Bunbury Outer Ring Road
Southern Section

Post Approval Offset Strategy

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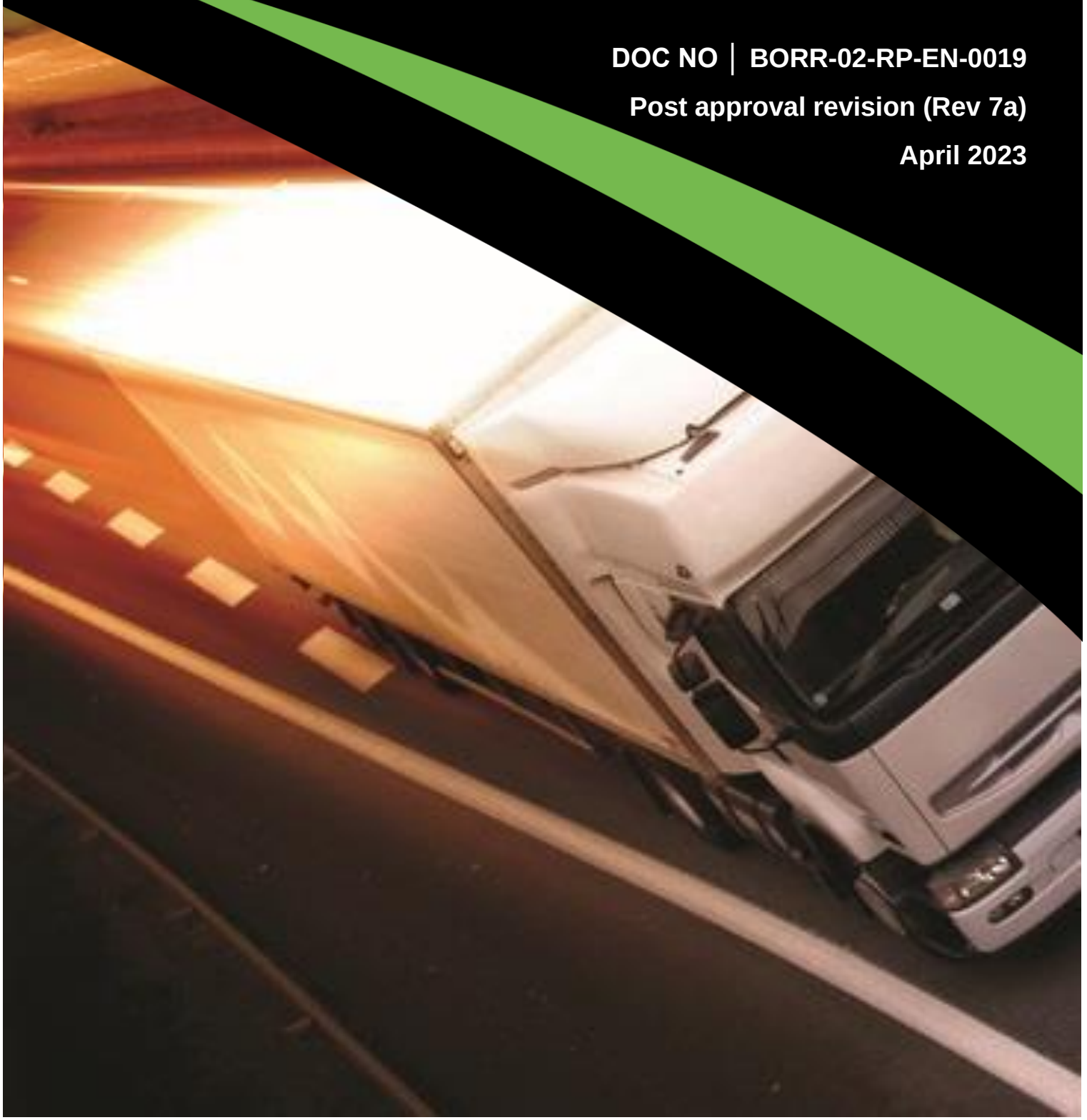

EXECUTIVE SUMMARY

Bunbury Outer Ring Road Project

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 of the Project will be ongoing.

Purpose of this Strategy

This Offset Strategy has been prepared to meet conditions 14 and 15 of the EPBC Act approval for EPBC 2019/8543, which detail the Environmental Offset Requirements:

- Condition 14: To compensate for the residual significant impact on Black Cockatoos, Western Ringtail Possum, Banksia Woodland TEC and Tuart Woodlands and Forests TEC, the approval holder must submit to the Department, for approval by the Minister, an Offset Strategy within 6 months of commencement of the action. The Offset Strategy must, within 9 months of commencement of the action, meet the requirements of the Environmental Offsets Policy to the satisfaction of the Minister. The approval holder must implement the Offset Strategy approved by the Minister.

- Condition 15: The Offset Strategy must:
    a. identify a suitable environmental offset(s) for the impacts on listed threatened species and listed ecological communities
    b. include summary information on the impacted areas and detailed baseline information on the proposed offset(s) and commit to achievable ecological benefits, and timeframes for their achievement, for the proposed offset(s)
        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 cleared.
    c. describe the monitoring program(s) to be implemented that will determine progress towards, attainment of and maintenance of the ecological benefits for the Black Cockatoos, Western Ringtail Possum, Banksia

Woodland TEC and Tuart Woodlands and Forests TEC at the proposed offset(s)

d. specify how and at what frequency offset(s) management results, monitoring program findings and assessments of ecological benefits will be reported to the Department and the public

e. detail how the offset(s) will be protected, and ecological benefits maintained, in perpetuity.

Relevant to condition 14 and 15 above, condition 1 of EPBC Act approval for EPBC 2019/8543 states that Main Roads must not clear more than:

- 60.9 ha of Black Cockatoo habitat, including:
  - no more than 1,088 trees with a diameter at breast height of greater than 500 mm
  - no more than 11 trees containing suitable nest hollows.
- 60.9 ha of Western Ringtail Possum habitat
- 23.4 ha of Banksia Woodland TEC
- 4.4 ha of Tuart Woodlands and Forests TEC.

The following MNES are addressed in this strategy:

- Western Ringtail Possum (*Pseudocheirus occidentalis*) (WRP) (Critically endangered)
- Carnaby's Cockatoo (*Zanda latirostris*) (Endangered)
- Baudin's Cockatoo (*Zanda baudinii*) (Endangered)
- Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*) (Vulnerable)
- Banksia Woodlands of the Swan Coastal Plain (SCP) Threatened Ecological Community (TEC) – EPBC Act listed as Endangered ('Banksia Woodlands TEC')
- Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain TEC, EPBC Act listed as Critically endangered ('Tuart Woodlands TEC').

The three cockatoo species are collectively referred to herein as black cockatoos.

Table E-1 presents a summary of the proposed offset sites.

Table E-1. Summary of offset sites provided under this Offset 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 (*Pseudocheirus occidentalis*)	60.9 ha	126 ha	65 ha	270 ha	126 ha land acquisition plus 335 ha revegetation
Habitat for black cockatoos	60.9 ha	-	49 ha	200 ha	249 ha revegetation
Banksia woodlands of the Swan Coastal Plain Threatened ecological community (TEC)	23.4 ha	124.1 ha	-	-	124.1 ha land acquisition
Tuart (*Eucalyptus gomphocephala*) 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

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Document *Control*

Revision	Date	Description	Prepared	Reviewed	Approved
0	09/10/20	Final	BORR IPT	Main Roads	FH
1	05/03/2021	Revised Final	Main Roads	Main Roads	FH
2	31/03/2021	Updated Revised Final	Main Roads	Main Roads	FH
3	04/08/2021	Updated Revised Final	Main Roads	Main Roads	MS
4	23/09/2022	Post Approval Revision	Main Roads	Main Roads	MS
5	23/12/2022	Post Approval Revision	Main Roads	Main Roads	MS
6	13/04/2023	Post Approval Revision	Main Roads	Main Roads	MS
7	24/04/2023	Post Approval Revision	Main Roads	Main Roads	MS
7a	26/04/2023	Post Approval Revision	Main Roads	Main Roads	MS

1 INTRODUCTION

1.1 Project description

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 (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.

Project construction commenced 1 August 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 of the Project will be ongoing.

1.2 Environmental assessment

1.2.1 Commonwealth assessment

EPBC Act approval for the Project was granted on 29 June 2022.

1.3 Purpose of this strategy

This Offset Strategy has been prepared to meet conditions 14 and 15 of the EPBC Act approval for EPBC 2019/8543. The condition requirements and in-plan section references are provided in Table 1-1.

The following Matters of National Environmental Significance are addressed in this strategy:

- Western Ringtail Possum (*Pseudocheirus occidentalis*) (WRP) (Critically endangered)
- Carnaby's Cockatoo (*Zanda latirostris*) (Endangered)
- Baudin's Cockatoo (*Zanda baudinii*) (Endangered)
- Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*) (Vulnerable)
- Banksia Woodlands of the Swan Coastal Plain (SCP) Threatened Ecological Community (TEC) – EPBC Act listed as Endangered ('Banksia Woodlands TEC')
- Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain TEC, EPBC Act listed as Critically endangered ('Tuart Woodlands TEC').

The three cockatoo species are collectively referred to herein as black cockatoos.

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

Condition No.	Condition	Section of this plan
15	The Offset Strategy must:	This Plan
	a) identify a suitable environmental offset(s) for the impacts on listed threatened species and listed ecological communities	4.1.1, 4.1.2, 4.1.3, 4.1.4
	b) include summary information on the impacted areas and detailed baseline information on the proposed offset(s) and commit to achievable ecological benefits, and timeframes for their achievement, for the proposed offset(s)	Impact summary 2.2.1.2, 2.2.2.2, 3.2.3, 3.3.3 Proposed offsets detail 4.1.1.1, 4.1.2.1, 4.1.3.1, 4.1.4, 4.1.4.2, 4.1.4.3, 4.1.4.4, 4.1.4.5 Achievable ecological benefit 4.1.1.2, 4.1.2.2, 4.1.3.2 Timeframes for achievement 4.1.1.3, 4.1.2.3, 4.1.3.3
	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 cleared.	3.3.4
	c) describe the monitoring program(s) to be implemented that will determine progress towards, attainment of and maintenance of the ecological benefits for the Black Cockatoos, Western Ringtail Possum, Banksia Woodland TEC and Tuart Woodlands and Forests TEC at the proposed offset(s)	4.1.1.4, 4.1.2.4, 4.1.3.4, 4.1.4.6
	d) specify how and at what frequency offset(s) management results, monitoring programs findings and assessments of ecological benefits will be reported to the Department and the public	5.2
	e) detail how the offset(s) will be protected, and ecological benefits maintained, in perpetuity.	4.1.1.5, 4.1.2.5, 4.1.3.5, 4.1.4

1.4 Summary of offset requirement

Offset requirements have been determined through assessment of the residual impacts of the Project . The residual impacts are summarised in Sections 2 and 3 below.

1.5 Achievable ecological benefits

Main Roads has committed to achievable ecological benefits for each MNES included in this plan at each offset site. These are detailed in Sections 4.1.1.2, 4.1.2.2 and 4.1.3.2 and 4.1.4.

1.6 Roles and responsibilities

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

- Attaining the ecological benefits by the timeframes stated in Sections 4.1.1.2, 4.1.2.2, and 4.1.3.2 and 4.1.4
- Maintenance of the ecological benefits for the life of the approval (i.e. 50 years)
- For reporting against the requirements of Conditions 14 and 15 of the EPBC Act approval for EPBC 2019/8543 and commitments specified in this Offset Strategy for the life of the approval.

2 FLORA AND VEGETATION ASSESSMENT AND IMPACTS

2.1 Environmental surveys

The flora and vegetation studies and surveys undertaken that are relevant to the Project and proposed offset areas are shown in Table 2-1. These investigations have been used to define the residual environmental impacts, and as the basis for determining environmental offset requirements.

Table 2-1 Studies and surveys relevant to the Project

SURVEY / REPORT NAME	LOCATION / EXTENT IN SURVEY AREA	METHODOLOGY
Surveys undertaken for the Project prior to referral		
Bunbury Outer Ring Road Southern Section Vegetation and Flora Study (BORR IPT, 2020a)	Detailed flora and vegetation assessment	Detailed flora and vegetation survey and targeted survey conducted August (late winter/ early spring) and September 2018 (spring). A targeted survey for TECs, including Tuart TEC, and confirmation of vegetation types in previously unsurveyed gaps in the survey area, was also undertaken in September 2019. The survey report presents the results of numerous field surveys conducted for the Project over several seasons/years.
Phytophthora Dieback Survey Bunbury Outer Ring Road South (Great Southern Bio Logic Pty Ltd, 2020)	Phytophthora dieback survey of the Bunbury Outer Ring Road southern section alignment	Survey undertaken in accordance with DBCA guidelines
Additional surveys undertaken post-referral		
Phytophthora Dieback Occurrence Survey Bunbury Outer Ring Road South 2022 (Great Southern Bio Logic, 2022)	Full reassessment of Phytophthora Dieback occurrence using the and also produces operational level disease hygiene information for application across all assessable vegetation within the survey area	Comprehensive survey methodology in accordance with DBCA guidelines

The assessment of the broader flora and vegetation values of the area are provided in BORR IPT (2022) and BORR IPT (2020a) with the outcomes of these assessments, as they relate to offsets, summarised below.

2.2 Threatened ecological communities

Implementation of the Project will result in clearing of up 27.8 ha of vegetation within the Development Envelope that is representative of TECs (BORR IPT, 2022). Details of TEC vegetation to be cleared and addressed by this Offset Strategy are provided in Table 2-2. The locations of these occurrences are shown in Attachment A of EPBC Act approval for EPBC 2019/8543 (Figure 5, Appendix C) and Figure 2 (Appendix A).

Table 2-2 Area and Condition of TEC within the Development Envelope (BORR IPT, 2020a)

TEC	CONSERVATION STATUS	EXTENT IN DEVELOPMENT ENVELOPE	VEGETATION CONDITION
Banksia Woodlands of the Swan Coastal Plain TEC (Banksia Woodlands TEC)	Endangered – EPBC Act	23.4 ha	Excellent: 0.49 ha Very Good - Excellent : 4.0 ha Very Good: 2.28 ha Good - Very Good: 2.38 ha Good: 1.47 ha Degraded - Good: 11.58 ha Degraded: 0.71 ha Degraded - Completely Degraded: 0.46 ha Completely Degraded: 0.07 ha
Tuart (*Eucalyptus gomphocephala*) Woodlands and Forests of the Swan Coastal Plain ecological community (Tuart Woodlands TEC)	Critically Endangered – EPBC Act	4.4 ha	Very Good: 0.80 ha Degraded - Good: 2.91 ha Degraded - Completely Degraded: 0.01 ha Completely Degraded: 0.68 ha

The residual impact of the Project to each of the TECs is discussed in the following sections.

2.2.1 Banksia Woodlands TEC

2.2.1.1 Banksia Woodlands TEC description

'Banksia Woodlands of the Swan Coastal Plain' was listed as an Endangered TEC under the EPBC Act in September 2016.

The Banksia Woodlands TEC is largely restricted to the Perth (SWA02) and Dandaragan (SWA01) subregions of the Swan Coastal Plain (SCP) bioregion, from around Jurien Bay in the north to Dunsborough in the south. The TEC also extends into immediately adjacent areas on the Whicher and Darling escarpments (TSSC, 2016).

On the Southern Swan Coastal Plain, where the Project is situated, the TEC has been extensively cleared and generally remains in small, fragmented occurrences.

2.2.1.2 Impacts to be offset

Up to 23.4 ha of vegetation representing Banksia Woodlands TEC in three separate patches will be cleared to implement the Project, as shown in Figure 2 (Appendix A) and in Attachment A of EPBC Act approval for EPBC 2019/8543 (Figure 5, Appendix C). This represents all of the TEC extent within the Development Envelope, excluding that within Clearing Exclusion Areas, as shown in Figure 2 (Appendix A). No Banksia Woodlands TEC vegetation will remain within the Development Envelope outside of the Clearing Exclusion Areas once clearing has been completed.

Three vegetation types mapped by BORR IPT (2020a) (VT1, VT2 and VT4) were considered to represent Banksia Woodlands TEC:

- VT1 had affinity to Floristic Community Type (FCT) 25 'Southern *Eucalyptus gomphocephala-Agonis flexuosa* woodlands' however, Tuart did not form part of the overstorey
- VT2 was assigned to FCT21a 'Central *Banksia attenuata – Eucalyptus marginata* woodland'
- VT4 was assigned to FCT25.

FCTs 21a and 25 form part of the state-listed 'Banksia Woodlands of the Swan Coastal Plain' Priority three ecological community (PEC).

The Banksia Woodlands TEC vegetation within the Development Envelope forms part of a large remnant of more than 200 ha of a similar Eucalyptus / Banksia open forest vegetation type (BORR IPT, 2020a). This includes vegetation remaining throughout the rural residential settlement of Gelorup.

Assessment of BORR IPT (2020a) indicates that 45 quadrats were installed in Banksia Woodlands TEC vegetation within the Project flora and vegetation survey area (which extends beyond the clearing area in some places). These quadrats contained an average native species richness of 20.5. According to the Approved Conservation Advice for Banksia Woodland TEC (TSSC, 2016), the species richness for the TEC ranges from 30 to 65 species. Average species richness is approximately 38 % of that determined for FCT21a by Gibson *et al.* (1994) (54.6). Compared to the recorded species richness for the FCT and the TEC, species richness within the Development Envelope Banksia Woodland TEC vegetation is low.

The composition and condition of the three Banksia Woodlands TEC patches are detailed in Table 2-3. In 2022, Phytophthora dieback was confirmed to be present in 3.3 ha of Banksia Woodlands TEC vegetation at three sites located at in Gelorup (Great Southern Bio Logic, 2022).

The Banksia Woodlands TEC vegetation provides foraging and denning habitat for WRPs as well as foraging and potential breeding habitat for black cockatoos.

Table 2-3 Banksia Woodlands TEC impact sites

SITE	LOCATION	TEC AREA (PATCH SIZE)	DIRECT IMPACT	VEGETATION COMPOSITION AND CONDITION
BW-S-D-1	Bussell Highway road reserve from Calinup Road and Lakes Road intersection extending north of Woods Road	23.9 ha Banksia Woodlands TEC	20.0 ha Banksia Woodlands TEC	• VT1 - Open forest of *E. marginata*, *C. calophylla* and *Banksia attenuata* on Karrakatta deep sands • VT3 - Scattered *E. marginata*, *C. calophylla* and +/- *A. flexuosa* over a Tall Open Shrubland of *B. attenuata*, *B. ilicifolia*, *Xylomelum occidentale* and *Kunzea glabrescens* over grassland over introduced grasses, • VT4 - Open forest of *B. attenuata* and *A. flexuosa* Condition: 2-3 to 7 (Very Good - Excellent to Completely Degraded) Phytophthora dieback status: contains 3.3 ha of dieback-infested vegetation at three locations, Woods Road, Banksia Road and Lakes Road (Great Southern Bio Logic, 2022)
BW-S-D-2	North of Jilley Road	4.6 ha Banksia Woodlands TEC	2.9 ha Banksia Woodlands TEC	• VT1 - Open forest of *E. marginata, C. calophylla* and *B. attenuata* on Karrakatta deep sands Condition: 2-3 (Very Good - Excellent)
BW-S-D-3	Marchetti Road	0.5 ha Banksia Woodlands TEC	0.5 ha Banksia Woodlands TEC	• VT2 - Open forest of *E. marginata, C. calophylla, B. attenuata* and *A. flexuosa* on Bassendean dunes Condition: 2 (Excellent)

2.2.2 Tuart Woodlands TEC

2.2.2.1 Tuart Woodlands TEC description

The 'Tuart *(Eucalyptus gomphocephala)* Woodlands and Forests of the Swan Coastal Plain ecological community' was listed as a TEC under the EPBC Act in 2019 at the level of 'Critically Endangered' as assessed using the criteria of the IUCN (2015) and guidance of TSSC (2019).

The Tuart Woodlands TEC has a discontinuous distribution in the west of the SCP of south-west Western Australia, with areas either heavily cleared and / or degraded across much of its range. Many remnants are small and isolated, and most have been heavily modified, and are subject to ongoing threats such as weed invasion and frequent burning.

2.2.2.2 Impacts to be offset

Several portions totalling 4.4 ha of one patch of Tuart Woodlands TEC are required to be cleared for the Project, the composition and condition of which is detailed in Table 2-4. The extent of Tuart

Woodlands TEC to be cleared is shown in Figure 2 (Appendix A) and in Attachment A of EPBC Act approval for EPBC 2019/8543 (Figure 5, Appendix C). Tuart Woodlands TEC within the Development Envelope does not have a buffer zone as defined in TSSC (2019).

One vegetation type mapped by BORR IPT (2020a) (VT1b) was considered to represent Tuart Woodlands TEC. VT1b was assigned to FCT25 'Southern *Eucalyptus gomphocephala-Agonis flexuosa* woodlands' which is a state-listed PEC, and which also forms part of the state-listed 'Tuart (*Eucalyptus gomphocephala*) Woodlands and Forests of the Swan Coastal Plain' Priority three PEC.

The Tuart Woodlands TEC vegetation within the Development Envelope forms part of a >32 ha patch of similar Tuart woodlands TEC vegetation and is situated within 100 m of another patch of native vegetation.

BORR IPT (2020a) installed two quadrats in the Tuart Woodlands TEC patch of which a portion will be cleared. Cover of native species within the quadrats ranged from 5-20 % cover, which is considered low. Exotic species cover was recorded as 5-50 % cover. The quadrats contained between 18-20 native species (< 3 m) in the understorey. Despite the low native species cover, the Approved Conservation Advice (TSSC, 2019), indicates that due to the understorey species richness, the patch is classed as 'Very high' condition Tuart Woodlands TEC.

BORR IPT (2020a) recorded more than 200 Tuart trees over 15 cm DBH within the patch and noted the presence of a large number of smaller trees within the patch at 15 cm DBH that have recruited from a previous disturbance event.

No evidence of Phytophthora dieback was observed within the Tuart Woodlands TEC vegetation in the Development Envelope (Great Southern Bio Logic, 2022).

Table 2-4 Tuart Woodlands TEC impact site

SITE	LOCATION	TEC AREA (PATCH SIZE)	DIRECT IMPACT	VEGETATION COMPOSITION AND CONDITION
TW-S-D-2	Eastern side of Bussell Highway at the intersection of Bussell Highway and Centenary Road	> 7.3 ha Tuart Woodlands TEC Note, patch extends north and south beyond the Surveyed Area (total extent > 25 ha)	4.4 ha of Tuart Woodlands TEC	VT1b – Open forest of *Eucalyptus gomphocephala* with occasional *E. marginata* over *Agonis flexuosa* and *Banksia attenuata* on yellow sand over limestone Condition: 4-6 (Majority Good to Degraded with parts Very Good and Completely Degraded)

2.3 Residual TEC impacts

Table 2-5 provides a summary of the key residual impacts to TECs. Impacts set out in the table represent the maximum possible impacts to TECs associated with the Project.

Table 2-5 Predicted residual impacts to TECs

ISSUE	SUMMARY OF RESIDUAL IMPACTS
Banksia Woodlands TEC	Clearing of up to 23.4 ha of Banksia Woodlands TEC
Tuart Woodlands TEC	Clearing of up to 4.4 ha of Tuart Woodlands TEC

3 FAUNA ASSESSMENT AND IMPACTS

3.1 Environmental surveys

Fauna field surveys and investigations undertaken relevant to the Project are listed in Table 3-1.

Table 3-1 Fauna investigations undertaken for the purpose of this Project

SURVEY / REPORT NAME	LOCATION / EXTENT IN SURVEYED AREA	METHODOLOGY
Surveys undertaken for the Project prior to referral		
Bunbury Outer Ring Road (Southern Section) Black Cockatoo Tree Survey. Biota Environmental Sciences (Biota) (2018a)	Bunbury Outer Ring Road (BORR) southern section extending from South Western Highway to Bussell Highway	Updated assessment of Black cockatoo habitat values assessed by GHD in 2011 (GHD, 2012), and comparison of new data with the 2011 data. Including: • Reassessment of the black cockatoo breeding habitat trees previously identified in 2011 by GHD (2012) and confirming whether they remain standing and intact • Reassessment of trees previously identified as containing hollows • reassessment of previously identified breeding habitat trees • marking trees with paint, based on presence of suitable nest hollows and black cockatoo use.
Bunbury Outer Ring Road South Section Targeted Fauna Assessment (Biota, 2020a)	Targeted habitat survey encompassing the 200 ha Development Envelope and approximately 97 ha buffering context area	Targeted field surveys conducted in five phases over the course of spring and summer 2018, and winter 2019 for conservation significant black cockatoos and WRP
Bunbury Outer Ring Road Southern Section Western Ringtail Possum Assessment (Biota, 2018b)	Bunbury Outer Ring Road Southern Section alignment	Survey for WRP. Sampling undertaken over four nights between 10/07/2018 – 13/07/2018 and comprised walking 38 transects, totalling 7.87 km in the BORR (southern section). No transects were repeat sampled.
Additional surveys undertaken for Proposal following referral		
Western Ringtail Possum: *Pseudocheirus occidentalis* Regional Surveys (Biota, 2020b)	Local vicinity of Northern, Central and Southern Section alignments and buffering context area	Focussed regional surveys from December of 2019 through December 2020. Surveys including radio tagging for home range assessments, trapping and survey of potential offset areas and other local context sites to better define local movement of populations.

The assessment of the broader fauna values of the area are provided in Biota (2020a) and BORR IPT (2022), with the outcomes of these assessments, as they relate to offsets, summarised below.

3.2 Western Ringtail Possum

3.2.1 WRP species description

The WRP was once widely distributed across the south and south-west of the state (from north of Perth to east of Albany) but is now restricted to the southern Swan Coastal Plain, the Jarrah forests near Manjimup and the south coast between Walpole and Albany. WRP was first listed as threatened under the Western Australian *Wildlife Conservation Act 1950* in 1983, and under the Commonwealth EPBC Act in 2000. Its listing status was revised to critically endangered under the EPBC Act in 2018.

3.2.2 Development Envelope habitat

The Development Envelope contains 60.9 ha of WRP foraging, breeding and dispersal habitat[4] that will be cleared for the Project, as shown in Attachment A of EPBC Act approval for EPBC 2019/8543 (Figure 3, Appendix C) and Figure 3 (Appendix A). The habitat to be cleared comprises the following Shedley and Williams (2014) habitat classes:

- 11.5 % 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 % of habitat not assessed (21.6 ha).

Based on the results of their regional WRP surveys, Biota estimate the 2019 regional WRP population within the SCP management zone to be approximately 9,720 individuals (Biota, 2020b).

3.2.3 Impact to be offset

The potential impacts to WRP associated with the implementation of the Project are summarised in Table 3-2 and discussed further below.

Table 3-2 Summary of potential impacts to WRP

FACTOR IMPACTED	DESCRIPTION
Clearing of native vegetation	Clearing of up to 60.9 ha of WRP foraging, breeding and dispersal habitat, comprising 49 to 72 WRP individuals' home ranges

Clearing of native vegetation

Implementation of the Project will result in clearing of up to 60.9 ha of WRP foraging, breeding and dispersal habitat within the Development Envelope. None of the habitat areas that are currently known to support WRP (based on the surveys undertaken by Biota) are anticipated to become unviable as WRP habitat as a result of Project implementation.

The WRP habitat to be cleared for the Project is a typical example of low density (less than 2 WRP/ha) modified mixed woodland habitat that is widespread in the area. It is currently fragmented, dissected by existing roads, easements and cleared agricultural land. WRP density within the Development Envelope is 0.93 WRP/ha.

[4] As defined in the *Significant impact guidelines for the vulnerable western ringtail possum (*Pseudocheirus occidentalis*) in the southern Swan Coastal Plain, Western Australia*. EPBC Act policy statement 3.10 (Commonwealth of Australia, 2009).

Biota (2020a) mapped two WRP habitat types within the Development Envelope:

- Marri / *Eucalyptus* woodland: Jarrah (*Eucalyptus marginata*) and Marri (*Corymbia calophylla*) dominated overstorey, varying understorey of Banksia (*Banksia attenuata* and *B. grandis*) and/or Peppermint (*Agonis flexuosa*)
- Marri / *Eucalyptus* in paddocks and road reserves: Typically occurring as widely spaced trees or occasionally as small stands in paddocks; comprising a mosaic of scattered trees of Marri and/or Flooded Gum. When occurring as small stands, the midstorey typically comprised Melaleuca or Peppermint and the heavily grazed understorey comprised introduced grasses.

WRP habitat structure

Approximately two thirds of the WRP habitat to be cleared comprised the Marri / *Eucalyptus* woodland habitat type. This effectively overlaps with the vegetation types mapped as Banksia Woodlands TEC. Structurally, these three vegetation types vary but all provide structural complexity that would facilitate a high degree of arboreal WRP movement, with the presence of a canopy layer plus a sub-canopy layer and / or one or more shrubland layers. According to the National Vegetation Information System (NVIS) Version 7 (NVIS (2017) , the description of these strata provided by BORR IPT (2020a) indicates foliage cover of 30-70 % and crown cover of 50-80 % for both the canopy and shrubland layers. VT2, which comprises the majority of the WRP habitat, is the most structurally complex, also containing a sub-canopy layer that provides foliage cover of 30-70 % and crown cover of 50-80 %. All three vegetation types also comprise ground layers of grassland and herbland with VT1 and VT2 also containing a sedgeland.

The foliage cover of the remaining one third of WRP habitat, comprising of the Marri / *Eucalyptus* in paddocks and road reserves habitat type (which predominantly comprises scattered (isolated) trees or isolated small stands of trees) is 0-5 % and the crown cover 0.25 %. The lack of canopy connectivity within this habitat would require WRPs to go to ground to move between trees and stands of trees.

Groundcover for WRP shelter

Of the nine vegetation types identified during the flora and vegetation survey conducted for the Project (BORR IPT, 2020a) that comprise WRP habitat, three contained a reasonably intact understorey or groundcover stratum that would provide shelter for WRPs (i.e. a shrubland, sedgeland, herbland and / or forbland). The remaining six WRP habitat vegetation types did not contain an intact understorey layer. At the time of the BORR IPT survey, one small area was burnt but there was no other visual evidence of recent (i.e. within ten years) fire (BORR IPT, 2020a).

Presence of dreys and hollows

During their field survey, Biota (2020a) did not record the presence of dreys or the specific presence of hollows showing use by or potentially used by WRP, however WRP are resident and therefore denning in dreys and / or hollows. Hollow abundance is in part demonstrated by Biota's black cockatoo tree hollow assessment, which indicated the presence of 215 hollows of varying sizes within the 1,088 suitable diameter at breast height (DBH) trees contained within the Development Envelope (Biota, 2020a).

Presence of WRP predators

With regard to WRP predator species (fox and feral cat) presence within the Development Envelope, Alpha Pest Animal Solutions conducted an assessment between Bussell Highway and Jilley Road in the first half of 2022 (Alpha Pest Animal Solutions, 2022). Fox activity was assessed as Medium to High in the section between Bussell Highway and Woods Road, and as Medium in the section between Woods Road to Jilley Road. Evidence of feral cats was recorded at low levels in both sections.

3.3 Black Cockatoo

3.3.1 Black cockatoo species description

Black cockatoos are long-lived, slow-breeding birds that display strong pair bonds and probably mate for life. All three species addressed in this Strategy breed in hollows in very long-lived trees.

Carnaby's Cockatoo and Baudin's Cockatoo are listed as Threatened fauna under both the EPBC Act and the State *Biodiversity Conservation Act 2018* (BC Act) at the level of 'Endangered' as assessed under the criteria of the IUCN (2012). The Forest Red-tailed Black Cockatoo is listed as Threatened fauna under both EPBC and BC Acts at the level of 'Vulnerable' as assessed under the criteria of the IUCN (2012).

3.3.2 Development Envelope habitat

Targeted fauna surveys conducted for the Project identified evidence of foraging by all three species of black cockatoo both within and adjacent to the Development Envelope, and either Baudin's Cockatoo or Carnaby's Cockatoo were observed flying overhead during field surveys (Biota, 2020a). All three species were identified as likely to occur within the area of the Project with suitable foraging and potential breeding habitat[5] (trees containing a suitably-sized hollow(s) for nesting) present (Biota, 2020a).

Within the Development Envelope, black cockatoo foraging and potential breeding habitat was comprised of two mapped habitat types: Marri / *Eucalyptus* woodland and Marri / *Eucalyptus* in paddocks and road reserves, as shown in Figure 4 (Appendix AAppendix A).

3.3.3 Impact to be offset

Potential impacts of the Project to black cockatoos are outlined in BORR IPT (2020b) and summarised in Table 3-3. Potential impacts from the Project result from the loss of habitat and are discussed further below.

Table 3-3 Summary of potential impacts to black cockatoos

IMPACT	DESCRIPTION
Loss of habitat	Clearing of native vegetation comprising up to: • 60.9 ha of foraging and potential breeding habitat • 1,088 trees with a diameter at breast height (DBH) ≥ 500 mm • Eleven trees (of the 1,088 trees with a DBH ≥ 500 mm) that contain a potentially suitable nest hollow(s).

[5] As defined in the *EPBC Act Referral Guidelines for Three Threatened Black Cockatoo Species* (DSEWPaC, 2012).

Implementation of the Project will result in clearing of up to 60.9 ha of black cockatoo foraging and potential breeding habitat within the Development Envelope as shown in Figure 4 (Appendix A) and in Attachment A of EPBC Act approval for EPBC 2019/8543 (Figure 2, Appendix C).

Potential nesting trees

The Development Envelope includes eleven trees with a DBH of ≥ 500 mm that contain a hollow(s) assessed as potentially suitable for nesting by black cockatoos. Two of these indicated some evidence of potential nesting use, however no direct signs of black cockatoo breeding were observed (Biota, 2020a). The Development Envelope contains 1,077 suitable DBH trees without suitable hollows that will be removed by the Project. No trees contain known nest hollows. Suitable DBH trees and trees with potentially suitable nest hollows within the Development Envelope are shown in Figure 5 (Appendix A).

Habitat quality

The environmental surveys conducted for the Project identified habitat quality and vegetation condition (Biota, 2020a; BORR IPT, 2020a), which establish the baseline habitat health condition prior to implementation of the Project. Almost half (49 %) of surveyed vegetation was mapped as Degraded or worse condition, 23 % as Good–Degraded and 28 % as Good or better condition (BORR IPT, 2020a).

Two thirds of the Development Envelope habitat comprises 'Marri / *Eucalyptus* woodland' habitat type, classified as 'high quality foraging habitat' (Biota, 2020a). These areas supported a high density of foraging trees (primarily Marri and Jarrah) in the upper strata but often also included Banksia in the mid-storey. The remaining one-third comprises the 'Marri / *Eucalyptus* in paddocks and road reserves' habitat type, classified as 'moderate quality foraging habitat'. This habitat type typically occurred as widely spaced trees or occasionally as small stands in paddocks comprising a mosaic of scattered trees of Marri and/or Flooded Gum. When occurring as small stands, the midstorey typically comprised Melaleuca or Peppermint and the heavily grazed understorey comprised introduced grasses (Biota, 2020a).

Evidence of foraging by all three species of black cockatoo was recorded during field surveys, with Forest Red-tailed Black Cockatoo and Carnaby's Black Cockatoo foraging most commonly recorded (Biota, 2020a).

Surrounding habitat

The Development Envelope black cockatoo habitat is situated within 12 km of approximately 8,000 hectares of modelled suitable black cockatoo habitat (Biota, 2020a).

3.3.4 Preclearance survey data and August 2022 clearing impacts

Condition 15(b)(i) requires that this Strategy includes information pertaining to the total number of suitable black cockatoo nest hollows identified during the pre-clearing survey specified in condition 7[6] and the number of suitable nest hollows and trees with a DBH of greater than 500 mm cleared.

Based on detailed GIS mapping conducted for the Project, the Development Envelope contains 1,088 suitable DBH trees, with 11 trees containing hollows potentially suitable for use by black

[6] Which specifies that pre-clearance surveys must be undertaken within 5 business days prior to clearing.

cockatoos. This represents the maximum potential clearing for the Project with regard to DBH trees and / or trees containing potentially suitable black cockatoo nest hollows.

In the July / August 2022 clearing phase, pre-clearance surveys recorded 146 suitable DBH trees to be cleared, of which five had hollows assessed as being potentially suitable for black cockatoo nesting. The August 2022 clearing resulted in the removal of 80 suitable DBH trees, including two trees with hollows potentially suitable for black cockatoo nesting, of which one was ground-assessed only. Therefore, at the date of this Offset Strategy, two hollows potentially suitable for black cockatoo nesting have been cleared.

Condition 18(c)(i) of the EPBC Act approval for EPBC 2019/8543 requires Main Roads to install three artificial black cockatoo nest hollows (ANHs) for every suitable nest hollow cleared for the Project. Up to 11 trees with suitable nest hollows will be cleared for the Project, requiring the installation of up to 33 ANHs, assuming each tree only has one hollow. For hollows not cleared prior to finalisation of the *Offset Management Plan* (in preparation), 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 the *Offset Management Plan* (in preparation) will be installed in the selected ANH sites prior to 1st July immediately following clearing of the potentially suitable hollow.

Condition 15(b)(i) of EPBC Act approval for EPBC 2019/8543 requires Main Roads to quantify the total number of 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. In the interest of being conservative, and to address any concerns regarding the intent of this condition, Main Roads commits to installing 45 ANHs to address the loss of the future hollow potential of the 1,088 suitable DBH trees that will be cleared for the Project.

Refer to Section 4.1.4 for more information regarding ANHs to be installed for the Project.

3.4 Residual fauna impacts

Table 3-4 provides a summary of the key residual impacts to fauna. Impacts set out in the table represent the maximum possible impacts associated with the Project.

Table 3-4 Predicted residual impacts to fauna

ISSUE	SUMMARY OF RESIDUAL IMPACTS
Western Ringtail Possums	Clearing of up to 60.9 ha of suitable WRP habitat and disturbance of between 49 and 72 individual home ranges
Black cockatoos	Clearing of up to 60.9 ha of suitable black cockatoo foraging and potential breeding habitat including up to 1,088 suitable DBH trees including up to 11 suitable DBH trees containing potentially suitable hollows

4 ENVIRONMENTAL OFFSETS

The proposed environmental offsets detailed in this Offset Strategy are submitted to the DCCEEW for approval by the Minister for the Environment.

Main Roads has pursued a number of options in developing a package of offsets to counterbalance residual impacts of the Project. The options investigated have comprised acquisition of land providing TEC vegetation and fauna habitat, and the creation of TEC and fauna habitat by habitat restoration and rehabilitation. Three of the proposed offset sites (Offsets A, B and C) will address the requirement for more than one offset attribute e.g. TEC and provision of WRP habitat, or WRP habitat and black cockatoo habitat, at a single site.

Table 4-1 provides an overview of the offset package proposed[8].

Table 4-1 Overview of proposed offset package

	OFFSET TYPE	OFFSET SUMMARY	PROPERTY LOCATION	EXISTING TENURE
A	Land Acquisition and On-ground management	140.1 ha of native vegetation[9] comprising. • 126.0 ha of foraging, breeding and dispersal habitat for WRP • 124.1 ha of Banksia Woodlands TEC.	Lots 153, 267 and 268 Ducane Road, Gelorup	Main Roads funded purchase of these properties by DBCA. The properties are now owned by the State of Western Australia The properties total 162.6 ha of which 22.5 ha is set aside under an existing Conservation Covenant under Section 30B of the *Soil and Land Conservation Act, 1945* Lots 153, 267 and 268 are currently zoned as Rural under the Greater Bunbury Region Scheme
B	On-ground management	65 ha of revegetation to provide foraging, breeding and dispersal habitat for WRP incorporating 49 ha of foraging and potential breeding habitat for black cockatoos	Lot 104 (North) Willinge Drive Davenport (comprising the northern and central land parcels)	Purchased and owned by the Commissioner of Main Roads

[8] Note that these are Commonwealth offsets; there are additional offsets required by the State under Ministerial Statement 1191 that are not required as part of condition 14 and 18, but that address and offset impacts to MNES values. Refer to Section 6 for more information.

[9] These environmental values are external to the covenanted area.

	OFFSET TYPE	OFFSET SUMMARY	PROPERTY LOCATION	EXISTING TENURE
C	On-ground Management	270 ha of revegetation to provide foraging, breeding and dispersal habitat for WRP incorporating 200 ha of foraging and potential breeding habitat for black cockatoos and 37 ha of Tuart Woodlands TEC	Ludlow State Forest (also referred to as State Forest No. 2 (SF No.2)) / Tuart Forest National Park (TFNP)	Vested in the Conservation and Parks Commission. DBCA have confirmed that 270 ha is available for revegetation

4.1 Description of offsets

The various components of the proposed offset package are described below.

4.1.1 Offset A – Lots 153, 267 and 268 Ducane Road, Gelorup

Offset A comprises Lots 153, 267 and 268 Ducane Road, Gelorup ('Ducane Offset Area') which have a total area of 162.6 ha. 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 A.

The Ducane Offset Area is located 2 km east of the BORR Southern Section alignment as shown in Figure 6 (Appendix A).

4.1.1.1 Ducane Offset Area environmental attributes

The vegetation within the Ducane Offset Area was surveyed as part of the environmental assessment for the Project. The studies conducted are listed in Table 4-2.

Table 4-2 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 TEC
Targeted Fauna Survey: Lots 267, 268 and 153 Ducane Road, Gelorup (Biota, 2019)	Targeted fauna survey and habitat assessment for WRP and black cockatoos conducted in June and July 2019
BORR offsets WRP rapid assessment (SW Environmental, 2022a)	Rapid assessment survey to confirm the presence or absence of WRP within the Ducane Offset Area

STUDY	DESCRIPTION
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*
Information Request BORR South Offsets - Memo report (Biota, 2022)	Confirmation and compilation of information pertaining to parameters specified in the Habitat Quality Scoring

Outside of the covenanted area, the Ducane Offset Area has been confirmed to contain the following values that are offsets proposed for the purpose of this Strategy:

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

Banksia Woodlands TEC

The extent and condition of Banksia Woodlands TEC within the Ducane Offset Area was assessed by Biota in spring 2020 (Biota, 2021). The resulting report informs this section.

The Ducane Offset Area comprises the following vegetation units that comprise Banksia Woodland TEC (Figure 7, Appendix A), as well as habitat for WRP (Figure 8, Appendix A):

- Vegetation unit 1 *Banksia attenuata* woodland with emergent *Eucalyptus marginata - Banksia attenuata*, (*Eucalyptus marginata*) low woodland with scattered *Nuytsia floribunda* and *Xylomelum occidentale* over *Kunzea glabrescens* tall open shrubland over *Hibbertia hypericoides* subsp. *hypericoides, Melaleuca thymoides, Stirlingia latifolia* and *Calytrix fraseri* low open shrubland over *Lyginia imberbis* and *Desmocladus flexuosus* scattered sedges
- Vegetation unit 2 *Banksia attenuata* woodland with *Banksia ilicifolia - Banksia attenuata, B. ilicifolia*, (*Nuytsia floribunda*) low woodland over *Kunzea glabrescens* tall open shrubland over *Hibbertia vaginata, Bossiaea eriocarpa, Stirlingia latifolia, Xanthorrhoea brunonis* low open shrubland over *Lyginia imberbis, Desmocladus flexuosa* scattered sedges
- Vegetation unit 3 *Banksia attenuata* woodland with *Agonis flexuosa - Banksia attenuata, Agonis flexuosa*, (*Eucalyptus marginata*) low woodland over *Kunzea glabrescens* tall open shrubland over *Hibbertia hypericoides* subsp. *hypericoides, Macrozamia riedlei, Xanthorrhoea brunonis* low open shrubland over *Desmocladus flexuosus, Austrostipa compressa* very open grassland and *Phlebocarya ciliata* scattered herbs.

The three vegetation units aligning with Banksia Woodlands TEC were assigned to FCT21a 'Central *Banksia attenuata – Eucalyptus marginata* woodlands' which forms part of the state-listed 'Banksia Woodlands of the Swan Coastal Plain' Priority three PEC. These vegetation types also provide habitat for all three species of black cockatoo.

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 vegetation rated as Very Good condition. No visual evidence of recent (i.e. within ten years) fire was recorded.

A broadscale assessment to determine the Phytophthora dieback status of the offset area vegetation was undertaken by Terratree in December 2022 (Terratree, 2023). Approximately 5.4 ha

of the Banksia Woodland TEC vegetation was not included the assessment. Based on the results of the visual assessment, the disease was not considered to be present however five positive results were returned from the five samples collected for testing. Only one of the four samples was taken from vegetation adjacent to an access track which appears to indicate that the primary vector for introduction of the pathogen is not human and / or vehicle movement. Considering the high density of kangaroos present within the site, it is most likely that these animals are the primary vector. While the five samples taken returned positive results, the great majority of Banksia Woodland TEC appears to be dieback free. Of the assessed Banksia vegetation, one hectare was assessed as 'moderate confidence Infested' and 117.7 ha was assessed as 'low confidence Uninfested' (Terratree, 2023).

The extent of the Banksia Woodlands TEC patch outside of the Ducane Offset Area was not recorded by Biota (2021) however assessment of aerial photography combined with contour mapping indicates the wider patch would extend to a minimum of 300 ha. This includes the nearby Franklandia Nature Reserve.

Quadrat data from the Ducane Offset Area (Biota, 2021) shows that average species richness for the Ducane Offset Area is 45.6 which is more than double that of the Banksia Woodlands TEC in the Development Envelope. According to the Approved Conservation Advice for Banksia Woodland TEC (TSSC, 2016), the species richness for the TEC ranges from 30 to 65 species. Species richness within the Ducane Offset Area Banksia Woodland TEC vegetation is approximately 20 % below that recorded for FCT21a by Gibson *et al.* (1994) but given the decline in Banksia-dominated vegetation on the SCP since the Gibson report was released, is considered to be high.

WRP habitat

WRP foraging, breeding and dispersal habitat within the Ducane Offset Area is represented by two habitat types as mapped by 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. Two thirds of this habitat was mapped by Biota as being in Very good condition, described as having a "healthy overstorey, intact shrub layer and a diverse groundstorey [with] minimal signs of disturbance and few weeds". The remainder was mapped as Good condition, and described as having a "generally healthy overstorey, diverse shrub and groundstorey. Some small patches with signs of kangaroo disturbance and past grazing of the area by livestock [with] greater number of weeds in this area but still fairly sparse" (Biota, 2021). No visual evidence of recent (i.e. within ten years) fire was recorded.

The structure of the canopy layer of these vegetation types is described by Biota (2021) as 'low woodland'. According to the NVIS Version 7 (NVIS (2017) in BORR IPT (2020a)), this indicates foliage cover of 10-30 % and crown cover of 20-50 % in this stratum. Biota also describe two

components to the shrublayer for each of these vegetation types, being a tall and a low 'open shrubland'. Both shrubland types are indicated to provide foliage cover of 10-30 % and crown cover of 20-50 %. A groundcover layer is also indicated to be present, although for two of the vegetation types, it is described as scattered rather than as a consistent herbland / grassland / sedgeland. Across all strata, the habitat within the offset area provides for a high degree of arboreal movement of WRPs.

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.

During their field survey, Biota (2019) did not record the presence of dreys or the specific presence of hollows showing use by or potentially used by WRP, however WRP are resident and therefore denning in dreys and / or hollows. In their brief field assessment conducted in December 2022, SW Environmental (2022a) noted the presence of many intact and well-maintained (indicating recent use) dreys, although only a few were recorded during the site inspection. Hollow abundance at the offset area is in part demonstrated by Biota's black cockatoo tree hollow assessment, conducted as part of the fauna survey. This indicated the presence of 154 hollows potentially suitable for black cockatoo breeding (as far as could be determined from ground level) from 133 trees. Given that a total of 1,243 suitable DBH trees were mapped within the offset area, it is likely that many more hollows are present that are suitable for use by WRP but not for breeding by black cockatoos.

With regard to WRP predator species (fox and feral cat) presence within the Ducane Offset Area, evidence of fox (including dens) have previously been recorded (Biota, 2022). There has been no record of evidence of feral cats.

Threats to Banksia Woodlands TEC and WRP habitat

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.

Unplanned 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).

4.1.1.2 Ducane Offset Area achievable ecological benefits

For the Ducane Offset Area, Main Roads commits 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 habitat[10]
  - Improving the extent of ground cover that provides shelter for WRP
  - Multiple individuals detected on site within last 2 years
  - No unplanned fire for at least 15 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.

The stated achievable ecological benefits are aligned with the objectives of the Banksia Woodlands TEC Conservation Advice (TSSC, 2016) and WRP Recovery Plan (DBCA, 2017), respectively.

On the basis of the expertise, science and evidence provided in Sections 4.1.1.1 and 4.1.1.3 and by the nature of management activities proposed in Section 4.1.1.3, the ecological benefits stated above are considered to be achievable within the stated timeframe of 20 years.

4.1.1.3 Ducane Offset Area achievement of ecological benefits

To achieve and maintain the ecological benefits stated in Section 4.1.1.2, 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 and presented in detail in the *Offset Management Plan* (in preparation).

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. Additional culling will be conducted if the vegetation monitoring results are showing a decline in vegetation condition 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.

[10] Noting the requirement for firebreaks.

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.

Pest animal control
Pest animal control contractors engaged for the Project are experts in their field. Monitoring for pest animals (rabbits, foxes, feral cats) is currently being undertaken in the Development Envelope by this contractor during the construction phase of the Project, in accordance with the methodology detailed in the approved *MNES Fauna Management Plan* (Main Roads Western Australia, 2022a). This methodology has successfully detected the presence of rabbits, foxes and feral cats within the Development Envelope during previous monitoring periods. The same methodology will be applied to the detection of these pest animal species in the offset areas included in this Strategy. Where on site observations indicate the presence of rabbits, foxes or feral cats, control measures such as baiting and / or trapping will be undertaken.

Selective weed control
Weed control comprising spot spraying of WONS and Declared weed species will be undertaken. Control of environmental weeds such as annual grasses will be undertaken where they are increasing in prevalence and/or are impacting revegetation / rehabilitation activities and natural regeneration, or if required to attain the desired ecological benefit.

Phytophthora dieback
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 Strategy 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 unplanned 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). 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*
- *Agonis flexuosa*
- *Adenanthos meisneri*
- *Banksia attenuata*
- *Banksia ilicifolia*
- *Calytrix fraseri*
- *Melaleuca thymoides*
- *Phlebocarya ciliata*
- *Stirlingia latifolia*

The full species list will be included in the *Offset Management Plan* (in preparation).

4.1.1.4 Ducane Offset Area monitoring

Monitoring will be conducted at the Ducane Offset Area to enable early detection of changes that may impede realisation of the ecological benefits, and to enable measurement of progress towards and maintenance of the ecological benefits. The monitoring program, which is detailed in the *Offset Management Plan* (in preparation), is summarised in **Error! Reference source not found.**.

4.1.1.5 Ducane Offset Area protection mechanism

Main Roads funded the purchase of the Ducane Offset Area by DBCA. DBCA consists of a number of authorities and body corporates, including the Conservation and Parks Commission, which is responsible for conserving the State's biological diversity and ensuring the conservation estate is managed in an ecologically sustainable manner, as required by the *Conservation and Land Management Act 1984*.

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 Conditions 14 and 15 of the EPBC Act approval for EPBC 2019/8543, for the period of EPBC Act approval.

Table 4-3 Summary of Ducane Offset Area monitoring program

Aspect	Methodology	Methodology description	Timing and frequency
Fence condition and firebreaks	Visual inspection	Vehicle and / or on foot inspection of fencing by suitably experienced personnel to determine effectiveness and identify any maintenance requirements	Twice yearly commencing Year 2023
Kangaroo population	Population estimate	Strip and/or distance sampling or otherwise as advised by consulting zoologist to be conducted by suitably experienced personnel	Baseline spring 2023, then annually in spring
Banksia Woodlands TEC: Vegetation condition (including weed species cover and overgrazing impacts including native species diversity, cover and reproductive capacity, and evidence of natural regeneration)	Floristic quadrats and visual inspection	Installation and assessment of 10x10m floristic quadrats and visual inspection via walking meander survey. Banksia Woodlands TEC monitoring to be conducted by suitably experienced personnel.	Annually for four years commencing 2023, then three-yearly
Banksia Woodlands TEC: Phytophthora dieback	Field survey / visual inspection	Field survey by registered dieback interpreter in accordance with the *Phytophthora Dieback Interpreters Manual for Lands Managed by the Department (DBCA, 2017)*. This may include collection and testing of samples.	Three-yearly commencing 2026[12]
WRP: Distribution and density	Nocturnal field survey	Repetition of methodology implemented by Biota (2019). Nocturnal field survey 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.	Three-yearly commencing 2023
WRP: Canopy connectivity, vegetation cover and structure	• Floristic quadrats and visual inspection	• Floristic quadrats and visual inspection - see above 'Banksia Woodlands TEC: Vegetation condition'	Three-yearly commencing 2023

Aspect	Methodology	Methodology description	Timing and frequency
	• Aerial drone survey	• Aerial drone survey – capture of aerial photography via drone.	
WRP: Ground cover (presence of groundcover layer)	Floristic quadrats and visual inspection	See above under 'Banksia Woodlands TEC: Vegetation condition'	Annually for four years commencing 2023, then three-yearly
WRP: Nests / dreys / hollows	Field survey / visual inspection	Visual inspection during nocturnal field surveys described above under 'WRP distribution and density'. Additional daytime surveys may also be conducted.	Three-yearly commencing 2026
WRP: Pest animals / predators	Field survey / visual inspection	Vehicle and / or on foot inspection by suitably experienced personnel to identify and record evidence of pest animals / predators.	Annually commencing 2023

4.1.2 Offset B – Lot 104 (North) Willinge Drive, Davenport

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 9, Appendix A).

Much of Lot 104 was previously used for a commercial Blue Gum operation with the timber being harvested in 2017. The great majority of the offset area is now cleared. Main Roads proposes to rehabilitate and revegetate a 65 ha portion of the property to provide foraging, breeding and dispersal habitat for WRP, of which 49 ha will also comprise foraging and potential breeding habitat for black cockatoos.

4.1.2.1 Lot 104 (North) Offset Area environmental attributes

The Lot 104 North Offset Area is currently devoid of vegetation apart from some vegetated sections of an ephemeral watercourse that crosses the property from east to west.

WRP

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, as indicated in Figure 10 (Appendix A) (Biota, 2019).

Black cockatoos

The Lot 104 North Offset Area is essentially devoid of native vegetation and therefore does not currently provide any habitat value for black cockatoos, however evidence of all three species of black cockatoo has been recorded in the vicinity (GHD, 2014). The existing BORR Central Section divides the Lot 104 central land parcel from the northern land parcel. This provides an indication of the close proximity of the Lot 104 North Offset Area to the black cockatoo habitat that will be impacted by the Project, for which the offset is proposed. At its nearest point, the offset area is 2.1 km from the impact area (Figure 9, Appendix A). The northern land parcel is also situated approximately 800 m from Lot 2 Boyanup Picton Road, a large area of remnant native banksia woodland vegetation approved as an offset against residual impacts to all three species of black cockatoo associated with clearing conducted for the BORR Northern and Central Sections Project. The portions of the Lot 104 North Offset Area that comprise the 49 ha black cockatoo offset are shown in Figure 11 (Appendix A).

4.1.2.2 Lot 104 (North) Offset Area achievable ecological benefits

For the Lot 104 (North) Offset Area, Main Roads commits 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
- No unplanned fire for at least 15 years. 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 containing suitable foraging tree species for each of the three species of black cockatoos with at least 40 % projected foliage cover.

The stated achievable ecological benefits are aligned with the objectives of the WRP recovery plan (DBCA, 2017), black cockatoo conservation advices and / or recovery plans (DPAW, 2013; DEWHA, 2009; TSSC, 2018).

On the basis of the expertise, science and evidence provided in Sections 4.1.2.1 and 4.1.2.3 and by the nature of management activities proposed in Section 4.1.2.4, the ecological benefits stated above are considered to be achievable within the stated timeframe of 20 years.

4.1.2.3 Lot 104 (North) Offset Area achievement of ecological benefits

To achieve the ecological benefit stated in Section 4.1.2.2, Main Roads proposes to undertake the following 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.

Fencing and access management

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 access will be installed. Fauna escape gates may be installed in strategic locations to enable kangaroos and other fauna to leave the site.

Pest animal control

Pest animal control contractors engaged for the Project are experts in their field. Monitoring for pest animals (rabbits, foxes, feral cats) is currently being undertaken in the Development Envelope

by this contractor during the construction phase of the Project, in accordance with the methodology detailed in the approved *MNES Fauna Management Plan* (Main Roads Western Australia, 2022a). This methodology has successfully detected the presence of rabbits, foxes and feral cats within the Development Envelope during previous monitoring periods. The same methodology will be applied to the detection of these pest animal species in the offset areas included in this Strategy. Where on site observations indicate the presence of rabbits, foxes or feral cats, control measures such as baiting and / or trapping will be undertaken.

Selective weed control

Weed control comprising spot spraying of WONS and Declared weed species will be undertaken. Control of environmental weeds such as annual grasses will be undertaken where they are increasing in prevalence after the exclusion of kangaroos and / or are impacting revegetation / rehabilitation works or natural regeneration.

Phytophthora dieback

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 Strategy regardless of 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 unplanned fire.

Revegetation

Native species typical of the Southern River and Swan vegetation complexes (within which the Lot 104 North Offset Area is situated) will form the basis of the revegetation species list. The species list, which is detailed in the *Offset Management Plan* (in preparation), includes species known to provide habitat for WRP and foraging habitat as defined in DSEWPaC (2012) for all three species of black cockatoo. The species list has been developed based on the soil land system and vegetation complexes mapped for the area (Southern River and Swan), as well as local knowledge of the sites. Native species from other vegetation complexes in the local area may be included to supplement the Southern River and Swan species and provide additional fauna habitat value.

For revegetation for the Project, local provenance seed will be collected or sourced and provided to registered nurseries for propagation.

The vegetation coverage will include a variety of species within vegetation structural groups that will provide a cover of native vegetation for WRP and all three species of black cockatoo (noting that only 49 of the 65 ha offset area being allocated to black cockatoo habitat, as shown in Figure 11 (Appendix A)), with a focus on the upper and mid-storey layers. Plant density will vary across the site in response to local soil types, existing (remnant) vegetation density, and will aim to minimise bare ground and maximise the structural integrity and long-term viability of the established vegetation.

Successful creation of WRP habitat

Main Roads has a solid track record of establishing high quality foraging, breeding and dispersal habitat for WRP, as evidenced in the assessment of existing revegetation at the Ludlow State Forest

by Stream Environment and Water (Stream EW) (2022a) and the *Bussell Highway Revegetation Technical Memorandum* (Main Roads Western Australian, 2023b). Given this, it is reasonable to expect that the habitat created at Lot 104 will also be of a high quality, and therefore highly likely that WRP within the adjacent riparian vegetation will colonise the habitat within 20 years. Main Roads considers it reasonable to expect that evidence of WRP presence in the form of scats and / or dreys will be present at the site in 20 years. As recorded by Stream EW (2022a), a drey was established in five-year old revegetation in the Ludlow State Forest, indicating that the habitat created was attractive to the species. It is expected that the habitat created on the Lot 104 North Offset Area will be as attractive to the individuals in habitat adjacent to Lot 104 and that the local WRP population will expand into the newly created available habitat.

In the *BORR Northern and Central Sections Conservation Significant Fauna Action Management Plan* (BORR IPT, 2020), Main Roads committed to the installation of a permanent possum rope bridge under the Preston River bridge. This will provide connectivity between the central and northern land parcels to facilitate WRP movement along the riverine vegetation, similar to the rope bridges that have been installed and are being utilised by the species at other local bridges.

Successful creation of black cockatoo habitat

Main Roads is proposing to establish 49 ha of new black cockatoo foraging and potential breeding habitat at this offset area.

In December 2022, Stream EW (2022a) assessed the black cockatoo foraging value of the five year old revegetated site as moderate for Carnaby's Black Cockatoo and Forest Red-tailed Black Cockatoo and low for Baudin's Black Cockatoo. As at December 2022, overall foliage cover of the site was estimated to be 20-30 % for *Eucalyptus* species. Evidence of black cockatoos foraging (chew marks suggest Baudin's Black Cockatoo and potentially Carnaby's Black Cockatoo) was found on site. A small flock of up to ten white tailed Black Cockatoos was observed flying over the site during the field survey.

Given that all three species of black cockatoos are known to be present within the vicinity of the Lot 104 North Offset Area, it is highly likely that the species will utilise the habitat once it is established.

4.1.2.4 Lot 104 (North) Offset Area monitoring

Monitoring will be conducted at the Lot 104 (North) Offset Area to enable early detection of changes that may impede realisation of the ecological benefits, and to enable measurement of progress towards and maintenance of the ecological benefits. The monitoring program, which is detailed in the *Offset Management Plan* (in preparation), will be conducted as outlined in Table 4-4.

4.1.2.5 Lot 104 (North) Offset Area protection mechanism

Both the northern and central portions of Lot 104 Willinge Drive, Davenport (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. 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. 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. 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.

Table 4-4 Summary of Lot 104 North Offset Area monitoring program

Aspect	Methodology	Methodology description	Timing and frequency
Fence condition and firebreaks	Field survey / visual inspection	Vehicle and / or on foot inspection of fencing by suitably experienced personnel to determine effectiveness and identify any maintenance requirements	Twice yearly commencing 2023
Black cockatoos: Evidence of foraging	Field survey / visual inspection	Visual inspection via walking meander survey conducted by suitably experienced personnel	Three-yearly commencing 2029
WRP and black cockatoos: Canopy connectivity, vegetation cover and structure	• Floristic quadrats and visual inspection • Aerial drone survey.	• Floristic quadrats and visual inspection - Installation and assessment of 10x10m floristic quadrats and visual inspection via walking meander survey by suitably experienced personnel (including weed presence) • Aerial drone survey – capture of aerial photography via drone.	• Drone survey: Three-yearly commencing 2023 • Quadrats: Three-yearly commencing 2026.
WRP: WRP distribution and density	Nocturnal field survey	Repetition of methodology implemented by Biota (2019). Nocturnal field survey 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	Three-yearly commencing 2029
WRP: Ground cover (presence of groundcover layer)	Floristic quadrats and visual inspection	See above under 'WRP and black cockatoos: Canopy connectivity, vegetation cover and structure'	Annually for four years commencing once revegetation works completed, then three-yearly
WRP: Nests / dreys / hollows	Field survey / visual inspection	Visual inspection during nocturnal field surveys described above under 'WRP distribution and density'. Additional daytime surveys may also be conducted	Three-yearly commencing 2029
WRP: Pest animals / predators	Field survey / visual inspection	Vehicle and / or on foot inspection by suitably experienced personnel to identify and record evidence of pest animals / predators	Annually commencing 2023

4.1.3 Offset C – State Forest No. 2 / Tuart Forest National Park

Offset C ('Ludlow Offset Area') comprises the proposed revegetation and rehabilitation 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, are described in Table 4-6 below and are shown in Figure 12 (Appendix A).

The Ludlow Offset Area rehabilitation will provide 270 ha of foraging, breeding and dispersal habitat for WRP and 200 ha of foraging and potential breeding habitat for black cockatoos, as well as 37 ha of Tuart Woodlands TEC.

4.1.3.1 Ludlow Offset Area environmental attributes

The vegetation within the Ludlow Offset Area was surveyed as part of the environmental assessment for the Project. The studies conducted are listed in Table 4-5.

Table 4-5 Relevant baseline studies for the Ludlow Offset Area

STUDY	DESCRIPTION
Assessment of Main Roads revegetation area, State Forest No.2. (Stream Environment and Water, 2022a)	Survey of the Vasse Block revegetation to provide an indication of vegetation cover and structure and evidence of utilisation by target MNES (WRP and BC) and assess progress towards re-establishment of Tuart Woodlands TEC vegetation
Flora and Vegetation Survey of Ludlow Offset Site 7 (Stream Environment and Water, 2022b)	Reconnaissance flora and vegetation survey of a parcel of land within the Ludlow State Forest referred to as Offset Site 7 to delineate key flora and vegetation values within the proposed offset site
FRTBC foraging evidence at State Forest No. 2 / Tuart Forest National Park (Main Roads Western Australia, 2022d)	Main Roads Senior Environmental Officer confirmed utilisation of habitat within State Forest No. 2 / Tuart Forest National Park and thus suitability of the recreation of habitat in this location as an offset for the species
Memorandum: Ludlow State Forest Black Cockatoo Occurrence (SW Environmental, 2022b)	Memorandum prepared to provide a brief background and comment on potential usage of the offset sites by black cockatoos
Reconnaissance Flora and Vegetation Survey Ludlow Offset Sites (Ecoedge, 2022)	Reconnaissance flora and vegetation survey of three parcels of land, site 12a, site 2 and site 3, within the Ludlow State Forest (State Forest No.2) and the Tuart Forest National Park to establish baseline information prior to the commencement of offset activities.

The condition and environmental attributes (where relevant) of each of the four sites comprising the Ludlow Offset Area are described in Table 4-6.

Table 4-6 Ludlow Offset Area description and environmental attributes

SITE No.	DESCRIPTION	SIZE
Site 12 **(DBCA Site 12)**	The Ludlow Offset Area Site 12 revegetation offset 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 (Figure 13, Appendix A). 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 taken from the Ecoedge (2022) report. Site 12 is located ≤100 m of remnant native vegetation of a similar type and condition. 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 understorey, which was dominated by *Zantedeschia aethiopica* (Arum lily). A dieback survey was not conducted as the site is expected to be uninterpretable due to its very poor condition and general lack of indicator species. It is also noted that the offset area is situated on calcareous soils, and as such it is highly unlikely that *Phytophthora cinnamomi* is present. A detailed assessment for Tuart Woodlands TEC was beyond the scope of the Ecoedge (2022) survey however their field assessment determined that all of the vegetation within the assessment area comprised the TEC. This conclusion was based on the total area of Tuart woodland vegetation being over 5 ha, contiguous with much larger areas of Tuart woodland outside the survey area, and being dominated by Tuart trees on average less than 60 metres apart. A subsequent desktop analysis conducted by Main Roads has confirmed this. The primary degrading factors at Site 12 are weed infestation (primarily Arum lily and Bridal creeper under existing canopy and pasture grasses in bare areas) and grazing pressure (from rabbits and macropods) which together are impeding natural regeneration and recruitment. Revegetation comprising canopy, mid-storey and understorey species is required across the site. The Tuart Woodlands TEC revegetation offset area does not have a buffer zone as defined in the Approved Conservation Advice (TSSC, 2019). 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). Main Roads intends to revegetate 185 ha at Site 12 to increase WRP habitat extent and connectivity with an aim to homogenise WRP density across the site (i.e. WRP density is more even across the site).	185 ha
Site 2	The Ludlow Offset Area Site 2 offset comprises an advanced offset for WRP and black cockatoos (Figure 14, Appendix A). Site 2 provides 5 ha of newly created	5 ha

SITE No.	DESCRIPTION	SIZE
	foraging, breeding and dispersal habitat for WRPs and foraging and potential breeding habitat for all three species of black cockatoo. 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, 2012) and four are known to be utilised by WRP. 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.	
Site 4 **(BORR SF2)**	The Ludlow Offset Area Site 4 comprises an advanced offset for WRP and black cockatoos (Figure 14, Appendix A). 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. 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. The 45 species used in initial planting works are listed in Appendix A. Of these, ten comprise foraging habitat for black cockatoos and 11 are known to provide habitat for WRP. Main Roads proposes Site 4 as an advanced offset for WRP and black cockatoos.	10 ha
Site 7	The Ludlow Offset Area Site 7 comprises the creation of 14 ha of WRP habitat and the enhancement and management of 56 ha of WRP habitat (Figure 15, Appendix A). 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. Site 7 was assessed by Stream EW in 2021 to determine baseline condition. Information provided below is taken from the Stream EW (2022b) report.	70 ha

SITE No.	DESCRIPTION	SIZE
	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 *Zantedeschia aethiopica* (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. 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.	

4.1.3.2 Ludlow Offset Area achievable ecological benefits

For the Ludlow Offset Area, Main Roads commits 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
- No unplanned fire for at least 15 years. 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 containing suitable foraging tree species for each of the three species of black cockatoos with at least 40 % projected foliage cover.

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 ≥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 >15cm DBH per hectare.

The stated achievable ecological benefits are aligned with the objectives of the WRP recovery plan (DBCA, 2017), black cockatoo conservation advices and / or recovery plans (DPAW, 2013; DEWHA, 2009; TSSC, 2018) and Tuart Woodlands TEC conservation advice (TSSC, 2019) respectively.

On the basis of the expertise, science and evidence provided in Sections 4.1.3.1 and 4.1.3.3 and by the nature of management activities proposed in Section 4.1.3.4, the ecological benefits stated above are considered to be achievable within the stated timeframe of 20 years from commencement of revegetation works.

4.1.3.3 Ludlow Offset Area achievement of ecological benefits

To achieve the ecological benefits stated in Section 4.1.3.2, 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 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.

Fencing and access management

Fencing to fauna fencing standards (1500 mm high with 300 mm vermin skirt) will be installed to protect the revegetation areas from herbivore grazing. Gates to allow for maintenance access will be installed. Fauna escape gates may be installed in strategic locations to enable kangaroos and other fauna to leave the site.

Pest animal control

Where on site observations indicate the presence of rabbits, foxes or feral cats, control measures such as baiting and / or trapping will be undertaken.

Selective weed control

Weed control comprising spot spraying of WONS and Declared weed species will be undertaken. Control of environmental weeds such as annual grasses will be undertaken where they are increasing in prevalence after the exclusion of kangaroos and / or are impacting revegetation / rehabilitation and / or natural regeneration.

Phytophthora dieback
Main Roads standard *Phytophthora* dieback management measures will be applied during the construction and maintenance of firebreaks and fences and weed control activities. The risk of dieback spread should reduce when access to the site is controlled and kangaroos are excluded.

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

Revegetation
Advice has been provided by DBCA in regard to the species appropriate for inclusion in the revegetation of both WRP and black cockatoo habitat and of Tuart Woodlands TEC. Native species typical of the vegetation complexes associated with Tuart forest vegetation, including those listed in the Approved Conservation Advice (TSSC, 2019) will form the basis of the revegetation species list, which will be the same for all four Ludlow Offset Area sites. For low-lying areas, a sub-set of species suitable to these conditions has been prepared. For revegetation for the Project, local provenance seed will be collected or sourced and provided to registered nurseries for propagation.

The vegetation coverage will include a variety of species within each vegetation structural group that will provide a cover of native vegetation including lower, middle and upper storey species, with a focus on the upper and mid-storey layers for WRP and black cockatoo habitat. Plant density will vary across the site in response to local soil types, existing (remnant) vegetation density. The species list is included in Appendix A.

The proposed rehabilitation works are congruent with the objectives of the Tuart Forest National Park Management Plan (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, Western Ringtail Possum and Common Brushtail Possum)
- Enhance the resilience of this zone to disturbance and threatening processes.

Proposed management actions to achieve these objectives include “Re-establishing native vegetation in cleared areas, adapting management according to results of experimental trials.” (DPaW, 2014).

At existing revegetation Sites 2 and 4, the density and richness of black cockatoo foraging species will continue to be supplemented through infill planting and seeding. Additional revegetation including of Marri and Jarrah will be undertaken across the site to ensure the ecological benefit is attained.

At Sites 7 and 12, revegetation comprising canopy, mid-storey and understorey species is required.

At all sites, 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 and long-term viability of the established vegetation.

Successful creation of Tuart Woodlands TEC

Main Roads has demonstrated the ability to establish high quality revegetation within the Ludlow State Forest (refer to Stream EW (2022a)), and has successfully created Tuart Woodlands TEC in revegetation projects in the past, such as the for Ludlow Deviation Project. This is covered in brief in the *Bussell Highway Revegetation Technical Memorandum* (Main Roads Western Australian, 2023b).

Successful creation of WRP and black cockatoo habitat

As outlined in Section 4.1.2.3., Main Roads has demonstrated the ability to create good quality WRP and black cockatoo habitat (Stream Environment and Water, 2022a; Main Roads Western Australian, 2023b).

4.1.3.4 Ludlow Offset Area monitoring

Monitoring will be conducted at the Ludlow Offset Area to enable early detection of changes that may impede realisation of the ecological benefits, and to enable measurement of progress towards and maintenance of the ecological benefits. The monitoring program, which is detailed in the *Offset Management Plan* (in preparation), will be conducted as outlined in Table 4-7.

4.1.3.5 Ludlow Offset Area protection mechanism

The four sites comprising the Ludlow Offset Area are located on Crown land that is managed by DBCA. DBCA consists of a number of authorities and body corporates, including the Conservation and Parks Commission, which is responsible for conserving the State's biological diversity and ensuring the conservation estate is managed in an ecologically sustainable manner, as required by under the Conservation and Land Management Act 1984. This land tenure provides in perpetuity protection and maintenance of ecological benefits beyond the life of the approval.

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.

Table 4-7 Summary of Ludlow Offset Area monitoring program

Aspect	Methodology	Methodology description	Timing and frequency
Fence condition and firebreaks	Field survey / visual inspection	Vehicle and / or on foot inspection of fencing by suitably experienced personnel to determine effectiveness and identify any maintenance requirements	Twice yearly commencing 2023
Black cockatoos: Evidence of foraging	Field survey / visual inspection	Visual inspection via walking meander survey conducted by suitably experienced personnel	Three-yearly commencing 2029
WRP and black cockatoos: Canopy connectivity, vegetation cover and structure	• Floristic quadrats and visual inspection • Aerial drone survey.	• Floristic quadrats and visual inspection - Installation and assessment of 10x10m floristic quadrats and visual inspection via walking meander survey by suitably experienced personnel (including weed presence) • Aerial drone survey – capture of aerial photography via drone.	• Drone survey: Three-yearly commencing 2023 • Quadrats: Three-yearly commencing 2026.
WRP: WRP distribution and density	Nocturnal field survey	Repetition of methodology implemented by Biota (2019). Nocturnal field survey 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	Three-yearly commencing 2029
WRP: Ground cover (presence of groundcover layer)	Floristic quadrats and visual inspection	See above under 'Banksia Woodlands TEC: Vegetation condition'	Annually for four years commencing once revegetation works completed, then three-yearly
WRP: Nests / dreys / hollows	Field survey / visual inspection	Visual inspection during nocturnal field surveys described above under 'WRP distribution and density'. Additional daytime surveys may also be conducted.	Three-yearly commencing 2029
WRP: Pest animals / predators	Field survey / visual inspection	Vehicle and / or on foot inspection by suitably experienced personnel to identify and record evidence of pest animals / predators	Annually commencing 2023

Tuart Woodlands TEC: Native understorey species cover and diversity	Floristic quadrats and visual inspection	Installation and assessment of 10x10m floristic quadrats and visual inspection via walking meander survey conducted by suitably experienced personnel.	Annually for four years commencing once revegetation works completed, then three-yearly

4.1.4 Artificial nest hollows

4.1.4.1 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 commits 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.

To determine the appropriate quanta of ANHs required to offset the clearing of 1,088 suitable DBH trees, Main Roads undertook an analysis of suitable DBH trees and suitable hollows within the Development Envelope, the BORR Northern and Central Sections development envelope and four local reference sites, being the Ducane Offset Area (Section 4.1.1), Lot 29 Ducane Road (which is an offset under Ministerial Statement 1191), Lot 156 Marchetti Road (which is also an offset under Ministerial Statement 1191) and Lot 167 Jilley Road, Gelorup. This analysis showed that on average, 1.4 % of suitable DBH trees contained a suitable hollow. Using this average, it is estimated that approximately 15 of the 1,088 suitable DBH trees to be cleared could have suitable hollows at any point in time in the next 150 years. Given that condition 18(c)(i) of the EPBC Act approval for EPBC 2019/8543 requires three ANHs to be installed for every suitable hollow cleared, Main Roads proposes to apply the same multiplier and install 45 ANHs to conservatively offset the loss of up to 15 future potential breeding hollows. Although, based on the proportion of counted suitable DBH trees, up to 15 hollows are predicted to be impacted, given the avoidance and minimisation strategies that have been applied, it should be noted that the likely number of suitable hollows actually impacted by the Project is estimated to be around 4 or 5.

4.1.4.2 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 will be cleared for the Project, potentially requiring the installation of up to 33 ANHs (more if any of those 11 trees contain multiple suitable nest hollows).

4.1.4.3 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, up to six ANHs may be 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.

The locations of all ANH sites and relevant information as set out in condition 18 of EPBC Act approval for EPBC 2019/8543 will be detailed in the *Offset Management Plan* (in preparation).

For hollows not cleared prior to finalisation of the *Offset Management Plan* (in preparation), 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 the *Offset Management Plan* (in preparation) will be installed in the selected ANH sites prior to 1st July immediately following clearing of the potentially suitable hollow.

4.1.4.4 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). An *Artificial Nest Hollow Installation and Maintenance Plan* has been prepared for the Project that will be appended to the *Offset Management Plan* (in preparation).

4.1.4.5 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 has committed maintaining 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.

4.1.4.6 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.

5 REPORTING AND ACCOUNTABILITY

5.1 Roles and responsibility

This Offset Strategy outlines the environmental management activities to be undertaken by Main Roads or its delegate in association with offset areas. Main Roads acknowledges that the environmental management actions contained within this strategy are legal requirements to be met by Main Roads for the period of EPBC Act approval.

The Manager Environment at Main Roads will maintain responsibility for implementation of the management actions specified in this Offset Strategy, 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.

5.2 Reporting

Main Roads will report to DCCEEW on the implementation of this Offset Strategy as part of the Environmental Performance report and annual compliance reporting, which will both be publicly available, under the conditions of the EPBC Act approval.

Publicly available summary reports will be prepared in 2023, 2024, 2028 and then every five years until expiry of the EPBC Act approval (2072). The summary reports will outline management activities undertaken and the methodologies and findings of monitoring programs, and will indicate progress towards achievement and maintenance of the ecological benefits stated in Sections 4.1.1.2, 4.1.2.2, 4.1.3.2 and 4.1.4.

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

The reporting requirements for this Offset Strategy are identified in Table 5-1. The format and content of annual reporting will be in accordance with the requirements of the annual reporting conditions.

Table 5-1 Reporting requirements

ASPECT	REPORT FROM	REPORT TO	REPORTING FREQUENCY
Implementation of Offset Strategy	Manager Environment	DCCEEW	Annually (as part of annual compliance reporting)
		Public	Summary reports prepared in 2023, 2024, 2028 and then every five years until expiry of the EPBC Act approval (2072)

6 ADDITIONAL STATE OFFSETS

The offset areas detailed in Section 4.1 are those required under conditions 14 and 18 of the EBPC Act approval for EPBC 2019/8543. Additional offsets are required under MS1191 that, while not required to address the Commonwealth's Offset Policy, address and offset MNES values. To provide for completeness to create a holistic picture of the State and Commonwealth offsets, the additional offsets are listed below:

- Lot 156 Marchetti Road, Gelorup. Land acquisition offset providing 14.2 ha of WRP foraging, breeding and dispersal habitat and 9.7 ha of black cockatoo foraging and potential breeding habitat
- Lot 29 Ducane Road, Gelorup. Land acquisition offset providing 2.8 ha of Banksia Woodlands TEC as well as 38.5 ha of WRP foraging, breeding and dispersal habitat and 37.7 ha of black cockatoo foraging and potential breeding habitat
- Lot 27 Tredrea Road, Myalup. Land acquisition offset providing 19 ha of Tuart Woodlands TEC
- A one-hectare Peppermint orchard (monoculture) on DBCA managed land at Lot 12 Bussell Highway within the Shire of Capel. The orchard was established in consultation with DBCA to provide foliage for WRP wildlife carers for use as a WRP food resource.
- A $200,000 contribution to DBCA to enhance on-ground feral animal baiting to manage predation of WRP within the Ludlow State Forest and the TFNP. Supplementation of DBCA's SF No. 2 and TFNP fox baiting program contributes to achievement of Objectives 2 and 4 of the species' recovery plan (DBCA, 2017).

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APPENDIX A

Figures

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6,306,000 6,305,000 6,304,000 6,303,000 6,302,000 6,301,000 6,300,000 6,299,000 6,298,000 6,297,000

Legend

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

Crampton Av
Nalbarra Dr
Carr Pl
Brand Av
Griffin L
Dudley Dr
Parade Rd
Mosedale Av
Ocean Dr
Somerville Dr
Possum Wy
Centenary Rd
Atkins Rd
Neslite Rd
Starlite Bend
Ferndale Av
Lewana App
Wongin Rd
Murtin Rd
Beryl L
Crystal Bend
Sleaford Dr
Maynard Pde
Duffield Pl
Paragon Loop
Hutt Dr
Kardil St
Hornibrook Rd
Samrose Rd
Moondar Pde
Daablone Vista
Lawson Rd
Poole Rd
Blaxland Rd
Norton Prom
Tiffany Ctr
English View
Loretta Av
Bibra Loop
McKenzie Cr
Gutmann Pkwy
Katinka St
Lapwing Rd
Killerby Dr
McMillan Dr
Nicolay App
Chisholm Rd
Walton App
Wake Dr
Frances Rd
Lillydale Rd
Allenville Rd
Jules Rd North
Jenour Ct
Palmer Pl
Boley Ct
Hawkins Dr
Jules Rd
Hasties Rd
Dalyellup Bvd
Sapphire Rd
Sherwood Dr
Harewoods Rd
Bussell Hwy
Sheoak St
Brookview Av
Crowd Rd
Hampstead St
Coachwood Av
Ducane Rd
Watkins Rd
Ridge Pl
Yalinda Dr
Marchetti Rd
Maidment Pde
Gelorup Rise
Ken Bell Rd
Eucalypt Dr
Woods Rd
Brockway Dr
Marri Pl
Manea Dr
Hair Pl
Quambi Dr
Lakes Rd
Calinup Rd
Jaymon Rd
Cokelup Rd
Jilley Rd
Skippings Rd

N

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

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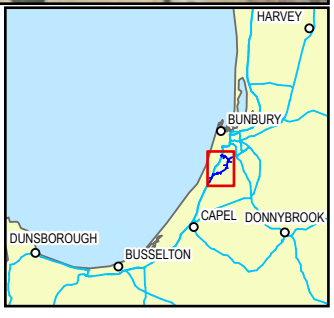
Bunbury Outer Ring Road Southern Section Offset Strategy

BORR South Development Envelope

Figure 1

mainroads WESTERN AUSTRALIA



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Legend

- BORR Southern Section Referral Boundary
- Clearing Exclusion Areas
- Banksia Woodlands TEC
- Tuart Woodlands TEC
- MRWA State Road Network

TW-S-D-2
TW-S-D-2
TW-S-D-2
TW-S-D-2
Bussell Hwy
BW-S-D-3
BW-S-D-1
BW-S-D-2

N

Coordinate System: GDA 1994 Perth Coastal Grid 1994
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Created Date: 12/04/2023
Author: c8323

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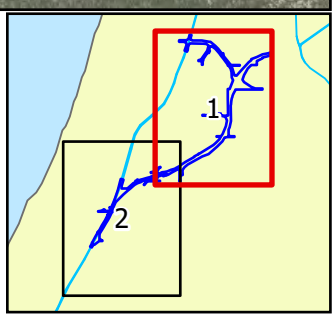
Bunbury Outer Ring Road Southern Section Offset Strategy

TEC within the Development Envelope

mainroads WESTERN AUSTRALIA

Figure 2



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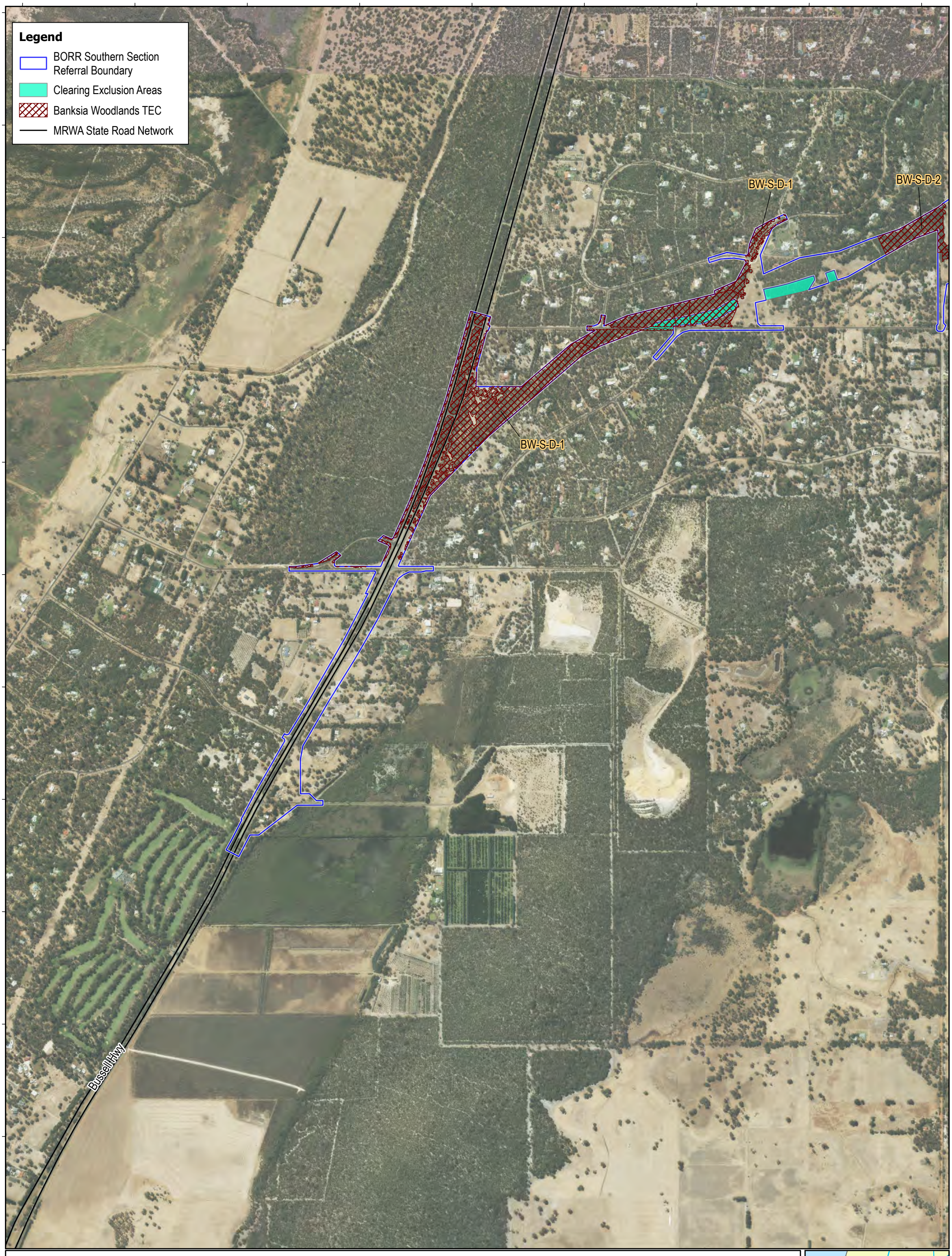

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Created Date: 12/04/2023
Author: c8323

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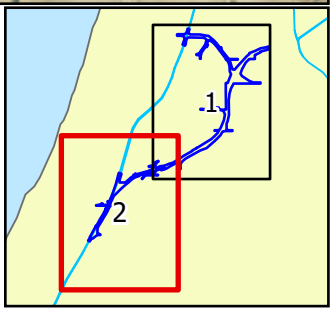
Figure 2

Bunbury Outer Ring Road Southern Section
Offset Strategy

TEC within the Development Envelope

mainroads WESTERN AUSTRALIA



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Legend

- BORR Southern Section Referral Boundary
- Clearing Exclusion Areas

Western Ringtail Possum Habitat Types

- Marri/Eucalyptus in paddocks and road reserves
- Marri/Eucalyptus woodland
- MRWA State Road Network

Bussell Hwy

N

Coordinate System: GDA 1994 Perth Coastal Grid 1994
Scale: 1:15,000 @ A3
Created Date: 12/04/2023
Author: c8323

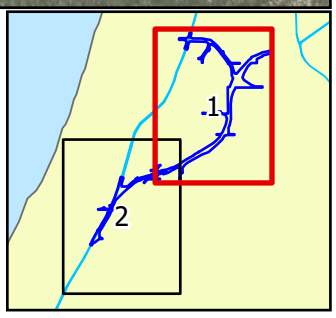
0 200 400 600 Metres

Figure 3

Bunbury Outer Ring Road Southern Section
Offset Strategy

Western Ringtail Possum Habitat within the Development Envelope

mainroads WESTERN AUSTRALIA



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Legend

- BORR Southern Section Referral Boundary
- Clearing Exclusion Areas

Western Ringtail Possum Habitat Types

- Marri/Eucalyptus in paddocks and road reserves
- Marri/Eucalyptus woodland
- MRWA State Road Network

Bussell Hwy

N

Coordinate System: GDA 1994 Perth Coastal Grid 1994
Scale: 1:15,000 @ A3
Created Date: 12/04/2023
Author: c8323

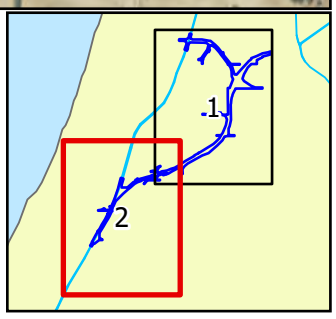
0 200 400 600 Metres

Figure 3

Bunbury Outer Ring Road Southern Section
Offset Strategy

Western Ringtail Possum Habitat within the Development Envelope

mainroads WESTERN AUSTRALIA



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Legend

- BORR Southern Section Referral Boundary
- Clearing Exclusion Areas

Black Cockatoo Foraging/Breeding Habitat

- Marri/Eucalyptus in paddocks and road reserves
- Marri/Eucalyptus woodland
- MRWA State Road Network

Bussell Hwy

N

Coordinate System: GDA 1994 Perth Coastal Grid 1994
Scale: 1:15,000 @ A3
Created Date: 12/04/2023
Author: c8323

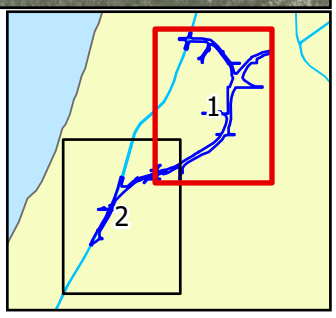
0 200 400 600 Metres

Figure 4

Bunbury Outer Ring Road Southern Section
Offset Strategy

Black Cockatoo Foraging Habitat within the Development Envelope

mainroads WESTERN AUSTRALIA



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Legend

- BORR Southern Section Referral Boundary
- Clearing Exclusion Areas

Black Cockatoo Foraging/Breeding Habitat

- Marri/Eucalyptus in paddocks and road reserves
- Marri/Eucalyptus woodland
- MRWA State Road Network

Bussell Hwy

N

Coordinate System: GDA 1994 Perth Coastal Grid 1994
Scale: 1:15,000 @ A3
Created Date: 12/04/2023
Author: c8323

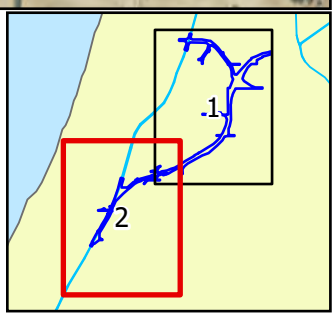
0 200 400 600 Metres

Figure 4

Bunbury Outer Ring Road Southern Section
Offset Strategy

Black Cockatoo Foraging Habitat within the Development Envelope

mainroads WESTERN AUSTRALIA



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373,000 373,500 374,000 374,500 375,000 375,500 376,000 376,500

6,305,000
6,304,500
6,304,000
6,303,500
6,303,000
6,302,500
6,302,000
6,301,500
6,301,000
6,300,500
6,300,000

Legend

Large Trees (DBH >500mm)

- Suitable Nest Hollow
- Suitable DBH Tree
- BORR Southern Section Referral Boundary
- Clearing Exclusion Areas
- MRWA State Road Network

Bussell Hwy

N

Coordinate System: GDA 1994 Perth Coastal Grid 1994
Scale: 1:15,000 @ A3
Created Date: 13/04/2023
Author: c8323

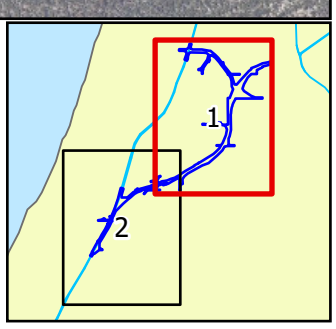
0 200 400 600 Metres

Figure 5

Bunbury Outer Ring Road Southern Section Offset Strategy

Black cockatoo Suitable DBH Trees and Trees with Potentially Suitable Hollows within the Development Envelope

mainroads WESTERN AUSTRALIA



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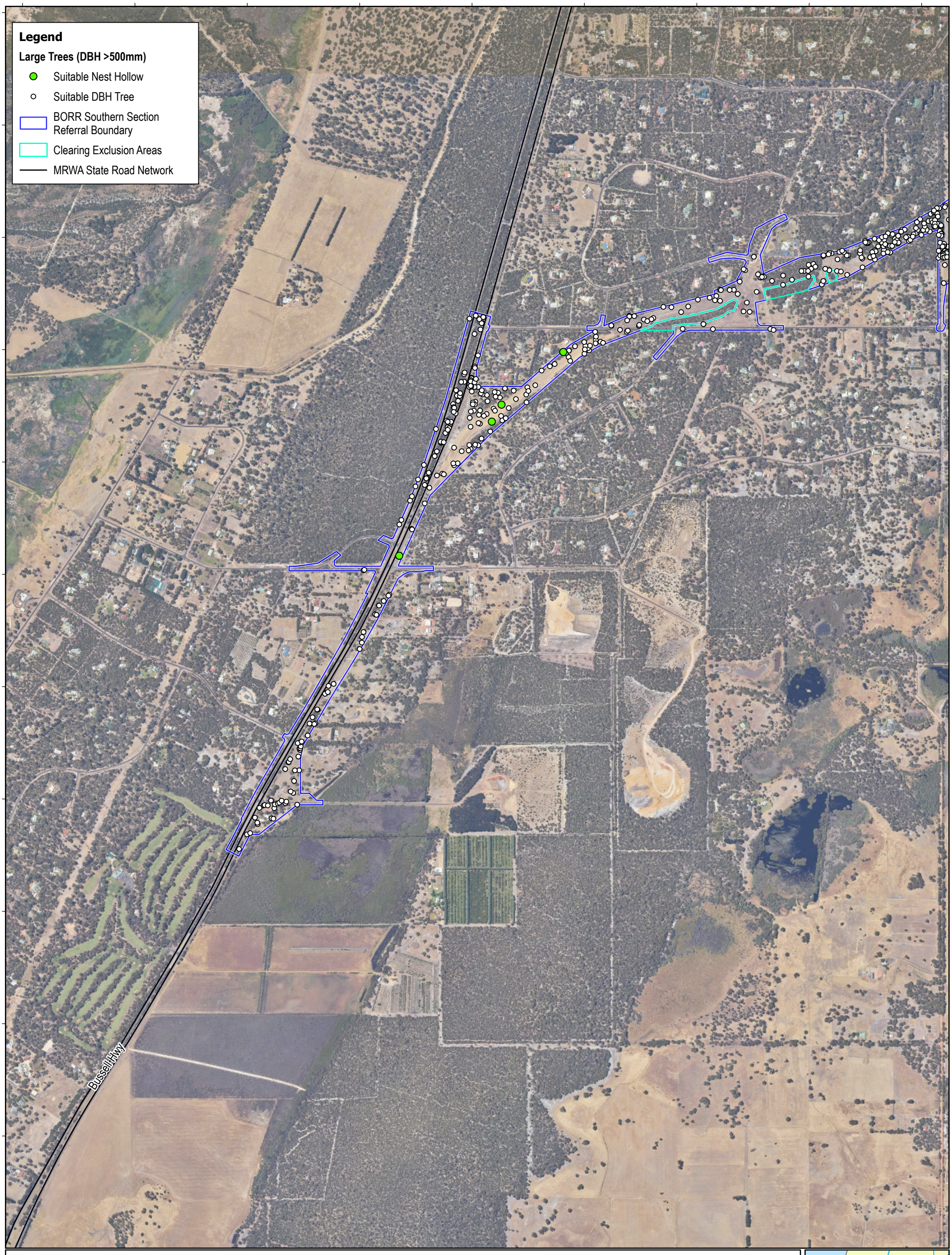


N

Coordinate System: GDA 1994 Perth Coastal Grid 1994
Scale: 1:15,000 @ A3
Created Date: 13/04/2023
Author: c8323

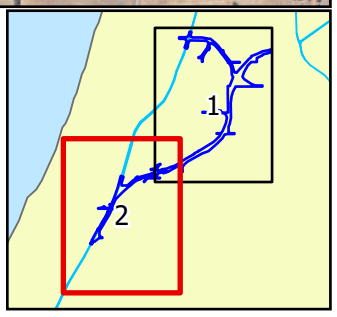
0 200 400 600 Metres

Figure 5

Bunbury Outer Ring Road Southern Section Offset Strategy

Black cockatoo Suitable DBH Trees and Trees with Potentially Suitable Hollows within the Development Envelope

mainroads WESTERN AUSTRALIA



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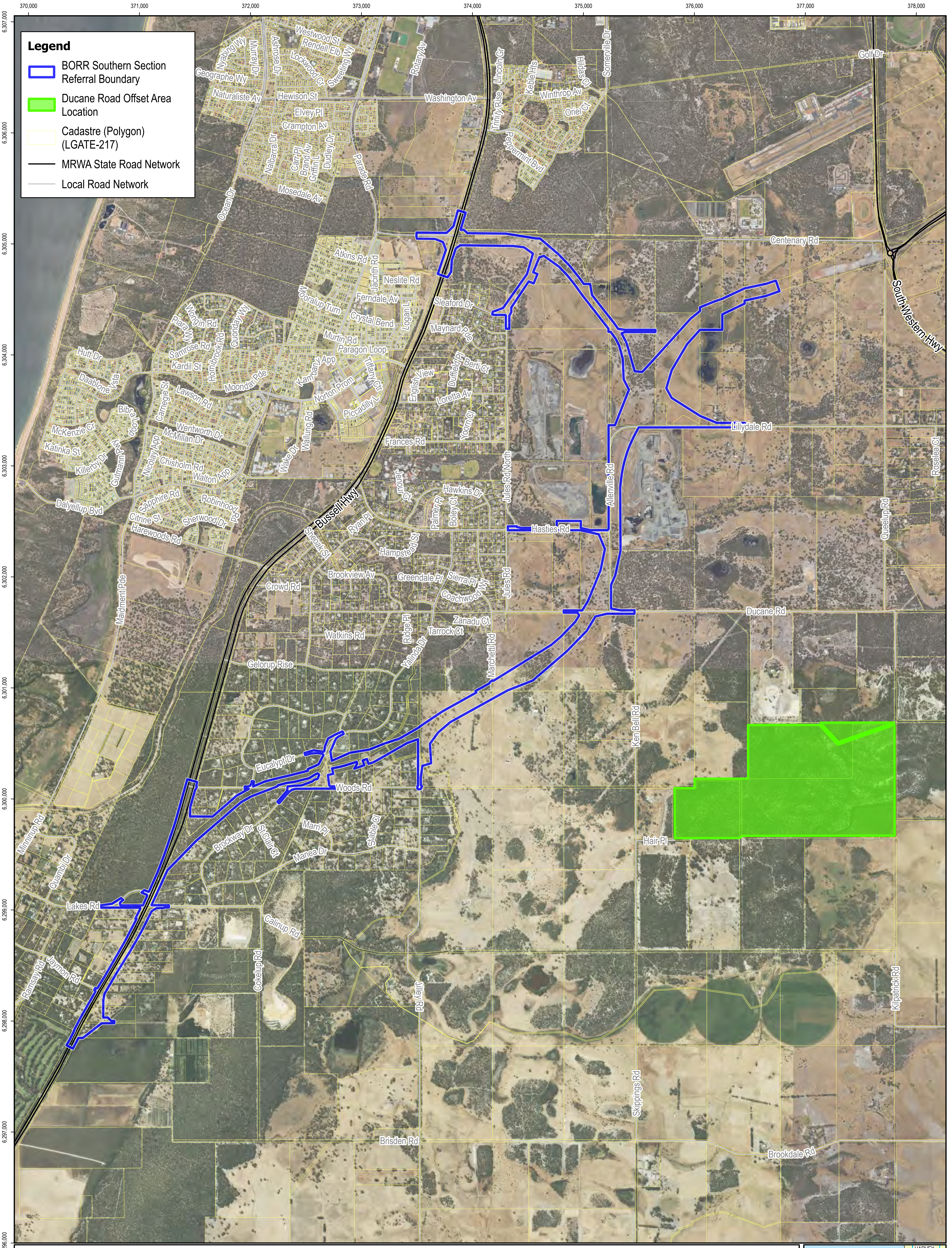


N

Coordinate System: GDA 1994 Perth Coastal Grid 1994
Scale: 1:30,000 @ A3
Created Date: 12/04/2023
Author: c8323

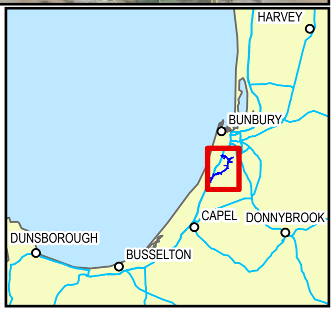
0 200 400 600 800 1,000 Metres

Figure 6

Bunbury Outer Ring Road Southern Section
Offset Strategy

Ducane Road Offset Site Location

mainroads WESTERN AUSTRALIA



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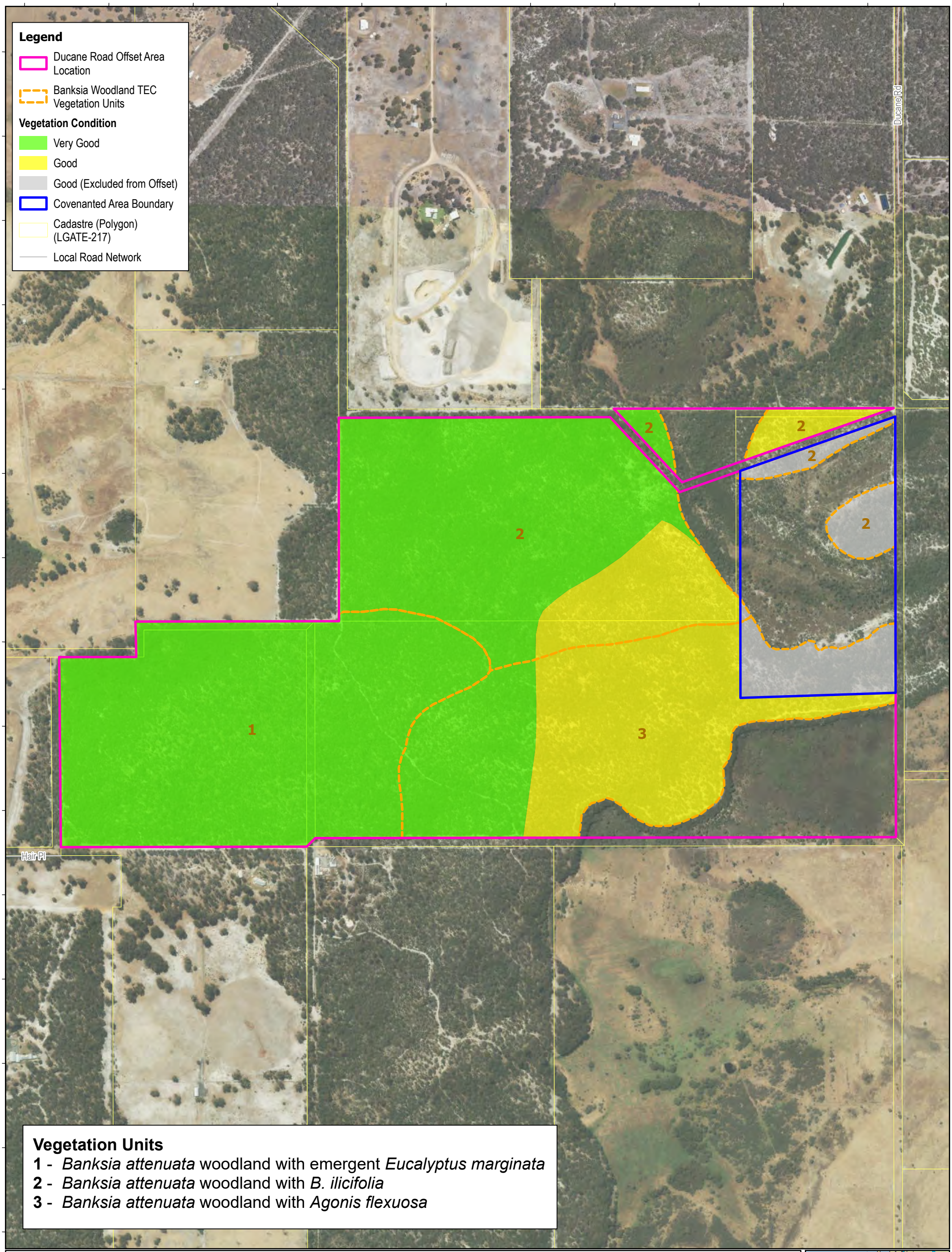


Vegetation Units

1 - *Banksia attenuata* woodland with emergent *Eucalyptus marginata*

2 - *Banksia attenuata* woodland with *B. ilicifolia*

3 - *Banksia attenuata* woodland with *Agonis flexuosa*

N

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

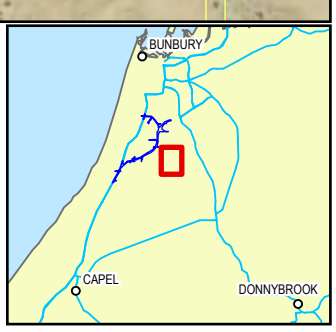
0 200 400 600 Metres

Figure 7

Bunbury Outer Ring Road Southern Section
Offset Strategy

Ducane Offset Area Banksia Woodland TEC and Vegetation Condition

mainroads WESTERN AUSTRALIA



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6,301,600 6,301,400 6,301,200 6,301,000 6,300,800 6,300,600 6,300,400 6,300,200 6,300,000 6,299,800 6,299,600 6,299,400 6,299,200 6,299,000 6,298,800

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

P232768 264
P232768 265
P251514 2269
D037023 2
Ducane Rd
P232768 270
P232768 266
P232768 263
CCLOSED ROAD
P144371 268
P232768 267
D018927 1
P232768 267
P232768 269
P232768 153
P144371 268
P232768 398
Hair Pl
D070776 2
D070775 1
P232768 140
P251588 2852
P232768 132
P232768 131

N

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

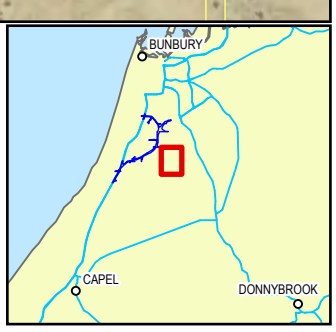
0 200 400 600 Metres

Figure 8

Bunbury Outer Ring Road Southern Section
Offset Strategy

Ducane Road Offset Site Location
Western Ringtail Possum Habitat

mainroads WESTERN AUSTRALIA



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6,317,000 6,316,000 6,315,000 6,314,000 6,313,000 6,312,000 6,311,000 6,310,000 6,309,000 6,308,000 6,307,000 6,306,000 6,305,000 6,304,000 6,303,000 6,302,000 6,301,000 6,300,000 6,299,000 6,298,000 6,297,000

Willinge Dr

Bunbury Outer Ring Rd

Willinge Dr

Forrest Hwy

South Western Hwy

Boyanup Picton

Bussell Hwy

Bunbury Outer Ring Rd

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

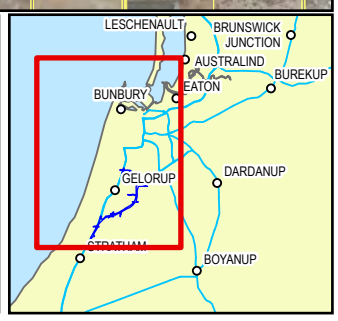
0 0.5 1 1.5 2 Kilometres

Figure 9

Bunbury Outer Ring Road Southern Section
Offset Strategy

Lot 104 (North) Offset Site Location

mainroads WESTERN AUSTRALIA



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6,317,000 6,316,000 6,315,000 6,314,000 6,313,000 6,312,000 6,311,000 6,310,000 6,309,000 6,308,000 6,307,000 6,306,000 6,305,000 6,304,000 6,303,000 6,302,000 6,301,000 6,300,000 6,299,000 6,298,000 6,297,000

Willinge Dr

Bunbury Outer Ring Rd

Willinge Dr

Forrest Hwy

South Western Hwy

Boyanup Picton

Bussell Hwy

Bunbury Outer Ring Rd

Legend

- BORR Southern Section Referral Boundary
- Lot 104 (North) Offset Area - Black Cockatoo Habitat
- 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

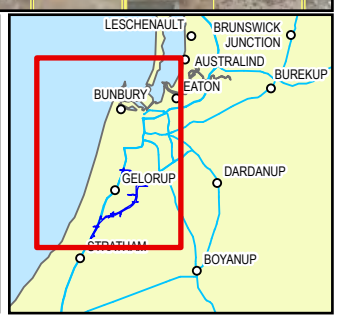
0 0.5 1 1.5 2 Kilometres

Figure 11

Bunbury Outer Ring Road Southern Section
Offset Strategy

Lot 104 (North) Offset Site Location - Black Cockatoos

mainroads WESTERN AUSTRALIA



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

Legend

- BORR Sth - Site 2
- BORR Sth - Site 4 (DBCA Site 5)
- BORR Sth - Site 7
- BORR Sth - Site 12 Boundary
- BORR Southern Section Referral Boundary
- Cadastre (Polygon) (LGATE-217)
- MRWA State Road Network

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

0 1 2 3 Kilometres

Bunbury Outer Ring Road Southern Section
Offset Strategy

Ludlow Offset Areas

Figure 12

mainroads WESTERN AUSTRALIA

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

362,400 362,600 362,800 363,000 363,200 363,400 363,600 363,800 364,000 364,200 364,400 364,600 364,800 365,000

6,290,000 6,289,800 6,289,600 6,289,400 6,289,200 6,289,000 6,288,800 6,288,600 6,288,400 6,288,200 6,288,000 6,287,800 6,287,600 6,287,400 6,287,200 6,287,000 6,286,800 6,286,600

Gutman Rd
Ludlow North Rd
Rd No 300
Treloar Rd
Mallokup Rd
Gum Club Rd
Stirling Rd

N

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

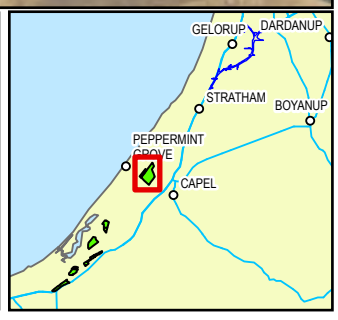
0 100 200 300 400 500 Metres

Figure 13

Bunbury Outer Ring Road Southern Section
Offset Strategy

Ludlow Offset Area Site 12 - WRP, Black cockatoos and Tuart Woodland TEC

mainroads WESTERN AUSTRALIA



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6,280,000 6,279,800 6,279,600 6,279,400 6,279,200 6,279,000 6,278,800 6,278,600 6,278,400 6,278,200 6,278,000 6,277,800 6,277,600 6,277,400 6,277,200

Legend

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

Tuart Dr

Bussell Hwy

Ruabon Rd

N

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

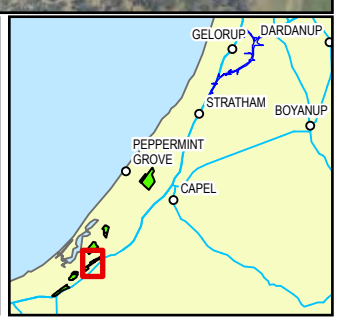
0 100 200 300 400 Metres

Figure 14

Bunbury Outer Ring Road Southern Section
Offset Strategy

Ludlow Offset Area Sites 2 and 4 WRP and Black cockatoos

mainroads WESTERN AUSTRALIA



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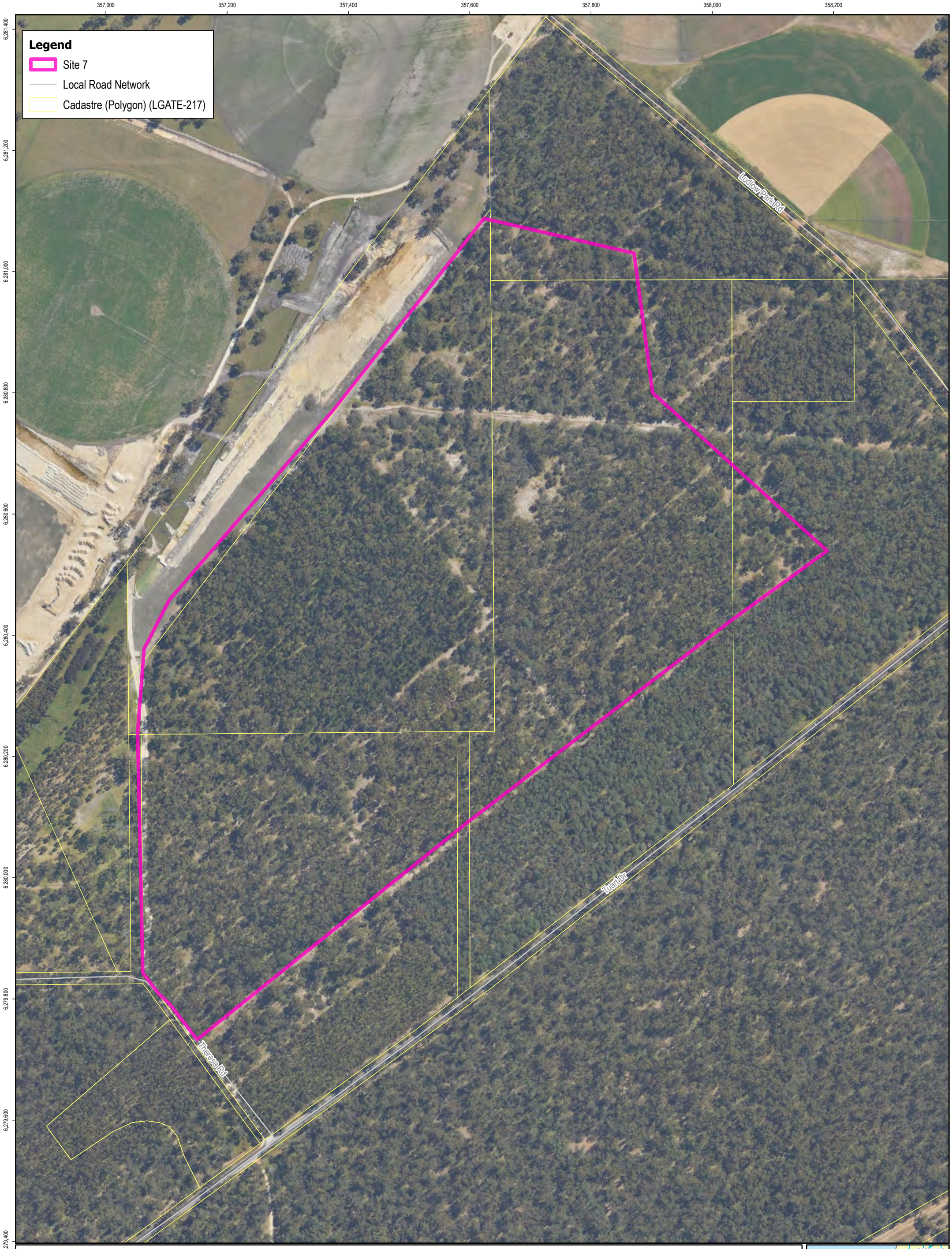


N

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

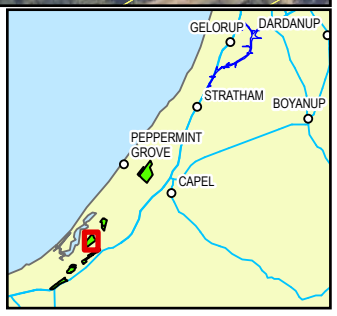
0 100 200 300 400 Metres

Bunbury Outer Ring Road Southern Section
Offset Strategy

Ludlow Offset Area Site 7 WRP

Figure 15

mainroads WESTERN AUSTRALIA



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APPENDIX B

Summary Table of Ecological Benefits

Offset site	MNES	Ecological benefit/s to be achieved by implementing this Offset Strategy
Ducane	Banksia Woodland TEC (BWTEC)	Ecological benefits will be achieved by improving site condition across the 124.1 ha BWTEC offset site. Specifically, this will be achieved by increasing vegetation condition from, depending on patch start condition, either 'good' to 'very good' or 'very good' to 'excellent' (according to Keighery) across the entire site.
	Western Ringtail Possum (WRP)	Ecological benefits will be achieved by preventing site condition decline including through weed and pest control and enhancing the presence and/or usage by WRP across the 126 ha offset site. Specifically, this will be achieved by: - improving the extent of ground cover that provides shelter for the WRP; - Multiple individuals detected on site within last 2 years ; and - controlling weed species and pests.
Lot 104	Western Ringtail Possum (WRP)	Ecological benefits will be achieved by improving site condition, site context, and presence and/or usage by WRP across the 65 ha offset site. Specifically, this will be achieved by: - revegetating the site with tree species known to provide habitat for WRP; - attaining high rates (70-89%) of canopy cover and canopy continuity to support WRP movement in the upper and/or mid storey layer; - establishing ground cover that provides shelter for the WRP; - attaining a moderate density of WRP nests, dreys and/or hollows; - establishing continuous connected vegetation to the Preston River riparian corridor; - establishing a resident population of WRP that is evidenced by the presence of individuals of varying age classes (juvenile, sub-adult, adult) in any year; and - controlling weed species and pests.
	Forest Red-tail Black Cockatoo (FRTBC)	Ecological benefits will be achieved by improving site condition across the 49 ha offset site. Specifically, this will be achieved by revegetating the site with appropriate FRTBC foraging tree species (Marri-Jarrah-Karri Forest, other eucalypt woodlands, or allocasuarina woodland species), to achieve a >40% projected foliage cover.

Offset site	MNES	Ecological benefit/s to be achieved by implementing this Offset Strategy
	Baudin's Black Cockatoo (BBC)	Ecological benefits will be achieved by improving site condition across the 49 ha offset site. Specifically, this will be achieved by revegetating the site with appropriate BBC foraging tree species (Marri-Jarrah Forest and woodland species) to achieve a >40% projected foliage cover.
	Carnaby's Black Cockatoo (CBC)	Ecological benefits will be achieved by improving site condition across the 49 ha offset site. Specifically, this will be achieved by revegetating the site with appropriate CBC foraging species of native kwongan heath and shrubland, banksia or eucalypt woodland species to achieve a >40% projected foliage cover.
SF Lots 2 and 4	Western Ringtail Possum	Ecological benefits will be achieved by improving site condition, site context, and presence and/or usage by WRP across the 15 ha offset site. Specifically, this will be achieved by: - revegetating the site with tree species known to provide habitat for WRP; - attaining high rates (70-89%) of canopy cover and canopy continuity to support WRP movement in the upper and/or mid storey layer; - establishing ground cover that provides shelter for the WRP; - attaining a moderate density of WRP nests, dreys and/or hollows; - establishing continuous connected vegetation to adjacent WRP habitat; - establishing a resident population of WRP that is evidenced by the presence of individuals of varying age classes (juvenile, sub-adult, adult) in any year; and - controlling weed species and pests.
	Forest Red-tail Black Cockatoo	Ecological benefits will be achieved by improving site condition across the 15 ha offset site. Specifically, this will be achieved by revegetating the site with appropriate FRTBC foraging tree species (Marri-Jarrah-Karri Forest, other eucalypt woodlands, or allocasuarina woodland species), to achieve a >40% projected foliage cover.
	Baudin's Black Cockatoo	Ecological benefits will be achieved by improving site condition across the 15 ha offset site. Specifically, this will be achieved by revegetating the site with appropriate BBC foraging tree species (Marri-Jarrah Forest and woodland species) to achieve a >40% projected foliage cover.
	Carnaby's Black Cockatoo	Ecological benefits will be achieved by improving site condition across the 15 ha offset site. Specifically, this will be achieved by revegetating the site with appropriate CBC foraging tree species of native kwongan heath and shrubland, banksia or eucalypt woodland species to achieve a >40% projected foliage cover.
SF Lot 7	Western Ringtail Possum	Ecological benefits will be achieved by improving site condition, site context, and presence and/or usage by WRP across the 70 ha offset site. Specifically, this will be achieved by: - revegetating the site with tree species known to provide habitat for WRP; - attaining high rates (70-89%) of canopy cover and canopy continuity to support WRP movement in the upper and/or mid storey layer; - establishing ground cover that provides shelter for the WRP; - attaining a moderate density of WRP nests, dreys and/or hollows;

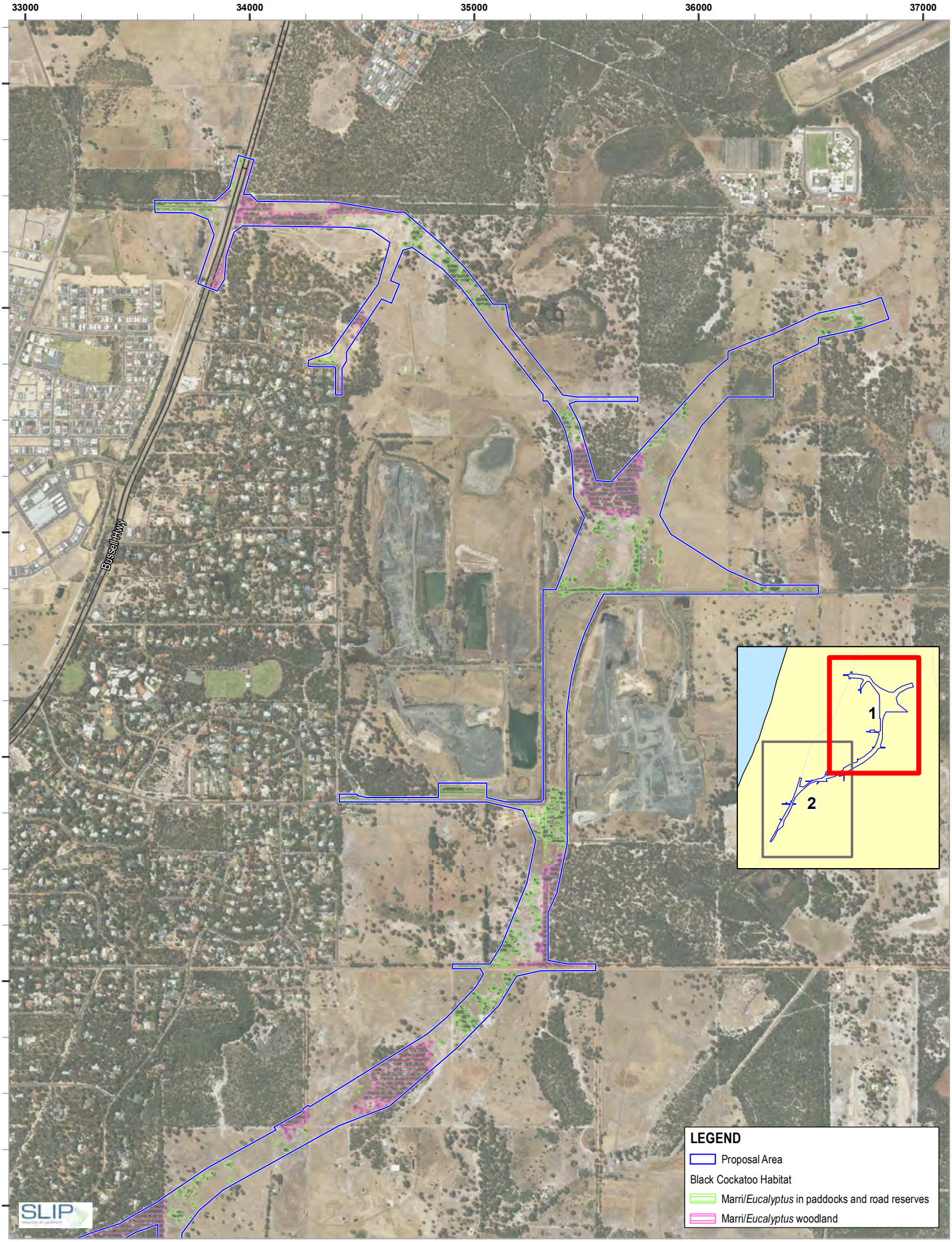
Offset site	MNES	Ecological benefit/s to be achieved by implementing this Offset Strategy
		- establishing continuous connected vegetation to adjacent WRP habitat; - establishing a resident population of WRP that is evidenced by the presence of individuals of varying age classes (juvenile, sub-adult, adult) in any year; and - controlling weed species and pests.
SF Lot 12	Tuart Woodland TEC (TWTEC)	Ecological benefits will be achieved by improving site condition across the 37 ha TWTEC offset site. Specifically, this will be achieved by: - revegetating native understory to at least 80% native species cover or at least 12 species per floristic quadrat, with native understory species typical of the vegetation complexes associated with Tuart forest vegetation (see Section 2.3.3 of the TWTEC conservation advice); and - effectively controlling grazing pressure to realise at least 30 naturally occurring recruits of corymbia or eucalypt species, achieving >15cm dbh, per hectare.
	Western Ringtail Possum	Ecological benefits will be achieved by improving site condition, site context, and presence and/or usage by WRP across the 185 ha offset site. Specifically, this will be achieved by: - revegetating the site with tree species known to provide habitat for WRP; - attaining high rates (70-89%) of canopy cover and canopy continuity to support WRP movement in the upper and/or mid storey layer; - establishing ground cover that provides shelter for the WRP; - attaining a moderate density of WRP nests, dreys and/or hollows; - establishing continuous connected vegetation to adjacent WRP habitat; - establishing a resident population of WRP that is evidenced by the presence of individuals of varying age classes (juvenile, sub-adult, adult) in any year; and - controlling weed species and pests.
	Forest Red-tail Black Cockatoo	Ecological benefits will be achieved by improving site condition across the 185 ha offset site. Specifically, this will be achieved by infill planting the site with appropriate FRTBC foraging tree species (Marri-Jarrah-Karri Forest, other eucalypt woodlands, or allocasuarina woodland species), to achieve a >40% projected foliage cover.
	Baudin's Black Cockatoo	Ecological benefits will be achieved by improving site condition across the 185 ha offset site. Specifically, this will be achieved by infill planting the site with appropriate BBC foraging tree species (Marri-Jarrah Forest or woodland species) to achieve a >40% projected foliage cover.
	Carnaby's Black Cockatoo	Ecological benefits will be achieved by improving site condition across the 185 ha offset site. Specifically, this will be achieved by infill planting the site with appropriate CBC foraging tree species of native kwongan heath and shrubland, banksia or eucalypt woodland species to achieve a >40% projected foliage cover.

APPENDIX C

EPBC Act approval for EPBC 2019/8543 Attachment A

Attachment A Figure 2	**Black cockatoo habitat**
Attachment A Figure 3	**WRP habitat**
Attachment A Figure 5	**Banksia Woodland TEC and Tuart Woodland TEC**

Attachment A - Figure 2



Paper Size ISO A3

0 100 200 300 400 500

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 Perth Coastal Grid 1994

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BORR Team

Australian Government
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Main Roads Western Australia
Bunbury Outer Ring Road Southern Section
EPBC ARI

Project No.	**61-37041**
Revision No.	**1**
Date	**13/06/2022**

Black Cockatoo Habitat

FIGURE 2-1

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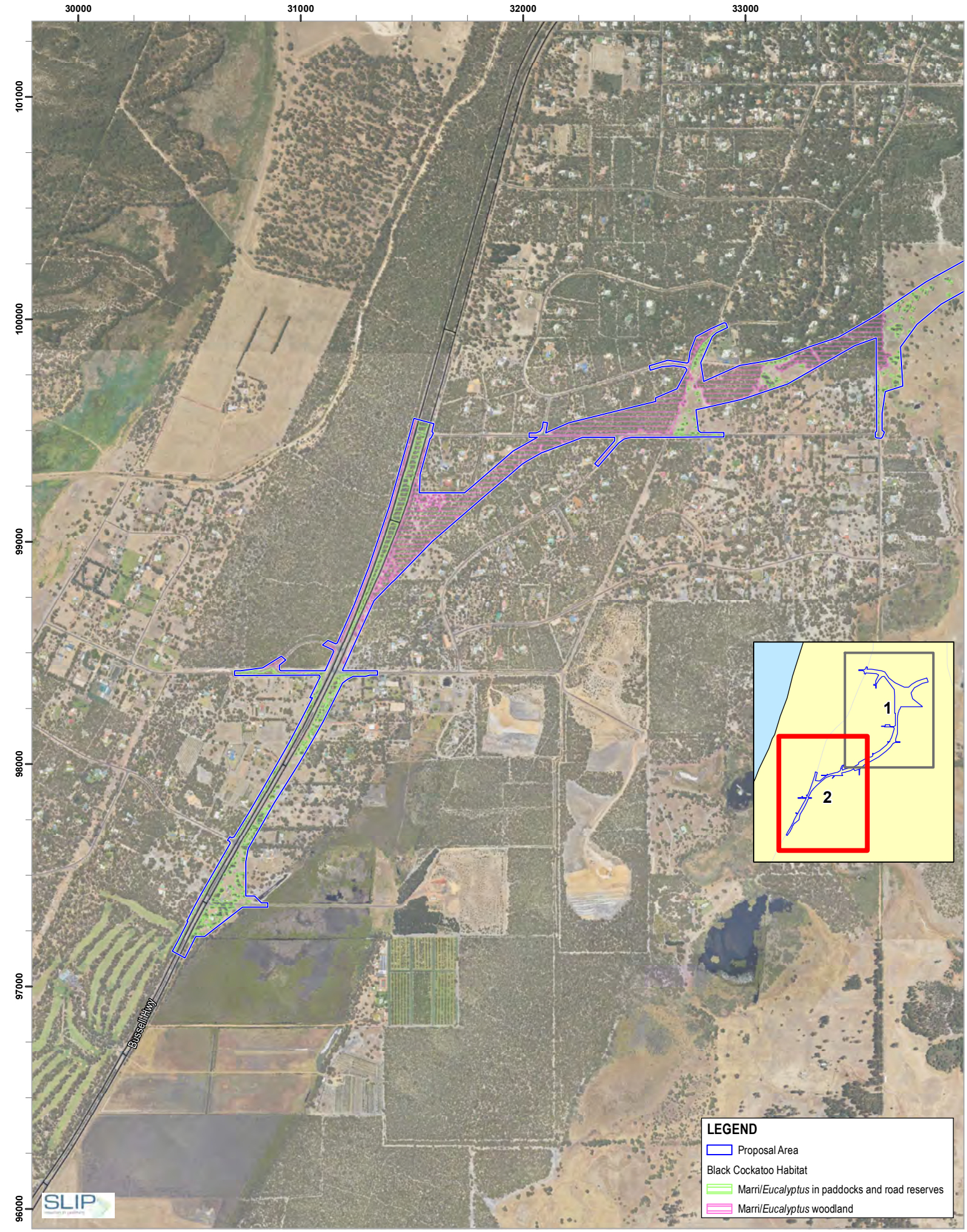
Print date: 13 Jun 2022 - 14:13

Data source: Geoscience Australia: GeoData Topo 250k Series III - 2006; Landgate: Roads - 20180501, Imagery - WA Now accessed 20220613; BORR: Proposal Area - 20191212; Biota: Large trees (DBH>50mm), Black Cockatoo Habitat - 20200403. Created by: mmikkonen



Paper Size ISO A3

0 100 200 300 400 500

Metres

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 Perth Coastal Grid 1994

BORR Team

Australian Government
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Main Roads Western Australia
Bunbury Outer Ring Road Southern Section
EPBC ARI

Black Cockatoo Habitat

Project No. **61-37041**
Revision No. **1**
Date **13/06/2022**

FIGURE 2-1

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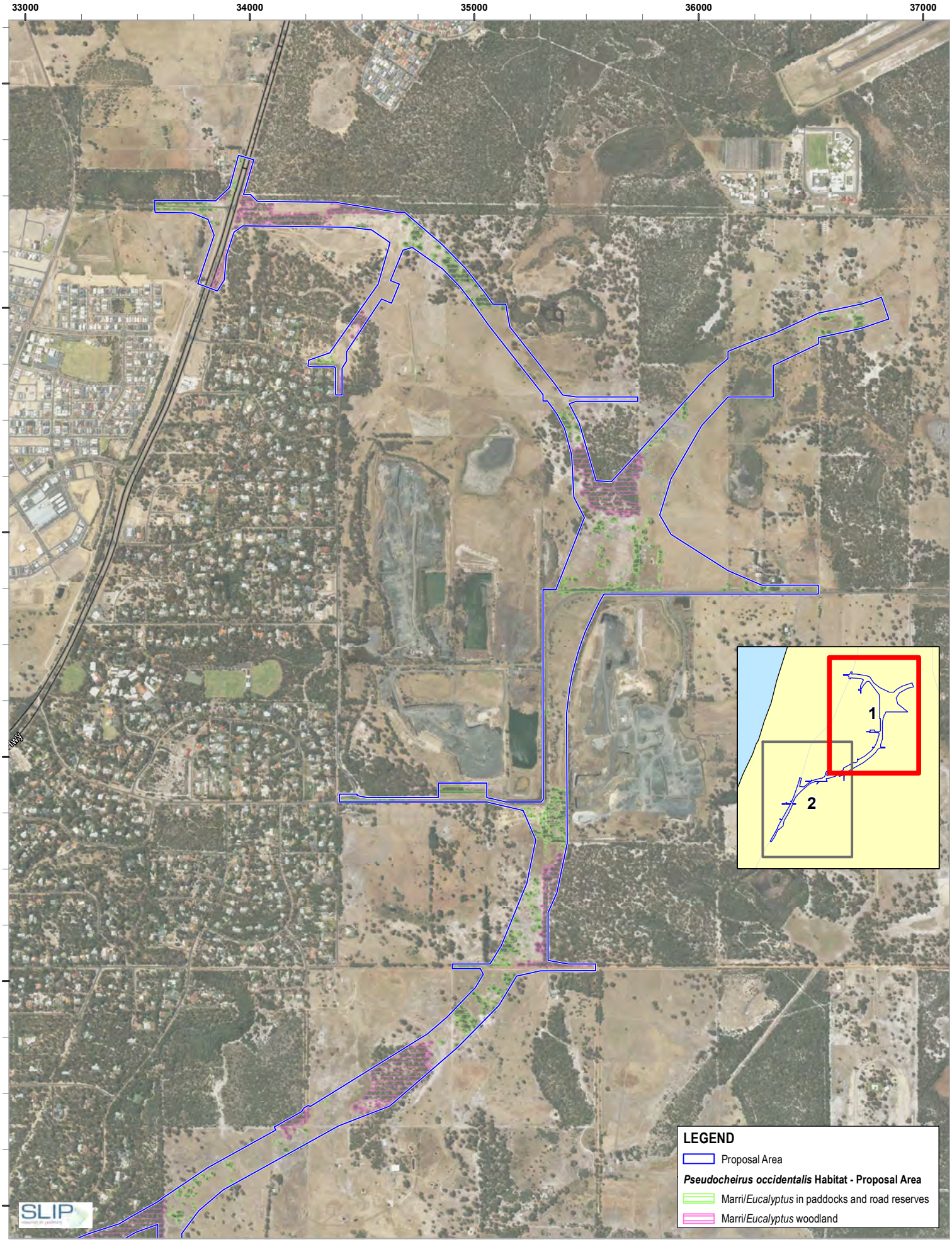
Print date: 13 Jun 2022 - 14:13

Data source: Geoscience Australia: GeoData Topo 250k Series III - 2006; Landgate: Roads - 20180501, Imagery - WA Now accessed 20220613; BORR: Proposal Area - 20191212; Biota: Large trees (DBH>500mm). Black Cockatoo Habitat - 20200403. Created by: mmikkonen

Attachment A - Figure 3



Paper Size ISO A3

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 Perth Coastal Grid 1994

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Western Ringtail Possum Habitat

Project No. **61-37041**
Revision No. **1**
Date **13/06/2022**

FIGURE 3

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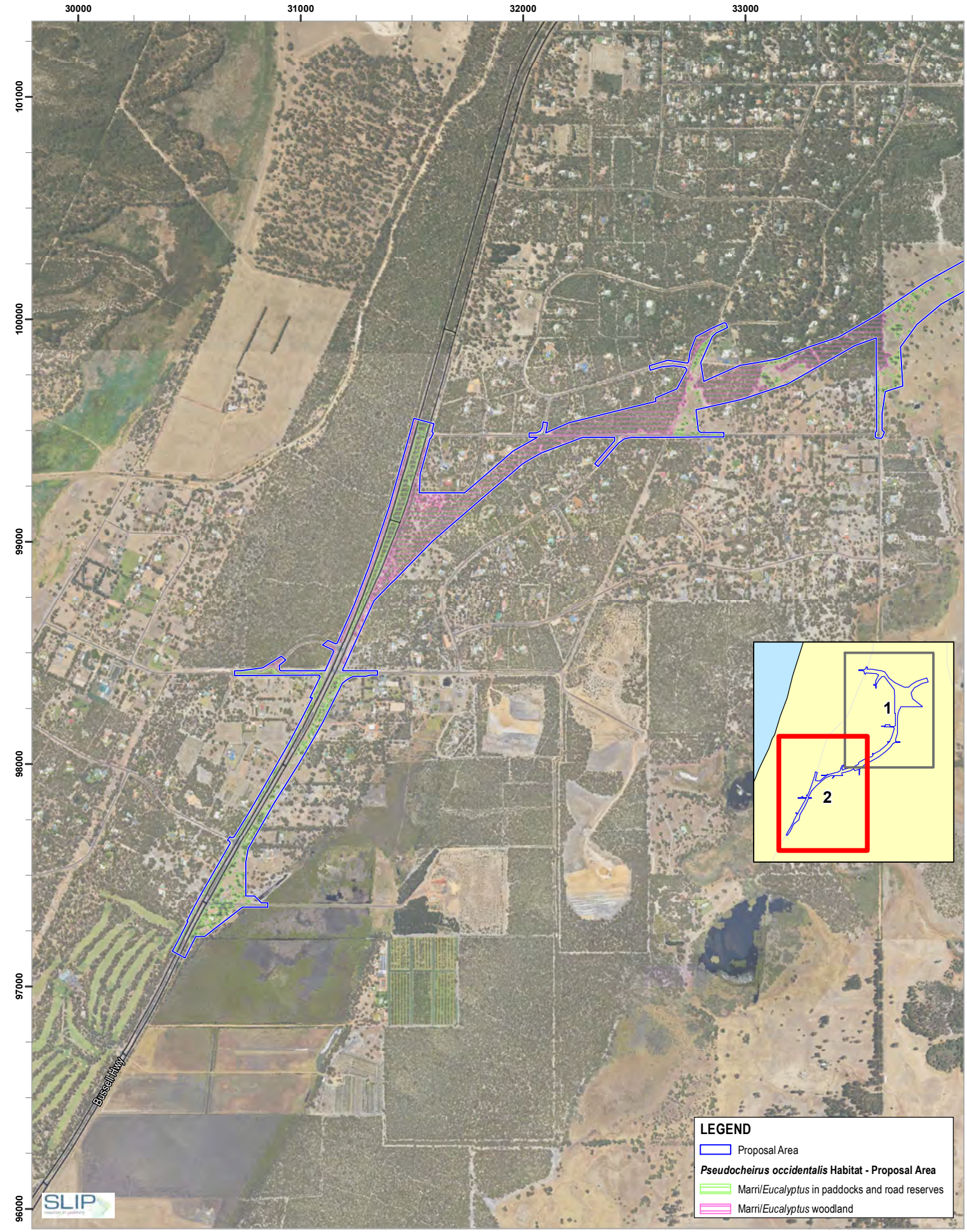
Print date: 13 Jun 2022 - 14:58

Data source: Geoscience Australia: GeoData Topo 250k Series III - 2006; DBCA: *Pseudocheirus occidentalis* Habitat - 20200220; Landgate: Roads - 20180501; Imagery - WA Now accessed 20220613; BORR: Proposal Area - 20191212, Environmental Survey Area - 20200214; Biota: Western Ringtail Possum Observations - 20200130. Created by: mmikkonen



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Grid: GDA 1994 Perth Coastal Grid 1994

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FIGURE 3

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Attachment A - Figure 5

Paper Size ISO A3

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Metres

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TEC extent within the Proposal Area

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Revision No.	**4**
Date	**13/06/2022**

FIGURE 5

G:\61\37041\19_0_GIS\Maps\Working\BORR South EPBC ARI\DAWE submission\61\37041_005_BORRSouthTECAdjacent_Rev4.mxd
Print date: 13 Jun 2022 - 15:14

Data source: BORR team: South referral boundary - 20191212, TEC/PEC - 202005, Reference sites - 20200327; Landgate: Roads - 201805, Localities - 20180319, Imagery - WA Now accessed 20220613; EcoEdge: Reference sites - 20200325. Created by: mmikkonen

Paper Size ISO A3

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Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
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Revision No.	**4**
Date	**13/06/2022**

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Metres

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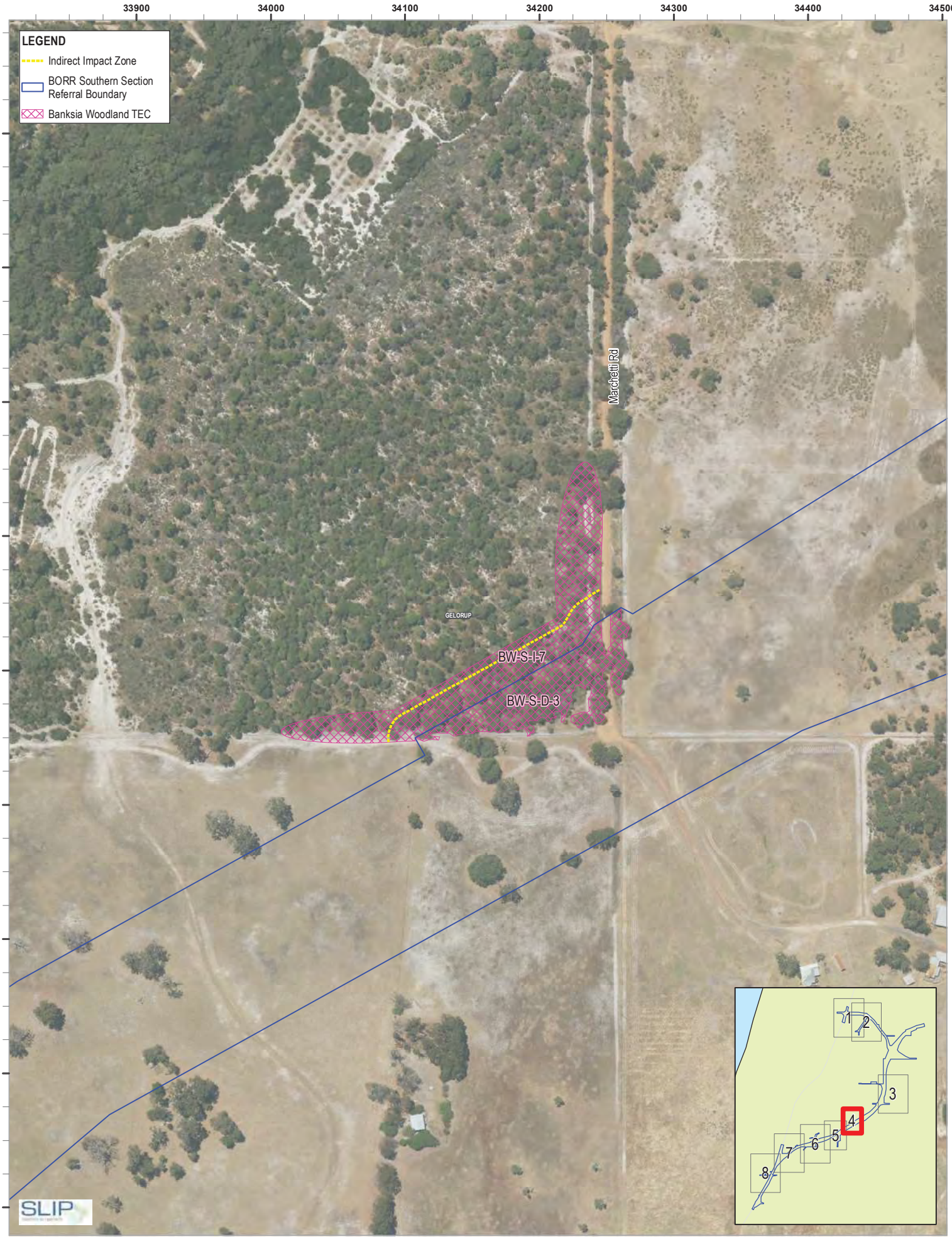

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Metres

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Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 Perth Coastal Grid 1994

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FIGURE 5

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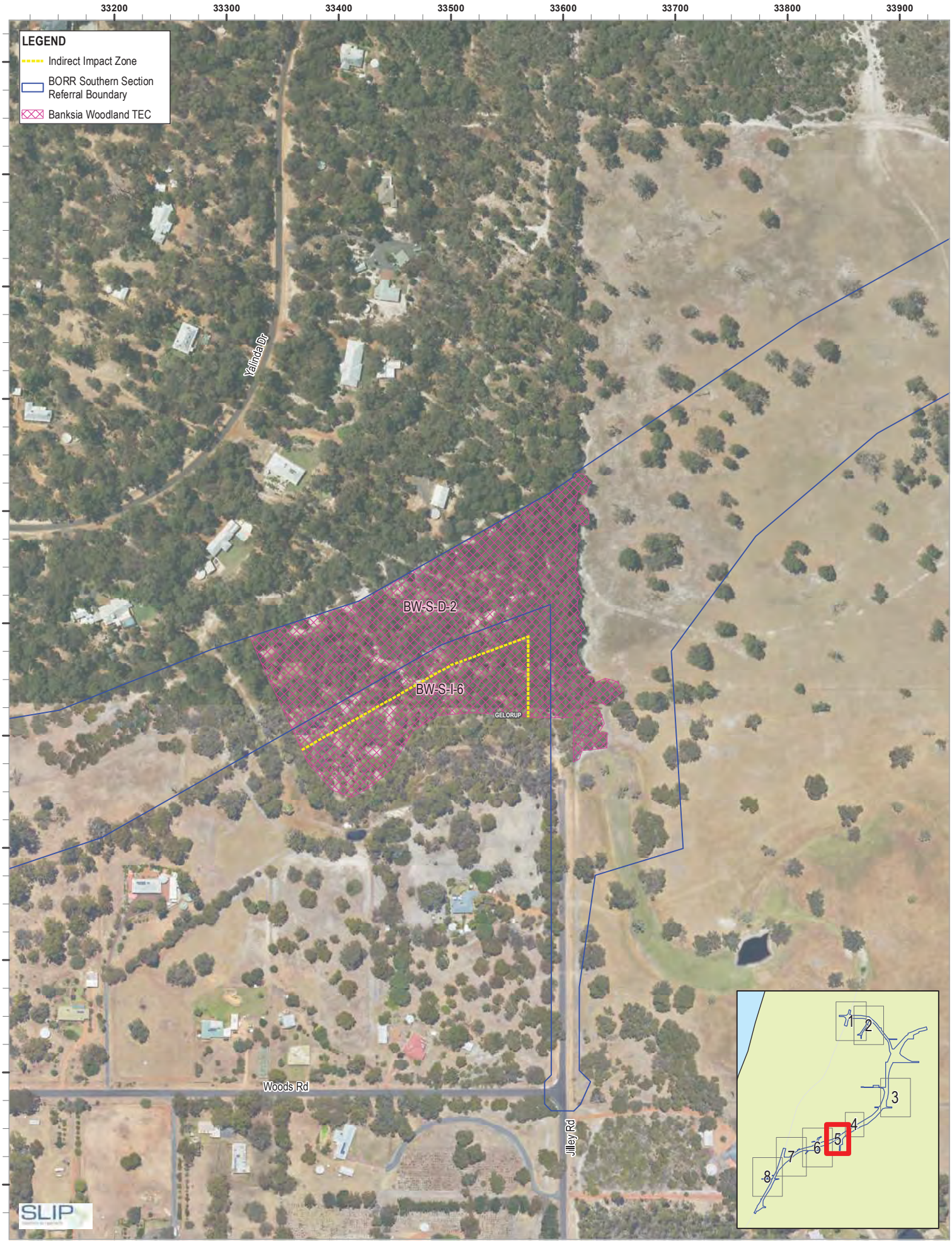

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Metres

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Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 Perth Coastal Grid 1994

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FIGURE 5

G:\61\37041\19_0_GIS\Maps\Working\BORR South EPBC ARI\DAWE submission\61\37041_005_BORRSouthTECAdjacent_Rev4.mxd
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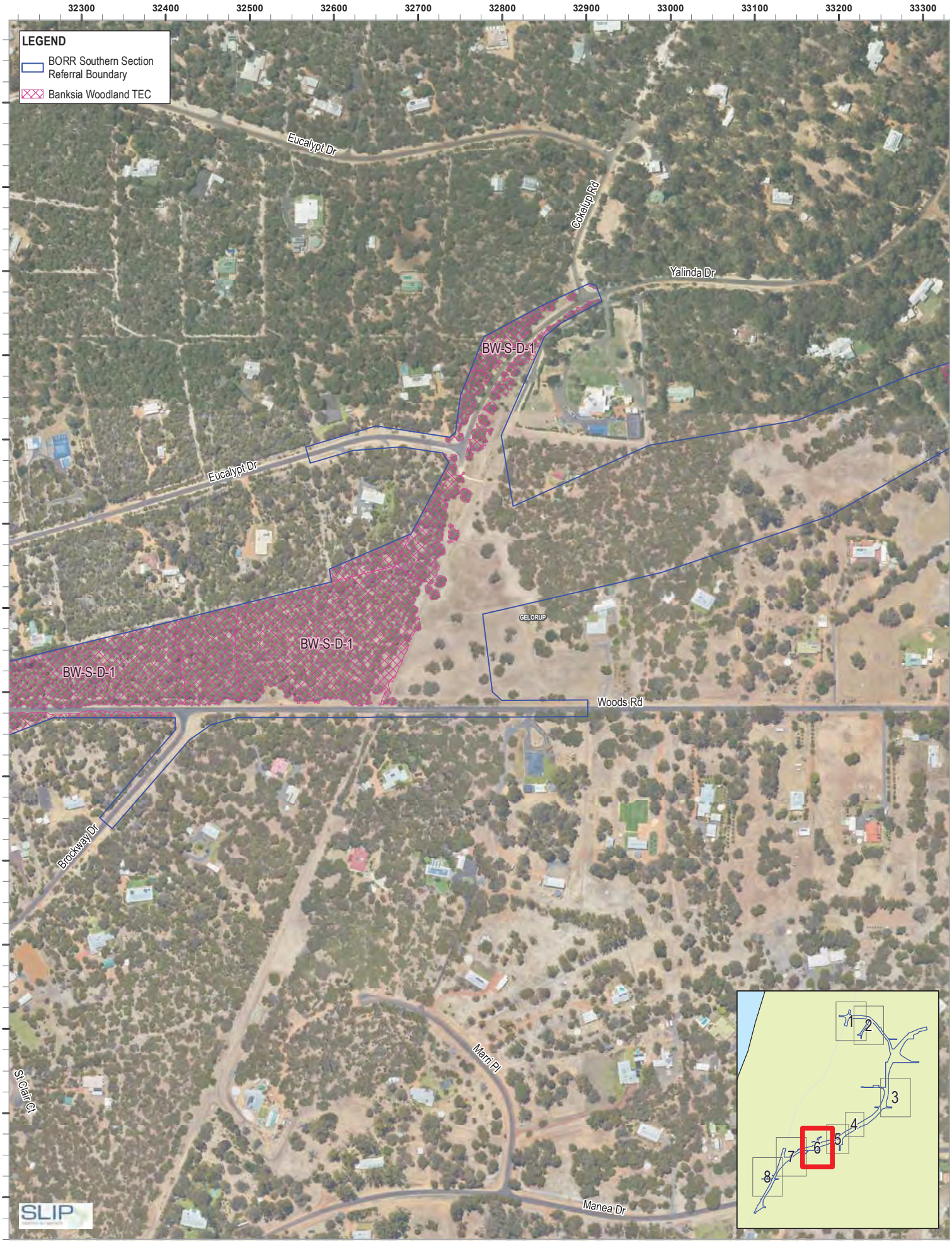

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Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 Perth Coastal Grid 1994

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FIGURE 5

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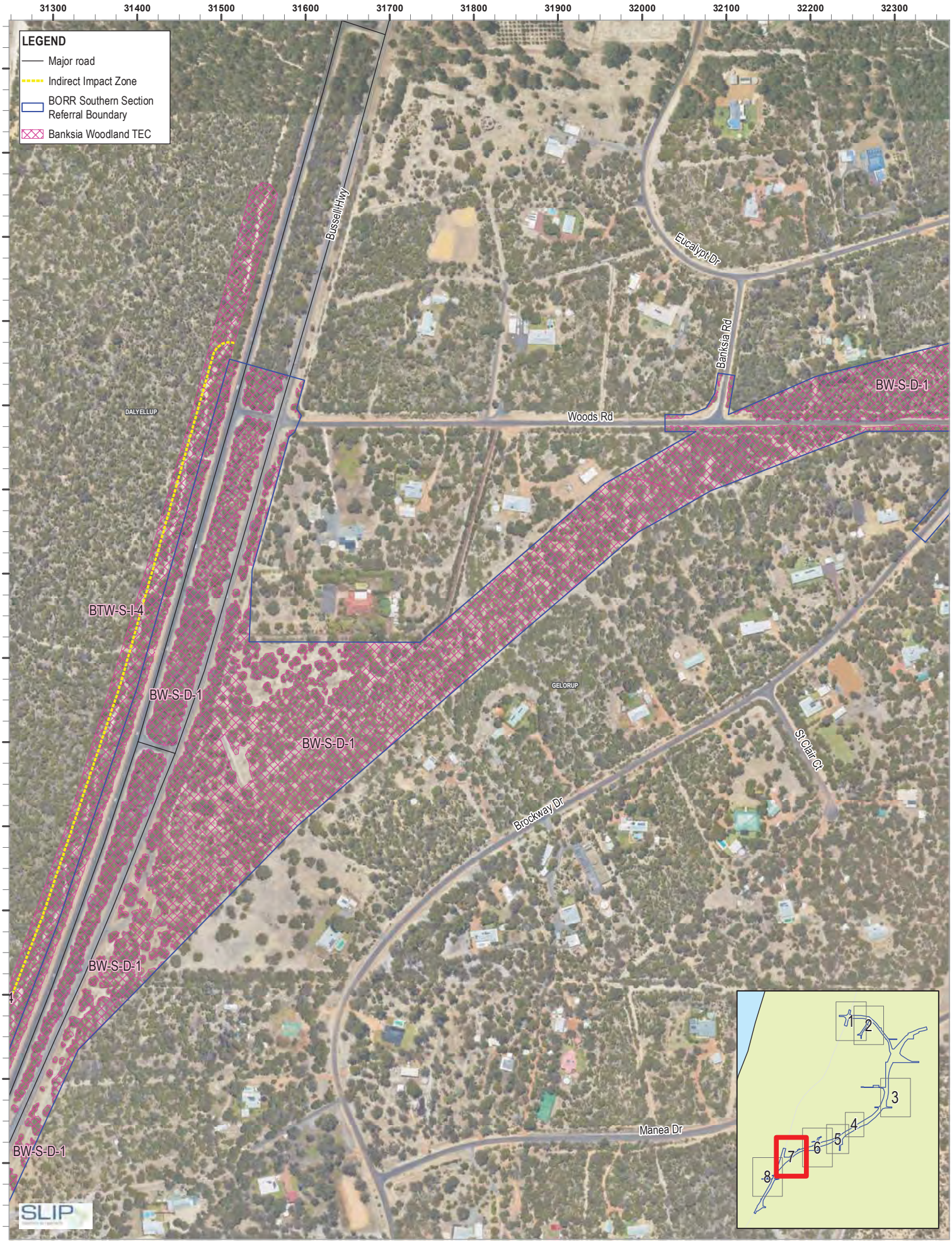

Paper Size ISO A3

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 Perth Coastal Grid 1994

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FIGURE 5

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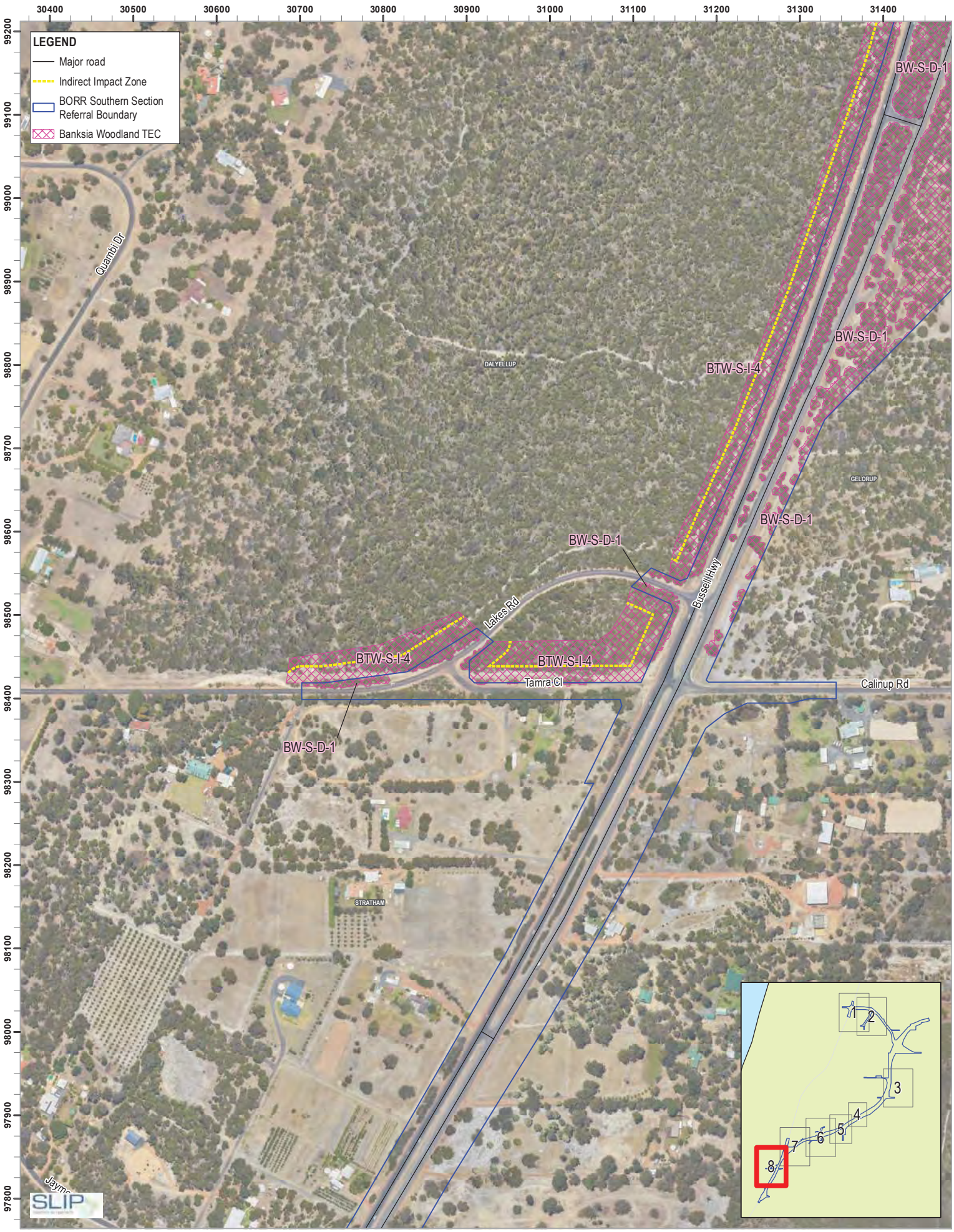

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Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 Perth Coastal Grid 1994

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FIGURE 5

G:\61\37041\19_0_GIS\Maps\Working\BORR South EPBC ARI\DAWE submission\61\37041_005_BORRSouthTECAdjacent_Rev4.mxd
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APPENDIX D

Initial revegetation species list for Ludlow Offset Area Site 4

Species	Dryland	Wetland - transition	Form	WRP forage	Black cockatoo forage
Acacia littorea	X		Shrub		
Acacia pulchella	X	X	Shrub		
Acacia saligna	X		Shrub / Tree	X	X
Acanthocarpus preissii			Shrub		
Agonis flexuosa	X	X	Tree	X	
Anigozanthos manglesii	X	X	Grass / herb		
Banksia attenuata	X		Tree		X
Banksia grandis	X		Tree		X
Billardiera fusiformis	X		Shrub		
Calothamnus quadrifidus	X		Shrub		
Corymbia calophylla	X		Tree	X	X
Dianella revoluta		X	Shrub		
Dichopogon capillipes		X	Grass / herb		
Eucalyptus gomphocephala	X		Tree		X
Eucalyptus marginata	X		Tree	X	X
Eucalyptus rudis	X	X	Tree	X	X
Ficinia nodosa	X		Rush		
Gompholobium tomentosum	X		Shrub		
Hakea amplexicaulis	X		Shrub		X
Hakea lissocarpha	X	X	Shrub		X
Hakea oleifolia	X		Shrub		
Hakea prostrata	X		Shrub		X
Hardenbergia comptoniana	X		Climber	X	
Hibbertia cuneiformis	X	X	Shrub		
Hypocalymma angustifolium		X	Shrub		
Jacksonia furcellata	X		Shrub		

Kennedia prostrata	X		Groundcover		
Kunzea glabrescens	X		Shrub	X	
Kunzea ericifolia	X		Shrub		
Leptocarpus scariosus			Grass / herb		
Melaleuca huegelii			Shrub		
Melaleuca incana		X	Shrub		
Melaleuca rhaphiophylla		X	Tree		
Melaleuca systena	X		Shrub		
Melaleuca thymoides	X	X	Shrub		
Melaleuca viminea		X	Shrub	X	
Olearia axillaris	X		Shrub		
Phyllanthus calycinus	X	X	Shrub		
Regelia ciliata		X	Shrub		
Rhagodia baccata	X		Shrub		
Scaevola crassifolia	X		Rush		
Spyridium globulosum	X		Shrub		
Templetonia retusa	X		Shrub		
Trachymene coerulea		X	Shrub		
Xylomelum occidentale	X		Small tree		

APPENDIX E

Revegetation species list for Ludlow Offset Area Sites 7 and 12

Species	Dryland	Wetland - transition	Form	WRP forage	Black cockatoo forage
Acacia cyclops	X		Shrub	X	
Acacia extensa	X		Shrub		
Acacia pulchella	X	X	Shrub		
Acacia saligna	X		Shrub / Tree	X	X
Adenanthos meisneri			Shrub		
Agonis flexuosa	X	X	Tree	X	
Allocasuarina humilis	X	X	Shrub		
Alyxia buxifolia	X		Shrub		
Anigozanthos manglesii	X	X	Grass / herb		
Anthocercis littorea	X		Shrub		
Banksia attenuata	X		Tree		X
Banksia grandis	X		Tree		X
Banksia littoralis		X	Tree		X
Baumea juncea		X	Rush		
Billardiera fusiformis	X		Shrub		
Bossiaea eriocarpa	X		Shrub		
Clematis linearifolia	X		Climber		
Conostylis aculeata	X		Grass		
Corymbia calophylla	X		Tree	X	X
Cyathochaeta avenacea			Grass		
Daviesia physodes	X	X	Shrub		
Dianella brevicaulis	X	X	Herb		
Diplolaena dampieri	X		Shrub		
Eucalyptus gomphocephala	X		Tree		X
Eucalyptus marginata	X		Tree	X	X

Species	Dryland	Wetland - transition	Form	WRP forage	Black cockatoo forage
Eucalyptus rudis			Tree	X	X
Ficinia nodosa	X		Rush		
Gahnia trifida			Rush		
Gastrolobium praemorsum			Shrub		
Gompholobium tomentosum	X		Shrub		
Haemodorum spicatum			Herb		
Hakea amplexicaulis	X		Shrub		X
Hakea lissocarpha	X	X	Shrub		X
Hakea prostrata	X		Shrub		X
Hakea ruscifolia	X		Shrub		X
Hakea varia		X	Shrub		X
Hardenbergia comptoniana	X		Climber	X	
Hemiandra pungens	X		Shrub		
Hibbertia cuneiformis	X	X	Shrub		
Hypocalymma angustifolium			Shrub		
Juncus pallidus			Rush		
Kennedia prostrata	X		Groundcover		
Kunzea glabrescens	X		Shrub	X	
Kunzea micrantha		X	Shrub		
Lepidosperma gladiatum	X		Sedge		
Lepidosperma longitudinale			Sedge		
Lepidosperma pubisquameum			Sedge		
Logania vaginalis			Herb		
Melaleuca incana		X	Shrub		
Melaleuca preissiana		X	Tree	X	
Melaleuca rhaphiophylla		X	Tree		
Melaleuca thymoides	X	X	Shrub		
Melaleuca viminea		X	Shrub	X	
Orthrosanthus laxus	X	X	Grass / Herb		
Patersonia occidentalis	X		Grass / Herb		
Phyllanthus calycinus	X	X	Shrub		
Regelia ciliata		X	Shrub		
Rhagodia baccata	X		Shrub		
Solanum symonii	X		Shrub		
Spyridium globulosum	X		Shrub		
Trymalium ledifolium		X	Shrub		
Xanthorrhoea brunonis	X		Grass		
Xanthorrhoea preissii			Grass		X
Xylomelum occidentale	X	X	Tree		

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