Government of Western Australia
Department of Water and Environmental Regulation

Clearing Permit Decision Report

1 Application details and outcome

1.1. Permit application details

Permit number:	CPS 9179/1
Permit type:	Purpose permit
Applicant name:	Commissioner of Main Roads Western Australia (MRWA)
Application received:	12 January 2021
Application area:	15.67 hectares
Purpose of clearing:	Constructing stages 2 and 3b of the Albany Ring Road (ARR)
Method of clearing:	Mechanical
Property:	Properties in Glendhow, Marbelup, Mount Elphinstone, Mount Melville & Robinson
LGA area/s):	City of Albany

1.2. Description of clearing activities

MRWA proposes to clear 15.67 hectares of native vegetation within a larger footprint of 96.65 hectares in the City of Albany to construct stages 2 and 3b of the ARR.

The proposed works would provide a dedicated freight route around the City of Albany, enabling movement of freight to and from the Port of Albany. MRWA note that the ARR will cater for the travel demands associated with growth in grain, woodchip and other agricultural industries, increased mining production, increased population growth, urban expansion, and the expected increase in tourists (GHD, 2021).

MRWA advise that the project would significantly improve traffic flow on the existing road network by reducing the number of heavy vehicles on Albany Highway, South Coast Highway and Chester Pass Road, enhancing safety outcomes for local traffic (GHD, 2021).

MRWA note that the project is a 175 million-dollar COVID stimulus project that would provide a vital economic boost for the Great Southern Region, creating up to 1,000 jobs, with initiatives to maximise local content incorporated as part of the contract (GHD, 2021).

MRWA advise that the clearing of native vegetation is required to facilitate the following activities (GHD, 2021):

- earthworks, embankments and pavement construction (cut and fill as required),
- modification of the Albany to Wagin railway line,
- modification of local roads including severance, realignment or reconfiguration,
- site geotechnical investigations along alignment (if required),
- installation of drainage infrastructure as required (swales, pits/ pipes),
- installation of new street lighting,
- relocation of existing services where required, and
- installation of pavement marking and signage.

The application area comprises several portions of remnant native vegetation that border the southern and western extents of the Albany townsite, in a landscape subject to historical clearing for urban and industrial development associated with the Albany townsite, and agricultural clearing within surrounding rural properties.

During the assessment of the application, MRWA reduced the area of proposed clearing from 24.44 hectares to 15.67 hectares to reduce the extent of impact on WRP and black cockatoo habitat.

1.3. Decision on application

Decision:	Granted
Decision date:	8 November 2021
Decision area:	15.67 hectares of native vegetation as depicted in Section 1.5, below.

1.4. Reasons for decision

This application was accepted, assessed, and determined in accordance with sections 51E and 51O of the *Environmental Protection Act 1986* (EP Act).

The Department of Water and Environmental Regulation (DWER) advertised the application for 21 days and no public submissions were received.

In undertaking their assessment and in accordance with section 51O of the EP Act, the Delegated Officer had regard for:

- the site characteristics (see Appendix B),
- the Clearing Principles set out in Schedule 5 of the EP Act (see Appendix C)
- relevant planning instruments and other matters (see Section 3.3),
- the findings of biological surveys,
- relevant datasets available at the time of the assessment (see Appendix F),
- actions taken by MRWA which resulted in the avoidance and minimisation of impacts to native vegetation (Section 3.1 of this report), and
- advice from the Department of Biodiversity, Conservation and Attractions (DBCA) on the impacts of the proposed clearing on conservation significant fauna and flora.

After consideration of the above information, as well as the avoidance, minimisation and mitigation actions taken by MRWA, the Delegated Officer determined that the proposed clearing will result in the following significant residual impacts (SRI):

- the loss of 11.92 hectares of native vegetation that provides significant habitat for western ringtail possum (WRP) (*Pseudocheirus occidentalis*) including:
  - 0.91 hectares of core habitat, and
  - 11.01 hectares of supporting habitat (with linkage values).
- the loss of 6.76 hectares of native vegetation that provides significant foraging habitat and suitable roosting habitat for Carnaby's cockatoo (*Calyptorhynchus latirostris*), Baudin's cockatoo (*Calyptorhynchus* baudinii) and forest red-tailed black cockatoo (*Calyptorhynchus banksia* subsp. *naso*) (collectively referred to as black cockatoos herein this report),
- the loss of 10 trees with 14 suitable breeding hollows for black cockatoos (no signs of use within these hollows identified),
- the loss of five western ringtail possum dreys (three occur in a non-native tree species), and
- the loss of 5.8 hectares of potential habitat for south-western brush-tailed phascogale.

To address the above SRIs and applying the EPBC Offsets assessment guide (Commonwealth Offsets Calculator), the Delegated Officer determined that the following rehabilitation and land acquisition (through monetary contribution) offsets are required:

- revegetation and rehabilitation of 3.56 hectares of native vegetation, of which 1.47 hectares will be placed under a conservation covenant issued under section 30B of the *Soil and Land Conservation Act 1945*, improving the condition of the vegetation from completely degraded to good (Keighery, 1994), with native vegetation comprising suitable habitat for WRP, black cockatoos and south-western brush-tailed phascogale. The rehabilitation will provide landscape linkage values for WRP.
- provide a monetary contribution of $321,750 for the acquisition and conservation (in perpetuity) of 65 hectares of native vegetation with the following values:
  - 65 hectares of significant habitat for western ringtail possum
  - 29.6 hectares of significant habitat for Carnaby's cockatoo; and
  - 22.2 hectares of suitable habitat for south-western brush-tailed phascogale

The above offsets will address 100 per cent of the SRIs of the proposed clearing.

The Delegated Officer determined that the proposed clearing may also result in the following impacts:

- the introduction and spread of weeds and dieback into adjacent native vegetation,
- minor wind erosion and potential sedimentation of surface water, and
- direct impacts to fauna utilising the application area during the time of clearing.

The Delegated Officer therefore decided to grant a clearing permit subject to the following conditions, which have been imposed on the clearing permit, to manage and address the impacts of clearing:

- avoid and minimise measures to reduce the impacts and extent of clearing,
- take hygiene steps to minimise the risk of the introduction and spread of weeds and dieback,
- development activities must occur within three months of clearing to minimise wind erosion and sedimentation risks,
- undertake slow, progressive one directional clearing to allow terrestrial fauna to move into adjacent habitat ahead of the clearing activity,
- install artificial black cockatoo nest hollows within nearby DBCA managed land at a 1:1 ratio to those being removed,
- install a fauna underpass to minimise impacts to fauna corridor values and allow safe fauna movement between areas of remnant vegetation,
- install a WRP rope bridge to allow WRP to move over Hanrahan Road between areas of remnant vegetation,
- fauna management measures to inspect habitat trees for evidence of current breeding by black cockatoo species and avoid in-use trees for the duration of the breeding season,
- fauna management measures to remove and relocate (if present) western ringtail possums and south-western brush tailed phascogales to an adjacent area of suitable habitat,
- submission of a rehabilitation plan for the offset rehabilitation as described above, and
- a monetary offset contribution for land acquisition, as described above.

Given the above and noting that the offset provided (see Section 4) counterbalances the impacts to black cockatoo, western ringtail possum and south-western brush-tailed phascogale habitat, the Delegated Officer determined that the proposed clearing is unlikely to lead to an unacceptable risk to the environment.

1.5. Site map

Figure 1. Map of the application area

The area cross-hatched yellow indicates the area authorised to clear under the granted clearing permit.

2 Legislative context

The clearing of native vegetation in Western Australia is regulated under the EP Act and the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* (Clearing Regulations).
In addition to the matters considered in accordance with section 51O of the EP Act (see Section 1.4), the Delegated Officer has also had regard to the objects and principles under section 4A of the EP Act, particularly:

- the precautionary principle
- the principle of intergenerational equity
- the polluter pays principle
- the principle of the conservation of biological diversity and ecological integrity.

Other legislation of relevance for this assessment include:

- *Biodiversity Conservation Act 2016* (WA) (BC Act)
- *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act)
- *Planning and Development Act 2005* (WA) (P&D Act)

Relevant policies considered during the assessment include:

- *Environmental Offsets Policy* (2011)

The key guidance documents which inform this assessment are:

- *A guide to the assessment of applications to clear native vegetation* (DER, December 2013)
- *Procedure: Native vegetation clearing permits* (DWER, October 2019)
- *Environmental Offsets Guidelines* (August 2014)
- technical guidance – *Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA, 2016)
- technical guidance – *Terrestrial Fauna Surveys for Environmental Impact Assessment* (EPA, 2016)

3 Detailed assessment of application

3.1. Avoidance and mitigation measures

Avoidance measures

MRWA notes that it has selected an alignment to minimise environmental impacts. MRWA advise that although the total application area footprint comprises 96.65 hectares, less than 20 per cent, being 15.67 hectares, contains native vegetation, with most of the application area containing cleared pastoral areas or areas containing revegetation/plantation (GHD, 2021).

MRWA note that it has utilised the hierarchy of avoid, minimise, reduce and rehabilitate to minimise the environmental impacts of the proposed clearing, noting specifically that that impacts to black cockatoos and WRPs, have been carefully considered (GHD, 2021).

MRWA noted that it has undertaken the following project design measures to avoid and minimise impacts to black cockatoo and WRP habitat (GHD, 2021):

- the width of the application area footprint was reduced between Albany Highway and Lower Denmark Road to reduce the clearing area,
- connections at selected existing roads will be removed and access to suburbs and key transport routes will be controlled at key sections along the alignment to reduce the clearing area,
- the project was redesigned at South Western Highway to remove the requirement for a road realignment through native vegetation west of George Street,
- the Project was amended between Hanrahan Road and Princess Drive to minimise clearing impacts,
- around 69 per cent of the application area is within degraded (Keighery, 1994) or worse condition vegetation, and
- inclusion of infrastructure to facilitate fauna movement, such as an underpass, rope-bridge, modified drainage structures and strategically placed fencing.

During the assessment of the application, MRWA reduced the area of proposed clearing from 24.44 hectares to 15.67 hectares to reduce the extent of impact on WRP and black cockatoo habitat. The revised application area resulted in the following:

- retention of an additional 6.28 hectares of black cockatoo foraging habitat,
- retention of an additional 8.31 hectares of WRP habitat, including 3.4 hectares of core habitat, and
- retention of a tree with a suitably sized black cockatoo breeding hollow.

Mitigation measures

MRWA advised that a Construction Environmental Management Plan (CEMP) will be prepared prior to construction. MRWA note that mitigation measures in the CEMP will include the following (GHD, 2021):

- Vegetation clearing management:
  - the removal of vegetation will be restricted to the minimum area required for construction works and comply with the native vegetation clearing permit,
  - vegetation to be retained will be clearly marked with flagging on site including clear demarcation of clearing areas and temporary fencing to minimise the risk of impacting adjacent vegetation,
  - additional areas required for construction such as laydown areas, stockpile areas and vehicle turn around, will be located in areas cleared for permanent works,
  - vehicles and machinery traffic will be confined to the disturbance area to prevent damage to retained vegetation, and
  - machinery and materials will not be placed against trees, in vegetation or waterways.

- Fauna management
  - pre-clearance fauna surveys will be undertaken for all areas proposed to be cleared,
  - a fauna spotter will be present during clearing to remove/shepherd any fauna remaining or entering the clearing area,
  - an appropriately qualified fauna handler will be on site during clearing of WRP habitat,
  - wherever practical, clearing will be undertaken on one front only, to provide an opportunity for fauna to move out of the Proposal area into adjacent vegetated areas,
  - if native fauna is disturbed during clearing, animals will be allowed to move into adjacent vegetation,

- speed limits between 40-60 km/hr will be applied throughout the construction site which will consequently reduce the risk of fauna strikes during construction,
- native mammals or birds injured as a result of the construction or operation shall be taken to a designated veterinary clinic or a wildlife carer, and
- undertake works in compliance with the WRP Management Plan.

- Erosion and sediment control
  - a Landscape Management Plan will be prepared for revegetation works within temporary construction areas, roadsides and medians, as required,
  - water carts and/or surface stabilisation measures (e.g., hydro mulch) will be used to minimise dust, erosion and sedimentation generated from cleared areas,
  - temporary drainage will be installed to capture and infiltrate surface runoff from road and bridge construction areas to prevent runoff from entering adjacent native vegetation,
  - site specific erosion and sediment controls will be established to prevent direct run off into adjacent water courses and wetlands,
  - existing natural drainage lines within the construction area will be maintained at all times (i.e., water flows not blocked or adversely obstructed or restricted) and include erosion control and scour protection measures at crossings, and
  - topsoil will be harvested, stockpiled and reused in accordance with Main Roads Environmental Guideline Topsoil Management / Topsoil Management Plan.

- Weed and pest management
  - all heavy plant and machinery will be inspected at entry and exit of the work site and be confirmed to be clean and free of vegetation and soil material,
  - weed control will be undertaken during works, specifically targeting WoNS and Declared Pests. The Proposal area will also be subject to the yearly Main Roads weed spraying program, and
  - the Proposal is in a Phytophthora dieback susceptible bioregion, with conservation significant protectable vegetation adjacent to the application area. A Dieback Management Plan (Southern Ecology, 2020c) has been developed and will be utilised during clearing.

Western Ringtail Possum Management Plan

MRWA has developed a WRP Management Plan (WRPMP) for the project which has been prepared to achieve the following objectives (MRWA, 2021a):

- reduce potential impacts on individual WRP's, and
- provide for the management of any WRP's encountered during road construction with the objective of minimising the risk of injury or mortality to any WRP encountered during the clearing operations.

The WRPMP includes the following measures (MRWA, 2021a):

- MRWA shall obtain the necessary license under the *Biodiversity Conservation Regulations 2018* to take, disturb or relocate any fauna, including WRP on-site,
- site inductions and pre-start toolbox meetings shall include education regarding WRP management to avoid impacts as far as possible through awareness and behaviour change,
- WRP management will be communicated (as appropriate) at: inductions, toolbox meetings, and contract meetings,
- relevant management measures detailed in the WRPMP will be communicated to project and construction personnel, (including sub-contractors) prior to the commencement of project activities and during project implementation,
- visual message boards will be used to warn drivers of the potential for WRP to cross the road during clearing operations,
- significant trees on the edge of the clearing line shall be assessed and where possible shall be retained,
- a suitably qualified zoologist or environmental scientist shall be on-site during clearing operations,
- traffic management will be put in place to reduce speed limits during clearing operations,
- visual message boards will be used to warn drivers of the potential for WRP to cross the road during clearing operations,
- pre-clearing WRP spotlight searches shall be conducted prior to clearing operations commencing,
- if WRP 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 48 hours, the animal will be coerced / moved to a safe area outside of the clearing footprint by the fauna specialist,

- trees that have been identified as supporting WRP or possum dreys will be 'bumped gently' with a machine prior to felling. The operator and zoologist will wait and observe the tree for a short time. If no possum appears to be present then the tree shall be pushed over slowly to minimise risk of injury to the animal,
- WRP encountered during the clearing operation shall be trapped or collected by the fauna spotter and relocated into nearby vegetation outside of the clearing area or encouraged to move into vegetation away from the highway,
- possums collected by the zoologist shall be immediately relocated into adjacent vegetation,
- fallen trees that contained possum dreys shall be mulched the day they are fallen, or moved at least 50 m from where they were fallen to prevent animals re-entering,
- a post-clearing survey shall be undertaken immediately following each days clearing operations within Core and Linkage Western Ringtail habitat and the following morning to identify the presence of any injured animals, and
- clearing shall be undertaken in stages and along one front to allow fauna to move from the clearing area into adjacent habitats.

In addition to the above avoidance and minimisation measures, MRWA has committed to installing a WRP rope bridge over Hanrahan Road and constructing a fauna underpass adjacent to George Street to facilitate safe WRP movement. The construction of the rope bridge will be undertaken in consultation with DBCA.

Conclusion

The Delegated Officer was satisfied that the applicant has made a reasonable effort to avoid and minimise potential impacts of the proposed clearing on environmental values.

After considering the avoidance and mitigation measures, the Delegated Officer determined that offsets to counterbalance the significant residual impacts to black cockatoo habitat, western ringtail possum habitat and south-western brush-tailed phascogale were necessary. In accordance with the Government of Western Australia's *Environmental Offsets Policy* and *Environmental Offsets Guidelines*, the residual impacts have been addressed through the conditioning of environmental offset requirements on the permit. The offsets are summarised in Section 4.

3.2. Assessment of impacts on environmental values

In assessing the application, the Delegated Officer had regard for the site characteristics (see Appendix B), survey data, current datasets and other supporting information, and the extent to which the impacts of the proposed clearing present a risk to biodiversity, conservation, or land and water resource values.

The assessment identified that the clearing presents a risk to flora and fauna values, and that these required further consideration. The consideration of impacts to these values, and the extent to which they can be managed through conditions applied in line with sections 51H and 51I of the EP Act, is set out below.

3.2.1. Environmental value: Biological values (fauna) – Clearing Principle (b)

Fauna Surveys

The application area was subject to a Biological Survey (Southern Ecology, 2020a), Black Cockatoo Habitat Assessment (Black Cockatoo Assessment) (Biota, 2019) and Western Ringtail Possum Assessment (WRP Assessment) (Biota, 2020). The method for these surveys is described under Appendix E.

Fauna habitat types

The Biological Survey categorised fauna habitat into four major groups, based on the vegetation types recorded within the application area (see Appendix B), these comprise (Southern Ecology, 2020a):

- Eucalypt (Jarrah/Marri) Woodland/Forest habitat (comprising 5.8 hectares of the application area); including the following vegetation types
    - Jarrah/Marri/Sheoak Laterite Forest
    - Jarrah/Sheoak/*Eucalyptus staeri* Sandy Woodland
    - Marri/Jarrah Forest/Peppermint Woodland

- Non-Eucalypt Woodland/Forest (comprising 6.59 hectares of the application area)

- *Taxandria juniperina* Closed Forest
- Peppermint Low Forest

- Shrubland/woodland (comprising 1.03 hectares of the application area)
  - *Hakea* spp. Shrubland/Woodland Complex
  - Mosaic *Taxandria marginata*/*Gastrolobium bilobum* Granite Shrubland/Yate Woodland

- Wetland (comprising 1.86 hectares of the application area)
  - *Evandra aristata* Sedgeland
  - *Homalospermum firmum* /*Callistemon glaucus* Peat Thicket

Fauna species

The Biological Surveys and Fauna Assessments identified evidence of the following five conservation listed fauna species within the application area (GHD, 2021; Southern Ecology, 2020a):

- Carnaby's cockatoo (*Calyptorhynchus latirostris*) (state and federally listed as Endangered (EN)),
- Baudin's cockatoo (*Calyptorhynchus baudinii*) (state and federally listed as EN),
- Forest red-tailed black cockatoo (*Calyptorhynchus banksii naso*) (state & federally listed as Vulnerable (VU)),
- Western ringtail possum (*Pseudocheirus occidentalis*) (state and federally listed as Critically Endangered (CR)), and
- Quenda (*Isoodon obesulus* subsp. *fusciventer*) (state listed as Priority (P) 4).

In addition to the above species, a further seven conservation listed fauna species may occur within the application area, based on the presence of suitable habitat, despite not being recorded during field investigations (GHD, 2021; Southern Ecology, 2020a):

- south-western brush-tailed phascogale (*Phascogale tapoatafa wambenger*) (state listed as Conservation Dependent (CD)),
- Masked owl (*Tyto novaehollandiae* subsp. *novaehollandiae*) (state listed as P3),
- Short-nosed snake (*Elapognathus minor*) (state listed as P2),
- Fork-tailed swift (*Apus pacificus*) (protected under International Agreement (IA)),
- Woollybush bee (*Hylaeus globuliferus*) (state listed as P3),
- Water-rat (*Hydromys chrysogaster*) (state listed as P4), and
- Peregrine falcon (*Falco peregrinus*) (state listed as Other specially protected fauna (OS)).

Black cockatoos (Carnaby's cockatoo, Baudin's cockatoo and forest red-tailed black cockatoo)

Habitat summary

The application area is within the known breeding range of all three black cockatoo species. As shown below within Table 1, the application area contains native vegetation that is suitable foraging, breeding, and roosting habitat for black cockatoos, which comprises (GHD, 2021; Southern Ecology, 2020a)):

- 5.54 hectares of high-quality foraging and potential breeding and roosting habitat,
- 1.22 hectares of low-quality foraging habitat, and
- 6.52 ha of potential roosting habitat (largely *Taxandria juniperina* closed forest).

Table 1. A summary of black cockatoo habitat types within the application area (GHD, 2021; Southern Ecology, 2020a).

Habitat value	Habitat type	Vegetation type	Area of vegetation type (ha)	Total area (ha)
High value foraging, potential breeding, and roosting	Eucalypt woodland or forest	Jarrah, Marri, Sheoak Laterite Forest	0.48	5.54
		Jarrah/ Sheoak/ *E. staeri* Sandy Woodland	0.34	
		Marri/ Jarrah Forest/ Peppermint Woodland	4.44	
		Mosaic *T. marginata*/ *Gastrolobium bilobum* Granite Shrubland/ Yate Woodland	0.28	

Low quality foraging	Degraded Eucalypt Woodlands with Allocasuarina and Hakea Shrubland	*Hakea* spp. Shrubland/ Woodland Complex	0.75	1.22
		Jarrah/ Marri/ Sheoak Laterite Forest	0.33	
		Jarrah/ Sheoak/ *E. staeri* Sandy Woodland	0.14	
Potential Roosting	Tall Taxandria Forest and *Evandra arista* dominated sedgeland	*Taxandria juniperina* Closed Forest	4.67	6.52
		Evandra aristata Sedgeland	0.64	
		Homalospermum firmum/ *Callistemon glaucus* Peat Thicket	1.21	
Total				13.28

Breeding Habitat

Black cockatoos generally breed in woodland or forest but may also breed in former woodland or forest now present as isolated trees (Commonwealth of Australia, 2012). They commonly breed in several different tree species, including jarrah and marri, which are utilised by all three species (Commonwealth of Australia, 2012).

Suitable breeding habitat for black cockatoos includes trees which either have a suitable nest hollow or are of a suitable diameter at breast height (DBH) to develop a nest hollow. For most tree species a suitable DBH is 500 millimetres (Commonwealth of Australia, 2012).

The closest known breeding sites for Carnaby's and forest red-tailed black cockatoo are located around 55 and 57 kilometres from the application area respectively. The closest known Baudin's cockatoo breeding site is unknown, given the lack of available data relating to confirmed breeding records for this species.

The Black Cockatoo Assessment identified 604 native trees with a suitable DBH to provide breeding habitat in the larger survey area. Of these 604 native trees, the application area contains 191. Of these trees, 10 contain a combined 14 hollows of a suitable size to provide breeding habitat for black cockatoos. No signs of breeding were identified within any of these trees (Southern Ecology, 2020a).

Roosting Habitat

There are 10 known black cockatoo roost sites within six kilometres of the application area. The closest known roost site is around 270 metres from the application area.

The Biological Survey and Black Cockatoo Assessment did not identify any evidence of roosting within the application area (Biota, 2019; Southern Ecology, 2020a). However, the application area contains numerous tall trees, and provides around 12.06 hectares of suitable roosting habitat for black cockatoos (see Table 1) (GHD, 2021; Southern Ecology, 2020a).

Foraging Habitat

Carnaby's cockatoo forage on the seeds, nuts and flowers of a large variety of plants including Proteaceous species (*Banksia*, *Hakea* and *Grevillea*), as well as *Allocasuarina* and *Eucalyptus* species, *Corymbia calophylla* and a range of introduced species (Valentine and Stock, 2008).

Baudin's cockatoos forage within Eucalypt woodlands and forest, and proteaceous woodland and heath. During the breeding season this species feeds primarily on marri, and to a lesser extent proteaceous trees and shrubs (Commonwealth of Australia, 2012).

Forest red-tailed black cockatoo forages within jarrah and marri woodlands and forest, and edges of karri forests including wandoo and blackbutt, within the range of the subspecies. This species mostly feeds on seeds of marri and jarrah (Commonwealth of Australia, 2012).

As shown in Table 1, the vegetation within the application area comprises 6.76 hectares of suitable black cockatoo foraging habitat, of which 5.54 hectares is considered high quality, noting it largely comprises preferred foraging species in the form of jarrah, marri forest or woodland (GHD, 2021).

The Biological Survey noted that evidence of black cockatoo was found throughout the survey area within the Eucalypt Woodland/Forest vegetation types. Specifically, the Biological Survey notes that foraging evidence on fruits of *Corymbia calophylla*, *Eucalyptus marginata* and *E. staeri* of all three species was observed (Southern Ecology, 2020a).

The forest red tailed-black cockatoo and Baudin's cockatoo recovery plan notes that habitat critical to the survival of these species includes all marri, karri and jarrah forests, woodlands, and remnants in the south-west of Western Australia receiving, on average, more than 600 millimetres annual rainfall (Department of Environment and Conservation (DEC), 2008). It is considered that 6.76 hectares of the application area fits the description of critical habitat.

The importance of foraging habitat for Carnaby's cockatoo increases when it occurs within foraging distance of nesting sites (12 kilometres), as it supports breeding effort (Department of Parks and Wildlife, 2013). The closest known breeding site occurs around 55 kilometres from the application area, although noting the abundance of large trees within the local area, there is the potential for breeding to occur within 12 kilometres.

Food resources within the range of roost sites are also important to sustain populations of black cockatoos, and foraging resources should therefore be viewed in the context of the proximity to known night roosting sites (EPA, 2019). Specifically, night roosting sites need suitable foraging habitat and water within six kilometres (EPA, 2019). Overlapping foraging ranges within 12 kilometres also support roosting sites and maintain habitat connectivity and movement across the landscape (EPA, 2019). There are 10 black cockatoo roost sites within 6 kilometres of the application area.

The Biota (2019) black cockatoo habitat assessment estimated that up to 8,756 hectares of foraging habitat is available within a 12-kilometre radius, based upon the Albany Regional Vegetation Survey data.

DBCA (2021) provided comment on the proposed clearing and advised that "the recovery plans identify the need to protect and manage as much habitat as possible to minimise the impacts of habitat loss [to black cockatoos]. Although there are large areas of suitable habitat surrounding the site, all remaining resources are significantly important to black cockatoos".

While the extent of black cockatoo habitat in the local area is acknowledged, the Delegated Officer considers that the application area provides 6.76 hectares of significant foraging habitat for black cockatoos noting the following:

- evidence of historical foraging from all three species was identified within the application area,
- there are known black cockatoo roosting sites within six kilometres of the application area, and
- the application area includes 6.76 hectares of preferred foraging habitat for all three species, of which 5.54 hectares is considered high quality habitat.

Summary

Noting the above, the application area is considered to represent significant habitat for black cockatoos, given that it contains 6.76 hectares of significant foraging habitat and 10 trees with 14 potentially suitable breeding hollows.

It is considered that not all roost habitat within the application area is significant. Specifically, the loss of 6.52 hectares of suitable roost habitat largely comprising *Taxandria juniperina* closed forest, is not considered a significant residual impact, noting the limited value of this vegetation as potential roost habitat with no signs of current roosting.

To mitigate the loss of 6.76 hectares of significant black cockatoo habitat, MRWA has committed to the following offset measures, which are detailed under Section 4:

- rehabilitating approximately 3.56 hectares of nearby cleared land parcels with suitable habitat for black cockatoos, and
- providing a monetary offset contribution for the purchase of up to 29.6 hectares of black cockatoo habitat in the local area, to be conserved in perpetuity.

Western Ringtail Possum (WRP)

The application area is within the known distribution of WRP, which is listed as critically endangered under the state *Biodiversity Conservation Act 2016* and federal Commonwealth *Environment Conservation and Biodiversity Conservation Act 1999*.

The current distribution of the western ringtail possum is patchy and largely restricted to the moister south-western corner of Western Australia, especially near coastal areas of peppermint (*Agonis flexuosa*) woodland and peppermint/tuart associations from the Australind/Eaton area to the Waychinicup National Park (DPaW, 2017).

According to the WRP recovery plan (DPaW, 2017), habitat critical to survival for WRP is not well understood and is therefore based on the habitat variables observed where WRP are most commonly recorded. These appear to vary between key management zones. Vegetation communities critical to the species include (DPaW, 2017):

- peppermint (*Agonis flexuosa*) woodlands,
- jarrah (*Eucalyptus marginata*) and marri (*Corymbia calophylla*) forests and woodlands,
- coastal heath,
- myrtaceous heaths and shrublands,
- Bullich (*Eucalyptus megacarpa*) dominated riparian zones, and
- karri forest.

The Biological Survey notes that in the Albany Region most WRP records were from coastal limestone heath vegetation units (Southern Ecology, 2020a). The Survey noted that recent radio collaring of WRP individuals in the Albany area observed this species frequenting jarrah and marri at night, suggesting a preference for these species as foraging trees. Daytime refuges included dreys, large trees, tree hollows (marri only) and thick ground cover (Southern Ecology, 2020a).

The Biological Survey identified that a wide range of vegetation types in various levels of condition (degraded to excellent) were utilised by WRP in the broader survey area. These include (Southern Ecology, 2020a):

- Jarrah, marri and peppermint woodlands,
- Jarrah/marri forest, and
- *Taxandria juniperina* woodland.

The Biological Survey identified that the application area comprises 11.92 hectares of suitable habitat for this species, which was separated into the following habitat types (Southern Ecology, 2020a; Biota, 2020) (see Table 2 below which shows mapped habitat categories):

- 0.91 hectares of core habitat (of which 0.04ha is core urban habitat),
- 11.01 hectares of supporting habitat, and
- 1.81 hectares of linkage habitat.

The Commonwealth WRP significant impact guidelines categorised areas important for WRP, including core habitat, primary corridors and supporting habitat. The Biological Assessment notes that these guidelines pertain only to the southern Swan Coastal Plain population, however in the absence of a guideline relevant to the south coast, these habitat categories were used as a guide, in combination with current available data on WRP ecology, to define habitat for the south coast population (Southern Ecology, 2020a). The categories were defined as shown below in Table 2.

Table 2. WRP habitat management categorises (Southern Ecology, 2020a).

Habitat Category
Core • likely contain sites necessary for breeding and dispersal, and support recruitment and population maintenance • large remnants able to support multiple home ranges
Supporting • likely contain lower numbers of individuals and possibly survivorship • likely provide an opportunity for an immigration source and emigration destination to allow for natural fluctuations in the species fecundity • may be breeding occurring or not • can be native or non-native vegetation
Linkage • no resident individuals, movement of animals only • do not need to be continuous, but can contain small gaps as WRP can move short distances on ground • any structure that allows movement at a small to medium scale (eg. street scape, non-natives)

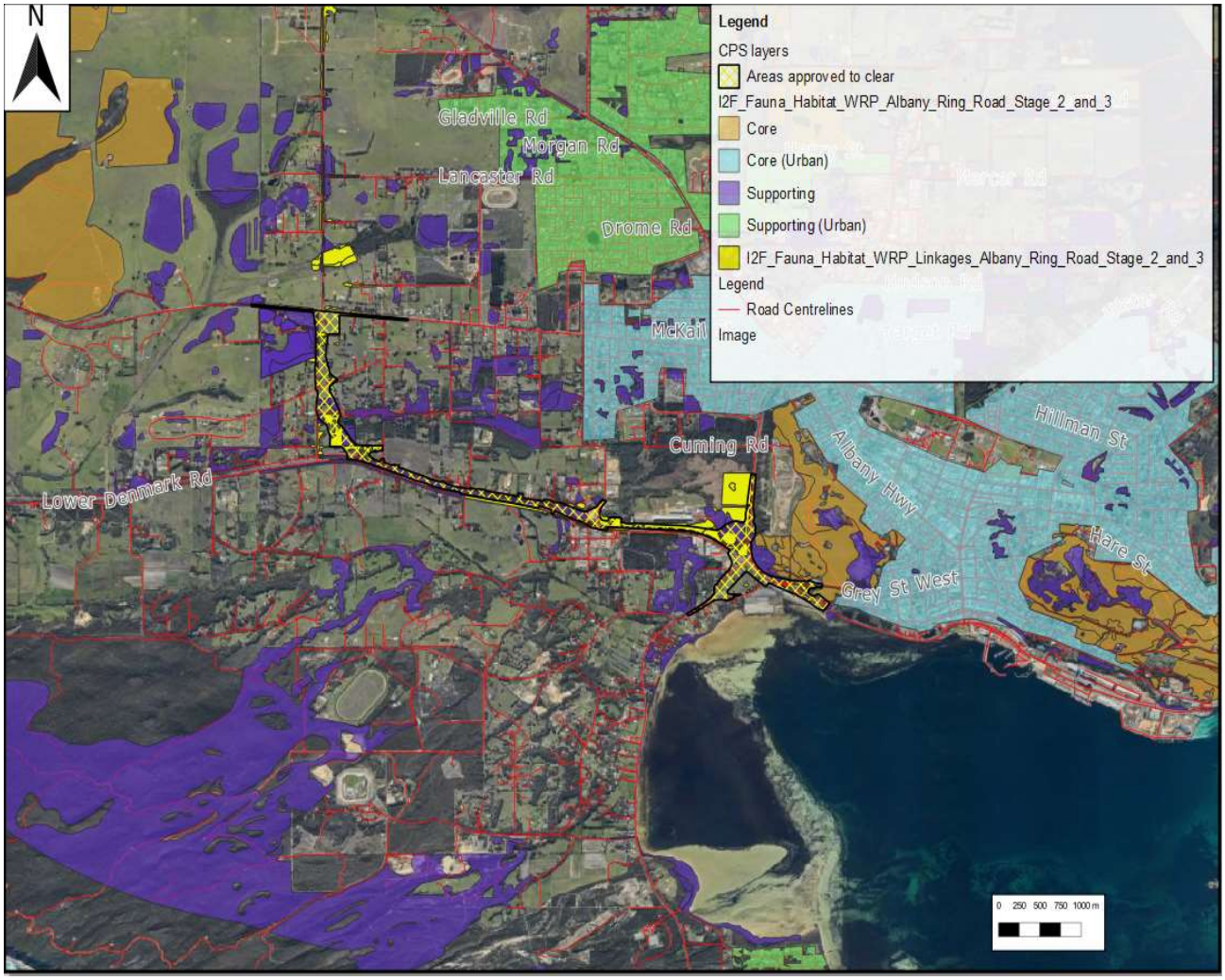

Figure 2. Mapped WRP habitat within and surrounding the approved clearing area (Southern Ecology, 2020a).

The impact to core habitat is limited to a small portion of a larger area of core habitat adjacent to the southeast extent of the application area. This area is largely mapped as the jarrah, marri and peppermint woodland vegetation type (Southern Ecology, 2020a).

The supporting habitat includes a variety of mapped vegetation types, including the jarrah, marri, and peppermint woodland and *Homalospermum firmum*/*Callistemon glaucus* peat thicket (most prominent). This habitat occurs throughout the application area, with significant areas along Lower Denmark Road, and immediately adjacent to George Street, in the northern portion of the application area (Southern Ecology, 2020a).

Evidence of WRP in the form of scats and dreys was identified throughout the survey area in multiple native and non-native habitats of varying condition (Southern Ecology, 2020a). Numerous scats and five dreys occurred within the application area (Southern Ecology, 2020a). These are described below, and shown in Figure 3:

- Drey 1 – occurs within *Hakea florida*, not occupied but intact, 2 metres up the tree,
- Drey 2 – not occupied, half collapsed, tree species not identified,
- Drey 3-5 – occurs within Victorian Tea Tree (*Leptospermum laevigatum* (non-native flora species), occupancy of these dreys was not specified.

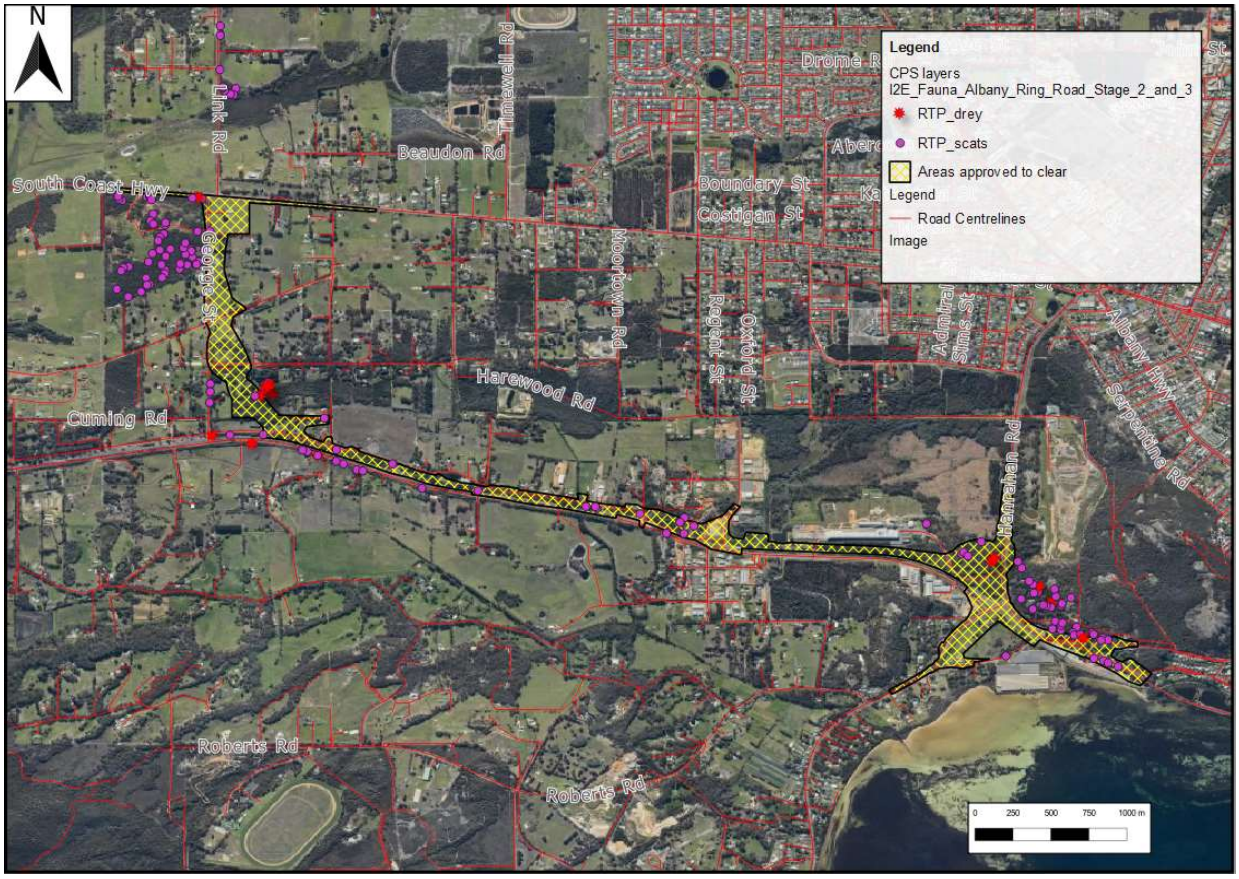

Figure 3. WRP dreys and scats identified within the survey area (Southern Ecology, 2020a).

In considering the extent and significance to WRP habitat MRWA notes that (GHD, 2021):

> "the clearing associated with [the application] relates to a road corridor, typically no more than 100 m wide that intersects areas of WRP habitat. In areas where WRP have been recorded in the … application area, extensive areas of habitat are known to occur beyond the road reserve within the local area. Accordingly, it is considered that home ranges of individual WRPs will be affected to varying degrees, with most home ranges expected to only be partially cleared.
>
> Based on Biota (2020) density estimate of 0.14 to 0.36 individuals/ha for Supporting habitat, and those used by City of Albany of 2.45 individuals/ha for Core habitat (Biota, 2019), it is predicted that less than 6 WRPs would potentially have their home range reduced or impacted (to varying degrees) within the … application area.
>
> It is estimated there are more than 3,000 individual WRPs in the sub-population around Albany. The potential impact to the home ranges of up to 6 WRPs within the NVCP area represents 0.2 % of the population…".

In considering MRWA's advice, it is noted that the western ringtail possum recovery plan identifies a ten-year goal of slowing the decline in population size, extent and area of occupancy through managing major threatening processes affecting the subpopulations and their habitats, and allowing the persistence of the species in each of the identified key management zones, the Swan Coastal Plain, southern forests and south coast (DPaW, 2017a). The WRP recovery plan states any habitat where WRP occur naturally is considered critical and worthy of protection (DPaW, 2017).

DBCA provided comment on the impact of the original area of proposed clearing (24.44 hectares) on WRP and advised the following (DBCA, 2021):

> "the application will impact on 20.23 hectares of WRP habitat including core, supporting and linking habitat for an estimated 16 individuals. In terms of reduction of the local population this is unlikely to have a significant conservation impact but there will be an impact on connectivity between habitat areas and subsequently the movement of animals through the area of the

[clearing] due to the removal of native vegetation and establishment of man-made barriers that can result in road kills.

Consideration should be given to infrastructure to facilitate fauna crossing at key locations where vegetative corridors intersect the transport corridors and fauna are likely to attempt to cross the newly constructed road. Revegetation in appropriate locations for habitat and connectivity should also be considered…"

Summary

While the extent of WRP habitat in the local area is acknowledged, the Delegated Officer considers that the application area provides 11.92 hectares of significant habitat for WRP noting that the application area provides core and supporting habitat, that is currently being utilised by WRP's, including five dreys. The value of the application area in providing linkage habitat for this species is also acknowledged, and it is considered that the supporting habitat provides key linkage values.

To mitigate the loss of 11.92 hectares of significant WRP habitat, MRWA has committed to the following offset measures, which are detailed under Section 4:

- rehabilitating approximately 3.56 hectares of nearby cleared land parcels with suitable habitat for WRP, increasing linkage values, and
- providing a monetary offset contribution for the purchase of up to 65 hectares of WRP habitat in the local area, to be conserved in perpetuity.

It is considered that the 'linkage habitat', which is mapped over 1.81 hectares of the application area, is not considered significant habitat that requires direct offsetting, noting its broad habitat description which comprises any native or non-native vegetation that allows/may allow WRP landscape movement.

MRWA has committed to constructing a fauna rope bridge and underpass to facilitate the movement of WRP between areas of suitable habitat, these are shown respectively within figures 4 and 5 below.

MRWA has also committed to undertaking works in accordance with a Western Ringtail Possum Management Plan which has been developed to minimise impacts to this species.

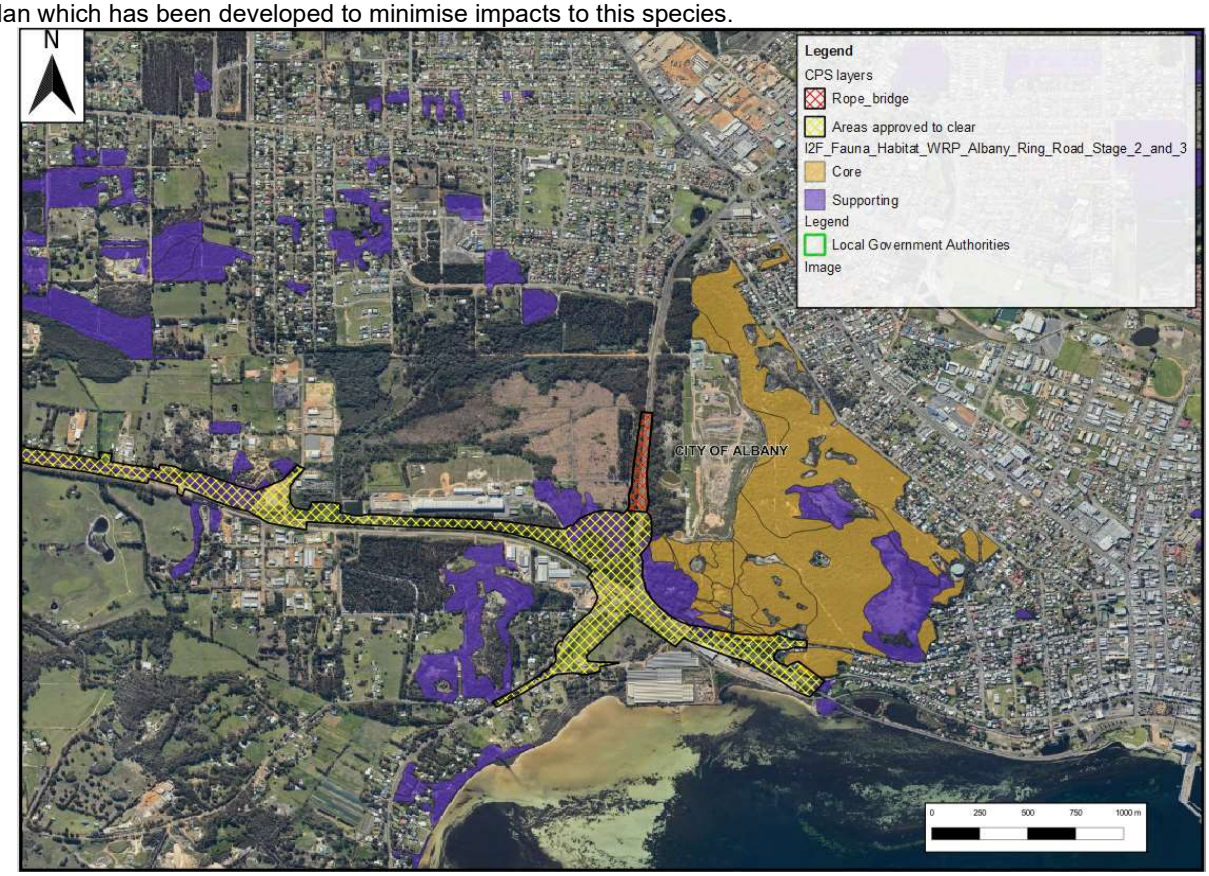

Figure 4. General location of WRP rope bridge to be installed by MRWA.

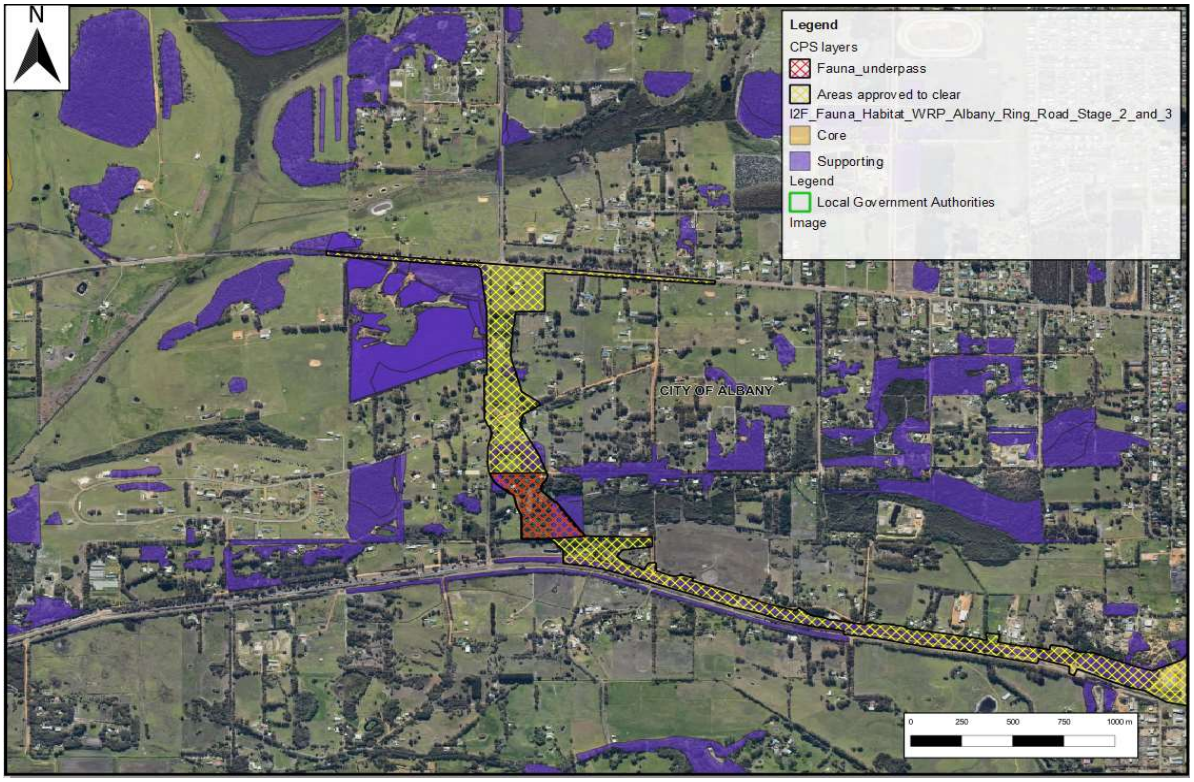

Figure 5. Location of proposed fauna underpass (hatched red), with supporting habitat for WRP shown purple.

South-western brush-tailed phascogale

The preferred habitat for this species in Western Australia is within dry sclerophyll forests and open woodlands that contain hollow bearing trees (DEC, 2012a).

While evidence of this species was not identified within the application area, it provides suitable habitat in the form of the following vegetation types, which comprise 5.8 hectares (Southern Ecology, 2020a):

- Jarrah, marri, sheoak laterite forest, and
- Marri, jarrah forest and peppermint woodland vegetation types.

The threatening process for this species includes habitat clearing, fragmentation, and alteration by logging as they reduce the availability of trees with hollows, and subsequently increase susceptibility to predation by foxes and cats (DEC, 2012a).

The proposed clearing would result in the loss of 5.8 hectares of preferred habitat for this species, including several trees with suitably sized hollows. Therefore, it is considered that an offset is required to address the residual impact to this species habitat.

To mitigate the loss of 5.8 hectares of south-western brush-tailed phascogale habitat, MRWA has committed to the following offset measures, which are detailed under Section 4:

- rehabilitating approximately 3.56 hectares of nearby cleared land parcels with suitable habitat for this species, and
- providing a monetary offset contribution for the purchase of up to 22.2 hectares of habitat for this species in the local area, to be conserved in perpetuity.

Quenda

Quenda is known to inhabit scrubby, swampy vegetation with low, dense understorey, located nearby water courses, pasture, or forest/woodland that is regularly burnt. Populations which inhabit jarrah and wandoo forests are usually associated with watercourses (DEC, 2012b). The application area comprises jarrah woodland and around 7.17 hectares of riparian habitat (noting 4.53 hectares is degraded to completely degraded condition).

It is considered that the entire application area provides suitable habitat for this species and quenda diggings were identified within the application area, mainly along Lower Denmark Road (Southern Ecology, 2020a).

It is considered that suitable habitat for this species is widespread and well represented in the local area, and the proposed clearing of 15.67 hectares of roadside vegetation, of which 10.8 hectares is in a degraded to completely degraded (Keighery, 1994) condition, is not likely to impact on significant habitat for this species.

This species may be impacted if utilising the application area at the time of clearing. Slow, one directional clearing methods will help to allow this species to disperse into surrounding native vegetation ahead of clearing should it occur on site at the time of clearing.

Masked owl

The masked owl inhabits forests, woodlands, timbered waterways and open country on the fringe of these areas. The main requirements are tall trees with suitable nesting hollows and adjacent areas for foraging.

This species possibly occurs within the application area, due to presence of suitable hollows for nesting in Eucalypt woodland/forest vegetation types. This species was not identified during the field surveys (Southern Ecology, 2020a).

This species is only known from two records within the local area, both taken in 1954, therefore it is considered unlikely that species will be utilising the roadside vegetation proposed for clearing.

Short-nosed snake

Habitat for the short-nosed snake is poorly known. Noting there are some records of this species on the south coast, suitable habitat may occur within the application area. This species was not identified during the field surveys (Southern Ecology, 2020a).

There are five records of this species within the local area, three of which were recorded in 1950-1951. Noting this, the application area is not likely to provide significant habitat for this species, however it may be impacted if utilising the application area at the time of clearing.

Slow, one directional clearing methods will help to allow this species to disperse into surrounding native vegetation ahead of the clearing activity should it occur on site at the time of clearing.

Woollybush bee

Only the type specimen (recorded in 1929) of the Woollybush Bee is known from the Albany area. Its potential habitat in the south coast is unknown and therefore may occur within the application area (Southern Ecology, 2020a). Noting that vegetation types within the application area are well represented with the surrounding locality, the proposed clearing of 15.67 hectares of roadside vegetation is not likely to result in the loss of significant habitat for this species.

Water-rat

This species lives in the vicinity of permanent water bodies of fresh or brackish water and can travel a considerable distance overland (Van Dyck, 2008). Dens are made at the end of tunnels in banks or occasionally in logs. The Water Rat hunts on land but takes much of its food from the water, searching among vegetation along the shoreline and diving around submerged roots and logs (Van Dyck, 2008).

The application area intersects one natural minor watercourse, and several artificial drains. No signs of this species were identified, however the one artificial drain that crosses Lower Denmark Road, connecting to the Robinson Road drain, is intercepted by the application area and may provide habitat for this species (Southern Ecology, 2020a). The application area also includes larger areas of riparian habitat; however these are associated with seasonally wet areas rather than perennial watercourses which provide the highest value habitat for this species.

Based on the limited extent of preferred habitat for this species within the application area, the proposed clearing is not likely to impact on significant habitat for this species.

This species may be impacted if utilising the application area at the time of clearing. Slow, one directional clearing methods will help to allow this species to disperse into surrounding native vegetation should it occur on site at the time of clearing.

Fork-tailed swift and Peregrine falcon

These species are widespread, highly mobile and found in various habitats. The application area may comprise suitable habitat for these species, however, noting habitat preferences and the small extent of the proposed clearing, the application area is unlikely to comprise a significant habitat for these species.

Ecological Linkages

The application area is within Strategic Zones A, B and C (around one, 4.5 and 1.5 kilometres of the alignment respectively) of the Western Australian South Coast Macro Corridor Network, which was designed to identify a regional-scale Macro Corridor Network of native vegetation. This Network extends 700 kilometres from Israelite Bay, east of Esperance and west through Albany along Western Australia's southern coastline (CALM, 2006).

The vegetation in these zones is described as follows (CALM, 2006):

- Zone A is considered to potentially form the most strategic link between major protected areas and are thus of potentially higher vale and significance for fauna movement across the landscape
- Zone B is described as having large areas (greater than 30 hectares) of woody vegetation and protected areas, but which did not create the most direct link between protected areas
- Zone C is described as potentially providing habitat for wildlife at the local scale but requires closer assessment to determine its value for a regional scale Macro Corridor Network.

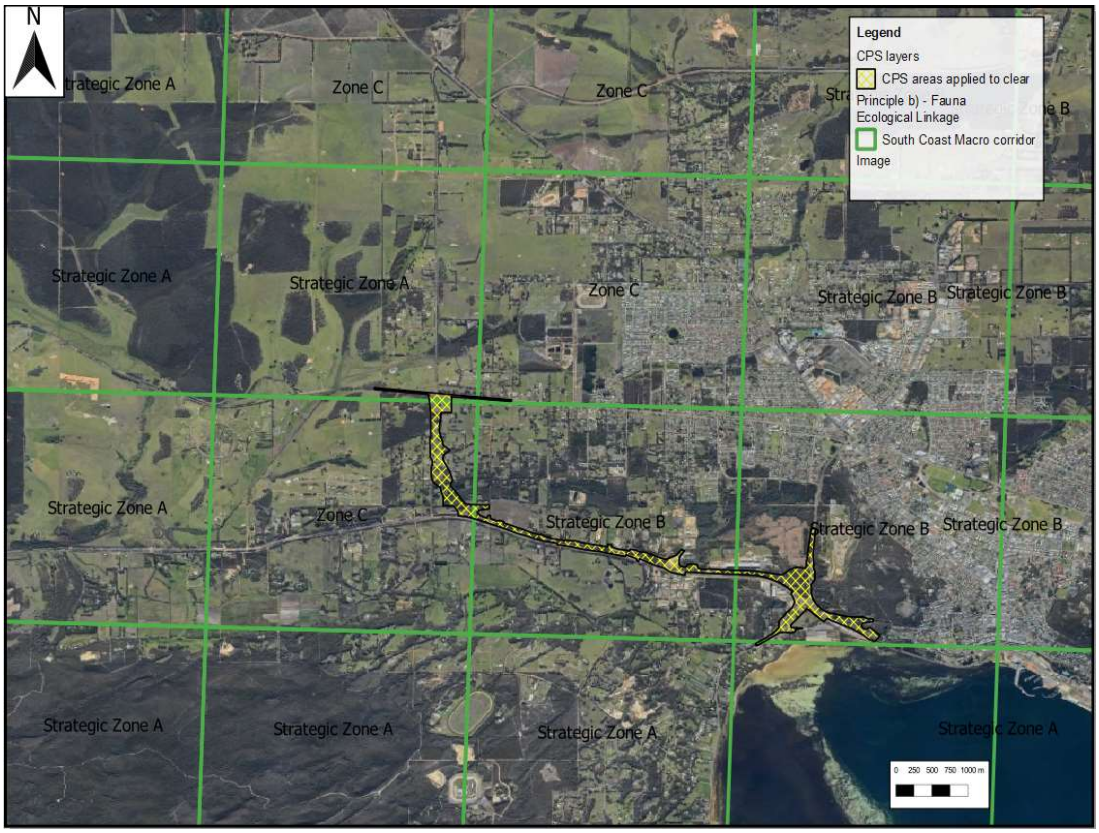

Figure 6. Western Australian South Coast Macro Corridor Network mapping.

The proposed clearing will impact on native vegetation that contributes to the values of this corridor network. It will also impact on very localised east-west linkage values on either side of George Street, within a highly cleared portion of the landscape. This local linkage is considered particularly relevant for WRP, with suitable habitat for this species mapped on either side of the current road, which will be widened as part of this project.

To minimise impacts to these linkage values, the applicant has committed to installing a fauna underpass adjacent to George Street as shown in Figure 5 above.

The applicant has also committed to offset measures, including revegetating 3.56 hectares within the local area, to improve WRP linkage values, and providing a monetary contribution to acquire land in the local area for the purpose of conservation (see Section 4 for further information).

Conclusion

Based on the above assessment, and with consideration of the applicants measures to avoid and minimise impacts, the proposed clearing will result in:

- the loss of 6.76 hectares of significant foraging habitat, and suitable roost habitat for Carnaby's cockatoo, forest red-tailed black cockatoo and Baudin's cockatoo,
- the loss of 10 trees with 14 suitably sized hollows to support black cockatoo breeding,
- the loss of 11.92 hectares of significant habitat for western ringtail possum,
- the loss of 5.8 hectares of suitable habitat for south-western brush-tailed phascogale,
- impacts to ecological linkage values that support fauna movement throughout the landscape, and
- potential direct impacts to quenda, water-rat and short nosed snake, should they occur within the application area at the time of clearing.

It is noted that MRWA has reduced the initial area of 24.44 hectares of native vegetation proposed for clearing to 15.67 hectares, and in doing so has retained 6.28 hectares of black cockatoo foraging habitat and 8.31 hectares of WRP habitat (including 3.4 hectares of core habitat).

Outcome

The Delegated Officer determined that the proposed clearing requires management and offset conditions in relation to this environmental value. Therefore, the following management/offset measures will be required as conditions on the clearing permit:

- slow directional clearing to allow quenda, water-rat, and short nosed snake individuals to move into adjacent vegetation ahead of the clearing activity,
- pre-clearance surveys for black cockatoos and WRP (with additional management measures in accordance with MRWA's WRP Management Plan) to ensure that individuals are not harmed during clearing,
- installation of artificial black cockatoo nesting hollow (at a 1:1 ratio to those being removed) within a secured property identified and managed by DBCA,
- installation of a fauna underpass at George Street to mitigate impacts to ecological linkage values and allow the safe west–east movement of fauna,
- installation of a WRP rope bridge over Hanrahan Road to allow safe movement of WRP over this area, and
- an offset involving the following (described in detail under Section 4):
    - rehabilitation of 3.56 hectares of nearby cleared land parcels with suitable habitat for WRP, black cockatoos and south-western brush-tailed phascogale, and
    - providing a monetary offset contribution for the purchase and long-term conservation tenure of 65 hectares of native vegetation, which contains 65, 29.6 and 22.2 hectares of significant habitat for WRP, black cockatoos and south-western brush-tailed phascogale, respectively.

3.2.2. Environmental value: Biodiversity values (flora) – Clearing Principles (a) and (c)

Surveys

The application area was subject to a Biological Survey (Southern Ecology, 2020a), and *Prasophyllum paulinae* (P1) Targeted Regional Flora Survey (Southern Ecology, 2020b). The Biological Survey included vegetation type and condition mapping and targeted searches for conservation listed flora species (detailed methodology described in Appendix E), with various field surveys undertaken over three years, including three spring seasons (October 2017 to October 2019).

Background

The Biological Survey identified 11 vegetation types in the application area, including two granite, six upland and three wetland vegetation types (Southern Ecology, 2020a). These are described within the Site Characteristics under Appendix B.

The Biological Survey (Southern Ecology, 2020a) identified 342 flora taxa from 65 families, including 60 weeds within the larger survey area. The plant families most represented were Myrtaceae (40 taxa), Fabaceae (37 taxa), Cyperaceae (27 taxa) and Proteaceae (25 taxa) (Southern Ecology, 2020a). MRWA note that the species assemblages were typical of the local region and the vegetation types encountered (GHD, 2021).

Priority Flora

There are records of 57 priority flora species and 10 threatened flora species within the local area. Of these, a likelihood of analysis identified 34 species that may occur within the application area. This presumption is based on presence of suitable habitat within the application area, and the presence of known records within the local area.

Targeted field surveys identified the following four conservation listed flora species within the larger survey area (Southern Ecology, 2020a):

- *Synaphea incurva* (P3), two populations totalling eight individuals were identified on road verges in the survey area.
- *Boronia crassipes* (P3), identified within *Homalospermum firmum* and *Empodisma gracillimum* on peat and sand. Several large populations of this species are known within the vicinity of Albany.
- *Andersonia* sp. Jamesii (J. Liddelow 84) (P4), 22 individuals were recorded in the large City of Albany Reserve on George Street, and one individual was recorded on Albany Highway.
- *Thysanotus isantherus* (P4), two individuals were recorded on the western slopes of Mt Melville.

Of those species identified within the larger survey area, one species was identified within the application area, being *Synaphea incurva*. A total of four individuals of this species were recorded within the application area (Southern Ecology, 2020a).

DBCA provided comment on the impact to this species and advised that “as this species is known from a several locations, with some in conservation estate, and is represented regionally, the removal of 4 plants is unlikely to be considered significant at the species or regional level” (DBCA, 2021).

The application area initially included 13 individuals of *Andersonia* sp. Jamesii (J. Liddelow 84), however MRWA amended the application area to avoid impacts to this species and provide a minimum 15 metre buffer to this species. The applicant has committed to a number of management measures during construction (see Section 3.1) that will minimise the risk of any indirect impacts to this species through clearing and road construction.

The recorded occurrences of *Boronia crassipes* and *Thysanotus isantherus* are 500 and 150 metres from the application area at their closest points, respectively, and the proposed clearing is not likely to impact on these species.

The application area is also within close proximity (around 25 metres from) from a historical record of *Prasophyllum paulinae* (P1). The Biological Survey notes that the precise location of the species within this area is unknown (Southern Ecology, 2020a).

The Biological Survey notes that extensive surveys were undertaken within areas of suitable habitat for *Prasophyllum paulinae* over several days in spring of 2017, 2018 and 2019, and no individuals were detected (Southern Ecology, 2020a). It is noted that the failure to detect this species during the survey does not exclude its presence from the previously known habitat or its potential to emerge in future years, particularly after fire (Southern Ecology, 2020a).

Suitable habitat for *Prasophyllum paulinae* is considered to comprise recently burnt *Homalospermum firmum* / *Callistemon glaucus* peat thicket and *Taxandria juniperina* closed forest. The survey noted that 19.25 hectares of these vegetation types occurs within the survey area that are long unburnt (Southern Ecology, 2020a; Southern Ecology, 2020b). Of this 19.25 hectares, 6.54 hectares of these vegetation types occur within the application area. A targeted survey for *Prasophyllum paulinae* in these areas over consecutive springs has not detected any individuals. However, the potential exists for it to emerge following fire within this habitat (Southern Ecology, 2020a; Southern Ecology, 2020b).

DBCA provided comment on the potential impact to this species and advised the following (DBCA, 2021):

> "Little is known about this species however it is thought to respond favourably to appropriately timed fire, flowering well for the first few years following fire with a decline observed over subsequent years…
>
> As the exact location of plants is unknown, plants may occur within any areas of suitable habitat. The habitat appears to extend to the east of the application area. Given this, indirect impacts to the adjoining habitat such as altered hydrology and weed invasion should be minimised and areas of suitable habitat be retained where possible, as a total loss of one of the two known locations for this species would be considered significant at a species level".

The applicant has committed to the following management measures which will assist to minimise the risk of indirect impact to this species habitat (GHD, 2021):

- temporary drainage will be installed to capture and infiltrate surface runoff from road and bridge construction areas to prevent runoff from entering adjacent native vegetation,
- site specific erosion and sediment controls will be established to prevent direct run off into adjacent water courses and wetlands,
- existing natural drainage lines within the construction area will be maintained at all times (i.e. water flows not blocked or adversely obstructed or restricted) and include erosion control and scour protection measures at crossings,
- timing of operations and construction (particularly in Protectable Areas) will be conducted in dry soil conditions where possible (generally between November and April), and
- undertaking weed hygiene measures including:
  - heavy plant and machinery will be inspected by the contractor prior to entry at the work site and be confirmed to be clean and free of vegetation and soil material,
  - effective clean down prior to accessing will be conducted to remove soil and plant material (including weed seeds), and
  - WoNS and Declared Pests within the construction site boundary will be controlled according to the weed control management outlined by Weeds Australia with the aim of controlling weed spread.

The applicant has also revised the application area from 24.44 hectares to 15.67 hectares which has resulted in the retention of 1.57 hectares of suitable habitat for *Prasophyllum paulinae*.

Threatened flora

Targeted flora surveys of the application area did not identify any threatened flora species (Southern Ecology, 2020a), and no threatened flora have been historically recorded within the application area. Therefore, the proposed clearing is not likely to impact on threatened flora.

Conservation significant fauna

As discussed in Section 3.2.1., the application area comprises native vegetation which provides:

- significant habitat for black cockatoos,
- significant habitat for WRP,
- suitable habitat for south west-brush-tailed phascogale and ground dwelling conservation significant fauna, and
- ecological linkage values.

Threatened and priority ecological communities (TEC/PECs)

According to available datasets, there are no TECs or PECs mapped within the application area. The Biological Survey did not identify the presence of any known TECs or PECs within the application area or broader survey area (Southern Ecology, 2020a), and the proposed clearing is not likely to impact on any TECs or PECs.

Dieback and weed risks to biodiversity

The Biological Survey identified 60 weeds species within the broader survey area. Five of these are listed as Declared Pests under the *Biosecurity and Agriculture Management Act 2007* and Weeds of National Significance (WoNS) including: Blackberry (Rubus species), Bridal creeper (*Asparagus asparagoides*), Gorse (*Ulex*

europaeus), Arum Lily (*Zantedeschia aethiopica*) and Lantana (*Lantana camara*). Blackberry and Gorse have both been identified at the southern end of the application area (Southern Ecology, 2020a).

The application area is in a dieback susceptible region, based on rainfall, soils, drainage and vegetation. Dieback surveys undertaken by Southern Ecology (2020b) identified most of the application area as excluded or uninterpretable, typically due to existing road and agricultural disturbance, as well as lack of indicator species that could be impacted by the pathogen. The south-west side of South Western Highway was mapped as infested, as was vegetation to the west of Roundhay Street and east side of Hanrahan Road intersection.

The proposed clearing will increase the risk of spreading weeds and dieback into adjacent areas of native vegetation and may impact on the biodiversity values of these areas through resource competition, the prevention of seedling recruitment of native plant species, alteration of geomorphological and hydrological cycles, and changes to soil nutrients.

The applicant commissioned a Dieback Management Plan (Southern Ecology, 2020c) to identify and minimise the risk of dieback spreading into adjacent vegetation.

MRWA will be required (as condition on the clearing permit) to undertake weed and dieback management measures to minimise the risk of spread into adjacent native vegetation and nearby conservation areas. MRWA has also committed to the following management measures as part of the construction works (GHD, 2021):

- contractor induction will include familiarisation with dieback management and hygiene management,
- heavy plant and machinery will be inspected by the contractor prior to entry at the work site and be confirmed to be clean and free of vegetation and soil material. Entry and exit records will be kept for Clean on Entry (CoE) points,
- effective clean down prior to accessing the CoE point will be conducted to remove soil and plant material (including weed seeds),
- demarcation of Dieback Protectable Areas will be check/retaped shortly prior to construction,
- basic raw material imported into Protectable areas should be low risk for Dieback contamination,
- Weeds of National Significance and Declared Pests within the construction site boundary will be controlled according to the weed control management outlined by Weeds Australia with the aim of controlling weed spread,
- topsoil containing Declared Pests or WoNS shall not be reused in revegetation or revegetation,
- topsoil from infected or potentially infected dieback areas shall be segregated and not used in non-infected areas, and
- dieback protectable areas will be identified and established within the Proposed Action area and adjacent land to guide dieback hygiene practices including restrictions on equipment and vehicle movement, soil movement, CoE and/or exit.

Conclusion

Based on the above assessment the Delegated Officer has determined that proposed clearing will impact on native vegetation which contains a high level of biodiversity as the application area contains the following values:

- 11.92 hectares of significant habitat for WRP,
- 6.76 hectares of significant foraging and suitable roost habitat for black cockatoos,
- 10 trees with 14 hollows of a suitable size for black cockatoo breeding,
- 5.8 hectares of suitable habitat for south-western brush-tailed phascogale,
- vegetation comprising ecological linkage values,
- four individuals of priority 3 flora species *Synaphea incurva*, and
- suitable habitat for priority 1 flora species *Prasophyllum paulinae*.

The Delegated Officer has determined that the proposed clearing will also result in potential impacts to biodiversity values within adjacent native vegetation through increasing the risk of spreading of weeds and dieback.

Outcome

The Delegated Officer determined that the proposed clearing requires management and offset conditions in relation to this environmental value. Therefore, the following management/offset measures will be required as conditions on the clearing permit:

- pre-clearance surveys for black cockatoos and WRP (with additional management measures in accordance with MRWA's WRP Management Plan) to ensure that individuals are not harmed during clearing,
- installation of artificial black cockatoo nesting hollows at a ratio of 1:1 to those being removed, within a secured property identified and managed by DBCA,
- installation of a fauna underpass at George Street to mitigate impacts to ecological linkage values and allow the safe west–east movement of fauna,
- installation of a WRP rope bridge over Hanrahan Road to allow safe movement of WRP over this area, and
- an offset involving the following (described in detail under Section 4):
    - rehabilitation of 3.56 hectares of nearby cleared land parcels with suitable habitat for WRP, black cockatoos and south-western brush-tailed phascogale, and
    - providing a monetary offset contribution for the purchase and long-term conservation of 65 hectares of native vegetation, which contains 65, 29.6 and 22.2 hectares of habitat for WRP, black cockatoos and south-western brush-tailed phascogale, respectively.

3.3. Relevant planning instruments and other matters

Albany Ring Road Project

MRWA advise that the Albany Ring Road (ARR) will be a dedicated freight route around the City of Albany to enable the effective movement of freight to and from the Port of Albany. MRWA note that the project has been separated into a staged construction process as follows (GHD, 2020):

- Stage 1 of the ARR is the east to west connection of Menang Drive linking Chester Pass Road to Albany Highway which was built in 2007,
- Stage 2 of the ARR is the southern link of the ring road and is located between the Lower Denmark Road Link and Frenchman Bay Road. Stage 2 works end west of Festing Street (part of the application),
- Stage 3 of the ARR is the western link of the ring road and is located between the intersection of Albany Highway and Lower Denmark Road. Stage 3 is separated into two sections for construct-ability purposes:
    - Part a – from Albany Highway along Link Road to South Western Highway, and
    - Part b – South Coast Highway to Lower Denmark Road (part of the application).
- Stage 4 of the ARR is the duplication of Princess Royal Drive from Hanrahan Road to York Street including duplication of the existing Princess Royal Drive Bridge over rail east of Festing Street.

The proposed clearing considered under this clearing permit application relates to Stages 2 and 3b.

The proposed clearing intersects Crown, Freehold and Reserve land titles and easements, plus a combination of Easement, Primary Road and other (e.g., railway, water, and vacant Crown land) lot types. All land required for the proposed clearing will be acquired by MRWA prior to construction activities under the WA *Land Administration Act 1997*.

Aboriginal heritage

MRWA notes that Stages 2 and 3 of this project were subject to ethnographic and archaeological survey by Brad Goode and Associates in 2006 and updated in 2019. MRWA notes that an archaeological survey was carried out in June 2006 using a site identification methodology, covering close to 100per cent of the proposed route using evenly spaced pedestrian transects. Where the proposed route deviated slightly off existing roads into private property or remnant bushland, these areas were inspected where possible. MRWA advised that any areas not examined during the course of the archaeological survey hold a very low likelihood of containing any cultural material (GHD, 2020).

MRWA advise that an additional search by Brad Goode and Associates confirmed the presence of two ethnographic heritage places that may be impacted by ARR (GHD, 2020). MRWA note that consultation with the Wagyl Kaip and Southern Noongar Native Title Claim representatives confirmed that significant parts of the site are confined to a small area, and the proposed clearing will not affect this significant area (GHD, 2020).

EPA Referral

The project was referred to the Environmental Protection Authority (EPA) under Part IV of the EP Act who determined on 27 July 2020 to not assess the Proposal. The key environmental factors considered in the referral decision included:

- flora and vegetation,
- terrestrial environmental quality (including acid sulfate soils),
- terrestrial fauna,
- inland waters (including dewatering, acid sulfate soils, stormwater runoff), and
- social surroundings (including visual amenity, noise, heritage).

The EPA's decision noted that it considers that the likely environmental effects of the proposal are not so significant as to warrant formal EPA assessment.

EPBC Act Assessment

On 1 September 2020, the applicant referred the project to the Department of Agriculture, Water and the Environment (DAWE) for assessment under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). On 1 October 2020, DAWE determined that the proposed action was a controlled action and required approval under the EPBC Act.

DAWE is currently assessing the referral, and a decision has not yet been made.

Non-native vegetation

It is noted that the project will involve the clearing of several hectares of non-native vegetation, which provides supporting habitat for WRP and black cockatoos.

DBCA (2021) provided comment on the proposed clearing of WRP habitat, including non-native vegetation and advised that:

> "The clearing permit application only deals with the clearing of native vegetation … However, the Southern Ecology biological report includes areas of non-native vegetation and identifies these as supporting habitat (with evidence of WRP…), much of which forms linkage habitat between supporting or core native vegetation...
>
> It is important to consider the broader context of clearing native vegetation based WRP habitat within a mosaic of support non-native vegetation..."

It is noted that impacts to non-native vegetation that forms suitable habitat for WRP will be considered in DAWE's assessment and decision making under the EPBC Act.

RIWI Act 1914 considerations

The application area is within the Albany Groundwater Area proclaimed under the *Rights in Water Irrigation Act 1914* (RIWI Act). There are no proclaimed RIWI Act Surface Water Areas within the application area.

Contaminated sites

Internal DWER contaminated sites advice notes that the application area (around three hectares) intersects an area mapped as 'possibly contaminated – investigation required' under the *Contaminated Sites Act 2003*. The site is a former landfill. DWER holds no reports relating to the investigation of suspected contamination at the site and the quality of soil across the site is unknown. MRWA is encouraged to undertake clearing and ground disturbance activities in accordance with an appropriate management plan that accounts for the potential presence of landfill wastes (including asbestos) within the areas being disturbed.

Zoning

MRWA has advised that works associated with the proposed clearing will be conducted within areas currently zoned "Primary Regional Road" or "Other Regional Roads" under the City of Albany Town Planning Scheme. MRWA notes that it does not require further planning approval to construct roads within these zonings (GHD, 2020).

Stakeholder engagement

MRWA notes that stakeholder consultation was done in association with the planning and design works, starting in 2006 when the alignment definition works began. MRWA notes that discussions were initially limited to government agencies and heritage groups (GHD, 2020).

MRWA note that a concerted effort and more focussed consultation commenced in May 2019 when the Federal and State Governments allocated funding for the planning, development, and construction of the project (GHD, 2020).

Stakeholders included in the more consultations include (GHD, 2020):

Commonwealth Government

- Federal Minister for Infrastructure and Transport
- Department of Agriculture, Water and the Environment
- State Government Minister for Transport
- Department of Planning Land and Heritage
- Heritage Council Department of Water and Environment Regulation (Office of the EPA)
- Department of Water and Environment Regulation (Native Vegetation Regulation)
- Department of Transport
- Department of Treasury
- Department of Infrastructure
- Regional Development and Cities Albany Port Authority
- Great Southern Development Commission
- Public Transport Authority
- Department of Biodiversity, Conservation and Attractions
- Water Corporation
- City of Albany

Community

- Landowners
- Wagyl Kaip and Southern Noongar Native Title Claim representatives
- Albany Visitor Centre Albany cycling groups
- Albany Residents and Ratepayers General public and local residents

Environmental Groups

- Torbay Catchment Group
- Denmark Community Environment Centre
- South Coast NRM
- Wildflower Society WA (Albany)
- Oyster Harbour Catchment Group
- Albany Community Environment Centre

No public submissions have been received in relation to this application.

4 Offset suitability

Background

The Delegated Officer determined that the following significant residual impacts remain after the application of avoidance and mitigation measures summarised in Section 3.1:

- the loss of 6.76 hectares of significant foraging habitat and suitable roosting habitat for black cockatoos,
- the loss of 10 trees containing 14 hollows of a suitable breeding size for black cockatoos,
- the loss of 11.92 hectares of significant habitat for WRP, including core and supporting habitat with linkage values, and
- the loss of 5.8 hectares of suitable habitat for south-western brush-tailed phascogale.

To counterbalance the above impacts, the applicant has proposed environmental offsets as summarised below.

Offset 1 - Rehabilitation

The applicant has committed to rehabilitation of 3.56 hectares of six historically cleared land parcels adjacent to and nearby the application area (see figures 7 and 8 below). MRWA acquired these land parcels as part of the larger project and has determined that these areas can be retained and rehabilitated, where 1.47 hectares will be placed under a conservation covenant issued under section 30B of the *Soil and Land Conservation Act 1945* and the remaining 2.08 hectares will remain in MRWA tenure. The rehabilitation will (MRWA, 2021b):

- achieve a 'good' vegetation (Keighery, 1994) condition
- provide 3.56 hectares of suitable habitat for WRP
- provide north south, and east west linkage values for WRP
- provide 3.56 hectares of suitable habitat for black cockatoos
- provide 3.56 hectares of suitable habitat for south-western brush-tailed phascogale

As a condition of the clearing permit the applicant will be required to provide a comprehensive rehabilitation plan which commits to specific revegetation activities, including completion criteria, in accordance with DWR's '*A Guide to Preparing Revegetation Plans for Clearing Permits*'.

In addition to the rehabilitation proposed, portions of these six land parcels comprise native vegetation and retain the following values (MRWA, 2021b):

- 1.78 hectares of the *Homalospermum firmum* / *Callistemon glaucus* peat thicket riparian vegetation type,
- 0.19 hectares of foraging habitat for black cockatoos (as well as breeding and roosting habitat),
- 0.11 hectares of supporting habitat for WRP, and
- 0.16 hectares of habitat for south-western brush-tailed phascogale.

Offset 2 - Monetary offset contribution for land acquisition

The applicant has committed to providing $321,750 as a monetary contribution to fund the purchase of a 65-hectare land parcel in the local area, to be conserved in perpetuity. The land acquired will contain the following values:

- 65 hectares of native vegetation containing significant habitat for WRP,
- 29.6 hectares of native vegetation containing significant foraging habitat and suitable roosting and breeding habitat for black cockatoos, and
- 22.2 hectares of native vegetation containing suitable habitat for south-western brush-tailed phascogale.

Summary

In assessing whether the proposed offset is adequate and proportionate to the significance of environmental values being impacted, a calculation using the EPBC Act Offset Calculator was undertaken. The calculation indicates that when combined, the proposed offsets will address 100 percent of the significant residual impacts of clearing and is consistent with the WA Environmental Offsets Policy September 2011.

The offset calculations are available at Appendix E.

Figure 7. Areas proposed for rehabilitation (1)

Figure 8. Areas proposed for rehabilitation (2)

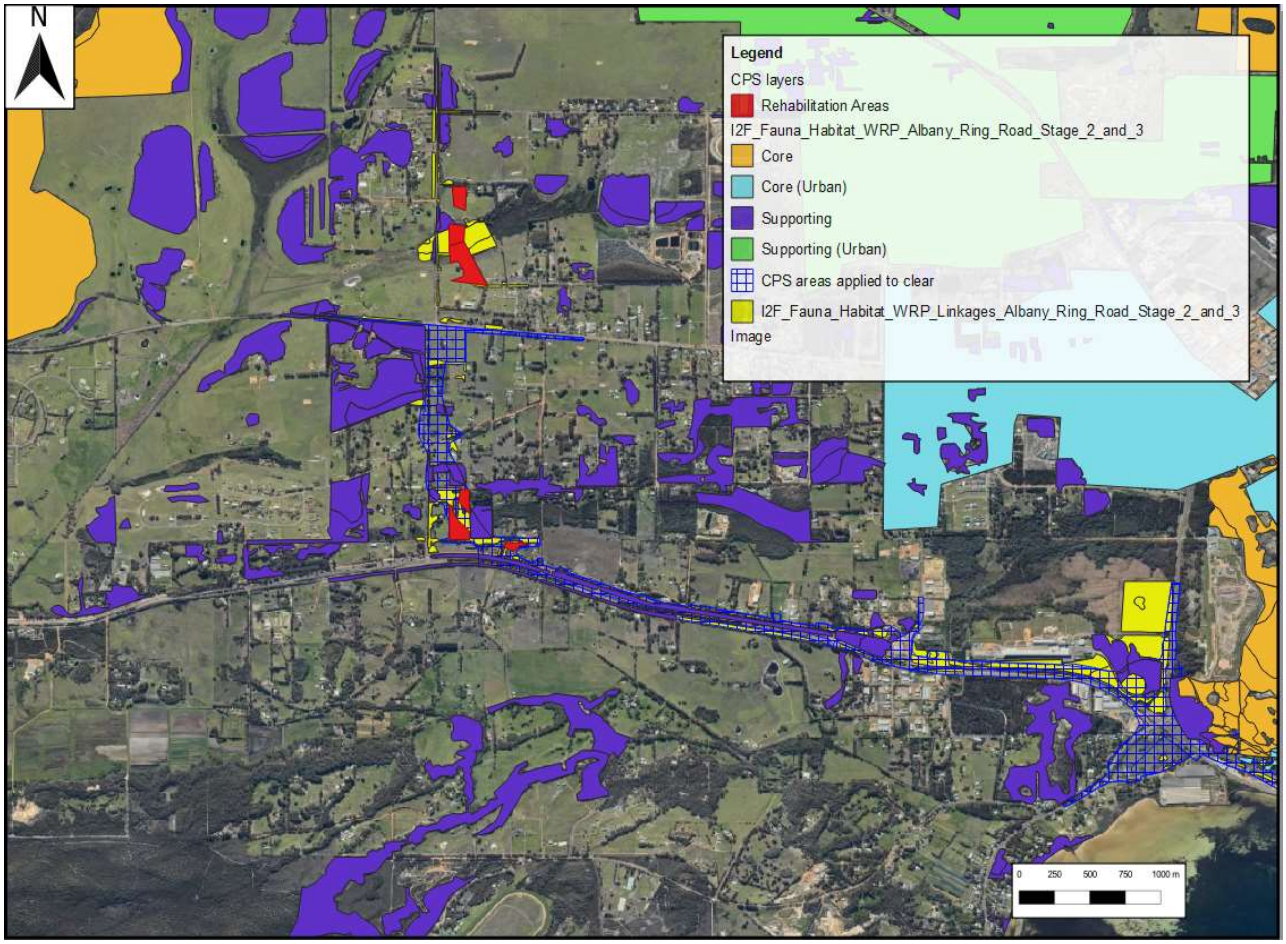

Figure 9. Areas proposed for rehabilitation shaded red, with application area and surrounding WRP habitat shown.

End

Appendix A. Additional information provided by applicant

Summary of comments
DWER – 23 March 2021 – Additional Information required (1) MRWA had indicated during a meeting of 3 February 2021 that the design footprint, which involved a proposed clearing area of 24.44 hectares, would be further refined to avoid impacts to WRP habitat. DWER had not yet received a revised application with adequate WRP avoid and minimise measures and requested additional information on this matter. DWER's review also identified a number of impacts that would likely require an environmental offset, including impacts to WRP, black cockatoo and south-western brush-tailed phascogale habitat, and encouraged MRWA to provide an offset with the revised application area. **MRWA – 20 July 2021** MRWA provided a revised (reduced) application area and supporting information to reflect the reduction in proposed clearing area from 24.44 hectares to 15.67 hectares. No offset was provided at this stage.
DWER – 11 August 2021 – Additional information required (2) DWER's review of the revised application area and associated supporting information, identified that the proposed clearing would result in significant residual environmental impacts, including • the loss of 6.76 hectares of significant foraging habitat for black cockatoos, • the loss of 10 trees containing 14 hollows of a suitable breeding size for black cockatoos, • the loss of 11.92 hectares of significant habitat for WRP, and • the loss of 5.8 hectares of habitat for south-western brush-tailed phascogale. DWER subsequently requested an environmental offset to address the above impacts, indicating a preference for offsets which are located close to the impact site and contain rehabilitation measures. DWER also requested that additional measures be included within the WRP Management Plan and requested that MRWA provide the general location of the proposed WRP rope bridge and fauna underpass. **MRWA – 18 August 2021** MRWA provided additional information to DWER, including the following: • Clearing Permit Offset Strategy, • Revised Western Ringtail Possum Management Plan, and • Figures showing locations of fauna bridge and rope bridge locations. The Offset Strategy involved a stand alone monetary offset contribution to acquire land for long term conservation.
DWER – 3 September 2021 – Additional information required (3) Upon reviewing the offset proposal, DWER advised that as a standalone measure, a monetary offset contribution is not considered adequate to address impacts to WRP habitat, and particularly WRP linkage habitat that will be impacted by the proposed clearing. DWER therefore requested a revised offset proposal which included rehabilitation measures to increase linkage values for WRP. **MRWA – 13 October 2021** MRWA provided a revised offset proposal which included 3.56 hectares of rehabilitation as an offset measure to improve WRP linkage values.

Appendix B. Site characteristics

B.1. Site characteristics

<table>
<tr><th>Characteristic</th><th>Details</th></tr>
<tr><td>Local context</td><td>The application area is in the Jarrah Forest Bioregion, and City of Albany. It borders the western extent of the Albany townsite and is surrounded by a mixture of rural/urban/industrial related end land uses, with patches of remnant native vegetation dispersed between.

Spatial data indicates the local area (10-kilometre radius surrounding the application area), retains around 35.5 percent (around 12,088 hectares) of the original native vegetation cover.</td></tr>
<tr><td>Climate and Landform</td><td><u>Climate</u>
Albany experiences a Mediterranean climate with cool wet winters and warm, dry summers. Rainfall is generally received in winter (June - August) and the mean annual rainfall is 925mm.

<u>Landform (GHD, 2021)</u>
• Stage 3b - surface elevation ranges from around 60 m Australian Height Datum (AHD) in the northern end to 12 m AHD at the southern end (GoWA, 2020). There are undulations on Link Road/George Street, with low points associated with wetland vegetation.
• Stage 2 - generally low lying with elevation ranging from approximately 12 m AHD at the western end to 2 m AHD at the eastern end (GoWA, 2020). There are also several elevated areas in Stage 2, to a maximum of around 44m AHD, associated with granite.</td></tr>
<tr><td>Vegetation description and condition</td><td>The Flora Survey indicates that the application area comprises the following vegetation types and condition (Southern Ecology, 2020a):
<table>
<tr><th rowspan="2">Vegetation type</th><th colspan="6">Extent within the application area</th></tr>
<tr><th>Excellent</th><th>Very good</th><th>Good</th><th>Degraded</th><th>Completely degraded</th><th>Total (ha)</th></tr>
<tr><td>Evandra aristata sedgeland</td><td></td><td>0.64</td><td></td><td></td><td></td><td>0.64</td></tr>
<tr><td>Hakea sp., shrubland/woodland</td><td>0.75</td><td></td><td></td><td></td><td></td><td>0.75</td></tr>
<tr><td>Homalospermum firmum/Callistemon glaucus peat thicket</td><td></td><td>0.81</td><td></td><td></td><td>0.41</td><td>1.22</td></tr>
<tr><td>Jarrah, marri, sheoak laterite forest</td><td>0.16</td><td>0.32</td><td></td><td>0.33</td><td></td><td>0.81</td></tr>
<tr><td>Jarrah, sheoak, Eucalyptus staeri sandy woodland</td><td></td><td></td><td></td><td>0.47</td><td></td><td>0.47</td></tr>
<tr><td>Marri, jarrah forrest and peppermint woodland</td><td></td><td>0.03</td><td>0.96</td><td>3.08</td><td>0.45</td><td>4.52</td></tr>
<tr><td>Mosaic of Taxandria marginata/Gastrolobium bilobum, granite shrubland/Yate woodland</td><td></td><td></td><td></td><td>0.28</td><td></td><td>0.28</td></tr>
<tr><td>Peppermint low forest</td><td></td><td></td><td></td><td></td><td>1.27</td><td>1.27</td></tr>
<tr><td>Taxandria juniperina closed forest</td><td></td><td>1.2</td><td></td><td>1.00</td><td>3.12</td><td>5.32</td></tr>
<tr><td>Taxandria marginata granite shrubland</td><td></td><td></td><td></td><td>0.28</td><td></td><td>0.28</td></tr>
<tr><td>Eucalyptus occidentalis woodland</td><td></td><td></td><td></td><td></td><td>0.11</td><td>0.11</td></tr>
<tr><td>Total clearing area</td><td>0.91</td><td>3.00</td><td>0.96</td><td>5.44</td><td>5.36</td><td>15.67</td></tr>
</table></td></tr>
</table>

The above table shows that the following two vegetation types dominate the application area:

- Marri (*Corymbia calophylla*), jarrah (*Eucalyptus marginata*) forest, peppermint (*Agonis flexuosa*) woodland; and
- *Taxandria juniperina* closed forest.

These vegetation types are described as:

Marri, jarrah, peppermint woodland

Lifeform	% Cover	Dominant taxa
Tree >10m	30-70%	*Corymbia calophylla, Eucalyptus marginata, Eucalyptus cornuta, Agonis flexuosa*
Shrubs >2m	<10%	*Bossiaea linophylla, Hovea elliptica, Agonis theiformis*
Shrubs 1-2m	10-30%	*Hovea elliptica, Leucopogon obovatus subsp. obovatus*
Shrubs <1m	10-30%	*Pteridium esculentum, Tremandra stelligera, Opercularia hispidula, Hibbertia furfuracea, Hibbertia cuneiformis, Xanthosia rotundifolia*
Sedges/Grasses	30-70%	*Loxocarya cinerea, Tetrarrhena laevis, Tetraria octandra*

***Taxandria juniperina* closed forest**

Lifeform	% Cover	Dominant taxa
Shrubs >2m	>70%	*Taxandria juniperina, Homalospermum firmum, Astartea species*
Grasses	>10%	*Leptocarpus scariosus, Baumea acuta, Lepidosperma striatum*

According to broad scale vegetation mapping, the application area is mapped as the following Beard Vegetation Associations (BVA's) (Shepherd et al, 2001):

- BVA 3 (around 85 per cent of the application area) - medium forest, jarrah-marri
- BVA 978 (around 15 per cent of the application area) - low forest; jarrah, *Eucalyptus staeri* and *Allocasuarina fraseriana*

Portions of the application area are representative of these vegetation types, with the marri, jarrah and peppermint woodland corresponding to BVA 3.

The full Keighery (1994) condition rating scale, with a description of each condition, is provided in Appendix D.

Soil description and land degradation risk

The application is mapped as the following soil types (DPRID, 2019).

Soil Unit ID	Name	Description
242TbOW (around 75% of the application area)	Owingup Subsystem	Plains with swamps, lunettes and dunes. Yellow solonetzic soils, organic loams and diatom
242TbCOy (around 4% of the application area)	Collis yellow duplex Phase	Gravelly yellow duplex soils
242MmGAs (around 3% of the application area)	Gardner Sandy Phase	Leached sands and podzols
242MmGAg (around 2% of the application area)	Gardner granite Phase	Granite outcrop
242KgDMs (around 3% of the application area)	Dempster slope Phase	Sands and gravells on smooth slopes

	242KgDMc (around 10% of the application area)	Dempster crest Phase	Sands and laterite on elongate crests
	242KgS7h (around 3% of the application area)	Minor Valleys S7 slope Phase	Broad valleys in sedimentary rocks; 30m relief; smooth slopes. Deep sands and iron podzols on slopes.

The majority of the application area is mapped as the Owingup Subsystem. This subsystem is subject to the following mapped land degradation risks:

- 10-30% of map unit has a high to extreme wind erosion risk,
- 3-10% of map unit has a high to extreme water erosion risk,
- >70% of map unit has a moderate to very high waterlogging risk, and
- 3-10% of map unit has a moderate to high salinity risk or is presently saline.

Conservation areas

The closest conservation areas to the application area are:

- An Un-named Conservation Park located approximately 520 m north, and
- Gledhow Nature Reserve approximately 500 m north.

Ecological linkage

The application area is within Strategic Zones A, B and C (around 1, 4.5 and 1.5 kilometres of the alignment respectively) of the Western Australian South Coast Macro Corridor Network, which was designed to identify a regional-scale Macro Corridor Network of native vegetation. The Network extends from around 700 kilometres from Israelite Bay, east of Esperance and westwards through Albany along Western Australia's southern coastline (CALM, 2006).

Waterbodies

According to available datasets, there are no wetlands mapped within the application area.

The northern portion of the application area is intersected by a minor non-perennial watercourse and there are several artificial drains that intersect various other portions of the application area.

Stage 2, along Lower Denmark Road, is intercepted by a number of artificial channels. These channels flow north to south across Lower Denmark Road, connecting to Robinson Drain (Southern Ecology, 2020a).

The closest Nationally Important Wetland is Oyster Harbour, which lies approximately 8 km east of the application area. The Gledhow Conservation Category Wetlands, as mapped in the South Coast Significant Wetlands dataset, are located 250 m south of the central portion of the application area.

In addition, Conservation Category wetlands Seven Mile Creek, within the King River Suite, are located approximately 2 to 3 km's west.

The Flora Survey identified 7.17 hectares of riparian habitat within the application area, which is considered to occur in un-mapped wetland areas. The majority of this comprises *Taxandria juniperina* closed forest in a degraded to completely degraded (Keighery, 1994) condition.

Flora

According to available datasets, there are records of 57 priority flora species and 10 threatened flora species within the local area. Of these, a likelihood of analysis identified 34 species that may occur within the application area, which are presented below in section B.3.

Of these species the following species were recorded in the larger survey area:

- *Andersonia* sp. Jamesii (J. Liddelow 84) (P4),
- *Boronia crassipes* (P3),
- *Synaphea incurva* (P3), and
- *Thysanotus isantherus* (P4).

Of these, the following priority flora were identified within or adjacent to the application area (Figure 7, Appendix A):

- four *Synaphea incurva* (P3) individuals were recorded just within the boundary of the application area.

	• 13 *Andersonia* sp. Jamesii (J. Liddelow 84) (P4) individuals were recorded adjacent to the application area, a 15m buffer is maintained to this population. *Caladenia harringtoniae* is the closest known record of threatened flora to the application area, located 2.2 kilometres away. Flora surveys did not identify any threatened flora species within the application area (Southern Ecology, 2020a).
Ecological communities	There are no threatened or priority ecological communities (TEC/PECs) mapped within the application area. The closest TEC/PEC is the *Astartea scoparia* Swamp Thicket (Priority 1) PEC located 15m north of a central portion of the application area. The next closest TEC/PEC is the Subtropical and Temperate Coastal Saltmarsh (Priority 3) PEC which is a federally listed TEC (Vulnerable), located 85 metres from the southern portion of the application area. Both of the above communities are separated by cleared roads/tracks and areas of existing development respectively, and the Flora Survey did not identify any vegetation communities that are considered representative of these PEC's.
Fauna	According to available datasets, there are records of 59 conservation listed fauna species within the local area. Of these, a likelihood of occurrence analysis (based on known records in the local area and habitat suitability) identified 12 species that may occur within the application area, as presented in section B.4 below. Evidence of the following fauna species were identified within the larger survey area: • Carnaby's cockatoo (*Calyptorhynchus latirostris*), • Baudin's cockatoo (*Calyptorhynchus baudinii*), • Forest red-tailed black cockatoo (*Calyptorhynchus banksii naso*), • Western ingtail Ppossum (*Pseudocheirus occidentalis*), and • Quenda (*Isoodon obesulus subsp. fusciventer*).

B.2. Vegetation extent

	Pre-European extent (ha)	Current extent (ha)	Extent remaining (%)	Current extent in all DBCA managed land (ha)	Current proportion (%) of pre-European extent in all DBCA managed land
IBRA bioregion*					
Jarrah Forest	4,506,660	2,399,838	53.25	1,673,614	37.14
Vegetation association (within Bioregion)					
Beard vegetation Association 3 (85% of the application area)	2,390,591	1,604,101	67.10	1,299,263	54.35
Beard vegetation Association 978 (15% of the application area)	53,016	18,751	35.37	5,024	9.48
Local area					
10km radius	34,081	12,088	35.46	-	-

*Government of Western Australia (2019a)

B.3. Flora records table

The below table shows threatened and priority flora historically recorded within the local area that may occur within the application area on the basis of habitat suitability.

Threatened flora

Species name	Conservation status (state listing)	Suitable habitat present [Y, N, N/A]	Are surveys adequate to identify? [Y, N, N/A]	Did surveys identify? [Y, N, N/A]
Banksia goodii	Vulnerable	Y	Y	N
Caladenia harringtoniae	Vulnerable	Y	Y	N
Chordifex abortivus	Vulnerable	Y	Y	N
Drakaea micrantha	Endangered	Y	Y	N
Isopogon uncinatus	Critically Endangered	Y	Y	N
Verticordia fimbrilepis subsp. Australis	Endangered	Y	Y	N

Priority flora

Species name	Conservation status (state listing)	Suitable habitat present [Y, N, N/A]	Are surveys adequate to identify? [Y, N, N/A]	Did surveys identify? [Y, N, N/A]
Prasophyllum paulinae	P1	Y	Y	N
Thomasia multiflora	P1	Y	Y	N
Thomasia purpurea x *solanacea*	P1	Y	Y	N
Conospermum quadripetalum	P2	Y	Y	N
Isopogon buxifolius var. *buxifolius*	P2	Y	Y	N
Leucopogon bracteolaris	P2	Y	Y	N
Leucopogon cymbiformis	P2	Y	Y	N
Schoenus sp. Grassy (E. Gude & J. Harvey 250)	P2	Y	Y	N
Thelymitra variegata	P2	Y	Y	N
Stylidium falcatum	P2	Y	Y	N
Acacia ataxiphylla subsp. *ataxiphylla*	P3	Y	Y	N
Andersonia auriculata	P3	Y	Y	N
Andersonia setifolia	P3	Y	Y	N
Boronia crassipes	P3	Y	Y	Y – several individuals recorded outside the application area, around 500 metres north
Chorizema carinatum	P3	Y	Y	N
Corybas abditus	P3	Y	Y	N
Juncus meianthus	P3	Y	Y	N
Leucopogon alternifolius	P3	Y	Y	N
Leucopogon interruptus	P3	Y	Y	N

Species name	Conservation status (state listing)	Suitable habitat present [Y, N, N/A]	Are surveys adequate to identify? [Y, N, N/A]	Did surveys identify? [Y, N, N/A]
Synaphea incurva	P3	Y	Y	Y – Four individuals were recorded within the application area
Synaphea preissii	P3	Y	Y	N
Verticordia endlicheriana var. *angustifolia*	P3	Y	Y	N
Andersonia sp. *Jamesii* (J. Liddelow 84)				Y – 13 individuals recorded just outside the application area. A 15m buffer to this population is maintained
Banksia seneciifolia	P4	Y	Y	N
Banksia serra	P4	Y	Y	N
Drosera fimbriata	P4	Y	Y	N
Gahnia sclerioide	P4	Y	Y	N
Gonocarpus pusillus	P4	Y	Y	N
Gonocarpus simplex	P4	Y	Y	N
Lysinema lasianthum	P4	Y	Y	N
Microtis pulchella	P4	Y	Y	N
Microtis quadrata	P4	Y	Y	N
Spyridium spadiceum	P4	Y	Y	N
Thysanotus isantherus	P4	Y	Y	Y – two individuals recorded outside of the application area, around 150 metres from the southern extent

B.4. Fauna records table

The below table shows conservation listed fauna with potential to occur within the application area based on the presence of suitable habitat.

Species name	Conservation status (state listing)	Did surveys identify? [Yes, No, N/A]	Suitable habitat present [Yes, No, N/A]	Are surveys adequate to identify [Yes, No, N/A]
Carnaby's cockatoo (*Calyptorhynchus latirostris*)	Endangered	Y	Y	Y
Baudin's cockatoo (*Calyptorhynchus baudinii)*	Endangered	Y	Y	Y
Forest red-tailed black cockatoo (*Calyptorhynchus banksii naso*)	Vulnerable	Y	Y	Y
Western ringtail possum (*Pseudocheirus occidentalis*)	Critically Endangered	Y	Y	Y
Quenda (*Isoodon obesulus* subsp. *fusciventer*)	Priority (P) 4	Y	Y	Y
South-western brush-tailed Phascogale (*Phascogale tapoatafa wambenger*)	Conservation Dependant	N	Y	Y
Masked owl (*Tyto novaehollandiae* subsp. *novaehollandiae*)	P3	N	Y	Y
Short-nosed snake (*Elapognathus minor*)	P2	N	Y	Y
Fork-tailed swift (*Apus pacificus*)	IA	N	Y	Y

Species name	Conservation status (state listing)	Did surveys identify? [Yes, No, N/A]	Suitable habitat present [Yes, No, N/A]	Are surveys adequate to identify [Yes, No, N/A]
Woollybush bee (*Hylaeus globuliferus*)	P3	N	Y	Y
Water-rat (*Hydromys chrysogaster*)	P4	N	Y	Y
Peregrine falcon (*Falco peregrinus*)	Other specially protected fauna	N	Y	Y

Appendix C. Assessment against the clearing principles

Assessment against the clearing principles	Variance level	Is further consideration required?
Environmental value: biodiversity values		
Principle (a): *"Native vegetation should not be cleared if it comprises a high level of biodiversity."* Assessment: The application area comprises a high level of biodiversity as it contains: • 6.76 hectares of significant foraging habitat and suitable roost habitat for black cockatoos, • 10 trees with 14 hollows of a suitable size for breeding by black cockatoos, • 11.92 hectares of significant habitat for WRP, including linkage values, and • One priority 3 listed flora species (*Synaphea incurva*).	At variance	Yes *Refer to Section 3.2.1, above.*
Principle (b): *"Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna."* Assessment: The application area comprises significant habitat for fauna, as it contains: • 6.76 hectares of significant foraging habitat and suitable roost habitat for black cockatoos, including, 5.54 ha of high quality foraging habitat, • 10 trees with 14 hollows of a suitable size for breeding by black cockatoos, • 11.92 hectares of significant habitat for WRP (0.87 hectares of core habitat and 11.05 hectares of supporting habitat), including linkage values, • 5.8 hectares of suitable habitat for south-western brush tailed phascogale, and • 15.67 hectares of suitable habitat for quenda.	At variance	Yes *Refer to Section 3.2.1, above.*
Principle (c): *"Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, threatened flora."* Assessment: There are no threatened flora species recorded in the application area.	Not likely to be at variance	Yes *Refer to Section 3.2.1, above.*

Assessment against the clearing principles	Variance level	Is further consideration required?
A likelihood of occurrence assessment for threatened flora known from the local area identified that six threatened species that may occur within the application area. The Flora Survey did not identify any threatened flora within the application area, or wider survey area (Southern Ecology, 2020a).		
Principle (d): *"Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a threatened ecological community."* Assessment: According to available datasets, and flora surveys of the application area, the vegetation within the application area is not representative of any known state listed threatened ecological communities (Southern Ecology, 2020a).	Not likely to be at variance	No
Environmental value: significant remnant vegetation and conservation areas		
Principle (e): *"Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared."* Assessment: The national objectives and targets for biodiversity conservation in Australia has a target to prevent clearance of ecological communities with an extent below 30 percent of that present pre-1750, below which species loss appears to accelerate exponentially at an ecosystem level (Commonwealth of Australia, 2001). The extent of the mapped vegetation types and native vegetation in the local area is greater than the national objectives and targets for biodiversity conservation in Australia.	Not likely to be at variance	No
Principle (h): "Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area." Assessment: The application area does not intersect or occur within any DBCA managed land. The closest DBCA managed land includes: • An un-named conservation reserve (R 23088) located around 520 m north, and • Gledhow Nature Reserve located approximately 500 m north. The proposed clearing is not likely to impact on these conservation areas.	Not likely to be at variance	No
Environmental value: land and water resources		
Principle (f): *"Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland."* Assessment: There are no wetlands or major watercourses mapped within the application area. The northern portion of the application area is intersected by a minor non-perennial watercourse and there are several non-natural drains that intersect various other portions of the application area. The Biological Survey identified three riparian vegetation types comprising 7.17 hectares within the application area, which largely occur along Lower	At variance	No

Assessment against the clearing principles	Variance level	Is further consideration required?
Denmark Road. These vegetation associations are reliant on surface or subsurface expression of groundwater and include the following (Southern Ecology, 2020a): • *Homalospermum firmum* / *Callistemon glaucus* Peat Thicket (1.22 hectares), • *Evandra aristata* sedgeland (0.64 hectares), and • *Taxandria juniperina* closed forest (5.32 hectares). The application area initially included 8.74 hectares of riparian vegetation; however this has been reduced to 7.17 hectares. Of the 7.17 hectares, 4.53 hectares is in a degraded or completely degraded (Keighery, 1994) condition, including 4.12 hectares of *Taxandria juniperina* closed forest in a degraded to completely degraded (Keighery, 1994) condition. These areas largely comprise linear strips adjacent to Lower Denmark Road. As discussed under Section 4, MRWA has committed to revegetating 3.56 hectares of cleared land parcels as an offset measure. These land parcels also include areas of native vegetation. One of these parcels comprises 1.78 hectares of *Homalospermum firmum* / *Callistemon glaucus* peat thicket, which will be secured in MRWA tenure, and is proposed for long term retention. The proposed clearing is unlikely to significantly impact on the extent of riparian vegetation in the local area noting the following: • MRWA has reduced the extent of riparian vegetation proposed for clearing, • MRWA has committed to retaining 1.78 hectares of riparian habitat within MRWA managed land, and • the majority of riparian habitat in the application area is in a degraded to completely degraded (Keighery, 1994) condition. There is a risk of weeds and dieback spreading into the riparian vegetation as a result of clearing, and as a condition of the clearing permit the applicant will be required to adhere to weed and dieback management measures to minimise this risk.		
Principle (g): *"Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation."* Assessment: The majority of the dominant landform unit mapped within the application area is susceptible to waterlogging, noting that greater than 70 per cent of this unit has a moderate to very high risk of waterlogging. Portions of the application area comprising sandy soils, including areas within the northern extent of the application area, also have a high risk of wind erosion. The above waterlogging and wind erosion risks are likely to be minimal as a direct result of clearing, should appropriate management measures occur immediately post clearing, such as minimising the exposure of bare soils, stabilising soils and providing appropriate infrastructure drainage. The applicant has advised that the following measures will be undertaken as part of the development (GHD, 2021): • water carts and/or surface stabilisation measures will be used to minimise dust, erosion and sedimentation generated from cleared areas,	Not likely to be at variance	No

Assessment against the clearing principles	Variance level	Is further consideration required?
• temporary drainage will be installed to capture and infiltrate surface runoff from road and bridge construction areas to prevent runoff from entering adjacent native vegetation, • site specific erosion and sediment controls will be established to prevent direct run off into adjacent water courses and wetlands, and • existing natural drainage lines within the construction area will be maintained at all times (i.e., water flows not blocked or adversely obstructed or restricted) and include erosion control and scour protection measures at crossings. As a condition of the clearing permit, the applicant will be required to ensure that road widening, and associated activities commence within three months of the authorised clearing being undertaken to reduce the risk of soil erosion by minimising the exposure time of soils prior to construction.		
Principle (i): *"Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water."* Assessment: Mapped groundwater salinity levels within the application area are marginal (500 to 1000 mg/TDS), and the proposed clearing is not likely to substantially increase groundwater levels or increase the risk of salinity surface expression impacting surface water. The northern portion of the application area is intersected by a minor non-perennial watercourse and there are several artificial drains and channels that intersect various other portions of the application area along Lower Denmark Road. The proposed clearing may increase the risk of sedimentation within these drains and channels. The Biological Survey also identified riparian habitat along Lower Denmark Road, and in several patches the riparian habitat extends beyond the clearing footprint (Southern Ecology, 2020a). It is not clear whether these areas hold standing water through the winter months, however, should they, the proposed clearing will increase the risk of sedimentation within these areas. The applicant has advised that the following measures will be undertaken as part of the development to reduce the risk of sedimentation (GHD, 2021): • water carts and/or surface stabilisation measures will be used to minimise dust, erosion and sedimentation generated from cleared areas, • temporary drainage will be installed to capture and infiltrate surface runoff from road and bridge construction areas to prevent runoff from entering adjacent native vegetation, • site specific erosion and sediment controls will be established to prevent direct run off into adjacent water courses and wetlands, • existing natural drainage lines within the construction area will be maintained at all times (i.e., water flows not blocked or adversely obstructed or restricted) and include erosion control and scour protection measures at crossings, and • timing of operations and construction will be conducted in dry soil conditions where possible (generally between November and April). Given the above measures, the proposed largely linear roadside clearing is unlikely to significantly impact on the quality of surface water through sedimentation or otherwise.	Not likely to be at variance	No

Assessment against the clearing principles	Variance level	Is further consideration required?
As a condition of the clearing permit, the applicant will be required to ensure that road widening, and associated activities commence within three months of the authorised clearing being undertaken to reduce the risk of soil erosion by minimising the exposure time of soils prior to construction.		
Principle (j): *"Native vegetation should not be cleared if the clearing of the vegetation is likely to cause, or exacerbate, the incidence or intensity of flooding."* Assessment: The applicant has committed to implementing surface water management measures, including culverts, drains and swales to maintain natural hydrological flows, based on the results of flood modelling undertaken for the project. Given the above, the linear roadside clearing of 15.67 hectares of native vegetation over a length of 7 km's is unlikely to exacerbate flooding.	Not likely to be at variance	No

Appendix D. Vegetation condition rating scale

Vegetation condition is a rating given to a defined area of vegetation to categorise and rank disturbance related to human activities. The rating refers to the degree of change in the vegetation structure, density and species present in relation to undisturbed vegetation of the same type. The degree of disturbance impacts upon the vegetation's ability to regenerate. Disturbance at a site can be a cumulative effect from a number of interacting disturbance types.

Considering its location, the scale below was used to measure the condition of the vegetation proposed to be cleared. This scale has been extracted from: Keighery, B.J. (1994) *Bushland Plant Survey: A Guide to Plant Community Survey for the Community*. Wildflower Society of WA (Inc). Nedlands, Western Australia.

Measuring vegetation condition for the South West and Interzone Botanical Province (Keighery, 1994)

Condition	Description
Pristine	Pristine or nearly so, no obvious signs of disturbance.
Excellent	Vegetation structure intact, with disturbance affecting individual species; weeds are non-aggressive species.
Very good	Vegetation structure altered, with obvious signs of disturbance. For example, disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and/or grazing.
Good	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. For example, disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and/or grazing.
Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. For example, disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and/or grazing.
Completely degraded	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees or shrubs.

Appendix E. Offset calculator value justification

Offset Calculation - WRP revegetation 1

Field Name	Description	Justification for value used
IUCN Criteria	The IUCN criteria for the value being impacted	**6.8** - afforded to Western Ringtail Possum habitat as this species is listed and Critically Endangered under the *Environmental Protection and Biodiversity Conservation Act 1999* .
Area of impact (habitat/community) or Quantum of impact (features/individuals)	The area of habitat/community impacted or number of features/individuals impacted	**11.92** - application area comprises 11.92 ha of significant WRP habitat.
Quality of impacted area (habitat/community)	The quality score for area of habitat/community being impacted - a measure of how well a particular site supports a particular threatened species or ecological community and contributes to its ongoing viability	**6** - the majority of the suitable habitat is in a good or degraded condition. Suitable WRP exists along the majority of the clearing footprint, and the application area includes core, supporting and linkage habitat.
Time over which loss is averted (habitat/community)	This describes the timeframe over which changes in the level of risk to the proposed offset site can be considered and quantified	**1** - The offset site would be protected in perpetuity. The *How to use the offsets assessment guide* (DSEWPaC, 2012), states that "longer timeframes are valued more highly than shorter timeframes." However in this instance a value of 1 represents a longer time period for the purpose of this calculation noting this relates to a critically endangered species. As such 1 has been selected to maximise the value of the offset assigned by this component of the calculation.
Time until ecological benefit (habitat/community) or Time horizon (features/individuals)	This describes the estimated time (in years) that it will take for the main benefit of the quality (habitat/community) or value (features/individuals) improvement of the proposed offset to be realised	**10** - it is expected that values of revegetation would be present after 10 years.
Start area (habitat/community) or Start value (features/individuals)	The area of habitat/community or number of features/individuals proposed to offset the impacts	**1.47** - area of proposed revegetation with suitable WRP habitat.
Start quality (habitat/community)	The quality score for the area of habitat/community proposed as an offset - a measure of how well a particular site supports a particular threatened species or ecological community and contributes to its ongoing viability	**1** - the areas proposed for revegetation are largely cleared and devoid of native vegetation.
Future quality without offset (habitat/community) or Future value without offset (features/individuals)	The predicted future quality score (habitat/community) or value (features/individuals) of the proposed offset site without the offset	**1** - it is assumed that the areas would retain the same value into the future without offset.
Future quality with offset (habitat/community) or Future value with offset (features/individuals)	The predicted future quality score (habitat/community) or value (features/individuals) of the proposed offset site with the offset	**6** - it is assumed that the revegetation site would provide similar WRP habitat values to the proposed clearing area once completed.
Risk of loss (%) without offset (habitat/community)	This describes the chance that the habitat/community on the proposed offset site will be completely lost (i.e. no longer hold any value for the protected matter of concern) over the foreseeable future without an offset	**20** - Assumed that the land is within MRWA vesting, and won't be subject to development, but is not in formally recognised conservation tenure (which would provide a risk of loss of 10%)
Risk of loss (%) with offset (habitat/community)	This describes the chance that the habitat/community on the proposed offset site will be completely lost (i.e. no longer hold any value for the protected matter of concern) over the foreseeable future with an offset	**10** - The offset proposal indicates that the revegetated land within Lot 1 on Diagram 60157 and Lot 54 on Deposited Plan 222501 will be entered into a conservation covenant, and so risk of loss is reduced.
Confidence in result (%) – risk of loss (habitat/community)	The capacity of measures to mitigate risk of loss of the proposed offset site	**100** - there is no change in this value predicted so this has been given an arbitrary value of 100.
Confidence in result (%) – Change in quality (habitat/community) or Change in value (features/individuals)	The level of certainty about the successful achievement of the proposed change in quality (habitat/community) or value (features/individuals)	**70** - there is a relatively high level of confidence that the site could be revegetated to a similar condition to the current application area, with consideration of some difficulties of successful revegetation.
% of impact offset	% of the significant residual impact that would be offset by the proposed offset (note: the offset calculations combined should equate to 100% for each residual impact)	**4.02**

Offset Calculation - WRP revegetation 2

Field Name	Description	Justification for value used
IUCN Criteria	The IUCN criteria for the value being impacted	**6.8** - afforded to Western Ringtail Possum habitat as this species is listed and Critically Endangered under the *Environmental Protection and Biodiversity Conservation Act 1999* .
Area of impact (habitat/community) or Quantum of impact (features/individuals)	The area of habitat/community impacted or number of features/individuals impacted	**11.92** - application area comprises 11.92 ha of significant WRP habitat.
Quality of impacted area (habitat/community)	The quality score for area of habitat/community being impacted - a measure of how well a particular site supports a particular threatened species or ecological community and contributes to its ongoing viability	**6** - the majority of the suitable habitat is in a good or degraded condition. Suitable WRP exists along the majority of the clearing footprint, and the application area includes core, supporting and linkage habitat.
Time over which loss is averted (habitat/community)	This describes the timeframe over which changes in the level of risk to the proposed offset site can be considered and quantified	**1** - The offset site would be protected in perpetuity. The *How to use the offsets assessment guide* (DSEWPaC, 2012), states that "longer timeframes are valued more highly than shorter timeframes." However in this instance a value of 1 represents a longer time period for the purpose of this calculation noting this relates to a critically endangered species. As such 1 has been selected to maximise the value of the offset assigned by this component of the calculation.
Time until ecological benefit (habitat/community) or Time horizon (features/individuals)	This describes the estimated time (in years) that it will take for the main benefit of the quality (habitat/community) or value (features/individuals) improvement of the proposed offset to be realised	**10** - it is expected that values of revegetation would be present after 10 years.
Start area (habitat/community) or Start value (features/individuals)	The area of habitat/community or number of features/individuals proposed to offset the impacts	**2.08** - area of proposed revegetation with suitable WRP habitat.
Start quality (habitat/community)	The quality score for the area of habitat/community proposed as an offset - a measure of how well a particular site supports a particular threatened species or ecological community and contributes to its ongoing viability	**1** - the areas proposed for revegetation are largely cleared and devoid of native vegetation.
Future quality without offset (habitat/community) or Future value without offset (features/individuals)	The predicted future quality score (habitat/community) or value (features/individuals) of the proposed offset site without the offset	**1** - it is assumed that the areas would retain the same value into the future without offset.
Future quality with offset (habitat/community) or Future value with offset (features/individuals)	The predicted future quality score (habitat/community) or value (features/individuals) of the proposed offset site with the offset	**6** - it is assumed that the revegetation site would provide similar WRP habitat values to the proposed clearing area once completed.
Risk of loss (%) without offset (habitat/community)	This describes the chance that the habitat/community on the proposed offset site will be completely lost (i.e. no longer hold any value for the protected matter of concern) over the foreseeable future without an offset	**20** - Assumed that the land is within MRWA vesting, and wont be subject to development, but is not in formally recognised conservation tenure (which would provide a risk of loss of 10%)
Risk of loss (%) with offset (habitat/community)	This describes the chance that the habitat/community on the proposed offset site will be completely lost (i.e. no longer hold any value for the protected matter of concern) over the foreseeable future with an offset	**20** - The offset proposal does not indicate that the land within Lot 6 on Diagram 60157 will be entered into conservation estate, or vested for the purpose of conservation, and so remains the same.
Confidence in result (%) – risk of loss (habitat/community)	The capacity of measures to mitigate risk of loss of the proposed offset site	**100** - there is no change in this value predicted so this has been given an arbitrary value of 100.
Confidence in result (%) – Change in quality (habitat/community) or Change in value (features/individuals)	The level of certainty about the successful achievement of the proposed change in quality (habitat/community) or value (features/individuals)	**70** - there is a relatively high level of confidence that the site could be revegetated to a similar condition to the current application area, with consideration of some difficulties of successful revegetation.
% of impact offset	% of the significant residual impact that would be offset by the proposed offset (note: the offset calculations combined should equate to 100% for each residual impact)	**4.22**

Offset Calculation - WRP monetary

Field Name	Description	Justification for value used
IUCN Criteria	The IUCN criteria for the value being impacted	**6.8** - afforded to Western Ringtail Possum habitat as this species is listed and Critically Endangered under the *Environmental Protection and Biodiversity Conservation Act 1999* .
Area of impact (habitat/community) or Quantum of impact (features/individuals)	The area of habitat/community impacted or number of features/individuals impacted	**11.92** - application area comprises 11.92 ha of significant WRP habitat.
Quality of impacted area (habitat/community)	The quality score for area of habitat/community being impacted - a measure of how well a particular site supports a particular threatened species or ecological community and contributes to its ongoing viability	**6** - the majority of the suitable habitat is in a good or degraded condition. Suitable WRP exists along the majority of the clearing footprint, and the application area includes core, supporting and linkage habitat.
Time over which loss is averted (habitat/community)	This describes the timeframe over which changes in the level of risk to the proposed offset site can be considered and quantified	**1** - The offset site would be protected in perpetuity. The *How to use the offsets assessment guide* (DSEWPaC, 2012), states that "longer timeframes are valued more highly than shorter timeframes." However in this instance a value of 1 represents a longer time period for the purpose of this calculation noting this relates to a critically endangered species. As such 1 has been selected to maximise the value of the offset assigned by this component of the calculation.
Time until ecological benefit (habitat/community) or Time horizon (features/individuals)	This describes the estimated time (in years) that it will take for the main benefit of the quality (habitat/community) or value (features/individuals) improvement of the proposed offset to be realised	**1** - it is expected that land acquisition for conservation could be made within 1 year.
Start area (habitat/community) or Start value (features/individuals)	The area of habitat/community or number of features/individuals proposed to offset the impacts	**65** - acquisition of 65 hectares of WRP habitat would be required to offset the residual impacts to this species taking into account revegetation.
Start quality (habitat/community)	The quality score for the area of habitat/community proposed as an offset - a measure of how well a particular site supports a particular threatened species or ecological community and contributes to its ongoing viability	**6** - it is assumed that the offset site would provide similar WRP habitat values to the proposed clearing area.
Future quality without offset (habitat/community) or Future value without offset (features/individuals)	The predicted future quality score (habitat/community) or value (features/individuals) of the proposed offset site without the offset	**6** - it is assumed that the offset vegetation will retain the same value into the future.
Future quality with offset (habitat/community) or Future value with offset (features/individuals)	The predicted future quality score (habitat/community) or value (features/individuals) of the proposed offset site with the offset	**6** - it is assumed that the offset vegetation is likely to remain the same without ongoing management measures committed to by the applicant.
Risk of loss (%) without offset (habitat/community)	This describes the chance that the habitat/community on the proposed offset site will be completely lost (i.e. no longer hold any value for the protected matter of concern) over the foreseeable future without an offset	**30** - Assumed that the land acquired would be zoned rural or similar, and not be subject to any existing planning approvals.
Risk of loss (%) with offset (habitat/community)	This describes the chance that the habitat/community on the proposed offset site will be completely lost (i.e. no longer hold any value for the protected matter of concern) over the foreseeable future with an offset	**10** - The future conservation (in perpetuity) of the site would result in a substantial increased security and substantially reduce the risk of loss.
Confidence in result (%) – risk of loss (habitat/community)	The capacity of measures to mitigate risk of loss of the proposed offset site	**90** - There is a high level of confidence that conservation (in perpetuity) would successfully mitigate the future risk of loss of the site.
Confidence in result (%) – Change in quality (habitat/community) or Change in value (features/individuals)	The level of certainty about the successful achievement of the proposed change in quality (habitat/community) or value (features/individuals)	**100** - there is no change in this value predicted so this has been given an arbitrary value of 100.
% of impact offset	% of the significant residual impact that would be offset by the proposed offset (note: the offset calculations combined should equate to 100% for each residual impact)	**91.9**

Offset Calculation - Black cockatoos revegetation 1

Field Name	Description	Justification for value used
IUCN Criteria	The IUCN criteria for the value being impacted	**1.2%** - Afforded to black cockatoo habitat as two of these species are listed as Endangered under the Wildlife Conservation Act 1950 and the *Environment Protection and Biodiversity Conservation Act 1999* . It is noted that forest red-tailed black cockatoo is listed as 'vulnerable' which is of lower conservation status, therefore setting this criteria as endangered also addresses the criteria for this species.
Area of impact (habitat/community) or Quantum of impact (features/individuals)	The area of habitat/community impacted or number of features/individuals impacted	**6.76** - application area comprises 6.76 ha of significant black cockatoo foraging habitat.
Quality of impacted area (habitat/community)	The quality score for area of habitat/community being impacted - a measure of how well a particular site supports a particular threatened species or ecological community and contributes to its ongoing viability	**6** - the majority of foraging habitat is in a good or degraded condition and comprises suitable foraging habitat, suitable breeding, and suitable roosting habitat, with evidence of foraging identified on site. There are no known breeding sites within a 12km radius.
Time over which loss is averted (habitat/community)	This describes the timeframe over which changes in the level of risk to the proposed offset site can be considered and quantified	**20** - The offset site will be within MRWA tenure and is not proposed for future development.
Time until ecological benefit (habitat/community) or Time horizon (features/individuals)	This describes the estimated time (in years) that it will take for the main benefit of the quality (habitat/community) or value (features/individuals) improvement of the proposed offset to be realised	**15** - it is expected that values of revegetation would be present for black cockatoo after 15 years.
Start area (habitat/community) or Start value (features/individuals)	The area of habitat/community or number of features/individuals proposed to offset the impacts	**1.47** - area of proposed revegetation with suitable black cockatoo habitat.
Start quality (habitat/community)	The quality score for the area of habitat/community proposed as an offset - a measure of how well a particular site supports a particular threatened species or ecological community and contributes to its ongoing viability	**1** - the areas proposed for revegetation are largely cleared and devoid of native vegetation.
Future quality without offset (habitat/community) or Future value without offset (features/individuals)	The predicted future quality score (habitat/community) or value (features/individuals) of the proposed offset site without the offset	**1** - it is assumed that the areas would retain the same value into the future without offset.
Future quality with offset (habitat/community) or Future value with offset (features/individuals)	The predicted future quality score (habitat/community) or value (features/individuals) of the proposed offset site with the offset	**6** - it is assumed that the revegetation site would provide similar black cockatoo habitat values to the proposed clearing area once completed.
Risk of loss (%) without offset (habitat/community)	This describes the chance that the habitat/community on the proposed offset site will be completely lost (i.e. no longer hold any value for the protected matter of concern) over the foreseeable future without an offset	**20** - Assumed that the land is within MRWA vesting, and wont be subject to development, but is not in formally recognised conservation tenure (which would provide a risk of loss of 10%)
Risk of loss (%) with offset (habitat/community)	This describes the chance that the habitat/community on the proposed offset site will be completely lost (i.e. no longer hold any value for the protected matter of concern) over the foreseeable future with an offset	**10** - The offset proposal indicates that the revegetated land within Lot 1 on Diagram 60157 and Lot 54 on Deposited Plan 222501 will be entered into a conservation covenant, and so risk of loss is reduced.
Confidence in result (%) – risk of loss (habitat/community)	The capacity of measures to mitigate risk of loss of the proposed offset site	**100** - there is no change in this value predicted so this has been given an arbitrary value of 100.
Confidence in result (%) – Change in quality (habitat/community) or Change in value (features/individuals)	The level of certainty about the successful achievement of the proposed change in quality (habitat/community) or value (features/individuals)	**70** - there is a relatively high level of confidence that the site could be revegetated to a similar condition to the current application area, with consideration of some difficulties of successful revegetation.
% of impact offset	% of the significant residual impact that would be offset by the proposed offset (note: the offset calculations combined should equate to 100% for each residual impact)	**10.2**

Offset Calculation - Black cockatoos revegetation 2

Field Name	Description	Justification for value used
IUCN Criteria	The IUCN criteria for the value being impacted	**1.2%** - Afforded to black cockatoo habitat as two of these species are listed as Endangered under the Wildlife Conservation Act 1950 and the *Environment Protection and Biodiversity Conservation Act 1999* . It is noted that forest red-tailed black cockatoo is listed as 'vulnerable' which is of lower conservation status, therefore setting this criteria as endangered also addresses the criteria for this species.
Area of impact (habitat/community) or Quantum of impact (features/individuals)	The area of habitat/community impacted or number of features/individuals impacted	**6.76** - application area comprises 6.76 ha of significant black cockatoo foraging habitat.
Quality of impacted area (habitat/community)	The quality score for area of habitat/community being impacted - a measure of how well a particular site supports a particular threatened species or ecological community and contributes to its ongoing viability	**6** - the majority of foraging habitat is in a good or degraded condition and comprises suitable foraging habitat, suitable breeding, and suitable roosting habitat, with evidence of foraging identified on site. There are no known breeding sites within a 12km radius.
Time over which loss is averted (habitat/community)	This describes the timeframe over which changes in the level of risk to the proposed offset site can be considered and quantified	**20** - The offset site will be within MRWA tenure and is not proposed for future development.
Time until ecological benefit (habitat/community) or Time horizon (features/individuals)	This describes the estimated time (in years) that it will take for the main benefit of the quality (habitat/community) or value (features/individuals) improvement of the proposed offset to be realised	**15** - it is expected that values of revegetation would be present for black cockatoo after 15 years.
Start area (habitat/community) or Start value (features/individuals)	The area of habitat/community or number of features/individuals proposed to offset the impacts	**2.08** - area of proposed revegetation with suitable black cockatoo habitat.
Start quality (habitat/community)	The quality score for the area of habitat/community proposed as an offset - a measure of how well a particular site supports a particular threatened species or ecological community and contributes to its ongoing viability	**1** - the areas proposed for revegetation are largely cleared and devoid of native vegetation.
Future quality without offset (habitat/community) or Future value without offset (features/individuals)	The predicted future quality score (habitat/community) or value (features/individuals) of the proposed offset site without the offset	**1** - it is assumed that the areas would retain the same value into the future without offset.
Future quality with offset (habitat/community) or Future value with offset (features/individuals)	The predicted future quality score (habitat/community) or value (features/individuals) of the proposed offset site with the offset	**6** - it is assumed that the revegetation site would provide similar black cockatoo habitat values to the proposed clearing area once completed.
Risk of loss (%) without offset (habitat/community)	This describes the chance that the habitat/community on the proposed offset site will be completely lost (i.e. no longer hold any value for the protected matter of concern) over the foreseeable future without an offset	**20** - Assumed that the land is within MRWA vesting, and wont be subject to development, but is not in formally recognised conservation tenure (which would provide a risk of loss of 10%)
Risk of loss (%) with offset (habitat/community)	This describes the chance that the habitat/community on the proposed offset site will be completely lost (i.e. no longer hold any value for the protected matter of concern) over the foreseeable future with an offset	**20** - The offset proposal does not indicate that the land within Lot 6 on Diagram 60157 will be entered into conservation estate, or vested for the purpose of conservation, and so remains the same.
Confidence in result (%) – risk of loss (habitat/community)	The capacity of measures to mitigate risk of loss of the proposed offset site	**100** - there is no change in this value predicted so this has been given an arbitrary value of 100.
Confidence in result (%) – Change in quality (habitat/community) or Change in value (features/individuals)	The level of certainty about the successful achievement of the proposed change in quality (habitat/community) or value (features/individuals)	**70** - there is a relatively high level of confidence that the site could be revegetated to a similar condition to the current application area, with consideration of some difficulties of successful revegetation.
% of impact offset	% of the significant residual impact that would be offset by the proposed offset (note: the offset calculations combined should equate to 100% for each residual impact)	**12.01**

Offset Calculation - Black cockatoo monetary

Field Name	Description	Justification for value used
IUCN Criteria	The IUCN criteria for the value being impacted	**1.2%** - Afforded to black cockatoo habitat as two of these species are listed as Endangered under the Wildlife Conservation Act 1950 and the *Environment Protection and Biodiversity Conservation Act 1999* . It is noted that forest red-tailed black cockatoo is listed as 'vulnerable' which is of lower conservation status, therefore setting this criteria as endangered also addresses the criteria for this species.
Area of impact (habitat/community) or Quantum of impact (features/individuals)	The area of habitat/community impacted or number of features/individuals impacted	**6.76** - application area comprises 6.76 ha of significant black cockatoo foraging habitat.
Quality of impacted area (habitat/community)	The quality score for area of habitat/community being impacted - a measure of how well a particular site supports a particular threatened species or ecological community and contributes to its ongoing viability	**6** - the majority of foraging habitat is in a good or degraded condition and comprises suitable foraging habitat, suitable breeding, and suitable roosting habitat, with evidence of foraging identified on site. There are no known breeding sites within a 12km radius.
Time over which loss is averted (habitat/community)	This describes the timeframe over which changes in the level of risk to the proposed offset site can be considered and quantified	**20** - The offset site will be conserved in perpetuity under a conservation covenant. 20 years is the maximum value associated with this field.
Time until ecological benefit (habitat/community) or Time horizon (features/individuals)	This describes the estimated time (in years) that it will take for the main benefit of the quality (habitat/community) or value (features/individuals) improvement of the proposed offset to be realised	**1** - it is expected that land acquisition for conservation could be made within 1 year.
Start area (habitat/community) or Start value (features/individuals)	The area of habitat/community or number of features/individuals proposed to offset the impacts	**29.6** - acquisition of 29.6 hectares of black cockatoo foraging habitat would be required to offset the residual impacts to this species taking into account revegetation.
Start quality (habitat/community)	The quality score for the area of habitat/community proposed as an offset - a measure of how well a particular site supports a particular threatened species or ecological community and contributes to its ongoing viability	**6** - it is assumed that the offset site would provide similar or better black cockatoo habitat values to the proposed clearing area.
Future quality without offset (habitat/community) or Future value without offset (features/individuals)	The predicted future quality score (habitat/community) or value (features/individuals) of the proposed offset site without the offset	**6** - it is assumed that the offset vegetation will retain the same value into the future.
Future quality with offset (habitat/community) or Future value with offset (features/individuals)	The predicted future quality score (habitat/community) or value (features/individuals) of the proposed offset site with the offset	**6** - it is assumed that the offset vegetation is likely to remain the same without ongoing management measures committed to by the applicant.
Risk of loss (%) without offset (habitat/community)	This describes the chance that the habitat/community on the proposed offset site will be completely lost (i.e. no longer hold any value for the protected matter of concern) over the foreseeable future without an offset	**30** - Assumed that the land acquired would be zoned rural or similar, and not be subject to any existing planning approvals.
Risk of loss (%) with offset (habitat/community)	This describes the chance that the habitat/community on the proposed offset site will be completely lost (i.e. no longer hold any value for the protected matter of concern) over the foreseeable future with an offset	**10** - The future conservation (in perpetuity) of the site would result in a substantial increased security and substantially reduce the risk of loss.
Confidence in result (%) – risk of loss (habitat/community)	The capacity of measures to mitigate risk of loss of the proposed offset site	**90** - There is a high level of confidence that conservation (in perpetuity) would successfully mitigate the future risk of loss of the site.
Confidence in result (%) – Change in quality (habitat/community) or Change in value (features/individuals)	The level of certainty about the successful achievement of the proposed change in quality (habitat/community) or value (features/individuals)	**100** - there is no change in this value predicted so this has been given an arbitrary value of 100.
% of impact offset	% of the significant residual impact that would be offset by the proposed offset (note: the offset calculations combined should equate to 100% for each residual impact)	**77.88**

Offset Calculation - south-western brush-tailed phascogale revegetation 1

Field Name	Description	Justification for value used
IUCN Criteria	The IUCN criteria for the value being impacted	**0.0** - afforded to south-western brush-tailed phascogale habitat as this species is listed and Conservation Dependant under the *Biodiversity Conservation Act 2016* .
Area of impact (habitat/community) or Quantum of impact (features/individuals)	The area of habitat/community impacted or number of features/individuals impacted	**5.8** - application area comprises 5.8 ha of south-western brush-tailed phascogale habitat.
Quality of impacted area (habitat/community)	The quality score for area of habitat/community being impacted - a measure of how well a particular site supports a particular threatened species or ecological community and contributes to its ongoing viability	**6** - the majority of the suitable habitat is in a good or degraded condition. Suitable south-western brush-tailed phascogale habita exists along the majority of the clearing footprint, and the application area includes suitable hollows for this species.
Time over which loss is averted (habitat/community)	This describes the timeframe over which changes in the level of risk to the proposed offset site can be considered and quantified	**20** - The offset site will be within MRWA tenure and is not proposed for future development.
Time until ecological benefit (habitat/community) or Time horizon (features/individuals)	This describes the estimated time (in years) that it will take for the main benefit of the quality (habitat/community) or value (features/individuals) improvement of the proposed offset to be realised	**15** - it is expected that values of revegetation would be present for this species after 15 years.
Start area (habitat/community) or Start value (features/individuals)	The area of habitat/community or number of features/individuals proposed to offset the impacts	**1.47** - area of proposed revegetation with suitable south-western brush-tailed phascogale habitat.
Start quality (habitat/community)	The quality score for the area of habitat/community proposed as an offset - a measure of how well a particular site supports a particular threatened species or ecological community and contributes to its ongoing viability	**1** - the areas proposed for revegetation are largely cleared and devoid of native vegetation.
Future quality without offset (habitat/community) or Future value without offset (features/individuals)	The predicted future quality score (habitat/community) or value (features/individuals) of the proposed offset site without the offset	**1** - it is assumed that the areas would retain the same value into the future without offset.
Future quality with offset (habitat/community) or Future value with offset (features/individuals)	The predicted future quality score (habitat/community) or value (features/individuals) of the proposed offset site with the offset	**6** - it is assumed that the revegetation site would provide similar south-western brush-tailed phascogale habitat values to the proposed clearing area once completed.
Risk of loss (%) without offset (habitat/community)	This describes the chance that the habitat/community on the proposed offset site will be completely lost (i.e. no longer hold any value for the protected matter of concern) over the foreseeable future without an offset	**20** - Assumed that the land is within MRWA vesting, and wont be subject to development, but is not in formally recognised conservation tenure (which would provide a risk of loss of 10%)
Risk of loss (%) with offset (habitat/community)	This describes the chance that the habitat/community on the proposed offset site will be completely lost (i.e. no longer hold any value for the protected matter of concern) over the foreseeable future with an offset	**10** - The offset proposal indicates that the revegetated land within Lot 1 on Diagram 60157 and Lot 54 on Deposited Plan 222501 will be entered into a conservation covenant, and so risk of loss is reduced.
Confidence in result (%) – risk of loss (habitat/community)	The capacity of measures to mitigate risk of loss of the proposed offset site	**100** - there is no change in this value predicted so this has been given an arbitrary value of 100.
Confidence in result (%) – Change in quality (habitat/community) or Change in value (features/individuals)	The level of certainty about the successful achievement of the proposed change in quality (habitat/community) or value (features/individuals)	**70** - there is a relatively high level of confidence that the site could be revegetated to a similar condition to the current application area, with consideration of some difficulties of successful revegetation.
% of impact offset	% of the significant residual impact that would be offset by the proposed offset (note: the offset calculations combined should equate to 100% for each residual impact)	**14.36**

Offset Calculation - south-western brush-tailed phascogale revegetation 2

Field Name	Description	Justification for value used
IUCN Criteria	The IUCN criteria for the value being impacted	**0.0** - afforded to south-western brush-tailed phascogale habitat as this species is listed and Conservation Dependant under the *Biodiversity Conservation Act 2016* .
Area of impact (habitat/community) or Quantum of impact (features/individuals)	The area of habitat/community impacted or number of features/individuals impacted	**5.8** - application area comprises 5.8 ha of south-western brush-tailed phascogale habitat.
Quality of impacted area (habitat/community)	The quality score for area of habitat/community being impacted - a measure of how well a particular site supports a particular threatened species or ecological community and contributes to its ongoing viability	**6** - the majority of the suitable habitat is in a good or degraded condition. Suitable south-western brush-tailed phascogale habita exists along the majority of the clearing footprint, and the application area includes suitable hollows for this species.
Time over which loss is averted (habitat/community)	This describes the timeframe over which changes in the level of risk to the proposed offset site can be considered and quantified	**20** - The offset site will be within MRWA tenure and is not proposed for future development.
Time until ecological benefit (habitat/community) or Time horizon (features/individuals)	This describes the estimated time (in years) that it will take for the main benefit of the quality (habitat/community) or value (features/individuals) improvement of the proposed offset to be realised	**15** - it is expected that values of revegetation would be present for this species after 15 years.
Start area (habitat/community) or Start value (features/individuals)	The area of habitat/community or number of features/individuals proposed to offset the impacts	**2.08** - area of proposed revegetation with suitable south-western brush-tailed phascogale habitat.
Start quality (habitat/community)	The quality score for the area of habitat/community proposed as an offset - a measure of how well a particular site supports a particular threatened species or ecological community and contributes to its ongoing viability	**1** - the areas proposed for revegetation are largely cleared and devoid of native vegetation.
Future quality without offset (habitat/community) or Future value without offset (features/individuals)	The predicted future quality score (habitat/community) or value (features/individuals) of the proposed offset site without the offset	**1** - it is assumed that the areas would retain the same value into the future without offset.
Future quality with offset (habitat/community) or Future value with offset (features/individuals)	The predicted future quality score (habitat/community) or value (features/individuals) of the proposed offset site with the offset	**6** - it is assumed that the revegetation site would provide similar south-western brush-tailed phascogale habitat values to the proposed clearing area once completed.
Risk of loss (%) without offset (habitat/community)	This describes the chance that the habitat/community on the proposed offset site will be completely lost (i.e. no longer hold any value for the protected matter of concern) over the foreseeable future without an offset	**20** - Assumed that the land is within MRWA vesting, and wont be subject to development, but is not in formally recognised conservation tenure (which would provide a risk of loss of 10%)
Risk of loss (%) with offset (habitat/community)	This describes the chance that the habitat/community on the proposed offset site will be completely lost (i.e. no longer hold any value for the protected matter of concern) over the foreseeable future with an offset	**20** - The offset proposal does not indicate that the land within Lot 6 on Diagram 60157 will be entered into conservation estate, or vested for the purpose of conservation, and so remains the same.
Confidence in result (%) – risk of loss (habitat/community)	The capacity of measures to mitigate risk of loss of the proposed offset site	**100** - there is no change in this value predicted so this has been given an arbitrary value of 100.
Confidence in result (%) – Change in quality (habitat/community) or Change in value (features/individuals)	The level of certainty about the successful achievement of the proposed change in quality (habitat/community) or value (features/individuals)	**70** - there is a relatively high level of confidence that the site could be revegetated to a similar condition to the current application area, with consideration of some difficulties of successful revegetation.
% of impact offset	% of the significant residual impact that would be offset by the proposed offset (note: the offset calculations combined should equate to 100% for each residual impact)	**16.74**

Offset Calculation - south-western brush-tailed phascogale monetary

Field Name	Description	Justification for value used
IUCN Criteria	The IUCN criteria for the value being impacted	**0.0** - afforded to south-western brush-tailed phascogale habitat as this species is listed and Conservation Dependant under the *Biodiversity Conservation Act 2016* .
Area of impact (habitat/community) or Quantum of impact (features/individuals)	The area of habitat/community impacted or number of features/individuals impacted	**5.8** - application area comprises 5.8 ha of south-western brush-tailed phascogale habitat.
Quality of impacted area (habitat/community)	The quality score for area of habitat/community being impacted - a measure of how well a particular site supports a particular threatened species or ecological community and contributes to its ongoing viability	**6** - the majority of the suitable habitat is in a good or degraded condition. Suitable south-western brush-tailed phascogale habita exists along the majority of the clearing footprint, and the application area includes suitable hollows for this species.
Time over which loss is averted (habitat/community)	This describes the timeframe over which changes in the level of risk to the proposed offset site can be considered and quantified	**20** - The offset site will be conserved in perpetuity under a conservation covenant. 20 years is the maximum value associated with this field.
Time until ecological benefit (habitat/community) or Time horizon (features/individuals)	This describes the estimated time (in years) that it will take for the main benefit of the quality (habitat/community) or value (features/individuals) improvement of the proposed offset to be realised	**1** - it is expected that land acquisition for conservation could be made within 1 year.
Start area (habitat/community) or Start value (features/individuals)	The area of habitat/community or number of features/individuals proposed to offset the impacts	**22.2** - acquisition of 22.2 hectares of south-western brush-tailed phascogale habitat would be required to offset the residual impacts to this species taking into account revegetation.
Start quality (habitat/community)	The quality score for the area of habitat/community proposed as an offset - a measure of how well a particular site supports a particular threatened species or ecological community and contributes to its ongoing viability	**6** - it is assumed that the offset site would provide similar south-western brush-tailed phascogale habitat values to the proposed clearing area.
Future quality without offset (habitat/community) or Future value without offset (features/individuals)	The predicted future quality score (habitat/community) or value (features/individuals) of the proposed offset site without the offset	**6** - it is assumed that the offset vegetation will retain the same value into the future.
Future quality with offset (habitat/community) or Future value with offset (features/individuals)	The predicted future quality score (habitat/community) or value (features/individuals) of the proposed offset site with the offset	**6** - it is assumed that the offset vegetation is likely to remain the same without ongoing management measures committed to by the applicant.
Risk of loss (%) without offset (habitat/community)	This describes the chance that the habitat/community on the proposed offset site will be completely lost (i.e. no longer hold any value for the protected matter of concern) over the foreseeable future without an offset	**30** - Assumed that the land acquired would be zoned rural or similar, and not be subject to any existing planning approvals.
Risk of loss (%) with offset (habitat/community)	This describes the chance that the habitat/community on the proposed offset site will be completely lost (i.e. no longer hold any value for the protected matter of concern) over the foreseeable future with an offset	**10** - The future conservation (in perpetuity) of the site would result in a substantial increased security and substantially reduce the risk of loss.
Confidence in result (%) – risk of loss (habitat/community)	The capacity of measures to mitigate risk of loss of the proposed offset site	**90** - There is a high level of confidence that conservation (in perpetuity) would successfully mitigate the future risk of loss of the site.
Confidence in result (%) – Change in quality (habitat/community) or Change in value (features/individuals)	The level of certainty about the successful achievement of the proposed change in quality (habitat/community) or value (features/individuals)	**100** - there is no change in this value predicted so this has been given an arbitrary value of 100.
% of impact offset	% of the significant residual impact that would be offset by the proposed offset (note: the offset calculations combined should equate to 100% for each residual impact)	**68.9**

Appendix F. Biological survey information excerpts

The application area has been subject to several biological surveys, which are further detailed below:

- Biological Survey, Albany Ring Road (Southern Ecology, 2020a),
- *Prasophyllum paulinae*, Targeted Regional Flora Survey (Southern Ecology, 2020b),
- Albany Ring Road Black Cockatoo Habitat Assessment (Biota, 2019), and
- Albany Ring Road, Western Ringtail Possum Assessment (Biota, 2020).

The findings of these surveys have been summarised and made specific to the application area in the supporting document produced by GHD (2021) '*Main Roads Western Australia, Albany Ring Road Stage 2 and 3B. Native Vegetation Clearing Permit Supporting Document'*.

Southern Ecology Biological Survey (Southern Ecology, 2020a)

The assessment was primarily conducted by a senior botanist and zoologist and involved the following:

- desktop assessment,
- conservation listed flora and fauna likelihood of occurrence assessment, and
- field assessment, including:
    - various field surveys for vegetation, flora and fauna undertaken over three years, including three spring seasons (October 2017 to October 2019),
    - the majority of the survey area was assessed in 2017 and 2018; some minor additional areas were included in 2019 due to potential changes in the project envelope,
    - some key areas (such as the known population of *Prasophyllum paulinae*) were surveyed over repetitive seasons,
    - surveys were conducted in accordance with the Environmental Protection Authority (EPA) *Technical Guidance - Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016a), *Technical Guidance - Sampling methods for Terrestrial Vertebrate Fauna Surveys* (EPA and DEC 2010) and *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) guidance for significant species (e.g., black cockatoos),
    - detailed flora and vegetation survey for the entire survey area,
    - targeted flora surveys (including a targeted regional survey),
    - level 1 fauna survey,
    - targeted fauna survey for WRP, and
    - targeted fauna survey for black cockatoos.

No significant survey limitations were identified.

***Prasophyllum paulinae*, Targeted Regional Flora Survey (Southern Ecology, 2020b)**

The assessment was primarily conducted by a senior botanist and involved the following:

- a desktop assessment of known populations of *P.paulinae* to inform survey timing and location, and
- a field survey, between 18 and 26 October 2019 which:
    - was undertaken in accordance with the EPA (2016) document, Technical Guidance Flora and Vegetation Surveys for Environmental Impact Assessment,
    - surveyed via a meandering traverse to identify habitat areas and other colonies of orchids (i.e., other Prasophyllum species),
    - included a more intensive overlay of meandering transects where suitable habitat occurred, and
    - was conducted in late October, which is considered appropriate for *P.paulinae*. Due to dry seasonal conditions a slight shift to early flowering may be expected. Survey timing was adjusted to account for possible early flowering.

The Survey notes that the taxonomy of *Prasophyllum* is complex, and that a former DBCA employee with expertise in Orchidaceae has been consulted with and provided guidance in relation to the taxonomy of the group. The Survey also notes that recent fire is considered an essential disturbance to detect this species, and the time since previous fire is < 6 years in all areas proposed.

Albany Ring Road Black Cockatoo Habitat Assessment (Biota, 2019)

The assessment was primarily conducted by experienced biologists and involved the following:

- a desktop assessment, and

- a field survey undertaken in two phases between 5-7 August and 15 August 2019, including:
    - assessment of all potential breeding trees within the application area through walking transects,
    - all trees with potential to form hollows were recorded,
    - habitat trees with potentially suitable breeding hollows were checked for breeding evidence with a drone, and
    - an assessment of foraging habitat.

Albany Ring Road, Western Ringtail Possum Assessment (Biota, 2020)

The survey was undertaken over 11 nights between 5 and 21 July by experienced zoologists and included the following:

- strip transects survey searches at no greater than 20m apart within areas of scattered trees and shrubs and narrow vegetation remnants, to yield greater than 90 per cent probability of detection,
- each transect was searched for WRP presence using a high-powered spotlight, and
- a distance sampling approach was used to estimate density and abundance of WRP within the nearby Dowd Nature Reserve to provide local context for WRP habitat assessment.

Appendix F. Sources of information

F.1. GIS databases

Publicly available GIS Databases used (sourced from www.data.wa.gov.au):

- 10 Metre Contours (DPIRD-073)
- Aboriginal Heritage Places (DPLH-001)
- Cadastre (LGATE-218)
- Cadastre Address (LGATE-002)
- Consanguineous Wetlands Suites (DBCA-020)
- DBCA – Lands of Interest (DBCA-012)
- DBCA Legislated Lands and Waters (DBCA-011)
- Directory of Important Wetlands in Australia – Western Australia (DBCA-045)
- Environmentally Sensitive Areas (DWER-046)
- Groundwater Salinity Statewide (DWER-026)
- Hydrography – Inland Waters – Waterlines
- Hydrological Zones of Western Australia (DPIRD-069)
- IBRA Vegetation Statistics
- Imagery
- Local Planning Scheme – Zones and Reserves (DPLH-071)
- Native Title (ILUA) (LGATE-067)
- Offsets Register – Offsets (DWER-078)
- Pre-European Vegetation Statistics
- Public Drinking Water Source Areas (DWER-033)
- Ramsar Sites (DBCA-010)
- Remnant Vegetation, All Areas
- Soil Landscape Mapping – Best Available
- Soil Landscape Mapping – Systems
- Soil Landscape Land Quality – Flood Risk (DPIRD-007)
- Soil Landscape Land Quality – Wind Erosion Risk (DPIRD-016)
- Soil Landscape Land Quality – Water Erosion Risk (DPIRD-013)
- Soil Landscape Land Quality – Waterlogging Risk (DPIRD-015)
- Soil Landscape Land Quality – Water Repellence Risk (DPIRD-014)
- Soil Landscape Land Quality – Subsurface Acidification Risk (DPIRD-011)
- Soil Landscape Land Quality – Phosphorus Export Risk (DPIRD-010)
- South Coast Significant Wetlands (DBCA-018)
- RIWI Act, Surface Water Areas and Irrigation Districts (DWER-037)
- RIWI Act, Groundwater Areas (DWER-034)

Restricted GIS Databases used:

- ICMS (Incident Complaints Management System) – Points and Polygons

- Threatened Flora (TPFL)
- Threatened Flora (WAHerb)
- Threatened Fauna
- Threatened Ecological Communities and Priority Ecological Communities

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