



mainroads
WESTERN AUSTRALIA

Bunbury Outer Ring Road Southern Section –EPBC 2019/8543 Offset Management Plan

October 2023

Rev 2

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Amendments

Revision Number	Revision Date	Description of Key Changes	Section / Page No.
A	July 2023	Review Draft	All
0	August 2023	Final for Approval	Various
0a	September 2023	Final for Approval	Minor Edits
1	October 2023	Final for Approval	Section 1.5 and Minor Edits
2	October 2023	Final for Approval	Table 3-6, Table 4-4 , Table 4-5 and 5-6, Sections 3.5.4, 4.5.4, 5.5.4

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SUMMARY

Bunbury Outer Ring Road Southern Section Project

The Bunbury Outer Ring Road (BORR) Southern Section Project (BORR Southern Section/the Project) includes the construction and operation of 10.5 km of new freeway standard dual carriageway, associated bridges, interchanges and other road infrastructure including, but not limited to, culverts, lighting, noise barriers, fencing, landscaping, road safety barriers and signs. The Project is located approximately 200 km south of Perth and, at its closest point, approximately six km south-east of Bunbury.

The Project will be constructed within the 200 ha Development Envelope (also referred to as the Project Area) (Figure 1, Appendix A) which is located within the City of Bunbury and Shire of Capel. Approximately 62 per cent of land within the Development Envelope is cleared. The Development Envelope comprises 76 ha of native vegetation and 124 ha of cleared agricultural land.

Construction of the Project commenced in 2022 and is anticipated to continue for a period of 2-3 years. Once the BORR Southern Section is constructed and open for public use, operation will be ongoing.

Purpose of this Plan

The *Bunbury Outer Ring Road Southern Section EPBC 2019/8543 Offset Management Plan* (this Plan) is submitted in accordance with *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) approval for EPBC 2019/8543 condition 18 for the Project by Main Roads Western Australia.

Table E-1 presents a summary of this Plan, including the residual impacts this Plan is required to offset. Table E-2 presents a summary of the offset sites.

Table E-1. Bunbury Outer Ring Road Southern Section Offset Management Plan summary

Item	Details
Title of Project	Bunbury Outer Ring Road Southern Section
Proponent name	Commissioner for Main Roads Western Australia
EPBC number	2019/8543
Purpose of this Plan	This Plan is submitted to fulfil the requirements of conditions 18-21 of EPBC Act approval for EPBC 2019/8543
Environmental objective	To counterbalance the significant residual impacts to: <ol style="list-style-type: none"> (1) 60.9 ha of habitat for western ringtail possum (2) 60.9 ha of black cockatoo foraging and breeding habitat (3) 23.4 ha of Banksia Woodlands of the Swan Coastal Plain Threatened Ecological Community (TEC) (4) 4.4 ha of Tuart (<i>Eucalyptus gomphocephala</i>) woodlands and forests of the Swan Coastal Plain TEC.

This Plan addresses all of the significant residual impacts associated with the project in accordance with EPBC Act approval for EPBC 2019/8543.

Table E-2. Summary of offset sites provided under this Plan

Value	Significant residual impact to be offset	Offset provided			
		Offset A – Lots 153, 267 and 268 Ducane Road Gelorup	Offset B – Lot 104 Willinge Drive Davenport (north)	Offset C – State Forest No. 2 / Tuart Forest National Park	TOTAL
Habitat for western ringtail possum (<i>Pseudocheirus occidentalis</i>)	60.9 ha	126 ha	65 ha	270 ha	126 ha land acquisition plus 335 ha revegetation
Habitat for Carnaby's Cockatoo (<i>Zanda latirostris</i>), Baudin's Cockatoo (<i>Zanda baudinii</i>) and Forest Red-tailed Black Cockatoo (<i>Calyptorhynchus banksii naso</i>)	60.9 ha	-	49 ha	200 ha	249 ha revegetation
Banksia woodlands of the Swan Coastal Plain TEC	23.4 ha	124.1 ha	-	-	124.1 ha land acquisition
Tuart (<i>Eucalyptus gomphocephala</i>) woodlands and forests of the Swan Coastal Plain TEC	4.4 ha	-	-	37 ha	37 ha revegetation
Suitable black cockatoo nest hollows and suitable diameter at breast height (DBH) trees	Up to 11 trees with suitable nest hollows and 1,088 suitable DBH trees	-	-	-	For suitable DBH trees, 45 Artificial Nest Hollows (ANHs) and for every suitable nest hollow cleared, three ANHs

COVER PAGE AND DECLARATION OF ACCURACY

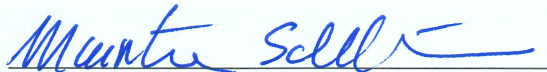
- **EPBC number:** 2019/8543
- **Project name:** Bunbury Outer Ring Road Southern Section
- **Action management plan title:** Bunbury Outer Ring Road Southern Section (EPBC 2019/8543) Offset Management Plan
- **Proponent /approval holder and ACN or ABN:** Main Roads Western Australia, ABN 50860676021
- **Proposed / approved action:** Construction and operation of the Southern Section of the Bunbury Outer Ring Road (BORR) project
- **Location of the action:** South Western Highway to Bussell Highway, within the City of Bunbury and Shire of Capel
- **Date of preparation of the action management plan:** August 2023
- **Person accepting responsibility for the action management plan:** Martine Scheltema, Manager Environment, Main Roads Western Australia

Declaration of accuracy

I declare that to the best of my knowledge, all the information contained in, or accompanying this document is complete, current and correct. I am duly authorised to sign this declaration on behalf of the proponent/approval holder. I am aware that:

- a) giving false or misleading information is a serious offence under section 137. 1 of the *Criminal Code Act 1995* (Cth)
- b) section 137.2 of the *Criminal Code Act 1995* (Cth) makes it an offence for a person to produce a document to another person in compliance or purported compliance with a law of the Commonwealth where the person knows that the document is false or misleading;
- c) section 490 of the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) makes it an offence for an approval holder to provide information in response to an approval condition where the person is reckless as to whether the information is false or misleading; and
- d) section 491 of the EPBC Act makes it an offence for a person to provide information or documents to specified persons who are known by the person to be performing a duty or carrying out a function under the EPBC Act or the *Environment Protection and Biodiversity Conservation Regulations 2000* (Cth) (EPBC Regulations) where the person knows the information or document is false or misleading.

Signed:



Full name:

Martine Scheltema, Director Environment and Heritage

Organisation:

Main Roads Western Australia (ABN 50 860 676 021)

Date

30 / 10 / 23

1 BACKGROUND

1.1 Context and scope

This Offset Management Plan has been prepared to document measures to counterbalance adverse impacts on conservation significant terrestrial fauna and ecological communities that may occur during construction of the Bunbury Outer Ring Road Southern Section Project (BORR Southern Section/the Project), as required under *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) approval for EPBC 2019/8543 condition 18.

This Plan has been developed to facilitate implementation of the approved Offset Strategy (Main Roads Western Australia, 2023b). This Plan details the management and monitoring activities that will be undertaken in order to achieve the ecological benefits Main Roads committed to in the approved Offset Strategy (Main Roads Western Australia, 2023b), and addresses impacts that the Project will have on:

- Western ringtail possum (*Pseudocheirus occidentalis*) (WRP) (critically endangered)
- Black cockatoos
 - Baudin's Cockatoo (*Zanda baudinii*) (endangered)
 - Carnaby's Cockatoo (*Zanda latirostris*) (endangered)
 - Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*) (vulnerable)
- Banksia Woodland of the Swan Coastal Plain Ecological Community (Banksia Woodlands Threatened Ecological Community (TEC)) (endangered)
- Tuart (*Eucalyptus gomphocephala*) Woodlands and Forests of the Swan Coastal Plain TEC (Tuart Woodlands TEC) (critically endangered).

1.2 Environmental assessment

1.2.1 Commonwealth assessment

The Proposal was formally referred to the then Commonwealth Department of the Environment and Energy (DoEE, now the Department of Climate Change, Energy, Environment and Water) in September 2019 (EPBC Act referral 2019/8543) as a potential Controlled Action under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) due to impacts on Matters of National Environmental Significance (MNES) (BORR IPT, 2020a).

Approval for EPBC 2019/8543 under the EPBC Act was granted on 29 June 2022.

1.2.2 State assessment

In September 2019, Main Roads referred the Proposal to the Environmental Protection Authority (EPA) of Western Australia (WA) for assessment under Section 38 of the Environmental Protection Act 1986 (EP Act). In October 2019, the EPA determined that the Proposal would be subject to an environmental assessment at the level of Referral Information, with additional information required under Section 40(2)(a) of the EP Act.

The Project was approved by the EPA under Ministerial Statement 1191 (MS 1191) on 31 May 2022.

1.3 Project

The BORR Southern Section Project (Figure 1, Appendix A) includes the construction and operation of 10.5 km of new freeway standard dual carriageway, associated bridges, interchanges and other road infrastructure including, but not limited to, culverts, lighting, noise barriers, fencing, landscaping, road safety barriers and signs. The Project is located approximately 200 km south of Perth and, at its closest point, approximately six km south-east of Bunbury.

The 200 ha Development Envelope (also referred to as the Project Area) is within the City of Bunbury and Shire of Capel. Approximately 62 per cent of land within the Development Envelope is cleared. The Development Envelope comprises 76 ha of native vegetation and 124 ha of cleared agricultural land.

Construction of the Project commenced in July 2022 and is anticipated to continue for a period of 2-3 years. Once the Project is constructed and open for public use, operation will be ongoing. The measures and monitoring identified in this Plan will continue into operation, as required under condition 18(g) of EPBC Act approval for EPBC 2019/8543.

1.4 Summary of residual impacts

Residual (direct) impacts for which Main Roads proposes environmental offsets are detailed in Table 1-1.

Table 1-1. Residual (direct) environmental impacts requiring offset

Environmental Attribute	Condition	Residual Impact
WRP habitat	Habitat mapped within the Project Area comprises Shedley and Williams (2014) habitat classes as follows: <ul style="list-style-type: none"> • 11 % of Habitat Quality Class B (High) (7.0 ha) • 52 % of Habitat Quality Class C (Medium) (31.9 ha) • < 1 % of Habitat Quality Class D (Low) (0.3 ha) • 35.5 % not rated (21.6 ha) 	60.9 ha
Black cockatoo habitat	<p>Approximately two thirds of the black cockatoo habitat within the Development Envelope was mapped as high quality foraging habitat ('Marri / <i>Eucalyptus</i> woodland'), with the remaining amount mapped as moderate quality ('Marri / <i>Eucalyptus</i> in paddocks and road reserves')</p> <p>The Development Envelope contains 1088 suitable DBH trees, with 11 of these containing potentially suitable hollows.</p> <p>Up to 27 June 2023, pre-clearance surveys recorded clearing of a total of 458 trees with a diameter at breast height of greater than 500 mm. Of the 458 trees cleared, four had been identified as having 'potentially suitable' nest hollows for black cockatoos. One of these was downgraded by SW Environmental in April 2023 to 'not suitable' due to a snapped hollow and active beehive (SW Environmental, 2023).</p> <p>Therefore, a total of three trees with 'potentially suitable' nest hollows for black cockatoos have been cleared.</p> <p>No trees with actual known, or likely, black cockatoo nesting hollows have been cleared to date within the Project Area.</p>	<p>60.9 ha</p> <p>11 trees with potentially suitable nesting hollows</p>

Environmental Attribute	Condition	Residual Impact
Banksia Woodlands TEC	<ul style="list-style-type: none"> • Excellent: 0.49 ha • Excellent – Very Good: 4.0 ha • Very Good: 2.28 ha • Very Good – Good: 2.38 ha • Good: 1.47 ha • Good – Degraded: 11.58 ha • Degraded: 0.71 ha • Degraded – Completely Degraded: 0.46 ha • Completely Degraded: 0.07 ha 	23.4 ha
Tuart Woodlands TEC	<ul style="list-style-type: none"> • Very Good: 0.80 ha • Good – Degraded: 2.91 ha • Degraded – Completely Degraded: 0.01 ha • Completely Degraded: 0.68 ha 	4.4 ha

Potential indirect impacts are summarised in Table 1-2.

Table 1-2. Potential indirect impacts of the Project

Environmental Attribute	Potential indirect impacts
WRP habitat	<ul style="list-style-type: none"> • Decline in habitat quality • Displacement of individuals due to noise and / or light
Black cockatoo habitat	<ul style="list-style-type: none"> • Noise impacts during construction • Increased likelihood of fauna strike from vehicle movements post-construction
Banksia Woodlands TEC	<ul style="list-style-type: none"> • Introduction and / or spread of weeds and Phytophthora dieback • Damage through the accidental generation of a bushfire during construction
Tuart Woodlands TEC	<ul style="list-style-type: none"> • Introduction and / or spread of weeds and Phytophthora dieback • Damage through the accidental generation of a bushfire during construction

1.5 Requirements of the Approval

Condition 14 of EPBC Act approval for EPBC 2019/8543 required Main Roads to submit to the Department, for approval by the Minister, an Offset Strategy within 6 months of commencement of the action.

Main Roads submitted a draft Offset Strategy to DCCEEW on 28 September 2022 for review and comment, with subsequent versions submitted to the Department on 23 December 2022, 13 April 2023, 24 April 2023 and 26 April 2023. The Offset Strategy was approved by the Department on 1 May 2023.

The offsets approved in the strategy are separated into three sites:

- Offset A – Lots 153, 267 and 268 Ducane Road Gelorup – 126 ha
- Offset B – Lot 104 Willinge Drive Davenport (north) – 65 ha
- Offset C – State Forest No. 2 Tuart Forest National Park – 270 ha.

Conditions 18-21 of EPBC Act approval for EPBC 2019/8543 required Main Roads to submit to the Department, for approval by the Minister, an Offset Management Plan within 12 months of commencement of the action. The Offset Management Plan must cover each of the offset sites

specified in the approved Offset Strategy (as listed above), and describe the management actions, and their timing, to be implemented to achieve the ecological benefits for each protected matter.

This Plan is submitted in accordance with conditions 18-21 of EPBC Act approval for EPBC 2019/8543. The condition requirements and in-plan section references are provided in Table 1-3.

This Plan has been developed in accordance with the *Environmental Management Plan Guidelines* (Commonwealth of Australia, 2014).

None of the EPBC 2019/8543 approval conditions relating to this Plan are based on or reference MS1191 conditions.

Table 1-3. Requirements of EPBC Act approval for EPBC 2019/8543

Condition No.	Condition	Section of this Plan
18	The approval holder must, within 12 months of commencement of the action, submit to the Department for approval by the Minister, an Offset Management Plan for each of the offset sites specified in the approved Offset Strategy. Each Offset Management Plan must, to the satisfaction of the Minister, meet the requirements of the Environmental Offsets Policy within 15 months of commencement of the action. Each Offset Management Plan must meet the requirements of the Environmental Management Plan Guidelines and include the following:	This Plan
	a) summary of the residual impacts to protected matters that will be compensated for by the offset. This summary must include the area(s) of habitat for protected matters and its condition and quality at all impact sites which the particular offset is to address	1.4
	i. for Black Cockatoos, this must include the total number suitable nest hollows identified during the pre-clearance survey specified in condition 7 and the number of suitable nest hollows and trees with a diameter at breast height of greater than 500 mm actually cleared.	1.4 Appendix B
	b) the relevant protected matters and a reference to the EPBC Act approval conditions to which the particular Offset Management Plan refers	1.1, 1.5
	c) management actions, and the timing of those actions, that will be implemented to achieve the ecological benefits for relevant protected matters	3.5.4, 4.5.4, 5.5.4
	i. for Black cockatoos, this must include details of the design, location and methods of installation and maintenance for 10 years following installation, of artificial hollows totalling at least 3 times the number of suitable nest hollows cleared under condition 1(a)(ii).	6
	d) a table of commitments made in the Offset Management Plan to achieve the ecological benefits for relevant protected matters, and a reference to where the commitments are detailed in the Offset Management Plan	2

Condition No.	Condition	Section of this Plan
	e) reporting and review mechanisms, and documentation standards that will be implemented to inform others annually regarding compliance with management and environmental commitments, and attainment and maintenance of the ecological benefits as specified in the Offset Management Plan	7.2, 8.3
	f) an assessment of risks to achieving the ecological benefits and what risk management strategies will be applied to address these	3.7, 4.7, 5.7
	g) a monitoring program, which must include:	
	i. evaluating evidence that effectively determine progress towards, attainment of and maintenance of the ecological benefits for the protected matters	3.6, 4.6, 5.6
	ii. measurable performance indicators to monitor attainment of the ecological benefits for the protected matters	3.6, 4.6, 5.6
	iii. trigger values for corrective actions	3.6, 4.6, 5.6
	iv. the timing and frequency of monitoring to detect trigger values and changes in the performance indicators	
	h) proposed corrective actions to ensure ecological benefits for the protected matters are attained or maintained if trigger values are reached or performance indicators not attained	
	i) links to referenced plans and applicable conditions of approval (including State approval conditions) if any.	1.5, 3.5.3, 4.5.3, 5.5.3

2 TABLE OF COMMITMENTS

In accordance with condition 18(d) of EPBC Act approval for EPBC 2019/8543, Table 2-1 presents a table of commitments made in this Plan to achieve the ecological benefits for MNES impacted by the Project (as outlined in Section 1.4), and a reference to where the commitments are detailed in this Plan.

Table 2-1. Table of commitments

Relevant MNES	Commitment	Section of this Plan
WRP	Offset A (Ducane Offset Area): Protection and conservation of 126 ha of WRP habitat	3
	Offset B (Lot 104 (North) Offset Area): Rehabilitation and management of 65 ha of WRP habitat	4
	Offset C (Ludlow Offset Area): Manage and rehabilitate 270 ha of habitat suitable for WRP	5
Black cockatoos	Offset B (Lot 104 (North) Offset Area): Rehabilitation and management of 49 ha of WRP habitat and black cockatoo foraging and potential nesting habitat	4
	Offset C (Ludlow Offset Area): Rehabilitation and management of 200 ha of black cockatoo foraging and potential nesting habitat	5
	Artificial Nest Hollows	6
Banksia Woodlands TEC	Offset A (Ducane Offset Area): Protection and conservation of 124.1 ha of Banksia Woodlands TEC vegetation	3
Tuart Woodlands TEC	Offset C (Ludlow Offset Area): Re-establishment of 37 ha of Tuart Woodlands TEC vegetation	5

Under the EPBC Act approval for EPBC 2019/8543, Main Roads is responsible for:

- Attaining the ecological benefits by the timeframes stated in Sections 3.4, 4.4, and 5.4
- Maintenance of the ecological benefits for the life of the approval (i.e. 50 years)
- For reporting against the requirements of Condition 18 of the EPBC Act approval for EPBC 2019/8543 and commitments specified in this Plan for the life of the approval.

3 OFFSET A – LOTS 153, 267 AND 268 DUCANE ROAD GELORUP

This chapter describes the 'Lots 153, 267 and 268 Ducane Road Gelorup' offset (Ducane Offset Area). The following sections identify:

- The offset being proposed (Section 3.1)
- The environmental attributes of the offset (Section 3.2)
- The protection mechanism for the offset (Section 3.3)
- The achievable ecological benefits (Section 3.4)
- Management and / or rehabilitation actions, including objectives, targets and completion criteria (Section 3.5)
- Monitoring (Section 3.6)
- Risk assessment (Section 3.7).

3.1 Identification of offset

Offset 1 comprises three adjoining land parcels, being Lots 153, 267 and 268 Ducane Road, Gelorup ('Ducane Offset Area'), which have a total area of 162.6 ha. The Ducane Offset Area is located 2 km east of the Project (Figure 2, Appendix A). The previous owner set aside 22.5 ha of the property under a Conservation Covenant through Section 30B of the *Soil and Land Conservation Act 1945*. The remaining 140.1 ha is proposed as Offset 1. The Ducane Offset Area contains approximately 140.1 ha of remnant native vegetation, of which approximately 124.1 ha comprises Banksia dominated woodlands. Wetland and dampland areas, representing Conservation and Resource Enhancement category wetlands, feature in the eastern third of the site. Lots 153, 267 and 268 are separated by fences from the surrounding agricultural land.

3.2 Environmental attributes of and threats to offset area

3.2.1 Attributes of offset area

The vegetation within the Ducane Offset Area was surveyed as part of the environmental assessment for this project. The studies conducted are listed in Table 3-1.

Table 3-1. Relevant baseline studies for the Ducane Offset Area

Study	Description
Vegetation assessment of Lots 153, 266, 267 & 268 Ducane Road (DBCA, 2010, 2018)	Vegetation assessed by DBCA to provide an indication of the vegetation and habitat value in regard to its potential for use as an environmental offset
Lots 153, 267 and 268 Ducane Road Banksia Woodlands TEC Assessment (Biota, 2021)	Survey objective was to determine the extent and condition of vegetation within the survey area that may be consistent with the Banksia Woodlands of the Swan Coastal Plain TEC
Targeted Fauna Survey: Lots 267, 268 and 153 Ducane Road, Gelorup (Biota, 2019)	Identifies fauna habitats present on site and reports the findings of a targeted on-ground search for significant fauna species
BORR offsets WRP rapid assessment (SW Environmental, 2022)	Rapid assessment survey to confirm the presence or absence of WRP within the Ducane Offset Area
Broadscale Dieback assessment of proposed offset sites for BORR (Terratree, 2022)	Broadscale assessment undertaken in accordance with the Dieback Interpreter Guidelines: FEM047 Phytophthora Dieback Interpreter's Manuel for lands managed by the department

Study	Description
Vegetation assessment of Lots 153, 266, 267 & 268 Ducane Road (DBCA, 2010, 2018)	Vegetation assessed by DBCA to provide an indication of the vegetation and habitat value in regard to its potential for use as an environmental offset
Information Request BORR South Offsets - Memo report (Biota, 2022)	Confirmation and compilation of information pertaining to parameters specified in the Habitat Quality Scoring

The Ducane Offset Area has been confirmed to contain the following values:

- 126 ha of WRP foraging, breeding and dispersal habitat
- 124.1 ha of Banksia Woodlands TEC.

TEC vegetation. The Ducane Offset Area comprises the following vegetation units. These comprise Banksia Woodland TEC as well as habitat for WRP (Figure 3, Figure 4, Appendix A).

- *Banksia attenuata* woodland with emergent *Eucalyptus marginata*
- *Banksia attenuata* woodland with *Banksia ilicifolia*
- *Banksia attenuata* woodland with *Agonis flexuosa*.

Vegetation on Lots 153, 267 and 268 was mapped as 'Very Good' (67 %) or 'Good' (33 %) condition (Biota, 2021), with most of the Banksia Woodland TEC occurrence rated as Very Good condition.

Vegetation condition. Two thirds of the TEC vegetation was mapped by Biota as being in Very good condition, with remainder was mapped as Good condition. Some small patches with signs of kangaroo disturbance and past grazing of the area by livestock were present that also had a greater number of weeds (Biota, 2021). No visual evidence of recent (i.e. within ten years) fire was recorded.

Dieback. Based on the results of a visual dieback assessment, the disease was not considered to be present however five positive results were returned from five samples collected for testing (Terratree, 2023). While the five samples taken returned positive results, the great majority of the TEC appears to be dieback free. Of the assessed Banksia vegetation¹, one hectare was assessed as 'moderate confidence Infested' and 117.7 ha was assessed as 'low confidence Uninfested' (Terratree, 2023).

WRP habitat. WRP foraging, breeding and dispersal habitat within the Ducane Offset Area is represented by two habitat types as mapped by Biota (Biota, 2019):

- 'Jarrah-Banksia woodland', described as dominating the large majority of the upland area of the offset area. When intact, the lower stratum of this habitat comprised a diverse heath; this was absent in heavily grazed areas
- 'Peppermint fringing wetland', an approximately 100 m wide stretch of woodland fringing the wetland in the southeast corner of the offset area.

These habitat types effectively overlap with the three vegetation types mapped as Banksia Woodlands TEC described above. Across all strata (ground layer, mid-storey and upperstorey), the habitat within the site provides for a high degree of arboreal movement of WRPs.

¹ Approximately 5.4 ha of the Banksia Woodland TEC vegetation was not included the assessment.

WRP observations. Evidence of WRPs was recorded within the Ducane Offset Area during Biota's field surveys, including direct WRP sightings and the observation of dreys and scats. With regard to sightings, a total of 41 individual WRPs were recorded from 34 observations (Biota, 2019) including four observations of mother with juvenile. The WRP density estimate for the offset area was 0.61 ± 0.11 WRPs per hectare.

3.2.2 Threats to offset area values

Kangaroo overgrazing and weed invasion. Recent studies have demonstrated that kangaroos can have a significant impact on conservation areas, especially through overgrazing. Prevention of grazing damage from overabundant kangaroos is specified as a priority management action in the Banksia Woodland TEC Approved Conservation Advice (TSSC, 2016). In 2023, Main Roads prepared a literature review that considered the key ecological impacts of overgrazing by kangaroos on terrestrial biodiversity, in particular ecological communities and fauna habitat, and the conservation benefits of kangaroo exclusion fencing to these communities (Main Roads Western Australia, 2023a).

The review drew on numerous studies, including seven that specifically included assessment of the effect of exclusion plots or exclusion fencing. All seven studies showed that kangaroo overgrazing resulted in deleterious effects on the conservation areas being assessed and that exclusion of kangaroos from these areas via fencing enabled recovery of the vegetation cover and thus biomass, as well as species richness and vegetation structural complexity (Main Roads Western Australia, 2023a).

The dominant threatening process identified by both DBCA (DBCA, 2010, 2018) and Biota (2021) in the Banksia vegetation was overgrazing by kangaroos. The second of the two key threatening process identified by DBCA in their 2018 assessment and also by Biota in their 2021 report, was invasion by annual weeds. This threat was noted as being linked to kangaroo overgrazing impacts, meaning that where overgrazing impacts were more prevalent, invasion by exotic species was also more prevalent and that in these areas, exotics were present at higher densities. An assessment of these reports shows that during the period 2010 to 2021, the Banksia vegetation within the Ducane Offset Area decreased in condition from 'Pristine to Excellent' across its entirety to a combination of 'Very good' and 'Good with some Degraded' condition. This is a significant loss of vegetation quality and habitat value in a relatively short period of time.

Due to potential negative outcomes on the wider kangaroo population as a result of the exclusion fencing and / or on individual kangaroos contained within an exclusion fence, DBCA's preferred management approach for the Ducane Offset Area in relation to overgrazing impacts is not fencing but kangaroo culling. Kangaroo culling via the engagement of professional shooters is currently occurring in the local area in response to grazing impacts on adjacent agricultural lands, however considering the decline in vegetation condition observed at the offset area, the current level of kangaroo control is not adequate to mitigate the overgrazing impact.

Unauthorised vehicle access. Unauthorised vehicle access to the Ducane Offset Area is not effectively limited due to a lack of effective gates and barriers. Access control is an effective tool for preventing a range of detrimental impacts to bushland caused by unauthorised vehicle access.

Introduced pest animals. No evidence of feral predators was recorded within the Ducane Offset Area during Biota's 2019 fauna survey (Biota, 2019). No evidence of rabbits was recorded during the fauna or flora and vegetation surveys (Biota, 2021). However, foxes, cats and rabbits are known

to be present in the general area (Biota, 2020a) and it is likely that they are present within, or may periodically visit, the site.

Fire. The risk of wildfire is a potential threat for the Ducane Offset Area. Wildfire has the potential to significantly reduce the fauna habitat extent and value and degrade the Banksia Woodland TEC vegetation. This is particularly the case if overgrazing by kangaroos occurs during the post-fire recovery period.

Phytophthora dieback. While vegetation within the offset area largely appears to be dieback-free, dieback was identified during a broadscale assessment conducted in December 2022 (Terratree, 2023).

3.3 Protection mechanism and management contribution

The properties are now owned by the State of Western Australia and managed for conservation purposes, providing protection and maintenance of ecological benefits in perpetuity, beyond the life of the approval. DBCA has indicated that the properties will be rezoned to Regional Open Space or Conservation and managed as part of the Conservation Estate.

Main Roads intends to manage the site for three years before handing management over to DBCA and is in the process of formalising this agreement and process with DBCA. DBCA are supportive of this approach. Main Roads will contribute management fees to DBCA to facilitate management of the site for 50 years post-approval. This management fee will be negotiated with DBCA. Main Roads will be responsible for reporting in accordance with the requirements of Condition 18 of the EPBC Act approval, for the period of EPBC Act approval.

3.4 Achievable ecological benefits

For the Ducane Offset Area, Main Roads has committed to achieving the following ecological benefits:

- For Banksia Woodlands TEC, within 20 years from commencement of the offset, vegetation condition achieves:
 - Improvement in vegetation condition such that areas mapped as Good condition in 2021 will improve to Very good and areas mapped as Very good in 2021 will improve to Excellent (according to the scale of Keighery (1994) in EPA (2016)).
- For WRPs, within 20 years from commencement of the offset, habitat quality achieves:
 - High (70-89 %) canopy continuity for WRP movement (upper and/or mid storey layer) including a high level of canopy connectivity to adjacent habitat²
 - Improving the extent of ground cover that provides shelter for WRP
 - Multiple individuals detected on site within last 2 years
 - Planned fire will only be for ecological purposes.
 - Evidence of a moderate density of WRP nests / dreys / hollows
 - Evidence of a lack of WRP predators
 - Controlling weed species and pests.

² Noting the requirement for firebreaks.

It should be noted that WRP density at the Ducane Offset Area is considered low at 0.61 ± 0.11 WRPs per hectare (Biota, 2019) and therefore a 'moderate density' of WRP nests / dreys / hollows must be interpreted in proportion to the low density of WRPs present at the site.

In addition to the above, Main Roads has committed to installing up to six black cockatoo Artificial Nest Hollows (ANHs) at the Ducane Offset Area (refer to Section 6).

3.5 Offset management

3.5.1 Management approach

Management of the Ducane Offset Area is based on the approach outlined in Table 3-2.

Table 3-2. Ducane Offset Area management approach

Management aspect	Description	Defined in
Objective	Aim of the Offset Area	Table 3-3
Target	Specific goal identified for the Offset Area	
Completion criteria	Measurable outcomes identified for the Offset Area	
Management actions	Actions to be taken to achieve stated objective, targets and completion criteria, including timing	Table 3-5
Monitoring program	Assessment of progress towards achievement of objective, targets or completion criteria	Table 3-6
Performance indicator	Variable that allows for measurable assessment of progress towards achievement of objective, targets or completion criteria	
Trigger value	Measurable event in any assessed parameter that indicates achievement of the objective, targets or completion criteria may be at risk	
Corrective actions	Action(s) to be taken in response to a trigger value being reached	
Reporting	Documentation of progress towards achievement of the objective, targets or completion criteria and any non-compliances that may have occurred	
Risk assessment	Consideration and appraisal of risks that may impede achievement of the objective, targets or completion criteria	Table 3-7
Risk management strategies	Actions to be taken to manage and/or mitigate identified risks	

3.5.2 Objectives, targets and completion criteria

Table 3-3 sets out the objectives, targets and completion criteria for the Ducane Offset Area that have been developed to ensure achievement of the ecological benefits stated in Section 3.4. Site management for long term conservation will include fencing and access management, weed control, firebreaks and feral and pest animal control to maintain / improve habitat quality. The completion criteria will be assessed annually during compliance reporting and must be maintained for the life of the approval (i.e. 50 years).

Table 3-3. Objective, targets and completion criteria for the Ducane Offset Area

Objective	Target	Completion criteria
Counterbalance significant residual impacts to habitat supporting WRP	Conserve and manage 126 ha of WRP habitat	<p>Within 20 years from commencement of the offset, habitat quality achieves:</p> <ul style="list-style-type: none"> • High (70-89 %) canopy continuity for WRP movement (upper and/or mid storey layer) including a high level of canopy connectivity to adjacent habitat³ • Improving the extent of ground cover that provides shelter for WRP • Multiple WRP individuals detected on site • Planned fire will only be for ecological purposes. • Evidence of a moderate density of WRP nests / dreys / hollows • Evidence of a lack of WRP predators • Weeds and pests controlled to the extent necessary to achieve the ecological benefits stated in Section 3.4.
Counterbalance impacts to black cockatoo potentially suitable nesting hollows	Install artificial nesting hollows for black cockatoos	Installation and maintenance of a portion of up to six artificial nesting hollows for black cockatoos required under EPBC Act approval for EPBC 2019/8543 condition 18(c)(i) ⁴
Counterbalance significant residual impacts to Banksia Woodlands TEC	Conserve and manage 124.1 ha of Banksia Woodlands TEC	Within 20 years from commencement of the offset, vegetation condition achieves improvement in vegetation condition such that areas mapped as Good condition in 2021 will improve to Very good and areas mapped as Very good in 2021 will improve to Excellent (according to the scale of Keighery (1994) in EPA (2016)).

These objectives will be achieved through the implementation of the active management practices detailed in Section 3.5.4.

3.5.3 Consistency with recovery plans

The objectives and targets in Table 3-3 are consistent with the objectives of relevant guidance, including but not limited to recovery plans or area management plans. Of the values being offset by the Ducane Offset Area, WRP and black cockatoos have associated recovery plans or guidances.

WRP

The activities within this Plan are consistent with the objectives of the *Western Ringtail Possum* (*Pseudocheirus occidentalis*) *Recovery Plan* (DBCA, 2017) to mitigate threatening processes that are constraining the recovery of WRPs (Table 3-4).

³ Noting the requirement for firebreaks.

⁴ Baseline studies indicated 11 suitable DBH trees with hollows potentially suitable for nesting by black cockatoos are present within the clearing area. EPBC Act approval for EPBC 2019/8543 condition 18(c)(i) requires installation of artificial hollows totalling at least three times the number of suitable nest hollows cleared. Clearing has been conducted in two stages between 2022 and 2023 and at the time of preparation of this Plan, was not complete. The number of potentially suitable nest hollows cleared cannot be confirmed until clearing has been completed.

Banksia Woodlands TEC

The activities within this Plan are consistent with both the 'protect' and 'restore' conservation actions listed in the *Approved Conservation Advice (incorporating listing advice) for the Banksia Woodlands of the Swan Coastal Plain ecological community* (TSSC, 2016) as described in Table 3-4.

Table 3-4. Consistency of activities at the Ducane Offset Area with relevant recovery plans

Objective and action themes from recovery plan / conservation advice	Activities undertaken within this Plan
WRP	
Threatening processes that are constraining the recovery of WRPs are mitigated	<ul style="list-style-type: none"> • Creation of ha of WRP habitat • Weed control and feral animal control
Banksia Woodlands TEC	
Protect the ecological community to prevent further loss of extent and condition	<ul style="list-style-type: none"> • Protecting and placing 124.1 ha of Banksia Woodlands TEC vegetation into the conservation estate to be managed for conservation
Restore the ecological community within its original range by active abatement of threats, re-vegetation and other conservation initiatives	<ul style="list-style-type: none"> • Fencing, weed control, feral animal control and rubbish removal • Targeted revegetation if required (see Section 3.5.4)

3.5.4 Management activities and timeframes

To achieve and maintain the ecological benefits stated in Section 3.4, Main Roads will undertake the following management activities:

- Kangaroo control to mitigate overgrazing impacts
- Installation of barriers to manage unauthorised vehicle access
- Pest animal control (foxes, feral cats and rabbits)
- Selective weed control to improve vegetation condition and habitat quality
- Fire management
- *Phytophthora* dieback management
- Revegetation, if natural regeneration is not occurring at a pace required to achieve the ecological benefit within the stated 20 year timeframe and / or to maintain the ecological benefit.

These are further described below.

Vehicle access management. To restrict vehicle access to the site, in consultation with DBCA, reinforced fencing, heavy duty gates and additional barriers such as boulders or steel roadside barriers will be installed along key boundaries and at potential access points.

Kangaroo overgrazing management. To address overgrazing impacts within the Ducane Offset Area, a culling program comprising two shooting rounds throughout the year at approximately six month intervals will be undertaken in coordination with the activities of local landholders. The emphasis of the culling program will be on reducing population size by culling both males and females, rather than just heavy weight large males. Additional culling will be conducted if the vegetation monitoring results are showing a decline or failure to attain the desired vegetation condition, or if the annual kangaroo count does not show a decline in population size despite the culling effort.

If after five years of adaptive management of the expanded shooting program (as outlined above), vegetation condition is not trending towards achievement of the committed ecological benefit to

be achieved (within 20 years from commencement of the offset), fencing to exclude kangaroos may be considered in order to ensure the ecological benefit is achieved.

Artificial nesting hollows. Artificial nesting hollows for black cockatoos will be installed in consultation with DBCA and according to DPaW guidance *How to design and place artificial hollows for Carnaby's Cockatoo* (DPaW, 2015). Up to six artificial nesting hollows for black cockatoos required under EPBC Act approval for EPBC 2019/8543 condition 18(c)(i) will be installed within the black cockatoo habitat at the Ducane Offset Area.

Pest animal control. As required based on site observations (i.e. observation of evidence of recent (~>2 months old) presence via scats, tracks, diggings or the taking of baits (as relevant)):

- Commencing in autumn 2024, rabbit baiting using a combination of Rabbit Haemorrhagic Disease Virus (RHDV) and Pindone will be undertaken annually from spring through to late autumn where rabbit impacts are noted as having a detrimental impact to native vegetation
- Commencing in autumn 2024, fox baiting using 1080 (sodium fluoroacetate) and / or trapping will be undertaken annually during late winter through to autumn
- Commencing in autumn 2024, feral cats will be targeted using cage traps set in areas where cat activity has been identified during monitoring.

Autumn monitoring is ideal as areas dry out and less food is available, therefore bait take is higher. Also tracks are easier to detect as biomass cover is lower and there is more bare ground. At this time of year, there are also more young animals dispersing from the den.

Selective weed control. Weed control comprising spot spraying of WONS and Declared weed species will be undertaken twice per year for years 1 and 2 (in spring, autumn) and annually thereafter, as required based on site observations. Control of environmental weeds such as annual grasses will be undertaken where they are impacting revegetation / rehabilitation activities and natural regeneration, or if required to attain the desired ecological benefit.

Phytophthora dieback management. Main Roads standard *Phytophthora* dieback management measures (Main Roads Western Australia, 2019) will be applied during the construction and maintenance of firebreaks and fences and weed control activities. These are applicable to all offset areas included in this Plan regardless of the whether the offset comprises protection and management of existing vegetation / habitat or revegetation / restoration of habitat.

Fire. Firebreaks have been installed and will be maintained to the required standard to assist in the mitigation of fire.

Targeted revegetation. Main Roads will undertake targeted planting and / or direct seeding to supplement natural regeneration if by 2028, the rate of natural regeneration and subsequent improvement in vegetation condition is not considered sufficient to achieve the longer term ecological benefit. Revegetation would comprise native species that would naturally occur in FCT21a, as comprises this occurrence of Banksia Woodland TEC. The revegetation species list will be compiled from records taken during the flora and vegetation survey (Biota, 2021), included in Appendix C. DBCA has provided input regarding the species to be used in the revegetation, and have agreed to the following species being included as a minimum, where commercially available:

- *Eucalyptus marginata*
- *Adenanthos meisneri*
- *Agonis flexuosa*
- *Banksia attenuata*

- *Banksia ilicifolia*
- *Calytrix fraseri*
- *Melaleuca thymoides*
- *Phlebocarya ciliata*
- *Stirlingia latifolia*

Rubbish removal. Rubbish will be removed from the site opportunistically to improve vegetation condition and limit the attraction of pest animals.

Table 3-5 details the timing and frequency of management actions required to achieve the ecological benefits.

Table 3-5. Ducane Offset Area management actions and timeframes

Activity	Actions	Timeframe and frequency	Status
Unauthorised vehicle access	Install gates and other barriers such as boulders, steel roadside barriers to restrict vehicle access	<ul style="list-style-type: none"> • Installation late 2023 • Ongoing twice-yearly inspections 	Commencing late 2024
Artificial nesting hollows	Install up to six artificial nesting hollows	<ul style="list-style-type: none"> • Installation winter 2023 • Ongoing annual inspections 	Commencing winter 2023
Fire management	Maintain 3 m wide firebreak around the offset area boundary	<ul style="list-style-type: none"> • Firebreaks were re-instated in 2020 • Ongoing annual inspections 	Maintenance ongoing
Kangaroo control	Kangaroo control using shooting	Twice-yearly at six-month intervals for years 1-5 with additional culling if required, annually thereafter based on site observations of grazing impact	Commencing spring 2024
Pest animal control	Fox control using 1080 baiting	Annually in late winter to autumn based on site observation of fox presence	Commencing late winter 2024
	Rabbit control using Rabbit Haemorrhagic Disease Virus (RHDV) and Pindone	Annually in spring to autumn based on site observation of rabbit presence	Commencing spring 2024
	Feral cat control using trapping	Annually in spring to autumn based on site observation of cat presence	Commencing autumn 2024
Weed control	Conduct baseline weed survey	Spring 2023	Commencing spring 2023
	Ongoing selective weed control program	Twice-yearly in spring and autumn or as required for years 1 and 2, annually thereafter based on site observations of weed cover	Commencing spring 2024
Targeted revegetation	Undertake site preparation, planting/seeding, mulching	Annually from 2028 as required based on the progress of natural regeneration	Commencing 2028 if required

3.6 Monitoring

Monitoring will be conducted at the Ducane Offset Area to enable early detection of changes that may lead to trigger values being reached and the measurement of progress towards completion criteria.

Monitoring will comprise of five methods:

- Visual inspection (via driving/walking meander) conducted for: firebreaks, gates / barriers, black cockatoo ANHs. May also be used for evidence of pest animal presence.
- Line-transect survey conducted for: WRP nests / dreys / hollows, evidence of pest animals
- Assessment of floristic quadrats conducted for: species diversity, percent ground cover, canopy continuity, weed cover, natural regeneration, vegetation condition
- Aerial drone survey conducted for: canopy continuity, vegetation cover and structure
- Strip and / or distance sampling conducted for: WRP distribution and density (nocturnal survey), and kangaroo population density.

These are described below.

Visual inspection. Involves visually assessing the factor being monitored for condition and maintenance requirements. May be undertaken via driving (such as driving the boundary to check fences) or walking meander survey (such as to opportunistically record evidence of pest animal presence)

Line-transect survey. Approximately 20 m wide line-transects with centrelines spaced approximately 75 m apart. Each transect walked by one suitably experienced observer. WRP nests / dreys / hollows observed along the transects to be recorded, along with evidence of pest animal presence.

Floristic quadrats. Installation and assessment of 10 x 10 m floristic quadrats established as per the guidance provided in EPA (2016). Canopy continuity assessment will be conducted via both quadrats and drone imagery analysis in 2023 (baseline) and 2026. After this time, the effectiveness of the drone imagery analysis to determine canopy continuity will be assessed. If the drone imagery analysis method is effective to measure this parameter, it will be removed from the quadrat assessment from 2026 onward. If the drone imagery analysis is not effective at measuring canopy continuity, this parameter will continue to be determined via quadrat assessment for the duration of the monitoring program.

Aerial drone survey. Capture and subsequent analysis of aerial photography via drone.

Strip and / or distance sampling. Repetition of methodology implemented by Biota (2019). Field survey (nocturnal forWRP) via line-transect distance sampling. Transects spaced at approximately 75 m intervals with each transect walked by one suitably experienced observer using a high-powered head torch.

Kangaroo control monitoring detail

With specific regard to the kangaroo population monitoring, to determine the adequacy and effectiveness of the culling program, monitoring of the kangaroo population, vegetation condition (including native species and bare earth cover) and species diversity will be undertaken.

A baseline population estimate will be conducted in spring 2023. Population estimates will be conducted annually to track population dynamics and inform the frequency of shooting rounds. Vegetation condition and species diversity will be determined via assessment of 10 x 10 m floristic quadrats. Ten quadrats will be installed in vegetation central to the offset area (where grazing impacts are potentially lower) and ten quadrats installed in vegetation at the periphery (where grazing impacts are expected to be higher). Quadrats will be assessed for vegetation condition and grazing impact (native and weed species biomass, evidence of growth of individual plants and / or

juvenile plants, and bare earth cover) annually in late summer, when grazing pressure is expected to be highest. Every five years, species diversity and the impact of grazing on reproductive capacity (by loss of flowers thus preventing seed formation and seed set) will also be measured via additional assessment of quadrats in winter / spring.

If, in the first five years of the expanded shooting program, if any of the following are recorded during a monitoring phase, the frequency of shooting rounds will be increased:

- Vegetation condition has not improved on the previous year's data
- Native species cover has not improved on the previous year's data
- The kangaroo population has not declined by at least 5 % on the previous year's data.

If after five years, the control method is not sufficient to reduce kangaroo population to a level enabling achievement of the ecological benefits, consultation with DBCA will be undertaken regarding the installation of kangaroo-proof fencing.

Little data is available on the impacts of kangaroo culling for conservation in southwest WA, and what the target density of kangaroos may be for vegetation conservation purposes however a study conducted by Gordon et al. (Gordon, 2021) in the Australian Capital Territory indicated that in woodland or open forest vegetation (such as that at the Ducane Offset Area) a density of between 0.1 and 0.5 kangaroos per hectare might be appropriate.

Monitoring will be undertaken as outlined in Table 3-6, which also specifies trigger values and corrective actions to be taken should these values be reached.

3.7 Risk management

Potential risks to the successful implementation of this offset and achievement of the objectives in Section 3.5.2 are set out in Table 3-7 along with potential strategies for mitigating risks. The risk assessment was conducted based on information determined through biophysical surveys undertaken for the Project to date and on Main Roads experience in previous conservation and rehabilitation projects in the vicinity of the Project and more broadly.

Table 3-6. Ducane Offset Area monitoring program

Parameter	Performance indicator	Methodology	Frequency and timing	Trigger value	Corrective action	Reporting
Unauthorised vehicle access						
Gates / barriers condition	Presence of gates and/or barriers along key boundaries and at potential access points	Visual inspection of gates / barriers	Annually commencing spring 2025	Gates / barriers not intact or to specifications	<ul style="list-style-type: none"> Investigate cause and raise incident report Implement corrective actions which may include: <ul style="list-style-type: none"> Review practicality of fencing design and structure Undertake repair / modification of fence as required Improve personnel training and education Review monitoring frequency and method Monitor outcomes. 	Report annually as part of annual compliance reporting
Firebreaks						
Firebreak condition	Condition of firebreaks	Visual inspection of firebreaks	Annually commencing 2024	Firebreaks not to required standard	<ul style="list-style-type: none"> Investigate cause and raise incident report Implement corrective actions which may include: <ul style="list-style-type: none"> Review practicality of firebreak network Undertake firebreak modification and maintenance as required Improve personnel training and education Review monitoring frequency and method Monitor outcomes. 	Report annually as part of annual compliance reporting
Pest animal control						
Kangaroo population	Population estimate	Strip and / or distance sampling or otherwise as advised by consulting zoologist	Annually in spring commencing 2024 (baseline)	At year 3, kangaroo population not reduced by at least 15 % of baseline	<ul style="list-style-type: none"> Investigate cause and raise incident report Implement corrective actions which may include: <ul style="list-style-type: none"> Review practicality of control Increase frequency of control Improve personnel training and education Review monitoring frequency and method If after five years, control method is not sufficient to reduce kangaroo population to a level enabling achievement of ecological benefits, liaison with DBCA regarding installation of kangaroo-proof fencing will be initiated Monitor outcomes. 	Report annually as part of annual compliance reporting
	Evidence of kangaroo grazing impacting plant growth and / or natural regeneration, vegetation condition and bare earth cover	Field survey (walking meander and 10 m x 10 m floristic quadrats) for visual evidence of kangaroo grazing impacts	Annually in late summer. Every five years, quadrats also scored in late winter / spring for spp. diversity and flowering	Vegetation recovery and / or natural regeneration not occurring at a rate sufficient to achieve the stated ecological benefits within 20 years		

Parameter	Performance indicator	Methodology	Frequency and timing	Trigger value	Corrective action	Reporting
Pest animal control cont.						
Fox, cat and rabbit presence	Evidence of recent (<2 months old) fox or rabbit presence	Field survey for visual evidence of fox or rabbit presence	Annually in autumn commencing 2024	Visual evidence of recent fox or rabbit activity detected (e.g. scats, diggings)	<ul style="list-style-type: none"> Investigate cause and raise incident report Implement corrective actions which may include: <ul style="list-style-type: none"> Undertake baiting and / or trapping monthly until no fresh visual evidence is observed for two consecutive months Review monitoring frequency and method Monitor outcomes. 	Report annually as part of annual compliance reporting
WRP						
Canopy continuity	Percentage of canopy continuity (upper and/or mid storey layer)	Field survey (walking meander and 10 m x 10 m floristic quadrats)	Three-yearly commencing in 2023 (baseline) until High (70-89 %) canopy continuity achieved	At year six, or any monitoring period thereafter, averaged across quadrats, combined cover across upper and / or mid storey layer is less than 60 %	<ul style="list-style-type: none"> Investigate cause and raise incident report Implement corrective actions which may include: <ul style="list-style-type: none"> Review and modify as required kangaroo and pest animal control program Review and modify as required weed control program Undertake targeted revegetation as required For the number of nests / dreys / hollows, investigate WRP population trends within the site to determine whether there is a corresponding reduction in WRP observations. Regional WRP populations trends may also be investigated if required to qualify the cause of the reduction in the number of nests / dreys / hollows Improve personnel training and education Review monitoring frequency and method Monitor outcomes. 	Report annually as part of annual compliance reporting
Canopy continuity, vegetation cover and structure	Average canopy continuity across upper and / or mid storey layers Vegetation cover and structure	Drone footage (3D imagery)	Three-yearly in autumn or spring commencing 2024 (baseline)	At year six, or any monitoring period thereafter, averaged across quadrats, combined cover across upper and / or mid storey layer is less than 60 %.		
Groundcover layer cover	Percentage cover of native groundcover species	Field survey (walking meander and 10 m x 10 m floristic quadrats)	Three-yearly in late summer commencing in 2024 (baseline)	At year six or any monitoring period thereafter, native species cover averaged across groundcover layer has not increased over baseline		
Nest / drey / hollow density	Number of nests / dreys / hollows ha	Field survey (gridline survey) to record nests / dreys / hollows	Three-yearly in October / November commencing in 2023 (baseline)	WRP nest / drey / hollow density is more than 50 % lower than baseline (with baseline considered moderate for this low density WRP population)		

Parameter	Performance indicator	Methodology	Frequency and timing	Trigger value	Corrective action	Reporting
WRP cont.						
WRP presence	WRP observations	Nocturnal field survey (strip and / or distance sampling or otherwise as advised by consulting zoologist)	Three-yearly in October / November commencing in 2023 (baseline)	Only one WRP individual recorded during field surveys in any given year	<ul style="list-style-type: none"> Investigate cause and raise incident report Implement corrective actions which may include: <ul style="list-style-type: none"> Review and modify as required kangaroo and pest animal control program Review and modify as required weed control program Undertake targeted revegetation as required Improve personnel training and education Review monitoring frequency and method Monitor outcomes. 	Report annually as part of annual compliance reporting
Black Cockatoo						
Black cockatoo ANHs	Condition of ANHs Evidence of investigation and / or use of ANHs	Visual inspection of ANHs	Annually in summer / autumn commencing one year after installation	ANHs not in place or in need of maintenance or repair	<ul style="list-style-type: none"> Investigate cause and raise incident report Implement corrective actions which may include: <ul style="list-style-type: none"> Re-install, repair and / or maintain ANH(s) Review monitoring frequency and method Monitor outcomes. 	Report annually as part of annual compliance reporting
Banksia Woodland TEC vegetation						
Condition	Condition of vegetation assessed against EPA (2016)	Field survey (walking meander and 10 m x 10 m floristic quadrats)	Every five years in spring commencing spring 2023 (baseline, noting that data from previous surveys may also be used to inform baseline)	At year five or any monitoring period thereafter: <ul style="list-style-type: none"> When averaged across quadrats placed in vegetation classed as 'Good' at baseline, vegetation condition is not showing signs of improvement over baseline When averaged across quadrats placed in vegetation classed as 'Very good' at baseline, vegetation condition is not showing signs of improvement over baseline 	<ul style="list-style-type: none"> Investigate cause and raise incident report Implement corrective actions which may include: <ul style="list-style-type: none"> Review and modify as required kangaroo and rabbit control program Review and modify as required weed control program Undertake targeted revegetation Improve personnel training and education Review monitoring frequency and method Monitor outcomes. 	Report annually as part of annual compliance reporting

Parameter	Performance indicator	Methodology	Frequency and timing	Trigger value	Corrective action	Reporting
Banksia Woodland TEC vegetation cont.						
Weed species distribution and diversity	Presence and distribution (location) of weeds impacting natural regeneration	Field survey (walking meander and 10 m x 10 m floristic quadrats and opportunistic recording)	Annually in spring for five years, every two years thereafter commencing spring 2023 (baseline)	Weed cover negatively impacting natural regeneration or revegetation	<ul style="list-style-type: none"> • Investigate cause and raise incident report • Implement corrective actions which may include: <ul style="list-style-type: none"> - Review and modify as required kangaroo and rabbit control program - Review and modify as required weed control program - Undertake targeted revegetation - Improve personnel training and education - Review monitoring frequency and method • Monitor outcomes 	Report annually as part of annual compliance reporting
Natural regeneration	Presence of regeneration of understorey and overstorey species, particularly in areas mapped by Biota as Degraded (2021)	Field survey (walking meander and 10 m x 10 m floristic quadrats and opportunistic recording)	Annually in late summer for five years, every two years thereafter commencing spring 2023 (baseline)	Natural regeneration not occurring at a rate sufficient to achieve the stated ecological benefits within 20 years		

Table 3-7. Ducane Offset Area offset implementation risk and mitigation strategies

Objective: Counterbalance significant residual impacts to habitat supporting WRP and to Banksia Woodlands TEC					
Key environmental values: WRP individuals and habitat and Banksia Woodlands TEC					
Environmental objective	Risk	Pre control risk assessment	Management approach and controls	Post control risk assessment	Monitoring approach
Long term security of tenure	Security of tenure is not secure	Likelihood: Possible Consequence: High Risk outcome: Medium	<ul style="list-style-type: none"> The Ducane Offset Area is owned by the State of Western Australia and is therefore in secure tenure The properties are currently zoned rural under the Greater Bunbury Region Scheme (GBRS). DBCA has indicated that the properties will be rezoned to Regional Open Space or Conservation under the scheme in the future and managed as part of the Conservation Estate Funding provided for management actions (refer to Section 3.5.4). 	Likelihood: Unlikely Consequence: Minor Risk outcome: Low	<ul style="list-style-type: none"> Assessment of land zoning Assessment of management funding resources.
Implementation of management and monitoring actions	Management actions not implemented	Likelihood: Possible Consequence: High Risk outcome: Medium	<ul style="list-style-type: none"> Main Roads required to comply with requirements of EPBC 2019/8543, including implementation of management actions (refer to Section 3.5.4) within this Plan Main Roads required to report annually to CEO on compliance with this Plan, including implementation of management actions. 	Likelihood: Unlikely Consequence: Moderate Risk outcome: Low	<ul style="list-style-type: none"> Annual audit conducted to ensure management actions have been implemented
Achievement of completion criteria	Failure to achieve completion criteria	Likelihood: Possible Consequence: Moderate Risk outcome: Medium	<ul style="list-style-type: none"> Re-assess completion criteria (refer to Section 3.5.2) 12 months after failure and continue to assess until completion criteria are met Review management actions and / or completion criteria in accordance with the review provisions for this Plan if management actions are no longer feasible, completion criteria are no longer attainable or other extenuating circumstances arise. 	Likelihood: Unlikely Consequence: Moderate Risk outcome: Low	<ul style="list-style-type: none"> Monitor progress toward achieving completion criteria over time through annual audits (refer to Section 3.6 for monitoring detail)

4 OFFSET B – LOT 104 (NORTH) WILLINGE DRIVE DAVENPORT

This chapter describes the 'Lot 104 (North) Willinge Drive Davenport' offset. The following sections identify:

- The offset being proposed (Section 4.1)
- The environmental attributes of the offset (Section 4.2)
- The protection mechanism for the offset (Section 4.3)
- The achievable ecological benefits (Section 4.4)
- Management and / or rehabilitation actions, including objectives, targets, completion criteria, monitoring and risk management (Section 4.5)
- Monitoring (Section 4.6)
- Risk assessment (Section 4.7).

4.1 Identification of offset

Lot 104 (North) Willinge Drive, Davenport, (Lot 104 North Offset Area) is owned freehold by the Commissioner of Main Roads and was purchased as a potential sand source and environmental offset site. Lot 104 is zoned rural under the GBR.

The Lot 104 North Offset Area comprises a 65 ha portion of the northern and central portions of the property, bound to the west by the Preston River, to the south by an ephemeral water course and to the east by Willinge Drive (Figure 5, Appendix A).

4.2 Environmental attributes of offset area

4.2.1 Attributes of offset area

Historic farming practices has resulted in the removal of the majority of native vegetation at the Lot 104 North Offset Area. The majority of the property was previously the used as a commercial Blue Gum plantation, with the timber harvested in 2017. The offset area is predominantly cleared apart from some vegetated sections of an ephemeral watercourse that crosses the property from east to west.

Main Roads proposes to rehabilitate and revegetate a 65 ha portion of the property to provide 65 ha of foraging, breeding and dispersal habitat for WRP incorporating 49 ha of foraging and potential habitat for black cockatoos. Revegetation flora species will be selected to provide habitat and foraging vegetation suitable for these fauna species and will be based on site parameters. This reflects the approach for similar offset revegetation works by Main Roads in the region. Ongoing site management for long term conservation (i.e. the life of the approval) will include fencing and access management, weed control, firebreaks and feral animal control to maintain / improve habitat quality.

The Lot 104 North Offset Area abuts the Preston River to the west. The riparian woodland of the Preston River represents a habitat linkage for fauna. The riverine woodland provides a corridor to a number of widely separated reserve areas occurring outside the vicinity of the Offset Area (e.g. Manea Park and Franklandia Nature Reserve) (Biota, 2019). The riparian vegetation along the adjacent Preston River has been shown to support a population of WRP (Biota, 2019), and evidence of all three species of black cockatoo has been recorded in the vicinity (GHD, 2014). The portions of

the Lot 104 North Offset Area that comprise the 49 ha black cockatoo offset are shown in Figure 6 (Appendix A).

4.2.2 Threats to offset area values

The Lot 104 North Offset Area is currently predominantly devoid of native vegetation and habitat for WRP and black cockatoos, therefore has no present value for the MNES considered under this Plan.

4.3 Protection mechanism and management contribution

Both the northern and central portions of Lot 104 Willinge Drive, Davenport that comprise the Lot 104 North Offset Area are owned freehold by the Commissioner of Main Roads. The property was purchased in 2014 as a potential sand source and environmental offset site. The property is currently managed by Main Roads for conservation purposes and will continue to be so, ensuring the protection and maintenance of ecological benefits in perpetuity, beyond the life of the approval.

The Lot 104 North Offset Area is currently zoned Rural under the GBRS. Main Roads will request the Western Australian Planning Commission to rezone the property from the current zoning of Rural to Regional Open Space or Conservation.

Main Roads will fund the rehabilitation of the Lot 104 North Offset Area and discuss long term management options with DBCA and the City of Bunbury. Until an alternative management structure is in place, Main Roads will maintain ownership and fund and manage the property. Should the land tenure or on-going management responsibilities change, Main Roads will develop a funding agreement with the land manager to address ongoing management costs for the balance of EPBC Act approval. Main Roads will fund management of the Lot 104 North Offset Area for the purposes of conservation for the life of the of approval (i.e. 50 years).

4.4 Achievable ecological benefits

For the Lot 104 North Offset Area, Main Roads has committed to achieving the following ecological benefits:

- For WRPs, the creation and management of 65 ha of diverse foraging, breeding and dispersal habitat within 20 years from commencement of the offset, within which habitat quality achieves:
 - High (70-89 %) canopy cover and canopy continuity for WRP movement (upper and/or mid storey layer)
 - Establishing continuous connected vegetation to the Preston River riparian corridor
 - Establishing ground cover that provides shelter for WRPs
 - Establishing a resident population of WRPs that is evidenced by the presence of individuals of varying age classes (juvenile, sub-adult, adult) in any year
 - Attaining a moderate density of WRP nests / dreys / hollows
 - Planned fire will only be for ecological purposes
 - Controlling weed and pest species.

- For black cockatoos, creation and management of at least 49 ha of diverse foraging and potential breeding habitat within 20 years from commencement of the offset, within which habitat quality achieves:
 - Banksia and eucalypt woodlands, which have at least 40 % projected foliage cover, that contain suitable foraging tree species for each of the three species of black cockatoos.

4.5 Offset management

4.5.1 Management approach

Management of the the Lot 104 North Offset Area is based on the approach outlined in Table 4-1.

Table 4-1. Lot 104 North Offset Area management approach

Management aspect	Description	Defined in
Objective	Aim of the Offset Area	Table 4-2
Target	Specific goal identified for the Offset Area	
Completion criteria	Measurable outcomes identified for the Offset Area	
Management actions	Actions to be taken to achieve stated objective, targets and completion criteria, including timing	Table 4-4
Monitoring program	Assessment of progress towards achievement of objective, targets or completion criteria	Table 4-5
Performance indicator	Variable that allows for measurable assessment of progress towards achievement of objective, targets or completion criteria	
Trigger value	Measurable event in any assessed parameter that indicates achievement of the objective, targets or completion criteria may be at risk	
Corrective actions	Action(s) to be taken in response to a trigger value being reached	
Reporting	Documentation of progress towards achievement of the objective, targets or completion criteria and any non-compliances that may have occurred	
Risk assessment	Consideration and appraisal of risks that may impede achievement of the objective, targets or completion criteria	Table 4-6
Risk management strategies	Actions to be taken to manage and/or mitigate identified risks	

4.5.2 Objectives, targets and completion criteria

Table 4-2 sets out the objectives, targets and completion criteria for the Lot 104 North Offset Area that have been developed to ensure achievement of the ecological benefits stated in Section 4.4.

Site management for long term conservation will include fencing and access management, weed control, firebreaks, feral animal control and rehabilitation to establish and maintain fauna habitat. The completion criteria will be assessed annually during compliance reporting and must be maintained for the life of the approval (i.e. 50 years).

Table 4-2. Objective, targets and completion criteria for the Lot 104 North Offset Area

Objective	Target	Completion criteria
Counterbalance significant residual impacts to habitat supporting WRPs	Rehabilitate and manage 65 ha of WRP habitat	<p>Within 20 years from commencement of the offset, habitat quality achieves:</p> <ul style="list-style-type: none"> • High (70-89 %) canopy continuity for WRP movement (upper and/or mid storey layer) including continuous vegetation connectivity to adjacent Preston River riparian habitat⁵ • Ground cover that provides shelter for WRP • A resident population of WRPs that is evidenced by the presence of individuals of varying age classes (juvenile, sub-adult, adult) in any year • Planned fire will only be for ecological purposes. • Evidence of a moderate density of WRP nests / dreys / hollows • Weeds and pests controlled to the extent necessary to achieve the ecological benefits stated in Section 4.4.
Counterbalance significant residual impacts to habitat supporting black cockatoos	Rehabilitate and manage 49 ha of black cockatoo habitat	<p>Within 20 years from commencement of the offset, habitat quality achieves:</p> <ul style="list-style-type: none"> • Banksia and eucalypt woodlands to have at least 40 % projected foliage cover and contain suitable foraging tree species for each of the three species of black cockatoos.

4.5.3 Consistency with recovery plans

The objectives and targets in Table 4-2 are consistent with the objectives of relevant guidance, including but not limited to recovery plans or area management plans. All of the values being offset by the Lot 104 North Offset Area have associated recovery plans or guidances.

WRP

The activities within this Plan are consistent with the objectives of the *Western Ringtail Possum* (*Pseudocheirus occidentalis*) *Recovery Plan* (DBCA, 2017) to mitigate threatening processes that are constraining the recovery of WRPs (Table 4-3).

Carnaby's Cockatoo

The activities within this Plan are consistent with the objectives of the *Carnaby's Cockatoo* (*Calyptorhynchus latirostris*) *Recovery Plan* (DPAW, 2013) to stop further decline in the distribution and abundance of Carnaby's Cockatoo by protecting the birds and enhancing their habitat critical for survival. The recovery plan also recommends the maintaining or increasing the area of non-breeding feeding habitat and night roosts by planting areas of native vegetation (Table 4-3).

Baudin's Cockatoo

The activities within this Plan are consistent with the objectives of the *Baudin's Cockatoo* (*Calyptorhynchus baudinii*) *Recovery Plan* (DEC, 2008) to stop further decline in the distribution and abundance of Baudin's Cockatoo by protecting the birds and enhancing their habitat critical for survival. The Commonwealth conservation advice (TSSC, 2018) also lists habitat restoration as a key objective (Table 4-3).

⁵ Noting the requirement for firebreaks.

Forest Red-tailed Black Cockatoo

The activities within this Plan are consistent with the objective of the *Forest Red-tailed Black Cockatoo Recovery Plan* (DEC, 2008) and Approved Conservation Advice (DEWHA, 2009) to stop further decline in the breeding populations of the black cockatoo and to ensure their persistence throughout their range in the southwest of Western Australia (Table 4-3).

Table 4-3. Consistency of activities at the Lot 104 North Offset Area with relevant recovery plans

Objective and action themes from recovery plan / conservation advice	Activities undertaken within this Plan
WRP	
Threatening processes that are constraining the recovery of WRPs are mitigated	<ul style="list-style-type: none"> • Creation of 65 ha of WRP habitat • Firebreaks, fencing, weed control, feral animal control and rubbish removal
Carnaby's Cockatoo	
Implement management to protect and improve the condition of breeding habitat and associated feeding habitat, including activities that promote regeneration and revegetate areas within and adjacent to breeding habitat and associated feeding habitat	<ul style="list-style-type: none"> • Creation of 49 ha of foraging habitat • Weed control and feral animal control
Baudin's Cockatoo	
Undertake habitat restoration by revegetating suitable areas with key tree species	<ul style="list-style-type: none"> • Creation of 49 ha of foraging habitat
Stop further decline in the breeding populations of the black cockatoo and to ensure their persistence throughout their range in the southwest of Western Australia	<ul style="list-style-type: none"> • Weed control and feral animal control
Forest Red-tailed Black Cockatoo	
Stop further decline in the breeding populations of the black cockatoo and to ensure their persistence throughout their range in the southwest of Western Australia	<ul style="list-style-type: none"> • Creation of 49 ha of foraging habitat • Weed control and feral animal control

4.5.4 Management activities and timeframes

To achieve the ecological benefits stated in Section 4.4, Main Roads proposes to undertake the below activities.

- Management activities:
 - Installation and maintenance of fencing on the property boundary to prevent unauthorised property access
 - On-going pest animal control (foxes, feral cats and rabbits)
 - Selective weed control to improve vegetation condition and habitat quality
 - Fire management
 - *Phytophthora* dieback management.
- Revegetation activities:
 - Earthworks (site preparation), including formation of access tracks and drainage structures
 - Planting
 - Ongoing maintenance.

These are further described below.

4.5.4.1 Management activities

The following management actions will be undertaken as part of the Lot 104 North Offset Area.

Fencing requirements. Vehicle access to the site will be restricted through the installation of kangaroo exclusion fencing. The fence will be to fauna fencing standards (1500 mm high with 300 mm vermin skirt). Gates to allow for maintenance and monitoring access will be installed. Fauna escape gates may be installed in strategic locations to enable kangaroos and other fauna to leave the site.

Access control is an effective tool for preventing a range of detrimental impacts to revegetation works caused by unauthorised vehicle access, such as land degradation, trampling of vegetation, illegal dumping of rubbish and spread of weeds and disease.

Pest control. Fox and rabbit controls are already in place and will continue to be used within the Lot 104 North Offset Area. As required based on site observations (i.e. observation of evidence of recent (~>2 months old) presence via scats, diggings, tracks and / or the taking of baits (as relevant)):

- Commencing in spring 2023, rabbit baiting using a combination of RHDV and Pindone will be undertaken annually from spring through to late autumn
- Commencing in autumn 2024, fox baiting using 1080 (sodium fluoroacetate) and / or trapping will be undertaken annually during late winter through to autumn
- Commencing in autumn 2024, feral cats will be targeted annually using cage traps set in areas where cat activity has been identified during monitoring.

Autumn monitoring is ideal as areas dry out and less food is available, therefore bait take is higher. Also tracks are easier to detect as biomass cover is lower and there is more bare ground. At this time of year, there are also more young animals dispersing from the den.

Weed control. A weed management strategy will be prepared for the Lot 104 North Offset Area based on the results of a baseline weed survey. Weed control comprising spot spraying of WONS and Declared weed species will be undertaken twice-yearly for years 1-3 post planting and annually thereafter (as required based on site observations) for the life of the approval (i.e. 50 years) to control weeds. Control of environmental weeds such as annual grasses will be undertaken where they are impacting revegetation / rehabilitation activities and natural regeneration (once it begins to occur) to the extent that achievement of the ecological benefit is jeopardised.

Fire management. Firebreaks have been installed and will be maintained to the required standard to assist in the mitigation of fire.

***Phytophthora dieback* management.** Historical land use and ground disturbing activities may have exposed the site to *Phytophthora dieback*. Main Roads standard dieback management measures (Main Roads Western Australia, 2019) will be implemented during all rehabilitation, maintenance and monitoring activities conducted onsite.

Guiding principles to reduce the risk of spreading dieback will include:

- Imported soil amendments to be dieback free (certified)
- Seedlings to be sourced only from nurseries that hold appropriate certification

- Rehabilitation to be undertaken over several years to enable isolation and definition of specific areas of ground disturbing activities
- Fencing of the offset area to limit vehicle access

4.5.4.2 Rehabilitation activities

Activities associated with the on-ground management for rehabilitating the Lot 104 North Offset Area are set out below and in Table 4-4. These are directly linked to the stated completion criteria (see Table 4-2) to ensure that the completion criteria will be achieved. Due to the size of the rehabilitation area and to enable effective management of resources (seed, seedlings, etc), revegetation of the Lot 104 North Offset Area will require a staged approach to the rehabilitation. Initial works, which commenced in 2019, included the mechanical removal of remaining stumps in conjunction with initial herbicide treatments to minimise weeds prior to revegetation.

Rubbish removal. Rubbish will be removed from the site as required to improve vegetation condition and limit the attraction of pest animals. This will commence when control over access has been established via the installation of fencing. This includes significant tyre removal.

Access tracks. A network of internal access tracks will be established throughout the offset area to enable ongoing maintenance of revegetation.

Drainage. Site drainage is required to manage runoff quality and quantity to the Preston River. Constructed wetlands will also be placed within the offset area where required to manage water quality and limit nutrient inputs into the Preston River.

Earthworks (site preparation). Due to compaction and other effects of the previous land use, rip / furrow site preparation is required to enable establishment of seedlings. In areas where remnant native vegetation limits machinery access or where the use of mechanical ground disturbing activities poses an unacceptable risk to the health of remnant vegetation (such as disturbance of the structural root zone), alternative site preparation methodologies will be used. This may include manual planting using hand-held equipment such as powered augers.

Planting. Planting requirements will be specified with the completion criteria listed in Table 4-2 assumed as a minimum standard. Native species typical of the Southern River and Swan vegetation complexes (within which the Lot 104 North Offset Area is situated) form the basis of the revegetation species list. Native species from other flora and vegetation survey sites in the local area may be included to supplement the Swan and Southern River species and provide additional fauna habitat value. The indicative project species list, including indications of species suitability as habitat for target species, is presented in Appendix D. Local provenance seed will be collected or sourced for revegetation and provided to registered nurseries for propagation.

Planting density will be managed to ensure achievement of the completion criteria and ecological benefits stated in Section 4.4.

Table 4-4. Lot 104 North Offset Area management actions and timeframes

Activity	Actions	Timeframe
Clearing / stockpiling stumps	<ul style="list-style-type: none"> Clearing of regrowth bluegums as required, vegetative material to be mulched 	Completed
Fencing	<ul style="list-style-type: none"> Survey fence location to obtain accurate calculation of offset area Removal of dilapidated fence Installation of new fence (fauna fence specification) (noting that seasonal inundation limits site access, fence can be installed during summer only) 	Completed
Earthworks / drainage	<ul style="list-style-type: none"> Contouring the revegetation area to reduce areas of standing water Installation of maintenance access / fire tracks Rip / furrowing of unvegetated areas in preparation for planting 	Commencing autumn 2023
Weed control	<ul style="list-style-type: none"> Baseline weed survey Initial herbicide application prior to planting including treatment of woody weeds (Blue gums) Revegetation areas treated with pre-emergent herbicide where required prior to planting Ongoing management of WONS and Declared weeds 	<ul style="list-style-type: none"> Preliminary weed control commenced 2015 / 2016 Baseline weed survey to be conducted spring 2023 Estimated two treatments in Years 1-3 post rehabilitation and annually thereafter as required based on site observations
Pest animal control	<ul style="list-style-type: none"> Rabbit baiting using a combination of RHDV and Pindone Fox baiting using 1080 (sodium fluoroacetate) 	Commencing autumn 2023 or prior <ul style="list-style-type: none"> Rabbit baiting conducted annually from spring through to late autumn as required based on site observations Fox baiting conducted annually during late winter through to autumn as required based on site observations Cat trapping conducted annually during late winter through to autumn as required based on site observations
Remediation / rubbish removal	<ul style="list-style-type: none"> Disposal of tyres / waste Rubbish removal opportunistically and as required 	Completed
Firebreak maintenance	<ul style="list-style-type: none"> Maintenance of fire breaks to remove flammable material 	Annually and opportunistically
Rehabilitation	Seed Collection / Propagation	Seed collection and propagation commencing 2023

Activity	Actions	Timeframe
	<ul style="list-style-type: none"> • Seed collections to be ordered annually as required • Seedling propagation / cuttings taken annually as required Revegetation – Commencing 2023 <ul style="list-style-type: none"> • Site is expected to be fully planted using seedlings, with direct seeding to be undertaken if seedlings do not achieve targets • Rip / mound, plant out in 2023 and annually thereafter as required 	The remaining tasks will commence within 12 months of the completion of construction. Revegetation works are expected to continue for up to five years.
Completion of rehabilitation	Rehabilitation meets completion criteria	20 years from commencement of rehabilitation

4.6 Monitoring

Monitoring will be conducted at the Lot 104 North Offset Area to enable early detection of changes that may lead to trigger values being reached and the measurement of progress towards completion criteria. Monitoring will be undertaken as outlined in Table 4-5, which also specifies trigger values and corrective actions to be taken should these values be reached.

Monitoring will be conducted using five primary methodologies, as follows:

- Visual inspection (via driving/walking meander) conducted for: fence maintenance, firebreak maintenance. May also be used for evidence of pest animal presence.
- Line-transect survey conducted for: WONS, Declared weeds and other weeds impacting vegetation establishment, WRP nests / dreys / hollows, evidence of pest animal presence, ground cover layer presence and extent
- Assessment of floristic quadrats conducted for: percent ground cover, projected foliage cover of banksia and eucalypt woodlands (if necessary, quadrats may be extended out to 20 m x 20 m to assess tree cover)
- Targeted nocturnal surveys conducted for: WRPs (to determine the presence of a resident population comprising individuals of varying age classes). These may be conducted via strip and / or distance sampling as described in Section 3.6
- Aerial drone survey, conducted for: canopy continuity, vegetation cover and structure including connectivity to Preston River riparian vegetation.

The above methodologies are described in Section 3.6.

Within the 65 ha offset area, seven floristic quadrats will be established (approximately one quadrat per 10 ha), with quadrats placed randomly.

4.7 Risk management

Potential risks to the successful implementation of this offset and achievement of the objectives in Section 4.5.2 are set out in Table 4-6 along with potential strategies for mitigating risks. The risk assessment was conducted based on information determined through biophysical surveys undertaken for the Project to date and on Main Roads experience in previous conservation and rehabilitation projects in the vicinity of the Project and more broadly.

Table 4-5. Lot 104 North Offset Area monitoring program

Parameter	Performance indicator	Methodology	Frequency and timing	Trigger value	Corrective action	Reporting
Unauthorised vehicle access						
Fencing	Presence and condition of fencing	Visual inspection of fence condition	Annually commencing spring 2023	Fence not intact or to specifications	<ul style="list-style-type: none"> Investigate cause and raise incident report Implement corrective actions which may include: <ul style="list-style-type: none"> Review practicality of fencing design and structure Undertake repair / modification of fence as required Improve personnel training and education Review monitoring frequency and method Monitor outcomes. 	Report annually as part of annual compliance reporting
Firebreaks						
Firebreaks	Condition of firebreaks	Visual inspection of firebreaks	Annually commencing spring 2023	Firebreaks not to specified standard	<ul style="list-style-type: none"> Investigate cause and raise incident report Implement corrective actions which may include: <ul style="list-style-type: none"> Review practicality of firebreak network Undertake firebreak modification and maintenance as required Improve personnel training and education Review monitoring frequency and method Monitor outcomes. 	Report annually as part of annual compliance reporting
Pest animal control						
Fox, cat and rabbit presence	Evidence of recent (<2 months old) fox, cat or rabbit presence	Field survey for visual evidence of fox, cat or rabbit presence	Annually in autumn commencing 2023	Visual evidence of recent fox, cat or rabbit activity detected	<ul style="list-style-type: none"> Investigate cause and raise incident report Implement corrective actions which may include: <ul style="list-style-type: none"> Undertake baiting and / or trapping monthly until no fresh visual evidence is observed for two consecutive months Review monitoring frequency and method Monitor outcomes. 	Report annually as part of annual compliance reporting

Parameter	Performance indicator	Methodology	Frequency and timing	Trigger value	Corrective action	Reporting
WRP						
Canopy continuity	Percentage of canopy continuity (upper and/or mid storey layer)	Field survey (walking meander and 10 m x 10 m floristic quadrats)	Three-yearly commencing in 2023 (baseline) until High (70-89 %) canopy continuity achieved.	At year ten, or any monitoring period thereafter, averaged across quadrats, combined cover across upper and / or mid storey layer is less than 60 %	<ul style="list-style-type: none"> Investigate cause and raise incident report Implement corrective actions which may include: <ul style="list-style-type: none"> Review and modify as required pest animal control program Review and modify as required weed control program Undertake targeted infill planting as required Review and modify as required fire management measures Improve personnel training and education Review monitoring frequency and method Monitor outcomes. 	Report annually as part of annual compliance reporting
Canopy continuity, vegetation cover and structure	Average canopy continuity across upper and / or mid storey layers Vegetation cover and structure	Drone footage (3D imagery)	Three-yearly in autumn or spring commencing 2024 (baseline)	At year ten, or any monitoring period thereafter, averaged across quadrats, combined cover across upper and / or mid storey layer is less than 60 %		
Groundcover layer cover	Percentage cover of native groundcover species averaged across quadrats	Field survey (line-transects)	Three-yearly in late summer commencing in 2024 (baseline)	At year six, or any monitoring period thereafter, native species cover across groundcover layer has not increased over baseline		
WRP presence	WRP observations	Nocturnal field survey (strip and / or distance sampling or otherwise as advised by consulting zoologist)	Three-yearly in October / November commencing in 2023 (baseline)	WRP absent for more than 3 years from areas where they were present at baseline		
Weed species distribution and diversity	Presence and distribution (location) weed species impacting revegetation and /or natural regeneration	Field survey (line-transect survey and opportunistic recording)	Annually in spring for five years, every two years thereafter commencing spring 2023 (baseline)	Weed cover negatively impacting revegetation works and / or natural regeneration (once it begins to occur)		

Parameter	Performance indicator	Methodology	Frequency and timing	Trigger value	Corrective action	Reporting
WRP cont.						
Nest / drey / hollow density	Number of nests / dreys / hollows ha	Field survey (gridline survey) to record nests / dreys / hollows	Three-yearly in October / November commencing in 2023 (baseline)	At year ten or any monitoring period thereafter, no WRP nests / dreys / hollows are present	<ul style="list-style-type: none"> ● Investigate cause and raise incident report ● Implement corrective actions which may include: <ul style="list-style-type: none"> - Review and modify as required kangaroo and rabbit control program - Review and modify as required weed control program - Undertake targeted revegetation as required - Regarding WRP nests / dreys / hollows, investigate whether WRP are utilising the created habitat as well as the availability of suitable denning material - Improve personnel training and education - Review monitoring frequency and method ● Monitor outcomes. 	Report annually as part of annual compliance reporting
Black cockatoos						
Projected foliage cover	Projected foliage cover of banksia and eucalypt woodlands	Field survey (10 m x 10 m floristic quadrats)	Three-yearly in spring commencing 2023 (baseline)	At year ten or any monitoring period thereafter, projected foliage cover of banksia and eucalypt woodlands averaged across quadrats is less than 20 %	<ul style="list-style-type: none"> ● Investigate cause and raise incident report ● Implement corrective actions which may include: <ul style="list-style-type: none"> - Review and modify as required pest animal control program - Review and modify as required weed control program - Undertake targeted infill planting as required - Review and modify as required fire management measures - Improve personnel training and education - Review monitoring frequency and method ● Monitor outcomes. 	Report annually as part of annual compliance reporting

Table 4-6. Lot 104 North Offset Area implementation risk and mitigation strategies

Objective: Counterbalance significant residual impacts to habitat supporting WRP and black cockatoo Key environmental values: WRP individuals and habitat and black cockatoo individuals and habitat					
Environmental objective	Risk	Pre control risk assessment	Management approach and controls	Post control risk assessment	Monitoring approach
Long term security of tenure	Security of tenure is not secure	Likelihood: Possible Consequence: High Risk outcome: Medium	<ul style="list-style-type: none"> The Lot 104 (North) Offset Area is owned by the State of Western Australia and is therefore in secure tenure Lot 104 is currently zoned as rural under the GBRS. Main Roads will request WAPC to rezone the entire Lot 104 to Regional Open Space or Conservation under the scheme. Funding provided for management actions (refer to Section 4.5.4) Investigate potentially appointing an appropriate management authority. 	Likelihood: Unlikely Consequence: Minor Risk outcome: Low	<ul style="list-style-type: none"> Assessment of land zoning Assessment of management funding resources.
Implementation of management and monitoring actions	Management actions not implemented	Likelihood: Possible Consequence: High Risk outcome: Medium	<ul style="list-style-type: none"> Main Roads required to comply with requirements of EPBC 2019/8543, including implementation of management actions (refer to Section 4.5.4) within this Plan Main Roads required to report annually to CEO on compliance with this Plan, including implementation of management actions. 	Likelihood: Unlikely Consequence: Moderate Risk outcome: Low	<ul style="list-style-type: none"> Annual audit conducted to ensure management actions have been implemented
Achievement of completion criteria	Failure to achieve completion criteria	Likelihood: Possible Consequence: Moderate Risk outcome: Medium	<ul style="list-style-type: none"> Re-assess completion criteria (refer to Section 4.5.2) 12 months after failure and continue to assess until completion criteria are met Review management actions and / or completion criteria in accordance with the review provisions for this Plan if management actions are no longer feasible, completion criteria are no longer attainable or other extenuating circumstances arise. 	Likelihood: Unlikely Consequence: Moderate Risk outcome: Low	<ul style="list-style-type: none"> Monitor progress toward achieving completion criteria over time through annual audits (refer to Section 4.6 for monitoring detail)

5 OFFSET C – LUDLOW STATE FOREST / TUART FOREST NATIONAL PARK

This chapter describes the ‘Ludlow State Forest / Tuart Forest National Park’ offset (Ludlow Offset Area). The following sections identify:

- The offset being proposed (Section 5.1)
- The environmental attributes of the offset (Section 5.2)
- The protection mechanism for the offset (Section 5.2.2)
- The achievable ecological benefits (Section 0)
- Management and / or rehabilitation actions, including objectives, targets, completion criteria, monitoring and risk management (Section 5.5)
- Monitoring (Section 5.6)
- Risk assessment (Section 5.7).

5.1 Identification of offset

The Ludlow Offset Area comprises the proposed revegetation of 270 ha across four degraded land parcels within the Ludlow State Forest (also known as State Forest No. 2 (SF No.2)) and Tuart Forest National Park (TFNP). The TFNP and Ludlow State Forest are located approximately 10-15 km east of the Busselton town centre and are the focus of an on-going revegetation program. The sites, which are 12-25 km from the southern end of the Project Area, are described in Table 5-1 below and are shown in Figure 7 (Appendix A).

The Ludlow Offset Area rehabilitation will provide 270 ha of habitat for WRP and 200 ha of habitat for black cockatoos, as well as 37 ha of re-created Tuart Woodlands TEC vegetation.

5.2 Environmental attributes of offset area

5.2.1 Attributes of offset area

The condition and environmental attributes (where relevant) of each of the four sites comprising the Ludlow Offset Area are described in Table 5-1.

Table 5-1. Ludlow Offset Area description and environmental attributes

Site no.	Description	Size
2 (Vasse)	<p>The Ludlow Offset Area Site 2 offset (Figure 8, Appendix A) is an advanced offset for WRP and black cockatoos. Site 2 provides 5 ha of newly created foraging, breeding and dispersal habitat for WRPs and foraging and potential breeding habitat for all three species of black cockatoo.</p> <p>Site 2 was revegetated by Main Roads in 2017 to provide habitat for WRPs and black cockatoos with the intent to use the habitat created as future offsets for the Project. Revegetation site preparation works commenced at Site 2 in 2016 with stump removal, deep ripping mounding and application of soil ameliorants. Initial planting commenced in 2016 and was completed in 2017. As at mid-2021, four years post-planting, the average native plant density across the site was 3,200 stems / ha (Tranen, 2021). A total of 17 species were used in the initial revegetation, of which four comprise foraging habitat for black cockatoos (DSEWPaC, 2012a) and four are</p>	5 ha

Site no.	Description	Size
	<p>known to be utilised by WRP.</p> <p>Since revegetation works commenced, management of weeds such as Arum lily, Bridal creeper and lupins as well as annual grasses weeds has been conducted several times annually via herbicide treatment (and manual / mechanical removal where appropriate). In areas where plant density is low or where plant deaths have occurred creating gaps in native vegetation cover, infill planting has been undertaken and will continue to be undertaken as required to ensure the ecological benefit is achieved.</p>	
4 (BORR SF2)	<p>The Ludlow Offset Area Site 4 offset (Figure 8, Appendix A) comprises an advanced offset for WRP and black cockatoos. Site 2 provides 10 ha of newly created foraging, breeding and dispersal habitat for WRPs and foraging and potential breeding habitat for all three species of black cockatoo.</p> <p>Site 4 was revegetated by Main Roads in winter 2021 to provide habitat for WRPs and black cockatoos with the intent to use the habitat created as future offsets for the Project. Site preparation works commenced in 2019 with pine stump removal. Fencing was completed by July 2020, at which time weed control was initiated. Revegetation commenced May 2021 was completed by the end of June 2021. Just over 22,000 seedlings were planted and approximately 14 kg of seed was broadcast.</p>	10 ha
7	<p>The Ludlow Offset Area Site 7 offset (Figure 9, Appendix A) comprises the creation of 14 ha of WRP habitat and the enhancement and management of 56 ha of WRP habitat. In total Site 7 provides 70 ha of foraging, breeding and dispersal habitat for WRPs and foraging and potential breeding habitat for all three species of black cockatoo.</p> <p>Site 7 was assessed by Stream EW in 2021 to determine baseline condition. Information provided below is taken from the Stream EW (Stream Environment and Water, 2022) report.</p> <p>Site 7 comprises 70 ha of tuart-marri woodland vegetation generally in poor condition. Approximately 75 % of the survey area was mapped as being in Degraded condition, with a further approximate 20 % mapped as Completely degraded. Canopy continuity in the upper and mid storeys is up to 20 %. The Declared Pest species <i>Zantedeschia aethiopica</i> (Arum lily) occurred throughout the site at a 'heavy' density (> 10 individuals within a 20 m radius) over approximately 50 ha of the 70 ha site.</p> <p>Due to its large area and the dominance of Tuart in the overstorey, vegetation onsite represents an occurrence of the Tuart Woodlands TEC regardless of its very poor condition. The site contains approximately 14 ha of pines which are scheduled to be cleared in 2023. The site has been divided into two management areas; Site 7a comprising the area cleared of pines and Site 7b comprising the remaining 56 ha from which pines have already been removed. Post-removal of pines, Site 7a will require creation of completely new habitat while Site 7b requires enhancement of the existing low-quality habitat.</p>	70 ha
12 (DBCA Site 12)	<p>The Ludlow Offset Area Site 12 offset (Figure 10, Appendix A) comprises the enhancement and management of 185 ha of foraging, breeding and dispersal habitat for WRPs and foraging and potential breeding habitat for all three species of black cockatoo, as well as 37 ha of Tuart Woodlands TEC. Site 12 contains areas of mid 1980s Tuart ashbed regeneration over grass.</p> <p>A 78 ha portion of Site 12 that is representative of the entire 185 ha site was assessed by Ecoedge in 2022 to determine baseline condition. Information provided below is</p>	185 ha

Site no.	Description	Size
	<p>taken from the Ecoedge (Ecoedge, 2022) report.</p> <p>A total of 54 % of the assessed area of Site 12 was in Degraded condition with the remainder classed as Completely degraded. More than half of the taxa present (36 out of 69 species) were introduced. While the site has reasonable cover of Tuart with some Peppermint also present, native species were generally depauperate, especially in the midstorey and understorey, which was dominated by <i>Zantedeschia aethiopica</i> (Arum lily).</p> <p>Revegetation comprising canopy, mid-storey and understorey species is required across the site. While vegetation and habitat cover at Site 12 is discontinuous, the site is known to support an existing WRP population, with WRP density varying across the site (Biota, 2020b). Vegetation within the site also comprises degraded Tuart Woodlands TEC.</p>	

5.2.2 Threats to offset area values

Threats are consistent across all four Ludlow Offset Area sites, being:

- Weed infestation, primarily Arum lily and Bridal creeper under existing canopy and pasture grasses in bare areas, which impedes natural regeneration
- Grazing pressure from rabbits and macropods which impedes natural regeneration
- For resident and dispersing WRP within the sites, pest animal predators also comprise a threat.

5.3 Protection mechanism and management contribution

The four sites comprising the Ludlow Offset Area are located on Crown land that is managed by DBCA under the *Conservation and Land Management Act 1984*. Accordingly, the offset areas have long term tenure protection. DBCA has advised that the four sites are available to Main Roads for use as an offset towards the Project. Main Roads will be responsible for the implementation of revegetation works, ongoing monitoring and maintenance, and reporting against the requirements of EPBC Act approval for EPBC 2019/8543. Main Roads will establish a Memorandum of Understanding (or similar) with DBCA that details the agreed revegetation and ongoing management parameters, as well as the terms for handover of the site to DBCA once the completion criteria are met.

Main Roads will fund and manage the Ludlow Offset Area for the purposes of conservation for the life of the of approval (i.e. 50 years).

5.4 Achievable ecological benefits

For the Ludlow Offset Area, Main Roads has committed to the below ecological benefits.

- For WRPs, the enhancement and management of 270 ha of foraging, breeding and dispersal habitat within 20 years from commencement of the offset, within which habitat quality achieves:
 - High (70-89 %) canopy cover and canopy continuity for WRP movement (upper and/or mid storey layer)
 - Establishing ground cover that provides shelter for WRPs

- Establishing continuous connected vegetation to adjacent WRP habitat
 - Establishing a resident population of WRPs that is evidenced by the presence of individuals of varying age classes (juvenile, sub-adult, adult) in any year
 - Planned fire will only be for ecological purposes.
 - Attaining a moderate density of WRP nests / dreys / hollows
 - Evidence of a lack of WRP predators
 - Controlling weed species and pests.
- For black cockatoos, enhancement and management of at least 200 ha of foraging and potential breeding habitat within 20 years from commencement of the offset, within which habitat quality achieves:
 - Banksia and eucalypt woodlands, which have at least 40 % projected foliage cover, that contain suitable foraging tree species for each of the three species of black cockatoos.
 - For Tuart Woodlands TEC, management of at least 37 ha of TEC within 20 years from commencement of the offset, within which vegetation condition achieves:
 - Native understorey cover reaches $\geq 80\%$ or ≥ 12 species per floristic quadrat (as per 'Very high condition rating in the Approved Conservation Advice (TSSC, 2019)) with native understorey species typical of the vegetation complexes associated with Tuart forest vegetation (see Section 2.3.3. of TSSC (2019))
 - Effectively controlling grazing pressure to realise at least 30 naturally occurring recruits of *Corymbia* or eucalypt species achieving $> 15\text{cm}$ DBH per hectare.

5.5 Offset management

5.5.1 Management approach

Management of the the Ludlow Offset Area is based on the approach outlined in Table 5-2.

Table 5-2. The Ludlow Offset Area management approach

Management aspect	Description	Defined in
Objective	Aim of the Offset Area	Table 5-3
Target	Specific goal identified for the Offset Area	
Completion criteria	Measurable outcomes identified for the Offset Area	
Management actions	Actions to be taken to achieve stated objective, targets and completion criteria, including timing	Table 5-5
Monitoring program	Assessment of progress towards achievement of objective, targets or completion criteria	Table 5-6
Performance indicator	Variable that allows for measurable assessment of progress towards achievement of objective, targets or completion criteria	
Trigger value	Measurable event in any assessed parameter that indicates achievement of the objective, targets or completion criteria may be at risk	
Corrective actions	Action(s) to be taken in response to a trigger value being reached	
Reporting	Documentation of progress towards achievement of the objective, targets or completion criteria and any non-compliances that may have occurred	
Risk assessment	Consideration and appraisal of risks that may impede achievement of the objective, targets or completion criteria	Table 5-7
Risk management strategies	Actions to be taken to manage and/or mitigate identified risks	

5.5.2 Objectives, targets and completion criteria

Main Roads proposes to rehabilitate, revegetate and / or manage a total of 270 ha at this site to provide habitat for WRP, incorporating 200 ha of black cockatoo habitat and 37 ha of Tuart Woodlands TEC. Each of the four revegetation sites at the Ludlow Offset Area will be fenced to fauna fence standards to ensure protection of revegetation and emerging habitat. Ongoing site management for long term conservation will include fencing and firebreak maintenance, weed control and feral animal control to maintain / improve habitat quality. This approach aligns with that used by Main Roads for similar offset revegetation works in SF No. 2 and the region.

The proposed rehabilitation works are congruent with the objectives of the Tuart Forest National Park Management Plan (TFNPMP) (DPaW, 2014), which are to:

- Protect and enhance the eastern wetland / tall Tuart community transition zone
- Protect and increase habitat for fauna that are highly represented in zones 5 and 6 (for example, WRP and Common Brushtail Possum)
- Enhance the resilience of this zone to disturbance and threatening processes.

Rehabilitation works proposed for the Ludlow Offset Area will improve the connectivity of WRP habitats within and between areas of SF No. 2 and the TFNP.

Table 5-3 sets out the objectives, targets and completion criteria for the Ludlow Offset Area that have been developed to ensure achievement of the ecological benefits stated in Section 0. The completion criteria will be assessed annually during compliance reporting and must be maintained for the life of the approval (i.e. 50 years).

Table 5-3. Objective, targets and completion criteria for the Ludlow Offset Area

Objective	Target	Completion criteria
Counterbalance significant residual impacts to habitat supporting WRP	Restore and / or manage 270 ha of WRP habitat	<p>Within 20 years from commencement of the offset, habitat quality achieves:</p> <ul style="list-style-type: none"> • High (70-89 %) canopy cover and canopy continuity for WRP movement (upper and/or mid storey layer) including continuous connected vegetation to adjacent WRP habitat⁶ • Ground cover that provides shelter for WRPs • A resident population of WRPs that is evidenced by the presence of individuals of varying age classes (juvenile, sub-adult, adult) in any year • Planned fire will only be for ecological purposes. • Attaining a moderate density of WRP nests / dreys / hollows • Evidence of a lack of WRP predators • Weeds and pests controlled to the extent necessary to achieve the ecological benefits stated in Section 0.
Counterbalance significant residual impacts to habitat supporting black cockatoos	Restore and / or manage 200 ha of black cockatoo habitat	<p>Within 20 years from commencement of the offset, habitat quality achieves:</p> <ul style="list-style-type: none"> • Banksia and eucalypt woodlands to have at least 40 % projected foliage cover and contain suitable foraging tree species for each of the three species of black cockatoos.
Counterbalance significant residual impacts to Tuart Woodlands TEC	Restore and / or manage 37 ha of Tuart Woodland TEC	<p>Within 20 years from commencement of the offset, vegetation condition achieves:</p> <ul style="list-style-type: none"> • Native understorey cover reaches $\geq 80\%$ or ≥ 12 species per floristic quadrat (as per 'Very high' condition rating in the Approved Conservation Advice (TSSC, 2019)) with native understorey species typical of the vegetation complexes associated with Tuart forest vegetation (see Section 2.3.3. of TSSC (2019)) • At least 30 naturally occurring recruits of <i>Corymbia</i> or eucalypt species achieving $> 15\text{cm}$ DBH per hectare.

5.5.3 Consistency with recovery plans

The objectives and targets in Table 5-3 are consistent with the objectives of relevant guidance, including but not limited to recovery plans or area management plans. All of the values being offset by the Ludlow Offset Area have associated recovery plans or guidances.

WRP

The activities within this Plan are consistent with the objectives of the *Western Ringtail Possum* (*Pseudocheirus occidentalis*) *Recovery Plan* (DBCA, 2017) to mitigate threatening processes that are constraining the recovery of WRPs (Table 5-4).

Carnaby's Cockatoo

The activities within this Plan are consistent with the objectives of the *Carnaby's Cockatoo* (*Calyptorhynchus latirostris*) *Recovery Plan* (DPAW, 2013) to stop further decline in the distribution and abundance of Carnaby's Cockatoo by protecting the birds and enhancing their habitat critical

⁶ Noting the requirement for firebreaks.

for survival. The recovery plan also recommends the maintaining or increasing the area of non-breeding feeding habitat and night roosts by planting areas of native vegetation (Table 5-4).

Baudin’s Cockatoo

The activities within this Plan are consistent with the objectives of the *Baudin’s Cockatoo* (*Calyptorhynchus baudinii*) *Recovery Plan* (DEC, 2008) to stop further decline in the distribution and abundance of Baudin’s Cockatoo by protecting the birds and enhancing their habitat critical for survival. The Commonwealth conservation advice (TSSC, 2018) also lists habitat restoration as a key objective (Table 5-4).

Forest Red-tailed Black Cockatoo

The activities within this Plan are consistent with the objective of the *Forest Red-tailed Black Cockatoo Recovery Plan* (DEC, 2008) and Approved Conservation Advice (DEWHA, 2009) to stop further decline in the breeding populations of the black cockatoo and to ensure their persistence throughout their range in the southwest of Western Australia (Table 5-4).

Tuart Woodlands TEC

The activities in this Plan are consistent with the ‘restore’ priority conservation action listed in the *Approved Conservation Advice (incorporating listing advice) for the Tuart* (*Eucalyptus gomphocephala*) *woodlands and forests of the Swan Coastal Plain ecological community* (TSSC, 2019) (Table 5-4).

Table 5-4. Consistency of activities at the Ludlow Offset Area with relevant recovery plans

Objective and action themes from recovery plan / conservation advice	Activities undertaken within this Plan
WRP	
Threatening processes that are constraining the recovery of WRPs are mitigated	<ul style="list-style-type: none"> • Creation of 270 ha of WRP habitat • Weed control and feral animal control
Carnaby’s Cockatoo	
Implement management to protect and improve the condition of breeding habitat and associated feeding habitat, including activities that promote regeneration and revegetate areas within and adjacent to breeding habitat and associated feeding habitat	<ul style="list-style-type: none"> • Creation of 200 ha of foraging habitat • Weed control and feral animal control
Baudin’s Cockatoo	
Undertake habitat restoration by revegetating suitable areas with key tree species	<ul style="list-style-type: none"> • Creation of 200 ha of foraging habitat
Stop further decline in the breeding populations of the black cockatoo and to ensure their persistence throughout their range in the southwest of Western Australia	<ul style="list-style-type: none"> • Weed control and feral animal control
Forest Red-tailed Black Cockatoo	
Stop further decline in the breeding populations of the black cockatoo and to ensure their persistence throughout their range in the southwest of Western Australia	<ul style="list-style-type: none"> • Creation of 200 ha of foraging habitat • Weed control and feral animal control
Tuart Woodlands TEC	
Revegetation and regeneration Control invasive species and diseases	<ul style="list-style-type: none"> • Creation of 37 ha of TEC vegetation • Weed control

5.5.4 Management activities and timeframes

To achieve the ecological benefits stated in Section 0, Main Roads proposes to undertake the below activities.

- Management activities:
 - Installation and maintenance of fencing of rehabilitation areas to ensure protection of revegetation and emerging habitat
 - On-going feral animal control (foxes, feral cats and rabbits)
 - Selective weed control to maintain / improve vegetation condition and habitat quality
 - Fire management.

- Revegetation activities:
 - Earthworks (site preparation), including formation of access tracks drainage structures
 - Sourcing seed and plant material
 - Seedling planting / seeding
 - Ongoing maintenance.

These are described below.

5.5.4.1 Management actions

The following specific management actions will be undertaken as part of the Ludlow Offset. Table 5-5 details management actions required to achieve the proposed revegetation outcomes.

Fencing requirements. Access to the offset area revegetation sites will be restricted through the installation of fencing. The fence will be constructed to fauna fence standards, and will be 1.5 m high with a 300 mm rabbit wire apron to reduce burrowing animals from entering the sites. A minimum of two fauna escape gates will be installed at each site. The aim of the fauna fence is to minimise further degradation of native vegetation and maximise success of revegetation efforts by limiting macropod (and rabbit) grazing pressure. The minimisation of grazing pressure will create favourable conditions for both revegetation and natural regeneration.

Access control is an effective tool for preventing a range of detrimental impacts to bushland caused by unauthorised vehicle access, such as land degradation, trampling of vegetation, illegal dumping of rubbish and spread of weeds and disease.

DBCA have requested that public access to all three sites is maintained, and specified that access for recreational horse riding must be maintained for Site 12. As such, all fences will have gates enabling access.

Site preparation. Pine removal in Site 7 is expected to be conducted by DBCA in 2023. Rip / furrow preparation works is required for all sites and will occur when seasonal conditions are optimal and soil moisture is suitable for planting. Some thinning of Tuarts may be required in some areas. Manual auger planting to be undertaken in areas where access is reduced or where lower impact site works is deemed appropriate.

All planting areas will require routine maintenance access. Informal tracks are to be established at 30 m to 50 m intervals to enable efficient access (where possible). Some sites may require more permanent internal tracks including suitable materials at gateways to enable fire access.

All sites to have vehicle access tracks that may serve as firebreaks on the internal boundary fences.

Pest control. As required based on site observations (i.e. observation of evidence of recent (~>2 months old) presence via scats, diggings, tracks and / or the taking of baits (as relevant)):

- Commencing in spring 2024, rabbit baiting using a combination of RHDV and Pindone will be undertaken annually from spring through to late autumn
- Commencing in late winter 2024, fox baiting using 1080 (sodium fluoroacetate) and / or trapping will be undertaken annually during late winter through to autumn
- Commencing in spring 2024, feral cats will be targeted annually using cage traps set in areas where cat activity has been identified during monitoring.

Autumn monitoring is ideal as areas dry out and less food is available, therefore bait take is higher. Also tracks are easier to detect as biomass cover is lower and there is more bare ground. At this time of year, there are also more young animals dispersing from the den.

The proposed pest control approach detailed for the Ludlow Offset Area will be conducted in consultation with DBCA.

Weed control. Weed control comprising spot spraying of WONS and Declared weed species is ongoing in Sites 2 and 4 and will be undertaken at Sites 7 and 12 prior to planting commencing in 2024. Weed control will continue to be undertaken twice per year for years 1-3 post planting / seeding and annually thereafter (as required based on site observations) for the life of the approval (i.e. 50 years) to control weeds. Control of environmental weeds such as annual grasses will be undertaken where they are impacting revegetation / rehabilitation activities and natural regeneration (once it begins to occur) to the extent that achievement of the ecological benefit is jeopardised.

Fire management. Firebreaks have been installed and will be maintained to the required standard to assist in the mitigation of fire.

Rubbish removal. Rubbish will be removed from the sites to improve vegetation condition and limit the attraction of pest animals when control over access has been established via the installation of fencing.

5.5.4.2 Rehabilitation actions

Activities associated with the on-ground management for rehabilitating the Ludlow Offset Area are set out below and in Table 5-5. These are directly linked to the stated completion criteria (see Table 5-3) to ensure that the offset's completion criteria will be achieved.

Rehabilitation works will consist of site preparation (fencing, weed control, ripping/furrow-lining and pest control), seeding/planting and ongoing management.

Approach. The site preparation and revegetation methodology applied at Sites 7 and 12 will be the same as that used at Sites 2 and 4, and all other Main Roads revegetation sites in the Ludlow State Forest with minor variation as required dependant on site conditions. Aspects comprising this

approach are outlined below. As Sites 2 and 4 have already been revegetated, different, less intensive management actions are required for these sites.

Staging. To minimise risk of losses and maximise resource availability, the overall strategy to revegetate Sites 7 and 12 requires a staged approach. Initial weed control treatments will commence at all sites in Q2, 2025 or before. Subsequent fencing, ripping / furrow-lining and revegetation works will be staged between the sites as outlined in Table 5-5.

Species selection. Species used in the revegetation have been selected in consultation with DBCA based on their value as habitat and foraging vegetation for these fauna species, their presence in Tuart Woodlands TEC (as per the conservation advice (TSSC, 2019)) and the general site parameters. The revegetation will include a variety of species within each structural layer to provide native vegetation cover. The indicative revegetation species list, based on species generally expected to be commercially available, is presented in Appendix E. It includes both upland and wetland species to be used as appropriate. The range of species used in the rehabilitation will be taken from this list. Additional species from the broader DBCA-approved list may also be used in seed form where site conditions are conducive to direct seeding.

Seed and material sourcing. Licenced seed collectors will be engaged to collect provenance seed over several years until sufficient seed is collected. Collected seed will be used for both propagation of seedlings and for direct seeding in select areas. Vegetative material such as cuttings and material obtained by division may also be collected.

Seedling propagation. Collected seed and vegetative material will be provided to nurseries that meet the Nursery and Garden Industry Western Australia certification to ensure appropriate hygiene protocols are observed. Alternative nurseries may be considered as potential suppliers if the plants can be supplied to the required standards and conditions.

Seeding / seedlings. Sites 7 and 12 contain a significant weed burden. The presence of weeds may limit the option to undertake direct seeding in some areas. Direct seeding and / or seedling planting will occur once project sites are prepared (weed control, pest control, fencing). Seedlings will be planted with slow release native fertiliser tablets and systemic insecticide tablets to offer suitable nutrients and protection from insects in the establishment phase.

Planting density. Planting densities will be managed to maximise canopy connectivity and resource availability for WRP and foraging species for black cockatoos (where required). Planting density will also aim to minimise bare ground and maximise the structural integrity (in accordance with the completion criteria presented in Table 5-3) and long-term viability of the established vegetation. Tuart canopy cover will be established to align with requirements for Tuart Woodlands TEC as per the conservation advice (TSSC, 2019).

Table 5-5. Ludlow Offset Area management actions and timeframes

Activity	Offset Area	Action	Timeframe
Pine removal	Site 7	Removal of existing pine plantation (approx. 14 ha) by DBCA	<ul style="list-style-type: none"> Anticipated to occur during 2023, with timeframe to be determined by DBCA
Weed control	Site 2	Post revegetation – ongoing weed control targeting Arum lily, Bridal creeper and other WONS and Declared weeds as required	<ul style="list-style-type: none"> Up to two treatments annually in late winter/early spring and summer/autumn in years 1-3 post revegetation and annually thereafter
	Site 4	Post revegetation – ongoing weed control targeting Arum lily, Bridal creeper and other WONS and Declared weeds as required	<ul style="list-style-type: none"> Up to two treatments annually in late winter/early spring and summer/autumn in years 1-3 post revegetation and annually thereafter
	Sites 7 and 12	Herbicide application targeting Arum lily, Bridal creeper WONS and Declared weeds as required	<ul style="list-style-type: none"> Up to two treatments annually in late winter/early spring and summer/autumn in years 1-3 post revegetation and annually thereafter
Pest control	Site 2	Pest animal control	<ul style="list-style-type: none"> Rabbit baiting ongoing annually as required based on site observations Fox baiting not currently required (requirement monitored annually) Cat trapping to commence spring 202 and continue annually as required based on site observations
	Site 4		
	Sites 7 and 12	Pest animal control	<ul style="list-style-type: none"> Rabbit baiting to commence spring 2025 and continue annually as required based on site observations Fox baiting to commence in spring 2025 and continue annually or biannually as required based on site observations Cat trapping to commence spring 2025 and continue annually as required based on site observations
Fencing	Site 2	Ongoing maintenance of existing fence as required	Fence installed in 2017
	Site 4		Fence installed in 2021

Activity	Offset Area	Action	Timeframe
	Sites 7 and 12	<ul style="list-style-type: none"> • Construction of revegetation area fences to fauna fence specification • Fauna gates to be installed • Fence locations surveyed to obtain accurate calculation of Offset Area • Ensure fence position maintains fire and fauna access 	Fence to be installed 2024
Rubbish removal	All sites	Rubbish removal as required	Q1 2024 and ongoing
Revegetation - seed collection / propagation	All sites	<ul style="list-style-type: none"> • Order seed collections • Order seedlings • Seedling propagation 	Sites 2 and 4 - Seedlings for infill planting ordered annually as required based on monitoring results to enable achievement of completion criteria Sites 7 and 12 - Seed and seedlings to be ordered in spring 2024
Revegetation - site preparation	Sites 2 and 4	N/A	N/A
	Site 12	Rip and furrow-line throughout open areas, hand-augur in amongst existing vegetation in preparation for planting	Site 12 - Site preparation works to commence in 2025
Revegetation – planting and seeding	Sites 2 and 4	<ul style="list-style-type: none"> • Infill planting as required 	Infill planting will be undertaken annually as required
	Sites 7 and 12	<ul style="list-style-type: none"> • Direct seedling of areas with low weed burden • Rip / furrow planting with seedlings • Targeted planting required for areas of remnant vegetation • Infill planting as required 	<ul style="list-style-type: none"> • Planting to commence in winter 2025 and be completed in winter 2029 (5-year revegetation program) • Post-2029, infill planting will be undertaken annually as required

5.6 Monitoring

Monitoring will be conducted at the Ludlow Offset Area to enable early detection of changes that may lead to trigger values being reached and the measurement of progress towards completion criteria. Monitoring will be undertaken as outlined in Table 5-6, which also specifies trigger values and corrective actions to be taken should these values be reached.

Monitoring will be conducted using five primary methodologies, as follows:

- Visual inspection (via driving/walking meander) conducted for: fence maintenance, firebreak maintenance. May also be used for evidence of pest animal presence.
- Line-transect survey conducted for: WONS, Declared weeds and other weeds impacting vegetation establishment, WRP nests / dreys / hollows, evidence of pest animal presence, ground cover layer presence and extent
- Assessment of floristic quadrats conducted for: percent ground cover, projected foliage cover of banksia and eucalypt woodlands (if necessary, quadrats may be extended out to 20 m x 20m to assess tree cover)
- Targeted nocturnal surveys conducted for: WRPs (to determine the presence of a resident population comprising individuals of varying age classes). These may be conducted via strip and / or distance sampling as described in Section 3.6
- Aerial drone survey, conducted for: canopy continuity, vegetation cover and structure including connectivity to Preston River riparian vegetation.

The above methodologies are described in Section 3.6.

Quadrats will be established as follows:

- Site 2 (5 ha): two quadrats
- Site 4 (10 ha): two quadrats
- Site 7 (70 ha): seven quadrats
- Site 12 (185 ha): 18 quadrats

Quadrats will be placed randomly within each offset site.

5.7 Risk management

Potential risks to the successful implementation of this offset and achievement of the objectives in Section 5.5.2 are set out in Table 5-7 along with potential strategies for mitigating risks. The risk assessment was conducted based on information determined through biophysical surveys undertaken for the Project to date and on Main Roads experience in previous conservation and rehabilitation projects in the vicinity of the Project and more broadly.

Table 5-6. Ludlow Offset Area monitoring program

Parameter	Performance indicator	Methodology	Frequency and timing	Trigger value	Corrective action	Reporting
Unauthorised vehicle access						
Fencing	Presence and condition of fencing	Visual inspection of fence condition	Annually commencing spring 2023	Fence not intact or to specifications	<ul style="list-style-type: none"> Investigate cause and raise incident report Implement corrective actions which may include: <ul style="list-style-type: none"> Review practicality of fencing design and structure Undertake repair/modification of fence as required Improve personnel training and education Review monitoring frequency and method Monitor outcomes 	Report annually as part of annual compliance reporting
Firebreaks						
Firebreaks	Condition of firebreaks	Visual inspection of firebreaks	Annually commencing spring 2023	Firebreaks not to specified standard	<ul style="list-style-type: none"> Investigate cause and raise incident report Implement corrective actions which may include: <ul style="list-style-type: none"> Review practicality of firebreak network Undertake firebreak modification and maintenance as required Improve personnel training and education Review monitoring frequency and method Monitor outcomes 	Report annually as part of annual compliance reporting
Pest animal control						
Fox, cat and rabbit presence	Evidence of recent (<2 months old) fox, cat or rabbit presence	Field survey for visual evidence of fox, cat or rabbit presence	Annually in autumn commencing 2023	Visual evidence of recent fox, cat or rabbit activity detected	<ul style="list-style-type: none"> Investigate cause and raise incident report Implement corrective actions which may include: <ul style="list-style-type: none"> Undertake baiting and / or trapping monthly until no fresh visual evidence is observed for two consecutive months Review monitoring frequency and method Monitor outcomes 	Report annually as part of annual compliance reporting

Parameter	Performance indicator	Methodology	Frequency and timing	Trigger value	Corrective action	Reporting
WRP						
Canopy continuity	Percentage of canopy continuity (upper and/or mid storey layer)	Field survey (walking meander and 10 m x 10 m floristic quadrats)	Three-yearly commencing in 2023 (baseline) until High (70-89 %) canopy continuity achieved	At year six, or any monitoring period thereafter, averaged across quadrats, combined cover across upper and / or mid storey layer is less than 60 %	<ul style="list-style-type: none"> • Investigate cause and raise incident report • Implement corrective actions which may include: <ul style="list-style-type: none"> - Review and modify as required pest animal control program - Review and modify as required weed control program - Undertake targeted infill planting as required - Review and modify as required fire management measures - Improve personnel training and education - Review monitoring frequency and method • Monitor outcomes 	Report annually as part of annual compliance reporting
Canopy continuity, vegetation cover and structure	Average canopy continuity across upper and / or mid storey layers Vegetation cover and structure	Drone footage (3D imagery)	Three-yearly in autumn or spring commencing 2023 (baseline)	At year six, or any monitoring period thereafter, averaged across quadrats, combined cover across upper and / or mid storey layer is less than 60 %		
Groundcover layer cover	Percentage cover of native groundcover species averaged across quadrats	Field survey (line-transects)	Three-yearly in late summer commencing in 2023 (baseline)	At year six or any monitoring period thereafter, native species cover across groundcover layer has not increased over baseline		
WRP presence	WRP observations	Nocturnal field survey (strip and / or distance sampling or otherwise as advised by consulting zoologist)	Three-yearly in October / November commencing in 2023 (baseline)	WRP absent for more than 3 years from areas where they were present at baseline		
Weed species distribution and diversity	Presence and distribution (location) of weeds impacting revegetation and / or natural regeneration	Field survey (line-transect survey and opportunistic recording)	Annually in spring for five years, every two years thereafter commencing spring 2023 (baseline)	Weed cover negatively impacting revegetation works and / or natural regeneration (once it begins to occur)		

Parameter	Performance indicator	Methodology	Frequency and timing	Trigger value	Corrective action	Reporting
WRP cont.						
Nest / drey / hollow density	Number of nests / dreys / hollows ha	Field survey (gridline survey) to record nests / dreys / hollows	Three-yearly in October / November commencing in 2023 (baseline)	WRP nest / drey / hollow density is >50 % lower than baseline (with baseline considered moderate for this low density WRP population)	<ul style="list-style-type: none"> • Investigate cause and raise incident report • Implement corrective actions which may include: <ul style="list-style-type: none"> - Review and modify as required kangaroo and rabbit control program - Review and modify as required weed control program - Undertake targeted revegetation as required - For the number of nests / dreys / hollows, investigate WRP population trends within the site to determine whether there is a corresponding reduction in WRP observations. Regional WRP population trends may also be investigated if required to qualify the cause of the reduction in the number of nests / dreys / hollows - Improve personnel training and education - Review monitoring frequency and method • Monitor outcomes 	Report annually as part of annual compliance reporting
Black cockatoos						
Projected foliage cover	Projected foliage cover of banksia and eucalypt woodlands	Field survey (10 m x 10 m floristic quadrats)	Three-yearly in spring commencing 2023 for Sites 2 and 4 and 2024 for Sites 7 and 12 (baseline)	At year ten or any monitoring period thereafter, projected foliage cover of banksia and eucalypt woodlands averaged across quadrats is less than 20 %	<ul style="list-style-type: none"> • Investigate cause and raise incident report • Implement corrective actions which may include: <ul style="list-style-type: none"> - Review and modify as required pest animal control program - Review and modify as required weed control program - Undertake targeted infill planting as required - Review and modify as required fire management measures - Improve personnel training and education - Review monitoring frequency and method • Monitor outcomes 	Report annually as part of annual compliance reporting

Parameter	Performance indicator	Methodology	Frequency and timing	Trigger value	Corrective action	Reporting
Tuart Woodlands TEC						
Understorey cover or species richness	Native understorey cover or species richness	Field survey (10 m x 10 m floristic quadrats)	Every five years in spring commencing spring 2023 (baseline)	By year five or any monitoring period thereafter: <ul style="list-style-type: none"> Native understorey cover is less than 50 % or ≥9 species per floristic quadrat Native understorey species are not typical of the vegetation complexes associated with Tuart forest vegetation 	<ul style="list-style-type: none"> Investigate cause and raise incident report Implement corrective actions which may include: <ul style="list-style-type: none"> Review and modify as required pest animal control program Review and modify as required weed control program Undertake targeted infill planting as required <ul style="list-style-type: none"> Review and modify as required fire management measures Improve personnel training and education Review monitoring frequency and method Monitor outcomes 	Report annually as part of annual compliance reporting
Corymbia or eucalypt species recruitment	Presence of Corymbia or eucalypt species recruits	Field survey (10 m x 10 m floristic quadrats, opportunistic)	Every five years in spring commencing spring 2023 (baseline)	At year 10 or any monitoring period thereafter, <20 naturally occurring recruits of Corymbia or eucalypt species per hectare achieving > 10cm DBH		
Condition	Condition of vegetation assessed against EPA (2016)	Field survey (10 m x 10 m floristic quadrats)	Every five years in spring commencing spring 2023 (baseline)	At year five or any monitoring period thereafter, condition is Poor (TSSC, 2019)		

Table 5-7. Ludlow Offset Area implementation risk and mitigation strategies

Objective: Counterbalance significant residual impacts to habitat supporting WRP, black cockatoos and Tuart Woodlands TEC					
Key environmental values: WRP individuals and habitat, black cockatoo individuals and habitat and Tuart Woodlands TEC					
Environmental objective	Risk	Pre control risk assessment	Management approach and controls	Post control risk assessment	Monitoring approach
Long term security of tenure	Security of tenure is not secure	Likelihood: Possible Consequence: High Risk outcome: Medium	<ul style="list-style-type: none"> The four sites comprising the Ludlow Offset Area are located on Crown land that is managed by DBCA. This land tenure provides in perpetuity protection and maintenance of ecological benefits beyond the life of the approval. Memorandum of Understanding (MOU) established with DBCA Funding provided for management actions (refer to Section 5.5.4). 	Likelihood: Unlikely Consequence: Minor Risk outcome: Low	<ul style="list-style-type: none"> Assessment whether MOU in place Assessment of management funding resources.
Implementation of management and monitoring actions	Management actions not implemented	Likelihood: Possible Consequence: High Risk outcome: Medium	<ul style="list-style-type: none"> Main Roads required to comply with requirements of EPBC 2019/8543, including implementation of management actions (refer to Section 5.5.4) within this Plan Main Roads required to report annually to CEO on compliance with this Plan, including implementation of management actions. 	Likelihood: Unlikely Consequence: Moderate Risk outcome: Low	<ul style="list-style-type: none"> Annual audit conducted to ensure management actions have been implemented
Achievement of completion criteria	Failure to achieve completion criteria	Likelihood: Possible Consequence: Moderate Risk outcome: Medium	<ul style="list-style-type: none"> Re-assess completion criteria (refer to Section 5.5.2) 12 months after failure and continue to assess until completion criteria are met Review management actions and / or completion criteria in accordance with the review provisions for this Plan if management actions are no longer feasible, completion criteria are no longer attainable or other extenuating circumstances arise. 	Likelihood: Unlikely Consequence: Moderate Risk outcome: Low	<ul style="list-style-type: none"> Monitor progress toward achieving completion criteria over time through annual audits (refer to Section 5.6 for monitoring detail).

6 ARTIFICIAL NESTING HOLLOWES

6.1 Artificial nest hollows to offset future hollow potential of suitable DBH trees

Condition 15(b)(i) of EPBC Act approval for EPBC 2019/8543 requires Main Roads to quantify the total number suitable nest hollows identified during the pre-clearance survey specified in condition 7, and the number of suitable nest hollows and trees with a diameter at breast height of greater than 500 mm cleared. It is unclear whether this condition requires the impact to trees with a diameter at breast height of greater than 500 mm cleared to be offset. It is noted that black cockatoos are not known to breed in the vicinity of the Project, with the nearest record at Lake Preston, 52 km to the north, and that DBCA have indicated that nest hollows are not a limiting factor for black cockatoo breeding on the Swan Coastal Plain. In the interest of being conservative, and to address any concerns regarding the intent of this condition, Main Roads committed to installing 45 ANHs to address the loss of the future suitable hollow-bearing potential of the 1,088 suitable DBH trees that will be cleared for the Project, noting that the likely number of suitable hollows that will actually be impacted by the Project is estimated to be around 4 or 5.

6.2 Artificial nest hollows to offset suitable nest hollows

Condition 18(c)(i) of the EPBC Act approval for EPBC 2019/8543 requires Main Roads to install three ANHs for every suitable nest hollow cleared for the Project. Up to 11 trees containing suitable nest hollows were authorised to be cleared for the Project. Three potentially suitable hollows have been cleared for the Project, with no further trees with potentially suitable hollows are expected to be cleared for the Project (Australian Black Cockatoo Specialists, 2023a). Nine ANHs shall be installed to offset the loss of three potentially suitable nesting hollows.

Assuming only three potentially suitable black cockatoo hollows will be cleared, a total of 54 ANHs will be installed to offset the Project's impacts on black cockatoo breeding habitat.

6.3 Location of artificial nest hollows

DBCA's Fauna Note *Artificial Nest Hollows for All Black Cockatoos* (DBCA, 2023) recommends that ANHs are used in known nesting areas where there has been a decrease in the availability of natural hollows. DBCA (2023) lists five key criteria for consideration when determining suitable ANH locations:

1. The site is a Eucalypt woodland or forest within the known breeding range of the species
2. Breeding by black cockatoos is known or suspected at the site. There must also be evidence that a lack of suitable available tree hollows is preventing breeding that would otherwise occur in the area.
3. The artificial hollows can be located in close proximity to adequate feeding areas – within a 12 km radius
4. The hollows are placed in secure locations and the owner/manager of these areas is supportive and willing to provide the necessary long-term security and annual maintenance for the entire time that the artificial hollow will be in place
5. A suitable artificial hollow design is used.

Preliminary consultation with DBCA has commenced regarding suitable locations for the ANHs. Based on initial discussions, three ANHs have been installed in the Ducane Offset Area (Offset A) and up to six may be installed in Lot 156 Marchetti Road, Gelorup, which is designated as Offset 3 under condition 9 of Ministerial Statement (MS) 1191. The actual location of ANHs will be

determined in consultation with DBCA, based on the above criteria. As at 1 July 2023, three ANHs have been installed in the Ducane Offset Area (Offset A) (Australian Black Cockatoo Specialists, 2023b) (Appendix F).

Main Roads will continue to consult DBCA on where the remainder of the ANHs should be placed to ensure they appropriately offset the impacts of the Project.

For hollows not cleared prior to finalisation of this Plan, subsequent hollows that cannot be avoided (i.e. that will be cleared) will be reported in the annual report and offset in accordance with condition 18(c)(i). ANHs required to offset hollows that are not cleared prior to finalisation of this Plan will be installed in the selected ANH sites prior to 1st July immediately following clearing of the potentially suitable hollow.

6.4 Artificial nest hollow installation and management methodology

ANHs will be installed and maintained in accordance with the recommendations contained in DBCA's Fauna Note *Artificial Nest Hollows for All Black Cockatoos* (DBCA, 2023). A draft *Artificial Nest Hollow Installation and Maintenance Plan* (ANHIMP) has been prepared for the Project and submitted to DBCA for comment. ANH installation and maintenance will be conducted in accordance with the finalised ANHIMP.

6.5 Artificial nest hollow management timeframe

While condition 18(c)(i) only requires Main Roads to maintain ANHs for a period of ten years, Main Roads intends to maintain all ANHs for the period of the EPBC Act approval. This timeframe aligns with the timeframe to which Main Roads has committed for the management of offsets sites.

6.6 Artificial nest hollow monitoring

Monitoring and maintenance of the ANHs will be undertaken in accordance with the DBCA fauna note *Artificial hollows for black cockatoos* (DBCA, 2023). ANHs will be surveyed annually in summer/autumn, which is the completion of each species' peak breeding season. Surveys will be undertaken by a suitably experienced person. Hollows will be inspected using a range of techniques as appropriate including using binoculars at ground level to check for signs of use, e.g. chew marks, birds entering/exiting the hollow, bees), drones, remotely operated camera on a pole and ladders. Surveys will identify:

- If ANHs are currently in use or show evidence of previous use
- Maintenance requirements for ANHs (such as replacement of the sacrificial wooden post or removal of feral bees)
- If ANHs are no longer able to be used by black cockatoos, for example they have been invaded by feral bees, the hollow has been damaged or the limb has fallen.

The results of monitoring surveys will be provided to DBCA contributing to broader research into the species. This information will also be available to other research organisations and individuals upon request.

Main Roads commits to ensuring the ANHs are in good working condition at the end of the period of approval before offering all ANH assets to DBCA.

7 REPORTING AND ACCOUNTABILITY

7.1 Roles and responsibility

This Offset Management Plan identifies the environmental management of activities to be undertaken by Main Roads or its delegate in implementation of the offset proposal. Main Roads acknowledges that the environmental management actions contained within this Plan are legal requirements to be met by Main Roads.

The Manager Environment at Main Roads will maintain responsibility for implementation of the management actions specified in this Plan, on behalf of Main Roads Managing Director. Management actions may be undertaken by employees and / or contractors of Main Roads on behalf of Managing Director.

Where management actions are undertaken by employees and / or contractors of Main Roads, these will be communicated and documented to the relevant personnel through relevant environmental training and contractual arrangements (refer to Section 7.3).

7.2 Reporting

Main Roads will report to DCCEEW on the implementation of this Plan as part of the Environmental Performance report and annual compliance reporting, which will both be publicly available, under condition 28 of EPBC Act approval for EPBC 2019/8543.

Where compliance audits undertaken by Main Roads identify that the environmental management actions and / or the environmental objectives are not being achieved (e.g. non-compliance or an environmental incident), Main Roads will notify DCCEEW as soon as practicable and no later than within seven days of the non-compliance being known. When such a notification is made to the DCCEEW, it is noted that follow up reporting may be required under EPBC 2019/8543.

Consistent with standard document control procedures, Main Roads will maintain copies of all reports submitted to DCCEEW.

The reporting requirements for this Plan are identified in Table 7-1.

Table 7-1. Reporting requirements

Aspect	Report from	Report to	Reporting frequency
Implementation of Offset Management Plan	Manager Environment	DCCEEW	Annually (as part of annual compliance reporting)
Non-compliance with Offset Management Plan or Environmental Incident	Manager Environment	DCCEEW	As soon as reasonably practicable but not more than seven days

The format and content of annual reporting will be in accordance with the requirements of condition 28 of EPBC Act approval for EPBC 2019/8543. The format and content of reporting of a non-compliance event or an environmental incident will be subject to the nature of the non-compliance / incident and will include all requested information from DCCEEW. In consideration of this, specific templates for reporting these are not provided as part of this Plan.

7.3 Environmental training

Main Roads will ensure that all personnel undertaking works for the Project, including visitors, have undertaken a site induction training program, or are escorted to the site. Main Roads will evaluate all personnel undertaking the site induction training program through a written test to ensure that all personnel have an understanding of the environmental requirements for the Project.

Where it is identified that personnel have not undertaken the works in accordance with the environmental requirements for the Project, Main Roads will require such personnel to repeat the site induction training program. The general content of the site induction training program for the Project is outlined in Table 7-2.

Table 7-2. BORR Southern Section project offset areas site induction training program content

Aspect	Site induction training program content
Site induction training program	Awareness of Main Roads Environmental Policy
	Identification of the environmental values in the Offset Area
	Identification of key environmental risks associated with the Offset Area, and the identification of management requirements to control such risks
	Roles and responsibilities of all personnel in the protection and management of the environment, including identification of key personnel that have specific roles or responsibilities
	Awareness of importance of compliance with the environmental requirements (including penalties for non-conformance with the environmental requirements)
	Pegging of the area of works, and other pegging types (for example, monitoring sites/photopoints)
	Hygiene procedures for <i>Phytophthora</i> Dieback management and weed management
	Appropriate disposal of wastes
	Environmental incidents, including the requirements for management and reporting

7.4 Emergency contacts and procedures

Emergency contact details will be signposted at appropriate locations within the area of the Project, to enable immediate contact and response in the event of an emergency / environmental incident observed by Main Roads personnel, contractors or the public. Emergency response procedures will be followed in the event of an emergency / environmental incident. Main Roads general and emergency contacts for the Project are provided in Table 7-3.

Table 7-3. Emergency contact details

Aspect	Contact details
General contact	<ul style="list-style-type: none"> Main Roads Head Office Address: Don Aitken Centre, Waterloo Crescent, EAST PERTH WA 6004 Mail: PO Box 6202, EAST PERTH WA 6002 Email: enquiries@mainroads.wa.gov.au Phone: 138 138 Main Roads South West Region Address: Robertson Drive, BUNBURY WA 6231 Mail: PO Box 5010, EAST PERTH WA 6231 Email: enquiries@mainroads.wa.gov.au Phone: 138 138 / (08) 9724 5600
Emergency contact	<ul style="list-style-type: none"> Manager Environment, Main Roads Email: Martine.Scheltema@mainroads.wa.gov.au Phone: (08) 9323 4614 Regional Manager, Main Roads South West Region Email: robert.barnsley@mainroads.wa.gov.au Phone: (08) 9724 5600

8 ADAPTIVE MANAGEMENT AND REVIEW

In accordance with conditions 34-39 of EPBC Act approval for EPBC 2019/8543, Main Roads may review and revise this Plan. Main Roads will also review and revise this Plan as and when directed by the Minister. The approved version of the plan will continue to be implemented until directed otherwise.

8.1 Adaptive management

This Offset Management Plan adopts an ‘adaptive management’ approach which seeks to embed a cycle of monitoring, reporting and implementing change, where required. Accordingly, it is intended that this Plan is intended to be dynamic and may be updated (as required) to reflect changes in the monitoring and management practices, subject to the results of the monitoring to identify that the environmental objectives are being achieved. The Plan may also be revised to address learnings from the implementation of corrective actions, should this occur.

Relevant corrective actions for each Offset Area are detailed in this Plan under the relevant subsections.

8.2 Environmental review

Main Roads proposes to review this Plan annually for the first three years after commencing construction and three-yearly after this point in order to consider:

- The management and monitoring actions
- Opportunities for an improvement in environmental performance (for example, changes to methodologies or timing)
- Identify a need to update this Plan to capture changes to the management and / or monitoring actions
- Identify any general need to update this Plan (for example, to capture new information on WRP knowledge or management).

Main Roads acknowledge that a revision to this Plan may trigger a need for additional approval by DCCEEW prior to implementing any changes to the specified management or monitoring actions.

The proposed Plan review schedule for the Project is identified in Table 8-1.

Table 8-1. Offset Management Plan review schedule

Timing	Action	Schedule
Construction and Post construction	<ul style="list-style-type: none"> • Review of Offset Management Plan management and monitoring actions • Review of opportunities for an improvement in environmental performance • Revise Offset Management Plan (if appropriate) and seek DCCEEW approval of revised plan. 	Annually for three years after construction commences then once every three years for the life of the approval

8.3 Data management

Main Roads will maintain records on the implementation of this Offset Management Plan in accordance with Main Roads corporate standard document control procedures.

Data will be provided to DCCEEW in accordance with condition 27 of EPBC Act approval for EPBC 2019/8543.

The retention of records held by Main Roads will be maintained and managed in accordance with the Western Australian *State Records Act 2000* (WA).

9 STAKEHOLDER CONSULTATION

Main Roads consulted with stakeholders while developing this Plan. This section provides a summary of consultation that occurred. The comments raised during consultations with stakeholders were considered in developing this Plan. Table 9-1 presents a summary of consultation and Main Roads’ response.

Table 9-1. Stakeholders consulted, comments and responses

Date	Organisation	Summary of consultation	Main Roads response to comments / concerns
Ducane Offset Area			
May 2019	DBCA	DBCA Corporate office advised Main Roads of opportunity to purchase these properties as an environmental offset	Main Roads noted interest in purchase and arranged site fauna survey
July 2019	DBCA	DBCA SW region indicated support for Main Roads to fund the purchase of these properties as an environmental offset for BORR	Main Roads advised DBCA it would fund the acquisition of the properties as an environmental offset for BORR. Acquisition was finalised in March 2020.
October 2020 and August 2021	EPA	Properties included in Environmental Offset Strategy submitted to EPA	N/A
November 2020	DAWE, EPA Services and DBCA	Main Roads presented these properties as proposed environmental offsets for BORR Southern Section project during workshop presented to regulators	N/A
December 2020	Shire of Capel	The Shire reviewed the Offset Strategy as part of the public consultation process of both the EPA and DAWE referrals. In regard to offsets, the same concerns were provided in both the EPA and DAWE submissions.	Main Roads addressed the Shire’s concerns in both the EPA and DAWE submission response documents, and we have also sought consultation on this Plan subsequent to the Minister releasing his Statement.
Lot 29 Offset Area			
August 2019	DBCA SW Region	General discussion of BORR environmental offsets for BORR project	N/A
July 2020	DBCA SW Region	Discussion of Ducane Rd properties as environmental offsets for BORR project	
December 2020	DPLH	DPLH raised this property as a potential environmental offset site for BORR	Main Roads indicated it would investigate environmental values of the property

Date	Organisation	Summary of consultation	Main Roads response to comments / concerns
December 2020	Shire of Capel	The Shire reviewed the Offset Strategy as part of the public consultation process of both the EPA and DAWE referrals. In regard to offsets, the same concerns were provided in both the EPA and DAWE submissions.	Main Roads addressed the Shire’s concerns in both the EPA and DAWE submission response documents, and we have also sought consultation on this Plan subsequent to the Minister releasing his Statement.
August 2021	EPA	Properties included in environmental Offset Strategy submitted to EPA	N/A
Lot 156 Offset Area			
February 2020	DBCA	DBCA advised they would not incorporate this property into the conservation estate	Main Roads to manage until alternative management can be resolved
October 2020 and August 2021	EPA	Properties included in environmental Offset Strategy submitted to EPA	N/A
November 2020	DAWE, EPA Services and DBCA	Main Roads presented these properties as proposed environmental offsets for BORR Southern Section project during workshop presented to regulators	N/A
December 2020	Shire of Capel	The Shire reviewed the Offset Strategy as part of the public consultation process of both the EPA and DAWE referrals. In regard to offsets, the same concerns were provided in both the EPA and DAWE submissions.	Main Roads addressed the Shire’s concerns in both the EPA and DAWE submission response documents, and we have also sought consultation on this Plan subsequent to the Minister releasing his Statement.
June 2022		The Shire reviewed the Offset Plan (Rev A) and provided comments to Main Roads.	The Shire has provided preliminary advice indicates that the Shire was not interested in assuming management responsibility for the Lot 156 offset site at this point in time. Given the long time frames associated with the offset implementation for this project, Main Roads will continue to consult with all relevant land management authorities until the most appropriate management arrangements is identified.

Date	Organisation	Summary of consultation	Main Roads response to comments / concerns
Lot 104 North Offset Area			
October 2020 and August 2021	EPA	Properties included in environmental Offset Strategy submitted to EPA	N/A
November 2020	DAWE, EPA Services and DBCA	Main Roads presented these properties as proposed environmental offsets for BORR Southern Section project during workshop presented to regulators	N/A
December 2020	Shire of Capel	The Shire reviewed the Offset Strategy as part of the public consultation process of both the EPA and DAWE referrals. In regard to offsets, the same concerns were provided in both the EPA and DAWE submissions.	Main Roads addressed the Shire's concerns in both the EPA and DAWE submission response documents, and we have also sought consultation on this Plan subsequent to the Minister releasing his Statement.
Ludlow Offset Area			
2014 - present	DBCA SW region	Discussed and agreed on development of environmental offset sites	N/A
October 2020 and August 2021	EPA	Properties included in environmental Offset Strategy submitted to EPA	N/A
November 2020	DBCA SW Region	Meeting to discuss Main Roads options for environmental offset in Ludlow State Forest	N/A
November 2020	DAWE, EPA Services and DBCA	Main Roads presented these properties as proposed environmental offsets for BORR Southern Section project during workshop presented to regulators	N/A
December 2020	Shire of Capel	The Shire reviewed the Offset Strategy as part of the public consultation process of both the EPA and DAWE referrals. In regard to offsets, the same concerns were provided in both the EPA and DAWE submissions.	Main Roads addressed the Shire's concerns in both the EPA and DAWE submission response documents, and we have also sought consultation on this Plan subsequent to the Minister releasing his Statement.
Tredrea Offset Area			
February 2020	DBCA SW Region	DBCA advised via e-mail that the property is too small and isolated to be incorporated into the conservation estate	Main Roads to manage until alternative management can be resolved

Date	Organisation	Summary of consultation	Main Roads response to comments / concerns
October 2020 and August 2021	EPA	Properties included in environmental Offset Strategy submitted to EPA	N/A
November 2020	DAWE, EPA Services and DBCA	Main Roads presented these properties as proposed environmental offsets for BORR Southern Section project during workshop presented to regulators	N/A
December 2020	Shire of Capel	The Shire reviewed the Offset Strategy as part of the public consultation process of both the EPA and DAWE referrals. In regard to offsets, the same concerns were provided in both the EPA and DAWE submissions.	Main Roads addressed the Shire’s concerns in both the EPA and DAWE submission response documents, and we have also sought consultation on this Plan subsequent to the Minister releasing his Statement.

10 REFERENCES

- Australian Black Cockatoo Specialists. (2023a). *Assessment of 12 trees for Nesting values for three species of Black-Cockatoo Bunbury Outer Ring Project, WA*. Unpublished report prepared for Main Roads Western Australia.
- Australian Black Cockatoo Specialists. (2023b). *Report: Installation of four Artificial Hollows Ducane Reserve W.A.* Unpublished report prepared for Main Roads Western Australia.
- Biota. (2019). *Targeted Fauna Survey: Lots 267, 268 and 153 Ducane Road, Gelorup*. Unpublished report prepared for Main Roads Western Australia.
- Biota. (2020a). *Bunbury Outer Ring Road Southern Section Targeted Fauna Assessment*. Unpublished report prepared for BORR IPT on behalf of Main Roads Western Australia.
- Biota. (2020b). *Western Ringtail Possum (Pseudocheirus occidentalis) Regional Surveys*. Unpublished report prepared by Biota Environmental Sciences for Main Roads Western Australia.
- Biota. (2021). *Lots 153, 267 and 268 Ducane Road Banksia Woodlands TEC Assessment*. Unpublished report prepared for Main Roads Western Australia.
- Biota. (2022). *Information Request BORR South Offsets - Memo report*. Unpublished memo report prepared for Main Roads Western Australia.
- Commonwealth of Australia. (2014). *Environmental Management Plan Guidelines*.
- DBCA. (2010, 2018). *Vegetation assessment of Lots 153, 266, 267 & 268 Ducane Road*. Unpublished report prepared for Main Roads Western Australia.
- DBCA. (2017). *Western Ringtail Possum (Pseudocheirus occidentalis) Recovery Plan*. Department of Biodiversity, Conservation and Attractions.
- DEC. (2008). *Forest Black Cockatoo (Baudin's cockatoo Calyptorhynchus baudinii and Forest Red-Tailed Black Cockatoo Calyptorhynchus banksii naso) Recovery Plan*. Perth, Western Australia: Department of Environment and Conservation.
- DEWHA. (2009). *Approved Conservation Advice for Calyptorhynchus banksii naso (Forest Red-tailed Black Cockatoo)*. Canberra, Australian Capital Territory: Department of the Environment, Water, Heritage and the Arts.
- DPAW. (2013). *Carnaby's cockatoo (Calyptorhynchus latirostris) Recovery Plan*. Perth, Western Australia: Department of Parks and Wildlife.
- DPaW. (2014). *Tuart Forest National Park Management Plan*. Perth, Western Australia: Department of Parks and Wildlife.
- DPaW. (2015). *How to design and place artificial hollows for Carnaby's cockatoo*. Department of Parks and Wildlife.
- DSEWPaC. (2012a). *EPBC Act Referral Guidelines for Three Threatened Black Cockatoo Species*. Canberra, Australian Capital Territory: Australian Government, Department of Sustainability, Environment, Water, Population and Communities.
- Ecoedge. (2018). *A Flora and Vegetation survey on Lot 104 Willinge Drive, Davenport*. Unpublished report prepared for Main Roads Western Australia.
- Ecoedge. (2022). *Reconnaissance Flora and Vegetation Survey Ludlow Offset Sites*. Unpublished report in preparation for Main Roads Western Australia.
- EPA. (2016). *Technical Guidance Flora and Vegetation Surveys for Environmental Impact Assessment*. Perth, Western Australia: Environmental Protection Authority.
- GHD. (2014). *Part Lot 5 Boyanup - Picton Road Environmental Values Assessment*. Unpublished report prepared for Main Roads Western Australia.
- Gordon, I. S.-B. (2021). Herbivore management for biodiversity conservation: A case study of kangaroos in the Australian Capital Territory (ACT) . *Ecol Manag Restor*, 22: 124-137. doi:<https://doi.org/10.1111/emr.12443>

- Keighery, B. &. (1994). *Bushland plant survey : a guide to plant community survey for the community*. Nedlands, W.A: Wildflower Society of WA (Inc.).
- Main Roads Western Australia. (2019). *Principal Environmental Management Requirements - Dieback Management*. Main Roads Western Australia.
- Main Roads Western Australia. (2023a). *Literature Review - Effects of herbivore [kangaroo] grazing on terrestrial biodiversity*. Unpublished report prepared for Main Roads Western Australia.
- Main Roads Western Australia. (2023b). *Bunbury Outer Ring Road Southern Section Post-approval Offset Strategy Rev7a*. Unpublished report prepared by Main Roads Western Australia.
- Stream Environment and Water. (2022). *Flora and Vegetation Survey of Ludlow Offset Site 7*. Unpublished report prepared for Main Roads Western Australia.
- SW Environmental. (2022). *BORR offsets WRP rapid assessment*. Unpublished memo report prepared for Main Roads Western Australia.
- SW Environmental. (2023). *(SW409) Bunbury Outer Ring Road (BORR) Southern Alignment: Commonwealth (EPBC 2019/8543 Condition 18(a)(i): Summary of results to date [29 June 2023]*. Letter report prepared for the South West Gateway Alliance.
- Terratree. (2022). *Preliminary results - Broadscale Dieback assessment of proposed offset sites for BORR*. Unpublished email update to Main Roads Western Australia.
- Terratree. (2023). *BORR South Offset Areas Broadscale Phytophthora Dieback Assessment*. Unpublished Report prepared for Main Roads Western Australia.
- Tranen. (2021). *Ludlow Tuart Offset - Stage 1 Autumn 2021 Monitoring Assessment Main Roads WA P699C-08-00*. Unpublished report prepared for Main Roads Western Australia.
- TSSC. (2016). *Approved Conservation Advice (incorporating listing advice) for the Banksia Woodlands of the Swan Coastal Plain ecological community*. Canberra, Australian Capital Territory: Threatened Species Scientific Committee, Department of the Environment and Energy.
- TSSC. (2018). *Conservation Advice Calyptorhynchus baudinii Baudin's cockatoo*. Canberra, Australia: Department of the Environment and Energy.
- TSSC. (2019). *Approved Conservation Advice (incorporating listing advice) for the Tuart (Eucalyptus gomphocephala) woodlands and forests of the Swan Coastal Plain ecological community*. Canberra, Australian Capital Territory: Threatened Species Scientific Committee, Department of the Environment and Energy.

APPENDIX A. Figures

Figure 1. Development Envelope

Figure 2. Ducane Offset Area location

Figure 3. Ducane Offset Area vegetation units and Banksia Woodlands TEC

Figure 4. Ducane Offset Area fauna habitat types

Figure 5. Lot 104 North Offset Area - WRP

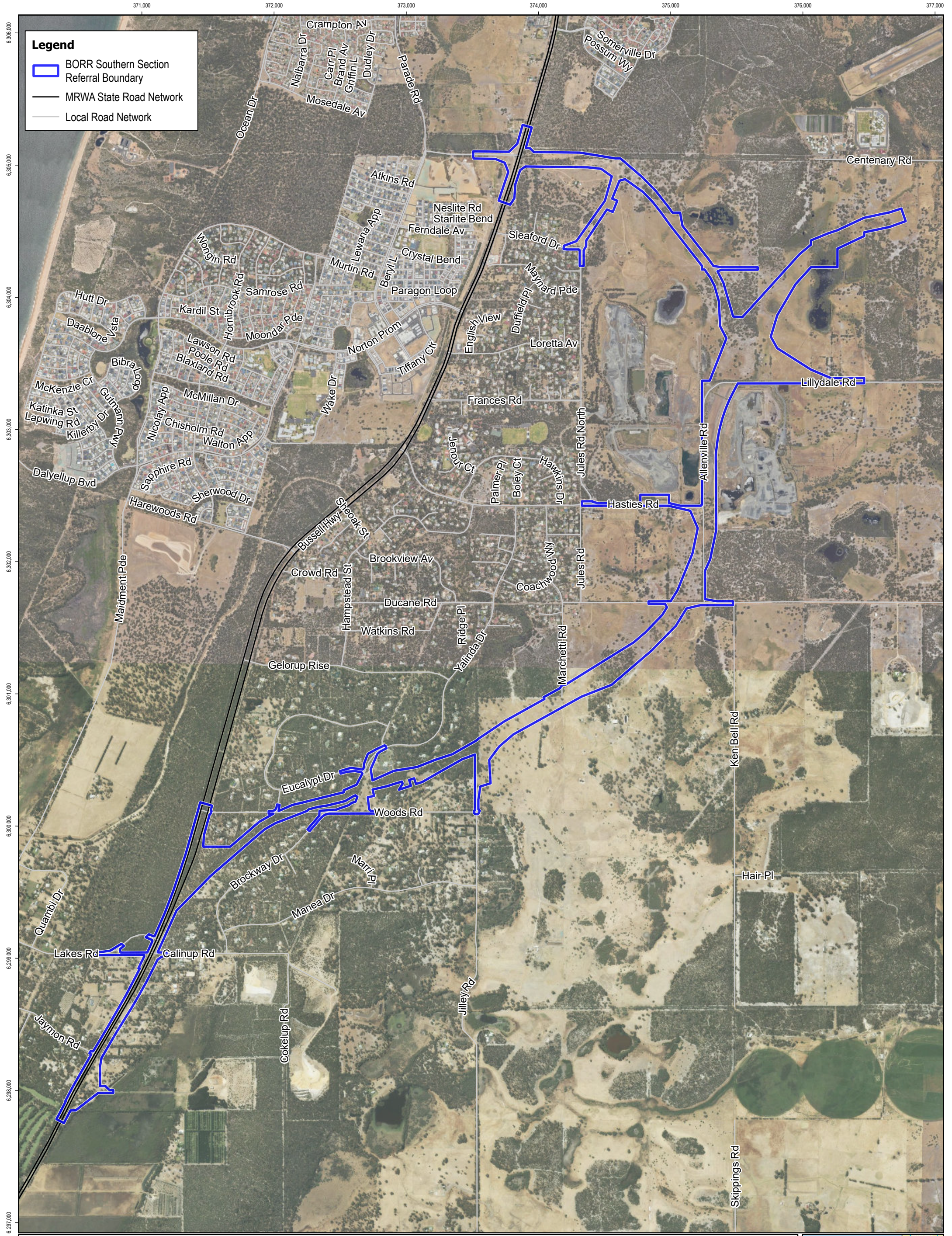
Figure 6. Lot 104 North Offset Area – black cockatoos

Figure 7. Ludlow Offset Area

Figure 8. Ludlow Offset Area Sites 2 and 4 - WRP and black cockatoos

Figure 9. Ludlow Offset Area Site 7 - WRP

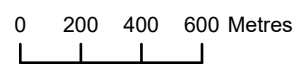
Figure 10. Ludlow Offset Area Site 12 - WRP, black cockatoos and Tuart Woodlands TEC



Legend

- BORR Southern Section Referral Boundary
- MRWA State Road Network
- Local Road Network

N
 Coordinate System: GDA 1994 Perth Coastal Grid 1994
 Scale: 1:25,000 @ A3
 Created Date: 12/04/2023
 Author: c8323

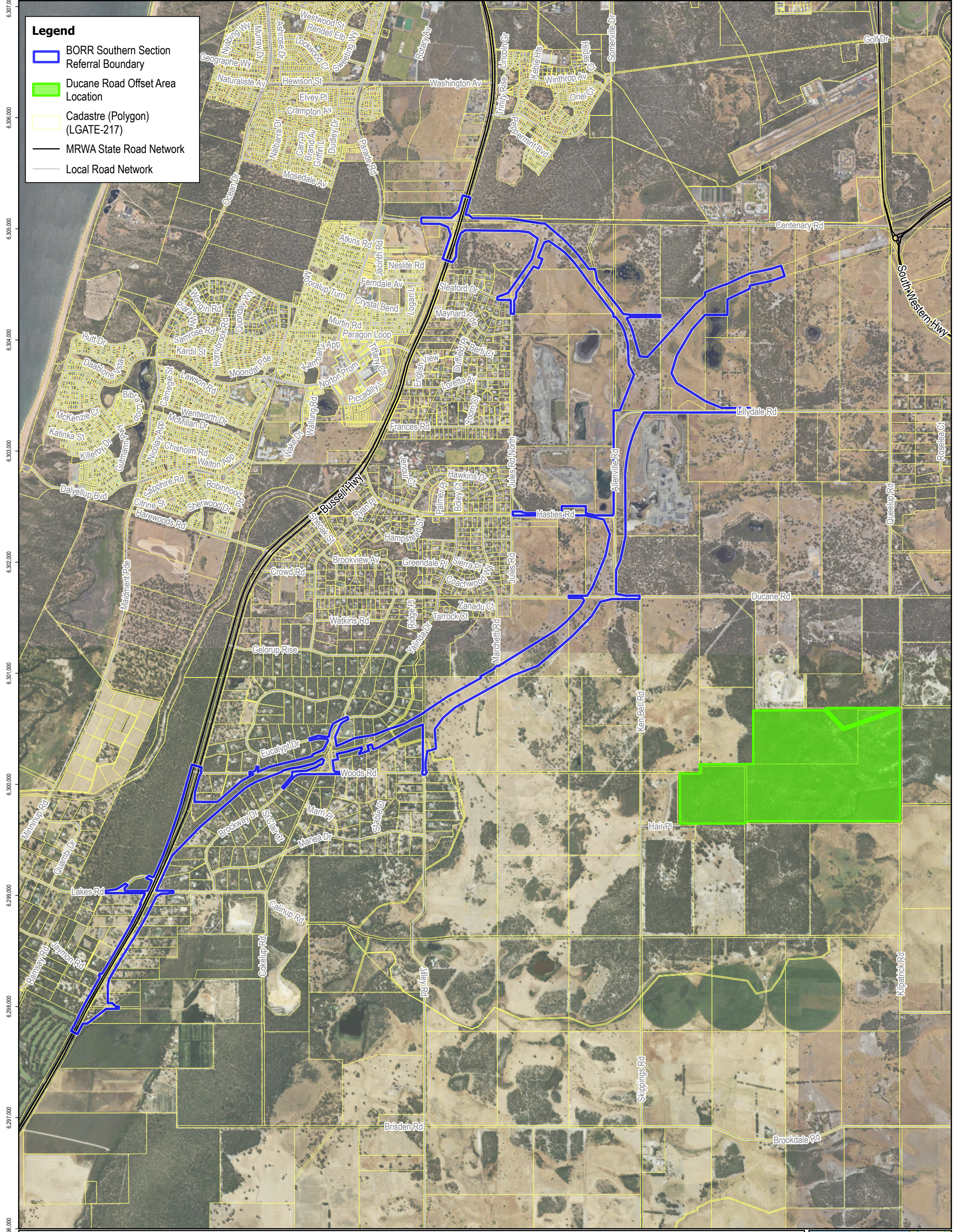


**Bunbury Outer Ring Road Southern Section
 Offset Strategy**
BORR South Development Envelope



Figure 1

Path: F:\working directories\june\20230405_BORR_South_Offset_Strategy\20230405_BORR_South_Offset_Strategy.aprx



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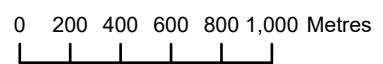
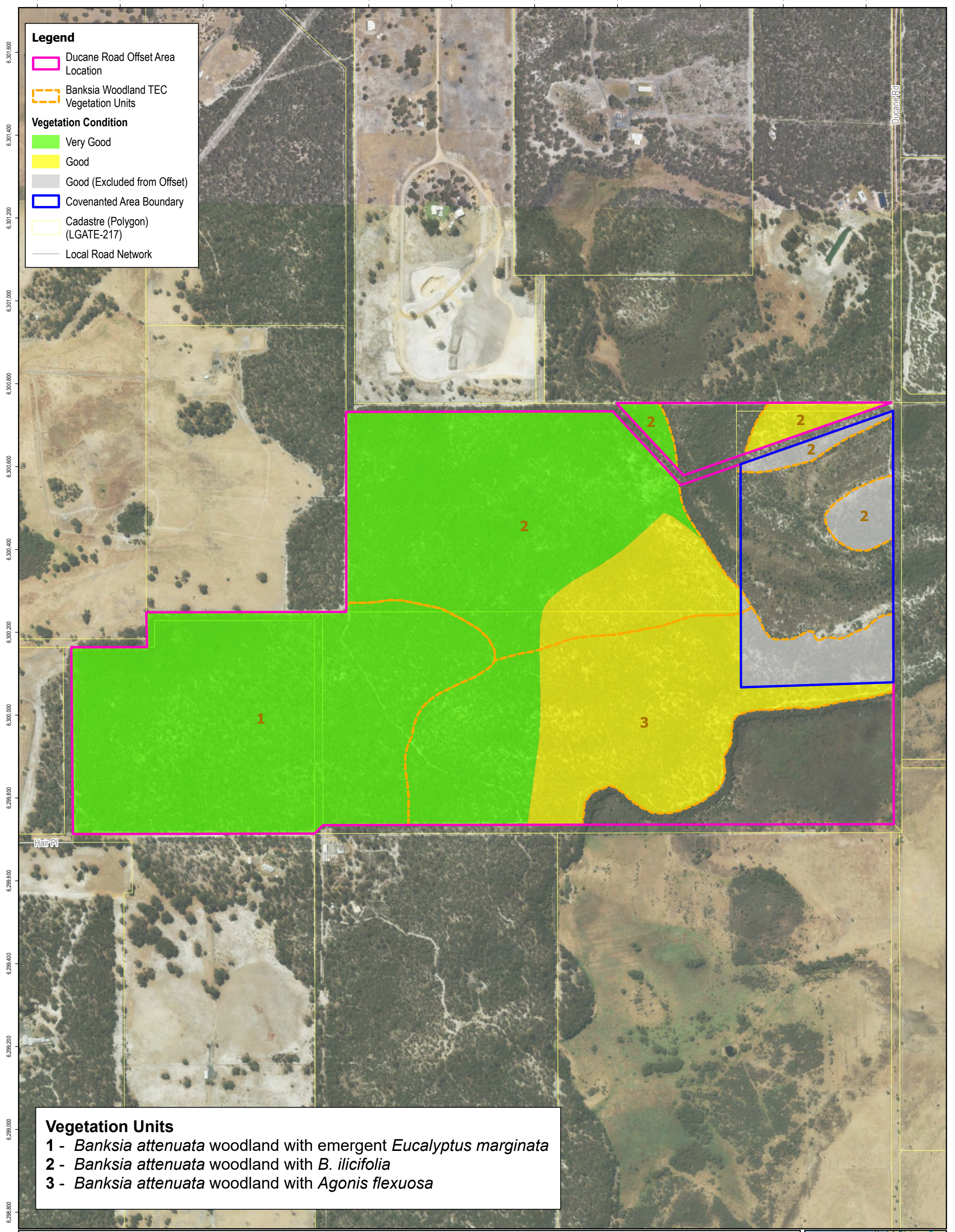


Figure 2

Bunbury Outer Ring Road Southern Section
Ducane Road Offset Area Location





Legend

- Ducane Road Offset Area Location
- Banksia Woodland TEC Vegetation Units

Vegetation Condition

- Very Good
- Good
- Good (Excluded from Offset)
- Covenanted Area Boundary
- Cadastre (Polygon) (LGATE-217)
- Local Road Network

Vegetation Units

- 1** - *Banksia attenuata* woodland with emergent *Eucalyptus marginata*
- 2** - *Banksia attenuata* woodland with *B. ilicifolia*
- 3** - *Banksia attenuata* woodland with *Agonis flexuosa*

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 Scale: 1:8,000 @ A3
 Created Date: 12/04/2023
 Author: c8323

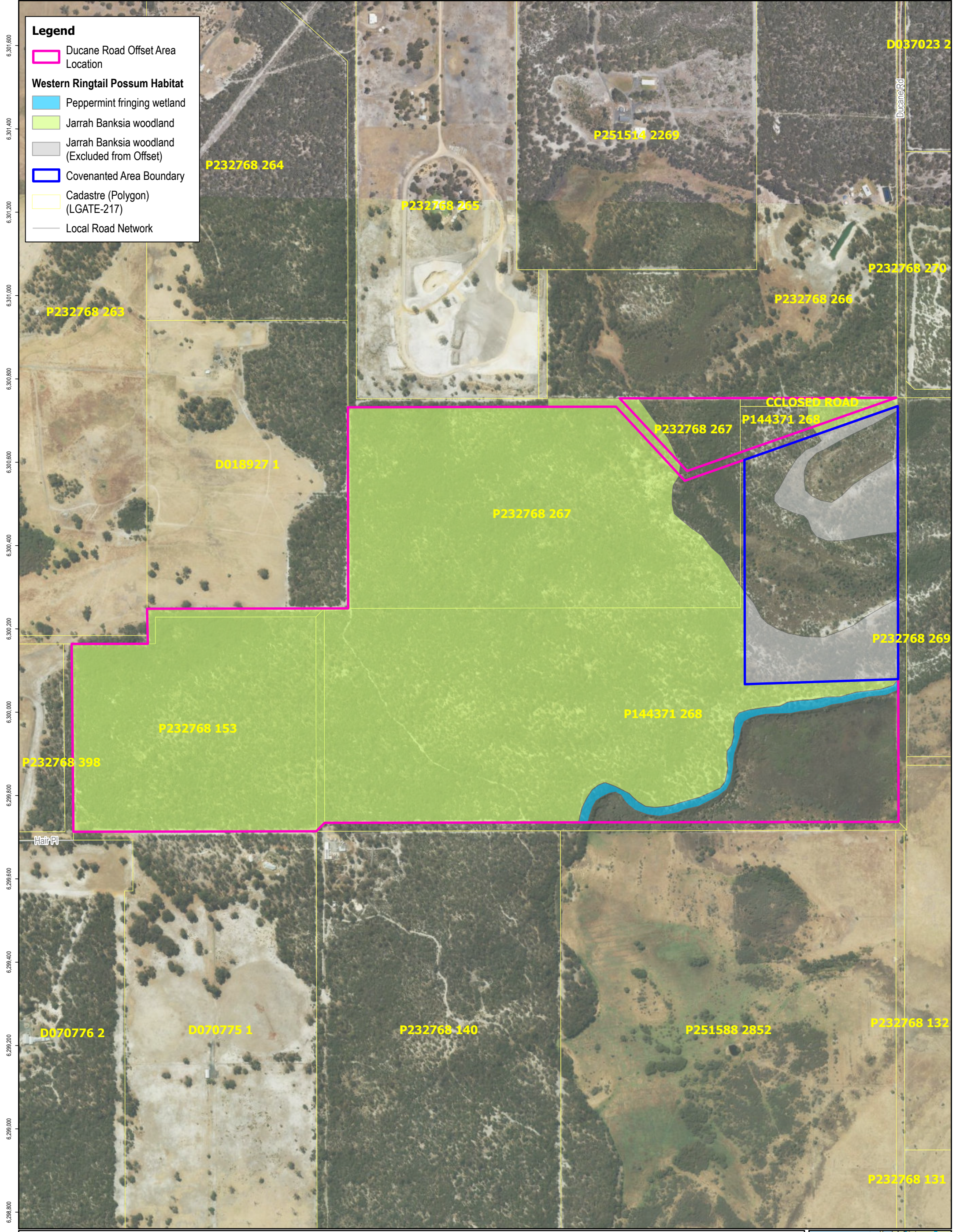
0 200 400 600 Metres

**Bunbury Outer Ring Road Southern Section
 Ducane Offset Area Banksia Woodlands
 TEC and Vegetation Condition**



Figure 3

Path: F:\working directories\june\20230405_BORR_South_Offset_Strategy\20230405_BORR_South_Offset_Strategy.aprx



Legend

- Ducane Road Offset Area Location
- Western Ringtail Possum Habitat**
 - Peppermint fringing wetland
 - Jarrah Banksia woodland
 - Jarrah Banksia woodland (Excluded from Offset)
 - Covenanted Area Boundary
 - Cadastre (Polygon) (LGATE-217)
 - Local Road Network

N
 Coordinate System: GDA 1994 Perth Coastal Grid 1994
 Scale: 1:8,000 @ A3
 Created Date: 12/04/2023
 Author: c8323

Bunbury Outer Ring Road Southern Section
Ducane Road Offset Area Location
WRP Habitat

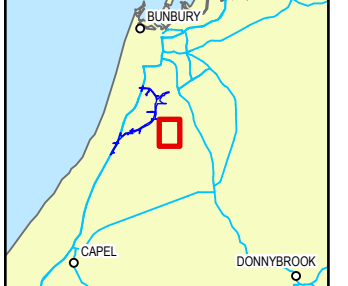
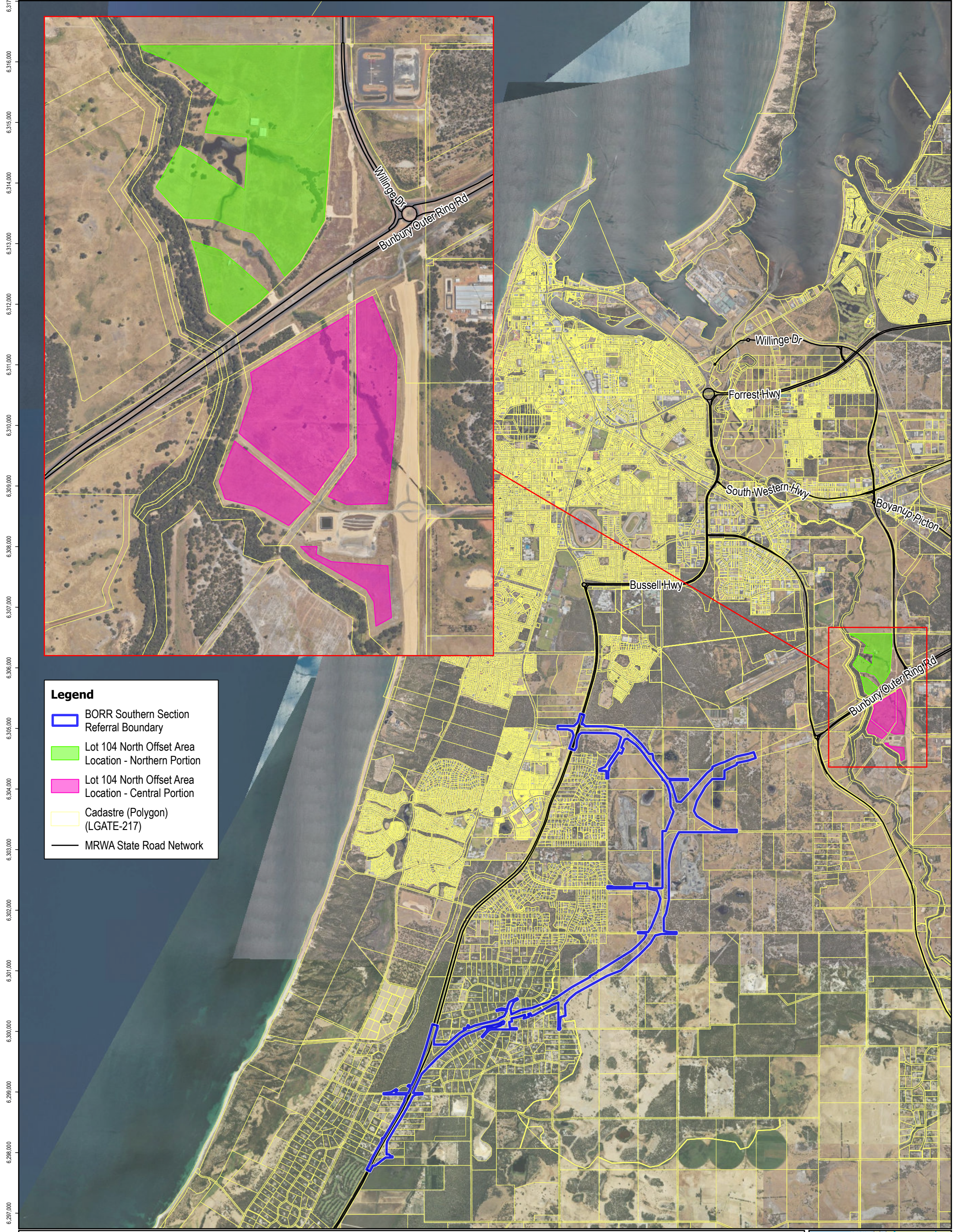


Figure 4

Path: F:\working directories\june\20230405_BORR_South_Offset_Strategy\20230405_BORR_South_Offset_Strategy.aprx



Legend

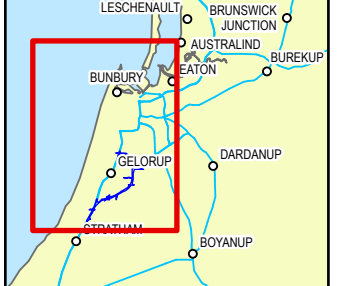
- BORR Southern Section Referral Boundary
- Lot 104 North Offset Area Location - Northern Portion
- Lot 104 North Offset Area Location - Central Portion
- Cadastre (Polygon) (LGATE-217)
- MRWA State Road Network

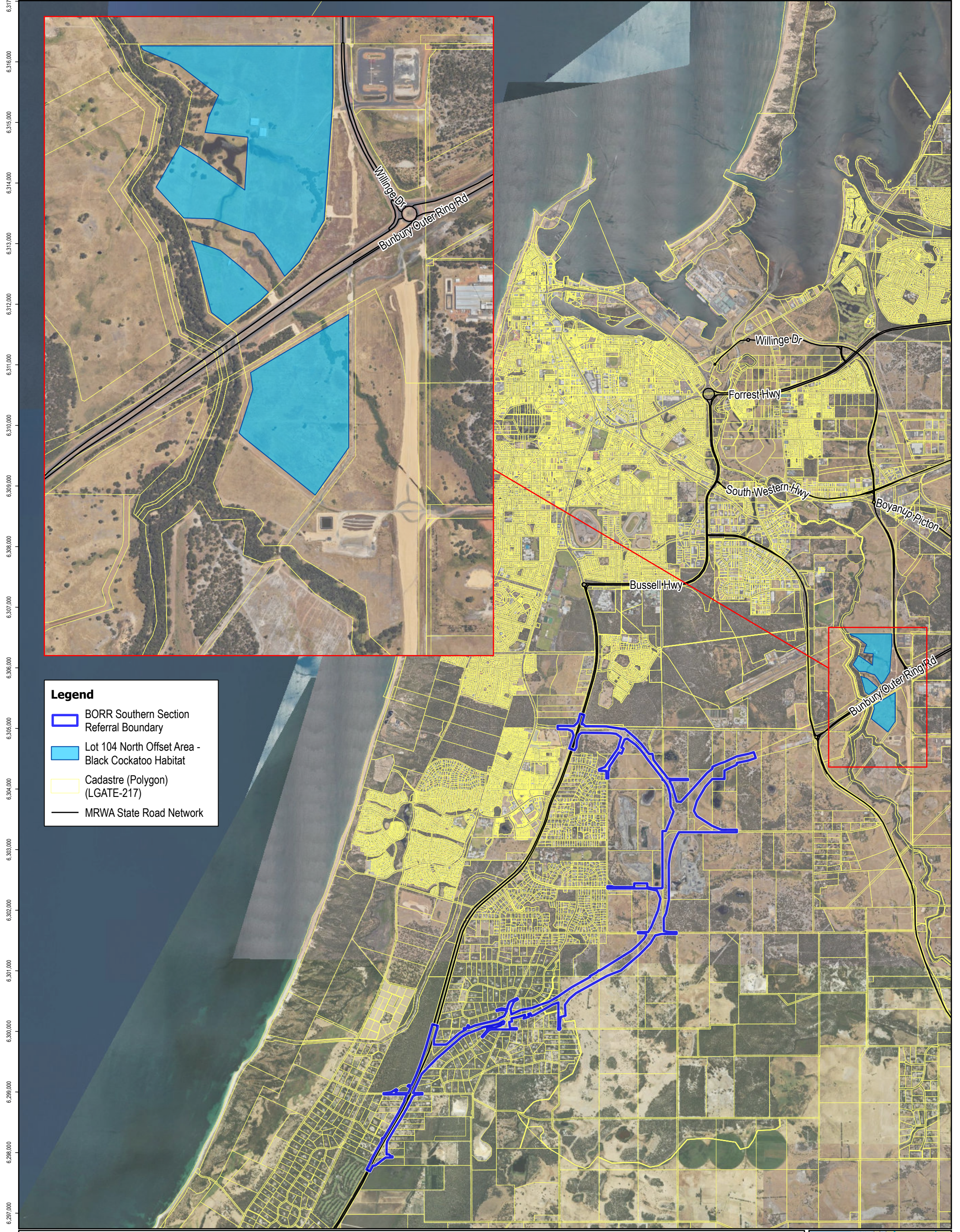
N
 Coordinate System: GDA 1994 Perth Coastal Grid 1994
 Scale: 1:55,000 @ A3
 Created Date: 12/04/2023
 Author: c8323

0 0.5 1 1.5 2 Kilometres

Bunbury Outer Ring Road Southern Section

Lot 104 North Offset Area Location - Entirety comprises WRP offset





N
 Coordinate System: GDA 1994 Perth Coastal Grid 1994
 Scale: 1:55,000 @ A3
 Created Date: 12/04/2023
 Author: c8323

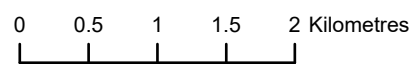
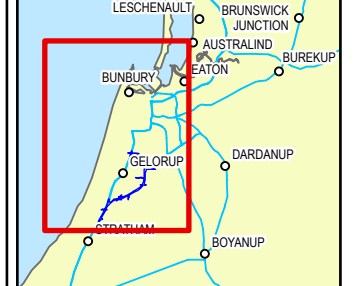
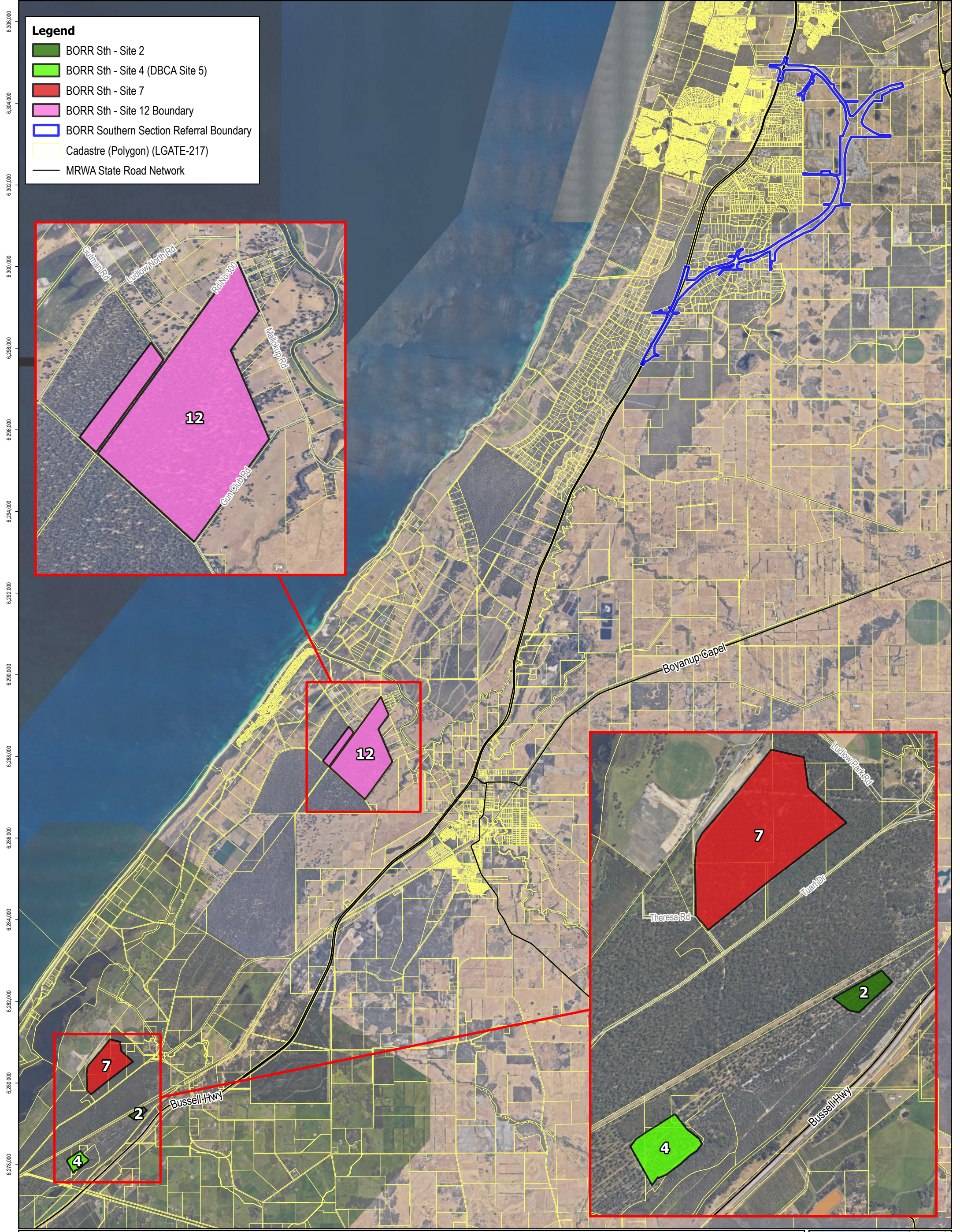


Figure 6

Bunbury Outer Ring Road Southern Section
Lot 104 North Offset Area Location
- Black Cockatoos





N
 Coordinate System: GDA 1994 Perth Coastal Grid 1994
 Scale: 1:81,639 @ A3
 Created Date: 18/04/2023
 Author: c8323

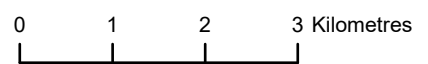
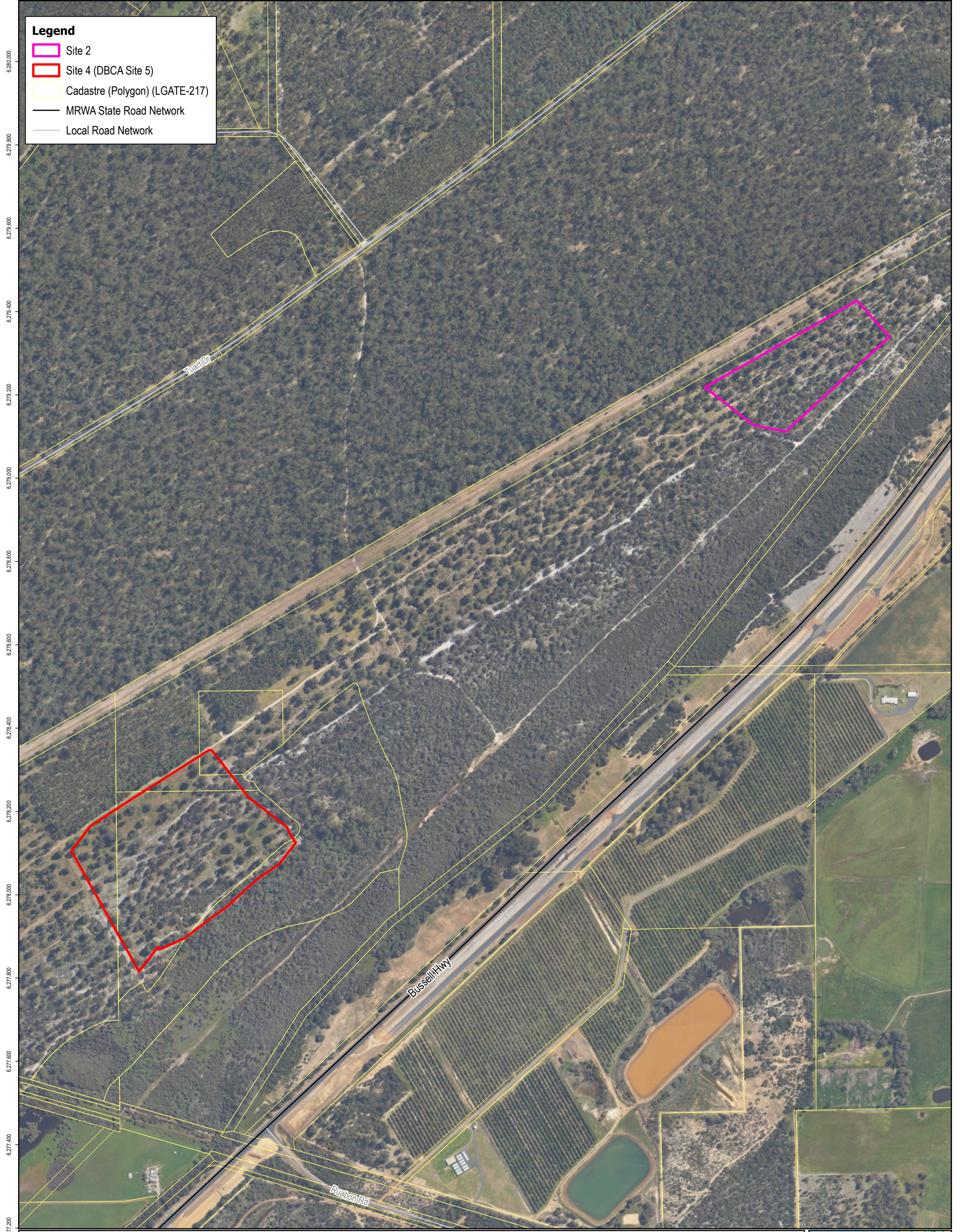


Figure 7

**Bunbury Outer Ring Road Southern Section
 Ludlow Offset Area**

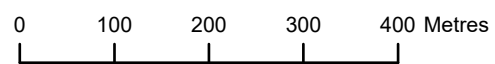




Legend

- Site 2
- Site 4 (DBCA Site 5)
- Cadastre (Polygon) (LGATE-217)
- MRWA State Road Network
- Local Road Network

N
 Coordinate System: GDA 1994 Perth Coastal Grid 1994
 Scale: 1:8,000 @ A3
 Created Date: 12/04/2023
 Author: c8323



Bunbury Outer Ring Road Southern Section
Ludlow Offset Area Sites 2 and 4
WRP and Black cockatoos

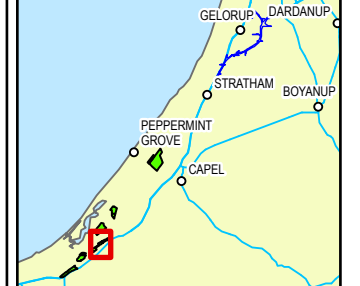
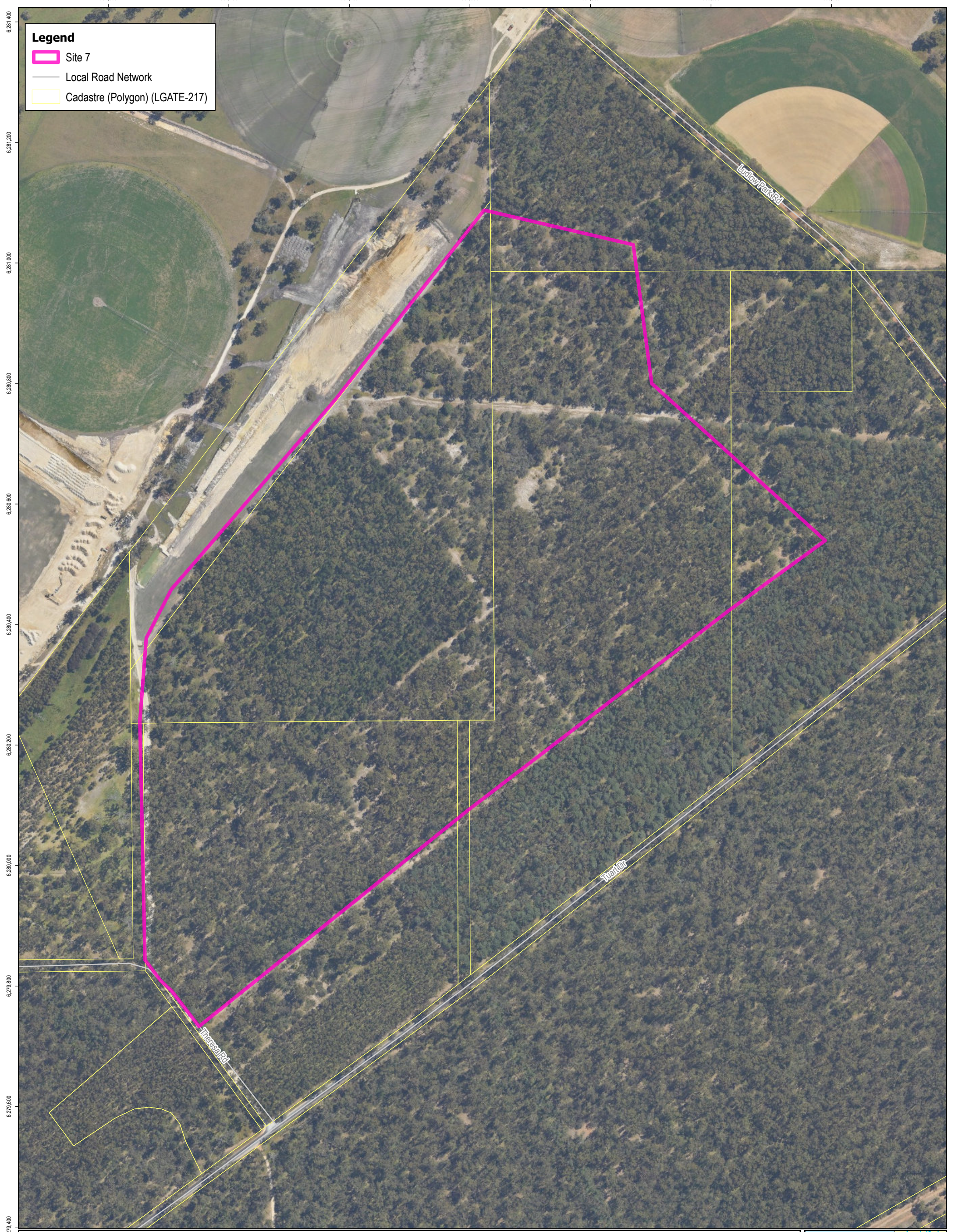


Figure 8

Path: F:\working directories\june\20230405_BORR_South_Offset_Strategy\20230405_BORR_South_Offset_Strategy.aprx



Legend

- Site 7
- Local Road Network
- Cadastre (Polygon) (LGATE-217)

N
 Coordinate System: GDA 1994 Perth Coastal Grid 1994
 Scale: 1:5,500 @ A3
 Created Date: 12/04/2023
 Author: c8323

0 100 200 300 400 Metres

Bunbury Outer Ring Road Southern
 Section **Ludlow Offset Area Site 7**
WRP

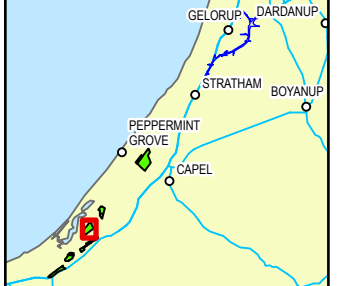
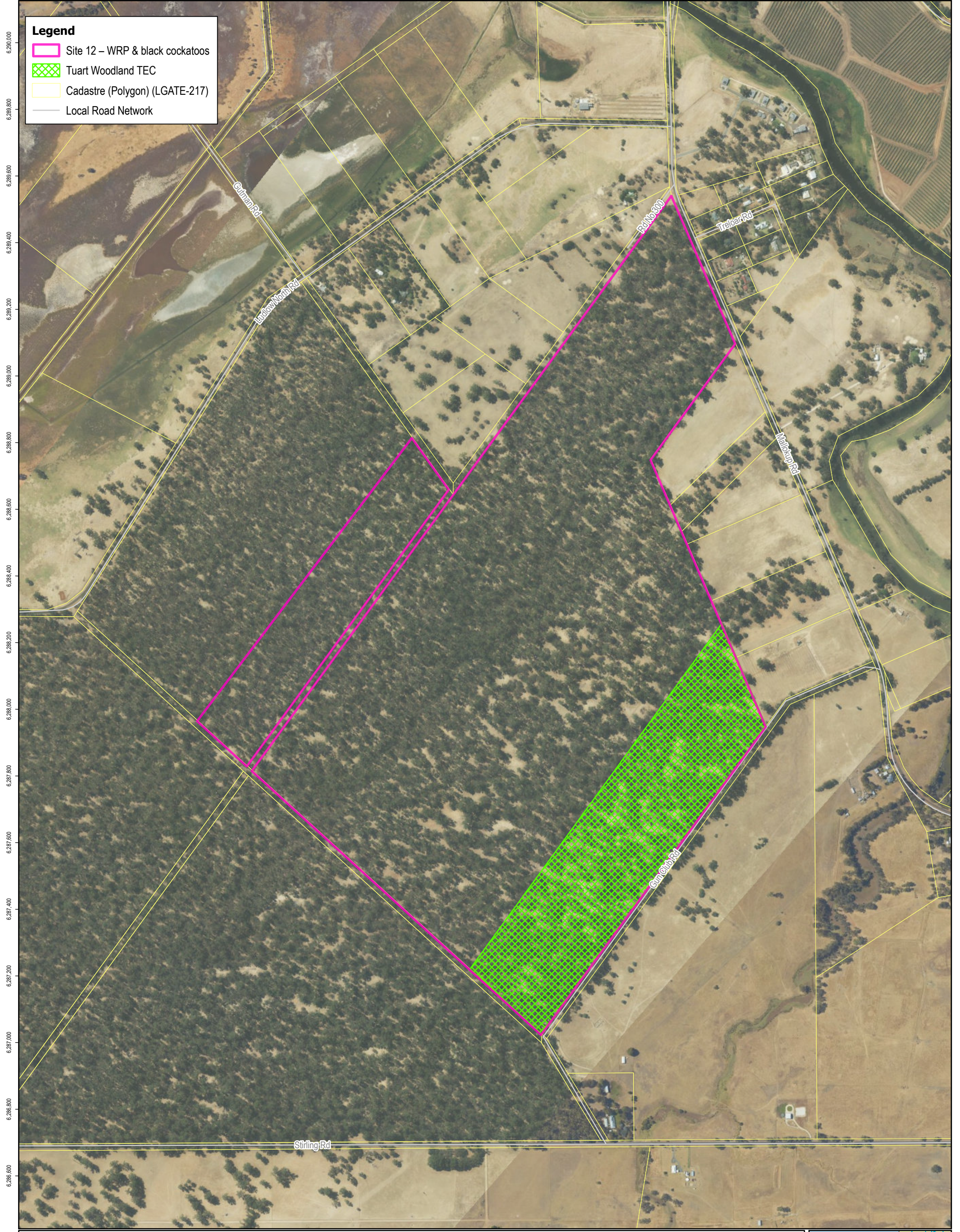


Figure 9

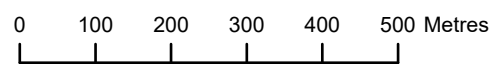
Path: F:\working directories\june\20230405_BORR_South_Offset_Strategy\20230405_BORR_South_Offset_Strategy.aprx



Legend

- Site 12 – WRP & black cockatoos
- Tuart Woodland TEC
- Cadastre (Polygon) (LGATE-217)
- Local Road Network

N
 Coordinate System: GDA 1994 Perth Coastal Grid 1994
 Scale: 1:10,000 @ A3
 Created Date: 12/04/2023
 Author: c8323



Bunbury Outer Ring Road Southern Section
Ludlow Offset Area Site 12 - WRP, Black
cockatoos and Tuart Woodland TEC

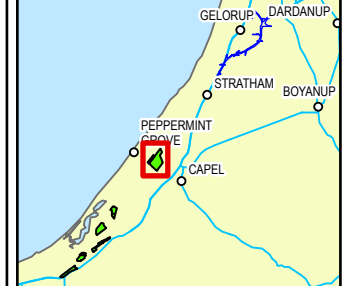


Figure 10

Path: F:\working directories\june\20230405_BORR_South_Offset_Strategy\20230405_BORR_South_Offset_Strategy.aprx

APPENDIX B. Pre-clearance survey report

28 June 2023

Ernie Stead-Richardson
Environmental Manager | Construction
South West Gateway Alliance
Ernest.Stead-Richardson@swgateway.com.au

Dear Mr. Stead-Richardson,

RE: (SW409) Bunbury Outer Ring Road (BORR) Southern Alignment: Commonwealth (EPBC 2019/8543 Condition 18(a)(i): Summary of results to date

I am pleased to provide you with the Black Cockatoo Preclearance Survey results (Attachment 1) Condition 18(a)(i) for the BORR Southern project, relating to trees with suitable nest hollows and trees with a diameter at breast height of greater than 500 mm cleared to date.

If you have any enquiries regarding the contents of this letter, please contact me on 0437 700 917.

Yours sincerely,

Shane Priddle

A handwritten signature in black ink, appearing to read 'Shane Priddle', written in a cursive style.

Principal Consultant
SW Environmental
M +61 (0)437 700 917

shane@swenvironmental.com.au

ATTACHMENTS

Attachment 1 Background, Methods and Results

Attachment 2 Clearing Area

ATTACHMENT 1

BACKGROUND

The purpose of this letter is to provide the results from the Black Cockatoo pre-clearance surveys undertaken in accordance with Commonwealth (EPBC 2019/8543) implementation conditions in relation to the construction of the Bunbury Outer Ring Road (BORR) South Section. The results are required to inform the preparation of an Offset Management Plan. The conditions relevant to the Offset Management Plan in EPBC 2019/8543 include:

Offset Management Plan(s)

18. The approval holder must, within 12 months of commencement of the action, submit to the Department for approval by the Minister, an Offset Management Plan for each of the offset sites specified in the approved Offset Strategy. Each Offset Management Plan must, to the satisfaction of the Minister, meet the requirements of the Environmental Offsets Policy within 15 months of commencement of the action. Each Offset Management Plan must meet the requirements of the Environmental Management Plan Guidelines and include the following:

a. a summary of the residual impacts to protected matters that will be compensated for by the offset. This summary must include the area(s) of habitat for protected matters and its condition and quality at all impact sites which the particular offset is to address

i. for Black Cockatoos, this must include the total number suitable nest hollows identified during the pre-clearance survey specified in condition 7 and the number of suitable nest hollows and trees with a diameter at breast height of greater than 500 mm actually cleared.

Condition 7 in EPBC 2019/8543 reads "Prior to clearing, the approval holder must:

- a. undertake a baseline survey within 30 days prior to clearing*
- b. undertake a pre-clearance survey within 5 business days prior to clearing*
- c. notify the Department in writing of the total number of suitable nest hollows identified during the pre-clearance survey*

This summary addresses EPBC 2019/8543 Condition 18(a)(i) relating to trees with *suitable nest hollows and trees with a diameter at breast height of greater than 500 mm actually cleared* to date along the BORR South Section of the Development Envelope (DE), as shown in Attachment 2. These results are summarised from previous survey reports, that have been carried out separately to address Condition 7. The results are current up to and including the 27th June 2023, and include an 'as cleared' footprint (Category 1-3 combined) of approximately 101.8 hectares.

METHODS

A baseline survey of suitable Black Cockatoo breeding habitat within the BORR South Section development envelope was undertaken in 2020 (Biota 2020). The survey identified numerous Black Cockatoo habitat trees (diameter at breast height > 500 mm) with and without hollows within the development envelope. The locations of all trees identified during the 2020 baseline survey were recorded using a GPS within an accuracy to within four metres.

To address the requirement of Conditions 7 and 8(f)(ii) of EPBC 2019/8543, surveys were undertaken, and all potential habitat trees within the clearing envelope were rechecked for hollows, and if hollow, for evidence of Black Cockatoo use. The survey was conducted by Biota and SW Environmental zoologists/ecologists throughout 2022 and 2023.

RESULTS

Based on current survey information, 458 trees with a diameter at breast height of greater than 500 mm have been cleared to date.

No trees with actual known, or likely, Black Cockatoo breeding hollows have been cleared to date within the BORR Southern Alignment.

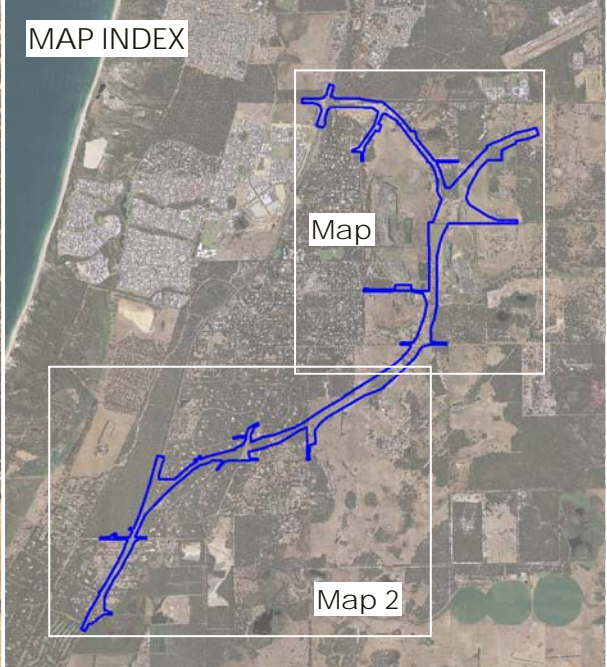
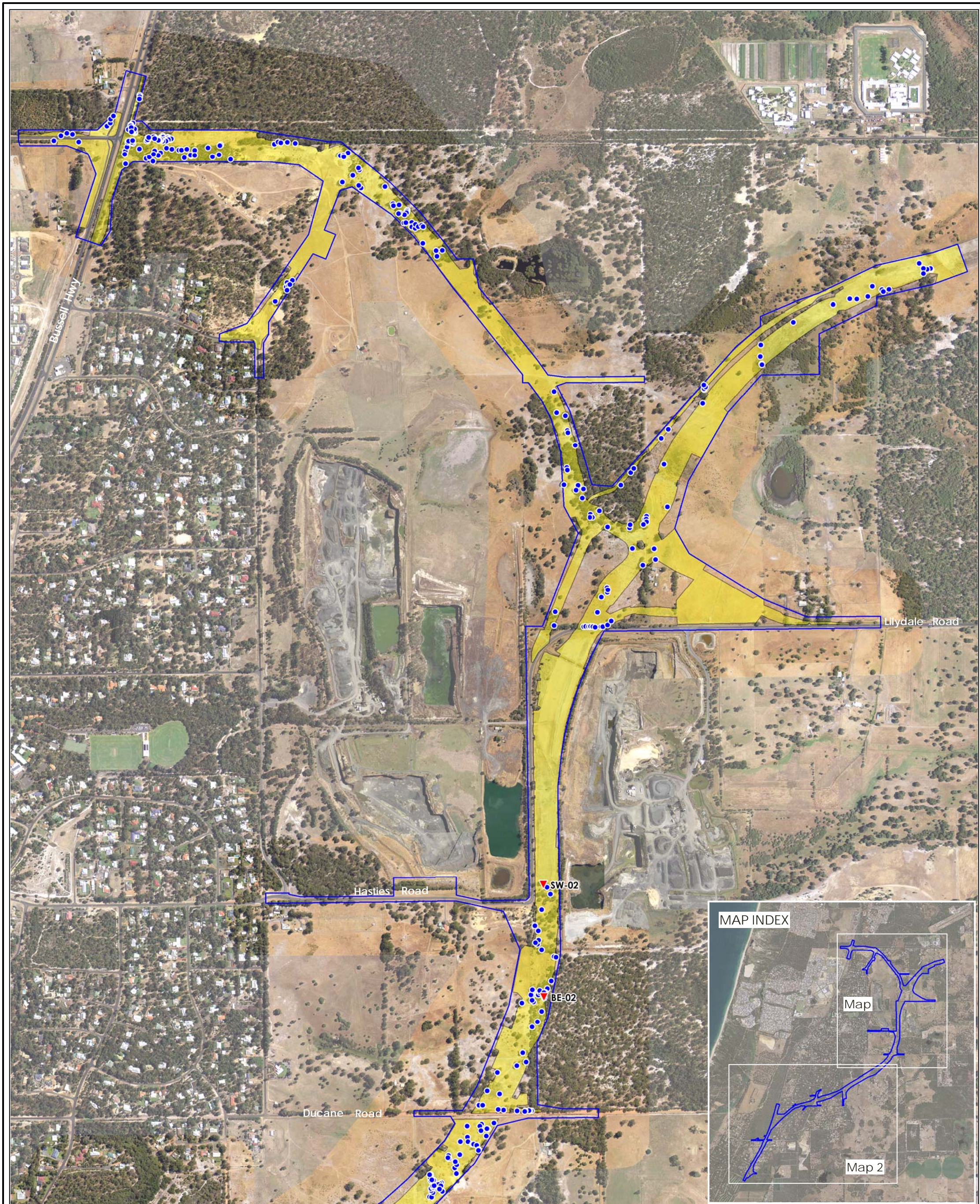
Of the 458 trees cleared, there were four trees identified with 'potentially suitable' nest hollows for Black Cockatoos (BE-02, BE-05, BE-11, SW-02). One of the trees (BE-02) identified as potentially suitable (Biota, 2020) was downgraded by SW Environmental in April 2023 to 'not suitable' due to a snapped hollow and active beehive.

REFERENCES

Biota (2020). *Bunbury Outer Ring Road Southern Section Targeted Fauna Assessment*. Unpublished report prepared for BORR IPT, Biota Environmental Sciences, Perth, Western Australia.

ATTACHMENT 2

Black Cockatoo Habitat Tree Assessment BORR South: Condition 18(a)(i) Summary of results to date



LEGEND

- BORR South approval area
- Cleared areas (27/06/2023)

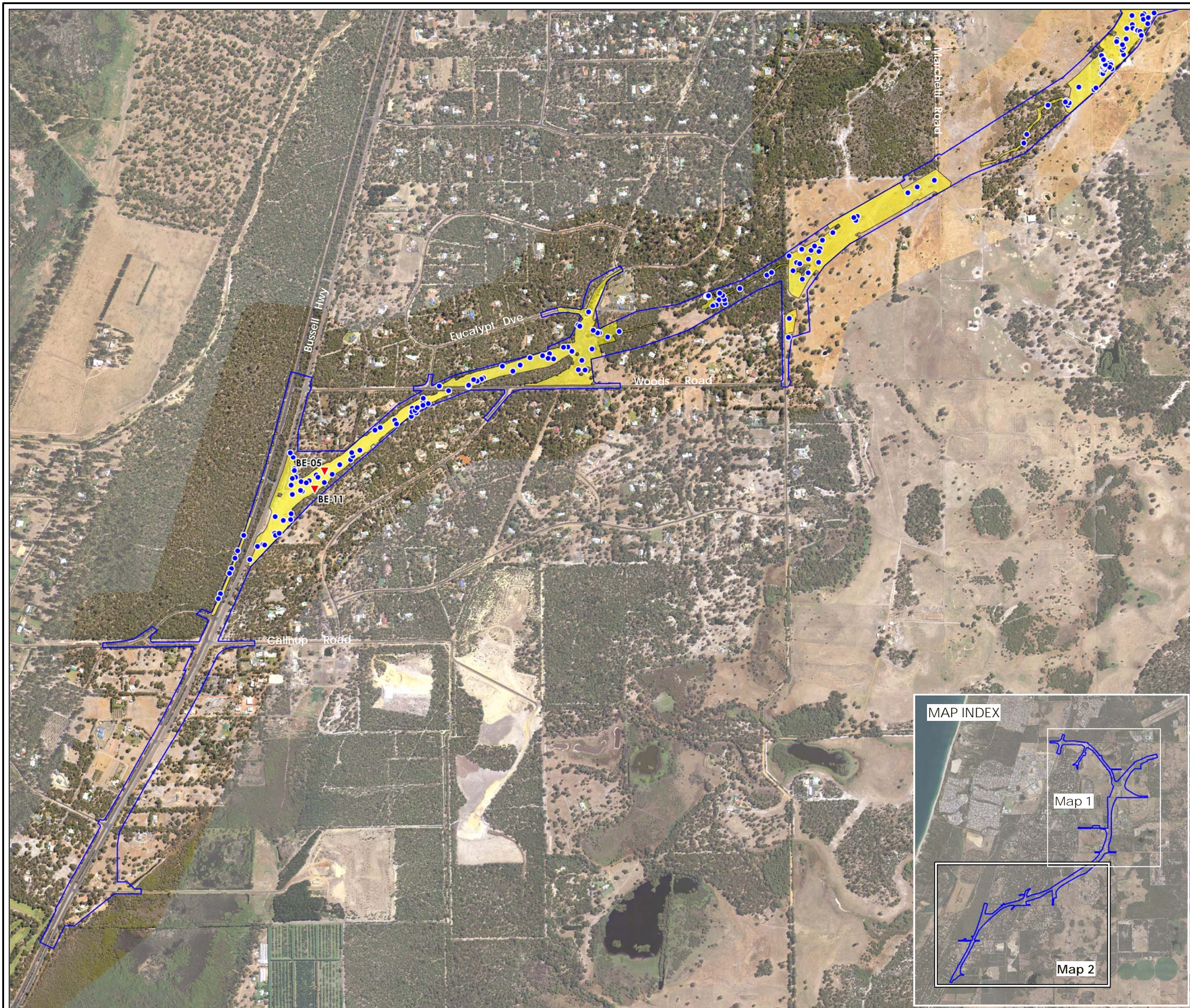
BC Habitat Trees Cleared

- ▼ Potentially suitable hollow
- Suitable DBH trees

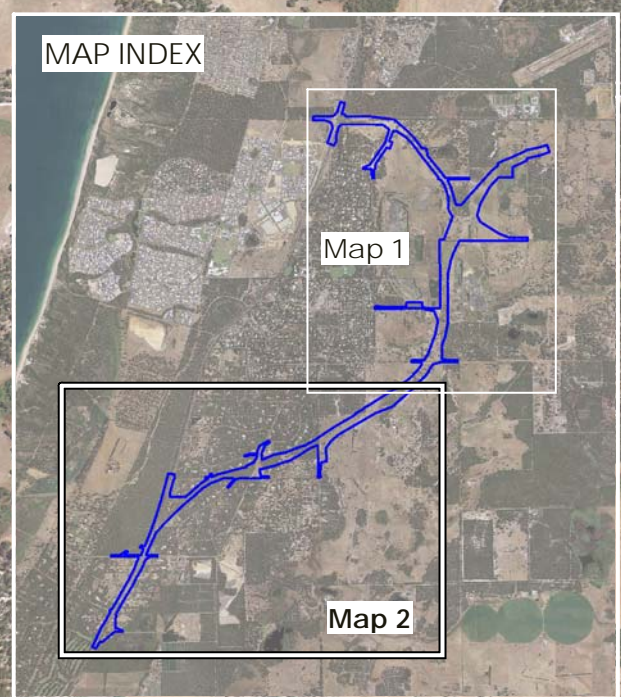
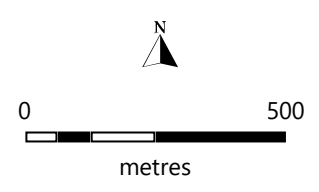


**BORR South
Black Cockatoo Habitat Trees
Clearing Summary Map 1
June 2023**





- LEGEND**
- BORR South approval area
 - Cleared areas (27/06/2023)
- BC Habitat Trees Cleared**
- ▼ Potentially suitable hollow
 - Suitable DBH trees



Author: Biota Drawn: P Sawers Job No.: 1765
 Date: 29 Jun 2023 BC_S_CS_M1_002 Revised:
 Projection: MGA Z50 (GDA94) Scale: 1:14,500 @ A3

**BORR South
 Black Cockatoo Habitat Trees
 Clearing Summary Map 2
 June 2023**

APPENDIX C. Revegetation species list for the Ducane Offset Area

*Taken from Biota (2021), excluding annuals and species known to be commercially unavailable.

Family	Species	Status
Casuarinaceae	<i>Allocasuarina humilis</i>	
Cyperaceae	<i>Isolepis marginata</i> <i>Lepidosperma leptostachyum</i> <i>Lepidosperma pubisquamum</i> <i>Lepidosperma squamatum</i> <i>Schoenus sublateralis</i> <i>Tetraria octandra</i>	
Dasypogonaceae	<i>Dasypogon bromeliifolius</i>	
Dilleniaceae	<i>Hibbertia hypericoides</i> subsp. <i>hypericoides</i> <i>Hibbertia racemosa</i> <i>Hibbertia stellaris</i> <i>Hibbertia vaginata</i>	
Fabaceae	<i>Acacia applanata</i> <i>Acacia extensa</i> <i>Acacia pulchella</i> var. <i>glaberrima</i> <i>Bossiaea eriocarpa</i> <i>Gompholobium capitatum</i> <i>Gompholobium tomentosum</i> <i>Hardenbergia comptoniana</i> <i>Hovea trisperma</i> <i>Jacksonia furcellata</i> <i>Kennedia prostrata</i> <i>Pultenaea skinneri</i>	Priority 4
Goodeniaceae	<i>Dampiera linearis</i>	
Haemodoraceae	<i>Conostylis aculeata</i> subsp. <i>gracilis</i>	
Iridaceae	<i>Patersonia occidentalis</i> var. <i>occidentalis</i>	
Loranthaceae	<i>Nuytsia floribunda</i>	
Myrtaceae	<i>Agonis flexuosa</i> <i>Astartea scoparia</i> <i>Calytrix flavescens</i> <i>Calytrix fraseri</i> <i>Eremaea asterocarpa</i> subsp. <i>asterocarpa</i> <i>Eremaea pauciflora</i> <i>Eucalyptus marginata</i> <i>Hypocalymma angustifolium</i> <i>Hypocalymma ericifolium</i> <i>Hypocalymma robustum</i> <i>Kunzea glabrescens</i> <i>Melaleuca incana</i> subsp. <i>incana</i> <i>Melaleuca lateritia</i> <i>Melaleuca pauciflora</i>	

Family	Species	Status
Myrtaceae cont.	<i>Melaleuca teretifolia</i> <i>Melaleuca thymoides</i> <i>Pericalymma ellipticum</i> var. <i>ellipticum</i>	
Phyllanthaceae	<i>Phyllanthus calycinus</i> <i>Poranthera microphylla</i>	
Poaceae	<i>Austrostipa compressa</i>	
Proteaceae	<i>Banksia attenuata</i> <i>Banksia grandis</i> <i>Banksia ilicifolia</i> <i>Persoonia longifolia</i> <i>Petrophile linearis</i> <i>Stirlingia latifolia</i> <i>Xylomelum occidentale</i>	
Restionaceae	<i>Desmocladius fasciculatus</i> <i>Desmocladius flexuosus</i> <i>Hypolaena exsulca</i>	
Rutaceae	<i>Boronia spathulata</i> <i>Philotheca spicata</i>	
Xanthorrhoeaceae	<i>Xanthorrhoea brunonis</i> <i>Xanthorrhoea ? gracilis</i> (seedling)	
Zamiaceae	<i>Macrozamia riedlei</i>	

APPENDIX D. Revegetation species list for the Lot 104 North Offset Area

*Based on Ecoedge (2018) and species lists associated with relevant vegetation complexes.

Species	Dryland	Wetland - transition	Form	WRP forage
<i>Acacia extensa</i>	X	X	Shrub	
<i>Acacia huegelii</i>	X		Shrub	
<i>Acacia pulchella</i>	X	X	Shrub	
<i>Acacia saligna</i>	X	X	Shrub/Tree	X
<i>Acacia urophylla</i>		X	Shrub	
<i>Adenanthos meisneri</i>		X	Shrub	
<i>Agonis flexuosa</i>	X		Tree	X
<i>Allocasuarina humilis</i>	X		Shrub	
<i>Anigozanthos manglesii</i>	X	X	Grass/Herb	
<i>Astartea scoparia</i>		X	Shrub	
<i>Babingtonia camphorosmae</i>		X	Shrub	
<i>Banksia attenuata</i>	X		Shrub	
<i>Banksia grandis</i>	X		Tree	
<i>Banksia littoralis</i>		X	Tree	
<i>Baumea juncea</i>		X	Rush	
<i>Billardiera fusiformis</i>	X		Shrub	
<i>Bossiaea eriocarpa</i>	X		Shrub	
<i>Bossiaea linophylla</i>		X	Shrub	
<i>Brachysema praemorsum</i>		X	Groundcover	
<i>Callistachys lanceolata</i>		X	Small tree	
<i>Clematis linearifolia</i>	X		Climber	
<i>Conostylis aculeata</i>	X	X	Grass/Herb	
<i>Corymbia calophylla</i>	X	X	Tree	X
<i>Cyathochaeta avenacea</i>		X	Grass	
<i>Daviesia physodes</i>	X	X	Shrub	
<i>Eucalyptus marginata</i>	X		Tree	X
<i>Eucalyptus patens</i>		X	Tree	X
<i>Eucalyptus rudis</i>		X	Tree	X
<i>Ficinia nodosa</i>	X		Rush	
<i>Gahnia trifida</i>		X	Rush	
<i>Gastrolobium bilobum</i>		X	Shrub	
<i>Gastrolobium praemorsum</i>		X	Shrub	
<i>Grevillea diversifolia</i>		X	Shrub	
<i>Hakea amplexicaulis</i>	X		Shrub	
<i>Hakea lissocarpha</i>	X		Shrub	
<i>Hakea prostrata</i>	X	X	Shrub	
<i>Hakea ruscifolia</i>	X		Shrub	
<i>Hakea varia</i>		X	Shrub	
<i>Hardenbergia comptoniana</i>	X	X	Climber	X
<i>Hemiandra pungens</i>	X		Shrub	
<i>Hibbertia cuneiformis</i>	X	X	Shrub	

Species	Dryland	Wetland - transition	Form	WRP forage
<i>Hypocalymma angustifolium</i>		X	Shrub	
<i>Jacksonia furcellata</i>	X	X	Shrub	
<i>Juncus pallidus</i>		X	Rush	
<i>Kennedia prostrata</i>	X		Groundcover	
<i>Kunzea glabrescens</i>	X	X	Shrub	X
<i>Lepidosperma effusum</i>		X	Sedge	
<i>Lepidosperma gladiatum</i>	X		Sedge	
<i>Lepidosperma longitudinale</i>		X	Sedge	
<i>Lepidosperma tetraquetrum</i>		X	Sedge	
<i>Leucopogon australis</i>		X	Shrub	
<i>Macrozamia riedlei</i>	X	X	Shrub	
<i>Melaleuca preissiana</i>		X	Tree	X
<i>Melaleuca raphiophylla</i>		X	Tree	
<i>Melaleuca thymoides</i>	X		Shrub	
<i>Melaleuca viminea</i>		X	Shrub	X
<i>Mesomelaena tetragona</i>		X	Sedge	
<i>Mirbelia dilatata</i>		X	Shrub	
<i>Nuytsia floribunda</i>	X	X	Tree	
<i>Orthrosanthus laxus</i>	X	X	Grass/Herb	
<i>Paraserianthes lophantha</i>		X	Small tree	
<i>Patersonia occidentalis</i>	X	X	Grass/Herb	
<i>Persoonia longifolia</i>		X	Small tree	
<i>Phyllanthus calycinus</i>	X	X	Shrub	
<i>Taxandria linearifolia</i>		X	Shrub	
<i>Trymalium floribundum</i>		X	Shrub	
<i>Xanthorrhoea brunonis</i>	X	X	Grass	
<i>Xanthorrhoea preissii</i>		X	Grass	
<i>Xylomelum occidentale</i>	X		Tree	

APPENDIX E. Revegetation species list for the Ludlow Offset Area

*Based on DBCA's approved master list, refined to include species known to be commercially available.

Species	Dryland	Wetland - transition	Form	WRP forage	Black cockatoo forage
<i>Acacia cyclops</i>	X		Shrub	X	
<i>Acacia extensa</i>	X		Shrub		
<i>Acacia pulchella</i>	X	X	Shrub		
<i>Acacia saligna</i>	X		Shrub / Tree	X	X
<i>Acanthocarpus preissii</i>	X		Shrub		
<i>Adenanthos meisneri</i>			Shrub		
<i>Agonis flexuosa</i>	X	X	Tree	X	
<i>Allocasuarina humilis</i>	X	X	Shrub		
<i>Alyxia buxifolia</i>	X		Shrub		
<i>Anigozanthos manglesii</i>	X	X	Grass / herb		
<i>Anthocercis littorea</i>	X		Shrub		
<i>Banksia attenuata</i>	X		Tree		X
<i>Banksia grandis</i>	X		Tree		X
<i>Banksia littoralis</i>		X	Tree		X
<i>Baumea juncea</i>		X	Rush		
<i>Billardiera fusiformis</i>	X		Shrub		
<i>Bossiaea eriocarpa</i>	X		Shrub		
<i>Clematis linearifolia</i>	X		Climber		
<i>Conostylis aculeata</i>	X		Grass		
<i>Corymbia calophylla</i>	X		Tree	X	X
<i>Cyathochaeta avenacea</i>			Grass		
<i>Daviesia physodes</i>	X	X	Shrub		
<i>Dianella brevicaulis</i>	X	X	Herb		
<i>Diplolaena dampieri</i>	X		Shrub		
<i>Eucalyptus gomphocephala</i>	X		Tree		X
<i>Eucalyptus marginata</i>	X		Tree	X	X
<i>Eucalyptus rudis</i>			Tree	X	X
<i>Ficinia nodosa</i>	X		Rush		
<i>Gahnia trifida</i>			Rush		
<i>Gastrolobium praemorsum</i>			Shrub		
<i>Gompholobium tomentosum</i>	X		Shrub		
<i>Haemodorum spicatum</i>			Herb		
<i>Hakea amplexicaulis</i>	X		Shrub		X
<i>Hakea lissocarpa</i>	X	X	Shrub		X
<i>Hakea prostrata</i>	X		Shrub		X
<i>Hakea ruscifolia</i>	X		Shrub		X
<i>Hakea varia</i>		X	Shrub		X
<i>Hardenbergia comptoniana</i>	X		Climber	X	
<i>Hemiandra pungens</i>	X		Shrub		
<i>Hibbertia cuneiformis</i>	X	X	Shrub		

Species	Dryland	Wetland - transition	Form	WRP forage	Black cockatoo forage
<i>Hypocalymma angustifolium</i>			Shrub		
<i>Jacksonia furcellata</i>	X	X	Shrub		
<i>Juncus pallidus</i>			Rush		
<i>Kennedia prostrata</i>	X		Groundcover		
<i>Kunzea glabrescens</i>	X		Shrub	X	
<i>Kunzea micrantha</i>		X	Shrub		
<i>Lepidosperma gladiatum</i>	X		Sedge		
<i>Lepidosperma longitudinale</i>			Sedge		
<i>Lepidosperma pubisquameum</i>			Sedge		
<i>Logania vaginalis</i>			Herb		
<i>Melaleuca incana</i>		X	Shrub		
<i>Melaleuca preissiana</i>		X	Tree	X	
<i>Melaleuca raphiophylla</i>		X	Tree		
<i>Melaleuca thymoides</i>	X	X	Shrub		
<i>Melaleuca viminea</i>		X	Shrub	X	
<i>Orthrosanthus laxus</i>	X	X	Grass / Herb		
<i>Patersonia occidentalis</i>	X		Grass / Herb		
<i>Phyllanthus calycinus</i>	X	X	Shrub		
<i>Regelia ciliata</i>		X	Shrub		
<i>Rhagodia baccata</i>	X		Shrub		
<i>Solanum symonii</i>	X		Shrub		
<i>Spyridium globulosum</i>	X		Shrub		
<i>Trymalium ledifolium</i>		X	Shrub		
<i>Xanthorrhoea brunonis</i>	X		Grass		
<i>Xanthorrhoea preissii</i>			Grass		X
<i>Xylomelum occidentale</i>	X	X	Tree		

APPENDIX F. Artificial Nesting Hollow Installation report (Australian Black Cockatoo Specialists, 2023b)



Australian Black Cockatoo Special

Report: Installation of four Artificial Hollows Ducane Reserve W.A



Main Roads
Western Australia

5 June 2023



Australian Black Cockatoo Specialists

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All images source: Rick Dawson

INTRODUCTION

Australian Black Cockatoo Specialists (ABCS) are pleased to submit this report to the Department of Main Roads Western Australia (MRWA) regarding the installation of four artificial hollows (ANH) in Ducane Reserve on Friday 2 June 2023, as an initial offset for the Bunbury Outer Ring Road (BORR) project.

APPROVAL AND LICENSES DBCA

As agreed ABCS liaised with Department of Biodiversity Conservation and Attractions (DBCA) regarding the installation of the four ANH and obtained an authority to 'ACCESS TO LAND FOR A DESIGNATED ACTIVITY' (Pursuant to Regulation 101 of the Biodiversity Conservation Regulations 2018). DBCA gave approval for ANH to be installed on nominated trees D3, D8, D9 and D12.

INSTALLATION METHOD

On Friday 2 June 2023, assisted by Dr Peter Mawson four ANH were installed in Ducane Reserve using a ladder (No access for EWP), and in accordance with requirements of latest guideline for ANH by the WA Department of Parks and Wildlife publications is *DBCA (2023). Fauna Notes – Artificial hollows for black cockatoos* which has replaced *DPAW Fauna Note 'How to design and place artificial hollows for Carnaby's cockatoo 2015'*

On closer inspection of D3 it was observed that it had extensive fire scarring on the lower trunk. As a result, I spoke with Kim Williams DBCA at approximately 9am that day, and obtained approval for the ANH (DR01) to be installed on D4.

Each hollow was 375 mm internal diameter (430mm external), 1.2m in height, and installed 8m above ground to reduce the chance of 'Nest Robbing', and allow maintenance by ladder. The hollows were attached to the tree by chain and fixed by 4 points. A sacrificial post was placed in each hollow along with a minimum of 20lts of premium quality hardwood woodchips. All hollows used by ABCS are made to last at 50 years, except for substrate and sacrificial post, which will need to be change periodically. The hollow is attached to the tree so that when it grows the hollow will rise with the tree and not place the fixings under stress.

The four ANH were numbered on the base DR01 to DR04 and installed in locations close to the perimeter access track in the eastern area of the reserve as approved by DBCA.

At approximately 12:30pm in the west and southwest ends of the reserve >40 Baudin's Cockatoos (*Zanda baudinii*) were observed and photographed feeding on Marri and Banksia, and drinking in the water trough in the adjacent property. Also in the north-western end of the reserve >20 Forest Red-tail Black cockatoos (*Calyptorhynchus banksia*) naso where observed and photographed feeding on Marri. See Annex 5

All hollows were placed on Jarrah (*Eucalyptus. marginata*) within Ducane Reserve. Research has shown that by placing the ANH in a manner that the foliage provides shade can considerably reduce the heat in the hollow. Each hollow was placed with this in mind with a minimum of a shade rating of 3. Shade over the hollow was rated from 5-1, with 5 full shade and 1 full sun.

RECOMMENDATIONS

That this year's nesting survey is conducted **in late to mid-October and December 2023**, to enable data to be taken from nestlings (if present) to provide valuable information on the health of the birds using the area.

If prescribed burning is to take place in Ducane then the four trees that have ANH on them must have the understory cleared from around the trees to ensure that ANH's are not affected and the canopy remains intact to provide shade.

CONTACT INFORMATION

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Rick Dawson
Director
Australian Black Cockatoo Specialists
5 June 2023

APPENDIX 1 – ARTIFICIAL HOLLOW DETAILS

Artificial Hollow DR01



ANH DR01

Location	Tree Species	SJ No	Hollow No	Easting	Northing	Sacrificial Post	Aspect	Height to Entrance	Diameter	Depth	Depth to substrate	Shade
Ducane	<i>Eucalyptus. marginata</i>	1082	DR01	376990	6299787	Wando	SE	8010	375	1200	930	4

Artificial Hollow DR02



ANH DRO2

Location	Tree Species	SJ No	Hollow No	Easting	Northing	Sacrificial Post	Aspect	Height Entrance to	Diameter	Depth	Depth to substrate	Shade
Ducane	<i>Eucalyptus. marginata</i>	1091	DR02	377887	6300210	Wando	N	8060	375	1200	940	5

Artificial Hollow DR03



ANH DR03

Location	Tree Species	SJ No	Hollow No	Easting	Northing	Sacrificial Post	Aspect	Height Entrance to	Diameter	Depth	Depth to substrate	Shade
Ducane	<i>Eucalyptus marginata</i>	1076	DR03	377890	6300237	Wando	S	8000	375	1200	930	3

Artificial Hollow DR04



ANH DR04

Location	Tree Species	SJ No	Hollow No	Easting	Northing	Sacrificial Post	Aspect	Height to Entrance	Diameter	Depth	Depth to substrate	Shade
Ducane	<i>Eucalyptus marginata</i>	1075	DR04	376921	6300760	Wando	ESE	8020	375	1200	930	4

Appendix 2 – Installation method



Wood Chips, ladder and Sacrificial post.

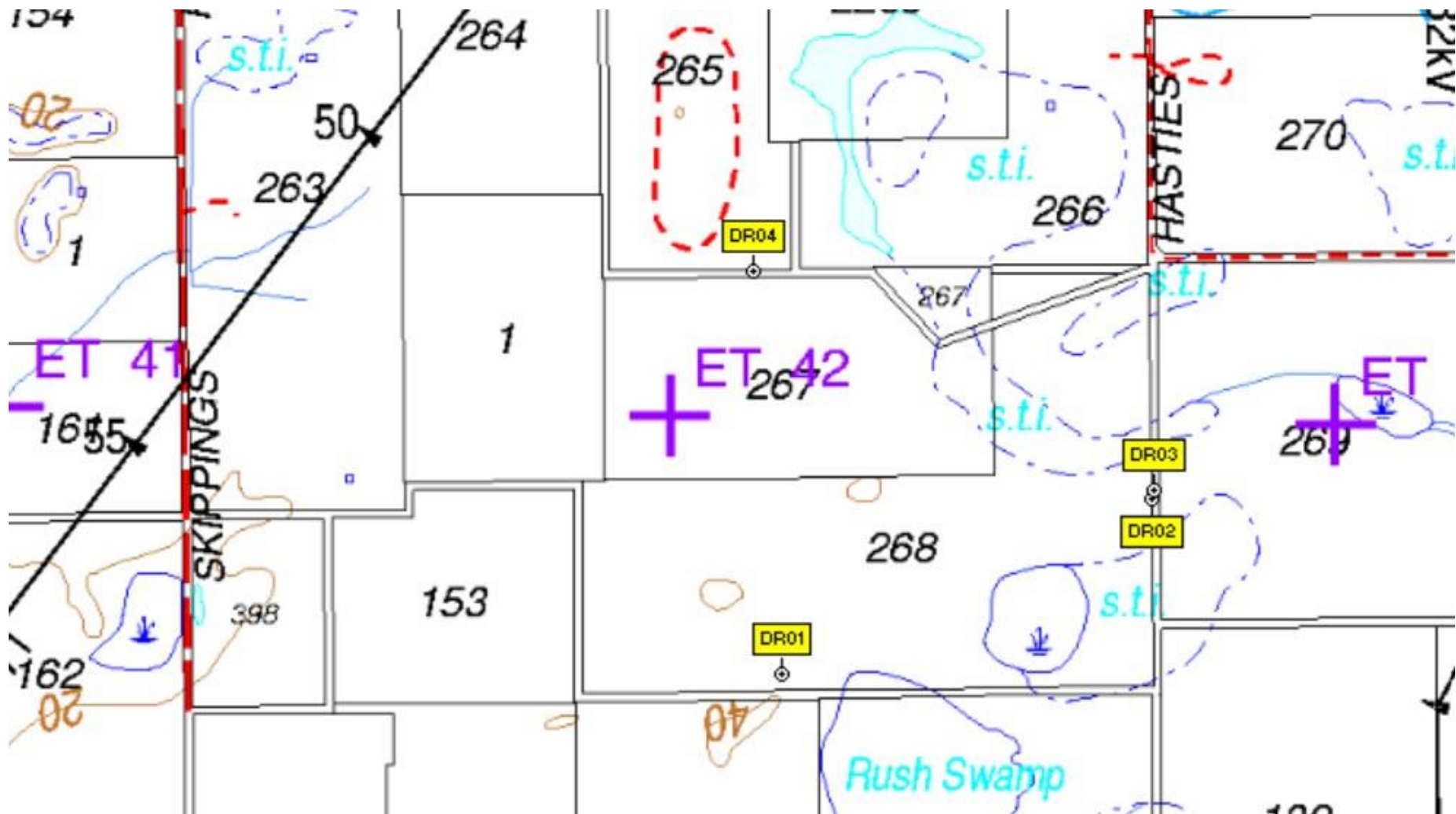


Upper Fixings



Lower fixings placed in a manner to ensure the hollow can grow up with the tree

APPENDIX 3 – MAP OF HOLLOW INSTALLATIONS.



APPENDIX 4 – DETAILS OF EACH ANH

Location	Tree Species	SJ No	Hollow No	Easting	Northing	Sacrificial Post	Aspect	Height Entrance to	Diameter	Depth	Depth to substrate	Shade
Ducane	<i>Eucalyptus. marginata</i>	1082	DR01	376990	6299787	Wando	SE	8010	375	1200	930	4
Ducane	<i>Eucalyptus. marginata</i>	1091	DR02	377887	6300210	Wando	N	8060	375	1200	940	5
Ducane	<i>Eucalyptus. marginata</i>	1076	DR03	377890	6300237	Wando	S	8000	375	1200	930	3
Ducane	<i>Eucalyptus. marginata</i>	1075	DR04	376921	6300760	Wando	ESE	8020	375	1200	930	4

APPENDIX 5 – BLACK COCKATOOS IN DUCANE RESERVE

