



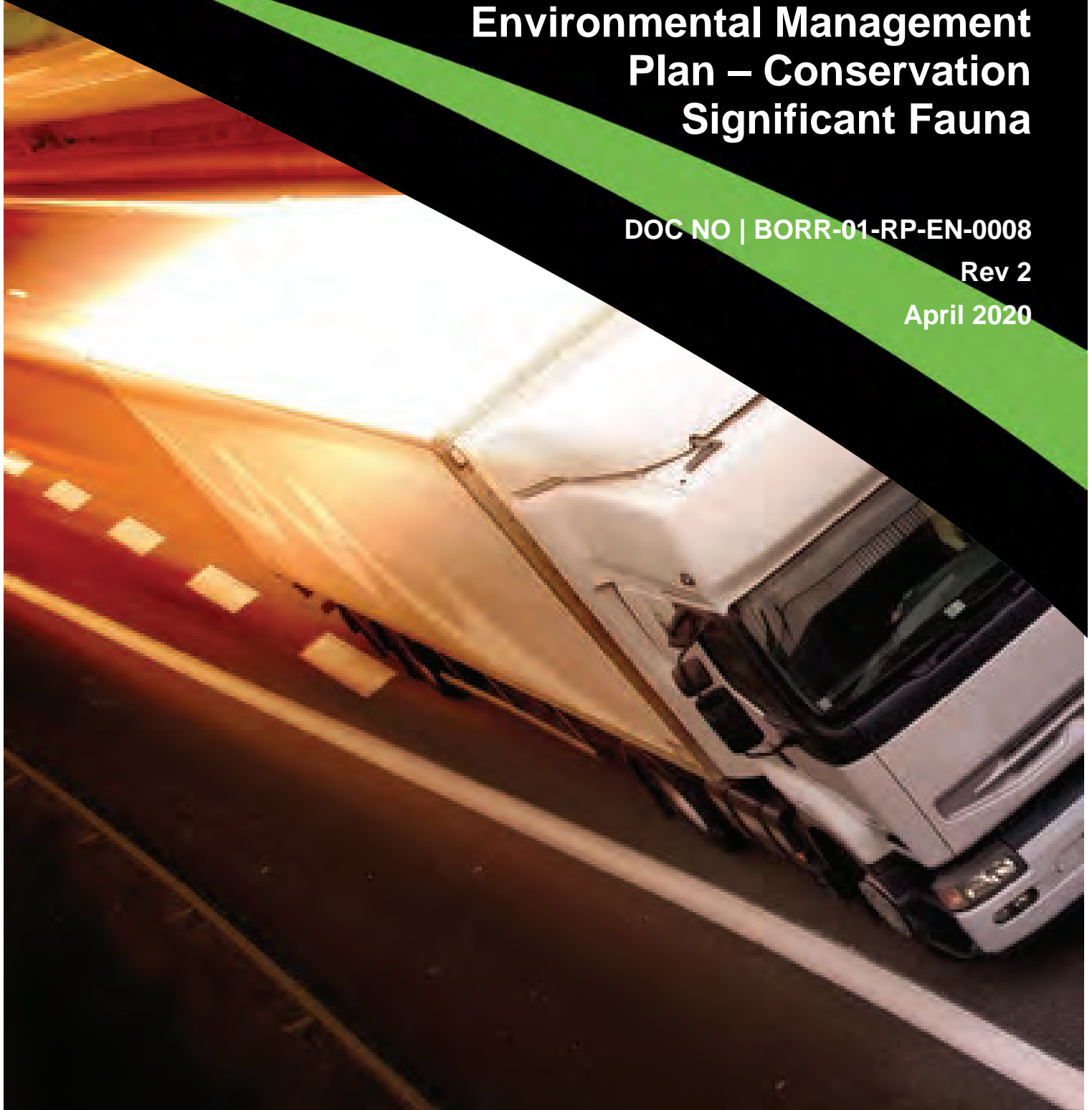
Bunbury Outer Ring Road Northern and Central Sections

Environmental Management Plan – Conservation Significant Fauna

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Document Control					
Revision	Date	Description	Prepared	Reviewed	Approved
A	29/10/2019	Draft for Main Roads review	BORR IPT	FH	
B	29/01/2020	Rev 0	MRWA	MRWA	FH
C	01/03/2020	Rev 1	MRWA	MRWA	FH
D	27/04/2020	Rev 2	BORR IPT	FH	FH

1 SUMMARY

1.1 Purpose

This Environmental Management Plan (EMP) is submitted in accordance with *Environmental Protection Act 1986* (EP Act) Section 40(2)(a) Notice Requiring Information for Assessment for the Northern and Central sections of the Bunbury Outer Ring Road (BORR), which will be developed by Main Roads Western Australia (Main Roads).

This document sets out the environmental management actions to manage, monitor and mitigate direct and indirect impacts of the Proposal on the following conservation significant fauna:

- Western Ringtail Possum - (Critically endangered, Schedule 1)
- Carter’s Freshwater Mussel - (Vulnerable, Schedule 3)
- Black-stripe Minnow - (Endangered, Schedule 2)
- Brush-tailed Phascogale - (Schedule 6)

Table 1-1 details the environmental management targets to measure achievement of the environmental objectives that must be met through implementation of the plan.

Table 1-1 Purpose of the Environmental Management Plan

ITEM	DESCRIPTION
Title of Proposal	BORR Northern and Central
Proponent name	Main Roads Western Australia
Purpose of the EMP	This EMP is submitted to fulfil the requirements of the EPA’s Section 40(2)(a) Notice Requiring Information for Assessment. This EMP has been developed as a ‘management-based’ EMP to document management actions throughout the life of the Proposal (planning / design / implementation and operations).
Key environmental factor	Terrestrial Fauna
EPA’s environmental objective for the key environmental factor terrestrial fauna	To protect terrestrial fauna so that biological diversity and ecological integrity are maintained
Environmental objective	To ensure that impacts to conservation significant fauna are avoided and minimised as far as practicable during the construction and operation of the Proposal
Management Targets	Management target 1: Construct and operate the Proposal to avoid and minimise impacts to conservation significant fauna Management target 2: Fauna underpasses and overpasses will be designed, situated and constructed using best practice guidelines, and based on data from site fauna surveys Management target 3: Avoid mortality of conservation significant fauna during construction

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2 CONTEXT, SCOPE AND RATIONALE

2.1 Description of the Proposal

The Commissioner of Main Roads is proposing to construct and operate the Northern and Central sections of the Bunbury Outer Ring Road (BORR) (the Proposal) (Figure 1, Appendix A). 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 and facilitate proposed development to the east of the City of Bunbury. BORR will also provide an effective bypass of Bunbury for inter-regional traffic.

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, an existing four km section which was completed in May 2013, along with a three km extension of Willinge Drive southwards to South Western Highway
- ‘BORR Southern Section’ – South Western Highway (near Bunbury Airport) to Bussell Highway.

This document refers to BORR Northern and Central Sections only. Construction of the Proposal is anticipated to commence in Quarter 1 (Q1) 2021 and continue for a period of 2-3 years.

2.2 Purpose and scope of this Environmental Management Plan

The Proposal was referred to the EPA under Section 38 of the EP Act in June 2019. The level of assessment set for the Proposal is ‘Additional Information Requirement’. One of the additional information items required is an Environmental Management Plan (EMP) addressing conservation significant fauna (this document). Specifically, this EMP has been prepared in response to a Notice Requiring Information for Assessment under section 40(2)(a) of the EP Act, dated 17 July 2019. The Notice specifies the following:

Terrestrial Fauna

- Provide supplemental information and append a fauna management plan to manage, monitor and mitigate direct and indirect impacts to the following conservation significant species:
 - Western Ringtail Possum (WRP) – (*¹critically endangered, **schedule 1)
 - Carter’s Freshwater Mussel (CFM) – (*vulnerable, **schedule 3)
 - Black-stripe Minnow (BSM) – (*endangered, **schedule 2)
 - Brush-tailed Phascogale (BTP) – (**schedule 6)
- Include detailed mapping within the EMP to illustrate impacts and the proposed mitigation and management measures.

This EMP has been prepared to ensure the EPA’s objective for terrestrial fauna will be met and to satisfy the EPA that Main Roads can manage the Proposal so that impacts to threatened fauna are acceptable. The EMP has been developed in accordance with the EPA Instructions on how to prepare *Environmental Protection Act 1986* Part IV Environment Management Plans (EPA, 2018) and has taken into consideration relevant guidelines such as recovery plans, interim recovery plans, conservation advices and threat abatement plans.

The EMP includes the environmental management of activities to be undertaken by Main Roads, its employees and contractors.

¹ * denotes Commonwealth status. ** denotes status in Western Australia.

This EMP has been developed as a ‘management-based’ EMP to document management actions throughout the life of the Proposal (implementation and operations). Management measures within this EMP are specific to the Proposal and the species listed above and specifies management actions that are over and above ‘business as usual’ environmental management practises.

A Construction Environmental Management Plan (CEMP) will be prepared by the Construction Contractor and include the management actions detailed in this EMP and Main Roads ‘business as usual’ environmental management measures. The CEMP will be prepared prior to, and implemented to minimise and manage impacts to the above conservation significant species.

2.3 Key Environmental Factor

This EMP specifically addresses the terrestrial fauna environmental factor, which is part of the Land theme. The relevance of this environmental factor to the Proposal is presented in Table 2-1. Table 2-1 also summarises the environmental aspects, impacts and activities for this key environmental factor.

Table 2-1 Key environmental factor, impact and activities relevant to the EMP

ENVIRONMENTAL ASPECT OF PROPOSAL	AFFECTED SPECIES	IMPACT	ACTIVITY/THREATENING PROCESS
Clearing of native Vegetation	<ul style="list-style-type: none"> • Western Ringtail Possum • Carter’s Freshwater Mussel • Black-stripe Minnow • Brush-tailed Phascogale 	Loss of habitat and ecological connectivity (habitat/ population fragmentation)	<ul style="list-style-type: none"> • Loss of habitat • Loss of ecological connectivity leading to increased risk of loss of genetic diversity and ecological diversity • Severance of ecological linkages. • Increased risk of fire, disease and predation due to loss of shelter • Potential for fauna to be killed or injured by construction machinery during construction activities other than clearing.

2.4 Rationale and approach in meeting the Environmental Objective

For each of the threatened fauna species listed above, the EMP details:

- Management measures to address potential impacts, including fauna injury/mortality, habitat loss and connectivity
- Monitoring programs developed for each of the species, where direct and indirect impacts may occur
- A risk-based approach to identify and prioritise provisions
- Early warning indicators and potential adaptive management actions

The management approach, developed to meet environmental objectives stated in Section 1.1, has been informed by the results of baseline surveys and the assumptions and uncertainties listed in Section 2.4.2.

2.4.1 Survey and study findings

Studies and surveys undertaken within or are relevant to the Proposal and EMP are listed in Table 2-2. Targeted fauna surveys and an aquatic fauna survey were and continue to be undertaken in accordance with relevant guidelines.

Implementation of the Proposal will result in clearing of up to 44 hectares (ha) of conservation significant fauna habitat within the 625 ha Proposal Area. The Proposal also has the potential to indirectly impact

conservation significant fauna and their habitat in uncleared and adjacent areas during the construction and operation.

The Proposal predominantly extends north-south, potentially disrupting east-west terrestrial and aquatic habitat connectivity, as well as reducing or removing terrestrial linkages north and south along existing road corridors, especially at the BORR / Forrest Highway interchange and the BORR / Boyanup Picton Road interchange.

Table 2-2 Studies and surveys relevant to the EMP

SURVEY / REPORT NAME	LOCATION / EXTENT IN SURVEY AREA	METHODOLOGY
Bunbury Outer Ring Road Northern and Central Section Targeted Fauna Assessment (Biota Environmental Sciences (Biota) , 2020)	Surveyed of entire 625 ha Proposal Area	Day and night targeted field surveys conducted over the surveyed area (plus four WRP reference sites within an 18 km radius) in late winter and spring 2018. Methodology consistent with EPA Technical Guidance (EPA, 2016).
Bunbury Outer Ring Road Northern and Central Investigation Area: Targeted Conservation Significant Aquatic Fauna Survey (WRM, 2020)	12 assessment sites	Sampling of five creek/river sites and seven wetlands undertaken over four consecutive days in November 2018. Methodology was consistent with that used by others in similar surveys across Australia.
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
Bunbury Outer Ring Road (Northern and Central) WRP Surveys 2019 - on-going (unpublished survey results)	BORR Northern and Central sections alignment and two reference sites	Targeted field surveys conducted over the surveyed area in August 2019, October 2019, December 2019 and February 2020 consistent with EPA Technical Guidance (EPA, 2016). These surveys will be on-going during 2020.

2.4.2 Key assumptions and uncertainties

The key assumption and uncertainties within this EMP include:

- Fauna underpasses and fauna bridges are effective in maintaining ecological linkages.
- All significant direct and indirect impacts to conservation significant fauna that may result from the Proposal have been identified.
- Direct impacts to fauna during construction are limited to habitat loss and mortality during construction activities (clearing and plant movement).
- Mobile fauna will disperse in front of clearing activities.
- Possum fencing (combined with noise and screen walls) will exclude WRP and BTP from the road during construction and operations limiting the potential for mortality of these species.
- Road reserve boundary fencing will exclude fauna from the road during construction and operations limiting the potential for mortality of these species.
- The relevant studies and surveys have accurately recorded the presence of all conservation significant fauna species within the Proposal Area.

- Existing cleared areas within the Proposal Area do not contain habitat for or known records of conservation significant species.
- Conservation significant fauna are not expected to occur within areas cleared of native vegetation, therefore these areas do not require management during the construction of the Proposal to meet the environmental objective.
- If any conservation significant species assumed not to occur in the Proposal Area are subsequently recorded, the proposed management actions would ensure there are no additional impacts.

More information on the key assumptions and uncertainties are provided in the appendices of the BORR North and Central Environmental Referral Supporting Document (BORR IPT, 2019).

2.4.3 Management approach

The management approach has been informed by best practice and Main Roads experience on road projects in Western Australia. The hierarchical approach taken focuses on avoiding ecologically sensitive areas through, for example, route selection and design refinement. Where not able to be avoided, management aims to minimise the intensity and/or extent of impacts on fauna during construction. Any significant unavoidable residual impacts on fauna will be offset through an Environmental Offset Strategy (BORR IPT, 2020).

The management measures proposed are based on field studies and surveys, and relevant information provided in species Recovery Plans where they exist.

The following Recovery Plans and Conservation Advice have informed the development of this EMP:

- Department of Parks and Wildlife (2017). Western Ringtail Possum (*Pseudocheirus occidentalis*) Recovery Plan
- Threatened Species Scientific Community (TSSC) (2018a). Conservation Advice *Galaxiella nigrostriata* Black-stripe Minnow
- Threatened Species Scientific Community (TSSC) (2018b). Conservation Advice *Westralunio carteri* Carter's Freshwater Mussel
- Department of Conservation and Land Management (2002). Brush-tailed Phascogale *Phascogale tapoatafa* (Meyer, 1793) Species Profile.

It is noted that although there is no recovery plan in place for the brush-tailed phascogale:

“in working towards effective conservation of the western ringtail possum, other species with similar habitat needs to the western ringtail possum are likely to benefit. Such threatened fauna species include Baudin's cockatoo, brush-tailed phascogale, Chuditch, Carnaby's cockatoo, forest red-tailed black cockatoo” (DBCA, 2017).

2.4.4 Rational for choice of management targets

The impact assessment (BORR IPT, 2019) for the Proposal identified ecological connectivity loss and conservation significant fauna mortalities as significant environmental values with the potential to be impacted by the Proposal. The rationale for the choice of management targets is described below.

Management target 1: Construct and operate the Proposal to avoid and minimise impacts to conservation significant fauna.

This management target focuses on the implementation of management actions developed for the Proposal to avoid and minimise impacts to conservation significant fauna during construction and operation of the Proposal.

Management target 2: Fauna underpasses and overpasses will be designed, situated and constructed using best practice guidelines, and based on data from site fauna surveys.

This management target focuses on the design and construction of the fauna underpasses and rope bridges – if these are not designed and built to enable and encourage fauna use, they will not be effective in managing issues associated with loss of ecological connectivity, a key environmental objective for the Proposal.

The disruption of ecological linkages and potential fragmentation of habitat that supports fauna populations is a key risk for the Proposal. Fauna underpasses and overpasses (including rope bridges) have been shown to be effective for allowing the movement of species between previously linked or intact habitat. Locations for the fauna underpasses and overpasses were identified based on the results of fauna surveys.

Management target 3: Avoid mortality of conservation significant fauna during construction.

This management target focuses on achieving a sensitive clearing program that is as effective as practicable in removing fauna from the Proposal footprint and reduces the risk of mortality. Fauna mortality has been identified as a risk during construction. Removal and / or blocking of dreys and / or hollows, and inspection of hollows prior to any clearing disturbance will reduce disruption to conservation significant fauna during clearing.

2.4.4.1 Western Ringtail Possum

Western Ringtail Possums (WRP) have been recorded throughout and adjacent to the Proposal Area as shown in Figure 2 (Appendix A).

Throughout project planning, Main Roads has taken steps to avoid and / or minimise impacts to WRP, reducing the area of habitat to be cleared by approximately 26 ha (from approximately 70 ha to 44 ha), and therefore the number of WRP home ranges likely to be disrupted. A summary of the original impact, design changes and resulting impact is presented within the BORR North and Central Environmental Assessment on Referral Information (BORR IPT, 2019).

The Proposal will result in the loss of up to 44 ha of WRP habitat within the 625 ha Proposal Area. The habitat to be cleared is currently fragmented, dissected by existing roads, easements and cleared agricultural land as shown in Figure 2 (Appendix A).

The approach to WRP management during the clearing operations is focused on:

- pre-clearing surveys
- WRP monitoring during clearing works
- timing of clearing (when WRP are at/near their expected seasonal low)
- sensitive clearing practises
- staged clearing operations to encourage WRP to move into adjacent habitat beyond the clearing area.

Although primarily arboreal, WRPs are known to move on the ground.

The approach of allowing WRP to self-relocate to adjacent habitat has been selected over the more traditional approach of animal translocation as it is considered to provide the best outcome in terms of animal welfare. The success rates of documented WRP translocation projects is poor, and as yet no successful methodology has been developed or implemented (Clarke, 2011) (De Tores, 2004). Allowing WRP to relocate to adjacent habitat of their own accord avoids the need for translocation and handling animals, substantially reducing the likelihood of WRP being put under undue stress. Their mobile nature also makes their familiarity with adjacent habitat, which may be part of their existing home range likely. Given the linear nature of the majority of clearing and the size of individual home ranges, it is anticipated that WRPs will initially relocate into other parts of their home range.

WRP habitat clearing protocols have been developed based on WRP site surveys and observations, and the potential for WRP use. Habitat clearing categories within the Proposal Area have been developed in

consultation with Barbara Jones² and are based on her WRP knowledge and the results of recent targeted WRP surveys within the Proposal Area completed to date (August 2019, October 2019, December 2019 and February 2020).

The habitat clearing categories are shown in Figure 2 (Appendix A) and the habitat clearing protocols for each are detailed in Table 2-3. The habitat clearing category mapping may be updated based on the results of additional on-going WRP surveys of the Proposal Area to be conducted during 2020.

Table 2-3 WRP habitat clearing categories

HABITAT CLEARING CATEGORY	DESCRIPTION	CLEARING MANAGEMENT
1	<p>Resident WRP regularly observed</p> <p>Resident and transient WRP expected to be encountered during clearing</p>	<p>Clearing to be conducted during the period of February to August</p> <p>Temporary supplementary watering points (a minimum of two per hectare) will be installed and maintained in potential WRP/BTP to be retained at least 6 weeks prior to clearing commencing</p> <p>Temporary dreys (a minimum of two per hectare) will be installed and maintained in potential WRP/BTP habitat to be retained at least six weeks prior to clearing commencing</p> <p>One clearing operation per Habitat Clearing Category 1 patch at a time</p> <p>Maximum clearing area of one ha per day per Habitat Clearing Category 1 patches with a total of five ha per week</p> <p>Habitat Clearing Category 2 and 3 areas within 500 m of Habitat Clearing Category 1 areas shall be cleared prior to clearing Habitat Clearing Category 1 areas</p> <p>Temporary possum exclusion fencing to be install during staging to exclude WRP from re-entering the work area</p> <p>Two fauna spotters per machine conducting clearing operations</p> <p>Clearing to be conducted as per the Proposed Clearing and Clearing Staging Plans</p> <p>(Note: Main Roads preliminary surveys suggest that for the Bunbury area, most mature females have pouch young or young at heel between August and December. This will be confirmed by on-going WRP monitoring to be conducted during 2020.)</p>
2	<p>Monitored habitat patches that were often not utilised</p> <p>These areas are considered not suitable for resident WRP breeding females but</p>	<p>Habitat Clearing Category 2 areas to be cleared prior to clearing Habitat Clearing Category 1 areas</p> <p>One fauna spotter per machine conducting clearing</p>

² Barbara Jones has been studying the WRP population for more than 30 years and is recognised by the Commonwealth as one of the pre-eminent experts regarding WRP populations and ecology (TSSC, 2018a)

HABITAT CLEARING CATEGORY	DESCRIPTION	CLEARING MANAGEMENT
	<p>may be used by a transient animal for the short term</p> <p>High probability of no WRP being encountered during clearing</p>	
3	<p>Other WRP habitat.</p> <p>These areas include small areas of isolated remnant vegetation and paddock trees. The habitat is considered to be unsuitable for resident WRP but may be used by a transient animal for the short term</p> <p>Very high probability of no WRP being encountered during clearing.</p>	<p>Habitat Clearing Category 3 areas to be cleared prior to clearing Habitat Clearing Category 1 and 2 areas</p> <p>One fauna spotter per machine conducting clearing</p>

Based on the habitat clearing categories, WRP surveys and habitat extent proposed clearing operations and staging have been defined and are shown at Figure 3 (Appendix A).

WRP habitat connectivity will be retained / re-established in the longer term through the installation of underpasses/rope bridges (engineered movement structures) connected to adjacent habitat. Multiple structures at several locations have been proposed, as shown in Figure 4 (Appendix A). Four different designs are proposed to be used for WRP underpasses, as shown in Figure 5 (Appendix A). This includes one design that has been successfully utilised for a nearby Main Roads project, where an underpass connects the riparian zones along the Collie River in Australind. The proposed monitoring detailed below, will assess the effectiveness / use of the different designs by WRP.

Possum fencing will be installed adjacent at known habitat areas to exclude WRP moving onto the road. The fencing will be 1.5 m high and constructed to prevent possums being able to climb it or dig under it. Possum fencing is proposed to be both permanent and temporary (minimum of five years). Possum fencing has been located based on the Habitat Clearing Categories, targeted WRP surveys and adjacent habitat patches as shown on Figure 6 (Appendix A). The possum fence will be constructed in addition to noise and screen walls to exclude possum movements from adjacent habitat onto the road carriageway.

2.4.4.2 Carter's Freshwater Mussel

Carters Freshwater Mussel (CFM) were observed in the Proposal Area, see Figure 7 (Appendix A).

This species is acutely sensitive to salinity, >1.6 g/L, and its distribution has been reduced as a result of secondary salinisation of waterways in the south west of Western Australia (Klunzinger, M.W., Beatty, S.J., Morgan, D.L., Lymbery, A.J., Pinder, A.M. and Cale, D.J., 2012) Sedimentation to the point of burying mussels has been reported to cause mortality in CFM (IUCN, 2019).

During the planning of the project and development of the BORR Drainage Strategy, consideration has been given to minimise the potential for impacts to waterways (and therefore habitat for CFM) by maintaining existing surface water flows during and following construction. Changes to the Proposal design have

removed the requirement for bridge piers or abutments in any water courses. The Proposal will not directly impact any known CFM habitat.

The Proposal is considered unlikely to exacerbate any of the threats listed in the conservation advice for this species (TSSC, 2018b). The construction of new bridges across potential CFM habitat may provide positive outcomes for the species. Studies of habitat requirements for CFM indicate that bridges may create preferred habitat for the species (Hastie, *et al.*, 2000; Klunzinger, M W; Beatty, S J; Morgan, D L; Pinder, A M; Lymbery, A J, 2015), as the shade created by the bridge provides cooler conditions that are beneficial to the species.

Through the clearing controls and pre-clearing surveys, potential for impacts during construction will be carefully managed.

The risk of other potential impacts, such as contamination through spills and sedimentation of waterways will also be managed through implementation of appropriate procedures to be included in the CEMP.

2.4.4.3 Black-stripe Minnow

The Black-stripe Minnow (BSM) was recorded within the referral boundary for the Proposal, see Figure 8 (Appendix A).

The Proposal may affect local populations of the BSM by reducing the connectivity between sections of habitat and reducing the overall areas of seasonal wetlands.

To reduce the potential indirect impacts on BSM, the BORR Drainage Strategy has been prepared to minimise the potential for impacts to wetlands and waterways (including as habitat for BSM) during and following construction of the Proposal.

Clearing and disturbance of BSM habitat will be carefully managed throughout construction. The proposed drainage related monitoring that will be undertaken for BSM is detailed below.

Impacts to existing hydrology will be mitigated through the implementation of the Drainage Strategy which aims to maintain hydrological conditions as far as possible, and connectivity between habitats through use of suitable drainage design e.g. culvert design and construction to allow movement of fish.

The risk of other potential impacts, such as contamination of waterways through spills, will also be managed through implementation of appropriate procedures to be included in the CEMP.

2.4.4.4 Brush-tailed Phascogale

BTP were recorded within the Proposal Area (Figure 9, Appendix A).

BTP habitat within the Proposal Area consists of jarrah woodland, which also comprises WRP habitat. Modifications to the detailed design and maintenance of movement pathways proposed to avoid impacts to WRP will also avoid impacts to BTP.

Management measures proposed for WRP will also address potential impacts on BTP as the species share similar habitat types.

2.5 Index of Biodiversity Surveys for Assessments (IBSA)

The electronic Index of Biodiversity Surveys for Assessments (IBSA) data package has been submitted with this EMP, in accordance with the EPA *Instructions for the Preparation of Data Packages for IBSA*.

3 ENVIRONMENTAL MANAGEMENT PLAN PROVISIONS

3.1 Management targets

Management targets will be used to measure and report achievement against the environmental objective (Table 3-1).

Table 3-1 Management target to measure the efficacy of management actions relative to the environmental objective

ITEM	DETAIL
Environmental objective	To ensure that impacts to conservation significant fauna are avoided and minimised as far as practicable during the construction and operation of the Proposal
Management targets	Management target 1: Construct and operate the Proposal to avoid and minimise impacts to conservation significant fauna
	Management target 2: Fauna underpasses and overpasses will be designed, situated and constructed using best practice guidelines, and based on data from site fauna surveys
	Management target 3: Avoid mortality of conservation significant fauna during construction

3.2 Management actions

Risk-based management actions have been identified and prioritised to achieve the environmental objective detailed in section 1.1 (Table 3-2). The management actions focus the greatest management effort on reducing habitat and ecological connectivity loss and impact to individual conservation significant fauna. These management actions were specifically developed to ensure that impacts are minimised as far as practicable during the final design, construction and operation of the Proposal.

Table 3-2 Management actions to be implemented to achieve the environmental objective

KEY IMPACTS/RISKS	MANAGEMENT ACTIONS	Risk-based priority
Habitat clearing	<ul style="list-style-type: none"> • Prior to clearing, the final road design will be assessed against the proposed clearing area to ensure the required clearing area is no more than the approved amount • All WRP and BTP habitat that is to be retained within the development envelope will be surveyed and delineated with temporary fencing prior to site works to ensure it is conserved • No night time clearing of vegetation will occur • Cleared vegetation will be chipped immediately or transported at least 100 m from possum habitat before further processing • Movement / disturbance of clearing stockpiles will be confined to the period one hour after sunrise and / or one hour prior to sunset. 	High
Building demolition	<ul style="list-style-type: none"> • All buildings requiring demolition for the Proposal will be inspected for possums and BTP for two days prior to demolition works • Where possums or BTP are observed, or suspected, to be in any building to be demolished attempts shall be made to capture the animal prior to the demolition works commencing • An experienced zoologist / environmental scientist / fauna-spotter will be on-site at all times during the demolition of buildings suspected or observed to house possum or BTP • Machinery operators will maintain radio communication with their spotter • Any pest animal baits used in buildings to be demolished will be in bait stations. 	High
Mortality of Conservation Significant Fauna	<p>Sensitive clearing protocols</p> <ul style="list-style-type: none"> • Spotlighting of potential WRP and BTP habitat will be undertaken by a suitably experienced person for two nights immediately prior to clearing • Pre-clearing fauna searches shall be conducted immediately prior to and during clearing operations and will include hollows, dreys, ground debris, dense ground-level vegetation, fallen timber and logs • Clearing will be conducted congruent with the habitat clearing categories as detailed at Table 2-3 and shown in Figure 2 (Appendix A) • Vacant dreys will be removed prior to clearing where they are accessible • Vacant tree hollows suitable for possums will be removed or blocked prior to clearing where they are accessible • If WRP or BTP are observed during clearing operations, the tree containing the animal shall be left for up to 48 hours to allow for the animal to vacate, while clearing continues in adjacent vegetation. If the tree continues to be occupied after 	High

KEY IMPACTS/RISKS	MANAGEMENT ACTIONS	Risk-based priority
	<p>48 hours, the animal will be coerced / moved to a safe area outside of the clearing footprint by the appointed zoologist / environmental scientist / fauna spotter.</p> <ul style="list-style-type: none"> • Trees, as noted above, that are observed to support WRP and / or BTP after 48 hours will be ‘bumped gently’ with a machine prior to felling. The operator and spotter will wait and observe the tree for a short time. If the animal remains in the tree it shall be pushed over slowly onto vegetation within the clearing area that is yet to be cleared. The ‘soft felling’ of habitat trees will provide a ‘cushion’ for the vegetation being felled, minimising the risk of injury to the animal and allowing any WRP and BTP present with the opportunity to safely vacate. • Felled trees with hollows will be checked immediately for fauna after felling and prior to further processing. If it is not possible to fully inspect the hollow the tree will be left on the ground overnight to allow time for any undetected fauna to vacate. • Habitat clearing is to be staged, commencing from existing edge lines / roads and progressing towards habitat that will be retained to direct WRP and BTP towards these areas as per the proposed clearing staging (Figure 3, Appendix A). • A post-clearing survey shall be undertaken immediately following each days clearing operations and the following morning to identify the presence of any injured animals • Possum fencing (temporary and permanent) will be installed adjacent at known habitat areas to exclude WRP moving onto the road (Figure 4, Appendix A). The fencing will be 1.5 m high and be constructed to prevent possums being able to climb it or dig under it. <p>Terrestrial Fauna Handling</p> <ul style="list-style-type: none"> • Fauna handling will only be conducted by a suitably experienced persons i.e. zoologist / fauna spotter • Any WRP and BTP showing signs of injury or illness will be caught, bagged and taken to an experienced veterinarian • If an injured WRP and BTP has not already been captured, then the appointed fauna-spotter must attempt to capture the animal for the purposes of veterinary assessment and treatment • All treatment of injured fauna will be undertaken by a veterinarian • Where clearing operations abut existing roads, in addition to standard traffic management measures, visual message boards will be installed to warn drivers of the potential for fauna to cross the road during clearing operations. <p>Aquatic Fauna Relocation</p> <ul style="list-style-type: none"> • Refinement to the Proposal design means that no direct impact to CFM habitat is anticipated (no piers of bridge abutments located in water course) 	

KEY IMPACTS/RISKS	MANAGEMENT ACTIONS	Risk-based priority
	<ul style="list-style-type: none"> Relocation of CFM would only be triggered in response to sedimentation of water ways resulting from construction activities. If required, relocation will be conducted in consultation with the Department of Biodiversity Conservation and Attractions or the Fisheries Branch of the Department of Primary Industries and Regional Development. 	
Loss of ecological connectivity	<ul style="list-style-type: none"> Install permanent possum rope bridges / underpasses at key location(s) to enable fauna including WRP and BTP to move between retained habitat areas, see Figure 4 (Appendix A), including but not limited to: <ul style="list-style-type: none"> Across the existing Forrest Highway to facilitate movement within existing habitat east and west of the highway Across Clifton Road to facilitate movement north to the Brunswick River Across the Proposal Area at the Paris Road interchange to facilitate movement to the Brunswick River At the Picton Boyanup interchange to connect retained vegetation At the Collie, Ferguson and Preston Rivers to facilitate movement along the riverine vegetation The size and design of all movement devices will be based on MRWA Design of Fauna Underpasses (Main Roads Western Australia, 2010), topography at the site, expert advice (Barbara Jones, pers. comm.), information from relevant studies and reports (Harper, M., Mccarthy, M. & van der Ree, R, 2008)(QDMR, 2000) and in line with the concept designs (Figure 5, Appendix A) Underpass dimensions will be based on the fauna recorded or expected to occur in the vicinity, Figure 2 (Appendix A) The final underpass designs will incorporate the following features known to encourage use by fauna and reduce the risk of predation: <ul style="list-style-type: none"> Connection to nearby habitat via overhead rope hawsers (10 0m diameter) and poles (minimum 2.5m high) Objects for fauna to shelter on, under or in (furniture) will be locally sourced and will include sand, mulch, logs and rocks Revegetation using fast growing species at underpass entrances to provide cover for animals approaching, entering and leaving the underpasses Natural flooring such as sand or gravel Possum fencing to direct fauna towards the underpass entrance Dual-use underpasses will have a concrete substrate and will not contain furniture (furniture would be washed away by drainage flows) Install a suitable culvert to maintain habitat connectivity for BSM (small watercourse) during construction at the drainage line where it has been located at the southern end of the Proposal. 	High

KEY IMPACTS/RISKS	MANAGEMENT ACTIONS	Risk-based priority
Impacts to fauna in adjacent habitat	<ul style="list-style-type: none"> • Install possum fence adjacent to known habitat areas to limit WRP access to the Proposal Area, see Figure 4 (Appendix A) • The possum fence will be 1.5 m high and constructed to prevent possums being able to climb it or dig under it congruent with Figure 6 (Appendix A) • Road construction activities (i.e. activities undertaken after clearing has been completed) adjacent to WRP and BTP habitat will only be undertaken during daylight hours • The Proposal Area boundary will be fenced according to the detailed design to restrict pedestrian and vehicular access to retained WRP and BTP habitat • Where possible, initial earthworks in CFM and BSM habitat will occur during summer months (Oct-April) when wetlands are dry and water levels are at their lowest • Install silt curtains up and downstream of the Collie, Ferguson and Preston River bridge construction areas • Install silt fences as required at the Collie, Ferguson and Preston River bridge construction areas. 	Medium
Hydrology and drainage changes	<ul style="list-style-type: none"> • Long term hydrocarbon storage (i.e. hydrocarbons which shall not be used that day or not stored within equipment waiting to be used) or re-fuelling of equipment (with the exception of stationary plant) will not be permitted within 50 m of CFM habitat • The Construction Contractor will prepare a Spill Response Procedure for oil, chemical or hazardous material spill events to ensure any spill is contained effectively and cleaned up appropriately and efficiently with approved materials • Through detailed design, maintain hydrologic connections between BSM habitat areas to enable fish movement • Design and construction of drainage to maintain surface water flows and groundwater regimes consistent with the pre-disturbance condition (baseline) as far as practicable • Prior to any interruption of current surface water flows or fish pathways, culverts will be installed. 	Medium

3.3 Monitoring

The purpose of monitoring is to inform, through the management targets, if the environmental objectives are being achieved, and whether management actions need to be reviewed or revised.

Monitoring will be undertaken for each management target as detailed in Table 3-3. The method, location, parameters and frequency of monitoring is specified. Early warning indicators provide advance warning that a management target may not be met. The results of monitoring will be compared against these indicators and will enable actions to be put in place to control the contributing processes so that the environmental objective can be met.

Main Roads will liaise with DBCA as required to refine proposed early warning indicators and adaptive management actions.

Detail on the monitoring methodologies proposed for each conservation significant fauna species is included in Sections 3.3.1 to 3.3.3.

Table 3-3 Monitoring to measure the efficacy of management actions against the management targets

INDICATOR	METHOD	LOCATION	PARAMETERS	FREQUENCY	EARLY WARNING INDICATOR
Management target 1: Construct and operate the Proposal to avoid and minimise impacts to conservation significant fauna.					
Habitat clearing	Construction area assessment to visually check / review clearing boundaries and assess vegetation clearing	Within cleared areas containing native vegetation	Within design specification	Daily	Clearing or disturbance of WRP or BTP habitat outside of the approved works area Unauthorised clearing of WRP or BTP habitat within the approved development envelope
Impacts to fauna in adjacent habitat	Nocturnal survey for WRP and BTP	In potential impact sites (retained habitat at the Paris / Clifton interchange and Boyanup Picton Rd interchange) and current reference sites (Lot 2 Boyanup Picton Road and Reserve R23000 Bussell Highway)	Presence/ absence, abundance and distribution	Biannually during construction and for three years post construction	Loss of WRP in any monitoring period at potential impact sites but not in reference sites in two consecutive monitoring periods
	Inspect possum fence installation and maintenance	All possum fence locations (once constructed)	Within design specification	During construction and biannually for five years post-construction	N/A – The possum fence will be in or out of specification
	Measure surface water quality parameters critical to CFM and BSM survival (including TN, TP, temperature, pH, oxidation-	CFM: Upstream and downstream of the Ferguson River bridge site BSM: Suitable habitat within each section of BORR	Levels within specified guidelines	Ongoing quarterly prior to and during construction and biannually for three years post construction	ANZECC guidelines Vol 1 standard triggers for toxicants at 95% level of protection (Table 3.4.1) and Tables 3.3.6 – 3.3.7 default trigger values for physical and

INDICATOR	METHOD	LOCATION	PARAMETERS	FREQUENCY	EARLY WARNING INDICATOR
	reduction potential, conductivity and turbidity) Sampling using appropriate water quality meters and / or laboratory analysis				chemical stressors for south-west Australia for slightly disturbed ecosystems and/or significant difference from baseline conditions in one monitoring period
	Visual inspection presence of CFM	In known habitat areas within the Proposal Area (Ferguson River) and in one reference site (Preston River)	Presence/absence	Annually during construction and for three years post construction	CFM absent from known habitat areas within the Proposal Area
	Visual inspection for presence of BSM	In known habitat areas and in at least one reference area	Presence /absence	Annually during construction and for three years post construction	BSM absent from known habitat areas adjacent to the Proposal Area
Hydrology and drainage changes	Manual water level sampling and / or measurement of waterbody depth	Known CFM and BSM habitat	Surface water flows and groundwater levels	Quarterly (where able e.g. winter /spring only for surface water) during construction and biannually for three years post construction	Change in hydrology from baseline conditions (quantum to be determined based on baseline monitoring)
	Visual inspection of condition and functioning of installed silt curtain / fence and for offsite discharges from the	Offsite discharge sites from the Proposal Area into known CFM habitat	Presence/absence of offsite discharge	Opportunistic and weekly during construction	Plume detected outside of silt curtain Silt curtain / fence damaged or ineffective

INDICATOR	METHOD	LOCATION	PARAMETERS	FREQUENCY	EARLY WARNING INDICATOR
	Proposal Area into CFM habitat				
	Visual inspection of condition / presence of adjacent riparian vegetation	Known CFM habitat areas	Presence/absence and condition	Opportunistic and weekly visual inspection during construction and biannually post construction	New physical damage to or loss of adjacent riparian vegetation in known CFM habitat areas
	Visual inspection of bank stability including for evidence of erosion or sedimentation of CFM and BSM habitat	CFM and BSM habitat within and adjacent to the Proposal Area	Presence/absence of erosion or sedimentation	Opportunistic and weekly visual inspection during construction and biannually post construction	Evidence of bank instability or new erosion / sedimentation in monitored CFM or BSM habitat

Management target 2: Fauna underpasses and overpasses will be designed, situated and constructed using best practice guidelines, and based on data from site fauna surveys.

Loss of ecological connectivity	Review of design reports and drawings to ensure WRP and BTP bridges / underpasses are designed and incorporated into the Proposal	All committed WRP and BTP bridge / underpass locations	Within design specification	At 50% design and IFC (issued for construction)	N/A – the bridges / underpasses will be included or excluded from the drawings
	Visual inspection of WRP and BTP bridges / underpasses	All WRP and BTP bridge / underpass locations (once constructed)	Within design specification Presence of furniture	Bi-annual monitoring during construction	N/A – The bridges / underpasses will be in or out of specification
	Visual inspection for WRP and BTP scats to assess utilisation	Beneath rope bridges and in underpasses	Presence/absence of scats	Quarterly for five years post construction	Bridges / underpasses not used within 24 months of installation

INDICATOR	METHOD	LOCATION	PARAMETERS	FREQUENCY	EARLY WARNING INDICATOR
	Use motion sensor IR cameras to assess utilisation (visual assessment of footage)	At rope bridge and underpass locations	WRP or BTP filmed using rope bridge or underpass	Intermittent for five years post construction	Bridges / underpasses not used within 24 months of installation
	Visual inspection for damage to or blockage of BSM habitat and / or fish pathways	BSM habitat and / or fish pathways	Presence /absence of damage or blockage	Annually in winter during construction and for three years post construction	Culvert blocked or ineffective
Management target 3: Avoid mortality of conservation significant fauna during construction.					
Mortality of Conservation Significant Fauna	Visual inspection to review clearing boundaries and assess vegetation clearing	Within cleared areas containing native vegetation	Within design specification	Daily during clearing operations	Clearing or disturbance of WRP or BTP habitat outside of the approved works area Unauthorised clearing of WRP or BTP habitat within the approved development envelope
	Conduct walkover inspection of cleared areas and fallen trees for conservation significant fauna species	Within cleared areas containing native vegetation	Number of fauna seen during clearing activities	Daily, prior to and after clearing during clearing operations	WRP or BTP injured or killed by site activities Unexpected observation of WRP or BTP on site
	Pre-demolition fauna assessments	Sites to be demolished	Presence /absence of conservation significant fauna	Daily prior to demolition activities	Unexpected observation of WRP or BTP on site during demolition activities

INDICATOR	METHOD	LOCATION	PARAMETERS	FREQUENCY	EARLY WARNING INDICATOR
	Visual inspection of vegetation stockpile areas	Vegetation stockpiles	Presence /absence of conservation significant fauna	Daily or as required prior to removal of vegetation stockpiles	Encounter one or more live or injured conservation significant species in vegetation stockpiles

3.3.1 Western Ringtail Possum and Brush-tailed Phascogale monitoring program

Objective

The objectives of the monitoring program are to

1. conduct WRP surveys in areas of retained habitat and compare the survey results with data collected from reference sites
2. obtain evidence of use by WRP of underpasses and possum rope bridges
3. obtain detected / undetected data for BTP and build a record of where BTP have been sighted.

Monitoring for impacts to WRP and BTP will be conducted at both reference sites and areas of retained habitat abutting the Proposal Area. The monitoring will comprise scat counts and nocturnal surveys to be conducted by a suitably experienced zoologist / environmental scientist.

Reference sites and potential impact sites

Main Roads has commenced monitoring of two reference sites outside of the Proposal Area. These are located abutting the existing BORR Stage 1 (Lot 2 Boyanup Picton Road) and Reserve (R23000) abutting Bussell Highway in Gelorup. Any reduction in WRP presence at potential impact sites will be compared with those in the reference sites. This will enable determination of the likelihood of impacts having resulted from the Proposal.

Data analysis

Field data will be collated and reviewed after each monitoring survey. Analysis will include comparison of data and trends between seasons and years, and also between reference sites and potential impact sites.

3.3.2 Carter's Freshwater Mussel monitoring program

Monitoring for impacts to CFM will be conducted at both reference sites and potential impact site (Ferguson River) within the Proposal Area. A reference site will be established at the Preston River for the purposes of providing comparative species and population trend data. Monitoring will comprise sampling and visual assessments, and include photo monitoring. Monitoring will be conducted by a suitably experienced zoologist / environmental scientist.

Reference sites and potential impact sites

Baseline data collection at monitoring sites will commence early 2020. Any changes in conditions at potential impact sites will be compared with those in the reference site. Note: if relocation should be required, monitoring of CFM during construction will focus on monitoring of the relocation and reference sites and following completion of construction would include the impact site following the replacement of CFM (during operational phase). This will enable determination of the likelihood of impacts having resulted from Proposal.

Data analysis

Data analysis will consist of the following:

Water quality

Assessment of change against baseline conditions and comparison with ANZECC guideline values.

Presence / absence

Assessment of presence / absence data and trends between monitoring periods and between potential impact sites and reference sites.

3.3.3 Black-stripe Minnow monitoring program

Monitoring for impacts to BSM will be conducted at a reference site (Manea Park) and potential impact site (drainage line at southern extent of the Proposal Area (approx. Ch.110.700)). The reference site will be established for the purposes of providing comparative species and population trend data. Monitoring will

comprise sampling and visual assessment, and will include photo monitoring. Monitoring will be conducted by a suitably experienced zoologist / environmental scientist.

Reference sites and potential impact sites

Reference sites for BSM will be identified prior to commencement of clearing activity. Baseline data collection at reference sites will commence early 2020. Any changes in conditions at potential impact sites will be compared with those in reference sites. This will enable determination of the likelihood of impacts having resulted from Proposal implementation to ensure surface water flows are maintained through the implementation of the Proposal.

Photo point design

Photo points will be used in assessing sedimentation and function of the culvert and will be established prior to construction commencing. Where possible, photo points will be marked permanently with a stake and their locations will be and recorded using a handheld GPS. All photographs will be taken from the top of the stake. Photo point monitoring will form part of each monitoring event.

Data analysis

Data analysis will consist of the following:

Water quality

Assessment of change against baseline conditions and comparison with ANZECC guideline values.

Presence / absence

Assessment of presence / absence data and trends between monitoring periods and between potential impact sites and reference sites.

3.4 Review and revision of management actions

Where an early warning indicator is triggered, management actions are not implemented and/or a management target is not met, Main Roads will:

- Investigate the cause of the management actions not being implemented and/or management targets being exceeded.
- Investigate to determine potential environmental harm or alteration of the environment that occurred due to failure to implement management actions
- Review the management actions (Table 3-1) and revise if required.
- Develop additional management actions where necessary.

Potential adaptive management actions are listed in Section 4.

3.5 Reporting provisions

3.5.1 Annual Compliance Assessment Report

A Compliance Assessment Report (CAR) will be submitted to the Environmental Protection Authority (EPA) Services unit of DWER as prescribed by the EPA. The report will document compliance with conditions of approval including assessment of compliance with management plan requirements where management plans form part of approval conditions.

3.5.2 Reporting on Management Actions not Implemented or Exceedance of the Management Targets

In the event that the management target is exceeded (or not met), DWER will be advised in writing within seven days of identification of the exceedance.

A report will be provided to DWER within 60 days of a management target not being met including details on:

- The cause for failure to implement management actions and/or management targets to be exceeded
- Findings of the investigation to determine potential environmental harm or alteration of the environment that occurred due to failure to implement management actions
- Details of revised and/or additional management actions to be implemented to prevent exceedance of the management targets and/or ensure the implementation of management actions
- Relevant changes to the Proposal activities
- Measures implemented to prevent, control or abate environmental harm which may have occurred.

4 ADAPTIVE MANAGEMENT AND REVIEW OF THE EMP

4.1 Adaptive management

The adaptive management approach aims to reduce impacts by embedding a cycle of monitoring, reporting and implementing change (where required). Main Roads will apply the principles of adaptive management through monitoring, adaptive management actions and implementing changes necessary to effectively meet the environmental objective. The EMP is intended to be dynamic and will be updated to reflect changes in management practices over the life of the Proposal. This will also allow flexibility to respond to new environmental impacts and adopt new technologies / management measures. Adaptive management has been embedded throughout this document, with the key management processes described below.

Potential adaptive management actions for each of the conservation significant fauna species are listed in Table 4-1 to Table 4-3.

Table 4-1 Potential adaptive management actions – WRP and BTP

ITEM	POTENTIAL ADAPTIVE MANAGEMENT ACTION
Clearing or damage to WRP or BTP habitat outside of approved clearing area	<ul style="list-style-type: none"> • Investigate cause and raise an incident report • Implement corrective actions which may include: <ul style="list-style-type: none"> - Review practicality and relevance of management measures - Improve training and education for all personnel - Improve and implement increased protective measures as necessary - Improve methods for defining clearing lines - Install additional temporary fencing or signs. • Monitor outcomes.
WRP or BTP injured or killed by site activities	<ul style="list-style-type: none"> • All clearing and / or construction within known WRP and BTP habitat is immediately ceased • Investigate cause of injury or loss • Main Roads to consult with DBCA of the WRP and BTP injury or mortality occurring • Measures for minimising impacts to WRP and BTP as a result of clearing and construction are revised in consultation with DBCA to reduce the likelihood of any further WRP and BTP injury or mortality before clearing and construction recommences • Improve training and education for all personnel • Restart clearing within core habitat area and monitor outcomes.
Loss of WRP in any monitoring period at monitored habitat areas but not in reference sites in three consecutive monitoring periods	<ul style="list-style-type: none"> • Investigate cause and consult with DBCA • Implement contingency actions which may include: <ul style="list-style-type: none"> - Review practicality and relevance of management measures - Repair / alter design of fencing to block vehicular access if required - Install additional signage - Better connecting populations. • Monitor outcomes.
Bridges / underpasses not used within 48 months of installation	<ul style="list-style-type: none"> • Investigate cause and consult with DBCA • Implement contingency actions which may include: <ul style="list-style-type: none"> - Assessment of bridge / underpass to determine reason for lack of utilisation - Modification of bridge / underpass structure if required.

ITEM	POTENTIAL ADAPTIVE MANAGEMENT ACTION
	<ul style="list-style-type: none"> • Monitor outcomes.
Possum fence not installed per design or required timeframe	<ul style="list-style-type: none"> • Investigate cause and raise an incident report • Implement contingency actions which may include: <ul style="list-style-type: none"> - Review practicality and relevant of management measures - Improve training and education for all personnel - Improve and implement increased protective measures/controls as necessary - Review monitoring frequency and method • Monitor outcomes.

Table 4-2 Potential adaptive management actions - CFM

ITEM	POTENTIAL ADAPTIVE MANAGEMENT ACTION
CFM found in potential impact site	CFM relocated to identified recipient habitat by a suitably qualified environmental scientist
ANZECC guidelines Vol 1 standard triggers on two occasions and/or significant difference from baseline conditions in one monitoring period	<ul style="list-style-type: none"> • Investigate the cause and raise an incident report if necessary. Include consideration of results from baseline monitoring and comparison with reference sites for the same period • Remedial action controls will be undertaken if required – to be determined based on likely cause e.g. spills, sedimentation or erosion • A review will be conducted of management measures and/or further education of staff / contractors to ensure that all possible steps are taken to prevent any reoccurrence • Preventative actions such as modifications to infrastructure and additional engineering post-construction will be taken to prevent further non-compliance. • Monitor the effectiveness of the control(s).
Erosion / sedimentation cause has not been remediated within 5 days of detection	<ul style="list-style-type: none"> • Investigate the cause and raise an incident report if necessary • Remedial action controls will be undertaken immediately to repair damage if required • Preventative actions such as modifications to infrastructure and additional engineering post-construction will be taken to prevent further non-compliance. These may include: <ul style="list-style-type: none"> - Application of fill/mulch - Installation of gabion cages - Installation of jute matting to secure bank • A review will be conducted of management measures and/or further education of staff / contractors to ensure that all possible steps are taken to prevent any reoccurrence • Monitor the effectiveness of the control(s).
Plume detected outside of silt curtain Silt curtain / fence damaged or ineffective	<ul style="list-style-type: none"> • Investigate cause and raise an incident report • Implement contingency actions which may include: <ul style="list-style-type: none"> - Inspect and repair any damaged/ineffective silt curtain / fencing - Review practicality and relevant of management measures - A review will be conducted of management measures and/or further education of staff / contractors to ensure that all possible steps are taken to prevent any reoccurrence

ITEM	POTENTIAL ADAPTIVE MANAGEMENT ACTION
	<ul style="list-style-type: none"> - Review monitoring frequency and method. • Monitor outcomes.

Table 4-3 Potential adaptive management actions - BSM

THRESHOLD	CONTINGENCY ACTION
ANZECC guidelines Vol 1 standard triggers on two occasions and/or significant difference from baseline conditions in one monitoring period	<ul style="list-style-type: none"> • Investigate the cause and raise an incident report if necessary. Include consideration of results from baseline monitoring and comparison with reference sites for the same period • Remedial action controls will be undertaken if required – to be determined based on likely cause eg spills, sedimentation or erosion • A review will be conducted of management measures and/or further education of staff / contractors to ensure that all possible steps are taken to prevent any reoccurrence • Preventative actions such as modifications to infrastructure and additional engineering post-construction will be taken to prevent further non-compliance. • Monitor the effectiveness of the control(s).
Erosion / sedimentation cause has not been remediated within 5 days of detection	<ul style="list-style-type: none"> • Investigate the cause and raise an incident report if necessary • Remedial action controls will be undertaken immediately to repair damage if required • Preventative actions such as modifications to infrastructure and additional engineering post-construction will be taken to prevent further non-compliance. These may include: <ul style="list-style-type: none"> - Application of fill/mulch - Installation of gabion cages - Installation of jute matting to secure bank • A review will be conducted of management measures and/or further education of staff / contractors to ensure that all possible steps are taken to prevent any reoccurrence. • Monitor the effectiveness of the control(s).
Culvert blocked or ineffective five days after initial detection	<ul style="list-style-type: none"> • Investigate cause and raise an incident report • Implement contingency actions which may include: <ul style="list-style-type: none"> - Unblocking the culvert - Review practicality and relevance of management measures - Revision of maintenance and weed control program to ensure culvert remains free of debris and other matter - Preventative actions such as modifications to infrastructure and additional engineering post-construction to prevent further non-compliance - A review will be conducted of management measures and/or further education of staff / contractors to ensure that all possible steps are taken to prevent any reoccurrence - Review monitoring frequency and method • Monitor outcomes.

4.2 EMP revision

This EMP will be reviewed on an annual basis during construction of the Proposal. The review will take into account the adaptive management and continual improvement process. Potential reasons or triggers for revising management actions include:

- Changes to construction methods and timing
- Trigger of early warning indicators
- New or revised information becoming available about target species (specifically their behaviour and habitat requirements)
- Changes to action plans for target species developed under state or federal legislation.

After completion of the construction contract, the BORR will be managed in line with Main Roads operational management procedures for the maintenance of roads.

The implementation of this plan will be audited annually during construction.

4.3 Audits

Environmental audits will be undertaken to ensure the management measures outlined in this EMP are being adequately implemented. Auditing of the commitments outlined in this EMP will be undertaken as follows:

- During construction regular system audits of management actions and compliance procedures, including:
 - Pre-construction: a review of the CEMP for compliance with this EMP and environmental approval conditions
 - Post-construction: correction of any non-conformances at completion of construction
- Annual third party audit of the CEMP and environmental approval conditions during construction
- Regular site CEMP compliance inspections including audits of key contractor's environmental management and monthly inspections. The Construction Contractor will carry out weekly / daily compliance checks as per the CEMP.

Audit findings will be reported by Main Roads within four weeks of the audit being completed.

5 COMMUNICATION

5.1 Stakeholder consultation

MRWA has consulted with a number of stakeholders while developing this plan, consistent with the EPA's expectations to align the plan with the principles of environmental impact assessment. This section provides a summary of consultation that occurred. The comments raised during consultations with stakeholders were considered in preparing this EMP. A summary of stakeholder consultation undertaken during preparation of this EMP is presented in Table 5-1.

Table 5-1 Stakeholder consultation summary

STAKEHOLDERS CONSULTED	ADVICE RECEIVED	RESPONSE
Biota Environmental Sciences (Dr. Roy Teale)	Advice regarding monitoring and management of WRP and BTP	Provided advice incorporated into the development of this EMP
Wetland Research and Management	Advice regarding monitoring and management of CFM and BSM	Provided advice incorporated into the development of this EMP
Ms. Barbara Jones	Advice regarding monitoring and management of WRP	Provided advice incorporated into the development of this EMP
Stakeholder workshop 13 November 2019. Attendees included officers from Department of Water and Environment Regulation (EPA Services), DBCA, Commonwealth Department of Agriculture, Water and Environment)	Advice regarding the level of information to be included within Threatened Fauna EMP	Conservation Significant Fauna EMP to only include actions specific to the Proposal, with standard management measures to be implemented for Proposal but not included in plan

5.2 External communications and complaints

The Construction Contractor will develop and maintain a complaints register to record all complaints. Complaints will be recorded by the person who receives the complaint (at the time it is received). Records to be obtained about a complaint include:

- Contact details for the person making the complaint (name and phone number as a minimum)
- Approximate location that the issue was identified by complainant
- Date, time and issues that the complaint relates to.

6 REFERENCES

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APPENDIX A FIGURES

Figure 1 The Proposal – Bunbury Outer Ring Road – Northern and Central Sections

Figure 2 WRP observations and habitat clearing categories

Figure 3 Clearing staging plans

Figure 4 Fauna crossing provisions and exclusion fencing concept plans

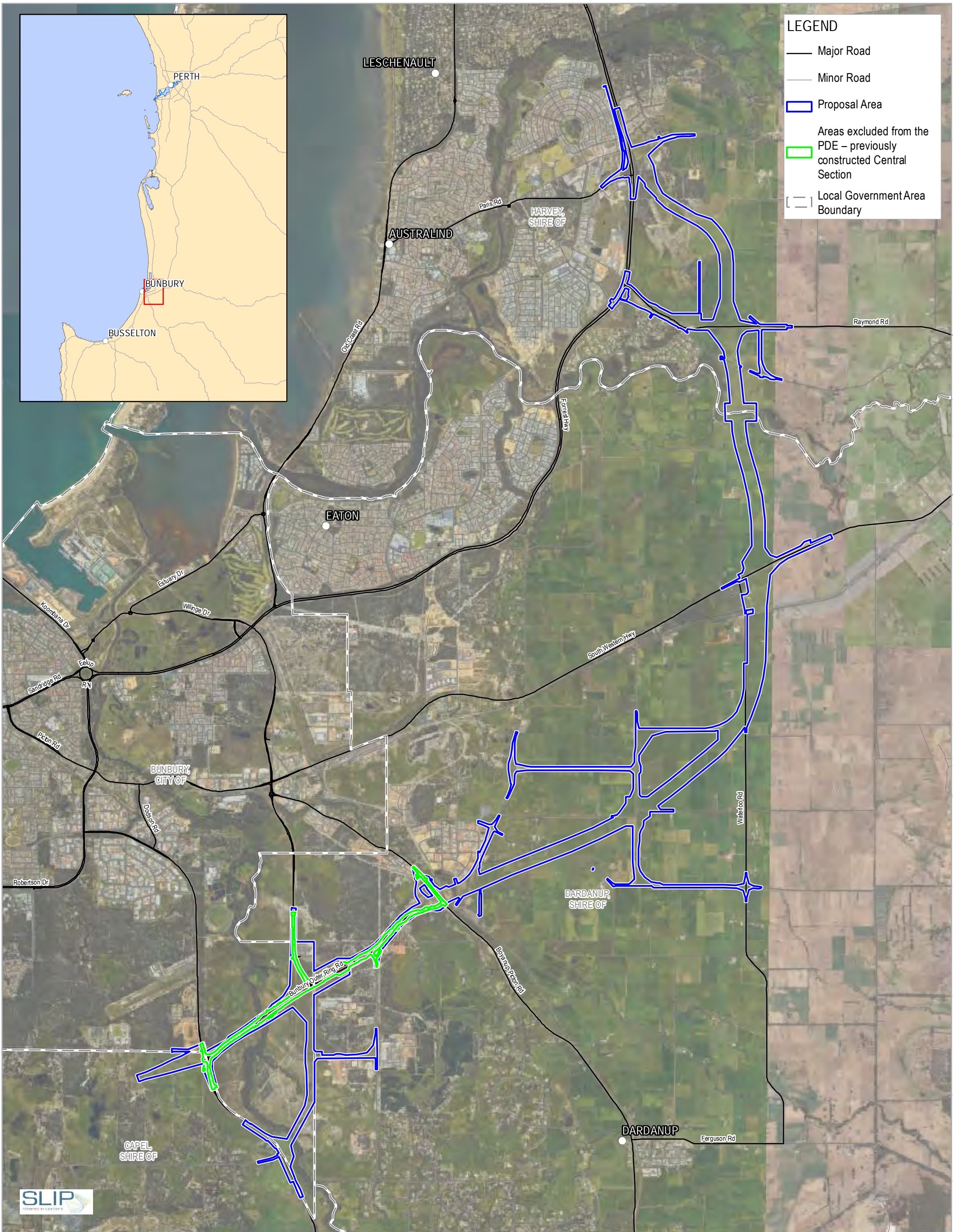
Figure 5 Fauna crossing typical details

Figure 6 Possum fence concept plan

Figure 7 Carter’s Freshwater Mussel observations within and adjacent to the Proposal Area

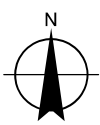
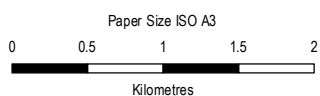
Figure 8 Black-stripe Minnow observations within and adjacent to the Proposal Area

Figure 9 Brush-tailed Phascogale records within and adjacent to the Proposal Area



LEGEND

- Major Road
- Minor Road
- ▭ Proposal Area
- ▭ Areas excluded from the PDE – previously constructed Central Section
- [- -] Local Government Area Boundary



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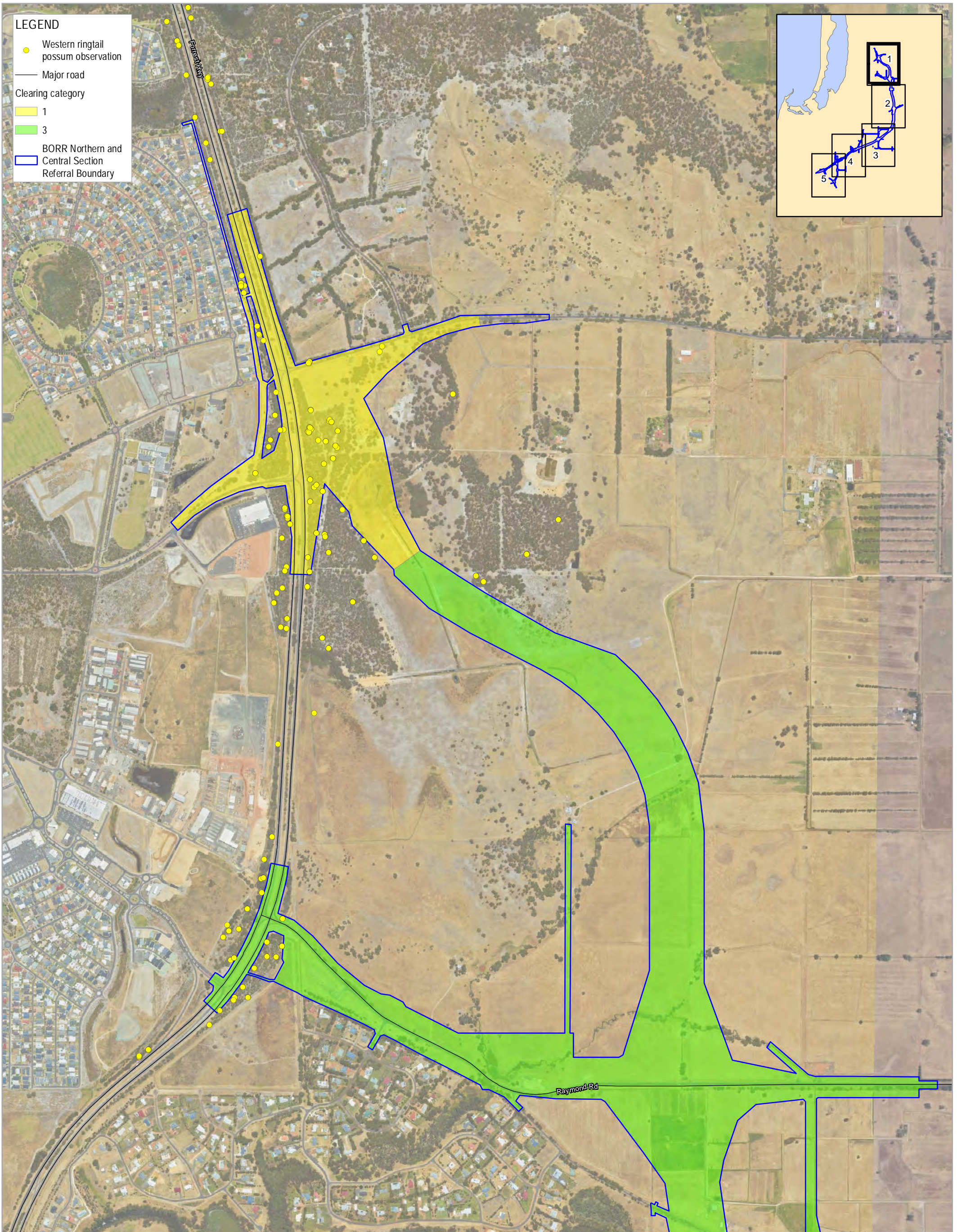


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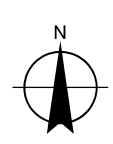
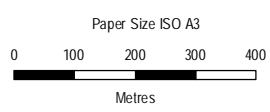
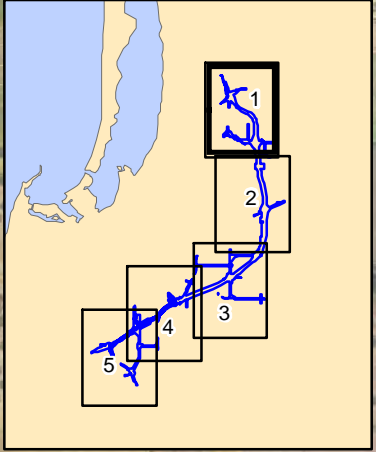
Proposal Area

FIGURE 1



LEGEND

- Western ringtail possum observation
- Major road
- Clearing category
- 1
- 3
- BORR Northern and Central Section Referral Boundary



Map Projection: Transverse Mercator
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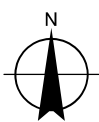
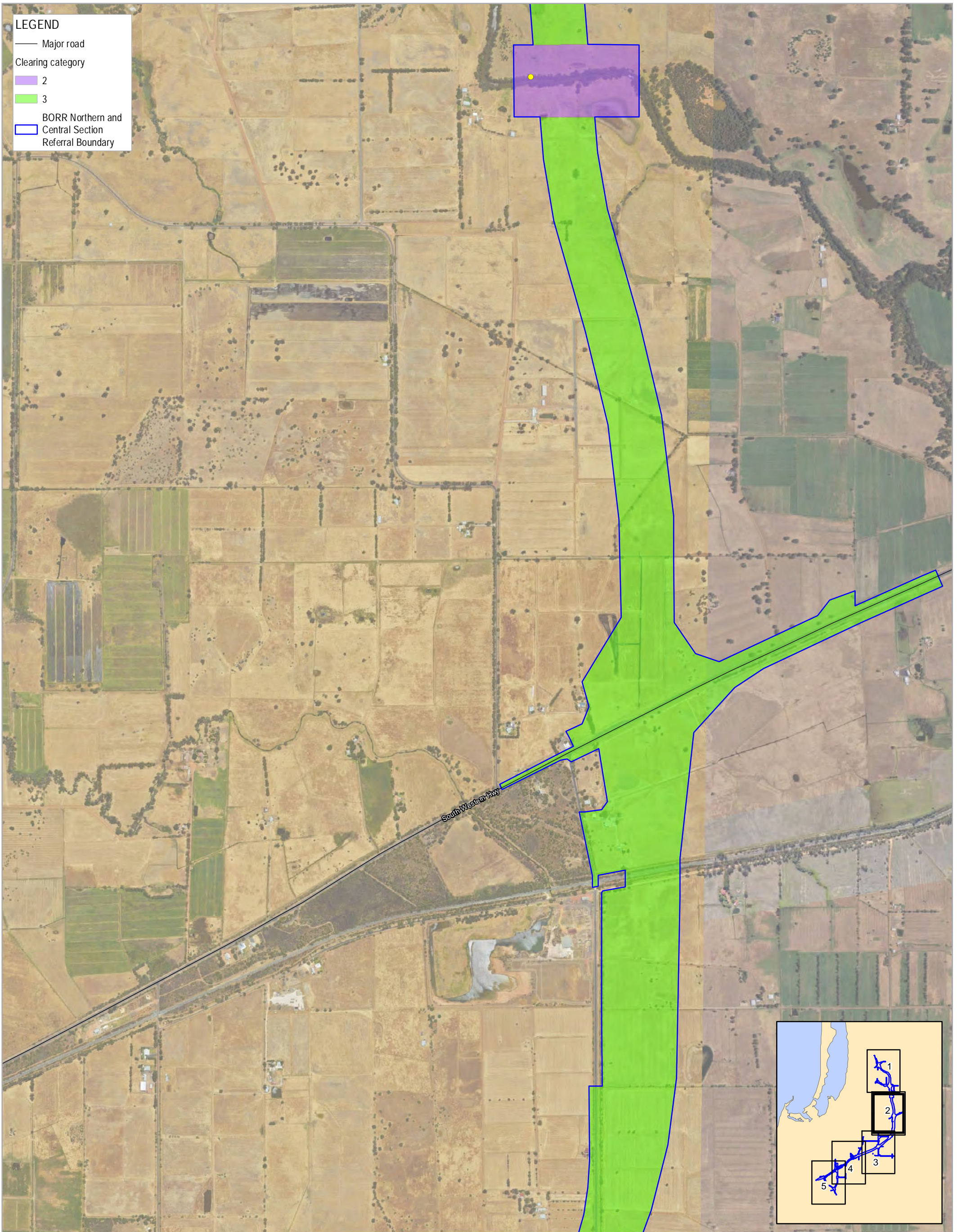
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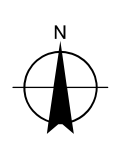
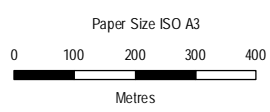
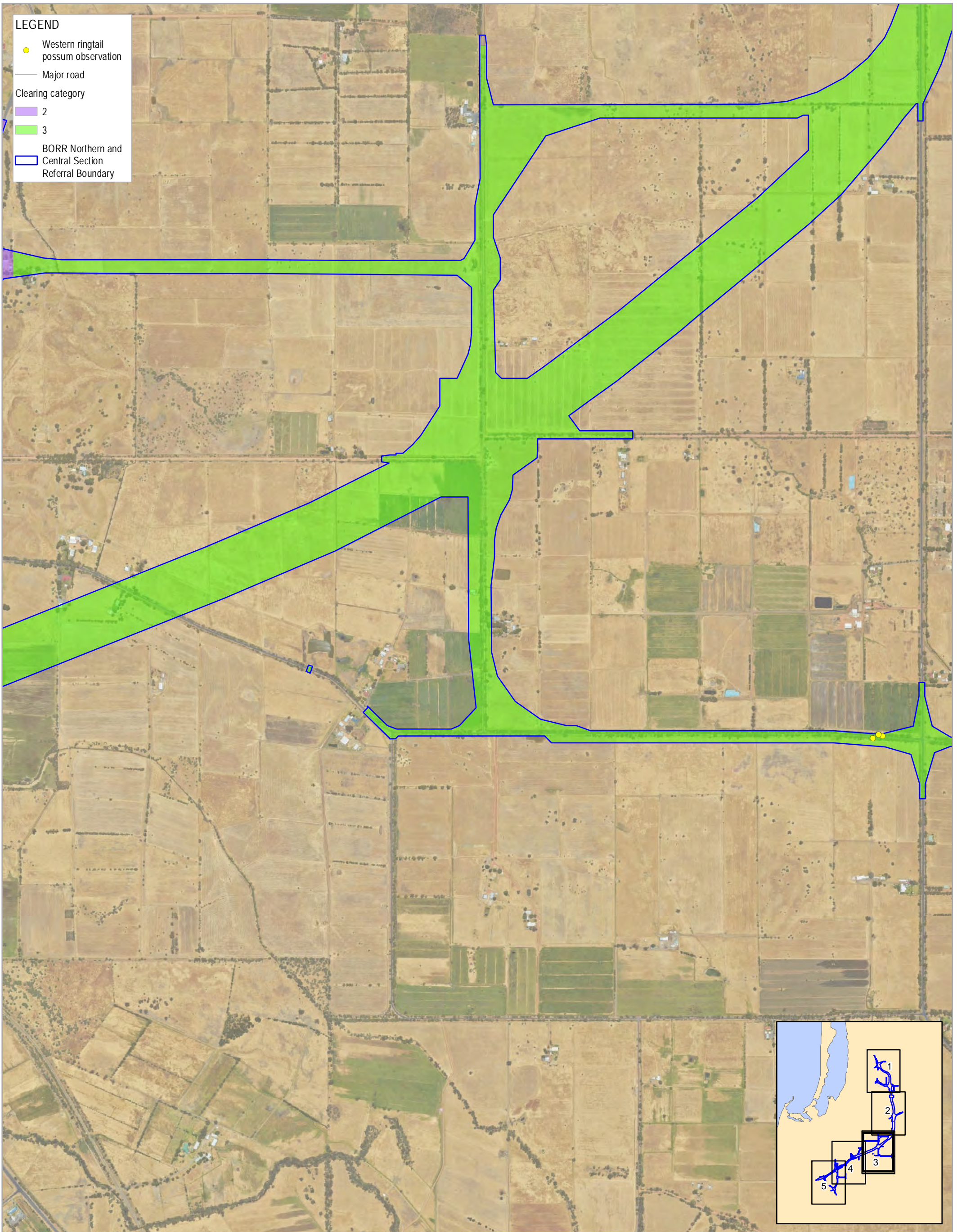
WRP observations and
 habitat clearing categories

Page 1 of 5
FIGURE 2

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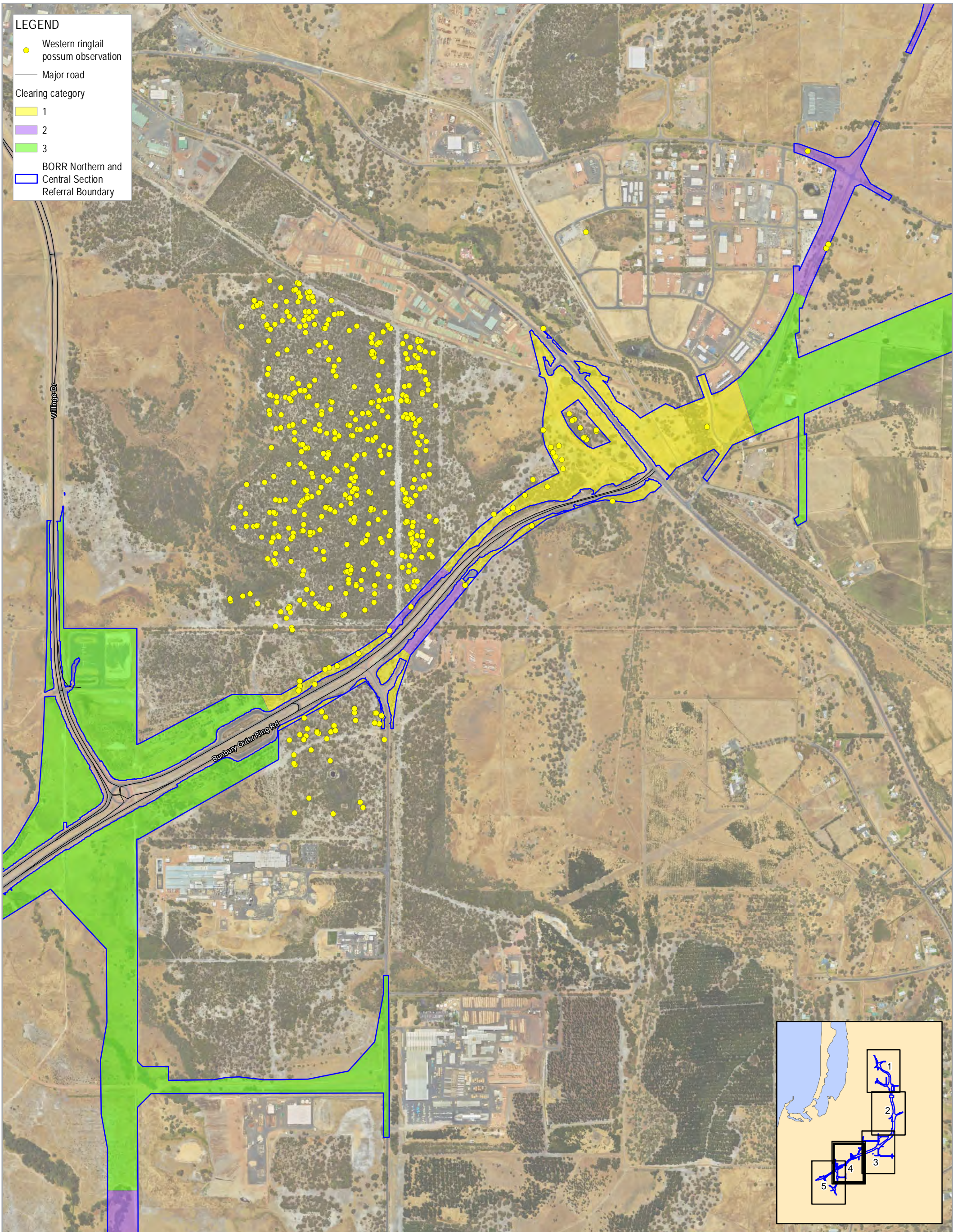


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WRP observations and
habitat clearing categories

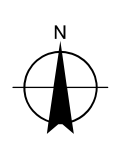
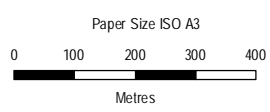
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FIGURE 2



LEGEND

- Western ringtail possum observation
- Major road
- Clearing category
 - 1
 - 2
 - 3
- BORR Northern and Central Section Referral Boundary



Map Projection: Transverse Mercator
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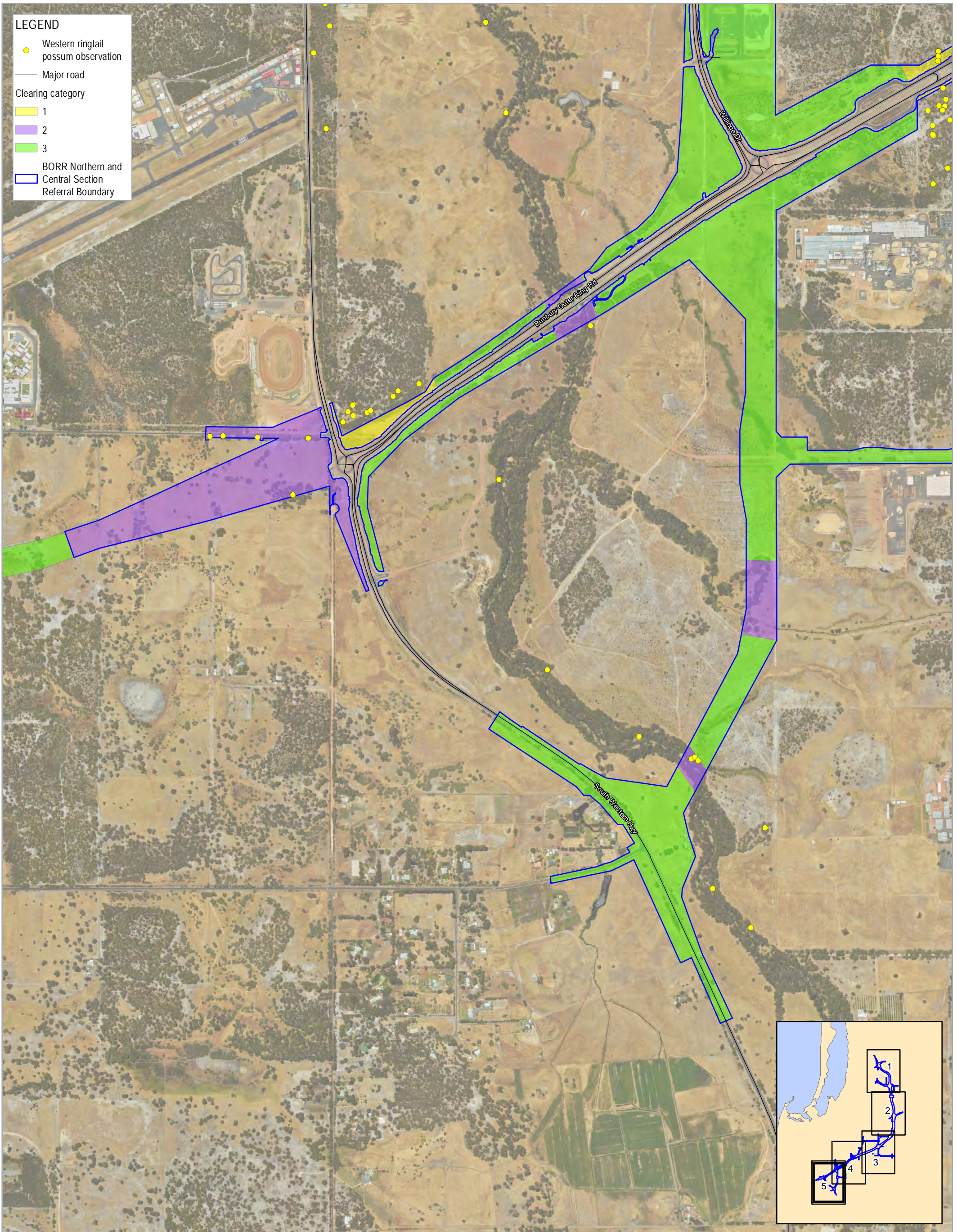
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WRP observations and habitat clearing categories

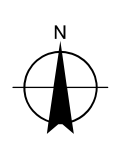
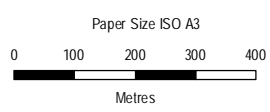
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 accessed 20/20/2020. Created by: mmkkonen



LEGEND

- Western ringtail possum observation
- Major road
- Clearing category
- 1
- 2
- 3
- BORR Northern and Central Section Referral Boundary



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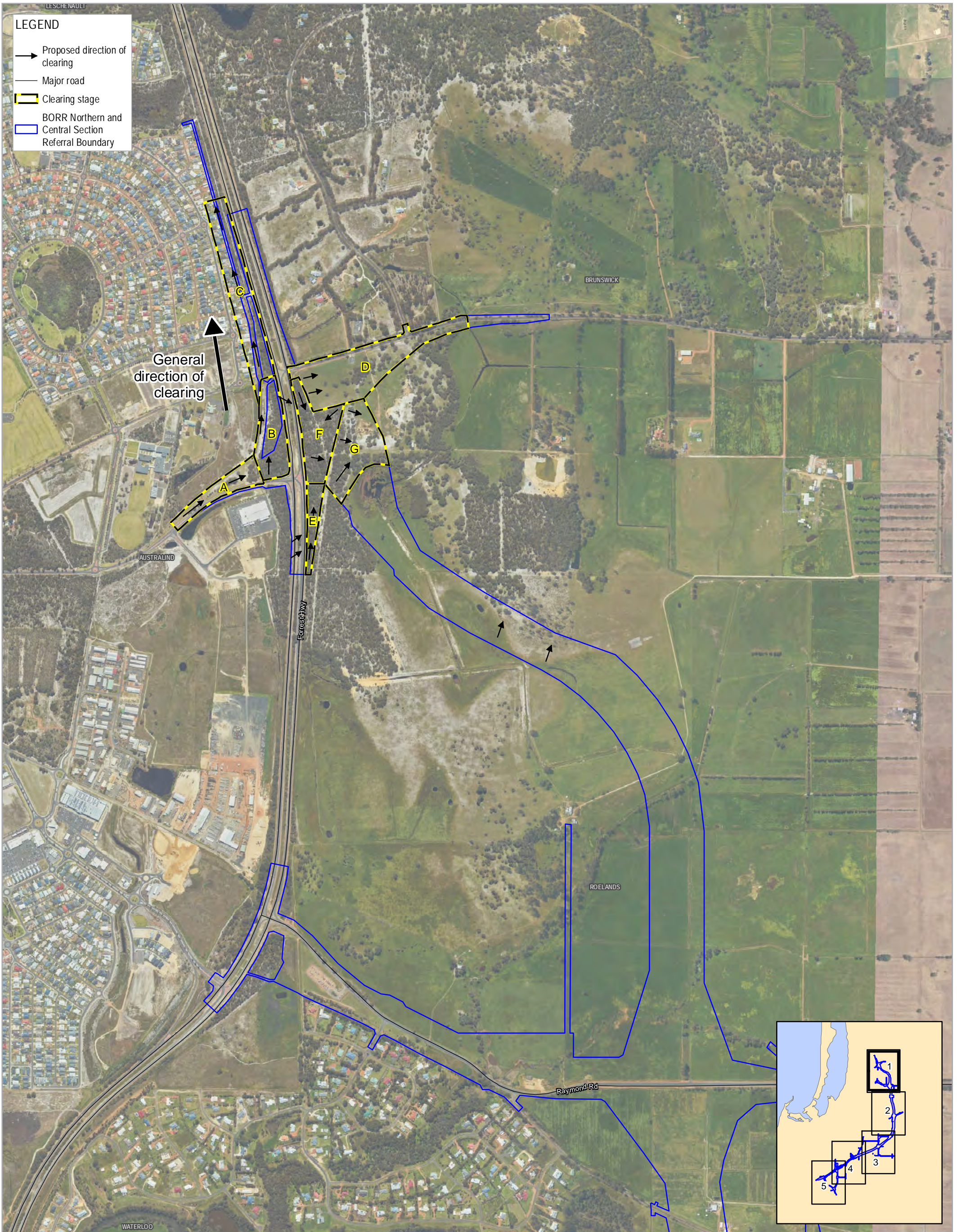
Main Roads Western Australia
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Environmental Management Plan

WRP observations and
habitat clearing categories

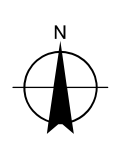
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FIGURE 2

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 Grid: GDA 1994 Perth Coastal Grid 1994

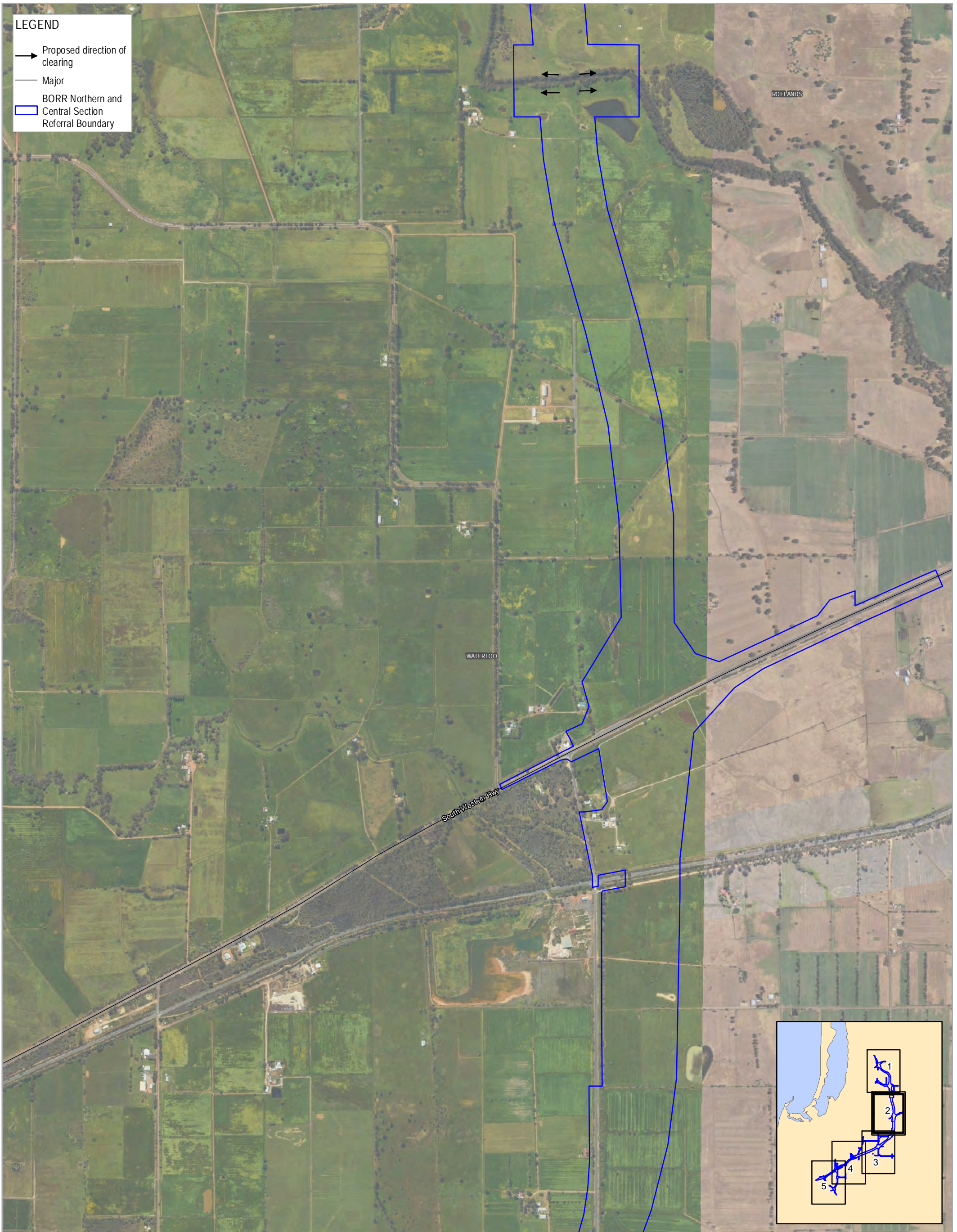


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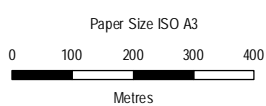
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 Clearing Staging

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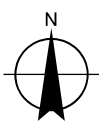


LEGEND

- Proposed direction of clearing
- Major
- BORR Northern and Central Section Referral Boundary



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



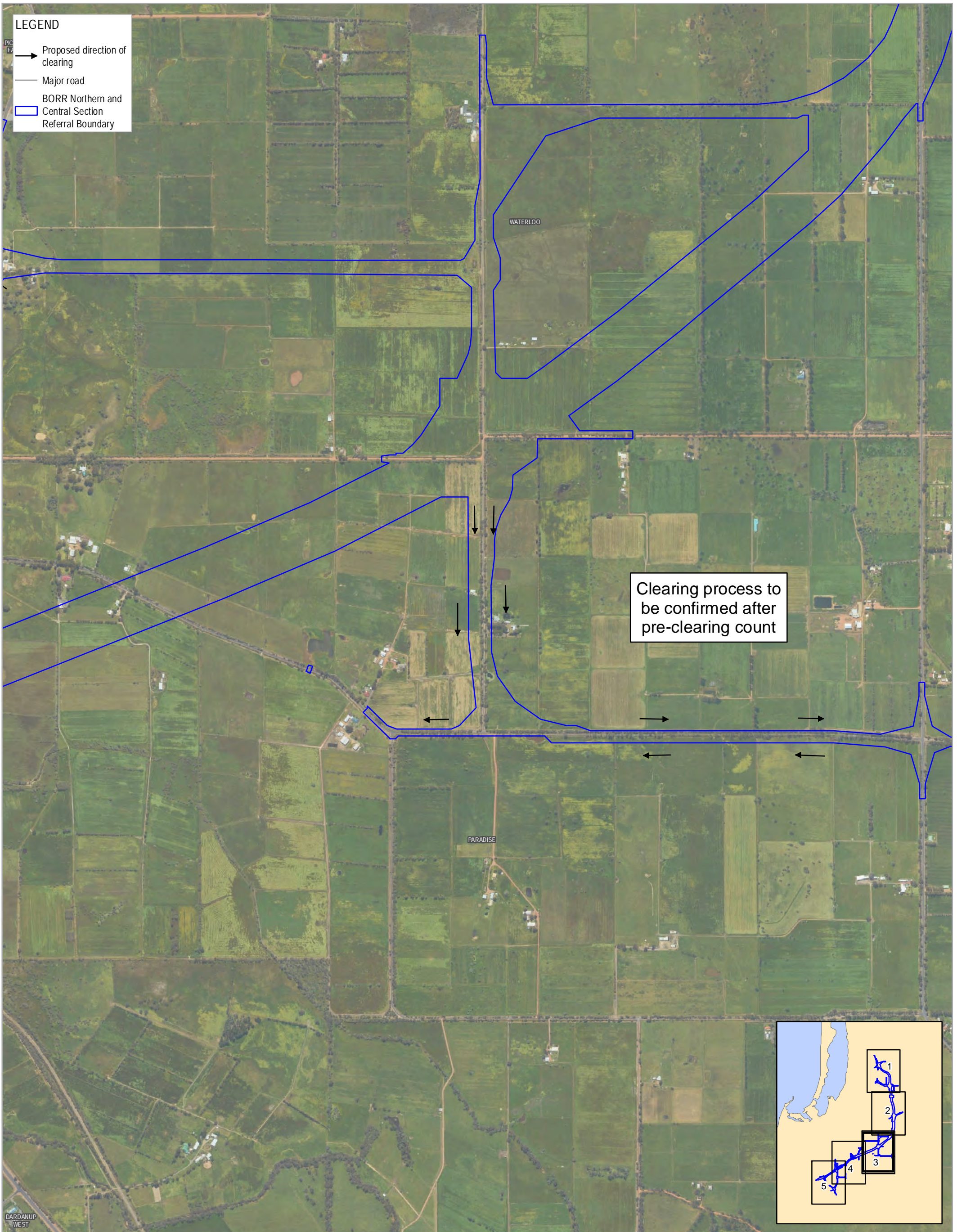
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Environmental Management Plan

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Proposed Clearing and
Clearing Staging

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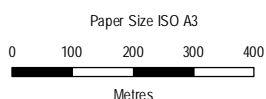
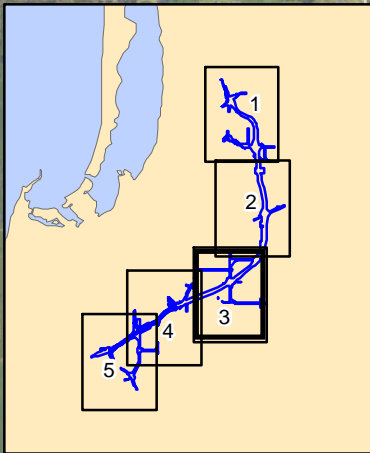
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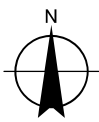
LEGEND

- Proposed direction of clearing
- Major road
- BORR Northern and Central Section Referral Boundary

Clearing process to be confirmed after pre-clearing count



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



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Environmental Management Plan

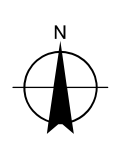
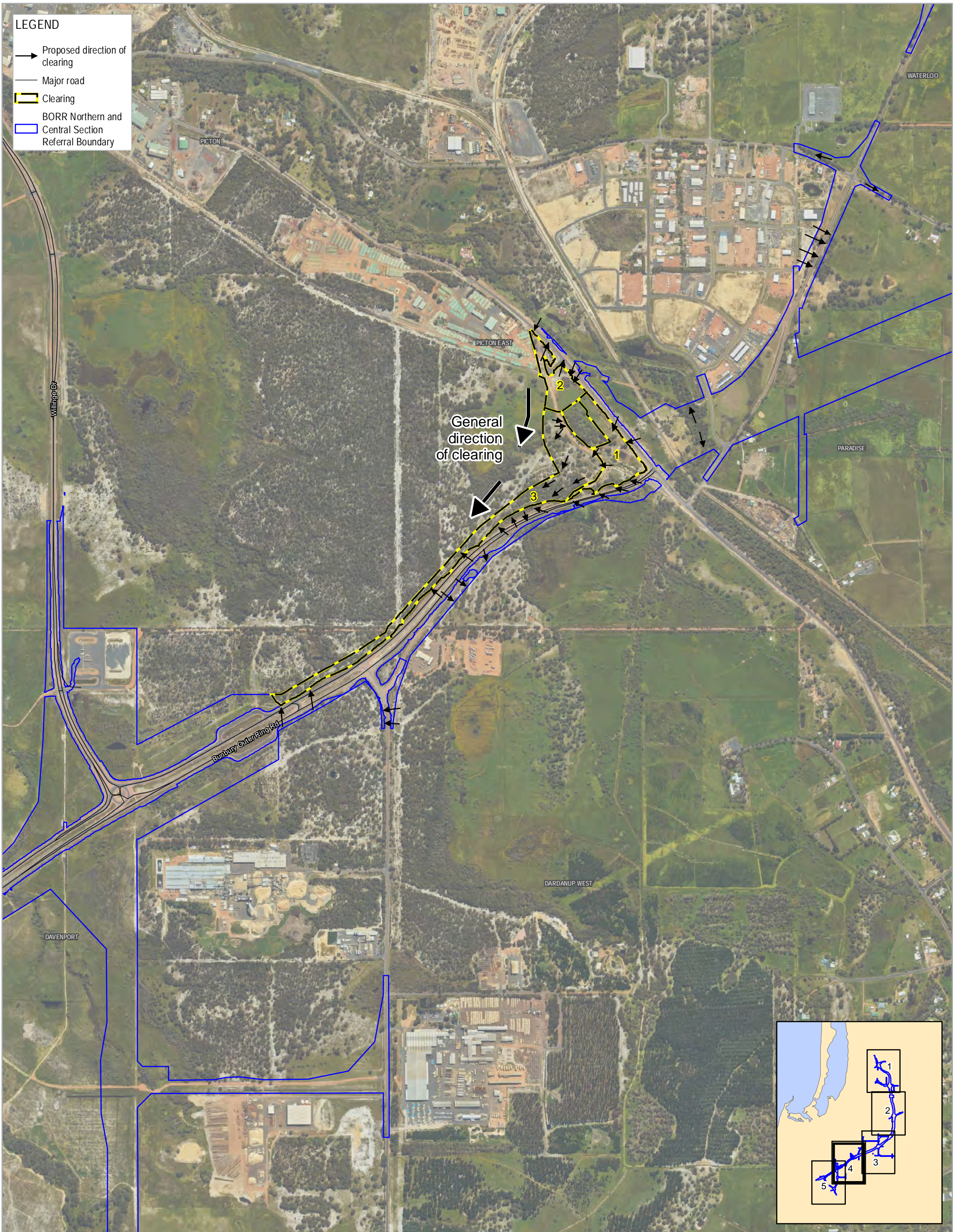
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Proposed Clearing and
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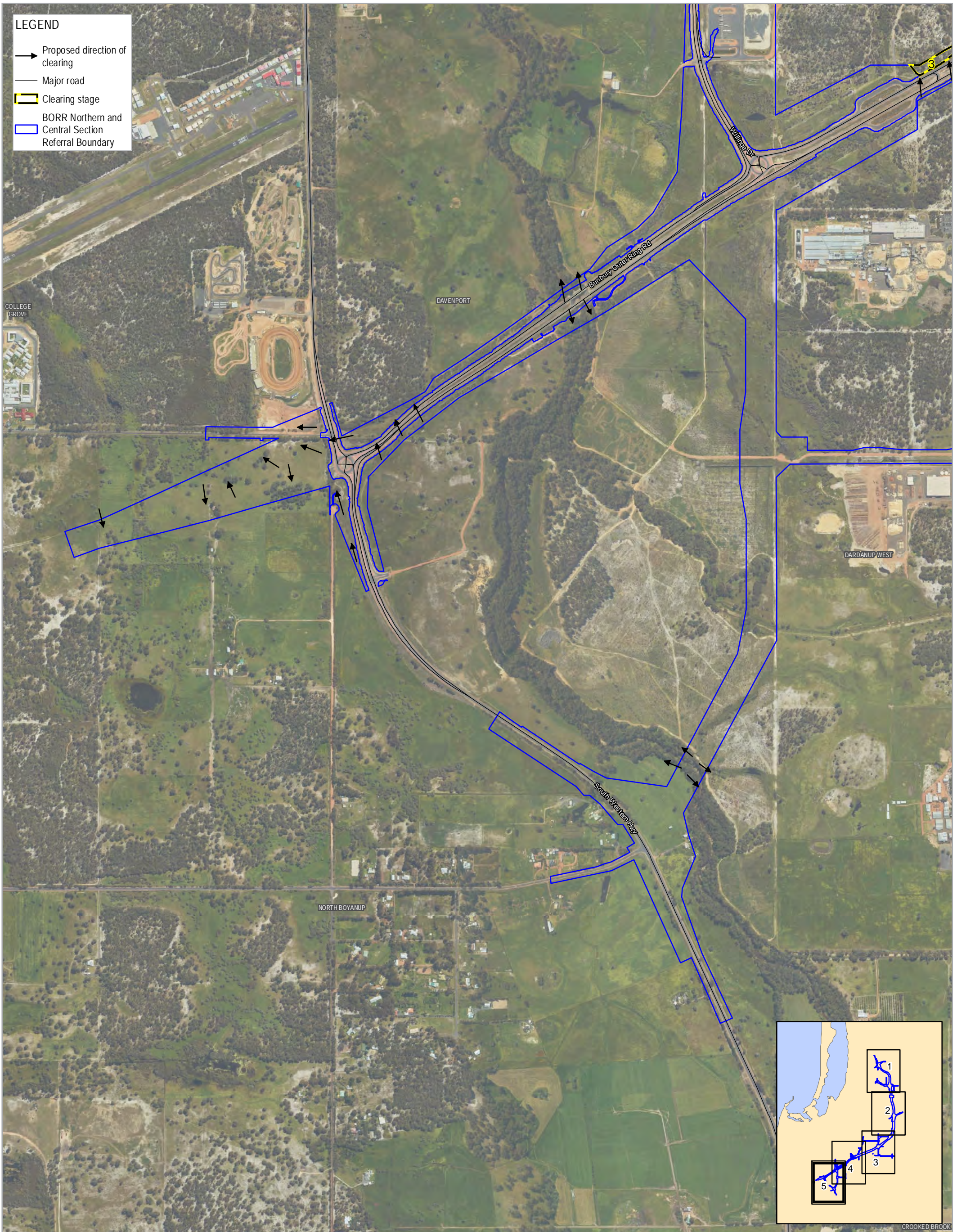
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FIGURE 3

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LEGEND

- Proposed direction of clearing
- Major road
- ▭ Clearing stage
- ▭ BORR Northern and Central Section Referral Boundary

COLLEGE GROVE

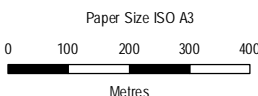
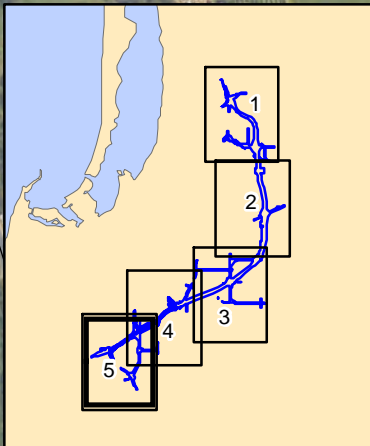
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South Western Hwy

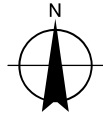
Bunbury Outer Ring Rd

NORTH BOYANUP

DARDANUP WEST



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



Main Roads Western Australia
Bunbury Outer Ring Road Northern and Central Section
Environmental Management Plan

Proposed Clearing and
Clearing Staging

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FIGURE 3

Data source: BORR team: North referral boundary - 20191016, Clearing stages, directions - 20200131; Biota: WRP Observations - 201912; Landgate: Roads - 201805, Localities - 20180319; Imagery - WA Now accessed 20/20/20131. Created by: mmkknonen