APPENDIX K

BORR Northern and Central Sections Offset Strategy Plan (Main Roads 2020)

BORR Team

Bunbury Outer Ring Road
Northern and Central Sections

Offset Strategy

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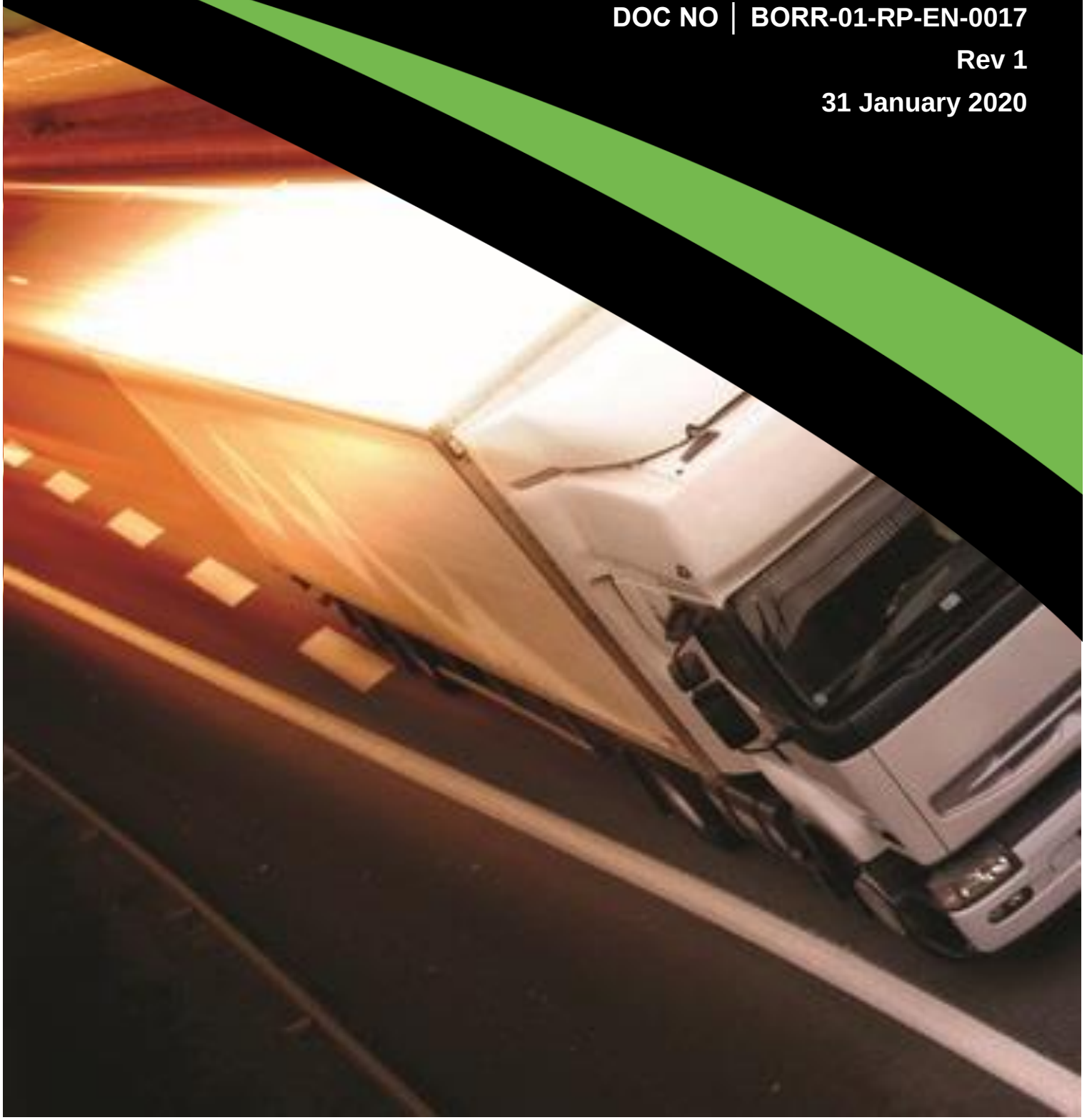

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Document *Control*

Revision	Date	Description	Prepared	Reviewed	Approved
A	20/12/19	Draft for Main Roads Review	BORR Team	FH	FH
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1 INTRODUCTION

1.1 Proposal background

The Commissioner of Main Roads Western Australia (Main Roads) is proposing to construct and operate the Northern and Central sections of the Bunbury Outer Ring Road (BORR) project. BORR is a planned Controlled Access Highway linking the Forrest Highway and Bussell Highway. The completed project will provide a high standard route for access to the Bunbury Port, improved road safety and facilitate proposed development to the east of the City of Bunbury.

The proposed BORR comprises three sections:

- 'BORR Northern Section' – Forrest Highway to Boyanup-Picton Road
- 'BORR Central Section' – Boyanup-Picton Road to South Western Highway
- 'BORR Southern Section' – South Western Highway (near Bunbury Airport) to Bussell Highway.

This Offset Strategy relates to the residual environmental impacts of the BORR Northern and Central Sections (the Proposal).

1.2 Purpose of this document

The Proposal is located approximately 200 km south of Perth and at its closest point, approximately six kilometres south-east of Bunbury. It occurs within the City of Bunbury and Shires of Capel, Dardanup and Harvey.

The Proposal includes construction and operation of BORR Northern and Central sections. These sections comprise 19 km of new freeway standard dual carriageway and associated bridges, interchanges and other road infrastructure including, but not limited to, culverts, lighting, noise barriers, fencing, landscaping, road safety barriers and signs.

The area being referred by Main Roads is up to 625 hectares (ha) and referred to as the Proposal Area. The majority of the land within the Proposal Area is cleared agricultural land. Pockets of native vegetation are present within the Proposal Area in road reserves, along sections of the Collie, Ferguson and Preston Rivers, or as isolated patches on properties. The Proposal Area excludes areas within BORR Central Section which was constructed in 2013. The implementation of the Proposal will result in clearing of up to 73 hectares (ha) of vegetation and 19 ha of revegetation (~15 % combined) within the 625 ha Proposal Area. The Proposal Area is shown at Figure 1 (Appendix A).

1.3 Purpose of this strategy

In June 2019, Main Roads referred the Proposal to the Environmental Protection Authority (EPA) for assessment under Section 38 of the Environmental Protection Act 1986 (EP Act). In July 2019, the EPA advised that under Section 40(2)(a) further information was to be provided to allow it to properly assess the impacts of the Proposal, including the provision of an Offsets Strategy.

This Offset Strategy has been prepared to address the EPA's Section 40(2)(a) request and will:

- Identify, describe and quantify the potential residual impacts (direct, indirect and cumulative) on the identified key environmental factors (Flora and Vegetation and Terrestrial Fauna), that will occur following implementation of the Proposal after consideration and applying avoidance and minimisation measures.

- Determine the significance of any residual impacts on the identified key environmental factors using the WA Environmental Offsets Guidelines and application of the Residual Impact Assessment Model.
- Where significant residual impacts remain, propose an offset strategy to counterbalance the residual impacts of the proposal that is consistent with the WA Environmental Offsets Policy (GoWA, 2011) and WA Offset Guidelines (GoWA, 2014) and where residual impacts relate to threatened species or communities the Environmental Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy (DSEWPaC, 2012).

1.4 Impact avoidance

The WA Environmental Offsets Policy notes that environmental offsets will only be considered after avoidance and mitigation options have been pursued. Since the referral of the Proposal in June 2019, Main Roads has undertaken a comprehensive review of the design and amended the Proposal Area to reduce the potential impacts on key environmental features including:

- Western Ringtail Possum
- South-western Brush-tailed Phascogale
- Black Cockatoos
- Banksia Woodland TEC and PEC
- Claypan TEC
- Corymbia Woodland TEC.

The changes to the Proposal include:

- Reducing median widths where the alignment is on high fill embankments
- Amending the form of interchanges to reduce impacts, including fragmentation
- Increasing batter slope (gradients) and using retaining walls to reduce the area of clearing required
- Avoiding the need for bridge piers or abutments within watercourses
- Amending the alignment to reduce the area of native vegetation cleared
- Staging construction to allow for the reduced clearing footprint
- Shifting the principal shared path closer to the highway to reduce the project footprint
- Including fauna crossings.

Table 1-1 Summary of design changes and benefits

DESIGN CHANGE	SPECIES AND COMMUNITIES BENEFITTING					
	BC	WRP	BTP	CFM	BSM	TEC
Whole of alignment						
1800 m chainlink fence along the BORR road reservation with a fine gauge skirt in areas where smaller fauna may be present (i.e. not in farmland areas)	X	X	X			X
The median widths have been reduced where the BORR alignment is on high fill embankments to mitigate the environmental impacts	X	X	X			X

DESIGN CHANGE	SPECIES AND COMMUNITIES BENEFITTING					
	BC	WRP	BTP	CFM	BSM	TEC
All bridge designs have been prepared to avoid the need to have piers or abutments within the watercourse, mitigating environmental and heritage impacts				X	X	
BORR / South West Highway (North)						
Design of works along South West Highway has been modified to mitigate the impact to the TEC west of Waterloo Road						X
BORR/Forrest interchange						
BORR main alignment has been designed to mitigate impacts on vegetation	X	X	X			X
Form for the interchange deliberately planned to reduce impacts to habitat and vegetation. Environmental benefits are substantial however the solution is largely unpopular with the community	X	X	X			X
Reduced median width on BORR to minimise the impacts on vegetation	X	X	X			X
Noise wall alignment designed to mitigate environmental impacts by building wall along an existing cleared track	X	X	X			X
Noise walls will be utilised instead of bunds to minimise the clearing footprint	X	X	X			X
Road profile has been adapted to ensure the existing hydrological flows are maintained and sufficient culverts can be provided				X	X	
Batter slopes have been steepened to minimise width of clearing	X	X	X			X
Existing vegetation on the south west quadrant of the interchange has been removed from the referral area. This will restrict the construction staging options and require additional traffic staging at a cost to Main Roads	X	X	X			X
Existing vegetation on the north west quadrant of the interchange will be protected through engineering solutions to maintain the connectivity to the Brunswick River	X	X	X			X
Works along Forrest Highway have been minimised to retain as much vegetation as possible	X	X	X			X
43 fauna crossings included in the design to maintain and enhance existing movement pathways		X	X			
Potential inclusion of a water source for WRP and BTP within drainage infrastructure at the interchange – this is being negotiated with the Department of Water and Environmental Regulation (DWER)		X	X			
Fauna fence established as close to the highway as possible so that batters can be used for revegetation and recreation of habitat	X	X	X			X
BORR / Boyanup Picton Road interchange						
PSP moved closer to the BORR alignment to reduce footprint width and potential vegetation and habitat fragmentation impacts	X	X	X			X
Vegetation within the loop ramp has been removed from the referral boundary	X	X	X			X
Fauna movements will be supplemented with fauna crossings to provide connectivity to the Ferguson River		X	X			
BORR / Moore Road interchange						
Drainage design to move infrastructure to cleared areas not within vegetation or habitat	X	X	X			X

DESIGN CHANGE	SPECIES AND COMMUNITIES BENEFITTING					
	BC	WRP	BTP	CFM	BSM	TEC
BORR / South West Highway (South) interchange						
Alignment modified to save existing vegetation on the northern boundary of the existing alignment. This will require additional construction staging efforts to accommodate existing traffic patterns while the new highway is constructed.	X	X	X			X

This has resulted in a reduction in the Proposal Area (651 to 625 ha), a reduction in the clearing area of remnant native vegetation from 91 to 73 ha and a reduction in clearing area of revegetation areas from 28 to 19 ha.

1.5 Summary of offset requirements

Offset requirements have been determined through assessment of the direct residual impacts of the Proposal based on the revised design, field survey and site assessment. Details of the residual impacts are included in the Bunbury Outer Ring Road Northern and Central Sections – Response to EPA Notice of Decision (BORR IPT, 2020) and are summarised in Section 2 and 3 below. Table 1-2presents a summary of the residual impacts this Offset Strategy proposes to offset.

Table 1-2 Offset requirements

ITEM	DETAILS
Title of proposal	Bunbury Outer Ring Road Northern and Central Section
Proponent name	Commissioner for Main Roads Western Australia
EPA Assessment No.	2215 / CMS 17624
Purpose of this plan	This plan is submitted to address the EPA request for additional information in respect to environmental offsets.
Environmental Offset	To counterbalance the significant residual impacts to: • 3.7 ha of vegetation representative of Banksia Woodland TEC and PEC. • 0.6 ha of vegetation representative of 'Herb rich shrublands in clay pans (FCT08). • 43.9 ha of Western Ringtail Possum habitat comprising impacts to the home range of 20-25 individuals • 17.7 ha of Southern Brush-tailed Phascogale habitat • 37.8 ha of potential habitat for Black Cockatoo species (Baudin's Black-Cockatoo (*Calyptorhynchus baudinii*), Carnaby's Black-Cockatoo (*Calyptorhynchus latirostris*) and Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksia naso*).

1.6 Consultation

The proposed offset measures and approach detailed in this strategy were discussed with officers from the Department of Water and Environmental Regulation, Department of Biodiversity Conservation and Attractions and Commonwealth Department of the Environment and Energy during a workshop with Main Roads on 13 November, 2019.

2 FLORA AND VEGETATION ASSESSMENT AND IMPACTS

2.1 Environmental surveys

The flora and vegetation studies and surveys have been undertaken within, or are relevant to, the Proposal are shown in Table 2-1. These investigations and the refinement of the Proposal design have been used to define the residual environmental impacts, and consequently used as the basis for determining the environmental offset requirements.

Table 2-1 Studies and surveys relevant to the Proposal

SURVEY / REPORT NAME	LOCATION / EXTENT IN SURVEY AREA	METHODOLOGY
Bunbury Port Access Road Project Stage 2 – Flora and Vegetation Survey (GHD, 2010)	Near Boyanup Picton Road to South Western Highway. Two survey areas overlap the current Proposal Area.	Survey completed on the 13, 14 and 17 October and the 4 – 5 November 2009. The survey included vegetation type and condition mapping.
Lot 1 Ducane Road, Environmental Values Assessment (GHD, 2014)	Survey of Lot 1 Ducane Road (40.5 ha) – which is located approximately 2.5 km south-west of the current Survey Area.	Survey on the 13 June 2013. This survey included vegetation mapping and quadrat based sampling.
Dardanup Structure Plan (GHD, 2015a)	Approximately 2,700 ha between Collie River and approximately Boyanup Picton Road. The study boundaries overlap the current Survey Area.	Two season flora survey in accordance with EPA guidelines at the time of survey (EPA, 2004a). Late winter (13 – 14 August 2014) and mid-spring (30 – 31 October 2014). Vegetation type and condition mapping based on quadrats and opportunistic records. Searches for conservation significant flora.
BORR South Flora Survey (GHD, 2015b)	Survey for BORR South Project Area. This occurs immediately south of the current Survey Area and is used to provide context. Two quadrats are within the current Survey Area.	Survey completed on 21 – 23 September 2011 and 16 – 18 June 2014. Level 2 flora and vegetation survey including quadrat sampling, targeted searches and vegetation type / condition mapping.
Reassessment of Floristic Communities (Biota, 2016)	Target areas within BORR South alignment. Two quadrats are within the current Survey Area.	Additional quadrats and re-analysis of the FCTs presented in GHD (2015b). Surveys carried out in September 2016.
Biota 2018 – Banksia TEC Assessment for BORR South (Biota, 2018)	24 target areas within BORR South area and surrounds. This report also provides context for the Banksia TEC assessment. Three target sites are located south-west of the current Survey Area. The closest target site is approximately 3 km south-west of the current Survey Area.	Walking transects and quadrats within the target sites. Surveys carried out in November 2017.
A Flora and Vegetation survey on Lot 104 Willinge Drive Davenport	Survey of the 83.3 ha within Lot 104 (North east of the Preston River). The study boundary intersects the Proposal Area.	Survey carried out on 30 October and 2 and 3 November 2017. Vegetation type and condition mapping and species lists presented.

SURVEY / REPORT NAME	LOCATION / EXTENT IN SURVEY AREA	METHODOLOGY
(Ecoedge, 2018)		
Bunbury Outer Ring Road North – Phytophthora Dieback Occurrence Survey (GSB, 2018)	BORR Northern and Central sections alignment.	Visual diagnosis of disease supported by laboratory assessment of soil and tissue samples within areas of assessable remnant vegetation.
BORR Northern and Central Sections Drainage Strategy (BORR IPT, 2018)	BORR Northern and Central sections alignment.	Outlines broad strategies for management of surface water throughout the Proposal Area, including flood mitigation and maintaining surface water flows to wetlands and agricultural land.
BORR Northern and Central Sections Vegetation and Flora Assessment (BORR IPT, 2019b)	Detailed flora and vegetation assessment of 1,128 ha, including the Proposal Area.	Detailed vegetation and flora survey was undertaken from 20 August 2018 to 19 December 2018. The survey included early spring, mid-spring, late spring and summer survey periods.
Bunbury Outer Ring Road Central and Northern Sections Claypan TEC Assessment Survey Report 2019 (Ecoedge, 2019a)	Within the locality of Waterloo, in the BORR Northern and Central sections alignment.	Survey carried out on 26 July to 1 August 2019. Condition, hydrology and species diversity were assessed to confirm whether the vegetation met the floristic and condition thresholds of the Claypan TEC. Results informed the avoidance, management, mitigation and monitoring actions.
A Review of the Regional Conservation Status of a Clay-based Wetland Community (Clay pans) (Ecoedge 2019b)*	Region defined as on the Swan Coastal Plain within Harvey, Bunbury, Capel, Dardanup and Busselton local government areas	Desktop and field assessments conducted in August 2019

The assessment of the broader flora and vegetation values of the area are provided in BORR IPT (2019a)and BORR IPT (2020), with the outcomes of these assessments, as they relate to offsets, summarised below.

2.2 Conservation significant flora

The Proposal will not impact any Environment Protection and Biodiversity Conservation Act (EPBC Act) nor WA Biodiversity Conservation Act (BC Act) listed flora and will have a minor impact on three Department of Biodiversity, Conservation and Attractions (DBCA) Priority Flora.

Main Roads does not propose to provide an environmental offset for expected residual impacts on priority flora.

2.3 Threatened and priority ecological communities

The implementation of the Proposal will result in clearing of up to 73 hectares (ha) of vegetation and 19 ha of revegetation (~15 % combined) within the 625 ha Proposal area. An estimated 5.7 ha of this vegetation comprises vegetation representative of TECs and / or PECs, of which 0.9 ha is situated on private land, 0.7 ha is vested in the State and approximately 4.1 ha is within existing road or railway reserves.

Occurrences of three Threatened Ecological Communities (TECs) and one Priority Ecological Community (PEC) will potentially be impacted by the Proposal, these being:

- Banksia Woodlands of the Swan Coastal Plain (SCP) TEC – EPBC Act listed ('Banksia Woodlands TEC')

- 'Herb rich shrublands in clay pans (FCT08)' TEC – BC Act listed, and also a component of the EPBC Act listed Clay Pans of the Swan Coastal Plan TEC ('FCT08')
- 'Corymbia calophylla - Xanthorrhoea preissii woodlands and shrublands of the SCP (FCT03c)' TEC – BC Act and EPBC Act listed ('FCT3c')
- Banksia dominated woodlands of the SCP IBRA region Priority Ecological Community (PEC) ('Banksia Woodlands PEC').

Figure 2 (Appendix A) shows the extent of the TECs and PECs within the Proposal Area and broader Survey Area. Details of the TECs and PECs within the Proposal Area and addressed by this Offset Strategy is provided in Table 2-2.

Table 2-2 Area and condition of TEC/PEC within the Proposal Area

TEC / PEC	CONSERVATION STATUS	EXTENT IN PROPOSAL AREA	VEGETATION CONDITION
Banksia Woodland TEC and PEC	Endangered TEC – EPBC Act	3.7 ha	Excellent – Very Good: 0.15 ha Good: 1.95 ha Good – Degraded: 0.13 ha Degraded: 1.51 ha
Banksia dominated woodlands of the Swan Coastal Plain IBRA region – PEC	Priority 3 PEC* - DBCA listed		
Herb rich shrublands in clay pans (FCT08) - TEC	Critically Endangered TEC – EPBC Act and Vulnerable – BC Act	0.6 ha	Very Good: 0.332 ha Good: 0.171 ha Degraded: 0.123 ha
Corymbia calophylla - Xanthorrhoea preissii woodlands and shrublands of the Swan Coastal Plain Floristic Community Type (FCT3c)	Critically Endangered TEC – EPBC Act and Critically Endangered – BC Act	1.3 ha	Very Good: 0.022 ha Good: 0.03 ha Degraded: 0.034 ha Completely degraded 1.146 ha

The residual impacts, impact significance and avoidance on each of the TECs is discussed in the following sections.

2.3.1 Banksia Woodland TEC/PEC

Banksia Woodlands of the Swan Coastal Plain was listed in September 2016 as an Endangered TEC under the EPBC Act. The 'Banksia dominated woodlands of the Swan Coastal Plain IBRA region' PEC is listed as Priority 3 by the WA Department of Biodiversity and Conservation (DBCA). The PEC differs from the TEC in that it has no minimum condition and patch size thresholds.

2.3.1.1 Impacts

3.7 ha of Banksia Woodland TEC/ PEC vegetation within the Proposal Area will be cleared as a result of Proposal implementation, all of which occur at three locations near the Paris Road / Clifton Road interchange (Figure 2 Appendix A)) and those directly adjacent to the Proposal Area are shown in Figure 3 (Appendix A). The composition and condition of these occurrences are detailed in Table 2-3.

Table 2-3 Banksia Woodlands TEC/PEC direct impact sites

SITE NO.	LOCATION	TEC / PEC TYPE	VEGETATION COMPOSITION AND CONDITION
BW-N-D-1	Forrest Highway road reserve northbound, north of Paris Road adjacent to Kingston Estate	Banksia Woodland TEC and PEC	Vegetation type: Woodland of *Eucalyptus marginata*, Banksia spp., *Kunzea glabrescens* Condition: 4-6 (Good to Degraded)
BW-N-D-2	Forrest Highway road reserve northbound, south of Paris Road adjacent to the Spud Shed	Banksia Woodland TEC and PEC	Woodland of *Eucalyptus marginata* over *Agonis flexuosa, Banksia attenuata* and *B. ilicifolia* Condition: 2-3 (Excellent to Very good)
BW-N-D-3	Forrest Highway road reserve southbound, south of Clifton Road and opposite Paris Road and Private property east of Forrest Highway, south of Site 3	Banksia Woodland TEC and PEC	Woodland of *Eucalyptus marginata* over *Agonis flexuosa, Banksia attenuata* and *B. ilicifolia* Condition: 4 and 6 (Good and Degraded)

No occurrences of Banksia Woodland TEC will be fragmented or indirectly impacted by the Proposal to the extent that they no longer represent occurrences of the TEC.

2.3.1.2 Impact avoidance

As discussed in Section 1.4, the changes to the design have included a range of refinements to minimise the impacts to the environment such as reducing median widths and changing the design and location of interchanges to reduce clearing requirements.

A summary of the original impact and current impact after the implementation of avoidance measures is presented in Table 2-4. Through the design changes, the area of Banksia Woodlands TEC and PEC that will be cleared as a result of Proposal implementation has been almost halved.

Table 2-4 Detailed design changes to avoid impacts to Banksia Woodland TEC/PEC vegetation

TEC / PEC TYPE	MAY 2019 S.38 REFERRAL	JANUARY 2020 S43A APPLICATION	REDUCTION IN TEC / PEC CLEARING AREA
Banksia Woodlands of the SCP TEC and Banksia dominated woodlands of the SCP IBRA region PEC	Up to 7.6 ha combined	Up to 3.7 ha of TEC and PEC	3.9 ha

2.3.1.3 Predicted outcome

A high level of mitigation and management has been applied to the Proposal, with Main Roads making substantial and costly changes to the Proposal design in order to reduce potential impacts on flora and vegetation, including Banksia Woodland TEC and PEC vegetation. The changes made have resulted in more than halving the area of Banksia Woodland TEC and PEC impacted to 3.7 ha.

The EPA objective for Flora and Vegetation will be met for the Proposal through the implementation of the management and mitigation actions detailed in BORR IPT (2019a).

Based on these assessments, it is unlikely that the Proposal will have a significant impact on the Banksia TEC and PEC.

Main Roads proposes to further address the residual impacts of the Proposal on Banksia Woodlands TEC/PEC through the provision of environmental offsets.

2.3.2 Herb Rich Shrublands in Clay Pans (FCT08) TEC

The clay pans of the SCP Plain ecological community occurs where clay soils form an impermeable layer close to the ground surface, and wetlands form that rely solely on rainfall to fill and then dry to impervious pans in summers (TSSC 2012). FCT08 is listed as a Critically Endangered TEC under the EPBC Act and Vulnerable under the WA BC Act.

2.3.2.1 Impacts

Up to 0.6 ha of vegetation representing FCT08 was identified within the Proposal area, with a further 9.1 ha located directly adjacent. Occurrences within the Proposal Area are shown at (Figure 2 Appendix A) and those directly adjacent to the Proposal Area are shown in Figure 3 (Appendix A).

The composition and condition of these occurrences is also shown in Table 2-5.

Table 2-5 FCT08 Claypan TEC direct impact sites

SITE NO.	LOCATION	AREA (HA)	VEGETATION COMPOSITION AND CONDITION
CP-N-D-1	Railway Road	0.41	Woodland to open forest of *Corymbia calophylla* and *Eucalyptus rudis* and sometimes *Melaleuca rhaphiophylla* over tall shrubland of *Acacia saligna*, *Viminaria juncea* and *Xanthorrhoea preissii* over shrubland of *Astroloma ciliatum*, *Daviesia physodes*, *Grevillea bipinnatifida*, *Hakea varia*, *Hemigenia incana*, *Hypocalymma angustifolium* and *Viminaria juncea* over sedgeland of *Cyathochaeta avenacea*, *Mesomelaena tetragona* and *Tetraria octandra* and open herbland of **Babiana angustifolia*, *Haemodorum simplex*, **Oxalis pes-caprae* and **Watsonia meriana* (in more disturbed areas) and very open grassland of **Briza maxima* on red-brown or yellow-brown clay loam. Condition: 3 (Very good) - 0.206 ha 4 (Good) - 0.133 ha 6 (Degraded) - 0.075 ha
CP-N-D-2	Wireless Road	0.12 ha	Shrubland of *Acacia incurva, A. saligna*, *Hakea varia*, *Hypocalymma angustifolium*, *Melaleuca lateritia*, *M. pauciflora*, *Olearia elaeophila* and *Xanthorrhoea preissii* with emergent tall shrubs of *Viminaria juncea* over sedgeland of *Leptocarpus roycei* and *Schoenus* sp. and open herbland of *Agrostocrinum scabrum* subsp. *scabrum*, *Borya sphaerocephala*, *Cycnogeton lineare*, *Drosera erythrorhiza*, *Haemodorum simplex* and *Opercularia vaginata* on yellow-brown clay and Scattered tall shrubs of *Acacia saligna*, *Viminaria juncea* and *Xanthorrhoea preissii*, with occasional *Melaleuca rhaphiophylla* trees over grassland of **Briza maxima*, **Cenchrus clandestina* and **Ehrharta calycina* on yellow-brown clay loam Condition: 3 (Very good) - 0.054 ha

SITE NO.	LOCATION	AREA (HA)	VEGETATION COMPOSITION AND CONDITION
			4 (Good) - 0.038 ha 6 (Degraded) - 0.033 ha
CP-N-D-3	Bell Road	0.09	Shrubland of *Acacia incurva, A. saligna*, *Hakea varia*, *Hypocalymma angustifolium*, *Melaleuca lateritia*, *M. pauciflora*, *Olearia elaeophila* and *Xanthorrhoea preissii* with emergent tall shrubs of *Viminaria juncea* over sedgeland of *Leptocarpus roycei* and *Schoenus* sp. and open herbland of *Agrostocrinum scabrum* subsp. *scabrum*, *Borya sphaerocephala*, *Cycnogeton lineare*, *Drosera erythrorhiza*, *Haemodorum simplex* and *Opercularia vaginata* on yellow-brown clay Condition: 3 (Very good) - 0.072 ha 6 (Degraded) - 0.015 ha

* - non native species

No FCT08 Claypan TEC occurrences will be fragmented as a result of the Proposal as all occurrences that require clearing will be cleared in their entirety. Similarly no occurrences of FCT08 Claypan TEC are expected to be indirectly impacted.

The extent of FCT08 directly adjacent to the Proposal Area, as confirmed by Ecoedge (2019a), as specified in Table 2-5and shown in Figure 3 (Appendix A). The composition and condition of these occurrences is also detailed.

An assessment of the loss of FCT08 Claypan TEC within local and regional context has been made through comparing the extent within the Proposal area to that published for the community (regional) and extent within the broader BORR IPT (2019b) Survey Area. Based on this assessment, the clearing of up to 0.60 ha associated with the Proposal would result in a reduction of up to 0.23 % in the reported extent of the TEC. At the greater Bunbury region scale, this represents a reduction of up to 0.5%. Of this, 0.5 ha was rated as in Good or Better condition. This represents the maximum possible direct impact associated with the proposal.

2.3.2.2 Impact avoidance

The WA Environmental Offsets Policy (GoWA, 2011) notes that environmental offsets will only be considered after avoidance and mitigation options have been pursued. In accordance with this, substantial changes to the Proposal design were made in order to avoid impacts to FCT08 TEC vegetation. A summary of the original impact, design changes and resulting impact is presented in Table 2-6.

Table 2-6 Detailed design changes to avoid impacts to FCT08 TEC vegetation

TEC	JUNE 2019 S38 REFERRAL	JANUARY 2020 S43A APPLICATION	REDUCTION IN TEC / PEC CLEARING AREA
Herb rich shrublands in clay pans (FCT08) TEC	Up to 1.6 ha (including 1 ha unconfirmed)	Up to 0.6	0.2 ha (surveys subsequently showed that 0.8 ha was not Claypan TEC).

2.3.2.3 Predicted outcome

No FCT08 Claypan TEC occurrences will be fragmented as a result of the Proposal as all occurrences that require clearing will be cleared in their entirety.

A high level of mitigation and management has been applied to the Proposal, with Main Roads making substantial and costly changes to the Proposal design in order to mitigate potential impacts on flora and vegetation, including FCT08 Claypan TEC vegetation. The changes made have resulted in a 25% reduction in the area of this TEC to be impacted, to 0.6 ha.

Main Roads intends to further counterbalance the residual impacts of the Proposal through implementation of an environmental offset strategy.

2.3.3 *Corymbia calophylla – Xanthorrhoea preissii* woodlands and shrublands of the SCP (FCT3c) TEC

Corymbia calophylla - Xanthorrhoea preissii woodlands and shrublands of the SCP Floristic Community Type (FCT3c) was listed as a TEC in 2000 under the EPBC Act. It is also listed as Critically Endangered under the BC Act. The DoEE (2017a) describes the TEC as a Marri (*Corymbia calophylla*) dominated plant community located on heavy soils of the eastern side of the Swan Coastal Plain between Bullsbrook, and Capel. It is noted that weed levels in most occurrences are generally quite low.

The conservation advice identifies critical habitat for the TEC as the heavy soils on which it occurs, the fresh superficial groundwater, and/ or surface water that may help sustain flora species in this community, and the catchment for this groundwater and surface water.

FCT3c was identified in a supplementary flora and vegetation survey conducted after the submission of the Section 38 referral.

2.3.3.1 Impacts

Up to 1.3 ha of FCT3c TEC was identified within the Proposal Area, and approximately 0.9 ha directly adjacent. Occurrences within and abutting the Proposal Area are shown in Figure 2 and Figure 3 (Appendix A).

The composition and condition of this TEC within the Proposal Area is detailed in Table 2-7.

Table 2-7 FCT3c direct impact sites

SITE NO.	LOCATION	AREA (HA)	VEGETATION COMPOSITION AND CONDITION
CW-N-D-1	Raymond Road	0.29	Open woodland to scattered trees of *Corymbia calophylla* over an open shrubland of *Xanthorrhoea preissii, Hypocalymma angustifolium* and *Hakea varia* Condition: 6-7 (Degraded to Completely degraded)
CW-N-D-2	Treendale Road	0.33	Open woodland to scattered trees of *Corymbia calophylla* over an open shrubland of *Xanthorrhoea preissii, Hypocalymma angustifolium* and *Hakea varia* Condition: 6-7 (Degraded to Completely degraded)
CW-N-D-3	Railway Road	0.15	*Corymbia calophylla-Eucalyptus rudis-Melaleuca rhaphiophylla* woodland/open forest. Woodland to open forest of *Corymbia calophylla* and *Eucalyptus rudis* and sometimes *Melaleuca rhaphiophylla* over tall shrubland of *Acacia saligna*, *Viminaria juncea* and *Xanthorrhoea preissii* over shrubland of *Astroloma ciliatum*, *Daviesia physodes*, *Grevillea bipinnatifida*, *Hakea varia*, *Hemigenia incana*, *Hypocalymma angustifolium* and *Viminaria juncea* over sedgeland of *Cyathochaeta avenacea*, *Mesomelaena tetragona* and *Tetraria octandra* and open herbland of **Babiana angustifolia*, *Haemodorum simplex*, **Oxalis pes-caprae* and **Watsonia meriana* (in more disturbed areas) and very open grassland of **Briza maxima* on red-brown or yellow-brown clay loam. Condition:

SITE NO.	LOCATION	AREA (HA)	VEGETATION COMPOSITION AND CONDITION
			3 (Very good) - 0.022 ha 4 (Good) - 0.028 ha 6 (Degraded) - 0.034 ha 7 (Completely degraded) 0.006 ha
CW-N-D-4	Harris Road	0.52	Open woodland to scattered trees of *Corymbia calophylla* over an open shrubland of *Xanthorrhoea preissii, Hypocalymma angustifolium* and *Hakea varia* Condition: 7 (Completely degraded)

Two FCT3c TEC occurrences will be fragmented as a result of the Proposal – at Raymond Road and at Railway Road. Neither of these occurrences are likely to be left unviable as a result of Proposal implementation as both are already small, isolated and have high edge-to-area ratios. As such their long term viability is currently at risk, and their viability will not change as a result of the Proposal. 0.05 ha of the 0.15 ha Railway Road site is in Good or Very good condition with the remainder Degraded or Completely degraded. The Raymond Road site is Degraded to Completely degraded.

2.3.3.2 Impact avoidance

Main Roads has made changes to the Proposal design to reduce impacts to areas of FCT3c TEC to 0.6 ha.

FCT 3c was identified in a supplementary flora and vegetation survey conducted after the submission of the s.38. The Proposal Area boundary was then modified to reduce impacts to FCT3c. A summary of the design changes and resulting impact is presented in Table 2-8.

Table 2-8 Detailed design changes to avoid impacts to TEC/PEC vegetation

TEC / PEC TYPE	MAY 2019 S. 38 REFERRAL	JANUARY 2020 S43A APPLICATION	REDUCTION IN TEC / PEC CLEARING AREA
Corymbia calophylla - Xanthorrhoea preissii woodlands and shrublands of the SCP (FCT3c) TEC	Nil	Up to 1.3 ha	0.6 ha (Vegetation condition Very Good: 0.022 ha Good: 0.03 ha Degraded: 0.557 ha Degraded to completely degraded: 0.62 Completely degraded 0.032 ha

As detailed at Table 2-8, the majority of the residual impact of the Proposal on this TEC is Degraded to Completely degraded (approximately 1.23 ha), with only 0.052 ha in Good or Better condition.

2.3.3.3 Predicted outcome

A high level of mitigation and management has been applied to the Proposal, with Main Roads making substantial and costly changes to the Proposal design in order to mitigate potential impacts on flora and vegetation, including FCT3c TEC vegetation. The changes made have resulted in a 35% reduction in the area of this TEC to be impacted, to 1.3 ha.

As the majority of the residual impact of the Proposal on this TEC (0.65 ha) is degraded to completely degraded, with only 0.05 ha in good or better condition. Main Roads does not consider that this scale of impact is such that it warrants the provision of an environmental offset and none is proposed in this Offset Strategy.

3 FAUNA ASSESSMENT AND IMPACTS

Seven conservation significant fauna species were identified in the 2019 referral document as occurring or likely to occur within the Proposal area. These species include:

- Western Ringtail Possum (*Pseudocheirus occidentalis*) (Critically Endangered, Schedule 1)
- Baudin's Cockatoo (*Calyptorhynchus baudinii*) (Endangered, Schedule 2)
- Carnaby's Cockatoo (*Calyptorhynchus latirostris*) (Endangered, Schedule 2)
- Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksia naso*) (Vulnerable, Schedule 3)
- Brush-tailed Phascogale (*Phascogale tapoatafa wambenger*) (Schedule 6)
- Black-stripe Minnow (*Galaxiella nigrostriata*) (Endangered, Schedule 2)
- Carter's Freshwater Mussel (*Westralunio carteri*) (Vulnerable, Schedule 3)

3.1 Environmental surveys

Following referral of the Proposal in June 2019, additional surveys targeting threatened fauna species identified as occurring within the Proposal area (and of key concern to stakeholders) were undertaken.

The following sections consider the results of these studies where they are relevant to those threatened fauna species.

In addition to studies undertaken to determine the sizes and densities of local WRP populations and assess habitat quality, studies were also undertaken to inform habitat clearing regimes and the design of engineered fauna movement (connectivity) structures.

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

Table 3-1 Fauna investigations undertaken for the purposes of this Proposal

YEAR SURVEY COMPLETED	CONSULTANT	SURVEY NAME
2018	Biota Environmental Sciences (Biota)	Bunbury Outer Ring Road Northern and Central Section Targeted Fauna Assessment (Biota, 2019a)
2019	Biota Environmental Sciences (Biota)	Western Ringtail Possum: *Pseudocheirus occidentalis* Regional Surveys DRAFT (Biota, 2019b) (in prep)
2018	Wetland Research & Management (WRM)	Bunbury Outer Ring Road Northern and Central Investigation Area: Targeted Conservation Significant Aquatic Fauna Survey (WRM, 2019)
2019	Biota Environmental Sciences (Biota)	Bunbury Outer Ring Road Northern and Central Section – Targeted Fauna Assessment (Biota, 2019a)
2019	Wetland Research & Management (WRM)	Bunbury Outer Ring Road Northern and Central Investigation Area: Targeted Conservation Significant Aquatic Fauna Survey (WRM, 2019)

The implementation of the Proposal will result in clearing of up to 73 hectares (ha) of vegetation and 19 ha of revegetation (~15 % combined) within the 625 ha Proposal area.

The assessment of the broader fauna values of the area are provided in BORR IPT (2019a) and BORR IPT (2020), with the outcomes of these assessments, as they relate to offsets, summarised below.

3.2 Western Ringtail Possum

The WRP was once widely distributed across the south and south-west of the state (from north of Perth to east of Albany) but are 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 status was reassessed to critically endangered under the BC Act in 2016 and EPBC Act in 2018.

WRP occur in three main habitat areas within the Proposal area Figure 4 (Appendix A). From north to south these are:

- At and around the Clifton Road / Paris Road interchange and north to the Brunswick River
- Around the Boyanup Picton Road interchange
- In the south near Manea Park.

These areas support patches of suitable WRP habitat and none of which are isolated from adjoining habitat.

3.2.1 Impacts

To reflect the seasonal and transient fluctuations in population size, the potential impact of the Proposal on individual WRP home ranges is presented as a range rather than a discrete figure. Based on this data, it is estimated that between 20 and 25 WRPs within the Proposal area will potentially have their home ranges disturbed by the Proposal. This indicates that approximately or up to 0.28 % and 0.34 % of the 2019 estimated regional population (of approximately 6,500 individuals) could potentially be impacted. A summary of the potential impact is presented in Table 3-2.

Table 3-2 Summary of potential direct impacts to WRP

FACTOR IMPACTED	LOSS (HA OR NUMBER)	LOSS (%)
WRP Habitat	43.9 ha	Up to 0.70 % of habitat in the Bunbury management zone of Shedley and Williams (2014)
WRP home ranges disturbed	20 to 25	0.28 % to 0.34 % of the estimated 2019 regional population

No WRP mortalities are expected as a direct result of the Proposal.

The Proposal Area is a relatively long and narrow road corridor, 200 m wide at its maximum width and 19 kilometres long. As such, it is highly unlikely that any entire WRP home ranges are contained within the Proposal area. Between 20 and 25 home ranges may be disturbed to some degree but WRP utilising habitat within the alignment are very likely to be familiar with adjacent habitat areas, which is likely to also be part of their home range, and with navigating between these areas. As such, the impact of the Proposal on WRP home ranges is expected to be minor.

Connectivity between habitat patches in the Proposal Area is already compromised by the existing Forrest Highway and arterial roads, easements and large expanses of cleared agricultural land. Connectivity between some habitat areas will be temporarily disrupted during Proposal construction. However the majority of habitat within the Proposal area is already disconnected from the wider landscape and will not

be further impacted in this way by the Proposal. Conversely, connectivity across the alignment between existing habitat areas will be improved as a result of Proposal implementation through the installation of approximately 43 possum over/underpasses and or rope bridges.

The maintenance of existing movement pathways and connectivity along either side of the alignment has been a priority during Proposal planning. Connectivity and suitability of cleared areas remaining within the Proposal area will be further enhanced with targeted revegetation post construction. As shown on Figure 5, Appendix A), the detailed design ensures this connectivity will remain after Proposal implementation.

The 43.9 ha of WRP habitat to be cleared through the Proposal constitutes 7.0% of the 625 ha Proposal area.

The targeted fauna assessment to support the assessment of the Proposal, mapped and surveyed fauna habitats within a study area of 1,128.01 ha including the current Proposal area and adjoining remnant vegetation (Biota 2019a). Approximately 147 ha of WRP habitat was mapped in this study area.

Key information that has resulted from the additional investigations and surveys for WRP are summarised below:

- That the regional WRP population is substantially greater than previously understood
- WRP presence, population trends and movement pathways within and around the Proposal Area
- Habitat areas adjacent to the Proposal Area have been confirmed to consistently support populations of WRP
- The importance of maintaining connectivity between habitat areas
- That there are low WRP densities in habitat areas within and adjacent to the Proposal Area compared to those along the 'Holy Mile' in Busselton where possum rope bridges have been the most successful.

None of the habitat areas that are currently known to support WRP (from the surveys undertaken by Biota) are anticipated to become unviable as WRP habitat as a result of Proposal implementation.

3.2.2 Impact Avoidance

The impact to WRP resulting from the BORR North and Central Proposal Area as referred to the EPA (June 2019) was expected to result in a loss of up to 70.3 ha of habitat, and disturbance of up to 49 individual home ranges. This equated to approximately 0.7 % of the regional population (Swan Coastal Plain and Crooked Brook Forest populations), which in early 2019 was estimated to be approximately 7,166 individuals.

In consideration of the predicted impact of the original proposal as submitted in June 2019, Main Roads has gone to significant lengths to avoid and mitigate impacts to WRP habitat and home ranges, see Table 3-3.

Table 3-3 Detailed design changes to avoid impacts to WRP

WESTERN RINGTAIL POSSUM	JUNE 2019 S.38 REFERRAL	JANUARY 2020 S43A APPLICATION
Habitat extent (ha)	Approximately 70.3 ha WRP habitat	Approximately 43.9 ha WRP habitat in revised Proposal Area – with up to 26.4 ha of WRP habitat or approximately 37.5 % of expected habitat loss saved through detailed design phase

WESTERN RINGTAIL POSSUM	JUNE 2019 S.38 REFERRAL	JANUARY 2020 S43A APPLICATION
Observations (number of individuals)	Disturbance of home ranges of up to 49 individual WRPs (44 individuals observed by Biota within the Proposal Area in early 2019)	Field data indicates disturbance of home ranges of 20 to 25 individual WRPs (0.28 to 0.34% of the 2019 estimated regional population)
Bridges and underpasses	No quantity specified	Installation of forty three (43) underpasses/rope bridges now included within the design to reduce fragmentation and to maintain movement corridors

The changes outlined in Table 3.5 have resulted in a reduction of up to 26.4 ha of WRP habitat requiring removal for the Proposal. The areas that have been retained through these changes comprise intact habitat and known WRP movement pathways, not isolated trees or insignificant patches. Based on field survey data, in regards to the number of displaced WRP, this equates to between 24 to 29 individuals no longer likely to have their home ranges disturbed.

3.2.3 Predicted Outcome

A high level of mitigation and management will be applied to the Proposal, with Main Roads making substantial and costly changes to the Proposal design in order to mitigate potential impacts on WRP. As a result of the changes, a maximum of 43.9 ha of WRP habitat will be cleared, and between 20 and 25 home ranges potentially disturbed.

No areas of habitat will be cleared in their entirety and it is also unlikely that any entire home ranges will be impacted. Connectivity along and across the Proposal Area will be retained through a combination of a retention of key habitat areas where possible, and potentially improved over baseline conditions through installation of a series of fauna underpasses and / or rope bridges. Impacts of the Proposal on WRP will be manageable.

Proposed construction management and mitigation measures during operation of the Proposal are detailed in BORR IPT (2019a) and include:

- Timing of clearing
- Staging of clearing
- Sheparding of WRP from the clearing footprint
- WRP exclusion fencing and monitoring

Main Roads proposes to further address the residual impacts of the Proposal on WRP through the provision of environmental offsets.

3.3 Black Cockatoos

Three species of threatened black cockatoo were identified as occurring (foraging evidence) within the Proposal area during detailed fauna assessments:

- Baudin's Black-Cockatoo (*Calyptorhynchus baudinii*)
- Carnaby's Black-Cockatoo (*Calyptorhynchus latirostris*)
- Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksia naso*).

The Proposal Area is located in what is generally considered to be the typical breeding distribution of the Forest Red-tailed Black Cockatoo, however, all three cockatoo species have breeding areas overlapping the Proposal Area (Biota, 2019a).

All trees and areas of potential Black Cockatoo habitat within the Proposal Area were included in field surveys. Evidence of foraging by all three species was recorded within and adjacent to the Proposal Area, and either Baudin's or Carnaby's cockatoo were observed flying overhead during field surveys (Biota, 2019a). All three species were identified as occurring within the Proposal Area with suitable habitat for foraging and potentially breeding also identified in targeted surveys (Biota, 2019a).

Within the Proposal Area, Black Cockatoo foraging habitat was comprised of three mapped habitat types: 'Marri/Eucalyptus woodland', 'Riparian woodland' and 'Marri/Eucalyptus in paddocks and road reserves'.

3.3.1 Impacts

The Proposal Area provides 37.8 ha of suitable foraging and potential breeding habitat for Black Cockatoos (Carnaby's Cockatoo, Forest Red-tailed Black Cockatoo and Baudin's Cockatoo). Of the 710 Suitable DBH Trees assessed within the Proposal Area, no Known Nesting Trees were recorded.

No Trees with a Suitable Nest Hollow were recorded, while tree trees had potentially suitable hollows. The remaining Suitable DBH Trees did not contain hollows or suitably sized hollows.

Assessment of the potential impacts on Black cockatoo habitat using the vegetation complexes within a 12 km radius indicated that the vegetation complexes which provided the highest quality foraging habitat (e.g. Bassendean Central and South and the Southern River vegetation complexes) were, in general, well represented outside of the Proposal Area (Biota, 2019a). Within 12 km of the Biota (2019a) Study Area, the Guildford Complex has 1,022 ha of remnant vegetation remaining, the Southern River Complex has 2,046 ha and Bassendean Complex – Central and South has 3,834 ha. The clearing of 37.8 ha of potential habitat represents a 0.5 % reduction in potential foraging and breeding habitat for the Black Cockatoo species within the local area.

No Trees with Suitable Nest Hollows will be cleared. No known breeding trees will be cleared in the Proposal Area and availability of suitable breeding hollows is not considered to be a limitation for the survival of black cockatoos within the Proposal Area (DBCA pers. Comm). In surveyed areas adjacent to the Proposal Area, Biota (2019a) located 19 trees with 20 suitable hollows for Black Cockatoo nesting, including one tree with evidence (egg fragments) of previous use for nesting.

3.3.2 Impact Avoidance

Substantial changes to the Proposal design have been made in order to avoid impacts to Black Cockatoos. Changes relating to the extent of Black Cockatoo habitat to be impacted are detailed in Table 3-4.

Table 3-4 Detailed design changes to avoid impacts to Black Cockatoo Habitat

HABITAT TYPE	JUNE 2019 S.38 REFERRAL	JANUARY 2020 S43A APPLICATION
Habitat area (Ha)	59.7	37.8
Suitable DBH trees	1116	710
Trees with a Suitable Nest Hollow	5	0
Known nesting trees	0	0

Changes to the Proposal Area have resulted in the retention of 21.9 ha of habitat and 406 Suitable DBH Trees that would have been cleared if the Proposal had been implemented as referred. The detailed design changes have also resulted in the retention of all Trees with a Suitable Nest Hollow, ensuring no direct impact to the species' breeding habitat.

Predicted Outcome

A high level of mitigation and management has been applied to the Proposal, with Main Roads making substantial and costly changes to the Proposal design in order to mitigate potential impacts on terrestrial fauna including black cockatoos. The changes made have resulted in the reduction in the area of black cockatoo habitat impacted to just under 22 ha, and ensure that no Trees with Suitable Nest Hollows will be cleared. Connectivity of habitat will be maintained and enhanced through revegetation of additional areas within the Proposal Area.

Main Roads intends to further counterbalance the residual impacts of the Proposal through implementation of an environmental offset strategy.

3.4 Southern-western Brush Tailed Phascogale

The BTP is a small (100 – 300g), strongly arboreal marsupial. They are carnivorous, short-lived and nocturnal and are listed as Conservation Dependent (Schedule 6) under the BC Act.

3.4.1 Environmental Impacts

The Proposal Area provides a total of 17.7 ha of suitable habitat for the BTP comprising the 'Riparian Woodland' and 'Marri/ Eucalyptus Woodland' habitat types. The 'Riparian Woodland' habitat, of which there is 4.9 ha within the Proposal Area, was described as woodlands of the upper banks and floodplains of the significant drainages (Preston River, Collie River and Brunswick River). The 'Marri/ Eucalyptus Woodland' habitat refers to larger more intact remnants of his type of woodland as opposed to small, isolated, weedy remnants. There is 12.8 ha of 'Marri/ Eucalyptus Woodland' within the Proposal Area.

Phascogale habitat is closely correlated with both WRP habitat and Black Cockatoo habitat. Biota (2019a) estimated approximately 7,618 ha of suitable potential Black Cockatoo habitat with a 12 km radius of the Proposal Area. A large proportion of this habitat is also likely to comprise habitat for BTP.

No BTP mortalies are expected as a direct result of Proposal implementation.

Within Biota's recorded 47.92 ha of 'Marri/ Eucalypt Woodland' and 30.14 ha of 'Riparian Woodland' within their 1,128 ha fauna survey study area within and around the Proposal Area (Biota, 2019a). Of this 78.06 ha total, 17.7 ha or 23 % will be cleared.

BTP have large home ranges of up to 20 ha (Biota, 2019a). The Proposal Area is a long and narrow road corridor, 200 m wide at its maximum width and 19 kilometres long. As such, it is highly unlikely that any entire BTP home ranges – which are generally more than 20 ha in area - are contained within the Proposal Area.

Connectivity between habitat patches in the Proposal Area is already compromised by the existing Forrest Highway and arterial roads, easements and large expanses of cleared agricultural land. Connectivity between some habitat areas will be temporarily disrupted during Proposal construction. However the majority of habitat within the Proposal Area is already disconnected and will not be further impacted in this way by the Proposal. None of the areas of potentially suitable BTP habitat are anticipated to become unviable as habitat as a result of Proposal implementation.

No BTP mortalities are expected as a direct result of the Proposal.

3.4.2 Impact Avoidance

As noted in Section1-4, in consideration of the predicted impact of the original proposal as submitted in June 2019, Main Roads has gone to significant lengths to avoid and mitigate impacts to conservation significant fauna, including BTP. The majority of the detailed design changes implemented to avoid impacts to WRP will also result in the avoidance of impacts to BTP. The result of this effort is a revised Proposal Area that has substantially lower impact on BTP than originally proposed.

To minimise the impacts outlined above, the BORR North and Central Proposal Area was further refined during the design process. These changes are summarised in Table 3-5.

Table 3-5 Detailed design changes to avoid impacts to BTP habitat

WESTERN RINGTAIL POSSUM	JUNE 2019 S.38 REFERRAL	JANUARY 2020 S43A APPLICATION
Habitat extent (ha)	Approximately 28.2 ha BTP habitat	Approximately 17.7 ha BTP habitat in revised Proposal Area – with up to 10.5 ha or approximately 37 % of expected habitat loss saved through detailed design phase
Bridges and underpasses	No quantity specified	Installation of approximately 43 underpasses/rope bridges now included within the design to reduce fragmentation and to maintain movement corridors

3.4.3 Predicted Outcome

A high level of mitigation and management has been applied to the Proposal, with Main Roads making substantial and costly changes to the Proposal design in order to mitigate potential impacts on conservation significant fauna including the BTP. As a result of the changes made to the Proposal, a maximum of 17.7 ha of BTP habitat will be cleared. No areas of habitat will be cleared in their entirety and it is also highly unlikely that any entire home ranges will be impacted. Connectivity along and across the Proposal Area will be retained through a combination of a retention of key habitat areas where possible, and possibly even improved over baseline conditions through installation of a series of fauna underpasses and / or rope bridges. Impacts of the Proposal on BTP will be minor and manageable.

Main Roads intends to further counterbalance the residual impacts of the Proposal on BTP through implementation of an environmental offset strategy.

3.5 Black-stripe Minnow

The Black-stripe Minnow (*Galaxiella nigrostriata*) is listed as Endangered under the EPBC Act.

During additional surveys conducted in August 2019, BSM were recorded from one sampling site within the Proposal area and four sites outside of the Proposal Area.

Due to the high mobility of the species and connectivity between wetlands in wetter years, it is possible that Black-stripe Minnows migrate between wetlands and are still located within the local area.

3.5.1 Impacts

BSM were restricted within the Proposal Area to a small area of relatively undisturbed wetland in the southern end of the alignment. It was not recorded from additional areas (7 sites surveyed) of wetland habitat in the Proposal Area. The BSM was recorded from four additional sites adjacent to the Proposal area. All sites outside of the Proposal area were relatively undisturbed or intact wetlands within or adjacent to Manea Park bushland reserve.

Given the distribution of the species in wetlands adjacent to the Proposal area and to the south, loss of 0.55 ha as a result of construction of the Proposal is unlikely to have a significant impact on the species..

Given the distribution of the species in wetlands adjacent to the Proposal area and to the south, loss of 0.55 ha as a result of construction of the Proposal is unlikely to have a significant impact on the species.

There is potential for Black-stripe Minnow to opportunistically utilise habitat within the Proposal Area. The majority (>99 %) of the 578 ha of Geomorphic Wetlands within the proposal area are classified as ‘Multiple Use’.

Known impacts to BSM from the Proposal are considered relatively minor. Direct loss of habitat will be limited to 0.55 ha. No residual impact is anticipated.

3.5.2 Impact Avoidance

The impacts of the Proposal have been reduced through the design process. Clearing and disturbance of habitat will be carefully managed throughout construction through mechanisms outlined in (BORR IPT, 2019a) and through the implementation of a CEMP.

Impacts to hydrology will be mitigated through the implementation of the drainage strategy which aims to maintain hydrological conditions as far as possible. Fragmentation of habitat and connectivity between habitats will be mitigated through installation of culverts to maintain hydrologic linkage between the northern and southern sections. Current design for culverts is two concrete box culverts (1200 mm wide x 900 mm tall) built on a concrete base. Culverts will be set at or slightly below the existing channel invert to ensure the existing drainage is maintained either side of the culvert.

3.5.3 Predicted Outcome

Impacts to BSM from the Proposal are considered relatively minor. Direct loss of habitat will be limited to 0.55 ha and other potential impacts will be mitigated through implementation of appropriate drainage and management. No residual impact is anticipated.

Main Roads does not propose an environmental offset for BSM.

3.6 Carter's Freshwater Mussel

Carter's Freshwater Mussel (*Westralunio carteri*) (CFM) is the only freshwater mussel occurring in the south west of Western Australia. Carter's Freshwater Mussel was listed as vulnerable under the EPBC Act and the BC Act in 2018.

This species was recorded at a tributary of the Collie River (North Creek 5), Ferguson River (North Creek 5) and Preston River (North Creek 2) by WRM (2019) and in the Preston River by Biota (2019a), during the 2018 surveys.

3.6.1 Impact

Surveying for CFM was undertaken in drainage areas during targeted fauna surveys in 2018 and 2019. Within the Proposal Area, CFM is restricted to major creeklines with shallow sandy banks (Biota, 2019a).

During surveys undertaken in 2018 and 2019 by WRM (2019), CFM were recorded from:

- A tributary of the Collie River (North Creek 3) downstream of the Proposal Area;
- Ferguson River (North Creek 5 and Mussels 2) within and just upstream of the Proposal Area
- Preston River (North Creek 2) (Mussels 1 shells only and North Creek 2) within and upstream of the Proposal Area.

Potential habitat for CFM includes the Collie (tributary), Ferguson and Preston Rivers and has been mapped as maximum of 1.4 ha within the Proposal Area.

No direct impact to CFM or habitat is likely to occur as a result of the construction of this from the Proposal, indeed bridge construction may potentially provide positive outcomes for the species. Previous studies and assessments of habitat requirements for CFM have suggested bridges may be a preferred habitat for the species (Klunzinger *et al.,* 2015; Hastie *et al*., 2000). Shading created by bridges may provide cooler conditions that are beneficial to the species.

3.6.2 Impact Avoidance

Changes to the Proposal design have removed the requirement for bridge piers or abutments within any water courses to minimise the potential impacts on watercourses and CFM habitat at the Collie, Ferguson and Preston. This has resulted in the removal of any direct impacts to habitat for the CFM.

These changes to the design will also avoid any impacts to hydrology i.e. effects on flow velocities and erosion or deposition of sediment caused by instream structures.

3.6.3 Predicted Outcome

Impacts to CFM from the Proposal are considered to be minor. There will be no direct loss of habitat and other potential impacts will be mitigated through implementation of appropriate drainage and management during construction. No residual impact is anticipated.

Main Roads does not propose an environmental offset for CFM.

3.7 Residual fauna impacts

The alignment selected for the Proposal minimises impacts to fauna and with implementation of the mitigation measures proposed to address the potential impacts of the Proposal, the EPA objective for fauna, will be met. Table 3-6 provides a summary of the key residual impacts to fauna. Impacts set out in the table represent the maximum possible impacts associated with the Proposal.

Main Roads intends to further counterbalance the residual impacts of the Proposal through implementation of an environmental offset strategy addressing WRP and Black Cockatoos and BTP.

Table 3-6 Predicted residual impacts to fauna

ISSUE	SUMMARY DISCUSSION OF RESIDUAL / CUMULATIVE IMPACTS	OUTCOME
Western Ringtail Possums	Up to 43.9 ha of suitable Western Ringtail Possum habitat will potentially be cleared, and between 20 and 25 individual home ranges may be disturbed. Based on the results of regional surveys, this is estimated to represent 0.28 % to 0.34 % of the 2019 regional population.	The clearing of Western Ringtail Possum habitat and disturbance of 0.28 % to 0.34 % of the estimated 2019 regional population will result in a minor residual impact associated with the Proposal.
Black Cockatoos	The Proposal may potentially result in loss of up to 37.8 ha of suitable Black Cockatoo habitat. The clearing of 37.8 ha of potential habitat represents a <1 % reduction in potential foraging and breeding habitat for the Black Cockatoo species within the local area (suitable remnant vegetation within a 12 km radius).	The reduction in foraging and potential breeding habitat for Black Cockatoo species will result in a minor residual impact associated with the Proposal.
South-western Brush-tailed Phascogale	Up to 17.7 ha of suitable South-western Brush-tailed Phascogale habitat will potentially be cleared as a result for the Proposal. Brush-tailed Phascogales maintain relatively large ranges (>20 ha) and densities therefore tend to be low (Biota, 2019a).	The impact to the South-western Brush-tailed Phascogale are unlikely to be significant.

ISSUE	SUMMARY DISCUSSION OF RESIDUAL / CUMULATIVE IMPACTS	OUTCOME
Carter's Freshwater Mussel	Potential disturbance of up to 1.4 ha of Carter's Freshwater Mussel (Vulnerable) habitat during construction of bridges. It is anticipated that disturbance to waterways will be temporary and minor.	The impact to Carter's Freshwater Mussel is unlikely to be significant.
Black-stripe Minnow	Loss of up to 0.55 ha of Black-stripe minnow habitat.	The impact to the Black-stripe Minnow is unlikely to be significant.

4 ENVIRONMENTAL OFFSETS

4.1 Background

Environmental offsets are conservation actions that provide environmental benefits intended to counterbalance the significant residual environmental impacts associated with a proposal (GoWA, 2014). Main Roads intend to counterbalance the residual impact of the Proposal through implementation of an environmental offset strategy. The strategy will be prepared in accordance with the WA Government's Environmental Offset Policy (GoWA, 2011), WA Offset Guideline (GoWA, 2014) and the Australian Government's EPBC Act Environmental Offset Policy (DSEWPaC, 2012). The offset will be proportionate to the level of impact and significance of the environmental impact.

Main Roads operates on a hierarchy of avoid, minimise, reduce, rehabilitate and offset environmental impacts. This hierarchy is achieved primarily through changes in scope and design, development and implementation of the EMP and finally, an offset proposal. Application of the management hierarchy has been summarised in this Offset Strategy and is detailed in BORR IPT (2019a).

The proposed environmental offsets detailed in this Offset Strategy will form the basis of an Environmental Offset Plan to be submitted for approval by the EPA.

4.2 EPBC Act Environmental Offsets Policy (DSEWPaC, 2012)

The EPBC Environmental Offsets Policy (DSEWPaC, 2012) requires the following Principles are met by an offset:

- Suitable offsets must deliver an overall conservation outcome that improves or maintains the viability of the protected matter
- Suitable offsets must be built around direct offsets but may include other compensatory measures
- Suitable offsets must be in proportion to the level of statutory protection that applies to the protected matter
- Suitable offsets must be of a size and scale proportionate to the residual impacts on the protected matter
- Suitable offsets must effectively account for and manage the risks of the offset not succeeding
- Suitable offsets must be additional to what is already required, determined by law or planning regulations, or agreed to under other schemes or programs
- Suitable offsets must be efficient, effective, timely, transparent, scientifically robust and reasonable
- Suitable offsets must have transparent governance arrangements including being able to be readily measured, monitored, audited and enforced.

4.3 WA Environmental Offset Policy (GoWA, 2011)

The WA Environmental Offsets Policy (GoWA, 2011) requires the following Principles are considered when developing an offset proposal:

- Environmental offsets will only be considered after avoidance and mitigation options have been pursued

- Environmental offsets are not appropriate for all projects
- Environmental offsets will be cost-effective, as well as relevant and proportionate to the significance of the environmental value being impacted
- Environmental offsets will be based on sound environmental information and knowledge
- Environmental offsets will be applied within a framework of adaptive management
- Environmental offsets will be focussed on longer term strategic outcomes.

4.4 Residual impact

Residual impacts associated with the Proposal have been determined through application of the residual impact significance model detailed in the WA Environmental Offsets Guidelines (GoWA, 2014). Residual impacts for which Main Roads proposes environmental offsets are detailed in Table 4-1.

Table 4-1 Residual environmental impacts requiring offset

ENVIRONMENTAL ATTIBUTE	RESIDUAL IMPACT
Western Ringtail Possum habitat	43.9 ha
Brush-tailed Phascogale habitat	17.7 ha
Black Cockatoo (Carnaby's and Baudin's Cockatoo and the Forest Red-tailed Black Cockatoo) habitat	37.8 ha
Banksia Woodlands of the SCP TEC	3.7 ha
'Herb rich shrublands in clay pans (FCT03) TEC	0.6 ha

Main Roads has pursued a number of options in developing a package of offsets to counterbalance these residual impacts. The options investigated have comprised acquisition of land providing fauna habitat, creation of fauna habitat by on ground rehabilitation and provision of research funding. Several of the proposed offset sites will address the requirement for more than one offset attribute ie provision / creation of habitat for WRP, Black Cockatoos and BTP at a single site (Offsets 1, 2 and 3).

Table 4-2 provides an overview of the offset package under consideration, with offset property locations presented in Figures 6 and 7.

Table 4-2 Overview of proposed offset package

NO.	OFFSET TYPE	OFFSET SUMMARY	PROPERTY LOCATION	EXISTING TENURE
1	Land Acquisition	55 ha of existing native vegetation providing : • Banksia Woodlands of the SCP (BWSCP) TEC (to be confirmed) • WRP habitat • SW Brush-tailed Phascogale habitat • Black Cockatoo habitat	Lot 2 Boyanup Picton Road	Freehold owned by the Commissioner of Main Roads
2	On-ground Management	Revegetation of 45 ha to provide habitat for WRP, BTP and Black Cockatoo species	Lot 104 Willinge Drive, Davenport	Freehold owned by the Commissioner of Main Roads

3	On-ground Management	Revegetation of 90 ha to provide habitat for WRP and Black Cockatoo species	Ludlow State Forest (SF No. 2)	Vested in the Conservation and Parks Commission
4	Land Acquisition	Purchase of land supporting 1.07 ha of herb rich clay pans of the SCP (FCT08)	Confidential	Privately owned freehold land
5	Research Projects	Research projects are appropriate as an offset for the Proposal as there was a high degree of uncertainty regarding impacts of a Proposal and new science was required to develop better mitigation measures or predictive tools to avoid and minimise the particular type of impact Funding contribution to undertake a WRP Regional Survey. Objective of research was to better understand the Western Ringtail Possum population in the WA southwest through rigorous and robust field assessments.		

4.5 Description of offsets

The components of the offset package are described below. Offset 1 has been subject to some detailed survey which has confirmed the presence of WRP, Black Cockatoo and BTP. Additional surveys are proposed for 2020 to confirm the extent of Banksia woodlands TEC/PEC.

4.5.1 Offset 1 – Lot 2 Boyanup Picton Road

Offset 1 comprises a 55 ha portion of Lot 2 Boyanup Picton Road (previously Lot 102 then Lot 5) which is shown at Figure 6 (Appendix A). Lot 2 is owned freehold by the Commissioner of Main Roads and was acquired with the intention of utilising the site vegetation as an offset for the BORR project A 22.3 ha portion was set aside as an offset for the existing BORR Stage 1 (BORR Central) constructed in 2013. Lot 2 directly abuts the existing BORR Central section of the current Proposal.

After purchase, Main Roads initiated the re-zoning of the property from rural to Regional Open Space under the Greater Bunbury Region Scheme (GBRS).

The property has been assessed by ground survey and has been shown to support habitat for, and a population of both WRP and BTP (Biota, 2019). Lot 2 was used as a survey site for the WRP Regional Survey and is also used as a research site by the University of Western Australia for zoology students. The property has been shown to provide foraging habitat and potential breeding and roosting sites for Black Cockatoo species (GHD, 2014).

A site survey conducted in October 2013 (GHD, 2014) identified six main vegetation types within the property including:

- Dense Banksia woodland
- Jarrah, Marri, *Banksia ilicifolia* and Melaleuca woodland
- Agonis, Jarrah, Marri and *Banksia ilicifolia* woodland.

Additional site assessment is proposed in spring 2020 to confirm the proposed offset area vegetation conforms to Banksia woodland TEC / PEC.

Lot 2 was identified by the EPA (2008), being part of Investigation Area 11 as comprising regionally significant vegetation. The lot forms part of Recommendation Area B which the EPA (2008) recommended be reserved as Regional Open Space.

Main Roads propose that Offset 1 comprise a 55 ha portion of Lot 2 to address offset requirements for WRP, BTP, Black Cockatoo habitat and Banksia Woodland TEC.

4.5.2 Offset 2 – Lot 104 Willinge Drive Davenport

Lot 104 is also owned freehold by the Commissioner of Main Roads and was purchased as a potential sand source and environmental offset site. Lot 104 occurs as two land parcels bisected by the existing BORR central section. Offset 2 comprises a portion of the 79.6 ha southern portion of the property.

Lot 104 is zoned as rural under the GBRS.

The majority of the property was previously the used as a commercial Blue Gum plantation with the timber harvested in 2017 and the land now essentially cleared with some small patches of remnant vegetation. Vegetation and flora assessment of the remnant vegetation over a portion of the proposed offset site (Ecoedge, 2017) noted that the Lot supports approximately 15 ha of good to degraded remnant native vegetation comprising:

- Jarrah, Marri, Peppermint and *Banksia attenuata* woodland.
- Jarrah, Peppermint and Banksia woodland
- Eucalyptus rudis and Corymbia calophylla over Melaleuca rhaphiophylla Woodland

The remnant vegetation within the proposed offset area has been shown to support a population of WRP (Biota, 2020).

The proposed offset site abuts the Preston River (to the west) and is traversed east to west by Gavins Gully (Reserve 31 866), which provides a vegetated linkage across the property from the east to the Preston River. The riparian woodland of the Preston River is represents a habitat linkage for WRP and BTP. The riverine woodland provides a corridor to a number of widely separated reserve areas occurring outside the Referral Area (e.g. Manea Park and Franklandia Nature Reserve) (Biota, 2019a).

As noted above, much of Lot 104 was previously used for a commercial Blue Gum operation with the timber being harvested in 2017 and the area now cleared. Main Roads proposes to rehabilitate and revegetate a 55 ha portion of the property to provide habitat for WRP, BTP and Black Cockatoo species. Revegetation flora species will be selected to provide habitat and foraging vegetation suitable for these fauna species and will be based on site parameters and selected in consultation with DBCA . This reflects the approach for similar offset revegetation works by Main Roads in the region.

Revegetation completion criteria will be determined with EPA based on advice from DBCA.

Main Roads may excavate sand from the cleared areas of the Lot prior to implementing revegetation and rehabilitation works.

4.5.3 Offset 3 – State Forest No. 2

Offset 3 comprises the proposed revegetation of a 90 ha area of a degraded portion of State Forest No. 2 (SF No. 2) which is located approximately 10-15 km east of the Busselton town centre, and is the focus of an on-going revegetation program. The site is 35-40 km from the Proposal Area and also within the Swan Coastal Plain IBRA sub-region.

The proposed rehabilitation works are congruent with the objectives of the Tuart Forest National Park Management Plan (TFNPMP) (Department of Parks and Wildlife, 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 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."

The exact location of the 90 ha revegetation site/s is yet to be agreed with DBCA, although Main Roads has 'in principle' agreement with DBCA to conduct additional offset revegetation works in SF No. 2. Potential offset areas are shown at Figure 7 (Appendix A).

The proposed offset is congruent with similar environmental offsets within SF No. 2 negotiated by Main Roads with DBCA, DWER and DoEE for other road projects. Similar to Offset 2 plant species will be selected to provide habitat for offset target species based on site parameters. Seed and seedling species will be selected in consultation with DBCA as per similar Main Roads offsets in SF 2.

Completion criteria will be determined with EPA based on advice from DBCA in line with existing Main Roads revegetation environmental offset sites if SF 2.

Main Roads proposes to rehabilitate and revegetate a 90 ha portion of State Forest No. 2 to provide habitat for WRP and Black Cockatoo species.

4.5.4 Offset 4 – Land Acquisition

Main Roads is currently investigating the purchase of a 1.3 ha privately owned property that has been determined through ground survey (Ecoedge, 2019b) to support vegetation that represent Claypan ecological communities. Site surveys conducted in 2019 did not clearly define the exact FCT that is present on the site, although indications are that it supports 1.07 ha of FCT08. Additional survey will be conducted in 2020 in consultation with DBCA to confirm the ecological community that is present.

Should the above offset site not be realised, Main Roads will further consult with DBCA to identify suitable offset FCT08.

4.5.5 Offset 5 – Western Ringtail Possum Regional Survey

Main Roads has funded research on WRP through the a WRP Regional Survey. The survey included sites over the range of the species from the Swan Coastal Plain, Cape to Cape Region, Southern Forests and Great Southern (Albany area).

The survey methodology included line survey distance sampling as agreed with the West Australian Western Ringtail Possum Recovery Team The purpose of the survey was to develop a robust abundance estimate of the survey sites, and a consistent approach to estimating WRP abundance.

The survey was aimed to significantly improve understanding of the conservation status of this species and redress the knowledge gap identified as a key threatening process in line with recommendations of the WRP Recovery Plan (Department of Parks and Wildlife, 2017).

Main Roads have funded the survey to a total of approximately $834, 000 for the WRP survey population research. It is proposed that funding for the survey provides a 10% indirect offset for the Proposal's significant residual impacts to WRP.

5 OFFSET GUIDE INPUTS AND JUSTIFICATION

Preliminary offset calculations have been based on the Commonwealth DoEE Environmental Offset Calculator and EPBC Offset assessment guide.

The offset values for Offsets 1-4 have been based on the available information for each of the proposed offset properties. These sites have been subject to some field survey, with further investigations proposed in spring 2020 to confirm earlier site assessments in respect to Banksia Woodland of the Swan Coastal TEC/PEC and Herb rich Claypans FCT08 TEC.

Given the habitat within the Proposal Area is likely to be used by all three Black Cockatoo species, rather than attempting to specify how much each species uses each offset site, for the purposes of calculating the offsets for impacts on the three Black Cockatoo species, the offset calculation was undertaken using the highest value for any of the attributes for any one of the three species ie 'endangered'.

Offset calculations are included at Appendix B for reference.

5.1 Western Ringtail Possum

Table 5-1 to Table 5-4 provide the inputs used in the EPBC Offset Assessment Guide in relation to WRP.

Table 5-1 Impact calculator – Western Ringtail Possum

ATTRIBUTE	VALUE	JUSTIFICATION
Area of impact	44 ha	Site assessments and the Proposal design have been used to identify the quanta of WRP impacted by the project.
Quality	8	
Site Condition		Site supports habitat for, and known population of WRP as identified through field surveys.
Site Context		Habitat values vary over the length of the Proposal from habitat patches up to some 10ha to individual paddock trees.
Species stocking rate		Site contains evidence of use by WRP as assessed by field survey.

Table 5-2 Offset calculator – Western Ringtail Possum – Site 1 (Lot 2 Boyanup Picton Rd, Davenport)

ATTRIBUTE	VALUE	JUSTIFICATION
Offset area (ha)	55	
Start Quality	8	Site supports known habitat for and a population of WRP as identified through field surveys (Biota, 2019a).
Future quality without offset	6	Loss of habitat quality due to lack of site management ie impacts through illegal firewood cutting, bushfire, weeds and feral animals.
Future quality with offset	8	Site management (fencing and access management, weed control, firebreaks and feral animal control) to maintain/improve habitat quality.
Time over which loss is averted (years)	20	Site will be managed (risk mitigation) for conservation purposes for the long term (maximum 20 years)
Time until ecological benefit (years)	1	Land has been purchased and is being managed for conservation purposes
Risk of loss without offset (%)	15	Previous zoning and land use was rural with the property used for grazing cattle.

ATTRIBUTE	VALUE	JUSTIFICATION
Risk of loss with offset (%)	5	Main Roads purchased the property and initiated rezoning from rural to Regional Open space under the GBRS. The lot has been actively managed for conservation purposes to maintain / improve WRP habitat quality including weed and feral animal control, fencing and the installation of firebreaks.
Confidence in result (%)	80	High level of certainty of habitat attributes being retained and property being managed for conservation purposes in the long term.
% of impact offset	22.6	

Table 5-3 Offset calculator – Western Ringtail Possum – Site 2 (Lot 104 Willinge Drive Revegetation)

ATTRIBUTE	VALUE	JUSTIFICATION
Offset area (ha)	45	Revegetation of cleared portion of Lot 104
Start Quality	0	Site is currently mainly cleared with small isolated patches of remnant vegetation
Future quality without offset	0	The property is zoned as rural under the GBRS and could be on sold for rural activity. Site is unlikely to be revegetated to provide WRP habitat by a third party.
Future quality with offset	6	Revegetation with species suitable to create habitat for WRP and provide linkages to existing remnant vegetation. Site management (fencing and access management, weed control, firebreaks and feral animal control) to improve habitat quality.
Time over which loss is averted (years)	20	Site will be managed (risk mitigation) for conservation purposes for the long term (maximum 20 years)
Time until ecological benefit (years)	10	10 years to allow for revegetation works to provide WRP habitat after implementation.
Risk of loss without offset (%)	40	The property is zoned as rural under the GBRS and could be on sold for rural activity. Site is unlikely to be revegetated to provide WRP habitat by a third party.
Risk of loss with offset (%)	5	After revegetation the property will be actively managed for conservation to improve WRP habitat quality including weed and feral animal control, fencing and the installation of firebreaks. Main Roads will seek rezoning to Regional Open Space under GBRS. Revegetation completion criteria will ensure habitat creation.
Confidence in result (%)	80	High level of certainty of habitat WRP attributes being created through compliance with completion criteria.
% of impact offset	23.3	

Table 5-4 Offset calculator – WRP – Site 4 (State Forest No. 2 Revegetation)

ATTRIBUTE	VALUE	JUSTIFICATION
Offset area (ha)	90	Revegetation of heavily degraded portion of State Forest No. 2
Start Quality	1	Site is likely to have low value WRP habitat values.
Future quality without offset	1	Site is unlikely to be revegetated by a third party in the short term.
Future quality with offset	6	Revegetation with species suitable to create habitat for WRP and provide linkages to existing remnant vegetation. Site management (fencing and access management, weed control, firebreaks and feral animal control) to improve habitat quality.
Time over which loss is averted (years)	20	Site will be managed (risk mitigation) for conservation purposes for the long term (maximum 20 years)
Time until ecological benefit (years)	10	10 years to allow for revegetation works to provide WRP habitat after implementation.
Risk of loss without offset (%)	30	The site is unlikely to revegetated by a third party in the short term
Risk of loss with offset (%)	5	After revegetation the property will be actively managed to improve habitat quality including weed and feral animal control, fencing and the installation of firebreaks. Revegetation completion criteria will ensure habitat creation to a suitable standard.
Confidence in result (%)	80	High level of certainty of habitat WRP attributes being created through compliance with completion criteria.
% of impact offset	38.5	

In addition to the above proposed offsets, Main Roads is seeking a 10% offset for the WRP Regional Survey.

A combination of the proposed offsets (Lot 2 vegetation, Lot 104 revegetation, State Forest No. 2 revegetation and the WRP Regional survey) exceeds the 100% offset requirement.

5.2 Black Cockatoo

Table 5-5 to Table 5-8 provide the inputs used in the EPBC Offset Assessment Guide in relation to Black Cockatoo.

Table 5-5 Impact calculator – Black Cockatoo

ATTRIBUTE	VALUE	JUSTIFICATION
Impact area (ha)	38	Site assessments and the Proposal design have been used to identify the quanta of Black Cockatoo habitat impacted by the project. Offset requirement calculated based on Carnaby's Cockatoo (endangered)
Quality	8	
Site Condition		Site supports known foraging species for Black Cockatoos and potential nest hollows as identified through field surveys (Biota, 2019a).
Site Context		Site occurs within the known range of these species. Habitat values vary over the length of the Proposal from vegetation patches to individual paddock trees.

ATTRIBUTE	VALUE	JUSTIFICATION
Species stocking rate		Site contains evidence of use by Black Cockatoos species as determined by field survey

Table 5-6 Offset calculator – Black Cockatoos – Site 1 (Lot 2 Boyanup Picton Rd)

ATTRIBUTE	VALUE	JUSTIFICATION
Offset area (ha)	55	
Start Quality	8	Site supports known foraging species for Black Cockatoo and potential nest hollows as identified through field surveys
Future quality without offset	6	Loss of habitat quality due to lack of site management ie impacts through illegal firewood cutting, bushfire, weeds and feral animals
Future quality with offset	8	Site management (fencing and access management, weed control, firebreaks and feral animal control) to maintain/improve habitat quality.
Time over which loss is averted (years)	20	Site will be managed (risk mitigation) for conservation purposes for the long term (maximum 20 years)
Time until ecological benefit (years)	1	Land has been purchased and managed for conservation purposes
Risk of loss without offset (%)	15	Previous zoning and land use was rural with the property used for grazing cattle.
Risk of loss with offset (%)	5	Main Roads purchased the property and initiated rezoning from rural to Regional Open space under the GBRS. The lot has been actively managed for conservation purposes to maintain / improve WRP habitat quality including weed and feral animal control, fencing and the installation of firebreaks.
Confidence in result (%)	80	High level of certainty of habitat attributes being retained and property being managed for conservation purposes in the long term.
% of impact offset	33.4	

Table 5-7 Offset calculator – Black Cockatoos – Site 2 (Lot 104 Revegetation)

ATTRIBUTE	VALUE	JUSTIFICATION
Offset area (ha)	45	Revegetation of cleared portion of Lot 104
Start Quality	0	Site is cleared of habitat
Future quality without offset	0	Site is unlikely to be revegetated by a third party
Future quality with offset	6	Revegetation with species suitable to create habitat for the Black cockatoos Site management (fencing and access management, weed control, firebreaks and feral animal control) to improve quality
Time over which loss is averted (years)	20	Site will be managed (risk mitigation) for conservation purposes for the long term (maximum 20 years)
Time until ecological benefit (years)	10	Development of revegetation species to provide foraging habitat 5 years after implementation.
Risk of loss without offset (%)	40	The site is unlikely to revegetated by a third party. Potential to return to pasture and sell to private buyer for agriculture.
Risk of loss with offset (%)	5	After revegetation the property will be actively managed to improve habitat quality including weed and feral animal control, fencing and the installation of firebreaks.

ATTRIBUTE	VALUE	JUSTIFICATION
		Revegetation completion criteria will ensure habitat creation.
Confidence in result (%)	80	High level of certainty of habitat attributes being created through compliance with completion criteria.
% of impact offset	49.6	

Table 5-8 Offset calculator – Black Cockatoos – Site 4 (State Forest No. 2 Revegetation)

ATTRIBUTE	VALUE	JUSTIFICATION
Offset area (ha)	16	Revegetation of heavily degraded portion of Lot 104
Start Quality	1	Site is likely to be mainly cleared of habitat
Future quality without offset	1	Site is unlikely to be revegetated by a third party in the short term
Future quality with offset	6	Revegetation with species suitable to create habitat for the Black cockatoos Site management (fencing and access management, weed control, firebreaks and feral animal control) to improve quality
Time over which loss is averted (years)	20	Site will be managed (risk mitigation) for conservation purposes for the long term (maximum 20 years)
Time until ecological benefit (years)	10	Development of revegetation species to provide foraging habitat 5 years after implementation.
Risk of loss without offset (%)	30	The site is unlikely to revegetated by a third party in the short term. Site management will include fencing and access management, weed control, firebreaks and feral animal control to improve quality
Risk of loss with offset (%)	5	After revegetation the property will be actively managed to improve habitat quality including weed and feral animal control, fencing and the installation of firebreaks. Revegetation completion criteria will ensure habitat creation.
Confidence in result (%)	80	High level of certainty of habitat attributes being created through compliance with completion criteria.
% of impact offset	18.1	

A combination of the proposed offsets (Lot 5 vegetation, Lot 104 revegetation and State Forest No. 2 revegetation) exceeds the 100% offset requirement for Black Cockatoos.

5.3 Banksia Woodland of the Swain Coastal Plain TEC

Table 5-9 and Table 5-10 provide the inputs used in the EPBC Offset Assessment Guide in relation to Banksia Woodland of the Swan Coastal Plain (BWSCP) TEC.

Table 5-9 Impact calculator – Banksia Woodland of the Swan Coastal Plain TEC

ATTRIBUTE	VALUE	JUSTIFICATION
Area of impact (ha)	3.7	Site assessments and the Proposal design have been used to identify the quanta of Banksia Woodlands TEC impacted by the project.
Quality	7	
Site Condition		Site condition varies from degraded to excellent as detailed below: Excellent – Very Good: 0.15 ha

ATTRIBUTE	VALUE	JUSTIFICATION
		Good: 1.95 ha Good – Degraded: 0.13 ha Degraded: 1.51 ha 2.1 ha (57%) of the 3.7 ha TEC clearing area rated as in good or better condition
Site Context		The Banksia Woodlands TEC occur as small isolated stands within a highly disturbed landscape. The remnant patches have high edge to area ratios as shown at Figure 2
Species stocking rate		Clearing impact will result in the loss of 0.001% of the reported TEC extent, and 0.0045% in the Perth sub-region.

Table 5-10 Offset calculator – Banksia Woodland of the SCP TEC – Offset 1 (Lot 2 Boyanup Picton Rd)

ATTRIBUTE	VALUE	JUSTIFICATION
Offset Area (ha)	14.5	Site supports Banksia woodland (GHD, 2014). Additional survey proposed in 2020 to confirm are of Banksia Woodland TEC.
Start Quality	8	Majority of mapped Banksia woodland vegetation is in very good-excellent condition (GHD, 2014). Area proposed as offset to be confirmed through planned survey in 2020.
Future quality without offset	6	Loss of habitat quality due to lack of site management ie impacts through illegal firewood cutting, bushfire, weed invasion and feral animals.
Future quality with offset	8	Site management (fencing and access management, weed control, firebreaks and feral animal control) to maintain/improve habitat quality.
Time over which loss is averted (years)	20	Site will be managed (risk mitigation) for conservation purposes for the long term (maximum 20 years)
Time until ecological benefit (year)	1	Land has been purchased and is being managed for conservation purposes
Risk of loss without offset (%)	15	Previous zoning and land use was rural with the property used for grazing cattle.
Risk of loss with offset (%)	5	Main Roads purchased the property and initiated rezoning from rural to Regional Open space under the GBRS. The property has been actively managed for conservation purposes to maintain / improve WRP habitat quality including weed and feral animal control, fencing and the installation of firebreaks.
Confidence in result (%)	80	High level of certainty of habitat attributes being retained and property being managed for conservation purposes in the long term.
% of impact offset	103.5	

The proposed offset of 14.5 ha of Banksia Woodland occurring with Lot 2 Boyanup Picton Road exceeds the 100% offset requirement for Banksia Woodland TEC/PEC.

5.4 Herb Rich Shrublands on Clay Pans (FCT08) TEC

Table 5-11 and Table 5-12 provide the inputs used in the EPBC Offset Assessment Guide in relation to Herb Rich Shrublands on Clay Pans (FCT08) TEC.

Table 5-11 Impact calculator – Herb Rich Shrublands on Clay Pans TEC (FCT08)

ATTRIBUTE	VALUE	JUSTIFICATION
Area of impact (ha)	0.6	Site assessments and the Proposal design have been used to identify the quanta of Banksia Woodlands TEC impacted by the project.
Quality	5	
Site Condition		Site condition based on site assessment varies from degraded to very good as detailed below: Very Good: 0.332 ha Good: 0.171 ha Degraded: 0.123 ha 0.6 ha is in good or better condition.
Site Context		FCT 08 occurs as isolated remnants within road and rail reserves within a highly disturbed landscape. The remnant patches have very high edge to area ratios as shown at Figure 2.
Species stocking rate		Clearing will result in a reduction of up to approximately 2 % in the reported regional context of this TEC, and up to approximately 0.5 % of the recorded TEC within the greater Bunbury region.

Table 5-12 Herb Rich Shrublands on Clay Pans (FCT08) TEC – Offset 3 (Confidential private property acquisition)

ATTRIBUTE	VALUE	JUSTIFICATION
Area of impact (ha)	1.07	Site is suspected to support FCT08 (Ecoedge, 2019b).
Start Quality	7	Site condition varies from degraded to very good as detailed below: Very Good: 0.022 ha Good: 0.03 ha Degraded: 0.034 ha Completely degraded 1.146 ha 1.025 ha (96%) of the 1.07 ha of the site vegetation is in good or better condition.
Future quality without offset	4	The site is currently privately owned and zoned as rural under the GBRS. Abutting land uses comprise farming activities with an unsealed gravel road abutting the western boundary of the site. The property is currently not fenced. The vegetation has a high edge to area ration and is under threat from weed invasion via the adjacent land use. In the long term the vegetation will be further significantly degraded.
Future quality with offset	8	Site management will include (fencing and access management and weed control) to improve the site vegetation quality in the long term.

		Management will potentially include revegetation of the degraded 0.04 ha portion.
Time over which loss is averted (years)	20	Site will be managed (risk mitigation) for conservation purposes for the long term (maximum 20 years).
Time until ecological benefit (year)	1	Land will be purchased to managed for conservation purposes.
Risk of loss without offset (%)	15	The site is surrounded by agricultural land and is not actively managed for conservation.
Risk of loss with offset (%)	10%	Land will be purchased to managed for conservation purposes.
Confidence in result (%)	80	High level of confidence. The property will be purchased and actively managed for conservation purposes to improve habitat quality including fencing and weed control, with potential for revegetation.
% of impact offset	83.1%	

As noted above, with the application of this private property as an offset for the Proposal's residual impacts on FCT08 is does not fulfil the 100% offset requirement. Main Roads is further investigating additional offset options in consultation with DBCA.

6 COUNTERBALANCE OF SIGNIFICANT RESIDUAL IMPACTS

Table 6-1 provides a summary of the offset package to counterbalance the significant residual impacts to Banksia Woodlands of the SCP, Herb rich shrublands on Clay Pans (FCT08), Western Ringtail Possum (and BTP) and Black Cockatoo species.

Table 6-1 is based on preliminary offset calculations using the EPBC Act Offset Assessment Guide, as presented in Section 4 and Appendix B.

The offset package is expected to provide adequate compensation for significant residual impacts to those environmental attributes noted above apart from Herb rich shrublands of Claypans. Main Roads is currently investigating additional offset options in consultation with DBCA.

Table 6-1 Summary of preliminary offset calculations

PROPOSED OFFSET	OFFSET AREA	% OF OFFSET REQUIRED
Western Ringtail Possum (and Brush-tailed Phascogale) Impact: 44 ha of WRP habitat and 18 ha of BTP habitat		
Habitat on Lot 2 Boyanup Picton Road	55 ha	22.6
Revegetation of Lot 104 Willinge Drive	45 ha	23.3
Revegetation of State Forest No. 2	90 ha	45.3
WRP Regional Survey		10
Total Offset		**101.2**
Black Cockatoo Species Impact: 38 ha of Black Cockatoo habitat		
Habitat on Lot 2 Boyanup Picton Road	55 ha	33.4
Revegetation of Lot 104 Willinge Drive	45 ha	49.6
Revegetation of State Forest No. 2	16 ha	18.1
Total Offset		**101.1**
Banksia Woodlands TEC/PEC Impact: 3.7 ha		
Habitat on Lot 2 Boyanup Picton Road	14.5	103.5
Total		**103.5**

PROPOSED OFFSET	OFFSET AREA	% OF OFFSET REQUIRED
Herb rich Shrublands on Claypans Impact: 0.6 ha		
Purchase of private property supporting FCT08	1.07	**83.1**

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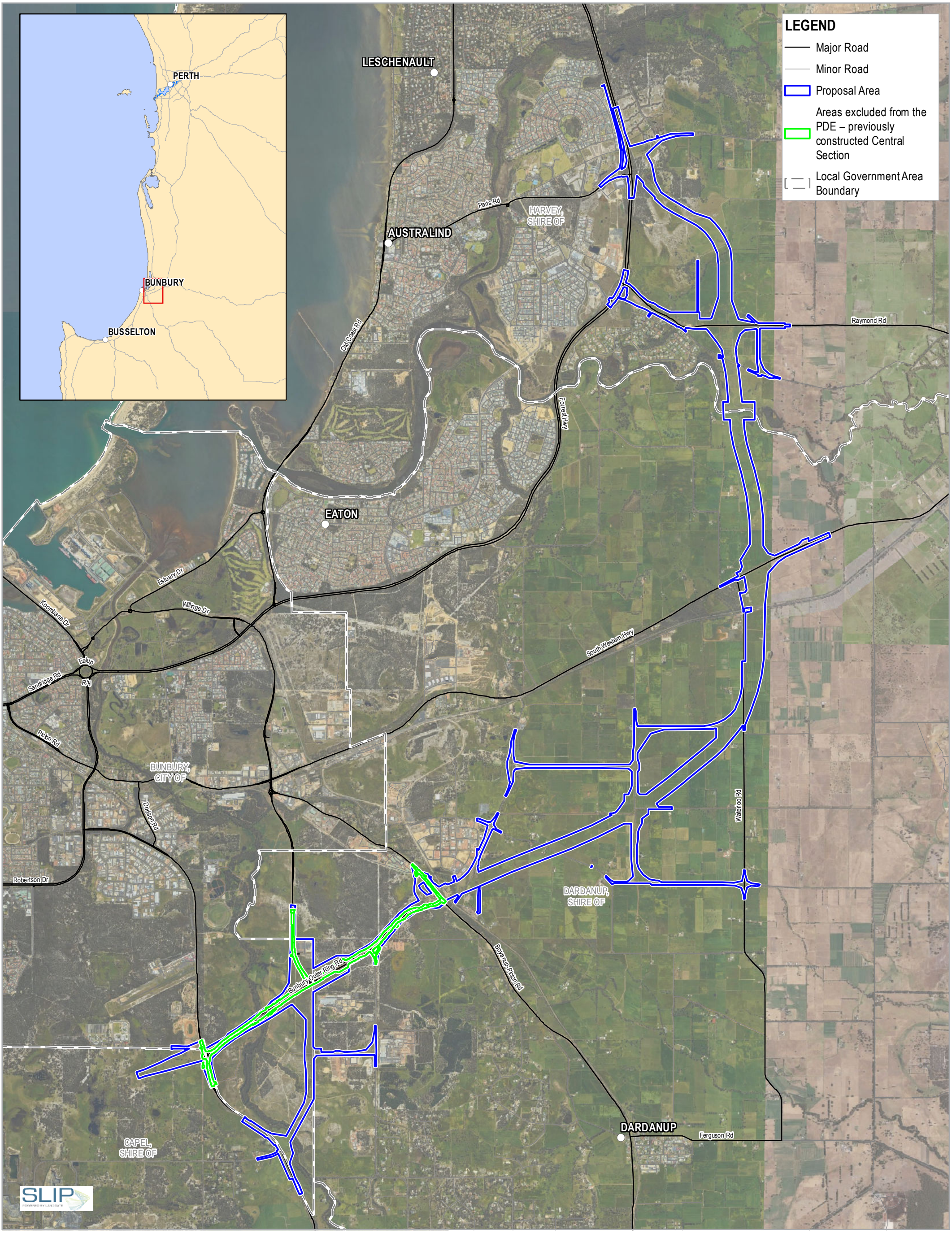
Appendix A

Figures



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Response to EPA Notice of Decision to Assess: Additional Information Request

Proposal Area

Project No. **61-37041**
Revision No. **0**
Date **06/11/2019**

FIGURE 1

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Response to EPA Notice of Decision to Assess: Additional Information Request

TEC and PEC extent within the Proposal Area

Project No.	**61-37041**
Revision No.	**0**
Date	**17 Dec 2019**

FIGURE 2

Data source: BORR team: North environmental survey area - 20191025, North referral boundary - 20191016, TEC/PEC - 201912; Landgate: Roads - 201805, Localities - 20180319, Imagery - WA Now accessed 20191217. Created by: mmikkonen

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Response to EPA Notice of Decision to Assess: Additional Information Request

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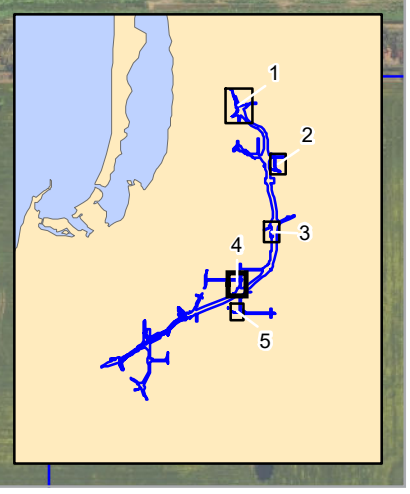
LEGEND

- Major road
- Herb rich shrublands on clay pans (TEC – Critically Endangered EPBC Act)
- BORR Northern and Central Section Referral Boundary

WATERLOO

Wireless Rd

Bell Rd



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Response to EPA Notice of Decision to Assess: Additional Information Request

TEC and PEC extent within the Proposal Area

Project No. **61-37041**
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Date **17 Dec 2019**

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LEGEND

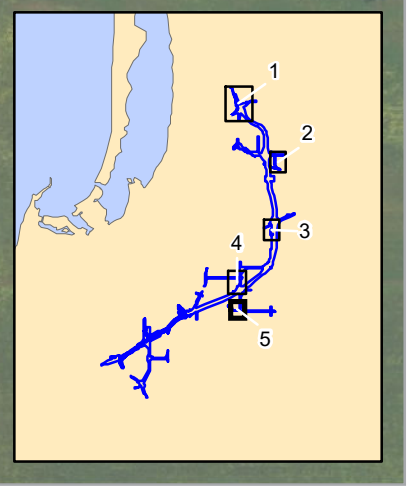
- Major road
- *Corymbia calophylla - Xanthorrhoea preissii* woodlands and shrublands of the Swan Coastal Plain
- BORR Northern and Central Section Referral Boundary

Wireless Rd

PARADISE

Harris Rd

Damiani Italiano Rd



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TEC and PEC extent within the Proposal Area

Project No. **61-37041**
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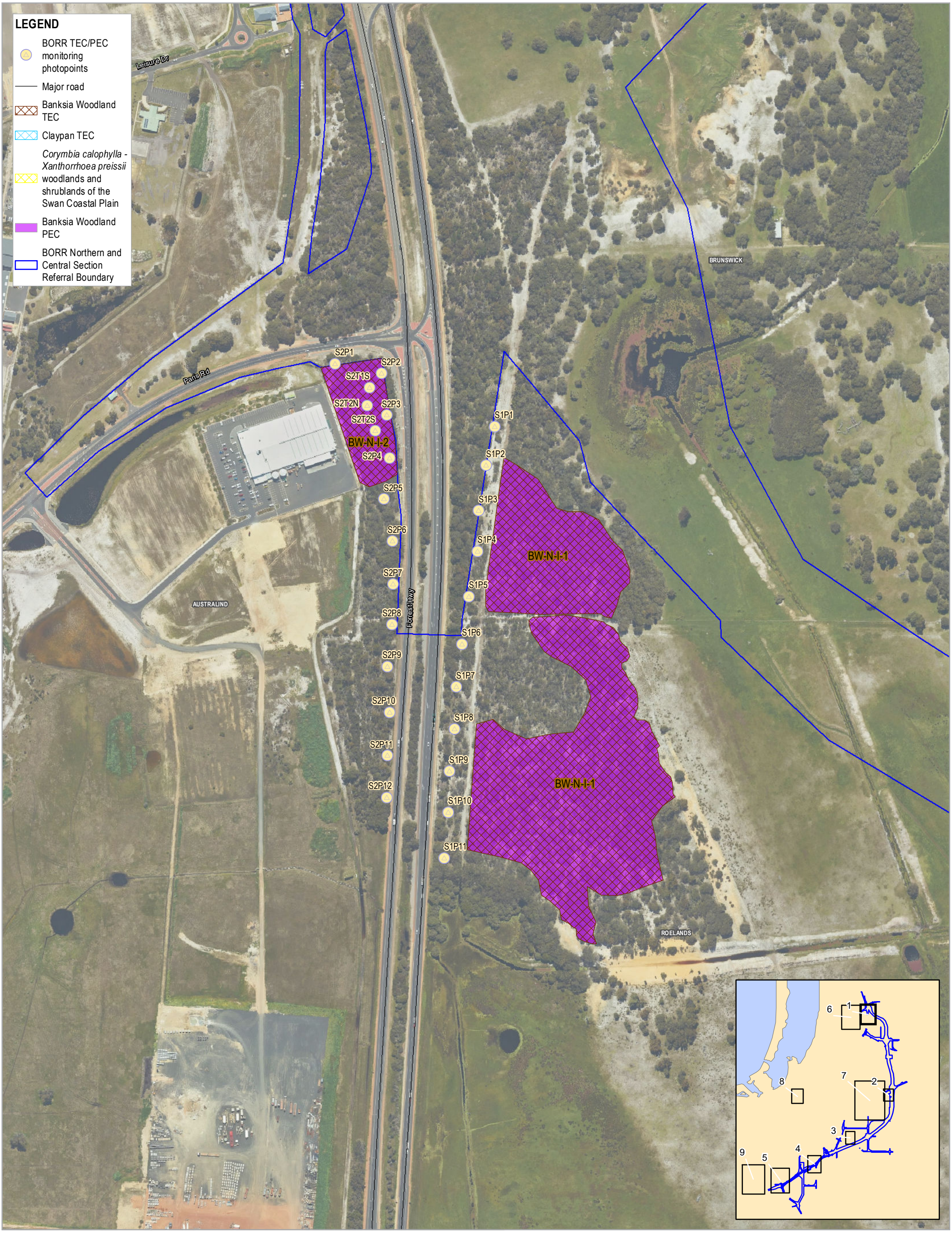

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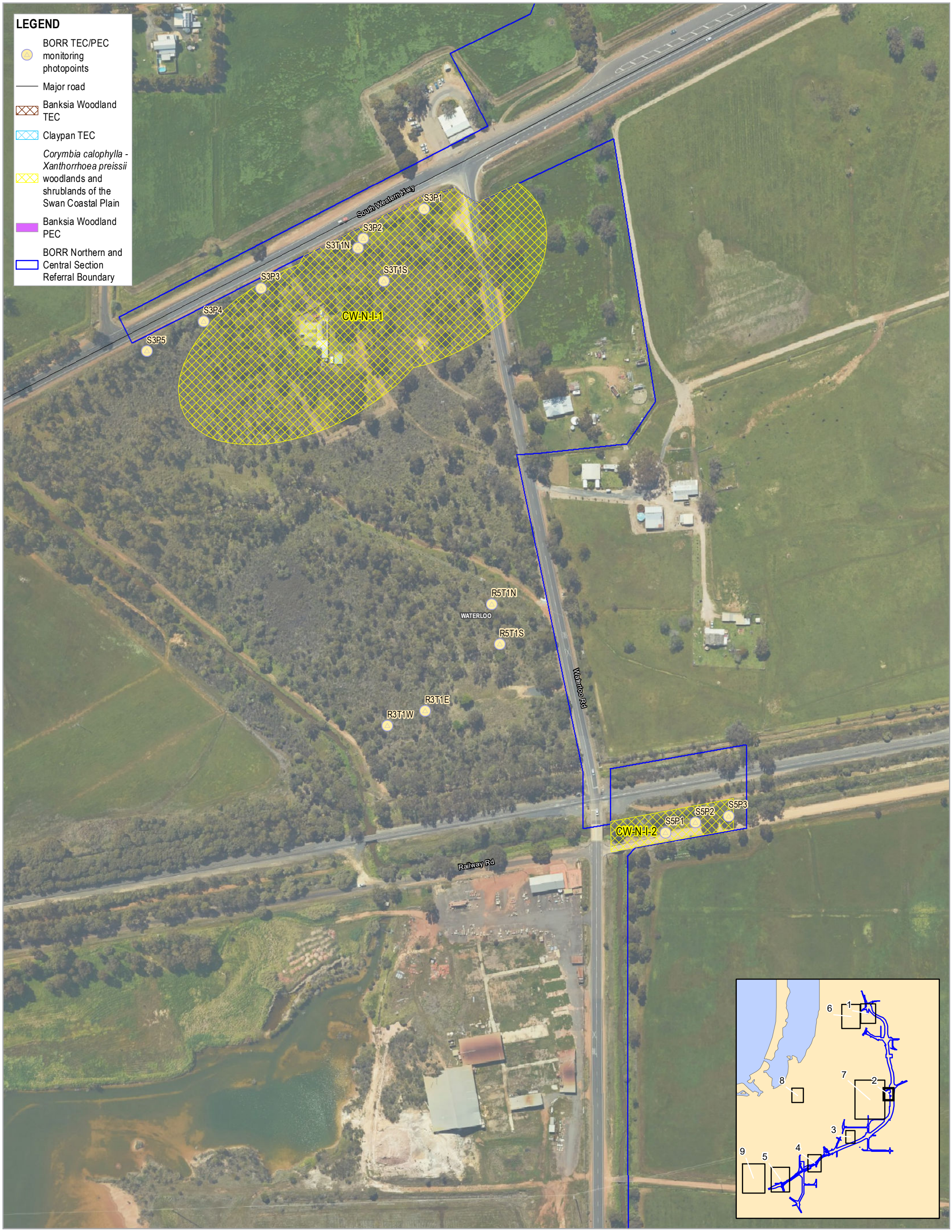
Bunbury Outer Ring Road Northern and Central Section
Response to EPA Notice of Decision to Assess: Additional Information Request

Threatened and priority ecological community monitoring sites

Project No. **61-37041**
Revision No. **0**
Date **31/01/2020**

FIGURE 3

Data source: BORR team: North referral boundary - 20191016, TEC/PEC Monitoring locations - 201912; Landgate: Roads - 201805, Localities - 20180319, Imagery - WA Now accessed 20200131. Created by: mmikkonen



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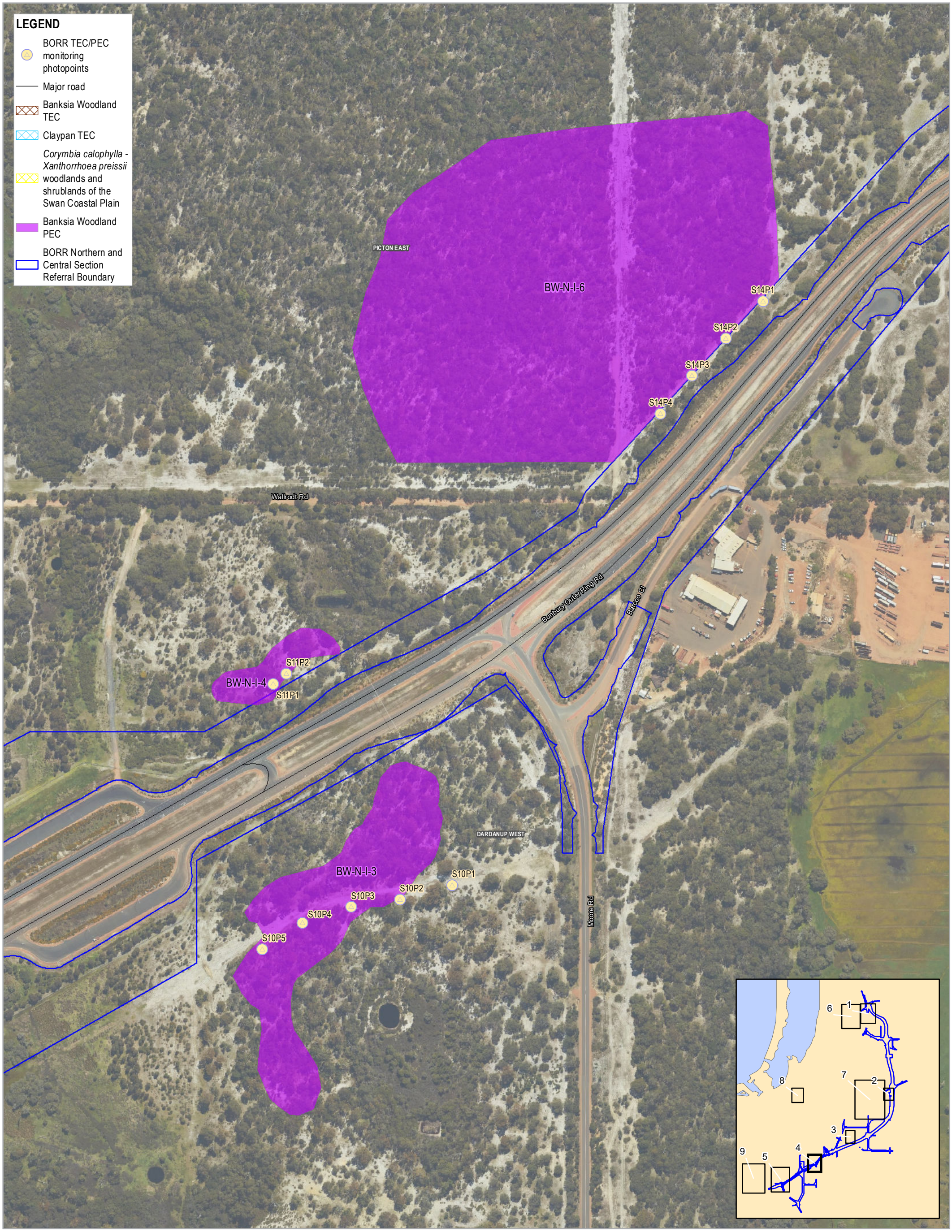

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Threatened and priority ecological community monitoring sites

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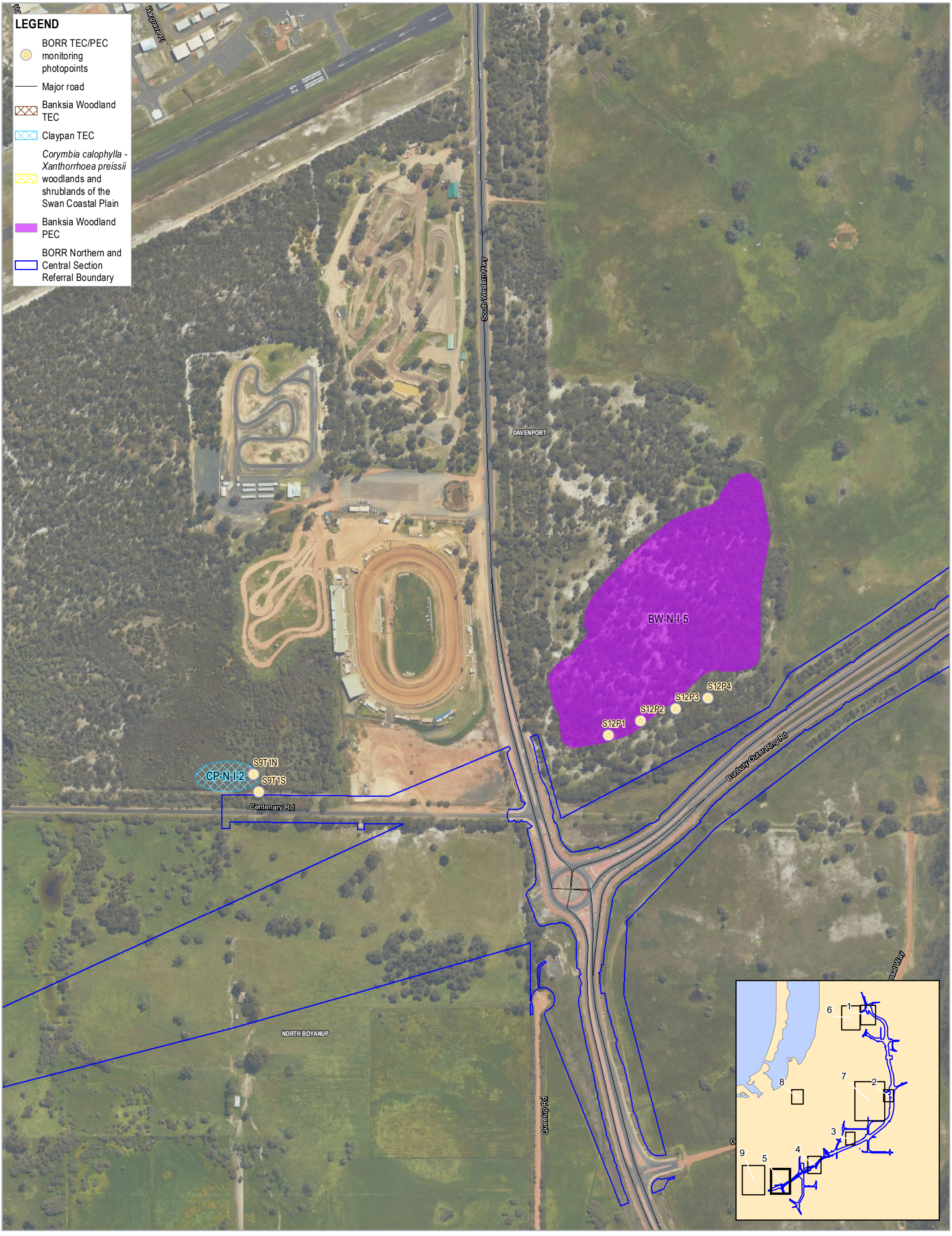

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Threatened and priority ecological community monitoring sites

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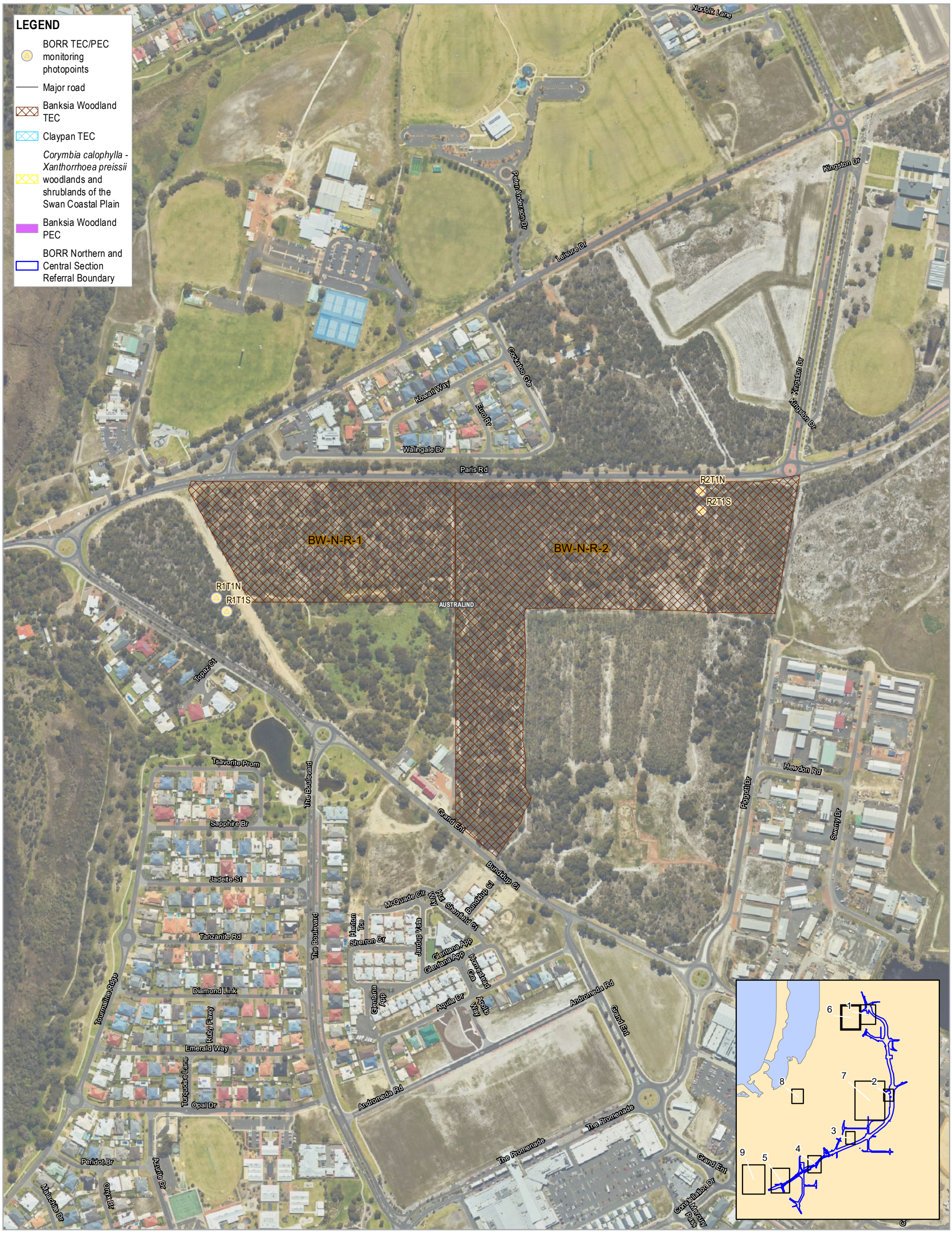
LEGEND

- BORR TEC/PEC monitoring photopoints
- Major road
- Banksia Woodland TEC
- Claypan TEC
- *Corymbia calophylla - Xanthorrhoea preissii* woodlands and shrublands of the Swan Coastal Plain
- Banksia Woodland PEC
- BORR Northern and Central Section Referral Boundary



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Response to EPA Notice of Decision to Assess: Additional Information Request

Threatened and priority ecological community monitoring sites

Project No. 61-37041
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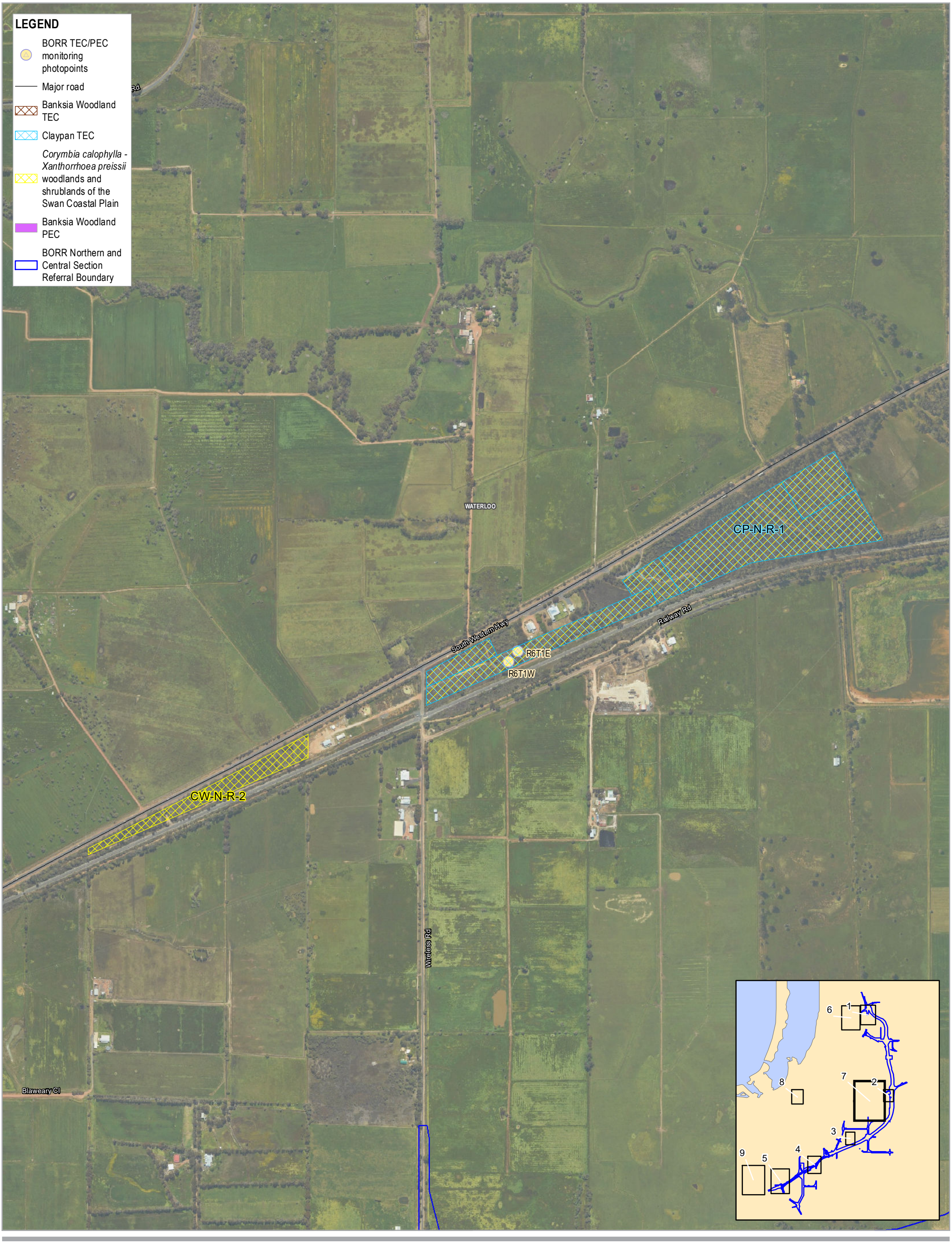

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Response to EPA Notice of Decision to Assess: Additional Information Request

Threatened and priority ecological community monitoring sites

Project No. **61-37041**
Revision No. **0**
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Response to EPA Notice of Decision to Assess: Additional Information Request

Threatened and priority ecological community monitoring sites

Project No. **61-37041**
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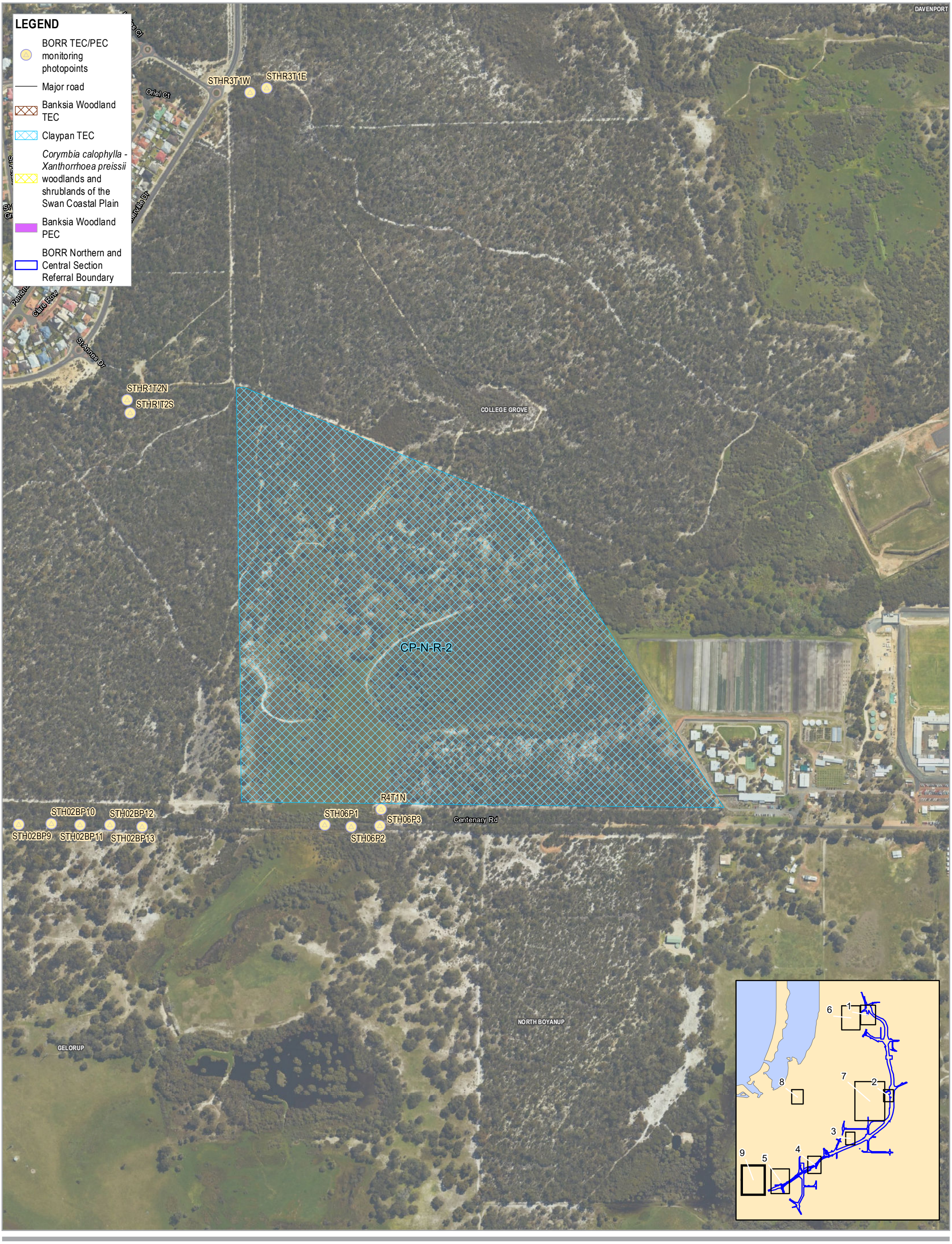

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Response to EPA Notice of Decision to Assess: Additional Information Request

Threatened and priority ecological community monitoring sites

Project No.	61-37041
Revision No.	0
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FIGURE 3

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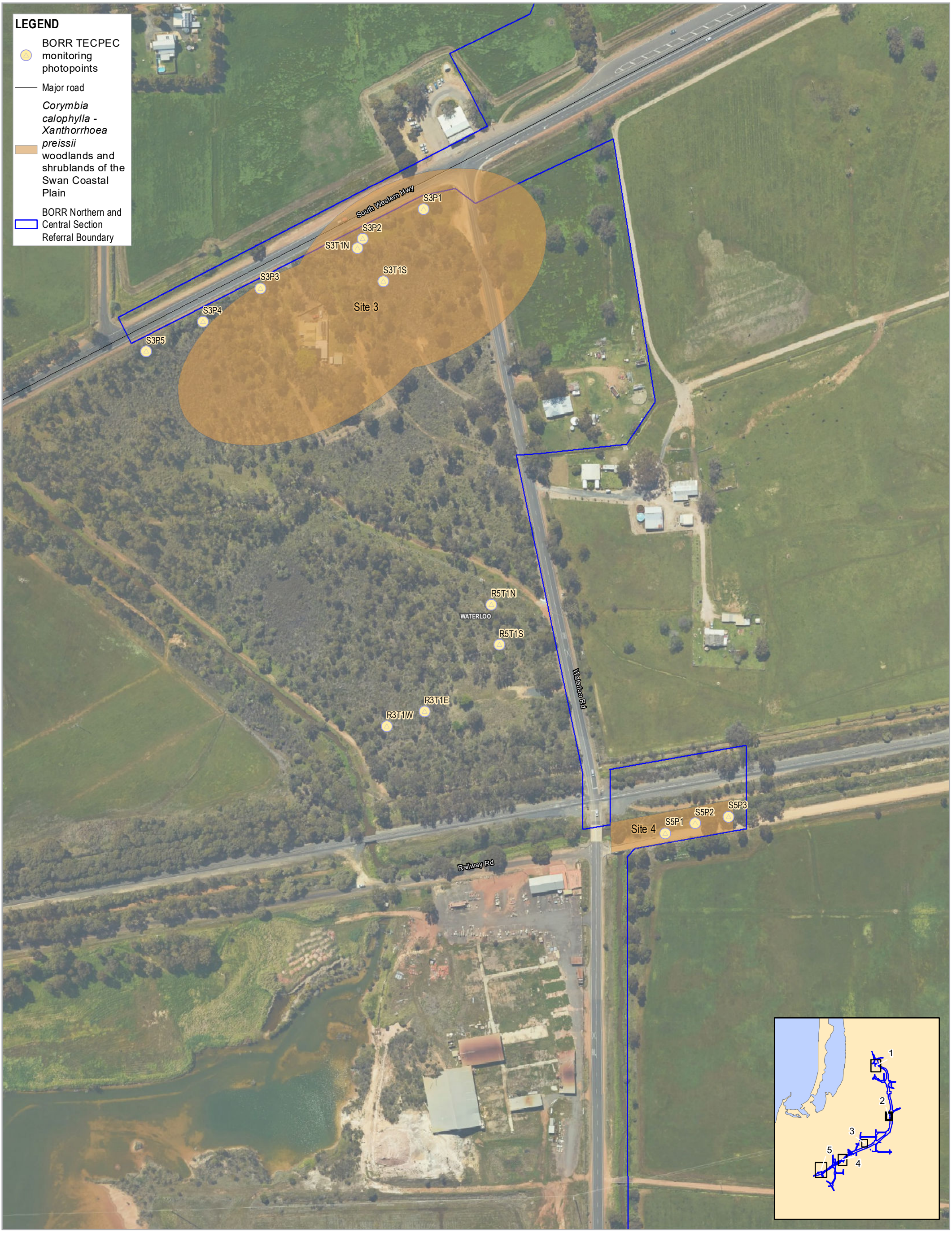
Bunbury Outer Ring Road Northern and Central Section
Response to EPA Notice of Decision to Assess: Additional Information Request

TEC and PEC extent adjacent to the Proposal Area

Project No.	**61-37041**
Revision No.	**0**
Date	**17 Dec 2019**

FIGURE 3

Data source: BORR team: North referral boundary - 20191016, TEC/PEC Monitoring locations - 201912; Landgate: Roads - 201805, Localities - 20180319, Imagery - WA Now accessed 20191217. Created by: mmikkonen



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Main Roads Western Australia
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Response to EPA Notice of Decision to Assess: Additional Information Request

TEC and PEC extent adjacent to the Proposal Area

Project No. **61-37041**
Revision No. **0**
Date **19 Dec 2019**

FIGURE 3

Data source: BORR team: North referral boundary - 20191016, TEC/PEC Monitoring locations - 201912; Landgate: Roads - 201805, Localities - 20180319, Imagery - WA Now accessed 20191217. Created by: mmikkonen

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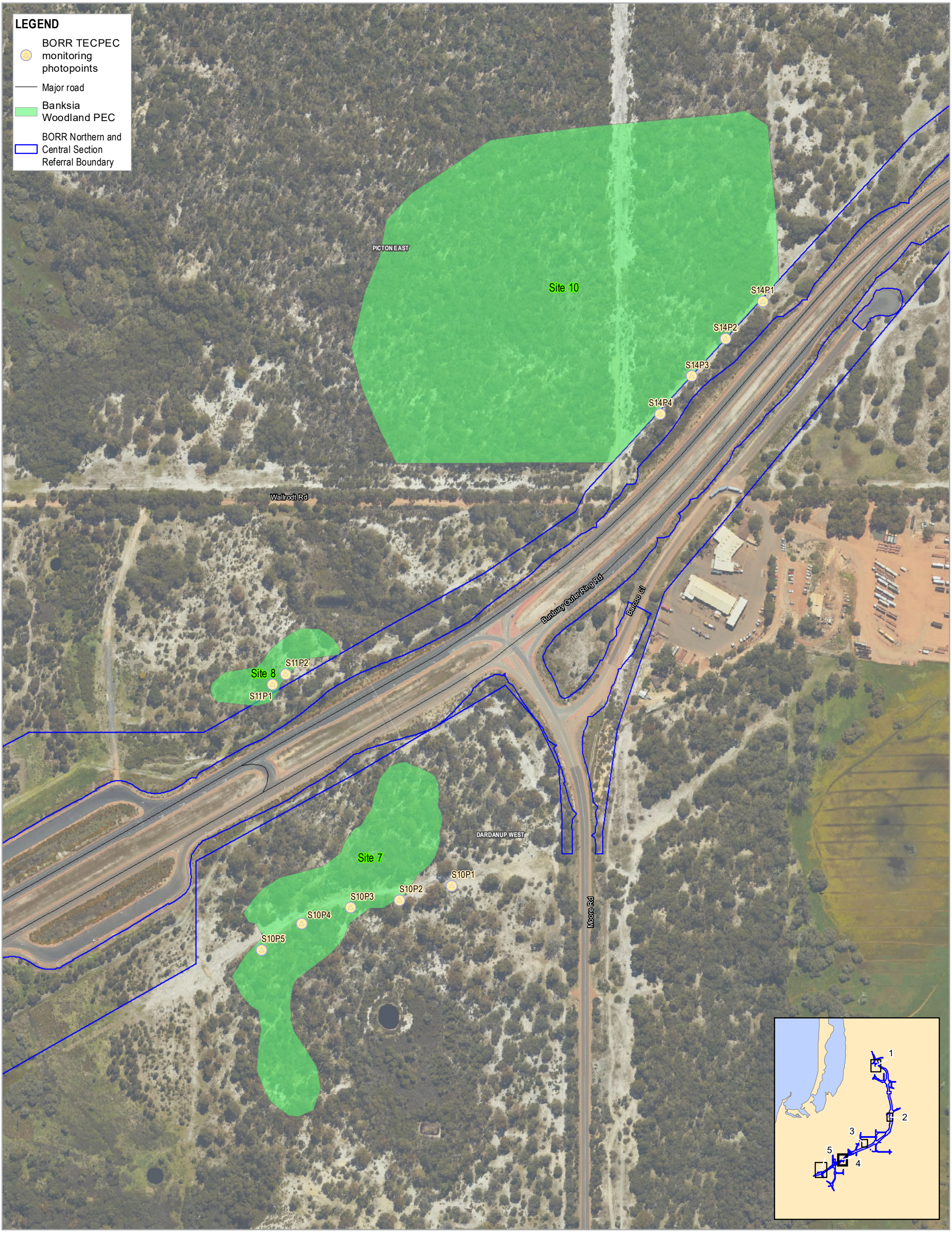
Main Roads Western Australia
Bunbury Outer Ring Road Northern and Central Section
Response to EPA Notice of Decision to Assess:
Additional Information Request

TEC and PEC extent adjacent to the Proposal Area

Project No. **61-37041**
Revision No. **0**
Date **17 Dec 2019**

FIGURE 3

Data source: BORR team: North referral boundary - 20191016, TEC/PEC Monitoring locations - 201912; Landgate: Roads - 201805, Localities - 20180319, Imagery - WA Now accessed 20191217. Created by: mmikkonen



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Main Roads Western Australia
Bunbury Outer Ring Road Northern and Central Section
Response to EPA Notice of Decision to Assess: Additional Information Request

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Project No. **61-37041**
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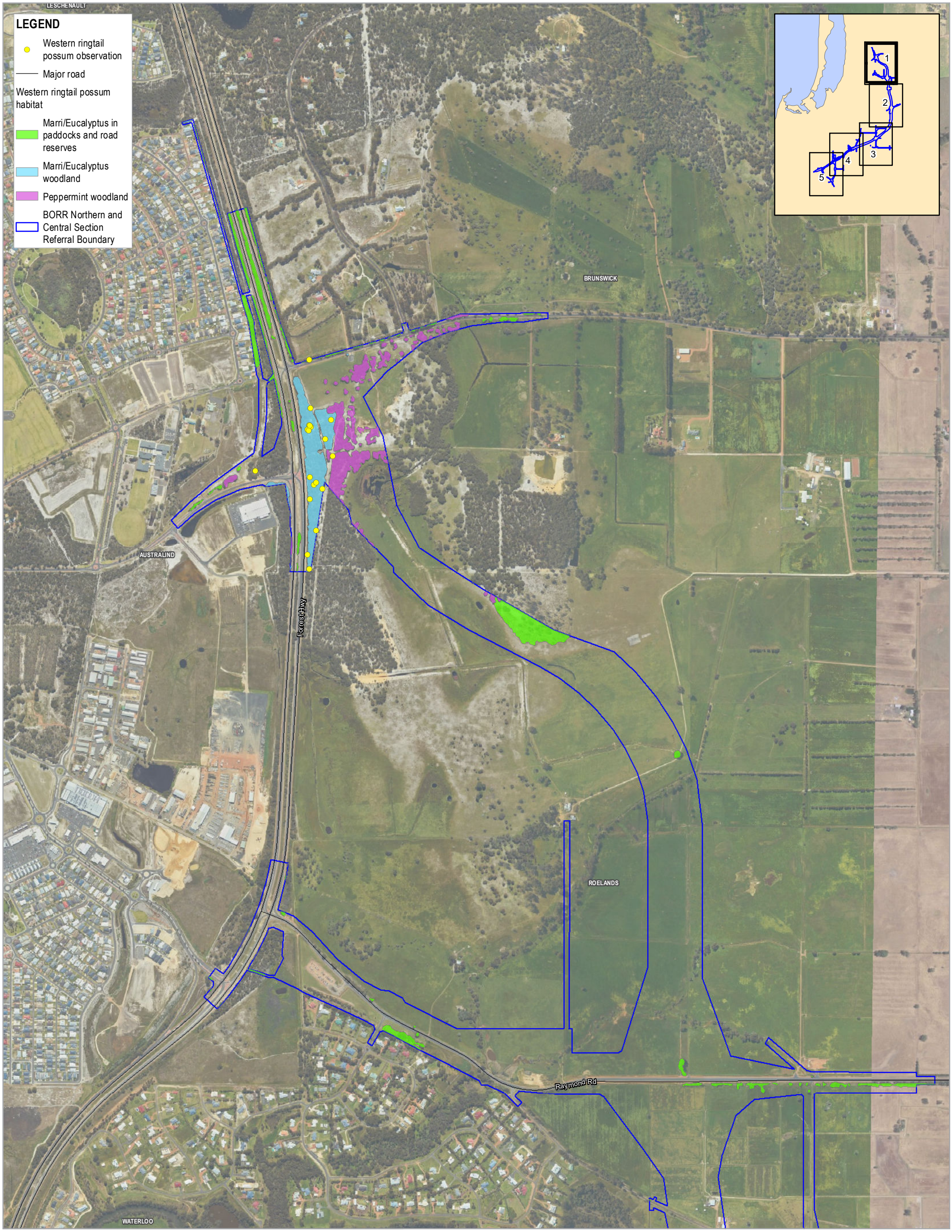
FIGURE 3

Data source: BORR team: North referral boundary - 20191016, TEC/PEC Monitoring locations - 201912; Landgate: Roads - 201805, Localities - 20180319, Imagery - WA Now accessed 20191217. Created by: mmikkonen



Paper Size ISO A3

0 100 200 300 400

Metres

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

N

Main Roads Western Australia
Bunbury Outer Ring Road Northern and Central Section
Response to EPA Notice of Decision to Assess:
Additional Information Request

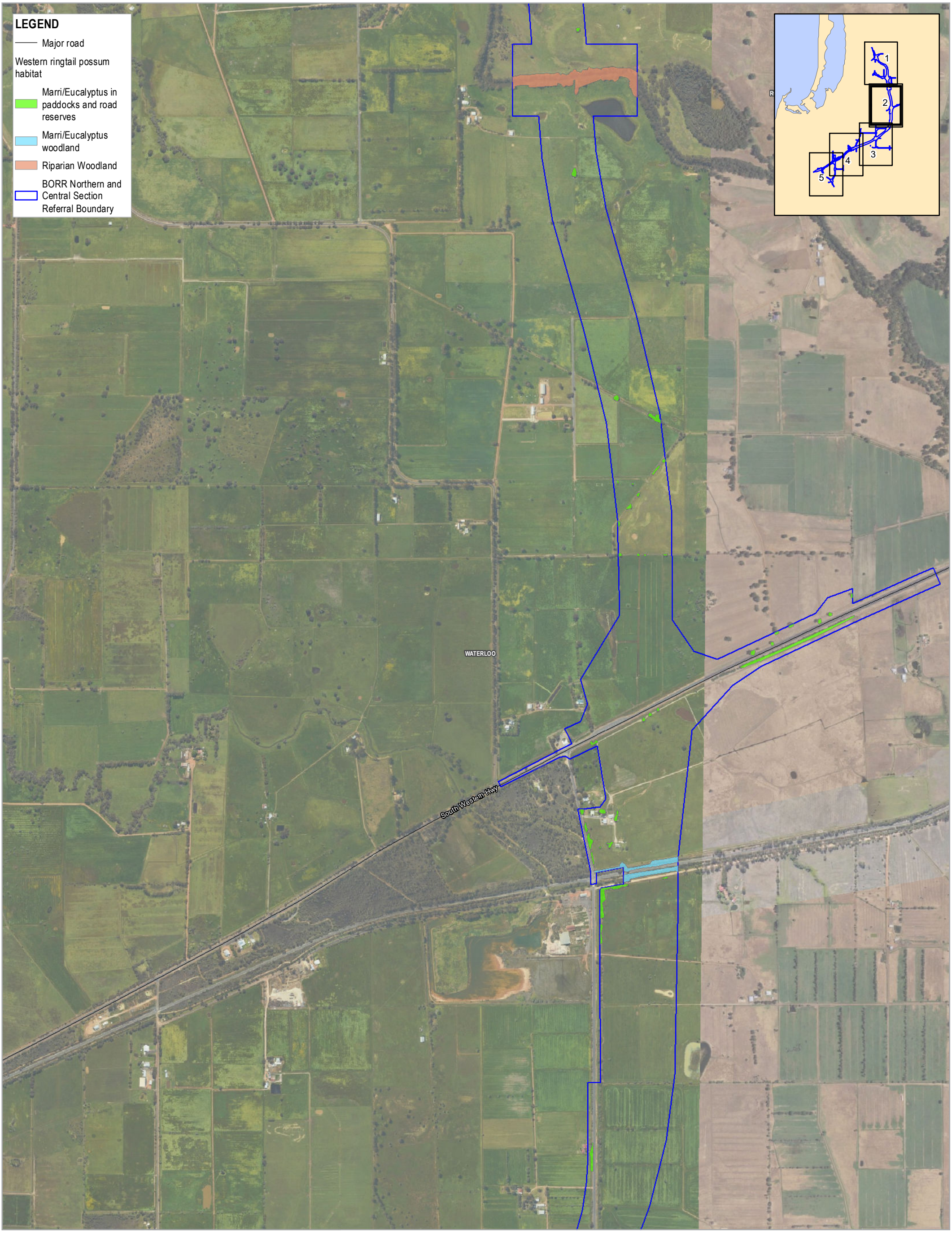
WRP observations and habitat types and extent within the Proposal Area

Project No. 61-37041
Revision No. 0
Date 18 Dec 2019

FIGURE 4

G:\61\37041\19_0_GIS\Maps\Working\BORRNorth_ARIFigures\6137041_006_WRP_Rev0.mxd
Print date: 18 Dec 2019 - 08:46

Data source: BORR team: North referral boundary - 20191016; Biota: WRP Habitats and Observations - 201912; Landgate: Roads - 201805, Localities - 20180319, Imagery - WA Now accessed 20191217.
Created by: mmikkonen



SLIP POWERED BY LANDGATE

Paper Size ISO A3

0 100 200 300 400

Metres

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

N

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Main Roads Western Australia
Bunbury Outer Ring Road Northern and Central Section
Response to EPA Notice of Decision to Assess: Additional Information Request

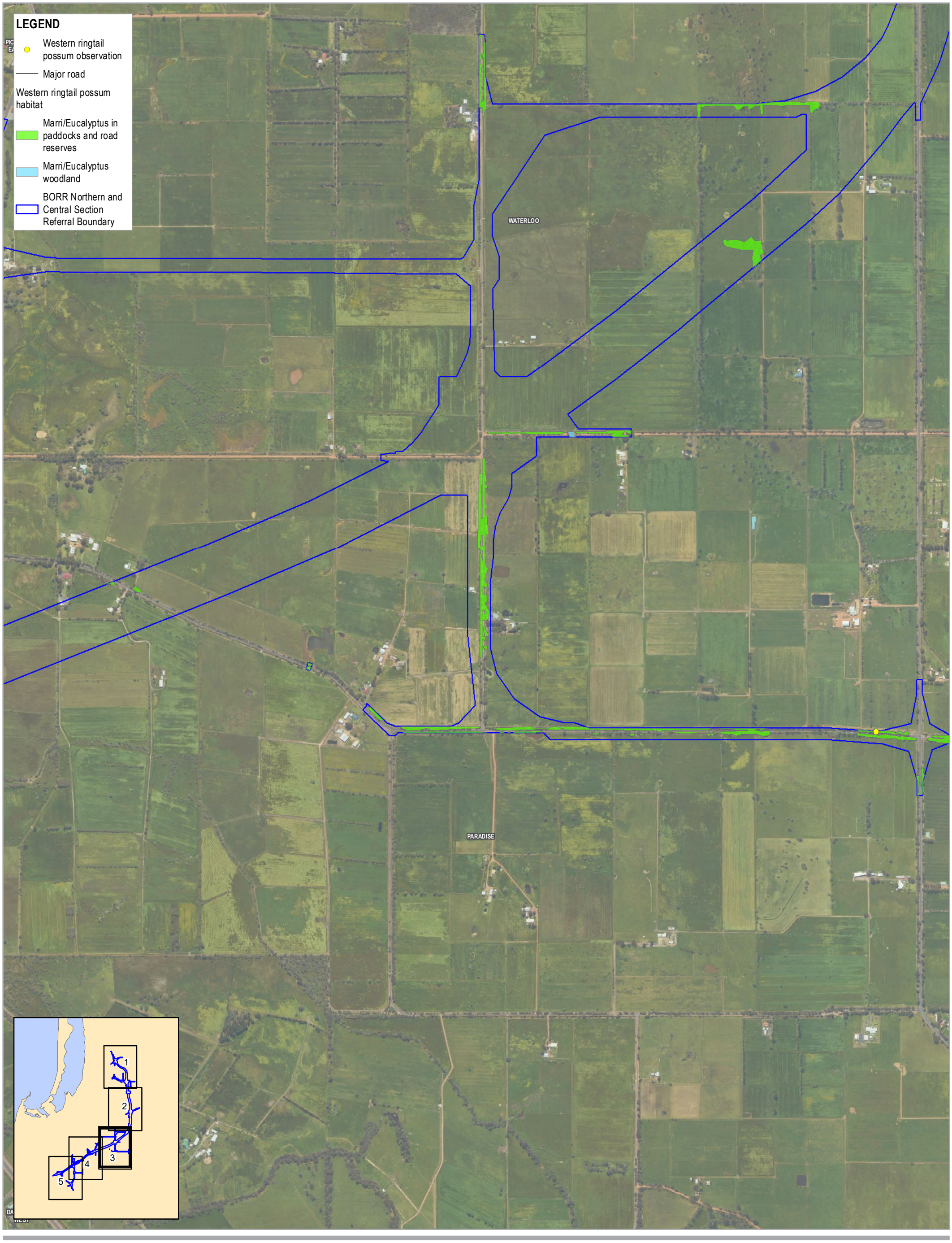
WRP observations and habitat types and extent within the Proposal Area

Project No. **61-37041**
Revision No. **0**
Date **18 Dec 2019**

FIGURE 4

G:\61\37041\19_0_GIS\Maps\Working\BORRNorth_ARIFigures\6137041_006_WRP_Rev0.mxd
Print date: 18 Dec 2019 - 08:46

Data source: BORR team: North referral boundary - 20191016; Biota: WRP Habitats and Observations - 201912; Landgate: Roads - 201805, Localities - 20180319, Imagery - WA Now accessed 20191217.
Created by: mmikkonen



SLIP POWERED BY LANDGATE

Paper Size ISO A3

0 100 200 300 400

Metres

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

N

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Bunbury Outer Ring Road Northern and Central Section
Response to EPA Notice of Decision to Assess: Additional Information Request

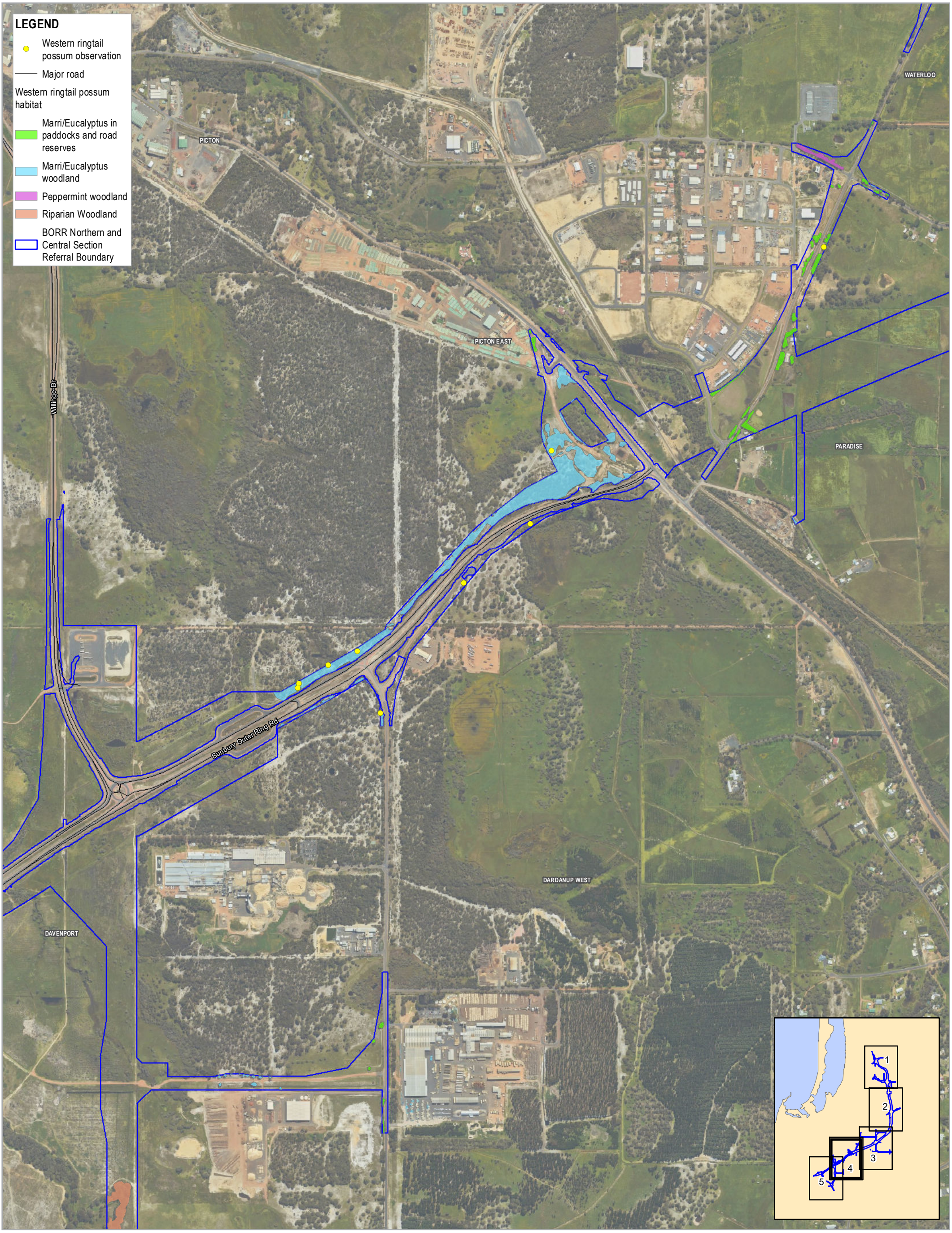
WRP observations and habitat types and extent within the Proposal Area

Project No. **61-37041**
Revision No. **0**
Date **18 Dec 2019**

FIGURE 4

G:\61\37041\19_0_GIS\Maps\Working\BORRNorth_ARIFigures\6137041_006_WRP_Rev0.mxd
Print date: 18 Dec 2019 - 08:58

Data source: BORR team: North referral boundary - 20191016; Biota: WRP Habitats and Observations - 201912; Landgate: Roads - 201805, Localities - 20180319, Imagery - WA Now accessed 20191217.
Created by: mmikkonen



SLIP POWERED BY LANDGATE

Paper Size ISO A3

0 100 200 300 400

Metres

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

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Main Roads Western Australia
Bunbury Outer Ring Road Northern and Central Section
Response to EPA Notice of Decision to Assess: Additional Information Request

WRP observations and habitat types and extent within the Proposal Area

Project No. **61-37041**
Revision No. **0**
Date **18 Dec 2019**

FIGURE 4

G:\61\37041\19_0_GIS\Maps\Working\BORRNorth_ARIFigures\6137041_006_WRP_Rev0.mxd
Print date: 18 Dec 2019 - 09:02

Data source: BORR team: North referral boundary - 20191016; Biota: WRP Habitats and Observations - 201912; Landgate: Roads - 201805, Localities - 20180319, Imagery - WA Now accessed 20191217.
Created by: mmikkonen

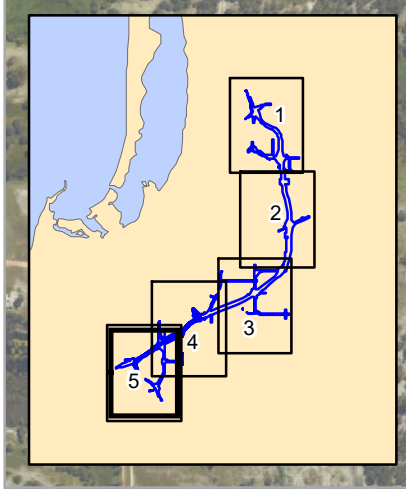
LEGEND

- Western ringtail possum observation
- Major road

Western ringtail possum habitat

- Marri/Eucalyptus in paddocks and road reserves
- Marri/Eucalyptus woodland
- Peppermint woodland
- Riparian Woodland
- BORR Northern and Central Section Referral Boundary

COLLEGE GROVE
DAVENPORT
Willinge Dr
Bunbury Outer Ring Rd
DARDANUP WEST
NORTH BOYANUP
South Western Hwy
CROOKED BROOK



SLIP POWERED BY LANDGATE

Paper Size ISO A3

0 100 200 300 400

Metres

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

N

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BUNBURY OUTER RING ROAD | PLANNING AND DEVELOPMENT

Main Roads Western Australia
Bunbury Outer Ring Road Northern and Central Section
Response to EPA Notice of Decision to Assess: Additional Information Request

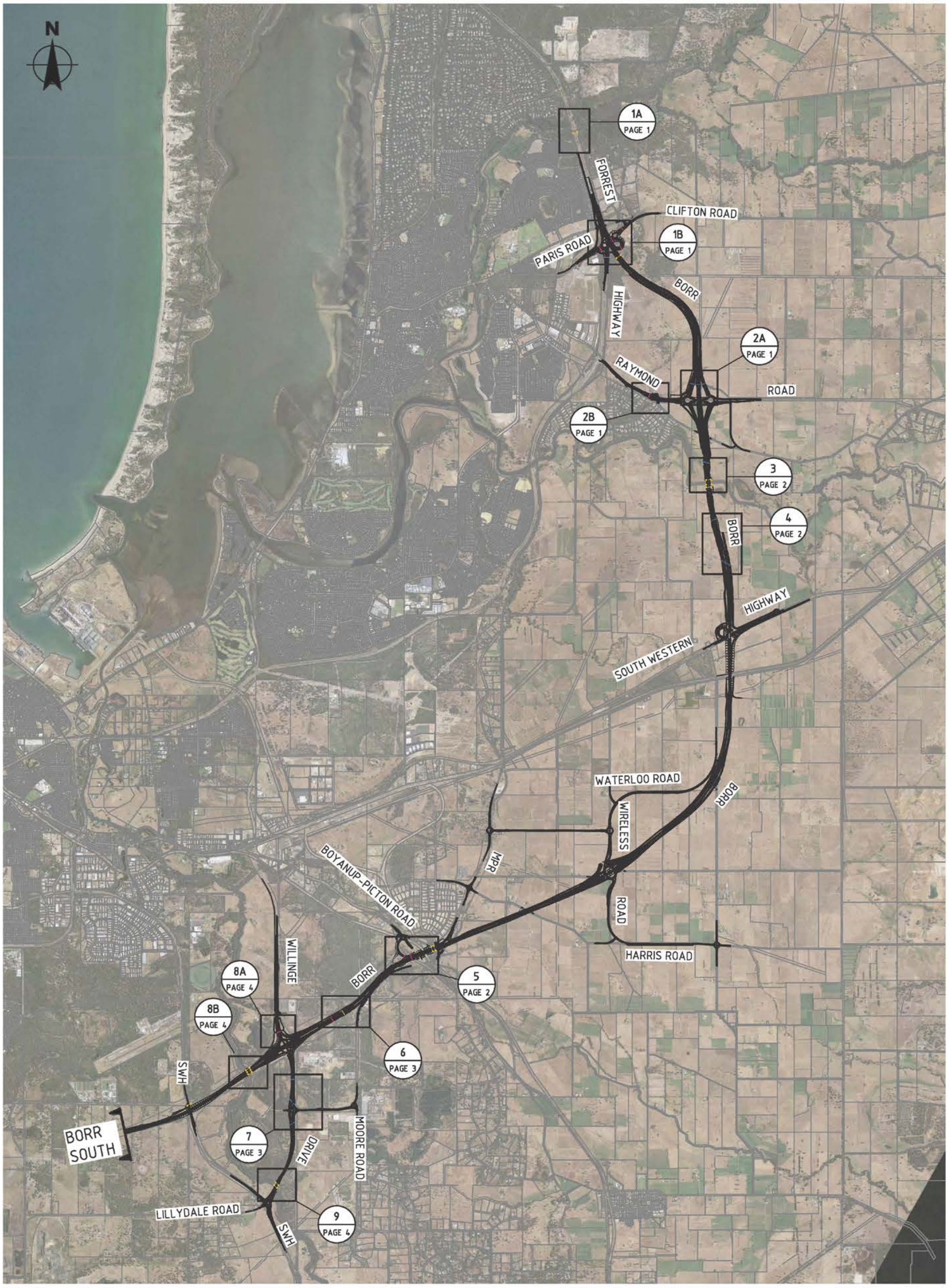
WRP observations and habitat types and extent within the Proposal Area

Project No. **61-37041**
Revision No. **0**
Date **18 Dec 2019**

FIGURE 4

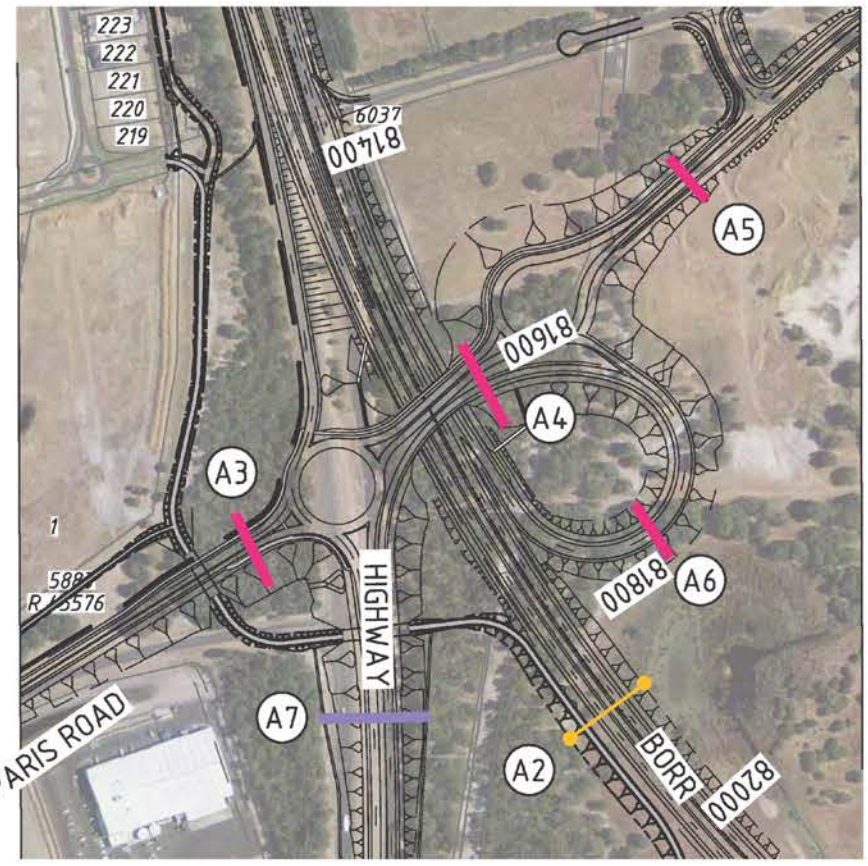
G:\61\37041\19_0_GIS\Maps\Working\BORRNorth_ARIFigures\637041_006_WRP_Rev0.mxd
Print date: 18 Dec 2019 - 08:56

Data source: BORR team: North referral boundary - 20191016; Biota: WRP Habitats and Observations - 201912; Landgate: Roads - 201805, Localities - 20180319, Imagery - WA Now accessed 20191217.
Created by: mmikkonen

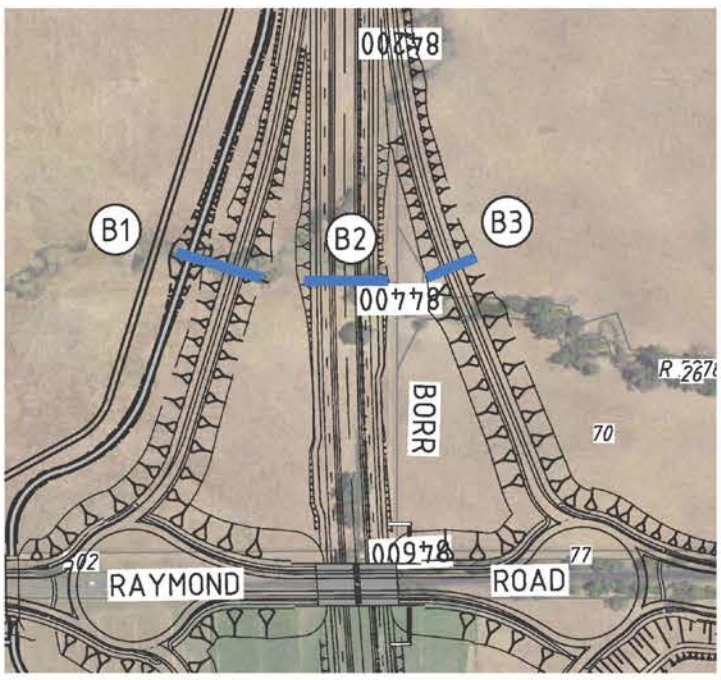


LOCALITY PLAN
1:50000m

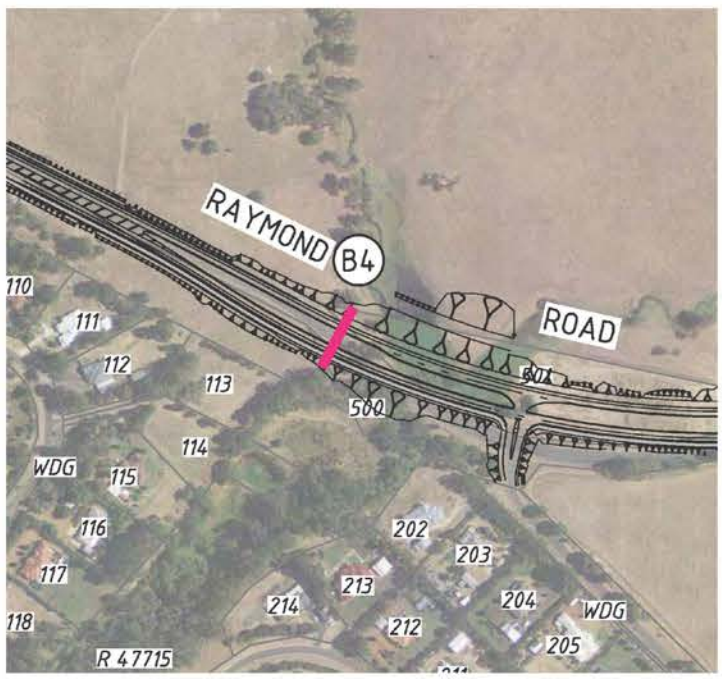
DETAIL 1A
1:5000



DETAIL 1B
1:5000



DETAIL 2A
1:5000



DETAIL 2B
1:5000

N

NOTES:

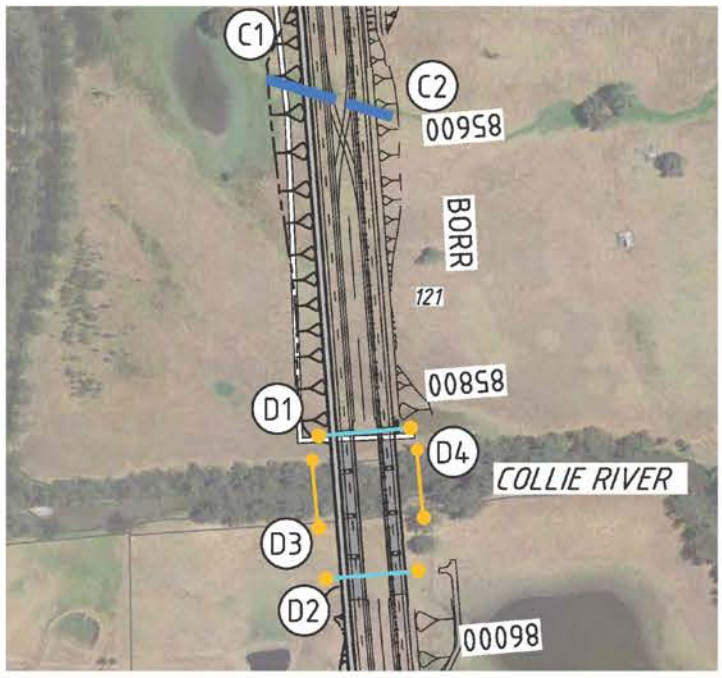
1. DUAL USE CULVERTS INCLUDE A SHELF ABOVE THE 1YR ARI EVENT THAT IS AT LEAST 300mm WIDE AND 300mm HIGH.
2. FAUNA UNDERPASSES TO INCLUDE 300mm WIDE SHELF NO MORE THAN 300mm FROM ROOF OF CULVERT.
3. FAUNA ROPE BRIDGES TO BE DESIGNED TO MAIN ROADS APPROVAL.
4. ALL LOCATIONS TO BE AGREED ON SITE.
5. STRUCTURE SIZES PROVIDED ARE MINIMUM REQUIREMENTS.

LEGEND

- FAUNA UNDERPASS (BOX)
- FAUNA UNDERPASS (ARCH)
- DUAL USE CULVERT
- FAUNA ROPE BRIDGE
- FAUNA ROPE BRIDGE (UNDER BRIDGE)

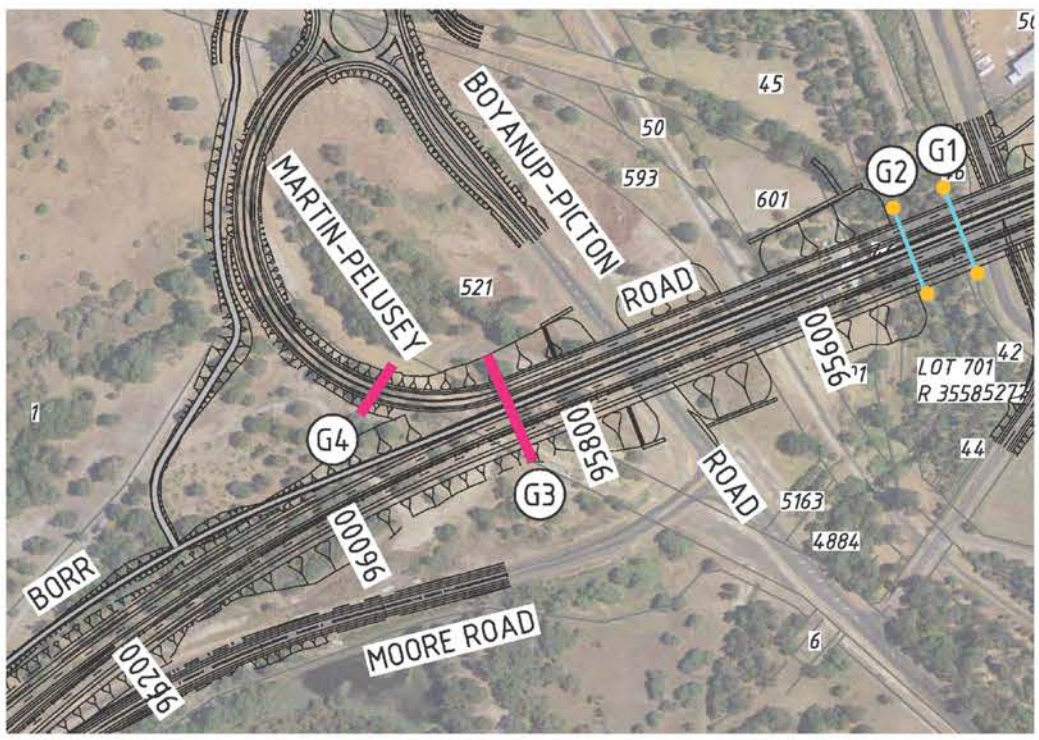
FAUNA UNDERPASS		
STRUCTURE No.	SIZE (mm)	TYPE
A3 TO A6	2100 x 2100H	BOX
A7	6000 x 2100H	ARCH
B1 TO B3	2400 x 1200H	BOX
B4	600 x 600H	BOX

1:5000 0 25m 50 75 100 125 150 175 200 225 250 275 300 325 350 375



DETAIL 3
1:5000

DETAIL 4
1:5000



DETAIL 5
1:5000

N

NOTES:

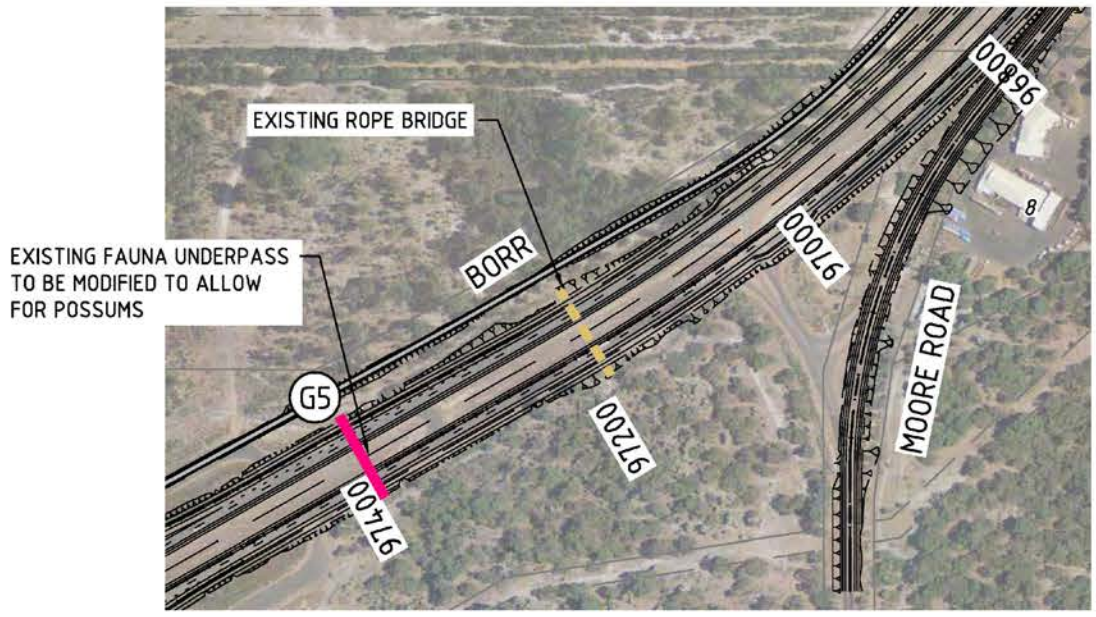
1. DUAL USE CULVERTS INCLUDE A SHELF ABOVE THE 1YR ARI EVENT THAT IS AT LEAST 300mm WIDE AND 300mm HIGH.
2. FAUNA UNDERPASSES TO INCLUDE 300mm WIDE SHELF NO MORE THAN 300mm FROM ROOF OF CULVERT.
3. FAUNA ROPE BRIDGES TO BE DESIGNED TO MAIN ROADS APPROVAL.
4. ALL LOCATIONS TO BE AGREED ON SITE.
5. STRUCTURE SIZES PROVIDED ARE MINIMUM REQUIREMENTS.

LEGEND

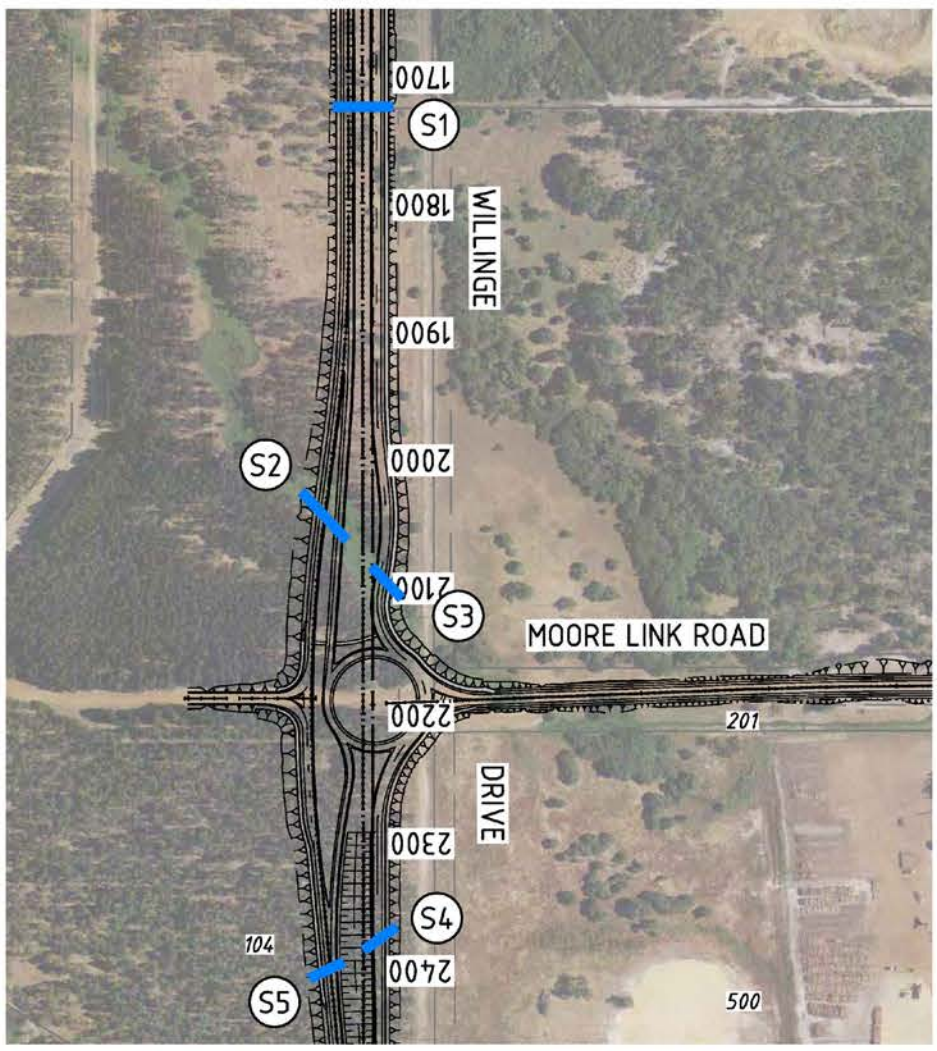
- FAUNA UNDERPASS (BOX)
- FAUNA UNDERPASS (ARCH)
- DUAL USE CULVERT
- FAUNA ROPE BRIDGE
- FAUNA ROPE BRIDGE (UNDER BRIDGE)

FAUNA UNDERPASS		
STRUCTURE No.	SIZE (mm)	TYPE
C1 & C2	900 x 900H	BOX
E1 & E2	1200 x 1200H	BOX
F1 TO F3	2100 x 1500H	BOX
G3	2100 x 2100H	BOX
G4	900 x 900H	BOX

1:5000 0 25m 50 75 100 125 150 175 200 225 250 275 300 325 350 375



DETAIL 6
1:5000



DETAIL 7
1:5000

N

NOTES:

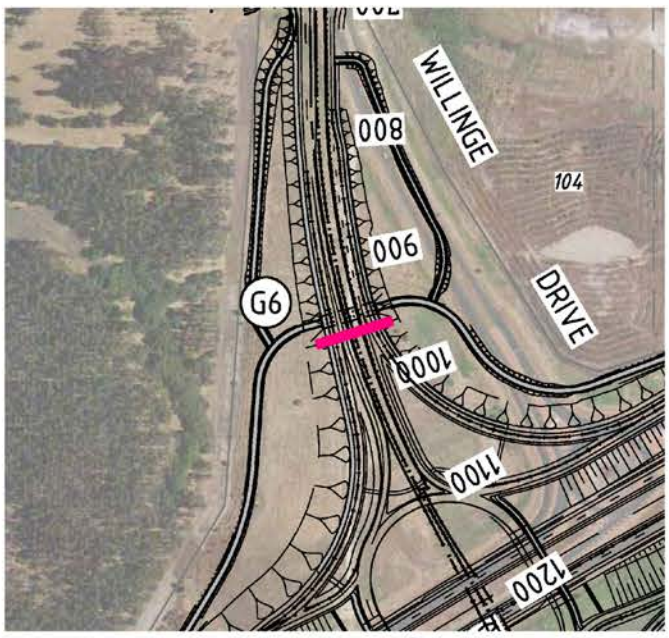
1. DUAL USE CULVERTS INCLUDE A SHELF ABOVE THE 1YR ARI EVENT THAT IS AT LEAST 300mm WIDE AND 300mm HIGH.
2. FAUNA UNDERPASSES TO INCLUDE 300mm WIDE SHELF NO MORE THAN 300mm FROM ROOF OF CULVERT.
3. FAUNA ROPE BRIDGES TO BE DESIGNED TO MAIN ROADS APPROVAL.
4. ALL LOCATIONS TO BE AGREED ON SITE.
5. STRUCTURE SIZES PROVIDED ARE MINIMUM REQUIREMENTS.

LEGEND

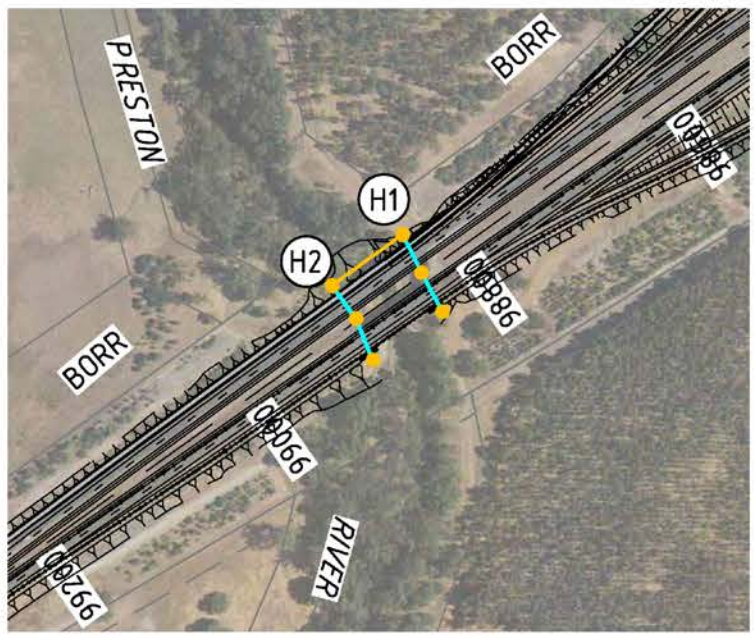
- FAUNA UNDERPASS (BOX)
- FAUNA UNDERPASS (ARCH)
- DUAL USE CULVERT
- FAUNA ROPE BRIDGE
- FAUNA ROPE BRIDGE (UNDER BRIDGE)

FAUNA UNDERPASS		
STRUCTURE No.	SIZE (mm)	TYPE
S1 TO S5	900 x 900H	BOX
G5	ø1500	PIPE

1:5000 0 25m 50 75 100 125 150 175 200 225 250 275 300 325 350 375



DETAIL 8A
1:5000



DETAIL 8B
1:5000

DETAIL 9
1:5000

N

NOTES:

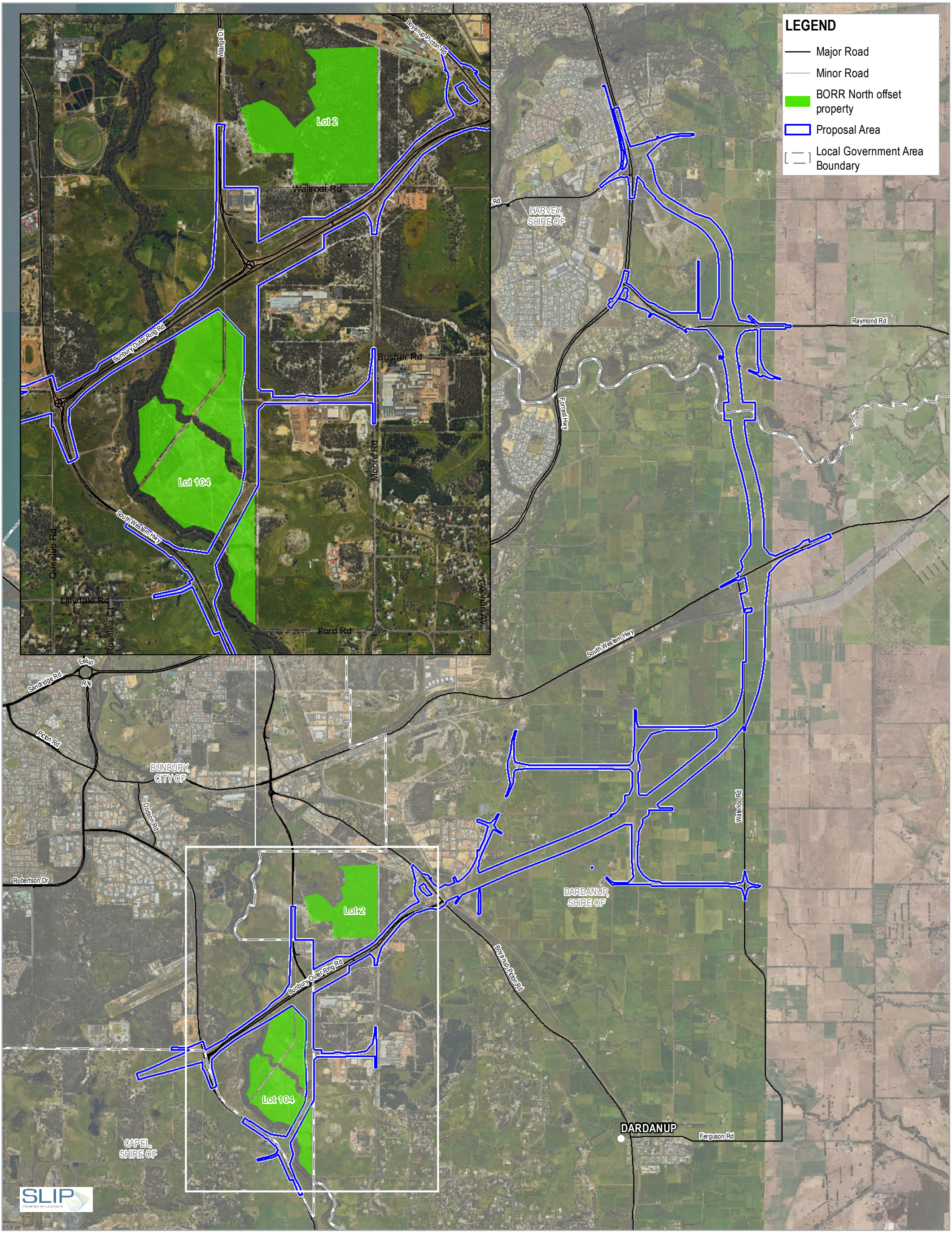
1. DUAL USE CULVERTS INCLUDE A SHELF ABOVE THE 1YR ARI EVENT THAT IS AT LEAST 300mm WIDE AND 300mm HIGH.
2. FAUNA UNDERPASSES TO INCLUDE 300mm WIDE SHELF NO MORE THAN 300mm FROM ROOF OF CULVERT.
3. FAUNA ROPE BRIDGES TO BE DESIGNED TO MAIN ROADS APPROVAL.
4. ALL LOCATIONS TO BE AGREED ON SITE.
5. STRUCTURE SIZES PROVIDED ARE MINIMUM REQUIREMENTS.

LEGEND

- FAUNA UNDERPASS (BOX)
- FAUNA UNDERPASS (ARCH)
- DUAL USE CULVERT
- FAUNA ROPE BRIDGE
- FAUNA ROPE BRIDGE (UNDER BRIDGE)

FAUNA UNDERPASS		
STRUCTURE No.	SIZE (mm)	TYPE
G6	2100 x 2100H	BOX

1:5000 0 25m 50 75 100 125 150 175 200 225 250 275 300 325 350 375



Paper Size ISO A3

0 0.5 1 1.5 2

Kilometres

N

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

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Main Roads Western Australia
Bunbury Outer Ring Road Northern and Central Section
Offset Strategy

Offset property locations

Project No. **61-37041**
Revision No. **0**
Date **31/01/2020**

FIGURE 6

G:\61\37041\19_0_GIS\Maps\Working\BORRNorth_ARIFigures\OffsetStrategy\6137041_008_OffsetProperties_Rev0.mxd
Print date: 31 Jan 2020 - 13:04

Data source: Geoscience Australia: GeoData Topo 250k Series III - 2006; Landgate: Roads, LGA Boundaries - 20180501, Imagery - WA Now accessed 20200129; BORR: Proposal Area - 201910, Offset properties - 20200130, Excluded area - 20190227. Created by: mmikkonen

LESCHENAULT
HARVEY, SHIRE OF
Paris Rd
AUSTRALIND
Old Coast Rd
Forrest Hwy
Raymond Rd
BUREKUP
EATON
BUNBURY
Willinge Dr
Sandridge Rd
Ocean Dr
BUNBURY, CITY OF
Waterloo Rd
DARDANUP, SHIRE OF
Bunbury Outer Ring Rd
DARDANUP
Ferguson Rd
GELORUP
Boyanup-Picton Rd
THAM
Boyanup Rd
BOYANUP
Trigwell Rd
South Western Hwy
Bussell Hwy
Railway Rd
CAPEL, SHIRE OF
DONNYBROOK-BALINGUP, SHIRE OF
PEPPERMINT GROVE
Capel Dr
CAPEL
DONNYBROOK
Goodwood Rd
Layman Rd
Sues Rd
BUSSELTON, CITY OF
Vasse Hwy

LEGEND

- Major Road
- Potential MRD rehabilitation area
- Proposal Area
- Local Government Area Boundary

Paper Size ISO A3

0 2 4

Kilometres

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

N

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Main Roads Western Australia
Bunbury Outer Ring Road Northern and Central Section
Offset Strategy

State Forest 2 potential offset areas

Project No. **61-37041**
Revision No. **0**
Date **31/01/2020**

FIGURE 7

G:\61\37041\19_0_GIS\Maps\Working\BORRNorth_ARIFigures\OffsetStrategy\6137041_007_StateForestOffsetAreas_Rev0.mxd
Print date: 31 Jan 2020 - 13:42

Data source: Geoscience Australia: GeoData Topo 250k Series III - 2006; Landgate: Roads, LGA Boundaries - 20180501, Imagery - WA Now accessed 20200129; BORR: Proposal Area - 201910, Potential rehab areas - 20200130, Excluded area - 20190227. Created by: mmikkonen

Appendix B

Offset calculations

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Western Ringtail Possum
EPBC Act status	Critically Endangered
Annual probability of extinction Based on IUCN category definitions	**6.8%**

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Threatened species habitat						
Area of habitat	Yes	Clearing of up to 44 ha of WRP habitat	**Area**	44	Hectares	Site assessment and Proposal design have been used to identify impacts
			Quality	**8**	Scale 0-10	
			Total quantum of impact	35.20	Adjusted hectares	
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)	% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																				
Area of community	No				**Risk-related time horizon (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**									
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0								
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**									
Threatened species habitat																				
Area of habitat	Yes	35.20	Adjusted hectares	WRP habitat within Lot 2 North Boyanup Road	**Time over which loss is averted (max. 20 years)**	20	**Start area (hectares)**	55	**Risk of loss (%) without offset**	15%	**Risk of loss (%) with offset**	5%	5.50	80%	4.40	1.18	7.95	22.58%	No	
									Future area without offset (adjusted hectares)	46.8	**Future area with offset (adjusted hectares)**	52.3								
					Time until ecological benefit	1	**Start quality (scale of 0-10)**	**8**	**Future quality without offset (scale of 0-10)**	**6**	**Future quality with offset (scale of 0-10)**	**8**	2.00	80%	1.60	1.50				
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**	**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																			
Condition of habitat Change in habitat condition, but no change in extent	No																			
Threatened species																				
Birth rate e.g. Change in nest success	No																			
Mortality rate e.g Change in number of road kills per year	No																			
Number of individuals e.g. Individual plants/animals	No																			

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0				$0.00		$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	35.2	7.95	22.58%	**No**	$0.00	#DIV/0!	#DIV/0!
Area of community	0				$0.00		$0.00
					$0.00	**#DIV/0!**	**#DIV/0!**

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Western Ringtail Possum
EPBC Act status	Critically Endangered
Annual probability of extinction Based on IUCN category definitions	**6.8%**

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Threatened species habitat						
Area of habitat	Yes	Clearing of up to 44 ha of WRP habitat	**Area**	44	Hectares	Site assessment and the Proposal design have been used to identify impacts
			Quality	**8**	Scale 0-10	
			Total quantum of impact	35.20	Adjusted hectares	
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)	% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																				
Area of community	No				**Risk-related time horizon (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**									
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0								
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**									
Threatened species habitat																				
Area of habitat	Yes	35.20	Adjusted hectares	Lot 104 - 45 ha of revegetation to create WRP habitat	**Time over which loss is averted (max. 20 years)**	20	**Start area (hectares)**	45	**Risk of loss (%) without offset**	50%	**Risk of loss (%) with offset**	5%	20.25	80%	16.20	4.35	8.20	23.30%	No	
									Future area without offset (adjusted hectares)	22.5	**Future area with offset (adjusted hectares)**	42.8								
					Time until ecological benefit	10	**Start quality (scale of 0-10)**	**0**	**Future quality without offset (scale of 0-10)**	**0**	**Future quality with offset (scale of 0-10)**	**6**	6.00	80%	4.80	2.49				
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**	**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																			
Condition of habitat Change in habitat condition, but no change in extent	No																			
Threatened species																				
Birth rate e.g. Change in nest success	No																			
Mortality rate e.g Change in number of road kills per year	No																			
Number of individuals e.g. Individual plants/animals	No																			

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0				$0.00		$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	35.2	8.20	23.30%	**No**	$0.00	#DIV/0!	#DIV/0!
Area of community	0				$0.00		$0.00
					$0.00	**#DIV/0!**	**#DIV/0!**

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	WRP
EPBC Act status	Critically Endangered
Annual probability of extinction Based on IUCN category definitions	**6.8%**

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Threatened species habitat						
Area of habitat	Yes	Clearing of up to 44 ha of WRP habitat	**Area**	44	Hectares	WRP impact assessed through site surveys and Proposal design
			Quality	**8**	Scale 0-10	
			Total quantum of impact	35.20	Adjusted hectares	
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)	% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																				
Area of community	No				**Risk-related time horizon (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**									
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0								
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**									
Threatened species habitat																				
Area of habitat	Yes	35.20	Adjusted hectares	Revegetation of SF No.2 to create WRP habitat	**Time over which loss is averted (max. 20 years)**	20	**Start area (hectares)**	90	**Risk of loss (%) without offset**	30%	**Risk of loss (%) with offset**	5%	22.50	80%	18.00	4.83	15.95	45.31%	No	
									Future area without offset (adjusted hectares)	63.0	**Future area with offset (adjusted hectares)**	85.5								
					Time until ecological benefit	10	**Start quality (scale of 0-10)**	**1**	**Future quality without offset (scale of 0-10)**	**1**	**Future quality with offset (scale of 0-10)**	**6**	5.00	80%	4.00	2.07				
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**	**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																			
Condition of habitat Change in habitat condition, but no change in extent	No																			
Threatened species																				
Birth rate e.g. Change in nest success	No																			
Mortality rate e.g Change in number of road kills per year	No																			
Number of individuals e.g. Individual plants/animals	No																			

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0				$0.00		$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	35.2	15.95	45.31%	**No**	$0.00	#DIV/0!	#DIV/0!
Area of community	0				$0.00		$0.00
					$0.00	**#DIV/0!**	**#DIV/0!**

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	BC
EPBC Act status	Endangered
Annual probability of extinction Based on IUCN category definitions	**1.2%**

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Threatened species habitat						
Area of habitat	Yes	38 ha of Black Cockatoo foraging and potential nesting and roosting habitat	**Area**	38	Hectares	Impact determined through field survey and assessment of Proposal design
			Quality	**8**	Scale 0-10	
			Total quantum of impact	30.40	Adjusted hectares	
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)	% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																				
Area of community	No				**Risk-related time horizon (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**									
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0								
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**									
Threatened species habitat																				
Area of habitat	Yes	30.40	Adjusted hectares	55ha of Lot 2 Boyanup Picton Road	**Time over which loss is averted (max. 20 years)**	20	**Start area (hectares)**	55	**Risk of loss (%) without offset**	15%	**Risk of loss (%) with offset**	5%	5.50	80%	4.40	3.47	10.16	33.43%	No	
									Future area without offset (adjusted hectares)	46.8	**Future area with offset (adjusted hectares)**	52.3								
					Time until ecological benefit	1	**Start quality (scale of 0-10)**	**8**	**Future quality without offset (scale of 0-10)**	**6**	**Future quality with offset (scale of 0-10)**	**8**	2.00	80%	1.60	1.58				
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**	**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																			
Condition of habitat Change in habitat condition, but no change in extent	No																			
Threatened species																				
Birth rate e.g. Change in nest success	No																			
Mortality rate e.g Change in number of road kills per year	No																			
Number of individuals e.g. Individual plants/animals	No																			

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0				$0.00		$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	30.4	10.16	33.43%	**No**	$0.00	#DIV/0!	#DIV/0!
Area of community	0				$0.00		$0.00
					$0.00	**#DIV/0!**	**#DIV/0!**

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Carnaby's Cockatoo
EPBC Act status	Endangered
Annual probability of extinction Based on IUCN category definitions	**1.2%**

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Threatened species habitat						
Area of habitat	Yes	Clearing of up to 44 ha of Black cockatoo habitat	**Area**	44	Hectares	Impact assessed through field survey and assessment of the Proposal design
			Quality	**8**	Scale 0-10	
			Total quantum of impact	35.20	Adjusted hectares	
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)	% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																				
Area of community	No				**Risk-related time horizon (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**									
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0								
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**									
Threatened species habitat																				
Area of habitat	Yes	35.20	Adjusted hectares	45 ha of revegetation in Lot 104 Revegetation	**Time over which loss is averted (max. 20 years)**	20	**Start area (hectares)**	45	**Risk of loss (%) without offset**	40%	**Risk of loss (%) with offset**	5%	15.75	80%	12.60	9.93	49.60%	No		
									Future area without offset (adjusted hectares)	27.0	**Future area with offset (adjusted hectares)**	42.8				17.46				
					Time until ecological benefit	10	**Start quality (scale of 0-10)**	**0**	**Future quality without offset (scale of 0-10)**	**0**	**Future quality with offset (scale of 0-10)**	**6**	6.00	80%	4.80	4.26				
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**	**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																			
Condition of habitat Change in habitat condition, but no change in extent	No																			
Threatened species																				
Birth rate e.g. Change in nest success	No																			
Mortality rate e.g Change in number of road kills per year	No																			
Number of individuals e.g. Individual plants/animals	No																			

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0				$0.00		$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	35.2	17.46	49.60%	**No**	$0.00	#DIV/0!	#DIV/0!
Area of community	0				$0.00		$0.00
					$0.00	**#DIV/0!**	**#DIV/0!**

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Carnaby's Cockatoo
EPBC Act status	Endangered
Annual probability of extinction Based on IUCN category definitions	**1.2%**

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Threatened species habitat						
Area of habitat	Yes	Clearing of up to 44 ha of Black cockatoo habitat	**Area**	38	Hectares	Impact assessed through field survey and assessment of the Proposal design
			Quality	**8**	Scale 0-10	
			Total quantum of impact	30.40	Adjusted hectares	
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)	% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																				
Area of community	No				**Risk-related time horizon (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**									
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0								
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**									
Threatened species habitat																				
Area of habitat	Yes	30.40	Adjusted hectares	Revegetation of 16a of SF No.2 to create Black Cockatoo habitat	**Time over which loss is averted (max. 20 years)**	20	**Start area (hectares)**	16	**Risk of loss (%) without offset**	30%	**Risk of loss (%) with offset**	5%	4.00	80%	3.20	2.52	5.49	18.06%	No	
									Future area without offset (adjusted hectares)	11.2	**Future area with offset (adjusted hectares)**	15.2								
					Time until ecological benefit	10	**Start quality (scale of 0-10)**	**1**	**Future quality without offset (scale of 0-10)**	**1**	**Future quality with offset (scale of 0-10)**	**6**	5.00	80%	4.00	3.55				
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**	**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																			
Condition of habitat Change in habitat condition, but no change in extent	No																			
Threatened species																				
Birth rate e.g. Change in nest success	No																			
Mortality rate e.g Change in number of road kills per year	No																			
Number of individuals e.g. Individual plants/animals	No																			

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0				$0.00		$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	30.4	5.49	18.06%	**No**	$0.00	#DIV/0!	#DIV/0!
Area of community	0				$0.00		$0.00
					$0.00	**#DIV/0!**	**#DIV/0!**

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Banksia Woodlands of the SCP
EPBC Act status	Endangered
Annual probability of extinction Based on IUCN category definitions	**1.2%**

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	Yes	Clearing of up to 3.7ha of Bansia woodland TEC	**Area**	3.7	Hectares	Site assessment and proposal design have used to identify residual impact
			Quality	**7**	Scale 0-10	
			Total quantum of impact	2.59	Adjusted hectares	
Threatened species habitat						
Area of habitat	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)		% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																					
Area of community	Yes	2.59	Adjusted hectares	14.5 ha of Banksia woodland TEC within Lot 2 Boyanup Picton Rd	**Risk-related time horizon (max. 20 years)**	20	**Start area (hectares)**	14.5	**Risk of loss (%) without offset**	15%	**Risk of loss (%) with offset**	5%	1.45	80%	1.16	0.91	2.68	103.46%	Yes		
									Future area without offset (adjusted hectares)	12.3	**Future area with offset (adjusted hectares)**	13.8									
					Time until ecological benefit	1	**Start quality (scale of 0-10)**	**8**	**Future quality without offset (scale of 0-10)**	**6**	**Future quality with offset (scale of 0-10)**	**8**	2.00	80%	1.60	1.58					
Threatened species habitat																					
Area of habitat	No				**Time over which loss is averted (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**										
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0									
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**										
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**		**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																				
Condition of habitat Change in habitat condition, but no change in extent	No																				
Threatened species																					
Birth rate e.g. Change in nest success	No																				
Mortality rate e.g Change in number of road kills per year	No																				
Number of individuals e.g. Individual plants/animals	No																				

Summary

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0				$0.00		$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	0				$0.00		$0.00
Area of community	2.59	2.68	103.46%	**Yes**	$0.00	N/A	$0.00
					$0.00	**$0.00**	**$0.00**

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Claypan TEC (FCT08)
EPBC Act status	Critically Endangered
Annual probability of extinction Based on IUCN category definitions	**6.8%**

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	Yes	0.6 ha of 'Herb rich scrublands in claypans (FCT 08)	**Area**	0.6	Hectares	Site assessment and Proposal design have been used to identify impacts
			Quality	**5**	Scale 0-10	
			Total quantum of impact	0.30	Adjusted hectares	
Threatened species habitat						
Area of habitat	No		**Area**			
			Quality	**0**		
			Total quantum of impact	0.00		
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)	% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																				
Area of community	Yes	0.30	Adjusted hectares	Purchase of private property suporting 1.07ha of FCT08	**Risk-related time horizon (max. 20 years)**	20	**Start area (hectares)**	1.07	**Risk of loss (%) without offset**	20%	**Risk of loss (%) with offset**	5%	0.16	80%	0.13	0.03	0.28	94.68%	Yes	
									Future area without offset (adjusted hectares)	0.9	**Future area with offset (adjusted hectares)**	1.0								
					Time until ecological benefit	1	**Start quality (scale of 0-10)**	**7**	**Future quality without offset (scale of 0-10)**	**4**	**Future quality with offset (scale of 0-10)**	**8**	4.00	80%	3.20	3.00				
Threatened species habitat																				
Area of habitat	No				**Time over which loss is averted (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**									
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0								
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**									
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**	**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																			
Condition of habitat Change in habitat condition, but no change in extent	No																			
Threatened species																				
Birth rate e.g. Change in nest success	No																			
Mortality rate e.g Change in number of road kills per year	No																			
Number of individuals e.g. Individual plants/animals	No																			

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0				$0.00		$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	0				$0.00		$0.00
Area of community	0.3	0.28	94.68%	**Yes**	$0.00	#DIV/0!	#DIV/0!
					$0.00	**#DIV/0!**	**#DIV/0!**

BORR Team

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