Government of **Western Australia**
Office of the **Appeals Convenor**
Environmental Protection Act 1986

Appeals Convenor's Report to the Minister for Environment

Appeals objecting to Report and Recommendations of EPA Report 1714 – Bunbury Outer Ring Road Southern Section

Appellants	170 individuals and groups (refer Attachment 1)
Proponent	Commissioner for Main Roads Western Australia
Authority	Environmental Protection Authority (EPA)
Appeal No.	045 of 2021
Date	April 2022

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Please contact us if you need the report in a different format.

Acknowledgement of Country

The Office of the Appeals Convenor acknowledges the traditional custodians throughout Western Australia and their continuing connection to the land, waters and community.

We pay our respects to all members of the Aboriginal communities and their cultures, and to Elders past, present and emerging.

Contents

1 Executive summary

1.1 Decision under appeal

The Commissioner of Main Roads Western Australia (the proponent) plans to construct the Bunbury Outer Ring Road (BORR) Southern Section (the proposal), about 200 kilometres (km) south of Perth in the South West region of Western Australia (Figure 1).

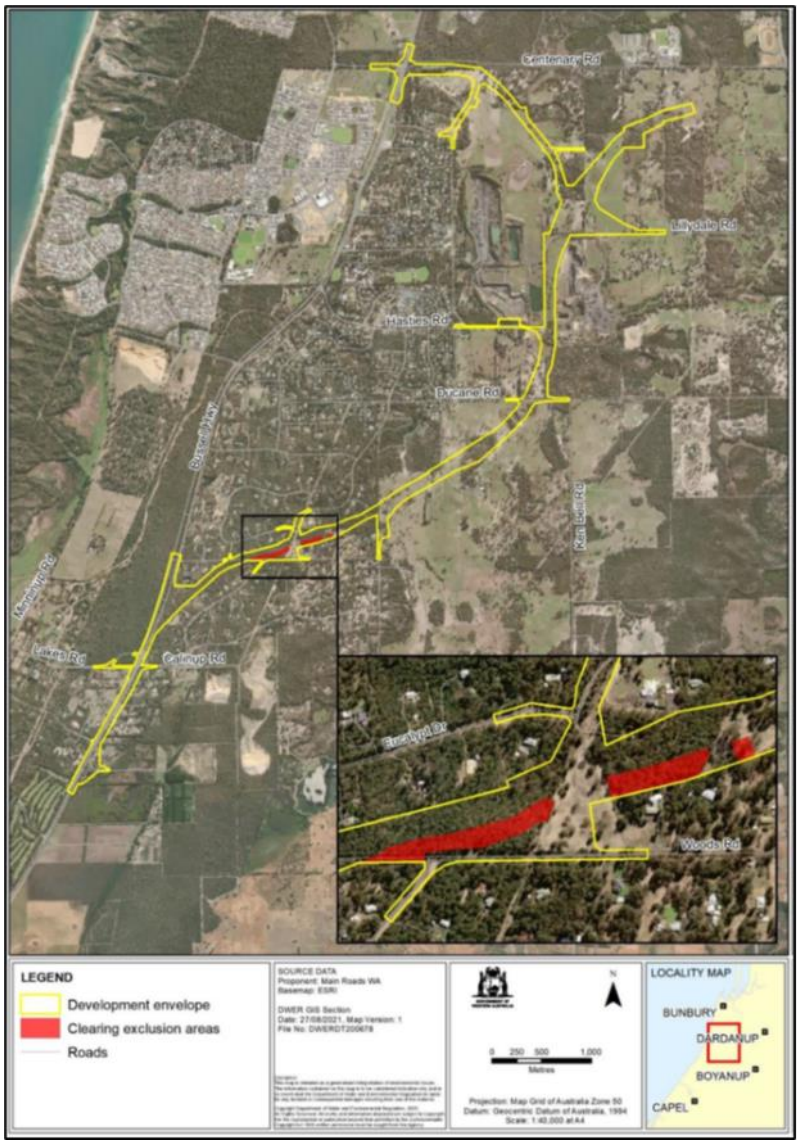

Figure 1 *Location and extent of the proposal (yellow outline)*[1]

The proposal was referred to the Environmental Protection Authority (EPA) in September 2019. Under the *Environmental Protection Act 1986* (EP Act), the EPA set the assessment level at 'Referral Information with Additional Information'.

The EPA identified four key environmental factors during its assessment: terrestrial fauna, flora and vegetation, inland waters, and social surroundings.

Having formed the view that reasonable conditions could be imposed on the proposal to ensure its implementation would be consistent with the EPA's objectives for the identified key

[1] Environmental Protection Authority (2021a), page 5, Figure 1

environmental factors, the EPA recommended that the proposal may be implemented subject to conditions.

On 19 October 2021 the EPA published Report 1714, setting out the assessment findings. These appeals are against the content of and recommendations in the EPA Report.

1.2 Grounds of appeal and appellant concerns

One hundred and seventy (170) appeals were lodged against the EPA's report and recommendations on the proposal (see Appendix 2 for a list of appellants).

The majority of the appellants were concerned about the alignment of the vegetated south-western portion of the development envelope between Jilley Road and Bussell Highway (herein referred to in this report as 'the Gelorup Corridor' – indicated in Figure 2).

Figure 2 *Location of the Gelorup Corridor indicated by red circle* [2]

[2] BORR IPT (2020d), Appendix A, Figure 2

Generally, appellants were of the view that the proposal alignment is environmentally unacceptable, and submitted that the EPA did not have proper regard for its own objectives and charter, the principles of the EP Act, recovery plans for threatened species, previous Government decisions and the planning regime, when assessing the proposal and recommending it may be implemented subject to conditions.

Appellants submitted that further information/evaluation on a number of environmental factors is needed to inform the assessment, and that the recommended conditions (in particular offsets) are inadequate to mitigate and counterbalance the residual impacts of the proposal.

Appellants' concerns are briefly summarised in Table 1 and Section 3, and are set out in detail in Section 3.12.

Table 1 *Grounds of appeal (summarised)*

Ground	Main concerns the appellant submitted
Alternative alignments	The current route through Gelorup is outdated and not fit-for-purpose; it was reserved for a two-lane road not a freeway-standard dual carriageway; it does not provide for future rail expansion. An alternative alignment has not been properly investigated; there are less environmentally impactful options.
Terrestrial and aquatic fauna	Impacts to western ringtail possums, three species of threatened black cockatoos, black-stripe minnow, south-western brush-tailed phascogale, south-western brown bandicoot, south-western snake-necked turtle, birds, insects, aquatic invertebrates, non-threatened fauna, and micro habitats. Inconsistency with principles of EP Act and threatened species recovery plans.
Flora and vegetation	Impacts to priority/threatened ecological communities, orchids, mycorrhizal network, 3,000 (or more) mature trees including 1,088 habitat trees, South West Regional Ecological Linkages, and priority/uncommon orchid species.
Inland waters and water quality	Impacts to hydrology, groundwater dependent ecosystems, significant wetlands/watercourses. Impacts from acid sulfate soils, hazardous materials, contaminated stormwater, soil erosion, soil compaction, soil quality/salinity, groundwater abstraction, groundwater contamination, and flooding. Failure to apply appropriate buffers. Need for modeling and geotechnical/other information.
Social surroundings and Aboriginal heritage	Impacts to lifestyle, landscape character, amenity values, noise pollution, light pollution, air pollution, drinking water, human health, Aboriginal heritage/cultural/spiritual values, 'world's largest' trees, public open space, local school. Impacts from division of community/loss of social connectivity, noise walls, road closures, and mental health. Lack of consultation on walk/cycle paths, bridges, and pedestrian underpasses.
Climate change and greenhouse gas emissions	Contribution to climate change, release of stored carbon, international conventions, scope 3 operational emissions/emissions from road use.
Holistic assessment	Failure to consider Gelorup Corridor portion of development envelope holistically as ecological entity, clearing footprint in context of importance to ecological function of local ecosystem, and cumulative impacts from multiple approvals (broader BORR and Bussell Highway duplication), disconnection of residential areas north and south of Gelorup, and environmental impacts associated with sourcing of raw materials for road construction.

Ground	Main concerns the appellant submitted
Other government processes	Recommendation inconsistent with other Government documents and decisions (including the EPA's own previous advice) in recommending the proposal for implementation.
Economic factors	Inappropriate consideration of economic factors (mining and farming) in alignment selection.
Adequacy of the recommended conditions	Insufficient mitigation measures in relation to residual impacts (monitoring and survey methodology, predator control, fauna crossings, management of weeds and dieback (*Phytophthora cinnamomi*), public availability of information and compliance reports, funds for scientific research, clearing protocols). Conditions should be informed by independent academic or other experts. Conditions required for non-threatened species and aquatic fauna, security fencing, and contingency measures. Offsets inadequate/ inappropriate. Offsets should be required for black-stripe minnows.

The appellants are seeking for the Minister to remit the proposal to the EPA for further assessment.

The appellants and the proponent also raised matters which are considered to be outside the scope of the EPA's report and recommendations and/or the appeal investigation. While these are considered to be beyond the scope of appeal, we have included a brief discussion of each in Section 3.12 of this report.

1.3 Key issues and conclusions

A key concern raised in the appeals is that the proposal would result in significant environmental and social impacts that cannot be adequately offset, and that it should be realigned to an alternative route east and south of Gelorup.

Given the nature of the appeals, the issue for determination is (in effect) whether the EPA's assessment was appropriate and justified based on the information available at the time of the assessment or any new information made available through the appeal investigation.

If defects or shortcomings in the EPA's assessment are identified, the question is whether this requires further assessment or reassessment through remittal to the EPA, or whether it can be remedied through varying the EPA's recommended conditions.

The Minister does not, on appeal, have authority to decide that the proposal should not be implemented.[3] Rather, this along with broader economic and social considerations are matters for the decision makers under section 45 of the EP Act.

In this context we note that the role of the EPA in assessing a referred proposal is advisory. The EPA is required to prepare an assessment report, which identifies key environmental factors and makes a recommendation as to whether or not the proposal referred to it may be implemented. In making its recommendation, the EPA is confined to the consideration of environmental factors relevant to the referred proposal and to the impact of the proposal on the environment.

Overall, on the information provided on appeal, it is clear that the implementation of this proposal will have a long term and ongoing impact on the local environment, particularly in Gelorup. However, for the reasons that follow, we conclude that it is not necessary for the

[3] *Conservation Council of Western Australia Inc v Hon Stephen Dawson* [2019] WASCA 102 per Buss P and Beech JA at [131].

proposal to be remitted to the EPA for reassessment. We consider that some changes are required to the EPA's recommended conditions to ensure that the identified significant residual impacts are fully counterbalance as well as a series of condition modification to provide confidence that the outcomes and objectives specified by the EPA for important environmental values are being met.

The report summarises the key appeal issues and our conclusions, with full details in Section 3. Section 2 sets out the background to the proposal and Section 3.12 sets out other matters raised by the appeals and Section 4 includes supporting information considered in the investigation.

Should the EPA have had regard for alternative alignments?

We find that the EPA has had regard for the proponent's investigation of alternative alignments, however has appropriately focussed its assessment on the proposal referred to it. For our full consideration, refer to Section 3.1.

Did the EPA have adequate regard for terrestrial and aquatic fauna?

This ground of appeal combines concerns raised in respect to the EPA's assessment of impacts to multiple species of fauna, including conservation-significant species western ringtail possum (critically endangered), three species of black cockatoos (endangered and vulnerable), black-stripe minnow (endangered), south-western brush-tailed phascogale (conservation dependent), as well as multiple non-threatened species.

We find that the implementation of the proposal will permanently remove around 61 hectares of western ringtail possum habitat and sever the links between existing vegetation that is important for the species and other threatened fauna. While the EPA has recommended conditions be applied to the proposal to require the proponent to monitor to confirm the population of the surrounding areas returns to pre-clearing levels in 10 to 15 years, it is accepted that up to 72 individuals will be lost from the Gelorup area due to the permanent loss of habitat.

The EPA recognised the uncertainty around the likelihood that the local population of western ringtail possums would fully recover to pre-clearing numbers in 10-15 years, and recommended monitoring and contingency offsets for the benefit of the regional population.

In general, we find the EPA's assessment of western ringtail possums to be acceptable, however have recommended a series of amendments to the conditions to improve transparency, clarify intent and provide confidence that the outcomes and objectives specified by the EPA for this important environmental value are being met

In relation to the identified significant residual impacts to about 61 ha of foraging and breeding habitat for three threatened species of black cockatoos we found that the proponent's offset for black cockatoos is insufficient to counterbalance the residual impacts. To address this we recommend that the minimum area to be revegetated as black cockatoo habitat within the Tuart National Park should be increased from 50 hectares to a minimum of 75.3 hectares.

In relation to other fauna values, including the black-stripe minnow, non-threatened fauna, impacts from light and noise, and other considerations we find that the EPA's assessment was generally appropriate

For our full consideration, refer to Section 3.2 and 3.11.

Did the EPA have adequate regard for flora and vegetation?

This ground of appeal combines concerns raised in respect to the EPA's assessment of impacts to multiple flora and vegetation values including cumulative impacts to State-listed priority / Commonwealth-listed threatened ecological communities, orchids, mycorrhizal networks and non-threatened flora.

The EPA's identification and assessment of the direct and indirect impacts from the proposal on flora and vegetation (subject to recommended conditions to address gaps in the information) is satisfactory, and had regard for the mitigation hierarchy, relevant Commonwealth conservation advice and other regulatory processes.

We note that the proposal will result in the removal of 23.4 ha of the Banksia Woodlands PEC, about half of which is in 'good' or better condition, and a combined total of 4.5 ha of the Tuart Woodlands PEC and Tuart-Peppermint Woodlands PEC, about a fifth of which is in 'good' or better condition. The EPA found the clearing of these PECs to be a significant residual impact and applied an offset.

We find that the offset should be increased to better reflect the values of the area to be cleared. In the case of the Banksia Woodlands PEC, this means the minimum extent of area to receive offset measures across the combined offset locations to be increased from 92 ha to 126.9 ha; while for the combined Tuart Woodlands PEC and Tuart-Peppermint Woodlands PEC, an additional 7.2 ha.

We otherwise find that the EPA's assessment of the other concerns raised in respect to this ground of appeal, including impacts to orchids, mycorrhizal networks, ecological linkages, was generally appropriate. For our full consideration, refer to Section 3.3.

Did the EPA have adequate regard for inland waters and water quality?

We note that the implementation of the proposal will impact on a total of 43.4 ha of geomorphic wetlands (including 0.2 ha 'conservation' category and 1.4 ha 'resource enhanced'), may impact on hydrological regimes and water quality in adjacent wetlands, and may have impacts associated with groundwater abstraction.

We find that the EPA's recommended condition 2 is reasonable, requiring the proponent to meet the objective that there are no project-attributable impacts to the hydrological regime and water quality of 'conservation' category and 'resource enhanced' wetlands, Five Mile Brook or black-stripe minnow habitat. Condition 2 also requires pre-disturbance monitoring of hydrological regimes and baseline conditions, and monitoring of these elements during and post-construction and includes relevant reporting requirements.

Overall we find that the EPA's assessment of this factor was acceptable and that no changes are required to the recommended conditions. For our full consideration, refer to Section 3.4.

Did the EPA have adequate regard for social surroundings?

The EPA recognised the likely impacts on social connectivity, visual amenity, light, noise and vibration, air quality, Aboriginal heritage and significant trees.

We find that generally the EPA's identification and assessment of the direct and indirect impacts from the proposal on social surroundings was adequate, and had regard for the mitigation hierarchy and other regulatory processes.

We find that the EPA was justified in concluding that the proposal (with additional mitigations) is consistent with its objective for social surroundings, noting that it recommended conditions

requiring the preparation of a Traffic Noise Management Plan and an Amenity Management Plan. For our full consideration, refer to Section 3.5.

Did the EPA have adequate regard for terrestrial environmental quality?

While the EPA did not identify terrestrial environmental quality to be a key environmental factor for this proposal, the EPA recognised the potential for impacts from acid sulfate soils, encountering contaminated sites, contamination from proposal activities, and land degradation following clearing. The EPA concluded that the potential impacts to terrestrial environmental quality can be managed through the proponent's mitigation measures and are therefore not significant.

We note that the proponent has committed to further site specific geotechnical and acid sulfate soil investigations following detailed design, and proposes to prepare a number of plans and procedures as part of a Construction Environmental Management Plan to address the management of hazardous materials, topsoil health, acid sulfate soils and dewatering activities.

On balance we find that the risks to terrestrial environmental quality can be adequately managed through the implementation of the proponent's proposed mitigation measures. For our full consideration, refer to Section 3.6.

Did the EPA have adequate regard for climate change and greenhouse gas emissions?

Some appellants considered that the EPA did not properly assess the impacts from greenhouse gas emissions associated with the proposal, or the effects of climate change.

While the EPA did not identify greenhouse gas emissions as a key environmental factor, it advised that it did considered them as part of the preliminary assessment following referral.

On the basis of the information provided by the proponent, total scope 1 greenhouse gas emissions for the proposal were identified as being 42,251 tonnes of carbon dioxide equivalent (tCO_2-e) over three years during construction and 666 tCO_2-e for operational maintenance. The proponent also modelled scope 3 emissions as being 91,638 tCO_2-e over three years during construction. In relation to scope 3 emissions from the use of the road by vehicles, the proponent determined that annual emissions in 2041 would be approximately 2,100 tCO_2-e.

In relation to climate change generally, while we accept the EPA's advice that it considered the specific threat climate change presents for fauna, flora and vegetation, and inland waters within the context of its assessment for these factors, we find that risks posed from the proposal from habitat fragmentation for a range of flora and fauna values is likely to be exacerbated by climate change and we consider that the interaction between these risks and cumulative impacts generally require acknowledgement.

It is widely recognised that natural ecosystems are undergoing change from exposure to multiple human disturbances[4]. It is recognised that multiple threats or disturbances (in this case climate change and fragmentation) can interact to result in cumulative impact through substantial changes at the species and remnant-level.[5]

Noting the above, while we agree that the GHG emissions of this proposal are not of a scale that would necessitate specific consideration by the EPA, they are emissions that will need to

[4] Hogdson et al (2019), page 1.
[5] Vitousek et al (1997)

be reflected in savings elsewhere in the economy to reflect the State's commitment to avoiding dangerous temperature rise. As we have advised for other recent proposals concerning cumulative contributions to GHG emissions, these are matters that are appropriately for consideration by key decision makers under section 45 of the EP Act.

Did the EPA have adequate regard for impacts holistically?

A number of appellants submitted that the EPA did not adequately consider the interrelated impacts of the proposal. For example, one appellant submitted that the EPA ought to have assessed the impacts associated with the extraction of basic raw materials required to facilitate construction.

We find that the EPA's report sets out how it considered the holistic impacts of the proposal across the four key environmental factors. The EPA's conclusion that the combined impacts of the proposal can be managed through the application of the proponent's mitigation measures, other statutory processes, and the recommended conditions, is reasonable and justified.

In relation to basic raw materials, we note that while quarries are not regulated under Part V of the Act in the manner described by the EPA, the requirement for decision making authorities to refer a significant proposal to the EPA (and for the EPA to call-in a proposal if it is not referred) provides assurance that areas of basic raw material extraction can be considered by the EPA, were significant. In addition, proposals involving the clearing of native vegetation for quarrying also generally require a clearing permit.

Based on the above, we find that the EPA's holistic assessment was appropriate in this case. For our full consideration, refer to Section 3.8.

Did the EPA have adequate regard for other government processes?

We consider that the EPA has had regard for its previous recommendations and advice as relevant to the proposal, and was justified in deciding to assess the proposal on its merits independent of previous decisions. For our full consideration, refer to Section 3.9.

Did the EPA inappropriately have regard for economic factors?

There are no references in Report 1714 to suggest that the EPA considered economic factors in its assessment of the proposal. On this basis, we conclude that the EPA did not inappropriately consider economic factors. For our full consideration, refer to Section 3.10.

Are the EPA's recommended conditions adequate?

The EPA's recommended conditions are generally appropriate and consistent with the EPA's assessment, relevant policy and guidance. However, to improve transparency and clarify the intent of the conditions we recommend a number of changes. Further, we have reviewed the proponent's calculations and consider that the offset requirements should be increased in order to adequately counterbalance the significant residual impacts. For our full consideration, refer Section 3.11.

1.4 Recommendation to the Minister

On balance we recommend that the appeals be allowed to the extent that the Minister varies the EPA's recommended conditions as follows:

- Changes to offset requirements, within conditions 9-2 (Table 1), 9-4(6) and 9-4(7), to provide additional offset requirements and improvements to revegetation / on-ground management criteria to ensure that the significant residual impacts to black cockatoo foraging and breeding habitat, Banksia Woodlands PEC, Tuart Woodlands PEC and Tuart-Peppermint Woodlands PEC are adequately counterbalanced, future quality of offset sites (as revised in Appendix 3) are met and offset sites adequately managed.
- A new requirement for the preparation and submission of an 'Environmental Performance Report' under condition 5 'Construction Fauna Management Plan' and condition 6 'Habitat Fragmentation Management Plan' in relation to western ringtail possum individuals and habitat. It is considered that these Environmental Performance Reports will provide for greater confidence and assurance that the proposed mitigation measures are adequate and effective in achieving the required outcomes and objectives.
- A new peer review requirement of the Habitat Fragmentation Management Plan and associated Environmental Performance Report, both required in condition 6. A peer review, to be carried out by an independent person or independent persons with suitable technical experience, will inform adaptive management and address scientific uncertainty in recovery of the local Gelorup population.
- A new requirement, within condition 4 'Terrestrial Fauna (Construction)', to strengthen mitigation measure for black cockatoo breeding habitat, through the installation, maintenance and monitoring of artificial nesting boxes for suitably sized hollow that cannot be avoided during construction.
- Changes to the extent of impacts permitted on conservation-significant ecological communities, within conditions 3-1(1) and 9-1(1), to clarify that the Tuart-Peppermint Woodlands PEC is nearly entirely overlapping with the Tuart Woodlands PEC and that only the clearing of 0.1 ha of Tuart-Peppermint Woodland is additional to that permitted for the Tuart Woodlands PEC.

Minor and consequential variations to conditions have also been suggested to improved clarity and consistency within the recommend conditions.

It is otherwise recommended that the appeals be dismissed.

The final decision on whether or not the proposal may be implemented, and the conditions which apply to any such implementation, is a matter for the Minister for Environment and key decision-making authorities to consider under section 45(3) of the *Environmental Protection Act 1986* (EP Act).

2 Background

2.1 The proposal

A proposal by the Commissioner of Main Roads Western Australia (the proponent) to extend the northern and central sections of the BORR (approved under Ministerial Statement 1155) 10.5 km southward to connect with the Bussell Highway was referred to the EPA by the proponent on 13 September 2019. The proposal has a 200 ha development envelope, and is located predominantly in the Shire of Capel with a small portion in the City of Bunbury.

The overall BORR project is being coordinated through the BORR Integrated Project Team (IPT), composed of Main Roads Western Australia, GHD Pty Ltd and BG&E Pty Ltd.

Key elements of the proposal (the BORR Southern Section) relevant to the appeals are set out in Table 2.

Table 2 *Key proposal elements*[6] *as relevant to the appeals*

Element	Maximum extent or range
10.5 km of freeway-standard dual carriageway, 3 km of rural distributor roads, bridges, drainage structures, noise walls, fauna crossings and other associated road infrastructure including fencing, landscaping, lighting and principal shared paths.	Clearing of no more than 71.5 ha of native vegetation within a 200 ha development envelope.

The referral documents were available for seven-day public comment from 20 to 26 September 2019. On 3 October 2019, the EPA decided to assess the proposal and set the level of assessment at 'referral information with additional information'. The additional information was available for eight-week public review from 19 October to 14 December 2020.

In April 2020, the proponent requested a change to the proposal during the assessment to amend the design, construction and alignment of the road, which reduced the size of the development envelope and the extent of clearing required. The EPA consented to these changes on 28 April 2020, having determined that they were unlikely to significantly increase any environmental impacts.

In April 2021, in response to the EPA's request to investigate further opportunities to avoid and minimise impacts to terrestrial fauna and social surroundings, the proponent presented additional measures for assessment, and requested a change to the proposal to incorporate these. The EPA consented to these changes on 1 September 2021.

The combined changes to the proposal during assessment are summarised in Section 4.

The proposal was also determined to be a controlled action under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) on 7 February 2020 (EPBC 2019/8543), but was not subject to accredited assessment under the EP Act. On 15 October 2021, the proponent requested a change to the proposal consistent with that submitted to the EPA. The Commonwealth Department of Agriculture, Water and the Environment accepted these changes on 10 November 2021. As at the date of this report, a final decision on the proposal by the Commonwealth is yet to be announced.

[6] Environmental Protection Authority (2021a), page 2 (Table 1)

The EPA recommended that the proposal may be implemented, provided the implementation of the proposal is carried out in accordance with the recommended conditions and procedures set out in Appendix A of EPA Report 1714.

2.1.1 Planning history

The concept for the BORR was originally developed by Main Roads WA in the 1970s in conjunction with the preparation of the Bunbury Region Plan. The BORR concept has been recognised in regional planning studies and forms a major component of the planned regional road network for the Greater Bunbury Region. The alignment of the Primary Regional Road reserve for the BORR links the Australind Bypass, north of Bunbury, to Bussell Highway, south of Bunbury, over a distance of approximately 19 km.[7]

The BORR Southern Section alignment underwent a number of reviews during the 1990s, prior to its inclusion in the Greater Bunbury Region Scheme (GBRS):

> The BORR corridor alignment was refined in 1995, based on work undertaken by Halpern, Glick and Maunsell (HGM) to prepare a BORR Concept Report (HGM, 1995). The purpose of that work was to develop an environmentally and socially acceptable concept alignment suitable for inclusion in the town planning scheme. The HGM assessment considered a number of alignment options, including the current GBRS alignment, and concluded that the current GBRS alignment was the most suitable alignment option of those considered.
>
> In 1997 Main Roads commissioned ERM Mitchell Mc Cotter (ERM Mitchell Mc Cotter, 1997), to undertake a further review of alternative alignments for the BORR Southern section through Gelorup as a result of the Gelorup community's appeals to the local Members of Parliament and direction from the Minister for Transport. The review investigated similar routes to the HGM report and one route proposed by the Gelorup community. A broad multi-criteria analysis (MCA) highlighted the advantage of the route currently identified in the GBRS over the other alternatives considered.[8]

In late 1995 the State Government announced the release of the Bunbury-Wellington Region Plan, to guide the development of the area over the next 20 years. At that time the population in the Greater Bunbury Region was forecast to 'almost double to 63,680' by 2011;[9] the Bureau of Statistics website indicates the population was 81,628 in 2011. The proponent advised that the population is forecast to reach 150,000 by 2041.[10]

In August 1996 the Western Australian Planning Commission (WAPC) gave notice to the EPA that it had resolved to prepare a Region Town Planning Scheme for the Greater Bunbury Region. Under the *Western Australian Planning Commission Act 1985*[11], the GBRS has the aim of providing greater certainty in the allocation of strategic land uses, conservation areas, and transport infrastructure in the Greater Bunbury Region.

In 2003, the EPA assessed the GBRS under section 48D of the EP Act.[12] The broader BORR alignment was considered as part of this. EPA Bulletin 1088 states that, the WAPC, in response to submissions about impacts from the BORR alignment, recommended that 'the current alignment be retained until all other alternative alignments have been investigated. Changes to the alignment of the road would be included as a future amendment to the GBRS'.

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[7] Environmental Protection Authority (2003)
[8] BORR IPT (2020d), page 11
[9] https://www.mediastatements.wa.gov.au/Pages/Court/1995/11/Release-of-Bunbury-Wellington-Region-plan.aspx
[10] Main Roads Western Australia (2019a)
[11] The *Western Australian Planning Commission Act 1985* was repealed by the *Planning and Development (Consequential and Transitional Provisions) Act 2005* on 09/04/06 (*Government Gazette* 21/03/06 page 1078).
[12] Environmental Protection Authority (2003)

The EPA's recommendations specific to the broader BORR alignment included:

> It is the EPA's opinion that subject to the Bunbury Outer Ring Road being realigned, designed and constructed to minimise impact on:
>
> 1) a wetland near the intersection with the Australind Bypass;
>
> 2) wetlands to the north of Lillydale Road; and
>
> 3) bushland at the intersection with Bussell Highway
>
> the alignment would be environmentally acceptable subject to Environmental and Noise/Vibration Management Plans, and Vegetation and Wetland Mitigation Strategies being prepared.[13]

The EPA's recommendations on the GBRS were subject to 47 appeals[14], with about 60% received from landowners affected by the EPA's recommendations or by environmental issues associated with the GBRS. The then-Minister for Environment's determination of the appeals resulted in environmental conditions and a revised alignment for gazettal.

The GBRS was effected in November 2007, and gazetted in January 2008. Since its gazettal, the GBRS has been subject to a number of amendments, including a portion of the alignment of the BORR Northern and Central Sections.

The current reservation for the broader BORR alignment is included in the City of Bunbury Local Planning Scheme No. 8 (October 2021), Shire of Dardanup Local Planning Scheme No. 3 (January 2021) and Shire of Capel Local Planning Scheme No. 7 (August 2020).

2.1.2 Previous referral

An earlier version of the BORR Southern Section (within the GBRS alignment) was referred to the EPA in 2012, which involved the construction of a 9 km dual carriageway (including service roads, bridges, drainage structures, noise walls, fauna/pedestrian underpass, fencing, landscaping and principal shared paths), and the clearing of 33 ha of native vegetation within a 95 ha development envelope.[15]

The EPA determined not to assess that earlier version of the proposal, however noted that it would 'have a significant local impact on flora, vegetation and fauna' and gave public advice which included a recommendation for an offset strategy.[16]

The proponent subsequently applied to the Department of Environment Regulation (now Department of Water and Environmental Regulation (DWER)) for a permit to clear 45.1 ha of native vegetation within the 2012 referral footprint (CPS 6877/1[17]), however withdrew the application in 2017 prior to a decision.

This earlier version of the BORR Southern Section was also determined to be a controlled action under the EPBC Act (2012/6652), however was withdrawn in 2017 prior to a decision.

The proponent advised that it has made a number of changes to the proposal since the 2012 referral, and that accordingly the EPA's assessment of the current proposal is valid and is not constrained by a prior decision.[18]

[13] Environmental Protection Authority (2003)
[14] Appeals 169-214 and 217 of 2003, https://www.appealsconvenor.wa.gov.au/Search-appeals
[15] GHD Pty Ltd (2012)
[16] Environmental Protection Authority (2013)
[17] https://ftp.dwer.wa.gov.au/permit/6877/
[18] Proponent response to Appeal 045/21 (15/12/21), page 42

The alignment of the current proposal generally follows that of the 2012 referral (i.e. largely contained within the GBRS alignment), but with a larger footprint including an additional connecting road and larger intersections. An overlay of the development envelopes for the current proposal and the 2012 referral is indicated in Figure 3.

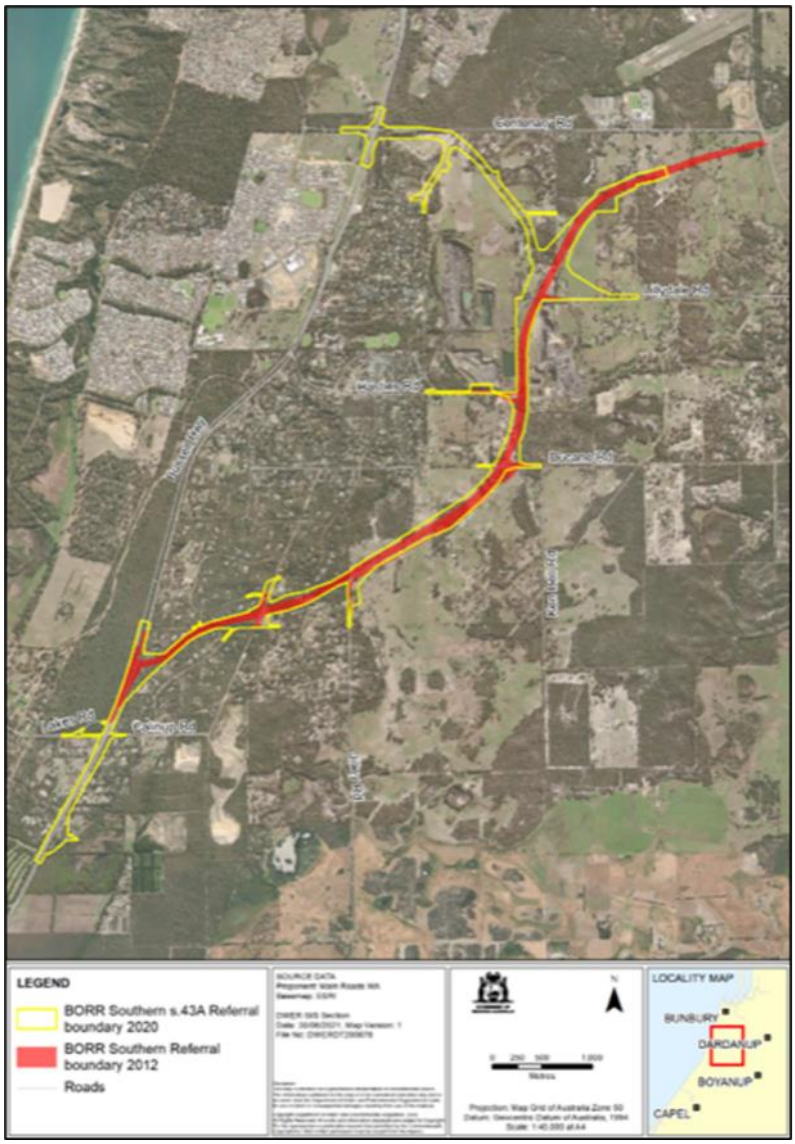

Figure 3 *Current proposal (yellow outline) and 2012 referral (red shading)*[19]

2.2 Issues for determination

Given the nature of the appeals as discussed above, the issue for determination in these appeals is (in effect) whether the EPA's assessment was appropriate and justified based on the information available at the time of the assessment or any new information made available through the appeal investigation.

If defects or shortcomings in the EPA's assessment are identified, the question is whether this requires further assessment or reassessment through remittal to the EPA, or whether it can be remedied through varying the EPA's recommended conditions.

[19] Environmental Protection Authority (2021b)

The Minister does not, on appeal, have authority to decide that the proposal should not be implemented.[20] Rather, this along with broader economic and social considerations are matters for the decision makers under section 45 of the EP Act.

It follows from the above that this report will consider:

- the nature of the environmental concerns raised by the appeals
- how each of the environmental concerns were assessed by the EPA
- whether the EPA's assessment and recommended conditions were adequate
- if shortcomings are identified, whether these are best remedied through either remitting the proposal to the EPA for reassessment (et cetera), or varying the EPA's recommended conditions.

The environmental concerns raised by appeals are:

- alternative alignments
- impacts to terrestrial and aquatic fauna
- impacts to flora and vegetation
- impacts to inland waters and water quality
- impacts to social surroundings and Aboriginal heritage
- impacts to terrestrial environmental quality
- impacts from climate change and greenhouse gas emissions
- cumulative impacts
- other government processes
- inappropriate consideration of economic factors
- adequacy of the recommended conditions (including offsets).

These issues will be considered in turn. For concerns raised in appeals that do not relate to environmental matters relevant to the proposal, these are be detailed separately in Section 3.12 as 'other matters'.

[20] *Conservation Council of Western Australia Inc v Hon Stephen Dawson* [2019] WASCA 102 per Buss P and Beech JA at [131].

3 Reasons for recommendation

3.1 Should the EPA have assessed alternative alignments?

The appellants submitted that the EPA ought to have found the referred proposal to be environmentally unacceptable on the basis that the proponent's referral documents included a review of an alternative alignment with less significant environmental impacts.

The appellants submitted that the GBRS alignment through Gelorup is out-dated, too narrow, was contemplated for a two-lane road rather than a freeway-standard dual carriageway, does not provide for future rail and other expansions, would result in substantially greater environmental and social impacts than the alternatives, and is not supported by the local government. Some appellants suggested upgrading existing roads instead, in particular Centenary Road north of Gelorup.

The EPA appropriately assessed the proposal referred to it

Our conclusion is that the EPA has had regard for the proponent's investigation of alternative alignments, however has appropriately focussed its assessment on the proposal referred to it. We explain our reasoning below.

The EPA advised that it is aware of the proponent's investigation of alternative alignments, however noted that it is required to assess proposals which are referred to it, in the location in which they are proposed. The EPA advised that the assessment of alternatives is outside of its scope (unless they were referred). The EPA noted that the proponent did not refer an alternative alignment for assessment, and advised that it therefore assessed the proposal referred, including consideration of the avoidance principle as it related to it.[21]

We note that the EPA's *Environmental Impacts Assessment Administrative Procedures 2016*[22] document (current at the time of the EPA's assessment; superseded 22 October 2021) is silent on the extent to which the EPA may have regard for alternatives, but does not state that the EPA must focus explicitly on the proposal as referred without consideration for less-impactful alternatives mentioned in the referral information.

As the consideration of an alternative alignment was a primary focus and outcome sought by nearly every appellant in this case, we set out the relevant background to the alignment selection for the Minister's consideration.

Since the 2012 referral, the conservation status of some environmental values has changed:

- in 2016 the 'Banksia woodlands on the Swan Coastal Plain' ecological community was listed as a threatened ecological community (TEC) under the EPBC Act
- in 2018 the conservation status of the western ringtail possum was elevated from 'Vulnerable' to 'Critically Endangered' at both State and Commonwealth levels
- in 2019 the 'Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain' ecological community was listed as TEC under the EPBC Act.

[21] EPA response to Appeal 045/21 (07/01/22), page 36
[22] *Government Gazette* No.223, 13 December 2016

Noting the change in the conservation status of the western ringtail possum, the proponent recognised that the BORR Southern Section within the GBRS alignment may need to be reconsidered.[23] To address this, in 2018 the proponent conducted an environmental options assessment of five options for the proposal, and selected two for further investigation.[24]

The five options considered for the south-western portion of the development envelope (the Gelorup Corridor, being the focus of the majority of the appeals), are indicated in Figure 4.

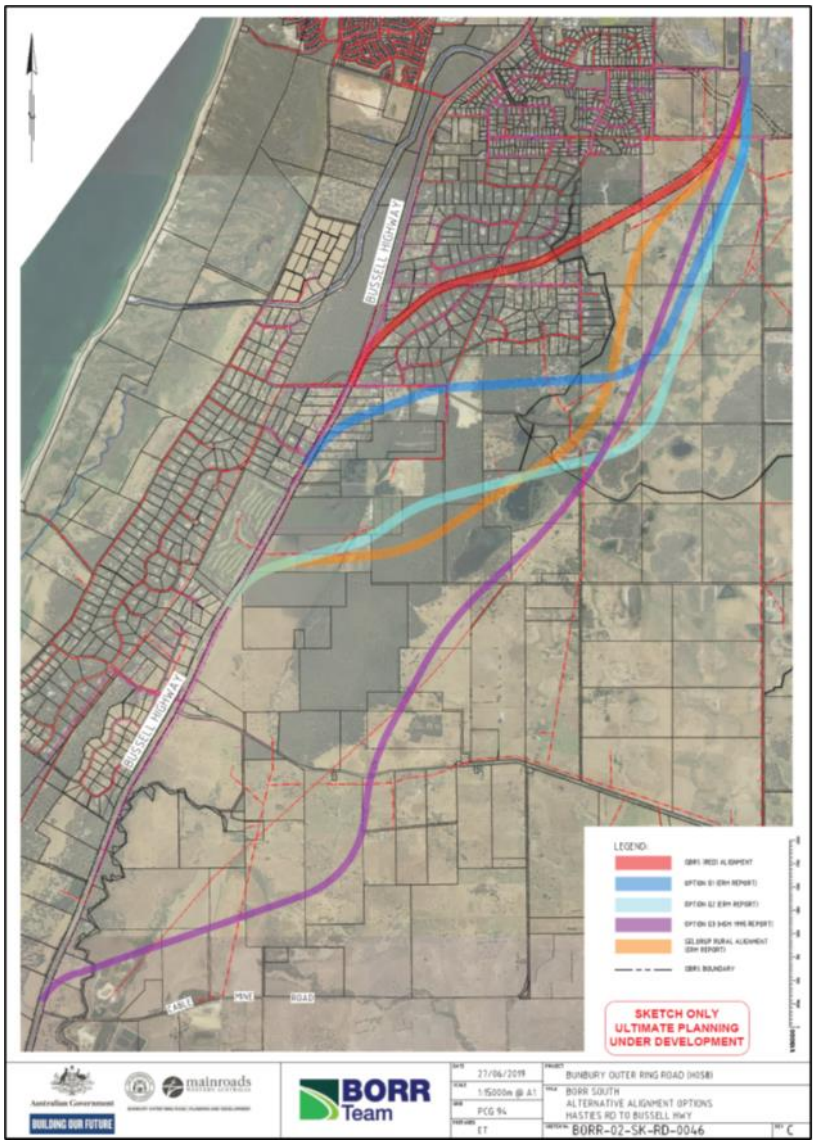

Figure 4 *Alignment options considered (south-western portion of development envelope): red 'GBRS alignment', dark blue 'Option G1 (ERM Report)', light blue 'Option G2 (ERM Report)', pink 'Option G3 (HGM 1995 Report)', orange 'Gelorup rural alignment (ERM Report)'*[25]

[23] BORR IPT (2020d), page 12-13
[24] BORR IPT (2019c)
[25] BORR IPT (2019a), Appendix C: Alignment Sketches

The proponent identified a broad alternative alignment corridor, notionally 750 metres (m) wide, based around the purple alignment in Figure 4. The proponent's *Alignment Selection Report* describes that a high-level multi-criteria assessment (MCA) was undertaken for a number of potential alignments within the alternative alignment corridor, and on the basis of the outcomes a preferred alternative alignment of 100 m wide was selected (Figure 5).[26]

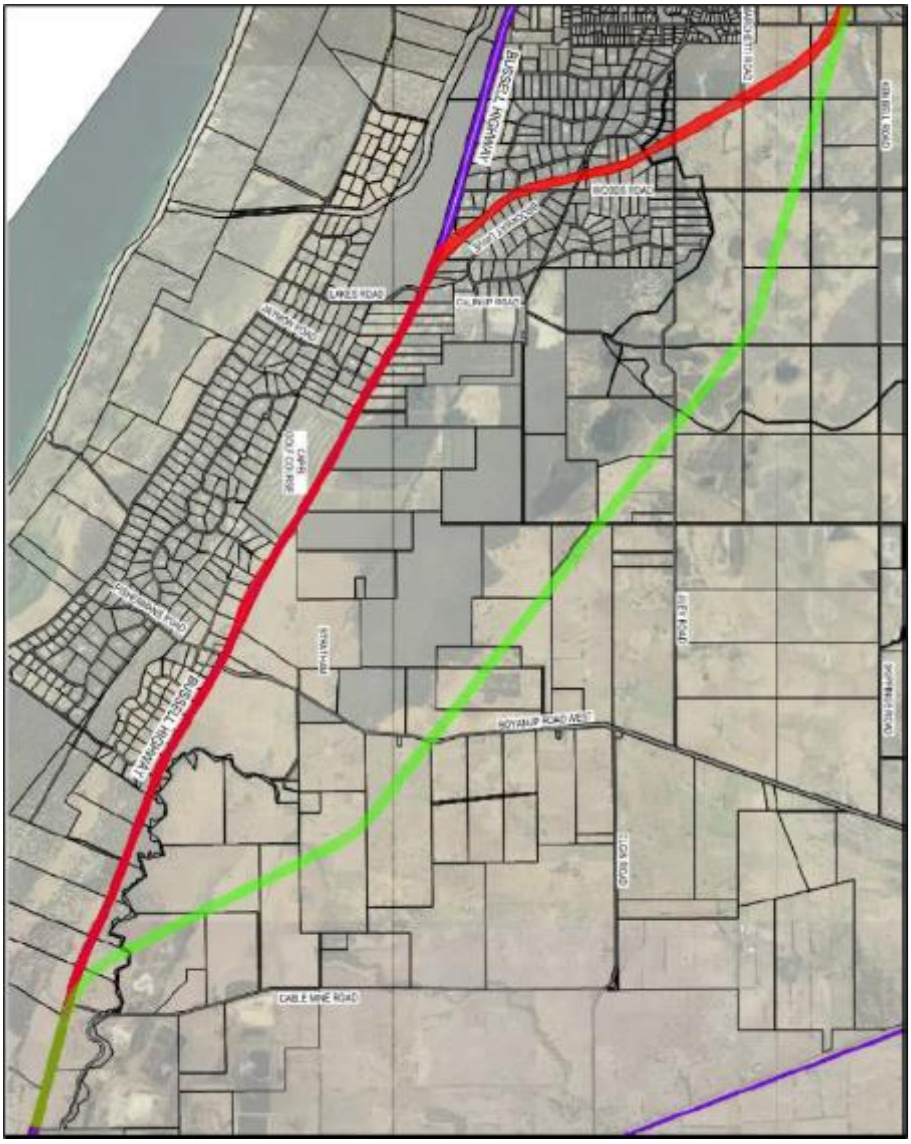

Figure 5 *Two alignments selected for multi-criteria analysis (south-western portion of development envelope): red 'GBRS alignment', light green 'alternative alignment'*[27]

The proponent's *Alignment Selection Report* concludes:

> Through an MCA process, the GBRS (Red) Alignment and Alternative (Green) Alignment were evaluated using Social, Engineering and Economic criteria. The assessment indicated that considering these criteria, the GBRS (Red) Alignment was more favourable.[28]

From the above, it appears that the MCA process for the preferred alternative alignment selection did not include environmental criteria, and that these were considered separately.

[26] BORR IPT (2019a), page 60
[27] BORR IPT (2019a), page 61
[28] BORR IPT (2019a), page 90

In relation to environmental considerations, the proponent's *Alignment Selection Report* states:

> Detailed environmental site surveys were completed in both the GBRS (Red) Alignment and Alternative (Green) Alignment and an Environmental Impact Assessment[29] prepared for each alignment …
>
> It was confirmed that both the GBRS (Red) Alignment and Alternative (Green) Alignment options have environmental impacts, although of a different scale and nature. The GBRS (Red) Alignment has a higher impact upon the Western Ringtail Possum and native vegetation, whereas the Alternative (Green) Alignment has a significantly higher impact upon wetlands and endangered aquatic fauna.[30]

A summary comparison of the environmental and social values/impacts (as relevant to the appeals) within the two alignments is set out in Table 3.

Table 3 *Summarised comparison of alignments (as relevant to the appeals)*

Consideration	GBRS alignment[31]	Alternative alignment[32]
Development envelope	200 ha	222 ha
Native vegetation to be cleared	71.5 ha (~9.65 ha riparian?)	~46 ha (~13 ha riparian)
Fauna		
Western ringtail possum habitat	60.9 ha (49-72 home ranges)	~38 ha (~15 individuals)
Black cockatoo habitat (foraging; breeding)	60.9 ha; 1,088 trees (11 hollows, 2 used)	~38 ha; 588 trees (2 used)
Black-stripe minnow habitat	5.5 ha	~0.3 ha
South-western brush-tailed phascogale habitat	39.2 ha	~26 ha
South-western brown bandicoot habitat	Not stated, assume 71.5 ha	~46 ha
South-western snake-necked turtle habitat	Not stated, assume 11 individuals[33]	Not stated
Flora and vegetation		
Banksia Woodlands TEC	23.4 ha	~4.5+6.9 ha
Tuart Woodlands TEC	4.4+0.1 ha	~0.4 ha
Caladenia speciosa (P4)	104 individuals	Not stated
Inland waters		

[29] Contained within BORR IPT (2019a) as Appendix G
[30] BORR IPT (2019a), page 90
[31] BORR IPT (2021b)
[32] BORR IPT (2019a), page 62-70
[33] BORR IPT (2020d)

Consideration	GBRS alignment[31]	Alternative alignment[32]
Geomorphic wetlands[34]	~43.4 ha (0.2 ha CCW, 1.4 ha REW, 41.8 ha MUW)	~75 ha (1 ha CCW, <1 ha REW, 73 ha MUW)
Rivers	Five Mile Brook	Five Mile Brook
Terrestrial environmental Quality[35]		
Acid sulfate soils	Low to moderate risk	Low to moderate risk
Contaminated sites	No impact anticipated	One 'restricted use' site
Air quality[36]		
Air quality	No significant impacts anticipated	No significant impacts
Social[37]		
State and Municipal heritage	No significant impacts anticipated	Municipal heritage register: Elgin Sports Club, Stratham School
Aboriginal heritage	Capel Bussell Highway (ID 5813), Paperbark Wetlands (ID 37869), Gelorup Corridor (ID 37870)	Buffered extents of Capel Bussell Highway (ID 5813) and Gelorup Corridor (ID 37870)
Noise and vibration	Semi-rural setting: Impacts not likely to be significant	Rural setting: Impacts not significant
Visual	Semi-rural setting: Direct and permanent impacts	Rural setting: Direct and permanent impacts
Amenity	Semi-rural setting: Changes in landscape	Rural setting: Loss of productive land, reduced carrying capacity, restricted access

During its assessment the EPA requested further information from the proponent on a number of elements of the proposal, including 'provide further detail of consideration given the alternative alignments' and 'provide justification for the chosen alignment for BORR southern, in accordance with the relevant EPA's objectives'.[38]

In response, the proponent outlined the planning history and alignment selection (as set out previously in this section). By virtue of its recommendations, the EPA considered the proponent's response demonstrated adequate consideration of alternatives and justification for the referred alignment.

[34] Being geomorphic wetlands of the Swan Coastal Plain: 'conservation category' wetlands (CCWs), 'resource enhancement' wetlands (REWs), and 'multiple use' wetlands (MUWs)
[35] BORR IPT (2019a), page 70
[36] BORR IPT (2019a), page 72
[37] BORR IPT (2019a), page 72-73
[38] Environmental Protection Authority (2019a)

In relation to staying within lands reserved for roads under the GBRS, we note that the referral supporting document states 'The alignment of the proposal will not be fully located within land currently reserved under the GBRS for Primary Regional Roads or Other Regional Roads', and that this will 'require an amendment to the GBRS to reserve the alignment for the purposes of Primary Regional Roads'.[39]

Further, the proponent's *Updated Referral Document* indicates that some (strategic) land would need to be acquired under section 28(1) of the *Land Administration Act 1997*, and that the Minister for Planning has declared a Planning Control Area for the BORR to ensure no development occurs on lands that may be needed for the road.[40]

We also note that some appellants raised that the alignment for the BORR Northern and Central Sections was modified to avoid an area of cleared land that is proposed for the Wanju housing development.

The proponent advised that the alternative alignment traverses long-established and profitable agricultural land that supports a range of farming systems and environmental values, and presented additional impacts on private landowners and impacts on key environmental factors. The proponent advised that as a government entity with responsibility for the sustainable use of public resources, it also accounted for socio-economic, planning and engineering requirements prior to referring the proposal. The proponent concluded that the alignment selection process confirmed that the GBRS alignment was the feasible option to progress given the cost, resource and land access benefits.[41]

From the above, the EPA has assessed the proposal referred, and has provided its report and recommendations to the Minister for Environment, which concluded that the proposal may be implemented subject to the EPA's recommended conditions. It is noted that the Minister will make a final decision as to whether or not the proposal may be implemented in consultation with relevant decision-making authorities under section 45(1) of the EP Act.

On this basis, we consider that the EPA has appropriately focussed its assessment of environmental impacts on the proposal referred to it.

In relation to future rail and other expansions, it is noted that these were not included in the referred proposal, nor was the matter addressed by the proponent or EPA in response to the appeals. In its response to previous appeals on the EPA's report for the BORR Northern and Central Sections, the proponent advised that 'planning associated with BORR has considered options for future rail including the planned Perth Bunbury Fast Rail Alignment'.[42]

3.2 Did the EPA have adequate regard for terrestrial and aquatic fauna?

The appellants are of the view that the EPA should find the proposal to be environmentally unacceptable on the basis that the proposal impacts on high biodiversity values within the Gelorup Corridor portion of the development envelope, including habitats for a diversity of native fauna.

[39] BORR IPT (2019b), page 3
[40] BORR IPT (2020d), page 6
[41] Proponent response to Appeal 045/21 (15/12/21), pages 8-9 and 11-12
[42] Proponent response to Appeal 033/20 (11 August 2020), page 8

Specifically, appellants raised concerns about the EPA's assessment of impacts to fauna, including the western ringtail possum[43], three threatened black cockatoo species[44], black-stripe minnow[45], south-western brush-tailed phascogale[46], south-western brown bandicoot[47], south-western snake-necked turtle[48], and non-threatened species, and were of the view that the EPA did not have proper regard for broader cumulative impacts or the principles of the EP Act when assessing the impacts of habitat loss.

The appellants submitted that the proposal is inconsistent with the recovery plans for threatened species known to occur in the development envelope, and would result in a decline in the local western ringtail possum population. The appellants also questioned the adequacy of the proponent's mitigation measures and the EPA's recommended conditions (including offsets) to address the impacts to fauna.

The EPA assessed impacts on terrestrial and aquatic fauna

Our conclusion is that the EPA has recognised the existing threats, pressures and cumulative impacts to the threatened fauna species impacted by the proposal that have resulted in their respective conservation statuses, and has also considered the impacts on non-threatened fauna in the context of impacts to habitats and habitat values on which they rely. We consider that the EPA's identification and assessment of the direct and indirect impacts from the proposal on fauna (subject to recommended conditions to address gaps in the information) is satisfactory, and has had regard for the mitigation hierarchy, relevant Recovery Plans and other regulatory processes.

However we note the uncertainty around the likelihood that the Gelorup population of western ringtail possums would fully recover to pre-clearing numbers in 10-15 years, and consider that a proportion of the displaced individuals may be unable to find alternative habitat, and that the proposal may result in a permanent net reduction in the number of western ringtail possums in the Gelorup area. The EPA has recognised this uncertainty in relation to the local population, and has recommended monitoring and contingency offsets for the benefit of the regional population.

We consider that the EPA's conclusion that the residual impacts can be managed through the proponent's mitigation measures and the recommended conditions (including offsets), as well as other statutory processes, to meet its objective for the environmental factor terrestrial fauna is reasonable and justified. We explain our reasoning below.

3.2.1 Western ringtail possum

In summary, the appellants submitted that:

- the EPA has ignored the precautionary principle, the principles of intergenerational equity and conservation of biological diversity and ecological integrity, and the western ringtail possum recovery plan[49] (WRP Recovery Plan)
- there is currently no standardised method informed by appropriately educated persons for determining abundance of western ringtail possums

[43] Western ringtail possum, ngwayir (*Pseudocheirus occidentalis*; Critically Endangered)
[44] Carnaby's cockatoo (*Calyptorhynchus (Zanda) latirostris*; Endangered), Baudin's cockatoo (*Calyptorhynchus (Zanda) baudinii*; Endangered), forest red-tailed black cockatoo (*Calyptorhynchus banksii* subsp. *naso*, Vulnerable)
[45] Black-stripe minnow (*Galaxiella nigrostriata*; Endangered)
[46] South-western brush-tailed phascogale, wambenger (*Phascogale tapoatafa* subsp. *wambenger*, Conservation Dependent)
[47] South-western brown bandicoot, quenda (*Isoodon fusciventer*, Priority 4)
[48] South-western snake-necked turtle (*Chelodina colliei*, IUCN Red List 'Near Threatened')
[49] Department of Parks and Wildlife (2017)

- no surveys have been conducted on adjacent properties to assess their suitability for relocation of western ringtail possums, nor of habitat and density of existing populations
- the clearing protocols are not practical because occupation safety and health protocols would prevent fauna spotters from being close enough to observe fleeing or injured animals, and trees should be observed to 72 hours including at night-time
- there is no scientific or other evidence that western ringtail possum individuals would survive the clearing, or subsequent relocation, or that the population would recover in 10-15 years, and given gaps in knowledge it is not possible to make definitive predictions
- there is no evidence that predator control in the month prior to clearing would enhance the survival of individuals that passively relocate into adjacent areas including private property, and there is no possibility of predator control on adjacent private property
- there is no evidence that the installation of artificial dreys in adjacent habitat would protect displaced possums
- fauna crossings installed for the BORR Northern and Central Sections have not been successful to date, and are unlikely to be successful for this proposal or protect western ringtail possums from road mortality and genetic isolation
- the proposed clearing is not consistent with the EPA's objective for terrestrial fauna given EPA's incorrect interpretation of secure habitat in the 'Bunbury' management sub-zone[50]
- fragmentation in the existing environment is not justification for further fragmentation
- Report 1714 states the loss of 60.9 ha habitat equates to 1% of suitable habitat, however the overall Bunbury habitat of 6,264.2 ha is 'medium' whereas the Gelorup Corridor portion of the development envelope is 'medium' to 'high'
- there has been no consultation by the proponent with, nor compensation offered to, FAWNA Inc. and local veterinarians who would be expected to take on displaced or injured wildlife as a result of the proposal
- some of the methods used by Barbara Jones for determining possum densities are dubious; Professor Roberta Bencini of the University of Western Australia (UWA) has been involved with the broader BORR in the beginning and should have been consulted.

3.2.1.1 State of knowledge

Population trends

The western ringtail possum was one of 20 mammals listed in the National *Threatened Species Strategy 2015-2020*[51] (and is one of 20 mammals listed in the current *Threatened Species Strategy 2021-2031*[52]). Under the *Threatened Species Strategy 2015-2020*, the Year 3 Scorecard for western ringtail possums[53] summarises population trends of the species to December 2018. These figures (and the sources from which they are derived) are set out in Table 4. The proposal is within the extent of the 'Southern Swan' sub-population, and a breakdown of estimated numbers for this area is also provided.

[50] The 'Bunbury' management zone described in: Shedley, E. and Williams, K. (2014); being a sub-zone of the DBCA broad 'Swan Coastal Plain' management zone described in: Department of Parks and Wildlife (2017).
[51] Department of the Environment (2015)
[52] Department of Agriculture, Water and the Environment (2021)
[53] National Environmental Science Program Threatened Species Research Hub (2019)

Table 4 *Estimated density and abundance of western ringtail possums*

Population parameters (wild; including translocations)	Published baseline[54,55,56]	2015 estimates[57]	2018 estimates[58,59]	Confidence in estimates
Extent of occurrence	40,400 km^2	40,000 km^2	n/a	Low
Area of occupancy	<500 km^2 (<50,000 ha)	<500 km^2 (<50,000 ha)	<500 km^2 (<50,000 ha)	Low
No. sub-populations	Three	Five (in DBCA broad mgt. zones)	Five (in DBCA broad mgt. zones)	High
No. locations	1	1	1	High
No. mature individuals	<8,000	3,400	<3,400	Low
No. individuals in 'Southern Swan' sub-population	2,000-5,000[60]	2,000	2,000	Medium-Low
Generation time	3	n/a	n/a	Medium

The Year Five Report for the *Threatened Species Strategy 2015-2020* found that for western ringtail possums there had been no significant change in trajectory from 2005-2020, and reported that 'ongoing decline appears less steep'.[61]

Threatening processes

The WRP Recovery Plan describes the threatening processes on western ringtail possums as complex, interactive and often population-specific, including: habitat loss and fragmentation; predation; climate change; timber harvesting; fire; competition for tree hollows; habitat tree decline; un-regulated relocation of orphaned, injured and rehabilitated individuals; disease; and gaps in knowledge.[62]

In addition to these, the Commonwealth conservation advice for western ringtail possums also describes threats to habitat from groundwater depletion and altered hydrology (which may affect habitat quality), increasing temperature, tree decline and insect outbreaks (for example gum leaf skeletoniser, *Phytophthora* sp. dieback, potentially myrtle rust affecting peppermints), and to individuals from domestic dogs and ravens (predation, injury).[63]

[54] Woinarski J.C.Z; Burbidge A.A. and Harrison P.L. (2014)
[55] IUCN guidelines used for records from 1993-2012
[56] Shedley, E. and Williams, K. (2014)
[57] Threatened Species Scientific Committee (2018c)
[58] Burbidge, A.A. and Zichy-Woinarski, J. (2017)
[59] Threatened Species Scientific Committee (2018c)
[60] Shedley, E. and Williams, K. (2014)
[61] Department of Agriculture, Water and the Environment (2020)
[62] Department of Parks and Wildlife (2017)
[63] Threatened Species Scientific Committee (2018c)

The *Strategy Action Plan 2021-2026*[64] under the *Threatened Species Strategy 2021-2031* lists 16 targets and outlines actions that will be the focus of national efforts and investments. Objective 1 of the *Strategy Action Plan 2021-2026* is 'By 2026, all priority species on track for improved trajectory by 2031'.

The report of a survey of western ringtail possums in the Greater Albany Area in 2008 states:

> Clearing of habitat for development will inevitably result in the death of animals, as a direct result of the clearing process or as a consequence of it. If no suitable habitat exists adjacent to the cleared site, the vulnerability of animals forced to come to the ground and traverse unsuitable [sic] means that animals will simply have nowhere to re-establish. Even if suitable habitat occurs adjacent to the cleared site, the territorial nature of Western Ringtail Possums and the amount of food resources limiting the number of animals that can be supported by a patch of vegetation means that any new animals entering the adjacent patch will likely be excluded or will starve.[65]

While this report relates to a different sub-population and management zone to those relevant to the proposal, we consider the views to be applicable to the species generally.

In a letter to the EPA dated 10 March 2021[66] DBCA advised that 'direct and indirect impacts of the proposal are likely to have a significant impact on the local Gelorup population, and potentially on the greater southern Swan Coastal Plain population, however, it is unlikely that the proposal on its own would result in the failure of the WRP Recovery Plan'.

Habitat loss

The Commonwealth EPBC Act Policy Statement 3.10 *Significant impact guidelines for the vulnerable western ringtail possum*[67] describes core habitat, primary corridors and supporting habitat for the species (Figure 6).

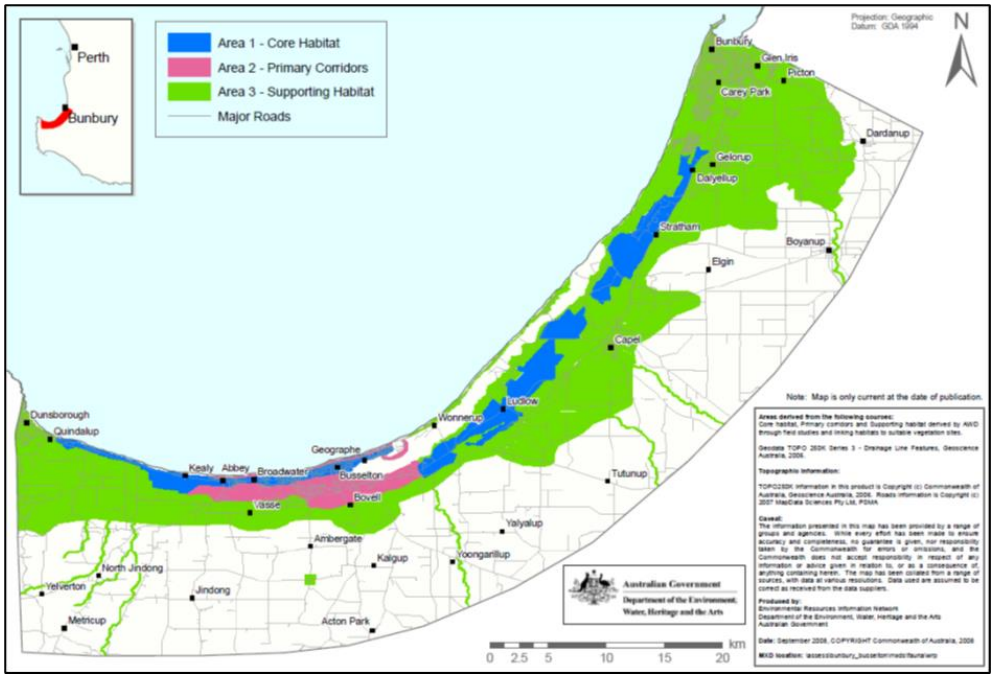

Figure 6 *Important areas for western ringtail possums on the Swan Coastal Plain: core (blue) and supporting (green) habitats, and primary corridors (pink)*[68]

[64] Department of Agriculture, Water and the Environment (2022)
[65] Gilfillan, S. (2008)
[66] Department of Biodiversity, Conservation and Attractions (2021c)
[67] Department of the Environment, Water, Heritage and the Arts (2009)
[68] Department of the Environment, Water, Heritage and the Arts (2009), Figure 1

The Gelorup Corridor is in close proximity to core habitat, and is mapped as supporting habitat. EPBC Act Policy Statement 3.10 describes the Australian Government's goal for supporting habitat as to 'improve habitat quality and connectivity on the plains and to the hinterland, thus increasing opportunities for foraging, breeding and dispersal'.

The WRP Recovery Plan states that habitat critical to the survival of western ringtail possums is thought to include 'high nutrient foliage availability for food, suitable structures for protection/nesting, and canopy continuity to avoid/escape predation and other threats', and that long-term species survival 'requires linkages between suitable habitat patches and as such habitat critical to survival incorporates this'. Critical vegetation communities include:

> [L]ong unburnt mature remnants of peppermint (*Agonis flexuosa*) woodlands with high canopy continuity and high foliage nutrients (high in nitrogen and low toxin levels); jarrah (*Eucalyptus marginata*)/marri (*Corymbia calophylla*) forests and woodlands with limited anthropogenic disturbance (unlogged or lightly logged, and a low intensity and low frequency fire history), that are intensively fox-baited and have low indices of fragmentation; coastal heath, jarrah/marri woodland and forest, peppermint woodlands, myrtaceous heaths and shrublands, Bullich (*Eucalyptus megacarpa*) dominated riparian zones and karri forest. Any habitat where western ringtail possums occur naturally are considered critical and worthy of protection.[69]

The proponent mapped a number of vegetation types within the development envelope, including the following: open forests (or scattered) jarrah (*Eucalyptus marginata*), marri (*Corymbia calophylla*) over slender banksia (*Banksia attenuata*) with/without peppermint (*Agonis flexuosa*); open forest of tuart (*Eucalyptus gomphocephala*) with occasional jarrah over peppermint and slender banksia; and open forest of slender banksia and peppermint (consistent with important habitat for western ringtail possums).[70]

A 2020 targeted fauna assessment[71] confirmed that marri/jarrah woodlands with varying banksia/peppermint understorey within the development envelope comprise suitable foraging and breeding habitat for western ringtail possums. This is reflected in Report 1714 (Figure 7).

[69] Department of Parks and Wildlife (2017)
[70] BORR IPT (2020d), page 54-58
[71] Biota Environmental Sciences Pty Ltd (2020a), page 109

Figure 7 *Western ringtail possum habitat (red shading) within the development envelope (yellow line)*[72]

An assessment of habitat suitability for western ringtail possums between Binningup and Dunsborough undertaken in 2014[73] (habitat suitability assessment) developed a spatial classification of habitat suitability describing five habitat classes across five management sub-zones (within the broad DBCA 'Swan Coastal Plain' management zone). The habitat suitability classes, along with expected western ringtail possum densities and associated habitat scores, are reproduced in Table 5.

[72] Environmental Protection Authority (2021a), Figure 3
[73] Shedley, E. and Williams, K. (2014)

Table 5 *Habitat suitability classes and expected densities of western ringtail possums*[74]

Habitat suitability class	Expected WRP density (no./ha)	Habitat quality score	Observed mean density (no./ha)	Observed density range	Predicted mean density (no./ha)
A – very high	>10	5	6.51	0.6-13.0	8.64
B – high	5-10	4	2.47	0.4-9.7	5.52
C – medium	2-5	3	1.31	0.1-4.3	0.11
D – low	0.5-2	2	1.01	0.3-2.0	-1.71
E – very low	<0.5	1	0.74	0.4-1.3	-4.54
U – unsuitable	-	-	-	-	-

The habitat suitability assessment includes a cautionary note that the habitat modelling and associated habitat suitability classes should be considered as a first approximation and not be relied on to predict potential carrying capacity.

Relevant to this proposal, the habitat suitability class and habitat importance for western ringtail possums within the development envelope, nearby/ linked reserves and some of the proposed offset sites is captured in Table 6.

Table 6 *Habitat suitability and importance for western ringtail possums*

Study site	Habitat suitability class[75]	Habitat importance[76]
Development envelope (Gelorup Corridor portion)	Consolidated habitat of C – medium; small portion of B – high	Supporting
Development envelope (north-east portion between South Western Highway and Jilley Road)	Scattered patches of C – medium; D – low	Supporting
Lots 153, 267, 268 Ducane Road, Gelorup (Lot 153 on Plan 232768, Lot 267 on Plan 232768, Lot 268 on Plan 144371; Offset 1)	C – medium; small portion of D – low	Supporting
Lot 1 Ducane Road, Gelorup (Lot 29 on Plan 419249; Offset 2)	C – medium; with B – high	Supporting
Lot 156 Marchetti Road, Gelorup (portion of former Lot 10 on Plan 419261; Offset 3)	C – medium; with B – high	Supporting
Lot 104 Willinge Drive, Davenport (Lot 104 on Plan 403618; Offset 4)	n/a	Supporting
Tuart Forest – Central ('North' block) (Lot 60 on Plan 91636 / Crown Reserve 40251; includes Offset 5: Site 12)	B – high	Core

[74] Shedley, E. and Williams, K. (2014)
[75] Dataset: Western Ringtail Possum Habitat Suitability (DBCA-049)
[76] Department of the Environment, Water, Heritage and the Arts (2009), Figure 1

Study site	Habitat suitability class[75]	Habitat importance[76]
Manea Park – Bunbury (155 ha Crown and unallocated Crown lands; opposite north-western end of development envelope)	C – medium	Supporting
Reserve 23000 Shire of Capel (146.1 ha Crown land; opposite south-western end of development envelope)	C – medium; small portion of B – high	Core

The proposal is within the 'Bunbury' management sub-zone identified in the habitat suitability assessment. Within this zone, 0.2 ha is mapped as 'very high' habitat suitability, 1,636.1 ha as 'high' and 4,627.9 ha as 'medium', across all land tenures. By way of context, the loss of 60.9 ha western ringtail possum habitat would reduce the extent of 'medium' or better habitat suitability within this zone to 6,203.3 ha, representing a ~1% reduction. This is reflected in Report 1714; the EPA concluded that this scale of habitat loss is not likely to be inconsistent with its environmental objective for terrestrial fauna.

In relation to the proportion of protected and non-protected habitat within the 'Bunbury' management sub-zone, the EPA advised:

> The EPA recognises that the habitat mapped by Shedley and Williams 2014 includes both protected and non-protected tenure. The EPA's assessment of impact relative to its remaining extent is irrespective of tenure. However, the EPA noted in its assessment large areas of habitat nearby the proposal are contained within conservation tenure and/or Regional Open Space and managed for conservation, for example the Kalgulup Regional Park and Reserve 23000.[77]

Western ringtail possum home ranges in the Busselton area vary from 0.5 ha in high quality habitat up to five ha in drier inland areas, with the size thought to reflect resource availability and potentially also social interactions and competition. The total area of habitat required to sustain a population will depend on the carrying capacity of the habitat patches; it is apparent that animals disperse when maximum carrying capacity is reached, possibly to avoid over-utilising resources.[78]

The proponent's *Response to Submissions* indicates that the majority (but not all) of the western ringtail possum home ranges impacted by the proposal extend beyond the development envelope, and states that the preliminary findings from a western ringtail possum movement study[79] (in preparation) indicate that the average home range size of females had a mean of 0.82 ha, and of males was up to 5.23 ha.[80]

The EPA recognised that the proposal would impact on 49 to 72 individual home ranges through partial or complete clearing, along with further displacement through fragmentation of the population in the Gelorup area. Report 1714 notes that the proponent expects between 10 to 20 of these home ranges to be wholly cleared for the proposal (thereby completely displacing up to 20 western ringtail possums), with the remainder being partially cleared.

In relation to cumulative impacts, Report 1714 acknowledges the cumulative impacts on western ringtail possum from the combination of this proposal, the BORR Northern and

[77] EPA response to Appeal 045/21 (07/01/22), pages 10-11
[78] Shedley, E. and Williams, K. (2014)
[79] Being undertaken for the proponent by Biota Environmental Sciences Pty Ltd
[80] BORR IPT (2021a)

Central Sections, and the Bussell Highway duplication as a combined total of 128.8 ha of habitat loss and 78-119 displaced individuals.[81]

Fragmentation (population and habitat)

A study published in 1996 considered the optimal level of connectivity between populations for conservation biology. The study concluded that 'one migrant per generation is a desirable minimum, but it may be inadequate for many natural populations' and suggested that 'a minimum of 1 and a maximum of 10 migrants per generation would be an appropriate general rule of thumb for genetic purposes, bearing in mind that factors other than genetics may further influence the ideal level of connectivity'.[82]

A review on the genetic effects of roads on wildlife populations, published in 2010, identified that roads exert various effects of conservation concern, including that they 'may rapidly cause genetic effects' as they 'restrict animal movement and increase the functional isolation of populations', and can often result in 'reduced population size and genetic drift'. The study notes however that roads rarely act as complete barriers, and indicates the importance of defragmentation measures such as over/under passes and wildlife bridges.[83]

In 2016 the results of a study were published on the effects of roads and other artificial linear structures on the movement of arboreal species (with a focus on western ringtail possums) in the Busselton area found positive genetic structure in continuous habitat over distances up to 600 m 'consistent with the sedentary nature of *P. occidentalis* and highlight their vulnerability to the effects of habitat fragmentation'. The study also found 'significant genetic divergences across an artificial waterway, suggesting that it was a barrier to gene flow', and that by contrast 'no genetic divergences were detected across the major road'.[84]

In relation to genetic diversity between sub-populations, the WRP Recovery Plan states:

> Wilson's (2009) microsatellite DNA analysis revealed three discrete populations existing with some as little as 30km apart. Populations in the southern forests showed slightly higher genetic variation than populations within the Swan Coastal Plain at Busselton and Gelorup (Wilson 2009). A recent study of a 200ha area near Busselton indicated that limited dispersal of western ringtail possums may result in population structuring at even finer-scales, and that genetic structuring was evident in continuous habitat over distances up to 600m (Yokochi 2015) but further work is needed to determine if similar patterns are found in other western ringtail populations.[85]

The proponent advised that western ringtail possums are widely dispersed in the Gelorup area and have been using the Bussell Highway median as a road crossing refuge, indicating that the majority of the east-west and north-south dispersal/ genetic flow options would be largely undisturbed by the proposal. The proponent advised that it has committed to installing 13 fauna crossings, and considered that these would assist in addressing anticipated minor and short-term genetic disjunction effects resulting from construction of the proposal.[86]

[81] Environmental Protection Authority (2021a), pages 19-20
[82] Mills, S.L. and Allendorf, F.W. (1996)
[83] Holderegger, R. and Di Giulio, M. (2010)
[84] Yokochi, K., Kennington, W.J. and Bencini, R. (2016)
[85] Department of Parks and Wildlife (2017), page 6
[86] Proponent response to Appeal 045/21 (15/12/21), pages 17-18

The EPA advised that the recommended conditions require the proponent to monitor the effects of fragmentation on the demographics and genetics of the local western ringtail possum population and the effectiveness of its mitigation measures towards meeting the *Habitat Fragmentation Management Plan* objectives/ outcomes.[87]

The EPA advised that it considered the potential impacts on western ringtail possums from habitat fragmentation, with regard for previous fragmentation by residential subdivision, and lack of security of tenure or management of remnant habitat on adjacent private lands:

> The EPA noted that although the [WRP] recovery plan states that any habitat where ringtail possums naturally occur is considered critical, the [WRP] recovery plan also noted that long-term survival of the species requires linkages between suitable habitat patches ... the EPA did not rely on existing fragmentation in the impact area to justify further fragmentation, but rather considered it as a part of evaluating the value and security of the existing habitat, and therefore whether it was appropriate to be offset or needed to be retained ...[88]

Predation

The EPA recommended conditions requiring the proponent to undertake predator control prior to, during and following clearing to reduce potential impacts to individual western ringtail possums. The EPA also recommended that predator control be required at the entry/ exit points of fauna crossings to maximise effectiveness and reduce impacts of fragmentation.

The proponent advised that it conducts feral animal (predator) control at its environmental offset sites and would implement the same for this proposal as agreed with DBCA. The proponent was of the view that the proposal is unlikely to result in increased predation due to its location in a semi-rural area. The proponent noted that the area has a low density of western ringtail possum (about one individual per ha), and considered that the majority of individuals would have portions of their home ranges available to relocate into during and following clearing. The proponent submitted that predation by domestic dogs and foxes is less likely for this proposal compared with an area that has a higher population density, and noted that the area has a high proportion (nearly 26%) of transient individuals indicating a persistence in the broader area despite the existing predation threats.[89]

The EPA acknowledged the constraints and challenges with predator control in urban areas, and noted that flexibility has been built into the recommended conditions to cater for this:

> [T]he condition does not require a specific method is used (either lethal or non-lethal), leaving flexibility for the proponent to implement the best available control method, which could still include lethal control in some locations where safe and appropriate. Upon advice of the DBCA, the EPA considered there to be sufficient methods and opportunities available to undertake predator control, and that control was necessary (despite potential limitations) to maximise the survival of displaced ringtail possums following loss of home-range when they are most vulnerable to predation. The condition also recommends that the proponent … consult with the DBCA during the development of its predator control program as part of its environmental management plan to ensure control methods, frequency and location are appropriate and designed to maximise results.[90]

[87] EPA response to Appeal 045/21 (07/01/22), page 9
[88] EPA response to Appeal 045/21 (07/01/22), pages 10-11
[89] Proponent response to Appeal 045/21 (15/12/21), pages 19-20
[90] EPA response to Appeal 045/21 (07/01/22), page 7

Competition for resources

In relation to competition with brushtail possums and for resources, the proponent advised:

> Brushtail Possums have home ranges that are larger, or much larger, than WRP home ranges which means that the Proposal's linear clearing area is too narrow to entirely include even a single Brushtail Possum home range. Thus … the density of Brushtails in the receiving habitat on either side of the proposed alignment will not increase as a result of clearing conducted for the Proposal ...
>
> For the Proposal, most displaced WRP will be associated with the Gelorup section. Field evidence suggests that overall, about 26% of the Gelorup habitat mosaic was suited for use by transient WRP and 74% was best suited to use by settled residents. This ratio suggests that in low (1 WRP/ha) density Bunbury mixed woodland habitat, some 20-30% of WRP habitat remains available for transients, including WRP displaced by a small enough low season clearing event.
>
> The Gelorup section receiving (i.e. retained adjacent) habitat is extensive, and has an abundance of connected WRP habitat that is immediately outside of the clearing area. Its suitability for transients and settled residents was confirmed in data collected during both the count sequence and tracking study. In most cases, shepherded or displaced WRP would be initially relocating to trees that are part of the retained connected Gelorup habitat that are less than 50 m from the edge of the clearing area, and generally less than 100-150 m from the closest part of their former home range.[91]

Relocation

Report 1714 defines 'passive relocation' to mean 'avoidance of physical capture and relocation where possible'. We understand that translocation (capture and release of animals to alternative habitat) is not supported for this proposal.

The EPA acknowledged appellants' concerns with regard to translocation:

> The EPA notes that translocation presents the potential for poor outcomes for ringtail possums as noted in the studies quoted by appellants [and] in the ringtail possum recovery plan. The EPA therefore assessed the proponent's approach to avoid translocation in favour of passive relocation. The ringtail possum recovery plan identifies that "improved relocation methods are required and need to be demonstrably effective before relocations are considered an effective offset" (p.44), and therefore the EPA did not rely on passive relocation being successful. Rather the EPA assessed that there was likely to be an irreversible impact to individuals due to the habitat loss … [h]owever also considered that the predicted number of individuals to be impacted from displacement represents a relatively small proportion of the ringtail possum population within 5 km.[92]

The proponent advised that control release areas do not form part of the clearing protocols, and that it has no plans to translocate animals away from their existing habitat. The proponent advised that artificial shelters (with water) would be added to the nearby receiving habitat to provide additional resources for individuals with a reduced home range, and would be removed after the winter rain has started in the following year. The proponent expects the post-clearing monitoring program would provide insight into the use of these resources.[93]

Gaps in knowledge

As a contribution to addressing gaps in knowledge about population size, the proponent commissioned a regional 'distance sampling' survey at 43 sites within the DBCA broad management zones (including within the 'Southern Swan' sub-population) to estimate density and abundance of the species across these areas[94] (distance sampling survey).

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[91] Proponent response to Appeal 045/21 (15/12/21), pages 22-23
[92] EPA response to Appeal 045/21 (07/01/22), pages 6-7
[93] Proponent response to Appeal 045/21 (15/12/21), page 20
[94] Biota Environmental Sciences Pty Ltd (2020b)

The proponent's funding of the distance sampling survey contributed a 10% indirect offset for the BORR Northern and Central Sections proposal's impacts on western ringtail possums:

> The survey methodology included line survey distance sampling as agreed with the West Australian Western Ringtail Possum Recovery Team. The purpose of the survey was to develop a robust abundance estimate of the survey sites, and a consistent approach to estimating WRP abundance. The survey was aimed to significantly improve understanding of the conservation status of this species and redress the knowledge gap identified as a key threatening process in line with recommendations of the WRP Recovery Plan ...[95]

The WA Western Ringtail Possum Recovery Team includes representatives from community and natural resource management groups, veterinary representatives, utility organisations, tertiary institutions and State Government departments. Its purpose is to facilitate and oversee the implementation of the WRP Recovery Plan recovery actions. Its current focus is on ensuring consistency in monitoring and survey methodologies, identifying and targeting research gaps, supporting on-ground conversation action, ensuring best-practice wildlife rehabilitation, and understanding conservation status and trends across the species range.[96]

The extent of the distance sampling survey is indicated in Figure 8, and the location of study sites within the Swan Coastal Plain southern section is indicated in Figure 9.

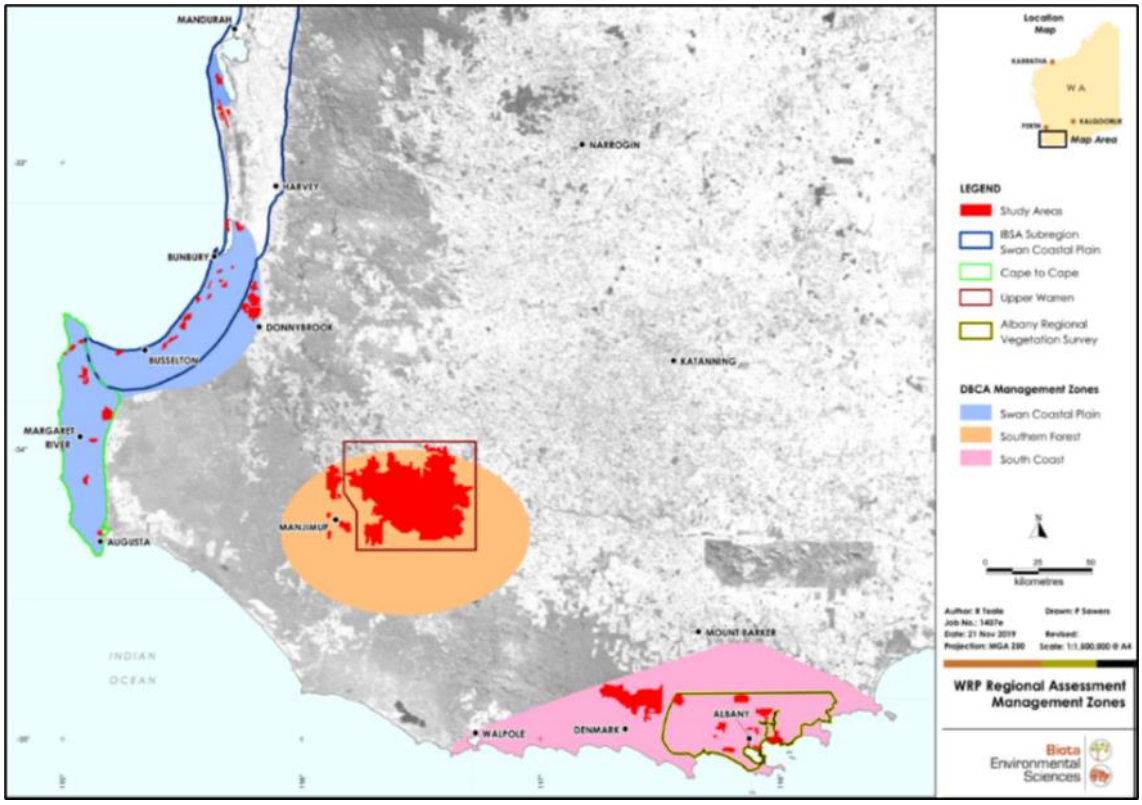

Figure 8 *DBCA broad management zones: Swan Coastal Plain (blue), Southern Forest (orange), South Coast (pink); distance sampling survey study areas (red)* [97]

[95] BORR IPT (2020g), page 40
[96] DBCA: https://www.dpaw.wa.gov.au/plants-and-animals/threatened-species-and-communities/threatened-animals/western-ringtail-possums?showall=&start=1&msclkid=9ae1eeebba2411ecae674efd68b7e713
[97] Biota Environmental Sciences Pty Ltd (2020b), Figure 3.1

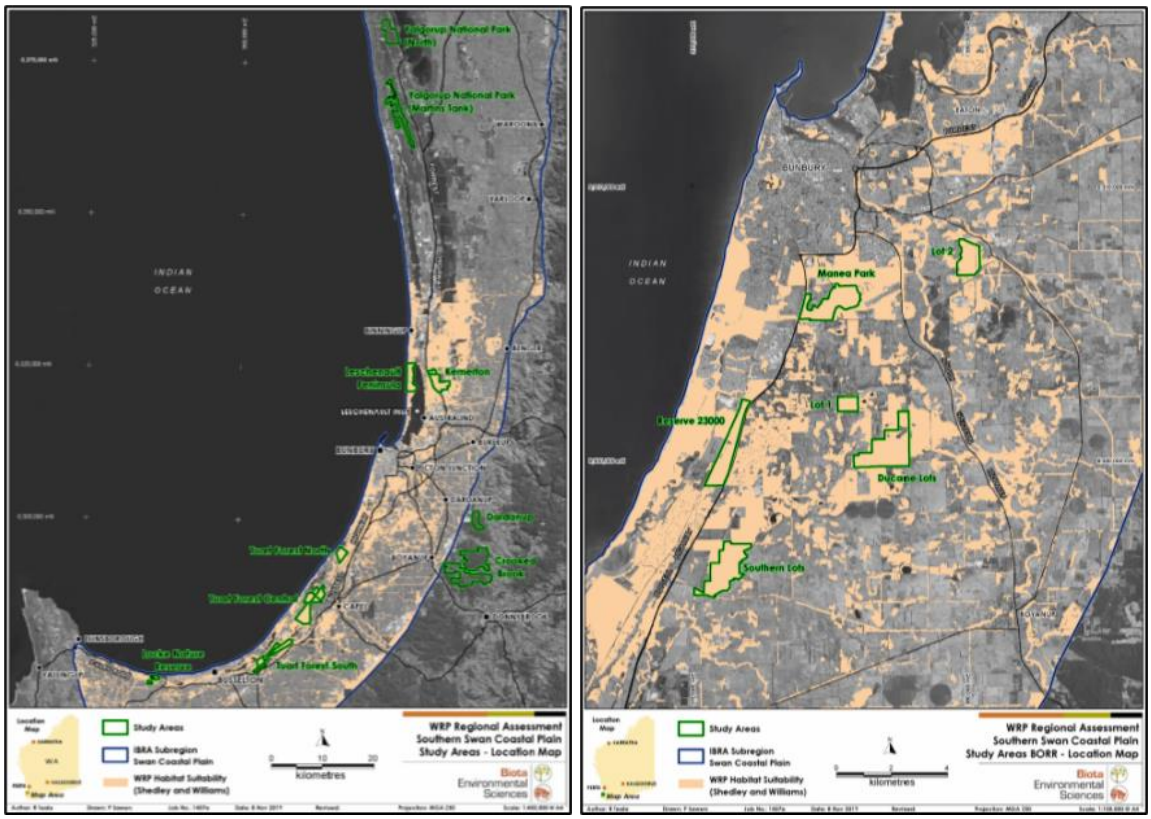

Figure 9 *Location of sites surveyed in distance sampling study (dark green outlines)*[98]

The distance sampling survey report indicates that sites were selected on the basis that they would support or have supported western ringtail possums, represented the geographic extent of each management zone, were readily accessible for the survey work, and were sufficiently large to undertake distance sampling. Methodology was based on the number of encounters with individuals along a series of transects within each site, and used to estimate the density of individuals within each site; the estimated abundance of individuals within each site is understood to have been determined by multiplying the estimated density by the area of each study site.

The distance sampling survey concluded that the total population could be more than 20,000 individuals across the species' known range, including more than 9,200 in the 'Swan Coastal Plain' management zone. Report 1714 notes that the proponent's estimated abundance of western ringtail possums within five km of the development envelope is 3,603 individuals.

Relevant to this proposal, the distance sampling survey estimates of the density and abundance of western ringtail possums within the development envelope, nearby/ linked reserves and some of the proposed offset sites is captured in Table 7.

[98] Biota Environmental Sciences Pty Ltd (2020b), Figures 3.2 and 3.3

Table 7 *Estimated density and abundance of western ringtail possums*[99]

Study site	Estimated density (individuals/ha)	Estimated abundance in site
Development envelope (60.9 ha of suitable habitat)	0.91 (average) (Aug 2019-Feb 2020) 1.12 in marri/ eucalypt woodland	n/a
Various Lots Ducane Road (194 ha, 30 transects, 55 individuals from 45 detections) (Lots 153, 266 and 267 on Plan 232768, and Lot 268 on Plan 144371; includes Offset 1)	0.65 (Jul 2019) 0.61 (Jul 2019)	126.37
Lot 1 Ducane Road (40.5 ha, 10 transects, 6 individuals from 5 detections) (Lot 29 on Plan 419249; Offset 2)	0.34 (Aug 2018) 0.21-0.47 (Feb/ Jul/ Aug 2018) 0.93 (Jul 2019)	13.62
Lot 156 Marchetti Road, Gelorup (portion of former Lot 10 on Plan 419261; Offset 3)	1.06 (Feb 2021)	n/a
Tuart Forest – Central ('North' block; 1,080 ha, 62 transects, 424 individuals from 293 detections) (includes Offset 5: Site 12)	1.32 (Jan 2019)	1,420.46
Manea Park – Bunbury (155 ha, 28 transects, 103 individuals from 74 detections) (155 ha Crown and unallocated Crown lands; opposite north-western end of development envelope)	1.23 (Oct 2018)	190.83
Reserve 23000 Shire of Capel (146.1 ha, 40 transects, 74 individuals from 55 detections) (146.1 ha Crown land; opposite south-western end of development envelope)	1.09-1.20 (Nov 2019-Feb 2020) 1.03 (Aug 2018) 0.56 (Feb 2018)	150.81

A 2019 targeted fauna assessment within the development envelope[100] reported 'The strip sampling of the Proposal area yielded 73 individual Western Ringtail Possums from 59 observations. There were a total of 45 observations of singular adults, while the 14 remaining observations comprised pairs of possums; of the latter, four appeared to be female with young, and there were 10 pairs of adults'.

A subsequent 2020 targeted fauna assessment within the development envelope reported:

> The abundance of Western Ringtail Possums recorded each phase of strip-sampling was as follows: 53 in August 2019, 76 in October 2019, 79 in December 2019 and 67 in February 2020.
>
> The average density of Western Ringtail Possums in the 75.39 ha of surveyed habitat was 0.91 individuals per hectare. Given that this survey included the large majority of habitat available, we may also present this as a Proposal Area density of 0.34 individuals per hectare (199.73 ha). Highest densities were recorded in the Marri/Eucalyptus Woodland habitat with an average of 1.12 individuals per hectare surveyed, followed by

[99] Estimated density and abundance from: Biota Environmental Sciences Pty Ltd (2020b), Tables 3.1, 4.1, 4.10, 4.12 and 4.13; BORR IPT (2021a); and supporting surveys: Biota Environmental Sciences Pty Ltd (2019b), Biota Environmental Sciences Pty Ltd (2020a) and Biota Environmental Sciences Pty Ltd (2021b)
[100] Biota Environmental Sciences Pty Ltd (2019a)

> Marri/Eucalyptus in Paddocks and Road Reserves at 0.87 individuals per hectare while the Melaleuca Shrubland and/or Woodland habitat supported a considerably lower density at 0.075 individuals per hectare.[101]

The proponent advised that it has undertaken 'bimonthly count sequence' of western ringtail possums within the development envelope and in nearby remnants since August 2019, and plans to continue this within the development envelope until clearing occurs. The proponent advised that, to date, the results from the study:

- indicate that about 45 ha of habitat within the development envelope is regularly used by one or more individuals on most nights, and within this portion there appear to be up to 40 settled home ranges (of which 30 would be 25-75% impacted and 10 wholly cleared)
- confirm that numbers fluctuate over seasons, increasing from an August low to seasonal peak around October-December, declining from January onwards indicating that the low impact seasonal clearing window for the proposal habitat extended from March to August
- reveal that the population had both a settled resident component (mature and dominant), and a substantial presence of transient animals that moved in and out of the survey areas that had settled home ranges (of other individuals), indicating that there was no shortage of suitable habitat outside of the alignment and implying that temporary transient animals were often tolerated by settled resident individuals.

The proponent further advised that, subject to ongoing consultation with DBCA, a displacement monitoring study would be undertaken that aims to radio collar up to 50 mature individuals prior to clearing, seeking to apply collars to 25 individuals within the Gelorup section and to 25 individuals in adjacent receiving habitat. The proponent indicated that information from the tracked animals would be collected before, during and after clearing, and that genetic samples would be collected from all captured animals. The proponent noted that this would be the first detailed study in about 20 years into the outcomes of shepherding as a western ringtail possum management tool.[102]

Discussion

From the above, there is no question that the overall western ringtail possum population has been in steady decline over the last decade, leading to its 'Critically Endangered' status. The habitat suitability assessment, Commonwealth EPBC Act Policy Statement 3.10, and the findings of the distance sampling survey suggest that the habitat within the Gelorup Corridor may have a primary function in facilitating the movement and dispersal of western ringtail possums between consolidated/ core habitat areas.

In a letter to the EPA Chair dated 10 March 2021, DBCA advised that 'For many threatened species the effect of cumulative impacts is a key factor in their continuing and ongoing decline'. DBCA also advised that:

> The likely residual impacts of the proposal (loss of individuals, fragmentation of habitat and likely decline in population connectivity) should be considered in the context of other current and proposed development projects in the Bunbury to Dunsborough area, which are likely to have an impact on important and occupied WRP habitat. This would include, but not be limited to further major road upgrades, major drainage infrastructure upgrades, continuing residential subdivisions and density infills, and a significant expansion in urban fire management actions ...
>
> It is likely that in the short-term there will be a reduction in the WRP population in the Gelorup area. This is unlikely to be reversible in the short or medium-term (2-8 years

[101] Biota Environmental Sciences Pty Ltd (2020a)
[102] Proponent response to Appeal 045/21 (15/12/21), pages 18-21

> representing 1-2 WRP generations). In the longer-term (10-15 years or more) when habitat creation actions (including fox control) along the project corridor become functional and the fragmentation of the remaining remnant vegetation is appropriately controlled, supported by ongoing WRP population monitoring programs, then the Gelorup habitat may potentially be able to support WRP abundances equivalent to the pre-disturbance level.[103]

In a subsequent letter to the EPA Chair dated 15 June 2021, DBCA advised:

> Insufficient information has been provided to advise with certainty whether the proposed changes [revised proposal] would have a material effect on the fragmentation impacts, and the likely short-term decline (2-8 years representing 1-2 WRP generations) of the Gelorup WRP population, or its longer-term recovery (of 10-15 years or more).[104]

DBCA's views are reflected in Report 1714; the EPA acknowledged that the WRP Recovery Plan identifies habitat loss as a threatening process, and that the proposal would contribute further to this. The EPA explained its assessment in this regard:

> When considering both the likely short-term population decline and the uncertainty of the populations' longer term recovery, the EPA considered the proposal's consistency with the principle of the conservation of biological diversity and ecological integrity, the precautionary principle, and the ringtail possum recovery plan …
>
> The EPA recognised … that an irreversible impact to individuals in the local population due to habitat loss would occur as a result of the proposal. This would be due to both fragmentation caused by the proposal, along with the associated habitat loss and loss of individual home ranges. This has the potential to have a short- medium term decline of 2-8 years in the local ringtail possum population. The EPA notes (as per the ringtail possum recovery plan) that any habitat where ringtail possums occur naturally are considered critical and worthy of protection, and that habitat loss and fragmentation are threatening processes. The EPA therefore considered that, if the losses in the local population and habitat were irreversible in the longer-term, it may be inconsistent with the principle of the conservation of biological diversity and ecological integrity.[105]

In Report 1714, the EPA acknowledges DBCA's advice as: 'disturbance and displacement of individuals and the fragmentation of habitat would likely result in a 2-8 year decline (representing 1-2 ringtail possum generations) in the ringtail possum population in Gelorup', and 'the predicted decline is likely to be reversible in the longer term (10 to 15 years) when the ringtail possum population recovers from the disturbance, after functional habitat is restored, reconnected by fauna crossings and predator risks are minimised'.

This raises the question of what is meant by 'population recovery' in 10-15 years. By the EPA's interpretation, it appears to be that the number of individuals in the Gelorup population would return to the same number as were present prior to the loss of 60.9 ha of habitat. This implies that habitat on adjacent lands (irrespective of tenure) has sufficient capacity to provide resources to support both resident and displaced individuals.

We consider that the intent of DBCA's advice for the current proposal was to acknowledge that there would likely be an irreversible impact to the Gelorup population, and to provide a concession that, over the long-term, if a number of habitat creation actions (additional to any already occurring in the area) are successful, the Gelorup area might be able to support a higher density of individuals.

We note that the current density of western ringtail possums in habitat on adjacent land, and the potential carrying capacity of this habitat, is presently unconfirmed, and that some landowners may decline to allow the proponent access for baseline monitoring purposes (as recognised in the EPA's recommended conditions and definition of 'receival sites').

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[103] Department of Biodiversity, Conservation and Attractions (2021c).
[104] Department of Biodiversity, Conservation and Attractions (2021b)
[105] EPA response to Appeal 045/21 (07/01/22), page 2

This could mean that the proponent is unable to obtain accurate information about the density of the existing resident population within all of the adjacent habitat, or the carrying capacity of all of that habitat to sustain both the existing residential population and the individuals displaced by the clearing.

The recommended conditions identify the location of 'clearing exclusion areas' and about five ha of 'vegetation retention areas' within the vicinity of the Gelorup Corridor portion of the development envelope (Figure 10). It is expected that at a minimum the proponent would be able to determine the current density of western ringtail possums within these areas, and that through habitat improvement for the benefit of western ringtail possums these areas could potentially support a higher density of individuals in future.

Figure 10 *Clearing exclusion areas (red shading) and vegetation retention areas (light green shading) within and adjacent to the development envelope*[106]

[106] Environmental Protection Authority (2021a), Figure 4 in recommended conditions

We consider that the EPA's identification and assessment of the direct and indirect impacts from the proposal on western ringtail possums (subject to recommended conditions to address gaps in the information) is satisfactory, and has had regard for the mitigation hierarchy, the WRP Recovery Plan and other regulatory processes.

However, we note that the combined area of the 'clearing exclusion areas' and 'vegetation retention areas' is less than the 60.9 ha proposed to be cleared for the proposal, and that those areas are likely to support an existing resident population. We also note that despite the proposed improvement of habitat within those areas to increase carrying capacity and the installation of fauna crossings to mitigate fragmentation, there is uncertainty around the likelihood that the Gelorup population of western ringtail possums would recover to pre-clearing numbers in 10-15 years. In this context, we consider that a proportion of the displaced individuals may be unable to find alternative habitat, and that the proposal may result in a permanent net reduction in the number of western ringtail possums in the Gelorup area. The extent to which this impact can be mitigated or counterbalanced is discussed below.

3.2.1.2 Proposed mitigation measures

The mitigation hierarchy is a sequence of proposed actions to avoid, minimise (reduce) and mitigate (rehabilitate) the environmental impacts of a proposal, and lastly, if environmentally acceptable but with significant residual impacts, offset. Report 1714 sets out that the proponent has considered the mitigation hierarchy in the development of the proposal, with the EPA encouraging the proponent to include further mitigation measures throughout the assessment process.

Report 1714 states that since the proposal was referred the proponent has modified the development envelope to reduce the extent of clearing of fauna habitats, including the retention of five ha of vegetated areas ('clearing exclusion areas') within the Gelorup Corridor portion of the development envelope, thereby avoiding a portion of the original proposed impact on conservation-significant fauna species. By these modifications, the proponent avoided 19.1 ha of western ringtail possum habitat,[107] compared with the proposal referred.

The proponent has proposed a number of measures to minimise, mitigate and monitor the identified direct and indirect impacts to western ringtail possums. These are set out in the proponent's *Updated Referral Document*[108] and *Fauna Action Management Plan*,[109] and are reflected in Report 1714 (page 9).

These measures include the development of plans and procedures, many of which would form part of the proponent's yet-to-be-developed *Construction Environmental Management Plan* (CEMP), to address specific threats to fauna habitats (refer Table 11). In addition, the EPA has recommended conditions 1, 4, 5, 6 and 9 (offsets) to manage residual impacts on western ringtail possums (the recommended conditions are considered in Section 3.11).

The proponent also proposes to revegetate areas within the development envelope that are disturbed during construction but not required for road infrastructure. The EPA considered that these areas would likely provide additional fauna habitat.

The EPA also noted that the proponent would likely require an authorisation for any inadvertent take of threatened fauna in accordance with the *Biodiversity Conservation Act 2016*.

[107] Derived from: BORR IPT (2021d), page 131, and BORR IPT (2021b), page 7
[108] BORR IPT (2020d), pages 131-136, and Tables ES-1 and 6-2
[109] BORR IPT (2021c)

Clearing protocols

Report 1714 states that 'Pre-clearance protocols should include, but not be limited to, fauna searches of hollows, dreys, ground debris, dense ground level vegetation, fallen timber and logs undertaken by a qualified fauna spotter immediately prior to and during clearing operations. Vacant dreys, suitable for western ringtail possum should be removed and hollows blocked prior to clearing'.

In a letter to EPA Services dated 2 September 2021, DBCA noted that the proponent's *Offset Strategy*[110] states 'No WRP mortalities are expected as a direct result of the Proposal' and that individuals would be shepherded from the clearing footprint. DBCA further advised:

> It is difficult to ascertain, with a high degree of certainty, that there will be no mortalities if WRP are shepherded into the home ranges of existing WRP individuals. Survival of displaced WRP can be affected by territorial conflicts and competition for food resources with resident possums.
>
> Monitoring of displaced WRP individuals will provide meaningful data to assess the effectiveness of the shepherding strategy to achieve no mortalities through the implementation of the Proposal.[111]

The proponent advised that 'the "gentle bumping" and "soft felling" of trees with respect to WRP is part of a larger process within which other actions to minimise the presence of WRP at the time clearing are anticipated to be the primary mechanism for relocation of WRP and is a standard clearing technique approved previously by both DBCA and DWER'. The proponent also advised that 'All protocols being undertaken are consistent with the DBCA management procedure *Procedures to Minimise the Risk to Western Ringtail Possums During Vegetation Clearing and Building Demolition*[112]'.[113]

The EPA advised that DBCA considered that the proposed clearing protocols, including passive relocation, are consistent with best-practice and include some protocols that go beyond those usually undertaken as best-practice during habitat clearing.[114]

While we accept that with the proposed clearing protocols in place, no direct WRP mortalities are expected, as described above we consider that a proportion of the displaced individuals may be unable to find alternative habitat, and that the proposal may result in a permanent net reduction in the number of western ringtail possums in the Gelorup area.

Fauna crossings

Report 1714 states that 26 fauna connections are proposed to provide multiple pathways to reconnect fauna habitats. The proponent's *Fauna Action Management Plan* describes these:

- 10 rope bridges
- seven fauna underpasses (five box underpasses and two arch underpasses)
- seven dual use fauna culverts
- two fauna land bridges (at the Yalinda Drive bridge and 300 m east of the bridge).[115]

[110] BORR IPT (2021d)
[111] Department of Biodiversity, Conservation and Attractions (2021a)
[112] Department of Parks and Wildlife (2015)
[113] Proponent response to Appeal 045/21 (15/12/21), page 21
[114] EPA response to Appeal 045/21 (07/01/22), page 6
[115] BORR IPT (2021c)

The proponent advised that specific landscaping would be undertaken in each overpass / underpass forecourt, access and egress areas to increase attractiveness to western ringtail possums, maximise use of the structures, and minimise the likelihood of predation while accessing or using the structures.[116]

The proponent noted the appellants' concerns regarding expert advice on fauna crossings, and provided the following response:

> The location of the existing fauna rope bridge structure on BORR Central Section was determined based on a number of factors including habitat connectivity, landform, road safety and engineering constraints. The structure provides a linkage between areas of WRP habitat as confirmed through site surveys. UWA did provide advice on the location of the structure as part of the site selection process ...
>
> Main Roads has committed to constructing thirteen fauna crossing structures within the 2,500 m Gelorup section to connect retained or revegetated habitat within the road reserve or on adjacent land. The suite of fauna crossing structures that Main Roads has committed to comprises several different designs. While Main Roads intends to use BORR as an opportunity to trial various designs, the crossing structures have been shown to be used by possums, either in Western Australia or the eastern states.
>
> Rope bridges are used to facilitate arboreal mammal and marsupial movement in Australia and around the world with high efficacy … There are four local southwest examples of successful WRP utilisation of rope bridges across roads or rivers: at Vasse, Dunsborough, Treendale and Mandurah. Possums including ringtails, have been also shown to use culverts … and fauna land bridges in the eastern states …
>
> Given the low WRP density in the Gelorup habitat, [Main Roads] do not expect swift uptake of crossover travel options. Monitoring the use of the structures is included in the Conservation Significant Fauna AMP …
>
> [A]dditional works and changes will be implemented on the existing BORR Central Section fauna rope bridge in order to encourage arboreal mammal use.[117]

The EPA advised that the design of the proposed fauna bridges has been informed by technical experts, have shorter span lengths, and have been improved since the unsuccessful rope bridges for BORR Northern and Central Sections. The EPA advised that the recommended conditions also require the proponent to implement and maintain revegetation of fauna land bridges and canopy connections to the rope bridges to increase their utilisation by western ringtail possums, and to evaluate their effectiveness to inform any adaptive management, bridge modifications or future designs.

> The EPA also noted that it 'did not rely on fauna bridges being successful and assessed there was likely to be irreversible impact to individuals in the local population due to the proposal, resulting in a short to medium term (2-8 years) decline'.[118]

Discussion

The EPA recognised that there is 'some scientific uncertainty regarding whether the local population will recover from disturbance given the potential threats and pressures on ringtail possums', and that it 'evaluated whether practicable steps could be taken to avoid the irreversible harm, and assessment of consequences of different options' (including recommending the proposal not be implemented, imposing additional conditions to the proponent's proposed mitigation, and relying on the proponent's mitigation alone).[119]

[116] Proponent response to Appeal 045/21 (15/12/21), page 20
[117] Proponent response to Appeal 045/21 (15/12/21), pages 20-21
[118] EPA response to Appeal 045/21 (07/01/22), page 7
[119] EPA response to Appeal 045/21 (07/01/22), pages 2-4

The EPA advised that in deciding between options and whether to recommend for or against proposal implementation, it considered:

- the ongoing values of habitat being disturbed (including previous fragmentation by residential subdivision, and lack of security of tenure or management of remnant habitat on adjacent private lands)
- the proportion of the predicted impact (displaced individuals) in the context of the western ringtail possum population within five km of the proposal
- the conditions that could be put in place (continuous adaptive management and monitoring to achieve the environmental outcome that the abundance and persistence of ringtail possums return to pre-disturbance levels within 15 years, contingency offsets if this outcome is not achieved, and offsets to deliver net benefit to the regional western ringtail possum population).

The EPA concluded that it 'did not consider it a proportionate response to recommend against implementation, and considered there was a greater likelihood of environmental protection and consistency with the EP Act principles if the proposal proceeded with conditions to ensure net environmental benefit'.[120]

From the appeals, the proponent's information, the EPA's assessment and published literature, there is no dispute that the proposal would result in direct impact from the loss of 60.9 ha of habitat and the displacement of individuals and habitat fragmentation and we agree with the EPA's conclusion that a significant residual impact remains for western ringtail possums.

We consider that the EPA has identified and assessed these impacts based on the information available to it at the time, with regard for the mitigation hierarchy and the WRP Recovery Plans. We note that the EPA has also had consideration for cumulative impacts on western ringtail possums at the local and regional levels. We also recognise that there are gaps in the information, and note that the EPA has recommended conditions to address those gaps prior to any clearing being allowed to occur.

The matter of whether these impacts can be adequately mitigated and counterbalanced through the EPA's recommended conditions is considered in Section 3.11.

3.2.2 Black cockatoos

In summary, the appellants submitted that:

- the EPA has ignored the precautionary principle, the principles of intergenerational equity and conservation of biological diversity and ecological integrity, and the Baudin's cockatoo and forest red-tailed black cockatoo recovery plan[121] and Carnaby's cockatoo recovery plan[122] (BC Recovery Plans)
- the EPA had inadequate regard for the cumulative impacts on the three threatened black cockatoo species from habitat loss (foraging and breeding, including 1,088 habitat trees)
- Report 1714 does not address threats to black cockatoos from illegal shooting, habitat loss, nest hollow shortage and competition from other species, and injury or death from European honeybees
- the EPA did not adequately consider the impacts to black cockatoos from climate change
- further information/evaluation is required to inform the assessment: impacts of vehicle strike on black cockatoos

[120] EPA response to Appeal 045/21 (07/01/22), pages 2-4
[121] Department of Environment and Conservation (2008)
[122] Department of Parks and Wildlife (2013)

- Report 1714 states the loss of 60.9 ha habitat equates to 1% of foraging and breeding habitat in the local area, but recognises that 40.6 ha is 'high' quality foraging habitat; the 8,000 ha of habitat in the local area should be assessed to determine quality, because if it is 'low' quality that may affect the viability for sustaining displaced black cockatoos.

3.2.2.1 State of knowledge

Population trends

There is extensive published literature available that documents downward trends in population estimates of all three threatened black cockatoos species mainly attributed to land clearing and associated loss of breeding and foraging habitats across their ranges.

A recent PhD thesis on the movement ecology of black cockatoos observed the following trends in populations:

> The distribution of Carnaby's cockatoos has seen a shift towards the SCP and southwards over the last 50-60 years (Johnstone et al. 1998, Johnstone and Kirkby 2005) [p7] ... The population size of Carnaby's cockatoos was estimated at 40,000 individuals in 2010 and declining (Garnett et al. 2011) [p41]
>
> [Baudin's cockatoos] population size had been estimated at between 15,000 and 20,000 individuals in the past, although at present the population is estimated at 5000 to 8000 individuals and has therefore been re-classified as Endangered at state and federal levels in 2018 (Johnstone and Kirkby 2018, Department of Environment and Energy 2019a) ... [p9]
>
> The population of [forest red-tailed black cockatoos] has seen a steady decline in WA, as the population was estimated to be between 16,000 and 26,000 individuals in 1998 and 15,000 with a declining trend from 2008 (Abbott 1998, Garnett et al. 2011) ... [p7][123]

Carnaby's cockatoo is listed as one of 20 bird species in the *Threatened Species Strategy 2021-2031*,[124] and is referenced in the *Strategy Action Plan 2021-2026* (for which Objective 1 states 'By 2026, all priority species on track for improved trajectory by 2031').

From the above, there is no question that the black cockatoo numbers (all three species) are in decline, leading to their 'Endangered' and 'Vulnerable' statuses.

Threatening processes

The BC Recovery Plans describe the threatening processes on black cockatoos as follows:

- Baudin's cockatoo and forest red-tailed black cockatoo: killing by illegal shooting, injury or death from feral honeybees (*Apis mellifera*), habitat loss, nest hollow shortage and competition for available nest hollows; also climate change which is likely to exacerbate the threatening processes as a result of changes to biodiversity and ecosystem function[125]
- Carnaby's cockatoo: continuing threats mostly relate to loss of habitat due to clearing or degradation, competition for nest sites, and loss of individuals due to illegal activities, collisions with motor vehicles and disease.[126]

[123] Rycken, S.J.E. (2019)
[124] Department of Agriculture, Water and the Environment (2021)
[125] Department of Environment and Conservation (2008)
[126] Department of Parks and Wildlife (2013)

In addition to these, the Commonwealth conservation advice for Baudin's cockatoo also describes the processes resulting in nest hollow shortages (land clearing practices for agriculture, forestry and mining, fire events and competition with invasive and native species) and the effects of climate change (decline in nesting trees, reduced food availability, increased fire frequency and altered movements), as well as noting that phytopathogens are also causing declines in breeding and foraging habitat.[127]

Habitat loss

The Commonwealth *EPBC Act referral guidelines for three threatened black cockatoo species* (2012)[128] contains modelled distributions of foraging and breeding areas for each of Carnaby's cockatoo, Baudin's cockatoo and forest red-tailed black cockatoo. The development envelope is within the distribution of all three species.

The BC Recovery Plans set out that habitat critical to the survival of black cockatoos can be summarised as follows:

- Baudin's cockatoo and forest red-tailed black cockatoo:
  - areas currently occupied by the cockatoos, and areas not currently occupied by the cockatoos due to recent fire but capable of supporting cockatoo populations when sufficiently recovered
  - areas of natural vegetation in which the cockatoos nest, feed and roost, and through which the cockatoos can move from one occupied area to another
  - areas of suitable vegetation within the recorded range in which undiscovered cockatoo populations may exist
  - all marri, karri (*Eucalyptus diversicolor*) and jarrah forests, woodlands and remnants in the south-west of Western Australia receiving more than 600 mm of annual average rainfall[129]
- Carnaby's cockatoo:
  - the eucalypt woodlands that provide nest hollows used for breeding, together with nearby vegetation that provides feeding, roosting and watering habitat that supports successful breeding
  - woodland sites known to have supported breeding in the past and which could be used in the future, provided adequate nearby food and/or water resources are available or are re-established
  - in the non-breeding season the vegetation that provides food resources as well as the sites for nearby watering and night roosting that enable the cockatoos to effectively utilise the available food resources.[130]

A recent PhD thesis on the movement ecology of black cockatoos found that 'that remnant native vegetation utilised by black cockatoos occurred in either public green spaces, roadside vegetation and nature reserves. As roadside verges form corridors between public green spaces and other foraging and roosting sites, they were identified as being crucial for each species across regions'. The research also found that key roosting sites in urban and peri-urban regions were located close to (within about 4.7 km of) high quality foraging habitat, and that key foraging sites in urban and peri-urban regions occurred as small or

[127] Threatened Species Scientific Committee (2018a)
[128] Department of Sustainability, Environment, Water, Population and Communities (2012)
[129] Department of Environment and Conservation (2008)
[130] Department of Parks and Wildlife (2013)

large nature reserves/ national parks, roadside vegetation, and for Carnaby's and Baudin's cockatoos also private property containing commercially-grown foraging species.[131]

The proponent mapped a number of vegetation types within the development envelope, including the following (consistent with important habitat for black cockatoos):

- open forests (or scattered) jarrah, marri over slender banksia with/without peppermint
- open forest of tuart with occasional jarrah over peppermint and slender banksia
- open forest of slender banksia and peppermint.[132]

Targeted fauna assessments[133,134] confirm that marri/jarrah woodlands within the development envelope have suitable foraging and potential breeding habitat for conservation significant species including black cockatoos. The fauna assessments indicate that the areas of jarrah/marri woodland (often including *Banksia* species in the mid-storey) within the development envelope represent 'high' quality foraging habitat and that the areas of largely scattered jarrah/marri in paddocks and road reserves represent 'moderate' quality foraging habitat. The fauna assessments indicate that there was no evidence of night roosting.

The location and extent of black cockatoo foraging and roosting habitat impacted by the proposal is indicated in Figure 11.

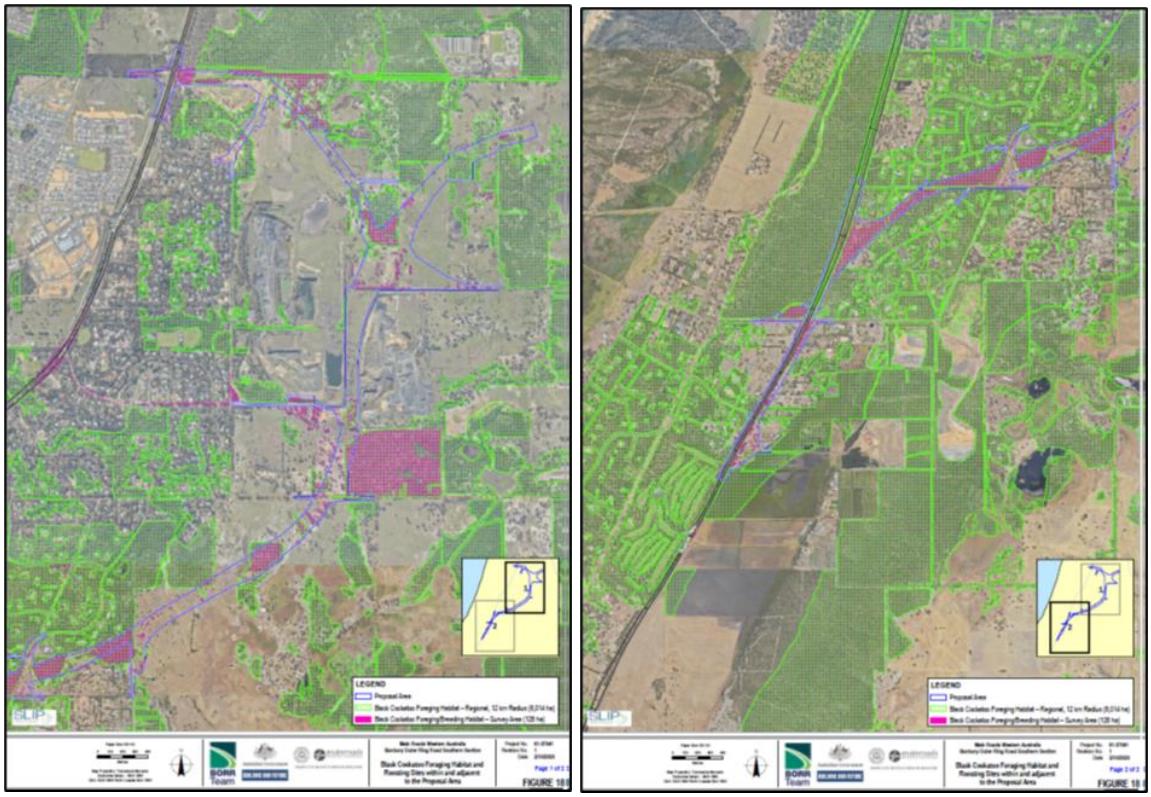

Figure 11 *Black cockatoo habitat (green and pink shading, representing different surveys) within the development envelope (blue line)*[135]

[131] Rycken, S.J.E. (2019)
[132] BORR IPT (2020d), page 54-58
[133] Biota Environmental Sciences Pty Ltd (2019a)
[134] Biota Environmental Sciences Pty Ltd (2020a)
[135] BORR IPT (2020d), Appendix A, Figure 18

One of the targeted fauna assessments estimated that about 8,000 ha of suitable/potential habitat for black cockatoos occurs within a 12 km radius (being the distance from a roosting site that an individual may travel to forage) of the development envelope.[136]

The proponent advised that the proposal may exacerbate threats relating to breeding and foraging habitats for black cockatoos, and that no confirmed nesting trees occur within the development envelope.

The EPA advised that it considered potential impacts to black cockatoos from habitat loss:

> In its assessment, the EPA considered the proportion of habitat proposed to be cleared represents a relatively small proportion (less than 1%) of the remaining extent of approximately 8,000 ha of habitat within 12 km. It is impractical to require a survey of habitat quality across the extent of 8,000 ha, therefore to EPA has taken a considered approach in the assessment of the proposed clearance of 60.9 ha and 1088 [habitat] trees. The EPA concluded this impact to be residual and significant after the application of the mitigation hierarchy by the proponent, and that the significant residual impacts are required to be counterbalanced by the implementation of offsets.[137]

In relation to cumulative impacts, Report 1714 acknowledges the cumulative impacts on black cockatoos from the combination of this proposal, the BORR Northern and Central Sections, and the Bussell Highway duplication as a combined total of 119.5 ha of foraging/ breeding habitat loss, 16 habitat trees containing suitable hollows, two habitat trees with previous signs of use, and 1,976 habitat trees with potential to develop hollows.[138]

Vehicle strike

The proponent acknowledged that the proposal may exacerbate the risk of vehicle strike. The proponent advised that revegetation for foraging habitat within the development area would not be established within 10 m of the road, and that drainage design would ensure the pooling of water on the road would be minimised.[139]

The EPA advised that it considered the potential impacts to black cockatoos from vehicle strike and disease:

> The EPA has recommended condition 4 to reduce the risk to black cockatoos during clearing and construction of the proposal, including reducing the potential risk to breeding cockatoos in hollows and the risk of vehicle strike. Potential indirect impacts to the remaining adjacent habitat from the potential to introduce weeds or Dieback will meet the EPA's objective for terrestrial fauna with the implementation of recommended condition 3-5.[140]

3.2.2.2 Proposed mitigation measures

Report 1714 states that since the proposal was referred the proponent has modified the development envelope to reduce the extent of clearing of fauna habitats. By these modifications, the proponent avoided 19.1 ha of black cockatoo habitat and seven habitat trees,[141] compared with the proposal referred.

[136] Biota Environmental Sciences Pty Ltd (2020a)
[137] EPA response to Appeal 045/21 (07/01/22), pages 12-13
[138] Environmental Protection Authority (2021a), pages 19-20
[139] Proponent response to Appeal 045/21 (15/12/21), page 24
[140] EPA response to Appeal 045/21 (07/01/22), page 12
[141] Derived from: BORR IPT (2021d), page 136, and BORR IPT (2021b), page 7

The proponent has proposed a number of measures to minimise, mitigate and monitor the identified direct and indirect impacts to black cockatoos. These are set out in the proponent's *Updated Referral Document*[142] and *Black Cockatoo Action Management Plan*,[143] and are reflected in Report 1714 (page 9).

These measures include the development of plans and procedures, many of which would form part of the proponent's CEMP, to address specific threats to fauna habitats (refer Table 11). In addition, the EPA has recommended conditions 1, 4, 5 and 9 (offsets) to manage residual impacts on black cockatoos (the recommended conditions are considered in Section 3.11).

The proponent advised that it 'will continue to consult with DBCA and is open to the use of artificial hollows should it be determined that the loss of breeding habitat is likely to have a significant residual impact on the breeding of Black Cockatoos in the area'.[144]

By Report 1714 and its response to the appeals, the EPA is satisfied that the proponent's mitigation measures in combination with the recommended conditions relevant to black cockatoos would ensure that implementation of the proposal could be undertaken in a manner that would meet its objective for terrestrial fauna.

Discussion

From the appeals, the proponent's information, the EPA's assessment and published literature, we agree with the EPA's conclusion that the proposal would result in significant residual impacts to black cockatoos from the loss of 60.9 ha of foraging, potential roosting and breeding habitat, including 1,088 habitat trees (being trees with a diameter at breast height (DBH) of greater than (>) 500 millimetres (mm) that have the potential to form large hollows) of which 11 trees were considered to be potentially suitable (two with evidence of use; eight not assessed by drone[145]).

We consider that the EPA's identification and assessment of the direct and indirect impacts from the proposal on black cockatoos was reasonable and had appropriate regard for cumulative impacts at a local and regional levels, the mitigation hierarchy and the BC Recovery Plans.

The extent to which these impacts can be adequately mitigated and counterbalanced through conditions, consistent with the EPA's objective for fauna, is considered in Section 3.11.

3.2.3 Black-stripe minnow

In summary, the appellants submitted that:

- the black-stripe minnow occurs in Five Mile Brook that runs through the Gelorup Corridor portion of the development envelope, and is likely to be significantly impacted during construction works (earth moving) and by culverts, run-off and pollution
- the surveys undertaken by the proponent are inadequate; a desktop study and field work done over the course of two-three years, mainly within the dry periods, is poor research
- the EPA has not given consideration to the permanent loss of habitat for the black-stripe minnow as a result of the proposal, or to the impacts of climate change on the species

[142] BORR IPT (2020d), pages 136-139, and Tables ES-1 and 6-2
[143] BORR IPT (2020c)
[144] Proponent response to Appeal 045/21 (15/12/21), pages 24-25

- any potential changes to the habitat for this species should be deemed unacceptable, and there should be no tolerance for habitat loss or degradation
- the extent of black-stripe minnow habitat that would be impacted requires clarification.

3.2.3.1 State of knowledge

Distribution

The black-stripe minnow is generally found in ephemeral, tannin-stained wetland habitats (as opposed to the more permanent stream habitats preferred by the western mud minnow). The species is largely restricted to near-coastal wetlands from Augusta to Albany, although populations are also known near Bunbury and in the Ellen Brook catchment north of Perth. Black-stripe minnow occupy ephemeral habitats and is capable of burrowing and aestivating (a state of dormancy similar to hibernation, characterised by inactivity and a lowered metabolic rate) to survive the dry summer.[146]

A 2020 targeted aquatic fauna survey describes the regional distribution of black-stripe minnow as follows:

> The majority of black-stripe minnow populations are confined to peat flat wetlands of the Warren sub-region between Augusta and Albany in the extreme south-west corner of W.A. …, though three isolated populations exist between Bunbury and Gingin on the Swan Coastal Plain (Lake Chandala ca. 55 km north-east of Perth, Melaleuca Park ca. 30 km north-east of Perth, and Kemerton Nature Reserve ca. 130 km south of Perth), intimating its historically-wider distribution … The discovery of black-stripe minnow during 2018 and 2019 surveys of the BORR southern investigation area, as well as nearby wetlands in the northern central investigation area … and the BORR southern alternate alignment investigation area …, extends the distribution of this species on the Swan Coastal Plain approximately 30 km south.[147]

On the basis of a desktop assessment, the 2020 survey identified up to 15 potential sites where black-stripe minnow were likely to occur within or adjacent to the development envelope. The survey report sets out that:

> Targeted surveys for black-stripe minnow in November 2018 and August 2019 revealed that the black-stripe minnow is present at wetlands both within, and adjacent to, the southern investigation area ... However, distribution appears restricted to a small water course (wetland chain) that flows westwards from South 8 across Jilley Road. These wetlands appear to be hydrologically linked to the chain of wetlands in Gelorup where black-stripe minnows were found by WRM in 2018 as part of aquatic fauna surveys of the BORR southern alternate alignment investigation area …, though these wetlands would likely only connect up during periods of high rainfall and flooding.[148]

The proponent's *Updated Referral Document* indicates that 1,186 ha of suitable habitat occurs within a five km radius of the development envelope.[149] In this context, the habitat within the development envelope represents about 0.46% of the estimated extent of suitable habitat within a five km radius.

The proponent's *Updated Referral Document* also states that surveys recorded black-stripe minnow at one location within the development envelope, and that the survey results extend the previously known distribution of the species within the greater Bunbury area.[150]

[146] Department of Water and Environmental Regulation (2022a)
[147] Wetland Research & Monitoring (2020)
[148] Wetland Research & Monitoring (2020)
[149] BORR IPT (2020d), Figure 20
[150] BORR IPT (2020d), page 113

In a letter to EPA Services dated 2 December 2020, DBCA advised:

> The total estimated area of BSM habitat within the project area is required to determine what percentage of BSM habitat is represented by clearing 5.5 ha. [The proponent's referral information] shows potential BSM habitat and the locations where BSM were observed. DBCA notes that there are various locations where BSM were observed, that are not mapped as potential habitat.
>
> The discovery of new populations in Manea Park, which forms part of the Kalgulup Regional Park and the occurrences within, and in proximity to the project area is a significant find within the local area. The genetic relationships of these recently discovered populations (and the species in general_ is unknown, therefore the conservation value of the population identified within the project area is unable to be determined.[151]

The location and extent of black-stripe minnow habitat impacted by the proposal is indicated in Figure 12.

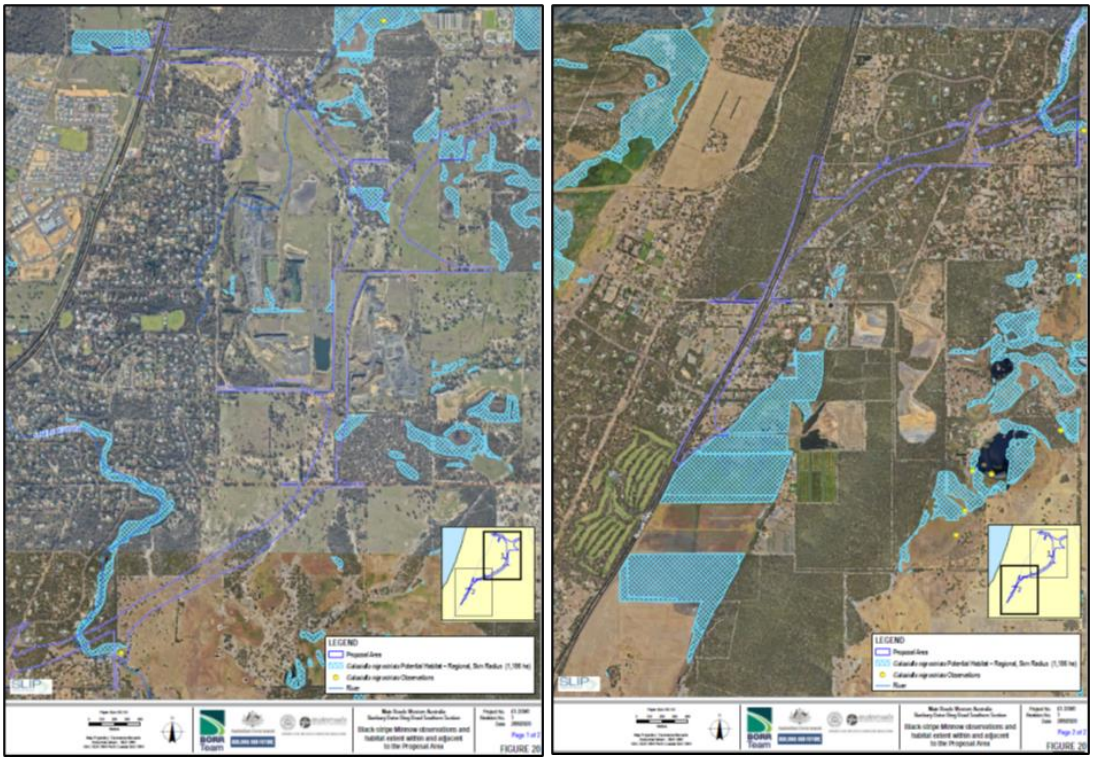

Figure 12 *Black-stripe minnow habitat (blue) within the development envelope (blue line)*[152]

Threatening processes

A 2008 report on the aquatic fauna in wetlands at Kemerton wetlands describes the threatening processes that may affect black-stripe minnow populations to be excavation or filling of seasonal pools, prescribed burning (resulting in loss of rich organic substrate in seasonal wetlands), clearing or modification for roads, forestry, dams and other such infrastructure, encroachment of urbanisation, mineral and quartzite sand mining under wetlands, excessive groundwater extraction (causing unseasonal or extended dry periods), climate change (decreasing rainfall, higher mean temperatures and increase in evapotranspiration), changing the tenure of reserves (when protected areas are no longer protected from agriculture, mining, or other habitat altering activities), and exotic fish.[153]

[151] Department of Biodiversity, Conservation and Attractions (2020)
[152] BORR IPT (2020d), Appendix A, Figure 19
[153] Galeotti, D.M., McCulloch, C.D. and Lund, M.S. (2008)

In addition to these, the 2016 Commonwealth conservation advice for black-stripe minnows describes threats from increased salinity (due to clearing and agricultural practices).[154]

The proponent advised that 5.5 ha assumes full loss of habitat within the development envelope; the construction of a bridge at Five Mile Brook suggests this maximum impact is unlikely to be realised. The proponent advised that key design requirements would minimise indirect impacts on hydrology that supports suitable habitat on either side of the development envelope at Five Mile Brook and south of Manea Park, and that hydrological modelling of surface water was conducted to ensure bridge and culvert design would minimise impacts on and maintain surface water flow.[155]

The proponent also advised that monitoring for impacts to this species would be conducted at Manea Park (reference site) and Five Mile Brook, and would comprise sampling and visual assessment (including photo monitoring) by a suitably experiences person. The proponent advised that baseline data collection commenced at the reference site in winter 2020, and that it has completed a 12-month groundwater and surface water monitoring program to provide baseline data for hydrological regimes and water quality.[156]

In recognising the values associated with Five Mile Brook (both downstream and at the crossing point) and habitat loss for this species, the EPA advised:

> …The proposal will directly impact 5.5 ha habitat, which represents a relatively small proportion (about 0.5%) of the extent of the 1,186 ha of potential habitat within the vicinity of the proposal. Given the small extent, and the short-life cycle of the aestivating fish, the EPA consider this direct impact to not be a significant residual impact and therefore did not consider offsets were required.
>
> The EPA considered that the potential indirect impacts from the proposal were to hydrological regimes, hydrological connectivity and degradation of water quality, given the construction of the road and bridges within or near to black stripe minnow habitats ...
>
> The EPA therefore recommended conditions relevant to the potential indirect impacts, requiring the proponent to (condition 2):
>
> - design and implement the proposal to meet the outcome of no indirect impacts to black stipe minnow habitats or the Fiver Mile Brook
> - not construct bridge footings or drainage structures inside the Five Mile Brook at its crossing with the BORR.
>
> These conditions are consistent with the EPA's assessment of BORR Northern and Sections and the conditions in Ministerial Statement 1155.
>
> The Report 1714 (Table 5) also recognises the complementary regulation under the *Rights in Water and Irrigation Act 1914* (RIWI Act) in its assessment of inland waters which would also contribute to the minimisation of potential impacts to inland waters containing black striped minnow habitat.[157]

In relation to cumulative impacts, Report 1714 acknowledges the cumulative impacts on black-stripe minnows from the combination of this proposal, the BORR Northern and Central Sections, and the Bussell Highway duplication as a combined total of 6.05 ha of habitat loss.[158]

[154] Threatened Species Scientific Committee (2018b).
[155] Proponent response to Appeal 045/21 (15/12/21) page 26
[156] Proponent response to Appeal 045/21 (15/12/21) page 26
[157] EPA response to Appeal 045/21 (07/01/22), pages 13-14
[158] Environmental Protection Authority (2021a), pages 19-20

3.2.3.2 Proposed mitigation measures

Report 1714 states that since the proposal was referred the proponent has modified the development envelope to reduce the extent of clearing of fauna habitats. By these modifications, the proponent avoided 4.1 ha of black-stripe minnow habitat,[159] compared with the proposal as initially referred.

The proponent has proposed a number of measures to minimise, mitigate and monitor the identified direct and indirect impacts to black-stripe minnows. These are set out in the proponent's *Updated Referral Document*[160] and *Fauna Action Management Plan*,[161] and are reflected in Report 1714 (page 9).

These measures include the development of plans and procedures, many of which would form part of the proponent's CEMP, to address specific threats to fauna habitats (refer Table 11). In addition, the EPA has recommended conditions 2 and 4 to manage residual impacts on black-stripe minnows (the recommended conditions are considered in Section 3.11).

Discussion

Based on the information available, we accept the EPA's assessment that the likely residual impacts of the proposal include direct impacts from the loss of 5.5 ha of habitat and potential indirect impacts to habitat from altered hydrological regimes and water quality (discussed further at Section 3.4). In reaching this conclusion the EPA has recognised the existing threats, pressures and cumulative impacts that have resulted in its 'Endangered' status.

The EPA has reviewed the proponent's mitigation measures during its assessment and was satisfied that in combination with its recommended conditions, impacts to black-stripe minnows could be managed to ensure that implementation of the proposal could be undertaken in a manner that would meet its objective for terrestrial fauna (and inland waters).

The extent to which these impacts can be adequately mitigated through conditions, consistent with the EPA's objective for fauna is considered in Section 3.11.

3.2.4 South-western brush-tailed phascogale

In summary, the appellants submitted that:

- the EPA's assessment of risks to the south-western brush-tailed phascogale appears to have been underestimated by its view that low numbers are likely to be present
- if phascogales are in the development envelope, their low numbers would result in greater impacts to the local populations.

3.2.4.1 State of knowledge

Threatening processes

DBCA's *Fauna profile* for this species describes the threatening processes on this species as habitat clearing, fragmentation, and alteration by logging and mining, as these activities reduce availability of trees with hollows, isolate populations, and increase susceptibility to predation by foxes and cats.[162]

The location and extent of south-western brush-tailed phascogale habitat impacted by the proposal is indicated in Figure 13.

[159] Derived from: BORR IPT (2020d), page 139
[160] BORR IPT (2020d), pages 139-140, and Tables ES-1 and 6-2
[161] BORR IPT (2021c)
[162] Department of Environment and Conservation (2012)

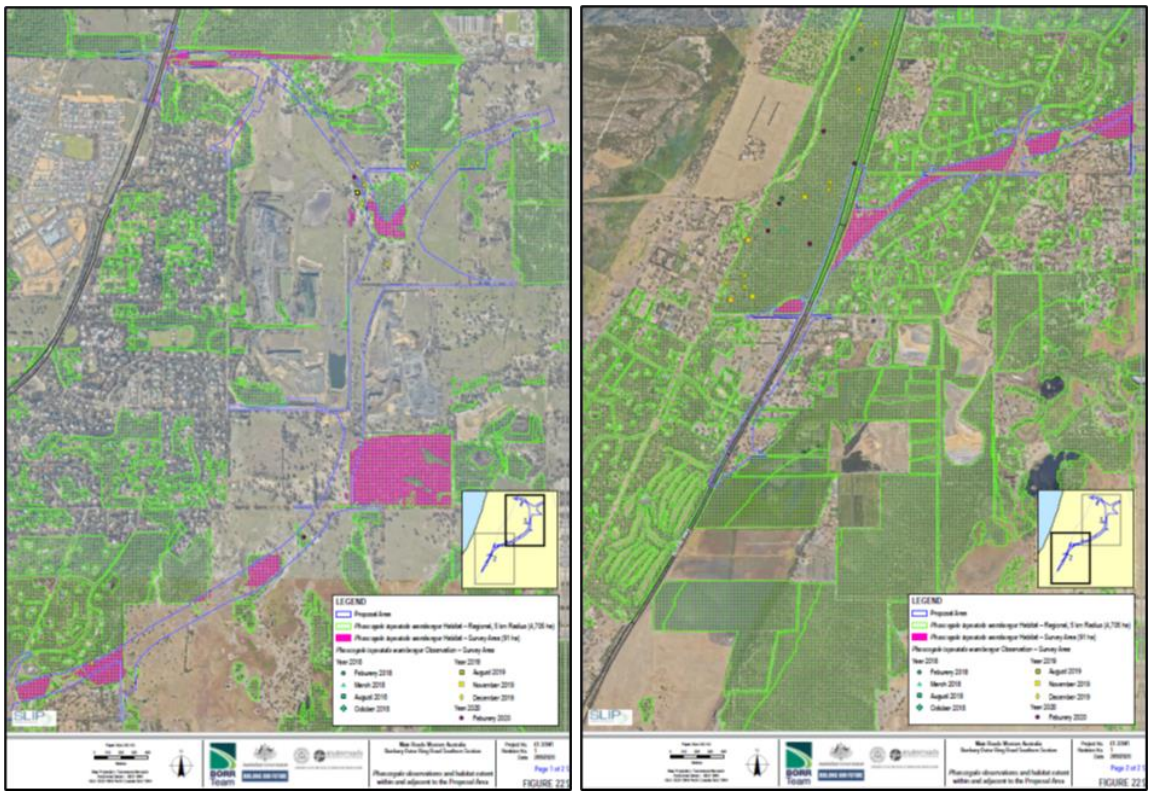

Figure 13 *South-western brush-tailed phascogale habitat (green and pink shading, representing different surveys) within the development envelope (blue line)*[163]

Report 1714 notes the close alignment of south-western brush-tailed phascogale habitat with western ringtail possum habitat.

A 2019 targeted fauna assessment within the development envelope[164] states that south-western brush-tailed phascogales 'maintain relatively large territories (over 20 ha) and female territories are exclusive; as a result, densities tend to be low', and that the species 'was not recorded within the Proposal area, however several individuals were recorded in the adjacent Reserve 23000 and suitable habitat occurs within the Proposal area'.

A subsequent 2020 targeted fauna assessment within the development envelope reported:

> Four Brush-tailed Phascogales were recorded within the Proposal Area during the recent strip-sampling phases while a further five were recorded in adjacent areas.[165]

The proponent's *Updated Referral Document* states that 'While the regional extent of BTP habitat has not been modelled, the local extent of BTP habitat within a five km radius of the Proposal has been estimated at 4,791 ha' and refers to 4,705 ha in another section.[166]

The proponent advised that the extent of phascogale habitat within five km of the development envelope was modelled at 4,705 ha, and that 'this quantitative modelled correlation based on known habitat associations represents a commonly used and appropriate method for determining potential impacts at a regional scale'.[167]

In the context of the above, the habitat within the development envelope represents about 0.82% to 0.83% of the estimated extent of suitable habitat within a five km radius.

[163] BORR IPT (2020d), Appendix A, Figure 18
[164] Biota Environmental Sciences Pty Ltd (2019a)
[165] Biota Environmental Sciences Pty Ltd (2020a)
[166] BORR IPT (2020d), page 114, Figure 22
[167] Proponent response to Appeal 045/21 (15/12/21), page 27

In its response to the appeals, the EPA advised that this direct impact is 'likely to be consistent with its objective [for] terrestrial fauna due to relatively small proportion the proposed clearing represents of the quantity of available habitat within 5 km'. The EPA advised that 'the linear shape of the development envelope and large home-ranges (>20 ha) means it's likely that no single home-range for phascogale would be cleared entirely, reducing the significance of the direct impacts to individuals'. The EPA also advised that the 'assessment of the proponent's minimisation measures and the relevant recommended conditions (4, 5 and 6) for ringtail possum therefore would also minimise impacts to phascogale from the proposal'.[168]

In relation to cumulative impacts, Report 1714 acknowledges the cumulative impacts on south-western brush-tailed phascogales from the combination of this proposal, the BORR Northern and Central Sections, and the Bussell Highway duplication as a combined total of 56.9 ha of habitat loss.[169]

3.2.4.2 Proposed mitigation measures

Report 1714 states that since the proposal was referred the proponent has modified the development envelope to reduce the extent of clearing of fauna habitats. By these modifications, the proponent avoided 23.8 ha of south-western brush-tailed phascogale habitat,[170] compared with the proposal as initially referred.

The proponent has proposed a number of measures to minimise, mitigate and monitor the identified direct and indirect impacts to south-western brush-tailed phascogales. These are set out in the proponent's *Updated Referral Document*[171] and *Fauna Action Management Plan*,[172] and are reflected in Report 1714 (page 9).

These measures include the development of plans and procedures, many of which would form part of the proponent's CEMP, to address specific threats to fauna habitats (refer Table 11). In addition, the EPA has recommended conditions 1, 4, 5, 6 and 9 (noting the alignment with western ringtail possums) to manage residual impacts on south-western brush-tailed phascogales (the recommended conditions are considered in Section 3.11).

Having assessed the impacts and with regard for the proponent's mitigation measures, the EPA's assessment finding for direct impacts to 39.2 ha of south-western brush-tailed phascogale habitat was that 'Significant residual impacts are likely to be able to be regulated through reasonable conditions and counterbalanced by offsets so the environmental outcome is likely to be consistent with the EPA's objective for terrestrial fauna'.

Discussion

From the appeals, the proponent's information, the EPA's assessment and published literature, we agree with the EPA's conclusion that the proposal would result in a significant residual impact to south-western brush-tailed phascogales from the loss of 39.2 ha of habitat.

Through its assessment, the EPA has recognised the existing threats, pressures and cumulative impacts to south-western brush-tailed phascogales that have resulted in its 'Conservation Dependent' status.

[168] EPA response to Appeal 045/21 (07/01/22), pages 14-15
[169] Environmental Protection Authority (2021a), pages 19-20
[170] Derived from: BORR IPT (2020d), page 141, and BORR IPT (2021b), page 7
[171] BORR IPT (2020d), pages 141-143, and Tables ES-1 and 6-2
[172] BORR IPT (2021c)

We note the close alignment of south-western brush-tailed phascogale habitat with western ringtail possum habitat, insofar as both species are arboreal, and require canopy and suitable tree hollows. We accept the EPA's conclusion that fragmentation impacts to these species are also closely aligned, and agree that the proponent's minimisation and mitigation measures for western ringtail possums are also relevant for south-western brush-tailed phascogales.

The extent to which these impacts can be adequately mitigated and counterbalanced through conditions, consistent with the EPA's objective for fauna is considered in Section 3.11.

3.2.5 Other fauna

In summary, the appellants submitted that:

- the EPA did not adequately assess the full range of potential impacts to fauna, including light and noise pollution affecting feeding, mating and sleeping
- there is no mention of the impact on the south-western snake-necked turtle, which has been observed in the development envelope
- the EPA has not considered impacts to insect populations from pesticides, habitat loss and light pollution; this could lead to reduced pollination and a collapse in the food chain
- disruption from traffic movements, pollution and noise would result in decreased local fauna diversity and density; in particular road noise detrimentally affects native bird species
- there is a lack of surveys and studies for invertebrate composition and conservation status in wetlands areas
- many native bird species are territorial, sedentary, and would not be able to relocate; birds have a function in insect control and pollination
- some 711 habitat trees are being cleared for the BORR Northern and Central Sections; the overall BORR footprint would constitute a negative cumulative impact on birds
- the EPA and the proponent have ignored available evidence regarding the local extinction of threatened species in the Gelorup Corridor portion of the development envelope if their habitat is not protected
- it should be mandatory for Government representatives to visit areas proposed to be cleared; decisions shouldn't be based on desktop studies.

In relation to impacts on wildlife from light and noise, the proponent's *Updated Referral Document* acknowledges that there is potential for 'death or displacement of individual fauna' through 'traffic noise exposure' and 'light spill' from street lighting and headlights (among other things).[173]

The proponent's *Updated Referral Document*[174] and response to the appeals[175] indicate that a number of mitigation measures would be applied to minimise impacts of noise and light on residents (refer Section 3.5). We consider that these measures are also likely to assist in limiting the effects on wildlife utilising adjacent vegetation in the locations where the treatments are applied.

In relation to the south-western snake-necked turtle, this species is listed as 'near threatened' ('close to the threatened thresholds or that would be threatened without ongoing conservation measures') on the *IUCN Red List of Threatened Species*.[176]

[173] Proponent response to Appeal 045/21 (13/12/21), Table ES-1
[174] BORR IPT (2020d), pages 173 and 176
[175] Proponent response to Appeal 045/21 (13/12/21), pages 36-37
[176] International Union for Conservation of Nature (2022)

This species is found from the Hill River region (about 300 km north of Perth) through to the south west and east along to the south coast (as far as the Fitzgerald River National Park), and lives in a broad range of seasonal and permanent freshwater habitats including wetlands, lakes and rivers. Threats to local populations may include injury by traffic, predation by foxes, fencing that blocks migrations, illegal fishing by humans, and destruction of natural habitat.[177]

The 2020 targeted aquatic fauna survey recorded multiple south-western snake-necked turtle in November 2018, including mature males and females as well as juveniles.[178] The proponent's *Updated Referral Document* states that up to 11 individuals were recorded in wetlands within the development envelope.[179]

The proponent advised that the MUW at the northern end of the development envelope in which the south-western snake-necked turtle was recorded would be impacted in part by the proposal, but would retain hydrological connectivity by the planned installation of culverts at the road crossing site.[180]

In relation to endemism and extinction, the proponent acknowledged that the development envelope contains environmental values that would be impacted by the proposal, however contended that there is no evidence that these individuals represent ecologically significant sub-populations of their species. The proponent advised that it has conducted all surveys and assessments of impacts required for assessment by the EPA.[181]

In relation to desktop studies and site visitation, the proponent advised that representatives of the EPA Board, EPA Services, DBCA and itself visited the development envelope in March 2021, including walking part of the south-western portion of the development envelope. The proponent advised that desktop studies are conducted as the first phase of survey work to inform the subsequent field assessment, and that detailed field assessments were conducted for all relevant aspects of the proposal.[182]

In relation to impacts to non-threatened terrestrial and aquatic fauna, the EPA explained their assessment in this manner:

> [The EPA] acknowledges it did not explicitly consider impacts to all non-threatened fauna. However, the EPA did consider the impacts to habitats and habitat values on which these other fauna species rely, and how the proposal may potentially impact and/or change these habitats and values. The EPA considers that assessing impacts at a habitat scale serves as an appropriate proxy to the species that rely on that habitat. The EPA therefore considers the other fauna species were implicitly assessed, with reasonable conditions applied to ensure the proposal would meet the objective for Terrestrial Fauna and that the extent of its assessment to be appropriate.[183]

By its assessment the EPA has determined that impacts to non-threatened terrestrial and aquatic fauna are, by proxy, considered generally in its assessment of impacts on conservation-significant terrestrial and aquatic fauna and their habitats. Further, the EPA considers that by managing impacts to threatened species and their habitats, the habitats of other species are likewise protected by default.

[177] Department of Water and Environmental Regulation (2022b)
[178] Wetland Research & Monitoring (2020), page 17
[179] BORR IPT (2020d), page 115
[180] Proponent response to Appeal 045/21 (15/12/21), pages 27-28
[181] Proponent response to Appeal 045/21 (15/12/21), pages 27-28
[182] Proponent response to Appeal 045/21 (15/12/21), pages 27-28
[183] EPA response to Appeal 045/21 (07/01/22), pages 15-16

From the proponent's information we note that 60.9 ha of the 71.5 ha of the native vegetation within the development envelope constitutes habitat for western ringtail possums, black cockatoos and south-western brush-tailed phascogales (and riparian vegetation relevant to the maintenance of aquatic habitat for black-stripe minnows).

This habitat for conservation-significant fauna species is undoubtedly also home for a wide range of other native fauna. We understand that the balance comprises scattered trees, is parkland cleared, and/or is in completely degraded condition with limited value for fauna.

From the above, we consider the EPA's view, that the assessment of impacts and application of management controls in relation to conservation significant fauna is also relevant for non-threatened fauna utilising the same habitats, to be reasonable.

3.3 Did the EPA have adequate regard for flora and vegetation?

The appellants are of the view that the EPA has not considered the Gelorup Corridor portion of the development envelope as a whole ecological entity, has not had proper holistic regard for the biodiversity and social (heritage) values, and has not considered the full suite of connections and interactions between environmental elements (with reference to mycorrhizal networks, micro-habitats and symbiotic relationships).

The appellants contended that the proposal would further fragment occurrences of the 'Banksia woodlands on the Swan Coastal Plain' (Banksia Woodlands) ecological community, the 'Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain' (Tuart Woodlands) ecological community, and the 'Southern Swan Coastal Plain *Eucalyptus gomphocephala* - *Agonis flexuosa* woodlands (floristic community type 25)' (Tuart-Peppermint Woodlands) ecological community, putting the remaining patches at risk of edge effects and pushing the ecological communities towards tipping point.

The appellants raised concerns about the loss of 1,088 habitat trees, that the overall number of trees to be cleared has been underestimated and is around 3,000 and that their proposed clearing is contrary to the EPA's recommendation that the proposal is not attributable to the direct or indirect impacts to significant trees. Some appellants also raised concern about the EPA's consideration of impacts to orchid species, the adequacy (timing) of flora and vegetation surveys, and the clearing of an area of revegetation largely funded by the National Landcare Program.

The EPA assessed impacts on flora and vegetation

Our conclusion is that the EPA has recognised the existing threats, pressures and cumulative impacts to conservation-significant ecological communities impacted by the proposal that have resulted in their respective conservation statuses, and has also had regard for orchids, mycorrhizal networks and non-threatened flora in the context of key habitats, indirect impacts, and cumulative impacts. We consider that the EPA's identification and assessment of the direct and indirect impacts from the proposal on flora and vegetation (subject to recommended conditions to address gaps in the information) is satisfactory, and has had regard for the mitigation hierarchy, relevant Commonwealth conservation advice and other regulatory processes.

We consider that the EPA's conclusion that the residual impacts can be managed through the proponent's mitigation measures and the recommended conditions, as well as other statutory processes, to meet its objective for the environmental factor flora and vegetation is reasonable and justified. We explain our reasoning below.

3.3.1 Ecological communities

In summary, the appellants submitted that:

- banksia woodlands have been decimated by clearing; the loss of 23.4 ha of the Banksia Woodlands ecological community is a major loss and past its tipping point
- if areas of tuart woodlands are cut down, then the remaining small pockets are subject to further environmental pressures including weeds and edge effect
- the EPA's conclusion that the impact to the Banksia Woodlands ecological community can be regulated and offset such that the likely environmental outcomes are 'small incremental losses to the extent … relative to their respective remaining extents' is an incorrect argument
- the EPA has incorrectly referred to the Banksia Woodlands and Tuart Woodlands ecological communities as priority ecological communities (PECs); they are threatened ecological communities (TECs) under the EPBC Act
- further information/evaluation is required to inform the assessment: to support the proponent's claims that the mitigation measures to address fragmented ecological communities would be effective
- further information/evaluation is required to inform the assessment: dieback and weed control procedures (including machinery washdown procedures, containment mechanisms for contamination, pesticides); weeds are a major issue on roadsides
- the EPA has not adequately assessed the indirect impacts from edge effects, including changes in water quality from run-off and pollution.

3.3.1.1 State of knowledge

Vegetation extent and types

The EPA's *Environmental Guidance for Planning and Development* sets out that to protect biodiversity, ecological communities should be maintained above 30% of their original extent in a bioregion[184], and above 10% in constrained areas (for example a Region Scheme) on the Swan Coastal Plain.[185] The proposal is on the boundary of the GBRS constrained area. The EPA advised that for this proposal it considered how impacts on ecological communities or vegetation complexes that have less than 10% remaining were avoided and minimised.[186]

The development envelope traverses three broad vegetation associations and four vegetation complexes (Table 8). Noting the spatial extents of each, the proposal would not result in any falling below the 10% threshold.

Table 8 *Vegetation extent statistics*

Broad scale vegetation mapping	Current extent in bioregion[187]		Estimated extent within development envelope (ha)[188]	Estimated extent post-construction (%)
	(ha)	(%)		
Association 6	13,362	23.72	~38.3	~23.6
Association 998	18,492	36.35	~3.2	~36.3

[184] https://www.awe.gov.au/agriculture-land/land/nrs/science/ibra/australias-bioregions-maps
[185] Environmental Protection Authority (2008), pages 4,
[186] EPA response to Appeal 045/21 (07/01/22), page 39
[187] Government of Western Australia (2019a); Government of Western Australia (2019b)
[188] BORR IPT (2020d), page 77; with estimated reduction to account for subsequent refinements

Broad scale vegetation mapping	Current extent in bioregion[187]		Estimated extent within development envelope (ha)[188]	Estimated extent post-construction (%)
	(ha)	(%)		
Association 1000	24,869	26.41	~30	~26.4
Karrakatta Complex – Central and South	12,467	23.49	~38.3	~23.4
Yoongarillup Complex	10,018	35.81	~2.7	~35.8
Southern River Complex	10,832	18.43	~7.3	~18.4
Bassendean Complex – Central and South	23,508	26.87	~23.2	~26.8

The proponent's information[189] describes 10 vegetation types within the development envelope, of which about 28% is in 'good' or better condition[190]. These include vegetation that is representative of the following ecological communities:

- the Banksia Woodlands ecological community is listed as a 'Priority 3(i)' PEC by DBCA, and as a component of the 'Endangered' TEC of the same name under the EPBC Act
- the Tuart Woodlands ecological community is listed as a 'Priority 3(iii)' PEC by DBCA, and as a component of the 'Critically Endangered' TEC of the same name under the EPBC Act
- the Tuart-Peppermint Woodlands ecological community is listed as a 'Priority 3(iii)' PEC by DBCA, and can be a component of either the Banksia Woodlands TEC or the Tuart Woodlands TEC under the EPBC Act.[191]

We note that the references in the proponent's documents, and the requirement for offsets set out in the recommended conditions, indicate that the Tuart-Peppermint Woodlands PEC is considered to be part of the Tuart Woodlands TEC for this proposal.

In Report 1714 the EPA has referred to these three ecological communities by their State-listed PEC conservation status. The EPA has recognised that the Banksia Woodlands PEC and Tuart Woodlands PEC are also TECs under the EPBC Act and are considered matters of national significance for Commonwealth assessment.[192] The EPA further advised:

> The State listing for the Banksia Woodlands and the Tuart Woodlands (that is, the community description, area, and condition thresholds) has been aligned to match those prescribed for these communities under the EPBC Act. The EPA has considered the State PEC and Commonwealth TEC as the same community for the purposes of this assessment.[193]

For ease of reference, and noting that the occurrences of Tuart Woodlands PEC and Tuart-Peppermint Woodlands PEC within the development envelope largely overlap, our discussion will herein refer to the Banksia Woodlands TEC and the Tuart Woodlands TEC (rather than as three PECs).

Thus, the impact of the proposal on TECs listed under the EPBC Act is 23.4 ha of the Banksia Woodlands TEC and 4.5 ha of the Tuart Woodlands TEC.

[189] BORR IPT (2019c); BORR IPT (2020e); BORR IPT (2020d)
[190] As per the scale described by Keighery, B.J. (1994) and adapted by Environmental Protection Authority (2016)
[191] Department of Biodiversity, Conservation and Attractions (2021d)
[192] Environmental Protection Authority (2021a), page 24
[193] EPA response to Appeal 045/21 (07/01/22), page 19

Threatening processes

The Commonwealth conservation advice for the Banksia Woodlands TEC[194] and Tuart Woodlands TEC[195] describe the primary threats and key threatening processes on these:

- Banksia Woodlands TEC: clearing and fragmentation (urban developments, uncontrolled vehicle access, wildflower and seed harvesting, agriculture and horticulture, and mining for basic raw materials and mineral/ silica sands that involve clearing and hydrological impacts); dieback diseases (in particular *Phytophthora* species); invasive species; fire regime change (increased fire frequency, prescribed burning in late autumn to late spring during active plant growth, flowering and seed development); hydrological degradation (groundwater abstraction, eutrophication, soil acidification); climate change (increasing temperatures, declining rainfall, changing rainfall timing); grazing (including overabundance of kangaroos particularly in peri-urban reserves); decline in pollinating and seed dispersing fauna; loss of keystone *Banksia* species and fragmenting of nectar/ pollen nutritional networks (for example loss of *Banksia ilicifolia* from water drawdown)
- Tuart Woodlands TEC: clearing and fragmentation (associated with agriculture and grazing, logging and timber removal, urban development and infrastructure, and mining and quarrying); invasive flora and fauna impact on biodiversity (weeds, invasive vertebrate/ invertebrate animals); tree dieback and pathogens; altered fire regimes; climate change (loss of climatic habitat caused by anthropogenic emissions of greenhouse gases); water extraction and other hydrological change; and loss of fauna supporting key ecological processes (predation, habitat degradation, competition and disease transmission by feral pigs; predation by feral cats; predation by European red fox; competition and land degradation by rabbits).

Clearing and fragmentation

The Banksia Woodlands TEC has undergone a decline of about 60% in its extent since European settlement, and almost all of that remaining occurs as highly fragmented patches less than 10 ha in size; it is estimated that about 336,489 ha remained in 2015, in over 12,000 patches with the median patch size being 1.6 ha (compared with 132 patches with the median patch size of 146 ha previously).[196] The proponent's information indicates that there are more than 700 occurrences[197] and more than 4,600 ha[198] of the Banksia Woodlands TEC within five km of the surveyed area.

The Tuart Woodlands TEC has undergone a decline of about 85% in its extent since European settlement; it is estimated that about 17,000 ha remained in 2015 (compared with about 125,400 ha previously).[199] The proponent's *Vegetation and Flora Study* indicates that there are more than 120 occurrences of the Tuart Woodlands TEC within five km of the surveyed area.[200]

The locations and extents of the Banksia Woodlands TEC and Tuart Woodlands TEC within and adjacent to the proposal are indicated in Figure 14.

[194] Department of the Environment and Energy (2016a)
[195] Department of the Environment and Energy (2019a)
[196] Department of the Environment and Energy (2016b)
[197] BORR IPT (2020e)
[198] BORR IPT (2020d), page 63
[199] Department of the Environment and Energy (2019b)
[200] BORR IPT (2020e)

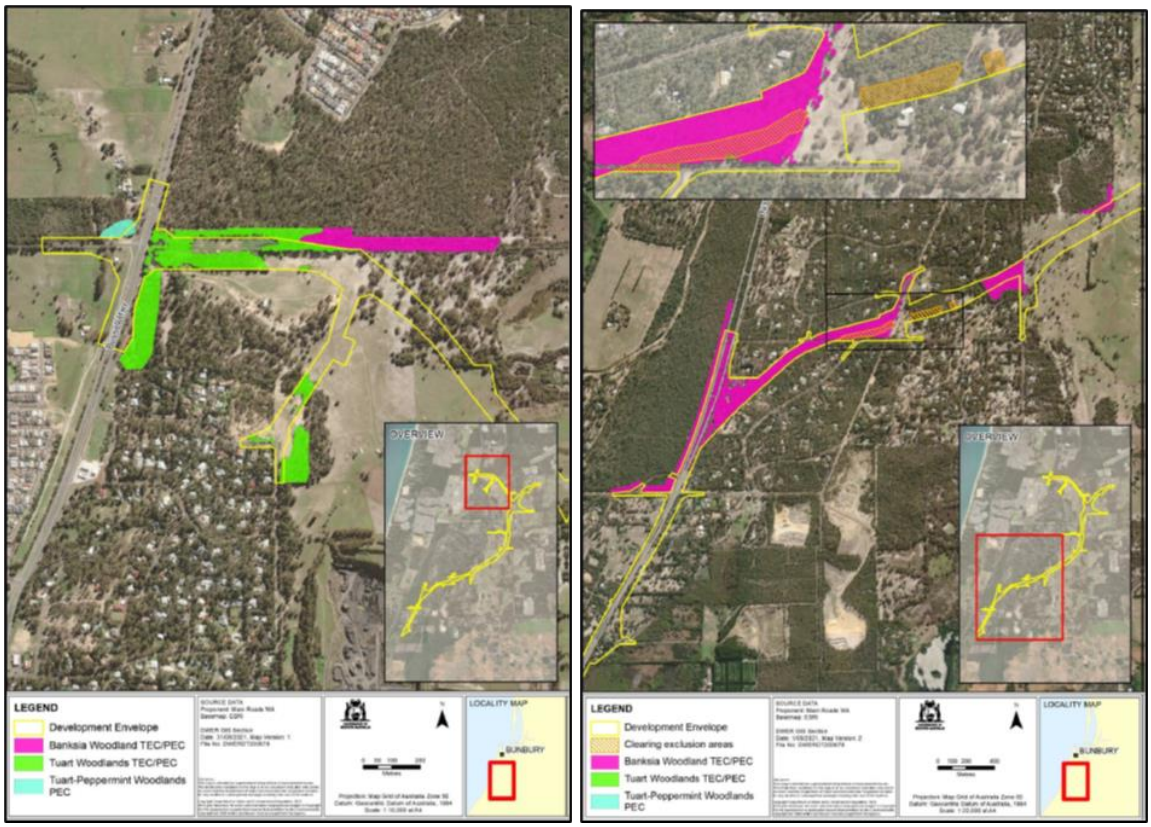

Figure 14 *Extents of Banksia Woodlands TEC (pink shading) and Tuart Woodlands TEC (green and light blue shading) within the development envelope (yellow line)*[201]

The proponent advised that the removal of 23.4 ha of Banksia Woodland TEC and 4.5 ha of Tuart Woodland TEC represents 0.007% and 0.03% of the respective remaining extents, and considered this to be insufficient impact to result in the extinction of these communities.[202]

The proponent's *Updated Referral Document* indicates that fragmentation of these TECs is not expected, on the basis that the proposal is not expected to remove either TEC to an extent that the remaining (adjacent) vegetation is no longer representative of those TECs.[203]

The EPA noted the appellants' concerns about the potential for fragmentation of the Banksia Woodlands ecological community as a result of the proposal. The EPA considered that:

> [T]he remaining extent of the patches outside the development envelope will continue to meet the conservation criteria to still be considered part of the Banksia Woodlands, as outlined in the *EPBC Act Approved Conservation Advice* (TSSC 2016). Fragmentation will not occur at the remaining patch as vegetation loss occurs along the edge of the consolidated area.[204]

In relation to cumulative impacts, the combined impacts of this proposal, the BORR Northern and Central Sections, and the Bussell Highway duplication on the Banksia Woodlands TEC is 27.1 ha of clearing, and on Tuart Woodlands TEC is 6.5 ha of clearing.[205]

[201] Environmental Protection Authority (2021a), Figures 4a and 4b
[202] Proponent response to Appeal 045/21 (15/12/21), page 14
[203] BORR IPT (2020d), pages 69, 72 and 74
[204] EPA response to Appeal 045/21 (07/01/22), page 18
[205] Derived from: Environmental Protection Authority (2020a), Environmental Protection Authority (2021a) and https://ftp.dwer.wa.gov.au/permit/9168/

Hydrological changes

The proponent's *Updated Referral Document* outlines potential indirect impacts to retained adjacent TECs, including alteration of existing flow paths which has the potential to negatively impact the hydrological regime (most notably drying) of TEC occurrences. The Document goes on to state that implementation of the *Drainage Strategy* and mitigation actions would maintain existing drainage patterns to adjacent TEC vegetation.[206]

In a letter to EPA Services dated 2 December 2020, DBCA advised:

> Plant stress through hydrological change adjacent to cuttings may be an issue with the Tuart/Banksia TECs. Without demarcated areas of trees that can have repeat visits, there is no baseline to compare plant stress. Establishing monitoring transects in these areas so that both understory and tree stress can be observed, adjacent to and away from the cuttings, will provide a better indication of hydrological plant stress than the proposed limited visual assessments ... Visual assessments may be relevant within the monitoring transects as they have repeatable areas where plant stress can be observed (albeit understory centred), however it is of limited value outside of the transects.
>
> The potential indirect impacts details in the referral document does not mention the potential for changes in surface hydrology caused by road cuttings. The document refers to the creation of a "significant cutting" in the Centenary Road area. It is also understood that another cutting is proposed at the southern extent of the works, near the connection to Bussell Highway. Soil profiles exposed by cuttings will have altered soil moistures (i.e. more rapid seasonal drying), which may impact the fringing remnant vegetation, that is comprised on Banksia and Tuart TEC.[207]

The EPA advised that its assessment had regard for changes to vegetation structure and floristic composition, particularly in road cuttings, through alteration of hydrological processes, in the context of indirect impacts on conservation significant flora and vegetation within 20 m of the development envelope. The EPA considered that the proponent's *Vegetation Monitoring Plan*[208] mitigates these indirect impacts.[209]

The EPA's recommended condition 3 requires the proponent to ensure that there are no project-attributable indirect impacts to the TECs (compared with the pre-construction baseline environment) within 20 m of the development envelope or within the identified clearing exclusion areas.

Weeds and dieback

The proponent's *Updated Referral Document* notes the increased risks of spread and/or introduction of weeds and dieback during construction works as potential indirect impacts to retained adjacent TECs.[210]

The EPA advised that it considered the likely indirect impacts to conservation significant flora and vegetation within 20 m of the development envelope from the introduction and spread of weeds and disease, including dieback. The EPA considered that the proponent's *Vegetation Monitoring Plan* and *Hygiene Management Plan* would mitigate these indirect impacts.[211]

[206] BORR IPT (2020d), pages 70, 72 and 74
[207] Department of Biodiversity, Conservation and Attractions (2020)
[208] BORR IPT (2021e)
[209] EPA response to Appeal 045/21 (07/01/22), pages 18-19
[210] BORR IPT (2020d), pages 69, 71 and 74
[211] EPA response to Appeal 045/21 (07/01/22), pages 18-19

Discussion

From the above, the EPA has recognised the existing threats, pressures and cumulative impacts to ecological communities that have resulted in their State-listed PEC / Commonwealth-listed TEC status. The EPA assessed the likely residual impacts of the proposal on these ecological communities as the loss of 23.4 ha of the Banksia Woodlands TEC and 4.5 ha of the Tuart Woodlands TEC (comprising 4.4 ha of Tuart Woodlands PEC, and 4.5 ha of the Tuart-Peppermint Woodlands PEC). We note that the EPA has also had consideration for cumulative impacts on these ecological communities.

We consider that the EPA's identification and assessment of the direct and indirect impacts from the proposal on TECs is satisfactory, and has had regard for the mitigation hierarchy, relevant Commonwealth conservation advice and other regulatory processes.

3.3.1.2 Proposed mitigation measures

Report 1714 states that since the proposal was referred the proponent has modified the development envelope to reduce the extent of clearing of flora and vegetation. By these modifications, the proponent avoided 26.5 ha of native vegetation (including about six ha of riparian vegetation), 3.2 ha of the Banksia Woodlands TEC and 0.5 ha of the Tuart Woodlands TEC,[212] compared with the proposal as initially referred.

The proponent has proposed a number of measures to minimise, mitigate and monitor the identified direct and indirect impacts to PECs/TECs (as well as flora and vegetation generally). These are set out in the proponent's *Updated Referral Document*[213] and *Vegetation Monitoring Plan*,[214] and are reflected in Report 1714 (page 27).

These measures include the development of plans and procedures, many of which would form part of the proponent's CEMP, to address specific threats to flora and vegetation (refer Table 11). In addition, the EPA has recommended conditions 1, 3 and 9 to manage residual impacts on TECs and vegetation generally (the recommended conditions are considered in Section 3.11).

The proponent advised that these measures are a combination of those included in its Standard Scope of Work and Technical Criteria and those formulated in consideration of the specific TEC occurrences that would remain after proposal implementation, and expects that these actions would sufficiently manage any indirect impacts resulting from proposal implementation. The proponent also advised that a drainage monitoring program for TEC vegetation adjacent to the development envelope would be conducted in conjunction with the *Vegetation Monitoring Plan*, and that risks of erosion, sedimentation and spills of hazardous chemicals during operation would be managed through drainage design: erosion control would be applied at drainage discharge points, and detention/ infiltration basins where there is potential for discharge/ hazardous spills into major waterways.[215]

The proponent also proposes to revegetate areas within the development envelope that are disturbed during construction but not required for road infrastructure.

[212] Derived from: BORR IPT (2020d), page 67, and BORR IPT (2021b), page 7
[213] BORR IPT (2020d), pages 87-88 (vegetation), pages 88-89 (flora), pages 89-97 (ecological communities), and Tables ES-1 and 6-2
[214] BORR IPT (2021e)
[215] Proponent response to Appeal 045/21 (15/12/21), page 14

The EPA noted that the proponent would need to comply with regulations to manage declared weeds present on the site in accordance with the *Biosecurity and Agricultural Management Act 2007* and comply with any further approvals, permits and licenses under the *Biodiversity Conservation Act 2016*.

Discussion

Many appellants were concerned about the potential for impacts on TECs and other vegetation adjacent to the development envelope from weeds, disease and other threats, and questioned how these would be managed.

The proponent's *Vegetation Monitoring Plan* states 'The monitoring program has designed to enable the detection of a decline in vegetation condition using species composition and vegetation health attributes as measurement parameters'.[216] From the figures included in the Plan 'monitoring and reference sites', we understand that in the vicinity of the Gelorup Corridor the monitoring would occur adjacent to the development envelope on Lot 10 on Plan 419261 on Marchetti Road east of Yalinda Drive, in Jilley Road reserve north of Woods Road, and along the western side of Bussell Highway on Reserve 23000.

In relation to a reportable decline in TEC vegetation health (that is, 'where monitoring shows a 20 per cent decline in the species composition and/or health/stress attributes' for 2-3 years post-construction), the *Vegetation Monitoring Plan* sets out the following contingency actions:

- review hydrological monitoring to confirm whether any incidents have occurred; if incidents have occurred, review these to determine their nature and extent and whether they could have impacted the sampling sites; implement hydrological contingency actions
- if there have been no environmental incidents recorded / occurred, assess monitoring sites and their adjacent area for evidence of other impacts, such as erosion or sedimentation, dumping of waste, dust accumulation on vegetation or an increase in weed species; assess these impacts to determine whether they are likely to be sourced from the proposal (for example whether erosion extends from the proposal boundary into the TECs or is there evidence of alternative pathways)
- report findings to EPA/DBCA and implement management actions if impacts attributable to the proposal are detected
- monitor effectiveness of management actions and recovery of TECs; update / revise management measure if needed (impact persists despite management actions).[217]

In addition to the above, the EPA's recommended condition 3 requires the proponent to ensure that there are no project-attributable indirect impacts to TECs (compared with the pre-construction baseline environment) within 20 m of the development envelope or within the identified clearing exclusion areas. We consider that in implementing its *Vegetation Monitoring Plan* and meeting the requirements of recommended condition 3, the proponent will be able to address any changes in adjacent vegetation caused by the proposal.

By Report 1714 and its response to the appeals, the EPA maintained its view that the proponent's mitigation measures in combination with the recommended conditions relevant to TECs and vegetation generally would ensure that implementation of the proposal could be undertaken in a manner that would meet its objective for flora and vegetation.

From the appeals, the proponent's information, the EPA's assessment and published literature, there is no dispute that the proposal would result in significant impacts to TECs and residual impacts on vegetation generally.

[216] BORR IPT (2021e)
[217] BORR IPT (2021e)

Through its assessment, and we accept, the EPA has recognised the existing threats, pressures and cumulative impacts to ecological communities that have resulted in their priority/threatened status, as well as to vegetation generally and concluded that the likely residual impacts of the proposal on TECs to be direct impact from the loss of 71.5 ha of native vegetation including 27.9 ha of TECs, including:

- direct impacts to 23.4 ha of the Banksia Woodlands TEC and 4.5 ha of the Tuart Woodlands TEC
- indirect impacts to flora and vegetation within 20 m of the development envelope as a result of changes to hydrological regimes, weeds and dieback.

We consider that the EPA's assessment of impacts on TECs is generally reasonable.

The matter of whether these impacts can be adequately mitigated and counterbalanced through conditions, consistent with the EPA's objective for flora and vegetation, is considered in Section 3.11.

3.3.2 Orchids

In summary, the appellants submitted that:

- the EPA ought to have assessed the removal of 104 *Caladenia speciosa* (Priority 4) as environmentally significant
- the EPA has not assessed impacts on a large population of the uncommon curled-tongue shell orchid (*Pterostylis rogersii*), which was not found during the proponent's flora surveys but was found by Dr Eddy Wajon while undertaking a tree survey.

In relation to *Caladenia speciosa*, the FloraBase website[218] indicates that this species is known from about 60 recorded populations (some records may overlap) from the local government areas of Bunbury, Busselton, Capel, Dandaragan, Dardanup, Gingin, Harvey, Murray, Toodyay, Victoria Plains, Wandering, Waroona. The Florabase website describes this species as a tuberous, perennial herb 0.35-0.6 m high, with white and pink flowers in September to October, growing in white, grey or black sand.

The proponent's 2020 flora and vegetation survey recorded up to 104 individuals in small populations in *Eucalyptus* / *Banksia* woodland within the south-western portion of the development envelope.[219] This is reflected in Report 1714 (page 23).

The proponent advised that the proposal would impact about 2.7% of the known population of *Caladenia speciosa*, and that it is likely that more individuals are present within suitable (unsurveyed) habitat outside the development envelope. The proponent also advised that it has been in discussions with the WA Native Orchid Study and Conservation Group regarding the salvage of orchids from the development envelope.[220]

In response to concerns about impacts on *Caladenia speciosa*, the EPA advised:

> Concern over the removal of 104 individuals of *Caladenia speciosa* was raised during the public review period and this was addressed by the proponent in its Response to Submissions. The EPA noted that 3 per cent of the known regional population was to be impacted by the proposal and that substantial habitat for this species remains within the vicinity of the proposal area. The EPA considered that due to the large remaining population and that the area to be impacted is not key habitat for the species, the EPA objective for flora and vegetation would be met.[221]

[218] Western Australian Herbarium (1998–)
[219] BORR IPT (2020e)
[220] Proponent response to Appeal 045/21 (15/12/21), page 15
[221] EPA response to Appeal 045/21 (07/01/22), page 17

In relation to *Pterostylis rogersii*, the FloraBase website[222] indicates that this species is known from about 55 recorded populations (some records may overlap) from the local government areas of Albany, Augusta Margaret River, Boyup Brook, Bridgetown-Greenbushes, Bunbury, Busselton, Capel, Denmark, Esperance, Manjimup, Ravensthorpe. The Florabase website describes this species as a tuberous, perennial herb 0.1-0.2 m high, with green, brown and pink flowers in June to July, growing in yellow-brown or black sand associated with coastal areas.

The proponent advised that this species was not recorded during the flora and vegetation surveys for the proposal.[223]

In response to concerns about impacts on *Pterostylis rogersii*, the EPA advised:

> The details and location of this population were not provided. Upon a review of this species, the EPA notes that it is known to grow in yellow-brown or black sand and in coastal areas (Western Australian Herbarium, 1998-). The species is not listed as a conservation significant species and has a wide distribution, occurring in Esperance Plains, Jarrah Forest, Swan Coastal Plain and Warren regions. Noting this, the EPA considers it unlikely that:
>
> - the proposal area is key habitat for the species; and,
> - the loss of these individuals would have a significant impact on the local or regional populations of the species.[224]

From the above, the EPA considers that the development envelope is not key habitat for either *Caladenia speciosa* and *Pterostylis rogersii*, and that the loss of reported individuals is not environmentally significant and does not warrant mitigation or offsetting.

In the context of the known range extents, number of populations, and habitat preferences of these species, we consider that the EPA's conclusion is reasonable.

3.3.3 Mycorrhizal network

In summary, the appellants submitted that:

- the EPA did not consider the presence and functions of the mycorrhizal networks, and the impacts to trees (including the 'Grey Giant' tuart tree) that could occur if this network is disturbed or severed.

The Australian National Herbarium[225] describes different types of mycorrhizas (fungi/plant root associations), and their ecology and roles in plant health. The website notes that at least 80% of plants form mycorrhizas, including the genera *Eucalyptus* and *Corymbia*, however 'many genera in the Proteaceae (which includes the widespread genera *Banksia*, *Grevillea* and *Hakea*) do not form mycorrhizas'.

From the appeals we understand that the 'Grey Giant' tuart tree is located about 40 m from the development envelope. We acknowledge that the root system of this tree is likely to be extensive, possibly extending more than 40 m in all directions. From the Australian National Herbarium website information, this tree is undoubtedly part of a mycorrhizal association.

[222] Western Australian Herbarium (1998–)
[223] Proponent response to Appeal 045/21 (15/12/21), page 15
[224] EPA response to Appeal 045/21 (07/01/22), page 33
[225] Australian National Botanic Gardens and Australian National Herbarium (2013)

The proponent advised that Pepe et al. (2018)[226] found that mycorrhizal networks are not dependent on the lifespan of their host plants and are able to persist beyond the death of their host plants. The proponent noted that while mycorrhizal fungi directly associated with the trees to be cleared are likely to be impacted, the broader soil network would persist.[227]

In response to this element of the appeals, the EPA advised the following:

> While the mycorrhizal network was not expressly considered in the EPA's assessment as an indirect impact, recommended condition 3 ensures that there will be no indirect impacts to flora and vegetation, contributing to meeting the EPA's objective for flora and vegetation.[228]

We consider that in implementing its *Vegetation Monitoring Plan* and meeting the requirements of recommended condition 3, the proponent would identify any changes in vegetation condition from the proposal (which would include any changes resulting from disturbance to mycorrhizas), and would be required to implement contingency actions to correct the impact.

3.3.4 Other flora and vegetation

In summary, the appellants submitted that:

- the 71.5 ha of native vegetation, which includes mature trees, threatened species and communities and an ecological corridor, should not be cleared
- the proposal intersects two South West Regional Ecological Linkages[229] (SWRELs), and severing these would negatively impact on the ecological integrity of remaining bushland
- the number of trees impacted by the proposal has been underestimated; a survey by Dr Eddy Wajon identified around 3,000 trees
- the mitigation measures do not address the broader suite of ecological factors (significance of habitat fragmentation, loss of genotypes, loss of ecological integrity, ecosystem resilience to climate change, risks from pollution from operation of the road, cumulative impacts of habitat loss)
- there is insufficient information on the dieback and weed control procedures, including machinery washdown procedures and methods for containing potentially dieback or weed seed contaminated water, and water pollution from pesticide use
- there is no mention of micro-habitats in Report 1714
- the flora and vegetation surveys were conducted out of season
- the proposal would impact on an area of revegetation, fencing, weed control, dieback interpretation works at Tuart Brook reserve on Centenary Avenue, largely funded by the Australian Government's National Landcare Program since 2015 for the benefit of western ringtail possums.

The proponent acknowledged the appellants' concerns regarding the environmental values present within the development envelope, including habitat for threatened species. The proponent noted that the Gelorup Corridor is part of a broader remnant within the Gelorup area, and advised that it does not contain 'critical' habitat for threatened fauna.[230]

[226] Pepe, A.G. (2018)
[227] Proponent response to Appeal 045/21 (15/12/21), page 14
[228] EPA response to Appeal 045/21 (07/01/22), pages 17-18
[229] As described in: Molloy, S., Wood, J., Hall, S., Wallrodt, S. and Whisson, G. (2009)
[230] Proponent response to Appeal 045/21 (15/12/21), page 9

The proponent's *Updated Referral Document* acknowledges that the proposal traverses the Dalyellup/ Gelorup/ Crooked Brook ecological linkage,[231] which is also recognised as a SWREL, as well as vegetation along road reserves, Five Mile Brook and associated with Gynudup Brook, which provide local ecological linkages that are likely to be used by fauna including conservation-significant species.[232]

The southern end of the development envelope and adjacent properties near Bussell Highway are part of a mapped SWREL that connects (largely by remnant vegetation on private properties, as well as Crown land parcels on Ducane Road) a north-south coastal linkage west of Reserve 23000 with a large area of State Forest near Dardanup. This SWREL would be traversed by the proposal.

The SWREL project was undertaken in 2009 to provide a response to the issues of fragmentation and climate change through the identification of regional-scale ecological linkages. The objective of the project was to support more effective recognition of ecological linkages in land use planning policy and procedures which would ultimately contribute to retention of native vegetation and fauna habitat, and reduce loss of biodiversity.[233]

The SWREL report states that 'while gaps in vegetation will, to some degree, compromise the capacity of flora and fauna species to persist, where the cleared gap between patches is <100 m those impacts will be limited in that such a gap does not bring about a significant barrier to the dispersal of many fauna species, seed and other genetic materials'.[234]

In this case, the proposal would create a gap of about 70 m (being the width of the gazetted road reserve at the location of the SWREL) from one side of the development envelope to the other; we understand that the advice in the SWREL report is based on cleared land, and does not take into account the additional complexities presented by a road in that gap.

The proponent's *Supplementary Information Document* indicates that in the vicinity of the SWREL and upper reaches of the Gynudup Brook catchment a fauna underpass (box) and an over-road rope bridge are proposed, and in the vicinity of Five Mile Brook two fauna rope bridges are proposed for the main alignment and a dual-use culvert at the Jilley Road crossing.[235]

By its assessment, the EPA is satisfied that the functionality of this SWREL and other linkages impacted by the proposal would be maintained though the proposed fauna crossings.

In relation to the number of trees within the development envelope, we acknowledge the appellants' view that there could be around 3,000 trees impacted.

The proponent's *Updated Referral Document*, flora and vegetation surveys, and fauna surveys, recognise that a large number of trees of different species would be impacted by the proposal, however do not specify a count for these. The EPA's assessment considered a sub-set of habitat trees with DBH >500 mm in the context of being of sufficient size to contain or develop suitable hollows for use by black cockatoos as breeding habitat.

[231] As described in: Environmental Protection Authority (2000)
[232] BORR IPT (2020d), page 103
[233] Molloy, S., Wood, J., Hall, S., Wallrodt, S. and Whisson, G. (2009)
[234] Molloy, S., Wood, J., Hall, S., Wallrodt, S. and Whisson, G. (2009)
[235] BORR IPT (2021b)

In response to the appellants' concerns generally, the EPA advised that it has considered measures proposed by the proponent to minimise impacts on flora and vegetation (Report 1714, page 27), and noted that the proponent would also need to comply with declared weed requirements of the *Biosecurity and Agricultural Management Act 2007* and any approvals required under the *Biodiversity Conservation Act 2016*. The EPA further advised:

> Cumulative impacts to flora and vegetation were given consideration in Section 2.2.8 of EPA's assessment report. In particular, the EPA assessed the residual impact to the Banksia Woodlands to be significant due to the cumulative impact on the community. The residual impact on this community aligns with the definition of significant residual impact which includes areas that are already defined as being critically impacted in a cumulative context (Government of Western Australia 2014) ... the proponent has proposed to offset the significant residual impact on this community to ensure the environmental outcome is likely to be consistent with the EPA objective.[236]

As previously outlined, the EPA also advised that its assessment had regard for changes to vegetation structure and floristic composition, particularly in road cuttings, through alteration of hydrological processes, in the context of indirect impacts on conservation significant flora and vegetation within 20 m of the development envelope. The EPA also considered that:

> [T]he proponent demonstrated the application of mitigation by preparing a Vegetation Monitoring Program and Hygiene Management Plan to manage potential indirect impacts. The EPA recognises the high environmental values adjacent to the development envelope and recommended condition 3 to ensure no project attributable indirect impacts would occur…[237]

Micro-habitats are not specifically mentioned in the proponent's information nor Report 1714, and it appears therefore that they were not considered by the EPA during its assessment.

We note that in relation to fauna, the EPA considered that impacts to non-threatened fauna are, by proxy, considered generally in its assessment of impacts on conservation-significant fauna and their habitats. Consistent with this, the EPA's assessment of vegetation and habitats more broadly, including for conservation-significant species and ecological communities, would likely have, by proxy, also considered impacts to micro-habitats.

In relation to survey timing, the proponent commissioned two flora and vegetation surveys within the development envelope as part of the referral. The first of these states that floristic diversity was assessed by combining floristic survey data from previous flora and vegetation surveys in the area[238] with a field component undertaken in August and September 2018.[239] The second survey considered a refined development envelope, and supplemented the first survey with a field component undertaken in September 2019.[240]

The EPA's technical guidance for flora and vegetation surveys describes the optimal time for primary survey within the south-west and interzone botanical provinces to be during spring (September to November), with supplementary survey after autumn rains.[241] The proponent's flora and vegetation surveys for the proposal are consistent with the EPA's guidance.

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[236] EPA response to Appeal 045/21 (07/01/22), page 20
[237] EPA response to Appeal 045/21 (07/01/22), pages 18-19
[238] Stated as: GHD Pty Ltd (2014) with field component in June 2013, GHD Pty Ltd (2015) with field components in September 2011 and June 2014, Biota Environmental Sciences Pty Ltd (2016) with field component in October 2016, Biota Environmental Sciences Pty Ltd (2018) with field component in November 2017, Ecoedge Environmental Pty Ltd (2017) with field component in November 2016, Ecoedge Environmental Pty Ltd (2019a) with field undertaken in November 2019, and Ecoedge Environmental Pty Ltd (2019b).
[239] BORR IPT (2019c) *Bunbury Outer Ring Road Southern Section Vegetation and Flora Study September 2019*. Rev B, 13/09/19. Report prepared for Main Roads Western Australia.
[240] BORR IPT (2020e)
[241] Environmental Protection Authority (2016), page 15

In relation to impacts on funded revegetation, the proponent's *Updated Referral Document* indicates that the proposal would impact on up to 1 ha of revegetation/ regrowth. We understand from Report 1714 that this area has been included in the EPA's assessment.

3.4 Did the EPA have adequate regard for inland waters and water quality?

The appellants are of the view that the EPA has inappropriately based its recommendations on desktop information in the absence of current modelling and site-specific geotechnical and other investigations (groundwater abstraction, flooding, acid sulfate soils, hydrology, impacts on groundwater dependent ecosystems).

The appellants submitted that the EPA has not recommended management and mitigation measures for the full suite of construction impacts (acid sulfate soils, hazardous materials, contaminated stormwater, soil erosion, soil compaction), and that the mitigation measures described should also apply for operational impacts. The appellants submitted that the proponent failed to avoid impacts to Five Mile Brook (filling, engineering).

The appellants raised concerns that the EPA has not recommended buffers (200 m) to waterways consistent with the *Rights in Water and Irrigation Act 1914* (RIWI Act) and DWER's *Roads Near Sensitive Water Resources*[242], and has made no provision for vegetated median strips as biological filters for stormwater runoff consistent with recommendations in the *Stormwater Management Manual*[243]. The appellants also considered that the EPA's view that direct impacts to 'conservation category' wetlands (CCWs), 'resource enhanced' wetlands (REWs) and 'multiple use' wetlands (MUWs) can be justified with conditions is unacceptable.

The EPA assessed impacts on inland waters and water quality

Our conclusion is that the EPA has recognised the likely impacts on water quality generally, including in relation to CCWs, REWs, MUWs and Five Mile Brook. We consider that the EPA's identification and assessment of the direct and indirect impacts from the proposal on inland waters is satisfactory, and had regard for the mitigation hierarchy and other regulatory processes (for example the RIWI Act).

We also consider that the EPA's conclusion that the residual impacts on inland waters are not so significant as to render the proposal environmentally unacceptable, and can be managed, is reasonable and justified. We explain our reasoning below.

3.4.1 Groundwater and surface water

In summary, the appellants submitted that:

- the EPA's view that the impacts from operation of the road on surface water or groundwater quality as 'not likely to be significant' is inadequate, and its view that that impacts to wetlands (in particular CCWs) can be justified with conditions is unacceptable
- the EPA has not considered appropriate buffers to wetlands and waterway buffers, nor had adequate consideration of diminishing rainfall and its effects on hydrological flows and the health of groundwater dependent ecosystems (GDEs), nor considered the potential for decline in water quality
- the significance of the wetland impacts from the proposal has been downplayed especially in regard to residual impacts from dewatering for bridge constructions, clearing

[242] Department of Water (2006)
[243] Department of Water (2004)

of vegetation, groundwater abstraction (333 Megalitres per annum), and from the (unassessed) risks to aquatic invertebrate populations
- the EPA has not adequately assessed the risk to water and waterways from the use of the road and has only considered hydrological factors during construction; this is inadequate and based on incomplete geotechnical data
- further site-specific investigations, detailed design to identify potential swamp/lacustrine deposits and characterise soils, wetland surveys at an appropriate time of year (not when dry), and the location of bores, is needed
- water quality impacts could arise from poor pollution management controls, such as from soil contaminants and during groundwater abstraction, and these need to be considered along with potential impacts to public, occupational, and environmental health
- clarification is required on the management of stormwater; wetlands which act as receiving basins for large volumes of urban stormwater usually exhibit water quality problems which include large algal blooms, noxious odours
- further information/evaluation is required to inform the assessment: accurately delineate the ecology of the wetland areas; sampling of aquatic invertebrates to identify species of conservation significance; impacts of stormwater runoff; containment of wastewater; soil and water sampling (to ensure that soil contamination is safely managed and contaminated groundwater is not used for dust suppression and other operations).

3.4.1.1 State of knowledge

Groundwater

Groundwater areas

Report 1714 notes that the proposal is located within the Bunbury and Busselton-Capel Groundwater Areas proclaimed under the RIWI Act, and that some areas on the western side of the development envelope overlap the Bunbury Water Reserve Public Drinking Water Source Area (Priority 3).

The Department of Water (now DWER) published the Water Quality Protection Note (WQPN) *Roads Near Sensitive Water Resources* to guide the development of and provide design recommendations for roads (new or upgraded, sealed or unsealed) and associated drainage and bridge works that could affect sensitive water resources. This WQPN states 'Within Priority 3 (P3) areas, roads are compatible with this Department's source protection strategy provided best industry design and construction practice is followed'.[244]

Abstraction

The proponent's *Updated Referral Document* states that 'temporary impacts to surface and groundwater during construction will be managed through the CEMP', and that on this basis 'permanent change to groundwater regimes due to the proposal is considered unlikely'. In relation to the siting of abstraction bores, the Document states:

> The location of abstraction bores will be determined prior to commencement of construction and a licence application for dewatering bores will be submitted to DWER. Dewatering and water abstraction activities associated with construction will be temporary and impacts are likely to be spatially restricted and not significant.[245]

[244] Department of Water (2006), page 3
[245] BORR IPT (2020d), pages vii and 154

The EPA noted that the proponent would need to obtain a licence from DWER under the RIWI Act if dewatering, groundwater abstraction or bed and bank disturbance is required. The EPA advised that one of the objectives of the RIWI Act is to provide for the management of water resources, and in particular for the protection of their ecosystems and the environment in which water resources are situated, including by the regulation of activities detrimental to them.[246]

The proponent advised that it has applied to DWER for a groundwater abstraction licence under the RIWI Act to take 333 Megalitres per annum from the Leederville and Yarragadee aquifers for the purposes of dust suppression and other activities over a 36-month construction period. The proponent advised that it does not intend to locate bores close to potentially sensitive sites, for example Five Mile Brook, if there is a risk of drawdown effects on the waterway. The proponent also advised that it is currently investigating alternative sources of water to reduce (and potentially avoid) reliance on groundwater use for construction and dust suppression purposes.[247]

Groundwater dependent ecosystems

Report 1714 recognises that most of the adjacent wetlands and associated vegetation as having a moderate to high potential of being GDEs, predominately in areas associated with vegetated wetlands, and that there is a potential impact to vegetation structure / condition in surrounding GDEs from changes to hydrological regimes or groundwater levels from abstraction and/or compaction of the construction footprint.

In response to appeals on this matter, the EPA noted the proponent's proposed drainage design and mitigation measures, and the need for approval under the RIWI Act if dewatering, groundwater abstraction or bed and bank disturbance is required. Noting the above, the EPA advised that it 'did not deem further studies on what effects diminishing rainfall and climate change will impact hydrological flows and the health of GDEs and flood modelling to be required from the proponent'.[248]

Surface water

Geomorphic wetlands

Some appellants submitted that the importance of wetlands within the development envelope has been downplayed (with reference to the directive of the *Wetlands Conservation Policy for Western Australia*[249]).

The portion of the development envelope south-west of the intersection of Allenville Road and Lillydale Road is within the catchment area of Five Mile Brook.

The Revitalising Geographe Waterways website describes Five Mile Brook as follows:

> Five Mile Brook is the most northern waterway in the Geographe Catchment, located just south of Bunbury. It is a seasonal waterway, and its catchment lies entirely on the Swan Coastal Plain. The Creek flows directly into Geographe Bay at Minninup Beach. Water sampling by local school groups have found evidence of macroinvertebrates, tadpoles and long-necked turtles …
>
> Since 2000, the mean annual flow for Five Mile Creek is 5GL/yr of a total of 203GL/yr for the waterways of the Geographe catchment ...

[246] EPA response to Appeal 045/21 (07/01/22), pages 21-22
[247] Proponent response to Appeal 045/21 (15/12/21), page 30
[248] EPA response to Appeal 045/21 (07/01/22), page 23
[249] Government of Western Australia (1997)

> Five Mile Brook has poor water quality, likely resulting from a combination of poor soils which do not retain nutrients and intensive land uses in the catchment.
>
> The nutrient loads in Five Mile Brook are driven by intensive agricultural land-uses, with a high proportion of beef grazing in the catchment. Smaller contributions of nutrient loads are from dairy sheds, dairy grazing (fertiliser), septics, rural lifestyle and urban residential properties ...
>
> Due to the seasonal nature of this waterway there is limited data on which to assess water quality. Limited data shows phosphorus and nitrogen concentrations to be above water quality targets.
>
> The Five Mile Brook catchment is categorised as a 'recovery' catchment as waterways do not meet the nitrogen or phosphorus target established in the Water Quality Improvement Plan.[250]

The section of Five Mile Brook in the Gelorup area is mapped as CCW, REW and MUW; the proposal's main alignment traverses the portion mapped as MUW immediately adjacent/ upstream of the portion mapped as CCW (also identified as habitat for black-stripe minnows); the proposal's Jilley Road upgrade traverses the portion mapped as MUW further upstream.

The portion of the development envelope north-east of Ducane Road traverses extensive areas of MUWs, as well as some REWs.

Report 1714 recognises that several surface water features including two REWs, a CCW, and 13 MUWs, traverse the proposal area, and that Five Mile Brook contains important environmental values. The EPA identified that the proposal would impact on these wetlands, including through clearing of riparian vegetation, changes to hydrological regimes and water quality, and that the proponent has proposed measures to manage these impacts.

In relation to cumulative impacts, the combined impacts of this proposal, the BORR Northern and Central Sections, and the Bussell Highway duplication on geomorphic wetlands is 626.5 ha of clearing (comprising 3.13 ha CCWs, 2.17 ha REWs and ~621.2 ha MUWs).[251]

Buffers

Some appellants submitted that the EPA has not recommended buffers consistent with the RIWI Act or DWER's *Roads Near Sensitive Water Resources*, and has not required vegetated median strips as recommended in DWER's *Stormwater Management Manual*.

The proponent has committed to no storage or refuelling within 200 m of a natural watercourse or within 50 m of a CCW or REW; this is reflected in Report 1714. In response to the appeals, the proponent submitted that by definition in the RIWI Act wetlands are not watercourses and do not require a 200 m buffer.

The DPLH published *Draft guideline for the determination of wetland buffer requirements* to 'assist landowners, developers, planners and architects to identify an appropriate buffer between wetlands and land uses that will enhance or maintain the significant attributes and values of the wetland'.[252] This draft guideline sets out a detailed step-by-step process for determining appropriate separation distances to wetlands based on attributes and ecological function determined on a case-by-case basis.

[250] Revitalising Geographe Waterways (2018)
[251] Derived from: Environmental Protection Authority (2020a), Environmental Protection Authority (2021a) and https://ftp.dwer.wa.gov.au/permit/9168/
[252] Essential Environmental Services (2005)

For threats to CCWs, DPLH's draft guideline recommends a minimum 50 m separation and/or management distance for recreational uses and about 100 m separation distance for habitat modification, and site-specific works and regulation to manage water quality and hydrological regime. These distances are reduced to 10-50 m and about 50 m respectively for threats to REWs and MUWs. DPLH's draft guideline also recognises, however, that the recommended separation distances may not be achievable for previous land planning decisions. For this proposal, the GBRS alignment and adjacent semi-rural development would be limiting factors in this regard.

DWER's WQPN *Roads Near Sensitive Water Resources*[253] contains a number of recommendations for road design and construction (and operation), and specifies that 'Any road-works proposed within 200 metres of a sensitive water resource should be referred to this Department's regional office for assessment'. In this case, the proposal is within 200 m of watercourses and wetlands, and the proponent referred the proposal to the EPA for assessment.

DWER's *Stormwater Management Manual* describes different buffers for different adjacent landuses, for example a 50 m vegetated buffer is recommended between a fertilised lawn area and stormwater drains or waterbodies.[254] For this proposal, the proponent has committed to preparing a *Landscape Management Plan* 'to ensure that roadsides and medians will be vegetated and capable of acting as a biological filter for run-off to mitigate the risk of impact to adjacent vegetation'.[255]

Discussion

We note that there is some overlap/ relatedness between appellants' concerns regarding inland waters, terrestrial environmental quality and black-stripe minnow habitat, and suggest that this part of our report is considered in conjunction with Sections 3.2.3 and 3.6.

In relation to groundwater abstraction, we note that the siting of bores is yet to be confirmed. The proponent advised that it does not intend to locate bores close to potentially sensitive sites, for example Five Mile Brook, if there is a risk of drawdown effects on the waterway. The proponent also advised that it is currently investigating alternative sources of water to reduce (and potentially avoid) reliance on groundwater use for construction and dust suppression purposes.[256]

Report 1714 states 'The EPA considers potential impacts from drawdown are manageable and can be regulated through recommended conditions 2 to ensure that the outcome would be consistent with the EPA's objective for inland waters'. Recommended condition 2 limits the extent of clearing on CCWs and REWs, and requires that there are no project attributable impacts to the hydrological regime and water quality of Five Mile Brooks, CCWs, REWs and black-stripe minnow habitat (the recommended conditions are considered in Section 3.11).

The appellants' concerns regarding the availability and adequacy of the information on which the EPA based its assessment of inland waters, and the suite of potential impacts considered, are noted. In response to this matter, the EPA advised:

> The proponent … indicated that further site specific geotechnical and acid sulfate soil investigations are planned following detailed design to identify potential swamp/lacustrine deposits and characterise soils underlying wetland areas …

[253] Department of Water (2006), pages 6-12
[254] Department of Water and Swan River Trust (2005)
[255] BORR IPT (2020d), pages viii and 87
[256] Proponent response to Appeal 045/21 (15/12/21), page 30

> During the assessment, the DWER provided advice in relation to inland waters. The advice noted that the proponent had appropriately considered waterways, Public Drinking Water Source Areas, and acid sulfate soils. DWER raised concerns that peaty material of greater than approximately one metre thickness may be an issue. The proponent addressed this by undertaking an extensive preliminary geotechnical investigation. Swamp deposit materials were found to intersect at the northern terminus of BORR South, near Centenary Road …
>
> The EPA identified the following as some of the potential impacts to inland waters:
>
> - changes to the hydrogeological and/or hydraulic conditions resulting in an increased risk of flooding and inundation in areas where swamp and lacustrine deposits
> - changes to vegetation structure/condition in surrounding GDEs (including geomorphic wetlands) resulting from changes to hydrological regimes or groundwater levels from abstraction and/or compaction of the construction footprint.
>
> The proponent proposes to minimise these impacts through design of a transverse drainage system to maintain the pre-development hydrological processes of the proposal area and to minimise potential drainage shadow effects on surrounding wetlands and waterways, vegetation and agricultural properties.
>
> While further investigations are yet to be undertaken and further details such as location of bores to be provided, the EPA had considered the mitigation measures ([Report 1714] section 2.3.6) and determined potential impacts to inland waters can be regulated through recommended condition 2 to ensure that the outcome would be consistent with the EPA's objective for inland waters.
>
> The EPA also noted that the proponent would need to obtain a licence from the DWER in accordance with the RiWI Act if dewatering, groundwater abstraction or bed and bank disturbance is required. One of the objectives of the RiWI Act is to provide for the management of water resources, and in particular for the protection of their ecosystems and the environment in which water resources are situated, including by the regulation of activities detrimental to them.
>
> Noting the above, the EPA did not deem further studies on what effects diminishing rainfall and climate change will impact hydrological flows and the health of GDEs and flood modelling to be required from the proponent.[257]

With respect to the appellants' concerns about the effects of decreased rainfall on inland waters and associated ecosystems, Report 1714 indicates that the EPA considered reduced rainfall and drying habitats in its assessment of impacts on black-stripe minnows.

The proponent noted that the primary direct and indirect impacts of the proposal would occur (and be managed) during construction over a 3-5 year period, and are not anticipated to be materially impacted by the long-term effects of climate change. The proponent noted that the potential for a drying climate to exacerbate or inform impacts during operation has been considered when relevant and practicable, and provided the example that in relation to hydrological connectivity and black-stripe minnow habitat within Five Mile Brook it prepared a *Drainage Management Strategy* to inform concept design particularly for the dimension and locations of culverts to maintain surface water flow.[258]

From the above, the EPA was satisfied that it had sufficient information on which to base its assessment of the direct and indirect impacts from the proposal on inland waters. The EPA assessed the likely residual impacts of the proposal on inland waters as the direct loss of 0.2 ha of CCWs and 1.4 ha of REWs, potential indirect impacts to hydrological regimes and water quality in adjacent CCWs, REWs, Five Mile Brook and black-stripe minnow habitat, and potential indirect impacts to groundwater from abstraction.

[257] EPA response to Appeal 045/21 (07/01/22), pages 21-22
[258] Proponent response to Appeal 045/21 (15/12/21), page 30

We consider that the EPA has recognised the occurrence and importance of, and the proposal's impacts on, surface and underground waters within the development envelope. We also consider that the EPA's identification and assessment of the direct and indirect impacts from the proposal on inland waters is satisfactory, and has had regard for the mitigation hierarchy and other regulatory processes.

3.4.1.2 Proposed mitigation measures

Report 1714 states that since the proposal was referred the proponent has modified the development envelope to reduce the extent of clearing of flora and vegetation. By these modifications, the proponent avoided about 20.2 ha of wetlands (mainly MUWs),[259] compared with the proposal as initially referred.

The proponent has proposed a number of measures to minimise, mitigate and monitor the identified direct and indirect impacts to surface and underground waters. These are set out in the proponent's *Updated Referral Document*,[260] and are reflected in Report 1714 (page 35).

These measures include the development of plans and procedures, many of which would form part of the proponent's CEMP, to address specific threats to surface and underground waters (refer Table 11). In addition, the EPA has recommended conditions 1 and 2 to manage residual impacts to inland waters (the recommended conditions are considered in Section 3.11).

The proponent also proposes to revegetate the riparian zone of Five Mile Brook where clearing is required for bridge construction.

The EPA also noted that the proponent would need to comply with separate approvals under the RIWI Act for activities involving dewatering, abstraction or bed/bank disturbance.

Discussion

In relation to proposal-attributed impacts to adjacent GDEs, we consider that in implementing its *Vegetation Monitoring Plan* and meeting the requirements of recommended condition 3, the proponent could address any changes in vegetation condition from the proposal (including impacts on GDEs), and would be required to implement contingency actions to correct any impacts identified.

With regard for location and buffer constraints posed by the GBRS alignment, the proponent's proposed management and mitigation measures appear to be generally consistent with the provisions of the RIWI Act and recommendations in DWER's *Roads Near Sensitive Water Resources* and *Stormwater Management Manual*.

In relation to stormwater management, in a letter to the EPA Chair dated 21 June 2021 the proponent advised that 'To ensure it manages stormwater effectively and in accordance with best practice, Main Roads works closely with [DWER]', and that 'The proposed road drainage strategy for the BORR project is based on at-source detention and infiltration' so that 'The majority of road runoff will be directed into a proposed shallow water quality management basins or existing localised depressions'.[261]

[259] Derived from: BORR IPT (2020d), pages 90 and 93, and BORR IPT (2021b), page 7
[260] BORR IPT (2020d), pages 156-157, plus Tables ES-1 and 6-2
[261] Main Roads Western Australia (2021a)

The EPA advised that in its assessment it noted that the proponent has considered engineering controls to reduce the risk of ground and surface water contamination and maintain the hydrological regime at all crossings. The EPA also advised:

> The proponent has completed a pre-construction surface and groundwater sampling program to establish baseline water quality across the proposal alignment and will continue undertaking water quality monitoring on a quarterly basis to monitor potential impacts the proposal may have on groundwater and surface water resources (MRWA 2021). The EPA considers that the monitoring program will assist in identifying where management actions may be required for the proponent to manage impacts accordingly.
>
> The EPA considers that the proposed approach to the drainage design and the proponent's minimisation measures are appropriate to ensure that the existing hydrological regime and water quality of the proposal area is maintained during construction and operation of the proposal. The EPA determined the potential indirect impacts to hydrological regimes and water quality can be regulated through recommended condition 2 to ensure that the outcome is consistent with the EPA's factor objective to maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected.[262]

In summary we note that the EPA has recognised the likely impacts on water quality generally, including in relation to CCWs, REWs, MUWs and Five Mile Brook and we agree with the EPA conclusion that the likely residual impacts of the proposal include:

- the direct loss of 0.2 ha of CCWs and 1.4 ha of REWs
- the potential indirect impacts to hydrological regimes and water quality in adjacent CCWs, REWs, Five Mile Brook and black-stripe minnow habitat
- the potential residual impacts to groundwater from abstraction and/or drawdown impacts provided minimisation measures are complied with.

In its response to the appeals, the EPA advised that it was satisfied that the proponent's mitigation measures in combination with the recommended conditions relevant to surface and underground waters and other statutory decision-making processes would ensure that implementation of the proposal could be undertaken in a manner that would meet its objective for inland waters.

The matter of whether these impacts can be adequately mitigated through the EPA's recommended conditions is considered in Section 3.11.

3.5 Did the EPA have adequate regard for social surroundings?

The appellants contended that the proposal would divide the Gelorup community causing loss of social connectivity, would permanently change the landscape character and amenity, and would cause ongoing and severe noise, light and air pollution (leading to contamination of drinking water and risks to human health). The appellants submitted that the proposal would impact areas of Aboriginal cultural significance, would impact trees with significant cultural, heritage value, is too close to a school, would cause impacts to public open space and by road closures, would impact local tourism, and would result in mental health decline in Gelorup residents.

The appellants submitted that the proposed bridges, walk/cycle paths and underpasses would not address these issues, and do not connect with local shopping areas or improve access to Bunbury. Some appellants were of the view that property security would be compromised by the proximity of the proposed walk/cycle paths to property boundaries. The appellants also submitted that affected residents were not consulted on the walk/cycle paths, underpasses and noise walls.

[262] EPA response to Appeal 045/21 (07/01/22), pages 20-21

The EPA assessed impacts on social surroundings

Our conclusion is that the EPA has recognised the likely impacts on social connectivity, visual amenity, light, noise and vibration, air quality, Aboriginal heritage and significant trees. We consider that the EPA's identification and assessment of the direct and indirect impacts from the proposal on social surroundings is satisfactory, and has had regard for the mitigation hierarchy and other regulatory processes.

We also consider that the EPA's conclusion that the residual impacts on social surroundings and Aboriginal heritage are not so significant as to render the proposal environmentally unacceptable, and can be managed, is reasonable and justified. We explain our reasoning below.

3.5.1 Social connectivity and visual amenity

In summary, the appellants submitted that:

- the Gelorup Corridor provides a buffer between semi-rural lifestyle properties with owners who appreciate the natural environment and nearby farmland, and its destruction would have a permanent and devastating effect on the community
- the EPA has not considered the cumulative impact of extinguishing the connection between the north and south rural residential areas of Gelorup
- the proposed clearing, freeway, bridges and intersections would permanently change the landscape character, and long-term operation of the freeway would cause ongoing and severe noise
- the proposal would divide Gelorup into two parts, separating a community and affecting social connectivity, with other impacts from road closures and loss of public open space
- the social connectivity cannot be replaced by a proposed bridge over Yalinda Drive and a pedestrian tunnel/ underpass
- the proponent did not consult with local residents about the proposed bike and walk paths; these do not connect with the local shopping precincts; potential security and safety issues for adjacent landowners have not been considered; they are likely to increase the risks of dieback spread, accidental fires, rubbish and invasion of privacy
- the proposal would result in a rapid and sustained decline in the mental health of Gelorup residents, including from months/years of construction noise and dust, and the daily sight of trees being felled, burnt, chipped or carted away
- the proposal is too close to the Bunbury Cathedral Grammar School and the general community
- residents would be affected by light pollution from the 12 m high lights that are proposed for the bridges
- light pollution would be present even with the proponent's mitigation measures; these suggestions would compromise road safety, particularly in addition to other compromises already proposed to make the road fit through a narrow corridor with no median strip.

3.5.1.1 State of knowledge

In its assessment the EPA recognised that 'The proposal would result in changes to social amenity, particularly through Gelorup where the majority of the vegetation clearing would occur and therefore reduce people's access to natural bushland. The proposal also has the potential to reduce social connectivity and local commuting through Gelorup as the proposal bisects the suburb'.

The proponent's documents indicate that visual amenity is proposed to be addressed through the construction of screen walls, vegetative screening, landscaping, and revegetation (among other things). This is reflected in Report 1714.

In response to the appeals in relation to social amenity generally, the proponent advised:

> Main Roads has made substantial documented changes to the Proposal to address social connectivity issues, changes that far exceed what is typically implemented. Grounds upon which Main Roads has been deemed to not address social impacts are capricious and not supported by the public record of the EPA's Assessment, and Main Roads documentation of consultation during planning and development.
>
> Pedestrian connections from BORR into the communities of Stratham and Dalyellup are local planning considerations and not within the scope of the BORR Proposal.[263]

The EPA advised that it considered impacts to amenity and social connectivity in its assessment of the proposal, and concluded that the residual impacts can be regulated through reasonable conditions so that the outcome is consistent with the EPA's objective for social surroundings. The EPA acknowledged that there would be unavoidable impacts to amenity (visual and social) and community connectivity as a result of the proposal:

> In considering the proposal's potential impacts, the EPA took into account the mitigation measures proposed, including local road tie-ins and the Yalinda Drive bridge to provide north-south connection. However, key to the EPA's consideration were the additional measures proposed as part of the s43A change to proposal that was approved in September 2021. The EPA considered that these additions further minimised the impacts compared to what was originally proposed. Together, these measures resulted in the EPA's view that the outcome is consistent with its objectives for social surroundings.[264]

The EPA noted the proponent's additional proposed measures to address the impact on social connectivity, including 'the provision of two additional pedestrian underpasses in Gelorup – one where the BORR crosses Tuart Brook and another located further west of Yalinda Drive bridge'. The EPA considered that the outcome with the additional elements, along with the original proposed mitigation measures, is consistent with its objective for social surroundings.

The EPA acknowledged that affected residents were not consulted about additional mitigation measures proposed in the proponent's *Response to Submissions*.

As a result, the EPA recommended 8-3 and 8-4, requiring the proponent to prepare an *Amenity Management Plan* within 12 months of proposal approval, which includes the a requirement to consult with and advise on the outcomes of consultation with the local community and relevant stakeholders on the specifications and locations of amenity infrastructure such as screen-walls, noise-walls, vegetative screening, landscaping, revegetation, pedestrian overpasses/underpasses, walking trails, foot/cycle paths, and any other relevant infrastructure, and implement it once approved. Recommended condition 8-5 requires the proponent to submit a report to the EPA following construction, which demonstrates that the requirements of the *Amenity Management Plan* were achieved.

In relation to light spill during construction and from operation, the proponent's *Lighting Design Guideline for Roadway and Public Spaces*[265] sets out that impact identification and mitigation design would comply with Australian Standards[266] for lighting of public roads.

[263] Proponent response to Appeal 045/21 (13/12/21), pages 36-37
[264] EPA response to Appeal 045/21 (07/01/22), page 26
[265] Main Roads Western Australia (2017)
[266] As referenced in the proponent's response to Appeal 045/21 (15/12/20): Standards Australia (2005)

The proponent advised that white/yellow LED (or alternatively high-pressure sodium) lighting[267] would be installed at intersections and interchanges, and that the main alignment would not be lit.[268]

3.5.1.2 Proposed mitigation measures

A number of measures to minimise, mitigate and monitor the identified direct and indirect impacts in relation to social connectivity and visual amenity (including light spill) are set out in the proponent's *Updated Referral Document*[269] and *Landscape and Visual Impact Assessment* (incorporating a *Landscape Concept Design*),[270] and are reflected in Report 1714 (pages 40-41 and 44-46).

These measures include the development of plans and procedures, many of which would form part of the proponent's CEMP, to address specific threats to social connectivity and visual amenity (refer Table 11). The proponent also proposes to revegetate areas within the development envelope that are disturbed during construction but not required for road infrastructure.

Further to the above, the proponent clarified that the mitigation measures would include:

- the sinking of the proposed road through Gelorup near Yalinda Drive by up to 1.5 metres over a length of 800 metres to reduce the height of the overpass and approaches, with retaining walls to avoid additional clearing for the sinking, and visual screening walls between Eucalypt Drive and Woods Road
- maintenance of social connectivity through a dual use path at the Yalinda Drive bridge; a pedestrian underpass at Woods Road to connect to local roads and walk trails; establishment of walking trails that connect underpasses, bridges, local roads, remnant bush areas, and to the large tuart tree; and establishment of a walking trail under the Five Mile Brook bridge to provide additional connection between the northern and southern sections of Gelorup.[271]

The EPA considered that the proposed screen walls and noise walls, in combination with the proposed lowering of the road profile, would minimise the visual impact of vegetation loss for affected private properties. The EPA also considered that the proposed reduced street lighting (placement and height), local road tie-ins, bridges, pedestrian underpasses, walk trails and the retention of about five ha on acquired properties adjacent to the development envelope for public passive recreation (Figure 15), would minimise impacts on social connectivity and visual amenity.

[267] With a correlated colour temperature of equal to or less than 3000 Kelvin in the blue spectrum, and a luminaire that minimises levels of lower wavelength light.
[268] Proponent response to Appeal 045/21 (13/12/21), pages 36-37
[269] BORR IPT (2020d), pages 172-176, and Tables ES-1 and 6-2
[270] BORR IPT (2020a)
[271] Proponent response to Appeal 045/21 (13/12/21), pages 36-37

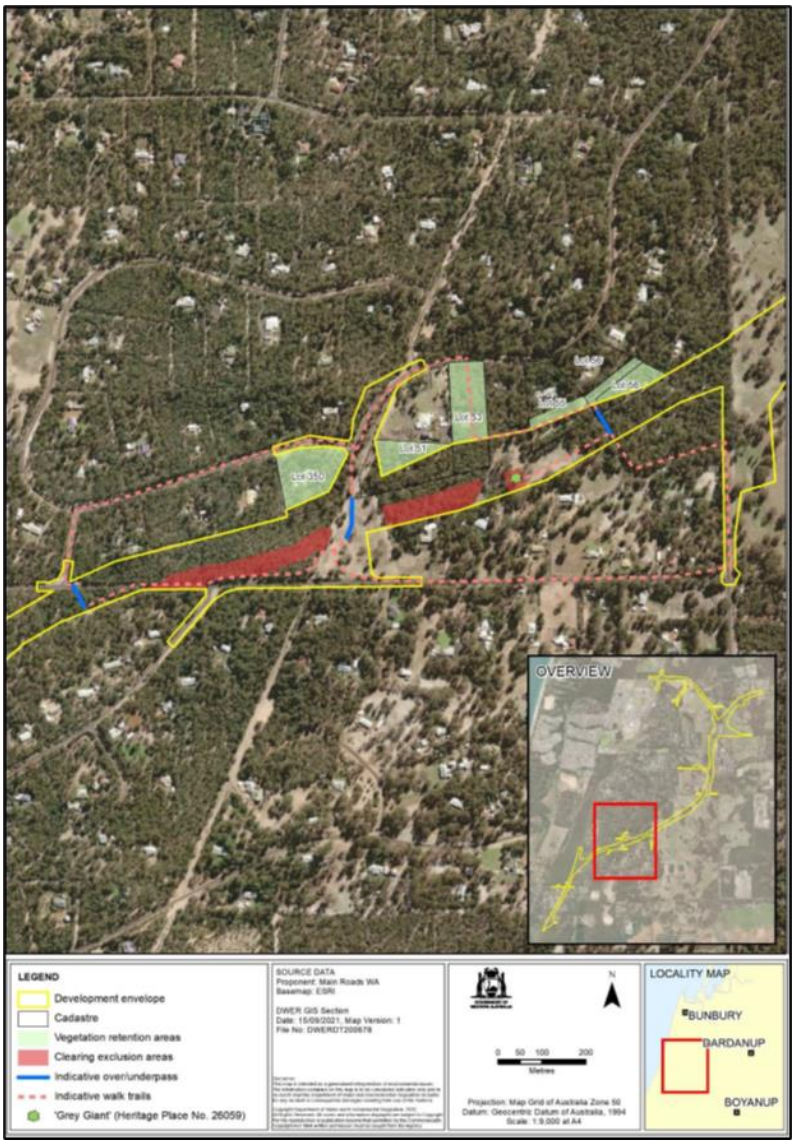

Figure 15 *Proposed mitigation measures for social connectivity and visual amenity: indicative overpasses (blue line), indicative walk trails (dotted pink line)*[272]

The EPA has recommended conditions 1 and 8 to manage residual impacts on social connectivity and visual amenity, and 6-3(11) in relation to the protection and long-term management of the 'vegetation retention areas' (the recommended conditions are considered in Section 3.11).

Discussion

By Report 1714 and its response to the appeals, the EPA maintained its view that the proponent's mitigation measures in combination with the recommended conditions relevant to social connectivity and visual amenity would ensure that implementation of the proposal could be undertaken in a manner that would meet its objective for social surroundings.

[272] Environmental Protection Authority (2021a), page 47, Figure 5

Through its assessment, the EPA has recognised the likely impacts on social connectivity and visual amenity. The EPA concluded that there would likely be some unavoidable visual impacts, however 'a sufficient level of minimisation has occurred, particularly with the addition of lowering the road, to ensure the outcomes is consistent with the EPA's objective for social surroundings'.

We understand that the proponent is currently undertaking detailed design for the proposal, which is yet to be finalised. Noting that there will be opportunity for community consultation on amenity infrastructure through recommended condition 8, we consider the EPA's conclusion on this matter to be generally reasonable.

The extent to which the conditions recommended by the EPA can adequately mitigate the impacts in respect to social connectivity and visual amenity is examined later in this section.

3.5.2 Air quality (and water tanks)

In summary, the appellants submitted that:

- the anticipated increase in vehicles is 10,000-15,000 per day; there would be significant decrease in air quality due to vehicle emissions and subsequent health impacts
- roof catchments and rainwater tanks are only metres from the proposal; residents are extremely concerned about particulate matter and other contaminants from road traffic settling on rooftops and washing into tanks.

3.5.2.1 State of knowledge

The development envelope is located within the Bunbury Regional Airshed. A 2003 aggregated emissions inventory of National Pollution Inventory substances within the Bunbury Regional Airshed considered emissions of six substances listed in the *National Environment Protection (Ambient Air Quality) Measure*[273] (AAQ NEPM) (excluding ozone and including VOCs). Of these, the study reported that motor vehicles contribute to lead and particulate emissions, and that paved and unpaved roads contribute to dust emissions.[274]

The World Health Organisation (WHO) *Global air quality guidelines*[275] recommend levels and interim targets for carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), ozone, and particulates (PM_{10} / $PM_{2.5}$). For CO, NO_2 and particulates, the guidelines include:

- CO: 10 milligrams per cubic m (mg/m^3) over 8 hours[276], and 7 mg/m^3 over 24 hours, and
- NO_2: 200 micrograms per cubic m ($\mu g/m^3$) over 1 hour, and 20(-40) $\mu g/m^3$ over 1 year
- particles as PM_{10}: 50(-150) $\mu g/m^3$ over 24 hours, and 20(-70) $\mu g/m^3$ over 1 year
- particles as $PM_{2.5}$: 25(-75) $\mu g/m^3$ over 24 hours, and 10(-35) $\mu g/m^3$ over 1 year.

The AAQ NEPM contains national environment protection standards for CO, NO_2, SO_2, photochemical oxidants (as ozone), lead, and (PM_{10} / $PM_{2.5}$) against which ambient air quality can be assessed. For CO, NO_2, particulates and lead, the NEPM standards include:

- CO: 9 parts per million (ppm) over 8 hours
- NO_2: 0.08 ppm over 1 hour, and 0.015 ppm over 1 year
- particles as PM_{10}: 50 $\mu g/m^3$ over 24 hours, and 25 $\mu g/m^3$ over 1 year
- particles as $PM_{2.5}$: 25 $\mu g/m^3$ over 24 hours, and 8 $\mu g/m^3$ over 1 year
- lead: 0.50 $\mu g/m^3$ over 1 year.

[273] National Environmental Protection Council (1998; as revised)
[274] Sinclair Knight Merz (2003)
[275] World Health Organisation (2021b)
[276] Times stated in World Health Organisation (2021b) and National Environmental Protection Council (1998; as revised) are given as averaging times

The proponent's *Updated Referral Document* outlines the findings from modelling of impacts from vehicle emissions using the AUSROADS dispersion model, based on 2019 traffic data from seven locations surrounding Bunbury. This is reflected in Report 1714, which states that the predicted maximum concentrations of pollutants (CO, carbon dioxide (CO_2) and particulates) from operational traffic volumes in 2041 are not expected to exceed the assessment criteria. The EPA concluded that operational traffic is unlikely to cause a significant residual impact to local air quality.

In relation to impacts on rainwater tanks and drinking water, the proponent's *Response to Submissions* acknowledges a number of sources of potential contaminants to the quality of water in tanks, including emissions from diesel and petrol vehicles.[277]

Report 1714 states that Commonwealth Department of Health guidance indicates that air contaminants from construction or operational traffic emissions in Australia are unlikely to cause significant impacts on the quality of rainwater collected in domestic tanks. The EPA concluded that the proposal is unlikely to result in significant residual impacts to air quality to such an extent that it would cause contamination of local rainwater sources.

The EPA advised that it considered impacts from increased road traffic on drinking water quality in its assessment of the proposal, and concluded that operational traffic is unlikely to cause a significant residual impact to local air quality. The EPA advised that

> This assessment was based on modelled scenarios provided by the proponent, which predicted pollutants levels for 2041 and compared these against the relevant criteria. None of the pollutants included in the modelling are predicted to exceed the relevant assessment criteria.[278]

3.5.2.2 Proposed mitigation measures

Report 1714 recognises that the proposal has the potential to affect air quality through dust generated during construction and from operational traffic emissions.

A number of measures to minimise, mitigate and monitor the impacts in relation to air quality during construction are set out in the proponent's *Updated Referral Document*,[279] and are reflected in Report 1714 (pages 46-48).

These include surface watering and hydromulch, avoidance of earthmoving works in high winds, restriction on vehicle speeds, use of low emissions-producing equipment where possible, staged clearing with progressive construction to minimise soil exposure times, dust monitoring, and a complaints register.

Discussion

While we note that the EPA did not identify 'air quality' to be an environmental factor (key or other) for the proposal, Report 1714 does set out the EPA's assessment of impacts on air quality from 'operational traffic emissions and dust generated during construction' in its assessment against the key environmental factor social surroundings (pages 46-48).

The appellants' concerns in regard to air quality appear to centre around health risks associated with respirable and ingested particulates and heavy metals associated with the ongoing operation (rather than construction) of the proposed road.

[277] BORR IPT (2021a), pages 110-111
[278] EPA response to Appeal 045/21 (07/01/22), page 23
[279] BORR IPT (2020d), pages 158-161, and Tables ES-1

Some appellants noted that WA Department of Health guidance *Water tanks on your property*[280] recognises 'air pollution from any nearby industrial emissions or heavy road traffic' as a contaminant of rainwater. The guidance goes on to recommend methods for protecting water quality in rainwater tanks from various contaminants.

In a letter to the EPA Chair dated 21 June 2021, the proponent noted the Australian Government's guidance for rainwater tanks and State Government's guidance for protecting the quality of collected rainwater, and advised 'The presence of airborne contamination within drinking water supplies has not been identified as an issue for our roads'.[281]

In response to the appeals, the proponent advised to maintain rooftop hygiene by regularly removing biological matter and to divert first flush water away from the water tank, to reduce the concentration of particulates from the tank.[282] This is consistent with the measures set out in the WA Department of Health guidance.

On this matter, the EPA advised:

> The EPA acknowledges that the Healthy WA website does advise that domestic rainwater tanks can be contaminated by industrial emissions and heavy road traffic. However, and as discussed in EPA Report 1714, the Australian Government's Department of Health (Department of Health 2011) guidance on the use of rainwater tanks identifies that urban emissions are unlikely to impact the quality of rainwater collected in domestics tanks. This information was based on analysis of water quality from domestic tanks in Brisbane, Adelaide and Newcastle. The guidelines does identify that nearby industrial uses may impact water quality in rainwater tanks (such as Port Pirie in South Australia), and therefore the use of domestic rainwater tanks may not be appropriate in all urban areas.[283]

Based on the proponent's modelled prediction that maximum concentrations of pollutants from operational traffic volumes in 2041 are not expected to exceed the assessment criteria, and the Commonwealth guidance indicating that urban emissions are unlikely to impact on water quality in domestic rainwater tanks, we consider that the EPA's view that operational traffic is unlikely to cause a significant residual impact to local air quality is reasonable. Further, by the recommended measures set out in the State guidance for protecting water quality from contaminants, these potential impacts can be managed.

We consider that the EPA has identified and assessed the impacts on air quality based on the information available to it at the time, with regard for the mitigation hierarchy and other regulatory processes, and determined that additional regulatory controls through the recommended conditions are not needed. We consider that the EPA's conclusion is reasonable.

3.5.3 Noise

In summary, the appellants submitted that:

- the EPA has not assessed the impacts of lowering the road profile (nor has this been modelled)
- the proposal would result in increased ambient noise levels even with noise walls installed, which would result in constant low-level noise posing mental and other health issues for residents

[280] Department of Health (undated)
[281] Main Roads Western Australia (2021a)
[282] Proponent response to Appeal 045/21 (15/12/22), page 33
[283] EPA response to Appeal 045/21 (07/01/22), page 23

- sound walls would result in permanent changes to the landscape character and amenity, including visually; sound walls would affect emergency service access routes and animal migratory and foraging paths
- State Planning Policy 5.4 cannot be properly applied to the semi-rural setting of Gelorup (noting that sound has different effects in non-urban settings and the houses do not have setbacks to the proposed road)
- a privately-commissioned noise monitoring report[284] for a sensitive receptor located about 115 m from the edge of the development envelope indicates that the proposal would exceed the noise level at that sensitive receptor.

3.5.3.1 State of knowledge

State Planning Policy 5.4

The scope of State Planning Policy 5.4 includes 'a proposed major redevelopment of existing major road or rail infrastructure in the vicinity of existing or future noise-sensitive land uses'. The types of proposals to which State Planning Policy 5.4 applies include:

> In addition to new major road infrastructure projects, this policy may be applied to a major redevelopment of an existing major road. Typically, a major redevelopment of an existing major road involves physical construction works designed to facilitate an increase in traffic-carrying capacity (such as carriageway duplication or the addition of a traffic lane), or a change in the alignment through design or engineering modifications. …[285]

State Planning Policy 5.4 sets out different outdoor noise targets where the project is a new road (55 dB $L_{Aeq(Day)}$ and 50 dB $L_{Aeq(Night)}$) or an upgrade to an existing road (60 dB $L_{Aeq(Day)}$ and 55 dB $L_{Aeq(Night)}$). Sections 5.6 and 5.8 of State Planning Policy 5.4 describe a range of noise mitigation measures to meet the noise criteria, and acknowledge that in some instances it may not be reasonable and practical to meet the noise criteria and that alternative measures may need to be considered.

Noise modelling

The appellant's privately-commissioned noise monitoring report indicated current average weekly noise levels at a sensitive receptor located about 115 m from the edge of the development envelope of 43.7 dB $L_{Aeq(Day)}$ and 38.5 dB $L_{Aeq(Night)}$.

The proponent's *Transportation Noise Assessment*[286] noted that the large majority of the proposal is considered to be a new road (as relevant to the noise targets set out in State Planning Policy 5.4). The Assessment sampled noise at five locations in proximity to the development envelope, and applied the results to a noise model to predict levels over a larger area, including from forecast traffic volumes and future road design. The Assessment predicted that in 2041 the average weekly noise levels in the absence of noise mitigation would exceed the outdoor noise targets set out in State Planning Policy 5.4; that is, in locations where noise walls and other measures are not proposed, traffic noise might exceed 55 dB $L_{Aeq(Day)}$ and 50 dB $L_{Aeq(Night)}$ at a distance of 300 m from the edge of the development envelope.

Report 1714 sets out that the EPA considered the proponent's noise modelling methodology and results reliable for its assessment. The EPA acknowledged that noise modelling to confirm the potential effects of the lowering of the road profile is yet to be undertaken, and that the proponent would need to undertake supplementary modelling in this regard.

[284] Prepared by Acoustic Engineering Solutions, 2020
[285] State Planning Policy 5.4, section 5.2.2
[286] Lloyd George Acoustics Pty Ltd (2020)

In response to the appellants' concerns on this matter, the EPA advised that it expects that the proposed lowering of the road may further attenuate the operational noise from the proposal. The EPA also advised:

> The EPA recognises that the proposal will increase traffic noise for nearby sensitive premises. However, these impacts have been assessed in accordance with the criteria in State Planning Policy 5.4, which is relevant to both new and upgrades to road, and to both urban and rural settings. While noise attenuation is different in urban versus rural settings, noise modelling and the application of mitigation measures such as noise walls can accommodate these differences.[287]

3.5.3.2 Proposed mitigation measures

A number of measures to minimise, mitigate and monitor the identified impacts in relation to noise are set out in the proponent's *Updated Referral Document*,[288] and are reflected in Report 1714 (pages 40 and 43-44).

These measures include the development of plans and procedures, many of which would form part of the proponent's CEMP, to address specific threats from noise (refer Table 11).

The EPA considered that the proponent is proposing reasonable and practicable measures to reduce traffic noise impacts (from current and future noise), consistent with SPP 5.4 and its objective for social surroundings. In addition, the EPA recommended condition 7 requiring the proponent to prepare a *Traffic Noise Management Plan* which includes application of mitigation measures in locations where construction of noise walls is not feasible or practical, and post-construction noise monitoring to demonstrate that relevant noise targets are met.

The proponent's *Transportation Noise Assessment* recommended that noise levels with mitigation could be managed to be within the outdoor noise targets for most receptors. In this regard the Assessment recommended the following noise controls:

- the road surface is to be upgraded from chip seal to stone mastic asphalt in the more densely populated area
- Centenary Road surface to be upgraded from chip seal to dense graded asphalt
- noise walls to be constructed as indicated in the report; heights are relative to the road design at the location of the wall; all walls are to be solid, free of gaps and of a material having a minimum surface mass of 15 kg/m^2
- architectural upgrades to be offered for residential dwellings where outdoor noise targets were unlikely to be met with the above controls.[289]

The proponent's proposed mitigation measures appear to be largely consistent with these recommendations.

The proponent advised that the proposed sinking of the road through Gelorup near Yalinda Drive would lower the noise profile of the roadway through the area, and that the noise model would be updated to ensure the detailed design would comply with State Planning Policy 5.4. The proponent also advised that the use of upgraded road surface and the construction of screen walls would further improve noise and visual amenity along the Gelorup section.[290]

[287] EPA response to Appeal 045/21 (07/01/22), page 23
[288] BORR IPT (2020d), pages 172-176, and Tables ES-1 and 6-2
[289] Lloyd George Acoustics Pty Ltd (2020)
[290] Proponent response to Appeal 045/21 (13/12/21), page 36

Discussion

From the above we note that the EPA recognised that noise levels would increase as a result of the proposal and we accept the EPA's advice that residual impacts could be managed and regulated through reasonable conditions. The EPA also recognised that further modelling in relation to the proposed lowered road profile is required.

The matter of whether these impacts can be adequately mitigated and counterbalanced through the EPA's recommended conditions is considered in Section 3.11.

3.5.4 Aboriginal heritage

In summary, the appellants submitted that:

- the EPA (and proponent) did not have proper regard for Aboriginal cultural and spiritual values directly impacted by the proposal, including a number of 'scar trees', two large moodjar / Western Australian Christmas trees with spiritual significance, a heritage-listed *Melaleuca preissiana* paperbark known as 'Birthing Tree', and a tool-making area between the basalt quarries
- heritage consultants did not properly investigate individual features such as culturally modified scar trees
- the EPA (and proponent) did not adequately address issues raised by Aboriginal leaders and heritage experts.

Relevant representative groups

Noongar boodja (country) covers the entire south-western portion of Western Australia from north of Jurien Bay and Moora to west of Esperance, and is made up of 14 language groups (may be referred to as Traditional Custodian boundaries[291]), each correlating with different geographic areas with ecological distinctions.[292] The development envelope is located within the Wardandi language group.[293]

The South West Aboriginal Land and Sea Council (SWALSC) Aboriginal Corporation (AC) is a representative native title body for the Noongar people, and is responsible for working with them to progress resolution of their native title claims, and helping to advance and strengthen Noongar culture, language, heritage and society. Within the SWALSC boundary are six regional corporations: Ballardong AC, Kada-Moda Maambakoort AC (Gnaala Karla Booja), Karri Karrak AC (South West Boojarah), Wagyl Kaip AC (Southern Noongar), Whadjuk AC and Yued AC.[294]

The South West Native Title Settlement (Settlement) area includes land covered by the eight registered Noongar native title claims, and the terms of the negotiated Settlement are in the form of six separate Indigenous Land Use Agreements (ILUAs). The ILUAs prescribe that six Regional Corporations would be established, supported by a Central Services Corporation (which the SWALSC AC is proposed to transition to).[295]

The development envelope is within the Gnaala Karla Booja ILUA boundary.[296] The Gnaala Karla Booja Aboriginal Native Title Claimants are the nominated spokespersons appointed by the SWALSC AC for the Gelorup area.[297]

[291] https://libguides.jcu.edu.au/indigenousstudiesguide/resources/maps-languages-boundaries
[292] https://www.noongarculture.org.au/noongar/
[293] Horton, D.R. (1996)
[294] https://www.noongar.org.au/
[295] South West Aboriginal Land and Sea Council (2019)
[296] https://nntt.maps.arcgis.com/apps/webappviewer/index.html?id=c57f0e996a7c485480570c38c823398c
[297] Brad Goode & Associates Pty Ltd (2020)

Heritage surveys

The Department of Planning, Lands and Heritage (DPLH) *Aboriginal Heritage Inquiry System* lists five heritage places with extents overlaying the development envelope:

- ID 18884 'Bunbury Bypass Archaeological Site 1' is listed as 'Artefacts/scatter' with the status 'Stored Data/Not a Site'
- ID 37869 'Paperbark Wetlands' is listed as 'Female Access Only' and 'Modified Tree, Birth Place, Hunting Place, Water Source' with the status 'Lodged'
- ID 37870 'Gelorup Corridor' is listed as 'Male Access Only' and 'Artefacts/Scatter, Ceremonial, Skeletal Material/Burial' with the status 'Stored Data/Not a Site'
- ID 38551 'Five Canoes' is listed as 'Modified Tree' with the status 'Stored Data/Not a Site'
- ID 38552 'Ancient Moojar Grove Burial Ground' is listed as 'Modified Tree, Skeletal Material/Burial' with the status 'Stored Data/Not a Site'.

The proponent's *Archaeological Aboriginal Heritage Survey*[298] (Archaeological Survey) for the proposal considered place IDs 18884, 37869 and 37870, and the *Ethnographic Surveys*[299,300] (Ethnographic Surveys) considered these plus place IDs 38551 and 38552.

The Archaeological Survey report states that following each survey undertaken by heritage specialists, the anthropologist surveyed the area accompanied by 8-10 Aboriginal traditional custodians 'mostly from Gnaala Karla Booja native title claim group' to advise and impart their knowledge of country, and further notes the following:

> Since 2018 many putative sites have been reported and submitted to the holder of Aboriginal heritage details in Western Australia, DPLH, by non-specialists. These putative sites include numerous scarred trees, a men's ceremonial site and a women birthing place. In recording these places, no one has sought the opinion of the GKB and heritage specialists. To override the main Aboriginal body entrusted with looking after the land reveals a great misunderstanding of the culture of the GKB and the Aboriginal heritage recording system by the people who made these reports. The submission of these putative places without consulting the GKB has caused great sorrow, mistrust, shame and disharmony within and between Aboriginal family groups.[301]

The Ethnographic Surveys note that the Gnaala Karla Booja Aboriginal consultants did not report any previously unrecorded ethnographic sites within the development envelope, did not provide any substantive cultural evidence to support the listing of place IDs 37869 or 37870, and considered that lodgement of these additional places was inappropriate. The Ethnographic Surveys further submit that neither place IDs 38551 or 38552 meet the benchmarks for inclusion in any category of the register of Aboriginal sites with respect to the evaluative criteria set out in sections 39(2) and (3) of the *Aboriginal Heritage Act 1972*.

The proponent advised that extensive Aboriginal heritage surveys for the proposal alignment have been commissioned over a 25-year period, and that subsequent to the referral of the proposal additional archaeological and ethnographic surveys were conducted in 2019 and 2020 in line with requirements under the *Aboriginal Heritage Act 1972* and *Noongar Standard Heritage Agreement*. The proponent advised that the surveys also considered the structural design of the proposed bridge over Five Mile Brook, and confirmed that the bridge would not impact on the cultural values of the watercourse.[302]

[298] Brad Goode & Associates Pty Ltd (2020)
[299] McDonald, M.E. and Turner, J.L. (2020b)
[300] McDonald, E.M and Phillips, T.E. (2020a)
[301] Brad Goode & Associates Pty Ltd (2020), page 28
[302] Proponent response to Appeal 045/21 (15/12/21), pages 34-35

In Report 1714, the EPA concludes that due to the low significance of place ID 18884 (given its previous disturbance), the complementary regulation via section 18 of the *Aboriginal Heritage Act 1972*, and the proponent's intent to implement the recommendations from heritage consultants and traditional owners, and noting that disturbance of place IDs 37869, 37870, 38551 and 38552 is unlikely to have a significant residual impact on Aboriginal heritage, the outcome would be consistent with the EPA's objective for social surroundings.

In addition to the above, the EPA advised:

> One culturally modified scar tree is located about 63 m from the development envelope and is unlikely to be indirectly impacted by the proposal. However, to ensure that indirect impacts are avoided and to ensure the outcome is consistent with the EPA's factor objective, the EPA recommended condition 8-2.[303]

3.5.4.1 Proposed mitigation measures

Report 1714 states that since the proposal was referred the proponent has modified the development envelope to reduce the extent of clearing of flora and vegetation. By these modifications, the proponent avoided a culturally modified jarrah tree (site BR1) 15 m east of the development envelope, and impacts to the Waugyl by not installing footings inside the Five Mile Brook and maintaining water quality and hydrological regimes.

The proponent has proposed a number of measures to minimise, mitigate and monitor the identified direct and indirect impacts to Aboriginal heritage. These are set out in the proponent's *Updated Referral Document*,[304] and are reflected in Report 1714 (pages 40-41).

These measures include the development of plans and procedures, many of which would form part of the proponent's CEMP, to address specific threats to Aboriginal heritage (refer Table 11). In addition, the EPA has recommended condition 8-2 requiring that there are no project-attributable direct or indirect impacts to significant trees including 'a culturally modified tree' (the recommended conditions are considered in Section 3.11).

The EPA noted that consent is required to disturb an Aboriginal heritage site under section 18 of the *Aboriginal Heritage Act 1972*.

Having assessed the impacts and with regard for the proponent's mitigation measures and other statutory processes, the EPA's assessment findings were:

- for potential impacts to an Aboriginal heritage tree 'Residual impacts to significant trees should be subject to implementation conditions to ensure consistency with the EPA's objective for social surroundings'
- for potential residual impacts to place ID 18884 and four other lodged sites 'Residual impact should be subject to implementation conditions to ensure there are no direct or indirect impacts to a culturally modified significant tree to ensure consistency with the EPA objective for social surroundings'.

The Archaeological Survey and the Ethnographic Surveys recommend that sites identified by the Gnaala Karla Booja Aboriginal consultants and project archaeologists as having high archaeological potential are monitored during ground disturbance, and that material from place ID 18884 is salvaged and appropriately stored.

[303] EPA response to Appeal 045/21 (07/01/22), pages 25
[304] BORR IPT (2020d), page 175, and Table 6-2

Discussion

From the appeals, the proponent's information, the EPA's assessment and published literature, the EPA has had regard for the findings of recent archaeological and ethnographic surveys of the development envelope, which included input from traditional custodians and Gnaala Karla Booja Aboriginal consultants, and has recognised that the proposal would impact on Aboriginal heritage sites.

We consider that the EPA has identified and assessed these impacts based on the information available to it at the time, with regard for the mitigation hierarchy and other statutory processes. On this basis, we consider that the EPA's conclusion is generally reasonable.

The matter of whether these impacts can be adequately mitigated through the EPA's recommended conditions is considered in Section 3.11.

3.5.5 Significant trees

In summary, the appellants submitted that:

- the proposal would require the removal of at least two culturally significant / 'world's largest' trees and indirectly impact on others
- the proposal may impact on a heritage-listed tuart 'Grey Giant' situated about 40 m from the proposed road (interference with root system)
- the loss and/or impacts to these trees would affect wildlife, the community and tourism opportunities, is unacceptable, and is contrary to the EPA's recommended condition 8-2
- the Shire of Capel passed a resolution at its Ordinary Council Meeting on 25th November 2020 (OC241/2020) to provide submissions under the EPBC Act and EP Act on the proposal, including request for registered big trees to be relocated.

3.5.5.1 State of knowledge

In the vicinity of the Gelorup Corridor portion of the development envelope, there are currently seven trees listed in one or more of the independent *National Register of Big Trees*, the National Trust of Australia's *Significant Tree Register*, and DPLH's *State Register of Heritage Places*, as indicated in Table 9.

Table 9 *Trees in the Gelorup area listed on big/significant tree / heritage place registers*

Tree	National Register of Big Trees[305]	Significant Tree Register[306]	State Register of Heritage Places[307]
Tuart 'Grey Giant' (Eucalyptus gomphocephala)	Listed in 2020; about 40 m from proposed road	-	Listed in 2018; Lot 48 between Yalinda Dr and Woods Rd
Paperbark – Swamp (Melaleuca rhaphiophylla) (5.5 m circumference)	Listed in 2019; Hasties Road; north-eastern end of Gelorup Corridor	-	-
Paperbark – Swamp (Melaleuca rhaphiophylla) (4.9 m circumference)	Listed in 2019; 100 m south-east of Tarrock	-	-

[305] McIntosh, D. (undated); http://nationalregisterofbigtrees.com.au/pages/home-page
[306] https://www.nationaltrust.org.au/services/significant-tree-register/
[307] https://www.wa.gov.au/government/document-collections/the-state-register-and-other-heritage-listings

Tree	National Register of Big Trees[305]	Significant Tree Register[306]	State Register of Heritage Places[307]
	Ct; appears to be within Offset 3		
Moodjar, WA Christmas Bush (*Nuytsia floribunda*) (4.30 m circumference)	Listed in 2019; within Gelorup Corridor (development envelope)	-	-
Moodjar, WA Christmas Bush 'Victory' (*Nuytsia floribunda*) (3.75 m circumference)	Listed in 2019; within Gelorup Corridor (development envelope)	-	-
Danja, dumbung, koongal, Western Woody Pear (*Xylomelum occidentale*)	Listed in 2019; appears to be on private property adjacent to Gelorup Corridor	-	-
Holly Leaf Banksia (*Banksia illicifolia*)	-	Listed in 2022; appears to be on private property adjacent to Gelorup Corridor	-

Report 1714 states that the likely residual impacts on social surroundings include 'Direct loss of two community significant trees, and potential indirect impacts to the 'Grey Giant' tuart tree (Heritage Place No. 26059) …'. The report states that the two community significant trees are 'two *Nuytsia floribunda* trees registered on the National Registry of Big Trees'.

It is understood that neither the *National Register of Big Trees* nor the *Significant Tree Register* are statutory registers, and do not provide legal protection for listed trees. The *State Register of Heritage Places* is a statutory and non-statutory register; the *inHerit* database entry the listing of the Tuart 'Grey Giant' (*Eucalyptus gomphocephala*) appears to be non-statutory.

The EPA advised that it considered impacts to significant trees in its assessment of the proposal, and concluded that the unavoidable loss of some of these trees is not inconsistent with its objective for social surroundings. The EPA also advised:

> The EPA notes that a nomination of a tree on the National Registry of Big Trees promotes its preservation but does not hold any statutory protection over the tree. The EPA recognises the avoidance measures undertaken by the proponent for three of the five significant trees through proposal design, which included a specific realignment to avoid impacting the tuart 'Grey Giant'. While an unavoidable loss to two of the registered trees will occur, in recognition of the local importance of the other trees listed on the national registry, and to ensure the outcome is consistent with the EPA's factor objective, the EPA recommended condition 8-2 requiring no proposal attributable direct or indirect impacts.[308]

[308] EPA response to Appeal 045/21 (07/01/22), page 24

3.5.5.2 Proposed mitigation measures

Report 1714 states that since the proposal was referred the proponent has modified the development envelope to reduce the extent of clearing of flora and vegetation. By these modifications, the proponent avoided a tuart 'Grey Giant' listed on the *State Register of Heritage Places*,[309] and four (of six) trees registered on the *National Register of Big Trees*,[310] compared with the proposal as initially referred.

The EPA has recommended condition 8-2 requiring that there are no project-attributable direct or indirect impacts to significant trees including 'a *Eucalyptus gomphocephala* tree – listed by the WA Heritage Council as 'Grey Giant' (Heritage Place No. 26059' (the recommended conditions are considered in Section 3.11).

Discussion

From the appeals, the proponent's information, we note that the EPA has recognised the proposal would have direct impacts on two trees registered on the *National Register of Big Trees*, and potential indirect impacts on a tuart 'Grey Giant' listed on the *State Register of Heritage Places*. We accept the EPA's advice that it considered that the loss of up to two individual trees listed on the *National Register of Big Trees* is not environmentally significant and does not warrant mitigation or offsetting.

We note that the proponent's measures to minimise, mitigate and monitor impacts to flora and vegetation generally (in particular, the monitoring of adjacent vegetation condition for project-attributable impacts) would also apply for significant trees within or adjacent to the development envelope and which are not cleared for the proposal.

3.6 Did the EPA have adequate regard for terrestrial environmental quality?

The appellants are of the view that the EPA has inappropriately based its recommendations on desktop information in the absence of site-specific geotechnical and acid sulfate soil investigations, and should have considered the potential for reduced soil quality. The appellants also submitted that there should be more information on erosion and contamination management.

The EPA considered the impacts on terrestrial environmental quality

Our conclusion is that, while the EPA did not identify terrestrial environmental quality to be a key environmental factor for this proposal, the EPA has recognised and assessed the potential for impacts from acid sulfate soils, encountering contaminated sites, contamination from proposal activities, and land degradation following clearing.

Noting that the EPA's recommended conditions relating to inland waters are linked to some of these elements, we consider that the EPA's conclusion that the impacts on terrestrial environmental quality are unlikely to be significant, and can be managed through the proponent's mitigation measures and other statutory processes (i.e. contaminated sites) without the need for additional controls through the recommended conditions, is reasonable and justified. We explain our reasoning below.

[309] https://www.wa.gov.au/government/document-collections/the-state-register-and-other-heritage-listings
[310] McIntosh, D. (undated); http://nationalregisterofbigtrees.com.au/pages/home-page

3.6.1 Soil

In summary, the appellants submitted that:

- no details have been provided on the management of excavation potentially contaminating land and/ or waters from exposure to acid sulfate soils; accidental release of environmentally hazardous material causing contamination of land; contamination of land and erosion from stormwater runoff during construction; and erosion impacts potentially leading to poor soil structure, reduced water infiltration and loss of soil health
- the EPA has not considered the potential for reduced soil quality, increased acidification and salinity
- the further site specific geotechnical and acid sulfate soil investigations referred to in Report 1714 should have been in the final analysis presented for assessment; the EPA should not have made a recommendation on the basis of desktop surveys only.

3.6.1.1 State of knowledge

Acid sulfate soils

Acid sulfate soils are naturally occurring soils and sediments containing iron sulfides, most commonly pyrite. When acid sulfate soils are exposed to air the iron sulfides in the soil react with oxygen and water to produce a variety of iron compounds and sulfuric acid. 'Actual' acid sulfate soils have a pH <4, while 'potential' acid sulfate soils have a pH close to neutral (6.5-7.5).[311]

The proponent's *Updated Referral Document* states that the development envelope is predominantly mapped as having a 'low' to 'moderate' risk of acid sulfate soils, with areas of 'high' risk associated with wetlands and watercourses. The Document states that it is likely that acid sulfate soils would be encountered within excavations for bridge footings greater than 1.0 m depth, particularly within riparian and wetland zones, and that associated dewatering could expose potential acid sulfate soils, allowing oxidation of exposed sulfides and consequential formation of sulfuric acid.[312] This is reflected in Report 1714 (page 99).

In response to appellants' concerns about acid sulfate soils, the proponent advised:

> Management of Acid Sulphate Soils is standard practice for Main Roads on almost all projects in coastal areas of the southwest, including the Swan Coastal Plain. Desktop Analysis with respect to Acid Sulphate soils is also standard practice with site specific conditions better managed in line with construction activities and with regard to site specific conditions. An Acid Sulphate Soil Management plan has been prepared and will be refined during detailed design. Compliance with the ASS Management Plan is required in the event of dewatering. Compliance will ensure correct dewatering methods, effluent management, effluent treatment, effluent disposal and monitoring requirements. This plan will include treatment of Potential Acid Sulphate Soil material and disposal of Actual Acid Sulphate Soil where required at appropriately classified landfill facilities.[313]

The EPA advised that the proponent has committed to further site specific geotechnical and acid sulfate soil investigations following detailed design to identify potential swamp/ lacustrine deposits and characterise soils underlying wetland areas. The EPA also advised:

> During the assessment, the DWER provided advice [noting] that the proponent had appropriately acid sulfate soils. DWER raised concerns that peaty material of greater than approximately one metre thickness may be an issue. The proponent addressed this by undertaking an extensive preliminary geotechnical investigation. Swamp deposit materials

[311] Department of Environment Regulation (2015)
[312] BORR IPT (2020d), pages 147-148
[313] Proponent response to Appeal 045/21 (15/12/21), page 33

were found to intersect at the northern terminus of BORR South, near Centenary Road (BORR Team 2020b). [314]

Contamination

The proponent's *Updated Referral Document* states that a search of DWER's *Contaminated Sites Database*[315] indicates that there are no reported contaminated sites within the development envelope (noting that the Database does not include sites that are 'possibly contaminated' or unreported). The Document states that the development envelope traverses cleared lands that may contain sources of contamination, and that potential impacts from the proposal include disturbance of unknown contaminated sites resulting in spread of contamination; accidental release or spread of wastes, hydrocarbons or chemicals resulting in contamination of land and water bodies; and contamination from stormwater runoff.[316] This is reflected in Report 1714 (page 99).

In relation to the management of contaminated stormwater runoff, the *Stormwater Management Manual*[317] provides a consistent approach to a variety of stormwater management options that may be suitable to a range of built environments throughout WA, and is directed at stormwater management in new developments and redevelopments. It is noted that the proponent was a contributor in the preparation of the Manual.

With respect to roads, the Manual sets out approaches to minimise runoff (for example use of non-kerbed roads and carparks and planting trees with large canopies over sealed surfaces), and integrate stormwater treatment into the landscape (for example water sensitive urban design approach to road layout).

The proponent's *Updated Referral Document states:*

> The adopted cross sections and geometry for road construction are consistent with Austroads, Main Roads and local government standards. The vertical alignment has been designed as low as possible to minimise impacts on the landscape and quantities of imported fill. Detailed design will address key constraints such as groundwater level, bridge and culvert clearances, sight distance, vertical curve lengths and surfacing which may result in changes to the Concept Design.[318]

Noting the reference to Austroads, we understand that Austroads' *Guidelines for treatment of stormwater runoff from the road infrastructure*[319] is the key guidance document for the management of stormwater in road design and construction.

The Austroads guidance was developed 'to assist practitioners with the selection and design of road runoff treatment measures, hydrologic design standards and design computations for selected treatment measures', on the basis that t 'Stormwater runoff from roads has the potential to impact aquatic and terrestrial ecosystems through changes to water quality, water quantity and water flowpath' and that 'It is important to manage stormwater to reduce such pressures on sensitive receiving environments'.

The proponent further advised that:

> With respect to the operational design of drainage for the Proposal, a Drainage Strategy was developed for the project with in-principle support from DWER (BORR IPT, 2019a). One of the main objectives of the strategy is "maintenance of existing water cycle balance within the project area whilst also improving the surface and groundwater quality". Drainage

[314] EPA response to Appeal 045/21 (07/01/22), pages 21-22
[315] https://www.der.wa.gov.au/your-environment/contaminated-sites
[316] BORR IPT (2020d), pages 147-148
[317] Department of Water (2004)
[318] BORR IPT (2020d), page 10
[319] Austroads (2003)

design will be undertaken at the detailed design stage to allow for pre-development flows to be maintained within the Proposal Area and is a standard practice for Main Roads projects.[320]

Erosion and salinity

The proponent's *Updated Referral Document* states that potential impacts that could arise during construction include salinity from vegetation clearing (though deemed to be a low risk), and soil erosion with associated sediment and contaminant transport resulting from unmanaged stormwater runoff and wind erosion following vegetation clearing, topsoil removal and soil excavation.[321] This is reflected in Report 1714 (page 99).

Available datasets indicate that the development envelope has:

- a predominantly high risk of wind erosion, with areas of moderate risk and small patches with low risk
- a predominantly low risk of water erosion, with areas of low-moderate risk towards the south-western and north-eastern ends, an area of moderate risk towards the north-eastern end, and an area of high risk in the vicinity of Five Mile Brook
- a predominantly low risk of salinity, with an area of low-moderate risk towards the north-eastern end.[322]

3.6.1.2 Proposed mitigation measures

Report 1714 recognises that the proposal has the potential to affect terrestrial environmental quality during construction and operation.

A number of measures to minimise, mitigate and monitor the impacts in relation to terrestrial environmental quality during construction are set out in the proponent's *Updated Referral Document*,[323] and are reflected in Report 1714 (page 99).

These include the development of plans and procedures, many of which would form part of the proponent's CEMP, to address threats from acid sulfate soils, storage and handling of hazardous materials, contamination, erosion and topsoil loss (refer Table 11).

Discussion

In relation to acid sulfate soils, DWER's guidance *Treatment and management of soil and water in acid sulfate soil landscapes*[324] provides technical and procedural advice to avoid environmental harm and to assist in achieving best practice environmental management in areas underlain by acid sulfate soils. In relation to managing unavoidable disturbance of acid sulfate soils, DWER's guidance states 'development should be undertaken in a manner that mitigates potential adverse impacts on the built and natural environment using the most appropriate management techniques', and that potential impacts must be managed to:

- neutralise existing and potential acidity and prevent the generation of acid and metal contaminants
- avoid releasing surface and/or groundwater flows containing elevated concentrations of acid and heavy metals into the environment
- prevent potential short and long term environmental harm
- make use of technologies that minimise soil disturbance.

[320] Proponent response to Appeal 045/21 (15/12/21), page 31
[321] BORR IPT (2020d), pages 148-149
[322] Datasets: Soil landscape land quality - Salinity Risk (DPIRD-009); Soil landscape land quality - Water Erosion Risk (DPIRD-013); Soil landscape land quality - Wind Erosion Risk (DPIRD-016)
[323] BORR IPT (2020d), pages 156-157, plus Tables ES-1 and 6-2
[324] Department of Water and Environmental Regulation (2015)

The proponent's *Updated Referral Document* sets out broad management measures to be included in its *Acid Sulfate Soils and Dewatering Management Plan*:

- spoil management including treatment via chemical neutralisation (use of agricultural lime or similar)
- dewatering management strategies and requirements for disposal of dewatering effluent
- groundwater monitoring and management.[325]

While the proponent's information does not expressly state that its *Acid Sulfate Soils and Dewatering Management Plan* would be prepared in line with DWER's guidance, we note that the proponent's proposed management measures are broadly consistent with it.

In relation to contamination and accidental spills, the proponent advised that the treatments in the *Drainage Strategy* would be informed by the main constituents in runoff from the road (sediments, oil and grease/ hydrocarbons, heavy metals, inorganics, nutrients). The proponent also advised that the CEMP would include details on the handling and storage of hydrocarbons, chemicals and hazardous materials during construction activities, including:

- ensuring there is a *Spill Response Procedure* for hazardous material spill events to ensure any spill is contained effectively and cleaned up appropriately
- not permitting storage of re-fuelling of hydrocarbons within 200 m of a natural watercourse, CCW or REW
- storing hydrocarbons within suitably designed containers within a bunded area onsite
- any incidences would require that a report for the regulator is prepared.[326]

The proponent's *Updated Referral Document* sets out management measures in relation to contaminated sites:

- undertake a contamination risk assessment of the entire alignment (when available) and remediating any contamination as required
- if, during construction works within the Proposal Area, contamination is identified, the site would be managed in accordance with the requirements of the *Contaminated Sites Act 2003* and DWER's guidance *Assessment and Management of Contaminated Sites*.[327]

In response to appellants' concerns about erosion and salinity, the proponent advised that the risk of erosion and sedimentation during operation of the proposal would be managed through drainage design, and that erosion control would be applied at drainage discharge points. The proponent also advised that the CEMP would contain site-specific controls to mitigate the risk of erosion and sedimentation during construction (in the context of inland waters), including:

- ensure there is no direct run-off to the adjacent watercourses and wetlands
- install temporary erosion and sediment control measures during bridge construction
- design watercourse crossings to include erosion control and scour protection measures
- prepare the *Landscape Management Plan* so that roadside and medians would be vegetated and capable of acting as a biological filter for runoff.[328]

[325] BORR IPT (2020d), page 149
[326] Proponent response to Appeal 045/21 (15/12/21), pages 33-34
[327] BORR IPT (2020d), page 149
[328] Proponent response to Appeal 045/21 (15/12/21), pages 14 and 31

The proponent's *Updated Referral Document* states that soil impacts would be minimised through measures in the CEMP:

- drainage treatments to minimise and / or direct runoff from cleared areas in order to minimise downslope erosion and sedimentation
- stabilisation techniques applied if erosion or sedimentation is evident
- vehicle and machinery traffic would be confined to the disturbance area to prevent damage to retained vegetation / land
- minimise the loss of soil structure through re-use in landscaped areas where appropriate via a *Topsoil Management Plan*
- sediment reduction and control methods for the retention areas of dewatering effluent
- monitoring during construction.[329]

We note that the EPA has identified that the proposal may have potential risks from acid sulfate soils contamination, and soil erosion and having regard for the proponent's mitigation measures and other statutory processes, we accept the EPA's conclusion that 'it is unlikely that the proposal would have a significant impact on Terrestrial Environmental Quality and that the impacts to this factor are manageable'.

3.7 Did the EPA have adequate regard for climate change and greenhouse gas emissions?

The appellants are of the view that the EPA has not properly assessed greenhouse gas emissions for the proposal and that further information is needed to inform the assessment. The appellants also submitted that the effects of climate change have not been considered.

The EPA considered the impacts of climate change and greenhouse gas emissions

Our conclusion is that, while the EPA did not identify greenhouse gas emissions to be a key environmental factor for this proposal, the EPA has recognised and assessed the potential for impacts from greenhouse gas emissions and climate change. We explain our reasoning below.

3.7.1 Greenhouse gas emissions

In summary, the appellants submitted that:

- the assessment of greenhouse gas emissions resulting from the proposal are incomplete and inadequate; further information/ evaluation is required to inform the assessment, including modelling of potential long-term carbon pollution impacts from induced travel
- the EPA has made unfounded assumptions about emissions by assuming the road vehicles of the future would increasingly be electrified or have improved emission control.

3.7.1.1 State of knowledge

The proponent's high-level modelling of estimated greenhouse gas emissions for the proposal is presented in Table 10. For comparison, the figures for BORR Northern and Central Sections are included.

[329] BORR IPT (2020d), page 149

Table 10 *Summary of potential construction emissions over three years*[330,331]

Activity	Scope 1 (tCO_2-e)		Scope 2 (tCO_2-e)		Scope 3 (tCO_2-e)	
BORR	Northern & Central	Southern	Northern & Central	Southern	Northern & Central	Southern
Vegetation removal	24,702	16,018	-	-	24	15
Demolition and earthworks	52,414	18,568	-	-	3,997	1,416
Construction	15,264	6,911	-	-	226,823	90,150
Site offices / general areas	754	754	-	-	57	57
Construction total	93,134	42,251[332]	-	-	230,901	91,638
Operational (maintenance)	Not specified	666	-	-	-	-
Overall total	Presume <100,000	42,917	-	-	-	-

From the above table, the total estimated Scope 1 greenhouse gas construction emissions for the broader BORR project are averaged to be less than the EPA's 100,000 tonnes of carbon dioxide equivalent (tCO_2-e) per annum which it says would generally trigger formal assessment.

The EPA advised that with regard for the modelled Scope 1 greenhouse gas emissions, the proponent's carbon reduction measures, and the proponent's prediction that the proposal would result in a net reduction in Scope 3 emissions, it concluded that:

> … the proponent has done all that is reasonably practicable throughout the mitigation hierarchy to reduce GHG emissions in order to minimise the risk of environmental harm associated with climate change [and based] on the residual emissions and the steps which have been taken to reduce [emissions], the proposal is consistent with the EPA's GHG Guideline and does not require a GHG management plan.[333]

In relation to scope 3 and vehicle emissions, the 2003 aggregated emissions inventory of National Pollution Inventory substances within the Bunbury Regional Airshed reported that those emissions for which motor vehicles made a substantial contribution to overall levels were carbon monoxide (CO), oxides of nitrogen (NO_x), and volatile organic compounds (VOCs).[334]

The proponent provided the following response in relation to operational greenhouse gas emissions:

> For operational emissions, transport modelling was undertaken to demonstrate the expected Scope 3 emissions from road users (operational emissions), once the project has

[330] BORR IPT (2020d), page 164
[331] BORR IPT (2020f)
[332] BORR IPT (2020d) also states 'total Scope 1 emissions of 68,542 tCO_2-e over the three-year construction period, or 22,847 tCO_2-e per annum' (p198). While higher than the total in the table, it is still below the trigger for assessment defined in the EPA's guidance.
[333] EPA response to Appeal 045/21 (07/01/22), pages 26-27
[334] Sinclair Knight Merz (2003)

been constructed. The process includes the calculation of fuel consumption on each road link and the conversion of fuel consumption to emissions (tCO_2-e). To appreciate the impact the Project is likely to have on emissions, the process adopted for this analysis essentially uses two Bunbury Transport Model (BTM) runs as follows:

- 2021 with BORR
- 2041 with BORR

The BTM is a 3-step strategic model that models 2 vehicle groups, namely Cars and Heavy Vehicles. It produces standard model outputs necessary for emissions calculations including vehicle volumes and link speeds. For 2021, construction of the BORR Southern Section results in additional annual emissions of approximately 1,400 CO_2-e tonnes, and for 2041, approximately 2,100 additional CO_2-e tonnes are expected. This quantum of impacts is not considered likely to be significant.

Contrary to the appellants' assertions, the BTM aligns to observable data in the study area and actually excludes any prediction of future fleet scenarios as the fleet evolves with time. The adoption of lower emission vehicles and alternative fuel sources such as electric vehicles would mean estimates in the Updated Referral Document (BORR IPT, 2020), especially in future years, are likely overstated.[335]

The EPA advised that it had regard to scope 3 emissions, but noted that as those emissions occur as a consequence of the activities of the proposal and are not owned or controlled by the proponent they were not within the scope of assessment for the proposal, and considered this to be consistent with its greenhouse gas guideline. The EPA also advised:

> The information on scope 3 emissions provided by the proponent included vehicle emissions (both light and heavy vehicles), ongoing street lighting, traffic signals and road maintenance activities (including the use of mobile construction equipment and materials used for maintenance activities). The EPA also noted the proponent's prediction that the road upgrade will result in a net reduction in scope 3 operational GHG emissions on the regional road network through potential increases in freight efficiencies. The proponent did not provide information on induced travel and this was not part of the EPA's consideration, however the EPA acknowledges the uncertainty around induced travel and considers the information provided by the proponent to represent credible estimates for scope 3 emissions.[336]

Discussion

The proponent's modelling indicates that greenhouse gas emissions during construction would be in the order of 42,917 tCO_2-e over three years, substantially lower than the 100,000 tCO_2-e per annum used by the EPA as a general guide to referral under Part IV of the EP Act.

In response to appeals raising scope 3 emissions, the EPA advised that as those emissions are beyond the control of the proponent they are outside the scope of assessment for the proposal. In any event, noting the modelling about the effect of emissions from vehicles in 2021 and 2041 from the use of the road (being 1,400 tCO_2-e and 2,100 tCO_2-e per annum respectively) do not significantly add to Western Australia's current annual GHG emissions and may reduce emissions through more efficient flow of vehicles around Bunbury.

From the above, we note that the EPA considered modelled greenhouse gas emissions during construction (including scope 3 emissions) as part of the referral. Noting the content of the GHG Factor Guideline in respect to when GHGe may be formally assessed, we consider the EPA was justified in not identifying GHG emissions as a key environmental factor for this proposal. As such, we accept the EPA's conclusion that the proposal is unlikely to result in

[335] Proponent response to Appeal 045/21 (15/12/21), pages 37-38.
[336] EPA response to Appeal 045/21 (07/01/22), page 27

significant impact on greenhouse gas emissions and that the impacts to this factor are manageable.

That said, we also note (as we have done on other recent appeals) that every tonne of GHGe contributes to global warming and that steep reductions in GHG emissions are required this decade to limit global warming to well below 2°C and pursuing efforts to limit it to 1.5°C, as set out in the UNFCCC Paris Agreement.[337] While emissions from this proposal are not of a scale that warranted assessment by the EPA, they are nonetheless emissions that will need to be considered in the context of achieving net zero emissions by 2050.

3.7.2 Climate change

In summary, the appellants submitted that:

- the south west of Western Australia has been identified as a global drying hotspot with reduced annual rainfall, higher temperatures, and more frequent and intense weather events (storms); the principle of intergenerational equity should be actively embraced; the EPA should have acknowledged the projected impact of climate change (including on fauna and vegetation)
- managed conservation estate needs to be protected against impacts of climate change
- the EPA has not considered the role of mature trees in the Gelorup Corridor in storing carbon and producing oxygen.

3.7.2.1 State of knowledge

In 2015, the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and the Australian Bureau of Meteorology (BoM) released the latest set of national climate projections for Australia. These included a projected decline in rainfall from a 2015 baseline of up to 15% by 2030, and up to 45% by 2090.[338]

It is broadly accepted that a changing climate is driving changes in the distribution of species and the composition and function of ecosystems, and could potentially exacerbate the impacts of existing threatening processes.[339]

The proponent's *Updated Referral Document* notes climate change in the context of threats to western ringtail possum habitat, black-stripe minnow habitat, TECs, underground and surface water availability (including GDEs and sea level), and greenhouse gas emissions. The Document states:

> In accordance with the Main Roads Guideline on Climate Change[340], impacts of climate change have been considered during Proposal planning. The Guideline specifies that impacts of a 300 mm sea level rise are to be considered during planning, design and construction for all Proposals in coastal areas. The Guideline also includes consideration of potential changes in rainfall pattern due to climate change and recommends that Intensity Frequency Duration (IFD) rainfall data are adjusted for future climate change. This recommendation will be incorporated in a review of the effects of rainfall intensification for transverse drainage during detailed design.[341]

Report 1714 indicates that the EPA had regard for climate change primarily in the context of impacts on black-stripe minnows (including reduced rainfall/ drying of habitats).

[337] Appeals Convenor (2022), pages 28-31.
[338] Hope et al (2015)
[339] Department of Agriculture, Water and the Environment (2022)
[340] Main Roads Western Australia (2020)
[341] BORR IPT (2020d), page 156

The proponent advised that existing vegetation can be expected to stop being a net carbon sink 40-100 years after establishment when the soil or vegetation reaches carbon equilibrium, and submitted that the vegetation in the development envelope is likely at equilibrium and not a significant source of carbon capture in the future.

The proponent acknowledged that vegetation clearing would release sequestered greenhouse gases (including carbon), and advised that construction emissions from clearing would release about 16,000 tCO_2-e.[342]

The EPA acknowledged appellants' specific concerns regarding the threat climate change presents for black cockatoos, black-stripe minnow, ecosystem resilience, hydrological flows, GDEs and conservation estate. The EPA advised that it acknowledges clearing of native vegetation contributes to climate change, however considered that from a greenhouse gas emissions perspective the loss of carbon sink due to clearing of 71.5 ha of vegetation for the proposal is not so significant as to require assessment and conditioning.[343]

Discussion

In February 2022, the Intergovernmental Panel on Climate Change (IPCC) published a report on Climate Change Impacts, Adaptation and Vulnerability.[344] The report identifies particular risks to ecosystems and ecosystem integrity including that increased global warming is likely to particularly affect the resilience of biodiversity values in most of Australia;[345] and to Western Australia from increased drought in south-western Australia,[346] with evidence of current warming causing dramatic declines in freshwater flows of up to 70 per cent since the 1970s.

While in this case we accept the EPA's advice that it considered the specific threat climate change presents for fauna, flora and vegetation, and inland waters within the context of its assessment for these factors we find that risks posed from the proposal from habitat fragmentation for a range of flora and fauna values is likely to be exacerbated by climate change and we consider that the interaction between these risks and cumulative impacts generally require acknowledgement.

It is widely recognised that natural ecosystems are undergoing change from exposure to multiple human disturbances[347]. It is recognised that multiple threats or disturbances (in this case climate change and fragmentation) can interact to result in cumulative impact through substantial changes at the species and remnant-level.[348]

Noting the above, whether or not a proposal should be approved is appropriately a matter for the decision makers under section 45 of the EP Act (on the basis that this process can consider impacts beyond the impacts of an individual proposal).

The EPA's consideration of cumulative impacts more broadly are discussed at section 3.8 Holistic assessment.

[342] Proponent response to Appeal 045/21 (15/12/21), page 10
[343] EPA response to Appeal 045/21 (07/01/22), page 26
[344] Intergovernmental Panel on Climate Change (2022)
[345] Intergovernmental Panel on Climate Change (2022), pages 2-6.
[346] Intergovernmental Panel on Climate Change (2022), pages 4-34.
[347] Hogdson et al (2019), page 1.
[348] Vitousek et al (1997)

3.8 Did the EPA have adequate regard for impacts holistically?

The appellants are of the view that the EPA has not properly assessed the cumulative impacts from the proposal, in the context of other approved proposals, the value of the Gelorup corridor in the broader area, clearing required to access road building materials, and holistically for all environmental factors in combination.

The EPA undertook a holistic assessment

Our conclusion is that the EPA has recognised and assessed the cumulative impacts for, and holistic interactions between, the key environmental factors. Noting the EPA's advice that the sourcing of materials did not form part of the referred proposal, and that the associated environmental impacts are usually assessed and regulated separately, we consider it reasonable that the EPA did not assess this matter. We explain our reasoning below.

3.8.1 Holistic assessment

In summary, the appellants submitted that:

- the EPA has failed to acknowledge the overall impact of multiple approvals requiring clearing to allow for construction of the broader BORR and Bussell Highway duplication
- the EPA has not considered the Gelorup Corridor as a whole ecological entity, and has therefore underestimated the total value of the Gelorup Corridor
- the EPA has not considered the area proposed to be cleared in context of its importance to the greater area to which it forms part; the loss of this area is cumulatively terminal to the current value and holistic ecological function of the greater area
- the EPA's assessment of cumulative impact is flawed in that it considers broader scale Swan Coastal Plain bioregion / Perth subregion, but does not consider the cumulative impact of permanent clearing on the local ecosystem
- environmental impacts associated with the sourcing of raw materials for construction of the road (for example fill, road base) should have been included in the EPA's assessment, and is crucial to understanding the cumulative impacts of the proposal
- the EPA's view is that the four key environmental factors identified can be considered holistically; it would be advisable to consider the whole proposal holistically within the context of south-west WA, noting the extensive and unsustainable clearing.

3.8.1.1 Nature of 'holistic assessment'

The concept of an 'holistic assessment' was described in the EPA's 2020 Procedures Manual as including:

> … assessment of the acceptability of the whole proposal, considering:
> - the interconnected nature of the environment
> - the principles of the EP Act
> - the objectives for the key environmental factors
> - cumulative impacts with other proposals
> - impacts that integrate across a proposal (e.g. mine closure)
> - significant residual impacts and offsets.[349]

In the current version of the Procedures Manual, the concept of 'holistic assessment' has been replaced with the phrase 'holistic impacts', which are described as:

> … connections and interactions between impacts, and the overall impact of the proposal on the environment as a whole.[350]

[349] Environmental Protection Authority (2020e), page 35.
[350] Environmental Protection Authority (2022), page 67.

A key change was the separation of consideration of holistic impacts with cumulative impacts. In that regard, the current Procedures Manual defines cumulative impacts as:

> … the successive, incremental and interactive impacts on the environment of a proposal with one or more past, present and reasonably foreseeable future activities.[351]

Amendments to the EP Act that took effect 2021 provide that a 'reference in this Act to the effect of a proposal on the environment includes a reference to the cumulative effect of impacts of the proposal on the environment.'[352]

3.8.1.2 State of knowledge

Report 1714 sets out the EPA's holistic assessment for the four key environmental factors. In its holistic assessment, the EPA recognised the intrinsic links, connections and interactions between these environmental factors, and that these interactions 'have the potential to influence the environment in a holistic and non-linear way, effecting all environmental values which are physically and intrinsically linked'.

The EPA was satisfied that by applying the proposed mitigation and management measures, the recommended conditions (including offsets), and the precautionary principle, the holistic impacts to the environmental factors are likely to be consistent with its environmental factor objectives. The EPA concluded that when the separate environmental factors of the proposal were considered together in a holistic assessment, the impacts from the proposal would not lead to any change to its view about consistency with its environmental factor objectives.[353]

Report 1714 also sets out the EPA's consideration of cumulative impacts for each of the key environmental factors at a local and/or regional scale. These are discussed in more detail under Sections 3.2, 3.3, 3.4 and 3.5.

In relation to consideration of cumulative impacts in a regional context generally, the proponent advised:

> Respective to the ongoing development of land within the Bunbury region, approval and assessment is encompassed under the GBRS and subsequent amendments which previously considered the cumulative context of BORR within the landscape. The GBRS provides the legal basis for land use planning within the Greater Bunbury area. The GBRS defines the future use of land and requires local government to provide detailed plans consistent with the GBRS local planning schemes. The GBRS has been in operation since November 2007 (WAPC, 2017) and encompasses the planning approval for the BORR alignment.[354]

The EPA acknowledged the appellants' concerns regarding cumulative impacts generally:

> [The] EPA Report considered both cumulative impacts to specific environmental factors ([Report 1714] sections 2.1.8 and 2.2.8) and the holistic impacts of the proposal as a whole ([Report 1714] section 3). In assessing the impacts to the terrestrial fauna and flora and vegetation, the EPA considered the size and extent of vegetation and habitat adjacent to the development envelope, and the potential impacts that would result from the proposal fragmenting the Gelorup bushland.
>
> The EPA acknowledges that the proponent did not undertake vegetation surveys on adjacent private property to provide further context regarding vegetation condition, which could be used as a proxy to assess ecological function for the local area as a whole. However the EPA advises that only a portion of the Gelorup corridor bushland is considered in good or better condition. The EPA therefore considers that given the vegetation condition, and that the extent and patch size of the remnant vegetation outside the development

[351] Environmental Protection Authority (2022), page 66.
[352] *Environmental Protection Act 1986,* section 3(1B).
[353] Environmental Protection Authority (2021a), pages 50-53
[354] Proponent response to Appeal 045/21 (15/12/21), page 38

> envelope is likely to continue to meet the conservation criteria to be considered Banksia Woodlands, it is unlikely that the loss of the Gelorup corridor bushland will result in a "permanent loss of ecological function".[355]

In relation to environmental impacts associated with sourcing basic raw materials for proposal construction, the proponent's *Updated Referral Document* states:

> Materials for construction of the road and associated structures will be sourced according to the Materials Sourcing Strategy (MSS) (BORR IPT, 2020b). The MSS considers projects, nearby developments, potential areas of acquisition and commercial quarries as well as alternative recyclable material sources. The key basic raw materials required for construction of the road include sand, limestone, clay, lateritic gravel and crushed rock aggregate. The impacts associated with sourcing materials are not considered part of the Proposal.[356]

On this matter, the EPA advised:

> The EPA acknowledges that the basic raw materials required for construction were not assessed as they did not form part of the proposal referred. The environmental impacts associated with the extraction of the raw materials are usually assessed and regulated separately. In most cases the proponent for such projects would be companies experienced in quarrying for basic raw materials (not the proponent).
>
> Most large quarries would be required to gain approval and be registered or licensed under Part V of the EP Act. Where relevant and appropriate, the EPA may determine a quarry is likely to have a significant impact on the environment, and it therefore would also be assessed by the EPA under Part IV of the EP Act. The end-user of the raw materials (in this case Main Roads WA) is responsible for ensuring that sourcing of raw materials is from a licenced or registered source.[357]

Discussion

Issues raised in this ground of appeal that relate to the cumulative impacts to biodiversity values locally are considered in Sections 3.2, 3.3, 3.4 and 3.5.of this Report.

In relation to wider impacts, for example, those associated with the extraction of basic raw materials at locations away from the proposal site, the EPA has advised these were not assessed on the basis that they do not form part of the proposal and in any event, are subject to separate regulatory processes, including that 'most large quarries would be required to gain approval and be registered or licensed under Part V of the EP Act'.

In an appeal against a decision of the EPA not to assess a quarry in the Shire of Northam in 2020, we noted advice from DWER that its role in regulating quarries under Part V is limited to crushing and screening of material above the prescribed threshold (50,000 tonnes per year). DWER went on to advise that 'mining, free digging, excavating, quarrying and blasting do not constitute screening etc of material, and therefore do not fall within the scope of category 12 premises.'[358] In that case, we recommended (and the Minister accepted) that the proposal should be remitted to the EPA for a fresh decision on whether or not to assess the proposal, including reconsideration of the extent to which (in that case dust emissions) could be adequately regulated by other statutory processes.[359]

[355] EPA response to Appeal 045/21 (07/01/22), page 37
[356] BORR IPT (2020d), page 10
[357] EPA response to Appeal 045/21 (07/01/22), page 37
[358] Appeals Convenor (2020), pages 8 to 9.
[359] Appeals Convenor (2020), page 9.

Given this earlier finding, it is unclear as to the relevance of Part V of the EP Act in considering environmental impacts associated with 'quarries'. Nonetheless, to the extent those quarries require clearing of native vegetation to supply basic raw materials for this proposal (which is an obvious cumulative impact), that clearing will require a clearing permit. As the EPA has also observed, if a quarry is a 'significant proposal' within the meaning of section 37B of the EP Act, it is required to be referred to the EPA by a decision-making authority under section 38(4). In default of this occurring, section 38A(1) requires the EPA to 'call-in' the proposal, by requiring either a decision-making authority or the proponent to refer the proposal.

While the EPA mischaracterised the extent to which quarries are subject to regulation under Part V, we consider that the significant environmental risks posed by those proposals are required to be referred to the EPA by a decision-making authority, in default of which, the EPA is required to 'call-in' the proposal. This provides assurance that the impacts of individual significant proposals will be considered.

While we consider it is open to the EPA to have considered the environmental effect of the sources of basic raw materials that are required for this proposal to be implemented (as part of its power to assess the cumulative impacts of a proposal), we also consider that given the above scheme, significant impacts associated with those other proposals trigger a requirement for referral to the EPA, in addition to other requirements in respect to (for example) clearing of native vegetation.

On holistic impacts more generally, the EPA has considered the holistic interactions between the key environmental factors in its assessment of the proposal and formed the view that these impacts can be managed to meet its environmental objectives. We find that it was open to the EPA to reach this conclusion. However, we also note that the implementation of the proposal will result in significant impacts to a number of environmental values. While measures to mitigate these impacts have been identified and conditioned, there remains a level or risk that the implementation of the proposal will result in long term adverse environmental impacts, including to habitat for the critically endangered western ringtail possum.

In other recent reports, the EPA has noted that decisions on the acceptability of GHG emissions from proposals is appropriately a matter for the decision makers under section 45 of the EP Act (on the basis that this process can consider impacts beyond the impacts of an individual proposal). Similarly, the decision-makers in this case will consider the environmental, social and related issues related to this proposal, and whether or not it should be approved for implementation.

3.9 Did the EPA have adequate regard for other government processes?

In summary, the appellants submitted that the EPA, by recommending the proposal for implementation, has failed to be consistent with multiple government documents and environmental legislation, policies, and principles regarding the need to protect remaining habitat and biodiversity, including:

- EPA Bulletin 1108[360]
- EPA Bulletin 1194[361]
- EPA Scheme Advice for Shire of Capel Local Planning Scheme 8[362]

[360] Environmental Protection Authority (2003)
[361] Environmental Protection Authority (2005)
[362] Environmental Protection Authority (2020b)

- EPA Technical Advice for Carnaby's cockatoo environmental impact assessment in the Perth and Peel region[363]
- EPA advice to the Shire of Capel in 2019[364]
- draft Western Australian Native Vegetation Policy
- the Kunming Declaration[365] commitment to reverse global biodiversity loss.

The EPA considered other government processes

Our conclusion is that the EPA has had regard for its previous recommendations and advice as relevant to the proposal, and was justified in deciding to assess the proposal on its merits independent of previous decisions. We explain our reasoning below.

EPA Bulletin 1108 set out the EPA's assessment of the GBRS. In that report, the EPA provided advice on the broader BORR alignment, however deferred its assessment of a number of environmental factors due to the broad scale of the assessment or because insufficient information was available at that stage of the planning process. For the BORR, the deferred factors for future assessment were identified as 'remnant vegetation, wetlands, watercourses, fauna and noise',[366] including remnant vegetation extents for which the report referred to the retention of 30% of the pre-clearing extent of the ecological communities in the Greater Bunbury Region (or 10% in constrained areas).

As discussed in Section 3.3.1, the EPA considered vegetation representation in the context of the proposal being within a constrained area; the proposal would not result in any of the vegetation associations or vegetation complexes within the development envelope falling below 10% of their pre-clearing extents within the Swan Coastal Plain bioregion.

The proponent advised that while a 30% remnant vegetation retention target was applied to developments under the GBRS (and to agricultural, strategic minerals and basic raw materials resource policy areas), it was not applied to any road reserves (including the broader BORR). The proponent advised that accordingly, development conditions used for decision-making under the GBRS do not legally constrain decision-making with respect to the current proposal. The proponent also advised that throughout the assessment process it has endeavoured to avoid remnant vegetation wherever possible, and has made modifications to the proposal design to maximise avoidance of areas around Reserve 23000 at Bussell Highway, in remnant bushland near Marchetti and Ducane Roads and wetlands north of Lilydale Road. The proponent advised that the first principle in all discussions with the EPA regarding the proposal was the application of the mitigation hierarchy.[367]

EPA Bulletin 1194 set out the EPA's assessment of a sandpit extension in Gelorup. That proposal was to extract sand from 18.87 ha over 20 years, to a maximum depth of 20 m Australian Height Datum. The EPA concluded that that proposal was environmentally unacceptable on the basis of impacts to regionally significant environmental values (including a vegetation complex that had less than 30% remaining, the Dalyellup/Gelorup/Preston River SWREL, and threatened fauna including western ringtail possums), and lack of evidence that rehabilitation following sand extraction would be successful.

[363] Environmental Protection Authority (2019b)
[364] Appellant referenced content in: Shire of Capel (2019)
[365] Australian Government (2021)
[366] Environmental Protection Authority (2003)
[367] Proponent response to Appeal 045/21 (15/12/21), pages 12-13

We note that the sandpit extension would have resulted in a modified landform with about 5-20 m of soil depth removed, and that the EPA did not have confidence that this could successfully be rehabilitated to re-instate the impacted environmental values. For the current proposal, the environmental impacts are proposed to be re-instated through protection of existing vegetation and revegetation at locations other than the impact site.

The EPA Chair's Determination for Shire of Capel Local Planning Scheme 8 included a recommendation 'Development should be located within existing cleared land, or within areas of existing degraded vegetation, where that vegetation is not significant habitat for threatened fauna' to protect and mitigate potential impacts to remnant native vegetation and threatened ecological communities, threatened flora, and threatened fauna (including western ringtail possums and black cockatoos) and their habitats.

The aim of Shire of Capel Local Planning Scheme 8 was to bring the zone and reserve designations into alignment with the Model Provisions in Schedules 1 and 2 of the *Planning and Development (Local Planning Schemes) Regulations 2015* and the GBRS. We understand that this did not include changes to the GBRS alignment for the broader BORR.

The EPA's Technical Advice for Carnaby's cockatoo environmental impact assessment in the Perth and Peel region states that 'Protection of existing habitat and minimising habitat loss will support efforts to increase the population and is important to achieve the success criteria of the Recovery Plan[368]'.

The purpose of the Guidance is to inform environmental impact assessment under Part IV of the EP Act, and other decision-making processes, for Carnaby's cockatoo in the Perth-Peel region. The Guidance sets out the status of knowledge, information gaps, key threats and impacts, and cumulative impacts in the Perth-Peel region, as relevant to Carnaby's cockatoo, as well as approaches to environmental impact assessment, management, and protection. The Guidance concludes that 'The EPA will take a holistic approach when considering proposals that may impact on Carnaby's cockatoo …'. Although the proposal is not located in the Perth-Peel region, Report 1714 includes a holistic assessment for black cockatoos.

The EPA's advice to the Shire of Capel in 2019 related to the proposed extension of Minninup Road, and indicated that that proposal did not need to be assessed by the EPA provided construction was undertaken in a manner to limit/ avoid the need to clear trees within the road reserve.

For the current proposal, the EPA identified that the proposal is significant and warranted formal environmental impact assessment. Report 1714 sets out the proponent's endeavours to avoid and minimise impacts from the proposal against each of the environmental factors identified by the EPA, and proposed mitigation to address the residual impacts.

The draft Native Vegetation Policy 'consultation draft' was available for public comment between 30 August and 25 October 2021. As at the closure date for appeals on EPA Report 1714, the draft policy was not yet finalised nor in effect. On this basis, we consider the EPA was correct in not having regard for a draft policy currently in review following public consultation.

[368] Department of Parks and Wildlife (2013)

The Kunming Declaration was adopted by more than 100 countries on 13 October 2021, one week before Report 1714 was published. The Declaration notes the need to protect species and ecosystems (among other things), and outlines general targets for the restoration and protection of biodiversity, including 17 commitments, to 'ensure that biodiversity is put on a path to recovery by 2030 at the latest'.

We acknowledge the appellants' view that this Declaration applies to all proposals going forward. We note, however, that it is a recent high level commitment by the Australian Government and requires the development of measurable outcomes.

In response to the matter of consistency with these processes, the EPA advised:

> The EPA advises that it assessed the proposal on its environmental merits rather than be bound by a previous policy, decision or report. In assessing this proposal, the EPA had due regard [sic] the potential environmental impacts, the principles of the EP Act, environmental factor guidelines, public submissions, advice provided by agencies, information provided by the proponent, and information obtained through its own inquiries …
>
> With regard to cockatoo habitat, the EPA advises the proponent undertook measures to further avoid and minimise the clearing of habitat through the assessment; since referral, the proponent has reduced the clearing of black cockatoo habitat by 19.1 ha through section 43A of the EP Act. This is consistent with the Cockatoo Advice. In addition, the offsets package includes a rehabilitation aspect that would increase the amount of foraging habitat available for black cockatoos and ensure no net loss. The Cockatoo Advice identifies that mitigation should include long-term actions such as rehabilitation and restoration of habitat as well as retention and protection of existing habitat.[369]

We consider that the EPA has had regard for its previous recommendations and advice (and other processes) as relevant to the proposal, and was justified in deciding to assess the proposal on its merits independent of previous decisions.

3.10 Did the EPA inappropriately have regard for economic factors?

In summary, the appellants submitted that:

- the EPA has considered economic factors for the proposal, relating to the impact of the alternative alignment on mining and farming, as indicated on page 4 of Report 1714; this is non-compliant with the scope of assessment defined in the EP Act (as per *Coastal Waters Alliance of Western Australia Incorporated v Environmental Protection Authority; ex parte Coastal Waters Alliance of Western Australia Incident* (1996) 90 LG ERA 136).

The EPA did not take into account economic factors

Our conclusion is that the EPA did not inappropriately consider economic factors. We explain our reasoning below.

The *Coastal Waters Alliance of Western Australia Incorporated v Environmental Protection Authority; ex parte Coastal Waters Alliance of Western Australia Incident* (1996) 90 LG ERA 136) was a case concerning an EPA Report which, while acknowledging the environmental impacts of that proposal, also took into account the impact on that proponent if approval was not given. In brief, Judge Rowland examined the meaning of 'environment' (and 'social'), and determined that it is not the function of the EPA to determine whether the economic value of a proposal takes precedence over the environmental issues.

[369] EPA response to Appeal 045/21 (07/01/22), page 39

We note that the statement on page 4 of Report 1714 reflects the findings set out in the proponent's *Alignment Selection Report* (which includes the proponent's environmental impact assessments for the GBRS alignment and alternative alignment), in the context of the proponent's demonstrated consideration of alternatives.[370] The complete paragraph reads:

> Prior to the referral of this proposal, the proponent considered options to avoid and minimise impacts to EPA factors by investigating an alternative alignment to the south-east of the referred alignment. The alignment selection process involved:
>
> - Environmental surveys and landowner consultation within the alternative alignment.
> - Preliminary Environmental Impact Assessments (BORR Team 2019b) which determined:
>   - The referred alignment would have greater impacts on native vegetation including threatened and priority ecological communities, and terrestrial fauna habitat for threatened western ringtail possum and black cockatoos.
>   - In contrast, the alternative alignment would have a greater impact on threatened aquatic fauna and wetlands.
>   - The referred alignment would potentially have greater impacts on social surroundings in the context of visual amenity and noise to the surrounding residents of Gelorup; while the alternative alignment may have a larger impact on agricultural businesses, properties containing basic raw materials and mining tenements.

In response to this matter, the EPA advised that it did not consider economic factors in its assessment of the proposal, as this is outside its remit as found in *Coastal Waters Alliance of Western Australia Incorporated v Environmental Protection Authority*; (*ex parte Coastal Waters Alliance (1996) 90 LGERA 136*).

There are no references in Report 1714 to suggest that the EPA considered economic factors in its assessment of the proposal. On this basis, we conclude that the EPA did not inappropriately consider economic factors.

3.11 Are the EPA's recommended conditions adequate?

The appellants are of the view that the conditions recommended by the EPA require strengthening, particularly in relation to required management plans, mitigation measures, baseline and ongoing monitoring, the adequacy of the proposed offsets to counterbalance the significant residual impacts, and public availability of data.

The EPA's recommended conditions should be strengthened

Our conclusion is that the EPA's recommended conditions are generally appropriate and consistent with the EPA's assessment, relevant policy and guidance. However, to improve transparency and clarify the intent of the conditions we recommend a number of changes, including:

- Changes to offset requirements, within conditions 9-2 (Table 1), 9-4(6) and 9-4(7), to provide additional offset requirements and improvements to revegetation / on-ground management criteria to ensure that the significant residual impacts to black cockatoo foraging and breeding habitat, Banksia Woodlands PEC, Tuart Woodlands PEC and Tuart-Peppermint Woodlands PEC are adequately counterbalanced, future quality of offset sites (as revised in Appendix 3) are met and offset sites adequately managed.
- A new requirement for the preparation and submission of an 'Environmental Performance Report' under condition 5 'Construction Fauna Management Plan' and condition 6 'Habitat Fragmentation Management Plan' in relation to western ringtail possum

[370] BORR IPT (2019a)

individuals and habitat. It is considered that these Environmental Performance Reports will provide for greater confidence and assurance that the proposed mitigation measures are adequate and effective in achieving the required outcomes and objectives.

- A new peer review requirement of the Habitat Fragmentation Management Plan and associated Environmental Performance Report, both required in condition 6. A peer review, to be carried out by an independent person or independent persons with suitable technical experience, will inform adaptive management and address scientific uncertainty in recovery of the local Gelorup population.
- A new requirement, within condition 4 'Terrestrial Fauna (Construction)', to strengthen mitigation measure for black cockatoo breeding habitat, through the installation, maintenance and monitoring of artificial nesting boxes for suitably sized hollow that cannot be avoided during construction.
- Changes to the extent of impacts permitted on conservation-significant ecological communities, within conditions 3-1(1) and 9-1(1), to clarify that the Tuart-Peppermint Woodlands PEC is nearly entirely overlapping with the Tuart Woodlands PEC and that only the clearing of 0.1 ha of Tuart-Peppermint Woodland is additional to that permitted for the Tuart Woodlands PEC.

We explain our reasoning below.

3.11.1 Regulatory approach

The proponent proposes to prepare and implement a *Construction Environmental Management Plan* (CEMP) to define techniques to minimise risks to the surrounding environment and provide monitoring during construction. The proponent's referral documents indicate that a number of plans and procedures are to be implemented, many of which would form part of the proposed CEMP, including those outlined in Table 11.

Table 11 *Plans, procedures and programs proposed by the proponent*

Plan/ procedure	Purpose/ objective	Relevance to environmental factors					
		Terrestrial fauna	Flora and vegetation	Inland waters	Social surroundings	Terrestrial environmental quality	Greenhouse gas emissions
Spill Response Procedure	Ensure any hazardous material spills are contained effectively and cleaned up appropriately.	Yes – BSM[371]	-	Yes	-	Yes	-
Hygiene Management Plan	Minimise risk of introducing or spreading weeds and/or plant pathogens including *Phytophthora* sp. Dieback into adjacent vegetation. Procedures for machinery/vehicle clean down, weed treatments and restrictions on vehicle/ machinery movements.	Yes – WRP,[372] BCs,[373] BSM	Yes	-	-	-	-
Fire/ Emergency Management Plan	Clearing activities are a potential risk of fire generation. To minimise the risk, clearing activities will not be undertaken when the Fire Danger Rating is severe or higher.	Yes – WRP, BCs, BSM	Yes	-	Yes – Air quality	-	-
Topsoil Management Plan	Ensure topsoil health is managed appropriately for rehabilitation works as well as traceability of weed-infested topsoil. Minimise the loss of soil structure through re-use in landscaped areas where appropriate	-	Yes	-	-	Yes	-
Landscape Management Plan	Guide revegetation of roadsides and medians, including so that they are capable of acting as a biological filter for run-off.	Yes – BSM	Yes	Yes	Yes – Visual amenity		

[371] Black-stripe minnow
[372] Western ringtail possum
[373] Black cockatoos

Plan/ procedure	Purpose/ objective	Relevance to environmental factors					
		Terrestrial fauna	Flora and vegetation	Inland waters	Social surroundings	Terrestrial environmental quality	Greenhouse gas emissions
Acid Sulfate Soils and Dewatering Management Plan	Ensure correct methods, effluent management, effluent treatment, effluent disposal and monitoring requirements during dewatering activities. Address spoil treatment, groundwater dewatering and water monitoring/ management.	-	-	Yes	-	Yes	-
Drainage Strategy	Maintain water cycle balance while seeking to improve surface and groundwater quality. Ensure pre-development flows are maintained' within development envelope.	-	Yes	Yes	-	-	-
Aboriginal Heritage Management Plan	Minimise the risk of any unauthorised disturbance of Aboriginal Heritage sites. Address recommendations made in Archaeological Survey report.	-	-	-	Yes – Aboriginal heritage	-	-

We understand that through its assessment, the EPA had regard for the proponent's mitigation and management measures, including the proposed intent and content of these plans, and identified gaps in the information which are addressed in the recommended conditions so that the proposal can be managed to meet its environmental objectives.

In this regard, the EPA has recommended environmental outcomes, and set out requirements to meet these (discussed in more detail in subsequent sections), including the preparation and implementation of additional plans listed below:

- a *Construction Fauna Management Plan* (condition 5)
- a *Habitat Fragmentation Management Plan* (condition 6-1 and 6-3)
- a *Noise Management Plan* (condition 7)
- an *Amenity Management Plan* (condition 8-3)
- an *Offset Management Plan* (condition 9-3) and contingency offsets (conditions 9-13).

We note that the proponent would also need to comply with other statutory approvals and legislative processes relevant to the proposal, including (but not necessarily limited to):

- *Aboriginal Heritage Act 1972* (disturbing sites of Aboriginal significance)
- *Biodiversity Conservation Act 2016* (taking of fauna, taking of flora)
- *Biosecurity and Agricultural Management Act 2007* (management of declared weeds)
- *Contaminated Sites Act 2003* (contamination)
- *Environmental Protection (Noise) Regulations 1997* (construction noise)
- *Land Administration Act 1997* (compulsory acquisition of land parcels)
- *Main Roads Act 1930* (construction of roads)
- *Planning and Development Act 2005* (planning amendment to GBRS, development application)
- *Rights in Water and Irrigation Act 1914* (dewatering, groundwater abstraction, disturbing bed and bank).

3.11.2 Fauna

The EPA recommended conditions 1, 2, 4, 5, 6 and 9 (offsets) 'so that the environmental outcome is likely to be consistent with the EPA's objective for terrestrial fauna'. Table 12 contains a summary of these recommended conditions.

Table 12 *Recommended conditions relating to fauna (summarised)*

No.	Requirements
1	Limits native vegetation clearing and disturbance for the proposal to 71.5 ha of within the 200 ha development envelope.
2	2-1(2)(d) requires that there are no project-attributable impacts to the hydrological regime and water quality of black stripe minnow habitats defined and mapped in the proponent's *Fauna Action Management Plan*.[374]
4	4-1(1) limits the extent of clearing of habitats to 60.9 ha for western ringtail possum, 60.9 ha and 1,088 trees for black cockatoos, 39.2 ha for south-western brush-tailed phascogale, and 5.5 ha for black-stripe minnow. 4-2(1)-(2) require surveys of black cockatoo potential nesting trees within seven days prior to clearing, and implementation of management measures where trees are found to be in use. 4-2(3) requires implementation of pre-clearance protocols within seven days prior to clearing to minimise impacts to terrestrial fauna.

[374] BORR IPT (2021c)

No.	Requirements
	4-3 requires fauna spotters to be present, that there are no project-attributable indirect impacts within clearing exclusion areas, and that black cockatoo foraging species are not planted within 10 m of the road.
5	5-1 sets out the objective to be achieved in relation to conservation-significant terrestrial fauna (including western ringtail possum and south-western brush-tailed phascogale). 5-2 to 5-4 require preparation of a Construction Fauna Management Plan for approval and subsequent implementation prior to ground-disturbing activities and in consultation with DBCA that specifies passive relocation, defines low-risk clearing timeframe, specifies monitoring including baseline surveys within the development envelope and receival sites and evaluation of passive relocation, identifies study area and reference sites for monitoring and evaluation, and specifies management actions and targets. 5-5 to 5-6 provide for review and amendment of the Construction Fauna Management Plan, and requires ongoing implementation until requirements met.
6	6-1 to 6-2 set out the objectives and outcome to be achieved in relation to impacts on western ringtail possum. 6-3 to 6-5 require preparation of a Habitat Fragmentation Management Plan for approval and subsequent implementation prior to ground-disturbing activities and in consultation with DBCA that specifies details in relation to fauna crossings, land bridges, fragmentation, predator control, abundance and persistence of western ringtail possum, and protection and enhancement of adjacent habitat, and includes management actions and targets and contingency actions. 6-6 to 6-7 provide for review and amendment of the Habitat Fragmentation Management Plan, and requires ongoing implementation until requirements met. 6-8 requires provision of a Habitat Fragmentation Performance Report within 16 years of commencement of construction.
9	Offsets (discussed in Section 3.11.6).

In summary, the appellants submitted that:

- the recommended conditions regarding monitoring are inadequate; the control measures for monitoring outcomes and reporting should be specified in more detail
- the proponent should be required to fund (published) research into the western ringtail possum clearing protocols, the proposed habitat connectivity mitigation measures, attrition rates from displacement, and the success of release following rehabilitation
- fauna spotters should monitor felled trees for a minimum of 72 hours to allow western ringtail possums to safely exit the felled trees, and monitor vegetation at night to ensure safe egress by western ringtail possums and prevent them re-entering hollows
- there is no provision for comparative genetic studies between the Gelorup western ringtail possum population and other populations to enable better understanding of the genetic significance/ ecological value of the Gelorup population
- a plan is needed for management of injured western ringtail possums, including appraisals for appropriate release sites, established fox management regimes, and partnerships and funding with veterinarians and rehabilitation group
- the feral animal control measures required under recommended condition 6 need specifications on monitoring.
- a condition should be added stating that construction works near habitat of black-stripe minnows should be limited to dry weather conditions
- any surveying methods or statistics, as relevant to fauna, should be informed by appropriately educated specialists, such as a biostatistician, university institution or academic body such as Data Analysis Australia

- the recommended conditions are insufficient to protect the full range of fauna species likely to be impacted; additional measures are required (for example passive relocation; searching hollows, dreys, ground debris, dense vegetation, fallen timber and logs for vertebrate fauna; capture and release, and incubating eggs)
- there should be a requirement to replace nesting hollows and dreys with by at least double the number of nesting boxes as those lost
- the recommended conditions should require that the compliance assessment reporting be independently assessed by an academic institution (including the Habitat Fragmentation Management Plan, Construction Fauna Management Plan, and offsets).

The EPA responded to appellants' concerns about the adequacy of the recommended conditions relating to fauna generally as follows:

> The EPA has made recommendations that outline the basis for the monitoring within the conditions for the Management Plans (conditions 5 and 6) using a practical level of detail. Consistent with *Conservation Council of Western Australia (Inc) v The Honorable Stephen Dawson MLC (2018) WASC 34*, the EPA notes "it is impracticable, and probably impossible to attach conditions to an approval which specify, in meticulous detail, the precise manner in which each and every aspect of the proposal will be implemented. It must also be remembered that the Management Plans, the subject of conditions (5 and 6), are simply a means to an end - the end being the achievement of the environmental objectives and outcomes specified in absolute terms in other conditions." Therefore, the conditions recommended by the EPA avoid the use of excess detail but include a requirement for technical review by the DBCA (conditions 5-2(6) and 6-3(14)) to ensure monitoring is designed to demonstrate whether the outcomes and objectives are being met.[375]

Monitoring

The *Construction Fauna Management Plan* is to include a monitoring program that:

- includes baseline surveys prior to clearing to confirm presence/absence and number of western ringtail possum and south-western brush-tailed phascogale individuals within the development envelope and in adjacent receival sites
- records encounters with threatened or priority fauna during clearing, and reports on the number of individuals relocated in line with lawful authority
- evaluates the suitability, adequacy and effectiveness of passive relocation at reducing impacts on displaced western ringtail possums
- evaluates impacts on residential western ringtail possums in adjacent receival sites
- uses methods including radio telemetry with robust sample sizes
- identifies and spatially defines study areas and reference sites for monitoring and evaluation
- specifies management actions and management targets.

The *Habitat Fragmentation Management Plan* is to include a monitoring program that:

- specifies methodologies to evaluate the effectiveness and utilisation of fauna crossings and fauna land bridges by western ringtail possums, and include camera monitoring and monitoring of DNA scat analysis
- specifies methodologies to evaluate project-attributable effects of fragmentation on demographics and genetics of the Gelorup western ringtail possum population, and the effectiveness of measures
- specifies methodologies to evaluate the abundance and persistence of western ringtail possums in receival sites

[375] EPA response to Appeal 045/21 (07/01/22), page 8

- demonstrate how the habitat in the 'clearing exclusion areas' and 'vegetation retention areas' would be maximised for western ringtail possums, and include provisions for revegetation of degraded areas
- include provisions for monitoring of revegetation in the 'clearing exclusion areas' and 'vegetation retention areas', and for maintenance and remedial measures to demonstrate that the habitat is self-sustaining and maximised for western ringtail possums
- outline the long-term management and protection mechanisms for in clearing exclusion / vegetation retention areas
- specifies management actions and management targets.

In relation to western ringtail possum predator control, the *Habitat Fragmentation Management Plan* is to:

- achieve the environmental objective: minimise the impacts from predation that are exacerbated by the proposal on western ringtail possum
- achieve the environmental outcome: abundance and persistence of the western ringtail possum in the receival sites returns to pre-disturbance levels within a maximum of fifteen (15) years from the commencement of construction
- specify actions to undertake targeted predator control to reduce predation impacts to conservation-significant fauna during construction (and for five years after) at the entrances/exits of fauna crossings (including land bridges).

Clearing protocols and research

In relation to the monitoring of felled trees, the proponent advised that 'Once a tree has been felled, an immediate search of the tree is considered appropriate in finding and recovering still in situ possums to ensure further stress of the animal or potential injury is managed'.[376]

On the matter of funding research, the proponent advised that it will monitor compliance and outcomes with respect to passive relocation, and report to DBCA and the EPA as required under recommended conditions 4 and 12.[377]

The EPA noted that recommended condition 5-2(3) requires the proponent to fund monitoring and evaluation of its passive relocation management actions using radio telemetry methods at a minimum and using robust sample sizes, with methodology to be developed in consultation with DBCA. The EPA considered this appropriate to ensure monitoring is designed to demonstrate the proponent's performance against the objective of the *Construction Fauna Management Plan*.

The EPA advised that the *Habitat Fragmentation Management Plan* is required to be implemented for a minimum period of 15 years, with five yearly reviews of effectiveness on advice of DBCA to allow for adaptive reviews (condition 6-3) to 'allow for adaptive reviews to ensure demonstration of the objectives and outcomes being achieved' and to 'require the proponent to monitor the effects of fragmentation on the demographics and genetics of the local ringtail possum population and the effectiveness of its mitigation measures'.

[376] Proponent response to Appeal 045/21 (15/12/21), page 46
[377] Proponent response to Appeal 045/21 (15/12/21), page 47

The EPA noted, however, that the purpose of the *Habitat Fragmentation Management Plan* is to provide the monitoring and adaptive management framework to address the scientific uncertainty regarding recovery of the local population, and advised that it 'therefore considers there is merit in having this plan (including the 5 yearly reviews and results) reviewed by an independent expert determined by the Chief Executive Officer to inform adaptive management and ensure the outcomes and objectives can be achieved'.[378]:

The EPA also advised that on review of the recommended conditions it 'considers amending the recommended conditions to require the proponent to conduct Environmental Performance Reporting following implementation of the proposal and the mitigation measures, to provide assurance of the adequacy and effectiveness of the mitigation measures proposed in relation to ringtail possums and habitat'.[379]

Nesting boxes

In relation to western ringtail possums, the proponent's *Fauna Action Management Plan*[380] states that a minimum of two 'temporary' dreys per hectare will be installed and maintained in potential western ringtail possum/ south-western brush-tailed phascogale habitat to be retained at least six weeks prior to clearing commencing.

By the EPA's recommended condition 5-2, the proponent is required to specify passive relocation management actions in the Construction Fauna Management Plan, including 'installation of artificial dreys, artificial watering points and protective natural structures (such as felled trees) in suitable habitat outside the development envelope at least six weeks prior to clearing'.

The proponent's *Response to Submissions*[381] indicates that the location and details of these dreys (along with artificial watering points and protective natural structures) will be further discussed with DBCA prior to clearing.

In relation to black cockatoos, the proponent's *Black Cockatoo Action Management Plan*[382] does not propose artificial hollows as replacement habitat for the loss of suitably-sized nesting hollows.

The proponent advised that based on its discussions with DBCA, nesting hollows on the Swan Coastal Plain are not believed to be a constraint for black cockatoo breeding. As noted under the section on terrestrial and aquatic fauna, the proponent also advised that it 'is open to the use of artificial hollows should it be determined that the loss of breeding habitat is likely to have a significant residual impact on the breeding of Black Cockatoos in the area'.[383]

The EPA responded as follows:

> The EPA is aware that artificial hollow usage is high for Carnaby's cockatoo when natural hollows are limited, for example in the Wheatbelt, although Carnaby's cockatoos do not always use the artificial hollows when provided (Department of Parks and Wildlife 2015). The presumption to date is that due the preference for forest cockatoo (Baudin's and forest red-tailed black cockatoos) nesting within marri/jarrah, and the extent of these habitats/tree remaining, natural hollows are not as limited as those for Carnaby's cockatoos. However little information is available regarding artificial hollow usage by forest cockatoos. This is likely due to limited knowledge regarding forest cockatoo breeding locations as it relates to the number of natural hollows available, and therefore limited knowledge regarding where

[378] EPA response to Appeal 045/21 (07/01/22), pages 8-9
[379] EPA response to Appeal 045/21 (07/01/22), pages 7-8
[380] BORR IPT (2021c)
[381] BORR IPT (2021a)
[382] BORR IPT (2020c)
[383] Proponent response to Appeal 045/21 (15/12/21), pages 24-25

artificial hollows may be required. In addition, few proposals to date have proposed or required artificial hollows for forest cockatoos.

The EPA considers that given the small proportion of natural hollows to be lost and the lack of information regarding the beneficial use of artificial hollows for forest cockatoos, the installation of artificial hollows is not warranted.[384]

Discussion

In relation to a requirement for construction works near black-stripe minnow habitat to be restricted to dry weather conditions, the EPA's recommended conditions are silent on the timing of construction activities. We understand that construction timing detail would be contained within the proponent's CEMP. Notwithstanding, we consider that compliance with the outcome-based requirement of recommended condition 2-1(2)(d) (no project attributable impacts to the hydrological regime and water quality of black stripe minnow habitat) will ensure that construction activities will not adversely affect habitats beyond the 5.5 ha that would be directly impacted by the proposal.

In relation to the funding of research, recommended condition 5-2(3) requires the proponent to fund monitoring and evaluation of its passive relocation management actions (in consultation with DBCA), to demonstrate the proponent's performance against the objective of the *Construction Fauna Management Plan*.

In relation to the monitoring of felled trees, we note that recommended condition 4-2(3) requires implementation of pre-clearance protocols within seven days prior to clearing, and that recommended condition 4-3(1) requires fauna spotters to be present during construction. We also note that recommended condition 5-2 requires the Construction Fauna Management Plan to include details of passive relocation management methods and the low-risk clearing timeframe for western ringtail possums. We consider that these clearing protocol requirements, in addition to the clearing protocol measures set out in the proponent's Action Management Plan, would generally be adequate to ensure (subject to appropriate compliance) that the impacts of clearing are appropriately managed to ensure minimal risk to western ringtail possums.

We acknowledge the appellants' concern that the recommended conditions do not require comparative genetic studies of western ringtail possum populations to determine the importance of the Gelorup population. In relation to this matter, we note that the proponent has committed to installing 13 fauna crossings to address habitat fragmentation, and that the EPA has recommended conditions requiring the proponent to monitor the effects of fragmentation on the demographics and genetics of the local population. Further the EPA's recommendation for independent expert review of the Fauna Fragmentation Management Plan will allow the EPA to consider the appropriateness of requiring comparative genetic studies to determine the importance of the Gelorup population.

We also note that habitat adjacent to the development envelope, despite it largely not having security of tenure or management, is likely to support an existing population of western ringtail possums and potentially a proportion of displaced individuals. Given this, we consider that if the proposal is implemented, the genotype of the Gelorup population would likely be preserved within the remaining population.

In relation to the preparation of a management plan for the rehabilitation and release of western ringtail possums injured through implementation of the proposal, we acknowledge

[384] EPA response to Appeal 045/21 (07/01/22), pages 36-37

the appellants' concerns that injuries (and possibly mortalities) may occur despite the proponent's assurance[385] of no mortalities as a direct result of the proposal.

The proponent's *Fauna Action Management Plan* includes a risk assessment for identified impacts on western ringtail possums, and describes management actions to address these. In relation to injured animals, the Plan sets out that fauna handling will be conducted by suitability experienced persons, that injured animals will be captured and taken to an experienced wildlife veterinarian for treatment or an approved wildlife rehabilitation facility.[386]

Further, the EPA's recommended condition 5 specifies that during construction, project-attributable adverse impacts on conservation significant fauna (including western ringtail possums) and minimised and managed.

We consider that the combination of the proponent's *Fauna Action Management Plan* and recommended condition 5 address the management of western ringtail possums (including injured animals) without the need for a separate plan.

In relation to conditions for the management of impacts on other fauna, as set out in Section 3.2.5, we consider the EPA's view that the assessment of impacts and application of management controls in relation to conservation significant fauna is also relevant for non-threatened fauna utilising the same habitats to be reasonable.

From the above, the EPA has recommended outcome-based fauna conditions based on the commitments and outcomes proposed by the proponent, and, in relation to western ringtail possums, has recommended further actions in the event that the proponent does not meet its proposed commitments and outcomes within a specified timeframe.

We note that the EPA's recommended conditions for fauna are outcome-based, and require monitoring, reporting and contingency actions to ensure the stated outcomes are achieved. We also note that other statutory processes apply for related impacts (for example the *Biodiversity Conservation Act 2016* provisions for taking of protected fauna).

While these measures are not prescriptive (for example the outcomes of predator control), they are likely to ensure that the pre-impact status of western ringtail possums and other fauna within the development envelope and in adjacent receival sites are properly understood, and can be used as a baseline against which subsequent monitoring can be compared to determine the level of success (or otherwise) of mitigation and management measures towards maintaining their status post-impact.

We consider that the EPA's recommended conditions in relation to fauna would generally be adequate to ensure (subject to appropriate compliance) that the impacts on fauna are minimised and managed. However, we suggest that the proposed conditions are strengthened to reflect the EPA's recommendations for:

- Environmental performance reporting, (that require an outline of the monitoring undertaken during the implementation of management plans to report the results, whether environmental objectives and outcomes have been achieved and any management actions undertaken during the implementation of the plans to meet the environmental objectives and outcomes) to provide assurance of adequacy of mitigation measures; and
- Peer review reporting of the Fauna Habitat Management Plan and associated Environmental Performance Report by an independent expert(s) with suitable technical

[385] BORR IPT (2020b), page 25
[386] BORR IPT (2021c)

experience, to inform adaptive management and address scientific uncertainty in recovery of the local Gelorup population.

We note that the success of monitoring, ongoing adaptive management, review of the *Habitat Fragmentation Management Plan*, and contingency offsets in relation to the recovery of the Gelorup population in 10-15 years post-construction would be subject to appropriate compliance.

In relation to artificial nesting boxes, we acknowledge the proponent's and EPA's views in relation to black cockatoos. However for consistency, and noting the uncertainty described by the EPA in relation to their use, we consider that the approach taken for clearing permits issued under Part V of the EP Act should apply and it would be reasonable to strengthen mitigation measure and require the proponent to install, maintain and monitor artificial nesting boxes for each suitably sized hollow that cannot be avoided during construction.

In this regard, we note that under Part V of the EP Act, the impact of clearing habitat trees containing suitably sized hollows for use by black cockatoos is typically conditioned by requiring permit holders to install one artificial nesting hollow for each suitably sized hollow that cannot be avoided. Consistent with this, DWER's assessment for the Bussell Highway duplication project Stage 2 identified that the proposed clearing would impact on 20.8 ha of critical habitat for black cockatoos, including a number of habitat trees (DBH >500 mm) with hollows; one of suitable size for black cockatoo breeding. DWER applied condition 14 on Clearing Permit CPS 9168/1 requiring the proponent to undertake the following:

- for each suitably sized hollow for black cockatoo nesting that cannot be avoided, install one artificial black cockatoo nesting hollow
- each artificial black cockatoo nesting hollow must be installed prior to commencement of the next black cockatoo breeding season following clearing of the related black cockatoo habitat tree(s)
- the artificial black cockatoo nest hollow(s) must be installed at the location identified by DBCA within Ludlow State Forest No.2; be designed and placed in accordance with the specifications details in DBCA guidance on the matter; and be monitored and maintained in accordance with stated specifications for a period of at least 10 years.

We note that a similar requirement was not included in Clearing Permit CPS 7016/2 for the Bussell Highway Capel to Hutton SLK 38 to 32.15 road widening project. In that case, DWER's decision report indicates the impact on black cockatoos was limited to foraging (and not breeding) habitat.

3.11.3 Flora and vegetation

The EPA recommended conditions 1, 3 and 9 (offsets) 'so that the environmental outcome is likely to be consistent with the EPA's objective for flora and vegetation'. Table 13 contains a summary of these recommended conditions.

Table 13 *Recommended conditions relating to flora and vegetation (summarised)*

No.	Requirements
1	Limits native vegetation clearing and disturbance for the proposal to 71.5 ha within the 200 ha development envelope.
3	3-1(1) limits the extent of clearing of PECs to 23.4 ha of vegetation representative of the Banksia Woodlands PEC, 4.4 ha of vegetation representative of the Tuart Woodlands PEC, and 4.5 ha of vegetation representative of the Tuart-Peppermint Woodlands PEC.

No.	Requirements
	3-1(2) requires that there are no project-attributable indirect impacts to these PECs within 20 m of the development envelope and within clearing exclusion areas. 3-2 to 3-4 require monitoring before, during and after clearing, and reporting in relation to this monitoring including a requirement to outline management actions taken to ensure that the outcomes are meet. 3-5 requires implementation of dieback hygiene protocols consistent with national best practice guidelines, and weed control, during and after construction.
9	Offsets (discussed in Section 3.11.6).

In summary, the appellants submitted that:

- any surveying methods or statistics, as relevant to flora and vegetation, are informed by appropriately educated specialists, such as a biostatistician, university institution or academic body such as Data Analysis Australia.
- there is insufficient evidence to support the claim that the proposed mitigation measures will be effective to address the impacts to the ecological integrity of the remaining bushland.
- the mitigation measures do not fully address the broader significance of a range of ecological factors (such as unique local species genotypes, habitat fragmentation, ecosystem resilience to climate change impacts, impacts from ongoing pollution, cumulative impacts of habitat loss).

Discussion

We note that the EPA's recommended conditions for flora and vegetation are outcome-based, and require monitoring, reporting and contingency actions to ensure the stated outcomes are achieved. We also note that other statutory processes apply for related impacts (for example the *Biodiversity Conservation Act 2016* provisions for taking of protected flora, and the *Biosecurity and Agricultural Management Act 2007* provisions for management of declared weeds).

We consider that the EPA's recommended conditions for flora and vegetation would generally be adequate to ensure (subject to appropriate compliance) that the direct and indirect impacts to flora and vegetation are limited to the extents described in conditions 3-1(1) and 3-2(1) and that any potential project-attributable impacts beyond those authorised are required to be identified and remediated.

On review of the recommended conditions and in response to the appeals, the EPA recommended further amending the conditions:

> … to require the proponent to conduct Environmental Performance Reporting following implementation of the proposal and the mitigation measures, to provide assurance of the adequacy and effectiveness of the mitigation measures proposed on Banksia Woodlands.[387]

We note that recommended condition 3-4 requires annual reporting (as part of the annual Compliance Assessment Report) to inform ongoing adaptive management through review of the post-construction monitoring for project-attributable impacts to vegetation within 20 m of the development envelope and within the 'clearing exclusion areas' for the benefit of the Banksia Woodlands TEC. We therefore consider the recommended conditions appropriately provide assurance of the adequacy and effectiveness of the mitigation measures, through performance reporting.

[387] EPA response to Appeal 045/21 (07/01/22), page 20

We note that the success of monitoring, ongoing adaptive management, and contingency actions in relation to the Banksia Woodlands TEC would be subject to appropriate compliance.

To improve clarity we suggest that both recommended conditions 3-1(1) and 9-1(1) could be changed to reflect the extent of clearing referred to by the proponent and in the EPA's assessment:

- 23.4 ha of vegetation representative of the Banksia Woodlands PEC
- 4.5 ha of vegetation representative of the Tuart-Peppermint Woodlands PEC
- 4.4 ha of vegetation representative of the Tuart Woodlands PEC (overlapping the Tuart-Peppermint Woodlands PEC).

This more clearly represents that the Tuart-Peppermint Woodlands PEC (4.5 ha) overlaps the Tuart Woodlands PEC (4.4 ha), as outlined in Section 3.3.1 of this report.

3.11.4 Inland waters

The EPA recommended conditions 1 and 2 'so that the environmental outcome is likely to be consistent with the EPA's objective for inland waters'. Table 14 contains a summary of these recommended conditions.

Table 14 *Recommended conditions relating to inland waters (summarised)*

No.	Requirements
1	Limits native vegetation clearing and disturbance for the proposal to 71.5 ha of within the 200 ha development envelope.
2	2-1(1) limits the extent of clearing of wetlands to 0.2 ha of CCW and 1.4 ha of REW. 2-1(2) requires that there are no project-attributable impacts to the hydrological regime and water quality of Five Mile Brook, a CCW, REWs, and black stripe minnow habitats (in proponent's *Action Management Plan Conservation Significant Fauna*). 2-2 to 2-3 require monitoring of hydrological regimes prior to ground-disturbing activities with submission of a report about pre-construction baseline conditions and post-development hydrological regime, and monitoring of hydrological regimes and water quality during and post-construction. 2-4 requires submission of a Compliance Assessment Report outlining details of monitoring and associated environmental outcomes. 2-5 limits construction (bridge footings, drainage structures and abutments) within Five Mile Brook.

In summary, the appellants submitted that:

- there should be a provision for protection of wetland fauna from the residual impacts of dewatering activities
- wetland buffers should be implemented where appropriate.

Discussion

We note that the EPA's recommended conditions for inland waters are outcome-based, and require monitoring, reporting and contingency actions to ensure the stated outcomes are achieved. We also note that other statutory processes apply for related impacts (for example the RIWI Act provisions for groundwater abstraction and disturbance to bed and banks).

We consider that the EPA's recommended conditions for inland waters would be adequate without the need for changes to ensure (subject to appropriate compliance) that impacts on geomorphic wetlands (CCWs and REWs), hydrological regimes and water quality are limited

to the recommended extents and that any potential project-attributable impacts beyond this would be identified and remediated.

3.11.5 Social surroundings

The EPA recommended conditions 1, 7 and 8 to ensure 'consistency with the EPA objective for social surroundings'. Table 15 contains a summary of these recommended conditions.

Table 15 *Recommended conditions relating to social surroundings (summarised)*

No.	Requirements
1	Limits native vegetation clearing and disturbance for the proposal to 71.5 ha of within the 200 ha development envelope.
7	7-1 requires implementation in a manner that, as far as practicable, minimises operational noise impacts on existing sensitive receptors. 7-2 and 7-3 require preparation of a Traffic Noise Management Plan for approval prior to the operation of the proposal that includes outdoor noise management targets and actions to meet them, details of noise walls, acoustic treatment of houses, and low noise road design measures, post-construction noise monitoring, and contingency actions if targets are not met. 7-4 provides for review and amendment of the Traffic Noise Management Plan. 7-5 and 7-6 require ongoing implementation of the most recent approved version of the Traffic Noise Management Plan until requirements met. 7-7 requires compliance reporting and implementation of management actions if requirements are not met.
8	8-1 requires implementation in a manner that minimises impacts to social connectivity and visual amenity. 8-2 requires that there are no project-attributable impacts to significant trees. 8-3 and 8-4 require preparation of an Amenity Management Plan for approval and subsequent implementation within 12 months of Ministerial approval that includes outcomes of community and stakeholder consultation about amenity infrastructure (including walls, screening, landscaping, revegetation, walking trails, foot/cycle paths), roles and responsibility for ongoing maintenance of amenity infrastructure, and how objectives in 8-1 and 8-2 would be achieved. 8-5 requires preparation of a report following construction that demonstrated the requirements of the Amenity Management Plan have been implemented and achieved.

In summary, the appellants submitted that:

- the proponent should be required to implement a water quality monitoring program, inclusive of treatment facilities to ensure water quality meets drinking water guidelines
- a mitigation hierarchy strategy should be required in the event of underground water contamination (affecting drinking water)
- subsidies should be considered toward the cost of employing professionals to advise and if necessary, implement suitable water treatment facilities for individual households
- security fences to be installed between public paths/carparks and adjoining private properties.

Discussion

We note that the EPA's recommended conditions for social surroundings (specifically social connectivity, visual amenity and noise) are outcome-based, and require monitoring, reporting and contingency actions to ensure the stated outcomes are achieved. We also note that other statutory processes apply for related impacts (for example the *Aboriginal Heritage Act 1972* provisions for disturbance to Aboriginal sites).

Noting this, we consider that the EPA's recommended conditions for social surroundings would be adequate without the need for changes to ensure (subject to appropriate compliance) that impacts on social connectivity and visual amenity and from noise are limited to the recommended extents and that any potential project-attributable impacts beyond this would be identified and remediated.

3.11.6 Offsets

The EPA recommended condition 9 which 'requires the proponent undertake offset measures to counterbalance the significant residual impact of direct and indirect impacts to the relevant environmental values' and 'sets out the offset locations, the type of offset measures to be implemented and the extent of the offset location that should be subject to the offset measures'. Table 16 contains a summary of this recommended condition.

Table 16 *Recommended conditions relating to environmental offsets (summarised)*

No.	Requirements
9-1	Requires offset measures to counterbalance the significant residual impacts to the following environmental values: - 60.9 ha of western ringtail possum habitat - 60.9 ha of black cockatoo foraging and breeding habitat - 39.2 ha of south-western brush-tailed phascogale habitat - 23.4 ha of Banksia Woodlands PEC - 4.4 ha of Tuart Woodlands PEC - 4.5 ha of Tuart-Peppermint Woodlands PEC.
9-2	Sets out the required offset measures (breakdown provided in Table 17).
9-3 to 9-4	Require preparation of an Offsets Management Plan for approval and in consultation with DBCA and local governments that meets specified objectives (including a net-gain in western ringtail possum populations in conservation tenure within 15 years), and describes how offset measures would be implemented, how environmental values in offset sites would be maintained and improved, how land acquisition sites would be protected and managed in the long-term, how revegetation/ on-ground management offsets would result in a tangible improvement to the environmental values to be offset (actions, targets, completion criteria, western ringtail possum densities, adaptive management, predator control).
9-5	Provides for review and amendment of the Offsets Management Plan, and requires ongoing implementation until requirements met.
9-6 to 9-8	Require ongoing implementation of the most recent approved version of the Offsets Management Plan until requirements met.
9-9 to 9-11	Require preparation of contingency actions for approval where offset actions, objectives or targets are unable to be met, reporting on outcomes, and ongoing implementation of contingency actions until offset objectives are met.
9-12 to 9-14	Require additional/ contingency offsets if the environmental outcome of the Habitat Fragmentation Performance Report has not been met and has resulted in an additional significant residual impact to western ringtail possums, updating of the Offsets Management Plan to include the additional/ contingency offsets, and ongoing implementation until requirements met.

In summary, the appellants submitted that:

- offsets are being offered as a solution to unacceptable environmental impacts, but without first having proper regard for avoidance and mitigation options
- the reliance on successful offsets is untested and speaks to the uncertainty principle contained in the EP Act; recent reviews of offset policies and practices have highlighted that offsets rarely achieve the necessary ecological compensatory outcome that results in an environmental net gain
- a large portion of the offset is within land managed by DBCA, moving taxpayer funds from one State department to another and claiming this as an offset is inappropriate, particularly as the funds would pay DBCA to undertake its core business
- the validity and efficacy of the land acquisition offsets is questionable; there is no guarantee that the land purchased would have been developed, this land would likely have retained its habitat value regardless of purchase as an offset; the protection of these areas does not provide a net gain in habitat
- offsets aimed at planting and regeneration cannot replace a mature forest ecosystem; relying on offsets to replace environmental values is contrary to the principle of conservation of biological diversity and ecological integrity
- the Tuart Forest National Park/ Ludlow State Forest No.2 is heavily weed invested and not suitable as an offset for western ringtail possums; (biodiverse) rehabilitation must be done in conjunction and under the advice of the Tuart Forest Restoration Group with respect to planting density of saplings and weed management
- offsets would only be maintained for a maximum of 20 years, however protection for 100 years or more is required to replace tree hollows; there is a significant time lag between the loss of habitat and the establishment of revegetated habitat
- there is a lack of clarity and transparency regarding securing offsets for conservation; the purchase and investment in conservation tenure must occur over the next 24 months with public notice of finalisation
- some offsets proposed are unacceptable, such as for black cockatoos at a distance from the proposal site but which are designed to account for lost habitat
- the offsets should be properly, proactively and effectively managed, should have small animal friendly kangaroo exclusion fencing to prevent over-grazing, and should be inspected on a six-monthly basis by an independent authority to ensure management, revegetation and weed control is in compliance with what has been agreed to
- the EPA's uncertainty over the ability of western ringtail possum numbers to recover from the proposal but to require contingency offsets at a later date and in another location is not sufficient to support the conservation of a critically endangered species, and does not meet the requirements of State or Commonwealth environmental offsets policies
- access to peppermint trees is not a limiting factor in the rehabilitation of possums so it is unlikely that the development of an orchard would have any impact on the species; the Possum Finishing School uses a variety of species as forage for rehabilitating western ringtail possums; it would take five years before the planted trees would provide suitable forage
- the proposed offsets are a duplication of those proposed for the BORR Northern and Central Sections (Ministerial Statement 1155) and reference the same offset properties
- offsets should be required for the loss of 104 *Caladenia speciosa* (Priority 4) individuals, two heritage *Nuytsia floribunda* trees, and a population of *Pterostylis rogersii*.
- the effectiveness of 1080 baits for fox control needs to be reviewed
- recommended condition 9 should be amended to require sufficient land for revegetation to ensure that there is a net gain, or at a minimum no incremental loss, of habitats for threatened species impacted by the proposal

- the proponent in conjunction with DBCA and the State Government must fully fund, and provide documentation on the level of success of, arum lily eradication in Tuart Forest National Park/ Ludlow State Forest No.2
- an offset should be required for the impact to 5.5 ha of habitat for black-stripe minnows.

3.11.6.1 Consideration of offsets

The *WA Environmental Offsets Policy*[388] states that the use of environmental offsets 'environmental offsets will not replace proper on-site environmental practices, such as avoidance and mitigation', and that they 'will be used to compensate for residual environmental impacts and be designed to achieve long-term outcomes, building upon existing conservation programs and initiatives'. The Policy describes two offset categories:

- Direct offsets are actions designed to provide for on-ground improvement, rehabilitation and conservation of habitat. Direct offsets vary, depending on the specific circumstances of environmental impacts, and include acquisition, restoration, revegetation and rehabilitation of natural areas outside the project area.
- Indirect offsets are actions aimed at improving scientific or community understanding and awareness of environmental values that are affected by a development or activity. These actions are designed to result in positive conservation outcomes and may include research to improve the management and protection of existing conservation estate or contributions to State Government initiatives, policies or strategic funds.

The *WA Environmental Offsets Guidelines*[389] describes three types of environmental offsets:

- Land acquisition offsets involve the protection of environmental values through improved security of tenure or restricting the use of the land. This may be achieved through ceding freehold land to the Crown for conservation purposes or perpetual covenants for conservation. The need for ongoing management must be considered. Any offsets proposing land acquisition, whether the land is to be managed by the proponent/applicant, a third party or the Department of Parks and Wildlife, must consider the upfront costs of establishing the offset site and the on-going management costs of maintaining the offset for the long term.
- On-ground management offsets include revegetation (re-establishment of native vegetation in degraded areas) and rehabilitation (repair of ecosystem processes and management of weeds, disease or feral animals). The objective of the management actions is tangible improvement to environmental values in the offset area.
- Research project offsets can only be applied under Part IV of the EP Act and must be reasonably related to the impact. Research projects can add significant value to the outcomes of on-ground management and the understanding of the environmental value being impacted.

After considering the proponent's proposed minimisation and mitigation measures, the EPA identified that the proposal would have a number of residual impacts (including significant residual impacts) on the key environmental factors that require counterbalancing through appropriate offsets. Report 1714 sets out that the EPA considered offsets to be appropriate for the proposal for the following reasons:

- proponent's additional application of the mitigation hierarchy to further reduce potential impacts (principle 1 of the *WA Environmental Offsets Policy*)

[388] Government of Western Australia (2011)
[389] Government of Western Australia (2014)

- magnitude of the likely significant residual impacts on environmental biodiversity values facing increasing pressures, such as threatened ecological communities and threatened fauna habitat (principle 2 of the *WA Environmental Offsets Policy*)
- residual impacts can be counterbalanced by the provision of significant additional offsets that are likely to have a long-term strategic benefit and demonstrated environmental benefit (principle 6 of the *WA Environmental Offsets Policy*).

The EPA concluded that the environmental outcomes of protection of conservation significant vegetation and the protection and creation of fauna habitat in offsets is likely to be consistent with its objectives for these factors and would therefore result in a net environmental benefit.

3.11.6.2 Effectiveness of offsets

Some appellants raised that the EPA should have regard for the effectiveness of offsets in Western Australia. This matter has been a subject of interest for a number of years.

In 2007, Hayes and Morrison-Saunders examined how the concept of environmental offsets is working in practice.[390] Hayes and Morrison-Saunders found that the environmental impact assessment practitioners surveyed gave a strong in-principle endorsement of the use of environmental offsets, but expressed considerable concerns about practice, indicating that implementation does not live up to the theoretical expectations (in particular, inadequate application of mitigation sequence, practical workability of like-for-like, failure to deliver net benefits, time lag and implementation timeline, need for greater guidance).

May, Hobbs and Valentine evaluated the effectiveness of 208 environmental offsets approved during the period 2004 to February 2015.[391] May et al found that at most 39% of offsets delivered an outcome and could be considered effective (with land acquisition comparing favourably), and 30% were ineffective due to non- or inadequate implementation. May et al noted that better implementation and on-ground management of offsets is required, along with improvements including timely reporting, compliance and measuring ecological outcomes.

Building on this, Richards explored whether State and Commonwealth offsets approved during the period 2011-2016 were delivering on the stated goals defined within offset policies, and specifically how these were applied for Carnaby's cockatoo.[392] Richards reported that specific requirements relating to State-approved offsets, including secondary documents referred to in the *WA Environmental Offsets Register* and related compliance documents, were often unavailable, suggesting a lack of transparency and accountability.

On the matter of the effectiveness of the offsets for this proposal, the EPA considered that recommended condition 9 is 'suitably rigorous to ensure the proposed offsets will counterbalance the significant residual impact and ensure a net environmental benefit'. The EPA also advised:

> The EPA accepts that poorly designed offsets, including inadequate compliance and monitoring of offset implementation, may not counterbalance the significant residual impact and result in a net gain for the environment. However, the offsets proposed by the proponent are well developed and have been developed in consultation with the land manager. The proponent has completed vegetation and fauna surveys of the properties to be acquired, which confirm the sites contain the values requiring offsetting. The EPA has also proposed objectives, completion criteria and targets, and reporting requirements to ensure that the offsets achieve a net environmental benefit. The proponent will also be

[390] Hayes, N. and Morrison-Saunders, A. (2007)
[391] May, J., Hobbs, R.J. and Valentine, L.E. (2016)
[392] Richards, B.S. (2016)

required to undertake annual compliance reporting (proposed condition 12) to demonstrate the condition requirements are being undertaken.

The direct offsets proposed (land acquisition and land rehabilitation) do provide a net gain in habitat. The proposal will result in the loss of 60.9 ha, with 170 ha of existing habitat to be protected and managed (land acquisition), and 220 ha of land to be rehabilitation to create habitat for ringtail possums and black cockatoos.[393]

The matter of whether offsets are successful or otherwise lies both with the proponent to ensure delivery, and with regulator to ensure compliance. In this case we consider that the EPA has had sufficient regard to the proponent's proposed measures and applied conditions to ensure effectiveness is capable of being measured and compliance determined.

3.11.6.3 Offsets for this proposal

The proponent's offsets package is described in its *Offset Strategy*,[394] and includes land acquisition, on-ground management (revegetation), and indirect/ contributing components. Report 1714 (section 4) sets out the EPA's assessment of the offsets package, and states that the anticipated outcome from the offsets is:

- protection of Banksia Woodlands PEC, Tuart Woodlands PEC and Tuart-Peppermint Woodlands PEC in 'good' or better condition
- protection of habitat critical for the survival of western ringtail possums
- protection of foraging habitat for black cockatoos and habitat for south-western brush-tailed phascogales
- creation of additional habitat and foraging habitat for western ringtail possums, south-western brush-tailed phascogales and black cockatoos
- a net gain in western ringtail possum populations within secure conservation tenure
- a reduction in regional fragmentation of habitat for ringtail possums.

The proponent undertook offset calculations using the Commonwealth *Offsets Assessment Guide*[395] (Commonwealth calculator). The proponent's offset calculations[396] indicate that the offsets achieve counterbalancing of the significant residual impacts through an improvement in habitat quality and a decrease in the risk of loss due to the offsets.

The components of the offsets package described in recommended condition 9-2, along with additional information about the sites, are set out in Table 17.

[393] EPA response to Appeal 045/21 (07/01/22), pages 35-36
[394] BORR IPT (2021d)
[395] Department of Sustainability, Environment, Water, Population and Communities (2012)
[396] BORR IPT (2021d), Appendix B

Table 17 *Proposed offsets package for BORR Southern Section (summarised)*

Offsets package components[397]	Western ringtail possum/ south-western brush-tailed phascogale	Black cockatoos	Banksia Woodlands TEC	Tuart Woodlands TEC
Offset 1: Lots 153, 267, 268 Ducane Road, Gelorup (land acquisition) - Land parcels: Lot 153 on Plan 232768 Crown ~28.8 ha, Lot 267 on Plan 232768 Crown ~45.3 ha, Lot 268 on Plan 144371 Crown ~88.5 ha. - Environmental values: 126.0 ha of western ringtail possum/south-western brush-tailed phascogale habitat; 124.1 ha of black cockatoo foraging habitat; 92 ha of Banksia Woodlands PEC/TEC; in Dalyellup/ Gelorup/ Crooked Brook ecological linkage/ SWREL. - Security of tenure: Proponent funded purchase of land by DBCA for addition to the conservation estate. Land zoned 'Rural' under GBRS; DBCA has indicated the land will be rezoned to 'Regional Open Space' or 'Conservation'. - Management: Proponent committed to ongoing site management for 20 years: firebreaks; boundary fencing; fox, rabbit and weed control; maintenance funding.	126 ha	124.1 ha overlapping	92 ha overlapping	-
Offset 2: Lot 1 Ducane Road, Gelorup (land acquisition) - Land parcel: Lot 29 on Plan 419249 Crown ~40.5 ha. - Environmental values: 38.5 ha of western ringtail possum/south-western brush-tailed phascogale habitat; 37.7 ha of black cockatoo potential foraging habitat; in Dalyellup/ Gelorup/ Crooked Brook ecological linkage/ SWREL. - Security of tenure: Land currently owned by WAPC, proponent negotiating acquisition. Land zoned 'Rural' and 'Primary Regional Road' under GBRS; proponent will seek rezoning to 'Regional Open Space' or 'Conservation'. Proponent will discuss long-term management with DBCA/Shire of Capel. - Management: Proponent committed to ongoing site management for 20 years: firebreaks; boundary fencing; fox, rabbit and weed control; maintenance funding.	38.5 ha	37.7 ha overlapping	-	-

[397] Information sourced from: BORR IPT (2021d) page 40-45

Offsets package components[397]	Western ringtail possum/ south-western brush-tailed phascogale	Black cockatoos	Banksia Woodlands TEC	Tuart Woodlands TEC
Offset 3: Lot 156 Marchetti Road, Gelorup (land acquisition, 16 ha north/west portion) - Land parcel: 16 ha north/west portion of former Lot 10 on Plan 419261 Freehold. - Environmental values: 14.2 ha of western ringtail possum and south-western brush-tailed phascogale habitat; 9.7 ha of black cockatoo foraging habitat; 8.5 ha of Banksia Woodland TEC; traversed by Five Mile Brook (local linkage). Security of tenure: Land owned by proponent. Land zoned 'Rural' under GBRS; proponent will seek rezoning to 'Regional Open Space' or 'Conservation'. Proponent will discuss long-term management with DBCA[398]/Shire of Capel. - Management: Proponent committed to ongoing site management for 20 years: firebreaks; boundary fencing; fox, rabbit and weed control; maintenance funding.	14.2 ha	9.7 ha overlapping	-	-
Offset 4: Lot 104 Willinge Drive, Davenport (revegetation) - Land parcel: Lot 104 on Plan 403618 Freehold ~196.7 ha. - Environmental values: minimal (former blue gum plantation); adjacent to Preston River (local linkage); within buffer to SWREL. - Security of tenure: Land owned by proponent. Land zoned 'Rural' under GBRS; proponent will seek rezoning to 'Regional Open Space' or 'Conservation'. Proponent will discuss long-term management with DBCA/Shire of Dardanup. - Management: Proponent committed to ongoing site management for 20 years: revegetation to provide habitat for western ringtail possums and south-western brush-tailed phascogales; firebreaks; boundary fencing; fox, rabbit and weed control; maintenance funding.	35 ha	-	-	-

[398] DBCA has advised it 'does not consider [this site] to be suitable for DBCA to manage, due to its small size and isolation from existing DBCA managed lands' (DBCA, 2020) and that 'Given the reserves further to the north along five mile brook are managed by the Shire of Capel, it is logical that they also take on the management of the acquired portion of Lot 156' (DBCA, 2021a)

Offsets package components[397]	Western ringtail possum/ south-western brush-tailed phascogale	Black cockatoos	Banksia Woodlands TEC	Tuart Woodlands TEC
Offset 5: Tuart Forest National Park/ Ludlow State Forest No.2 (revegetation) - Land parcels: portion of Tuart Forest National Park (Lot 60 on Plan 91636/ Crown Reserve 40251) ~1,136.7 ha (Site 12: 170 ha portion to rehabilitate), portion of Ludlow State Forest No.2 ~910.5 ha (Site 2: 5 ha existing five-year-old revegetation, Site 4: 10 ha existing one-year-old revegetation). - Environmental values: Site 12: some western ringtail possum and black cockatoo habitat; Sites 2 and 4: minimal (revegetation). - Security of tenure: Land within conservation estate, subject to management plan. - Management: Proponent committed to ongoing site management for 20 years: revegetation to provide habitat for western ringtail possums and black cockatoos.	185 ha	50 ha overlapping	-	-
Offset 6: Peppermint orchard (revegetation) - Land parcel: Lot 12 on Plan 414806 Freehold ~41.5 ha - Security of tenure: Land managed by DBCA. - Environmental values: existing one-year-old revegetation; to provide foliage/food resource for western ringtail possums in care, to manage harvesting on reserves.	1 ha	-	-	-
Offset 7: $200,000 for DBCA fox baiting program (financial contribution) - Management: Proponent to fund management of predation of western ringtail possums by foxes, in line with Objective 2 of WRP Recovery Plan.	Relevant	-	-	-
Offset 8: Lot 27 Tredrea Road, Myalup (land acquisition) - Land parcel: Lot 27 on Plan 13951 Freehold ~40 ha (~30 km north of proposal) - Environmental values: 20+ ha of Tuart Woodlands TEC. - Security of tenure: Land owned by proponent. Land zoned 'Rural' under GBRS; proponent to seek rezoning to 'Regional Open Space' or 'Conservation'. Proponent to discuss long-term management with DBCA/Shire of Harvey. - Management: Proponent committed to ongoing site management for 20 years: boundary fencing; rubbish removal; fox, rabbit and weed control.	-	-	-	19 ha

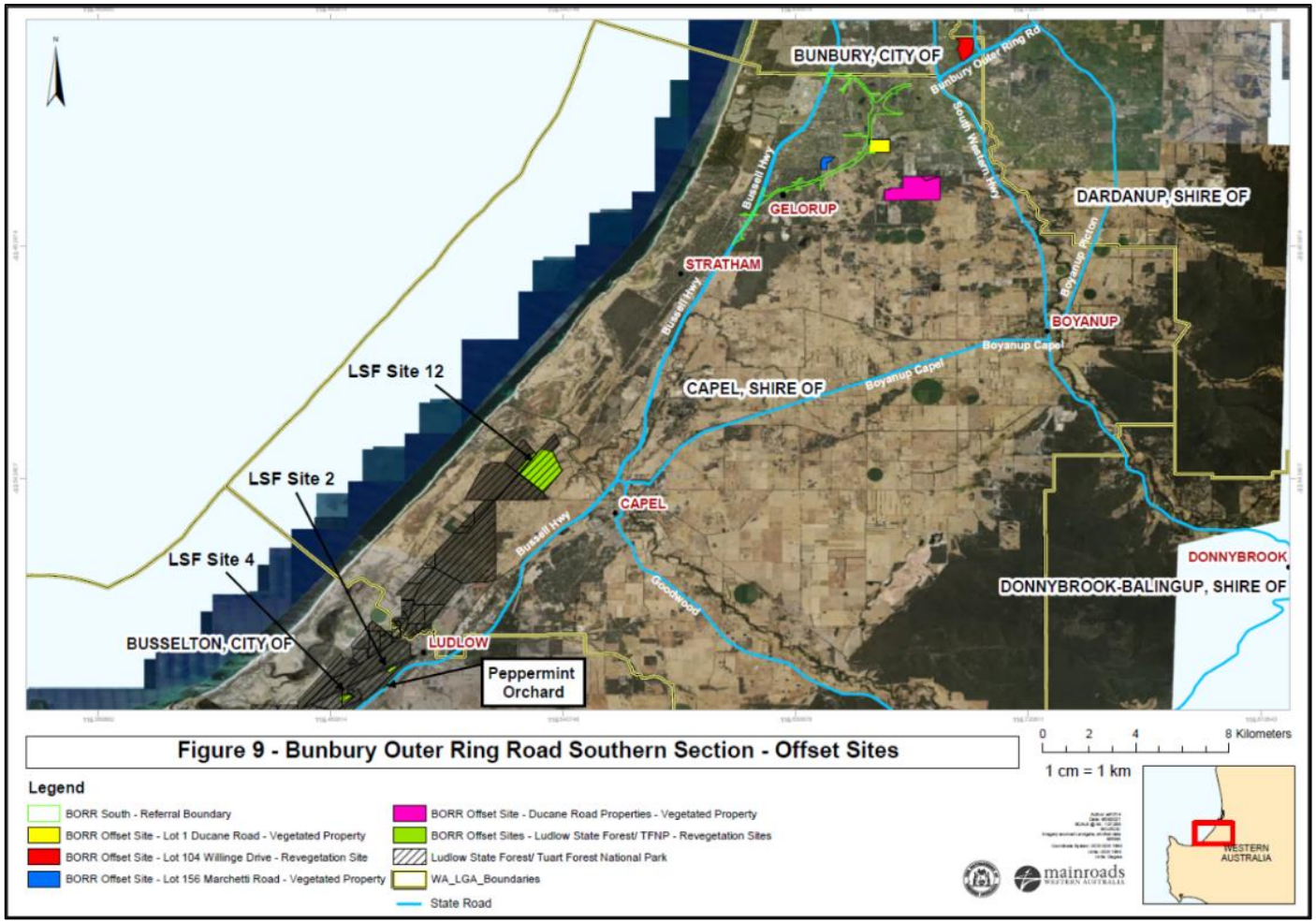

Figure 16 *Proximity of Offset 1 (pink shading), Offset 2 (yellow shading), Offset 3 (blue shading), Offset 4 (red shading) and Offset 5 (green shading) to development envelope (green outline)*[399]

[399] BORR IPT (2021b

Western ringtail possums (and south-western brush-tailed phascogales)

By the proponent's *Offsets Strategy* and the EPA's recommended condition 9-1, the significant residual impact to western ringtail possum (and south-western brush-tailed phascogale) habitat is proposed to be directly counterbalanced by Offsets 1, 2 and 3 (land acquisition) and Offsets 4 and 5 (revegetation), with indirect / contributing benefits from Offsets 6 and 7.

The EPA advised that it took a cautious and proportionate approach when considering whether offsets were appropriate for western ringtail possums:

> The EPA considered its recommendations are proportionate to the area's current values. However, in recognizing the ringtail possum's critically endangered status, the recommended offsets are much larger than the impact site (178 ha of existing habitat and 220 ha of revegetated habitat) to provide additional confidence that a net-gain in ringtail possum habitat and populations in secure tenure would be achieved.
>
> The proponent proposed further indirect offsets including strategic predator control in the Ludlow Tuart State Forest/Tuart Forest National Park to further facilitate a net-gain in ringtail possum populations. The EPA considers the overall environmental outcome would provide strategic long-term protection for the ringtail possum species, and not be inconsistent with the principle of conservation of biological diversity and ecological integrity.
>
> The DBCA advised the EPA that the offsets locally and regionally will contribute towards achieving the Objective 1 and Objective 2 of the ringtail possum recovery plan…
>
> In addition, the EPA recommended a contingency offset (condition 9-13) in the event the outcome of recovery to pre-disturbance levels is not met within 15 years…[400]

In a letter dated 10 March 2021, DBCA advised the EPA that it considered that the proposed offsets would contribute to the objectives of the WRP Recovery Plan.

In relation to Offset 6 (peppermint orchard), the EPA advised that Report 1714 discusses the Possum Finishing School as an example of the challenges facing rehabilitation of ringtail possums in care, however noted that the challenges of wildlife carers sourcing forage occur more generally as ringtail possums are also being cared for by private wildlife carers. The EPA advised that it is aware that rehabilitation efforts had been unintentionally impacted through forage collection on conservation-tenured lands, and that it does not intend that the peppermint orchard is for the exclusive use of the Possum Finishing School.[401]

Black cockatoos

For consistency with the proponent's *Offset Strategy*, we consider the offset calculations in the context of the 'Endangered' conservation status (noting that one of the three threatened black cockatoo species has the conservation status of 'Vulnerable').

By the proponent's *Offsets Strategy* and the EPA's recommended condition 9-1, the significant residual impact to black cockatoo foraging and breeding habitat is proposed to be directly counterbalanced Offsets 1, 2 and 3 (land acquisition) and Offset 5 (revegetation). In relation to Offset 5, we presume from the extent of revegetation proposed that the corresponding location is Offset 5: Site 12.

The EPA advised that it assessed the suitability of the proposed offsets for black cockatoos:

> In its assessment of offsets … the EPA notes that without the proposed land acquisition offsets and associated management measures it is likely that the condition and health of these breeding and foraging habitats and the amount available would decline over time from existing threats and pressures. The proposed conditions also require revegetation offsets to

[400] EPA response to Appeal 045/21 (07/01/22), pages 10-11
[401] EPA response to Appeal 045/21 (07/01/22), page 36

> ensure there is a net-gain in habitat for black cockatoos and that the significant residual impacts are counterbalanced…
>
> The EPA acknowledges the length of time required for hollows to form in large trees suitable for black cockatoo nesting. The EPA advises that 11 trees that contain suitably sized nest hollows would be cleared as a result of the proposal, although nesting was not observed during the fauna surveys. The specification of 20 years of funds for ongoing management of the offset is consistent with the Offset guidelines, which specify a maximum of 20 years of funding/management. This period relates to what is considered the foreseeable future. It is intended that the long-term conservation outcome will be achieved via conservation tenure or other mechanisms ...[402]

Banksia Woodlands TEC

For consistency with the proponent's *Offset Strategy*, we consider the offset calculations for impacts to 23.4 ha of the Banksia Woodlands PEC in the context of the loss of 23.4 ha of the Banksia Woodlands TEC ('Endangered').

By the proponent's *Offsets Strategy* and the EPA's recommended condition 9-1, the significant residual impact to the Banksia Woodlands TEC is proposed to be directly counterbalanced by Offset 1.

The EPA provided the following advice on the proposed offset for Banksia Woodlands TEC:

> The EPA assessed the impacts to conservation significant communities, including Banksia Woodlands, to be significant and needs to be counterbalanced by offsets so the environmental outcome can meet the EPA's objective for flora and vegetation.
>
> The proponent proposes to offset the significant residual impacts to conservation significant ecological communities by acquiring vegetated lands. In assessing the suitability of this offset, the EPA noted that the total area of conservation significant vegetation impacted will be 27.9 ha, and the total area proposed to be acquired and offset is 111 ha. The EPA noted in its assessment report that the vegetation on these offset sites is in much better condition than that being impacted. For example, over 50 per cent of the Banksia Woodlands impacted is considered in a Good to Completely Degraded condition, whereas all of the offset site vegetation is rated as Good to Very Good…[403]

Tuart Woodlands TEC

For consistency with the proponent's *Offset Strategy*, we consider the offset calculations for impacts to 4.5 ha of the Tuart-Peppermint Woodlands PEC and 4.4 ha of the Tuart Woodlands PEC (overlapping the former) in the context of the loss of 4.5 ha of the Tuart Woodlands TEC ('Critically Endangered').

By the proponent's *Offsets Strategy* and the EPA's recommended condition 9-1, the significant residual impact to the Tuart Woodlands TEC is proposed to be directly counterbalanced by Offset 8.

[402] EPA response to Appeal 045/21 (07/01/22), pages 13 and 36
[403] EPA response to Appeal 045/21 (07/01/22), pages 17-18

Overlapping offset sites

Some appellants raised concern that the offsets package for the proposal shares the same land parcels as offsets for the BORR Northern and Central Sections proposal.

The EPA acknowledged that some of the offset properties are the same as those conditioned in Ministerial Statement 1155. The EPA advised that it assessed the proponent's *Offset Strategy* and determined there is no duplication of offsets for the two proposals. In relation to large blocks addressing offsets for multiple projects, the EPA advised:

> Purchasing large blocks with offsets allocated to multiple projects is a common practice and provides an opportunity for greater net benefits as larger blocks are less susceptible to edge effects and can provide greater ecological linkages. As for the proposed revegetation offset sites within the Ludlow Tuart State Forest/Tuart Forest National Park, the EPA required evidence from the proponent during its assessment and confirmation by the DBCA to ensure there was no duplication of offsets between the BORR Southern Section and other proposals.
>
> The EPA recognises that the Ludlow Tuart State Forest/Tuart Forest National Park has been used previously for rehabilitation, including rehabilitation offsets. In determining whether offsets within this area would be suitable, the EPA consulted with DCBA who provided advice regarding which specific sites would benefit from additional rehabilitation works. Sites ranged from completely degraded sites, to areas that were previously revegetated but contained predominately tuarts, and therefore require further work to improve community functionality by increasing overstorey diversity and creating an understorey.[404]

The land parcel within which Offset 4 is located also contains an offset site for the BORR Northern and Central Sections proposal. We note that spatial mapping in the *Offset Strategy* for the BORR Northern and Central Sections proposal[405] and the *Offset Strategy* for the current proposal, these offset sites (despite being on the same land parcel) do not overlap.

The *WA Environmental Offsets Register* indicates that the eastern portion of Offset 5: Site 2 overlaps a 1.5 ha revegetation offset established within an area of the Ludlow State Forest No.2 to counterbalance impacts to western ringtail possums from the Bussell Highway Vasse Bypass project under Clearing Permit CPS 818/12 (decision date 22/01/15):

> It is expected that the rehabilitation will establish 1.5 hectares of native vegetation in good (Keighery 1994) condition in an extensively cleared area that includes at least 285 peppermint (*Agonis flexuosa*) trees suitable as habitat for the western ringtail possum. Species used in rehabilitation will be typical of those present in tuart (*Eucalyptus gomphocephala*) and peppermint forest.[406]

In addition, the whole of Offset 5: Site 4 is within the western portion of a ~40 ha footprint identified in EPBC Act approval 2015/7626 (decision date 05/01/17; variation 11/01/19) in which a 20.35 ha revegetation offset is to be established within an area of the Ludlow State Forest No.2 to counterbalance impacts to western ringtail possums from the Bussell Highway (Capel to Hutton) project.[407] The proponent's *Revegetation Plan - Bussell Highway (Capel to Hutton Section 26.38-32.15 SLK) - State Forest No. 2 Offset Site*[408] indicates a slightly different ~37 ha footprint excluding this portion for Clearing Permit CPS 7016/2 (decision date 06/06/19) for broadly the same project.[409]

The overlaps are indicated in Figure 17.

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[404] EPA response to Appeal 045/21 (07/01/22), page 35
[405] BORR IPT (2020b)
[406] *WA Environmental Offsets Register*: https://offsetsregister.wa.gov.au/public/projectversion/567/
[407] Department of the Environment and Energy (2019)
[408] Main Roads Western Australia (2019b)
[409] DWER FTP website: https://ftp.dwer.wa.gov.au/permit/7016/

CPS 818/12 WA Environmental Offsets Register

EPBC Act 2015/7626 ~40 ha offset footprint

CPS 7016/2 ~37 ha offset footprint (yellow)

BORR Southern Section Offset 5: Sites 2 and 4

Figure 17 *Overlapping offset sites*

On review, the proponent indicated that the overlap is a digitising error, and that Offset 5 would be adjusted to avoid the overlaps and retain the proposed extent.

In any event, Table 1 in recommended condition 9-2 specifies that a total of 185 ha is required to be revegetated within the Tuart Forest National Park/ Ludlow State Forest No.2, which is required to be demonstrated through revegetation targets for tangible outcomes, completion criteria, adaptive management, timeframes, monitoring, reporting and evaluation as part of the Offset Management Plan required by recommended condition 9-4.

Land acquisition offsets

By the proponent's *Offsets Strategy*, Offsets 1, 2, 3 and 8 comprise the land acquisition components of the offsets package. This is reflected in Table 1 in recommended condition 9-2 (and outlined in Table 17 above).

Recommended condition 9-4(6) requires that the *Offset Management Plan* (to be approved prior to ground-disturbing activities) contains the following information in relation to the land acquisition offsets:

- demonstrate that the minimum extents for each environmental value is achieved
- identify the long-term protection (tenure) of the sites for the purpose of conservation
- specify the quantum of works for maintenance of the sites for at least 20 years following purchase
- identify the relevant body for long-term/ ongoing management of the sites, and written confirmation that the relevant body accepts the responsibility.

We note that properties associated with Offset 1 have been purchased and are managed by DBCA. To improve clarity in requirements for maintenance of the sites we recommend condition 9-4(6)(c) is amended to account for land already purchased.

The proponent's *Offset Strategy* sets out a commitment to managing Offsets 1, 2, 3 and 8 for up to 20 years, with activities including firebreak construction, boundary fencing construction or repair to manage unauthorised access, fox and rabbit control, and selective weed control. These activities are expected to maintain current habitat quality for the specified duration.

Adequacy of land acquisition offsets

In response to the appellants' concerns about the adequacy of the proposed land acquisition offsets to partially counterbalance significant residual impacts to western ringtail possums, black cockatoos, and ecological communities, the EPA advised that it assessed the suitability of the offsets and noted the following:

- the total area of fauna habitat significantly impacted is 60.9 ha, whilst the total area proposed to be acquired for offsets is over 170 ha for the affected species, including western ringtail possums
- for western ringtail possums, the relative proportions of habitat quality of the area proposed to be cleared are similar to that of the offset sites, although the density of individuals is slightly lower
- Offsets 1 and 2 form part of an identified SWREL and the Dalyellup/Gelorup/ Crooked Brook ecological linkage, and Offset 3 is traversed by Five Mile Brook which creates a vegetated linkage to local government managed reserves to the north west.

The EPA considered that the land acquisition offsets are consistent with Objective 1 of the WRP Recovery Plan which aims to ensure that habitat critical for survival of western ringtail possums is identified and protected in each key management zone. The EPA considered that these offsets are also important in the context of the precautionary principle, given that fragmentation is identified as a key threatening process for western ringtail possums.

In considering the environmental gain from the land acquisition offsets, the EPA noted that Offsets 1, 2 and 3 are currently zoned as either 'Rural' or 'Primary Regional Road' under the GBRS, and that the proponent has committed to requesting these sites be rezoned to either 'Regional Open Space' or 'Conservation' for security of tenure for conservation. The EPA advised that its recommended conditions would also require the proponent to undertake ongoing site management to ensure long term conservation outcomes.

The EPA considered that with secure tenure and ongoing management, the outcome of the land acquisition offsets would improve connectivity of ringtail possum habitat and assist in ensuring a net gain in vegetation communities, fauna habitat and ringtail possum populations within conservation tenure, and ultimately contribute to the long-term conservation of environmental values impacted by this proposal. The EPA was of the view that without the offsets the condition and health of the remnant vegetation and fauna habitats at the sites would likely decline over time from existing threats and pressures.[410]

The reasonableness of the proponent's calculations for determining the land acquisition offsets is considered in more detail below.

[410] EPA response to Appeal 045/21 (07/01/22), pages 29-30

Discrepancy in recommended conditions

We note that for Offsets 1 and 2 as relevant to black cockatoos, the proponent's *Offset Strategy* refers to 124.1 ha and 37.7 ha respectively (being a combined total of 161.8 ha). However Table 1 of the EPA's recommended conditions contains a combined total of 161.1 ha for these sites.

We recommend that the reference to 161.1 ha in Table 1 of the recommended conditions be changed to 161.8 ha, consistent with the proponent's *Offset Strategy*.

On-ground management offsets

By the proponent's *Offsets Strategy*, Offsets 4, 5 and 6 comprise the on-ground management (revegetation/rehabilitation) components of the offsets package. This is reflected in Table 1 in recommended condition 9-2 (and outlined in Table 17 above).

Recommended condition 9-4(7) requires that the *Offset Management Plan* (to be approved prior to ground-disturbing activities) contains the following information in relation to the on-ground management/ revegetation offsets:

- state the on-ground management/ revegetation targets to be achieved, including completion criteria, to result in a tangible improvement for each environmental value
- demonstrate the consistency of these targets with the objectives of relevant guidance (for example recovery plans, management plans)
- detail the on-ground management actions and timeframes to achieve these targets
- detail the monitoring, reporting and evaluation mechanisms for these targets and actions.

Adequacy of revegetation offsets

The EPA acknowledged that some areas of the Tuart Forest National Park/ Ludlow State Forest No.2 have low vegetation condition and species diversity and high weed coverage, and that some areas have also been previously planted as pine plantation (but are now cleared) and do not contain suitable habitat for western ringtail possums or black cockatoos.

The EPA agreed with the appellants that a monoculture planting of tuarts would not counterbalance the impact to western ringtail possums or black cockatoos.

In relation to western ringtail possums, the EPA advised that recommended condition 9-3 requires the offsets to meet four objectives, which include ensuring a net-gain in populations and improved connectivity in population habitats. The EPA noted that the proponent would be required to prepare an *Offset Management Plan* in consultation with DBCA, which requires the establishment of completion criteria. The EPA advised that these include requirements for target densities, measures for abundance/distribution, habitat structure and vegetation condition, and adaptive management for successful revegetation specific to ringtail possum habitat requirements.[411]

In relation to the time lag between proposal implementation and revegetation completion (i.e. when revegetation has met completion criteria/ provides habitat), the EPA acknowledged that there would be a time lag and advised that to assist in addressing the time lag, it recommended condition 9-4(8) requiring the proponent to contribute to the predator control program currently undertaken by DBCA in the Tuart Forest National Park/ Ludlow State Forest No.2:

> The amount specified in the proponent's Offset Strategy (BORR Team 2021b) equates to approximately 8 years of additional funding, based on the current DBCA program. Given the

[411] EPA response to Appeal 045/21 (07/01/22), page 31

> significant threat posed by foxes to ringtail possum abundance, the EPA considers the expansion of the predator baiting program would complement the proposed revegetation offsets and facilitate achieving a net gain in ringtail possum populations within secure conservation tenure. It is also likely to contribute to addressing the time lag by assisting in managing threatening processes to the current population with the Ludlow Tuart State Forest/Tuart Forest National Park.[412]

The reasonableness of the proponent's calculations for determining the revegetation offsets is considered in more detail below.

Location in conservation estate

Offset 5 (Sites 2, 4 and 12) and Offset 6 (peppermint orchard) are located within the Tuart Forest National Park/ Ludlow State Forest No.2.

Some appellants contended that it is inappropriate to consider proposed revegetation on Crown lands, particularly those vested for the purpose of conservation, to be an offset.

The proponent advised that Offset 6, being the establishment of a 1 ha peppermint orchard, was undertaken at the request of DBCA, is consistent with Objective 4 of the WRP Recovery Plan relating to management of displaced, orphaned, injured and rehabilitated individuals, and is considered an indirect offset by the EPA.[413] Noting the size of Offset 6 and that the EPA considers it to be an 'indirect' offset, Offset 6 is not considered further in our review of the offsets package; the discussion below focusses on Offset 5.

In a letter to EPA Services dated 2 September 2021, DBCA generally supported the proposed revegetation within the Tuart Forest National Park/ Ludlow State Forest No.2, and the provision of funding towards fox control on conservation estate, for the benefit of western ringtail possums.

In a letter dated 10 March 2021, DBCA advised the EPA that:

> The most strategic and beneficial WRP offsets are the habitat creation actions being undertaken in the southern portions of the Tuart Forest National Park. This area is recognised as a significant habitat hotspot for the species and has the potential to support WRP at densities greater than the road corridor in 10-15 years time, if plantings in the area are successful.[414]

In Report 1714, the EPA has noted this as 'The [DBCA] has advised that the most strategic areas for habitat creation is within the secure conservation tenure of the Ludlow Tuart State Forest and Tuart Forest National Park. Given the relatively small proportion of habitat within conservation tenure, a focus on substantial creation of additional habitat in conservation tenure is a priority'.

Within the context of addressing impacts from fragmentation, the EPA further noted:

> The DBCA advised the EPA during its assessment that there is only a small proportion of existing habitat in conservation tenure relative to its remaining extent. The proposed offsets sites will increase the quantity of habitat for the species within the Western Ringtail Possum Bunbury Management Zone through revegetation and increase the quantity of habitat within … secure protected tenure through land acquisitions. The EPA notes the ringtail possum recovery plan states that the Ludlow-Busselton area has long been known as the last substantial stronghold for ringtail possums left on the Swan Coastal Plain ...
>
> DBCA also advised the EPA that with successful revegetation, these sites have the capacity to support higher densities of ringtail possums than the impact site. This is reflected in the

[412] EPA response to Appeal 045/21 (07/01/22), page 32
[413] Proponent response to Appeal 045/21 (15/12/21), page 40
[414] Department of Biodiversity, Conservation and Attractions (2021c).

> recommended conditions for offsets that would require the offset sites to be restored in accordance with completion criteria (agreed by DBCA prior to clearing) …[415]

We disagree in part with the EPA's interpretation of DBCA's advice. We consider that DBCA's advice was provided in the context of the *components* of the offsets package presented, rather than the suitability of locations or tenure more broadly. In this context, we consider that DBCA expressed the view that the most beneficial outcomes for western ringtail possum from the offsets package as presented would likely result from *successful* revegetation within the Tuart Forest National Park which, over the long-term, *might* support densities greater than those presently in the development envelope.

We next consider the question of whether Offset 5 is consistent with the *WA Environmental Offsets Policy* and *WA Environmental Offsets Guidelines* in relation to 'additionality'.

Offset 5 comprises three revegetation sites within different ecosystem management zones under the *Tuart Forest National Park Management Plan*[416] (TFNP Management Plan), as identified in Table 18. The TFNP Management Plan was prepared under the *Conservation and Land Management Act 1984* and was published in the *Government Gazette* on 19 August 2014.

Table 18 *Offset 5: Tuart Forest National Park Management Plan management zones*[417]

Offset site	Block	Ecosystem management zone (objectives/ actions)
Offset 5: Site 2 Offset 5: Site 4	'Lockhart'	Zone 2b: Plantations to be cleared. Contains some relict tuarts, as well as pine and karri plantations proposed for harvesting. The southern block also contains some wetland areas. Objectives: [Following tree harvesting] Protect and enhance the eastern wetland/tall tuart community transition zone. Protect and enhance the proposed Busselton yate TEC. Protect and increase habitat for fauna that are highly represented in zones 5 and 6 (for example, western ringtail possum and brushtail possum). Enhance resilience of this zone to disturbance and threatening processes. Actions: [Following tree harvesting] Undertake experimental trials in rehabilitation of the tall tuart communities to address knowledge deficits. Re-establish native vegetation in cleared areas, adapting management according to results of experimental trials.
Offset 5: Site 12	'North'	Zone 4: Old ash-bed tall tuart regeneration. Contains tuart that was regenerated 10 to 30 years ago using ash-bed stands. There is little diversity in secondary and understorey species. Objectives: Protect and enhance the condition of regenerated tuart, including a variation in the age-class structure. Improve the representation of secondary and understorey species. Actions: At selected sites, evaluate the need to introduce variation in the age-class structure of tuart and implement a regeneration program where required. Where necessary, modify the density of regenerated tuart stands to maintain health of remaining trees. Re-establish secondary and understorey vegetation.
		Zone 5: Mature tall tuart woodland. This zone is rich in fauna diversity and abundance, supporting species and communities from the Vasse-Wonnerup wetlands and tall tuart woodland. Supports a

[415] EPA response to Appeal 045/21 (07/01/22), page 10
[416] Department of Parks and Wildlife (2014)
[417] Department of Parks and Wildlife (2014), Table 3 page 18-20

Offset site	Block	Ecosystem management zone (objectives/ actions)
		large proportion of the possum populations in the planning area and contains mature tuart with hollows that provide fauna habitat. Objectives: Protect and enhance the condition of the mature tuart woodland. Protect fauna habitat and fauna populations that are highly represented in this zone (for example, western ringtail possum and brushtail possum). Actions: At selected sites, evaluate the need to introduce variation in the age-class structure of tuart and implement a regeneration program where required. Protect mature tuarts and tree hollows from threats such as inappropriate fire regimes. Re-establish native vegetation, including tuart, where gaps occur in the canopy because of a loss of senescent trees. Monitor tuart health for signs of decline.

In relation to additionality, the *WA Environmental Offsets Guidelines* states:

> Actions undertaken offsite which are required by other legislation generally cannot be considered an offset. However, where EPBC Act offsets address values that are also of relevance to EP Act processes, these would reduce any state-based offsets to the extent of the overlap.
>
> Some examples of actions required under legislation include where a proponent or applicant manages a pastoral lease and is required to manage feral animals through a condition of the lease. This management is not an offset. However, if the management went beyond legislative requirements and included additional actions for a conservation purpose, these management actions may be considered. For example, the installation of a predator-proof fence and the removal of pests around a high environmental value area could be considered as an offset if the environmental value was impacted by the project.
>
> Similarly, offset projects undertaken within conservation areas must be such that the actions being proposed are additional to work already undertaken by the Department of Parks and Wildlife or the land manager and not be part of normal responsibilities. It will be necessary to demonstrate the additionality of actions to the regulator. For example, an offset could be proposed to construct a predator-proof enclosure within a conservation area, as there is a clear purpose and an environmental benefit from this action which is beyond basic reserve management. Offsets may be used to expand an existing program, but must be additional to current work or programs being undertaken.
>
> Offsets do not include actions required to manage environmental impacts caused by a project, or to improve the social and economic wellbeing of a local community. These latter initiatives are sometimes referred to as corporate social responsibility initiatives.[418]

From the above, on-ground projects that are additional to the day-to-day management of a site and have long-term security of tenure, and/or are additional to the purpose for which an area of Crown land is vested, are likely to be acceptable as offsets. However, it could be argued that revegetation activities on land that is vested with or managed by DBCA for the purpose of conservation, and for which there is a current management plan that identified revegetation as a management objective/action, are part of the normal responsibilities of managing that land for conservation, and as such the land would not be suitable as an offset.

In response to this matter, the EPA advised that it acknowledges that consistent with the *WA Environmental Offsets Guidelines*, offsets must not be part of normal responsibilities and be additional to the work already undertaken by DBCA, however offsets may be used to expand an existing program. The EPA noted that the TFNP Management Plan identifies objectives and management actions related to rehabilitation and re-establishment of cleared and degraded areas, including the offset sites. The EPA further advised:

[418] Government of Western Australia (2014)

> The DBCA's current program of rehabilitation and re-establishment in the national park is currently limited in terms of the areas planned to be rehabilitated. Any offsets from the proponent would be additional to what is planned, resourced and implemented by the DBCA. Without the proponent's offsets, the achievement of the plan's objectives and management actions, particularly with respect to rehabilitation, would occur over a much longer timeframe and possibly over a small area.
>
> Therefore, the EPA considers the proposed offsets are an expansion of works planned by DBCA and therefore consistent with the Offset Guidelines.[419]

Noting the *WA Environmental Offsets Policy* and *Guidelines*, and previous decisions under the EP Act approving offsets within the Tuart Forest National Park/ Ludlow State Forest No.2 for proposals and clearing approvals, we consider that the EPA's decision to recommend offsets within the same conservation estate for this proposal was both within the EPA's power and consistent with current State Government policy and decision-making.

Revegetation outcomes

The EPA's Guidance Statement No.6 *Rehabilitation of Terrestrial Ecosystems*[420] states that completion criteria 'must be sufficiently stringent to ensure that the overall objectives of rehabilitation have been met' and must be designed to 'allow effective reporting and auditing to define an endpoint for rehabilitation activities where sites can be handed over to a third party'. The Guidance recognises that there 'are a wide diversity of projects which involve rehabilitation of ecosystems in WA, so it is not possible to provide project specific values for completion criteria', however describes completion criteria relevant to all projects, including the following biota-related components:

- vegetation is resilient and self-sustaining
- plant species diversity reaches targets; reintroduce species of conservation significance
- plant abundance or cover reaches targets
- adequate control of weeds
- pests and diseases are properly managed; control grazing, especially by feral animals
- maintain plant genetic diversity (local provenance)
- restore dominant plant species
- restore diversity of ecological communities
- animal diversity reaches set targets
- animal habitats are present or can be expected to return.

DWER's *A Guide to Preparing Revegetation Plans for Clearing Permits*[421] contains a typical framework for completion criteria of a revegetation project that aims to increase biodiversity. The framework includes species richness, species density, vegetation structure, proportion of herbs/ sedges/ grasses, weed cover, bare ground cover. The Guide states that quantitative completion criteria must be:

- defined by a measurable outcome so that the effectiveness of a revegetation action can be assessed
- designed to allow for monitoring, reporting and auditing
- developed based on data collected from a reference site (where possible)
- consistent with the SMART[422] principles.

[419] EPA response to Appeal 045/21 (07/01/22), pages 32-33
[420] Environmental Protection Authority (2006), Table 4
[421] Department of Water and Environmental Regulation (2018), Table 2
[422] Specific, measurable, achievable, relevant, time-based.

While prepared specifically for revegetation plans the subject of Part V clearing approvals, we consider it to be relevant for Part IV proposals also.

The recently-published *National standards for the practice of ecological restoration in Australia*[423] (Standards) describes a best-practice framework for ecological restoration. The Standards describe six key principles of ecological restoration practice. In relation to completion criteria, Principle 1 of the Standards recognises the need to identify 'an appropriate reference ecosystem to guide project targets and provide a basis for monitoring and assessing outcomes', and that target-setting needs to be informed by research into the anticipated effects of climate change to assist adaptive management. Principle 3 of the Standards sets out a five-star system 'designed to evaluate the progression of an ecosystem along its recovery trajectory' for six key attributes as compared with an intact reference site:

- absence of threats: degradation drivers present (one-star), to minimal/ none (five-star)
- physical conditions: most physical and chemical properties highly dissimilar (one-star), to highly similar (five-star)
- species composition: some colonising native species present (one-star), to high diversity of characteristic species (five-star)
- structural diversity: one horizontal stratum present/ largely dissimilar (one-star), to all strata present/ high resemblance (five-star)
- ecosystem function: processes and functions at a foundational stage (one-star), to on a secure trajectory/ evidence of being sustained (five-star)
- external exchanges: exchanges/ flows with surrounding environment for low number of species/ processes (one-star), to highly similar/ evidence of being sustained (five-star).[424]

The proponent's *Offset Strategy* contains minimal information about revegetation activities, completion criteria and timing for Offsets 4 and 5. Instead, the proponent defers to the selection of species based on site parameters and in consultation with DBCA, and to developing completion criteria to the EPA's satisfaction and on advice from DBCA.

In response to the appeals, the proponent advised that it is developing a revegetation strategy in close consultation with DBCA, and would apply learnings from previous revegetation within the Tuart Forest National Park/ Ludlow State Forest No.2 to this revegetation program.[425]

The EPA supports the proponent's approach, as reflected in Report 1714.[426]

The proponent's approach, as supported by the EPA, appears to be consistent with the EPA's Guidance Statement No.6 *Rehabilitation of Terrestrial Ecosystems* which states:

> The information provided for the EIA process often does not include complete details of rehabilitation, which will later be included in a final Environmental Management Plan, Rehabilitation Plan, or Decommissioning Plan. These plans are reviewed and approved before rehabilitation commences. The EPA is of the opinion that wherever feasible, comprehensive rehabilitation plans should be made available and assessed during the main proposal approval stage of the EIA process. The approval of these plans would be facilitated by greater standardisation of approaches, especially for similar projects within the same geographic regions ...[427]

[423] Standards Reference Group SERA (2021)
[424] Standards Reference Group SERA (2021), page 16-17
[425]Proponent response to Appeal 045/21 (15/12/21), pages 41-42
[426] Environmental Protection Authority (2021a)
[427] Environmental Protection Authority (2006)

The EPA advised that the proponent has previously undertaken rehabilitation works within this area, and DBCA has advised that based on previous works there is a sufficient level of confidence that the proposed revegetation would be successful.[428]

In relation to the proponent's previous rehabilitation works referred to by the EPA, we note that three recent clearing approvals propose to rehabilitate areas within the Tuart Forest National Park/ Ludlow State Forest No.2. The completion criteria for these, plus another approved revegetation offset within Ludlow State Forest No.2 for the benefit of western ringtail possums, are outlined in Table 19.

Table 19 *Completion criteria for previously approved revegetation/ rehabilitation offsets*

Instrument	Proposal	Completion criteria
Clearing Permit CPS 9168/1 EPBC Act 2020/8800 (2021 approval)	Bussell Highway duplication project Stage 2 (27.3 ha including 24 ha western ringtail possum habitat, 20.8 ha black cockatoo habitat, 2 ha Tuart Woodlands TEC)	The offsets package includes 60.26 ha under CPS 9168/1 / 16.18 ha under EPBC Act of rehabilitation in Ludlow State Forest No.2 for the benefit of western ringtail possums, black cockatoos and Tuart Woodlands TEC. The proponent's *Project Rehabilitation Plan* has not yet been published,[429] however clearing permit states that it 'shall be developed in accordance with *A Guide to Preparing Revegetation Plans for Clearing Permits*' and must include site preparation, weed control, revegetation methodology, monitoring program, contingency action, timings, and completion criteria. The completion criteria are required to include target weed cover, target vegetation condition, target density and structure, species richness, bare ground.
Ministerial Statement 1155 EPBC Act 2019/8471 (2020 approval)	BORR Northern and Central Sections (92 ha including 43.9 ha western ringtail possum habitat, 37.8 ha black cockatoo habitat, 3.7 ha Banksia Woodlands TEC and others)	The offsets package includes 90 ha of rehabilitation in Ludlow State Forest No.2 for the benefit of western ringtail possums and black cockatoos. The proponent's *Offset Strategy* for that proposal states 'The proposed offset is congruent with similar environmental offsets within SF No. 2 negotiated by Main Roads with DBCA, DWER and DoEE for other road projects. Similar to Offset 2 plant species will be selected to provide habitat for offset target species based on site parameters. Seed and seedling species will be selected in consultation with DBCA as per similar Main Roads offsets in SF 2. Completion criteria will be determined with EPA based on advice from DBCA in line with existing Main Roads revegetation environmental offset sites if SF 2'.[430] Both the State and Commonwealth approvals rely on the proponent preparing an Offset Management Plan containing full details for rehabilitation, including contingency actions to ensure success.
Clearing Permit CPS 7016/2 EPBC Act 2015/7626 (2016 approval, amended 2019)	Bussell Highway Capel to Hutton SLK 38 to 32.15 road widening project (6.59 ha under EPBC Act / 5.53 ha under CPS 7016/2 western	The offset comprises 20.35 ha under EPBC Act / 13.6 ha under CPS 7016/2 of rehabilitation in Ludlow State Forest No.2 for the benefit of western ringtail possums and black cockatoos. The proponent's *Revegetation Plan - Bussell Highway (Capel to Hutton Section 26.38-32.15 SLK) - State Forest No. 2 Offset Site* sets out the specified activities (revegetation methodology, 30 species and overall planting density @ 3,355 stems/ha, monitoring program, contingency actions, and timings) and completion criteria

[428] EPA response to Appeal 045/21 (07/01/22), page 31
[429] DWER FTP website: https://ftp.dwer.wa.gov.au/permit/9168/
[430] BORR IPT (2020g)

Instrument	Proposal	Completion criteria
	ringtail possum habitat)	for the rehabilitation.[431] The specified completion criteria include: a continuous canopy cover over the entire revegetation area; and a minimum 50% representation of species in each vegetation structural group present and persistent in each of the monitoring quadrats at handover.
Clearing Permit CPS 818/12 (2015 approval)	Bussell Highway Vasse Bypass project (2.54 ha including 1.01 ha western ringtail possum habitat and 25 peppermint trees)	The offsets package includes 1.5 ha rehabilitation in Ludlow State Forest No.2 for the benefit of western ringtail possums. The *WA Environmental Offsets Register* sets out the specified activities (site preparation, vegetation density and composition, monitoring program, remedial actions, and timings) and completion criteria.[432] The specified completion criteria include: 75% survival rate of seedlings; minimum of five different native species per 10x10 m quadrat; structure of 10-30% understorey, 40-70% midstorey and 5-20% upperstorey; <15% weed coverage; and minimum of 190 peppermint seedlings per ha.
Clearing Permit CPS 4433/2 EPBC Act 2011/6011 (2011 approval, amended 2013)	Busselton Health Campus (238 peppermint trees)	The offsets package includes 10.4 ha rehabilitation in Ludlow State Forest No.2 for the benefit of western ringtail possums. The *WA Environmental Offsets Register* sets out the specified activities (site preparation, vegetation density and composition, monitoring program, remedial actions, and timings) and completion criteria.[433] The specified completion criteria, consistent with the *Tuart Forest Revegetation Management Plan*[434] for that proposal, include: 75% survival rate for the tuart and peppermint trees (i.e. 750 each); 75% survival rate for all other species (i.e. 11,325 plants); and reduction in the affected area and population density of *Zantedeschia aethiopica* (arum lily) and *Trachyandra divaricata* (dune onion weed) by >80%.

We viewed revegetation sites within Tuart Forest National Park/ Ludlow State Forest No.2 which are understood to have been established by the proponent for one of the above projects. We consider that the photographs in Figure 18, taken from the edges of one such site, are broadly indicative of outcomes (rip/mound, weed control, fencing, planting density and species composition) that might be achieved 1-2 years after planting at Offsets 4 and 5.

[431] DWER FTP website: https://ftp.dwer.wa.gov.au/permit/7016/
[432] *WA Environmental Offsets Register*: https://offsetsregister.wa.gov.au/public/projectversion/567/
[433] *WA Environmental Offsets Register*: https://offsetsregister.wa.gov.au/public/projectversion/42/
[434] Natural Area Consulting (2013)

Figure 18 *Photographs of proponent's earlier revegetation in proximity to Offset 5*[435]

From the above, the completion criteria for Offset 5 should at a minimum specify the target vegetation condition, structure and composition (species richness and density), and the target (maximum) weed and bare ground cover, to be achieved by the revegetation project. Further, noting that the three offset sites outlined above for Bussell Highway projects are within close proximity to the two small revegetation sites (Offset 5: Sites 2 and 4) proposed for the current proposal, and have a common aim of providing habitat for western ringtail possums, the completion criteria should be consistent across the sites.

Recommended condition 9-4 specifies certain things that must be included in the Offsets Management Plan. This includes (in relation to revegetation and on-ground management offsets) a requirement to:

> … state the targets to be achieved by the revegetation and on-ground management, including completion criteria, which will result in a tangible improvement to the environmental values being offset.[436]

The term 'tangible improvement' is defined in the EPA's recommended conditions as a perceptible, measurable and definable improvement that provides additional ecological benefit and/or value.'

Noting that each offset site is different, and the value of each offset site was calculated by reference to the 'future quality with offset', it is recommended that the above condition be replaced with a condition that sets the completion criteria to be consistent with the attainment of the future quality score (as revised in Appendix 3).

Notwithstanding Guidance Statement No.6 recognises that 'it is not possible to provide project specific values for completion criteria', it is unclear from the available information whether the proponent's revegetation offsets for this proposal (Offsets 4 and 5) would be subject to methodologies and completion criteria consistent with the EPA's Guidance,

[435] From Office of the Appeals Convenor site visit undertaken on 25 February 2022
[436] Recommended condition 9-4(7)(a)

DWER's Guide, the Standards (for example, to achieve a four-star recovery outcome), or the target outcomes for previous revegetation projects in the area.

We consider that in the absence of this information, and with regard for the subjectiveness of the offsets calculations (discussed in detail below), it is difficult at this time to properly determine the net benefit of the proposed revegetation for the benefit of western ringtail possums and black cockatoos. Given this, there is uncertainty around the proportionate contribution of Offsets 4 and 5 to the offsets packages for these environmental values, and therefore whether the significant environmental impacts are adequately counterbalanced. Noting this uncertainty, the reasonableness of the calculations applied to determine whether the significant residual impacts have fully been counterbalanced is discussed in the following section.

In addition, we note that recommended conditions 9-9 to 9-11 require the proponent to notify of non-compliance with the actions, objectives, or targets in the *Offset Management Plan*, and provide a report on details and timing of contingency actions to be undertaken that 'will bring the impact within the management target'. There does not appear to be a limiting timeframe associated with this requirement.

From the above, the success of the proposed revegetation for the benefit of western ringtail possums and black cockatoos is reliant on the appropriate management by the regulatory agency of compliance with the recommended conditions, and the application of contingency actions if required to ensure the revegetation objectives are ultimately achieved.

Reasonableness of the calculations

Noting the appeal concerns about the adequacy of offsets to counterbalance the identified residual impacts, it is necessary to examine the reasonableness of the scores applied by the proponent in the calculations for the land acquisition and on-ground management components of the offsets package, as they relate to each of the environmental values for which the EPA has identified significant residual impacts.

In the absence of published State guidance on this matter, the EPA and proponent relied on the Commonwealth *How to use the offsets assessment guide*[437] (Commonwealth guidance) to inform its assessment and offset plan.

From our review of the calculations, we consider that most of the scores applied by the proponent can be justified within the context of the Commonwealth guidance, however we consider that some of the 'quality' and 'risk of loss' scores applied in the proponent's calculations require improvement to ensure that the significant residual impacts are adequately counterbalanced. Our reasoning is set out below.

Determining 'quality' scores

The Commonwealth guidance describes 'quality' to be a combination of the following, as relevant to the species or community to be offset:

- site condition (vegetation condition and structure, diversity, habitat features)
- site context (movement patterns, proximity to other habitat, role of site to overall population)
- species stocking rate (survey data, overall population viability or community extent).

The weighting given to each component is dependent on the ecological requirements of the impacted species or community. For some, the most important consideration might be the

[437] Department of Sustainability, Environment, Water, Population and Communities (2012)

location of a site in the landscape, whereas for others the presence of important habitat features on the site itself may be the most important influencing factor.

The recently-published State *Environmental offsets metric: Quantifying environmental offsets in Western Australia*[438] (State guidance) was prepared for use with the State calculator, however is generally consistent with and builds on the Commonwealth guidance, and we consider it is therefore also relevant for use with the Commonwealth calculator.

The State guidance recognises that an 'improvement in the quality of a site over time is a key means of achieving a conservation gain for the environmental value being impacted'. The State guidance describes how to determine 'quality' scores for use in offset calculations:

> [T]he method for determining quality must be consistently applied across all calculations relating to a particular environmental value, and should reflect the site's importance for the environmental value being impacted.
>
> The user must determine the site's quality score before impact and rate its importance between 0 and 10 as relevant to the environmental value identified in step 1, where '0' is an area with no importance and '10' is an area with the highest-possible importance. In this context, quality is a measure of how well a particular site supports a particular environmental value (i.e. the ecological requirements of the environmental value), and contributes to its ongoing viability. The determination of quality must consider the factors of vegetation condition, site context, and habitat value …The user must enter three scores: *current quality of offset site*, *future quality without offset*, and *future quality with offset* … it is expected that even if there is minimal existing native vegetation, the site would be selected to provide site context and habitat value.
>
> An improvement in the quality of a site over time is a key means of achieving a conservation gain for the environmental value being impacted. Where completion criteria for proposed revegetation or rehabilitation are available during the assessment process, the future quality with offset score must be consistent. For example, if the completion criteria state that revegetation or rehabilitation will achieve a future quality of '5', the future quality with offset score must be the same ...
>
> Depending on the timeframe, the quality of a site may decline without the proposed offset being implemented. For a reduction in the future quality to be applied in the calculations, evidence is required of current degrading processes or threats to the site. For example, surveys over a number of years may indicate gradual decline in the quality of a site in the absence of management, or that adjacent development approvals will result in detrimental 'edge effects' to that site …
>
> A future quality with offset score for revegetation/rehabilitation should be based on demonstrated success and/or scientific evidence; for example current best-practice techniques and positive research outcomes for those techniques for the vegetation type or feature being rehabilitated ...
>
> For offsets involving ceding of land to the crown, or conservation covenants in perpetuity, the future quality with offset score should be the likely quality in 20 years.[439]

Of note, in relation to on-site rehabilitation following clearing, the State guidance states:

> The future quality with rehabilitation score should be based on demonstrated success and/or scientific evidence; for example, current best-practice techniques and positive research outcomes for those techniques for the vegetation type or feature being rehabilitated. In the absence of supporting evidence, a score of not greater than '5' is generally the maximum applied.[440]

We consider this is also relevant for off-site (offset) revegetation – that through the establishment of a limited number of species to replace a basic vegetation structure within a

[438] Department of Water and Environmental Regulation (2021)
[439] Department of Water and Environmental Regulation (2021), pages 9 and 18-19
[440] Department of Water and Environmental Regulation (2021), page 13

highly modified site largely devoid of native vegetation, it is reasonable to assume a result achieving a medium quality outcome (for example, reinstated vegetation in 'good' condition).

Determining 'risk of loss' scores

The Commonwealth guidance describes 'risk of loss' to be 'the chance that the habitat on the proposed offset site will be completely lost (i.e. no longer hold any value for the protected matter) over the foreseeable future (either the life of the offset or 20 years, whichever is shorter)'. The guidance sets out examples of factors that could influence the risk of loss:

- presence and strength of formal protection mechanisms currently in place on the proposed site (for example zoning, restrictive covenants or vegetation clearing laws)
- presence of pending development applications, mining leases or other activities on the proposed offset site that indicate development intent and likelihood
- average risk of loss for similar sites.

We understand that the risk of loss in this context relates to anthropogenic events, and needs to consider development intent, tenure and surrounding landuse pressures, but does not include degradation of quality/condition due to current management practices, or loss due to natural events.

The State guidance describes 'risk of loss' as 'the likelihood that the environmental value on the offset site will be completely lost in the foreseeable future with the offset in place'. The State guidance describes how to determine 'risk of loss' scores for use in offset calculations:

> … The difference between the risk of future loss with a proposed offset and without the proposed offset indicates the level of averted loss provided by the proposed offset.
>
> [Risk of loss without offset] The user must enter, as a percentage, the likelihood that the environmental value on the offset site will be completely lost in the foreseeable future without an offset. The user should consider the duration for which the offset will be implemented in determining this score.
>
> [Risk of future loss with offset] The user must enter, as a percentage, the likelihood that the environmental value on the offset site will be completely lost in the foreseeable future with the offset in place. The user should consider the number of years over which the offset will be actively implemented in determining this score. For conservation covenants in perpetuity and land ceded to the crown, a 20-year timeframe should be considered.[441]

Discussion

From our review of the proponent's offset calculations detailed in the *Offset Strategy*, we consider that most of the scores applied by the proponent can be justified within the context of the Commonwealth and State guidance. However, we consider that there appears to be sufficient uncertainty around the determination of the 'quality' and 'risk of loss' scores applied by the proponent to indicate that some need improving to ensure significant residual impacts are adequately counterbalanced.

Following discussion with the proponent and further review, we suggest the revised scores set out in Appendix 3. Our rationale for these revised scores is also provided.

Based on our revised scores, we undertook preliminary offset calculations using the Commonwealth calculator, applying revised 'quality' and 'risk of loss' scores in line with our suggestions. Our findings, which are set out in Table 20, suggest that the offsets package described in recommended condition 9-2 is not sufficient to counterbalance some of the significant residual impacts identified by the EPA, insofar as the results are lower than the 100% minimum needed for each environmental value.

[441] Department of Water and Environmental Regulation (2021), pages 9 and 19

In response to this matter, the proponent noted that the existing offsets package addresses a number of overlapping values, and proposed to apportion additional extents to address the shortfalls identified by our preliminary calculations.

We undertook preliminary calculations for the additional offsets, applying revised 'quality' and 'risk of loss' scores consistent with those applied in our preliminary calculations for the proposed offsets package detailed in the proponent's *Offset Strategy* (Appendix 3). Our findings, which are set out in Table 21, indicate that the combination of the proposed offsets package and the additional offsets can generally achieve the 100% minimum counterbalance for each environmental value.

Given the above, we suggest that Table 1 in recommended condition 9-2 is revised as follows, to ensure that the significant residual impacts of the proposal are adequately counterbalanced:

- black cockatoo foraging and breeding habitat: the minimum extent of area to receive offset measures within the offset location Ludlow-Tuart State Forest and Tuart Forest National Park to be increased from 50 ha to 75.3 ha
- Banksia Woodlands TEC: the offsets package to include the additional offset location Lot 1 Ducane Road, Gelorup, and the minimum extent of area to receive offset measures across the combined offset locations to be increased from 92 ha to 126.9 ha
- Tuart Woodlands TEC: the offsets package to include the additional offset location Ludlow-Tuart State Forest and Tuart Forest National Park, and the minimum extent of area to receive offset measures within this additional offset location to be 7.2 ha.

Table 20 *Value of proposed offsets package – comparison of proponent outcomes with preliminary outcomes based on suggested revised scores*

Offset package	Western ringtail possum (critically endangered)		Black cockatoos (endangered)		Banksia Woodlands TEC (endangered)		Tuart Woodlands TEC (critically endangered)	
	Proponent	Revised	Proponent	Revised	Proponent	Revised	Proponent	Revised
Offset 1 (acquisition / management)	126 ha 37.37%	21.32%	124.1 ha 47.07%	37.91%	92 ha 100.26%	73.14%		
Offset 2 (acquisition / management)	38.5 ha 11.42%	6.52%	37.7 ha 14.3%	11.52%				
Offset 3 (acquisition / management)	14.2 ha 4.21%	2.48%	9.7 ha 3.68%	2.96%				
Offset 4 (acquisition / revegetation)	35 ha 13.95%	17.28%						
Offset 5: Sites 2 and 4 (revegetation)	185 ha 67.29%	15 ha 7.41%						
Offset 5: Site 12 (revegetation)		170 ha 54.94%	50 ha 35.21%	31.65%				
Offset 8 (acquisition / management)							19 ha 100.18%	58.02%
Offset package value	134.24%	109.95%	100.26%	84.04%	100.26%	73.14%	100.18%	58.02%

Table 21 *Value of additional offsets – comparison of proponent calculations with preliminary calculations based on suggested revised scores*

Offset package	Western ringtail possum (critically endangered)		Black cockatoos (endangered)		Banksia Woodlands TEC (endangered)		Tuart Woodlands TEC (critically endangered)	
	Proponent	Revised	Proponent	Revised	Proponent	Revised	Proponent	Revised
Offset 1 (acquisition / management)						32.1 ha 25.52%		
Offset 2 (acquisition / management)						2.8 ha 2.09%		
Offset 5: Site 12 (revegetation)				25.3 ha 16.01%				7.2 ha 41.99%
Additional offset value				16.01%		27.61%		41.99%
Revised offset package value		109.95%		105.05%		100.75%		100.01%

3.11.6.4 Offsets for other environmental values

Some appellants considered that offsets should be required for the loss of habitat for black-stripe minnows, 104 *Caladenia speciosa* (Priority 4) individuals, two heritage *Nuytsia floribunda* trees, and a population of *Pterostylis rogersii*.

Under the *WA Environmental Offsets Policy* (2011) and *WA Environmental Offsets Guidelines* (2014), environmental offsets are not appropriate for all projects and are not appropriate in all circumstances, and their applicability is considered on a project-by-project basis after avoidance and mitigation options have been pursued.

Principle 2 of the *WA Environmental Offsets Policy* further states 'While environment offsets may be appropriate for significant residual environmental impacts, they will not be applied to minor environmental impacts'. In other words, where a residual impact is not considered to be 'significant', an offset would not be required.

Discussion

As indicated under Sections 3.2.3 (black-stripe minnow), 3.3.2 (orchids) and 3.5.5 (significant trees), the EPA did not consider the impacts to black-stripe minnows *Caladenia speciosa*, *Pterostylis rogersii* or heritage *Nuytsia floribunda* trees to be 'significant' residual impacts that might trigger a requirement for offsets.

For the reasons set out under those sections, we agree with the EPA's finding that the residual impacts can be managed and are not significant, and it follows that offsets are not required to counterbalance them.

3.11.6.5 Contingency offsets

The EPA's recommended conditions 9-12 to 9-14 require the proponent to undertake an additional offset to counterbalance the significant residual impact from 'the additional impact to western ringtail possum in habitats adjoining the development envelope'.

Specifically, within 12 months of receiving notice from the CEO[442] that the environmental outcome of recommended condition 6-2 has not been achieved, the proponent is required to update the *Offset Management Plan* to include additional offsets 'to counterbalance the significant residual impacts to western ringtail possums'.

In response to the appellants' concerns about this requirement (on the basis of the uncertainties around recovery of the Gelorup population), the EPA agreed that there is some uncertainty given the timescale of 15 years and likely threats and pressures, and advised that it recommended condition 9-13 to address this:

> The proponent would be required to update the offset management plan with an appropriate contingency offset which will ensure a net-gain in ringtail possum populations if acquisition and revegetation-based offsets have not achieved this after 15 years.
>
> The EPA considers the recommended offset condition for the proposal is appropriate and consistent with the WA Environmental Offsets Guidelines (the Offset Guidelines) (Government of Western Australia 2014). The EPA considers the offset ratios to be adequate, that the extent of the offset actions are appropriately larger than the extent of residual impacts and proportionate to the significance of the environmental value being impacted.

[442] Defined as 'The Chief Executive Officer of the Department of the Public Service of the State responsible for the administration of section 48 of the Environmental Protection Act 1986, or delegate'.

> The EPA considers that the significant residual impact to ringtail possums can be regulated through reasonable conditions and counter-balanced by offsets so that the environmental outcome is consistent with the EPA's objective for terrestrial fauna.[443]

Discussion

The trigger for contingency offsets is the CEO's determination that, on review of the *Habitat Fragmentation Performance Report* required by recommended condition 6-8, the environmental outcome of recommended condition 6-2 that the 'abundance and persistence of the western ringtail possum in the receival sites returns to pre-disturbance levels within a maximum of fifteen (15) years from the commencement of construction' has not been met.

Recommended condition 6-8 requires the proponent to submit a *Habitat Fragmentation Performance Report* to the CEO 'Within a maximum of sixteen (16) years from the commencement of construction'. As outlined under Section 3.11.2, we recommend regular environmental performance reporting to inform ongoing adaptive management.

3.11.7 Reporting and publication of data

The EPA recommended condition 13 in relation to public availability of data generally. Elements of Recommended condition 12 also refer to public availability of compliance information. A brief outline of these recommended conditions is provided in Table 22.

Table 22 *Recommended conditions relating to public availability of reports (summarised)*

Number	Requirements
12-2(6)	The Compliance Assessment Plan shall indicate public availability of Compliance Assessment Reports.
12-6(4)	The Compliance Assessment Report shall be made publicly available in accordance with the approved Compliance Assessment Plan.
13-1 to 13-2	Requires all validated environmental data (including sampling design, sampling methodologies, empirical data and derived information products (for example maps)), management plans and reports relevant to the assessment and implementation of the proposal to be made publicly available, with the exception of confidential or other information approved not to be made publicly available by the CEO.

In summary, the appellants submitted that:

- many of the recommended conditions rely on the proponent providing compliance and/or monitoring data; there is no certainty that these conditions would be met or the data made public
- the recommended conditions regarding public availability of data in relation to fauna are inadequate
- recommended condition 13-1 must clearly define (or limit) the reasonable time period; it should be amended to 'within a reasonable time period (but no longer than 30 days)', and require this information to be publicly and readily available for 10 years
- the proponent's CEMP and *Drainage Strategy* for the proposal have not been made available for public review
- all documents referred to in the referral documentation during a public consultation period should be readily available to the public.

[443] EPA response to Appeal 045/21 (07/01/22), pages 30-31

Discussion

Recommended condition 12 requires annual compliance reporting. By recommended conditions 2-4, 3-4, 7-7 and 9-9, the following form part of this requirement:

- annual reporting on results/ outcomes of monitoring undertaken during implementation of the proposal to determine if specified environmental outcomes were achieved:
  - limits on clearing of: CCWs and REWs, and PEC vegetation
  - no project-attributable impacts to: hydrological regime and water quality (relevant to Five Mile Brook, CCWs, REWs and black-stripe minnow habitat), and PEC vegetation within 20 m of the development envelope and within clearing exclusion areas
- annual reporting on any management actions undertaken during implementation of the proposal to meet the environmental outcomes
- annual reporting on failure to implement management actions detailed in the approved *Traffic Noise Management Plan*
- notification of non-compliance with the actions, objectives, or targets in the *Offset Management Plan*, and reporting on details and timing of contingency actions to be undertaken.

By our recommended changes, environmental performance reporting would also be required as part of the compliance reporting, including in relation to the *Construction Fauna Management Plan* and the *Habitat Fragmentation Management Plan*.

The EPA advised that proposed conditions 12-6(4) and 13 require the proponent to make all data, management plans, reports and compliance assessment plans publicly available for the life of the proposal:

> A member of the public interested in viewing any of this information may request the proponent to provide a copy of the relevant report, and in accordance with these conditions the proponent must provide the information. While condition 13-2 has provisions for confidentiality of some data, this only occurs in limited circumstances.
>
> The proposed conditions also require the proponent to submit to DWER any potential non-compliances in addition to annual compliance reporting. These conditions are applied as standard to all proposals, and the EPA considers that modifications to the conditions as suggested is not warranted.[444]

In relation to the specification of a hard timeframe in recommended condition 13-1, the proponent advised:

> Main Roads is timely in the provision of documents and existing conditions already provide required timeframes appropriate to the project for submitting documentation to the EPA. It can reasonably be expected that documents appropriate for public release under freedom of information requirements will already be available to the EPA for public release if requested.[445]

In relation to publication of the CEMP and *Drainage Strategy*, we understand that these documents (along with a number of other plans and procedures listed in Table 11) will be prepared during the detailed design process.

We note that the proponent publishes compliance reports and plans required under current State and Commonwealth for road construction projects approvals on its website at: https://www.mainroads.wa.gov.au/community-environment/environment/construction-project-reports/.

[444] EPA response to Appeal 045/21 (07/01/22), page 39
[445] Proponent response to Appeal 045/21 (15/12/21), page 47

3.12 Other matters raised in appeals

The appellants raised a number of matters that are considered not to be directly relevant to the appeal, or to be outside its scope: compliance with *Animal Welfare Act 2002*; increased fire risk; mosquito risk; loss of basalt resource; compulsory acquisition of properties; mapping of CCWs; business plan; and amalgamation of departments.

These concerns are summarised in Table 23, along with the EPA's and proponent's advice where available.

The proponent requested a change to conditions, which is also discussed below.

Table 23 *Other concerns raised in the appeals*

Other concern	Main concerns the appellants submitted	Advice
Compliance with Animal Welfare Act 2002 (WA)	Bumping possums out of trees during daylight hours and hoping that the two fauna spotters will be able to retrieve and relocate these animals is inconsistent with the *Animal Welfare Act 2002* (WA) which requires 'proper and humane care and management of all animals in accordance with generally accepted standards'.	The EPA advised that compliance with the *Animal Welfare Act* is not considered to be within the scope of its assessment of the proposal. In response to this matter, the proponent advised: The taking of animals under the *Biodiversity Conservation Act 2016* (BC Act) is administered by DBCA, which maintains an Animal Ethics Committee recognised by the Department of Primary Industries and Regional Development (DPIRD) as compliant under the *Animal Welfare Act, 2002* (AW Act). DBCA's animal ethics committee currently assesses approximately 150 projects per year. It is also worth noting that taking native fauna for scientific purposes will soon require approval under both the AW Act and the BC Act. Main Roads is in compliance existing obligations and will be positioned to comply with future obligations under Animal Welfare Act.[446]
Increased fire risk	In an area already in the highest fire risk rating, the fire risks to the community have been inadequately assessed. Preliminary data obtained by Shire of Capel suggests emergency response vehicle times will be worse in Northern Gelorup, and that Northern Stratham will have insufficient firefighting infrastructure, once the road is complete. The addition of continuous sound walls has not been assessed for increased fire risk. An enquiry should be conducted to investigate the claimed necessary 'fire evacuation and appliance access' road that will destroy black cockatoo nesting sites but serve no purpose except to	The EPA advised that increased fire risk is not considered to be within the scope of its assessment of the proposal. In response to this matter, the proponent advised: With respect to fire management risks, Main Roads consulted with the Department of Fire and Emergency Services (DFES) during project development and will continue to liaise with DFES through detailed design to mitigate any additional risks identified. DFES advised that the connectivity afforded by the local road connections planned for the project will allow adequate provision to

[446] Proponent response to Appeal 045/21 (15/12/21), page 27

Other concern	Main concerns the appellants submitted	Advice
	give access to a future, yet undisclosed, sub-division. This road takes a completely different route from that on the original plan with the changes being advocated by those whose motives are suspect. The original plan gave us a way out and enabled fast response from the fire services.	meet response times. This consultation informed Main Roads commitment to provide a bore and tank on the eastern side of BORR for the exclusive use of the local fire fighting services. There is also a commitment to provide a bore and tank at Yalinda Drive, south of BORR for this same purpose. Improved local access roads will also provide a benefit, by connecting Jilley Road, Ducane Road and Lilydale Road East of BORR as part of the Proposal. The local area access strategy was developed to address the impacts on the local road network. This strategy has ensured that any impacts to local roads are mitigated by construction of additional local access. For example, the impact of closing Woods Road will be mitigated by the construction of Yalinda Drive over BORR. This strategy also ensures that two possible paths of egress are available from all properties. During the delivery phase of the project, the delivery Alliance will be responsible for communicating changes to the road network to emergency services authorities and the local community to enable necessary adjustments to bushfire and evacuation plans.[447]
Mosquito risk	The structural controls chapter of the *Stormwater Management Manual* sets out that in an area of significant Ross River viral infection due to mosquitoes, it is vital that any proposed measures do not increase the risk of water retention and larval breeding opportunities. Further, maintenance of devices and regular attention to monitoring is necessary for the longevity of the functionality of the any device installed to protect the groundwater.[448] The proponent has not offered any long-term monitoring or maintenance in their	The EPA advised that mosquito risks are not considered to be within the scope of its assessment of the proposal. In a letter to the EPA Chair dated 21 June 2021, the proponent advised that 'the retention basins are not designed to store water for prolonged periods of time. Accordingly, the existing breeding sources for the vector are likely to remain the key areas for the Shire of Capel to target in their [Ross River virus] control programme'.[449] The proponent reiterated this advice in its response to the appeals.[450]

[447] Proponent response to Appeal 045/21 (15/12/21), page 13
[448] Department of Water and Swan River Trust (2007)
[449] Main Roads Western Australia (2021a)
[450] Proponent response to Appeal 045/21 (15/12/21), page 31

Other concern	Main concerns the appellants submitted	Advice
	proposal, instead declaring that no long-term significant impact to the environment will occur.	
Loss of basalt resource	The road construction will result in between 7.226 million and 13.678 million tonnes of basalt being rendered unusable. At its current value of $50 per tonne, the value is between $361 million and $683 million. At current extraction rates this represents over 40 years of production that future generations cannot benefit from, and is contrary to the EP Act principle of intergenerational equity. The Gelorup Basalt is typically valued at $1 in the ground; $18 once the overburden is cleared, basalt blasted, transported to the crusher, crushed, screened and stockpiled. On leaving the quarry, transport costs are usually in the range of $1 to $2 per km travelled. The Gelorup locality has the lowest production costs of all of the possible alternative sites for Bunbury basalt. As for all basic raw materials, the cost of transport is a significant component of the overall cost. The Gelorup basalt is identified as a Strategic Geological Supply under State Planning Policy 2.4[451], and is of particular significance to the State and the South-West Region as it is a near surface deposit with high and consistent quality and has good accessibility to the Greater Bunbury and South-West markets. Basalt is used for making concrete for buildings and footpaths, constructing roads and building seawalls for erosion protection and to protect communities and structures from the effects of climate change. The Gelorup basalt was earmarked by the City of Bunbury for coastal mitigation. State and Federal government reports indicate that the region's coastline from Mandurah to Bunbury, Busselton and Dunsborough is predicted to be at serious risk of inundation from increased coastal erosion due to increasingly severe storm events. These government reports predict that over 30,000 homes	The EPA advised that the loss of a basalt resource and the safety of pedestrians and cyclists are not considered to be within the scope of its assessment of the proposal. In response to this matter, the proponent advised: While not a subject of review and approval from the EPA, Main Roads has considered the future extraction possibilities of basalt in this area throughout the planning and development of the Proposal. The current BORR route adjacent to quarry operations, and as reserved in the GBRS, predates Extractive Industry Licenses for the quarry operations. In recognition of the resource's regional importance, the basalt area boundary was a factor in the multi-criteria assessment used to determine the southern section alignment. Main Roads met with the Department of Mines, Industry Regulation and Safety and the two quarry operators in Gelorup and these discussions have guided development of the project and aimed to minimise any potential impacts to the basalt resource, whilst maintaining quarry operations and creating good accessibility to the BORR from those operations. In terms of long-term impacts on strategic basalt resource availability, the Gelorup basalt is not the only source of rock aggregate in the region. The GBRS Strategic Minerals and Basic Raw Materials Resource Policy[452] indicates another location for rock aggregate in Roelands. Main Roads is also aware of another

[451] Western Australian Planning Commission (2021)
[452] Western Australian Planning Commission and Department of Planning, Lands and Heritage (2018)

Other concern	Main concerns the appellants submitted	Advice
	and buildings will be at risk of inundation and collapse over the next 80 years. If the proposal proceeds, the two Gelorup basalt quarries will be required to build screening bunds and to implement 'No Fly Danger Zones', typically 100 m from the quarry face to the edge of neighboring road infrastructure. The proponent proposes to place walking trails alongside the road, presumably on the roadside of the screening bunds. There is no mention of the risk to pedestrians and cyclists using these walkways during blasting times. The Shire of Capel Council recently voted unanimously to accept a recommendation to refuse the proponent's development application, in part because the Shire recognises that the current road impacts the Gelorup basalt reserves and this has not been properly considered during the planning stages. The Shire of Capel considers that the proponent should accurately assess: (a) the volume of basalt to be sterilized; (b) the value of basalt to be sterilized, (c) the forecast of anticipated use in the short-term (1-10 years) medium term (10-100 years) and long term (100 years plus); (d) the location, depth, quantity, and quality of any alternative basalt resource; € the additional average distance to market of any alternative basalt resource; (f) the additional costs of developing any alternative resource, including the cost of clearing and impact on remnant bushland, establishing the quarry, cost of transport to market and so on; (g) the long-term intergenerational impact additional costs that will be passed on to future consumers (our descendants) because of not utilising this resource. Without this analysis the proponent has not adequately demonstrated consistency with State Planning Policy 2.4, and it is possible that the ability of future generations to protect the coastline in the South West from erosion and climate-change related sea level rise will be compromised by the proposal. Infrastructure WA (IWA), the WA Government's top state infrastructure body, has not been involved in performing any project	basalt resource area within the Shire of Capel, south of the Capel townsite.[453]

[453] Proponent response to Appeal 045/21 (15/12/21), page 48

Other concern	Main concerns the appellants submitted	Advice
	assessments of the proposal. One of their stated key objectives for major infrastructure projects is 'providing effective project advice and in continuously improving the standard of business cases which consider social, economic and environmental objectives'. This fundamental requirement has not been performed by IWA during the proposal planning phase or design phase.	
Compulsory acquisition of properties	In an impact statement, a community resident relates how she received assurances from MRWA that, 'no land resumptions would take place, and that affected landowners were being communicated with'. This turned out to be untrue. About 33 properties have been directly affected in part or whole (including homes).	The EPA considered this matter not to be within the scope of its assessment of the proposal.
Mapping of CCWs	Five Mile Brook is listed as a CCW up to the point of intersection with the development envelope. Five Mile Creek is one continuous waterway and its entirety should be re-classified as a CCW, and the impact formally reassessed in this context.	The mapping of wetlands in WA is coordinated by DBCA. Refer to be DBCA website for further information: https://www.dpaw.wa.gov.au/management/wetlands/mapping-and-monitoring.
Business plan	It is unclear whether a business plan for this proposal was prepared which details the enormous cost and loss of native vegetation and whether this was justified, and whether this plan is available for public scrutiny.	The matter of whether the proponent's business case for the broader BORR, which has attracted funding from both State and Commonwealth Governments, is available for public review is beyond the scope of the appeal right in this case.
Amalgamation of departments	Public and active transport options should be considered more favourably than the continued expansion of roads into natural areas and communities; an amalgamation of Main Roads WA with the Department of Transport would allow for more integrated, modern and cohesive transport planning, rather than large-scale road network expansion, proven to induce demand rather than reduce congestion.	This matter is beyond the scope of the appeal right in this case.
Condition change requested by proponent	During the appeal investigation, the proponent requested that the EPA's recommended condition 2-5 relating to the construction of a single span bridge over Five Mile Brook be changed to state that the requirement relates to the main alignment where it adjoins the	Noting that the request has the effect of limiting a recommended requirement and that the EPA ought to have input on the intent, we consider that this matter is more appropriately dealt with through the Minister's subsequent consultation process on whether or not

Other concern	Main concerns the appellants submitted	Advice
	CCW portion of the Brook (and not also to the upgraded crossing at Jilley Road).	the proposal may be implemented and if so the conditions to which it should be subject.

4 Supporting information

4.1 Grounds of appeal and appellants' concerns

The 170 appellants raised a number of concerns in their appeals. We have structured these in Table 24.

Table 24 *Grounds of appeal (detailed)*

Ground	Main concerns the appellants submitted
Alternative alignments	Other road alignment options should be fully investigated; there is cleared land further east. It makes no sense to destroy the Gelorup Corridor when other options have not been fully investigated and can never replace what has taken 40 years to establish. The proponent's justification for the current route is that "it has always been there". This is not good enough when governments must be open and transparent with their decision making. Over the years people were told the road would never happen. At a community meeting the proponent's representative indicated it is not normal practice to build a freeway through a community. The proponent investigated a lower environmental impact alternative alignment, but only sent the higher impact Gelorup route to the EPA for assessment. It is like they'd already made up their mind. The EPA has not fought hard enough to have the route extended to go around Gelorup instead of through it. The proponent has evaded rigorous public analysis of a cleared land option, and should not be rewarded for this flawed process. The EPA's position that it can only assess a proposal referred to it enables a proponent to evade submission of alternatives and only submit the one which it wants assessed. This manipulation unethically circumvents/prevents protection of the environment. The proponent's *Alignment Selection Report*[454] failed to appreciate the opportunities to utilise established transport corridors which would have had limited or no impact on Five Mile Brook and avoid sand fill and engineering requirements to traverse it, and concluded that the alternative 'green' route has a significantly higher impact on wetlands than the referred alignment despite the majority of these wetlands being MUWs. Desktop and out of season surveys were carried out on Five Mile Brook in search for the black-stripe minnow, this emphasises that the proponent wanted the data to fit their determination for the current alignment to proceed. The EPA's assessment has not weighed the consequences of the current proposal against the alternative alignment; therefore, the precautionary principle has not been properly applied. One major example of MRWA's withholding of information which should be released to the public is its refusal to publish a cost benefit analysis of its proposed route and the alternative route through cleared land. With this history of secrecy and failure to release information, there is serious doubt about the implementation of the EPA's conditions. An alternative route has not been properly investigated. The road could be developed along Centenary Road and Norton Promenade to connect with Bussell Highway. One option would be to make a main entrance into Dalyellup north of where Centenary Road would connect with Bussell Highway so Dalyellup traffic would not conflict with BORR traffic. This would save money, and avoid impacts to the community and wildlife. The proposed route is not fit for purpose; it was chosen over 30 years ago when traffic flow was less, and has not been revised to take into consideration the

[454] BORR IPT (2019a)

Ground	Main concerns the appellants submitted
	changes of people's support for keeping the environment intact. It will not provide a true bypass of Bunbury and is not future proofed. The area through the Gelorup Corridor is too narrow for a modern freeway and does not allow for future expansion or the inclusion of a public transport corridor. The destruction of native vegetation is unnecessary when there are other viable established road corridors that could be utilised with less impact and more long-term sustainable opportunity. The EPA Report states that the alternative alignment only 'may' have a larger impact. This is distinctly different to the EPA's advice that the referred project 'will' have a significant residual impact on threatened fauna and priority ecological communities and 'would' potentially have greater impacts on social surroundings. In applying the precautionary principle and the principle of intergenerational equity, the EPA ought to have given more weight to a 'certain' impact than a 'possible' impact in deciding which route would be environmentally acceptable. The alternative alignment is superior to the referred alignment for numerous reasons, and the postulated impacts of the alternative alignment on wetlands could probably be much reduced or avoided or much less significant than presumed if/once a full design of the road along the alternative alignment was proposed. The EPA erred in approving the project along the referred route, and should not approve a project if there is an alternative that has lower impact. Proponents must supply EPA with details of alternatives, under the guidelines provided by the EPA and those associated with the clearing regulations. Why can't governments look at putting a train line to Busselton, or introducing flights from Perth, so that we can encourage people to travel, without having to use their cars and having to keep building and upgrading more roads. The answer to congestion is to get cars off the road, not build more roads (especially on land that can be left in preference to degraded, unused land). Building Centenary Road alone would suffice as an east-west connection to make the Northern and Central sections of BORR flow out onto the Bussell Highway, without impacting on the Gelorup Corridor. In 2019, a couple of days before the government announced that they had chosen the Gelorup route over the alternative route, Transport Minister Saffioti said they had "identified savings in the Bunbury Outer Ring Road project".[455] It is clear that taking the shorter, narrower and outdated Gelorup Corridor route was simply a cost cutting decision where budgeting overruled reason in the decision-making process. The alternative alignment traverses agricultural land that has been described in the Greater Bunbury Region Scheme as 'degraded,' and not prime agricultural land. The Greater Bunbury Region Scheme states that for the targets to be met by the EPA all remaining vegetation in these complexes is in need of retention and some level of protection. The proponent ought to have been looking intently at ways to avoid building this freeway through Gelorup. There is no evidence in the EPA's report that the first objective of the mitigation hierarchy 'avoidance' has been considered by the EPA or the proponent with respect to the current proposed route. An alternative route is available where less clearing is required. The precautionary principles requirement of the assessment of various options has not been seriously and appropriately considered by the EPA as required by section 4A(1)(b) of the EP Act. The proposal will result in serious and irreversible damage; if the EPA does not require a new and completely independent review of the other possible route option, they are acting contrary to their own environmental principles.

[455] Fielding, K. and Elliott, S. (2019)

Ground	Main concerns the appellants submitted
	The Shire of Capel has passed five resolutions in relation to the route: to save the trees and environment;[456] to preserve the basalt;[457] nominating an alternative route with lesser environmental and community impacts and using existing infrastructure corridors;[458] to lodge submissions to the State and Federal EPAs opposing the route through Gelorup;[459] and most recently, to not accept the development application for the route through Gelorup due to a litany of incorrect and inadequate documentation on a range of critical concerns.[460]
Terrestrial and aquatic fauna – western ringtail possum	The proposal goes against the WRP Recovery Plan by causing habitat loss and fragmentation of home ranges. The WRP Recovery Plan recognises that there are gaps in knowledge, which means it is not possible to make definitive predictions about their survival. There is no scientific basis, evidence or data to support the EPA's assumption that the Gelorup western ringtail possum population will recover over 10-15 years. There is no evidence (scientific or otherwise) that western ringtail possum individuals will survive the clearing, or their release into a different area. The proposed strategies for clearing for the BORR Northern and Central Sections and the Bussell Highway duplication have resulted in catastrophic injuries to possums. A FAWNA representative has had to collect possums injured from falling out of trees or by machinery, or are suffering from shock, for rehabilitation through the Possum Finishing School. The data does not look promising for successful relocation. No surveys have been conducted on the adjacent properties to assess their suitability for relocation of western ringtail possum individuals, nor of the habitat and density of existing populations. Given that possums are highly territorial, a large presence of brushtail possums and/or western ringtail possums in these areas may render passive relocation unsuccessful. During development of the suburb of Dalyellup south of Bunbury, only a low number of successful translocations of western ringtail possums were recorded. The release of captured western ringtail possums into more distant offset sites containing suitable habitat is supported. The EPA has no evidence that predator control in the month prior to clearing will enhance the survival of western ringtail possum individuals that passively relocate into adjacent areas. The adjacent land is largely cleared private property, containing domestic animals which are known predators of possums. There is limited possibility for predator control on adjacent private property. There is no evidence that the fox baiting program will be successful, and little evidence to suggest that 1080 is still effective on foxes (given learned aversion and possible tolerance). It is difficult to achieve success of fox control in peri-urban areas using non-lethal methods (for example trapping) that is needed to protect displaced western ringtail possums. Soft jaw traps are difficult to use in sandy sites and to locate where foxes will pass. Cage traps often only capture young naïve foxes who do not have established territory like older foxes. Fauna crossings installed for the BORR Northern and Central Sections have not been successful to date. Available evidence to suggest that the current position and design of fauna crossings will lead to increased predation. A study of a $1.6 billion bypass in Queensland revealed that feral animals are the biggest users of wildlife corridors. Wildlife expert Dr Benjamin Allen (University of Southern Queensland)[461] said that roads are a barrier to wildlife irrespective of mitigation

[456] Shire of Capel (2019b)
[457] Shire of Capel (2019a)
[458] Shire of Capel (2021b)
[459] Shire of Capel (2020)
[460] Shire of Capel (2021a)
[461] https://staffprofile.usq.edu.au/Profile/Benjamin-Allen

Ground	Main concerns the appellants submitted
	measures. Investments in fences and underpasses are, in many cases, not so good at reducing risks to wildlife. Rope bridges installed for the BORR Northern and Central Sections have been under-utilised and ineffective to date due to their length and instability, fewer trees and possums, and high levels of noise and light pollution.[462] It is unlikely that rope bridges will be sufficient to protect western ringtail possums from road mortality or genetic isolation for the BORR Southern Section. Further research is required to determine if gene flow will be maintained. There is no evidence that the installation of artificial dreys in adjacent habitat will protect displaced possums. The development of a large possum habitat in the Tuart Forest National Park/ Ludlow State Forest No.2, and reducing the Gelorup western ringtail possum population, will result in a potential for loss of genetic diversity and increased risk of lack of resilience to disease, and exposes a larger percentage of the remaining possum population in the event of a catastrophic fire event or disease outbreak. Remaining populations of western ringtail possums must be retained in as many geographic diverse locations as possible in order to minimise vulnerability. The Ludlow Forest will not be a mature biosphere for many years. There is no evidence that the fox baiting program will be successful in the area of expanded habitat. There is no certainty that replanting will ever be successful, and the proposed monoculture planting cannot replace a mature biosystem like the Gelorup Corridor. DBCA has designated an area of land that is currently planted with saplings as a future offset. This is ludicrous considering that these trees will take many years to grow before they can support possum populations, and because possums require a varied diet. The peppermint tree orchard has been proposed on the assumption that peppermint trees are the main food source for western ringtail possums, however this is incorrect and at the Possum Finishing School they are fed a range of native species to promote survival in varying habitat. The orchard should be rehabilitated with a range of native species. The orchard will take five years before the peppermint trees are suitable for browse. The proposed clearing protocols to leave a tree with an observed animal in it for 48 hours should be extended to 72 hours, and fauna spotters should be required to monitor at night as well as during the day to ensure nocturnal fauna do not return to habitat trees prior to being mulched. These protocols are also impractical from an occupational health and safety perspective as fauna spotters would be prevented from being close enough to observe animals due to the presence of heavy machinery. The EPA assessed the proposed clearing of 60.9 ha of western ringtail possum habitat to represent 1% of the 6,264 ha of remaining habitat in the 'Bunbury' management zone, however this accounts for all tenures, including those outside of the conservation estate and at risk of clearing. The proposal is therefore inconsistent with the EPA's objective for Terrestrial Fauna given the incorrect interpretation of secure habitat in this Zone. Any well-connected B-class habitat (often located in low lying areas associated with watercourses or wetlands) within the Western Ringtail Possum Bunbury Management Zone should be afforded long-term protection, given the proportion of B-class habitat remaining is only 26% across all land tenures in this Zone. According to Report 1714, the potential habitat loss equates to approximately 1% (page 11), however the quoted overall habitat of 6264.2 ha is graded 'medium' whereas the proposal through Gelorup habitat is mapped as 'medium' to 'high'. It is questionable if this equation is scaled correctly to include density of population and/or condition of habitat in line with the EPA's own Guidance

[462] Kennedy, S. (2014)

Ground	Main concerns the appellants submitted
	Statement No.6[463] which states: 'Environmental Assets: Critical Assets - the most important environmental assets that must be protected and conserved. High Value Assets - environmental assets that are in good to excellent condition and considered to be of value by community and government. Low to Medium Value Assets - environmental assets that are somewhat degraded'. Recent research by Dan White (University of Western Australia)[464] using genomic sequencing to cluster genetically distinct groups across the current western ringtail possum range indicates a distinct cluster in the Leschenault catchment, different to those in Busselton and Bouvard. This genetic diversity should be conserved to ensure long-term survival of the species. The recent wildfires in Boranup, Osmington, and Meelup/ Eagle Bay raise further questions about habitat loss, and the sustainability of advice and management plans coordinated by the proponent, the EPA and Commonwealth regarding the western ringtail possum. There was no consultation with FAWNA Inc. on passive relocation despite the knowledge that this method would produce injured or abandoned wildlife. The fauna spotters have a standard operating procedure that requires them to take an animal to a veterinarian if collected. The veterinarians have to treat wildlife for free. There is no Wildlife Hospital in the South West and very little specialised wildlife skill in the local veterinary community. Wildlife are being presented in less that appropriate surroundings (dogs barking, people present) and the equipment and medication required for wildlife causalities is not readily available. The proposal will increase the workload for FAWNA volunteers and veterinarians without any pre-warning or compensation – there is little capacity to take on more displaced or injured wildlife. FAWNA Inc. has never met Barbara Jones despite her being considered and expert in this field, and only know of her by reputation through some dubious survey methods including 'the drunken walk' and counting possum scats to determine possum densities. We have worked alongside Professor Roberta Bencini of UWA for over 10 years and are surprised she is not mentioned by the proponent as she was involved with the broader BORR in the beginning. Her findings will likely contradict those that have been presented by the proponent.
Terrestrial and aquatic fauna – black cockatoos	We all love listening to a dawn chorus of magpies and the raucous announcement of the forest red-tailed black cockatoo. It is incumbent upon this generation of decision-makers to ensure that these sounds that we take for granted do not become a distant memory or a recording. Local residents have been part of Birdlife Australia's Great Cocky Count each year. Dozens of forest red-tailed black cockatoos and Carnaby's cockatoos have been registered in and around the Gelorup Corridor. We need to preserve the Gelorup Corridor for the future survival of our black cockatoos. They need this habitat for roosting. The population is known to be in decline. Every bird matters, every tree that can be used for roosting matters. Little thought has been given to the broader consequences on the three endangered black cockatoo species. There is growing concern that a mass starvation event will soon occur in Perth with the loss of pine forest habitat and foraging, due to ever decreasing habitat. The cumulative effects of clearing will have a devastating impact on habitat and foraging for black cockatoos. The proposal goes against the BC Recovery Plans by causing loss and fragmentation of breeding and foraging habitat.

[463] Environmental Protection Authority (2006)
[464] https://www.researchgate.net/profile/Daniel-White-40

Ground	Main concerns the appellants submitted
	Report 1714 does not address other threats to black cockatoos including illegal shooting, habitat loss, nest hollow shortage and competition from other species, and injury or death from European honeybees. The loss of 1,088 trees with DBH >500 mm will ultimately lead to the widespread loss of breeding habitat as large old trees are the main source of hollows. The stated loss of 60.9 ha of habitat being cleared is claimed to represent less than 1% of the estimated black cockatoo breeding and foraging habitat within the local area. However, it recognises that 40.6 ha are of 'high-quality' foraging habitat. The remaining 8,000 ha of potential habitat should be assessed and graded to determine quality. If the remaining 99% of habitat is low quality, that may affect the viability for sustaining the displaced black cockatoo population. The long-term retention and health of quality habitats is essential. The EPA did not adequately consider the impacts to black cockatoos from vehicles strike and the threats from climate change.
Terrestrial and aquatic fauna – black-stripe minnow	The black-stripe minnow occurs in Five Mile Brook that runs through the Gelorup Corridor. The biggest threat to this species is from loss of suitable habitat through urbanisation and rural development. Studies have not identified this species' precise habitat preferences apart from observations of tannin-stained vegetated wetlands with a pH range of 3-8.[465] Individual populations appear to be sensitive to sudden, localised changes in water quality variables.[466] Further decline in population is also attributed to climate change and habitat loss.[467] The EPA has not given consideration to the permanent loss of habitat for the black-stripe minnow as a result of the proposal, or how this species will be impacted as global warming causes further loss of habitat. The proposal will result in impacts from culverts, runoff and pollution. Any potential changes to the habitat for this species should be deemed unacceptable, and there should be no tolerance for habitat loss or degradation. The surveys for black-stripe minnow undertaken by the proponent are inadequate; a desktop study and field work done over the course of two-three years, and mainly within the dry periods, is not true scientific work, and is an example of poor research of an endangered species.
Terrestrial and aquatic fauna – south-western brush-tailed phascogale	The EPA's assessment of risks to the south-western brush-tailed phascogale appear to have been underestimated. The statement in Report 1714 that 'Displacement of individuals during clearing of 39.2 ha of habitat is possible, but the number of phascogales is likely to be low given their relatively large home-ranges (greater than 20 ha) and the linear shape of the proposed clearing' acknowledges the low numbers of phascogales but assumes that individual animals are unlikely to be in the development envelope during the construction phase. If phascogales are in the development envelope, their low numbers will result in greater impacts to the local populations.
Terrestrial and aquatic fauna – other fauna	The Gelorup Corridor is an area of extraordinary biodiversity that provides vital habitat, food and shelter for our native wildlife, including multiple threatened species which are all considered to be matters of national environmental significance (MNES). There is a great range of native fauna which will be impacted by the proposal, namely Carnaby's black cockatoo, Baudin's black cockatoo, forest red-tailed black cockatoo, western ringtail possum, south-western brush-tailed phascogale, and southern brown bandicoot. The bushland is home to bird species that are no longer present in most of the south west due to clearing and which have a function in insect control and pollination. The loss of 71.5 ha will be permanent and irreversible, will impact arboreal and other

[465] Galeotti, D.M., McCulloch, C.D. and Lund, M.S. (2008)
[466] Knott, B., Jasinska, E.J. and Smith, K.D. (2002)
[467] Ogston, G., Beatty, S.J., Morgan, D.L., Pusey, B.J. and Lymbery, A.J. (2016)

Ground	Main concerns the appellants submitted
	fauna through loss of foraging, breeding and roosting habitat, and will result in reduced biodiversity. The EPA and the proponent have ignored available evidence regarding extinction of western ringtail possums and black cockatoos if their habitat is not protected. Extinction is a word on everyone's lips when it comes to Australia's wildlife. Sir David Attenborough has well documented accounts of all the Australian species that are extinct or on the verge of extinction. Australia's rate of extinctions is expected to continue on an upward trajectory due to ongoing land clearing, habitat degradation, bushfire and continued pressure from predators (University of Sydney, Prof. Chris Dickman[468]). The proponent uses assumptions in place of evidence to justify that the proposal will not result in the local extinction of fauna species that occur in the Gelorup Corridor. The proponent's surveys have little substance when presented to experts in the management and monitoring of threatened species. The proponent dismisses other opinions but cannot prove the efficacy of its methodology in obtaining data relating to permanent environmental degradation It should be mandatory for Government representatives to visit areas that are going to be destroyed. On many occasions decisions are made by Government for the construction of major infrastructure projects which will significantly affect threatened species, however representatives do not actually visit the area and base decisions on desktop studies. The EPA has ignored its own principles for protecting of our native flora and fauna (the precautionary principle, the principle of intergenerational equity, and the principle for conservation of biological diversity and ecological integrity). Maintaining the health and diversity of the Gelorup Corridor is consistent with these principles. These principles are fundamental to any project requiring approval, and are at the centre of the intent and integrity of environmental protection. Some 711 habitat trees are being cleared for the BORR Northern and Central Sections. The overall BORR footprint will constitute a negative cumulative impact on existing bird populations. The EPA has failed to provide a framework for the protection of the threatened fauna species that occur in the Gelorup area. Light pollution and increased noise will disrupt the habits of nocturnal wildlife (feeding, mating and sleeping). Ongoing traffic noise will negatively affect wildlife; even low-level vibration are known to cause stress to native animals. Fauna will struggle to reinhabit the area due to constant disruption by traffic. There is no mention of the impact on the snake-necked turtle, listed on the IUCN Red List of Threatened Species as 'Near Threatened'[469] and observed within the investigation area. A current insect apocalypse is upon us due to the widespread agricultural use of pesticides and insecticides, habitat loss and light pollution, exacerbated by the reduced pollination activity of insects due to a 75% population decrease between 1989 to 2016. This will likely culminate in the collapse of the food chain with many insectivorous species including amphibians, reptiles, mammals and birds, starving due to lack of available food sources. Light pollution and increased mortality caused by traffic and safety precautions from the proposal will compound the problem.[470] Many native bird species are territorial, sedentary, and will not be able to relocate. Native species are interdependent on habitat for food and shelter, and are sensitive to intrusion and change. Birds do not habituate to traffic noise; road noise affects bird communications. Vehicle emissions change the micro-

[468] https://www.sydney.edu.au/science/about/our-people/academic-staff/chris-dickman.html
[469] International Union for Conservation of Nature (2022)
[470] Goulson, D. (2021)

Ground	Main concerns the appellants submitted
	climate for bird life, as well as food types and food availability. Artificial light adversely affects ecological communities and indirectly affect the availability of habitat or food resources. Natural darkness has a conservation value in the same way that clean air, water, and soil has intrinsic value. All-night street lighting changes the natural environment.
Flora and vegetation – ecological communities	It seems that even once a species or ecological community becomes critically endangered, one step away from extinction, government agencies are still not prepared to step away from the business as usual to protect biodiversity and ecological systems, despite international calls and pledges to do so. The proponent alone clears significant areas of TECs every year, conveniently with no publicly available total record of areas of each TEC cleared in any one year, or over the long term. The proposal will result in the destruction of 71.5 ha of bushland containing banksia and tuart woodlands. The EPA have not used the correct listings for these; Report 1714 refers to them as PECs while they are TECs under the EPBC Act. These listings imply that they should be protected at all costs, and should not be cleared. The impacts of the proposal on TECs and threatened flora and fauna will increase the likelihood / risk of their permanent loss. Banksia woodlands have been decimated by clearing. The EPA's conclusion that the significant residual impact to 23.4 ha of Banksia Woodlands TEC can be regulated and offset such that the likely environmental outcomes are 'small incremental losses to the extent … relative to their respective remaining extents' is a poor and incorrect argument. Noting they are now heavily fragmented,[471] this is a massive loss, past the tipping point for Banksia Woodlands TEC. Tuart woodlands are reduced to small remaining threatened pockets. If areas of tuart woodland are cut down, then the remaining small pockets are subject to further environmental pressures including weeds and edge effect.
Flora and vegetation – orchids	The proposal will result in the removal of 104 *Caladenia speciosa* (Priority 4) out of >3,900 individuals (2.7% of the population). The EPA has not assessed this impact as environmentally significant, whereas it is. The proposal will impact on a large population of the uncommon curled-tongue shell orchid (*Pterostylis rogersii*), which was not found during the proponent's surveys but was found by Dr Eddy Wajon while undertaking a tree survey. The impact on this population is significant.
Flora and vegetation – mycorrhizal network	In the approval, the EPA claims it has "considered the connections and interactions between all environmental elements to inform a holistic view of impacts to the whole environment". However, the mycorrhizal network[1] which connects all flora together has not been considered at all. The EPA advises that there will be direct and potential indirect impacts as a result of clearing and the negative effects on significant trees. Mycorrhizal networks are underground hyphal networks created by mycorrhizal fungi chains. These chains connect individual trees and plants together and transfer water, carbon, nitrogen, and other nutrients and minerals. It is widely believed that trees of a variety of ages are essential for the continued effectiveness of the Mycorrhizal network, as they act as nutritional hubs, spreading nutrients to affect growth and photosynthesis rates, survival and understorey regeneration.[1] Established and mature trees cannot be replaced by newly planted saplings due to the mutual beneficence of mycorrhizal networks. There is community concern that the 'Grey Giant' giant tuart tree and other mature trees surrounding the corridor will die due to severance of underground mycorrhizal networks. The Grey Giant in particular has a smaller sister tuart in

[471] Department of the Environment and Energy (2016b)

Ground	Main concerns the appellants submitted
	the immediate vicinity, which is highly likely to be interconnected by the mycorrhizal network. The EPA's recommended implementation conditions cannot guarantee the survival of these very significant trees. The dependence on the mycorrhizal fungi in the soil is fundamental for our flora, which is connected to habitat and feeding grounds for fauna. If the EPA and the proponent do not acknowledge this vital component that will be destroyed if the proposal goes ahead, then they are signing a death sentence for most species.
Flora and vegetation – other flora and vegetation	Maintaining the environment must include the retention of current areas of native vegetation, particularly when they are present in areas previously heavily cleared. The Gelorup Corridor is a high value environmental asset, due to the density of the habitat and age of its trees. The Corridor provides a haven for a high number of flora and fauna species that are currently endangered or vulnerable. Clearing the corridor and relying on offset land that is significantly degraded to replace the corridor is contrary to one of the EPA 's own principles which states that the conservation of biological diversity and ecological integrity should be a fundamental consideration. It is unclear whether a business plan for this proposal was prepared which details the enormous cost and loss of native vegetation and whether this was justified, and whether this plan is available for public scrutiny. Weeds have become a serious issue on the majority of roadsides because of widespread contamination of extractive industry sites and machinery spreading the weeds between sites, and a lack of available funding to manage them. There are multiple government documents regarding the need to protect remaining habitat and biodiversity, and multiple instances where this decision is contradictory to those documents and environmental legislation, policies, and principles. It is a short-sighted 'business as usual' approach; we need to fulfill our Kunming Declaration[472] commitment to reverse global biodiversity loss. If the proposal is allowed to proceed in its current alignment, then out enviable biological diversity (ranked as one of 35 global hotspots) will suffer from 'death by 1,000 cuts'. The proposal intersects two South West Regional Ecological Linkages (SWREL). Severing these linkages negatively impacts on the ecological integrity of remaining bushland and habitat. Fragmentation will result in the decline of species' ability to maintain biological biodiversity. The true value of 1,088 mature trees with DBH >500 mm as the potential future habitat and nesting hollows for threatened species has been underestimated. There is no mention of micro habitats in the report. Plants work together as a community and if you take one out then the other plants suffer. The symbiotic nature of some of our endemic species means that, like humans, they rely on each other for their very survival. If you break one of these linkages- these 'stepping stones', then the whole web disintegrates.
Inland waters and water quality	The EPA's recommendation that the direct impacts to 0.2 ha of a 'conservation' category wetland (CCW), 1.4 ha of a 'resource enhanced' wetland (REW) and 41.8 ha of 'multiple use' wetland (MUW) can be justified with conditions is unacceptable; any loss of CCWs should not be allowed. Report 1714 makes reference to 'no storage or refuelling within 200 m of a natural watercourse or within 50 m of a CCW or REW'. However the RIWI Act defines a watercourse to include any river, creek, stream or brook in which water flows, and any collection of water (including a reservoir) from these watercourses, and includes the bed and banks of these watercourses. This would indicate an exclusion zone of 200 m should apply.

[472] Australian Government (2021)

Ground	Main concerns the appellants submitted
	There is a lack of modelling to ensure accurate predictions. There is no modelling of the impact of groundwater abstraction (during construction) on water regimes and other users, nor a description of the approach to maintaining the integrity of wells which intercept multiple aquifers, nor the specification of the location of groundwater bores, nor of changes to the hydrogeological and/or hydraulic conditions. It is not clear whether flood modelling, including 100-year flood level predictions, has been completed. The CEMP and *Drainage Strategy* for the proposal have not been made available for public review. Based on the erroneous belief that there will be no significant ongoing impact, there is little confidence that an *Operational Environmental Management Plan* (OEMP) will be prepared. Diminishing rainfall has not been addressed; the effects of this will impact hydrological flows and the health of groundwater dependent ecosystems. The mitigation measures described only relate to construction of the road (and not operation of the road). The proponent has incorrectly dismissed the indirect impacts of operation of the road on surface water or groundwater quality as 'not likely to be significant'. There will be contamination of ground water and waterways during construction from run-off from the proposal in a sensitive water source area; this has not been addressed and the recommended buffers in *Roads Near Sensitive Water Resources*[473] are not mentioned. The EPA has not discussed wetland or waterway buffers, nor any water buffer studies as recommended by the EPA. Buffers assist in protecting the waterways and maintaining ecological and hydrological functions. No such buffers to protect the wetlands or waterways, have been included. The proposal has the potential to reduce soil quality, increase salinity, further reduce the rainfall in the region, and cause a decline water quality. The directive of the *Wetlands Conservation Policy for Western Australia*[474] is "to prevent the further loss or degradation of valuable wetlands and wetland types, and promote wetland conservation, creation and restoration." The significance of wetland impacts has been downplayed especially in regard to dewatering for bridge constructions, clearing of vegetation, groundwater abstraction (about 333 Megalitres per annum), and from the (unassessed) risks to aquatic invertebrate populations. The surveys and studies for the wetland areas were targeted and did not specifically assess invertebrate composition or consider the possibility that conservation status invertebrates or unique invertebrate species could be present in the area. The wetland areas have not been adequately evaluated for invertebrates of conservation significance and the region has not been subject to any DBCA aquatic invertebrate surveys. Ongoing monitoring of wetland invertebrate composition to provide a measure of ecological impact. There are ongoing threats from pollution events associated with transport infrastructure (for example stormwater management, hazardous materials spills, air pollution, pre-existing contamination with no formal listing on the Contaminated Sites Database, cement/ concrete industry, remediated sites). A full site contamination assessment should immediately be conducted to guide the management options for the site and that this should not be issued as a 'tack-on' investigation during the detailed design stage. The EPA Report provides no comment on these critical contamination management issues and the potential impacts to public, occupational, and environmental health from the disturbance and mobilisation of soil contamination during construction operations.

[473] Department of Water (2006)
[474] Government of Western Australia (1997)

Ground	Main concerns the appellants submitted
	Construction generated dust management and queries the strategies that will be applied for water containment are concerns. Pesticides commonly used along roadway rights-of-way and adjoining land could pollute surface waters. How will these risks be managed? The EPA has not adequately assessed the risk to water and waterways from the use of the road; they have only considered hydrological factors during construction. This is inadequate and is based on incomplete geotechnical data and acid sulfate soil testing. Further studies should be conducted into potential changes in hydrology and water quality, in particular with regard to CCWs and Five Mile Brook, and should inform predictions and remedial actions. Water quality impacts could arise from poor pollution management controls. The proponent does not give any regard to the risks from soil contaminants uncovered or mobilised during excavation and clearing operations during site construction. Report 1714 provides no comment on these critical contamination management issues and the potential impacts to public, occupational, and environmental health from the disturbance and mobilisation of soil contamination during construction operations. There is potential for groundwater contamination; how will this be addressed in groundwater abstraction activites?
Social surroundings – social connectivity, visual amenity and light pollution	The reason most residents decided to settle in Gelorup because they wanted a semi-rural life close to Bunbury. The bush setting and quiet ambiance is a major draw card (and is promoted by the Shire of Capel), and attracts people who care about the environment. Most residents have enhanced their blocks with tree planting and landscaping, giving Gelorup a significant green footprint. Possum dreys and cockatoo nesting tubes are evident on many properties. The Gelorup Corridor provides a buffer between these properties and nearby farmland, and its destruction will have a permanent and devastating effect on the community. The EPA has acknowledged that there will be direct and permanent impacts to sensitive receptors and amenity values within the Gelorup Corridor. Vegetation clearing, an urban-style freeway, bridges and major intersections will permanently change the landscape character; whilst long term operation of the freeway will cause ongoing and severe noise, light and air pollution. Impacts will be particularly severe for the surrounding homes as the land is undulating. The proposal will divide Gelorup into ‘north of the freeway’ and ‘south of the freeway’, separating a cohesive community. No consideration has been given to the loss of social connectivity, including for residents of Stratham and surrounding areas who will be impacted by road closures. No consideration has been given to the residents of Northern Gelorup where public open space that has been rehabilitated by the community will be destroyed. MRWA recognises that the proposal will divide the community, and proposes to mitigate this with a very expensive bridge over Yalinda Drive. The construction of this bridge, together with a tunnel and underpasses will not replace the connectivity that Gelorup residents already enjoy. The current natural walk trails through the bushland are quiet and secluded. The proposed walk-trails and pedestrian underpass will not be pleasant to use as they are planned to go next to a four-lane freeway, in a landscape that has been cleared and paved. The proposed bike and walk paths do not connect with the local shopping precincts of Dalyellup or the Shire of Capel office, nor do they improve walking or cycling access to Bunbury, and the proponent did not consult with local residents about them. The proposed bike and walk paths are alongside private properties, and threaten to compromise security in the absence of fencing, as well as increasing the risks of dieback spread, accidental fires, rubbish and invasion of privacy for adjacent property owners. The proponent has not addressed these issues, nor

Ground	Main concerns the appellants submitted
	has it consulted with the local community about them. This lack of respect and transparency is extremely concerning for the community. There will be a rapid and sustained decline in the mental health of Gelorup residents if the proposal proceeds. The months/years of construction noise and dust; the daily sight of trees being felled, burnt, chipped or carted away will be heartbreaking. The tangible connection and 'sense of place' cannot be replaced by walk trails and painted tunnels. Department of Health guidance for developers (2006) outlines that environmental physical determinants include: air, water, infrastructure, pollution, traffic, odour, vibration, noise and social effects; collectively all of the associated issues with these are detrimental to the health of Gelorup residents. The proposal is too close to the Bunbury Cathedral Grammar School and the general community; the quiet bushland setting will be severely impacted by the proposed road. Residents will be affected by light pollution from the 12 m high lights that are proposed for the bridges. Light pollution will be present even with mitigation measures suggested by MRWA (for example restricting lighting to intersections and interchanges, reducing light pole height). These suggestions would compromise road safety, particularly in addition to other compromises already proposed to make the road fit through a narrow corridor with no median strip. Since the EPA's assessment there have been design changes indicated on revised plans posted in the proponent's BORR Community Hub in Bunbury with cost being given as the reason: a dual-use footpath leading to an underpass has been removed and the underpass may also be removed; and an elevated roundabout has been reverted to a 'Y' intersection at ground level.
Social surroundings – air pollution and water tanks	There will be significant decrease in air quality due to vehicle emissions. The anticipated increase in vehicles is 10,000-15,000 per day, a number which studies have found releases many harmful air pollutants such as fine particles, ultrafine particles, lack carbon and carbon monoxide at levels 3-100 times the recommended target levels set by the World Health Organisation (WHO) in their global air quality guidelines.[475,476] Air pollution is a leading cause of premature death due to pneumonia, stroke, ischaemic heart disease, chronic obstructive pulmonary disease and lung cancer.[477] Chronic exposure to carbon dioxide (at levels as low as 1,000 parts per million) from exhaust fumes is linked to reduced cognition, bone demineralization, kidney calcification, oxidative stress and endothelial dysfunction.[478] There is no scheme water in Gelorup. Roof catchments and rainwater tanks are only metres from the proposal. Residents are extremely concerned about particulate matter (which can travel up to three km, and includes diesel fumes which are a class 1 carcinogen settling on rooftops and washing into tanks. The EPA claims rainwater is unlikely to be contaminated by the proposal, however, the Healthy WA Government website states that 'rainwater can be contaminated by air pollution from any nearby industrial emissions or heavy road traffic'.[479]
Social surroundings – noise pollution and vibration	There will be a significant increase in the current background noise levels in Gelorup even with the highest of sound walls. MRWA claim that sound walls will negate noise levels, however sound walls have not proven effective in other locations. The noise levels currently experienced by residents are extremely low and will be significantly increased irrespective of sound walls. The noise

[475] Brugge, D., Durant, J.L. and Rioux, C. (2007)
[476] World Health Organisation (2021b)
[477] World Health Organisation (2021a)
[478] Jacobson, T.A., Kler, J.S., Hernke, M.T., Braun, R.K., Meyer, K.C. and Funk, W.E. (2019)
[479] Department of Health (undated)

Ground	Main concerns the appellants submitted
	pollution during construction will not be reduced by sound walls or any means and will affect residents and fauna on a daily basis. Sound walls will result in permanent changes to the landscape character and amenity. There is a permanent visual pollution created by sound walls. Sound walls will impede the escape and emergency service access routes, and well as animal migratory and foraging paths. Constant low-level noise is recognised as an industrial safety hazard affecting mental health, stress levels, and general well-being. Noise pollution (in particular from traffic) has been positively associated with worsened cardiovascular health markers such as hypertension and increased incidence of cardiac events like acute myocardial infarction. Chronic childhood exposure to noise pollution has been linked to cognitive impairment and at all ages contributes to hearing loss and hearing conditions such as tinnitus and poorer mental health outcomes.[480] We have undertaken noise modelling at our own expense, the results show that the bypass will exceed the noise level at our home. State Planning has documented many health risks associated with noise that need to be considered in the planning of infrastructure. State Planning Policy 5.4[481] was drafted to address this issue, however it cannot be applied fairly to Gelorup because it refers mostly to new home builds, positioning and materials used, whereas homes in Gelorup were already built, many without setbacks or buffers to the proposed road. Homes in Gelorup cannot be compared to urban development; this is because in Gelorup the houses are spread apart, noise is not absorbed as it is in suburbia, but rather amplified to a greater magnitude. This has not been considered or acknowledged by the EPA.
Social surroundings – Aboriginal heritage	There are tall Noongar scar trees scattered throughout, which are traditional 'way points' dating well before colonisation; these are scheduled for destruction, marking loss of cultural identity. The Shire of Capel has seen fit to place a 'scar tree' in a glass cabinet in the Shire's office; this indicates that the Shire values and respects such significant evidence of Wardandi occupation before Europeans settled in the area. Five Mile Brook, with a grove of long-standing paperbarks and flooded gums, is a sacred site for Noongar women. An ancient heritage-listed *Melaleuca preissiana* is known as 'Birthing Tree'. For tens of thousands of years, the Noongar people would bring granite and quartz from Boyanup to Gelorup to make axes, spear tips and scrapers. There is a tool making area just south of Allenville Road between the quarries; it will be covered by the proposal. The moodjar/ WA Christmas tree is of significant spiritual and cultural importance for the Noongar people of the south west of WA, including for ancestors, personal healing, and indicating when rock lobsters can be caught. It is understood that Aboriginal surveys and consultation has been carried out in the Gelorup Corridor, and that no acknowledgement of the significance of the moodjah has been expressed. The site listed by the EPA/proponent as Place ID 18884 has 'no remaining stratigraphic integrity or research potential' and is now 'not considered a site due to previous disturbance'. This is a sad and unacceptable indictment of our lack of respect for Aboriginal people and their country. Aboriginal leaders and heritage experts have raised concerns about the impact of the proposal to cultural heritage sites and values, and we do not believe these concerns have been adequately addressed by the proponent. Aboriginal leaders have criticised the current legal rights for Traditional Owners to protect cultural heritage sites, including the lack of rights to withhold consent from projects

[480] World Health Organisation (2011)
[481] Western Australian Planning Commission (2019)

Ground	Main concerns the appellants submitted
	impacting cultural heritage and the lack of any provision or process for Free Prior and Informed Consent in WA's Aboriginal heritage Laws and other legislation. Heritage consultants hired to investigate individual features such as culturally modified scar trees did not do so, and in fact did not get out of the car.
Social surroundings – significant trees	The EPA is recommending that the Gelorup Corridor be reduced to a few walk trails and a carpark to see a tree, rather than preserving a corridor of over 3,000 mature trees, some of the largest trees in their species. Within a three km section of the development envelope there are six ancient trees that are recognised by the National Trust as an ecological community of significant trees, five of which (a tuart, a woody pear, a holly-leaf banksia, and two moodjar / WA Christmas trees) are the world's largest and are listed on the National Register of Big Trees[482]. The EPA has recommended that the proponent demonstrate that the proposal is implemented to ensure no project attributable direct or indirect impacts to significant trees (condition 8.2, page 73). However the proposal will destroy two of the five 'world's largest' trees and indirectly impact on the others. These individuals are unique and irreplaceable; their loss would be equivalent to removing or losing an iconic heritage building. The proponent has pledged to save a giant tuart tree and has suggested an underpass to view it as a plausible tourist trail. This is ridiculous and unnecessary, as Gelorup residents can already view this giant, and the majority of tourists would not want to wander along the side of a noisy freeway. The future of this giant tuart tree is in jeopardy, from the very fact that it is less than 40 m from the freeway; the root system will surely be disturbed and there is a strong possibility the tree will die. Loss of any of these trees is environmentally and economically unacceptable. The Shire of Capel passed a resolution at its Ordinary Council Meeting on 25th November 2020 (OC241/2020) to provide submissions under the EPBC Act and EP Act, including a request for registered big trees to be relocated. The 'world's largest' trees present a tourism opportunity. Their removal in the face of community opposition could potentially open the State government to claims of compensation for lost tourism earning potential by the Shire of Capel.
Terrestrial environmental quality	No details have been provided on how the following impacts will be managed: excavation potentially contaminating land and/ or waters from exposure to acid sulfate soils; accidental release of environmentally hazardous material causing contamination of land; contamination of land and erosion from stormwater runoff during construction; and erosion impacts potentially leading to poor soil structure, reduced water infiltration and loss of soil health. Report 1714 notes the proponent's advice that 'further site specific geotechnical and acid sulfate soil investigations are planned, following detailed design to identify potential swamp/lacustrine deposits and characterise soils underlying wetland areas'. These studies should have been in the final analysis presented and included in assessment. The EPA should not have made a recommendation on the basis of desktop surveys only. The public have not been given sufficient information to make an informed decision. Clearing of land has already proven to reduce soil quality, increase salinity from rising water tables, reduce rainfall and reduce water quality in the water table. Clearing an area that is key in providing biodiversity and healthy soil will only reduce soil quality and water quality. Removing large trees raises the water table, pushing salt towards the surface. This will increase the salinity of the

[482] McIntosh, D. (undated)

Ground	Main concerns the appellants submitted
	water in the Gelorup corridor, reducing water quality and potentially destroying whatever native vegetation is left. Report 1714 states that large portions of the development envelope have been modified for agriculture and industrial development, and the proponent notes that this land that may contain sources of contamination and that risk investigations will be undertaken during detailed project design. The cement/concrete industries near the Lillydale Road portion of the development envelope are likely to contain contaminated soils. There are several nearby contaminating industries, remediated for restricted use only sites, and areas of known groundwater contamination. A full site contamination assessment should immediately be conducted to guide the management options for the site and should not be a 'tack-on' investigation during the detailed design stage. Further information is required on any soil testing program for the area. The *Stormwater Management Manual*[483] states that stormwater management planning must be precautionary, and recognise inter-generational equity, conservation of biodiversity and ecological integrity. The Manual promotes the use of vegetated median strips as biological filters, however due to space constraints the median strip for the proposal will be concrete barriers with no vegetation, allowing various pollutants into waterways. Clarification is required on the management of stormwater; wetlands which act as receiving basins for large volumes of urban stormwater usually exhibit water quality problems which include large algal blooms, noxious odours.
Climate change and greenhouse gas emissions	The EPA has failed to fulfil legal and moral duties and obligations to address global problems on a local level, has acquiesced to outdated and ineffective mitigation strategies that (among other things) promote climate change. There has been a failure of the report to comply with the principles of the EP Act and a failure to acknowledge the projected impact of climate change. The south west of WA has been identified as a global drying hotspot with reduced annual rainfall, higher temperatures, and more frequent and intense weather events (storms). We are already enduring the results of climate change; nature may not be able to adapt to these rapid changes, and we fear for future generations. The principle of intergenerational equity should be actively embraced by the EPA. The UN's recent environmental reports states a lack of action by Australia and other 'developed' countries to reduce carbon emissions. The recent global warming conference in Glasgow highlighted the need for all countries to achieve zero emissions by 2050 or face the devastating consequences of a rise in global temperatures of at least 1.5 degrees Celcius. This proposal to clear for an unnecessary road is consequential to the future of not just to the area, but to our planet. The EPA has made unfounded assumptions about the greenhouse gas emissions from the use of the road by assuming the road vehicles of the future will increasingly be electrified or have improved emission control. Climate change has the potential to cause far greater loss of habitat and biodiversity than we are currently predicting. Water acidification caused by increased atmospheric carbon dioxide will lead to reduced biodiversity, and impact rivers, streams and aquatic biota (algae, fish, waterbirds). According to a report by Professor Brendan Mackey (Australian National University)[484] in 2008, one hectare of mature eucalyptus forest can store the equivalent of 5,500 tonnes of CO_2. This is about the same as the annual CO_2

[483] Department of Water (2004)
[484] https://press.anu.edu.au/publications/authors-editors/brendan-mackey

Ground	Main concerns the appellants submitted
	emissions from 1,300 motor vehicles, yet the proponent plans to clear 71.5 ha of native bushland and mature trees to accommodate more motor vehicles. The fact that the Gelorup Corridor of mature trees can store carbon and produce oxygen for our very existence, has not been considered once in the EPA assessment and conditional approval. The proponent has determined that the "implementation of the Proposal will not result in a significant increase in operational emissions, therefore, mitigation measures have not been proposed." The EPA has accepted the "Proponent's prediction that the road upgrade will result in a net reduction in Scope 3 operational greenhouse gas emissions on the regional road network through potential increases in freight efficiencies." It is concerning that such 'predictions' are likely to be unreliable as they do not typically take into consideration the induced traffic demand and trip creation that typically results from such developments. The potential long-term carbon pollution impacts from induced travel have not been modelled or assessed as part of the Proposal. The assessment of greenhouse gas emissions resulting from the proposal are incomplete and inadequate. The United Nations' report *Global Assessment Report on Biodiversity and Ecosystem Services*[485] lists the monumental crisis of the global biodiversity loss; the Earth is facing a dual crisis of rapid climate change and unprecedented biodiversity loss and extinctions.
Holistic assessment	The EPA has failed to acknowledge the overall impact of multiple approvals to clear 130 ha of native vegetation to allow for construction of Northern and Central BORR, the Bussell Highway duplication and now Southern BORR. The EPA has not looked at the Gelorup Corridor as a whole ecological entity (including habitats and biodiversity). Failure to take a holistic view of the 3,000 mature trees of many different species within the corridor (Gelorup Community Tree Survey led by Dr Eddie Wajon) has led to the EPA drastically underestimating the total value of the Gelorup Corridor. The area proposed to be cleared has not been considered in context of its importance to the greater area to which it forms part. The loss of this area to the ecological function of the greater area is cumulatively terminal to its current value and holistic ecological function. The EPA has not reasonably considered the cumulative impact of extinguishing the connection between the north and south rural residential areas of Gelorup. The EPA's assessment of cumulative impact is flawed in that it considers large scale across the Swan Coastal Plain bioregion / Perth subregion, but does not consider the cumulative impact of permanent clearing on the local ecosystem, nor scale, gauge or measure the effects on the holistic viability of the local ecosystem and ecological functioning of the Gelorup bushland. The EPA's view is that the four key environmental factors identified can be considered holistically. It would be advisable to consider the whole proposal holistically within the context of south-west WA; had this been done, the EPA's conclusion might have been that due to extensive and unsustainable clearing, further clearing and fragmentation is environmentally and socially unacceptable.
Other government processes	The EPA has failed to be consistent with EPA Bulletin 1108.[486] For that referral, the EPA stated the objective for the protection of ecological communities is to seek to retain at least 30% of the pre-clearing extent of the ecological communities in the Greater Bunbury Region where greater than 30% of an ecological community remains on the Swan Coastal Plain (outside constrained areas), and to preferentially locate developments in cleared areas, where 30%

[485] Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (2019)
[486] Environmental Protection Authority (2003)

Ground	Main concerns the appellants submitted
	or less of the preclearing extent of the ecological community remains on the Swan Coastal Plain (consistent with its 2003 policy statement). By recommending that the proposal may be implemented (resulting in the loss of 70.9 ha containing PECs/TECs, a major regional landscape feature 'Gelorup Hill' and regional ecological linkages), the EPA is being inconsistent with its own advice and recommendations for the GBRS. The EPA has failed to be consistent with Bulletin 1194 for the Southern Extension of Sandpit, Lot 2 Calinup Road, Gelorup, Shire of Capel. For that referral, the EPA recommended against implementation for reasons including that 'The proposal area supports a vegetation complex, a landscape feature and an ecological linkage which are all regionally significant. The re-establishment of the existing vegetation complex on the site after sand excavation will be extremely difficult and the proponent has not been able to provide evidence that the rehabilitation proposed will be successful. The EPA considers the proposal … is environmentally unacceptable as it cannot be managed to meet the EPA's objectives in relation to Vegetation and Flora, Fauna and Rehabilitation'. The EPA has failed to comply with its own advice and recommendations in its Technical Advice for Carnaby's cockatoo impact assessment,[487] on the retention of habitat for the black cockatoo species. The Technical Advice states that the best way to conserve key environmental values is in situ, and states on page 21 that protection of existing habitat and minimising habitat loss will support efforts to increase the population and is important to achieve the success criteria of the Recovery Plan. The EPA has failed to be consistent with its advice to the Shire of Capel in 2019 on a proposal to extend Minninup Road,[488] which indicated that the proposal did not need to be assessed under Part IV Division 3 of the EP Act provided the construction of sealed access roads is undertaken in a manner to limit the need to clear trees within the Minninup Road reserve (consistent with advice given by DBCA that a peripheral road should be established within the existing cleared portions of the parent lots to protect the road reserve native vegetation along the western and northern edges of the site). In this instance the EPA advised that clearing native vegetation within a road reserve should be avoided, and that use of adjacent cleared land was the preferred option. The EPA erred in its approval of the referred proposal and appeal against the approval of this project on the basis of not adequately considering government policy (the draft Native Vegetation Policy). The EPA's assessment of the Shire of Capel's Local Planning Scheme 8 recognised the significance of 'flora, vegetation and terrestrial fauna environmental values' and stated that 'Development should be located within existing cleared land, or within areas of existing degraded vegetation, where that vegetation is not significant habitat for threatened fauna' and that attention should be applied to cumulative effects.[489]
Economic factors	The EPA has considered economic factors in its assessment which is non-compliant with the scope of assessment defined in the EP Act (see *Coastal Waters Alliance of Western Australia Incorporated v Environmental Protection Authority*; *ex parte Coastal Waters Alliance (1996) 90 LGERA 136*). These economic factors are the supposed impact of the alternative route on mining and farming. This is shown in the EPA's statement on page 4 of the EPA 's Report which stated: "…while the alternative alignment may have a larger impact on agricultural businesses, properties containing basic raw material sand mining tenements." Not only does the EPA Report on this BORR project reference

[487] Environmental Protection Authority (2019b)
[488] Appellant referenced content in: Shire of Capel (2019)
[489] Environmental Protection Authority (2020b)

Ground	Main concerns the appellants submitted
	economic impacts, which is not within the EPA's remit to consider, but it also states that the alternative alignment only "may" have a larger impact.
Adequacy of conditions – fauna	The recommended conditions regarding [fauna] monitoring are inadequate. The recommended conditions do not allow for the [fauna] information to be made publicly available. The proponent should be required to fund scientific research into the clearing protocols involving passive relocation and make results publicly available. Western ringtail possums admitted into care following dog and cat attacks often die while in care and rarely make it to be released.[490] A plan is needed for injured individuals collected during and after clearing, including appraisals for release sites into low-density habitat, long unburnt habitat, established fox management regimes, partnerships and funding with veterinarians and rehabilitation groups. Determining the abundance of a species, and designing robust scientific monitoring requires a standardised sampling method for that species and is a complex undertaking. There isn't currently a standardised method developed for western ringtail possum; it is therefore fundamentally important that any surveying methods or statistics are informed by appropriately educated specialists, such as a biostatistician, university institution or academic body such as Data Analysis Australia. Further studies are needed into the long-term effects of habitat loss for all fauna including assessment of receiving habitat and feral/predator control. Further detailed assessment be completed of proposed connectivity mitigation measures i.e. rope bridges, fauna passes, the efficacy of clearing protocols and attrition rates from displacement. The control measures for monitoring outcomes and reporting be specified in more detail. The feral animal control measures required under recommended condition 6-2(2) and 6-4(7) need specifications on monitoring. Recommended condition 4-1(1)(e), relating to the extent of black-stripe minnow habitat, requires clarification. A condition limiting construction works near habitat of black-stripe minnows should be limited to dry weather conditions. The recommended conditions are insufficient to protect the full range of fauna species likely to be present within the development envelope (for example non-threatened vertebrate fauna such as any bird, reptile and mammal including bat). Additional measures are required: passive relocation management actions; searching hollows, dreys, ground debris, dense ground level vegetation, fallen timber and logs for all vertebrate fauna; capturing fauna using bare hands, bags, cages, pits or trench traps; removing live animals and eggs; releasing all captured fauna, and/or incubating eggs at animal rescue centres for subsequent release, in suitable alternative areas. The felling of trees must be followed by a minimum of 72 hours of monitoring by fauna spotters to allow western ringtail possums to safely exit the felled trees. Fauna spotters must also monitor the vegetation at night to ensure safe egress by western ringtail possums and prevent them re-entering hollows. The proponent must fully fund research with the University of Western Australia (UWA) on clearing protocols and passive relocation for the western ringtail possum with appropriate ethics approvals by UWA, to be undertaken during clearing to allow for scientific rigour to inform future projects.

[490] Wildlife Assistance and Rehabilitation Database, South West Catchments Council

Ground	Main concerns the appellants submitted
	The proponent in conjunction with DBCA and the State Government must fully fund UWA research on the success of release of western ringtail possums following rehabilitation. The recommended conditions do not provide for comparative genetic studies between the Gelorup population and other populations to enable better understanding of the genetic significance of the Gelorup population, nor assess the ecological value of the Gelorup population. The EPA has not recommended replacement of nesting hollows and dreys impacted by the proposal. This must form part of the recommended conditions; at least double the number of nesting hollows and dreys should be recreated. The location and installation of professionally made nesting boxes and dreys in surrounding areas must be advised by an independent source so that they give the relocated possums and birds that lose their homes the best chance of survival.
Adequacy of conditions – flora and vegetation	Any surveying methods or statistics, as relevant to flora and vegetation, are informed by appropriately educated specialists, such as a biostatistician, university institution or academic body such as Data Analysis Australia. Mitigation is the accepted stance for the proponent and it appears the EPA deems this as sufficient.
Adequacy of conditions – inland waters	There is no provision for protection of wetland fauna from the residual impacts of dewatering activities. Wetland buffers should be implemented where appropriate.
Adequacy of conditions – social surroundings	A mitigation hierarchy strategy should be required in the event of underground water contamination (affecting drinking water). Consider subsidies toward the cost of employing professionals to advise and if necessary, implement suitable water treatment facilities for individual households. There should be a requirement to undertake a program prior to construction, that includes water sampling by people qualified and experienced in water quality testing to safeguard residents drinking water. There should be a requirement to provide a summary of proposed technologies, emission reduction equipment and specific management practices; and undertake and report on updated noise modelling to reflect modifications to the proposal.
Adequacy of conditions – offsets	The effectiveness of offsets needs to be considered, as highlighted by May et al. (2016),[491] Terrestrial Ecosystems (2016),[492] and Richards (2016)[493]. There are wide inconsistencies in offsetting policies and practices with recent reviews (for example Samuel's Review[494]) highlighting that offsets rarely achieve the necessary ecological compensatory outcome that results in a net gain for the environment. Maron et al (2015)[495] found that even in jurisdictions with strong environmental laws such as Australia, averting loss using biodiversity offsets failed to deliver benefits by an order of five times, with offsets unable to show an effective improvement in biological status. Moreno-Mateos et al (2015)[496] also outlined how offsetting consistently failed to consider multiple ecological, regulatory, and ethical losses within the "no-net-loss" objective.

[491] May, J., Hobbs, R.J. and Valentine, L.E. (2016)
[492] Terrestrial Ecosystems (2016)
[493] Richards, B.S. (2016)
[494] Samuel, Prof. G. (AC) (2020)
[495] Maron, M., Gordon, A., Mackey, B.G., Watson, J.E.M., (2015)
[496] Moreno-Mateos, D., Maris, V., Béchet, A., Currane, M., (2015)

Ground	Main concerns the appellants submitted
	The *International Standards for Ecological Restoration*[497] emphasise that ecological restoration should not predicate the loss of natural habitat. This is especially relevant for the Gelorup Corridor, and also applies where knowledge, skills, and ability to reinstate complex species arrays or old-growth characteristics are unknown. The EPA has not adequately considered the mitigation hierarchy of avoidance, minimisation, rehabilitation (mitigation), and offsetting as the last step. Our interpretation of this hierarchy is that the proponent needs to demonstrate the need for the proposal, and with documented attempts to avoid and minimise clearing to the maximum extent possible and if there is no viable alternative. Offsets aimed at planting and regeneration cannot replace a mature forest and ecosystem. The Gelorup Corridor is an area of mature forest that should be preserved given its capacity to store carbon and produces oxygen for our earth and existence. Clearing the Gelorup Corridor and relying on offsets to replace the values is contrary to the principle of conservation of biological diversity and ecological integrity. No planting of saplings can replace a mature ecosystem. The reliance on successful offsets is untested and also speaks to the uncertainty principle contained in the EP Act. There is no certainty that replanting will ever be successful and planned mono-culture replanting cannot replace a mature biosystem like the Gelorup Corridor. The validity and efficacy of the proposed offsets is questionable. There is no guarantee that the private land purchased for offsets would have been developed – the proponent's own report states that the risk of loss without offset is only 30%, reducing to 10% with offset. This land would likely have retained its habitat value regardless of purchase by the proponent. Offsets will only be maintained for a maximum of 20 years; to replace tree hollows, a covenant of at least 100 years would be required. A large portion of the offset is within land managed by DBCA (including revegetation and pest control). It is unlikely the offset sites within the Tuart Forest National Park/ Ludlow State Forest No.2 would be threatened by future development as they are already vested with the Conservation Commission of WA. Habitat is not being created to replace that which has been cleared as the forest already exists – it is simply being enhanced. Moving taxpayer funds from one State department to another and claiming this as an offset is inappropriate, particularly as the funds will pay the recipient agency to undertake its core business. Public budgetary transparency is required. There is a lack of clarity and transparency regarding securing offsets for conservation; the purchase and investment in conservation tenure must occur over the next 24 months with public notice of finalization. The offsets should be properly, proactively and effectively managed, and should be inspected on a six-monthly basis to begin with, by an independent authority, to ensure that the management of these offsets and the revegetation and weed control undertaken complies with what has been agreed to. The offsets should have kangaroo exclusion fence, as most patches of remnant bushland are over-grazed and over-populated by too many kangaroos. The fence should have wide enough gaps in the lower mesh to allow the movement of bandicoots and long-necked turtles which live in the wetlands in this area. Patch burning should also be carried out to prevent the build up of fire prone material and to regenerate the bushland. Tree plantings will not take place for two years - how can that support remaining population? There is a significant time lag between the loss of habitat in the

[497] George D. Gann, Tein McDonald, Bethanie Walder, James Aronson, Cara R. Nelson, Justin Jonson, James G. Hallett, Cristina Eisenberg, Manuel R. Guariguata, Junguo Liu, Fangyuan Hua, Cristian Echeverría, Emily Gonzales, Nancy Shaw, Kris Decleer, Kingsley W. Dixon (2019)

Ground	Main concerns the appellants submitted
	Gelorup Corridor and the establishment of revegetated habitat that could support western ringtail possums. The EPA supports offsets which are detrimental to the ecological integrity of the Gelorup Corridor in a number of ways, and which trades that integrity away for a degraded, lower value area of land. In particular, an area of degraded, weed infested land in Tuart Forest National Park/ Ludlow State Forest No.2 to offset land of high ecological value bushland in the Gelorup Corridor is a complete and verifiable contradiction of offset principles, and cannot be seen as 'protection'. Offsets are being offered as a solution to unacceptable environmental impacts, but without first having proper regard for avoidance and mitigation options. Unacceptable offset measures are proposed, such as provision for vegetation offsets for black cockatoos at a distance from the proposal site, but which are designed to account for lost nesting hollows in the proposal site. Offsets should include at least double the number of nesting boxes as hollows lost. The EPA's uncertainty over the ability of ringtail possum numbers to recover from the proposal's disturbance but to provide 'contingency offsets' to 'counterbalance this additional significant residual impact' is unlikely to meet the EPBC Act Environmental Offsets Policy criteria to "effectively account for and manage the risks of the offset not succeeding". The provision of extra habitat at a different location at a later date after population numbers are seen to have been impacted or not recovering is not sufficient to support the conservation of a critically endangered species and does not meet the requirements of State or Commonwealth environmental offsets policies. The EPA's assertion that "With the implementation of recommended conditions, including offsets ... the potential environmental outcomes as a result of the proposal are likely to be ... a tangible improvement to the health and condition of Banksia Woodlands, Tuart Woodlands and Tuart-Peppermint Woodlands PECs and transfer of lands containing greater quantities of these communities to protected conservation tenure" is contested. It appears that the land areas included in the offsets package are unlikely to be threatened by future clearing, given the environmental values of these areas, so the protection of these areas does not provide a net gain in habitat to offset the net loss associated with the development. Access to peppermint trees is not a limiting factor in the rehabilitation of possums so it is unlikely that the development of an orchard will have any impact on the species. The properties proposed to be used as offsets are not the same quality as the heavily wooded and biodiverse Gelorup corridor. The Tuart Forest National Park/ Ludlow State Forest No.2 is heavily weed invested, planting a monoculture of tuarts will not counterbalance the loss of habitats in the Gelorup Corridor. The replanting and rehabilitation of the Tuart Forest National Park/ Ludlow State Forest No.2 must be done in conjunction and under the advice of the Tuart Forest Restoration Group with respect to planting density of saplings and weed management. The recommended conditions should be amended to ensure that the proposed offsets provide a net gain, or at a minimum, no incremental loss of habitat of threatened species impact by the proposal. The area is not suitable for western ringtail possums as their main diet is young peppermint leaves; the Tuart Forest National Park/ Ludlow State Forest No.2 has mostly tuarts and arum lilies. The invasive arum lilies in the tuart woodlands cannot be used as mitigation for relocation of western ringtail possums. The EPA has recommended that the proponent implement monitoring plans and undertake weed and dieback control; noting the proposed offset in Tuart Forest National Park/ Ludlow State Forest No.2 has obvious invasive weeds, there is little confidence that the proponent will undertake those actions at all areas.

Ground	Main concerns the appellants submitted
	The proposed offsets for this proposal are a duplication of those proposed for the BORR Northern and Central Sections, and reference the same offset properties as described in Ministerial Statement 1155. The efficiency of the 1080 bait regime is also up for question with belief that bait avoidance, learned aversion, and tolerance of the active ingredient sodium fluoroacetate in fox populations has not been researched enough. This plan to 'control' fox populations prior to land clearing is basically an experiment. Further assessment of the adequacy and accessibility of offsets be further assessed as to secure tenure (preferably vested in conservation estate), ongoing management of offsets, suitability and comparison in classification of quality and if the offset has been used in other projects. Recommended condition 9 should be amended to require, in addition to the proposed offsets, sufficient land for revegetation to ensure that there is a net gain, or at a minimum no incremental loss, of habitats for threatened species impacted by the proposal (particularly western ringtail possums). The proponent, in conjunction with DBCA and the State Government must fully fund, and provide documentation on the level of success of, arum lily eradication in Tuart Forest National Park/ Ludlow State Forest No.2. An offset should be required for the impact to 5.5 ha of habitat for black-stripe minnows.
Adequacy of conditions - publication of data and compliance reports	The EPA has recommended conditions that include a requirement for relevant documentation to be made public. The proponent has not provided compliance data and documentation for the Forrest Highway construction when requested, which should be publicly available until 2026 according to the approval. Many of the recommended conditions rely on the proponent providing compliance and monitoring data. There is no certainty that these requirements will in fact be met or made public. Our confidence in the proponent's ability to comply with conditions is undermined by previous alleged non-compliance. In order to prevent a repeated failure of public availability of data, recommended condition 13-1 must clearly define (or limit) the reasonable time period; it should be amended to 'within a reasonable time period (but no longer than 30 days)', and require this information to be publicly and readily available for 10 years. The EPA should recommend conditions that require compliance assessment reporting to be independently assessed by an academic institution. This includes but is not limited to the Habitat Fragmentation Management Plan, Construction Fauna Management Plan, and Offsets. Many of the conditions applied to the proposal rely on the proponent's compliance and monitoring data. During the EPA public submission period there were over 200 unpublished documents [referred to?] in the referral documentation that were unavailable to the public; this erodes public confidence in this process. All documents referred to in the referral documentation during a public consultation period should be readily available to the public.

4.2 Summary of EPA's assessment

Report 1714 sets out that the EPA took into account the following in its assessment of the proposal and its recommendation that the proposal may be implemented subject to the recommended conditions:

- environmental values likely to be significantly affected by the proposal
- assessment of key environmental factors separately and holistically (this has included considering cumulative impacts of the proposal where relevant)

- the likely environmental outcomes that can be achieved with the imposition of the EPA's recommended conditions
- consistency of environmental outcomes with the EPA's objectives for key environmental factors
- whether other statutory decision-making processes can mitigate the potential impacts of the proposal on the environment
- principles of the EP Act.

The EPA identified four 'key' and two 'other' environmental factors as being relevant for its assessment of the proposal. These environmental factors, the objectives associated with each,[498] and the EPA's recommended condition types in relation to them, are set out below.

4.2.1 Environmental factor: terrestrial fauna

The EPA determined 'terrestrial fauna' to be a key environmental factor for this assessment. The EPA's environmental objective for this factor is to 'protect terrestrial fauna so that biological diversity and ecological integrity are maintained'.

Report 1714 sets out the proponent's minimisation measures in relation to terrestrial fauna (page 9), as well as the proponent's commitment to revegetate areas within the development envelope disturbed during construction but not required for road infrastructure. Report 1714 also notes that the proponent would likely require an authorisation under the *Biodiversity Conservation Act 2016* for any inadvertent taking of threatened fauna.

The EPA assessed the likely residual impacts of the proposal on terrestrial fauna to be:

- direct impact to western ringtail possums from the loss of 60.9 ha of habitat, and indirect impact from displacement of individuals and habitat fragmentation
- direct impact to black cockatoos (three species) from the loss of 60.9 ha of foraging and breeding habitat, including 1,088 habitat trees with the potential to develop hollows and 11 trees containing suitable nesting hollows (two with evidence of use), and potential direct impact on nesting birds during clearing
- direct impact to south-western brush-tailed phascogale from the loss of 39.2 ha of habitat
- direct impact to black-stripe minnow from the loss of 5.5 ha of habitat and potential loss of individuals, and potential indirect impact from changes to hydrological regimes and water quality.

The EPA assessed the direct and indirect impacts to fauna, including having regard to uncertainties in outcomes and expert advice from the Department of Biodiversity, Conservation and Attractions (DBCA), and considered the residual impacts to the western ringtail possum, black cockatoos and south-western brush-tailed phascogale to be significant. The EPA concluded that these impacts are 'likely to be able to be regulated through reasonable conditions' and/or 'should be subject to conditions', and recommended conditions 1, 2, 4, 5, 6 and 9 'so that the environmental outcome is likely to be consistent with the EPA's objective for terrestrial fauna'.

In its holistic assessment for terrestrial fauna, the EPA recognised that the proposal 'has the potential to impact on terrestrial fauna and change the relationship between flora and vegetation and reduce people's social surroundings and interactions with nature'. The EPA was satisfied that by applying the proposed mitigation and management measures, the recommended conditions (including offsets), and the precautionary principle, the impacts to

[498] Environmental Protection Authority (2020c)

other environmental factors including the values associated with social surroundings and flora and vegetation are unlikely to be inconsistent with its environmental factor objectives.

4.2.2 Environmental factor: flora and vegetation

The EPA determined 'flora and vegetation' to be a key environmental factor for this assessment. The EPA's environmental objective for this factor is to 'protect flora and vegetation so that biological diversity and ecological integrity are maintained'.

Report 1714 sets out the proponent's minimisation measures in relation to flora and vegetation (page 27), as well as the proponent's commitment to undertake revegetation of all areas within the development disturbed during construction but not required for road infrastructure. Report 1714 also notes that the proponent would need to comply with regulations to manage declared weeds under the *Biosecurity and Agricultural Management Act 2007* and any further approvals, permits and licenses under the *Biodiversity Conservation Act 2016*.

The EPA assessed the likely residual impacts of the proposal on flora and vegetation to be:

- direct impact to 23.4 ha of vegetation representative of the 'Banksia woodlands on the Swan Coastal Plain' ecological community
- direct impact to 4.4 ha of vegetation representative of the 'Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain' ecological community and the 'Southern Swan Coastal Plain *Eucalyptus gomphocephala* - *Agonis flexuosa* woodlands (floristic community type 25)' ecological community
- direct impact to 4.5 ha of vegetation representative of the 'Southern Swan Coastal Plain *Eucalyptus gomphocephala* - *Agonis flexuosa* woodlands (floristic community type 25)' ecological community
- indirect impact to flora and vegetation within 20 m of the development envelope as a result of changes to hydrological regimes, weeds and dieback.

The EPA assessed the direct and indirect impacts to flora and vegetation, including having regard for fragmentation and the measures proposed by the proponent to minimise impacts, and considered the residual impacts to the Banksia Woodlands PEC, Tuart Woodlands PEC and Tuart-Peppermint Woodlands PEC to be significant. The EPA concluded that these impacts are 'likely to be able to be regulated through reasonable conditions', and recommended conditions 1, 3 and 9 'so that the environmental outcome is likely to be consistent with the EPA's objective for flora and vegetation'.

In its holistic assessment for flora and vegetation, the EPA recognised that the proposal 'has the potential to impact on terrestrial fauna by removing and altering habitats, including fragmentation specifically to the ringtail possum', and that the associated clearing 'may also change the relationship between people and their social surroundings'. The EPA was satisfied that by applying the proposed mitigation measures and the recommended conditions (including offsets), the impacts to other environmental factors including the values associated with terrestrial fauna and social surroundings are likely to be consistent with its environmental factor objectives.

4.2.3 Environmental factor: inland waters

The EPA determined 'inland waters' to be a key environmental factor for this assessment. The EPA's environmental objective for this factor is to 'maintain the hydrological regimes and quality of groundwater and surface water so that environmental values and protected'.

Report 1714 sets out the proponent's minimisation measures in relation to inland waters (page 35), as well as the proponent's commitment to revegetate the riparian zone of Five Mile Brook where clearing is required for bridge construction.

The EPA assessed the likely residual impacts of the proposal on inland waters to be:

- direct impacts to 0.2 ha of CCWs and 1.4 ha of REWs and 41.8 ha of MUWs
- potential indirect impacts to hydrological regimes and water quality in adjacent CCWs, REWs, Five Mile Brook and black stripe minnow habitats
- potential impacts to groundwater from abstraction and/or drawdown impacts.

The EPA considered the direct impacts to CCWs and REWs, the potential indirect impacts to hydrological regimes and water quality, and the potential impacts to groundwater, to be residual impacts that are 'likely to be able to be regulated through reasonable conditions', and recommended conditions 1 and 2 'so that the environmental outcome is likely to be consistent with the EPA's objective for inland waters'.

In its holistic assessment for flora and vegetation, the EPA recognised that potential impacts to hydrological regimes and water quality 'may also affect other values associated with flora and vegetation of adjacent wetlands and terrestrial fauna habitats of the conservation significant black stripe minnow', and in turn 'could impact social values associated with these other water-dependant values, and Aboriginal mythological or spiritual values associated with the Waugyl – the Noongar Rainbow Serpent present in all waterbodies including the Five Mile Brook'. The EPA was satisfied that by applying the proposed mitigation and management measures and the recommended conditions, the impacts to other environmental factors including the values associated with flora and vegetation, terrestrial fauna and social surroundings are likely to be consistent with its environmental factor objectives.

4.2.4 Environmental factor: social surroundings

The EPA determined 'social surroundings' to be a key environmental factor for this assessment. The EPA's environmental objective for this factor is to 'protect social surroundings from significant harm'.

Report 1714 sets out the proponent's avoidance and proposed minimisation measures in relation to social surroundings (pages 40-41), as well as the proponent's commitment to revegetate and landscape areas within the development disturbed during construction but not required for road infrastructure.

After considering the proponent's measures, the EPA identified that the proposal would have the following residual impacts on social surroundings:

- direct loss of two community significant trees, and potential indirect impacts to the 'Grey Giant' tuart tree (Heritage Place No. 26059) and an Aboriginal Heritage tree
- noise impacts to sensitive receptors from operational noise
- amenity impacts from changes to the landscape character, visual and social amenity in Gelorup
- potential residual impacts to Aboriginal Heritage site Place ID 18884 (artefact scatter) and four other sites lodged with the DPLH.

The EPA considered the direct impacts in relation to noise, amenity, loss of community significant trees and indirect impacts to the 'Grey Giant' tuart tree and an Aboriginal Heritage tree, and potential impacts to an Aboriginal Heritage site (artefact scatter), 'should be subject to implementation conditions', and recommended conditions 1, 7 and 8 to ensure 'consistency with the EPA objective for social surroundings'.

In its holistic assessment for flora and vegetation, the EPA recognised the 'intrinsic link between the factors of terrestrial fauna, flora and vegetation, inland waters and people's values of their social surroundings'. The EPA was satisfied that by applying the proposed mitigation measures and the recommended conditions (in relation to visual amenity, noise and connectivity), the proposal would not unreasonably impact social surroundings or be inconsistent with its environmental factor objectives.

4.2.5 Environmental factor: terrestrial environmental quality

The EPA did not identify 'terrestrial environmental quality' to be a key environmental factor for the proposal, however the EPA did identify this to be an 'other' environmental factor relevant to the proposal. The EPA's environmental objective for this factor is to 'maintain the quality of land and soils so that environmental values are protected'.

Report 1714 sets out the reasons for the EPA's conclusion that the outcomes for the proposal is unlikely to result in a significant impact on terrestrial environmental quality:

- management and mitigation measures proposed by the proponent, including a CEMP
- preparation and implementation of an *Acid Sulfate Soil Management Plan*
- the significance considerations in the EPA's *Statement of Environmental Principles, Factors and Objectives*
- ability to consider impacts under the DWER guidelines for management of acid sulfate soils.

4.2.6 Environmental factor: greenhouse gas emissions

The EPA did not identify 'greenhouse gas emissions' to be a key environmental factor for the proposal, however the EPA did identify this to be an 'other' environmental factor relevant to the proposal. The EPA's environmental objective for this factor is to 'reduce net greenhouse gas emissions in order to minimise the risk of environmental harm associated with climate change'.

Report 1714 sets out the reasons for the EPA's conclusion that the outcomes for the proposal is unlikely to result in a significant impact on greenhouse gas emissions:

- modelled Scope 1 greenhouse gas emissions of 42,251 tonnes of carbon dioxide equivalent (tCO_2-e) over three years from the vegetation clearing and construction of the proposal; this is below the EPA's criteria for assessment of Scope 1 emissions (being 100,000 tCO2-e per annum, as set out in its *Environmental Factor Guideline: Greenhouse Gas*[499])
- the carbon reduction measures proposed in section 4.8.5 of the proponent's *Updated Referral Document*
- proponent's prediction that the road upgrade would result in a net reduction in Scope 3 operational greenhouse gas emissions on the regional road network through potential increases in freight efficiencies
- the significance considerations in the EPA's *Statement of Environmental Principles, Factors and Objectives*.

4.3 Changes to proposal during assessment

The combined changes to the proposal since referral are summarised in the table below.

[499] Environmental Protection Authority (2020d)

Table 25 *Changes to proposal during assessment (as relevant to the appeals)*

Element	Referral proposal (Sep19)[500]	Variation 1 (Apr20)[501]	Variation 2 (Sep21)[502,503]
Development envelope	300 ha	200 ha	200 ha
Extent of native vegetation to be cleared	98 ha (15.4 ha riparian)	76 ha (~9.65 ha riparian, ~1 ha revegetation)	71.5 ha (~9.4 ha riparian, ~1 ha revegetation)
Fauna			
Western ringtail possum habitat	~59.4 ha (~73 home ranges)	65.4 ha (53-79 home ranges)	60.9 ha (49-72 home ranges)
Black cockatoo habitat - foraging - breeding	 ~59.4 ha 538 trees (18 suitable hollows)	 65.4 ha 1,096-1,109 trees (13 suitable hollows)	 60.9 ha 1,088 trees (11 suitable hollows)
Black-stripe minnow habitat	9.6 ha	5.5 ha	5.5 ha
South-western brush-tailed phascogale habitat	~63 ha	43.7 ha	39.2 ha
South-western brown bandicoot habitat	98 ha	76 ha	Present (assume 71.5 ha)
South-western snake-necked turtle habitat	11 individuals	11 individuals	Present (assume 11 indiv.)
Flora and vegetation			
Banksia Woodlands TEC	20.8-36.5 ha	24.92 ha	23.4 ha
Tuart Woodlands TEC	28.6 ha	4.4+0.1 ha	4.4+0.1 ha
Caladenia speciosa (P4)	71 individuals	104 individuals	104 individuals
Inland waters			
Geomorphic wetlands	~63.6 ha (0.1ha CCW, 3.5ha REW, 60ha MUW)	~43.4 ha (0.2ha CCW, 1.4ha REW, 41.8ha MUW)	~43.4 ha (0.2ha CCW, 1.4ha REW, 41.8ha MUW)

[500] BORR IPT (2019b). **NB**: At time of referral, only ~76-80% of development envelope had been surveyed.
[501] BORR IPT (2020d)
[502] BORR IPT (2020d)
[503] BORR IPT (2021b)

4.4 Relevant appeals

Appeal 034/21 – EPA Report 1705 (Perdaman Urea Project, Burrup Peninsula): greenhouse gas emissions.

Appeal 033/20 – EPA Report 1682 (BORR Northern and Central Sections): consideration of alignment, cumulative impacts, related proposal, consistency with similar appeal grounds.

Appeal 016/20 – EPA decision not to assess a proposal (Quarry at Lot 150 Clydesdale Road, Grass Valley): consideration of wider impacts (for example, basic raw materials).

Appeal 004/20 – conditions of Clearing Permit CPS 8253/1 (Shire of Kellerberrin, 2.8393 ha for Baandee North Road upgrade): determining 'risk of loss' scores for a revegetation offset site which has negligible (if any) value to the environmental value required to be offset.

Appeal C021-23/11 – grant of Clearing Permit CPS 4433/1 (Minister for Health, 238 trees for Busselton Health Campus expansion): consideration of western ringtail possum local population recovery following clearing of habitat trees.

Appeal 169-214/03 and 217/03 – EPA Bulletin 1108 (Greater Bunbury Region Scheme): background on GBRS alignment, deferred environmental factors.

4.4.1 Other relevant instruments (not appealed)

Clearing Permit CPS 9168/1[504] (Commissioner of Main Roads Western Australia, 23.7 ha for Bussell Highway duplication; granted): consideration of western ringtail possums, black cockatoos, Tuart Woodlands PEC/TEC, cumulative impacts, rehabilitation plan, offsets.

Clearing Permit CPS 7016/2[505] (Commissioner of Main Roads Western Australia, 5.53 ha for Bussell Highway Capel to Hutton SLK 38 to 32.15 road widening; granted): consideration of western ringtail possums, black cockatoos, revegetation plan, offsets.

Clearing Application CPS 6877/1[506] (Commissioner of Main Roads Western Australia, 45.1 ha for BORR Southern Section development; withdrawn): background relevant to proposal.

4.5 References

American Cancer Society (2015) *Diesel Exhaust and Cancer Risk*. 27/07/15. American Cancer Society. Available from: https://www.cancer.org/cancer/cancer-causes/diesel-exhaust-and-cancer.html

Appeals Convenor (2022) *Appeals Convenor's Report to the Minister for Environment: Appeal objecting to Report and Recommendations of EPA Report 1705 – Perdaman Urea Project, Burrup Peninsula*. Appeal 034/21, January 2022. Office of the Appeals Convenor, Perth, Western Australia. Available from: https://www.appealsconvenor.wa.gov.au/Appeal?id=31758

Appeals Convenor (2020) *Report to the Minister for Environment: Appeal in objection to the decision of the Environmental Protection Authority not to assess a proposal: Quarry at Lot 150 Clydesdale Road, Grass Valley, Resource Group (WA) Pty Ltd*. Appeal 016/20, November 2020. Office of the Appeals Convenor, Perth, Western Australia. Available from: https://www.appealsconvenor.wa.gov.au/Appeal?id=31638

[504] https://ftp.dwer.wa.gov.au/permit/9168/
[505] https://ftp.dwer.wa.gov.au/permit/7016/
[506] https://ftp.dwer.wa.gov.au/permit/6877/

Australian Government (2021) *Australia signs international biodiversity declaration*. The Hon Sussan Ley MP Minister for the Environment, Media Release 14/10/21. Available from: https://minister.awe.gov.au/ley/media-releases/australia-signs-international-biodiversity-declaration

Australian National Botanic Gardens and Australian National Herbarium (2013) *Information about Australia's flora – Australian fungi*. Australian Government, Canberra. Available from: https://www.anbg.gov.au/fungi/mycorrhiza.html

Austroads (2003) *Guidelines for treatment of stormwater runoff from the road infrastructure*. AP-R232-03. Austroads Incorporated, Sydney. Available from: https://austroads.com.au/publications/road-design/ap-r232-03

Biota Environmental Sciences Pty Ltd (2021a) *Lots 153, 267 & 268 Ducane Road Banksia Woodlands TEC Assessment*. March 2021. Report prepared for Main Roads Western Australia.

Biota Environmental Sciences Pty Ltd (2021b) *Targeted Fauna Survey: Lot 1 Ducane Road, Lot 156 Marchetti Road, & Lot 167 Jilley Road*. February 2021. Report prepared for Main Roads Western Australia.

Biota Environmental Sciences Pty Ltd (2020a) *Bunbury Outer Ring Road Southern Section Targeted Fauna Assessment.* June 2020. Report prepared for BORR IPT.

Biota Environmental Sciences Pty Ltd (2020b) *Western Ringtail Possum Pseudocheirus occidentalis Regional Surveys*. May 2020. Report prepared for Main Roads Western Australia.

Biota Environmental Sciences Pty Ltd (2019a) *Bunbury Outer Ring Road Southern Section Targeted Fauna Assessment.* September 2019. Report prepared for GHD Pty Ltd.

Biota Environmental Sciences Pty Ltd (2019b) *Targeted Fauna Survey: Lots 267, 268 and 153 Ducane Road, Gelorup*. December 2019. Report prepared for Main Roads Western Australia.

Biota Environmental Sciences Pty Ltd (2018) *Bunbury Outer Ring Road Southern Section – Banksia Woodlands TEC Assessment*. February 2018. Report prepared for Main Roads Western Australia.

Biota Environmental Sciences Pty Ltd (2016) *Bunbury Outer Ring Road Southern Section – Reassessment of Floristic Communities*. December 2016. Report prepared for Main Roads Western Australia.

BORR IPT (2021a) *BORR Southern Section Response to Public Submissions on Updated Referral BORR-02-RP-EN-0024 Rev 3 August 2021*. Rev 3, 30/08/21. Report prepared for Main Roads Western Australia.

BORR IPT (2021b) *Bunbury Outer Ring Road Southern Section - Supplementary Information Document, August 2021*. Proposal changes, Rev 0, 30/08/21. Report prepared for Main Roads Western Australia.

BORR IPT (2021c) *Bunbury Outer Ring Road Southern Section (EPBC 2019/8543) Action Management Plan - Conservation Significant Fauna BORR-02-RP-EN-0023 Rev 2 August 2021*. Rev 2, 27/08/21. Report prepared for Main Roads Western Australia.

BORR IPT (2021d) *Bunbury Outer Ring Road Southern Section Offset Strategy DOC NO / BORR-02-RP-EN-0019 Rev 3 August 2021*. Rev 3, 04/08/21. Report prepared for Main Roads Western Australia.

BORR IPT (2021e) *Bunbury Outer Ring Road Southern Section Vegetation Monitoring Plan*. Revised, 31/03/2021. Report prepared for Main Roads Western Australia

BORR IPT (2020a) *BORR Southern Section Landscape and Visual Impact Assessment BORR-02-RP-EN-0013 Rev 1 July 2020*. Rev 1, 10/07/20. Report prepared for Main Roads Western Australia.

BORR IPT (2020b) *Bunbury Outer Ring Road Northern and Central Sections Offset Strategy DOC NO / BORR-01-RP-EN-0017 Rev 2 May 2020*. Rev 3, 07/05/20. Report prepared for Main Roads Western Australia.

BORR IPT (2020c) *Bunbury Outer Ring Road Southern Section (EPBC 2019/8543) Black Cockatoo Action Management Plan BORR-02-RP-EN-0020 Rev 0 October 2020*. Rev 0, 09/10/20. Report prepared for Main Roads Western Australia.

BORR IPT (2020d) *Bunbury Outer Ring Road Southern Section Updated Environmental Referral Supporting Document and Additional Information (BORR-02-RP-EN-0014)*. Rev 2, 01/10/20. Report prepared for Main Roads Western Australia.

BORR IPT (2020e) *Bunbury Outer Ring Road Southern Section Vegetation and Flora Study BORR-02-RP-EN-0003 Rev 1 FINAL October 2020*. Rev 1, 09/10/20. Report prepared for Main Roads Western Australia.

BORR IPT (2020f) *Bunbury Outer Ring Road Northern and Central Section (EPA Assessment 2215): Request for Greenhouse Gas Information*. Letter to EPA dated 16/06/20.

BORR IPT (2020g) *Bunbury Outer Ring Road Northern and Central Sections Offset Strategy DOC NO / BORR-01-RP-EN-0009 Rev 2 May 2020*. Rev 2, 07/05/20. Report prepared for Main Roads Western Australia.

BORR IPT (2019a) *Bunbury Outer Ring Road Southern Section Alignment Selection Report DOC NO: BORR-02-RP-RD-0001; Rev: 1; Date: September 2019*. Report prepared for Main Roads Western Australia. Available from: https://www.mainroads.wa.gov.au/globalassets/projects-initiatives/projects/regional/bunbury-outer-ring-road/borr-south-alignment-selection-report-sep-19.pdf

BORR IPT (2019b) *Bunbury Outer Ring Road Southern Section EPA Environmental Referral Supporting Document, September 2019*. Rev 0, 13/09/19. Report prepared for Main Roads Western Australia.

BORR IPT (2019c) *Bunbury Outer Ring Road Southern Section Vegetation and Flora Study September 2019*. Rev B, 13/09/19. Report prepared for Main Roads Western Australia.

Brad Goode & Associates Pty Ltd (2020) *Report of an Archaeological Aboriginal Heritage Survey of the Bunbury Outer Ring Road, Southern Section: Greater Bunbury Region, Western Australia*. March 2020. Report prepared for BORR IPT on behalf of Main Roads Western Australia.

Brugge, D., Durant, J.L. and Rioux, C. (2007) Near-highway pollutants in motor vehicle exhaust: A review of epidemiologic evidence of cardiac and pulmonary health risks. Environmental Health, 09/08/07, 6: 23. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1971259/

Burbidge, A.A. and Zichy-Woinarski, J. (2017) *Pseudocheirus occidentalis*. The IUCN Red List of Threatened Species 2017: e.T18492A21963100. Available from: http://dx.doi.org/10.2305/IUCN.UK.2017-3.RLTS.T18492A21963100.en

Clarke, J.R. (2011) *Translocation outcomes for the western ringtail possum (Pseudocheirus occidentalis) in the presence of the common brushtail possum (Trichosurus vulpecula): health, survivorship and habitat use*. PhD thesis presented to Murdoch University. Available from: https://researchrepository.murdoch.edu.au/id/eprint/5119/

Conservation Council of Western Australia Inc v Hon Stephen Dawson [2019] WASCA 102 per Buss P and Beech JA at [131].

Conservation Council of Western Australia Inc v Hon Stephen Dawson [2019] WASCA 102 per Buss P and Beech JA at [130].

Dataset: Black cockatoo roosting (confirmed, unconfirmed, buffered) (DBCA-050-053, DBCA-064). Available from: https://catalogue.data.wa.gov.au/dataset/?q=cockatoo

Dataset: Black cockatoo breeding (confirmed, unconfirmed, buffered) (DBCA-054-055, DBCA-063). Available from: https://catalogue.data.wa.gov.au/dataset/?q=cockatoo

Dataset: Black cockatoo foraging (requires investigation) (DBCA-057). Available from: https://catalogue.data.wa.gov.au/dataset/?q=cockatoo

Dataset: Cadatre (LGATE). Available from: https://catalogue.data.wa.gov.au/dataset/?q=cadastre

Dataset: Soil landscape land quality - Salinity Risk (DPIRD-009). Available from: https://catalogue.data.wa.gov.au/dataset/soil-landscape-land-quality-salinity-risk

Dataset: Soil landscape land quality - Water Erosion Risk (DPIRD-013). Available from: https://catalogue.data.wa.gov.au/dataset/soil-landscape-land-quality-water-erosion

Dataset: Soil landscape land quality - Wind Erosion Risk (DPIRD-016). Available from: https://catalogue.data.wa.gov.au/dataset/soil-landscape-land-quality-wind-erosion-risk

Dataset: Threatened ecological communities (DBCA-038). Available from: https://catalogue.data.wa.gov.au/dataset/threatened-ecological-communities

Dataset: Western Ringtail Possum Habitat Suitability (DBCA-049). Based on Shedley, E. and Williams, K. (2014). Available from: https://catalogue.data.wa.gov.au/dataset/western-ringtail-possum-habitat-suitability

Department of Agriculture, Water and the Environment (2022) *Threatened Species Strategy Action Plan 2021-2026*. February 2022. Commonwealth of Australia, Canberra. Available from: https://www.awe.gov.au/environment/biodiversity/threatened/publications/threatened-species-strategy-2021-2031/action-plan-2021-2026

Department of Agriculture, Water and the Environment (2021) *The Australian Government's Threatened Species Strategy 2021-2031*. Commonwealth of Australia, Canberra. Available from: https://www.awe.gov.au/environment/biodiversity/threatened/publications/threatened-species-strategy-2021-2031

Department of Agriculture, Water and the Environment (2020) *Threatened Species Strategy Year Five Report*. Commonwealth of Australia, Canberra. Available from: https://www.awe.gov.au/environment/biodiversity/threatened/publications/threatened-species-strategy-2015-2020

Department of Biodiversity, Conservation and Attractions (2021a) *Bunbury Outer Ring Road Southern Section – Assessment No: 2215*. Letter to EPA Services dated 02/09/21.

Department of Biodiversity, Conservation and Attractions (2021b) *Proposed changes to Bunbury Outer Ring Road – Southern Section*. Letter to EPA Chair dated 15/06/21.

Department of Biodiversity, Conservation and Attractions (2021c) *Bunbury Outer Ring Road – Southern Section – Proposal under EPA Assessment*. Letter to EPA Chair dated 10/03/21.

Department of Biodiversity, Conservation and Attractions (2021d) *Priority Ecological Communities for Western Australia, Version 32*. Species and Communities Program, 15/07/21. Department of Biodiversity, Conservation and Attractions, Perth, Western Australia. Available from: https://www.dpaw.wa.gov.au/plants-and-animals/threatened-species-and-communities/wa-s-threatened-ecological-communities

Department of Biodiversity, Conservation and Attractions (2020) *Bunbury Outer Ring Road Southern Section – Assessment No: 2215*. Letter to EPA Services dated 2 December 2020.

Department of Environment and Conservation (2012) *Fauna profile: Brush-tailed Phascogale: Phascogale tapoatafa (Meyer, 1793)*. Department of Environment and Conservation, Perth, Western Australia. Available from: https://library.dbca.wa.gov.au/static/FullTextFiles/925273.pdf

Department of Environment and Conservation (2008) *Forest black cockatoo (Baudin's cockatoo Calyptorhynchus baudinii and forest red-tailed black cockatoo Calyptorhynchus banksii naso) Recovery Plan*. Department of Environment and Conservation, Perth, Western Australia. Available from: https://www.awe.gov.au/environment/biodiversity/threatened/recovery-plans/forest-black-cockatoo-and-forest-red-tailed-black-cockatoo-2008

Department of Environment Regulation (2015) *What are acid sulfate soils?* Acid Sulfate Soils Fact Sheet, July 2015. Government of Western Australia, Perth, Western Australia

Department of Health (undated) *Water tanks on your property*. Healthy WA. Department of Health, Perth, Western Australia. Available from: https://www.healthywa.wa.gov.au/Articles/U_Z/Water-tanks-on-your-property

Department of Parks and Wildlife (2017) *Western Ringtail Possum (Pseudocheirus occidentalis) Recovery Plan*. Wildlife Management Program No.58. Department of Parks and Wildlife, Perth, Western Australia. Available from: https://www.awe.gov.au/environment/biodiversity/threatened/publications/recovery/western-ringtail-possum-recovery-plan

Department of Parks and Wildlife (2015) *Procedures to minimise the risk to western ringtail possums during vegetation clearing and building demolition*. 19/05/15. Department of Parks and Wildlife, Perth, Western Australia. Available from: https://www.dpaw.wa.gov.au/plants-and-animals/threatened-species-and-communities/threatened-animals/western-ringtail-possums

Department of Parks and Wildlife (2014) *Tuart Forest National Park Management Plan 2014*. Management Plan No.79. Department of Parks and Wildlife, Perth, Western Australia. Available from: https://www.dpaw.wa.gov.au/parks/management-plans/approved-management-plans

Department of Parks and Wildlife (2013) *Carnaby's Cockatoo (Calyptorhynchus latirostris) Recovery Plan*. Wildlife Management Program No.52. Department of Parks and Wildlife, Perth, Western Australia. Available from:

https://www.awe.gov.au/environment/biodiversity/threatened/recovery-plans/calyptorhynchus-latirostris-recovery-plan

Department of Planning, Lands and Heritage (1998, updated 2020) *Shire of Capel Local Planning Scheme No. 7 – District Planning Scheme*. Last updated 14/08/20. Available from: https://www.wa.gov.au/government/document-collections/shire-of-capel-planning-information

Department of Sustainability, Environment, Water, Population and Communities (2012) *EPBC Act referral guidelines for three threatened black cockatoo species*. Commonwealth of Australia, Canberra. Available from: https://www.awe.gov.au/environment/epbc/publications/epbc-act-referral-guidelines-three-threatened-black-cockatoo-species-carnabys-cockatoo

Department of the Environment and Energy (2019a) *Approved Conservation Advice (incorporating listing advice) for the Tuart (Eucalyptus gomphocephala) woodlands and forests of the Swan Coastal Plain ecological community*. Department of the Environment and Energy, Canberra. Available from: https://www.environment.gov.au/cgi-bin/sprat/public/publicshowcommunity.pl?id=153&status=Critically+Endangered

Department of the Environment and Energy (2019b) *Tuart Woodlands and Forests of the Swan Coastal Plain: A Nationally Significant Ecological Community*. Department of the Environment and Energy, Canberra. Available from: https://www.awe.gov.au/environment/biodiversity/threatened/publications/tuart-woodlands-forests-swan-coastal-plain-guide

Department of the Environment and Energy (2019) *Variation of conditions attached to approval - Bussell Highway (Capel to Hutton Section 26.38 to 32.15 SLK), WA (EPBC 2015/7626)*. Australian Government, Canberra. Available from: http://epbcnotices.environment.gov.au/referralslist/

Department of the Environment and Energy (2016a) *Approved Conservation Advice (incorporating listing advice) for the Banksia Woodlands of the Swan Coastal Plain ecological community*. Department of the Environment and Energy, Canberra. Available from: https://www.environment.gov.au/cgi-bin/sprat/public/publicshowcommunity.pl?id=131&status=Endangered

Department of the Environment and Energy (2016b) *Banksia Woodlands of the Swan Coastal Plain: a nationally protected ecological community*. Commonwealth of Australia, Canberra. Available from: https://www.awe.gov.au/environment/biodiversity/threatened/publications/banksia-woodlands-swan-coastal-plain-guide

Department of the Environment (2015) *The Australian Government's Threatened Species Strategy 2015-2020*. Commonwealth of Australia, Canberra. Available from: https://www.awe.gov.au/environment/biodiversity/threatened/publications/threatened-species-strategy-2015-2020

Department of the Environment, Water, Heritage and the Arts (2009) *Significant impact guidelines for the vulnerable western ringtail possum (Pseudocheirus occidentalis) in the southern Swan Coastal Plain, WA*. EPBC Act Policy Statement 3.10. Commonwealth of Australia, Canberra. Available from: https://www.awe.gov.au/environment/epbc/publications/significant-impact-guidelines-vulnerable-western-ringtail-possum-pseudocheirus-occidentalis

Department of Water (2006) *Roads near sensitive water resources*. Water Quality Protection Note 44, October 2006. Perth, Western Australia. Available from: https://www.water.wa.gov.au/__data/assets/pdf_file/0012/4116/81912.pdf

Department of Water (2004) *Stormwater Management Manual for Western Australia*. Perth, Western Australia. Available from: https://www.water.wa.gov.au/urban-water/urban-development/stormwater/stormwater-management-manual

Department of Water and Environmental Regulation (2022a) *Black-stripe minnow – Galaxiella nigrostriata*. Healthy Rivers South-west project. Available from: https://rivers.dwer.wa.gov.au/species/galaxiella-nigrostriata/

Department of Water and Environmental Regulation (2022b) *South-western snake-necked turtle – Chelodina collieii*. Healthy Rivers South-west project. Available from: https://rivers.dwer.wa.gov.au/species/chelodina-colliei/

Department of Water and Environmental Regulation (2021) *Environmental offsets metric: Quantifying environmental offsets in Western Australia*. October 2021. Government of Western Australia. Available from: https://www.wa.gov.au/government/publications/guideline-environmental-offsets-metric-quantifying-environmental-offsets-wa

Department of Water and Environmental Regulation (2018) *A Guide to Preparing Revegetation Plans for Clearing Permits under Part V of the Environmental Protection Act 1986*. March 2018. Department of Water and Environmental Regulation, Perth, Western Australia. Available from: https://www.der.wa.gov.au/our-work/clearing-permits/48-guidelines-clearing-permits

Department of Water and Environmental Regulation (2015) *Treatment and management of soil and water in acid sulfate soil landscapes*. Final version, June 2015. Department of Water and Environmental Regulation, Perth, Western Australia. Available from: https://www.der.wa.gov.au/your-environment/acid-sulfate-soils/69-ass-guidelines

Department of Water and Environmental Regulation (2014; revised 2021) *Assessment and management of contaminated sites*. Guideline, published December 2014, revised and updated November 2021. Government of Western Australia. Available from: https://www.der.wa.gov.au/your-environment/contaminated-sites/61-contaminated-sites-guidelines

Department of Water and Swan River Trust (2007) *Structural Controls, Stormwater Management Manual for Western Australia*. Chapter 9, May 2007. Government of Western Australia. Available from: https://www.water.wa.gov.au/urban-water/urban-development/stormwater/stormwater-management-manual

Department of Water and Swan River Trust (2005) *Non-structural Controls, Stormwater Management Manual for Western Australia*. Chapter 7, April 2005. Government of Western Australia. Available from: https://www.water.wa.gov.au/urban-water/urban-development/stormwater/stormwater-management-manual

Dunlop, J., Smith, A., Burbidge, A.H., Thomas, N., Hamilton, N.A. and Morris, K. (2021) *Industry environmental offset funding facilitates a large multi-species fauna translocation program*. Pacific Conservation Biology, 16/07/21. Available from: https://doi.org/10.1071/PC20036

Ecoedge Environmental Pty Ltd (2017) *Report of a Targeted Rare Flora Survey for Diuris drummondii along four sections of the Bunbury Outer Ring Road proposed alignment*. Unpublished report for Main Roads Western Australia.

Ecoedge Environmental Pty Ltd (2019a) *Memorandum of a Targeted Rare Flora Survey for Diuris drummondii within and adjacent to the Bunbury Outer Ring Road South referral area*. Unpublished report for Main Roads Western Australia.

Ecoedge Environmental Pty Ltd (2019b) *Review of Potential Claypan Occurrences in the BORR Southern Section*. Unpublished memorandum to BORR IPT.

Environmental Protection Authority (2022), *Environmental Impact Assessment (Part IV Divisions1 and 2) Procedures Manual – Requirements under the Environmental Protection Act 1986*. Version 4.1, 23/03/22. Environmental Protection Authority, Perth, Western Australia. Available from: https://www.epa.wa.gov.au/procedures-manual

Environmental Protection Authority (2021a) *Bunbury Outer Ring Road Southern Section, Commissioner for Main Roads Western Australia*. Report 1714, October 2021. Environmental Protection Authority, Perth, Western Australia.

Environmental Protection Authority (2021b) Email to appellant dated 27/07/21.

Environmental Protection Authority (2020a) *Bunbury Outer Ring Road Northern and Central Section, Commissioner for Main Roads Western Australia*. Report 1682, June 2020. Environmental Protection Authority, Perth, Western Australia. Available from: https://www.epa.wa.gov.au/proposals/bunbury-outer-ring-road-northern-and-central-sections

Environmental Protection Authority (2020b) *Shire of Capel Local Planning Scheme 8 (LPS 8)*. Decision under section 48A(1)(a) of the *Environmental Protection Act 1986*, 17/04/20. Environmental Protection Authority, Perth, Western Australia Available from: https://www.epa.wa.gov.au/shire-capel-local-planning-scheme-8

Environmental Protection Authority (2020c) *Statement of Environmental Principles, Factors and Objectives*. April 2020. Environmental Protection Authority, Perth, Western Australia. Available from: https://www.epa.wa.gov.au/statement-environmental-principles-factors-and-objectives

Environmental Protection Authority (2020d) *Environmental Factor Guideline: Greenhouse Gas Emissions*. April 2020. Environmental Protection Authority, Perth, Western Australia. Available from: https://www.epa.wa.gov.au/policies-guidance/environmental-factor-guideline-%E2%80%93-greenhouse-gas-emissions-0

Environmental Protection Authority (2020e), *Environmental Impact Assessment (Part IV Divisions1 and 2) Procedures Manual – Requirements under the Environmental Protection Act 1986*. Version 3.0, 30/03/20. Environmental Protection Authority, Perth, Western Australia. Available from: https://www.epa.wa.gov.au/procedures-manual

Environmental Protection Authority (2019a) *Environmental Protection Act 1986 – Section 40(2)(a) – Notice requiring information for assessment*. Letter from EPA Chair to proponent, 21/10/19.

Environmental Protection Authority (2019b) *EPA advice: Carnaby's Cockatoo in Environmental Impact Assessment in the Perth and Peel Region, in accordance with section 16(j) of the Environmental Protection Act 1986*. Section 16(j) advice, 29/05/19. Environmental Protection Authority, Perth, Western Australia. Available from:

https://www.epa.wa.gov.au/policies-guidance/carnaby%e2%80%99s-cockatoo-environmental-impact-assessment-perth-and-peel-region

Environmental Protection Authority (2019c) *Environmental Protection Authority Strategic Plan 2019-2022*. Perth, Western Australia. Available from: https://www.epa.wa.gov.au/strategic-plan

Environmental Protection Authority (2016) *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment*. Environmental Protection Authority, Perth, Western Australia. Available from: https://www.epa.wa.gov.au/policies-guidance/technical-guidance-flora-and-vegetation-surveys-environmental-impact-assessment

Environmental Protection Authority (2013) *Public Advice – Bunbury Outer Ring Road Stage 2 – Southern Section – South Western Highway to Bussell Highway*. Notice under section 39A of the EP Act. Environmental Protection Authority, Perth, Western Australia.

Environmental Protection Authority (2008) Environmental Guidance for Planning and Development. Guidance Statement No. 33, dated May 2008. Government of Western Australia. Available from: https://www.epa.wa.gov.au/policies-guidance/environmental-guidance-planning-and-development-gs-33?msclkid=bc156d48bb8b11ecbeebe1011717e765

Environmental Protection Authority (2006) *Guidance for the Assessment of Environmental Factors Western Australia (in accordance with the Environmental Protection Act 1986) – Rehabilitation of Terrestrial Ecosystems*. Guidance Statement No.6, June 2006. Environmental Protection Authority, Perth, Western Australia. Available from: https://www.epa.wa.gov.au/policies-guidance/rehabilitation-terrestrial-ecosystems-gs-6

Environmental Protection Authority (2005) *Southern Extension of Sandpit, Lot 2 Calinup Road, Gelorup, Shire of Capel, APH Contractors*. Bulletin 1194, August 2005. Environmental Protection Authority, Perth, Western Australia. Available from: https://www.epa.wa.gov.au/proposals/southern-extension-sandpit-lot-2-calinup-road-gelorup-shire-capel

Environmental Protection Authority (2003) *Greater Bunbury Region Scheme, Western Australian Planning Commission*. Bulletin 1108, September 2003. Environmental Protection Authority, Perth, Western Australia. Available from: https://www.epa.wa.gov.au/greater-bunbury-region-scheme

Environmental Protection Authority (2000) *A strategy for the EPA to identify regionally significant natural areas in its consideration of the Greater Bunbury Region Scheme portion of the Swan Coastal Plain*. Environmental Protection Authority, Perth, Western Australia. Available from: https://www.epa.wa.gov.au/greater-bunbury-region-scheme

Essential Environmental Services (2005) *Guideline for the Determination of Wetland Buffer Requirements – for public comment December 2005*. Prepared for the Department of Planning and Infrastructure, December 2005. Western Australian Planning Commission, Perth, Western Australia. Available from: https://www.wa.gov.au/government/publications/draft-guideline-the-determination-of-wetland-buffer-requirements

Fielding, K. and Elliott, S. (2019) *Dual-lane fix for highway*. Busselton Dunsborough Times, 10/05/19. Available from: https://www.google.com.au/amp/s/www.bdtimes.com.au/news/busselton-dunsborough-times/dual-lane-fixfor-highway-ng-b881193975z.amp

Figueiredo, A.F., Boy, J. and Guggenberger, G. (2021) *Common Mycorrhizae Network: A Review of the Theories and Mechanisms Behind Underground Interactions*. Fungal Biology. Available from: https://www.frontiersin.org/articles/10.3389/ffunb.2021.735299/full / https://doi.org/10.3389/ffunb.2021.735299

Galeotti, D.M., McCulloch, C.D. and Lund, M.S. (2008) *Current State of Knowledge of the Black-stripe Minnow Galaxiella nigrostriata (Pisces: Galaxiidae) in Western Australia*. Prepared for Kemerton Silica Sand Pty Ltd, June 2008. Centre for Ecosystem Management Report No. 2008-12, Edith Cowan University, Western Australia. Available from: http://miwer.org/wp-content/uploads/2017/12/CEM_KSS_2008-12.pdf

George D. Gann, Tein McDonald, Bethanie Walder, James Aronson, Cara R. Nelson, Justin Jonson, James G. Hallett, Cristina Eisenberg, Manuel R. Guariguata, Junguo Liu, Fangyuan Hua, Cristian Echeverría, Emily Gonzales, Nancy Shaw, Kris Decleer, Kingsley W. Dixon (2019) *International principles and standards for the practice of ecological restoration. Second edition*. Restoration Ecology, 27(S1), S1-S46. Available from: https://doi.org/10.1111/rec.13035

GHD Pty Ltd (2015) *Bunbury Outer Ring Road, South Western Highway to Bussell Highway, Flora and Vegetation Assessment, Phase 1 and 2*. Report prepared for Main Roads Western Australia.

GHD Pty Ltd (2014) *Main Roads – Lot 1 Ducane Road – Environmental Values Assessment*. July 2014. Report prepared for Main Roads Western Australia.

GHD Pty Ltd (2012) *Report for Bunbury Outer Ring Road - Southern Section (South Western Highway To Bussell Highway) Environmental Impact Assessment*. November 2012. Report prepared for Main Roads Western Australia. Available from: https://www.epa.wa.gov.au/sites/default/files/Referral_Documentation/A574011-Environmental%20Impact%20Assessment-main%20report.pdf

Gibson, N., Keighery, B.J., Keighery, G.J., Burbidge, A.H., and Lyons, M.N. (1994) *A Floristic Survey of the Southern Swan Coastal Plain*. Report prepared for Australian Heritage Commission prepared by Department of Conservation and Land Management and Conservation Council of Western Australia (Inc). Available from: https://catalogue.nla.gov.au/Record/353318

Gilfillan, S. (2008) *Western Ringtail Possum (Pseudocheirus occidentalis) Survey and Data Collation in the Greater Albany Area. Phase 1 Final August 2008*. Report prepared for Department of Environment and Conservation, Albany Regional Office. Available from: https://library.dbca.wa.gov.au/static/FullTextFiles/069786.pdf

Goulson, D. (2021) *The insect apocalypse: 'Our world will grind to a halt without them'*. The Guardian, 25/07/21. Available from: https://www.theguardian.com/environment/2021/jul/25/the-insect-apocalypse-ourworld-will-grind-to-a-halt-without-them

Government of Western Australia (2019a) *2018 South West Vegetation Complex Statistics.* Current as of March 2019. WA Department of Biodiversity, Conservation and Attractions, Perth. Available from: https://catalogue.data.wa.gov.au/dataset/dbca

Government of Western Australia (2019b) *2018 Statewide Vegetation Statistics incorporating the CAR Reserve Analysis (Full Report).* Current as of March 2019. WA Department of Biodiversity, Conservation and Attractions, Perth. Available from: https://catalogue.data.wa.gov.au/dataset/dbca-statewide-vegetation-statistics

Government of Western Australia (2014) *WA Environmental Offsets Guidelines*. Government of Western Australia, August 2014. Available from: https://www.epa.wa.gov.au/policies-guidance/wa-environmental-offsets-policy-2011-and-guidelines

Government of Western Australia (2011) *WA Environmental Offsets Policy*. Government of Western Australia, September 2011. Available from: https://www.epa.wa.gov.au/policies-guidance/wa-environmental-offsets-policy-2011-and-guidelines

Government of Western Australia (1997) *Wetlands Conservation Policy for Western Australia*. Government of Western Australia, 1997. Available from: https://www.dpaw.wa.gov.au/images/documents/about/policy/wetlandspolicy_text.pdf

Hayes, N. and Morrison-Saunders, A. (2007) *Effectiveness of environmental offsets in environmental impact assessment: practitioner perspectives from Western Australia*. Impact Assessment and Project Appraisal, February 2012, 25:3, 209-218. Available from: https://doi.org/10.3152/146155107X227126

Hogdson, E.E, Halpern, B.S. and Essington, T.E. (2019) *Moving Beyond Silos in Cumulative Effects Assessment*. Frontiers in Ecology and Evolution, 11 June 2019. Available from: https://doi.org/10.3389/fevo.2019.00211

Holderegger, R. and Di Giulio, M. (2010) *The genetic effects of roads: A review of empirical evidence*. Basic and Applied Ecology, September 2010, 11(6): 522-531. Available from: https://www.sciencedirect.com/science/article/abs/pii/S1439179110000769

Holewinski, B. (undated) *Underground Networking: The Amazing Connections Beneath Your Feet*. National Forests Foundation. https://www.nationalforests.org/blog/underground-mycorrhizal-network

Hope, P., Abbs, D., Bhend, J., Chiew, F., Church, J., Ekström, M., Kirono, D., Lenton, A., Lucas, C., McInnes, K., Moise, A., Monselesan, D., Mpelasoka, F., Timbal, B., Webb, L., and Whetton, P. (2015) *Southern and South-Western Flatlands Cluster Report. Climate Change in Australia Projections for Australia's Natural Resource Management Regions*. Cluster Reports, eds. Ekström, M. et al., CSIRO and Bureau of Meteorology, Australia. Available from: http://www.climatechangeinaustralia.gov.au/

Horton, D.R. (1996) *Map of Indigenous Australia*. Australian Institute of Aboriginal and Torres Straight Islander Studies. Available from: https://aiatsis.gov.au/explore/map-indigenous-australia

Huston, R. (2010) *Chemical Contaminants in Urban Rainwater Tanks*. Thesis, Griffith School of Environment. Available from: https://doi.org/10.25904/1912/1079

Intergovernmental Panel on Climate Change (2022) *Climate Change 2022: Impacts, Adaptation and Vulnerability*. Working Group II contribution to the Sixth Assessment Report (AR6) of the Intergovernmental Panel on Climate Change, 27/02/22. Available from: https://report.ipcc.ch/ar6wg3/index.html

Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (2019) *Global Assessment Report on Biodiversity and Ecosystem Services*. 08/05/19. Germany. Available from: https://knowledge.unccd.int/publications/ipbes-2019-global-assessment-report-biodiversity-and-ecosystem-services

International Dark-sky Association (2021) *Light Pollution Effects on Wildlife and Ecosystems*. Available from: https://www.darksky.org/light-pollution/wildlife/

International Union for Conservation of Nature (2022) *IUCN Red List of Threatened Species*. Available from: https://www.iucn.org/resources/conservation-tools/iucn-red-list-threatened-species

Jacobson, T.A., Kler, J.S., Hernke, M.T., Braun, R.K., Meyer, K.C. and Funk, W.E. (2019) *Direct human health risks of increased atmospheric carbon dioxide*. Nature Sustainability, 2019, 2: 691-701. Available from: https://www.nature.com/articles/s41893-019-0323-1

Keighery, B.J. (1994) *Bushland plant survey – A guide to plant community survey for the community*. Wildflower Society of WA (Inc.), Nedlands, Western Australia. Available from: https://catalogue.nla.gov.au/Record/1778245

Kennedy, S. (2014) *Skyway highway crossing for endangered possums in Busselton and Bunbury*. ABC Local, 13/10/14. Available from: https://www.abc.net.au/local/stories/2014/10/13/4105896.htm

Knott, B., Jasinska, E.J. and Smith, K.D. (2002) *Limnology and aquatic fauna of EPP 173, Melaleuca Park, refuge for an outlier population of the black-stripe minnow Galaxiella nigrostriata (Galaxiidae), in southwestern Australia*. Records of the Western Australian Museum, 2002, 21: 291-298. Available from: https://museum.wa.gov.au/research/records-supplements/records

Lindenmayer, D.B., Crane, M., Evans, M.C., Maron, M., Gibbons, P., Bekessy, S. and Blanchard, W. (2017) *The anatomy of a failed offset*. Biological Conservation, 05/05/17, 210: 286-292. Available from: https://doi.org/10.1016/j.biocon.2017.04.022

Lloyd George Acoustics Pty Ltd (2020) *Transportation Noise Assessment Bunbury Outer Ring Road (South Section) Reference: 19075094-02c Noise Modelling.docx*. Rev D, 02/07/20. Prepared for BORR IPT.

Lloyd George Acoustics Pty Ltd (2012) *Noise Management Plan – Bunbury Outer Ring Road – Southern Section South Western Highway to Bussell Highway*. Reference 11081916-01a.docx, November 2012. Preliminary report prepared for GHD Bunbury.

Main Roads Western Australia (2021a) *Bunbury Outer Ring Road Southern Section – Assessment 2225 – Friends of the Gelorup Corridor correspondence*. Letter to EPA Chair dated 21/06/21.

Main Roads Western Australia (2021b) *Environmental Site Inspection Report – Indicative Targeted Vegetation [Assessment] – Lot 27 Tredrea Road Environmental Offset Area*. 11/03/21. Main Roads Western Australia, Perth.

Main Roads Western Australia (2020) *Climate change*. Version 3D, 28/01/20. Main Roads Western Australia, Perth, Western Australia. Available from: https://www.mainroads.wa.gov.au/technical-commercial/technical-library/road-traffic-engineering/climate-change/

Main Roads Western Australia (2019a) *Bunbury Outer Ring Road*. Brochure, November 2019. Available from: https://www.mainroads.wa.gov.au/contentassets/2e14f11db97f4b4fa52688fdc6747ce2/borr-brochure.pdf

Main Roads Western Australia (2019b) *Revegetation Plan - Bussell Highway (Capel to Hutton Section 26.38 - 32.15 SLK) - State Forest No. 2 Offset Site*. Main Roads Western Australia, Perth, Western Australia. Available from: https://ftp.dwer.wa.gov.au/permit/7016/

Main Roads Western Australia (2017) *Lighting Design Guideline for Roadway and Public Spaces*. Version 4, 03/07/17. Main Roads Western Australia, Perth, Western Australia. Available from: https://www.mainroads.wa.gov.au/technical-commercial/technical-library/road-traffic-engineering/roadside-items/lighting-design-guideline/

Maron, M., Brownlie, S., Bull, J.W., Evans, M.C., von Hase, A., Quetier, F., Watson, J.E.M. and Gordon, A. (2018) *The many meanings of no net loss in environmental policy*. Nature Sustainability, 08/01/18, 1: 19-27. Available from: https://www.nature.com/articles/s41893-017-0007-7/

Maron, M., Ives, C.D., Kujala, H., Bull, J.W., Maseyk, F.J.F., Bekessy, S., Gordon, A., Watson, J.E.M., Lentinin, P.E., Gibbons, P., Possingham, H.P., Hobbs, R.J., Keithm D.A., Wintle, B.A. and Evans, M.C. (2016) *Taming a Wicked Problem: Resolving Controversies in Biodiversity Offsetting*. BioScience, 01/06/16, Volume 66(6): 489-498. Available from: https://doi.org/10.1093/biosci/biw038

Maron, M., Gordon, A., Mackey, B.G., Watson, J.E.M., (2015) *Conservation: Stop misuse of biodiversity offsets*. Nature 22, 401-403. Available from: https://doi.org/10.1038/523401a

May, J., Hobbs, R.J. and Valentine, L.E. (2016) *Are offsets effective? An evaluation of recent environmental offsets in Western Australia*. Biological Conservation, February 2017, 206: 249-257. Available from: http://dx.doi.org/10.1016/j.biocon.2016.11.038

McDonald, E.M and Phillips, T.E. (2020a) *Addendum to Report of an Ethnographic Survey of Bunbury Outer Ring Road Southern Section, Gelorup, Western Australia*. December 2020. Report prepared for Main Roads Western Australia on behalf of Brad Goode & Associates Pty Ltd.

McDonald, M.E. and Turner, J.L. (2020b) *Report of an Ethnographic Survey of Bunbury Outer Ring Road Southern Section, Gelorup, Western Australia*. Ethnosciences, May 2020. Report prepared for Main Roads Western Australia on behalf of Brad Goode & Associates Pty Ltd.

McIntosh, D. (undated) *National Register of Big Trees*. Coordinator. Available from: https://www.nationalregisterofbigtrees.com.au/pages/treeregister

Mills, S.L. and Allendorf, F.W. (1996) *The One-Migrant-per-Generation Rule in Conservation and Management*. Conservation Biology, December 1996, 10(6): 1509-1518. Available from: https://www.jstor.org/stable/2387022

Molloy, S., Wood, J., Hall, S., Wallrodt, S. and Whisson, G. (2009) South West Regional Ecological Linkages Technical Report. Western Australian Local Government Association (WALGA) and Department of Environment and Conservation (DEC), Perth. Available at: https://www.researchgate.net/profile/Shaun_Molloy/publication/282738998_South_West_Regional_Ecological_Linkages_Technical_Report/links/561b1be808ae044edbb2106b/South-West-Regional-Ecological-Linkages-Technical-Report.pdf?origin=publication_detail

Moreno-Mateos, D., Maris, V., Béchet, A., Currane, M., (2015) *The true loss caused by biodiversity offsets*. Biological Conservation 192, 552–559. Available from: https://doi.org/10.1016/j.biocon.2015.08.016

National Environmental Protection Council (1998; as revised) *National Environmental Protection Measure for Ambient Air Quality*. June 1998. National Environmental Protection Council, Canberra. Available from: http://nepc.gov.au/nepms/ambient-air-quality

National Environmental Science Program Threatened Species Research Hub (2019) *Threatened Species Strategy Year 3 Scorecard – Western Ringtail Possum*. Australian

Government, Canberra. Available from: http://www.environment.gov.au/biodiversity/threatened/species/20-mammals-by-2020/western-ringtail-possum

Natural Area Consulting (2013) *Tuart Forest Revegetation Management Plan*. January 2013. Report prepared for Department of Health and Department of Finance. Available from: https://www.wacountry.health.wa.gov.au/About-us/Building-projects/Completed-projects/Completed-project---Busselton-Health-Campus

Ogston, G., Beatty, S.J., Morgan, D.L., Pusey, B.J. and Lymbery, A.J. (2016) *Living on burrowed time: Aestivating fishes in south-western Australia face extinction due to climate change*. Biological Conservation, March 2016, 195:235-244. Available from: https://doi.org/10.1016/j.biocon.2016.01.008

Pepe, A.G. (2018) *Lifespan and functionality of mycorrhizal fungal mycelium are uncoupled from host plant lifespan*. Sci Rep 8, 10235. Available from: https://doi.org/10.1038/s41598-018-28354-5

Revitalising Geographe Waterways (2018) *Five Mile Brook*. Department of Water and Environmental Regulation and Department of Primary Industries and Regional Development, Perth, Western Australia. Available from: https://rgw.dwer.wa.gov.au/geographe-waterways/five-mile-brook/

Richards, B.S. (2016) *Do environmental offsets deliver for Carnaby's cockatoos?* Honours Thesis. University of Western Australia. Synopsis available from: https://terrestrialecosystems.com/do-environmental-offsets-deliver-for-carnabys-cockatoo/

Rycken, S.J.E. (2019) M*ovement ecology of the three species of threatened black cockatoo (Calyptorhynchus latirostris, Calyptorhynchus baudinii, Calyptorhynchus banksii naso) endemic to Western Australia: Implications for the species' conservation management.* PhD thesis, Murdoch University. Available from: https://researchrepository.murdoch.edu.au/id/eprint/55805/

Samuel, Prof. G. (AC) (2020) *The independent review of the Environment Protection and Biodiversity Conservation Act 1999*. Final Report, October 2020. Australian Government. Available from: https://epbcactreview.environment.gov.au/

Shedley, E. and Williams, K. (2014) *An assessment of habitat for western ringtail possum on the southern Swan Coastal Plain*. Report prepared for the Department of Parks and Wildlife, Bunbury, Western Australia. Available from: https://www.dpaw.wa.gov.au/images/shedley_and_williams_2014_an_assessment_of_habitat_for_western_ringtail_possum_on_the_southern_swan_coastal_plain_-_binningup_to_dunsborough._department_of_parks_and_wildlife.pdf

Shire of Capel (2021a) Ordinary Council Meeting resolution 226 of 2021. Available from: https://www.capel.wa.gov.au/about/council/meetings/agenda-minutes/previous/

Shire of Capel (2021b) Ordinary Council Meeting resolution 119 of 2021. Available from: https://www.capel.wa.gov.au/about/council/meetings/agenda-minutes/previous/

Shire of Capel (2020) Ordinary Council Meeting on 25/11/20, Ordinary Council Meeting resolution 241 of 2020. Available from: https://www.capel.wa.gov.au/about/council/meetings/agenda-minutes/previous/

Shire of Capel (2019a) *Ordinary Council meeting, Wednesday 27 November 2019, Minutes*. Shire of Capel Ordinary Council meeting minutes, 27/11/19. Available from: https://www.capel.wa.gov.au/about/council/meetings/agenda-minutes/previous/

Shire of Capel (2019b) Special Council Meeting resolutions 185 and 186 of 2019. Available from: https://www.capel.wa.gov.au/about/council/meetings/agenda-minutes/previous/

Sinclair Knight Merz (2003) *Aggregated Emissions Inventory of NPI Substances for the Bunbury Regional Airshed.* Emission estimation report, 28/10/03. Department of Environmental Protection, Perth, Western Australia. Available from: http://npi.gov.au/system/files/resources/475cb254-629e-8ae4-edf7-14dbd7a01ac3/files/bunbury-airshed.pdfSouth West Aboriginal Land and Sea Council (2019) *Transition Program: Central Services Corporation 2019*. Available from: https://www.noongar.org.au/central-services-corporation

South West Catchments Council (2021) *Wildlife Assistance and Rehabilitation Database*. South West Catchments Council and National Landcare Program. Available from: https://ward.swccnrm.org.au/

Standards Australia (2005) *AS/NZS 1158.0:2005 Lighting for roads and public spaces - Introduction*. Available from: https://infostore.saiglobal.com/en-au/Standards/AS-NZS-1158-0-2005-117848_SAIG_AS_AS_246756/

Standards Reference Group SERA (2021) *National Standards for the Practice of Ecological Restoration in Australia*. Edition 2.2, September 2021. Society for Ecological Restoration Australasia. Available from: www.seraustralasia.org

Terrestrial Ecosystems (2016) *Environmental Offsets in WA −Are We Getting Value for Money and Can We Do it Better?* Terrestrial Ecosystems. Available from: https://terrestrialecosystems.com/environmental-offsets-in-wa-are-we-getting-value-for-money-and-can-we-do-it-better/

The Conversation AU (2021) *To fix Australia's environment laws, wildlife experts call for these four changes – all are crucial*. Professor Graeme Samuel, University of Queensland, on the EPBC Act. The Conversation, Environment and Energy, 03/02/21. Available from: https://theconversation.com/to-fix-australias-environment-laws-wildlife-experts-call-for-these-4-changes-all-are-crucial-154273

Threatened Species Scientific Committee (2018a) *Conservation Advice Calyptorhynchus baudinii Baudin's cockatoo*. Department of the Environment and Energy, Canberra. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/769-conservation-advice-15022018.pdf

Threatened Species Scientific Committee (2018b) *Conservation Advice Galaxiella nigrostriatal black-stripe minnow*. Department of the Environment and Energy, Canberra. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/88677-conservation-advice-11052018.pdf

Threatened Species Scientific Committee (2018c) *Conservation Advice Pseudocheirus occidentalis Western ringtail possum*. Department of the Environment and Energy, Canberra. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/25911-conservation-advice-11052018.pdf

Stream Environment and Water (2021) *Flora and vegetation survey of Lot 156 Marchetti Road Gelorup*. 09/03/21. Report prepared for Main Roads Western Australia.

Vitousek, P.M., Mooney, H.A., Lubchenco, J. and Melillo, J.M. (1997) *Human domination of Earth's ecosystems*. Science: 277, 494–499. Available from: https://www.science.org/doi/10.1126/science.277.5325.494

Western Australian Herbarium (1998–) *Florabase—the Western Australian Flora*. Department of Biodiversity, Conservation and Attractions. Available from: https://florabase.dpaw.wa.gov.au/

Western Australian Planning Commission and Department of Planning, Lands and Heritage (2018) *Greater Bunbury Region Scheme Strategic Minerals and Basic Raw Materials Resource Policy 2018*. October 2018. Available from: State of Western Australia. https://www.wa.gov.au/system/files/2021-06/POL-GBRS-Strategic-minerals-and-basic-raw-materials-policy.pdf

Western Australian Planning Commission (2021) *State Planning Policy 2.4 Planning for Basic Raw Materials*. State Planning Policy 2.4 prepared under section 26 of the *Planning and Development Act 2005*, July 2021. Government of Western Australia. Available at: https://www.wa.gov.au/government/publications/state-planning-policy-24-basic-raw-materials

Western Australian Planning Commission (2019) *State Planning Policy 5.4 Road and Rail Transport Noise and Freight Considerations in Land Use Planning*. Prepared under section 26 of the *Planning and Development Act 2005*, September 2019. Government of Western Australia. Available at: https://www.wa.gov.au/government/publications/state-planning-policy-54-road-and-rail-noise

Wetland Research & Monitoring (2020) *Bunbury Outer Ring Road Southern Investigation Area: Targeted Conservation Significant Aquatic Fauna Survey – August 2019 sampling final report*. March 2020. Report prepared for BORR IPT.

Woinarski, J.C.Z, Braby, M.F., Burbidge, A.A., Coates, D., Garnette, S.T., Fensham, R.J., Legge, S.M., McKenzie, N.L., Silcock, J.L. and Murphy, B.P. (2019) *Reading the black book: The number, timing, distribution and causes of listed extinctions in Australia*. Biological Conservation, 06/11/19, 239: 108261. Available from: https://doi.org/10.1016/j.biocon.2019.108261

Woinarski J.C.Z, Burbidge A.A. and Harrison P.L. (2014) *The 2012 action plan for Australian mammals*. CSIRO publishing.

World Health Organisation (2021a) *Household air pollution and health*. 22/09/21. World Health Organization, Geneva. Available from: https://www.who.int/news-room/fact-sheets/detail/household-air-pollution-and-health

World Health Organisation (2021b) *WHO global air quality guidelines: particulate matter (PM2.5 and PM10), ozone, nitrogen dioxide, sulfur dioxide and carbon monoxide*. WHO global air quality guidelines, 22/09/21. World Health Organization, Geneva. Available from: https://www.who.int/publications/i/item/9789240034228?ua=1

World Health Organisation (2011) *Burden of disease from environmental noise - Quantification of healthy life years lost in Europe*. 07/07/11. World Health Organization, Geneva. Available from: https://www.who.int/publications/i/item/burden-of-disease-from-environmental-noise-quantification-of-healthy-life-years-lost-in-europe

Yokochi, K., Kennington, W.J. and Bencini, R. (2016) *An Endangered Arboreal Specialist, the Western Ringtail Possum (*Pseudocheirus occidentalis*), Shows a Greater Genetic Divergence across a Narrow Artificial Waterway than a Major Road*. January 2019. PLoS

One January 2016, 11(1): e0146167.
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4718518/

Appendix 1 Appeal process

The EPA's report was published under section 44(3) of the EP Act on 19 October 2021.

By section 100(1)(d) of the EP Act, any person who disagrees with the content of, or recommendation in, a report of the EPA under section 44 may lodge an appeal with the Minister for Environment (the Minister) within 21 days of the date the report is published. By the closing date of appeals on 15 November 2021, a total of 170 appeals were received.

The Minister assesses the merits of a decision

Environmental appeals follow a merits-based process. This means the Minister can consider all the relevant facts, legislation and policy aspects of the decision and decide whether it was correct and preferable.

For appeals in relation to an EPA report and recommendations, the Appeals Convenor normally considers the environmental merits of the assessment by the EPA, based on objectives as set by the EPA as well as other environmental factors. The appeals process considers environmental significance, additional information not considered by the EPA, technical errors and attainment of policy objectives

The Minister has three options in dealing with appeals against a report of the EPA:

- dismiss the appeals (section 101(1)(a))
- allow the appeals by remitting the proposal to the EPA for further assessment or reassessment (section 101(1)(d)(i))
- allow the appeals by varying the EPA's recommendations by changing the implementation conditions (section 101(1)(d)(ii)).

It is not considered open to the Minister, on appeal, to refuse to approve the proposal, or to alter the proposal by unilaterally relocating it to a different place.

The Minister's decision under section 101(1) is final and without appeal.

We report to the Minister, as does the decision-making authority

On receipt of appeals, the Appeals Convenor requested the EPA to report to the Minister on the issues raised in the appeals under section 106(1)(a) of the EP Act. The proponent was also provided with the details of the appeals and provided an opportunity to respond.

We consulted with all appellants through the appeal investigation, including meetings with appellants representing community groups and/or raising detailed or technical grounds of appeal. We also met with representatives of the proponent.

This report is prepared for the consideration of the Minister under sections 106(1)(d) and 109(3)(b) of the EP Act. In reporting to the Minister, the Appeals Convenor is confined to environmental factors; broader economic, commercial and social factors are relevantly a matter for decision makers under section 45 of the EP Act.[507]

The key documents we reviewed in the appeals investigation are set out in Table 26. A full set of references cited in this report is available in Section 3.12.

[507] *Conservation Council of Western Australia Inc v Hon Stephen Dawson* [2019] WASCA 102 per Buss P and Beech JA at [130].

Table 26 *Key documents reviewed during the appeals investigation*

Document	Date
Submissions received from appellants	Throughout
The EPA's response to the appeals	January 2022
The proponent's response to the appeals: BORR Southern Section – Proponent Response to Appeals on Assessment 1714 (BORR-02-RP-EN-0024, Rev 0)	December 2021
EPA Report 1714	October 2021
The proponent's various referral documents	2019-2021

Appendix 2 List of appellants

1. Mr Peter Murphy
2. Ms Alexis Marsden
3. Dr Ann Ward
4. Mrs Natalie Adams
5. Mrs Jennifer Gates
6. Mrs Leonie Stock
7. Mr Ken Hammond
8. Mrs Lee Simi
9. Mr Erik Simi
10. Mr Mark Choules
11. Mr Ian Spicer
12. Dr Steve Mellett
13. Mr Ian Chapman
14. Ms Lauren Mellett
15. Dr Wilson Lim
16. Ms Imeogen Toomey
17. Prof Hans Lambers
18. Ms Anne Tournay
19. Ms Emma Tournay
20. Ms Claire Tournay
21. Miss Kate Panizza
22. Mr Andrew Williams
23. Mrs Barbara Stone
24. Mr Don Benzie
25. Mrs Shanayra Benzie
26. Mr Craig Henfry
27. Mr Kristian Moore
28. FAWNA Inc.
29. Mrs Becky Snow
30. Dr Julia Hobson
31. Mrs Denise Warren
32. Mrs Jamie Van Egmond
33. Ms Christine Waller
34. Ms Jan Hand
35. Mrs Rhonda Cullen
36. Ms Lyn Mueller
37. Mrs Heather Budiselik
38. Ms Anthea Brown
39. Ms Anne Macpherson
40. Mrs Catherine Bowen
41. Mrs Julie Mills
42. Mr Christopher Stone
43. Mr Brendan Kelly
44. Mr John Reid
45. Ms Leeann Hudson
46. Urban Bushland Council WA Inc
47. Mr Steve Bowen
48. Ms Kaye Handley
49. Ms Wendy Astbury
50. Ms Alison Dyall
51. Mrs Penny Herne
52. Mrs Lynley Juboy
53. Mr Dennis Jetta
54. Dr Eddy Wajon
55. Ms Robyn Walsh
56. Sue Kalab
57. Ms Denelle Kennedy
58. Mr Michael Smith
59. Miss Jennifer Lim
60. Ms Elizabeth Putland
61. Ms Sarah Adams
62. Mr Joshua Noonan
63. Mr Brian Rettinger
64. Prof John A Considine
65. Mr Brian English
66. Miss Emma Bowen
67. Mrs Carmel Simojoki
68. Wildflower Society of Western Australia (Inc.)
69. Mr Darryl Cotton
70. Ms Sue Kemp
71. Mrs Grace Gomme
72. Mr Frank Bear
73. Mrs Charlotte Steed
74. Mr John Spice
75. Mrs Patricia Scott
76. Mr Keith Wilcox
77. Ms Elizabeth Golden
78. Mrs Daphne Wilcox
79. Mr Peter Kerr
80. Mr Michael Noonan
81. Mrs Ethel Noonan
82. Mr Fran Fletcher
83. Mr Christopher Elks
84. Mr Kevin Jones
85. Mrs Sheila Masters
86. Dr Sue Chapman
87. Ms Jessica Chapman
88. Mrs Lucy Worgan
89. Mr Trevor and Christine Lancaster
90. Mr Neil Davies
91. Mr Johnny Prefumo
92. Dr Nathalie Casal
93. Mr Yvonne Goodlad

94. Ms Julia Mateljan
95. Mrs Jenny Dunlop
96. Ms Saibra Twigg
97. Ms Jennifer Catalano
98. Mrs Debrah Lim
99. Mr Brian Andrews
100. Mrs Sylvia Andrews
101. Mrs Genelle Abolis
102. Mr Philip Noonan
103. Mrs Trudi Macqueen
104. Ms Dale Smith
105. Mr Martyn Crook
106. Mr Terry Stone
107. Mr Peter Joyce
108. Mr Kye Twigg
109. Mrs Dianne Dunn
110. Miss Bonny Twigg
111. Mr John Dunn
112. Mr Kayne Beauglehole
113. Mr Beau Vaux
114. Mr Steve Adams
115. Mr Bryn Twigg
116. Ms Melanie Tan
117. Miss Annette Laird
118. Mr Kieran Noonan
119. Mr Justin Raabe
120. Mr Phillip O'Meehan
121. Mr Matthew Lim
122. Mrs Corinna Marsden
123. Ms Dayle Heighway
124. Mr Robert Scott
125. Mrs Ruth Waller
126. Mr Russell Crowe
127. Ms Rachel Hudman
128. Ms Stephanie Crowe
129. Mr Rob Oostryck
130. Mrs Helen Oostryck
131. Friends of the Gelorup Corridor Inc.
132. Ms Jean Sloan
133. Mrs Allison Swan
134. Miss Carly Stone
135. Mrs Jacqueline Hocking
136. Mr Peter Hocking
137. Mrs Maureen and Graham Briggs
138. Ms Terri Sharp
139. Ms Jaya Vaughan
140. Mr John Collingridge
141. Mr Joshua Oostryck
142. South West Catchments Council
143. Mr Michael Tichbon
144. Ms Carmel Boyce
145. Mrs Janette Bradford
146. Mr Julien Bradford
147. Mr Matthew Martin
148. Ms Kala Marshall
149. Ms Kirralee Rose
150. Mr Laurence Gomme
151. Ms Carolyn Bloye
152. Ms Emily Hampson
153. Mr Stuart Tompkins
154. Mr Bret Mills
155. Ms Naomi Cooper
156. Mr Pawel Mrugalski
157. Conservation Council of Western Australia
158. Mrs Kaara Andrew
159. Mr Donald Munro
160. Ms Jacqui Wells
161. Ms Wynn Dorricott
162. Mrs Marie Giorgi
163. Mr David Simojoki
164. Mrs Jennifer Harrison
165. Mr Adrian and Vicki Noonan
166. Mr Richard Deykin
167. Ms Pam Nairn
168. Mrs Donna Brown
169. John Sherwood
170. Glenys Malatesta

Appendix 3 Revised scores for offsets calculations

Table 27 *'Quality' scores for offset calculations – proponent's scores and suggested revised scores*

Site	Environmental value	Start quality		Future quality without offset		Future quality with offset		Rationale
		Proponent	Revised	Proponent	Revised	Proponent	Revised	
Impact site	Western ringtail possum	8	8					Vegetation: Type: marri/ *Eucalyptus* woodland with banksia/ peppermint, marri/ *Eucalyptus* in paddocks and road reserves, *Melaleuca* shrubland/ woodland; Condition: ~42.4% 'good' or better (ranging mainly 'excellent' to 'completely degraded'). Suitability: 'medium' with small portion of 'high'; Importance: 'supporting'; Linkages: to Reserve 23000 ('core') and Manea Park ('supporting'). August, October, December 2019 and February 2020 average: 0.91 individuals/ ha (higher in marri/ *Eucalyptus* woodland).
	Black cockatoos	8	7					Vegetation type and condition as above. Foraging: 43.71 ha 'high' and 21.66 ha 'moderate' quality, evidence of foraging; Roosting: n/a; Breeding (potential): 1,088 trees DBH >500mm (11 hollows). Carnaby's cockatoos observed (flock 5 individuals), nearby forest red-tailed black cockatoos and unidentified white-tailed black cockatoos observed. On review of the scores for Offsets 1, 2 and 3 as relevant to black cockatoos, we consider the impact site should be attributed a lower 'quality' value.
	Banksia Woodlands TEC	7	7					The proponent's *Vegetation and Flora Study* indicates that occurrences of the Banksia Woodlands TEC within the development envelope are generally in 'excellent' to 'degraded' condition (with about half in 'good' or better condition).
	Tuart Woodlands TEC	6	6					The proponent's *Vegetation and Flora Study* mapping appears to indicate that occurrences of the Tuart Woodlands TEC within the development envelope are generally in 'good' to 'very good' condition. The proponent contended that only about 0.8 ha (18%) of the 4.5 ha Tuart Woodland TEC is in 'good' or better condition.
Offset 1	Western ringtail possum	8	7	6	6	8	7	Vegetation: Type: jarrah/ banksia woodland, peppermint fringing wetland; Condition: 'very good' with 'good'. Suitability: 'medium' with small portion of 'low'; Importance: 'supporting'; Linkages: adjacent to areas of remnant vegetation. July 2019: 0.65 individuals/ ha and 0.61 individuals/ ha. Using the 'Quality' score for the impact site as a baseline, we suggest that Offset 1 would have a lower 'start quality' score. The proponent's *Offset Strategy* sets out a commitment to managing Offset 1 for 20 years. These activities are expected to maintain current habitat quality for the specified duration and prevent it degrading. On this basis we suggest that the 'future quality with offset' score should be the same as the 'start quality' score.
	Black cockatoos	7 / 8	8	5 / 6	7	8	8	Vegetation type and condition as above. Foraging: 'high' to 'very high' quality, evidence of foraging by Carnaby's cockatoo and forest red-tailed black cockatoo; Roosting: n/a; Breeding (potential): 1,243 trees DBH >500mm (154 hollows; White-tailed black cockatoo calls recorded (two individuals, thought to be Carnaby's). The proponent's *Offset Strategy* indicates that Offset 1 has not been managed to date, yet retains a relatively high 'start quality' score, We suggest that the proponent's view that habitat quality would degrade by 25% over 20 years in the absence of the offset is not justified, and suggest that the 'future quality without offset' score should be higher.
	Banksia Woodlands TEC	8 / 7	8	6 / 5	7	8 / 7	8	Vegetation type and condition as above. Available datasets indicate that the whole of Offset 1 is mapped as the Banksia Woodlands TEC. The proponent's flora and vegetation survey for Offset 1 confirmed that the site contains 124.1 ha of native vegetation consistent with the Banksia Woodlands TEC, in 'very good' to 'excellent' condition. We consider that Offset 1 is of comparable to higher quality compared with the impact area, and suggest the 'start quality' should reflect this. Rationale for 'future quality without offset' as for black cockatoos and 'future quality with offset' as for western ringtail possum.

Site	Environmental value	Start quality		Future quality without offset		Future quality with offset		Rationale
		Proponent	Revised	Proponent	Revised	Proponent	Revised	
Offset 2	Western ringtail possum	8	7	6	6	8	7	Vegetation: Type: jarrah/ marri woodland, jarrah/ peppermint woodland, jarrah/ marri/ banksia woodland, flooded gum (*Eucalyptus rudis*)/ *Astartea*/ *Melaleuca* wetlands; Condition: ~32.8% 'good' or better (ranging mainly 'very good' to 'degraded'). Suitability: 'medium'; Importance: 'supporting'; Linkages: to areas of remnant vegetation, however not well connected regionally. June 2013: observed; August 2018: 0.34 individuals/ ha; July 2019: 0.93 individuals/ ha. Using the 'Quality' score for the impact site as a baseline, we suggest that Offset 2 would have a lower 'start quality' score. The proponent's *Offset Strategy* sets out a commitment to managing Offset 2 for 20 years. These activities are expected to maintain current habitat quality for the specified duration and prevent it degrading. On this basis we suggest that the 'future quality with offset' score should be the same as the 'start quality' score.
	Black cockatoos	8	8	6	7	8	8	Vegetation type and condition as above. Foraging: 'high' quality; Roosting: suitable trees; Breeding (potential): 553 trees DBH >500mm (18 hollows); June 2013: Carnaby's and forest red-tailed black cockatoos observed foraging in marri trees; January 2019: Forest red-tailed black cockatoos observed (flock 5-12 individuals). The proponent's *Offset Strategy* indicates that Offset 2 has not been managed to date, yet retains a relatively high 'start quality' score, We suggest that the proponent's view that habitat quality would degrade by 25% over 20 years in the absence of the offset is not justified, and suggest that the 'future quality without offset' score should be higher.
	ADDITIONAL: Banksia Woodlands TEC	8	7	7	6	8	7	Vegetation type and condition as above. Available datasets indicate that the majority of Offset 2 is mapped as the Banksia Woodlands TEC. Using the 'Quality' score for the impact site as a baseline, we suggest that Offset 2 would have a comparable 'start quality' score as for the impact site. We suggest the 'future quality without offset' is of a similar margin of difference as for other offset sites, and rationale for 'future quality with offset' as for western ringtail possum.
Offset 3	Western ringtail possum	8	8	6	7	8	8	Vegetation: Type: marri/ *Eucalyptus* woodland with banksia/ peppermint, *Melaleuca* woodland; Condition: mainly 'very good' with 'excellent' and 'good' (some lesser condition). Suitability: 'medium' with 'high'; Importance: 'supporting'; Linkages: adjacent to areas of remnant vegetation. February 2021: 1.06 individuals/ ha. The proponent's *Offset Strategy* indicates that Offset 3 has not been managed to date, yet retains a relatively high 'start quality' score, We suggest that the proponent's view that habitat quality would degrade by 25% over 20 years in the absence of the offset is not justified, and suggest that the 'future quality without offset' score should be higher.
	Black cockatoos	8	8	6	7	8	8	Vegetation type and condition as above. Foraging: 'high' quality, evidence of foraging by forest red-tailed black cockatoo; Roosting: five forest red-tailed black cockatoos in marri tree; Breeding (potential): 205 trees DBH >500mm (2 hollows); January 2019: Forest red-tailed black cockatoo observed (flock 5-12 individuals). Rationale for 'future quality without offset' as above.
Offset 4	Western ringtail possum	0	0	0	0	6	6	Vegetation: Type: mapped primarily as Southern River Complex; Condition: n/a. Suitability: n/a; Importance: 'supporting'; Linkages: adjacent to riparian corridor.
Offset 5: Sites 2 and 4	Western ringtail possum	1	0	1	0	6	6	Vegetation: Type: Offset 5: Site 2 mapped as Cokelup Complex, Offset 5: Site 4 mapped as Karrakatta Complex – Central and South; Condition: n/a. Suitability: ~0.3 ha in north-west corner 'medium'; Importance: n/a; Linkages: adjacent to 'supporting'.; Condition: n/a. Suitability: n/a; Importance: n/a; Linkages: adjacent to 'supporting' habitat. Noting that the sites have negligible habitat value for western ringtail possums, and that in the absence of revegetation the sites will likely continue to have negligible value in 20 years we suggest a score of '0' for 'start quality' and 'future quality without offset'.

Site	Environmental value	Start quality		Future quality without offset		Future quality with offset		Rationale
		Proponent	Revised	Proponent	Revised	Proponent	Revised	
Offset 5: Site 12	Western ringtail possum	1	3	1	2	6	6	Vegetation: Type: mapped as Karrakatta Complex – Central and South and Yoongarillup Complex, predominantly tuart trees over minimal native understorey with introduced weed species; Condition: 'degraded'. Habitat suitability: 'high'; Habitat importance: 'core'. January 2019: 1.32 individuals/ ha. The TFNP Management Plan states 'Tree hollows are important across the range of the western ringtail possum. Hollow abundance has been positively correlated with possum abundance in peppermint/ tuart (*Eucalyptus gomphocephala*) associations … and generally constitutes more than 70 per cent of the refuges used by western ringtail possums in the jarrah forest …'. The decision report for Clearing Permit CPS 9168/1 sets out the scores considered by DWER in its assessment of the adequacy of the offsets package for that proposal. In that case, DWER applied consistent 'start quality' and 'future quality without offset' scores of '2', and a 'future quality with offset' score of '6', in relation to western ringtail possums. Under the TFNP Management Plan and habitat suitability mapping, this offset site is broadly comparable with Offset 5: Site 12; however was not included in the distance sampling survey for estimated density, and includes areas that appear to be plantation and were not mapped for habitat suitability. We consider that Offset 5: Site 12 has some value to the species, and higher value than the site for CPS 9168/1 and suggest higher 'start quality' score than applied for CPS 9168/1; however we note that given the current level of weed infestation, there is likely to be further degradation to the vegetation over time in the absence of management which may affect regeneration of understorey species relevant to this environmental value.
	Black cockatoos	1	3	1	2	6	6	Vegetation type and condition as above. Foraging/ Roosting/ Breeding: aerial photography and proponent's *Offset Strategy* indicate presence of mature tuart trees. We consider that Offset 5: Site 12 has some value to the species. Rationale for 'start quality', 'future value without offset' and 'future quality with offset' scores as above.
	ADDITIONAL: Tuart Woodlands TEC	3	3	3	3	7	7	Vegetation type and condition as above. Aerial photography and proponent's *Offset Strategy* indicate presence of mature tuart trees. We consider that Offset 5: Site 12 has value as a degraded occurrence of this TEC. The proponent advised that it has revegetated Tuart Woodlands areas to a '7' condition.
Offset 8	Tuart Woodlands TEC	7	7	5	6	7	7	Available datasets and the proponent's flora and vegetation survey for Offset 8 indicate that about 31.6 ha within the central and eastern portions of the site are mapped as the Tuart Woodlands TEC, predominantly in 'very good' to 'good' condition with small patches in 'excellent' condition. The proponent's *Offset Strategy* indicates that Offset 8 has not been managed to date, yet retains a moderately high 'start quality' score, We suggest that the proponent's view that habitat quality would degrade by around 25% over 20 years in the absence of the offset is not justified, and suggest that the 'future quality without offset' score should be higher.

Table 28 *'Risk of loss' scores for offset calculations – proponent's scores and suggested revised scores*

Site	Environmental value	Future risk of loss without offset		Future risk of loss with offset		Confidence in risk of loss scores		Rationale
		Proponent	Revised	Proponent	Revised	Proponent	Revised	
Offset 1	Western ringtail possum	15	15	5	5	80	100	Noting that the proponent has not provided a rationale for the 80% confidence in 'risk' scores, we suggest a score of '100' should be applied (consistent with the background formulae in the published WA Offsets Calculator).
	Black cockatoos	15	15	5	5	80	100	Rationale for confidence is 'risk' scores as above.
	Banksia Woodlands TEC	15	15	5	5	80	100	Rationale for confidence is 'risk' scores as above.

Site	Environmental value	Future risk of loss without offset		Future risk of loss with offset		Confidence in risk of loss scores		Rationale
		Proponent	Revised	Proponent	Revised	Proponent	Revised	
Offset 2	Western ringtail possum	15	15	5	5	80	100	Rationale for confidence is 'risk' scores as above.
	Black cockatoos	15	15	5	5	80	100	Rationale for confidence is 'risk' scores as above.
	ADDITIONAL: Banksia Woodlands TEC	15	15	5	5	100	100	
Offset 3	Western ringtail possum	15	15	5	5	80	100	Rationale for confidence is 'risk' scores as above.
	Black cockatoos	15	15	5	5	80	100	Rationale for confidence is 'risk' scores as above.
Offset 4	Western ringtail possum	40	0	5	5	80	100	Noting the Commonwealth and State guidance, the proponent's score of '40' implies that there is a 40% chance that the current value of the site as relevant to western ringtail possums would be lost in 20 years in the absence of the offset. Noting that the site has negligible habitat value for the species, we suggest a score of '0' would be appropriate for 'risk of loss without offset'. Rationale for confidence is 'risk' scores as above.
Offset 5: Sites 2 and 4	Western ringtail possum	30	0	5	5	80	100	Rationale for 'future risk of loss without offset' as for Offset 4. Rationale for confidence is 'risk' scores as above.
Offset 5: Site 12	Western ringtail possum	30	5	5	5	80	100	Noting that the site has existing habitat value for western ringtail possums and is already within conservation estate and subject to a management plan (and therefore has a slim chance of being lost – e.g. *Mining Act 1978*), we suggest a score of '5' would be appropriate for 'risk of loss without offset'. Rationale for confidence is 'risk' scores as above.
	Black cockatoos	30	5	5	5	80	100	Rationale for 'future risk of loss without offset' as above (as relevant to black cockatoos). Rationale for confidence is 'risk' scores as above.
	ADDITIONAL: Tuart Woodlands TEC	5	5	0	5	100	100	Noting that the site is already within conservation estate and subject to a management plan (and therefore has a slim chance of being lost – e.g. *Mining Act 1978*), we suggest a score of '5' would be appropriate for 'risk of loss with offset'.
Offset 8	Tuart Woodlands TEC	15	15	5	5	80	100	Rationale for confidence is 'risk' scores as above.