



## CLEARING PERMIT

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

<b>Purpose Permit number:</b>	CPS 8036/1
<b>Permit Holder:</b>	Michelle J McAllister Craig D McAllister
<b>Duration of Permit:</b>	17 November 2018 to 17 November 2028

The Permit Holder is authorised to clear native vegetation subject to the following conditions of this Permit.

### **PART I – CLEARING AUTHORISED**

**1. Purpose for which clearing may be done**

Clearing for the purpose of sand extraction.

**2. Land on which clearing is to be done**

Lot 137 on Deposited Plan 152967.

**3. Area of Clearing**

The Permit Holder must not clear more than 4.39 hectares of native vegetation within the area hatched yellow on attached Plan 8036/1a.

**4. Application**

This Permit allows the Permit Holder to authorise persons, including employees, contractors and agents of the Permit Holder, to clear native vegetation for the purposes of this Permit subject to compliance with the conditions of this Permit and approval from the Permit Holder.

### **PART II – MANAGEMENT CONDITIONS**

**5. Avoid, minimise and reduce the impacts and extent of clearing**

In determining the amount of native vegetation to be cleared authorised under this Permit, the Permit Holder must have regard to the following principles, set out in order of preference:

- avoid the clearing of native vegetation;
- minimise the amount of native vegetation to be cleared; and
- reduce the impact of clearing on any environmental value.

**6. Period in which clearing is authorised**

The Permit Holder shall not clear any native vegetation after 17 November 2023.

**7. Revegetation and rehabilitation**

The Permit Holder shall:

- retain the vegetative material and topsoil removed from the area cross hatched red on attached plan 8036/1b and stockpile the vegetative material and topsoil in an area that is already cleared.
- within 3 months following completion of extraction activities, *revegetate* and *rehabilitate*, within the areas cross-hatched red on attached Plan 8036/1b by:
  - re-shaping the surface of the land so that it is consistent with the surrounding 5 metres of uncleared land;
  - ripping the ground on the contour to remove soil compaction;

- (iii) deliberately laying the vegetative material and topsoil retained under condition 7(a) over the revegetation area; and
- (iv) deliberately *planting* and/or *direct seeding* native vegetation in order to achieve the completion criteria outlined in condition 7(d) of this permit.
- (c) The Permit Holder shall monitor annually for a period of 5 years areas *revegetated* and *rehabilitated* to determine species richness, density, structure and weed cover and to assess areas *revegetated* and *rehabilitated* under this Permit against the completion criteria identified at condition 7(d).
- (d) The Permit Holder shall achieve the following completion criteria after the 5 year monitoring period for areas *revegetated* and *rehabilitated* under this Permit:

Completion criteria	Minimum to be achieved
Species richness	10 native species
Foraging species for <i>Calyptorhynchus baudinii</i> , <i>Calyptorhynchus latirostris</i> and <i>Calyptorhynchus banksii</i> subsp. <i>naso</i>	60% density
Overstorey Density Midstorey Density Understorey Density	1200 stems per hectare 800 stems per hectare 600 stems per hectare
Overstorey species	Known to have the potential to develop suitable nesting hollows for <i>Calyptorhynchus baudinii</i> , <i>Calyptorhynchus latirostris</i> and <i>Calyptorhynchus banksii</i> subsp. <i>naso</i>
Structure - overstorey	>60%
Structure – midstorey	>20%
Structure - understorey	>20%
Weeds	<20 %

- (e) within 24 months of laying the vegetative material and topsoil on the cleared area in accordance with condition 7(b) of this Permit:
  - (i) engage an *environmental specialist* to determine the species composition, structure and density of the area *revegetated* and *rehabilitated*; and
  - (ii) where, in the opinion of an *environmental specialist*, the composition structure and density determined under condition 7(c) and 7(d) of this Permit will not result in a species composition meeting the completion criteria, *revegetate* the area by deliberately *planting* and/or *direct seeding* native vegetation that will result in a similar species composition, structure and density of native vegetation to pre-clearing vegetation types in that area and ensuring only *local provenance* seeds and propagating material are used.

## 8. Fauna management

The Permit Holder shall install five artificial black cockatoo nest hollows. The artificial black cockatoo nest hollows must:

- (a) be installed prior to clearing within Lot 137 on Deposited Plan 152967;
- (b) be designed and placed in accordance with the guidelines provided in Schedule 1 to this Permit; and
- (c) be monitored and maintained in accordance with the guidelines provided in Schedule 2 to this Permit, for a period of at least ten years.

## **PART III - RECORD KEEPING AND REPORTING**

### 9. Records must be kept

The Permit Holder must maintain the following records for activities done pursuant to this Permit:

- (a) In relation to the clearing of native vegetation authorised under this Permit:
  - (i) the species composition, structure and density of the cleared area;
  - (ii) 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;
  - (iii) the date that the area was cleared; and
  - (iv) the size of the area cleared (in hectares).

- (b) In relation to the revegetation of areas pursuant to condition 7 of this Permit:
  - (i) a description of the *revegetation* and *rehabilitation* activities undertaken;
  - (ii) the size of the area *revegetated* and *rehabilitated* (in hectares);
  - (iii) the date that the area was *revegetated* and *rehabilitated*; and
  - (iv) a copy of a report(s), prepared by an *environmental specialist*, detailing the *revegetation* and *rehabilitation* activities undertaken and results for the monitoring of density, diversity, structure and weed cover.
  
- (c) In relation to fauna management pursuant to condition 8 of this Permit:
  - (i) the date each artificial black cockatoo nest hollow was installed;
  - (ii) the location of each artificial black cockatoo nest hollow installed, recorded using a GPS unit set to GDA94, expressing the geographical coordinates in Eastings and Northings or decimal degrees;
  - (iii) a photo of each artificial black cockatoo nest hollow installed;
  - (iv) the dates each artificial black cockatoo nest hollow installed was monitored;
  - (v) a description of the monitoring methodology employed for each artificial black cockatoo nest hollow installed;
  - (vi) a description of the monitoring observations for each artificial black cockatoo nest hollow installed;
  - (vii) the date(s) each artificial black cockatoo nest hollow installed was maintained; and
  - (viii) a description of the maintenance activities undertaken for each artificial black cockatoo nest hollow installed.

## 10. Reporting

- (a) The Permit Holder must provide to the CEO on or before 30 June of each year, a written report:
  - (i) of records required under condition 9 of this Permit; and
  - (ii) concerning activities done by the Permit Holder under this Permit between 1 January to 31 December of the preceding calendar year.
- (b) If no clearing authorised under this Permit was undertaken between 1 January to 31 December of the preceding calendar year, a written report confirming that no clearing under this permit has been carried out, must be provided to the CEO on or before 30 June of each year.
- (c) Prior to 17 August 2028, the Permit Holder must provide to the CEO a written report of records required under condition 9 of this Permit, where these records have not already been provided under condition 10(a) of this Permit.

## DEFINITIONS

The following meanings are given to terms used in this Permit:

**CEO:** means the Chief Executive Officer of the Department responsible for the administration of the clearing provisions under the *Environmental Protection Act 1986*;

**direct seeding** means a method of re-establishing vegetation through the establishment of a seed bed and the introduction of seeds of the desired plant species;

**environmental specialist:** means a person who holds a tertiary qualification in environmental science or equivalent, and has experience relevant to the type of environmental advice that an environmental specialist is required to provide under this Permit;

**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;

**planting** means the re-establishment of vegetation by creating favourable soil conditions and planting seedlings of the desired species;

**regenerate/ed/ion** means re-establishment of vegetation from in situ seed banks and propagating material (such as lignotubers, bulbs, rhizomes) contained either within the topsoil or seed-bearing *mulch*;

**rehabilitate/ed/ion** means actively managing an area containing native vegetation in order to improve the ecological function of that area;

**revegetate/ed/ion** means the re-establishment of a cover of *local provenance* native vegetation in an area using methods such as natural *regeneration*, *direct seeding* and/or *planting*, so that the species composition, structure and density is similar to pre-clearing vegetation types in that area; and

**weed/s** means any plant -

- (a) that is a declared pest under section 22 of the *Biosecurity and Agriculture Management Act 2007*; or
- (b) published in a Department of Biodiversity, Conservation and Attractions species-led ecological impact and invasiveness ranking summary, regardless of ranking; or
- (c) not indigenous to the area concerned.



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Mathew Gannaway  
MANAGER  
NATIVE VEGETATION REGULATION

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

18 October 2018

## **SCHEDULE 1**

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

## Artificial hollows for Carnaby's cockatoo



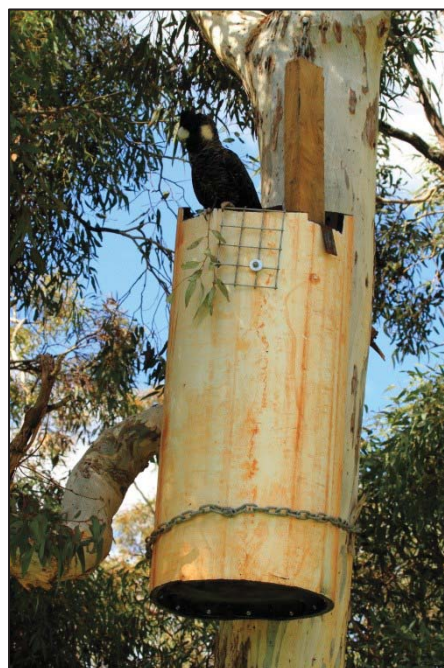
## How to design and place artificial hollows for Carnaby's cockatoo

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)

## 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. Zinalume ®), 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.

## 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.



## 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*.



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



Example fixing for artificial hollow  
Photo by Christine Groom

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## Artificial hollows for Carnaby's cockatoo



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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*.



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



Example fixing for artificial hollow  
Photo by Christine Groom

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## **SCHEDULE 2**

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





## 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 ([wildlifelicencing@dpaw.wa.gov.au](mailto:wildlifelicencing@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.

### **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.

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### **Observing parent behaviour around the hollow**

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

<b>Parent behaviour</b>	<b>Approximate age/stage of young</b>
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)

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### **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).

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### **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.

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### **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.

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### **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.

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### **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
<b>To determine possible use by Carnaby's cockatoo</b>	At least once during peak breeding season (i.e. between September and December)	<ul style="list-style-type: none"> <li>• Observing behaviour of adults around hollow</li> <li>• Tapping to see if female will flush from hollow (best undertaken between 10am and 3pm when females most likely to be sitting)</li> <li>• Listening for nestlings</li> <li>• Looking for evidence of chewing</li> <li>• Looking inside nest</li> </ul>
<b>To confirm use by Carnaby's cockatoo</b>	At least two visits during peak breeding season (i.e. between September and December)	<p>To observe at least two of the following:</p> <ul style="list-style-type: none"> <li>• Breeding behaviour of adults around hollow or evidence of chewing</li> <li>• Female flushed from hollow</li> <li>• Noises from nestlings in hollow</li> </ul> <p>Or to observe:</p> <ul style="list-style-type: none"> <li>• Nestlings or eggs in nest</li> </ul>
<b>To determine nesting success by Carnaby's cockatoo</b>	The more visits, the better. Preferably fortnightly visits between July and December. As a minimum, at least 3 visits spread throughout breeding season.	<ul style="list-style-type: none"> <li>• Looking inside nest to observe eggs or nestlings.</li> </ul>
<b>To determine use by any species</b>	As often as possible.	<ul style="list-style-type: none"> <li>• Inspection from ground as a minimum.</li> <li>• Looking inside nest for detailed observations.</li> </ul>
<b>To determine maintenance requirements</b>	At least every two years and preferably annually if hollow fitted with sacrificial chewing posts, can be longer if without.	<ul style="list-style-type: none"> <li>• 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</li> </ul>

**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.

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

- *How to design and place artificial hollows for Carnaby's cockatoo*
- *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>

## Artificial hollows for Carnaby's cockatoo



## 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 ([wildlifelicencing@dpaw.wa.gov.au](mailto:wildlifelicencing@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.

### **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.

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### **Observing parent behaviour around the hollow**

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

<b>Parent behaviour</b>	<b>Approximate age/stage of young</b>
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)

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### **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).

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### **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.

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### **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.

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### **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.

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### **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
<b>To determine possible use by Carnaby's cockatoo</b>	At least once during peak breeding season (i.e. between September and December)	<ul style="list-style-type: none"> <li>• Observing behaviour of adults around hollow</li> <li>• Tapping to see if female will flush from hollow (best undertaken between 10am and 3pm when females most likely to be sitting)</li> <li>• Listening for nestlings</li> <li>• Looking for evidence of chewing</li> <li>• Looking inside nest</li> </ul>
<b>To confirm use by Carnaby's cockatoo</b>	At least two visits during peak breeding season (i.e. between September and December)	<p>To observe at least two of the following:</p> <ul style="list-style-type: none"> <li>• Breeding behaviour of adults around hollow or evidence of chewing</li> <li>• Female flushed from hollow</li> <li>• Noises from nestlings in hollow</li> </ul> <p>Or to observe:</p> <ul style="list-style-type: none"> <li>• Nestlings or eggs in nest</li> </ul>
<b>To determine nesting success by Carnaby's cockatoo</b>	The more visits, the better. Preferably fortnightly visits between July and December. As a minimum, at least 3 visits spread throughout breeding season.	<ul style="list-style-type: none"> <li>• Looking inside nest to observe eggs or nestlings.</li> </ul>
<b>To determine use by any species</b>	As often as possible.	<ul style="list-style-type: none"> <li>• Inspection from ground as a minimum.</li> <li>• Looking inside nest for detailed observations.</li> </ul>
<b>To determine maintenance requirements</b>	At least every two years and preferably annually if hollow fitted with sacrificial chewing posts, can be longer if without.	<ul style="list-style-type: none"> <li>• 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</li> </ul>

**Acknowledgements**

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

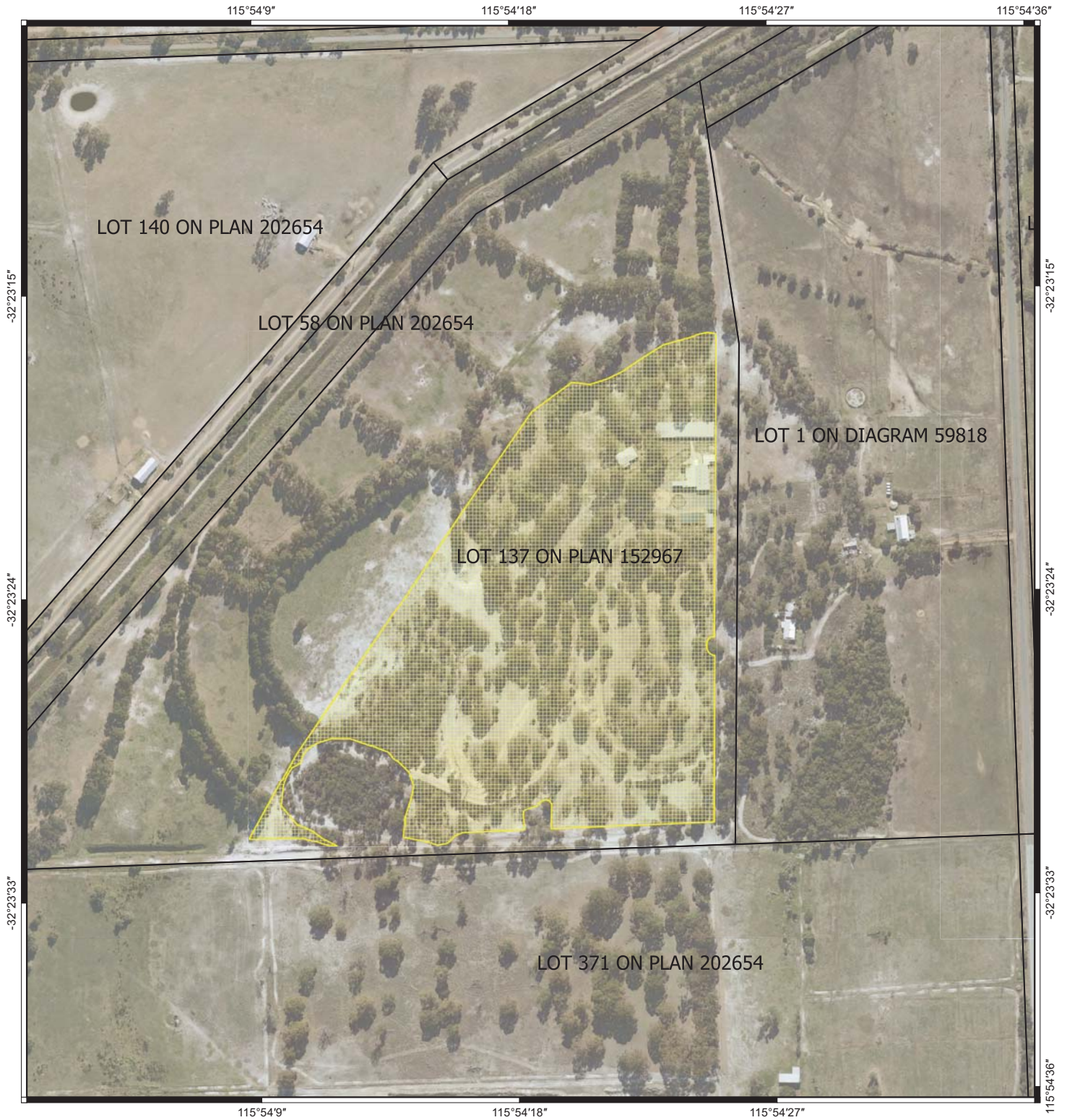
- *How to design and place artificial hollows for Carnaby's cockatoo*
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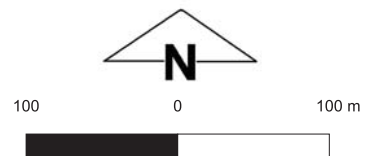


# Plan 8036/1a



## Legend

-  CPS areas approved to clear
- Virtual Mosaic - WA Now



MGA 94  
Geocentric Datum of Australia 1994

.....Date. 18/10/2018  
Mathew Gannaway

Officer with delegated authority under Section 20  
of the Environmental Protection Act 1986




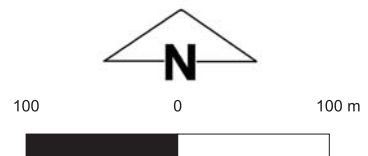
GOVERNMENT OF  
WESTERN AUSTRALIA

# Plan 8036/1b



## Legend

-  CPS subject to conditions
- Virtual Mosaic - WA Now



MGA 94  
Geocentric Datum of Australia 1994

.....Date..18/10/2018  
Mathew Gannaway

Officer with delegated authority under Section 20  
of the Environmental Protection Act 1986





## 1. Application details

### 1.1. Permit application details

Permit application No.: 8036/1  
Permit type: Purpose Permit

### 1.2. Applicant details

Applicant's name: Mr Craig and Mrs Michelle McAllister  
Application received date: 03 April 2018

### 1.3. Property details

Property: Lot 137 on Deposited Plan 152967, Hopeland  
Local Government Authority: Shire of Serpentine Jarrahdale  
Localities: Hopeland

### 1.4. Application

Clearing Area (ha)	No. Trees	Method of Clearing	Purpose category:
4.39		Mechanical Removal	Extractive industry

### 1.5. Decision on application

Decision on Permit Application: Grant  
Decision Date: 18 October 2018  
Reasons for Decision: The clearing permit application has been assessed against the clearing principles, planning instruments and other matters in accordance with section 51O of the *Environmental Protection Act 1986* (EP Act). It has been concluded that the proposed clearing is at variance to clearing principle (b) and is not likely to be at variance to the remaining principles.

Through assessment it was determined that the proposed clearing will result in the loss of 34 potential Carnaby's cockatoo (*Calyptorhynchus latirostris*), Baudin's cockatoo (*Calyptorhynchus baudinii*) and forest red-tailed black cockatoo (*Calyptorhynchus banksii* subsp. *naso*) (collectively referred to as black cockatoos) habitat trees, seven of which contain potential nesting hollows that are not currently being used.

The decision maker determined to grant a clearing permit for part of the application area, subject to conditions. The reduction in the area granted reduced the potential impact to 30 potential habitat trees, five of which contain potential hollows.

To mitigate the significant residual impacts to black cockatoos, a revegetation condition has been placed on the permit and the permit holder will be required to install and maintain five artificial nesting hollows within the property.

## 2. Site Information

**Clearing Description** The application is to clear 4.39 hectares (ha) of native vegetation, within a footprint of 12.23ha, within Lot 137 on Deposited Plan 152967, Hopeland, for the purpose of sand extraction.

**Vegetation Description** The vegetation under application is mapped within the Southern River complex described as; open woodland of *Corymbia calophylla* (Marri), *Eucalyptus marginata* (Jarrah), Banksia species with fringing woodland of *Eucalyptus rudis* (Flooded Gum) - *Melaleuca rhaphiophylla* (Swamp Paperbark) along creek beds (Heddl et al., 1980).

A site inspection undertaken by Department of Water and Environmental Regulation (DWER) Officers described the vegetation as (DWER, 2018):

- *Eucalyptus marginata*, *Xylomelum occidentale*, *Allocasuarina fraseriana* and planted non-endemic eucalyptus species over pasture species in a completely degraded condition (Figure 1); and
- Banksia woodland in a good to degraded condition (Figure 1).

**Vegetation Condition** Vegetation condition within this assessment has been assessed using the vegetation condition scale developed by Keighery (1994). All references to vegetation condition throughout this assessment therefore, reference this scale.

Given historical clearing and land use activities on Lot 137, the current vegetation type onsite no longer accurately reflects mapped vegetation. The vegetation description and condition was determined from a site visit conducted by the former Department of Environment Regulation (DER) officers on 20 October 2015 (DER, 2015), a site visit by DWER Officers on 20 August 2018 and a Level 2 Flora and Vegetation Survey

conducted on 19 and 20 September and 8 November 2016 by RPS Environment and Planning Pty Ltd (RPS, 2017).

RPS (2017) described the native vegetation (in the southwest corner of Lot 137) as a Banksia woodland comprising scattered *Eucalyptus marginata* and *Allocasuarina fraseriana* over *Banksia attenuata*, *B. menziesii* and *B. illicifolia* low open woodland to low open forest over *Kunzea glabrescens* and *Adenanthos cygnorum* tall shrubland over *Hibbertia hypericoides* and *Leucopogon conostephioides* low open shrubland over *Phlebocarya ciliata*, *Desmocladius flexuosus* and *Dasypogon bromeliifolius* herbland. It was noted that this vegetation unit to be the only intact native vegetation type within Lot 137.

The remainder of the application area consists predominantly of scattered mature planted exotic trees (including eucalypts and acacia species not native to Western Australia) and some mature jarrah trees over pasture grasses in a completely degraded condition (DWER, 2018). RPS (2017) described the vegetation within this area as remnant and regrowth *Eucalyptus marginata*, *Xylomelum occidentale* and planted eastern-states eucalyptus species over scattered planted eastern-states acacia species over closed grassland of exotic pasture grasses and herbs.

**Local area** The local area is defined as 10 kilometres from the edge of the application area (Figure 2).



Figure 1: Vegetation types and condition within Lot 137 (DWER, 2018).

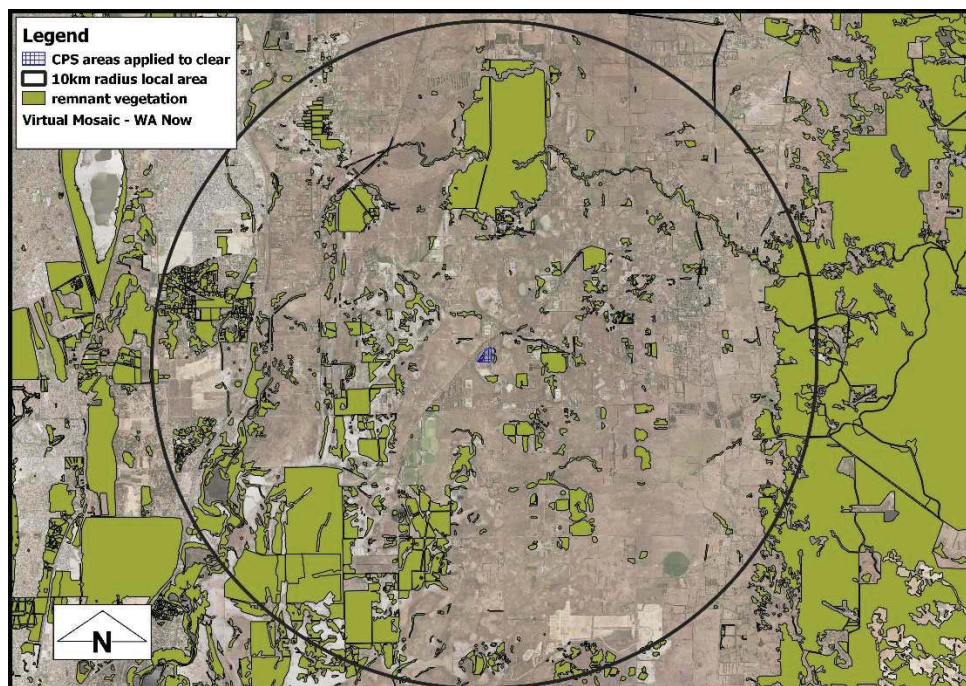


Figure 2: Remnant vegetation within the local area.

### 3. Avoidance and minimisation

Of the 1.99ha of banksia woodland within Lot 137, 0.34ha is being retained and protected by a 20 metre buffer (0.82ha in total), leaving approximately 1.17ha under application. The area retained represents the best quality vegetation within Lot 137 and is likely to be the only sustainable remnant.

The area removed was applied to be cleared under CPS 6746/1 and has now been removed from the application area in order to avoid and minimise environmental impacts.

### 4. Assessment of application against clearing principles

#### (a) Native vegetation should not be cleared if it comprises a high level of biological diversity.

##### Proposed clearing is not likely to be at variance to this Principle

Aerial imagery indicates the local area is approximately 20 per cent vegetated (Figure 2). This indicates that the application area is in a highly cleared landscape.

According to available datasets, 18 species of priority listed flora and seven species of rare flora are mapped within the local area (Western Australian Herbarium, 1998-). Appropriately timed targeted flora and vegetation surveys (September and November 2015; July, September and November 2016) did not identify any listed priority or rare flora species within the application area (RPS, 2017).

Seven threatened (TEC) and two priority (PEC) ecological communities have been recorded in the local area. A level 2 flora and vegetation survey, using the recognised methodology incorporating comprehensive species lists from quadrats scored at peak flowering and floristic data, determined that the banksia woodland within the application area has affinities with several flora community types (FCT) but in particular with FCT21a (not listed as threatened or priority) and FCT21c – “Low lying Banksia attenuata woodlands or shrublands”, listed in Western Australia as a Priority 3(i), and Federally as an Endangered ecological community.

As assessed within principle (d), the vegetation within Lot 137 does not meet the key diagnostic criteria to be considered representative of the Banksia woodlands TEC or PEC. As it is an isolated remnant, it is also not likely to aid in the maintenance of further patches in the local area.

As assessed within principle (b), the vegetation under application forms foraging and potential breeding habitat for Carnaby's cockatoo, Baudin's cockatoo and forest red-tailed black cockatoo. Forest red-tailed black cockatoo's were observed foraging within the application area and numerous hollows of a size as to be suitable for black cockatoo breeding were observed during a DWER site visit (DWER, 2018). A black cockatoo habitat assessment determined that 34 black cockatoo habitat trees, seven of which contain potential nesting hollows are present within the application area (Terrestrial Ecosystems, 2018).

Although habitat for avian fauna is present, as it is an isolated remnant in a degraded to completely degraded condition, the vegetation under application is not likely to support a high fauna diversity.

Given the above and the condition of vegetation under application, the vegetation proposed to be cleared is not likely to comprise a high level of biodiversity and the proposed clearing is not likely to be at variance to this 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 indigenous to Western Australia.

##### Proposed clearing is at variance to this Principle

Six fauna species listed as rare or likely to become extinct under the *Wildlife Conservation Act 1950* (WC Act) have been recorded within the local area; Baudin's cockatoo (*Calyptorhynchus baudinii*), forest red-tailed black cockatoo (*Calyptorhynchus banksii naso*), Carnaby's cockatoo (*Calyptorhynchus latirostris*), chuditch (*Dasyurus geoffroii*), curlew sandpiper (*Calidris ferruginea*) and Carter's freshwater mussel (*Westralunio cateri*) (Department of Parks and Wildlife [Parks and Wildlife], 2007-). Two priority fauna species have been recorded within the local area; quenda (*Isoodon obesulus*, southern brown bandicoot) and blue-billed duck (*Oxyura australis*) (Department of Biodiversity, Conservation and Attractions [DBCA], 2007-).

Aerial imagery indicates the local area is approximately 20 per cent vegetated. This means the application area is in a highly cleared landscape. The vegetation within the application area is isolated from other remnants, however it may provide a stepping stone through the landscape for avian fauna.

According to the Commonwealth Department of the Environment and Energy (DotEE) *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) referral guidelines for Western Australia's three threatened black cockatoo species, the proposed clearing falls within the breeding range for Carnaby's cockatoo (DotEE, 2012). It is also in the distribution range for forest red-tailed black cockatoo and a known foraging area for Baudin's cockatoo (DotEE, 2012). All three species of black cockatoo have been recorded in the local area (DBCA, 2007-). Carnaby's cockatoo is listed endangered under both the WC Act and the EPBC Act. Baudin's cockatoo is listed as endangered under the WC Act and vulnerable under the EPBC Act and forest red-tailed black cockatoo is listed as vulnerable under both the WC Act and EPBC Act.

Carnaby's cockatoo nests in large hollows of eucalyptus trees and forages on the seeds and flowers of the Proteaceae family including *Banksia*, *Hakea*, and *Grevillea* as well as species from *Allocasuarina* and *Eucalyptus* (Valentine and Stock, 2008). Black cockatoos generally forage within six kilometres of a night roost site and, while nesting, within a 12 kilometre radius of their nest site (DotEE, 2013). The southern half of the application area is within the six kilometre buffer to an unconfirmed Carnaby's cockatoo roost area and vegetation within the application area is mapped as possible feeding habitat.

The eastern half of the application area is within an area mapped as a possible Carnaby's cockatoo breeding area. Carnaby's cockatoo is said to nest in any species of eucalypt with a suitable hollow (Parks and Wildlife, 2013), while forest red-tailed black cockatoo is known to nest in the large hollows of marri, jarrah and karri (Johnstone and Kirkby, 1999) and Baudin's cockatoo nests in mature trees such as marri, karri, jarrah and wandoo in the lower southwest of Western Australia (Department of Environment and Conservation, 2008). DWER's site visit noted numerous trees with diameters more than 50 centimetres at breast height (DBH) containing hollows suitable for Black cockatoo breeding (DWER, 2018).

A black cockatoo habitat assessment determined that 34 black cockatoo habitat trees, seven of which contain potential nesting hollows are present within the application area. None of these are currently being used by Black cockatoos for breeding (Terrestrial Ecosystems, 2018).

A site visit conducted by DWER on 20 August 2018 recorded three forest red-tailed black cockatoo's foraging within the completely degraded portion of the application area (DWER, 2018). Vegetation in the remnant banksia woodland in the western side of the application area includes preferred feeding species for Carnaby's cockatoo. The DER site inspection in 2015 recorded chewed banksia cones beneath mature banksia trees in the northern part of the banksia woodland remnant as well as a number of freshly chewed *Banksia attenuata* flowers (DER, 2015).

Surveys of Carnaby's cockatoo populations and their feeding and roosting habits showed that this species uses the entire landscape of the Swan Coastal Plain (Shah, 2006). As one of the major threats to Carnaby's cockatoo is the accumulative clearing of feeding habitat on the Swan Coastal Plain, all feeding habitat within the Swan Coastal Plain is considered significant (DotEE, 2013). Any clearing of cockatoo feeding habitat on the Swan Coastal Plain will contribute to the cumulative loss and fragmentation of remaining habitat and poses a significant threat to the long term survival of Carnaby's cockatoo.

While the application area may provide suitable habitat for quenda, given the wide distribution through south western Australia, the proposed clearing is unlikely to have a significant impact on the conservation status of this species.

The remaining species of conservation significance identified above inhabit areas associated with permanent and/or standing water. The application area does not support suitable habitat for these species.

Considering the above, the application area comprises vegetation that may be significant feeding habitat for all three species of black cockatoo and potential breeding habitat for Carnaby's and forest red-tailed black cockatoos. To mitigate the significant residual impacts to black cockatoos, a revegetation condition has been placed on the permit and the permit holder will be required to install and maintain five artificial nesting hollows within the property.

Given the above, the proposed clearing is at variance to this Principle.

**(c) Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, rare flora.**

**Proposed clearing is not likely to be at variance to this Principle**

Eight species of rare flora have been recorded in the local area, six of which have been found on the same mapped vegetation and soil types as the application area.

The former Parks and Wildlife advised the application area may support potential habitat for two species of rare orchid (Parks and Wildlife, 2015). These species have been recorded approximately four and 4.6 kilometres from the application area, respectively, on the same mapped vegetation and soil types as the application area. These species are both listed as critically endangered under the WC Act and endangered under the federal EPBC Act.

The eastern half of the application area predominantly consists of scattered mature planted exotic trees (including eucalypts not native to the area) and some mature jarrah trees over pasture grasses and is in completely degraded condition (DWER 2018). This area is unlikely to support rare flora.

Appropriately timed (September and November 2015; July, September and November 2016) targeted flora and vegetation surveys of the banksia woodland remnant did not identify any listed rare flora species (RPS, 2017).

Given the above, the proposed clearing is not likely to be at variance to this 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.**

**Proposed clearing is not likely to be at variance to this Principle**

Seven threatened ecological communities (TEC) have been recorded in the local area. A level 2 flora and vegetation survey, using the recognised methodology incorporating comprehensive species lists from quadrats scored at peak flowering and floristic data, determined that the banksia woodland within the application area has affinities with several flora community types (FCT). In particular with FCT21a (not listed as threatened or priority) and FCT21c – "Low lying Banksia attenuata woodlands or shrublands". This community is listed in Western Australia as a Priority 3(i), and Federally as an Endangered ecological community.

A DWER site visit determined that the vegetation removed from the clearing area within the south west of the property is likely to be floristically consistent with the banksia woodlands of the swan coastal plain TEC. Vegetation within the adjoining application area may also have been consistent with the TEC.

The conservation advice for the “Low lying Banksia attenuata woodlands or shrublands” TEC lists the condition and patch size thresholds required to be considered part of the TEC (DotEE, 2016). Under the conservation advice, vegetation in a degraded condition does not align with the TEC. Two hectares of vegetation in good condition is required for a patch to align with the TEC and one hectare of very good condition vegetation.

RPS mapped 1.99 hectares of banksia woodland within Lot 137. A majority of this vegetation is in a degraded condition with 0.33 hectares in a very good – good condition. Given this, the banksia remnant on the property does not meet the condition and size thresholds to be considered part of the TEC. Despite this, 0.48 hectares of the remnant in the best condition has been removed from the application area.

The banksia remnant on the property is surrounded by completely degraded vegetation and it is therefore an isolated remnant. It does not form part of a linkage and is not connected to further vegetation. Given this, it is also not likely to aid in the maintenance of further patches in the local area.

Given the above, the proposed clearing is not likely to be at variance to this 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.**

**Proposed clearing is not likely to be at variance to this Principle**

The national objectives and targets for biodiversity conservation in Australia has a target to prevent clearance of ecological communities with an extent below 30 per cent of that present pre-1750, below which species loss appears to accelerate exponentially at an ecosystem level (Commonwealth of Australia, 2001).

The mapped Beard vegetation association within the Swan Coastal Plain bioregion retains 26.3 per cent native vegetation. Mapped Southern River vegetation complex retains 18.4 per cent native vegetation. The local area retains approximately 20 per cent native vegetation. As all mapped vegetation types and the local area fall below the 30 per cent threshold, the proposed clearing occurs within a highly cleared landscape.

It is noted however that a majority of the application area is not mapped as native vegetation (Figure 2) and therefore, removing the vegetation under application will not affect the calculated figures of remaining vegetation. Given its completely degraded condition, the vegetation under application is also not representative of the mapped vegetation types.

As displayed in Figure 2, the vegetation under application is an isolated remnant and does not form a linkage to further occurrences of native vegetation. Removing the vegetation under application is also not likely to effect the remaining vegetation in the local area. Given this and the condition of the vegetation under application, it is not likely to be a significant remnant within as area that has been extensively cleared.

Given the above, the proposed clearing is not likely to be at variance to this Principle.

Table 1: Vegetation extents.

	Pre-European (ha)	Current Extent (ha)	Remaining (%)	Current Extent in DBCA Managed Lands	
				(ha)	(%)
<b>IBRA bioregion</b>					
Swan Coastal Plain*	1, 501, 221.9	578, 997.3	38.5	222, 766.5	38
<b>Beard vegetation association in bioregion</b>					
1000*	94,175.31	24,805.96	26.34	4,764.1	19.21
<b>Swan Coastal Plain vegetation association*</b>					
Southern River Complex**	58, 781.48	10, 828	18.42	935	1.6

**(f) Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland.**

**Proposed clearing is not likely to be at variance to this Principle**

The Karnet Drain and Dirk Brook, classed as significant streams, occur approximately 200 metres to the west and 300 metres to the north. Given the distance to these watercourses, the proposed clearing is unlikely to impact upon them.

An extensive system of wetlands is mapped over the majority of the local area.

The remnant banksia woodland in the west of the property supports some species that grow in association with damp environments (DWER, 2018). This area is in a slight depression in the landscape of the property and an area of palusplain wetland, classified as multiple use wetland, is mapped approximately 40 metres to the west. Given the topography of the application area, vegetation types present and proximity to mapped wetlands, the vegetation in the Banksia woodland remnant in the western part of the property may be growing in association with an environment associated with a wetland. This area has however, been removed from the application area in order to minimise the potential environmental impacts of the clearing.

Given the above, the proposed clearing is not likely to be at variance to this Principle.

**(g) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.**

**Proposed clearing is not likely to be at variance to this Principle**

The vegetation under application is mapped within the Karrakatta Sand Yellow Phase soil subsystem described as; low hilly to gently undulating terrain, yellow sand over limestone at 1-2 metres (Department of Primary Industry and Regional Development [DPIRD], 2018). As described in Table 2, this soil subsystem has a low risk of water logging, water erosion, sub surface acidification, salinity or eutrophication. Given this and as no watercourses are present within the application area, the proposed clearing is not likely to cause or exacerbate these forms of land degradation.

Due to the sandy soil type, the application area has been mapped with a high risk of wind erosion. It is noted that the application area is predominantly in a completely degraded to degraded condition with a majority of the area devoid of groundcover and consisting of scattered trees. Given this, the proposed clearing is not likely to increase the risk of wind erosion greater than that which is already present.

Potential erosion as a result of the end land use is managed through other legislative processes.

Given the above, the proposed clearing is not likely to be at variance to this Principle.

Table 2: Land degradation risk categories (DPIRD, 2018).

Risk categories	Karrakatta Sand Yellow Phase
Wind erosion	>70% of map unit has a high to extreme wind erosion risk
Water logging	<3% of map unit has a moderate to very high waterlogging risk
Water erosion	3-10% of map unit has a high to extreme water erosion risk
Subsurface Acidification	10-30% of map unit has a high subsurface acidification risk or is presently acid
Salinity risk	30-50% of map unit has a moderate to high salinity risk or is presently saline
Phosphorus export risk	3-10% of map unit has a high to extreme phosphorus export risk
Flood risk	<3% of the map unit has a moderate to high flood risk

**(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.**

**Proposed clearing is not likely to be at variance to this Principle**

The nearest conservation area is Bush Forever site 378, approximately 2.5 kilometres to the west and the nearest DBCA area managed for conservation is 6.8 kilometres from the application area.

The vegetation within the application area is isolated from other remnants and conservation areas. Therefore it is unlikely to contribute to the maintenance of these areas and the proposed clearing is unlikely to impact upon the environmental values of conservation areas.

Given the above, the proposed clearing is not likely to be at variance to this 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.**

**Proposed clearing is not likely to be at variance to this Principle**

As assessed within Principles (f) and (g), no watercourses are present within the application area and the vegetation under application is mapped within the Karrakatta Sand Yellow Phase soil subsystem. This soil subsystem has a low risk of water logging, water erosion, sub surface acidification, salinity or eutrophication which have the potential to deteriorate water quality (Table 2).

Given this and the scattered nature of the vegetation under application, the proposed clearing is not likely to be at variance to this Principle.

**(j) Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence or intensity of flooding.**

**Proposed clearing is not likely to be at variance to this Principle**

As displayed in Table 2, the mapped risk of flooding within the application area occurs within the lowest risk category. Given this and the scattered nature of the vegetation under application, the proposed clearing is not likely to be at variance to this Principle.

**Planning instruments and other relevant matters.**

A similar application for the same clearing purpose was first submitted in September 2015. Due to insufficient information addressing potential impacts to flora and fauna habitat and that Shire planning approval had not been obtained, the application was subsequently withdrawn in 2016.

A Level 2 flora and vegetation survey was undertaken in September and November 2016 to address the flora and fauna habitat issues identified during the 2015 assessment. The 2016 survey confirmed the area of remnant Banksia woodland in the south-western corner of the application area does not meet the minimum patch size thresholds for the mapped Banksia woodland ecological community and therefore has insufficient environmental value to be considered Banksia TEC. The survey also confirmed that no priority or rare flora species occurred within the application area (RPS, 2017).



The Shire of Serpentine-Jarrahdale granted development approval and extractive industry licence in October 2017 with conditions, including the requirement to retain and protect the banksia woodland and submit a dust management plan (RPS,2018)

As part of a negotiated State Administrative Tribunal determination in March 2018, it was determined that 0.34 hectares of the banksia remnant be retained and protected by fencing and a 20 meter wide buffer.

The application area is within the Serpentine Groundwater Area, which is a proclaimed groundwater area under the *Rights in Water and Irrigation Act 1914* (RIWI Act). A Groundwater Licence with an allocation of 16,600kl per annum for domestic use only is currently in place for Lot 137. If the clearing activity requires any groundwater for any of the earthworks/ extraction purposes (i.e. dust suppression) an amendment to the current licence will need to be applied for.

The application area is located within the Serpentine River System Surface Water Area proclaimed under the RIWI Act. If the proposed clearing activities require the removal of surface water (i.e.: dust suppression) a 5C Licence to take water will be required. Dirk Brook runs through the northeast portion of Lot 137 and no licence to take water from this watercourse is current.

No Aboriginal sites of significance have been mapped within the application area.

The property is zoned rural under the Shire of Serpentine-Jarrahdale town planning scheme and the metropolitan regional scheme.

The clearing permit application was advertised on the DWER website on 30 April 2018 with a 21 day submission period. No public submissions have been received in relation to this application.

## 5. References

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- \*\*Government of Western Australia (2017) 2016 South West Vegetation Complex Statistics. Current as of December 2016. WA Department of Parks and Wildlife, Perth
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- RPS (2017) Level 2 Flora and Vegetation Survey, Lot 137 Punrak Road, Hopeland. April 2017 (DWER Ref: A1645998)
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- Valentine, L.E. and Stock, W. (2008) Food Resources of Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*) in the Gngangara Sustainability Strategy Study Area. Edith Cowan University and Department of Environment and Conservation. December 2008.
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### GIS Database List

- SAC Bio datasets (May 2018)
- Hydrography, linear
- Aboriginal Sites of Significance
- RIWI Areas
- Hydrography, linear  
CPS 8036/1

- Groundwater Salinity
- Pre-European vegetation
- DPaW Estate
- Soils, statewide
- Salinity Risk