicant committed to avoiding two of the identified habitat trees. The hollow that is being impacted will be mitigated by the installation of an artificial hollow. |
| A threatened flora species identified adjacent to the application area | The applicant advised they will mark the area sounding the plant (up to 5 metres) as a protection zone. Contractors will be physically shown the location of threatened flora. |

## Appendix B. Site characteristics

The information provided below describes the key characteristics of the area proposed to be cleared and is based on the best available information to DWER at the time of this assessment. This information was used to inform the assessment against the Clearing Principles, contained in Appendix C.

### B.1. Site characteristics

| Characteristic | Details |
|---|---|
| Local context | The area proposed to be cleared occurs along an approximately 3.2 kilometre linear stretch along an existing road.<br><br>Approximately 70 per cent of the local area comprises of conservation areas. The application area is located adjacent to an expansive track of vegetation.<br><br>Spatial data indicates the local area (10-kilometre radius from the centre of the area proposed to be cleared) retains approximately 63 per cent of the original native vegetation cover. |
| Ecological linkage | The application area intersects a mapped Perth Regional Ecological Linkage. |
| Conservation areas | The application area transects the Jarrahdale State Forest and Serpentine National Park which comprise approximately 70 per-cent of the local area. |
| Vegetation description | Photographs supplied by the Applicant (Shire of Serpentine Jarrahdale, 2021b) and Habitat tree survey (Emerge 2021b) indicate the vegetation within the proposed clearing area consists predominantly of *Corymbia calophylla* (marri), *Eucalyptus marginata* (jarrah) and *Eucalyptus patens* (blackbutt) over little to no understorey.<br><br>This is consistent with the mapped vegetation complexes as described and mapped by Heddle et al. (1980) as updated by Webb et al. (2016).:<br>• Dwellingup D1: Open forest of *Eucalyptus marginata* subsp. *marginata-Corymbia calophylla* on lateritic uplands in mainly humid and subhumid zones.<br>• Yarragil 1: Open forest of *Eucalyptus marginata* subsp. *marginata-Corymbia calophylla* on slopes with mixtures of *Eucalyptus patens* and *Eucalyptus megacarpa* on the valley floors in humid and subhumid zones.<br><br>Representative photos are available in Appendix E. |
| Vegetation condition | Photographs supplied by the applicant (Shire of Serpentine Jarrahdale, 2021b) indicate the vegetation within the proposed clearing area is in a degraded (Keighery, 1994) to completely degraded (Keighery, 1994) condition.<br><br>The full Keighery (1994) condition rating scale is provided in Appendix D. Representative photos are available in Appendix E. |
| Climate | • Mean annual rainfall: 1200 millimetres<br>• Evapotranspiration: 1000 and 900 millimetres<br>• Geology: Granite and Gneiss |
| Soil description and landform | The soil within the application area is mapped as following (Schoknecht et al. 2013):<br><br>Dwellingup Subsystem: Divides, lower to upper slopes and hillcrests. Duplex sandy gravels and loamy gravels with minor areas of shallow gravels, deep sandy gravels, yellow deep sands and yellow and pale deep sands, often gravelly.<br><br>Yarragil Subsystem: Shallow, narrow, upper valleys of the deeply dissected Murray, Bindoon and Helena units. Alluvial, clay and loam soils, moderately well drained, often gravelly, with some sands and loams. Salt prone. |

<table>
<tr><th>Characteristic</th><th>Details</th></tr>
<tr><td></td><td>Dwellingup 2 Phase: Very gently to gently undulating terrain (<10%) with well drained, shallow to moderately deep gravelly brownish sands, pale brown sands and earthy sands overlying lateritic duricrust.</td></tr>
<tr><td>Land degradation risk</td><td>The soil types mapped within the application area have a high variability of risk. All soils have a high to extreme wind erosion risk and a high susceptibility to subsurface acidification (Refer to section B.5.)</td></tr>
<tr><td>Waterbodies</td><td>One minor perennial watercourse intersects a small portion of the application area, this watercourse is a tributary of a conservation category wetland.</td></tr>
<tr><td>Hydrogeography</td><td>The application area falls within a RIWI Act Surface Water Area, for the Serpentine River System.</td></tr>
<tr><td>Flora</td><td>The local area includes five threatened flora and 25 priority flora. The nearest conservation significant flora species to the proposed clearing is Pimelea rara (P4). See Section B.3. for a flora habitat suitability analysis of conservation significant flora recorded in the local area.<br><br>A number of conservation significant flora associated with habitat types that do not occur within the application area are listed below (Western Australian Herbarium 1998-).<ul><li>Species endemic to the Swan coastal plain<ul><li>Synaphea sp. Pinjarra Plain (A.S. George 17182), (T)</li><li>Synaphea sp. Fairbridge Farm (D. Papenfus 696),(T)</li><li>Synaphea sp. Serpentine (G.R. Brand 103), T</li><li>Synaphea odocoileops, P1</li></ul></li><li>Species associated with granite outcrops,<ul><li>Acacia oncinophylla subsp. patulifolia (P4)</li><li>Acacia oncinophylla subsp. oncinophylla (P3)</li><li>Anthocercis gracilis (Threated)</li><li>Lasiopetalum pterocarpum (Threated)</li><li>Hibbertia acrotoma P1</li><li>Stackhousia sp. Red-blotched corolla (A. Markey 911) P3</li><li>Paracaleana granitica, P1</li></ul></li><li>Species associated with Riparian habitats:<ul><li>Drosera occidentalis (P4)</li><li>Cyathochaeta teretifolia P3</li></ul></li><li>Species associated with semi aquatic and sim-aquatic habitats,<ul><li>Meionectes tenuifolia (P3),</li></ul></li></ul>Conservation significant Lichen, Xanthoparmelia darlingensis (P1) was also recorded in the local area. A targeted flora survey was undertaken within the application area, no threatened or priority flora species were identified within the application area. One threatened flora, Verticordia plumosa var. ananeotes was identified immediately adjacent to the application area (Emerge, 2021a).</td></tr>
<tr><td>Ecological communities</td><td>No threatened or priority ecological communities have been mapped within the application area. The closest threatened ecological community is ‘Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region’ located approximately 4.9 kilometres west of the application area.<br><br>Threatened and Priority ecological communities mapped in the local area are listed in the table below, a targeted flora survey was undertaken over the application area and the vegetation proposed to be cleared does not represent any of the below mentioned ecological communities (Emerge, 2021a).<table><tr><th>Ecological community</th><th>State listing</th><th>Federal Listing</th></tr></table></td></tr>
</table>

| Characteristic | Details | | |
|---|---|---|---|
| | Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region | Priority 3 | Endangered |
| | Herb rich saline shrublands in clay pans (floristic community type 7 as originally described in Gibson et al. (1994)) | Vulnerable | Critically Endangered |
| | Herb rich shrublands in clay pans (floristic community type 8 as originally described in Gibson et al. (1994)) | Vulnerable | Critically Endangered |
| | Shrublands on dry clay flats (floristic community type 10a as originally described in Gibson et al. (1994)) | Endangered | Critically Endangered |
| | *Banksia attenuata* and/or *Eucalyptus marginata* woodlands of the eastern side of the Swan Coastal Plain (floristic community type 20b as originally described in Gibson et al. (1994)) | Endangered | Endangered |
| | *Corymbia calophylla* - *Kingia australis* woodlands on heavy soils, Swan Coastal Plain (floristic community type 3a as originally described in Gibson et al. (1994)) | Critically Endangered | Endangered |
| | *Corymbia calophylla* - *Eucalyptus marginata* woodlands on sandy clay soils of the southern Swan Coastal Plain (floristic community type 3b as originally described in Gibson et al. (1994)) | Vulnerable | - |
| Fauna | A total of 18 conservation significant fauna are recorded in the local area. The nearest record is for chuditch approximately 0.03 kilometres from the application area.<br>Numerous Carnaby's cockatoo, forest red-tailed black cockatoo and Baudin's cockatoo have been recorded within the local area (refer to section B.4.) Black cockatoo habitat mapped within the local area includes:<br>• Seven white tailed black cockatoo breeding sites occur in the local area the nearest is 4.4 kilometres west of the application area.<br>• Two red tailed black cockatoo breeding sites occur in the local area the nearest is 3.4 kilometres north of the application area.<br>• A total of 12 black cockatoo roosts sites. The nearest is 2.5 kilometres south west of the application area.<br>• Approximately 90 per cent of all remnant vegetation in the local area, is mapped as cockatoo feeding habitat.<br>Habitat suitability analysis is provided in table B.3. A number of fauna species dependent on marine and freshwater habitats have been omitted from the table as these species are highly unlikely to utilise the habitats within the application area. | | |

## B.2. Vegetation extent

| | Pre-European extent (ha) | Current extent (ha) | Extent remaining (%) | Current extent in all DBCA managed land (ha) | Current proportion (%) of pre-European extent in all DBCA managed land |
|---|---|---|---|---|---|
| **IBRA bioregion | | | | | |
| Jarrah Forest | 4,506,660.25 | 2,399,838.15 | 53.25 | 69.74 | 37.14 |
| *Vegetation complex | | | | | |

| | Pre-European extent (ha) | Current extent (ha) | Extent remaining (%) | Current extent in all DBCA managed land (ha) | Current proportion (%) of pre-European extent in all DBCA managed land |
|---|---|---|---|---|---|
| Dwellingup, D1 | 208490.90 | 181038.80 | 86.83 | 171561.01 | 82.29 |
| Yarragil 1 | 80202.95 | 64927.06 | 80.95 | 59063.57 | 73.64 |
| Local area | | | | | |
| 10 km radius | 37197.78 | 23430.77 | 63 | - | - |

*Government of Western Australia (2019a)

**Government of Western Australia (2019b)

## B.3. Flora analysis table

With consideration for the site characteristics set out above, relevant datasets (see Appendix F.1), and biological survey information, impacts to the following conservation significant flora required further consideration.

| Species name | Conservation status | Suitable habitat features? [Y/N] | Suitable vegetation type? [Y/N] | Suitable soil type? [Y/N] | Distance of closest record to application area (km) | Number of known records (total) | Are surveys adequate to identify? [Y, N, N/A] |
|---|---|---|---|---|---|---|---|
| *Pimelea rara* | P4 | Y | Y | Y | 0.03 | 4 | Y |
| *Grevillea pimeleoides* | P4 | N | Y | N | 1.74 | 4 | Y |
| *Meionectes tenuifolia* | P3 | N | N | N | 2.6 | 2 | Y |
| *Stylidium ireneae* | P4 | Y | Y | N | 2.7 | 6 | Y |
| *Lepyrodia heleocharoides* | P3 | N | Y | N | 2.9 | 1 | Y |
| *Boronia tenuis* | P4 | N | N | N | 2.9 | 4 | Y |
| *Acacia drummondii* subsp. *affinis* | P3 | Y | Y | N | 2.9 | 5 | Y |
| *Lasiopetalum glutinosum* subsp. *glutinosum* | P3 | Y | N | N | 3.3 | 3 | Y |
| *Cyanothamnus tenuis* | P4 | Y | N | N | 2.9 | 5 | Y |
| *Thysanotus anceps* | P3 | N | N | Y | 3.7 | 2 | Y |
| *Halgania corymbosa* | P3 | Y | Y | Y | 4.5 | 1 | Y |
| *Acacia horridula* | P3 | Y | Y | Y | 5.6 | 22 | Y |
| *Calothamnus graniticus* subsp. *leptophyllus* | P4 | N | N | N | 7.2 | 2 | Y |
| *Morelotia australiensis* | T | Y | N | N | 7.3 | 13 | Y |
| *Johnsonia pubescens* subsp. *cygnorum* | P2 | Y | Y | N | 9.3 | 2 | Y |
| *Verticordia plumosa* var. *ananeotes* | T | Y | Y | Y | 9.5 | 1 | Y |
| *Isopogon autumnalis* | P3 | N | N | N | 9.6 | 2 | Y |

T: threatened, CR: critically endangered, EN: endangered, VU: vulnerable, P: priority

## B.4. Fauna analysis table

| Species name | Conservation status | Suitable habitat features? [Y/N] | Suitable vegetation type? [Y/N] | Distance of closest record to application area (km) | Number of known records (total) | Are surveys adequate to identify? [Y, N, N/A] |
|---|---|---|---|---|---|---|
| *Dasyurus geoffroii (Chuditch, western quoll)* | VU | Y | Y | 0.3 | 14 | Y |
| *Isoodon fusciventer* (Quenda, southwestern brown bandicoot) | P4 | Y | Y | 0.5 | 22 | Y |
| *Ctenotus delli* (Dell's skink, Darling Range Southwest Ctenotus) | P4 | N | N | 1.2 | 6 | Y |
| *Zanda latirostris* previously *Calyptorhynchus latirostris* (Carnaby's cockatoo), | EN | Y | Y | 1.7 | 315 | Y |
| *Zanda Calyptorhynchus* previously *Calyptorhynchus banksii naso (forest red-tailed black cockatoo)* | VU | Y | Y | 3 | 10 | Y |
| *Calyptorhynchus baudinii (Baudin's cockatoo)* | EN | Y | Y | 3 | 26 | Y |
| *Falsistrellus mackenziei (Western false pipistrelle, western falsistrelle)* | P4 | Y | Y | 4.8 | 6 | Y |
| *Phascogale tapoatafa wambenger* | CD | N | N | 6 | 4 | Y |
| *Myrmecobius fasciatus* (*numbat, walpurti)* | P3 | N | Y | 7 | 8 | Y |
| *Setonix brachyurus (quokka)* | P3 | VU | Y | 7.1 | 4 | Y |
| *Notamacropus irma (Western brush wallaby)* | P4 | N | Y | 7.7 | 6 | Y |
| *Bettongia penicillata ogilbyi (woylie, brush-tailed bettong)* | CR | Y | Y | 8.5 | 2 | Y |
| *Tyto novaehollandiae novaehollandiae (masked owl (southwest)* | P3 | N | N | 9.8 | 1 | Y |
| *Falco peregrinus (Peregrine falcon)* | OS | N | N | 9.9 | 1 | Y |

T: threatened, CR: critically endangered, EN: endangered, VU: vulnerable, P: priority, CD: conservation dependent, OS: other specially protected fauna. White-tailed black cockatoo 11 records

## B.5. Land degradation risk table

| Risk categories | Dwellingup Subsystem | Yarragil Subsystem | Dwellingup 2 Phase |
|---|---|---|---|
| **Wind erosion** | >70% of map unit has a high to extreme wind erosion risk | >70% of map unit has a high to extreme wind erosion risk | >70% of map unit has a high to extreme wind erosion risk |
| **Water erosion** | 3-10% of map unit has a high to extreme water erosion risk | 10-30% of map unit has a high to extreme water erosion risk | <3% of map unit has a high to extreme water erosion risk |
| **Salinity** | <3% of map unit has a moderate to high salinity risk or is presently saline | <3% of map unit has a moderate to high salinity risk or is presently saline | <3% of map unit has a moderate to high salinity risk or is presently saline |
| **Subsurface Acidification** | 95% of map unit has a high susceptibility | 94% of map unit has a high susceptibility | 98% of map unit has a high susceptibility |
| **Flood risk** | 0% of the map unit has a moderate to high hazard | 10% of the map unit has a moderate to high hazard | 0% of the map unit has a moderate to high hazard |
| **Water logging** | <3% of map unit has a moderate to very high waterlogging risk | 3-10% of map unit has a high to extreme water erosion risk | <3% of map unit has a moderate to very high waterlogging risk |
| **Phosphorus export risk** | 10-30% of map unit has a high to extreme phosphorus export risk | 30-50% of map unit has a high to extreme phosphorus export risk | <3% of map unit has a high to extreme phosphorus export risk |

## Appendix C. Assessment against the clearing principles

| Assessment against the clearing principles | Variance level | Is further consideration required? |
|---|---|---|
| **Environmental value: biological values** | | |
| Principle (a): *"Native vegetation should not be cleared if it comprises a high level of biodiversity."*<br>Assessment:<br>The application area contains foraging, breeding and roosting habitat for threatened fauna. The application area is located adjacent to a threatened flora species. | May be at variance | Yes<br>*Refer to Section 3.2.1, above.* |
| Principle (b): *"Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna."*<br>Assessment:<br>The area proposed to be cleared contains foraging, breeding and roosting, habitat for conservation significant fauna. | At variance | Yes<br>*Refer to Section 3.2.2, above.* |
| Principle (c): *"Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, threatened flora."*<br>Assessment:<br>One threatened flora species has been recorded within close proximity of the application area. | May be at variance | Yes<br>*Refer to Section 3.2.1, above.* |
| Principle (d): *"Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a threatened ecological community."*<br>Assessment:<br>The vegetation proposed to be cleared is not likely to comprise or be representative a threatened ecological community. | Not likely to be at variance | No |
| **Environmental value: significant remnant vegetation and conservation areas** | | |
| Principle (e): *"Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared."*<br>Assessment:<br>The extent of the mapped vegetation type and native vegetation in the local area is consistent with the national objectives and targets for biodiversity conservation in Australia. The vegetation proposed to be cleared is not going to impact on the effectiveness of the ecological linkage that traverses the application area. | Not likely to be at variance | No |
| Principle (h): *"Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area."*<br>Assessment:<br>The application area transects the Jarrahdale State Forest and the Serpentine National Park.<br>The proposed clearing is unlikely to have any significant impact to the conservation value of the adjacent conservation area. | May be at variance | Yes<br>*Refer to Section 3.2.3, above.* |

| Assessment against the clearing principles | Variance level | Is further consideration required? |
|---|---|---|
| **Environmental value: land and water resources** | | |
| Principle (f): *"Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland."*<br>Assessment:<br>One minor perennial watercourse intersects a small portion of the application area. This watercourse is a tributary of a conservation category wetland.<br>Given the limited extent of the clearing, it is unlikely to impact on - or off-site hydrology and water quality. | Is at variance | No |
| Principle (g): *"Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation."*<br>Assessment:<br>Given the extent of clearing (2.12 hectares) along a narrow and linear stretch of 3.2 kms, comprising vegetation that has previously been disturbed, the condition of the vegetation and the road construction methodologies used, the proposed clearing is not likely to have an appreciable impact on land degradation. | Not likely to be at variance | No |
| Principle (i): *"Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water."*<br>Assessment:<br>One minor perennial watercourse intersects a small portion of the application area. The proposed clearing may increase sedimentation and runoff in the short term during clearing activities. However, given the long, linear nature of the proposed clearing and the small area of clearing proposed along this watercourse, the proposed clearing is not likely to cause deterioration in the quality of surface or underground water.<br>Groundwater salinity is mapped as 500-1000 milligrams per litre total dissolved solids and the local area is highly vegetated with over 60 per cent vegetation remaining within the local area. The proposed clearing is not likely to impact upon groundwater quality. | Not likely to be at variance | No |
| Principle (j): *"Native vegetation should not be cleared if the clearing of the vegetation is likely to cause, or exacerbate, the incidence or intensity of flooding."*<br>Assessment:<br>The mapped soils and topographic contours in the surrounding area do not indicate the proposed clearing is likely to contribute to increased incidence or intensity of flooding. | Not likely to be at variance | No |

## Appendix D. Vegetation condition rating scale

Vegetation condition is a rating given to a defined area of vegetation to categorise and rank disturbance related to human activities. The rating refers to the degree of change in the vegetation structure, density and species present in relation to undisturbed vegetation of the same type. The degree of disturbance impacts upon the vegetation's ability to regenerate. Disturbance at a site can be a cumulative effect from a number of interacting disturbance types.

Considering its location, the scale below was used to measure the condition of the vegetation proposed to be cleared. This scale has been extracted from Keighery, B.J. (1994) *Bushland Plant Survey: A Guide to Plant Community Survey for the Community*. Wildflower Society of WA (Inc). Nedlands, Western Australia.

**Measuring vegetation condition for the South West and Interzone Botanical Province (Keighery, 1994)**

| Condition | Description |
|---|---|
| Pristine | Pristine or nearly so, no obvious signs of disturbance. |
| Excellent | Vegetation structure intact, with disturbance affecting individual species; weeds are non-aggressive species. |
| Very good | Vegetation structure altered, with obvious signs of disturbance. For example, disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and/or grazing. |
| Good | Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. For example, disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and/or grazing. |
| Degraded | Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. For example, disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and/or grazing. |
| Completely degraded | The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees or shrubs. |

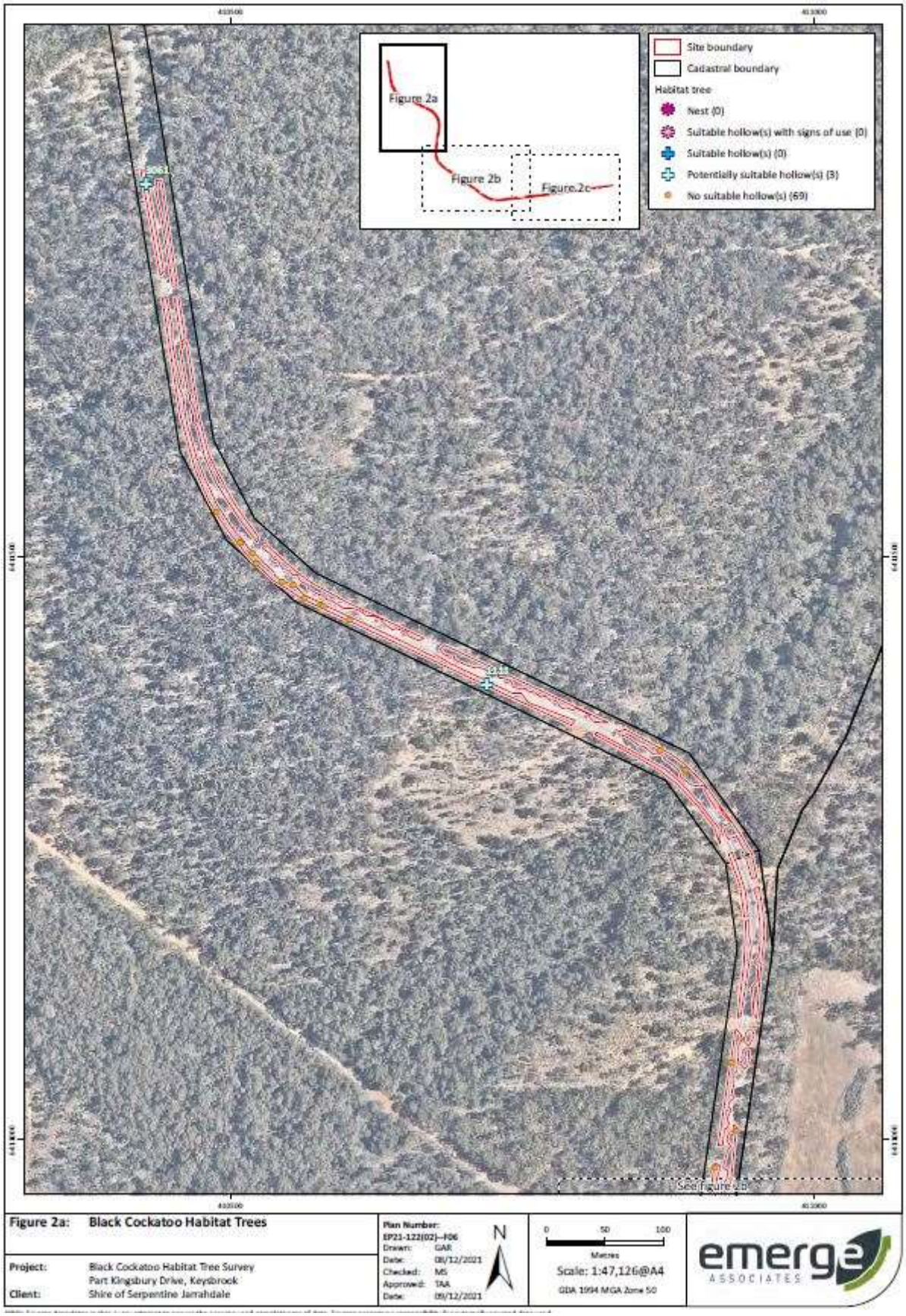


**Figure 7: Location of black cockatoo habitat trees (Emerge, 2021b). Blue crosses indicted trees with potentially suitable hollows, orange dots indicate trees with a diameter at breast Hight (DBH) of 30 centimetres or above**

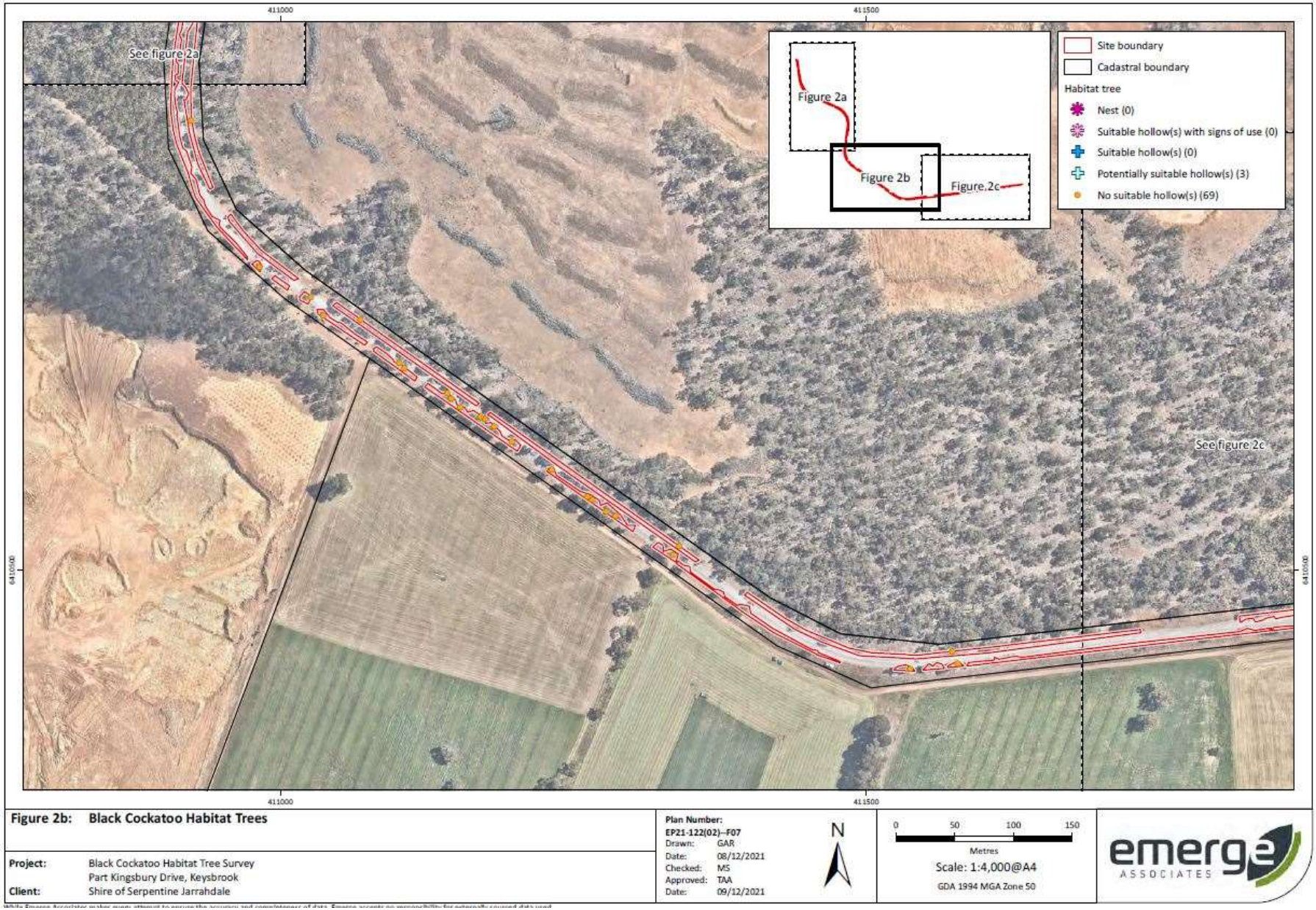


**Figure 8: Location of black cockatoo habitat trees (Emerge, 2021b). Blue crosses indicted trees with potentially suitable hollows, orange dots indicate trees with a diameter at breast Hight (DBH) of 30 centimetres or above**

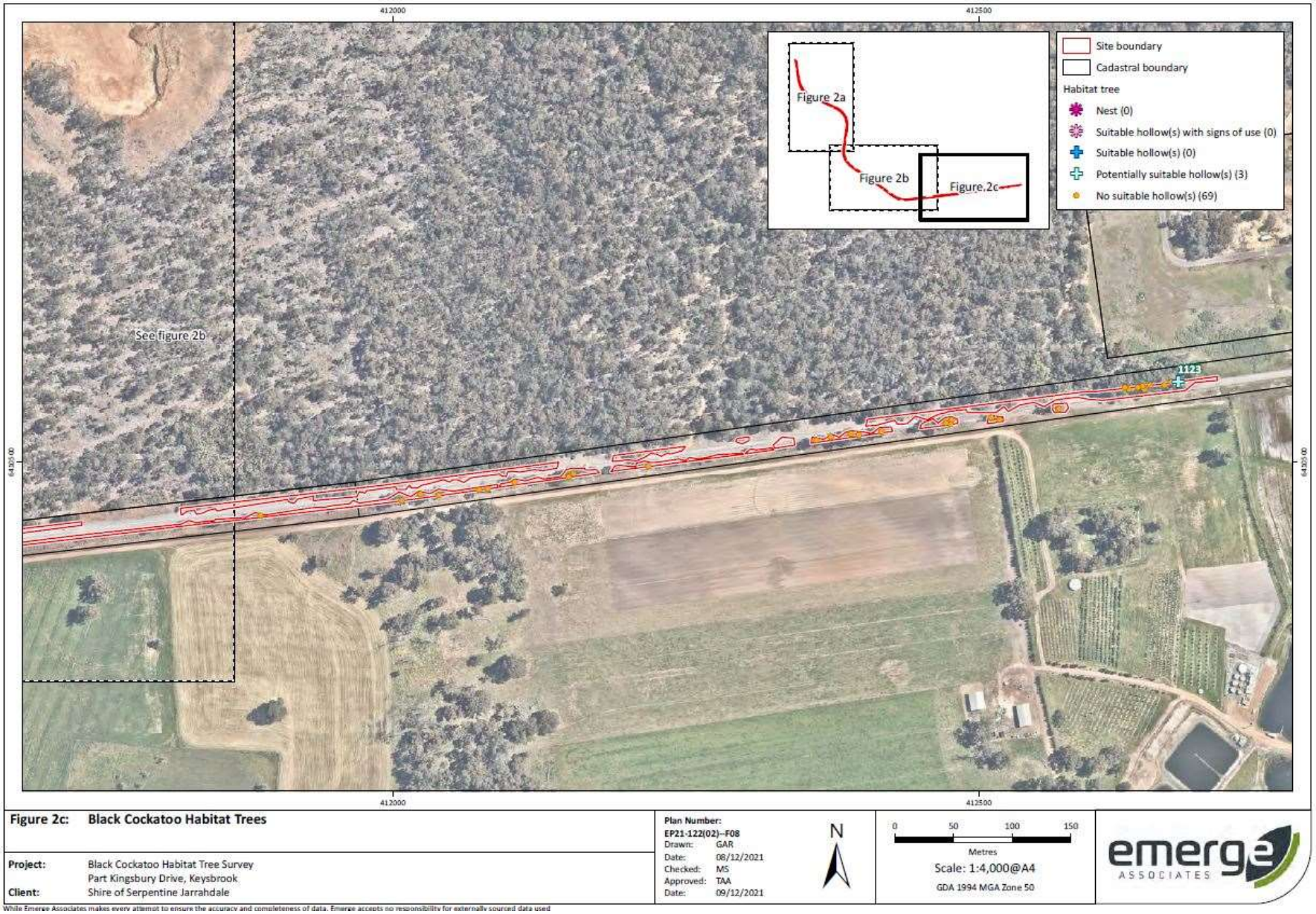


**Figure 9: Location of black cockatoo habitat trees (Emerge, 2021b). Blue crosses indicted trees with potentially suitable hollows, orange dots indicate trees with a diameter at breast Hight (DBH) of 30 centimetres or above**

| | | | | | | |
|---|---|---|---|---|---|---|
| 3061 | 410427.37 | 6411819.90 | 145 | *Stag* | Potentially suitable hollow(s) |  |
| 1111 | 410719.36 | 6411390.70 | 126 | *Eucalyptus marginata* | Potentially suitable hollow(s) |  |
| 1123 | 412670.09 | 6410568.45 | 103 | *Corymbia calophylla* | Potentially suitable hollow(s) |  |

**Figure 10: Habitat trees within the application area that contain hollows potentially suitable for black cockatoo nesting as plotted in Figures 7-9 (Emerge, 2021b).**

**Photographs provided by the applicant**

Figure 11: Photograph of the application area (Shire of Serpentine Jarrahdale, 2021)

Figure 12: Photograph of the application area (Shire of Serpentine Jarrahdale, 2021)

Figure 13: Photograph of the application area (Shire of Serpentine Jarrahdale, 2021)

Figure 14: Photograph of the application area (Shire of Serpentine Jarrahdale, 2021)

Figure 15: Photograph of the application area (Shire of Serpentine Jarrahdale, 2021)

# Appendix F. Sources of information

## F.1. GIS databases

Publicly available GIS Databases used (sourced from www.data.wa.gov.au):

- 10 Metre Contours (DPIRD-073)
- Aboriginal Heritage Places (DPLH-001)
- Cadastre (LGATE-218)
- Contours (DPIRD-073)
- DBCA Legislated Lands and Waters (DBCA-011)
- Environmentally Sensitive Areas (DWER-046)
- Flood Risk (DPIRD-007)
- Groundwater Salinity Statewide (DWER-026)
- Hydrography – Inland Waters – Waterlines
- Hydrological Zones of Western Australia (DPIRD-069)
- IBRA Vegetation Statistics
- Imagery
- Offsets Register – Offsets (DWER-078)
- Pre-European Vegetation Statistics
- Public Drinking Water Source Areas (DWER-033)
- Remnant Vegetation, All Areas
- RIWI Act, Groundwater Areas (DWER-034)
- RIWI Act, Surface Water Areas and Irrigation Districts (DWER-037)
- Soil Landscape Land Quality – Flood Risk (DPIRD-007)
- Soil Landscape Land Quality – Phosphorus Export Risk (DPIRD-010)
- Soil Landscape Land Quality – Subsurface Acidification Risk (DPIRD-011)
- Soil Landscape Land Quality – Water Erosion Risk (DPIRD-013)
- Soil Landscape Land Quality – Water Repellence Risk (DPIRD-014)
- Soil Landscape Land Quality – Waterlogging Risk (DPIRD-015)
- Soil Landscape Land Quality – Wind Erosion Risk (DPIRD-016)
- Soil Landscape Mapping – Best Available
- Soil Landscape Mapping – Systems
- Wheatbelt Wetlands Stage 1 (DBCA-021)

Restricted GIS Databases used:

- ICMS (Incident Complaints Management System) – Points and Polygons
- Threatened Flora (TPFL)
- Threatened Flora (WAHerb)
- Threatened Fauna
- Threatened Ecological Communities and Priority Ecological Communities
- Threatened Ecological Communities and Priority Ecological Communities (Buffers)

## F.2. References


Commonwealth of Australia (2001) *National Objectives and Targets for Biodiversity Conservation 2001-2005*, Canberra.

Department of Agriculture, Water and the Environment (DAWE) (2022) Referral guideline for 3 WA threatened black cockatoo species: Carnaby's Cockatoo, Baudin's Cockatoo and the Forest Red-tailed Blackcockatoo, Department of Agriculture, Water and the Environment, Canberra, February

Department of Environment and Conservation (2012) National Recovery Plan for the Woylie (*Bettongia penicillate ogilbyi*). Western Auastralia

Department of Environment Regulation (DER) (2013). *A guide to the assessment of applications to clear native vegetation*. Perth. Available from: https://www.der.wa.gov.au/images/documents/your-environment/native-vegetation/Guidelines/Guide2_assessment_native_veg.pdf.

Department of Parks and Wildlife (DPaW) (2013). Western Australian Wildlife Management Program No. 52 - Carnaby's Cockatoo (Calyptorhynchus latirostris) Recovery Plan. Government of Western Australia.

Department of Water and Environmental Regulation (DWER) (2019). *Procedure: Native vegetation clearing permits*. Joondalup. Available from: https://dwer.wa.gov.au/sites/default/files/Procedure_Native_vegetation_clearing_permits_v1.PDF.

Emerge (2021a) Targeted flora survey – Part Kingsbury Drive, Keysbrook *Clearing permit application CPS 9340/1*, received 13 December 2021 (DWER Ref: DWERDT537573).

Emerge (2021b) Black cockatoo habitat survey – Part Kingsbury Drive, Keysbrook *Clearing permit application CPS 9340/1*, received 13 December 2021 (DWER Ref: DWERDT537573).

Government of Western Australia (2019a) *2018 South West Vegetation Complex Statistics. Current as of March 2019*. WA Department of Biodiversity, Conservation and Attractions, Perth, https://catalogue.data.wa.gov.au/dataset/dbca

Government of Western Australia. (2019b) *2018 Statewide Vegetation Statistics incorporating the CAR Reserve Analysis (Full Report). Current as of March 2019.* WA Department of Biodiversity, Conservation and Attractions. https://catalogue.data.wa.gov.au/dataset/dbca-statewide-vegetation-statistics

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Keighery, B.J. (1994) *Bushland Plant Survey: A Guide to Plant Community Survey for the Community*. Wildflower Society of WA (Inc). Nedlands, Western Australia.

Schoknecht, N., Tille, P. and Purdie, B. (2004) *Soil-landscape mapping in South-Western Australia – Overview of Methodology and output*s Resource Management Technical Report No. 280. Department of Agriculture.

Shire of Serpentine Jarrahdale (2021a) *Clearing permit application CPS 9340/1*, Shire of Serpentine Jarrahdale, received 24 June 2021 (DWER Ref: DWERDT470171).

Shire of Serpentine Jarrahdale (2021b) Supporting Information for clearing permit application CPS 9340/1 – Kingsbury Drive – Photos of road verge vegetation received 24 June 2021 (DWERDT470171).

Shire of Serpentine Jarrahdale (2021c) Advice from Applicant – additional mitigation measures. Email received 20 December 2021 (DWER Ref: DWERDT541505)

Shire of Serpentine Jarrahdale (2022a) Advice from Applicant – additional mitigation measures. Email received 27 June 2022 (DWER Ref: DWERDT630985

Shire of Serpentine Jarrahdale (2022b) Advice from Applicant – additional mitigation measures. Email received 7 July 2022. (DWER Ref: A2113360)

Shire of Serpentine Jarrahdale (2022c) Advice from Applicant – additional mitigation measures. Email received 12 August 2022. (DWER Ref: A2113360)

Taylor, H., English, V., and Webb, A. (2008) *Tufted Plumed Featherflower* (Verticordiaplumosa *var.* ananeotes) *Recovery Plan*. Department of Environment and Conservation, Western Australia. Available from: http://www.environment.gov.au/biodiversity/threatened/recovery-plans/tufted-plumed-featherflower-verticordia-plumosa-var-ananeotes-interim-recovery-plan. In effect under the EPBC Act from 23-Oct-2008 as *Verticordia plumosa* var. *ananeotes*.

Threatened Species Scientific Committee (2018). *Conservation Advice* Myrmecobius fasciatus *numbat*. Canberra: Department of the Environment and Energy. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/294-conservation-advice-15022018.pdf. In effect under the EPBC Act from 15-Feb-2018.

Western Australian Herbarium (1998-). *FloraBase - the Western Australian Flora*. Department of Biodiversity, Conservation and Attractions, Western Australia. https://florabase.dpaw.wa.gov.au/