



Colac Pipeline Upgrade

**Final Preliminary Documentation
Response (EPBC 2022/09343)**

Barwon Water

9 November 2023



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Executive Summary

Project background

The Colac Pipeline provides the bulk water supply to the township of Colac, Victoria, from reservoirs in the Otway Ranges. Sections of the pipeline have been progressively replaced in recent years, and remaining sections are subject to progressive replacement and upgrade to maintain a secure water supply for Colac.

The Colac Pipeline Upgrade (the 'proposed action'/the Project) includes the proposed replacement of five sections of the existing Colac Pipeline (approximately 4.3 kilometres (km) in total length). These sections are located within a pipeline corridor in part of the Great Otway National Park and the Otway Forest Park.

GHD Pty Ltd ('GHD') was engaged by Barwon Water to assist with planning and environmental approvals matters for the Project. In accordance with the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), the potential for impacts on Matters of National Environmental Significance (MNES) in the vicinity of the proposed action area necessitated referral of the Project to the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) during 2022. Following the Project being deemed a controlled action, DCCEEW advised that assessment would be via the Preliminary Documentation pathway.

Purpose

This document is the Preliminary Documentation that has been prepared to address DCCEEW's information requests. This document includes several attachments that provide supporting information to adequately address DCCEEW's information requirements.

Scope of the proposed action

The proposed action comprises the Colac Pipeline Upgrade and encompasses all activities associated with the development and operation of the infrastructure. The Colac Pipeline Upgrade project covers the replacement of five high-risk pipeline sections (Sections 19, 20, 21, 23 and 25i) (approximately 4.3 kms in total length) of the existing Colac Pipeline.

Construction activity will be typically contained to a 10-metre wide construction corridor (including ancillary works and access routes). The construction corridor will be generally within the existing pipeline corridor, with isolated widenings at discrete locations for stockpiling of construction materials and safe movements of construction vehicles.

The construction of the pipeline will be primarily 'offline'. The new pipe will be laid in a trench typically 1.2 metres wide (varying up to 4 metres wide at some locations) alongside the existing operational pipeline which must remain in service. In some places along the pipeline alignment, there is an existing redundant and duplicate pipeline. In these areas, the new pipe will replace the redundant pipe in the same alignment via the construction method known as 'lift and relay'. The existing redundant pipe will be removed, and the new pipe laid in the same alignment.

Operational activities during the construction phase of the upgrade will include shutdown and isolation of the existing pipelines to facilitate connection of the new pipeline and recharging of the new main upon successful commissioning.

Operation and maintenance activities after completion of the upgrade will include routine inspections of the pipeline corridor to make sure safe access is maintained, mowing/slashing of the corridor, testing of pipeline fittings and repair of any damaged fittings. More significant maintenance would include repair of a burst in a section of the existing aged pipelines. Such a burst can cause significant damage to the access track and surrounding area, along with major disruption to the Colac water supply. The upgraded pipeline will significantly reduce the risk of bursts in those sections for the life of the new asset.

Impacts

The assessment of potential impacts on MNES was undertaken through a staged approach of:

- Desktop review of search results from the EPBC Act Protected Matters Search Tool (PMST).
- Evaluating the likelihood of occurrence within the proposed action area using the information from an ecological desktop review, flora and fauna surveys, and targeted surveys.
- Undertaking additional targeted surveys on threatened species to meet the requirements of EPBC Act survey guidelines.

Potential impacts to the following MNES that were considered possible or present within the proposed action area were evaluated against each criterion of the EPBC Act Significant Impact Criteria (and assessed using Conservation Advice, where available):

- Gang-gang Cockatoo
- Yellow-bellied Glider
- Long-nosed Potoroo
- Southern Brown Bandicoot
- Spot-tailed Quoll
- Swamp Antechinus.

The potential impacts considered were largely associated with construction activities, and included vegetation and habitat removal, noise and vibration, and potential water quality degradation (erosion and sedimentation). Further consideration was given to both short-term and long-term impacts on large trees and the associated loss of habitat, and how this could impact on relevant MNES.

Ultimately, the pipeline upgrade works are expected to have minimal impact for most EPBC Act listed fauna species identified by this assessment as likely to occur within the proposed action area. However, the Gang-Gang Cockatoo, Yellow-bellied Glider and Long-nosed Potoroo have a greater risk of being impacted.

The Yellow-bellied Glider and Gang-gang Cockatoo are at greater risk as they are both arboreal, hollow-obligate species that rely on trees for feeding, refuge (roosting or den sites) and breeding. Habitat removal and modification is a key impact for both species.

The Long-nosed Potoroo is also at greater risk of impact because of the removal of habitat from an area that is known to support an important population of the species. Therefore, the overall habitat for this population will be reduced by the proposed action.

Table A summarises the potential project impacts and key MNES of concern.

Table A Summary of potential impacts and outcomes of significant impact assessment

Species	Extent of habitat to be removed or modified	Assessment of significance outcome and key justification
Gang-gang Cockatoo	All vegetation within the action area is either foraging, roosting and/or connected habitat (7.31 ha). Removal of up to 16 potential hollow-bearing trees. Removal of habitat that is deemed suitable future breeding habitat (e.g., trees that may develop hollows in the future).	Likely significant impact The proposed action is likely to: <ul style="list-style-type: none"> – Reduce the area of occupancy of the species. – Adversely affect habitat critical to the survival of a species. – Disrupt the breeding cycle of a population. – Interfere with the recovery of the species.

Species	Extent of habitat to be removed or modified	Assessment of significance outcome and key justification
Yellow-bellied Glider	<p>A large portion of vegetation within the action area is considered to be known foraging, potential denning and breeding habitat (5.07 ha).</p> <p>Removal of up to 13 potential hollow-bearing trees.</p> <p>Removal of habitat that is deemed suitable future breeding habitat (e.g., trees that may develop hollows in the future).</p>	<p>Likely significant impact</p> <p>The proposed action is likely to:</p> <ul style="list-style-type: none"> – Reduce the area of occupancy of the species. – Adversely affect habitat critical to the survival of a species. – Disrupt the breeding cycle of a population. – Interfere with the recovery of the species.
Southern Brown Bandicoot	<p>The proposed action will involve the removal of up to 7.81 ha of known and potential habitat largely from the edge habitat (habitat to be removed from the edge of a patch) and does not include large patches of intact habitat. The species is unlikely to permanently occupy these edge areas, which are more likely to form a small component of the overall habitat area they use in the local area.</p>	<p>Unlikely significant impact with the implementation of mitigation measures</p>
Long-nosed Potoroo	<p>The Conservation Advice for the species (DAWE 2022c) lists the Otway Ranges including the Great Otway National Park as an important population for the species. The proposed action will remove or modify up to 7.81 ha of identified and potential habitat from within the proposed action area.</p> <p>The type and extent of habitat for each section to be removed that is relevant to this species is limited to linear strips along the edge of a patch less consisting of dense understorey-midstorey. The habitats within the study area are well represented along the extent of the pipeline corridor and extensive areas of better-quality habitat is located adjacent to the pipeline corridor in the form of remnant forest and woodland, which will be retained. However, the habitat will be permanently modified and, in some places, entirely removed and replaced by habitat unsuitable for the species (e.g., cleared easement) thus reducing the area of habitat.</p>	<p>Likely significant impact</p> <p>The proposed action is likely to:</p> <ul style="list-style-type: none"> – Reduce the area of occupancy of the species.
Swamp Antechinus	<p>The proposed action will involve the removal of up to 7.81 ha of known and potential habitat largely from the edge habitat (habitat to be removed from the edge of a patch) and does not include large patches of intact habitat. The species is unlikely to permanently occupy these edge areas, which are more likely to form a small component of the overall habitat area they use in the local area.</p>	<p>Unlikely significant impact with the implementation of mitigation measures</p>

Species	Extent of habitat to be removed or modified	Assessment of significance outcome and key justification
Spot-tailed Quoll	<p>The proposed action will remove or modify up to 7.81 ha of potential habitat from within the proposed action area.</p> <p>The species most likely uses the proposed action area for hunting. Areas with higher densities of hollow-bearing trees contain potential den sites, although very few logs on the ground with hollows and no rocky outcrops were recorded within the study area or proposed action area hence breeding opportunities within the proposed action area are limited. The study area has been searched and no den sites or latrine sites were recorded. Higher quality and identified habitats for this species (e.g., areas with dense understorey) are located along the lower lying areas of Section 21, within the Porcupine Creek area and most of Section 23, and Section 25i in the Dividing Creek area and south of the creek.</p>	<p>Unlikely significant impact with the implementation of mitigation measures</p>

Mitigation measures

Barwon Water has undertaken steps during planning for the Colac Pipeline Upgrade project to avoid and minimise impacts to vegetation and habitat.

During the design phase, a high-level assessment of re-routing the pipeline (as an alternative to replacing it within the existing corridor) found that this route would likely result in a substantially larger area of significant native vegetation loss when compared to the proposed action area, as it would require construction within uncleared land. Barwon Water has minimised impacts on native vegetation by locating the replacement sections of the pipeline within the existing pipeline corridor and access track, which has already been disturbed and cleared of trees.

The width of the construction corridor has been minimised where possible by identifying areas of native vegetation and fauna habitat along the proposed alignment that should be avoided. No-go zones have been identified to delineate areas to be protected during construction reducing the number of trees lost by 600.

During construction, an arborist will be onsite to assist with delineating No-go zones, to avoid impacts to Tree Protection Zones where possible. It is expected that some additional tree losses would be avoided through this process.

A trench shield will be used during construction, which will reduce the typical trench width from 4 metres to 1.2 metres. This will increase the distance from the edge of the trench to any impacted trees by 1.4 metres on each side of the trench.

A Construction Environmental Management Plan (CEMP) will be developed and implemented for the project to further minimise impacts to areas of ecological value. The CEMP will include measures such as:

- Installation of fencing to protect native vegetation to be retained within No-go zones
- Implementation of sediment control devices near any aquatic habitat and/or waterways (such as silt traps and sediment fencing) measures to prevent contaminants from entering any aquatic habitat or waterways
- Incorporation of weed, disease and pest control measures to prevent the spread of existing and/or introduction of new weeds, diseases or pests to the construction corridor
- Fauna protection measures, including monitoring, reducing vehicle speed limits, construction during daylight hours, and workforce awareness and training
- Trench management including tapered ends to trenches, to be left over overnight to facilitate fauna escape
- Habitat relocation and management, including the placement of removed tree hollows into adjoining habitat and spreading of mulched vegetation of the cleared construction corridor

Ongoing management of the Colac Water Supply Pipeline will continue to include inspection of the pipeline alignment during scheduled works. A clear access path along the pipeline will continue to be maintained for inspection purposes, as has been the case since the pipeline was first constructed. There are no plans to revegetate any area for the purpose of habitat rehabilitation. The ongoing maintenance would also include inspections, weed management and erosion and sediment control maintenance.

Residual impacts

Residual impacts were determined based on the extent to which the potential impacts on MNES could be avoided and minimised through the proposed mitigation measures.

Table B provides a summary of residual impacts on the Gang-gang Cockatoo, Yellow-bellied Glider and Long-nosed Potoroo, which are likely to be significantly impacted by the proposed action, in consideration of:

- The implementation of all pre-construction phase avoidance and minimisation measures
- The extent of impact
- Possible outcomes by implementing construction phase avoidance and minimisation measures

It is not possible to quantify how much (e.g., number of trees or area extent of native vegetation) the proposed construction phase measures will effectively reduce impacts, or if the measures will reduce the impacts to an acceptable level to avoid a significant impact to the three species. The extent of habitat removal quantified in Table B represents the impacts with the implementation of pre-construction measures only, which is adopted as the extent of residual impacts for the proposed action. The possible mitigation effects of construction phase measures are listed but not quantified.

Table B *Extent of residual impacts following implementation of proposed pre-construction mitigation measures (quantified) and construction-phase mitigation measures (listed)*

Species	Extent of habitat to be removed or modified following the implementation of pre-construction measures	Possible reduction of impacts following mitigation measures during construction phase
Gang-gang Cockatoo	<p>All vegetation within the action area is either foraging, roosting and/or connected habitat for this species (7.31 ha).</p> <p>Removal of up to 16 potential hollow-bearing trees (potential breeding habitat).</p> <p>Removal of habitat that is deemed suitable future breeding habitat (e.g., trees identified with currently unsuitable hollows, or trees of suitable diameter without hollows that may develop hollows in the future).</p>	<p>Possible reduction in number of existing hollow-bearing trees that will be removed.</p> <p>Possible reduction in number of future hollow-bearing trees that will be removed.</p> <p>Reduction in area of foraging habitat to be removed.</p>
Yellow-bellied Glider	<p>A large portion of vegetation within the action area is considered to be known foraging, potential denning and breeding habitat (5.07 ha).</p> <p>Removal of up to 13 potential hollow-bearing trees (potential breeding and denning habitat).</p> <p>Removal of habitat that is deemed suitable future breeding habitat (e.g., trees that may develop hollows in the future).</p>	<p>Possible reduction in number of existing hollow-bearing trees that will be removed.</p> <p>Possible reduction in number of future hollow-bearing trees that will be removed.</p> <p>Reduction in area of foraging habitat to be removed.</p>
Long-nosed Potoroo	<p>The proposed action will remove or modify up to 7.81 ha of identified and potential foraging habitat.</p> <p>The type and extent of habitat for each section to be removed is limited to linear strips along the edge of a patch, consisting of dense understorey-midstorey. The habitats within the study area are well represented along the extent of the pipeline corridor and extensive areas of better-quality habitat are located adjacent to the pipeline corridor in the form of remnant forest and woodland, which will be retained. However, the habitat will be permanently modified and, in some places, entirely removed and replaced by habitat unsuitable for the species (e.g., cleared or slashed easement) thus reducing the area of habitat.</p>	<p>Reduction in area of foraging habitat that will be removed.</p>

On this basis, the proposed action is likely to result in an adverse residual significant impact on the Gang-gang Cockatoo, Yellow-bellied Glider and Long-nosed Potoroo.

Offsets

Barwon Water has already obtained environmental offsets for the loss of native vegetation under the Victorian *Guidelines for the removal, destruction or lopping of native vegetation* and FFG Act listed flora and fauna species.

A proposed Offset Strategy has been prepared, which presents a summary of the potential residual impacts and subsequent offset requirements for the Project under Commonwealth legislation, along with the proposed Offset Strategy by which the Project will offset those residual impacts. The Offset Strategy fulfils the requirements of the EPBC Act Environmental Offsets Policy for the proposed action to submit an 'Offset Strategy'.

To provide the offsets to counterbalance the potential residual significant impacts, two offset sites have been identified and form part of the proposed Offset Strategy:

1. Offset site 1 – ██████████ Kwararren.
2. Offset site 2 – 245 Distillery Creek Road, Aireys Inlet.

Public Review

Preliminary documentation was published for a 10-day public comment period between 19 October to 2 November 2023. Barwon Water advertised and invited community and stakeholders to provide feedback on the proposed action via an online submission portal, and public display at the Colac Community Library and Learning Centre and State Library of Victoria. A total of one public submission was received and addressed in the Final Preliminary Documentation (this document), as detailed in Section 12 and Attachment 14. The Final Preliminary Documentation will be submitted for the Commonwealth Minister for the Environment and Water's assessment decision. The Final Preliminary Documentation will be published by Barwon Water for information.

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Attachments

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Attachment 2	Targeted Surveys for Yellow-bellied Glider and Gang-gang Cockatoo – Colac Pipeline Project – Survey Report (Revised)
Attachment 3	Colac Otway Shire planning permit PP259/2021-1, 2 August 2022
Attachment 4	Map of Eastern Maar Native Title claim area
Attachment 5	Cultural Heritage Management Plan (CHMP) 16600, 8 February 2022 (provided to DCCEE; redacted from the public version of this report due to cultural sensitivities)
Attachment 6	Ecological Impact Report (GHD, 2021)
Attachment 7	Greater Glider memo (GHD, 2022)
Attachment 8	Proposed Offset Site [REDACTED] Kawarren – Targeted fauna and vegetation survey report (GHD, 2023)
Attachment 9	Proposed Offset Site 245 Distillery Creek Road, Aireys Inlet – Targeted fauna and vegetation survey report (GHD, 2023)
Attachment 10	Offset Strategy for the Colac Pipeline Upgrade Project
Attachment 11	Proposed Offset Site [REDACTED] Kawarren – Offset Management Plan
Attachment 12	Proposed Offset Site 245 Distillery Creek Road, Aireys Inlet – Offset Management Plan
Attachment 13	Barwon Water environmental policy

1. Introduction

The Colac Pipeline provides the bulk water supply to the township of Colac, Victoria, from reservoirs in the Otway Ranges (Figure 1). Sections of the pipeline have been progressively replaced in recent years, and remaining sections are subject to progressive replacement and upgrade to maintain a secure water supply for Colac.

The Colac Pipeline Upgrade (the 'proposed action'/the Project) includes the proposed replacement of five sections of the existing Colac Pipeline (approximately 4.3 kilometres (km) in total length). These sections are located within a pipeline corridor in part of the Great Otway National Park and the Otway Forest Park (Figure 2).

GHD Pty Ltd ('GHD') was engaged by Barwon Water (the proponent) to assist with planning and environmental approvals matters for the Project. In accordance with the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), the potential for impacts on Matters of National Environmental Significance (MNES) in the vicinity of the proposed action area necessitated referral of the Project to the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) during 2022. Following the Project being deemed a controlled action, DCCEEW advised that assessment would be via the Preliminary Documentation pathway.

1.1 Report purpose

The purpose of the Preliminary Documentation Response (this report) is to address DCCEEW's post-referral request for further information (EPBC ref: 2022/09343, dated 31 January 2023) and to present an overarching summary of documentation submitted as part of the referral (including the Project Self-Assessment Report and ecological reports), as well as new information where applicable (including offset planning).

1.2 Report structure and content

This report includes:

- A description of the proposed action (Chapter 2)
- A description of the environment in the vicinity of the proposed action area, including MNES (Chapter 3)
- Assessment of potential impacts on relevant MNES (Chapter 4)
- Proposed impact avoidance and mitigation measures (Chapter 5)
- Assessment of residual impacts after mitigation, and proposed offsets (Chapter 6)
- Other relevant Project approvals and conditions (Chapter 7)
- Assessment of relevant social and economic matters (Chapter 8)
- Barwon Water's environmental record (Chapter 9)
- Consideration of ecologically sustainable development (Chapter 10)
- Conclusion, submissions, glossary, key information sources and references (Chapters 11 to 15)

The report is supported by attachments as listed in Table 1.

Table 1 Attachments

Attachment No.	Title	Reference	Description	Provided with Referral? / Notes
1	Colac Pipeline Upgrade – EPBC Self-Assessment Report	GHD, 2022a	Report presenting methods and findings of a proponent 'self-assessment' of the likelihood of significant impacts to MNES as a result of the action, identifying opportunities to avoid and minimise impacts, and identifying residual impacts associated with the proposed action	Yes. No change since referral Note that some information in Attachment 1 has been superseded by information in the Preliminary Documentation Response (this report)

Attachment No.	Title	Reference	Description	Provided with Referral? / Notes
2	Targeted Surveys for Yellow-bellied Glider and Gang-gang Cockatoo – Colac Pipeline Project – Survey Report (Revised)	GHD, 2023a	Report presenting methods and results for targeted surveys of Yellow-bellied Glider and Gang-gang Cockatoo, which were listed under the EPBC Act subsequent to earlier ecological assessments undertaken for the proposed action	Yes, however, Attachment 2 is a revised (current) version of the report that was provided with the referral
3	Colac Otway Shire planning permit PP259/2021-1, 2 August 2022	Colac Otway Shire Council, 2022	Approved local government planning permit for the proposed action	Yes. No change since referral
4	Map of Eastern Maar Native Title claim area		Map of Eastern Maar Native Title claim area, which overlaps the action area	Yes. No change since referral
5	Colac Pipeline Upgrade, Great Otway National Park, Barongarook, Kawarren and Barramunga – Cultural Heritage Management Plan (CHMP) 16600	Biosis, 2022	Approved Cultural Heritage Management Plan for the proposed action	Yes. No change since referral Provided in full to DCCEEW; redacted from the public version of this report due to cultural sensitivities
6	Ecological Impact Report	GHD, 2021	Report describing ecological (flora and fauna) investigations of the action area up to 2021, including site assessment methods and findings, and ecological impact assessment	Yes. No change since referral Note that some information in Attachment 6 has been superseded or updated by information in the Preliminary Documentation Response (this report) and other attachments
7	Greater Glider memo	GHD, 2022b	The Greater Glider is unlikely to occur within the action area; however, this species is addressed in a separate attachment due to changes in modelled distribution subsequent to the original ecological assessment work	Yes. No change since referral
8	Proposed Offset Site [REDACTED] Kawarren – Targeted fauna and vegetation survey report	GHD, 2023b	Report presenting methods and results of targeted fauna and habitat surveys for a proposed offset property at Kawarren, to understand the value of the site and its potential to meet offset requirements for the EPBC-listed Yellow-bellied Glider, Gang-gang Cockatoo and Long-nosed Potoroo	No
9	Proposed Offset Site 245 Distillery Creek Road, Aireys Inlet – Targeted fauna and vegetation survey report	GHD, 2023c	Report presenting methods and results of targeted fauna and habitat surveys for a proposed offset property at Aireys Inlet, to understand the value of the site and its potential to meet offset requirements for the EPBC-listed Long-nosed Potoroo	No

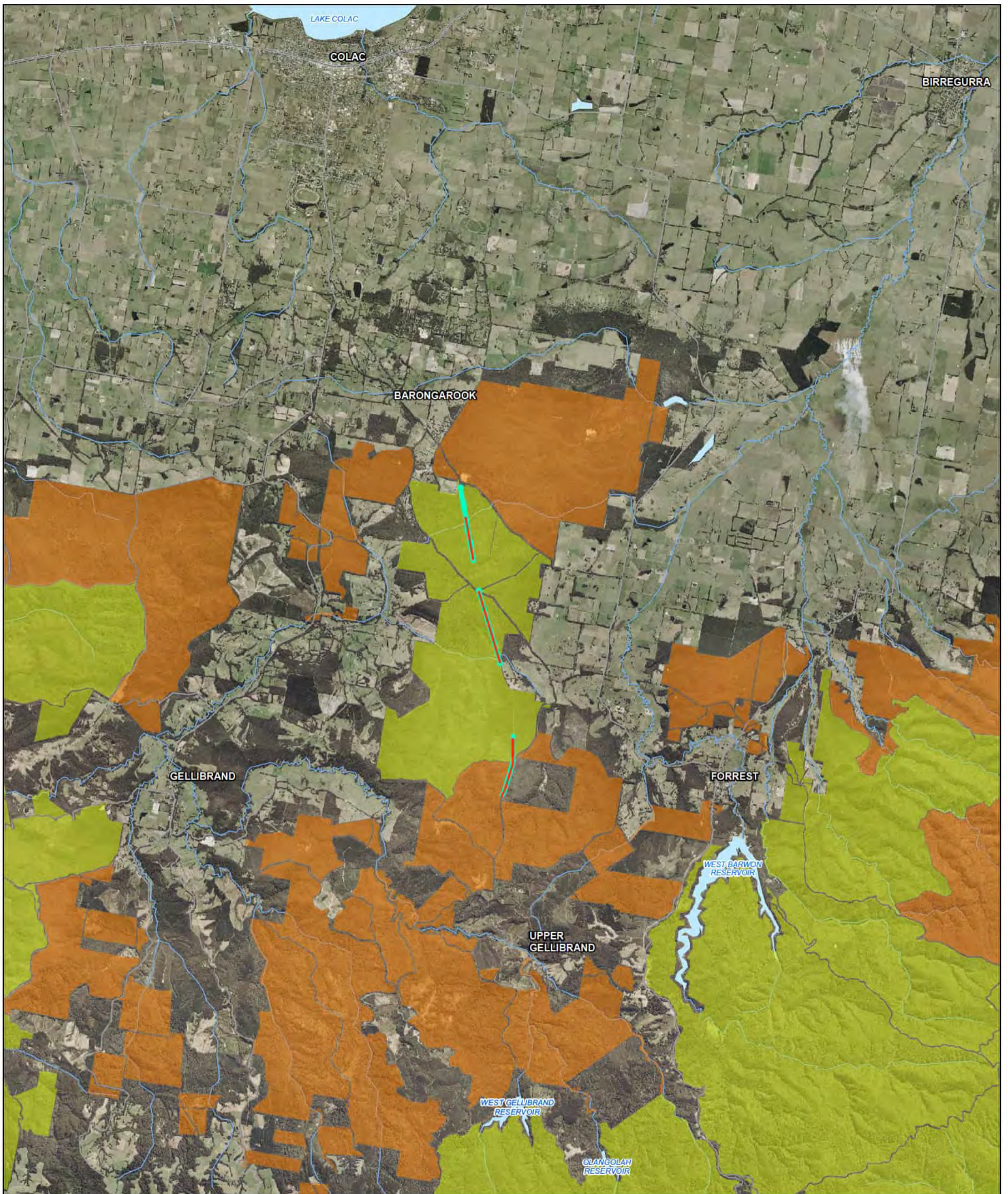
Attachment No.	Title	Reference	Description	Provided with Referral? / Notes
10	Offset Strategy for the Colac Pipeline Upgrade Project	GHD, 2023d	An offset strategy report providing details of the offset package proposed to compensate for residual impacts to MNES as a result of the proposed action, to demonstrate compliance with DCCEEW's documentation requirements	No
11	Proposed Offset Site [REDACTED] Kawarren – Offset Management Plan	Biosis, 2023	An offset management plan to address offset suitability and offset implementation (securing, maintaining and/or improving habitat) for the Yellow-bellied Glider and Gang-gang Cockatoo within the proposed offset site at Kawarren	No
12	Proposed Offset Site 245 Distillery Creek Road, Aireys Inlet – Offset Management Plan	Abzeco, 2023	An offset management plan to address offset suitability and offset implementation (securing, maintaining and/or improving habitat) for the Long-nosed Potoroo at the proposed offset site at Airey's Inlet	No
13	Barwon Water environmental policy	Barwon Water	Barwon Water environmental policy	Yes. No change since referral
14	Submission from Member of the Public		Preliminary Documentation, with all associated attachments, were publicly displayed for 10 days. One submission was received.	No

1.3 Scope and Limitations

This report has been prepared by GHD for Barwon Water for the purpose agreed between GHD and Barwon Water as set out in Section 1 of this report. This report may only be used and relied upon by Barwon Water and DCCEEW, and to the extent permitted by law GHD otherwise disclaims responsibility to any other third party arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.



LEGEND

- Freeway & highway
- Major road
- River
- Water body
- Construction Corridor
- Great Otway National Park
- Otway Forest Park
- Proposed pipeline alignment

Paper Size A3
0 0.5 1 2 3
Kilometers



Barwon Water
Colac Pipeline Upgrade

Job Number 31-37032
Revision C
Date 31 May 2023

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 54

Regional context of the proposed action **Figure 1**

180 Lonsdale Street Melbourne VIC 3000 Australia

W www.ghd.com

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Data source: Created by [redacted]



— Collector	Construction Corridor	No ground works or vegetation impacted. Used for access only along existing track.	Great Otway National Park	Proposed pipeline alignment	— Section 20
— River	Parcel	Access Routes	Otway Forest Park		— Section 21
— Stream					— Section 23
— Drain/Channel/...					— Section 25(i)
					— Section 19

Paper Size A3
 0 0.175 0.35 0.7 1.05
 Kilometers
 Map Projection: Transverse Mercator
 Horizontal Datum: GDA 1994
 Grid: GDA 1994 MGA Zone 54



Barwon Water
 Colac Pipeline Upgrade

Job Number 31-37032
 Revision F
 Date 29 Aug 2023

Local context of the proposed action

Figure 2

© 2023. Whilst every care has been taken to prepare this map, GHD (and DATA CUSTODIAN) make no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and cannot accept liability and responsibility of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and/or costs (including indirect or consequential damages) which are or may be incurred by any party as a result of the map being inaccurate, incomplete or unsuitable in any way and for any reason. Data source: DEECA 2023, VicMap, 2023, Aerial Imagery, Vicmap Basemap - Vicgrid Basemap - VicGrid04 - Aerial Data Custodian, Data Set Name/Title, Version/Date. Created by [redacted]

2. Description of the Action

2.1 Background

The existing Colac Pipeline transfers water from the West Gellibrand and Olangolah Reservoirs in the Otway Ranges to supply the greater Colac township and surrounding areas. The pipeline is approximately 28 km long and is located in the Great Otway National Park, Otway Forest Park, road reserves and private property.

The Colac Pipeline is more than 70 years old (Barwon Water, 2017), and current and projected failure rates of the pipeline with associated supply interruptions pose an unacceptable risk to the essential supply of water to the Colac area. As such, sections of the pipeline are subject to future progressive replacement and upgrade in stages.

Barwon Water has identified the need to replace the most critical sections of the existing Colac Pipeline as soon as possible to provide an ongoing and improved secure water supply for Colac.

Further information on Project, justification is provided in section 8.2 of this report.

2.2 Referred Proposed Action and Location

The proposed action comprises the Colac Pipeline Upgrade (the Project) and encompasses all activities associated with the development and operation of the infrastructure. The Project covers the replacement of five high-risk pipeline sections (Sections 19, 20, 21, 23 and 25i) of the existing Colac Pipeline (see Figure 1). The Project forms part of a larger Barwon Water program to replace the existing pipeline with a single 600 millimetre (mm) main (nominal) to maintain water security for Colac.

The referred proposed action involved the replacement of approximately 5 km of total pipeline length. Since referral, the replacement of pipeline section 25i has been shortened, revising the total pipeline length to 4.3 km. This is further discussed in section 2.3.

The northernmost point of the proposed action area is some 12 km south-southeast of Colac, Victoria, while the southernmost point is some 6 km west of Forrest. The sections of the existing Colac Pipeline that are to be replaced are in road reserve adjacent to the Otway Forest Park (approximately 1 km of pipeline) and in the Great Otway National Park (approximately 4 km of pipeline).

The pipeline replacement works are proposed to occur across multiple parcels of mainly Crown Land. Specific street addresses are not available; however, the following locations may assist in map searching (see Figure 2):

- Pipeline Road, Barongarook VIC 3249
- Colac-Olangolah Pipeline Track, Kwararren VIC 3249
- Pipeline Road, Kwararren VIC 3249

Table 2 summarises the titles and Crown folio statements for each parcel intersected as part of the pipeline upgrade works. A number of parcels are designated as 'Government Road' and do not have titles and Crown folio statements (parcel numbers 7, 14, 15 and 16).

The Colac Pipeline is located within a mostly slashed pipeline corridor which contains a gravel access track (Pipeline Road) for Barwon Water operational access. This existing corridor varies in width from 5 to 12 metres (m) wide, including the track. In addition to being used by Barwon Water, the access track is used by Parks Victoria, and sections of it are also publicly accessible.

Table 2 Land title details

No.	Standard Parcel Identifier	Lot or Crown allotment/ Section/Parish	Crown land administrator/ Landholder	Reservation
1	2\PS503347	Crown Allotment 2, Parish of Yaugher	Private ownership	
2	2001\PP2079	Crown Allotment 2001, Parish of Barongarook	Parks Victoria	

No.	Standard Parcel Identifier	Lot or Crown allotment/ Section/Parish	Crown land administrator/ Landholder	Reservation
3	2006\PP2079	Crown Allotment 2006, Parish of Barongarook		Permanent National Park – Great Otway National Park (GONP)
4	2007\PP2079	Crown Allotment 2007, Parish of Barongarook		
5	2031\PP3978	Crown Allotment 2031, Parish of Yaughter	Parks Victoria	Permanent National Park – Great Otway National Park (GONP)
6	2035\PP3978	Crown Allotment 2035, Parish of Yaughter		
7	2039\PP2079	Crown Allotment 2039, Parish of Barongarook		
8	36~A\PP3978	Crown Allotment 36, Section A, Parish of Yaughter	Department of Energy, Environment and Climate Action (DEECA)	Permanent – Otway Forest Park
9	38~A\PP3978	Crown Allotment 38, Section A, Parish of Yaughter	Parks Victoria	Permanent National Park – GONP
10	38A~A\PP3978	Crown Allotment 38A, Section A, Parish of Yaughter.	DEECA	
11	52D\PP2647	Crown Allotment 52D, Parish of Gerangamete	Parks Victoria	Permanent National Park – GONP
12	63A\PP2079	Crown Allotment 63A, Parish of Barongarook		
13	No ID (next to 2035\PP3978)	NA		
14	No ID (next to 2039\PP2079 and 2001\PP2079)	NA		
15	No ID (next to 36~A\PP3978 and 9~A\PP3978)	NA		

2.2.1 Pre-construction

Actions which have been or will be undertaken prior to construction commencement include:

- A planning permit has been obtained from the Colac Otway Shire (August 2022, see Attachment 3)
- Consent will be obtained by Barwon Water from Parks Victoria in accordance with Section 27 of the Victorian *National Parks Act 1975*, which relates to works by a public authority in a national park
- A Construction Environmental Management Plan (CEMP) will be prepared by the construction contractor to address matters including Conditions 4, 5, 11, 17 and 18 of the approved planning permit (including but not limited to erosion and sediment controls, chemical management, vegetation and fauna management, and weed and disease management). The CEMP will be reviewed and signed off by Barwon Water, prior to approval by both DEECA (regarding ecological aspects), Colac Otway Shire and Parks Victoria.
- A Site Environmental Plan (SEP) will be prepared by the construction contractor according to Barwon Water specifications. This will consist of an aerial image of the works area, identifying proposed environmental controls, location of site sheds, spill kits, etc., and a summary page of controls from the CEMP.
- A Traffic Management Plan (TMP) will be prepared by the construction contractor in accordance with Condition 6 of the planning permit, and to the satisfaction of Colac Otway Shire

- Vegetation to be removed and retained will be clearly demarcated on site prior to commencement of works (Condition 7)
- Native vegetation offsets have been secured in accordance with Conditions 12 to 14 of the planning permit, with evidence provided to the satisfaction of Colac Otway Shire
- Offsets relating to MNES will be secured using the process outlined in the DCCEEW guidance – *Environment Offset Policy* (DSEWPaC 2012) and in Attachment 10: Offset Strategy for the Colac Pipeline Upgrade Project (GHD, 2023d)
- A ‘works within road reserve permit’ will be obtained prior to any works being undertaken on council-managed road reserves within the Colac Otway Shire
- An ‘Asset Protection Permit’ with regards to council infrastructure will be obtained from Colac Otway Shire at least seven prior to commencement of works
- A ‘permit to take protected flora’ will be obtained from DEECA as per requirements of the *Flora and Fauna Guarantee Act 1988* (FFG Act), prior to commencement of works
- The Preliminary Documentation process will be completed in accordance with the requirements of DCCEEW, the EPBC Act, and associated regulations/guidelines/policy requirement. Ministerial approval of the controlled action will be obtained prior to commencement of works.
- Further community engagement, including (see also Section 8.1):
 - Updates to be provided to site neighbours and nearby residents prior to construction and regularly throughout the construction phase with regards to construction timeframes, potential traffic and noise impacts, as well as alternative access to their properties if required
 - Broader community engagement to inform local residents, businesses, and community groups about the Project, environmental assessments undertaken and mitigation measures proposed
 - Inviting public comments on Preliminary Documentation over a minimum 10-day period as part of the EPBC Act assessment process

2.2.2 Construction

The total action area (proposed development footprint or Project area) is 11.48 ha, comprising the extent within which proposed permanent and temporary project activities will occur, including vegetation clearing, pipeline trenching, construction laydown areas, No-go zones, access roads and intersections within the construction corridor. No-go zones comprise 3.13 ha of the development footprint. The majority of the development footprint is a 10 m-wide construction corridor throughout the 4.3 km length of the proposed pipeline upgrade.

The development footprint includes a disturbance footprint of 7.81 ha, which equates to the area of proposed native vegetation removal. This includes 0.151 ha of native vegetation previously removed as part of the geotechnical investigation stage.

The native vegetation removal area (7.81 ha) is a worst-case scenario estimate based on a maximum trench width of 4.0 m. By using trench shields to minimise trench width (typically to 1.2 m) and implementation of mitigation measures (outlined in section 5), the total disturbance footprint and vegetation removal area are likely to be reduced.

The construction of the pipeline will be primarily ‘offline’. Sections of new pipe will be laid in a trench alongside the existing operational pipeline, which must remain in service during construction. In some places along the pipeline alignment, there is an existing redundant and duplicate pipeline. In these areas, new pipe will replace the redundant pipe in the same alignment via a ‘lift and relay’ construction method. The existing redundant pipe will be removed, and the new pipe laid in the same alignment. Barwon Water propose to construct the new pipeline as follows:

- 600 mm diameter (nominal) pipeline to be installed via open cut trenching, with short sections of 250 to 375 mm diameter (nominal) pipeline at the connection points to existing pipelines
- In general, the pipeline will be installed at a depth of between 1.8 and 2.0 m (from ground surface to bottom of pipe), with minor increases in depth at discrete locations
- The excavation trench width is typically 1.2 m, with wider excavations required for connections to existing infrastructure, up to a maximum of 4.0 m wide

- No-go zones identified where existing assets or terrain make the cleared verge unsuitable for vehicle access or laydown

Details of the activities associated with construction are provided in Table 3.

Table 3 Construction components

Component	Description												
Sequence of works	<p>The proposed sequencing of works and activities for the Colac Pipeline Upgrade is:</p> <ul style="list-style-type: none"> - Site setup - Survey set-out, service proving (including operational pipeline identification), No-go zone delineation, tree protection zone (TPZ) setup - Clearing of vegetation where applicable; site stripping and stockpiling of topsoil - Excavation - Remove decommissioned pipework (where service clashes exist) - Offline pipeline installation and lift and re-lay construction - Pressure test of completed sections prior to cut-ins - Pipe cut-ins at connection points (most likely to be completed with one shutdown per section, however, this will be confirmed prior to construction) - Final testing and commissioning - Decommissioning of redundant pipe (including blank plating of all decommissioned assets and removal of above ground fixtures) - Reinstatement. <p>It is planned to undertake replacement of the discrete sections sequentially. For each of the three continuous sections (19 to 21, 23, and 25i), the intent is to construct the new pipeline offline to the existing operational asset, complete testing (pressure testing and water quality), and then shut down the existing pipeline for a short duration whilst connections are made from the existing pipelines into the new pipelines at each end of the section. The contractor would then move on to the next section of pipeline and repeat these steps.</p> <p>Currently, subject to weather and other site-specific constraints during construction, scheduling is envisaged as:</p> <ol style="list-style-type: none"> 1. Sections 19 to 21: February 2024 to mid-April 2024 (approximately 2.5 months) 2. Section 25i: mid-April to mid-June 2024 (approximately 2 months) 3. Section 23: mid-June to mid-September 2024 (approximately 3 months). 												
Timing, duration and construction hours	<p>The Project is proposed to commence in early 2024 and conclude in late 2024 (dependent upon the timing of Project approvals and weather conditions). Construction is expected to take approximately eight to nine months.</p> <p>Construction of the pipeline will occur during normal working hours in accordance with Environment Protection Authority (EPA) Victoria guidelines for commercial developments:</p> <ul style="list-style-type: none"> - Monday to Friday 7:00am to 6:00pm - Saturday 7:00am to 1:00pm. <p>An indicative program for the sequence of works and activities follows:</p> <p><i>Table 4 Indicative program for construction sequence and stages</i></p> <table border="1"> <thead> <tr> <th>Construction sequence/ stage</th> <th>Indicative duration</th> <th>Indicative timing (subject to approvals and weather)</th> </tr> </thead> <tbody> <tr> <td>Site setup</td> <td><1 month</td> <td>Feb 2024</td> </tr> <tr> <td>Survey set-out, service proving, No-go zone delineation, tree protection zone (TPZ) setup</td> <td><1 month</td> <td>Feb 2024</td> </tr> <tr> <td>Construction of Sections 19, 20 & 21 (including vegetation clearing, excavation, pipe installation, backfill and commissioning)</td> <td>2 months</td> <td>Mid-Feb 2024 to mid-April 2024</td> </tr> </tbody> </table>	Construction sequence/ stage	Indicative duration	Indicative timing (subject to approvals and weather)	Site setup	<1 month	Feb 2024	Survey set-out, service proving, No-go zone delineation, tree protection zone (TPZ) setup	<1 month	Feb 2024	Construction of Sections 19, 20 & 21 (including vegetation clearing, excavation, pipe installation, backfill and commissioning)	2 months	Mid-Feb 2024 to mid-April 2024
Construction sequence/ stage	Indicative duration	Indicative timing (subject to approvals and weather)											
Site setup	<1 month	Feb 2024											
Survey set-out, service proving, No-go zone delineation, tree protection zone (TPZ) setup	<1 month	Feb 2024											
Construction of Sections 19, 20 & 21 (including vegetation clearing, excavation, pipe installation, backfill and commissioning)	2 months	Mid-Feb 2024 to mid-April 2024											

Component	Description		
	Construction of Section 25i (including vegetation clearing, excavation, pipe installation, backfill and commissioning)	2 months	Mid-April 2024 to mid-June 2024
	Construction of Section 23 (including vegetation clearing, excavation, pipe installation, backfill and commissioning)	3 months	Mid-June 2024 to Mid-Sept 2024
	Demobilisation	<1 month	Sept 2024
Excavation	<p>A 600 mm diameter (nominal) pipeline is to be installed via open cut trenching, with short sections of 250 to 375 mm diameter (nominal) pipeline at the connection points to existing pipelines.</p> <p>In general, the pipeline will be installed between 1.8 and 2.0 m in depth (from ground surface to bottom of pipe), with minor increases in depth at discrete locations. Prior to commencing excavation, the natural topsoil will be stripped for the required width and stockpiled on site for reinstatement at a later date. The excavation trench width will typically be 1.2 m, with wider excavations of up to 4.0 m maximum required at connection locations to existing infrastructure.</p> <p>Once excavated, bedding sand (imported) will be used for embedment of the new pipeline, and the trench will be backfilled up to finished surface level with the <i>in-situ</i> soil that was excavated from the trench. The trench will be compacted and the natural ground level reinstated by respreading stockpiled topsoil.</p>		
Earthworks	No bulk earthworks are required. Earthworks will be limited to trench excavation and backfilling as described above, and reinstatement of the existing access track (where impacted).		
Construction corridor and laydown	<p>Construction activity will be typically contained to a 10-m-wide construction corridor (including ancillary works and access routes) generally within the existing pipeline corridor, with isolated widenings at discrete locations to facilitate stockpiling of construction materials and safe movements of construction vehicles.</p> <p>The proposed laydown area for the Project will be contained within defined construction corridors and/or within existing cleared road reserve at the intersection of Pipeline Road and Link Track.</p>		
Clearing of vegetation	<p>The proposed action will include removal of the modified vegetation in the pipeline corridor and, for some lengths, a small portion of understorey vegetation within the intact remnant vegetation which abuts the pipeline corridor. Trees will also be removed from within the pipeline corridor, and some trees will also be removed from the intact remnant habitat which abuts the pipeline corridor.</p> <p>Despite efforts undertaken to avoid and minimise impacts to native vegetation during the Project (see Section 4.1), 7.81 ha of native vegetation removal will be required for the Project. This includes the previously removed extent of 0.151 ha.</p> <p>No large swathes of vegetation will be removed from a particular area, rather many small portions of vegetation consisting of short and long narrow strips from the mostly cleared easement and into the remnant vegetation along the length of the construction corridor will be removed.</p> <p>An arboricultural assessment (Treelogic, 2021) recorded, measured and mapped a total of 3,483 trees within the construction corridor. Tree impacts were calculated primarily based on whether trees were in the area to be trenched (i.e., with associated impacts due to excavating the trench for the pipe to be laid in), or whether trees were in the broader construction corridor (i.e., with associated impacts due to the activities that could occur within the wider construction corridor such as laydown, stockpiling, vehicle movement and parking). Of the 3,483 trees mapped and assessed, 2,620 trees were determined to be impacted. Of the impacted trees, 215 are large trees and 32 trees contain hollows. See Section 4.2.1 of this report and Attachment 6 (Ecological Impact Report (GHD, 2021), including arborist's report appended to that document) for further detail regarding assessment of native vegetation impacts, including trees.</p>		
Access tracks	For all replacement sections within the scope of this Project, the primary access option is from the pipeline track at the northern end of each section. There are several alternative access options using other tracks, however the condition of these tracks means they will not be suitable for the large trucks and machinery required for construction without significant treatment or upgrades.		
Equipment	Construction equipment to install the new sections of pipeline would typically include excavation equipment and backhoes, pipeline laying and lifting equipment, graders and transport equipment to deliver pipeline sections to the proposed action area. To manage refuelling of earthmoving equipment a temporary refuelling facility will be required on the site, including a bunded storage container, a bunded refuelling station large enough to contain spills whilst refuelling, and spill kits.		

Component	Description
Waste	<p>Works under this Project will include the decommissioning and removal of existing underground services and tie-ins may require the handling and disposal of Asbestos Containing Materials (ACM) in the form of Asbestos Cement Pipes and existing pipe coating. Asbestos handling and disposal shall be undertaken only by licenced asbestos handling contractors in conformance with the <i>Occupational Health and Safety Act 2004</i>, <i>Occupational Health and Safety Regulations 2017</i> (Part 4.3 Asbestos) and relevant asbestos handling compliance codes.</p>
Reinstatement	<p>Reinstatement activities will be undertaken following the construction of the pipeline sections. Where excavation is required for installation of the new pipeline, bedding sand, crushed rock and soil will be used to backfill.</p> <p>The natural ground level and ground contours will be reinstated and compacted to the prior, or better condition upon completion.</p> <p>The access track will be reinstated to its original condition with new crushed rock where required, to ensure it can be used safely by any maintenance staff required to travel along the track during the ongoing operation of the asset.</p> <p>Natural topsoil will be reinstated on top of the disturbed/excavated areas. Erosion control measures (silt fences, rock logs, etc) will be retained temporarily after the completion of works to allow some natural regeneration to establish (contributing to soil stabilisation) before removal.</p> <p>Natural regeneration of vegetation is expected to occur relatively quickly in the context of the proposed action area (surrounding forest and relatively high rainfall).</p> <p>If or where necessary, Barwon Water may sow sterile ryegrass (which does not reproduce or spread) to avoid or mitigate erosion.</p>
Ancillary activities	<p>Operational fittings such as in-line valves, cross-connection valves, air valves, scour valves and cathodic protection anode beds with electrolysis test points will be installed along the pipeline at select locations within the construction corridor.</p> <p>In-line valves and cross-connection valves will be buried with surface covers for access to valve spindles.</p> <p>Air valves will be installed at high points along the pipeline to allow for the automatic release of accumulated air within the pipeline. Air valves will be installed within above ground concrete surrounds which protect the air valves from damage and minimise the risk of accumulated surface water from entering the pipeline.</p> <p>Scour valves will be located at low points along the pipeline to allow for controlled draining of the pipeline if maintenance is required. Scour valves include a buried discharge pit to dissipate energy during draining of the pipeline.</p> <p>Cathodic protection anode beds are required to provide additional corrosion protection to the mild steel sections of the pipeline. The sacrificial anodes will be buried within the pipeline trench. Electrolysis test points provide a means to regularly test the effectiveness of the cathodic protection system. The test points are contained within small pits with surface covers.</p>
Testing and commissioning	<p>For testing and commissioning, once the new section of pipeline has been constructed next to the existing pipeline, blank plates will be fitted to each end of the new section of pipework. The new pipeline will be filled and flushed with water from the existing pipeline to remove any dirt that might have entered the pipe during construction.</p> <p>A pressure test will be conducted in accordance with the Project specification, to confirm the new section of pipeline is free from defects and fit for operations.</p> <p>Following successful flushing and pressure testing, the blank plates will be removed, and shutdowns enacted to allow the pipework for the final connections to be installed. Once connections have been made, valves will be opened to bring the new pipeline into operation.</p> <p>Any surplus water from flushing and pressure-testing activities will be discharged to nearby constructed drains, drainage depressions, or watercourses in a controlled manner in accordance with EPA guidelines. Control measures to prevent erosion will be implemented as required.</p> <p>It is important to note that the sections of the Colac Pipeline to be upgraded are upstream of the Colac water treatment plant. Therefore, any water discharged from the pipeline during construction and commissioning will be derived from the West Gellibrand and/or Olangolah reservoirs and will be equivalent to water found in the surrounding environment. It will not contain additives that can be found in treated drinking water.</p>

2.2.3 Operation and maintenance

Operational activities associated with the existing pipeline during the construction phase of the upgrade will include shutdown and isolation of the existing pipelines to facilitate connection of the new pipeline, followed by recharging of the new main upon successful commissioning.

Operation and maintenance activities after completion of the upgrade will be for the existing pipeline, including routine visual inspections of the pipeline corridor for issues and faults, mowing/slashing of the corridor and maintenance of safe access, testing of pipeline fittings and repair of any damaged fittings.

More significant maintenance would include repair of a burst in a section of the existing aged pipelines. An example of a pipeline burst is shown in Plate 1. Such a burst can cause significant damage to the access track and surrounding area, along with major disruption to the Colac water supply and Colac community (see Plate 1). The upgraded pipeline will significantly reduce the risk of bursts in those sections for the life of the new asset.



Plate 1 Example of a pipeline burst incident on the existing Colac Pipeline

2.3 Changes to the Proposed Action Since Referral

Since Referral of the proposed action on 28 October 2022, two (2) changes to the referred proposed action have occurred. These changes are described below and summarised in Table 5:

1. The previously proposed offsite (external to the pipeline corridor) laydown area will no longer be required. There will be sufficient space within the defined construction corridor and within nearby road reserves to establish laydown areas and construction site amenities.

2. The proposed impact area has been reduced which has reduced the proposed loss of native vegetation and MNES habitat by 1.2 ha. The reduction in the proposed impact area is achieved by shortening the total length of pipeline to be upgraded, by removing approximately 694 m of Section 25i from the referred proposed action (refer Figure 2 and 4). This 694m of pipeline in Section 25i will be added to future stages of the progressive upgrade of the Colac Pipeline, which will undergo separate assessment and statutory approvals. This change does not affect the overall character of the proposed action, nor introduce any additional environmental risks or impacts to EPBC listed species and communities (i.e., the controlling provisions of the controlled action decision). A request for this variation was submitted to DCCEEW on 31 August 2023 and was subsequently approved.

Table 5 Proposed Action Area

Components of the Proposed Action Area	At Referral	Current
Native vegetation removal / MNES habitat within the construction corridor	9.01 ha	7.81 ha
Previously proposed offsite laydown areas (introduced vegetation removal)	0.49 ha	N/A
Subtotal: Disturbance footprint requiring vegetation removal	9.50 ha	7.81 ha
No-go zones (no disturbance proposed)	1.93 ha	3.13 ha
Existing access roads/intersections/unvegetated areas (no vegetation removal proposed)	0.54 ha	0.54 ha
Total action area	11.97 ha	11.48 ha

No other changes or refinements to the proposed action have occurred since Referral.

2.4 Relationship with Existing Reports

This document draws upon information presented in, and should be read in conjunction with, attachments as listed in Section 1.2.

While the majority of documentation submitted as part of the Project referral is unchanged (including the Self-Assessment Report provided as Attachment 1 to this report), the information provided in the referral to assist with determining impacts to the Gang-gang Cockatoo and Yellow-bellied Glider has since been revised (see Attachment 2: Targeted surveys for Yellow-bellied Glider and Gang-Gang Cockatoo – Colac Pipeline Project. Survey report (revised)). This report is a revised version of the targeted survey report submitted as part of the referral and includes all information provided therein, as well as the following:

- Additional information detailing the survey methods and effort used to target the Gang-Gang Cockatoo and Yellow-bellied Glider
- Additional data and discussion of results for the targeted Gang-gang Cockatoo surveys undertaken during the breeding season in November and December 2022 and January 2023
- Revised description of the habitat quality and extent for the Yellow-bellied Glider and Gang-gang Cockatoo within the proposed action area

Furthermore, the information gained from a review of the ecological surveys undertaken as part of this assessment – including the targeted surveys and implementation of the No-go zones to reduce impacts to native vegetation – have reduced the number of hollow-bearing trees expected to be impacted from 41 to 31.

3. Description of the Environment

3.1 Overview

3.1.1 Current condition of the environment

The sections of the existing Colac Pipeline that are to be replaced are in road reserves adjacent to the Otway Forest Park, the Great Otway National Park and private land. These parks are part of a large continuous reserve system spanning many thousands of square kilometres located within the Otway Plain (OtP) bioregion, transitioning into the Otway Ranges (OtR) bioregion. As such, the overall ecological condition of the action area and surrounds is considered to be moderate to high.

The pipeline itself is located within an existing corridor containing modified native vegetation and a gravel access track (Pipeline Road) for Barwon Water operational access. The existing pipeline corridor varies in width from 5 m to 12 m including the access track.

Native vegetation in the pipeline corridor is regularly slashed for access requirements. This maintains understorey vegetation to a height of approximately 20 cm, except for occasional/ scattered trees. The pipeline corridor crosses several waterways with associated riparian habitats.

The intact forest and woodland areas adjoining and surrounding the pipeline corridor provide high habitat value for native flora and fauna species. Land surrounding the proposed action area is characterised by dense native forest and woodland.

The pipeline corridor is largely cleared of woody debris (e.g., logs and branches), unlike the adjoining forest and woodland, which contains woody debris of large and small logs. Each habitat zone recorded was of moderate diversity and in moderate condition.

The proposed action area within the existing pipeline corridor consists of moderate to high quality native vegetation habitats. The overall ecological condition of the proposed action area is moderate to high.

Environmental condition aspects relating to bushfire, weeds, soils issues, and other required matters are discussed further below.

3.1.2 Existing or proposed uses

The proposed action area contains an existing operational underground water supply pipeline to Colac township and surrounds, along the length of the alignment. The pipeline corridor and the pipeline itself are regularly maintained. This involves routine visual inspections of the pipeline corridor for issues, slashing of the corridor, maintenance of safe access, routine testing of pipeline fittings and repair of any damaged fittings. The surrounding area includes the Great Otway National Park and the Otway Forest Park as described in section 3.1.1.

Existing roads and access to the alignment is described in section 3.3.2.

The Otway Forest Park (OFP) is not a reserve but publicly owned forest, managed by Forest Fire Management Victoria (FFMVic) for multiple commercial, recreation and conservation purposes. The portion of the OFP overlapping the proposed action area (Section 19 and 20 west of Pipeline Road, South of Fawcett Track; see Figure 1) is part of a multiple use zone. Activities permitted within the multiple use zone include recreational activities (e.g., four-wheel driving, trail bike riding, horse riding, dog walking, collection of fallen wood for campfires), and commercial activities (e.g., firewood and minor forest produce collection with permits) (PV and DSE, 2009).

The east of Pipeline Road along Section 19 and 20 is private property (Figure 1). The land is zoned for farming with an environmental significance overlay (ESO). Activities permitted within this zone within the Colac Otway Shire include dwellings, bed and breakfasts, various agriculture and timber production – within restrictions and permitting requirements. Under the ESO, a permit is required to remove, destroy, lop any vegetation, with exemptions.

The proposed action area around Pipeline Road has been proposed to be part of a fuel break network to be established in the Barwon South West region as part of DEECA's Strategic Fuel Breaks (SFB) program. FFMVic

(2021) defines a fuel break as: 'a strip of land where vegetation has been permanently modified to reduce rate of spread and intensity of fire for the direct protection of assets and/or to assist fire control'. The proposed fuel breaks are priority bushfire management measures identified by FFMVic Chief Fire Officer and are strategically placed across the landscape to protect communities from bushfires.

The proposed fuel break network within the proposed action area is expected to be actively maintained by FFMVic, so that ground fuel is kept in a short condition and there is a reduced tree canopy.

The planning for Strategic Fuel Breaks program by FFMVic is ongoing to assess the values, refine the footprint and priorities around the construction of Strategic Fuel Breaks. Online mapping for the Joint Fuel Management Program between FFMVic and the Victorian Country Fire Authority (CFA) does not indicate any Strategic Fuel Breaks work in the proposed action area between 2023 and 2025 (FFMVic, 2022).

See also Section 3.3.1 of this report – Land use and zoning – for further information on land uses.

3.1.3 Outstanding natural features and/or any other important or unique values

Four of the five km of the proposed action area (pipeline corridor) are located within the Great Otway National Park, with Section 19 and 20 west of Pipeline Road, South of Fawcett Track occurring within the Otway Forest Park.

While the existing pipeline corridor contains modified vegetation/habitat, adjoining areas contain intact native forest and woodland providing fauna habitat. No other specific outstanding natural features or important/ unique/ protected/ significant values are present in the vicinity of the proposed action area.

3.2 Physical Environment

3.2.1 Gradient

The proposed action area is situated in the northern foothills of the Otway Ranges. The topography of the proposed action area can generally be described as undulating, or flat to rolling (less than 20% slope), though with some moderately steep sections, mostly on the northern side of Porcupine Creek.

The northernmost point of the proposed action area near the junction of Pipeline Road and Gold Hole Road is approximately 245 m Australian Height Datum (AHD). Heading south, the pipeline alignment is undulating with several creek crossings. The lowest elevation of the alignment is at Porcupine Creek (137 m AHD) before rising again to 260 m AHD at the southernmost point. The maximum elevation is around 274 m AHD.

3.2.2 Geology and soils

The geology and associated soil types of the proposed action area are as follows (as per Colac Pipeline Upgrade (W1426) Geotechnical Factual Report, prepared by GHD for Barwon Water, July 2020):

- Primarily calcareous silt (Gellibrand Marl (Tmi) within Sections 21 and 23, and Demons Bluff Formation (Ted) within Section 25(i)), with soils characterised as silty sand
- Smaller areas of fluvial braided stream deposits (Wiridjil Gravel/Eastern View Formation (Tan/Tae1 and Tae2)), primarily in Sections 19 and 20, with soils characterised as sand
- Areas of colluvium and gully alluvium (Qrc) near Dividing Creek in Section 25(i) and Porcupine Creek in Section 23, with soils characterised as silty sand

The geotechnical assessment undertaken by GHD (as per the Colac Pipeline Upgrade – Geotechnical Planning Declaration, GHD 2022c) advised that:

- No landslide features were identified during the action area walkover. Based on site observations, the removal of vegetation required for construction is not considered to be a potential trigger for landslides along the pipeline alignment. No further landslip assessment or landslip risk assessment is recommended.
- Areas of rill erosion were observed in some areas of the alignment during the walkover. These are likely to have been initially triggered by vehicular activity or construction activity (pipeline maintenance). The soils

along the alignment are prone to erosion, so adequate erosion/sedimentation control measures should be put in place during construction with revegetation upon completion of construction (sections 5.3 and 5.4).

- Landslide and erosion risk will be reduced by the replacement of aged leaking infrastructure

3.2.3 Hydrology

The existing pipeline corridor crosses several minor unnamed waterways and two named waterways (Dividing Creek and Porcupine Creek) with associated riparian habitats, as shown in Figure 2. Porcupine Creek is a major stream at the point where it crosses the pipeline corridor, with a catchment of over 16 km² at that location.

The proposed action area is within the Corangamite Catchment Management Authority (CCMA) area. The northern part of the action area (approximately until the junction with Pipeline Road/Link Track) is within the upper catchment of the Barwon River, while the remainder of the alignment is within the catchment of the Gellibrand River.

The proposed action area is within the Hopkins-Corangamite Groundwater Catchment. Outcrops of the Dilwyn groundwater formation may be present in the vicinity.

3.3 Social, Economic and Cultural Environment

3.3.1 Land use and zoning

The proposed action area is primarily located within and surrounded by the Public Conservation and Recreation Zone (PCRZ), with some Farming Zone (FZ) adjacent. No zoning changes are proposed, however, under the Colac Otway Shire Planning Scheme, a planning permit is required for works within these zones.

A planning permit is also required for works within overlays applicable to the proposed action area, including the removal of vegetation on land within an Erosion Management Overlay (EMO1), removal of native vegetation on land within an Environmental Significance Overlay (ESO3), Significant Landscape Overlay (SLO1) and Clause 52.17 Native Vegetation.

A planning permit for the Colac Pipeline Upgrade was received from the Colac Otway Shire on 2 August 2022 (Attachment 3).

3.3.2 Use of existing road infrastructure

As per section 2.2.2, existing roads and access tracks will be used during construction and various construction equipment will be transported as such. Ongoing access during operation and maintenance will occur as described in section 2.2.3.

The existing pipeline is within a regularly slashed corridor, which contains a crushed rock access track. There are various access points to this access track via several local roads. The access track and local roads are all rural, unsealed roads that traverse through both vegetated areas and farmland and connect to more significant sealed roads in the area. More specifically, construction access to the proposed action area of each respective pipeline replacement section will likely be made via the following arrangements:

- Access to the pipeline corridor for the Section 25i replacement can be made from either the north via Barongarook Road (existing unsealed local road), or from the South via either Parks Lodge Road (from the east) or Pipeline Road (from the west). Both of these are unsealed local roads
- Access to pipeline corridor for the Section 23 replacement can also be made from the north also via either Parks Lodge Road or Pipeline Road (same roads as Section 25i)
- Access to the pipeline corridor for the replacement Sections 19, 20 and 21 of the pipeline can be made from the North via Pipeline Road (existing unsealed local road)

The above is in line with the red 'Access Routes' linework depicted in Figure 2.

Exact directions of travel and access arrangements will be confirmed once the construction contractor has prepared traffic management plans and had further consultation with council. The condition of and ability to use all of the roads may also vary depending on recent weather conditions, local traffic impacts and other third-party traffic impacts in the area.

Any of the above-described access arrangements may also be used for ongoing operational maintenance, depending on the geographical location of the maintenance task and condition of the roads at any point in time. Any operational access will be made via existing defined local roads and access tracks, as is done for current/existing pipeline corridor maintenance.

3.3.3 Heritage

3.3.3.1 Commonwealth heritage places and other places of heritage value

There are no Commonwealth heritage places located within 10 km of the proposed action area.

The action area does not intercept any place listed on the Victorian Heritage Register or Victorian Heritage Inventory and is not located within any local Heritage Overlays under the Colac Otway planning scheme (DELWP, 2022).

3.3.3.2 Indigenous heritage values

The proposed action is in a Native Title claim area (Eastern Maar VC2012/001) under the Commonwealth Native Title Act 1993 (refer map of claim area in Attachment 4). The Eastern Maar Aboriginal Corporation is also the Registered Aboriginal Party under the Victorian *Aboriginal Heritage Act 2006* (AH Act). Pursuant to the requirements of the AH Act, a mandatory Cultural Heritage Management Plan (CHMP) has been prepared and approved for the Project (CHMP reference no. 16600; Biosis, 2022) (Attachment 5 of this report).

The CHMP was required because works are being undertaken within a National Park and will involve significant ground disturbance within areas of Cultural Heritage Significance. As informed by the CHMP, three Aboriginal places will be impacted by the works. For one of these places, there are no longer any tangible remains at this location and no mitigation is required. Specific Management Conditions are identified in the CHMP for the other two places, including custody and management actions for both locations, and mitigation measures (survey and collection/salvage prior to works, and fencing for the duration of works) for one location.

The CHMP is attached for DCCEEW review (Attachment 5) but will be redacted in the public version of this report due to cultural sensitivities.

3.4 Ecological Environment

3.4.1 Flora and fauna

3.4.1.1 Ecological assessments

A range of ecological assessments (including desktop assessments, field assessments and targeted surveys) have been undertaken to understand and document the potential impacts of the Project on ecological values. Most recent ecological assessment for the Project has been in relation to potential impacts on threatened communities and species listed under the EPBC Act.

GHD completed ecological surveys of the proposed action area during 2019, 2020 and 2022 (refer Attachment 2 and Attachment 6).

In addition to the proposed action area (11.48 ha), other terms used when describing the area considered during the ecological assessments include:

- **Study site:** an area of approximately 34.12 ha that incorporates a 15 m wide section on both sides of the existing track from the edge of the verge. The study site includes the proposed action area and intact vegetation of the Great Otway National Park and Otway Forest Park alongside the existing pipeline corridor.
- **Study area:** refers to a broader region surrounding the study site (i.e., includes areas that are outside the proposed action area). The study area for this assessment includes the study site and a 10 km buffer. This description covers a much broader area than the expected zone of impact, and the additional information captured has been used to provide context to assess the significance of ecological features identified within the proposed action area. The study area was assessed at a desktop level.

3.4.1.2 Vegetation

Land surrounding the proposed action area is characterised by dense native vegetation (within National Park and State Forest) which extends for more than 1 km either side (east and west) of the corridor.

The pipeline corridor is dominated by modified native vegetation, regularly slashed to maintain to a height of approximately 20 cm, with the exception of the occasional large tree. The pipeline corridor is largely cleared of woody debris (e.g., logs, branches), unlike the adjoining remnant forest and woodland. Each habitat zone recorded was of moderate diversity and in moderate condition.

The field assessment (Attachment 6) resulted in observations and mapping of five Ecological Vegetation Classes (EVCs) within the study area:

- Lowland Forest (EVC 16)
- Heathy Woodland (EVC 48)
- Sedgy Riparian Woodland (EVC 198)
- Swampy Riparian Woodland (EVC 83)
- Wet Heathland (EVC 8)

No threatened vegetation communities listed under the EPBC Act or the FFG Act were observed within the study area. Further detail regarding vegetation in the study area is provided in the Ecological Impact Report (Attachment 6), Section 3.5 – native vegetation and vegetation quality assessment, pp21-27.

3.4.1.3 Flora and fauna

During the field assessment (Attachment 6), a total of 103 species were observed, including 93 native and 10 introduced species. The species composition along the pipeline corridor is consistent with the contiguous large areas of adjoining remnant forest. The intact forest and woodland areas of the Great Otway National Park and Otway Forest Park adjoining the pipeline corridor provide high habitat value for native flora and fauna species.

A total of 16 rare or threatened flora species are known or considered likely to occur within the proposed action area, including two (2) EPBC-listed species: Green-striped Greenhood (*Pterostylis chlorogramma*), and Leafy Greenhood (*Pterostylis cucullata*), both listed as Vulnerable. A total of three rounds of targeted surveys were undertaken in addition to the detailed assessment (October 2019, December 2019, July 2020). Two rounds of targeted surveys aligned with the flowering times of the EPBC Act listed species, and no EPBC Act-listed threatened flora species were identified during these surveys or any other survey times. See Section 3.6.3.1 for details on methods and results with regards to the targeted surveys.

Thirty species of flora protected under the FFG Act were identified during the field assessment and targeted surveys. There were four flora species considered rare in Victoria (DEPI, 2014) identified during the field assessments in 2019 to 2020:

- *Eucalyptus falciformis* (Western Peppermint) was observed flowering at the intersection of Colac-Olangolah Pipeline Track and Pipeline Road
- *Monotoca glauca* (Currant-wood) individuals were observed along the pipeline corridor
- *Lobelia beaugleholei* (Showy Lobelia) occurred in a few discrete locations of the study area
- *Nematolepis squamea* subsp. *Squamea* (Satinwood) – a few plants were identified during the targeted surveys

Surveys conducted during 2019, 2020 and 2022 recorded 69 fauna species, including 65 native species (eight mammals, 54 birds, three amphibians) and four non-native species.

Twelve fauna species of conservation significance are known from or have potential habitat within the study area. EPBC-listed fauna species known or likely to be present in the proposed action area include:

- Gang-gang Cockatoo (*Callocephalon fimbriatum*)
- Yellow-bellied glider (south-eastern) (*Petaurus australis australis*)
- Southern Long-nosed Potoroo (*Potorous tridactylus trisulcatus*)
- Southern Brown Bandicoot (eastern/south-eastern) (*Isodon obesulus obesulus*)

In addition to the four EPBC Act listed fauna species recorded during the ecological surveys, there is potential for two other EPBC Act listed threatened fauna species to occasionally occur within the proposed action area – the Swamp Antechinus and Spot-tailed Quoll (see Attachment 1).

3.4.2 Weeds

Although weeds including noxious weeds were recorded within the proposed action area during recent ecology surveys (predominantly *Watsonia* sp., and introduced grasses), these comprised less than 1% coverage of vegetation within the area and no large infestations of weeds were recorded.

The weed species *Cirsium vulgare* (Spear Thistle) which was identified during the field assessment is listed as a noxious weed in the Corangamite Catchment Management Authority (CMA) region under the *Catchment and Land Protection Act 1994* (CaLP Act).

3.4.3 Bushfire

Bushfire is an integral part of eucalypt forest and woodland ecology, and wildfire occurs at times in this environment. In the absence of fire, forest fuels (leaf litter, shed bark, etc.) accumulate over time, increasing the risk of a higher intensity fire if an uncontrolled fire was to occur. Fuel reduction burns are undertaken in the proposed action area periodically by land managers to minimise fire risks to nearby property, assets, and communities, and to reduce the risks of more intense wildfires with increased impacts on ecological values. As discussed in section 3.1.2, the proposed action area around Pipeline Road (see Figure 2) has been proposed to be part of a fuel break network to be established in the Barwon South West region for DEECA's Strategic Fuel Breaks program.

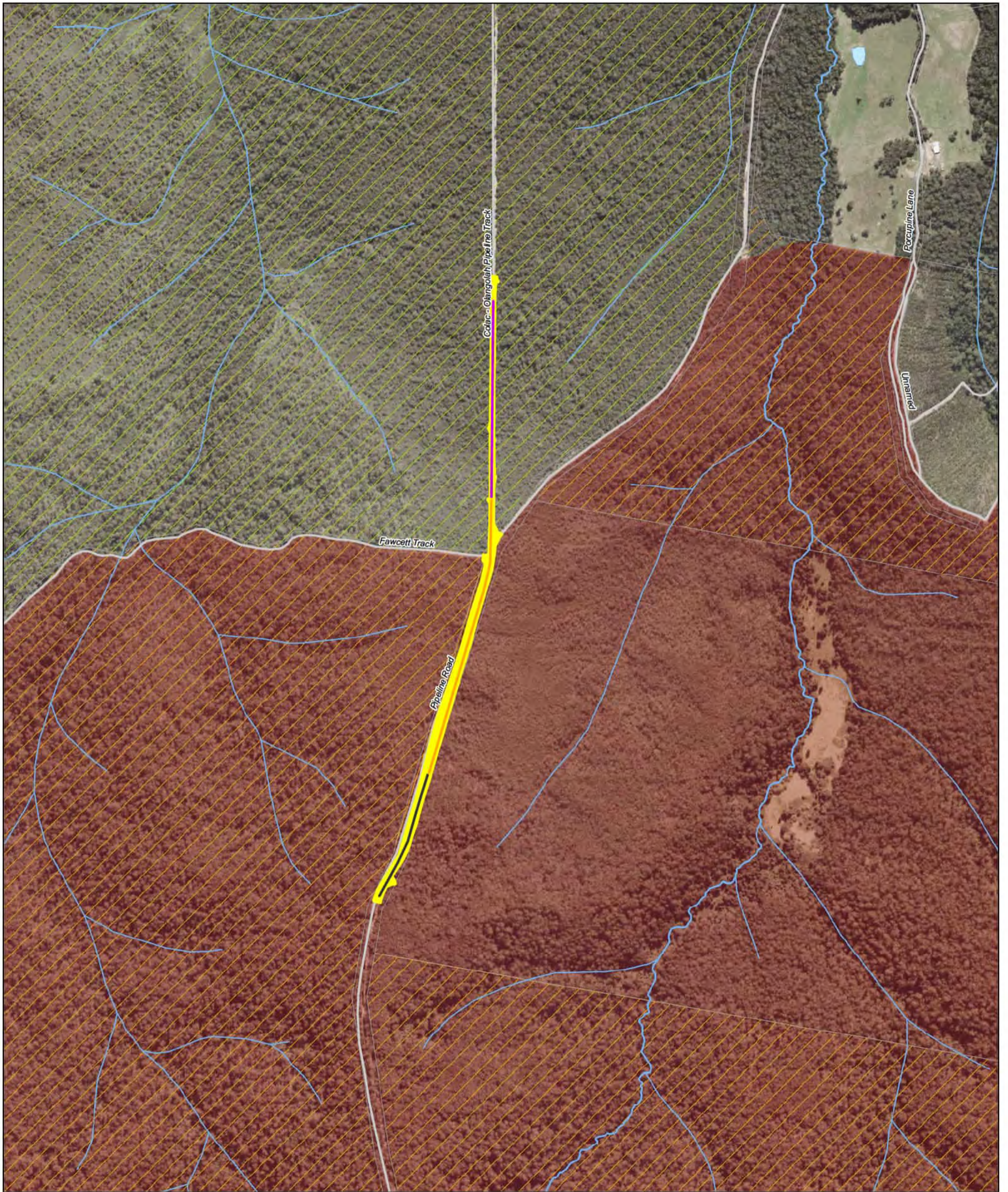
Fuel reduction burns were conducted by the then Victorian Department of Environment, Land, Water and Planning (DELWP) (now Department of Environment, Energy and Climate Action (DEECA)) in April 2022, within Sections 19 and 20 of the proposed action area (southernmost parts, south of the Fawcett Track/Pipeline Road intersection). Figure 3 shows the extent of these burns. Plate 2 shows part of this recently burnt area adjacent the proposed action area. The area to the east of this intersection was also previously burnt by DELWP in 2018.

At the time of the May 2022 ecology survey, groundcover species were already regenerating within burnt areas. The burn appeared to have been of varying intensity with a mosaic of burnt and unburnt areas of understorey. The tree canopy was mostly intact. Some lower hollows (e.g., <4 m above the ground) were burnt, but hollows greater than 4 m above ground level appeared unburnt. Many of the hollow-bearing trees and some large hollow logs on the ground were unburnt. Prior to undertaking the burn, forest fuels had been cleared from around the base of many large old trees to reduce chance of burning.

The effects of fire on this small portion of the proposed action area has not significantly modified the vegetation or habitat of the area.



Plate 2 *Recently burnt area adjacent the proposed action area*



LEGEND

— Road	Water body	Great Otway National Park	Proposed pipeline alignment	
— River	Construction Corridor	Otway Forest Park		— Section 19
— Stream	Parcel	Burn area		— Section 20
			— Section 21	

<p>Paper Size A3 0 0.05 0.1 0.2 0.3 Kilometers</p> <p>Map Projection: Transverse Mercator Horizontal Datum: GDA 1994 Grid: GDA 1994 MGA Zone 54</p>			<p>Barwon Water Colac Pipeline Upgrade</p> <p>Part of the proposed action area in recently burnt vegetation</p>	<p>Job Number 31-37032 Revision C Date 06 Jun 2023</p>
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3.6 Matters of National Environmental Significance (MNES)

The EPBC Act defines nationally and internationally important flora, fauna, ecological communities and heritage places as Matters of National Environmental Significance (MNES). Under the EPBC Act, actions that have, or are likely to have, a significant impact on MNES require approval from the Federal Minister for the Climate Change, Energy, the Environment and Water (the Minister).

3.6.1 Protected Matters Search Tool results

The Commonwealth Government's Protected Matters Search Tool (PMST) was used to assess MNES and other matters protected under the EPBC Act that may be relevant to the proposed action (results appended to Attachment 1). The PMST search applied a buffer of 10 km from the proposed action area.

The PMST identified four MNES that may occur in or relate to the area within 10 km of the proposed action area (Table 6).

Table 6 Count of Matters of National Environmental Significance (MNES)

Matters of National Environmental Significance (MNES)	PMST Search Results (count)
Listed threatened ecological communities	1
Listed threatened species	43
Listed migratory species	14
Wetlands of International Importance	2
Commonwealth Marine Area	0
World Heritage Properties	0
National Heritage Places	0
Great Barrier Reef Marine Park	0

The potential presence of listed marine species was identified as an additional 'other matter' protected under the EPBC Act identified through the PMST search (Table 7).

Table 7 Count of other matters protected under the EPBC Act

Other Matters Protected by the EPBC Act	PMST Search Results (count)
Commonwealth Lands	0
Commonwealth Heritage Places	0
Listed Marine Species	21
Whales and Other Cetaceans	0
Critical Habitats	0
Commonwealth Reserves Terrestrial	0
Australian Marine Parks	0
Habitat Critical to the Survival of Marine Turtles	0

Using the outputs from the PMST, a likelihood of occurrence assessment (appended to Attachment 1) was undertaken for the ecological communities and species identified. Species were considered relevant to the assessment if one or more of the following was true:

- They were found to be present within the proposed action area during ecological field surveys undertaken for the Project
- They were predicted as being possible to occur within the proposed action area based on habitat preference and the presence of suitable habitat within the study site and a review of recent historical records within the study area

Species considered unlikely or highly unlikely to occur within the proposed action area were excluded from the assessment.

MNES species considered relevant to the assessment are described below. In summary:

- No threatened ecological communities occur or are likely to occur within the proposed action area
- Two flora species Green-striped Greenhood (*Pterostylis chlorogramma*) and Leafy Greenhood (*Pterostylis cucullata*), both listed as Vulnerable under the EPBC Act
- Six fauna species:
 - Gang-gang Cockatoo (*Callocephalon fimbriatum*) – Endangered
 - Yellow-bellied Glider (south-eastern) (*Petaurus australis australis*) – Vulnerable
 - Long-nosed Potoroo (southern mainland) (*Potorous tridactylus trisulcatus*) – Vulnerable
 - Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (south-eastern mainland population) (*Dasyurus maculatus maculatus*) – Endangered
 - Southern Brown Bandicoot (eastern), Southern Brown Bandicoot (south-eastern) (*Isodon obesulus obesulus*) – Endangered
 - Swamp Antechinus (*Antechinus minimus maritimus*) – Vulnerable

3.6.2 Listed threatened ecological communities

The PMST identified one EPBC-listed threatened ecological community as having potential to occur within 10 km of the proposed action area: the critically endangered *White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland*.

The community is characterised by a species-rich understorey of native tussock grasses, herbs and scattered shrubs, and the dominance, or prior dominance, of White Box, Yellow Box or Blakely's Red Gum trees. The tree-cover is generally discontinuous and consists of widely-spaced trees of medium height in which the canopies are clearly separated (Yates & Hobbs, 1997, cited in TSSC, 2006).

In Victoria, the ecological community can be a component of the following EVCs in the Highlands – Northern Fall, Northern Inland Slopes, Riverina and Goldfields Bioregions: 47 – Valley Grassy Forest, 55 – Plains Grassy Woodland, 175 – Grassy Woodland (TSSC, 2006).

None of the EVCs recorded within the study site or proposed action area align with this community. None of the tree species characteristic of this community were recorded within the proposed action area.

This community was not identified during ecological field surveys within the proposed action area, nor is it considered likely to occur within the action area owing to a lack of suitable environmental attributes (Attachment 6).

3.6.3 Threatened flora species

The PMST search identified 16 EPBC-listed flora species as having potential to occur within the proposed action area. It is unlikely that 14 of the 16 species would occur within the proposed action area as suitable habitats were not present, and/or the species was not recorded during targeted surveys. Additional technical information on survey methods, flora species, habitats and study findings is provided in Attachment 6: Ecological Impact Report and appendices within:

- Colac Pipeline Upgrade (W1426) Targeted threatened flora species survey results October 2019
- Colac Pipeline Upgrade (W1426) Targeted threatened flora species survey results December 2019
- Colac Pipeline Upgrade (W1426) Targeted threatened flora species survey results July 2020

3.6.3.1 Green-striped Greenhood and Leafy Greenhood (*Pterostylis* spp.)

Potentially suitable habitat was identified within the study area for two threatened orchid species: Green-striped Greenhood (*Pterostylis chlorogramma*) and Leafy Greenhood (*Pterostylis cucullata*), both listed as Vulnerable under the EPBC Act.

In addition to the detailed assessment survey effort (June 2019), three separate targeted threatened species surveys were undertaken by GHD for threatened orchids listed under the EPBC Act and FFG Act to account for detectability owing to seasonal variation. These included:

- Targeted survey completed on 1 to 2 October 2019 to search for species listed under the EPBC Act and FFG Act including *P. cucullata*
- Targeted survey completed on 17 to 18 December 2019 to search for species listed under the EPBC Act and FFG Act
- Targeted survey completed on 29 to 30 July 2020 to search for *P. chlorogramma*

Targeted surveys were undertaken by qualified ecologists and followed the recommendations set out within *Draft survey guidelines for Australia’s threatened Orchids: Guidelines for detecting orchids listed as ‘Threatened’ under the Environment Protection and Biodiversity Conservations Act 1999* (DoE, 2013a), along with information about the species collected from the National Recovery Plan for Fifteen Threatened Orchids in South-eastern Australia (DSE, 2009), *Orchids of the Anglesea and Aireys Inlet District flowering times* (ANGAIR, 2023) and the *Flora of Victoria* (VicFlora, 2023a,b).

Table 8 summarises the survey methods, peak detectability period and survey adequacy. The surveys in 2019 and 2020 did not identify any Green-striped Greenhood or Leafy Greenhood within the proposed action area. It is considered unlikely that either species occurs within the proposed action area. As such, potential impacts to these species were not further assessed.

Table 8 Summary of survey methods, effort and adequacy for threatened orchids

Species	GHD survey methods	Peak detectability	Adequacy and justification
<i>Pterostylis chlorogramma</i>	Two people walking in parallel to the vehicle track (both sides) for the length of the study site including cleared (maintained) verge and remnant intact vegetation for a width of 3 m from the edge of the cleared verge Effort 32 hours over two days within the proposed action area (9.01 ha) for each targeted survey effort.	Flowers July to September (DoE, 2013a, ANGAIR, 2023 and VicFlora, 2023b). Occurs in mixed Box-Stringybark Forest with a shrubby understorey, often with <i>Pteridium esculentum</i> as a major component. Occurs on sandy or clay loam soils and restricted to natural gaps in the shrubby understorey or along road/track verges (DSE, 2009)	The survey timing was targeted to the relevant peak flowering seasons to increase the likelihood of detection. Although no historical records for the species are within 35 km of the study site, the detailed surveys highlighted potential suitable habitat for the species. Targeted surveys were undertaken during the peak flowering period which did not observe any specimens of the species or orchid like specimens that were not able to be identified.
<i>Pterostylis cucullata</i>	As above	Flower bud formation in August. Peak flowering period: mid-October to mid-November Although this species can form massive colonies it can be difficult to detect because plants can occur among dense grass and beneath low coastal scrub. Has distinctive rosettes that can be easily counted. Occurs on calcareous dunes and sand sheets in near coastal areas, within closed scrub (DoE, 2013a). Flowers August – October (VicFlora, 2023a)	The survey timing was targeted to the relevant peak flowering seasons to increase the likelihood of detection. Although no historical records for the species are within 37 km of the study site, the detailed survey identified potential suitable habitat in parts of the study site. Targeted surveys during the peak flowering period did not observe any specimens of the species or orchid like specimens that were not able to be identified.

3.6.4 Threatened fauna species

The PMST search identified 21 EPBC-listed fauna species as having potential to occur within the study area. It is unlikely that the majority of these species would occur within the proposed action area as suitable habitats are not present. The following sections address the presence or likelihood of species where suitable habitat are present. Additional technical information on survey methods, fauna species, habitats and study findings is provided in the following reports:

- Attachment 1: Colac Pipeline Upgrade – EPBC Self-Assessment Report (GHD, 2022a)
- Attachment 2: Targeted Surveys for Yellow-bellied Glider and Gang-gang Cockatoo – Colac Pipeline Project – Survey Report (Revised) (GHD, 2023a)
- Attachment 6: Ecological Impact Report (GHD, 2021)
- Attachment 7: Greater Glider memo (GHD, 2022b)¹
- Attachment 8: Proposed Offset Site [REDACTED] Kawarren – Targeted fauna and vegetation survey report (GHD, 2023b)
- Attachment 8: Proposed Offset Site 245 Distillery Creek Road, Aireys Inlet – Targeted fauna and vegetation survey report (GHD, 2023c).

3.6.4.1 Gang-gang Cockatoo (*Callocephalon fimbriatum*)

The Gang-gang Cockatoo (Endangered EPBC Act) is known from the study site, having 365 historical records (VBA, 2023 and ALA, 2023) from the study area (10 km area surrounding the study site). Habitat assessments and targeted surveys for Gang-gang Cockatoo completed in May 2022 and November – December 2022 and January 2023 demonstrated the presence of Gang-gang Cockatoo foraging habitat and potential nesting habitat within and surrounding the study site. All surveys recorded few instances of Gang-gang Cockatoos using habitat within the study site. In both seasons, Gang-gang Cockatoos were sighted flying through the forest, resting and/or foraging mostly in the northern section of the Project alignment.

During the targeted surveys, the species was recorded on 11 different occasions (different dates/times) across four locations during diurnal and opportunistic bird surveys within the study site. During the May (non-breeding season) survey, a pair of Gang-gangs (male and female) was regularly observed resting and/or foraging in the same general location in the northern section of the study site on five different mornings at generally the same time. Similarly, during the November-December survey (breeding season), Gang-gang Cockatoos were recorded outside the study site, in the same habitat and general location as the birds recorded during May 2022 surveys.

None of the Gang-gang Cockatoos observed were seen to occupy hollow-bearing trees or interact with any hollows. Two other species: Yellow-tailed Black Cockatoo and Crimson Rosella were observed during diurnal bird surveys moving in and out of hollows. Table 9 provides a summary of the survey methods and effort used for this assessment to determine the occurrence and habitat quality and extent for this species within the action area. See attachment 2 for detailed survey methods and results for the Gang-gang Cockatoo for this project.

¹ The Greater Glider is unlikely to occur within the study area and is therefore not discussed within this report; however, this species is addressed in a separate attachment due to changes in modelled distribution subsequent to the original ecological assessment work.

Table 9 Summary of survey methods, timing and effort and review of survey adequacy for the Gang-gang Cockatoo

Method /site number	Timing and effort	Survey adequacy
Diurnal bird survey (non-breeding season)/ 1-16	17 to 27 May 2022 16 surveys in or within 50 m of the study site including: 10 x 10-minute (min) point count search 6 x 20-min transect count search Approximately 22 hours of opportunistic observations whilst undertaking habitat surveys within study site	Suitable survey technique for detecting the Gang-gang Cockatoo (DAWE, 2022b) and other cockatoo/parrot species (DEWHA, 2010). <i>Summary of survey effort / outcomes for study site</i> No issues recorded. The May 2022 survey was undertaken outside the breeding season. Non-breeding season – 16 surveys over 10 days/3.5 hrs targeted survey effort (excluding opportunistic observations) Nine observations of Gang-gang Cockatoo were recorded during May 2022 surveys in or nearby the study site.
Diurnal bird survey / Study site (1-72, 78-87) Outside study site (73-77)	21 to 24 November 2022 and 28 November to 1 December 2022 <i>Study site</i> 82 surveys over 8 days in and within 50 m of the study site: 43 x 10 min point count search 39 x 20 min transect count search <i>Off site</i> 5 x 20-minute surveys over 6 days Approximately 20 hours of opportunistic observations whilst undertaking searches in and outside the study site (e.g., Barwon Reservoir, Lake Elizabeth, King Parrot Cottages and Lorne).	The November and December 2022 surveys were undertaken during the GGC breeding season. Surveys focussed on locations within the study site containing hollows, particularly locations with multiple hollows/clusters of hollows identified during the May 2022 habitat assessment, to increase the chance of observing breeding birds interacting with a possible nest inside a hollow. No issues recorded. <i>Summary of survey effort / outcomes</i> Breeding season – 82 surveys over 8 days/ 20.5 hrs targeted survey effort (excluding opportunistic observations) Seven observations of Gang-gang Cockatoo were recorded during 21 November to 1 December 2022 surveys in or nearby the study site.
Diurnal bird survey / Study site (88-95 and 98-104) Outside study site (DB 96 and 97)	21 December 2022 <i>Study site</i> 12 surveys within study site including: 2 x 10 min point count search 10 x 20 min transect count search <i>Off site</i> 2 x 20-minute surveys outside the study site. Approx 1.5 hours of opportunistic observations whilst moving between survey sites and undertaking searches outside the study site.	No issues recorded. <i>Summary of survey effort / outcomes</i> Breeding season – 12 surveys over 1 day/3.5 hrs targeted survey effort (excluding opportunistic observations) Gang-gang Cockatoo not recorded during this survey in or nearby the study site.
Diurnal bird survey / Within and adjacent to study site 105 – 111	13 January 2023 6 x 20 min transect count search sessions within study site Approx 1 hour of opportunistic observations whilst moving between survey sites and undertaking searches outside the study site.	No issues recorded. <i>Summary of survey effort / outcomes</i> Breeding season – 6 surveys over 1 day/2 hrs targeted survey effort (excluding opportunistic observations). Gang-gang Cockatoo not recorded during this survey in or nearby the study site. NOTE: Offsite surveys were also conducted approximately 3.5 kms west of study site from January and February 2023 in connected habitat at [REDACTED] (see Attachment 8: Proposed Offset Site [REDACTED] Kawarren).

Method /site number	Timing and effort	Survey adequacy
Habitat assessment	<p>The entire study site including proposed action area was walked by two ecologists for the purpose of mapping habitat including large trees and checking for signs 25 and 26 June 2019.</p> <p>The targeted habitat assessment involved two ecologists walking along either side of the track for the length of the study site from north to south 17 to 27 May 2022 to assess and map habitat. The assessment focussed on identifying areas of highest value including:</p> <ul style="list-style-type: none"> – Extent and occurrence of habitat for the Yellow-bellied Glider and Gang-gang Cockatoo including the documentation of feed signs and suitable hollows for within the study site using predetermined criteria – Brief assessment of habitat type and quality at 'off site' locations with historical records for either species – Review of existing vegetation mapping and alignment with species habitat requirements following field surveys 	<p>Daytime searches for suitable habitat is an accepted method (DEWHA, 2010)</p> <p><i>Summary of survey effort / outcomes</i></p> <p>231 large trees recorded in study site and 160 trees contained hollows. Of the 160 hollow-bearing trees recorded, approximately 77 are considered suitable for this species (e.g., located 5 m or more above the ground with an entrance diameter of at least 10 cm but less than 30 cm) and up to 16 are within the proposed action area</p> <p>141 additional trees were recorded with hollows not suitable for the Gang-gang Cockatoo or Yellow-bellied Glider at the time of the assessment (e.g., too small or too large or too low to the ground) within the study site outside of the proposed action area. All large trees without hollows are also likely to develop hollows in the future. It is important to note that not all hollow-bearing trees were recorded within the study site and the number presented in this report definitely underestimates the number of hollows within the study site excluding the action area.</p>

The majority of vegetation within the study site (34.12 ha) is considered to be foraging habitat for Gang-gang Cockatoos. Following targeted surveys during breeding and non-breeding seasons a review of the original area estimate regarding foraging and roosting/breeding habitat was undertaken. Foraging habitat was revised from 9.01 ha to up to 7.31 ha, to exclude the cleared easement sections that are regularly maintained and without trees within the proposed action area.

The cleared pipeline corridor component consisting of the maintained grassy verge without trees between the road/track and intact remnant vegetation is between 0.5 and 0.9 ha. However, the minimum area was used as it was difficult to confidently calculate the exact area of grassy verge vegetation without trees.

Roosting and potential breeding habitat was also revised from 9.01 ha to 6 ha to exclude parts of the Heathy Woodland habitats and edge area due to the sparsity and lack of tall Eucalyptus trees within the proposed action area. Of the 160 hollow-bearing trees recorded within the study site, approximately 77 are considered suitable for this species and up to 16 are within the proposed action area.

The extent of habitat is limited to linear strips along the edge of the remnant where it meets the existing easement consisting of moderate to dense understorey, ground cover and good tree canopy cover.

The habitats within the action area are well represented along the extent of the pipeline corridor and extensive areas of better-quality habitat is located adjacent to the pipeline corridor in the form of remnant forest and woodland, which will be retained (e.g., the Great Otway National Park).

3.6.4.2 Yellow-bellied Glider (south-eastern) (*Petaurus australis australis*)

There are 62 records of the Yellow-bellied Glider (Vulnerable EPBC Act) within the study area (ALA and VBA 2022). Habitat assessments and targeted surveys for the Yellow-bellied Glider were primarily undertaken during May 2022 with additional opportunistic surveys in November 2022. Yellow-bellied Gliders were successfully recorded using passive acoustic monitors (PAMs) and spotlighting during the survey within the study site and at new and historical locations off site.

During surveys in May 2022, Yellow-bellied Glider calls were recorded from three sites within and in close proximity (<50 m) to the study site and three off site locations from the analysis and review of acoustic data. The Yellow-bellied Glider was also recorded on 15 different occasions (different dates/times) across seven locations (some including repeat survey sites) during the listening period prior to spotlighting or during spotlight surveys. One of the seven locations was within 30 m of the proposed action area, at Porcupine Creek. All other locations were off site. Three of the remaining locations are south of the study site within 50 m of Pipeline Track and/or different sections of Porcupine Creek outside the study site. The locations off Pipeline Track and along Porcupine Creek outside the study site north of Ridge Road are within habitats contiguous with the habitats of the study site, and have no major natural barriers (e.g., steep-sided hills or major river crossings) that would prevent the Yellow-bellied Glider from moving through this area. The gliders observed and heard along Fawcett Track were located in contiguous habitat along a drainage line that connects with Porcupine Creek in the proposed action area.

One observation of Yellow-bellied Glider using a hollow was recorded whilst spotlighting in the Porcupine Creek area. The glider was then observed to move up the trunk to the back of the tree (*Eucalyptus ovata* or *E. viminalis*) away from the spotlight. After one to two minutes of searching the tree, the glider was observed in a hollow. The tree with the hollow is located within the study site but not in the proposed action area. Table 10 summarises the survey methods and effort used for this assessment to determine the occurrence and habitat quality and extent for this species within the proposed action area. See attachment 2 for detailed survey methods and results for the Yellow-bellied Glider for this project. Five survey techniques (Table 9) were used to survey for the Yellow-bellied Glider including recommended survey techniques listed in the Survey Guidelines for Australia’s Threatened Mammals (DSEWPC 2011, page 129 of the guidelines for detecting the presence of the Yellow-Bellied Glider (wet tropics)) and other current survey methods including passive acoustic monitoring (as per Whisson et al., 2021) not listed in the guidelines.

Table 10 Summary of survey methods, timing and effort and review of survey adequacy for Yellow-bellied Glider

Method /site number	Timing and effort	Survey adequacy
Passive Acoustic Monitoring/ PAM 1 - 13	<p>13 PAM locations. PAM locations at least 500 m apart (except sites 6 and 7 at 300 m apart) with at least 2 PAMs located in/within 50 m of each section of the proposed action area</p> <p><i>Study site</i></p> <p>3 locations for 5 hours each night for 8 consecutive nights 17 to 24/05/22</p> <p>7 locations for 5 hours each night for 9 consecutive nights 17 to 26/05/22</p> <p><i>Offsite (at least 100 m outside study site, within study area)</i></p> <p>3 x PAM locations at least 500 m apart</p> <p>2 for 5 hours each night for 2 nights 24-26/5/22 and 1 for 5 hours each night (Dando’s Campground – historical YBG location) for 10 nights (17 to 27/05/22)</p>	<p>According to Whisson et al. (2021) – Yellow-bellied Glider vocalisations were most common in the four hours after sunset, and rainfall negatively influenced detection probability, especially during the autumn/winter sampling period. Detection of Yellow-bellied Gliders with PAM requires programmed PAMs to record for four hours after sunset, for a minimum of six nights with minimal inclement weather (i.e., seeking little or no wind or rain). The survey period should be extended to 12 nights when rain or wind are forecast.</p> <p><i>Summary of survey effort / outcomes for study site</i></p> <p>No issues noted using this technique.</p> <p>10 sites for 80 survey-nights/ 555 survey-hours of recording</p> <p>Minor rainfall and light – moderate wind was recorded during the survey period. These conditions did not create sufficient background noise to mask identification of calls, and at one site Yellow-bellied Glider were recorded calling for 9 of the 10 survey nights. Yellow-bellied Glider vocalisations were recorded at 6 of the 13 PAM sites during the survey. One location was in the study site and one location was within 50 m of study site.</p>

Method /site number	Timing and effort	Survey adequacy
Call playback / CP 1-11	<p><i>Study site</i></p> <p>9 sessions across 5 nights (19, 21, 24, 25 and 26 May 2022) – approximately 10 mins each session prior to spotlight surveys</p> <p><i>Offsite</i></p> <p>2 sessions off site across 5 nights (19, 21, 24, 25 and 26 May 2022) – approximately 10 mins each session</p>	<p>Suitable survey technique for detecting the Yellow-bellied Glider (DSEWPC, 2011; DAWE, 2022b; Goldingay et al., 2017).</p> <p><i>Summary of survey effort / outcomes for study site</i></p> <p>No issues noted using this technique.</p> <p>9 sessions over 5 nights/ 1.5 hours broadcast</p> <p>Yellow-bellied Glider was not definitely recorded responding to this survey technique during the survey. This survey favoured PAM and spotlight as the primary survey techniques. Call playback sessions did not include broadcast of predatory owl species such as the Powerful Owl (<i>Ninox strenua</i>) as this species was heard calling each night of the survey and we did not want to disturb the resident bird(s) within the local area.</p>
Spotlight / SL 1-65	<p>Surveys completed for 8 nights (17 to 21/05/22 and 24 to 26/05/22) for approximately 2.5 to 3 hours each night. At least 5 spotlight surveys were completed in each section over 2 non-consecutive nights.</p> <p><i>Study site</i></p> <p>20 x 10 min-200 m on track transects 24 x 20 min-500 m on track transects 1 x 20 min-200 m off track transects</p> <p><i>Off site</i></p> <p>4 x 10 min-200 m on track transects 5 x 20 min-500 m on track transects 7 x 20 min-200 m off track transects 4 x 50 min-500 m off track transects</p>	<p>Suitable survey technique for detecting the Yellow-bellied Glider (DSE, 2011; DSEWPC, 2011, DAWE, 2022b; Goldingay et al., 2017).</p> <p><i>Summary of survey effort outcomes for study site</i></p> <p>No issues noted using this technique.</p> <p>45 sessions over 8 nights, >12 hours targeted spotlighting (excluding opportunistic spotlighting) within study site.</p> <p>Yellow-bellied Glider recorded across seven locations during the listening period prior to spotlighting or during spotlight surveys. One location was in the study site and one location was within 50 m of study site.</p>
Camera tree mounted / CT 1- 9	<p>Single baited cameras at 9 sites for 10 consecutive days 17 to 26/05/22, all located in the study site or within 50 m of action area</p>	<p>Not documented as a suitable technique for the Yellow-bellied Glider.</p> <p>Site CT2 – technical issues (No records from the 21/05/22). All other sites achieved desired survey effort.</p> <p>Other arboreal specie including Sugar Glider, Feathertail Glider recorded.</p> <p>Note: cameras probably need to be positioned at heights of 5 m or more to survey for the Yellow-bellied Glider – not possible due to safety requirements (e.g., working at height when installing cameras)</p>

Method /site number	Timing and effort	Survey adequacy
Habitat assessment	<p>The entire study site including proposed action area was walked by two ecologists for the purpose of mapping habitat including large trees and checking for signs 25 and 26 June 2019.</p> <p>The targeted habitat assessment involved two ecologists walking along either side of the track for the length of the study site from north to south 17 to 27 May 2022 to assess and map habitat. The assessment focussed on identifying areas of highest value including:</p> <p>Extent and occurrence of habitat for the Yellow-bellied including the documentation of feed signs and suitable hollows within the study site using predetermined criteria.</p> <p>Brief assessment of habitat type and quality at 'off site' locations with historical records.</p> <p>Review of existing vegetation mapping and alignment with species habitat requirements following field surveys.</p>	<p>Daytime searches for suitable habitat are an accepted method (DEWHA, 2011).</p> <p><i>Summary of survey effort / outcomes</i></p> <p>231 large trees recorded in study site and 160 trees contained hollows. Of the 160 hollow-bearing trees recorded, approximately 49 are considered suitable for this species (e.g., located 5 m or more above the ground with an entrance diameter of at least 10 cm but less than 30 cm) and up to 13 are within the action area</p> <p>141 additional trees were recorded with hollows not suitable for the Gang-gang Cockatoo or Yellow-bellied Glider at the time of the assessment (e.g., too small or too large or too low to the ground) within the study site outside the action area. All large trees without hollows are also likely to develop hollows in the future. It is important to note that not all hollow-bearing trees were recorded within the study site and the number presented in this report definitely underestimates the number of hollows within the study site excluding the action area.</p>

There are no major barriers preventing the movement of gliders or birds within the study site with the exception of the wider-than-average east-west road easement and firebreak of Link Track and Parkes Lodge Road Section which forms the northern boundary of Section 23. This combined road/firebreak is greater than 40 m wide in some sections including the section immediately adjacent to the study site and, while not too great for the Gang-gang Cockatoo, may be too great a gap for some glider species (e.g., the Sugar Glider and Feathertail Glider) to traverse without landing on the ground, particularly where tall trees are absent. It may present a significant barrier but to a complete barrier to traverse for the Yellow-bellied Glider. Furthermore, the road is commonly used by local residents and an east-west link between Kawarren and Forrest or Barwon Downs, therefore vehicle strike, particularly for ground fauna and possibly gliders attempting to traverse the gap at night may be an issue.

The majority of vegetation with the study site (27.35 of 34.12 ha) and action area (5.07 ha of 7.81 ha) – except for the Wet Heathland habitat and the cleared easement sections that are regularly maintained and without trees – was confirmed as foraging and connect habitat for the Yellow-bellied Glider. Of the 160 hollow-bearing trees recorded within the study site, approximately 49 are considered suitable for this species and up to 13 are within the action area.

The extent of habitat is limited to linear strips along the edge of the remnant where it meets the existing easement consisting of moderate to dense understorey, ground cover and good tree canopy cover.

The habitats within the action area are well represented along the extent of the pipeline corridor and extensive areas of better-quality habitat is located adjacent to the pipeline corridor in the form of remnant forest and woodland, which will be retained (e.g., the Great Otway National Park).

3.6.4.3 Long-nosed Potoroo (southern mainland)

The Long-nosed Potoroo is known from 75 historical records for the study area. There are five records from connected habitats within 1-2 kms of the action area including one recorded from 1993 within 100 m of the proposed action area from the southern tip of Section 23 – south of Porcupine Creek. This record from 1993 is within the same area of vegetation from the recent May 2022 surveys. The species is listed as Vulnerable under the EPBC Act. This species was recorded from one site near Porcupine Creek, from one image during the GHD survey. The camera also recorded a short video of the species enabling positive identification.

This survey used a combination of baited motion-sensing cameras, opportunistic surveys for predator scat and survey sign (e.g., tracks and digs) and assessment of habitat types to determine the species' occurrence within the study site. Table 11 provides a summary of the survey methods and effort used for this assessment to determine the occurrence and habitat quality and extent for this species within the action area.

Table 11 Summary of survey methods, timing and effort and review of survey adequacy for the Long-nosed Potoroo

Method /site number	Timing and effort	Survey adequacy
Spotlight / SL 1-65	Surveys completed for 8 nights (17 to 21/05/22 and 24 to 26/05/22) for approximately 2.5 to 3 hours each night within study site and offsite locations nearby study site. At least 5 spotlight surveys were completed in each section over 2 non-consecutive nights.	Not used as a targeted method however allows for opportunistic observations <i>Summary of survey effort outcomes for study site</i> 45 sessions over 8 nights, > 12 hours targeted spotlighting (excluding opportunistic spotlighting) within study site. Species not observed during spotlighting – many ground mammals observed including Swamp Wallaby, Red-necked Wallaby, small rodent/antechinus
Camera ground / CG 1- 4	Single baited cameras at 4 sites for 6 consecutive days 21 to 27/5/22, all located in study site within 10 to 20 m of the action area. Note cameras placed at least 20 m into the forest to minimise edge effects whilst avoiding potential theft.	Suitable survey technique for detecting the Long-nosed Potoroo (DEPI, 2013; DEWHA, 2011, Stevens et al., 2010; Robley et al. various dates). Approximately 1 site per 2.25 ha (action area)/1 site per 8.5 ha (study site), however cameras placed in areas of preferred habitat connected to nearby historical records in Porcupine Creek area. <i>Summary of survey effort / outcomes for study site</i> No issues recorded. Seven fauna species were recorded by the ground cameras including the threatened Southern Brown Bandicoot (<i>Isodon obesulus obesulus</i>) and Long-nosed Potoroo (<i>Potorous tridactylus trisulcatus</i>).
Habitat assessment	The entire study site including proposed action area was walked by two ecologists for the purpose of mapping habitat and checking for signs 25 and 26 June 2019 and between 17 and 27 May 2022.	Daytime searches for potentially suitable habitat resources and signs of activity (e.g., diggings); collection of predator scats area recommended (DEWHA, 2011). However, observers are cautioned that Long-nosed Potoroo diggings are usually indistinguishable in the field from those of sympatric species like bandicoots, where the Long-nosed Potoroo occurs in sympatry with other potoroo, bandicoot or small wallaby species, and where tracks cannot be distinguished, or may be difficult to distinguish between species (DSEWPC, 2011).

The wider-than-average east-west road easement and firebreak of Link Track and Parkes Lodge Road Section which forms the northern boundary of Section 23 is a potential barrier to the movement of ground fauna including potoroo and bandicoot. This combined road/firebreak is greater than 40 m wide in some sections including the section immediately adjacent to the study site. Furthermore, the road is commonly used by local residents and an east-west link between Kawarren and Forrest or Barwon Downs, therefore vehicle strike, particularly for ground fauna attempting to traverse the gap may be an issue.

The Pipeline Track and corridor at 5 to 12 m wide is a minor barrier to the movement of some small ground mammal species, including bandicoot as it exposes individuals to predation when attempting to move between patches either side of the track. Furthermore, the Pipeline Track provides a convenient north-south movement corridor for predators, including the European Red Fox (*Vulpes vulpes*) which was frequently observed on the track.

Investigation of the action area concluded that the species may regularly use all sections of the action area for foraging, particularly forested/dense areas of habitat located along creeks including Porcupine Creek (Section 25) and in low lying areas with dense vegetation. However, it is unlikely to nest or breed within the action area, particularly the cleared pipeline corridor component due to the lack of suitable habitat (absence of dense ground cover and shrub layer).

All habitat within the proposed action area (7.81 ha) is identified habitat and potential habitat for the Long-nosed Potoroo. Higher quality habitats for this species (e.g., areas with dense understorey) are located along Section 21, within the Porcupine Creek area and most of Section 23, and Section 25i in the Dividing Creek area and south of the creek. The cleared pipeline corridor component consisting of the maintained grassy verge without trees between the road/track and intact remnant vegetation (0.5 ha) is low quality occasional foraging habitat that lacks any structure and would not be used for breeding or refuge.

The extent of habitat is limited to linear strips along the edge of the remnant where it meets the existing easement consisting of moderate to dense understorey, ground cover and good tree canopy cover.

The habitats within the action area are well represented along the extent of the pipeline corridor and extensive areas of better-quality habitat is located adjacent to the pipeline corridor in the form of remnant forest and woodland, which will be retained (e.g., the Great Otway National Park).

3.6.4.4 Southern Brown Bandicoot (eastern), Southern Brown Bandicoot (south-eastern)

Southern Brown Bandicoot is known from 14 historical records (VBA and ALA 2022) for the study area including one record within 200 m of the southern tip of Section 23. The species is listed as Endangered under the EPBC Act. This species was recorded from one site near Porcupine Creek, from one image during surveys undertaken by GHD in 2022 conical digs were recorded along the top of the embankment of the track both north and south of Porcupine Creek and attributed to bandicoots, which commonly create conical shaped diggings. Fresh and old conical diggings were recorded adjacent to the track along Section 23 (Porcupine Creek and north of Porcupine Creek) during surveys in May 2022. The diggings in this area could be made by the common Long-nosed Bandicoot (*Perameles nasuta*) or the endangered EPBC and FFG Act listed Southern Brown Bandicoot (*Isoodon obesulus obesulus*). Both species are known from the Porcupine Creek area.

Surveys for the Southern Brown Bandicoot adopted the same methods and effort presented for the Long-nosed Potoroo. This survey used a combination of baited motion-sensing cameras, opportunistic surveys for predator scat and survey sign (e.g., tracks and digs) and assessment of habitat types to determine the species' occurrence within the study site. Table 12 provides a summary of the survey methods and effort used for this assessment to determine the occurrence and habitat quality and extent for this species within the action area.

Table 12 Summary of survey methods, timing and effort and review of survey adequacy for the Southern Brown Bandicoot

Method /site number	Timing and effort	Survey adequacy
Spotlight / SL 1-65	Surveys completed for 8 nights (17 to 21/05/22 and 24 to 26/05/22) for approximately 2.5 to 3 hours each night within study site and offsite locations nearby study site. At least 5 spotlight surveys were completed in each section over 2 non-consecutive nights.	Not used as a targeted method however allows for opportunistic observations. <i>Summary of survey effort outcomes for study site</i> 45 sessions over 8 nights, >12 hours targeted spotlighting (excluding opportunistic spotlighting) within study site. Species not observed during spotlighting – many ground mammals observed including Swamp Wallaby, Red-necked Wallaby, small rodent/antechinus.
Camera ground / CG 1- 4	Single baited cameras at 4 sites for 6 consecutive days 21 to 27/05/22, all located in study site within 10 to 20 m of the action area. Note cameras placed at least 20 m into the forest to minimise edge effects whilst avoiding potential theft.	Suitable survey technique for detecting the Southern Brown Bandicoot (DEWHA, 2011). Approximately 1 site per 2.25 ha (action area)/1 site per 8.5 ha (study site), however cameras placed in areas of preferred habitat connected to nearby historical records in Porcupine Creek area. <i>Summary of survey effort / outcomes for study site</i> No issues recorded. Seven fauna species were recorded by the ground cameras including the threatened Southern Brown Bandicoot and Long-nosed Potoroo.

Method /site number	Timing and effort	Survey adequacy
Habitat assessment	The entire study site including proposed action area was walked by two ecologists for the purpose of mapping habitat and checking for signs 25 and 26 June 2019 and between the 17 and 27 May 2022.	Daytime searches for potentially suitable habitat resources and signs of activity (e.g., diggings); collection of predator scats area recommended (DEWHA, 2011). However, observers are cautioned that bandicoot diggings may be indistinguishable in the field from other bandicoot species (DSEWPC, 2011).

The Southern Brown Bandicoot is subject to the same potential movement barriers and pressures from introduced predators as described for the Long-nosed Potoroo. Investigation of the proposed action area concluded that the species may regularly use all sections of the action area for foraging, particularly forested/dense areas of habitat located along creeks including Porcupine Creek and in low lying areas with dense vegetation. However, it is unlikely to nest or breed within the action area, particularly the cleared pipeline corridor component due to the lack of suitable habitat (absence of dense ground cover and shrub layer).

All habitat within the proposed action area (7.81 ha) is identified as habitat and potential habitat for the Southern Brown Bandicoot. Higher quality and identified habitats for this species (e.g., areas with dense understorey) are associated located along Section 21, within the Porcupine Creek area and most of Section 23, and Section 25i in the Dividing Creek area and south of the creek. The cleared pipeline corridor component consisting of the maintained grassy verge without trees between the road/track and intact remnant vegetation (0.5 ha) is low quality occasional foraging habitat that lacks any structure and would not be used for breeding or refuge.

The extent of habitat is limited to linear strips along the edge of the remnant where it meets the existing easement consisting of moderate to dense understorey, ground cover and good tree canopy cover. The habitats within the proposed action area are well represented along the extent of the pipeline corridor and extensive areas of better-quality habitat is located adjacent to the pipeline corridor in the form of remnant forest and woodland, which will be retained (e.g., the Great Otway National Park).

3.6.4.5 Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (south-eastern mainland population)

The Spot-tailed Quoll is known from 16 historical records (VBA and ALA 2022) for the study area including two records (pre-1990) within connected habitat 500 m west of Section 25. The species is listed as Endangered under the EPBC Act.

No suitable den sites were recorded within the study site or proposed action area during the surveys. The species was not recorded using ground or arboreal camera. Table 13 provides a summary of the survey methods and effort used for this assessment to determine the occurrence and habitat quality and extent for this species within the action area.

Table 13 Summary of survey methods, timing and effort and review of survey adequacy for the Spot-tailed Quoll

Method /site number	Timing and effort	Survey adequacy and outcomes
Spotlight / SL 1-65	Surveys completed for 8 nights (17 to 21/05/22 and 24 to 26/05/22) for approximately 2.5 to 3 hours each night within study site and offsite locations nearby study site. At least 5 spotlight surveys were completed in each section over 2 non-consecutive nights.	Not used as a targeted method however allows for opportunistic observations <i>Summary of survey effort / outcomes</i> 45 sessions over 8 nights, > 12 hours targeted spotlighting (excluding opportunistic spotlighting) within study site. Species not observed during spotlighting – many ground mammals observed including Swamp Wallaby, Red-necked Wallaby, small rodent/antechinus

Method /site number	Timing and effort	Survey adequacy and outcomes
Camera ground / CG 1- 4	Single baited cameras at 4 sites for 6 consecutive days 21 to 27/05/22, all located in study site within 10 to 20 m of the action area. Note cameras placed at least 20 m into the forest to minimise edge effects whilst avoiding potential theft.	<p>Suitable survey technique for detecting the quoll (DEWHA, 2011); however, bait used was not target species specific. Despite this, the standard bait mix is still suitable for attracting quoll (e.g., a study by Austin et al. (2016) notes camera baits with tuna lure detected more individuals than cameras bait with peanut butter, however the study acknowledges that other bait still attracts quoll). Other studies for <i>D. hallucatus</i> (e.g., Diete et al., 2015) have also proven that other bait mixes not recommended by the guidelines including the standard bait mix can be successfully used to lure quoll to remote camera locations. Therefore, species may still investigate baits or be drawn to the scent of potential prey animals investigating the standard bait mix used for this project.</p> <p><i>Summary of survey effort / outcomes</i> Approximately 1 site per 2.25 ha (action area)/ 1 site per 8.5 ha (study site). Cameras placed in potential habitat in Porcupine Creek area No issues recorded. Species not recorded. Seven fauna species were recorded by the ground cameras including the threatened Southern Brown Bandicoot and Long-nosed Potoroo.</p>
Camera tree mounted / CT 1- 9	Single baited cameras at 9 sites for 10 consecutive days 17 to 26/05/22, all located in the study site or within 50 m of the action area	<p>Not documented as a suitable technique for the quoll and bait used was not target species specific. However species is partly arboreal and may investigate baits or be drawn to the scent of potential prey animals investigating baits.</p> <p><i>Summary of survey effort / outcomes</i> Site CT2 – technical issues (No records from the 21/5/22). All other sites achieved desired survey effort. Approximately 1 site per 1 ha (action area)/1 site per 3.8 ha (study site) at approximately 500-1000 m intervals (except 2 locations at Porcupine Creek spaced less than 200 m apart). Cameras placed within 750 m of historical records Section 25. Other arboreal specie including Sugar Glider, Feathertail Glider recorded.</p>
Habitat assessment	<p>The entire study site including the proposed action area was walked by two ecologists for the purpose of mapping habitat, latrine and den sites (e.g., fallen hollow logs) and large trees 25 and 26 June 2019.</p> <p>The 17 to 27 May 2022 assessment involved two ecologists walking along either side of the track for the length of the study site from north to south to assess and map the number of hollow-bearing trees within the study site including the action area</p> <p>Brief assessment of habitat type and quality at 'off site' locations with historical records</p>	<p>Daytime searches for potentially suitable habitat resources including latrine and den sites recommended (DEWHA, 2011).</p> <p><i>Summary of survey effort / outcomes</i> No quoll scat, latrine sites or evidence of ground den sites was recorded during the survey. No observations of quoll were recorded within or interacting with any arboreal hollows during the hollow-bearing trees surveys.</p>

The Spot-tailed Quoll was assumed to be present within the study site and vegetated areas of the proposed action area based on presence of suitable habitat and nearby historical records. Due to the lack of suitable habitat (e.g., logs and dense ground cover) in the modified vegetation of the pipeline corridor, and location of habitat (e.g., primarily along the edge of an access track) this species is unlikely to den or breed within the proposed action area.

The Recovery Plan for the species (DELWP, 2022) lists the Great Otway National Park as an important population. The Spot-tailed Quoll occupies a range of forest habitats, particularly wet eucalypt forests associated with rocky outcrops, extensive riparian vegetation and high levels of ground dwelling prey. They have a large home range in excess of 580 ha but could be up to 2200 hectares, which is influenced by the quality of habitat and availability of den sites (SWIFFT, 2022a). Males can use one or more den sites, which can be made in hollow logs, hollow trees, rock crevices and caves. During a single night an individual may range over several kilometres. Movement of males is greater than females, particularly during the breeding season, which extends from April to July. Females may carry up to six young, which become independent after 18 weeks (SWIFFT, 2022a).

The Spot-tailed Quoll is predominantly nocturnal and rests during the day in dens (Jones et al., 2001 in DoE, 2022). Habitat requirements include suitable den sites such as hollow logs, tree hollows, rock outcrops or caves (DoE, 2022). Individuals also require an abundance of food, such as birds and small mammals, and large areas of relatively intact vegetation through which to forage (NSW NPWS, 1999 in DoE, 2022). They are proficient climbers and opportunistic feeders, feeding on terrestrial and arboreal prey such as small mammals (e.g., antechinus, bush rat), medium sized mammals (possums, gliders, and rabbits), birds and insects. Larger mammals such as wallabies have been analysed in scats indicating a scavenging and opportunistic feeding behaviour. Areas known as latrine sites serve as communal defecation sites and are often situated in exposed areas such as rock ledges. It is believed these areas may serve a role in communication of territory and possibly reproductive status (Edgar, 1983; Watt, 1993; Mansergh, 1995; DSE, 2005 in SWIFFT, 2022a).

Many populations of Spot-tailed Quoll have experienced a significant decline over the past 20 to 30 years to the extent where there is a question over their long-term viability. North East Victoria and East Gippsland are considered stronghold areas for this species (SWIFFT, 2022a). In 1984 it was estimated that the Spot-tailed Quoll had suffered a 50% reduction in its known range since European settlement (Mansergh, 1984 in SWIFFT, 2022a). Since that date there has been a further decline in population and range with reduced sightings and low survey counts. The main stronghold areas for this species in Victoria are now in North East and East Gippsland. In south-west Victoria there is grave concern for ongoing survival at Mt Eccles and the Otways. For example, in 1999 there were only 3 records from 51 survey sites in the Otways (Belcher, 2000). It is now considered that populations of *Dasyurus maculatus* in Southwest Victoria, including the Otway Ranges, Cobboboonee State Forest, Mt Eccles National Park and the Mt Eccles lava flow are critically endangered (Belcher, 2006).

The majority of vegetation within study site (34.12 ha) is considered hunting and to a lesser extent potential breeding habitat. The species most likely uses the 7.81 ha of the proposed action area for hunting. Areas with higher densities of hollow-bearing trees may contain potential den sites, however few logs with suitable hollows, no log piles and no rocky outcrops were recorded within the proposed action area hence breeding opportunities and denning sites within the proposed action area are limited. The study site has been searched and no den sites or latrine sites were recorded. Higher quality and identified habitats for this species (e.g., areas with dense understorey) are located along the lower lying areas of Section 21, within the Porcupine Creek area and most of Section 23, and Section 25i in the Dividing Creek area and south of the creek.

The extent of habitat is limited to linear strips along the edge of the remnant where it meets the existing easement consisting of moderate to dense understorey, ground cover and good tree canopy cover.

The habitats within the action area are well represented along the extent of the pipeline corridor and extensive areas of better-quality habitat is located adjacent to the pipeline corridor in the form of remnant forest and woodland, which will be retained (e.g., the Great Otway National Park).

3.6.4.6 Swamp Antechinus (*Antechinus minimus maritimus*)

The Swamp Antechinus is known from 2 historical records (VBA and ALA 2022) for the study area including one record within 500 m west of the Section 23. The species is listed as Vulnerable under the EPBC Act.

Swamp Antechinus habitat is typically wet heath, heathy woodland, sedgeland and dense tussock grassland, rarely above 200 m (DSE 1996, Menkhorst 2004, cited in SWIFFT, 2022b). In a study done by Wilson et al. (2001) it was found that although Swamp Antechinus (SE mainland) were found in a variety of vegetation communities with different dominant floristic groups these communities had a consistently high percentage of understorey cover across them. The spatial distribution of these communities is thought to be important for the preservation and dispersal of the species and the species is considered a habitat specialist at the microhabitat level, preferring dense, closed heathland (Wilson et al., 1986; Moro, 1991; Wilson et al. 2001, cited in SWIFFT, 2022b).

Surveys for the Swamp Antechinus used a combination of baited motion-sensing cameras, opportunistic surveys for predator scat and assessment of habitat types to determine the species' occurrence within the study site. Table 14 summarises the survey methods and effort used for this assessment to determine the occurrence and habitat quality and extent for this species within the proposed action area.

Table 14 Summary of survey methods, timing and effort and review of survey adequacy for the Swamp Antechinus

Method /site number	Timing and effort	Survey adequacy
Camera ground / CG 1- 4	Single baited cameras at 4 sites for 6 consecutive days 21 to 27/05/22, all located in study site within 10 to 20 m of the action area. Note cameras placed at least 20 m into the forest to minimise edge effects whilst avoiding potential theft.	Suitable survey technique for detecting the Swamp Antechinus (DEWHA, 2011). Approximately 1 site per 2.25 ha (action area)/1 site per 8.5 ha (study site). Cameras placed in habitat connected to nearby historical records in Porcupine Creek area. <i>Summary of survey effort / outcomes for study site</i> No issues recorded. Seven fauna species were recorded by the ground cameras including the threatened Southern Brown Bandicoot, Long-nosed Potoroo, small rodents and possible Antechinus species, although image quality was poor not allowing for positive confirmation of Antechinus species.
Habitat assessment	The entire study site including proposed action area was walked by two ecologists for the purpose of mapping habitat 25 and 26 June 2019 and between 17 and 27 May 2022.	Daytime searches for potentially suitable habitat resources and collection of predator scats (DEWHA, 2011).

The Swamp Antechinus was assumed to be present within the study site and vegetated areas of the proposed action area based on presence of suitable habitat and nearby historical records. Due to the lack of suitable habitat (dense ground cover) in the modified vegetation of the pipeline corridor, this species is unlikely to nest or breed within the action area. It may occur in wetter areas of habitat associated with watercourses and other low-lying areas with dense vegetation adjacent to the action area, occasionally foraging in the vicinity of the pipeline corridor.

Up to 4.48 ha of suitable habitat including EVC 198 Sedgy Riparian Woodland, EVC 8 Wet Heathland and EVC 83 Swampy Riparian Woodland occurs within the proposed action area. Suitable habitats for this species (e.g., wetter areas with dense understorey) are located along Section 21, within the Porcupine Creek area and most of Section 23, and Section 25i in the Dividing Creek area and south of the creek. The cleared pipeline corridor component consisting of the maintained grassy verge without trees between the road/track and intact remnant vegetation (0.5 ha) is low quality occasional foraging habitat that lacks any structure and would not be used for breeding or refuge.

The extent of habitat is limited to linear strips along the edge of the remnant where it meets the existing easement consisting of moderate to dense understorey, ground cover and good tree canopy cover. The habitats within the proposed action area are well represented along the extent of the pipeline corridor and extensive areas of better-quality habitat is located adjacent to the pipeline corridor in the form of remnant forest and woodland, which will be retained (e.g., the Great Otway National Park).

3.6.5 Migratory species

The PMST identified a total of 14 listed migratory species as being either known to occur, likely to occur, or possibly occurring within a 10 km buffer of the action area.

The Rufous Fantail (*Rhipidura rufifrons*) and Satin Flycatcher (*Myiagra cyanoleuca*) were recorded from the study site at Porcupine Creek during diurnal bird surveys in November 2022. The White-throated Needletail (*Hirundapus caudacutus*) could also possibly occur within the proposed action area. The habitat for all species is well represented in the surrounding National Park and Forest Park. Furthermore, the Project is unlikely to remove or modify a large area or important component of habitat for any of these species. It is unlikely that these species would breed within the habitat of the proposed action area. The Project is not expected to result in impacts to important habitat or populations of migratory fauna.

3.6.6 Wetlands of international importance

3.6.6.1 Port Phillip Bay (Western Shoreline) and Bellarine Peninsula

The Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar site is located on the western shoreline of Port Phillip Bay between Melbourne and Geelong and on the Bellarine Peninsula and Mud Islands (DAWE 2019a).

Due to the distance between the proposed action and the nearest part of this Ramsar site (over 70 km), it is highly unlikely that direct or indirect impacts to the ecological character or critical components, processes and services of the Ramsar site would occur.

3.6.6.2 Western District Lakes

The Western District Lakes Ramsar site is located within the western volcanic plains region of Victoria, near the township of Colac (DAWE, 2019b). It lies within the landlocked Lake Corangamite catchment and is comprised of nine separate lakes.

Due to the distance between the proposed action and the nearest part of this Ramsar site (over 20 km), it is highly unlikely that direct or indirect impacts to the ecological character or critical components, processes and services of the Ramsar site would occur.

3.6.7 Listed marine species

The PMST identified a total of 21 listed marine species within the 10 km buffer area. Given the inland location of the proposed action area, no species listed solely as marine are likely to occur.

4. Relevant Impacts on MNES

4.1 Overview of Potential Impacts

Potential environmental impacts from the proposed action were identified in consideration of the proposed construction method and ongoing operation of the existing water pipeline. These include direct and indirect impacts and have been identified and assessed in line with the EPBC Act MNES Significant Impact Guidelines 1.1 (DoE, 2013b).

Potential direct and indirect impacts include vegetation and habitat removal, noise and vibration, and potential impacts on water quality (sedimentation) from pipeline trenching and ancillary activities (such as construction of access roads and laydown areas). Further consideration was given to both short-term and long-term impacts on large trees and the associated loss of habitat, and how this could impact on relevant MNES.

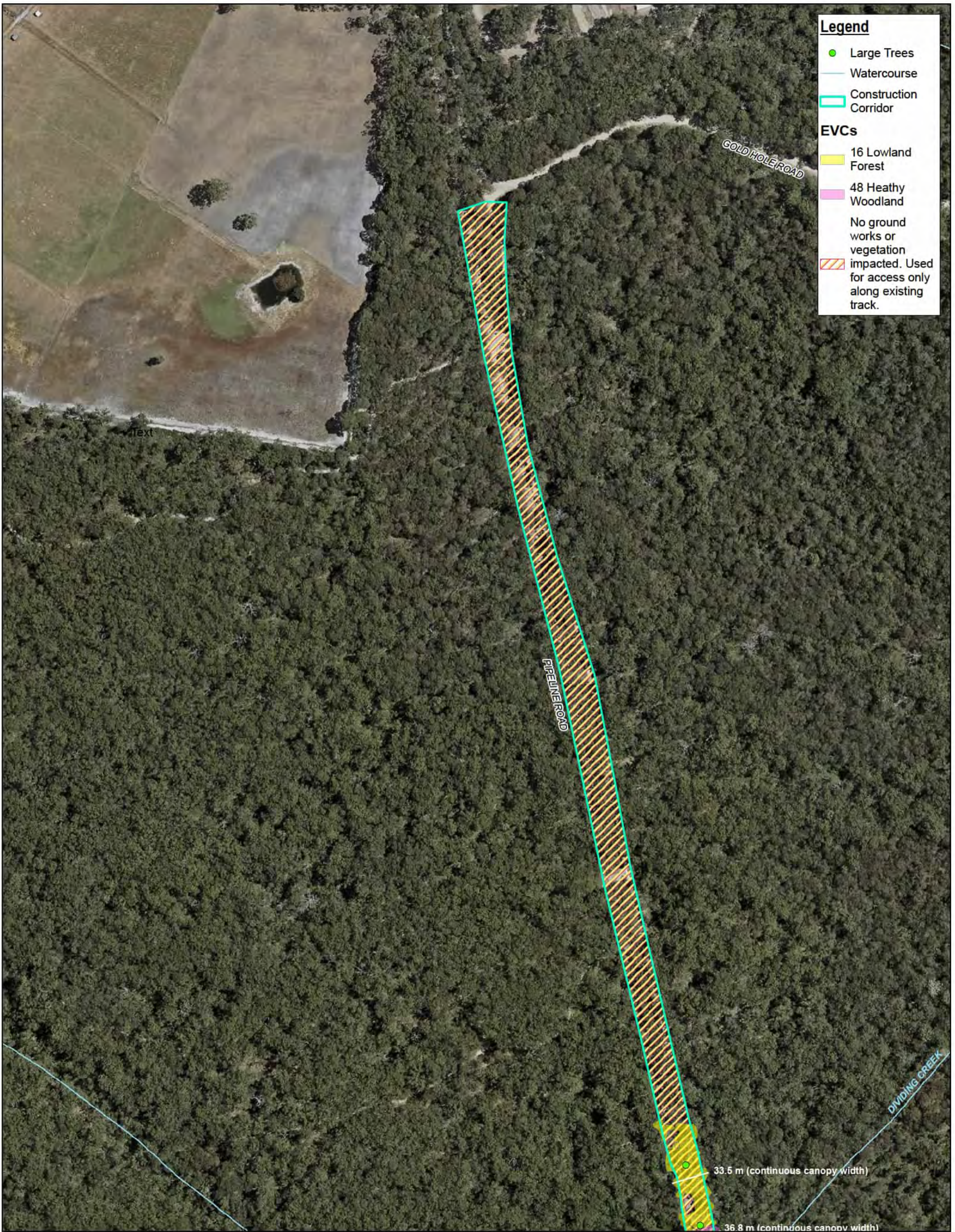
Table 15 summarises the potential impacts on listed threatened fauna species of concern that described in this Chapter. In summary, the works are expected to have minimal impact for most fauna species and their habitats, with a low risk of direct impacts (e.g., injury or death to a fauna) following the implementation of mitigation measures (see Sections 5.2 and 5.3).

Following a review of the information gathered from the various ecological studies there are three EPBC Act listed fauna species – Gang-Gang Cockatoo, Yellow-bellied Glider and Long-nosed Potoroo that have a greater risk of being impacted. The Yellow-bellied Glider and Gang-gang Cockatoo are at greater risk as they are both arboreal, hollow-obligate species that rely on trees for feeding, refuge (roosting or den sites) and breeding. Habitat removal and modification is a key impact for both species. The Long-nosed Potoroo is also at greater risk of impact because of the removal of habitat from an area that is known to support an important population of the species, therefore the overall habitat for that population will be reduced by the proposed action.

Table 15 Potential impacts to fauna identified as a result of ecological assessments undertaken to date

Potential impact	Description / quantity / location	MNES fauna species of concern
Disturbance/ loss/ degradation of terrestrial fauna habitat	Habitat including hollow-bearing trees will be removed from along the internal edge of remnant vegetation from three distinct areas (a. Section 25i, b. Section 23 and c. Sections 21, 20 and 19). Noting the last three sections are mostly continuous. The three areas combined include clearing/ modification of 7.81 ha of fauna habitat inclusive of up to 2,620 trees with 26 trees containing hollows (see Section 4.2 further details). Habitat removal has the potential to cause the greatest impact compared to other potential impacts.	Higher risk (arboreal, hollow-obligate and tree dependent species): – Yellow-bellied Glider – Gang-gang Cockatoo Lower risk species – ground dwelling fauna: – Long-nosed Potoroo – Swamp Antechinus – Southern Brown Bandicoot – Spot-tailed Quoll
Mortality of individuals from digging of trench and capture in trench when open	Burrowing animals may be dug up during trench construction. Ground dwelling fauna may become trapped in trench when open	Higher risk (ground dwelling/burrowing animals): – Long-nosed Potoroo – Swamp Antechinus – Southern Brown Bandicoot Lower risk – Spot-tailed Quoll (as species is more capable of navigating and escape from trench than species mentioned above)
Mortality of individuals from vehicle strike during construction	There will be an increase in vehicle movements during the construction process during the day, particularly when workers drive to site in the early morning and return each evening	Low risk for ground dwelling/burrowing animals: – Long-nosed Potoroo – Swamp Antechinus – Southern Brown Bandicoot – Spot-tailed Quoll

Potential impact	Description / quantity / location	MNES fauna species of concern
Degradation of watercourse and/or associated fauna habitat from construction	There are several minor waterways and one major stream (Porcupine Creek) that will be intersected during construction	Low risk for all species
Noise and vibration during construction	<p>There is the potential for impacts associated with elevated noise and vibration levels during construction of the Colac Pipeline Upgrade. Noise- and vibration-generating activities associated with construction may cause effects on native fauna which may disturb or displace local native fauna during construction, as well as interfere with communication and potentially affect animal behaviour surrounding the action area. Potential noise- and vibration-generating activities include:</p> <ul style="list-style-type: none"> – The operation of machinery during excavation – Movement of vehicles transporting personnel, equipment and materials to site. <p>Construction of the pipeline will occur during daytime hours only: Monday to Friday 7:00am to 6:00pm and Saturday 7:00am to 1:00pm</p>	<p>Higher risk (arboreal, hollow-obligate and tree dependent species)</p> <ul style="list-style-type: none"> – Yellow-bellied Glider – Gang-gang Cockatoo <p>Lower risk species – ground dwelling fauna</p> <ul style="list-style-type: none"> – Long-nosed Potoroo – Swamp Antechinus – Southern Brown Bandicoot – Spot-tailed Quoll
Introduction and spread of introduced/pest fauna species	Introduced fauna occur within the study site. The Project is unlikely to contribute to the introduction of new introduced vertebrate fauna species or increase the spread of existing introduced fauna species	Low risk for all species
Fragmentation of fauna habitat	<p>The proposed action will not result in the fragmentation of habitat due to the existence of an already largely cleared pipeline corridor and access track.</p> <p>The proposed action will increase the width of the existing cleared corridor but not substantially for any species of fauna given the action is within a very large and contiguous patch of habitat.</p> <p>The existing corridor varies in width from 5 to 12 m, including the track and maintained verge. On both sides of the existing corridor are contiguous patches of habitat/remnant vegetation.</p> <p>The proposed construction corridor (action area) will vary in width from 9.0 to 59.8 m wide including the track and maintained verge.</p> <p>Sections of the proposed construction corridor greater than 30 m wide are not extensive (e.g., not longer than 20 m, see Figure 4) and include calculations based on tree canopy, which does not always equate to the equivalent extent for the removal of the understorey and ground cover habitat layers. Whilst the proposed action will increase the width of the existing cleared corridor it is not considered substantial for any species of fauna, particularly as it is within a very large and otherwise contiguous patch of habitat.</p>	Low risk for all species



Legend

- Large Trees
- Watercourse
- Construction Corridor

EVCs

- 16 Lowland Forest
- 48 Heathy Woodland
- No ground works or vegetation impacted. Used for access only along existing track.

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Map Projection: Lambert Conformal Conic
 Horizontal Datum: GDA 1994
 Grid: GDA 1994 VICGRID94



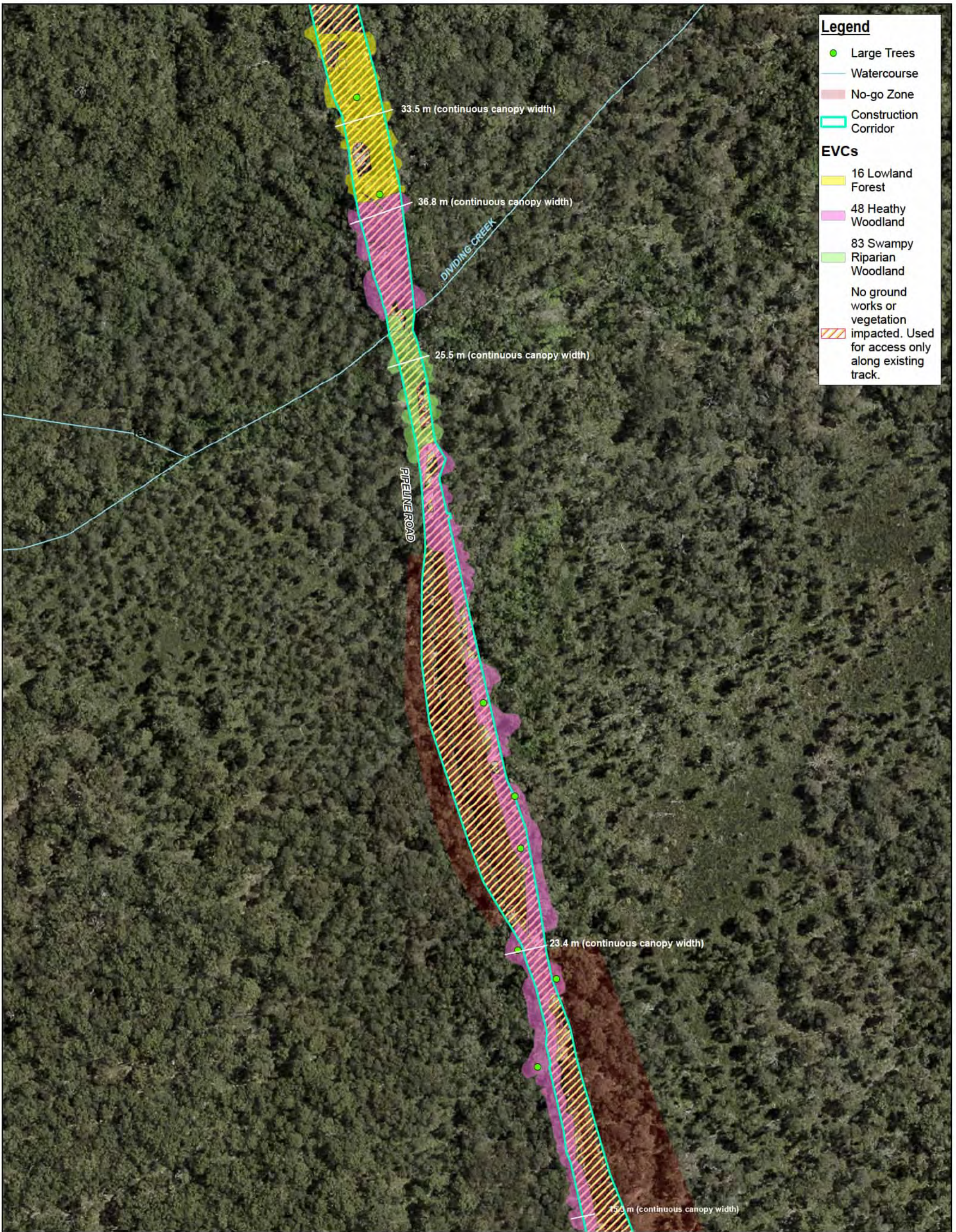
Barwon Water
 Colac Pipeline Upgrade Offset Strategy

Habitat types and extent within
 proposed action area

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FIGURE 4

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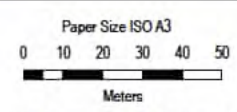


Legend

- Large Trees
- Watercourse
- No-go Zone
- Construction Corridor

EVCs

- 16 Lowland Forest
- 48 Heathy Woodland
- 83 Swampy Riparian Woodland
- No ground works or vegetation impacted. Used for access only along existing track.



Map Projection: Lambert Conformal Conic
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 Grid: GDA 1994 VICGRID94

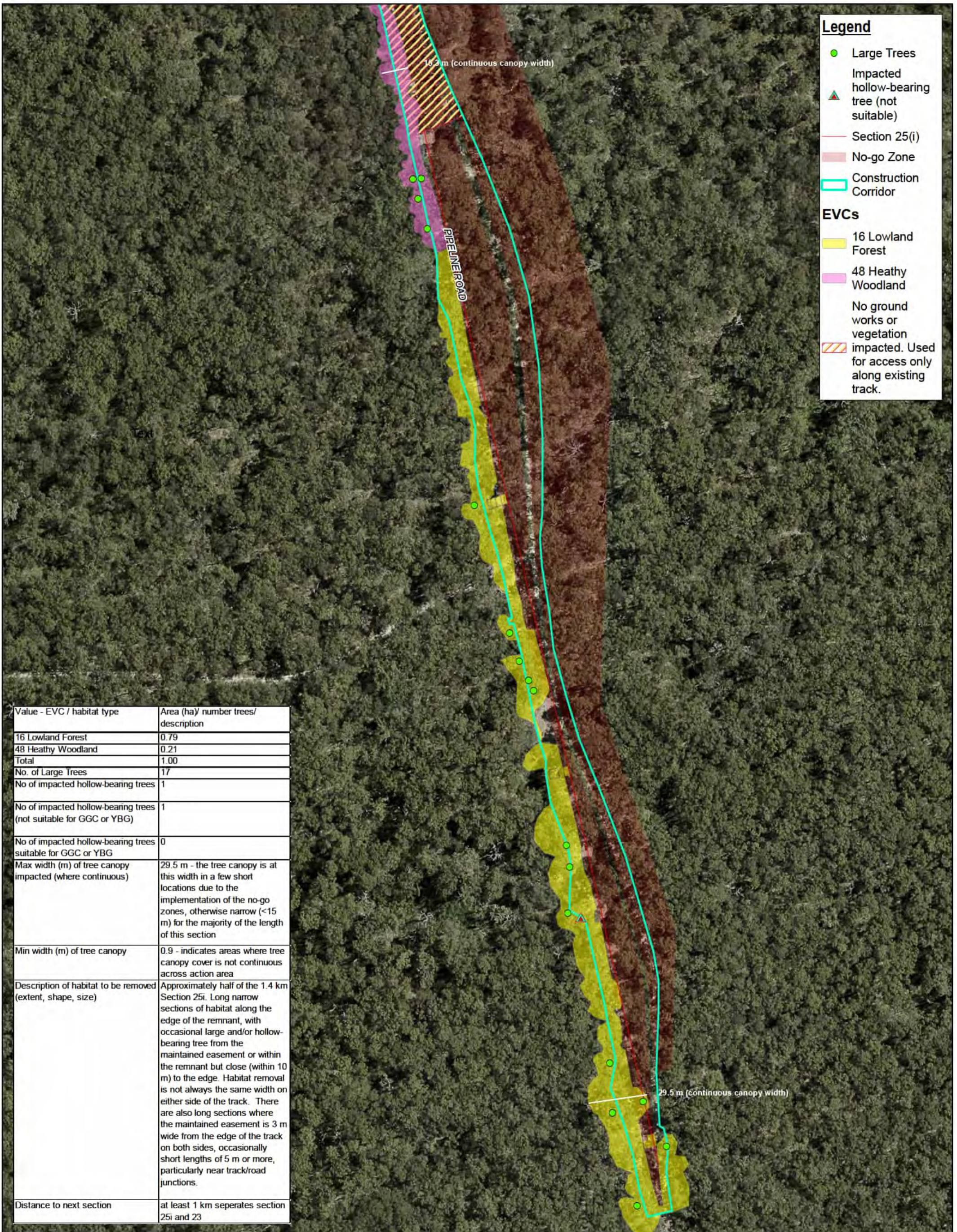


Barwon Water
 Colac Pipeline Upgrade Offset Strategy

Habitat types and extent within
 proposed action area

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Legend

- Large Trees
- ▲ Impacted hollow-bearing tree (not suitable)
- Section 25(i)
- No-go Zone
- Construction Corridor

EVCs

- 16 Lowland Forest
- 48 Heathy Woodland
- No ground works or vegetation impacted. Used for access only along existing track.

Value - EVC / habitat type	Area (ha) / number trees / description
16 Lowland Forest	0.79
48 Heathy Woodland	0.21
Total	1.00
No. of Large Trees	17
No of impacted hollow-bearing trees	1
No of impacted hollow-bearing trees (not suitable for GGC or YBG)	1
No of impacted hollow-bearing trees suitable for GGC or YBG	0
Max width (m) of tree canopy impacted (where continuous)	29.5 m - the tree canopy is at this width in a few short locations due to the implementation of the no-go zones, otherwise narrow (<15 m) for the majority of the length of this section
Min width (m) of tree canopy	0.9 - indicates areas where tree canopy cover is not continuous across action area
Description of habitat to be removed (extent, shape, size)	Approximately half of the 1.4 km Section 25i. Long narrow sections of habitat along the edge of the remnant, with occasional large and/or hollow-bearing tree from the maintained easement or within the remnant but close (within 10 m) to the edge. Habitat removal is not always the same width on either side of the track. There are also long sections where the maintained easement is 3 m wide from the edge of the track on both sides, occasionally short lengths of 5 m or more, particularly near track/road junctions.
Distance to next section	at least 1 km separates section 25i and 23

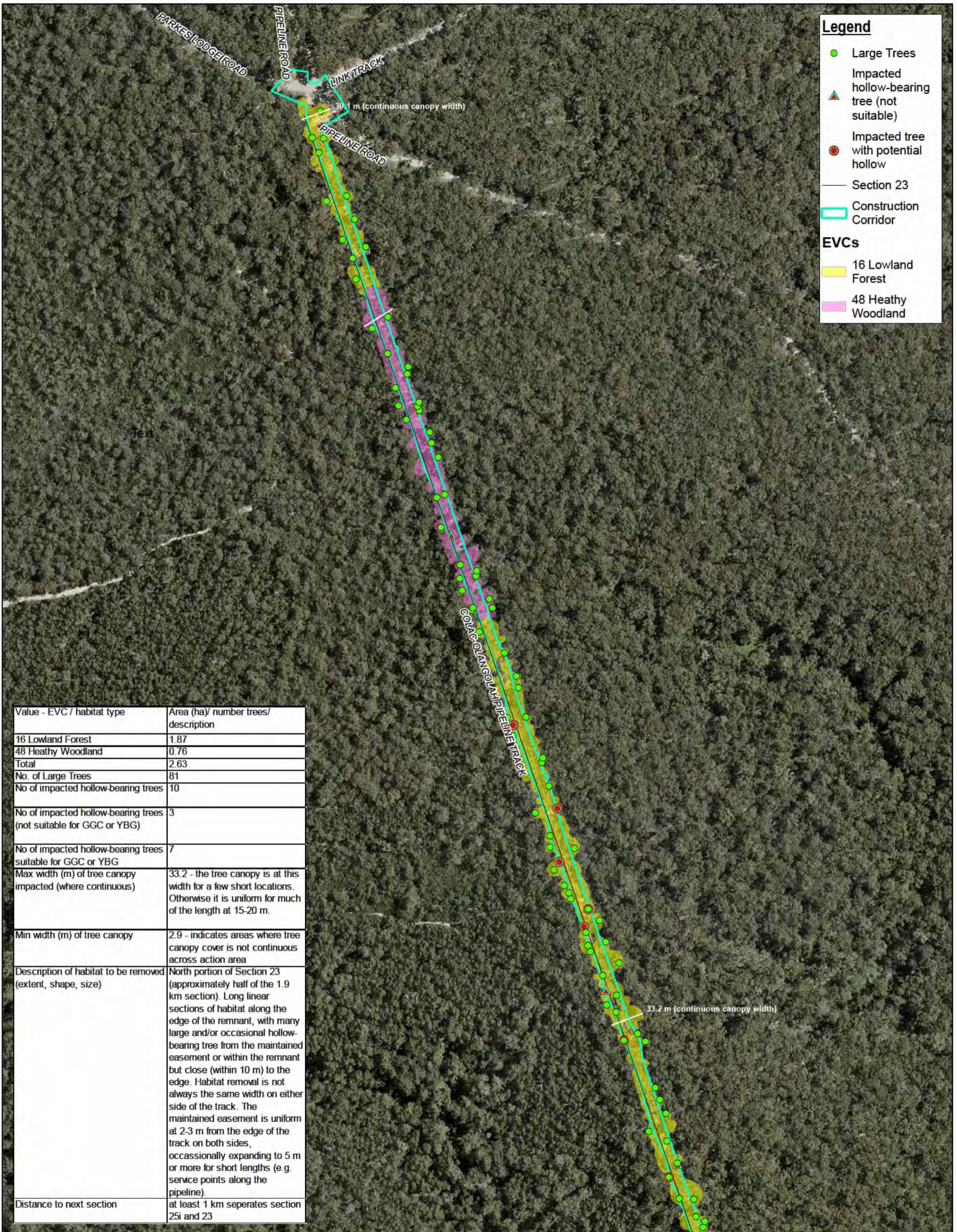
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Barwon Water
 Colac Pipeline Upgrade Offset Strategy
 Habitat types and extent within proposed action area

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Legend

- Large Trees
- ▲ Impacted hollow-bearing tree (not suitable)
- Impacted tree with potential hollow
- Section 23
- Construction Corridor

EVCs

- 16 Lowland Forest
- 48 Heathy Woodland

Value - EVC / habitat type	Area (ha) / number trees / description
16 Lowland Forest	1.87
48 Heathy Woodland	0.76
Total	2.63
No. of Large Trees	81
No of impacted hollow-bearing trees	10
No of impacted hollow-bearing trees (not suitable for GGC or YBG)	3
No of impacted hollow-bearing trees suitable for GGC or YBG	7
Max width (m) of tree canopy impacted (where continuous)	33.2 - the tree canopy is at this width for a few short locations. Otherwise it is uniform for much of the length at 15-20 m.
Min width (m) of tree canopy	2.9 - indicates areas where tree canopy cover is not continuous across action area
Description of habitat to be removed (extent, shape, size)	North portion of Section 23 (approximately half of the 1.9 km section). Long linear sections of habitat along the edge of the remnant, with many large and/or occasional hollow-bearing tree from the maintained easement or within the remnant but close (within 10 m) to the edge. Habitat removal is not always the same width on either side of the track. The maintained easement is uniform at 2-3 m from the edge of the track on both sides, occasionally expanding to 5 m or more for short lengths (e.g. service points along the pipeline).
Distance to next section	at least 1 km separates section 25i and 23

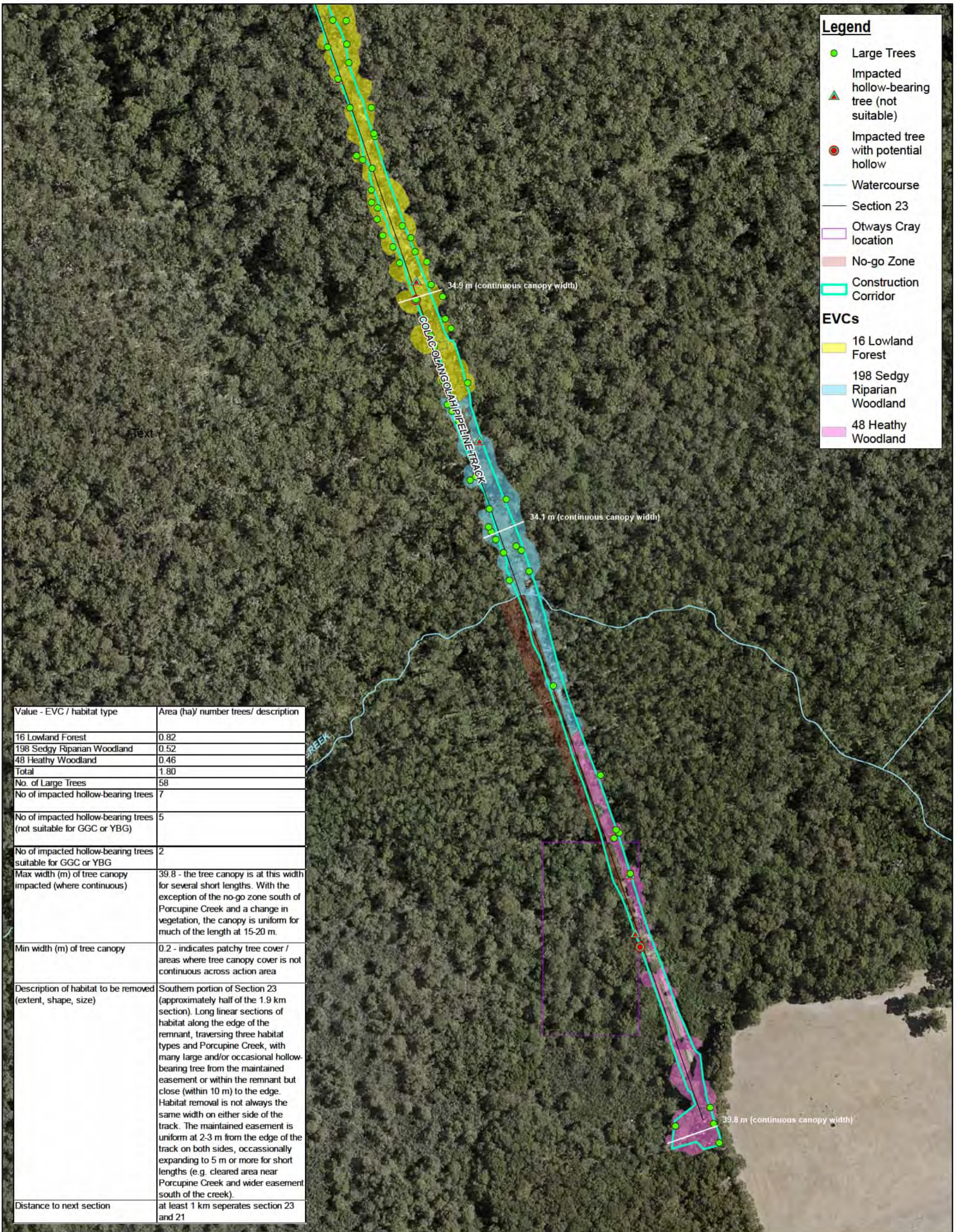
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Barwon Water
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 Habitat types and extent within proposed action area

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Legend

- Large Trees
- ▲ Impacted hollow-bearing tree (not suitable)
- Impacted tree with potential hollow
- Watercourse
- Section 23
- Otways Cray location
- No-go Zone
- ▭ Construction Corridor

EVCs

- 16 Lowland Forest
- 198 Sedgy Riparian Woodland
- 48 Heathy Woodland

Value - EVC / habitat type	Area (ha)/ number trees/ description
16 Lowland Forest	0.82
198 Sedgy Riparian Woodland	0.52
48 Heathy Woodland	0.46
Total	1.80
No. of Large Trees	58
No of impacted hollow-bearing trees	7
No of impacted hollow-bearing trees (not suitable for GGC or YBG)	5
No of impacted hollow-bearing trees suitable for GGC or YBG	2
Max width (m) of tree canopy impacted (where continuous)	39.8 - the tree canopy is at this width for several short lengths. With the exception of the no-go zone south of Porcupine Creek and a change in vegetation, the canopy is uniform for much of the length at 15-20 m.
Min width (m) of tree canopy	0.2 - indicates patchy tree cover / areas where tree canopy cover is not continuous across action area
Description of habitat to be removed (extent, shape, size)	Southern portion of Section 23 (approximately half of the 1.9 km section). Long linear sections of habitat along the edge of the remnant, traversing three habitat types and Porcupine Creek, with many large and/or occasional hollow-bearing tree from the maintained easement or within the remnant but close (within 10 m) to the edge. Habitat removal is not always the same width on either side of the track. The maintained easement is uniform at 2-3 m from the edge of the track on both sides, occasionally expanding to 5 m or more for short lengths (e.g. cleared area near Porcupine Creek and wider easement south of the creek).
Distance to next section	at least 1 km separates section 23 and 21

Paper Size ISO A3
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 Meters
 Map Projection: Lambert Conformal Conic
 Horizontal Datum: GDA 1994
 Grid: GDA 1994 VICGRID94



Barwon Water
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 Habitat types and extent within proposed action area

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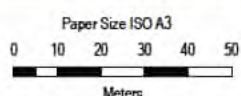
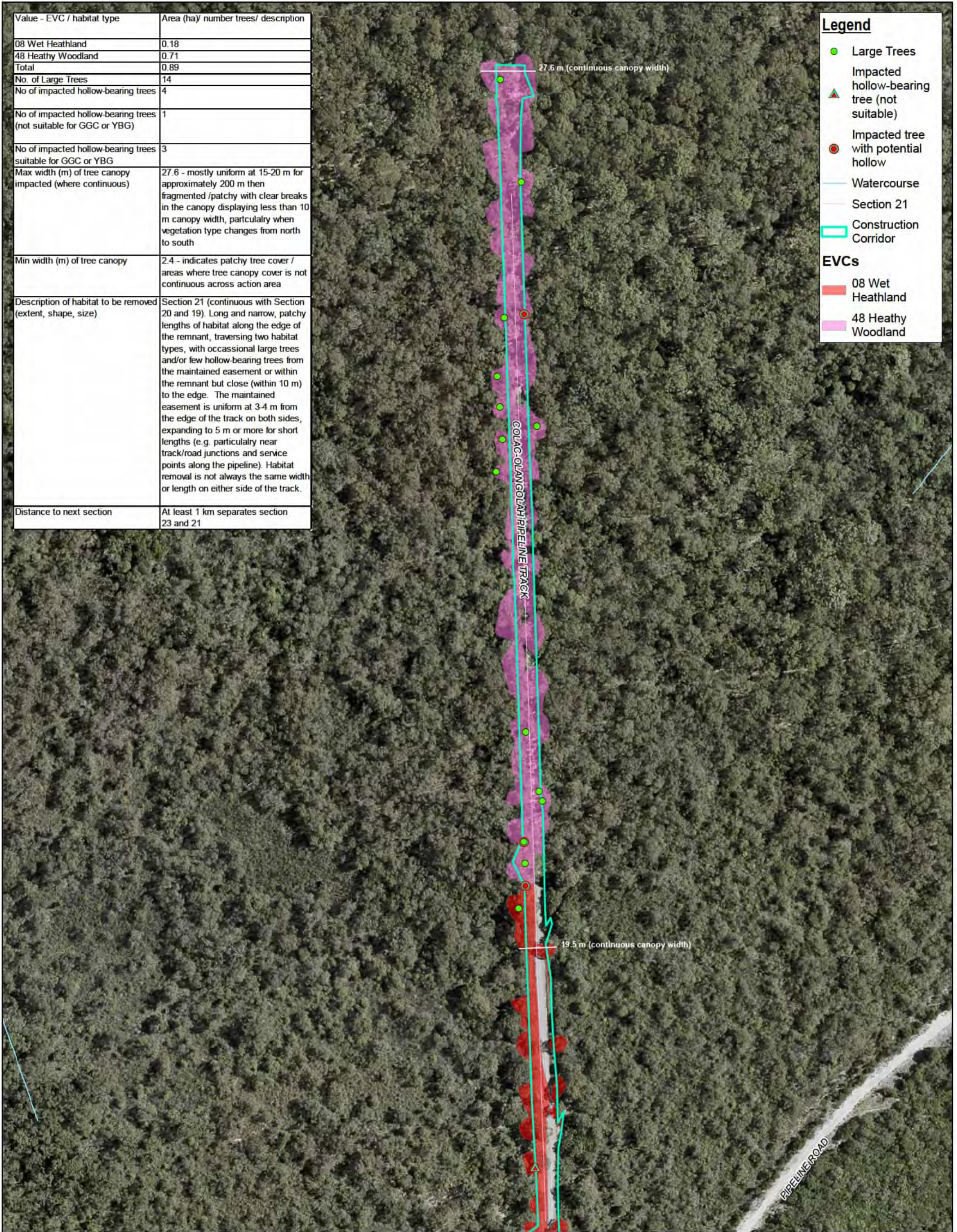
Value - EVC / habitat type	Area (ha) / number trees / description
08 Wet Heathland	0.18
48 Heathy Woodland	0.71
Total	0.89
No. of Large Trees	14
No of impacted hollow-bearing trees	4
No of impacted hollow-bearing trees (not suitable for GGC or YBG)	1
No of impacted hollow-bearing trees suitable for GGC or YBG	3
Max width (m) of tree canopy impacted (where continuous)	27.6 - mostly uniform at 15-20 m for approximately 200 m then fragmented /patchy with clear breaks in the canopy displaying less than 10 m canopy width, particularly when vegetation type changes from north to south
Min width (m) of tree canopy	2.4 - indicates patchy tree cover / areas where tree canopy cover is not continuous across action area
Description of habitat to be removed (extent, shape, size)	Section 21 (continuous with Section 20 and 19). Long and narrow, patchy lengths of habitat along the edge of the remnant, traversing two habitat types, with occasional large trees and/or few hollow-bearing trees from the maintained easement or within the remnant but close (within 10 m) to the edge. The maintained easement is uniform at 3-4 m from the edge of the track on both sides, expanding to 5 m or more for short lengths (e.g. particularly near track/road junctions and service points along the pipeline). Habitat removal is not always the same width or length on either side of the track.
Distance to next section	At least 1 km separates section 23 and 21

Legend

- Large Trees
- ▲ Impacted hollow-bearing tree (not suitable)
- Impacted tree with potential hollow
- Watercourse
- Section 21
- ▭ Construction Corridor

EVCs

- 08 Wet Heathland
- 48 Heathy Woodland



Map Projection: Lambert Conformal Conic
Horizontal Datum: GDA 1994
Grid: GDA 1994 VICGRID94

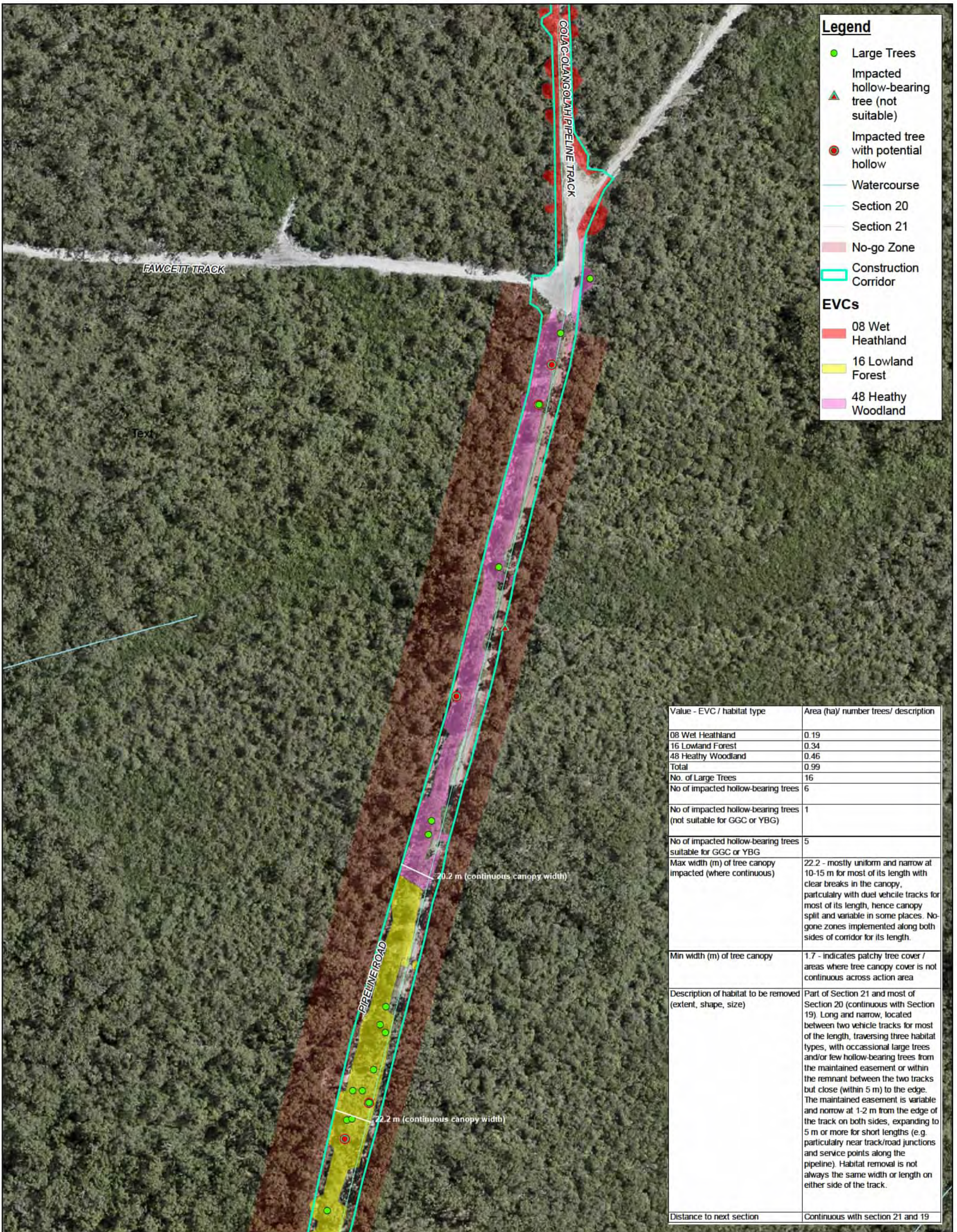


Barwon Water
Colac Pipeline Upgrade Offset Strategy

Habitat types and extent within
proposed action area

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FIGURE 4



Legend

- Large Trees
- ▲ Impacted hollow-bearing tree (not suitable)
- Impacted tree with potential hollow
- Watercourse
- Section 20
- Section 21
- No-go Zone
- Construction Corridor

EVCs

- 08 Wet Heathland
- 16 Lowland Forest
- 48 Healthy Woodland

Value - EVC / habitat type	Area (ha)/ number trees/ description
08 Wet Heathland	0.19
16 Lowland Forest	0.34
48 Healthy Woodland	0.46
Total	0.99
No. of Large Trees	16
No of impacted hollow-bearing trees	6
No of impacted hollow-bearing trees (not suitable for GGC or YBG)	1
No of impacted hollow-bearing trees suitable for GGC or YBG	5
Max width (m) of tree canopy impacted (where continuous)	22.2 - mostly uniform and narrow at 10-15 m for most of its length with clear breaks in the canopy, particularly with dual vehicle tracks for most of its length, hence canopy split and variable in some places. No-gone zones implemented along both sides of corridor for its length.
Min width (m) of tree canopy	1.7 - indicates patchy tree cover / areas where tree canopy cover is not continuous across action area
Description of habitat to be removed (extent, shape, size)	Part of Section 21 and most of Section 20 (continuous with Section 19). Long and narrow, located between two vehicle tracks for most of the length, traversing three habitat types, with occasional large trees and/or few hollow-bearing trees from the maintained easement or within the remnant between the two tracks but close (within 5 m) to the edge. The maintained easement is variable and narrow at 1-2 m from the edge of the track on both sides, expanding to 5 m or more for short lengths (e.g. particularly near track/road junctions and service points along the pipeline). Habitat removal is not always the same width or length on either side of the track.
Distance to next section	Continuous with section 21 and 19

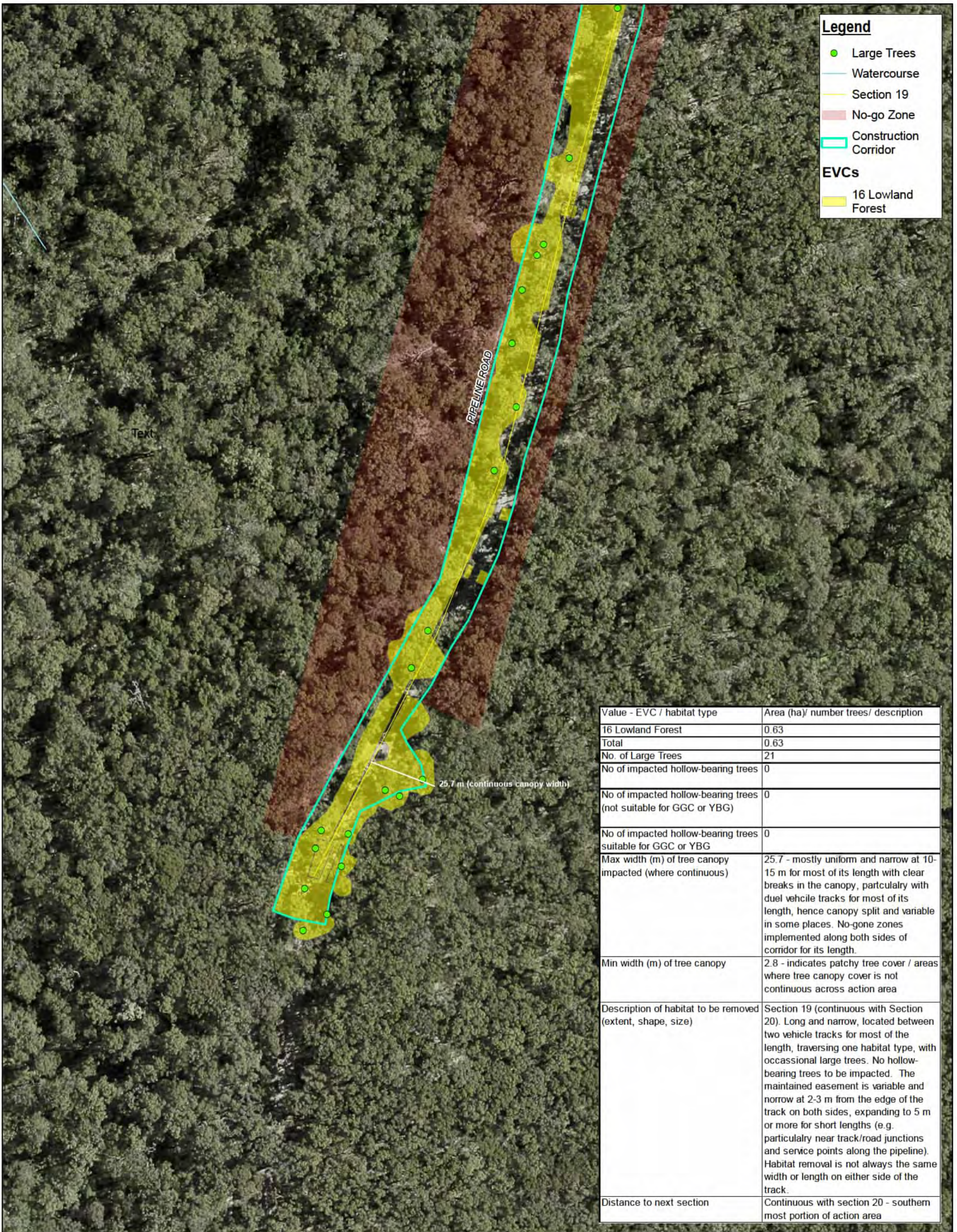
Paper Size ISO A3
 0 10 20 30 40 50
 Meters
 Map Projection: Lambert Conformal Conic
 Horizontal Datum: GDA 1994
 Grid: GDA 1994 VICGRID94



Barwon Water
 Colac Pipeline Upgrade Offset Strategy
 Habitat types and extent within proposed action area

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 Date 07/09/2023

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Legend

- Large Trees
- Watercourse
- Section 19
- No-go Zone
- Construction Corridor

EVCs

- 16 Lowland Forest

Value - EVC / habitat type	Area (ha)/ number trees/ description
16 Lowland Forest	0.63
Total	0.63
No. of Large Trees	21
No of impacted hollow-bearing trees	0
No of impacted hollow-bearing trees (not suitable for GGC or YBG)	0
No of impacted hollow-bearing trees suitable for GGC or YBG	0
Max width (m) of tree canopy impacted (where continuous)	25.7 - mostly uniform and narrow at 10-15 m for most of its length with clear breaks in the canopy, particularly with dual vehicle tracks for most of its length, hence canopy split and variable in some places. No-gone zones implemented along both sides of corridor for its length.
Min width (m) of tree canopy	2.8 - indicates patchy tree cover / areas where tree canopy cover is not continuous across action area
Description of habitat to be removed (extent, shape, size)	Section 19 (continuous with Section 20). Long and narrow, located between two vehicle tracks for most of the length, traversing one habitat type, with occasional large trees. No hollow-bearing trees to be impacted. The maintained easement is variable and narrow at 2-3 m from the edge of the track on both sides, expanding to 5 m or more for short lengths (e.g. particularly near track/road junctions and service points along the pipeline). Habitat removal is not always the same width or length on either side of the track.
Distance to next section	Continuous with section 20 - southern most portion of action area

Paper Size ISO A3
 0 7.5 15 22.5 30 37.5
 Meters
 Map Projection: Lambert Conformal Conic
 Horizontal Datum: GDA 1994
 Grid: GDA 1994 VICGRID94



Barwon Water
 Colac Pipeline Upgrade Offset Strategy
 Habitat types and extent within proposed action area

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4.2 Habitat Removal and Modification

The proposed action area and larger study site provide known and potential habitat for threatened EPBC Act listed fauna species, particularly the habitats of pipeline sections 23 and 25i. Attachments 2 and 6 provide a detailed description of the habitats recorded within the study area and the proposed action area.

4.2.1 Calculation of impacts

Vegetation and fauna habitat impacts have been calculated with consideration of the construction activity outlined in Section 2 and the expected tree losses detailed by an arborist assessment (appended to Attachment 6). The following steps outline the method of calculating impacts to vegetation and fauna habitat within the proposed action area (see Attachment 6 for further details):

1. The extent of native vegetation extent and habitats was mapped within the study site including the construction area (proposed action area) by an accredited Vegetation Quality Assessor (see Attachment 6) and Senior GHD Ecologist
2. A professional arboriculture consulting firm² was engaged to assess expected tree impacts due to the construction corridor and the pipeline trench. All canopy species (interpreted to be *Eucalyptus* spp.) greater than three metres in height were recorded or where the Tree Protection Zone was estimated on site to have more than 10% potential encroachment into the nominated works corridors. The arborist assessment (see appendix to Attachment 6) recorded 3,843 trees and identified:
 - Trees that would be lost due to construction impacts (within trench; lost due to >30% TPZ encroachment; lost due to <30% TPZ encroachment; lost due to borderline TPZ encroachment), and
 - Trees for retention (retain with minor TPZ impact or retain with no TPZ impact)
3. Following the arborists' assessment, further review was undertaken of the construction impacts. Where impacts could be avoided within the construction corridor, no-go zones were delineated. Within these areas, only trees with impacts to their TPZs from the pipeline trench were considered lost. Impacts from stockpiling, laydown and vehicle movement were removed from the construction corridor within no-go zones. Adjacent to no-go zones, vehicle movement is to be restricted to the access track only (see Figure 4). The delineation of no-go zones reduced tree impacts by 600 trees.
4. The canopies of impacted trees and other habitats were mapped using the information from the various ecological surveys, aerial imagery and GPS data. This included trees impacted by the construction corridor (with TPZ impacts >10%) and by the pipeline trench (with TPZ impacts >10%). Where a No-go zone had been instated, tree impacts were included if they resulted from the pipeline trench (TPZ impacts >10% or assessed by the arborist) as vehicles would be restricted to the access track only (as described above).

4.2.2 Habitat type and extent

The action proposes removal of up to 7.81 ha of native vegetation and fauna habitat, including 2,620 trees. This includes trees and the modified understorey vegetation in the existing pipeline corridor (the maintained verge between the road and remnant vegetation), and for some lengths a portion of understorey vegetation and some trees within the adjacent intact remnant vegetation. Of the 2,620 trees to be impacted, 215 are large trees and 26 contain hollows.

Table 16 summarises the potential impacts regarding habitat loss for EPBC Act listed fauna for the proposed action area and provides the extent of habitats within the adjacent local area (study site). Table 17 summarises the extent of proposed habitat loss for the Gang-gang Cockatoo, Yellow-bellied Glider and Long-nosed Potoroo given these species are likely to be at highest risk of impact.

² Treelogic. Arborist personnel accreditation including International Society of Arboriculture's (ISA) Tree Risk Assessment Qualification (TRAQ), overseen by personnel with both TRAQ and Quantified Tree Risk Assessment (QTRA) certification.

The extent of habitat to be removed for EPBC Act listed fauna for the proposed action is limited to long strips (e.g., 4 to 5 m wide and commonly <50 m long, but occasionally 100 to 200 m long) and shorter strip/small patches along the internal edge of the remnant habitats where it meets the existing easement along one or both sides of the track. These areas consist of moderate to dense ground cover and understorey, with a sparse to dense midstorey (tall shrubs, small trees) and sparse to dense tree canopy cover along the edge of the remnant.

Table 16 Summary of habitats within study area, study site and proposed action area for EPBC Act listed fauna species

EVC	Area (ha) of habitat type mapped in study site/study area**	Area (ha) of habitat type within proposed action area	No. of hollow-bearing trees in study site*	No. of hollow-bearing trees within proposed action area*
08 Wet Heathland	1.18 / 647	0.37	1	1
16 Lowland Forest	23.97 / 14,989	4.45	119	14
198 Sedgy Riparian Woodland	1.75 / 860	0.52	4	1
48 Heathy Woodland	6.94 / 6,449	2.46	35	10
17 Riparian Scrub/ Swampy Riparian Woodland Complex (Swampy Riparian woodland EVC 83)	0.29 / 1,591	0.01	1	0
Total	34.12 / 24,536	7.81	160	26

*includes both suitable and unsuitable hollow-bearing trees for Gang-gang Cockatoo and/or Yellow-bellied Glider **study site calculations based on detailed field surveys using VQA methodology, study area calculations based on modelled EVC extents and limited ground-truthing. Study area calculations are modelled and likely to over represent the areas of each EVC mentioned however provides a useful indication of the extent of remnant vegetation within the locality of the proposed action area.

Table 17 Summary of potential impacts to habitats for Gang-gang Cockatoo, Yellow-bellied Glider and Long-nosed Potoroo within the proposed action area

Habitat type	Gang-gang Cockatoo Area of suitable habitat (ha)/ no. hollow-bearing trees *	Yellow-bellied Glider Area of suitable habitat (ha)/ no. hollow-bearing trees*	Long-nosed Potoroo Area of suitable habitat (ha)
08 Wet Heathland	0.37 / 0	0 / 0	0.37
16 Lowland Forest	4.45 / 10	4.45 / 10	4.45
198 Sedgy Riparian Woodland	0.52 / 0	0.52 / 0	0.52
48 Heathy Woodland	2.46 / 7	0.59 / 6	2.46
17 Riparian Scrub/ Swampy Riparian Woodland Complex (Swampy Riparian woodland EVC 83)	0.01 / 0	0.01 / 0	0.01
Total	7.31 ha / 16 trees with suitable hollows#	5.07 ha / 13 trees with suitable hollows#	7.81 ha

Notes: * suitable hollow-bearing trees using criteria discussed in targeted survey report. # includes revised estimates after excluding the cleared easements (grassy verge areas between the road and remnant bush) from the various sections that are regularly mown/slashed and without trees. The area of cleared easements without trees is likely to be between 0.5 and 0.9 ha within the proposed action area; however, the minimum area was used as it was difficult to confidently calculate the entire area.

Figure 4 displays and summarises the extent of the habitat removal and modification for each of the three discrete areas within the proposed action area. In summary:

- Section 25i: approximately 560 m long and 10.0 to 43.6 m wide (on-ground width of proposed construction corridor including access tracks and maintained verge). Up to 0.87 ha of native vegetation/fauna habitat will be removed including 17 large trees including 1 hollow-bearing tree. The habitat to be removed consists of long narrow strips along the edge and short strips/small patches from either side of the track. This section is separated from Section 23 by at least 1 km.

- Section 23: 2.11 km long at 9.0 to 59.8 m wide (on-ground width of proposed construction corridor including access tracks and maintained verge). Up to 4.43 ha of native vegetation/fauna habitat will be removed including 139 large trees, 17 hollow-bearing trees of which 9 are suitable for the Gang-gang Cockatoo and/or Yellow-bellied Glider. The habitat to be removed consists of long narrow strips along the edge and short strips/small patches from either side of the track. This section is separated from Section 25 and Section 21 by at least 1 km.
- Sections 21, 20 and 19 are continuous apart from east-west intersecting tracks/roads. This area is 1.63 km long and 10.0 to 34.3 m wide (on-ground width of proposed construction corridor including access tracks and maintained verge). Up to 2.51 ha of native vegetation/fauna habitat will be removed including 51 large trees, 9 hollow-bearing trees of which 7 are suitable for the Gang-gang Cockatoo and/or Yellow-bellied Glider. The habitat to be removed consists of long narrow strips along the edge and short strips/small patches from either side of the track.

The habitats within the proposed action area and study site are well represented within the greater study area. A review of EVC modelling to gain an appreciation of the extent of habitats within the study area reveals approximately 85,806 ha of native vegetation of which approximately 24,536 ha represents the five EVCs documented within the proposed action area (Table 16). Typically, better quality habitat is located in remnant forest and woodland adjacent to the proposed action area, which will be retained.

To determine the area of impact for listed species potentially occurring within the action area, an analysis of EVCs, habitats, species habitat requirements and threatened species records was undertaken. A significant proportion of the vegetation to be impacted is attributable to tree canopy measurement. In accordance with the Victorian native vegetation assessment guidelines, where a tree occurs within a patch of native vegetation to be impacted, then the area within the perimeter of the canopy of the tree is deemed to be a part of the patch.

For the purpose of this EPBC assessment, it is important to distinguish:

- a. Trees that will be immediately lost due to removal during construction activity, and
- b. Trees that may potentially be lost over time (gradual loss) as a result of disturbance to the tree root zone during construction activities.

Trees identified within the construction corridor but not in the pipeline trench zone will not be removed during the construction process (unless they are determined to be a safety hazard), however, such trees may sustain sufficient damage to be counted as a loss over time. For the purposes of statutory approvals, these trees must be recorded as lost, even if they do recover over time.

It is important to note that the habitat provided by both hollow-bearing trees and other trees that will not be removed from the construction corridor but will be counted as losses due to impacts within the tree root zone will likely remain unaffected for some time, and it may be many years before a noticeable decline in habitat quality can be measured (e.g., loss of foliage, bark and decline in tree health), if at all. Some habitat elements, including hollows and crevices, will remain *in situ*, however, it is acknowledged that the microclimate conditions of these refuge areas may change over time with the potential declining health of the tree.

4.3 Assessment of Significant Impacts

A 'significant impact', as defined under the EPBC Act, is an impact which is important, notable, or of consequence, having regard to its context or intensity. Whether or not an action is likely to have a significant impact depends upon the sensitivity, value, and quality of the environment that is impacted, and upon the intensity, duration, magnitude and geographic extent of the impacts. All of these factors should be considered when determining whether an action is likely to have a significant impact on matters of national environmental significance.

Under the EPBC Act, for an impact to be 'likely', it is not necessary for a significant impact to have a greater than 50% chance of happening; it is sufficient if a significant impact on the environment is a real or not remote chance or possibility. If there is scientific uncertainty about the impacts of the action and potential impacts are serious or irreversible, the precautionary principle is applicable. Accordingly, a lack of scientific certainty about the potential impacts of an action will not itself justify a decision that the action is not likely to have a significant impact on the environment.

The 'significant impact criteria' for each matter of national environmental significance are intended to assist in determining whether the impacts of a proposed action on any matter of national environmental significance are likely to be significant impacts.

An assessment for each of the following threatened fauna species recorded within or adjoining habitat to the study site and therefore proposed action area that may be significantly impacted is provided in Section 4.3, Tables 17 to 22:

- Gang-gang Cockatoo
- Yellow-bellied Glider
- Long-nosed Potoroo
- Southern Brown Bandicoot
- Spot-tailed Quoll
- Swamp Antechinus

The assessment of significant impacts for these species included reference to the following guidelines and advice:

- DoE, 2013b, *Environment Protection and Biodiversity Conservation Act 1999* Policy Statement Significant Impact Guidelines 1.1 – Matters of National Environmental Significance. Commonwealth Department of the Environment, Canberra
- DAWE, 2022a – Conservation Advice for *Petaurus australis australis* (yellow-bellied glider (south-eastern)). Commonwealth Department of Agriculture, Water and the Environment, Canberra
- DAWE, 2022b – Conservation Advice for *Callocephalon fimbriatum* (Gang-gang Cockatoo). Commonwealth Department of Agriculture, Water and the Environment, Canberra
- DSEWPaC, 2011. *Environment Protection and Biodiversity Conservation Act 1999* Draft referral guidelines for the endangered southern brown bandicoot (eastern) *Isodon obesulus obesulus*. Commonwealth Department of Sustainability, Environment, Water, Population and Communities, Canberra
- DAWE, 2022c. Conservation Advice for *Potorous tridactylus trisulcatus* (southern long-nosed potoroo). Commonwealth Department of Agriculture, Water and the Environment, Canberra
- TSSC, 2016a. Conservation Advice *Antechinus minimus maritimus* swamp antechinus (coastal Victoria and far south-eastern South Australia). Threatened Species Scientific Committee, Department of the Environment. Canberra
- TSSC, 2020. Conservation Advice *Dasyurus maculatus maculatus* (southeastern mainland population) Spotted-tailed Quoll, south eastern mainland. Threatened Species Scientific Committee, Department of Agriculture, Water and the Environment. Canberra

4.3.1 Gang-gang Cockatoo

Table 18 Gang-gang Cockatoo – review of the proposed action against the significant impact criteria for endangered species and their habitats

Impact criteria	Review of impacts	Assessment outcomes
An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:		
Lead to a long-term decrease in the size of a population.	The Gang-gang Cockatoo is known from the proposed action area, having 365 historical from the study area. Habitat assessments and targeted surveys for Gang-gang Cockatoo completed in May 2022 and November – December 2022 and January 2023 demonstrated the presence of Gang-gang Cockatoo foraging habitat and potential nesting habitat within and surrounding the study site. All surveys recorded few instances of Gang-gang Cockatoos using habitat within the proposed action area. In both seasons, Gang-gang Cockatoos were	The species was not recorded to widely use all sections of the proposed action area, nor was it recorded breeding following targeted surveys. It is likely that the proposed action will remove key habitat components including foraging habitat and potential breeding trees and also recruitment of future breeding trees. However, this will occur across three discrete areas. The proposed action is unlikely to lead to a long-term decrease in the size of this species population within the

Impact criteria	Review of impacts	Assessment outcomes
	<p>sighted flying through the forest, resting and/or foraging mostly in the northern section of the proposed action area.</p> <p>During the targeted surveys, the species was recorded on 11 different occasions (different dates/times) across four locations within the study site. During the May (non-breeding season) survey, a pair of Gang-gangs (male and female) was regularly observed resting and/or foraging in the same general location in the northern section of the study site on five different mornings at generally the same time. Similarly, during the November-December survey (breeding season), Gang-gang Cockatoos were recorded outside the study site, in the same habitat and general location as the birds recorded during May 2022 surveys.</p> <p>None of the Gang-gang Cockatoos observed were seen to occupy hollow-bearing trees or interact with any hollows.</p> <p>The proposed action will remove or modify up to 7.31 ha from five different vegetation types of foraging habitat. Of the 77 trees deemed as suitable breeding hollows for the species within the study site, 16 are within the proposed action area.</p> <p>This removal will occur across three discrete areas of the proposed action area. The habitat for the species is well represented within the study site and the Otways region.</p> <p>The proposed action will involve the removal of habitat. According to the Conservation Advice Guidelines (DAWE 2022a), habitat critical to the survival of the Gang-gang Cockatoo includes all foraging habitat during both the breeding and non-breeding season.</p>	<p>proposed action area or the broader Otway Range region.</p> <p><i>Unlikely significant impact.</i></p>
<p>Reduce the area of occupancy of the species.</p>	<p>According to the Conservation Advice Guidelines (DAWE, 2022a), habitat critical to the survival of the Gang-gang Cockatoo includes all foraging habitat during both the breeding and non-breeding season.</p> <p>The proposed action will remove or modify up to 7.31 ha from five different vegetation types of foraging habitat. Of the 77 trees deemed as suitable breeding hollows for the species within the study site, 16 are within the proposed action area.</p> <p>This removal will occur across three discrete areas of the proposed action area.</p>	<p>Actions that remove habitat critical to survival would interfere with the recovery of Gang-gang Cockatoos and reduce the area of occupancy of the species. Given the proposed action would remove known foraging and potential breeding habitat</p> <p><i>Likely significant impact</i></p>

Impact criteria	Review of impacts	Assessment outcomes
Fragment an existing population into two or more populations.	There are no major barriers preventing the movement of the Gang-gang Cockatoo within the proposed action area or surrounding area. Whilst the proposed action may widen the existing easement it is highly unlikely to widen it sufficiently to form a barrier to the movement of this species.	The proposed action is unlikely to fragment a population of this species into two or more populations or provide a barrier that prevents the movement of this species. Unlikely significant impact.
Adversely affect habitat critical to the survival of a species.	According to the Conservation Advice Guidelines (DAWE, 2022a), habitat critical to the survival of the Gang-gang Cockatoo includes all foraging habitat during both the breeding and non-breeding season. The proposed action will remove or modify up to 7.31 ha from five different vegetation types of foraging habitat. Of the 77 trees deemed as suitable breeding hollows for the species within the study site, 16 are within the proposed action area.	The proposed action will adversely affect habitat critical to the survival of this species within the proposed action area Likely significant impact.
Disrupt the breeding cycle of a population.	Gang-gang Cockatoos typically breed between October and January, however, the species has been recorded breeding outside of those months (late August, early September and March). Despite undertaking targeted surveys during the breeding period none of the Gang-gang Cockatoos observed were seen to occupy hollow-bearing trees or interact with any hollows. The proposed action will remove or modify up to 7.31 ha of foraging habitat which could be utilised during the breeding season by parents raising young within suitable hollow in the action area or in adjoining areas of habitat. Furthermore, there are approximately 16 trees with suitable hollows that will be removed or modified over time as a result of the construction process. According to the Conservation Advice Guidelines (DAWE, 2022a), habitat critical to the survival of the Gang-gang Cockatoo includes all foraging habitat during both the breeding and non-breeding season.	The proposed action will adversely affect habitat critical to the survival of this species including potential breeding habitat within the proposed action area. The action will remove habitat that may develop hollows in the future for this species. Likely significant impact.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	The area of available habitat for the species is extensive within the study area as indicated by its wide distribution across the largely continuous habit for the species. The proposed action will not remove, destroy, isolate or modify any habitats within the study area or region.	The proposed action is unlikely to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that this species is likely to decline. Unlikely significant impact.
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat	The proposed action is very unlikely to result in the establishment of an invasive species or the spread of existing invasive species that are harmful to the Gang-gang Cockatoo.	Unlikely significant impact.

Impact criteria	Review of impacts	Assessment outcomes
Introduce disease that may cause the species to decline, or	The proposed action is very unlikely to introduce a disease that causes this species to decline.	Unlikely significant impact.
Interfere with the recovery of the species.	<p>A decision has been made to have a Recovery Plan. The Gang-gang Cockatoo has a large range throughout south-east Australia and requires a complex suite of recovery and threat abatement actions across multiple jurisdictions. Recovery actions will need to be coordinated across a large and diverse group of stakeholders and involve a wide variety of land managers and other stakeholders.</p> <p>A Recovery Plan is considered likely to provide the additional conservation benefits required for this species. According to the Conservation Advice Guidelines (DAWE, 2022a), the primary conservation outcome for the species is to prevent further declines and support increases in the population of the species.</p>	<p>Actions that remove habitat critical to survival would interfere with the recovery of Gang-gang Cockatoos and reduce the area of occupancy of the species. The proposed action would likely interfere with the recovery of the species as it will remove known foraging and potential breeding habitat.</p> <p>Likely significant impact.</p>

4.3.2 Yellow-bellied Glider

Table 19 Yellow-bellied Glider – review of the proposed action against the significant impact criteria for vulnerable species or their habitats

Impact criteria	Review of impacts	Assessment outcomes
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:		
Lead to a long-term decrease in the size of an important population of a species	<p>The Yellow-bellied Glider was recorded at two locations over 6 different occasions (different dates/times) during spotlighting and acoustic monitoring. The species was also recorded at offsite locations each night of the survey from the 17-26 May 2022 within the study site. The offsite locations off Pipeline Track and Porcupine Creek outside the study site north of Ridge Road/Fawcett's Road are within habitats contiguous with the habitats of the study site, and have no major natural barriers (e.g., steep sided hills or major river crossings) that would prevent the Yellow-bellied Glider from moving through this area. The gliders observed and heard along Fawcett Track were located in contiguous habitat along a drainage line that connects with Porcupine Creek.</p> <p>The proposed action will remove or modify up to 5.07 ha of foraging and potential denning habitat from four different vegetation types. Of the 49 trees deemed as suitable breeding hollows for the species within the study site, 13 are within the proposed action area.</p> <p>This removal will occur across three discrete areas of the proposed action area. The habitat for the species is well represented within the study area and the Otways region.</p> <p>The species Conservation Advice (DAWE, 2022b) lists important populations of the species – including the subpopulation of the species within the Otways as part of the</p>	<p>It is likely that the proposed action will remove key habitat components including foraging habitat, and potential den and breeding trees. However these actions will occur in three discrete areas.</p> <p>The proposed action is unlikely to lead to a long-term decrease in the size of this species population within the proposed action area or the broader Otway Range region.</p> <p>Unlikely significant impact.</p>

Impact criteria	Review of impacts	Assessment outcomes
	<p>known important Western Vic population listed by DAWE (DAWE, 2022b).</p>	
<p>Reduce the area of occupancy of an important population</p>	<p>Those individuals identified as part of the recent surveys undertaken by GHD within the study site are part of the subpopulation of the species within the Otways which is part of the known important Western Vic population listed by DAWE (DAWE, 2022b).</p> <p>The proposed action will remove or modify up to 5.07 ha of foraging and potential denning habitat from four different vegetation types. Of the 49 trees deemed as suitable breeding hollows for the species within the study site, 13 are within the proposed action area.</p> <p>This removal will occur across three discrete areas of the proposed action area.</p>	<p>The proposed action will involve the removal of habitat of an important population and therefore reduce the area of occupancy for this species. Given the proposed action would remove known foraging and potential den and breeding habitat a significant impact is likely.</p> <p>Likely significant impact.</p>
<p>Fragment an existing population into two or more populations</p>	<p>There are no major barriers preventing the movement of fauna within the proposed action area with the exception of the wider than average east-west road easement and firebreak of Link Track and Parkes Lodge Road Section which forms the northern boundary of Section 23. This combined road/firebreak is greater than 40 m wide in some sections including the section immediately adjacent the study site and may be too great a gap for the Yellow-bellied Glider to traverse without landing on the ground, particularly where tall trees are absent. Furthermore, the road is commonly used by local residents as an east-west link between Kawarren and Forrest or Barwon Downs. The proposed action will not further widen this road/firebreak.</p> <p>The Pipeline Track is unlikely to form a barrier to the east-west movement of this species. The existing corridor varies in width from 5 to 12 m, including the track and maintained verge. The proposed construction corridor (action area) will also vary in width at 9.0 to 59.8 m wide including the track and maintained verge. Sections of the proposed construction corridor greater than 30 m wide are not extensive (e.g., not longer than 20 m, see Figure 4). Given that the Yellow-bellied Glider is capable of traversing gaps greater than 60 m, and that the majority of the proposed construction corridor width will be less than 30 m (inclusive of the existing cleared corridor) it is unlikely that the proposed action would form a barrier to the movement of the species.</p>	<p>The proposed action is unlikely to fragment a population of this species into two or more populations or provide a barrier that prevents the movement of this species.</p> <p>Unlikely significant impact.</p>

Impact criteria	Review of impacts	Assessment outcomes
Adversely affect habitat critical to the survival of a species	Habitat critical to the survival of the species is defined by the Conservation Advice (DAWE, 2022b). The proposed action area contains habitat that is part of the larger area of habitat in the study area that is critical habitat including large contiguous areas of floristically diverse eucalypt forest, with winter-flowering and smooth-barked eucalypts (albeit confined to a few areas), mature living hollow-bearing trees and sap trees. Furthermore, parts of the proposed action area are post-fire refuges (i.e., unburnt habitat within or adjacent to recently burnt landscapes) that allow the species to persist, recover and recolonise burnt areas.	The proposed action will adversely affect habitat critical to the survival of this species within the proposed action area. Likely significant impact.
Disrupt the breeding cycle of an important population	The Yellow-bellied Glider reproduces seasonally, with timing varying across its broad range. Once sexual maturity is reached, individuals will pair up with each other, usually in a monogamous relationship. Breeding habitat for the species would include hollow-bearing trees and foraging habitat to support the development of young during the breeding period. The proposed action will remove or modify up to 5.07 ha of foraging habitat which could be utilised during the breeding season by parents raising young within a suitable hollow in the action area or in adjoining areas of habitat. Furthermore, there are approximately 13 trees with suitable hollows that will be removed or modified over time as a result of the construction process. The timing of the construction may also overlap with breeding period of the species, although this cannot be confirmed given the difficulty determining breeding events within the study site.	The proposed action is likely to disrupt the breeding cycle of this species as a result of the removal of foraging habitat and potential hollows. Furthermore, the action will remove habitat that may develop hollows in the future for this species. The proposed action may compromise adult and juvenile survival in the proposed action area and adjoining area during the construction period Likely significant impact.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The area of available habitat for the species is extensive within the study area as indicated by the historical records and recent survey findings from May 2022 in largely continuous habitat for the species. The proposed action will not remove, destroy, isolate or modify any habitats outside the proposed action area within the study area or region. The proposed action will remove or modify up to 5.07 ha of foraging and potential denning habitat from four different vegetation types. Of the 49 trees deemed as suitable breeding hollows for the species within the study site, 13 are within the proposed action area.	This removal will occur across three discrete areas of the proposed action area. The habitat for the species is well represented within the study area and the Otways region. The proposed action is unlikely to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that this species is likely to decline. Unlikely significant impact.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable habitat	The proposed action is very unlikely to result in the establishment of an invasive species or the spread of existing invasive species that are harmful to the Yellow-bellied Glider.	Unlikely significant impact.
Introduce disease that may cause the species to decline, or	The proposed action is very unlikely to introduce a disease that causes this species to decline.	Unlikely significant impact.

Impact criteria	Review of impacts	Assessment outcomes
Interfere with the recovery of the species	Currently there is no recovery plan for the species at a Victorian or national level. The primary conservation outcome for the species listed under the Conservation Advice, conservation and recovery actions (DAWE, 2022b) is to ensure the population size has stabilised because sufficient areas of habitat are protected from extensive severe fire, fragmentation and timber harvesting, known threats are mitigated and key habitat features (e.g., sap trees, hollow-bearing trees) and habitat connectivity are retained.	Actions that remove habitat would interfere with the recovery of Yellow-bellied Gliders and reduce the area of occupancy of the species. The proposed action would likely interfere with the recovery of the species as it will remove known foraging and potential breeding habitat. Likely significant impact.

4.3.3 Long-nosed Potoroo

Table 20 Long-nosed Potoroo – review of the proposed action against the significant impact criteria for vulnerable species or their habitats

Impact criteria	Review of impacts	Assessment outcomes
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:		
Lead to a long-term decrease in the size of an important population of a species	<p>The Long-nosed Potoroo was recorded from one location (Porcupine Creek) during the May 2022 surveys. The habitat for this species appears to be well represented within the Otway Ranges within at least 75 historical records from the study area. There are five records from connected habitats within 1 to 2 kms of the action area including one recorded from 1993 within the proposed action area from the southern tip of Section 23 – south of Porcupine Creek.</p> <p>The proposed action will remove or modify up to 7.81 ha of identified habitat and potential habitat from within the proposed action area from across five different vegetation types. Higher quality and identified habitats for this species (e.g., areas with dense understorey) are associated located along Section 21, within the Porcupine Creek area and most of Section 23, and Section 25i in the Dividing Creek area and south of the creek.</p> <p>The proposed action will involve the removal of linear strips of habitat largely from the edge of remnant vegetation (habitat to be removed from the edge of a patch). The 7.81 will be removed from three discrete areas and does not include removal large patches of intact habitat. The species is unlikely to permanently occupy these edge areas, which are more likely to form a small component of the overall habitat area they use in the local area.</p>	<p>It is unlikely that the proposed action will remove key habitat components for the species. Furthermore the habitat removal will occur in three discrete sections.</p> <p>The proposed action is unlikely to lead to a long-term decrease in the size of this species population within the proposed action area or the broader Otway Range region.</p> <p>Unlikely significant impact.</p>

Impact criteria	Review of impacts	Assessment outcomes
Reduce the area of occupancy of an important population	<p>The Conservation Advice for the species (DAWE, 2022c) lists the Otway Ranges including the Great Otway National Park as an important population for the species. The proposed action will remove or modify up to 7.81 ha of identified and potential habitat from within the proposed action area. The type and extent of habitat for each section to be removed that is relevant to this species is limited to linear strips along the edge of a patch consisting of dense understorey-midstorey. The habitats within the study site are well represented along the extent of the pipeline corridor and extensive areas of better quality habitat is located adjacent to the pipeline corridor in the form of remnant forest and woodland, which will be retained. However the habitat will be permanently modified and in some places entirely removed and replaced by habitat unsuitable for the species (e.g., cleared easement) thus reducing the area of habitat.</p>	<p>The proposed action is likely to reduce the area of occupancy for an important population of this species. Likely significant impact.</p>
Fragment an existing population into two or more populations	<p>There are no major barriers preventing the movement of fauna within the proposed action area with the exception of the wider than average east-west road easement and firebreak of Link Track and Parkes Lodge Road Section which forms the northern boundary of Section 23. This combined road/firebreak is greater than 40 m wide in some sections including the section immediately adjacent the study site and likely exposes the potoroo to increased predation and vehicle strike. The proposed action will not further widen this road/firebreak.</p> <p>Whilst the proposed action may widen the existing easement it is highly unlikely to widen it sufficiently to form a barrier to the movement of this species.</p>	<p>The proposed action is unlikely to fragment a population of this species into two or more populations or provide a barrier that prevents the movement of this species. Unlikely significant impact.</p>
Adversely affect habitat critical to the survival of a species	<p>According to the conservation advice for the species (DAWE, 2022c) the habitat critical to the survival of the southern long-nosed potoroo includes occupied forested habitats larger than 0.1 km². Unoccupied forested areas (larger than 0.1 km²) may also be considered critical if they are adjacent or proximal to extant subpopulations, as they can provide future habitat for the southern long-nosed potoroo as either a natural range expansion or as a translocation site for at-risk populations. Areas of habitat that supported the southern long-nosed potoroo in the past, but from which they are now absent, for example, because of high predation following a bushfire event, are also habitat critical, as the subspecies could be reintroduced to these sites.</p>	<p>Based on the species conservation advice the habitat within the proposed action area is part of a larger area of critical habitat occupied by the species. However given the type of habitat that will be removed (largely edge habitat) and the extent (narrow strips) of this habitat the proposed action is unlikely to adversely affect habitat critical to the survival of this species. Unlikely significant impact.</p>

Impact criteria	Review of impacts	Assessment outcomes
Disrupt the breeding cycle of an important population	<p>The Long-nosed Potoroo may breed throughout the year but more frequently in late winter to early spring and late summer. The habitat within the proposed action area is unlikely to form breeding habitat for this species given the type and extent of habitat to be removed (largely edge habitat consisting of narrow strips), however the proposed action will likely occur during the breeding period of the species.</p> <p>The proposed action will include the following mitigation measures:</p> <ol style="list-style-type: none"> 1. Pre-clearance surveys and translocation to nearby habitats if found for the species 2. Manual habitat modification following pre-clearance surveys to make habitat unsuitable for the species prior to clearing of habitats with machinery. <p>See Section 5.3.2, Table 28 for further details regarding mitigation measures for ground fauna.</p>	<p>The proposed action is unlikely to disrupt the breeding cycle of this species as the habitat within the proposed action area is unlikely to form breeding habitat. Furthermore, the implementation of appropriate mitigation measures will further reduce impacts to the species.</p> <p>Unlikely significant impact.</p>
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	<p>The area of available habitat for the species is extensive within the study area. The proposed action will not remove, destroy, isolate or modify any habitats within the study area or region outside the proposed action area.</p>	<p>The proposed action is unlikely to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that this species is likely to decline.</p> <p>Unlikely significant impact.</p>
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable habitat	<p>The proposed action is very unlikely to result in the establishment of an invasive species or the spread of existing invasive species that are harmful to this species.</p>	<p>Unlikely significant impact.</p>
Introduce disease that may cause the species to decline, or	<p>The proposed action is very unlikely to introduce a disease that causes this species to decline.</p>	<p>Unlikely significant impact.</p>
Interfere with the recovery of the species	<p>Currently there is no recovery plan for the species at a Victorian or national level. The primary conservation outcome for the species listed under the Conservation Advice, conservation and recovery actions (DAWE, 2022c) is to ensure populations across the range of the species, including coastal as well as inland populations, are stable or increasing in suitable habitats managed appropriately for the species. Habitat is protected to prevent further species loss or habitat fragmentation.</p>	<p>It is unlikely that the proposed action would lead to a long-term decrease in the size of an important population, disrupt the breeding cycle, create a significant barrier to the movement of the species or remove habitat critical to the survival of the species.</p> <p>The proposed action is unlikely to interfere with the recovery of the species.</p> <p>Unlikely significant impact.</p>

4.3.4 Southern Brown Bandicoot

Table 21 Southern Brown Bandicoot – review of the proposed action against the significant impact criteria for endangered species and their habitats

Impact criteria	Review of impacts	Assessment outcomes
<p>An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:</p>		
<p>Lead to a long-term decrease in the size of a population.</p>	<p>The Southern Brown bandicoot was recorded from one location (Porcupine Creek) during the recent May 2022 surveys. Although the habitat for this species appears to be well represented within the Otway Ranges there are few (n = 14) historical records for this species within the study area. There is one record nearby the proposed action area from 1993 south of Section 23. This record is from an area of habitat well connected with the habitat of Porcupine Creek.</p> <p>The proposed action will remove or modify up to 7.81 ha of identified habitat and potential habitat from within the proposed action area from across five different vegetation types. Higher quality and identified habitats for this species (e.g., areas with dense understorey) are associated located along Section 21, with the Porcupine Creek area and most of Section 23, and Section 25i in the Dividing Creek area and south of the creek.</p> <p>The proposed action will involve the removal of linear strips of habitat largely from the edge of remnant vegetation (habitat to be removed from the edge of a patch). The 7.81 will be removed from three discrete areas and does not include removal large patches of intact habitat. The species is unlikely to permanently occupy these edge areas, which are more likely to form a small component of the overall habitat area they use in the local area.</p>	<p>It is unlikely that the proposed action will remove key habitat components for the species. Furthermore, the habitat removal will occur in three discrete sections.</p> <p>The proposed action is unlikely to lead to a long-term decrease in the size of this species population within the proposed action area or the broader Otway Range region.</p> <p>Unlikely significant impact.</p>
<p>Reduce the area of occupancy of the species.</p>	<p>The proposed action will remove or modify up to 7.81 ha of identified and potential habitat from within the proposed action area. The type and extent of habitat for each section to be removed that is relevant to this species is limited to linear strips along the edge of a patch consisting of dense understorey-midstorey. The habitats within the study site are well represented along the extent of the pipeline corridor and extensive areas of better quality habitat is located adjacent to the pipeline corridor in the form of remnant forest and woodland, which will be retained within the Great Otway National Park.</p>	<p>The habitat to be removed is not substantial nor considered a patch of habitat critical to the survival of the species. Furthermore, the habitat to be removed consists of linear strips along the internal edge of a near continuous habitat from across three discrete sections.</p> <p>The proposed action is unlikely to reduce the areas of occupancy for this species to the point that it will be significantly impacted by the proposed project.</p> <p>Unlikely significant impact.</p>

Impact criteria	Review of impacts	Assessment outcomes
<p>Fragment an existing population into two or more populations.</p>	<p>There are no major barriers preventing the movement of fauna within the proposed action area with the exception of the wider than average east-west road easement and firebreak of Link Track and Parkes Lodge Road Section which forms the northern boundary of Section 23. This combined road/firebreak is greater than 40 m wide in some sections including the section immediately adjacent the proposed action area and likely exposes the bandicoot to increased predation and vehicle strike. The proposed action will not further widen this road/firebreak.</p> <p>Whilst the proposed action may widen the existing easement it is highly unlikely to widen it sufficiently to form a barrier to the movement of this species.</p>	<p>The proposed action is unlikely to fragment a population of this species into two or more populations or provide a barrier that prevents the movement of this species.</p> <p>Unlikely significant impact.</p>
<p>Adversely affect habitat critical to the survival of a species.</p>	<p>There are no areas of critical habitat or advice describing critical habitat for this species. The draft referral guidelines for the species (DSEWPC, 2011) defines suitable habitat to be any patches of native or exotic vegetation, within their distribution, which contains understorey vegetation structure with 50–80% average foliage density in the 0.2–1 m height range. In areas where native habitats have been degraded or diminished, exotic vegetation, such as Blackberry (<i>Rubus</i> spp.), can and often does, provide important habitat. The proposed action will not involve the removal of patches of suitable habitat however it will reduce the area of habitat, albeit edge habitat in the local area.</p>	<p>It is unlikely that the proposed action will remove key habitat components for the species. The proposed action will not remove suitable patches of habitat for the species. Furthermore, the habitat removal will occur in three discrete areas.</p> <p>The type and location of the habitat to be removed by the proposed action is unlikely to constitute critical habitat for this species.</p> <p>Unlikely significant impact.</p>
<p>Disrupt the breeding cycle of a population.</p>	<p>The breeding season for Southern Brown Bandicoots varies across their range, with peak breeding occurring from winter through to late summer. Also recorded with pouch young throughout the year in Belair NP in the Mount Lofty Ranges SA. The timing of the peak in the breeding season results in the population size of Southern Brown Bandicoots (eastern) increasing in spring to summer and peaking in late summer to autumn when juveniles are recruited into the population.</p> <p>The habitat within the proposed action area is unlikely to form breeding habitat for this species given the type and extent of habitat to be removed (largely edge habitat consisting of narrow strips), however, the proposed action will likely occur during the breeding period of the species.</p> <p>The proposed action will include the following mitigation measures:</p> <ol style="list-style-type: none"> 1. Pre-clearance surveys and translocation to nearby habitats if found for the species 2. Manual habitat modification following pre-clearance surveys to make habitat unsuitable for the species prior to clearing of habitats with machinery 	<p>The proposed action is unlikely to disrupt the breeding cycle of this species as the habitat within the proposed action area is unlikely to form breeding habitat. The implementation of appropriate mitigation measures will further reduce impacts to the species.</p> <p>Unlikely significant impact.</p>

Impact criteria	Review of impacts	Assessment outcomes
	See Section 5.3.2, Table 28 for further details regarding mitigation measures for ground fauna.	
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	The area of available habitat for the species is extensive within the study area. The proposed action will not remove, destroy, isolate or modify any habitats within the study area or region outside the proposed action area.	The proposed action is unlikely to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that this species is likely to decline. Unlikely significant impact.
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat	The proposed action is very unlikely to result in the establishment of an invasive species or the spread of existing invasive species that are harmful to this species.	Unlikely significant impact.
Introduce disease that may cause the species to decline, or	The proposed action is very unlikely to introduce a disease that causes this species to decline.	Unlikely significant impact.
Interfere with the recovery of the species.	There is no adopted recovery plan for this species. It is unlikely that the removal of habitat within the proposed action area would hinder the recovery of this species. It is unlikely that the proposed action would reduce the area of occupancy, create a significant barrier to the movement of the species or remove habitat critical to the survival of the species.	The proposed action is unlikely to interfere with the recovery of the species. Unlikely significant impact.

4.3.5 Swamp Antechinus

Table 22 Swamp Antechinus – review of the proposed action against the significant impact criteria for vulnerable species or their habitats

Impact criteria	Review of impacts	Assessment outcomes
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:		
Lead to a long-term decrease in the size of an important population of a species	<p>The habitat for this species appears to be well represented within the Otway Ranges, however there are very few historical records within the study area (n = 2) with one record within connected habitats 500 m west of Section 23.</p> <p>The proposed action will remove or modify up to 7.81 ha of potential habitat from within the proposed action area from across five different vegetation types from three discrete areas. Higher quality and identified habitats for this species (e.g., areas with dense understorey) are located along the lower lying areas of Section 21, within the Porcupine Creek area and most of Section 23, and Section 25i in the Dividing Creek area and south of the creek.</p> <p>The proposed action will involve the removal of linear strips of habitat largely from the edge of remnant vegetation (habitat to be removed from the edge of a patch). The 7.81 will be removed from three discrete areas and does not include removal large patches of intact habitat or large extensive damp areas of dense understorey. The species is unlikely to permanently occupy these edge areas, which are more likely to form a small component of</p>	<p>It is unlikely that the proposed action will remove key habitat components for the species. Furthermore, the habitat removal will occur in three discrete sections.</p> <p>The proposed action is unlikely to lead to a long-term decrease in the size of this species population within the proposed action area or the broader Otway Range region.</p> <p>Unlikely significant impact.</p>

Impact criteria	Review of impacts	Assessment outcomes
	the overall habitat area they use in the local area.	
Reduce the area of occupancy of an important population	<p>The Otway Ranges including the Great Otway National Park is listed to support concentrations of this species (SWIFFT, 2022b) however there are no important populations listed for this species. The proposed action will remove or modify up to 7.81 ha of identified and potential habitat from three discrete areas within the proposed action area. The type and extent of habitat for each section to be removed that is relevant to this species is limited to linear strips along the edge of a patch consisting of dense ground covers and understorey-midstorey. The habitats within the study site are well represented along the extent of the pipeline corridor and extensive areas of better quality habitat is located adjacent to the pipeline corridor in the form of remnant forest and woodland, which will be retained.</p>	<p>The proposed action is unlikely to reduce the areas of occupancy for this species. Furthermore, the habitat removal will occur in three discrete areas.</p> <p>Unlikely significant impact.</p>
Fragment an existing population into two or more populations	<p>There are no major barriers preventing the movement of fauna within the proposed action area with the exception of the wider than average east-west road easement and firebreak of Link Track and Parkes Lodge Road Section which forms the northern boundary of Section 23. This combined road/firebreak is greater than 40 m wide in some sections including the section immediately adjacent the proposed action area and likely exposes the small ground mammals like the Antechinus to increased predation. The proposed action will not further widen this road/ firebreak.</p> <p>The existing corridor varies in width from 5 to 12 m, including the track and maintained verge. The proposed construction corridor (action area) will also vary in width from 9.0 to 59.8 m including the track and maintained verge. Sections of the proposed construction corridor greater than 30 m wide are not extensive (e.g., not longer than 20 m, see Figure 4) and include calculations based on tree canopy, which does not always equate to the equivalent extent for the removal of the understorey and ground cover habitat layers.</p> <p>Given that the widening of the proposed construction corridor for most of its length will be less than 30 m wide (inclusive of the existing cleared corridor) and that wider sections (greater than 30 m) are not extensive or continuous and are separated by shorter sections of widening (e.g., less than 20 m) it is unlikely that the proposed action would form a barrier to the movement of the species.</p>	<p>Whilst the proposed action may widen the existing easement it is highly unlikely to widen it sufficiently to form a barrier to the movement of this species.</p> <p>The proposed action is unlikely to fragment a population of this species into two or more populations or provide a barrier that prevents the movement of this species.</p> <p>Unlikely significant impact.</p>

Impact criteria	Review of impacts	Assessment outcomes
Adversely affect habitat critical to the survival of a species	<p>There are no areas of critical habitat or advice describing critical habitat for this species. Based on the species conservation advice the habitat within the proposed action area is part of a larger area of habitat occupied by the species. However, given the type of habitat that will be removed (largely edge habitat), the extent (narrow strips) the proposed action is unlikely to adversely affect habitat critical to the survival of this species.</p>	<p>It is unlikely that the proposed action will remove key habitat components for the species. The proposed action will not remove suitable patches of habitat for the species. Furthermore, the habitat removal will occur in three discrete areas.</p> <p>The type and location of the habitat to be removed by the proposed action is unlikely to constitute critical habitat for this species.</p> <p>Unlikely to adversely affect habitat critical to the survival of this species.</p> <p>Unlikely significant impact.</p>
Disrupt the breeding cycle of an important population	<p>Mating for the species occurs during May to July. Females give birth in July to August. Males die within a few weeks after mating. Females of the species are monoestrus (one reproductive season per year).</p> <p>Although the habitat within the proposed action area is unlikely to form breeding habitat for this species, the proposed action will likely occur during the breeding period of the species and the species may breed in habitats adjoining the proposed action area.</p> <p>The proposed action will include the following mitigation measures:</p> <ol style="list-style-type: none"> 1. Pre-clearance surveys and translocation to nearby habitats if found for the species 2. Manual habitat modification following pre-clearance surveys to make habitat unsuitable for the species prior to clearing of habitats with machinery <p>See Section 5.3.2, Table 29 for further details regarding mitigation measures for ground fauna.</p>	<p>The proposed action is unlikely to disrupt the breeding cycle of this species as the habitat within the proposed action area is unlikely to form breeding habitat. The implementation of appropriate mitigation measures will further reduce impacts to the species.</p> <p>Unlikely significant impact.</p>
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	<p>The area of available habitat for the species is extensive within the study area. The proposed action will not remove, destroy, isolate or modify any habitats within the study area or region outside the proposed action area.</p>	<p>The proposed action is unlikely to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that this species is likely to decline.</p> <p>Unlikely significant impact.</p>
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable habitat	<p>The proposed action is very unlikely to result in the establishment of an invasive species or the spread of existing invasive species that are harmful to this species.</p>	<p>Unlikely significant impact.</p>
Introduce disease that may cause the species to decline, or	<p>The proposed action is very unlikely to introduce a disease that causes this species to decline.</p>	<p>Unlikely significant impact.</p>
Interfere with the recovery of the species	<p>Currently there is no recovery plan for the species at a Victorian or national level.</p>	<p>It is unlikely that the proposed action would reduce the area of occupancy, create a significant barrier to the movement of the species or remove habitat critical to the survival of the species.</p> <p>The proposed action is unlikely to interfere with the recovery of the species.</p> <p>Unlikely significant impact.</p>

4.3.6 Spot-tailed Quoll

Table 23 Spot-tailed Quoll – review of the proposed action against the significant impact criteria for endangered species and their habitats

Impact criteria	Review of impacts	Assessment outcomes
<p>An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:</p> <p>Lead to a long-term decrease in the size of a population.</p>	<p>The Recovery Plan for the species (DELWP, 2016) lists the Great Otway National Park as an important population. The habitat for this species appears to be well represented within the Otway Ranges, however there are very few historical records within the study area (n = 16). There are 2 historical records with connected habitat 500 m west of Section 25i.</p> <p>The proposed action will remove or modify up to 7.81 ha of potential hunting/forging across five vegetation types habitat from three discrete areas. The species most likely uses the proposed action area for hunting. Areas with higher densities of hollow-bearing trees may contain potential den sites although no evidence was recorded (e.g., scat/latrine sites). Few denning or breeding habitat elements (e.g., logs on the ground with hollows) were recorded and the site lacked any rocky outcrops, hence breeding opportunities within the proposed action area are limited. Higher quality and identified habitats for this species (e.g., areas with dense understorey, log piles, hollow logs on the ground) are located along the lower lying areas of Section 21, within the Porcupine Creek area and most of Section 23, and Section 25i in the Dividing Creek area and south of the creek.</p> <p>The proposed action will involve the removal of habitat largely from the edge habitat (habitat to be removed from the edge of a patch) from three discrete sections and does not include large patches of intact habitat. The species is unlikely to permanently occupy these edge areas, which are more likely to form a small component of the overall habitat area they use in the local area.</p>	<p>It is unlikely that the proposed action will remove key habitat components for the species. Furthermore, the species home range is likely to be in excess of 580 ha, therefore the proposed action area is probably a small component of the overall area required by the species. Furthermore, removal of habitat will occur in three discrete areas.</p> <p>The proposed action is unlikely to lead to a long-term decrease in the size of this species population within the proposed action area or the broader Otway Range region.</p> <p>Unlikely significant impact.</p>
<p>Reduce the area of occupancy of the species.</p>	<p>Genetic studies have found there is little evidence that quolls from south-west Victoria are genetically distinct from quolls in eastern or central Victoria or from New South Wales populations. The results suggest that mainland populations of the species form one evolutionary significant unit and the Victorian populations form one management unit and that Quolls in North East Victoria have the highest genetic diversity (Belcher, 2006 in SWIFFT, 2022a).</p> <p>The type and extent of habitat for each section to be removed that is relevant to this species is limited to the edge of a</p>	<p>The habitat to be removed is not substantial nor considered a patch of habitat critical to the survival of the species. Furthermore, the habitat to be removed consists of linear strips along the internal edge of a near continuous habitat from across three discrete sections.</p> <p>The proposed action is unlikely to reduce the areas of occupancy for this species to the point that it will be significantly impacted by the proposed project.</p> <p>Unlikely significant impact.</p>

Impact criteria	Review of impacts	Assessment outcomes
	<p>patch less with some potential hollow-bearing trees for denning and hunting. The habitats within the study site are well represented along the extent of the pipeline corridor and extensive areas of better quality habitat is located adjacent to the pipeline corridor in the form of remnant forest and woodland, which will be retained.</p>	
<p>Fragment an existing population into two or more populations.</p>	<p>In south-west Victoria there is grave concern for ongoing survival at Mt Eccles and the Otways. For example, in 1999 there were only 3 records from 51 survey sites in the Otways (Belcher, 2000 in SWIFFT, 2022a). It is now considered that populations in Southwest Victoria, including the Otway Ranges, Cobbobonee State Forest, Mt Eccles National Park and the Mt Eccles lava flow are critically endangered (Belcher, 2006 in SWIFFT, 2022a). There are no major barriers preventing the movement of this species within the proposed action area or surrounding area. Whilst the proposed action may widen the existing easement it is highly unlikely to widen it sufficiently to form a barrier to the movement of this species.</p>	<p>The proposed action is unlikely to fragment a population of this species into two or more populations or provide a barrier that prevents the movement of this species.</p> <p>Unlikely significant impact.</p>
<p>Adversely affect habitat critical to the survival of a species.</p>	<p>There are no areas of critical habitat or advice describing critical habitat for this species within the proposed action area. Based on the species conservation advice, SWIFFT (2022a) and historical records the habitat within the proposed action area is part of a larger area of habitat occupied by the species. However given the type of habitat that will be removed (largely edge habitat) the proposed action is unlikely to adversely affect habitat critical to the survival of this species.</p>	<p>Unlikely to adversely affect habitat critical to the survival of this species.</p> <p>Unlikely significant impact.</p>
<p>Disrupt the breeding cycle of a population.</p>	<p>The habitat within the proposed action area is unlikely to form breeding habitat for this species. The proposed action area lacks hollow logs on the ground, rocky outcrops and other opportunities for den sites and raising young. However, the species could breed in habitat adjoining the proposed action area.</p> <p>The proposed action will include the following mitigation measures:</p> <ol style="list-style-type: none"> 1. Pre-clearance surveys and translocation to nearby habitats if found for the species 2. Manual habitat modification following pre-clearance surveys to make habitat unsuitable for the species prior to clearing of habitats with machinery <p>See Section 5.3.2, Table 28 for further details regarding mitigation measures for ground fauna.</p>	<p>The proposed action is unlikely to disrupt the breeding cycle of this species as the habitat within the proposed action area is unlikely to form breeding habitat.</p> <p>The implementation of appropriate mitigation measures will further reduce impacts to the species.</p> <p>Unlikely significant impact.</p>

Impact criteria	Review of impacts	Assessment outcomes
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	The area of available habitat for the species is extensive within the study area. The proposed action will not remove, destroy, isolate or modify any habitats within the study area or region outside the proposed action area.	The proposed action is unlikely to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that this species is likely to decline. Unlikely significant impact.
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat	The proposed action is very unlikely to result in the establishment of an invasive species or the spread of existing invasive species that are harmful to this species.	Unlikely significant impact.
Introduce disease that may cause the species to decline, or	The proposed action is very unlikely to introduce a disease that causes this species to decline.	Unlikely significant impact.
Interfere with the recovery of the species.	The strategy for recovery will be to focus on reducing the impact of threatening processes throughout the species' range and subsequently halt the current decline in its distribution and abundance. Increasing knowledge of the distribution and status of populations, the impact and management of threatening processes, and investigation of key biological and ecological attributes is also required to facilitate recovery (DELWP, 2016). The loss of habitat and modification of habitat is probably the greatest threat to this species and is listed as a threatening process in the species recovery plan (DELWP, 2016). Despite this it is unlikely that the removal of habitat within the proposed action area would hinder the recovery of this species due to the type, extent and locations (edge habitats) of habitat removal. It is unlikely that the proposed action would reduce the area of occupancy, create a significant barrier to the movement of the species or remove habitat critical to the survival of the species.	The proposed action is unlikely to interfere with the recovery of the species. Unlikely significant impact.

4.4 Summary of Key Impacts on MNES

Table 24 summarises the potential impacts on listed threatened fauna species of concern. Overall, the works are expected to have minimal impact for most EPBC Act listed fauna species identified by the Self-Assessment Report (Attachment 1) as likely to occur within the proposed action area. However, three EPBC Act listed fauna species – Gang-Gang Cockatoo, Yellow-bellied Glider and Long-nosed Potoroo have a greater risk of being impacted:

- The Yellow-bellied Glider and Gang-gang Cockatoo are at greater risk as they are both arboreal, hollow-obligate species that rely on trees for feeding, refuge (roosting or den sites) and breeding. Habitat removal and modification is a key impact for both species
- The Long-nosed Potoroo is also at greater risk of impact because of the removal of habitat from an area that is known to support an important population of the species, therefore, the overall habitat for that population will be reduced by the proposed action

Table 24

Summary of potential impacts and outcomes of significant impact assessment

Species	Extent of habitat to be removed or modified	Assessment of significance outcome and key justification
Gang-gang Cockatoo	All vegetation within the action area is either foraging, roosting and/or connected habitat (7.31 ha). Removal of up to 16 potential hollow-bearing trees. Removal of habitat that is deemed suitable future breeding habitat (e.g., trees that may develop hollows in the future).	Likely significant impact The proposed action is likely to: <ul style="list-style-type: none"> – Reduce the area of occupancy of the species – Adversely affect habitat critical to the survival of a species – Disrupt the breeding cycle of a population – Interfere with the recovery of the species
Yellow-bellied Glider	A large portion of vegetation within the action area is considered to be known foraging, potential denning and breeding habitat (5.07 ha). Removal of up to 13 potential hollow-bearing trees. Removal of habitat that is deemed suitable future breeding habitat (e.g., trees that may develop hollows in the future).	Likely significant impact The proposed action is likely to: <ul style="list-style-type: none"> – Reduce the area of occupancy of the species – Adversely affect habitat critical to the survival of a species – Disrupt the breeding cycle of a population. – Interfere with the recovery of the species
Southern Brown Bandicoot	The proposed action will involve the removal of up to 7.81 ha of known and potential habitat largely from the edge habitat (habitat to be removed from the edge of a patch) and does not include large patches of intact habitat. The species is unlikely to permanently occupy these edge areas, which are more likely to form a small component of the overall habitat area they use in the local area.	Unlikely significant impact with the implementation of mitigation measures
Long-nosed Potoroo	The Conservation Advice for the species (DAWE, 2022c) lists the Otway Ranges including the Great Otway National Park as an important population for the species. The proposed action will remove or modify up to 7.81 ha of identified and potential habitat from within the proposed action area. The type and extent of habitat for each section to be removed that is relevant to this species is limited to linear strips along the edge of a patch consisting of dense understorey-midstorey. The habitats within the study site are well represented along the extent of the pipeline corridor and extensive areas of better quality habitat is located adjacent to the pipeline corridor in the form of remnant forest and woodland, which will be retained. However, the habitat will be permanently modified and, in some places, entirely removed and replaced by habitat unsuitable for the species (e.g., cleared easement) thus reducing the area of habitat.	Likely significant impact The proposed action is likely to: <ul style="list-style-type: none"> – Reduce the area of occupancy of the species
Swamp Antechinus	The proposed action will involve the removal of up to 7.81 ha of known and potential habitat largely from the edge habitat (habitat to be removed from the edge of a patch) and does not include large patches of intact habitat. The species is unlikely to permanently occupy these edge areas, which are more likely to form a small component of the overall habitat area they use in the local area.	Unlikely significant impact with the implementation of mitigation measures

Species	Extent of habitat to be removed or modified	Assessment of significance outcome and key justification
Spot-tailed Quoll	<p>The proposed action will remove or modify up to 7.81 ha of potential habitat from within the proposed action area.</p> <p>The species most likely uses the proposed action area for hunting. Areas with higher densities of hollow-bearing trees contain potential den sites, although very few logs on the ground with hollows and no rocky outcrops were recorded within the study site or proposed action area hence breeding opportunities within the proposed action area are limited. The study site has been searched and no den sites or latrine sites were recorded. Higher quality and identified habitats for this species (e.g., areas with dense understorey) are located along the lower lying areas of Section 21, within the Porcupine Creek area and most of Section 23, and Section 25i in the Dividing Creek area and south of the creek.</p>	<p><i>Unlikely significant impact</i> with the implementation of mitigation measures</p>

5. Proposed Impact Avoidance and Mitigation Measures

5.1 Policy Context

The Australian policy context on the need to avoid, minimise, mitigate, and/or offset potential direct and indirect impacts of a proposed action includes the following guidelines and advice:

- DoE, 2013b. *Environment Protection and Biodiversity Conservation Act 1999* Policy Statement Significant Impact Guidelines 1.1 – Matters of National Environmental Significance, Commonwealth Department of the Environment, Canberra
- DSEWPaC, 2012. EPBC Act Environmental Offset Policy, Commonwealth Department of Sustainability, Environment, Water, Population and Communities, Canberra
- Commonwealth of Australia, 2012. Environment Protection and Biodiversity Conservation Act 1999 – Environment Assessment Manual – Implementing Chapter 4, EPBC Act

The mitigation hierarchy is the basis of this policy context, summarised by DCCEE (2023) as:

...a tool that is used to limit the amount of damage an action, such as a development, will have on the environment. There are three steps, and each step must be followed in order and to the greatest extent possible before moving on to the next. These steps are: Avoid; Mitigate; Offset.

DoE (2013b) suggests that management and mitigation measures should be selected based on well-established effectiveness (e.g., through demonstrated application or studies), such that the extent of impact reduction and expected residual impacts can be assessed with a high degree of certainty.

Barwon Water has incorporated measures to avoid and mitigate environmental impacts from the Colac Pipeline Upgrade Project from the planning and design phase, through construction and operation. Where avoidance or mitigation is not possible, offsets have been proposed. Barwon Water regularly undertakes similar projects within the region, and previously have undertaken upgrade works on other sections of the Colac Pipeline. With this experience, Barwon Water has considered lessons learnt from the previous stages to ensure that realistic, constructable and effective mitigation measures have been adopted.

5.2 Design Phase

5.2.1 Avoidance

5.2.1.1 Avoiding the action

Avoidance of the action itself (i.e., not upgrading the Colac Pipeline) has not been considered as a prudent or realistic option, given that:

- a. The Colac Pipeline provides an essential service (water) to Colac and surrounds (with a forecast population of approximately 25,000 people).
- b. The existing pipeline is aging and has become prone to repeated and increasing failures, with resultant risk of water supply failure to Colac and associated risks of socio-economic consequences, as well as potential for environmental impacts of leaks.
- c. Upgrade of critical sections of the pipeline is necessary to ensure an ongoing secure water supply for Colac and surrounds.

This option is not a realistic or feasible solution given Barwon Water's commitment to deliver secure water services to its customers (Barwon Water, 2017). Further information on Project justification is provided in Section 8.2.

5.2.1.2 Investigation of alternative pipeline upgrade method

Barwon Water considered slip lining of the existing pipeline sections as opposed to replacement. Slip lining is a pipe renewal method whereby a smaller diameter pipe is inserted into the existing pipe. It does not require trenching of the full section of pipeline, and therefore may have reduced site disturbance. However, this method was deemed unfeasible due to the structural condition of existing sections of the Colac Pipeline and hydraulic constraints.

5.2.1.3 Investigation of an alternative pipeline route

Barwon Water undertook a high-level assessment of replacing and re-routing the entire Colac Pipeline on a new alignment, as an alternative to replacing or upgrading it within the existing corridor. An alternative pipeline route would likely divert upstream of the Great Otway National Park and to the east, before connecting back into the Colac supply. This alternative would have the benefit of avoiding construction impacts within the Great Otway National Park and the Otway Forest Park.

While an alternative pipeline route could potentially avoid vegetation losses and impacts to habitat within reserves, such a route would still need to pass through extensive areas of native vegetation, largely at the reservoir end (southern end) of the pipeline. Furthermore, the existing pipeline alignment is very direct (between the West Gellibrand and Olangolah Reservoirs and the Colac Water Treatment Plant), whereas an alternative route that avoided areas of National Park and Forest Park would be considerably longer. Undertaking construction through vegetation in a new, longer pipeline alignment would likely result in a significantly larger area of native vegetation loss and other potential impacts, with consequently poorer environmental outcomes, compared to the proposed works in and adjacent to the existing (modified) pipeline corridor.

Replacement of the pipeline through construction of an alternative route that avoids the Great Otway National Park would also require private land acquisition, increased capital expenditure (very high cost), and suboptimal hydraulic performance with increased risk to water supply.

Given that the environmental and operational costs of the creation of a new alignment would be greater than the benefits, the staged replacement of the existing pipeline on approximately the same alignment as the existing pipeline was selected as the only feasible option.

5.2.2 Minimisation

The alignment of the pipeline sections to be upgraded have been designed considering multiple constraints:

- The criticality of the pipeline remaining in operation and reliable in providing water supply to Colac and surrounds (including the ability to maintain operation during construction)
- The current condition of the existing pipeline which makes it especially susceptible to bursts that require emergency replacement and/or repairs
- The remote location of the pipeline and the steep and rugged terrain it traverses
- Other existing assets that run parallel to or cross the existing pipeline
- Other important infrastructure such as groundwater monitoring points and water infrastructure that are within the construction corridor and are required to have a minimum clearance
- Native vegetation, fauna habitat, and creek crossings, and the need to avoid and minimise impacts by remaining within the existing access track and slashed verge

Due to the vegetated environment immediately adjacent to the existing pipeline corridor, impacts on native vegetation and habitat (including MNES) are unable to be completely avoided. Where possible, Barwon Water has avoided and/or minimised such impacts through the design process.

Barwon Water has minimised expected impacts on native vegetation by designing the replacement sections of the pipeline within the existing pipeline corridor, which has previously been cleared of most trees with understorey vegetation regularly modified via slashing for access reasons. The proposed action has been contained in the verge and the track of the pipeline easement as much as possible to minimise impacts to native vegetation.

Early in the design process, Barwon Water engaged GHD to undertake a flora and fauna assessment of the action area. This assessment included identifying areas of native vegetation and fauna habitat along the alignment that should be avoided where possible, and areas where impacts may be able to be reduced as part of detailed design.

5.2.2.1 Arborist assessment and no-go zones

GHD engaged an arborist on behalf of Barwon Water to map and measure all trees within the construction corridor, and those that could be impacted by the construction. The scope of the arborist assessment included undertaking a review of the potential impacts of the pipeline upgrade on trees, taking into account the construction activity, location of the work, identified tree species, and potential impacts to the tree root zone. The aim was to identify trees that could be retained, as well as those that would be considered a loss.

Following this assessment, the width of the construction corridor was minimised where possible, and no-go zones were carefully considered and defined to delineate areas to be protected during construction as identified in Attachment 6 Ecological Impact Report. The no-go zones reduce expected tree impacts by 600 trees, which resulted in a significant reduction in overall impacts to native vegetation (see Attachment 6), including trees serving as habitat for key MNES fauna. Figure 4 shows the no-go zones within the action area – inferred by the boundary of the construction corridor, but also explicitly shown on pages 1, 2, 4, 6 and 7 of that Figure. Table 25 summarises the details of this key mitigation measure.

Table 25 Key mitigation measure: No-go zones

Mitigation measure (incl. location and timing):	No-go zones (whole of corridor, during construction).
Objective/s:	To delineate areas to be protected during construction to minimise unnecessary impacts on trees, other native vegetation, and fauna habitat.
Party responsible (implementation/funding):	Defined by Barwon Water, in conjunction with a qualified arborist. To be implemented by construction contractor and checked by arborist.
Ongoing management/monitoring:	To be fenced/delineated and monitored through regular inspections during construction by the construction contractor.
Any adaptive/contingency approaches:	No-go zones cannot be moved or reduced. It is possible that during construction, impact areas may be further minimised.
Assessment of predicted effectiveness (incl. benefits on impact scale/intensity):	Based on detailed arborist assessment, No-go zones are expected to reduce tree impacts by 600 trees (in addition to surrounding understorey vegetation), resulting in a significant reduction to native vegetation and habitat.

Further information on No-go zones implementation:

- No-go zones have been surveyed in order to calculate offset requirements under the *Victorian Planning and Environment Act 1987* and will be shown in construction issue technical drawings for the Project
- No-go zones take into consideration vegetation to be removed, vegetation to be retained and tree protection zones (measured in accordance with Australian Standard AS4970-2009 for Protection of Trees on Development Sites, as specified in the Victorian Native Vegetation Guidelines). They facilitate compliance with the approved planning permit (Attachment 3) by avoiding impacts on native vegetation that is not identified for removal.
- No-go zones will be established prior to works occurring on site. They will be established in stages, prior to works beginning in each stage/sub-section (as opposed to the entire length of the Pipeline Upgrade Project). The Construction Contractor will set up the no-go zone fencing in accordance with detailed plans. A Level 5 Certified Arborist will be on site during set-up to ensure that no-go zones are delineated appropriately, to avoid impacts to TPZs where possible. It is expected that some additional tree losses will be avoided through this process.
- The approved planning permit (Attachment 3) has a condition that no-go zones to protect native vegetation must be established prior to works, to the satisfaction of the Responsible Authority, meaning that the Colac Otway Shire must be satisfied with the extent, location and type of protection installed

- The Construction Contractor is required to provide the Barwon Water Environmental Advisor with plans and details of protection measures for approval and then install the measures on site. The Environmental Advisor will then inspect the protection measures prior to construction being allowed to commence.
- The Environmental Advisor will then inspect the protection measures throughout the construction phase of the Project. Inadequacy in any protection measures will be rectified at the time of the inspection or the Contractor will be issued with a non-compliance/improvement notice. Repeated breaches will result in a stop-work order.
- Construction personnel are required to undertake the Barwon Water general induction, which covers Health, Safety, Quality and Environment. They will also be required to undertake project-specific inductions, that will cover all of these topics in more detail, including site-specific environmental considerations, such as the No-go zone protections.
- Construction personnel will also be required to attend daily toolbox meetings, including toolbox discussion topics that will regularly cover environmental considerations, such as compliance with No-go zones as relevant to the works planned for the day
- No-go zone fencing may be achieved via various means. Commonly flagging and signage is used. However, in sensitive areas Barwon Water require the installation of 'parawebbing' fencing. Fencing will be identified with prominent signage indicating “No-go zone – No Entry. Vegetation Protection Area”.
- Such fencing has been effective across many Barwon Water construction projects to date, as deliberate effort is required to climb over the fencing or remove the fencing. Where parawebbing and steel star pickets are employed for protection fencing, damage can occur to plant or vehicles if they are driven through the fencing. On past Barwon Water projects that have utilised flagging or parawebbing fencing, there have been no incidents of contractor encroachment into no-go zones.
- In addition to establishing and enforcing no-go zone fencing, a Level 5 Certified Arborist will be required to maintain an inventory of all identified trees and to record during construction works whether each tree that was initially calculated as being impacted has been lost, saved, or saved with intervention

5.2.2.2 Construction methodology

During the design phase, Barwon Water also considered whether the construction methodology could be varied at key locations to minimise potential impacts to vegetation. For example, where the pipeline crosses Porcupine Creek, vegetation impacts were calculated for both trenched and trenchless (horizontal directional drilling) construction methods. It was determined that vegetation impact for trenched and trenchless methods would be very similar over a comparative length, equivalent to the longest possible trenchless crossing method.

While trenchless methods can minimise vegetation impact at the trenchless crossing, large setup areas are required for the launch and receival sites to manage the trenchless process. These sites would impact significant areas of vegetation beyond the existing corridor, as well as introduce other environmental risks such as the potential for spilling of high-pressure drilling fluids. As such, trenching has been adopted as the preferred method due to its similar net vegetation impact, lower cost and lower risk compared to trenchless methods.

5.3 Construction

5.3.1 Avoidance

During construction, Barwon Water will implement further measures to avoid impacts to native vegetation and fauna habitat.

An arborist will be engaged to be onsite during construction to assist with determining no-go zones to avoid impacts to TPZs where possible. It is expected that some tree losses will be avoided through this process. The arborist will be required to maintain an inventory of all identified trees and to record during construction works whether each tree that was initially calculated as being impacted has been lost, saved, or saved with intervention. The arborist and an ecologist will complete a reconciliation process once the construction and reinstatement works have been completed to capture the exact extent of vegetation loss. Table 26 summarises the details of this key mitigation measure.

Table 26 Key mitigation measure: On site Arborist

Mitigation measure (incl. location and timing):	Avoidance of impacts to native vegetation and fauna habitat (during construction)
Objective/s:	To have an inventory of all identified trees and to record during construction works whether each tree that was initially calculated as being impacted has been lost, saved, or saved with intervention.
Party responsible (implementation/funding):	Defined by Barwon Water. To be implemented by on site arborist.
Ongoing management/monitoring:	Maintenance of an inventory of all identified trees to be reconciled with an ecologist after construction and reinstatement works have been completed.
Any adaptive/contingency approaches:	Onsite Arborist enables construction to adapt to advice and feedback of the Arborist prior to impacts occurring.
Assessment of predicted effectiveness (incl. benefits on impact scale/intensity):	Reduced impacts to native vegetation and fauna habitat.

Barwon Water’s construction contractor will be required to use trench shields during construction, which will reduce the typical trench width from 4.0 m to 1.2 m. This will increase the distance from the edge of the trench to any impacted trees by 1.4 m on each side of the trench. Table 27 summarises the details of this key mitigation measure.

Table 27 Key mitigation measure: Trench Shields

Mitigation measure (incl. location and timing):	Trench shields (whole of corridor, during construction)
Objective/s:	While the primary purpose of trench shields is to protect workers in the event of a trench wall collapse, they also enable minimisation of trench width and consequent clearing/disturbance width (i.e., reduced impacts on native vegetation and habitat).
Party responsible (implementation/funding):	Barwon Water To be implemented by construction contractor
Ongoing management/monitoring:	To be deployed section by section during construction and removed prior to backfilling each section of trench.
Any adaptive/contingency approaches:	N/A
Assessment of predicted effectiveness (incl. benefits on impact scale/intensity):	Using trench shields is expected to reduce the total disturbance footprint including the native vegetation removal area.

Runoff (overland flow during/after rainfall) will be intercepted and diverted around works. Sedimentation fencing will be installed at key runoff points prior to running away from site and towards watercourses.

5.3.2 Minimisation

A Construction Environmental Management Plan (CEMP) will be developed and implemented for the Project to further minimise impacts to areas of ecological value. The CEMP will be prepared before construction commences, and will include measures such as:

- Installation of fencing to protect native vegetation to be retained, so that No-go zones are clearly delineated and construction workers are able to minimise any accidental damage to native vegetation during construction, beyond the approved construction corridor
- Implementation of sediment control devices such as silt traps and sediment fencing near any waterways and/or aquatic habitats during the construction period. Sedimentation fencing will be installed at key runoff points prior to water diverting towards watercourses.
- Measures to prevent contaminants (e.g., oils, chemicals) from entering any aquatic habitat or waterways as the results of accidental spills

- Incorporation of weed, disease and pest control measures (see Table 28) to prevent the spread of existing and/or introduction of new weeds, diseases or pests to the construction corridor, including:
 - Control of weeds prior, during and post construction where appropriate. Works would only be undertaken by an appropriately qualified and licensed person with the ability to accurately distinguish the relevant weed species from indigenous flora, in order to avoid impacting native species during weed control works
 - Weed control in or near aquatic habitat or areas of poor drainage will preferably be via manual removal, otherwise low-toxicity non-residual herbicides registered as suitable in watercourses (e.g., Roundup Bioactive®) may be appropriate for use in a targeted manner such as spot spraying, if necessary
 - Wash-down and inspection of vehicles, machinery and boots before entering/leaving working areas to avoid transporting viable plant materials (e.g., weed seed) or large clods of soil

Table 28 Key mitigation measure: Weed and Disease Management

Mitigation measure (incl. location and timing):	Weed and disease management (construction corridor)
Objective/s:	To prevent the spread of existing and/or introduction of new weeds, diseases or pests to the construction corridor.
Party responsible (implementation/funding):	Barwon Water. To be implemented by construction contractor
Ongoing management/monitoring:	Weed control post construction where appropriate.
Any adaptive/contingency approaches:	<ul style="list-style-type: none"> - Control of weeds prior, during and post construction where appropriate - Weed control in or near aquatic habitat or areas of poor drainage will preferable be via manual removal - Wash-down and inspection of vehicles, machinery and boots before entering/leaving working areas
Assessment of predicted effectiveness (incl. benefits on impact scale/intensity):	Weed control measures are expected to reduce the potential for the spread of weeds in areas of ecological value.

- Fauna mitigation measures (see Table 29), including:
 - Pre-clearance surveys for ground mammals including Southern Brown Bandicoot, Long-nosed Potoroo, Swamp Antechinus and Spot-tailed Quoll. Captured fauna will be relocated to suitable habitat nearby
 - Manual habitat modification following pre-clearance surveys to make habitat unsuitable for ground mammal species prior to clearing of habitats with machinery
 - Monitoring by a suitably qualified person of all hollow-bearing trees to be removed, including inspection of hollows, recovery and relocation of fauna found in hollows to suitable habitat nearby. Clear and obvious marking of hollow-bearing trees prior to removal must be completed. This step will ensure no hollow-bearing tree is missed
 - Monitoring to recover and relocate fauna found in open trenches
 - Trench management including tapered ends to trenches, to be left overnight to facilitate fauna escape
 - Imposing vehicle speed limits on works area tracks
 - Limiting construction to daylight hours
 - Installation of wildlife awareness signage
 - Discussion of wildlife/vehicle collision risk procedures during construction pre-start meetings

Table 29 Key mitigation measure: Fauna

Mitigation measure (incl. location and timing):	<p>Fauna mitigation measures (whole of corridor, but particularly areas of identified fauna habitat, during construction of each section), as above including:</p> <ul style="list-style-type: none"> - Pre-clearance surveys for ground mammals - Manual habitat modification prior to clearing with machinery - Marking and monitoring of hollow-bearing trees prior to removal; recovery and relocation of fauna where applicable - Trench management to facilitate fauna escape - Monitoring to recover and relocate fauna found in open trenches - Imposing vehicle speed limits; construction only in daylight hours - Wildlife awareness signage; wildlife procedures covered in construction pre-start meetings
Objective/s:	To minimise death and injury of fauna during construction
Party responsible (implementation/funding):	Barwon Water in conjunction with suitably qualified ecologists / construction contractors
Ongoing management/monitoring:	Measures to be applied as relevant during construction (e.g., trench measures only while trench is open in each section of pipeline)
Any adaptive/contingency approaches:	The effectiveness of measures will be reviewed and adapted based on outcomes.
Assessment of predicted effectiveness (incl. benefits on impact scale/intensity):	These measures will minimise death and injury to native fauna during the construction process.

- Tree protection measures, including:
 - Engage an arborist during the construction to assist with the micro-siting of stockpiling and laydown and storage to reduce impacts to tree TPZs
 - Engage an arborist and ecologist to complete a reconciliation process once the construction and reinstatement works have been completed to quantify the actual extent of vegetation loss. An arborist assessment would include a comparison of trees that were initially calculated as being impacted by potential activities within the construction corridor and the actual trees that were impacted by activity within the construction corridor.
- Habitat relocation and management including:
 - Any large trees (defined by the EVC benchmark for large trees) and/or trees with hollow/s that are felled during construction must be placed into the adjoining habitat or relocated to other nearby areas which lack suitable ground habitat (e.g., north of Link Track, east of the Pipeline Track in areas logged within the last 30 years that lack ground cover with coarse woody debris including large logs)
 - Mulched vegetation must not be heaped or piled into adjoining areas of remnant vegetation. Mulch obtained from cleared vegetation should be used to cover the recently cleared construction corridor as much as possible.

Table 30 summarises the details of key mitigation measures addressed by the CEMP that are not covered above.

Table 30 Key mitigation measures: Other CEMP Components

Other key mitigation measures of the CEMP (incl. location and timing):	Retention of native vegetation, sediment control and prevention of contaminants in areas of ecological value. Salvage and repurposing of important habitat features (e.g. hollow-bearing trees).
Objective/s:	To further minimise impacts to areas of ecological value.
Party responsible (implementation/funding):	Barwon Water. To be implemented by construction contractor.
Ongoing management/monitoring:	N/A

Any adaptive/contingency approaches:	<ul style="list-style-type: none"> - Installation and maintenance of fencing to protect native vegetation to be retained - Implementation of sediment control devices such as silt traps and sediment fencing near any waterways and/or aquatic habitats during the construction period - Measures to prevent contaminants (e.g., oils, chemicals) from entering any aquatic habitat or waterways as the results of accidental spills
Assessment of predicted effectiveness (incl. benefits on impact scale/intensity):	<ul style="list-style-type: none"> - Minimisation of any accidental damage to native vegetation during construction, beyond the approved construction corridor - Reduced sedimentation at key runoff points - Prevention of contaminants from entering any aquatic habitat or waterways - Repurposing of salvaged habitat

5.4 Operation

The ongoing management of the Colac Water Supply Pipeline following the proposed upgrades will remain as it currently is for the existing pipeline. This includes periodic inspections of the pipeline alignment during scheduled works to determine that there has been no slumping, leaking or any other issues that may impact on the operation of the pipeline or impact on the surrounding environment.

This ongoing maintenance has historically involved maintaining a clear access path along the pipeline for inspection purposes, which requires management of the extent of vegetation growth in the pipeline corridor (via slashing) and clearing fallen branches and other obstacles. The pipeline corridor will remain as modified (primarily native) vegetation. The ongoing maintenance will continue to include:

- Regular inspections for noxious and environmental weed incursion and/or spread along the pipeline corridor
- Prompt management to remove any noxious or environmental weeds identified within the pipeline corridor
- Regular inspections to identify and mitigate areas of soil erosion and sedimentation

6. Residual Impacts and Proposed Offsets

6.1 Residual Impacts

Avoidance and mitigation measures are the primary strategies for managing the potential significant impacts of a proposed action. They directly reduce the scale and/or intensity of potential impacts. Residual impacts are the remaining unavoidable impacts following the application of avoidance and mitigation measures (see Section 5).

During the design phase, measures were implemented to reduce the extent of vegetation removal from the proposed action area. However, there is an opportunity to further reduce impacts during the construction stage of the Project using the following techniques:

- An arborist will be engaged to be onsite during construction to assist with micro-siting of the pipeline alignment as well as stockpiling, laydown and storage areas, to avoid impacts to TPZs where possible
- Barwon Water’s construction contractor will be required to use a trench shield during construction, which will reduce the typical trench width from 4.0 m to 1.2 m. This will increase the distance from the edge of the trench to any impacted trees by 1.4 m on each side of the trench.

Table 31 provides a summary for the three species (Gang-gang Cockatoo, Yellow-bellied Glider and Long-nosed Potoroo), which are likely to be significantly impacted by the proposed action in consideration of:

- The implementation of all pre-construction phase avoidance and minimisation measures
- The extent of impact
- Possible outcomes by implementing construction phase avoidance and minimisation measures

It is not possible to quantify prior to construction the extent to which planned construction phase mitigation measures will effectively reduce impacts (such as number of trees or area of native vegetation impacted), or whether the measures will reduce impacts to a level that would avoid a significant impact to the three species. Consequently, the extent of habitat removal quantified in Table 31 represents the impacts with the implementation of pre-construction measures only, which is adopted as the extent of residual impacts for the proposed action. The possible mitigation effects of construction phase measures are listed but not quantified. On this basis, the proposed action is likely to result in an adverse residual significant impact on the Gang-gang Cockatoo, Yellow-bellied Glider and Long-nosed Potoroo.

Table 31 Extent of residual impacts following implementation of proposed pre-construction mitigation measures (quantified) and construction-phase mitigation measures (listed)

Species	Extent of habitat to be removed or modified following the implementation of pre-construction measures	Possible reduction of impacts following mitigation measures during construction phase
Gang-gang Cockatoo	All vegetation within the action area is either foraging, roosting and/or connected habitat for this species (7.31 ha). Removal of up to 16 potential hollow-bearing trees (potential breeding habitat). Removal of habitat that is deemed suitable future breeding habitat (e.g., trees identified with currently unsuitable hollows, or trees of suitable diameter without hollows that may develop hollows in the future).	Possible reduction in number of hollow-bearing trees that will be removed. Possible reduction in number of future hollow-bearing trees that will be removed. Reduction in area of foraging habitat to be removed.
Yellow-bellied Glider	A large portion of vegetation within the action area is considered to be known foraging, potential denning and breeding habitat (5.07 ha). Removal of up to 13 potential hollow-bearing trees (potential breeding and denning habitat). Removal of habitat that is deemed suitable future breeding habitat (e.g., trees that may develop hollows in the future).	Possible reduction in number of hollow-bearing trees that will be removed. Possible reduction in number of future hollow-bearing trees that will be removed. Reduction in area of foraging habitat to be removed.

Species	Extent of habitat to be removed or modified following the implementation of pre-construction measures	Possible reduction of impacts following mitigation measures during construction phase
Long-nosed Potoroo	<p>The proposed action will remove or modify up to 7.81 ha of identified and potential foraging habitat.</p> <p>The type and extent of habitat for each section to be removed is limited to linear strips along the edge of a patch, consisting of dense understorey-midstorey. The habitats within the study site are well represented along the extent of the pipeline corridor and extensive areas of better quality habitat are located adjacent to the pipeline corridor in the form of remnant forest and woodland, which will be retained. However the habitat will be permanently modified and, in some places, entirely removed and replaced by habitat unsuitable for the species (e.g., cleared or slashed easement) thus reducing the area of habitat.</p>	Reduction in area of foraging habitat to be removed.

On this basis, the proposed action is likely to result in an adverse residual significant impact on the Gang-gang Cockatoo, Yellow-bellied Glider and Long-nosed Potoroo.

6.2 Proposed Environmental Offsets

'Environmental offsets' are measures that compensate for the residual adverse impacts of an action on the environment. Offsets do not reduce the likely impacts of a proposed action, but instead compensate for any residual significant impact. These remaining, unavoidable impacts are termed 'residual impacts'. For assessments under the EPBC Act, offsets are only required if residual impacts are significant. Where appropriate, offsets are considered during the assessment phase of an environmental impact assessment under the EPBC Act. The suitability of a proposed offset is considered as part of the decision as to whether or not to approve a proposed action under the EPBC Act.

Barwon Water has already obtained environmental offsets with regard to the loss of native vegetation under the *Victorian Guidelines for the removal, destruction or lopping of native vegetation* and FFG Act listed flora and fauna species. These offsets are discussed in section 6.2.1. Unfortunately these offsets were not of a suitable land tenure to be considered for the EPBC Act offsets, therefore additional offsets sites have been proposed which are discussed in section 6.2.2.

The EPBC Act Environmental Offsets Policy (DSEWPC, 2012) provides a set of overarching principles that should be applied to determining the suitability of offsets, The Offset Strategy (Attachment 10) summarises how the proposed offsets achieve the overarching principals which is also presented in Table 33 . Table 32 provides a summary of the EPBC Act proposed offsets to compensate for the residual impacts to Gang-gang Cockatoo, Yellow-bellied Glider and Long-nosed Potoroo.

6.2.1 Existing environmental offsets

Despite efforts undertaken to avoid and minimise impacts to native vegetation during the Project, a total of 7.81 ha of native vegetation removal will be required for the proposed action.

In accordance with the *Victorian Guidelines for the removal, destruction or lopping of native vegetation*, the Native Vegetation Removal Report generated by DEECA (see Attachment 6) outlines the offset requirements for the Project under the *Victorian Planning and Environment Act 1987*. To date, Barwon Water has secured approximately 64.9 ha of land as offsets for the Project (Table 32). These offsets address Victorian requirements but are not able to be used to address Federal (EPBC) offset requirements.

Table 32 Species amounts and zone information provided by offset broker, Vegetation Link

Species Name	Site and Zone	Zone Size	SHU Balance	SHU Purchased	Approx Area (ha)
Otway Bush-pea	TFN-C2058-1C	14.5 ha	4.103	1.238	4.4 ha
Spotted Hyacinth Orchid**	BBA-3041-1A	See below	-	6.083	-
Small Sickle Greenhood	BBA-3041-1A	78.7 ha	19.008	11.312	46.8 ha
Scented Spider-orchid	CFL-3763-1A	17.8 ha	4.127	3.091	13.3 ha
Otway's Cray	BBA-0114-1B	0.92 ha	0.404	0.183	0.4 ha
TOTAL AREA					64.9 ha

* SHU = species habitat units. ** Offsets were purchased for two species from the same zone on BBA-3041. Therefore calculations were made on the species which had the highest amount.

Barwon Water has also set aside offsets from the Barwon Water Net Gain Credit Bank (property ID: BBA-2337_06-30-A) for the Project in addition to the above-mentioned offsets for the loss of Showy Lobelia (*Lobelia beaugleholei*): 11.312 species habitat units; Currant-wood (*Monotoca glauca*): 11.313 species habitat units; and 215 large trees with capacity for hollows. This site is located 6.7 km south of the township of Forrest and 8.8 km from the proposed action area, within the same catchment and bioregion as the proposed action area.

6.2.2 Proposed offset strategy

The proposed Offset Strategy (Attachment 10) presents a summary of the potential residual impacts and subsequent offset requirements for the Project under Commonwealth legislation, along with the proposed Offset Strategy by which the Project will offset those residual impacts. The Offset Strategy fulfils the requirements the *Environment Protection and Biodiversity Conservation Act 1999* Environmental Offsets Policy for the Project to submit an 'Offset Strategy'. How the proposed offsets achieve the overarching principles that should be applied to determining the suitability of offsets is outlined in Table 33. A summary of the proposed offset sites Barwon Water has investigated is described below and Table 34 outlines the overall offset package proposed.

In order to provide the offsets to counterbalance the potential residual impacts two offset sites have been identified and form this Offset Strategy:

1. Offset site 1 – ██████████ Kawarren. Targeted surveys were completed for the Yellow-bellied Glider, Gang-gang Cockatoo and Long-nosed Potoroo. The site is privately owned and consists of a large area of continuous intact native vegetation. It is currently managed in situ as a bush block with the existing house and campground area. As a result of the targeted surveys including vegetation and habitat assessment the Yellow-bellied Glider and Gang-gang Cockatoo were both considered to be resident within the offset site, however the Long-nosed Potoroo was not recorded. The offset site will be secured by a Section 69 on title security and will be actively managed for 10 years in accordance with the Offset Management Plan (OMP) (Attachment 11).
2. Offset site 2 – 245 Distillery Creek Road, Aireys Inlet. Targeted surveys for the Long-nosed Potoroo (*Potorous tridactylus trisulcatus*) including habitat and vegetation assessments were completed and the species was recorded at the site and is considered resident within the site. Gang-gang Cockatoo foraging habitat was also recorded on site. The proposed offset site is privately owned by Barwon Water and forms part of an uncleared portion of a Water Reclamation Plant. The proposed offset site is contiguous with the Great Otways National Park, with largely continuous intact native vegetation. The offset site will be secured by a Section 69 on title security and will be actively managed for 10 years in accordance with the OMP (Attachment 12).

Table 33

EPBC Act Offset overarching principles that are applied when determining the suitability of offsets

Offset principles	Response
<p>1- Suitable offsets must deliver an overall conservation outcome that improves or maintains the viability of the protected matter.</p>	<p>Two sites have been identified and assessed as meeting the offset requirements for the Gang-Gang Cockatoo and Yellow-bellied Glider (██████████ Kawarren) and Long-nosed Potoroo (245 Distillery Creek Road, Aireys Inlet).</p> <p>The offset values and calculations provided within this strategy are at least three times the area of the reported residual impact area. Furthermore the offsets are of an equivalent quality to the impact area habitat prior to implementation of management measures. For example:</p> <p>Gang-gang Cockatoo – impact area 7.31 ha – proposed offset area 41.28 ha (██████████ Kawarren), which equates to more than five times the impact area. Species frequently utilises the site as part of its broader home range.</p> <p>Yellow-bellied Glider – impact area 5.07 ha – proposed offset area 41.28 ha (██████████ Kawarren), which equates to eight times the impact area. Species considered resident with the site</p> <p>Long-nosed Potoroo – impact area 7.81 ha – proposed offset area 29.68 ha (245 Distillery Creek Road, Aireys Inlet), which equates to more than three times the impact area. Species considered resident within the site.</p> <p>The proposed offsets exceed the minimum of 90% of the total offsets required for each MNES following the introduction of management measures designed to reduce the identified threats at each of the sites. By securing the offset site at ██████████ a large patch of habitat on private land which is considered a local linkage/corridor for the Gang-gang Cockatoo and Yellow-bellied Glider will be protected. Securing the 245 Distillery Creek Road offset site will protect known habitat for the Long-nosed Potoroo and contribute to the greater reserve system in the local area for species.</p>
<p>2- Suitable offsets must be built around direct offsets but may include other compensatory measures.</p>	<p>The proposed offset sites exceed the minimum of 90% of the total offset requirement for each MNES. The management of habitat through ongoing protection and associated on-ground measures to improve vegetation condition is considered to be a direct offset. Once secured, offset sites would be managed in accordance with the Offset Management Plans.</p>
<p>3- Suitable offsets must be in proportion to the level of statutory protection that applies to the protected matter.</p>	<p>The proposed offset sites will be secured in proportion to the level of statutory protection that applies to the MNES associated with the project, in accordance with the EPBC Act (see section 7.3). This means MNES of greater conservation status have greater offset requirements as calculated in the <i>Offset assessment guide</i>.</p> <p>Gang-gang Cockatoo – Endangered Yellow-bellied Glider – Vulnerable Long-nosed Potoroo - Vulnerable</p>
<p>4- Suitable offsets must be of a size and scale proportionate to the residual impacts on the protected matter.</p>	<p>The offset values and calculations provided within this strategy are greater than three times the area of the reported residual impact area. Furthermore, the offsets are of an equivalent quality to the impact area habitat prior to implementation of management measures. For example:</p> <p>Gang-gang Cockatoo – impact area 7.31 ha – proposed offset area 41.28 ha (██████████ Kawarren).</p> <p>Yellow-bellied Glider – impact area 5.07 ha – proposed offset area 41.28 ha (██████████ Kawarren).</p> <p>Long-nosed Potoroo – impact area 7.81 ha – proposed offset area 29.68 ha (245 Distillery Creek Road, Aireys Inlet).</p>
<p>5- Suitable offsets must effectively account for and manage the risks of the offset not succeeding.</p>	<p>The offset sites will be secured under a Section 69 agreement with DEECA in accordance with the Conservation, Forests and Lands Act 1987. The legally secured offset sites will be managed by the landowner under a legal contract and site-specific OMPs that will contain a risk assessment detailing relevant risk and mitigation measures for each offset site. The OMPs enable land practices that promote positive outcomes for MNES.</p>
<p>6- Suitable offsets must be additional to what is already required, determined by law or planning regulations or agreed to under other schemes or programs</p>	<p>No specific offsets for MNES are prescribed under any State or Local Government offset prescriptions relevant to the project area.</p> <p>The project has met the offset obligations in regards to the Victorian process under the <i>Planning and Environment Act 1987</i> as demonstrated by Native Vegetation Credits.</p> <p>The proponent notes that the existing offsets purchased to comply with State offset obligations (see Appendix C) cannot be used to satisfy the MNES required offsets.</p>

Offset principles	Response
7- Suitable offsets must be efficient, effective, timely, transparent, scientifically robust and reasonable.	The legally secured offsets will be actively managed by the landowner under the supervision a suitably qualified ecologist. The decrease in condition scores of the offsets within the proposed timeframes are considered to be a conservative approach given the potential risks associated with vegetation and habitat quality decreasing without active management. Conversely, the objectives and implementation of appropriate management actions (to be outlined within the OMPs) are likely to improve the quality of communities/habitat. This will be achieved through proven management actions and monitored throughout the 10-year management period to ensure the desired environmental outcomes have been achieved for the offset sites (i.e. adaptive management for greater ecological gains).
8- Suitable offsets must have transparent governance arrangements including being able to be readily measured, monitored, audited and enforced.	Governance includes monitoring and reporting by a suitably qualified and independent ecologist with reports submitted to DCCEEW. Reports will provide a summary of management actions completed and include an assessment of their combined success against OMP objectives. The proposed offset sites will also include independent audits and reporting by a suitably qualified ecologist. Audit findings and recommendations will be discussed and agreed with the landowner and implemented accordingly.
9- Suitable offsets must be informed by scientifically robust information and incorporate the precautionary principle in the absence of scientific certainty	Two sites have been identified and assessed as meeting the offset requirements for the Gang-Gang Cockatoo and Yellow-bellied Glider (██████████ Kawarren) and Long-nosed Potoroo (245 Distillery Creek Road, Aireys Inlet). At each site targeted surveys were undertaken in January, February and March of 2023 following a review of relevant literature to determine the best methods and effort to detect each species. The Yellow-bellied Glider and Gang-gang Cockatoo were recorded at the ██████████ offset site and the Long-nosed Potoroo was recorded at the 245 Distillery Creek Road site. The surveys determined that each species was either resident (e.g. the Yellow-bellied Glider and Long-nosed Potoroo) or frequently used the habitat within the site (e.g. Gang-gang Cockatoo was frequently observed resting and foraging on site but not definitely breeding). See Attachment 10 for details.
10- Suitable offsets must be conducted in a consistent and transparent manner	The purpose of the Offset Strategy (Attachment 10) is to establish an offset process and provide a report which identifies and documents in a transparent manner the values of each offset site.

Table 34 Summary of residual impact and offset package

MNES	Residual impact	Offset package
Gang-gang Cockatoo (<i>Callocephalon fimbriatum</i>)	7.31 ha X quality 7 = 5.12 ha	Offset site 1 – 41.28 ha = 136.04% of direct offset
Yellow-bellied Glider (<i>Petaurus australis australis</i>)	5.07 ha X quality 8 = 3.55 ha	Offset site 1 – 41.28 ha = 108.31% of direct offset
Long-nosed Potoroo (<i>Potorous tridactylus trisulcatus</i>)	7.81 ha X quality 7 = 5.47 ha	Offset site 2 - 29.68 ha = 101.12% of direct offset

7. Other Approvals and Conditions

A number of planning, environmental and heritage approvals are being sought or have been obtained for the Colac Pipeline Upgrade Project, and several technical studies have been undertaken to support ongoing approvals processes.

A summary of relevant approvals and investigations is provided in Table 35.

Table 35 Planning, environmental and heritage approvals and assessments undertaken for the Colac Pipeline Upgrade

Approvals / Assessments	Description
Geotechnical investigations	<p>A geotechnical investigation was undertaken to determine design parameters for the pipeline, reaffirm the proposed construction method is suitable and to provide factual information for the contractor.</p> <p>The geotechnical investigations were undertaken in March to April 2020, in conjunction with service proving works on the existing pipeline. These works were undertaken to inform design and were in accordance with a minor works agreement between Barwon Water and Parks Victoria, executed 24 July 2019 and in accordance with the planning permit endorsed by Colac Otway Shire (PP200/2019-1) (Attachment 3).</p>
Approval under Section 27 of the Victorian <i>National Parks Act 1975</i>	<p>The majority of the Project falls within the Great Otway National Park, which will require an agreement with Parks Victoria under Section 27 of the <i>National Parks Act 1975</i>. As outlined in Section 4, Barwon Water has consulted with Parks Victoria regarding the Project and has submitted a Section 27 application to Parks Victoria. The application is currently being considered.</p>
Consent under the Victorian <i>Water Act 1989</i>	<p>The Project crosses over Porcupine Creek, which is a designated waterway managed by the Corangamite Catchment Management Authority (CMA). Barwon Water will submit a consent application to Corangamite CMA pursuant to By-law No.4 Waterways Protection 2014 for the works proposed as part of this Project.</p>
Planning permit application pursuant to the Victorian <i>Planning and Environment Act 1987</i>	<p>A planning permit for the Colac Pipeline Upgrade was received from the Colac Otway Shire on 2 August 2022 – (PP259/2021-1 – Pipeline Road GERANGAMETE – Planning Permit and Endorsed Plans [COS-CL.URI1542141]) (Attachment 3).</p> <p>Under the Colac Otway Shire Planning Scheme, a planning permit is required for buildings and works including the removal of all vegetation under the Erosion Management Overlay (EMO1), removal of native vegetation under the Environmental Significance Overlay (ESO3), Significant Landscape Overlay (SLO1) and Clause 52.17 Native Vegetation. A planning permit is also required for buildings and works within Public Conservation and Recreation Zone (PCRZ) and the Farming Zone (FZ).</p>
Cultural heritage investigations and CHMP required under the Victorian <i>Aboriginal Heritage Act 2006</i>	<p>Cultural heritage investigations have been undertaken for the Project.</p> <p>A standard assessment identified two existing Aboriginal places within the activity area - VAHR 7620-0209 and VAHR 7621-0111.</p> <p>A complex assessment requiring archaeological excavation was conducted at the identified cultural sites involving testing pits and ground surveys.</p> <p>A Cultural Heritage Management Plan (CHMP) has been prepared in consultation with the Eastern Maar Aboriginal Corporation as the appointed Registered Aboriginal Party (RAP) for the Project and has been evaluated by First Peoples – State Relations (FP-SR), formerly Aboriginal Affairs Victoria (AAV). Additional complex assessment was undertaken at the request of FP-SR and an additional Aboriginal place identified, added to the Victorian Aboriginal Heritage Register (VAHR) and included in the CHMP. The CHMP was approved by FP-SR on 4 March 2022 (CHMP reference no. 16600; Biosis, 2022) (Attachment 5).</p>
Victorian <i>Traditional Owners Settlement Act 2010</i>	<p>At the current point in time, no Land Use Activity Agreements (LUAAs) have been entered into between the State and Eastern Maar Aboriginal Corporation.</p> <p>If extinguishment of native title cannot be demonstrated and no LUAA under this Act applies, then the Commonwealth <i>Native Title Act 1993</i> will continue to apply (see below).</p>

Approvals / Assessments	Description
Commonwealth <i>Native Title Act 1993</i> and <i>Native Title Amendment Act 1998</i>	<p>The proposed works are in a Native Title claim area (Eastern Maar VC2012/001). Barwon Water will liaise with DEECA during the Crown Land consent process to determine the requirements under the Commonwealth <i>Native Title Act 1993</i>.</p> <p>These requirements are determined through discussion with First Nations Legal & Research Services via a Future Act Notification.</p> <p>Barwon Water is currently working with Parks Victoria to have this assessment completed.</p>
Flora and fauna investigations	<p>Barwon Water engaged GHD to undertake flora and fauna investigations to map the extent and condition of native vegetation and fauna habitat, as well as number of follow-up targeted surveys for the purpose of searching for 16 species listed under the Commonwealth EPBC Act, Victorian FFG Act or (then) DELWP Advisory list. The final Ecological Assessment report was issued on 10 May 2021. Preparation of the ecological assessment report included:</p> <ul style="list-style-type: none"> - A terrestrial field assessment to map the extent and condition of native vegetation and fauna habitat was undertaken on 25 and 26 June 2019 by GHD - The terrestrial field assessment for pipe locating investigation areas was undertaken on 8 and 9 August 2019 by GHD - Treelogic Pty Ltd was engaged by GHD on behalf of Barwon Water to assist in quantifying potential tree impacts in relation to the proposed replacement of five sections of the Colac Pipeline located along Pipeline Road within the Great Otway National Park and Otway Forest Park. Site assessments were conducted between 6 and 19 January 2021. - Targeted surveys were completed on 1 and 2 of October 2019 and on 17 and 18 of December 2019 by GHD. The main purpose of the surveys was to search for 16 threatened species listed under the EPBC Act, FFG Act or DELWP Advisory List. - Targeted surveys were completed on 29 and 30 of July 2020 by GHD. The main purpose of the survey was to search for the EPBC Act listed <i>Pterostylis chlorogramma</i> (Green-striped greenhood orchid). - Based on potential significant impacts to native vegetation and species, several workshops were held with Barwon Water teams in August and September 2021 to refine the construction corridor to reduce impacts - Arborist fieldwork was undertaken in January 2021 and draft Arborist Report completed in February 2021 - Further engagement with Barwon Water was undertaken in February and March 2021 to refine the construction corridor to further reduce both general vegetation impacts and species-specific impacts - Engagement with net gain offset brokers commenced in February and March 2021 - The 'Avoid and Minimise' strategy was progressed in March and April 2021, including several workshops with DELWP and Parks Victoria - Native Vegetation Removal report to support a planning permit application under the Victorian <i>Planning and Environment Act 1987</i> was completed in April 2021 <p>Significant reduction in general and species-specific impacts were achieved in this process.</p>
Permit under the FFG Act	<p>Flora species listed as protected under the FFG Act were identified during field assessment.</p> <p>A permit for the removal of Protected Flora under the FFG Act will be required on public land, which Barwon Water submitted in November 2021.</p>

Approvals / Assessments	Description
EPBC Self-Assessment	<p>Two species were recently listed under the EPBC Act and potential impacts to these species have not been considered against EPBC Significance Impact Criteria as part of previous flora and fauna investigations.</p> <p>The Gang-gang Cockatoo (<i>Callocephalon fimbriatum</i>) was recently listed as Endangered under the EPBC Act – effective 2 March 2022. The listing of the species is due to significant decline in population associated with loss of habitat. This species has not been considered previously by impact assessments against EPBC significant impact guidelines.</p> <p>The Yellow-bellied Glider (south-eastern) (<i>Petaurus australis australis</i>) was recently listed as Vulnerable under the EPBC Act, effective from 2 March 2022. The listing reflects the recent population reduction and habitat destruction following the 2019–20 bushfires and continuing population decline due to land clearing, habitat fragmentation, extensive severe fires, and climate change.</p> <p>The Colac Pipeline Upgrade has not previously been referred under the EPBC Act.</p>
Follow-up targeted surveys	<p>Follow-up targeted surveys were completed on May, November and December 2022 and January 2023 by GHD. The main purpose of the surveys was to search for the EPBC Act listed <i>Callocephalon fimbriatum</i> (Gang-gang Cockatoo) and <i>Petaurus australis australis</i> (Yellow-bellied glider (south-eastern)).</p>
Existing offset initiatives under the Victorian <i>Planning and Environment Act 1987</i>	<p>A Native Vegetation Removal report was prepared for the Project to support the planning permit application, as described in this table. The following Species Habitat Unit offsets are required for the Project under the Victorian <i>Planning and Environment Act 1987</i>.</p> <p>General offsets – No General Habitat Units are triggered for this Project due to the extent of the impacts and the consistent species habitat modelling across the area.</p> <p>Species offsets – any approval granted will include a condition to obtain offsets for 7 species, including:</p> <ul style="list-style-type: none"> – Spotted Hyacinth-orchid (<i>Dipodium pardalinum</i>): 6.083 species habitat units – Showy Lobelia (<i>Lobelia beaugleholei</i>): 11.312 species habitat units – Otway Bush-pea (<i>Pultenaea prolifera</i>): 1.238 species habitat units – Currant-wood (<i>Monotoca glauca</i>): 11.313 species habitat units – Scented Spider-orchid (<i>Caladenia fragrantissima</i>): 3.091 species habitat units – Small Sickle Greenhood (<i>Pterostylis lustra</i>): 11.312 species habitat units – Otways Cray (<i>Geocharax gracilis</i>): 0.183 species habitat units <p>Large tree offsets – 215 large tree offsets that must be located within the Corangamite CMA or Colac Otway Shire.</p> <p>Barwon Water maintains a bank of first party offsets which includes offsets that meet the requirements for the <i>Lobelia beaugleholei</i> and <i>Monotoca glauca</i> species habitat units, and 215 large trees. Sufficient species habitat units for these two species will be allocated to the Project planning permit number once approved, and DEECA will issue a Credit Extract to this effect.</p> <p>Barwon Water has separately acquired offsets for the remaining offsets through a third-party offset broker.</p>

8. Social and Economic

8.1 Community and Stakeholder Consultation

8.1.1 Key agencies and stakeholders

Barwon Water has sought to engage early in the planning process with key stakeholders.

Preliminary discussions were undertaken with key stakeholders during geotechnical investigations (2019 to 2020) as part of preliminary works associated with the proposed pipeline upgrade. Further regular and detailed engagement with key agencies has been undertaken during subsequent design and planning for the Project, as summarised in Table 36.

Table 36 Key agency and stakeholder consultation summary

Date	Stakeholder	Detail
May 2019	Parks Victoria and DELWP	General introduction to the proposed geotechnical works, including potential vegetation impacts.
September 2019	Parks Victoria and DELWP	General introduction to the pipeline upgrades, provide an overview of proposed works, including potential vegetation impacts and preliminary avoidance and minimisation strategy.
January to May 2020	Parks Victoria	A draft (<i>National Parks Act 1975</i>) Section 27 Agreement report and preliminary technical reports were submitted for discussion.
Mid-2020	Corangamite Catchment Management Authority (CMA)	Key points of the Project discussed, including consent requirements under By-Law No.4 Waterways Protection 2014, made under sections 160, 219 and 287ZC of the <i>Victorian Water Act 1989</i> .
2020 to 2022	Eastern Maar Aboriginal Corporation (RAP) and Aboriginal Victoria	A CHMP was prepared in consultation with the Eastern Maar Aboriginal Corporation as the RAP for the area, with CHMP evaluation by First Peoples – State Relations.
Late Feb 2021	Colac Otway Shire	Outlined the project, focussing on the current pipeline upgrade phase, provide an overview of proposed works, including vegetation impacts and discussion of key application triggers and requirements.
Mid-March 2021	Parks Victoria and DELWP	Re-introduction to the pipeline upgrades, provide an overview of proposed works, including potential vegetation impacts and preliminary avoidance and minimisation strategy. Insights sought on key approval matters, including Public Land Manager consent.
Mid-March 2021	Parks Victoria	Further discussion on various key approval matters, including Section 27 of the <i>National Parks Act 1975</i> , Native Title and Public Land Manager consent.
Late March 2021	DELWP	Discussion on likely native vegetation impacts, proposed mitigation measures and offsetting requirements.
Early April 2021	DELWP	Further discussion surrounding offsetting requirements.
Late April 2021	DELWP	Discussion surrounding Staged offsetting strategy, including potential options for the Otway Cray offset requirements. Further discussion on Public Land Manager consent.
Early May 2021	Colac Otway Shire	Progress update meeting to discuss key Project updates, including vegetation impact mitigation process and staged Project and offsetting approach.
2021 to 2022	Colac Otway Shire	Ongoing communication regarding planning permit application. Planning permit PP259/2021-1 (as per the <i>Victorian Planning and Environment Act 1987</i>) received 2/8/2022

Date	Stakeholder	Detail
2021 to 2023	Parks Victoria	Ongoing communication regarding the Agreement under Section 27 of the Victorian <i>National Parks Act 1975</i> .

Throughout the design phase Barwon Water has conducted extensive engagement with agencies and stakeholders such as Colac Otway Shire, Parks Victoria, Corangamite CMA, Eastern Maar Aboriginal Corporation, Aboriginals Victoria and DELWP/DEECA. This early engagement with key agencies and stakeholders has assisted in refining siting and design, including minimising the construction footprint to minimise impacts and collaboratively work through appropriate mitigation measures.

Barwon Water and Biosis Pty Ltd consulted with the Eastern Maar Aboriginal Corporation during the development of a Cultural Heritage Management Plan (CHMP) (Biosis, 2022; Attachment 5; provided to DCCEEW for assessment but redacted in the public version of this report due to cultural sensitivities), as required under the Victorian *Aboriginal Heritage Act 2006*. This consultation is documented in the CHMP and included correspondence regarding the administration and assessment of the CHMP (including arrangements for fieldwork), participation in fieldwork, and discussion of assessment results and CHMP evaluation. Barwon Water and Biosis Pty Ltd also consulted with the First Peoples – State Relations group within the Victorian Department of Premier and Cabinet in relation to assessment of the CHMP.

8.1.2 Local community and general public

In addition to engagement with key stakeholders, it is standard Barwon Water protocol to undertake extensive community engagement for major construction projects. Barwon Water will undertake thorough community and stakeholder engagement in the leadup to and during the construction phase of the Project.

To date (Q2 2023), community engagement has included early targeted engagement with local environment groups (The Conservation Ecology Centre and Barongarook Landcare Group/Central Otways Landcare Network), as well as Barwon Water’s Environmental Advisory Committee (EAC), which comprises representatives from local and regional community environment groups.

Barwon Water’s engagement methods have included phone calls, emails and invitations for relevant groups to attend briefings or question-and-answer sessions. This phase is currently underway and ongoing. Community engagement to date is summarised in Table 37.

Table 37 Summary of community consultation to date

Stakeholder group	Consultation date/method	Consultation content	Response
The Conservation Ecology Centre (Otways Region)	11 April 2023: Phone call and email 1 May 2023: Follow up email	Emails included: <ul style="list-style-type: none"> – Outline of the Project including proposed timing and map of proposed works – Information on aim to protect native flora and fauna, the planning approval processes, and site investigations – PowerPoint presentation (13 slides) with more information and visuals covering: Local and regional context, Caring for Country, planning approvals (incl. EPBC Act Referral and site investigations), ecological assessments, endangered flora and fauna species, mitigating impacts to flora and fauna, what 	30 May 2023: Email thanking Barwon Water for keeping them informed and stating they are comfortable the works are all being carried out for an important purpose, in accordance with planning regulations and that all efforts will be made to mitigate impacts.
Barongarook Landcare Group/Central Otways Landcare Network	11 April 2023: Email 1 May 2023: Follow up email	<ul style="list-style-type: none"> – PowerPoint presentation (13 slides) with more information and visuals covering: Local and regional context, Caring for Country, planning approvals (incl. EPBC Act Referral and site investigations), ecological assessments, endangered flora and fauna species, mitigating impacts to flora and fauna, what 	17 May 2023: Email thanking Barwon Water for the update, sharing they were aware of the project as the pipeline goes through several properties they work on, and stating they can share it with their e-news and Landcare committee in case anyone has any questions, concerns or want to discuss the project further.

Stakeholder group	Consultation date/method	Consultation content	Response
Barwon Water Environmental Advisory Committee (EAC)	6 April 2023: Email 2 June 2023: Follow up email	an environmental offset is, construction details – Contact details, with offer to address any questions, concerns or want to discuss the Project further to organise a briefing with a Project team member	2 June 2023: Email acknowledgment

Broader community engagement is planned as a second stage, closer to commencement of construction. Barwon Water will introduce the Project to local residents, businesses, and community groups, discuss the environmental assessments undertaken and mitigation measures proposed, and provide pre-construction information. Pre-construction engagement will also include providing information on Barwon Water’s ‘Your Say’ website prior to construction and regularly throughout the construction phase, to keep the community informed. Barwon Water will provide updates across a range of channels, such as media, social media, signage, newsletter, letters, emails and phone calls to site neighbours and nearby residents. This ensures impacted landowners and residents are informed about construction timeframes, potential traffic and noise impacts throughout construction, as well as alternative access to their properties if required.

Referral documentation for the proposed action as well as the current Preliminary Documentation Response (this report and attachments) have been/will be published for public comment at the appropriate times, in line with requirements for assessment under the EPBC Act.

8.2 Project justification, costs and benefits

Barwon Water is a statutory corporation under the *Victorian Water Act 1989*, which outlines the functions, powers and duties of water corporations in Victoria. Section 163 of the *Water Act* stipulates that authorities that have a water supply district must ‘provide, manage, operate and protect water supply systems’. In addition, under Section 41 of the *Victorian Water Industry Act 1994*, the Minister for Water may make and issue statements of obligations to water corporations. Under the current statement of obligations (authorised by the Minister for Environment, Climate Change and Water, 20/12/15) Barwon Water must ‘manage risk to protect public safety, quality and security of supply’ and is also required to ‘maintain agreed standards of service to customers’, ‘deliver water efficiently’ and ‘minimise the overall whole of life cost of providing the service’. The proposed action is essential for Barwon Water to meet their obligations under the *Water Act* and the *Water Industry Act*, to the community of Colac.

Barwon Water’s prices and service standards are regulated by the independent Essential Services Commission (ESC), who operate under the *Essential Services Commission Act 2001*. This project was accepted by the ESC as part of its assessment of Barwon Water’s 2018-2023 Price Submission (a five-year plan which sets out customer prices, services, capital and operational expenditure). The Project is essential to maintaining the security of the water supply to Colac and the surrounding region into the future.

The existing Colac Pipeline supplies drinking water to the greater Colac township, which is a medium-sized town of approximately 12,800 people (ABS, 2021). Colac is the largest town in the Colac Otway Shire and is the key industrial, commercial and service centre for the surrounding region (Colac Otway Shire, 2023). The Colac Pipeline also supplies rural customers and localities in the vicinity of Colac (at least another 500 people) and industrial customers in Colac that depend on reliable water supply and are significant to employment in the region (e.g., Bulla Dairy Foods, Australian Lamb Colac, AKD Softwoods). In addition, as part of a separate Barwon Water project, the township of Birregurra (population >600) will soon be supplied from Colac’s water supply. Considering population growth in Colac and surrounds, the pipeline will supply a forecast population of approximately 25,000 people.

The Colac Pipeline consists of approximately 28 km of pipe of differing sizes and materials in various states of condition and reliability of operation. Sections of the pipeline are more than 70 years old (Barwon Water, 2017) and the aging infrastructure is at risk of failure.

Sections of the Colac Pipeline were progressively replaced between 2003 and 2010, representing about 30% of the total pipeline length. Current and projected failure rates of the remaining sections of the pipeline and associated supply interruptions pose an unacceptable risk to the essential supply of water to Colac. As such, the remaining pipeline length is subject to future progressive replacement and upgrade in stages.

Barwon Water has identified the need to replace the most critical remaining sections of the existing Colac Pipeline as soon as possible to provide a secure supply for Colac and minimise the risk of ongoing supply interruptions and associated maintenance requirements. The priority sections of pipeline that are to be replaced within the scope of the Colac Pipeline Upgrade Project (the proposed action) have been subject to at least 117 bursts between their original construction and October 2018, with more frequent bursts in recent years (Barwon Water, 2017).

Sections of the existing pipeline (installed as dual or triple parallel mains in some sections) have had to be isolated down to a single main due to these persistent failures. The action of isolating these sections has the impact of creating hydraulic restrictions, as well as increasing pressures and the associated risk of failure in other sections of the pipeline, which is not sustainable in the long term. Repeated failures of the Colac Pipeline have the effect of reducing operational functionality of the existing asset.

Pipeline failures, bursts or also have potential to cause environmental impacts such as localised flooding, erosion/scour and sediment runoff. Barwon Water (2017) notes that there have been a number of washouts of embankments where the pipeline crosses creeks. Such erosion and sediment discharge to waterways potentially has detrimental impacts to local ecology. While large bursts may be detected quickly, smaller leaks may not be found for weeks or months. In the context of failure-prone sections of the Colac Pipeline, these environmental risks are increased.

Barwon Water's projected costs and benefits for this type of project are based on value to Barwon Water customers. Where an aging water supply asset is costing an unacceptable amount to regularly repair, and most importantly, putting the continuity of water supply to a significant community at repeated risk, that justifies replacement of the asset. Replacement of the most critical sections of the existing Colac Pipeline is essential to both secure Colac's water security and facilitate social and economic growth in the region.

In 2017, Barwon Water developed an upgrade strategy and business case for the remaining sections of the pipeline that need replacing. The outcome of this work informed the capital works plan for Barwon Water's 2018–2023 pricing submission, which the Essential Services Commission accepted.

The business case and subsequent board report (Barwon Water, 2018) identified a capital budget allocation of approximately \$6.3 million for design and construction of the proposed works (2018/19 dollars). The three priority sections identified for replacement have cost approximately \$875,000 to repair over the past 10 years (Barwon Water, 2017). In addition to these direct savings, Barwon Water (2017) notes that completing this Project addresses risks including:

- Heightened risk of supply to Colac township due to pipe failure and as a consequence of the Barwon System Interconnector
- Ongoing environmental impacts and customer impacts (property damage) of pipeline failures
- Higher cost pumped supply from the Barwon System (backup in the event of Colac Pipeline failure)
- Increasing risk to Barwon Water's reputation as a reliable service provider

Water is an essential service. Access to a share of water for both personal and business use is a right for everyone in Victoria (DELWP, 2019). It is also a right recognised by the United Nations, as being fundamental to everyone's health, dignity and prosperity (United Nations, 2023). The upgrade of the Colac Pipeline upholds these rights and provides direct ongoing social and economic benefits to the local community, with the pipeline upgrade being necessary to increase water security and the continual essential supply of water to Colac and surrounds. This also provides indirect social and economic benefits to the broader Colac-Otway region, the state of Victoria, and Australia.

8.3 Employment and Community Benefits

The Colac Pipeline Upgrade Project will provide employment during the design and construction phases of the Project, within the local region (e.g., construction contractors) and the state of Victoria more broadly (e.g., consulting services during the design/planning and environmental assessment/approvals stages).

Barwon Water's criteria for construction tenders include provision of local employment opportunities. As part of the construction tender process, tenderers were required to submit a Local Industry Development Plan to the Industry Capability Network of Victoria. At the time of tendering for the Project, Barwon Water's selected construction contractor estimated that their involvement in the Project would:

- Create 2.09 Annualised Employee Equivalents (AEEs) (i.e., create the equivalent of 2.09 new jobs for the duration of the construction period)
- Retain 15.49 AEEs (i.e., retain/secure 15.49 jobs for the duration of the construction period)
- Resulting in a Total Victorian employment result of 17.82 AEE

This is the best available information of expected Project-related employment at this point in the Project. The selected contractor is based within 20 km of the action area, implying a likelihood of positive local employment outcomes as a result of the Project, which can improve social and economic stability of local communities. Likely indirect benefits to the local economy could also be experienced through the local supply chain of goods and services required to support construction and the construction workforce.

The employment and community benefits of the Project once construction is completed are difficult to quantify, as the upgraded pipeline will support and enhance the function that the existing pipeline already serves. The upgraded pipeline will provide a continuation of the existing operational asset, with regular ongoing maintenance by operational personnel.

As discussed in Section 8.2, the existing pipeline is the primary drinking water supply to the township of Colac and surrounding communities. The Project improves water security to over 13,000 people as well as existing large industrial operators/employers. A secure water supply also supports future population (forecast up to 25,000 people) and industrial growth in the region. With the passing of time, the risk and frequency of pipeline failures and water supply interruptions increase, with consequent impacts on the community and businesses.

9. Environmental Record

The proponent for the Colac Pipeline Upgrade, Barwon Water, has delivered a number of projects that demonstrate an excellent record of responsible environmental management. Previous examples of projects where vegetation impact has been minimised are summarised in Table 38.

Table 38 Barwon Water Past Projects – Predicted vs. Actual Vegetation Losses

Project	Predicted Losses	Actual Losses at Project End
Colac Water Supply Interconnection Pipeline (operational)	0.609 ha of vegetation, 14 large trees	0.038 ha (-94%), 9 large trees (-36%)
Torquay High Level Feeder Main Stage 3 (operational)	0.36 ha of vegetation, 3 scattered trees	No losses (-100%)
Aireys Inlet Water Supply Pipeline (operational)	0.068 ha of vegetation, 56 trees	0.043 ha (-37%), 46 Trees (-18%)

Barwon Water, as the organisation undertaking the proposed action, does not have any environmental-related legal proceedings under Commonwealth or State law, relevant to this referral.

Barwon Water's Integrated Management System is a framework of policies, processes and procedures that define, control and facilitate continuous improvement of the organisation's environmental management, together with customer satisfaction, and the health and safety of customers and staff. The IMS complies with ISO 14001:2015 Environmental Management Systems — Requirements with guidance for use.

Certification in ISO 14001:2015 requires Barwon Water to have an Environmental Management System (EMS). The Barwon Water EMS includes:

- Documentation of legal obligations, application of systems to manage obligations and demonstrate record keeping, inspections and audits to demonstrate compliance with systems
- Annual external auditing, and ongoing internal reviews
- Re-certification under ISO 14001 every three years
- Tools used to identify and obtain the various environmental approvals required for every project. Key amongst these is the Project Approvals Assessment Tool (PAAT), which is generated for projects at the asset planning stage
- The PAAT initially identifies the potential for statutory planning and environmental approvals and environmental management requirements to be triggered for a project
- As the project progresses to design and construction, the PAAT is used to delve deeper into approvals and environmental requirements for the project, including commissioning specialist reports, such as ecology, groundwater, geotechnical and other reporting
- Using information generated by Subject Matter Expert investigations, the PAAT is then used to identify what project approvals will be required for the protection and management of environmental values, and then follows these approvals through to consent, for both capital and operational works programs
- The EMS also includes Environmental Management Plans for asset operations and Site Environment Plans (SEPs) for Barwon Water reservoirs, treatment and reclamation plants, groundwater fields and basins, and other projects such as the proposed action (see section 2.2.1)

Barwon Water is committed to continual environmental improvement through the prevention of pollution, compliance with all relevant environmental legal and other requirements and meeting community expectations. Barwon Water's Environmental Policy can be viewed at: www.barwonwater.vic.gov.au/about-us/policies-and-governance/environmental-policy (Attachment 13).

10. Ecologically Sustainable Development

The National Strategy for Ecologically Sustainable Development (ESD) (Commonwealth Department of the Environment and Energy, 1992) states that Australia’s goal for this Strategy is: ‘Development that improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends’. Section 3A of the EPBC Act provides a more detailed definition of the principles of ESD. Table 39 outlines how these principles have been applied to the proposed Colac Pipeline Upgrade action.

Related to the principles of ESD, Barwon Water has pledged to support and promote the United Nations’ 17 Sustainable Development Goals (SDGs) (United Nations, 2015). In particular, they have committed to achieving SDG 6 – ‘to ensure availability and sustainable management of water and sanitation for all’ – within the scope of their operations (Barwon Water, 2022). Undertaking environmental assessments and planning for specific projects contributes to Barwon Water’s management of its operations in line with the principles of ESD and against SDG 15 – ‘to protect, restore and promote sustainable use of terrestrial ecosystems... halt and reverse land degradation and halt biodiversity loss’. Ongoing maintenance of the Barwon Water EMS (see Chapter 9) also supports ESD by providing a framework of tools and planning which align with the principles outlined in Table 33.

Table 39 EPBC Act Principles of Ecologically Sustainable Development

No.	Principle	Consideration of principle in the proposal
A	Decision-making processes should effectively integrate both long-term and short-term economic, environmental, social and equitable considerations	<p>In the short term, the proposed action will provide economic benefits through providing local employment during the construction phase of the Project.</p> <p>Short- and long-term impacts to the environment have been assessed, with avoidance and mitigation measures adopted wherever practicable, and an offset strategy where adverse ecological impacts could not be negated.</p> <p>The proposed action will deliver both direct and indirect long term economic, social and equitable considerations. The Project will deliver improved water security to residents and businesses in Colac, with indirect economic benefits provided to businesses as a result. See Sections 8.2 and 8.3 of this report</p>
B	If there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation	<p>Detailed field surveys and technical studies have been undertaken as described in Section 3 of this report to assess the ecological values of the action area and the potential impacts of the proposed action, in order to achieve an appropriate level of scientific certainty regarding both aspects. This information has been used to develop measures to avoid environmental degradation to the extent practicable – including impact avoidance and mitigation measures – which have been adopted during Project design and planning, and will be implemented during pre-construction, construction and operational phases of the action where applicable.</p> <p>Where impact avoidance or direct mitigation is not possible, offsets have been proposed to address significant residual impacts.</p>
C	The principle of inter-generational equity – that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations	<p>The proposed action involves upgrade of existing essential services infrastructure. In the broader context of intergenerational equity – ‘that, to promote prosperity and quality of life for all, institutions should [undertake actions] that balance the short-term needs of today’s generation with the longer-term needs of future generations’ (UN, 2023) – improving the security of Colac’s water supply is beneficial to both present and future generations of the local community.</p> <p>In terms of the narrower definition of intergenerational equity in the context of ESD, within the constraints of Project requirements (for example, engineering practicalities) the Project will maximise the maintenance of environmental health and biodiversity to the extent possible, via the following:</p> <ul style="list-style-type: none"> – Locating the upgraded pipeline sections and associated construction activities largely within the existing pipeline corridor with its modified vegetation, thereby minimising clearing of intact higher quality vegetation, and minimising vegetation clearing in general – Regular inspections will occur during the operation of the pipeline to manage any noxious or environmental weeds and soil erosion – Where impacts cannot be avoided or mitigated, an Offset Management Strategy and Offset Management Plans have been prepared to mitigate these impacts (Attachments 10, 11 and 12)

No.	Principle	Consideration of principle in the proposal
D	The conservation of biological diversity and ecological integrity should be a fundamental consideration in decision-making	<p>The existing Colac Pipeline is located within a mostly cleared pipeline corridor, with the exception of scattered trees, with existing understorey vegetation regularly slashed for access requirements. The corridor also contains a gravel access track (Pipeline Road) for Barwon Water operational access.</p> <p>This principle has been considered in relation to the action as follows:</p> <ul style="list-style-type: none"> - Thorough environmental assessment has been undertaken to identify and characterise existing ecological and biodiversity values within the action area and surrounds, and to assess the expected or potential impacts of the proposed action on these values - The environmental assessment has informed planning of appropriate and practicable measures during the design, construction and operational phases of the Project in order to avoid and minimise impacts on such values, as well as informing the approvals decision-making process
E	Improved valuation, pricing and incentive mechanisms should be promoted	<p>The principle of internalising environmental costs into decision making requires consideration of all environmental resources which may be affected by the carrying out of a project, including air, water, land and living things. This principle has been considered in relation to the action as follows:</p> <ul style="list-style-type: none"> - During construction, the action will result in only minor emissions (e.g., from construction machinery) and wastes (e.g., old pipes). During operations, emissions and wastes relating to maintenance works will be negligible. As such, no specific taxes, duties, or charges are likely to apply - Barwon Water is responsible for the implementation and the economic cost of implementing the avoidance and mitigation measures including those relating to pollution and waste management. Applicable measures will be included in the CEMP. - Barwon Water will also be responsible for the economic costs for providing biodiversity offsets, where significant residual impacts to EPBC-listed species is likely to occur <p>The implementation of avoidance and mitigation measures, plus biodiversity offsets will increase the construction costs associated with the proposed action. These environmental costs incentivise avoidance measures. This has been adopted in the design and planning phase of the project. This demonstrates that environmental resources have been given appropriate consideration and valuation.</p>

11. Conclusion

The upgrade works to approximately 4.3kms of the existing Colac Pipeline are expected to have minimal impact for most EPBC Act listed fauna species identified by this assessment as likely to occur within the proposed action area.

Despite the implementation of design phase avoidance and minimisation measures, three EPBC Act listed fauna species – Gang-Gang Cockatoo, Yellow-bellied Glider and Long-nosed Potoroo – have a greater risk of being significantly impacted.

The Yellow-bellied Glider and Gang-gang Cockatoo are at greater risk as they are both arboreal, hollow-obligate species that rely on trees for feeding, refuge (roosting or den sites) and breeding. Given the number of trees proposed for removal, including trees which may provide hollows for den and nest sites in the future, habitat removal and modification is a key impact for both species.

The Long-nosed Potoroo is also at greater risk of impact because of the removal of habitat from an area that is known to support an important population of the species, therefore the overall habitat for that population will be reduced by the proposed action.

The proposed action is therefore likely to significantly impact the Gang-Gang Cockatoo, Yellow-bellied Glider and Long-nosed Potoroo.

The Colac Pipeline Upgrade Project is considered to be acceptable and justifiable given the necessity of the upgrade to improve water security to Colac. This Project considers impact avoidance, mitigation and offset to counterbalance residual impacts, consistency with Government policies and strategies, consideration of key stakeholder requirements, and economic and social benefits. The Project was assessed against the EPBC Act Principles of Ecologically Sustainable Development and adheres to all principles, with considerations applied to all principles within the proposal (see section 10).

12. Submissions

The Draft Preliminary Documentation was published for a 10-day public comment period between 19 October 2023 to 2 November 2023, in line with the requirements of Section 95(A)3 of the EPBC Act. Community and stakeholders were made aware of the public comment period through a public notice provided in The Age and Colac Herald newspapers, on 18 October 2023. In addition, a public notice was published on Barwon Water's website on 18 October 2023 seeking feedback. The public notice was also made available on the EPBC Act Public Portal throughout the duration of the public comment period.

The Draft Preliminary Documentation was made available on Barwon Water's website where community and stakeholders were invited to review the documentation and to provide submissions via an online submission form on the website, via email or via post. Hard copies of all documentation were also available at the State Library Victoria in Melbourne, Victoria and the Colac Community Library and Learning Centre in Colac, Victoria.

Specific notification of the public notice published in the newspapers was sent to the Eastern Maar Aboriginal Corporation (EMAC) via email on 18 October 2023. An email response acknowledging this notification was received on 19 October 2023.

In addition to the publications noted above, notification of the ability to review documentation and invitation for public comment was also sent to some local environmental groups. Details as follows:

- The Conservation Ecology Centre via email on 19 October 2023
- Barongarook Landcare Group via email on 19 October 2023
- Barwon Water Environmental Advisory Committee via email on 20 October 2023.

At the close of the submission period at 5:00PM on 2 November 2023, a total of one submission was received and this is provided in full in Attachment 14:

- One submission was from a member of the public (submission 1).

This section describes the comments received in the submission and provides a response. The submission raised the following key items:

- Item A: Protected Matters
- Item B: Matters of National Environmental Significance
- Item C: Mitigation measures for significant impacts
- Item D: Offsets for significant impacts
- Item E: Alternative routes

The responses to the submission queries are as follows:

Item A: Protected Matters

Comment ref 1: *'It does not include (I could not find) any Protected Matters Report within 5 km of the action.'*

Response: The Protected Matters Search Tool (PMST) was used to assess MNES and other matters protected under the EPBC Act. The PMST search applied a buffer of 10km from the proposed action area.

Further details can be found in:

- Section 3.6 'Matters of National Environmental Significance (MNES)' of the Colac Pipeline Upgrade Preliminary Documentation Response.
- Appendix D of Attachment 1 EPBC Self-Assessment report.
- Appendix A of Attachment 7.

Multiple searches of the PMST were completed for this project to provide the EPBC referral with the most up to date list of protected species potentially impacted by this project.

Item B: Matters of National Environmental Significance

Comment ref 2: *'It does not include (I could not find) any mention of the status of MNES (CE, E, V, Migratory, etc) species, such as Gang-gang Cockatoos, Yellow-bellied Glider and Long-nosed Potoroo. Such information should form the very basis of any Referral.'*

Response: Details on the status of Gang-gang Cockatoo, Yellow-bellied Glider and Long-nosed Potoroo are included in the Preliminary Documentation Report, in Section 3.6.4 'Threatened fauna species'.

Attachment 2 'Targeted surveys for Yellow-bellied Glider and Gang-gang Cockatoo - Colac Pipeline Project' details targeted survey methods and results for the Yellow-bellied Glider, Gang-gang Cockatoo and Long-nosed Potoroo within the proposed action area.

Item C: Mitigation measures for significant impacts

Comment ref 3: *'Mitigation measures for admitted significant impacts in Att 1, Part 1, Sect 6, p 45 to 48 are difficult to find and are very vague. This does not meet the requirements of the required assessment of Significant Impacts against the various criteria in the EPBC Act Significant Impact Guidelines'*

Response: Section 5 'Proposed Impact Avoidance and Mitigation Measures' of the Colac Pipeline Upgrade Preliminary Documentation Response details the avoidance and mitigation measures for all phases of the project, including the Design Phase, Construction, and Operation.

Item D: Offsets for significant impacts

Comment ref 4: *'Offsets in Att 2, Sect 4.1.4.11, p 5-7 for admitted significant impacts are very vague, seem to offer nothing new, rely on previous offsets for other works, and do not meet the requirements of the EPBC Act Offsets Guidelines - including requirements for scientific certainty, and having offsets in place before the action commences. It actually looks like the EPBC Offsets Guideline has not even been read/addressed.'*

Response: Section 6 'Residual Impacts and Proposed Offsets' of the Colac Pipeline Upgrade Preliminary Documentation Response details residual impacts following mitigation measures and proposed environmental offsets.

Attachments 8 - 12 of the Preliminary Documentation Response details the Offset Strategy, assessment of offset sites, and Offset Management Plans.

Attachment 10 - Proposed Offset Strategy describes the offset package and how it meets the requirements of the EPBC Act Offset guidelines.

Item E: Alternative routes

Comment ref 5: *'Reasons for not diverting pipeline around the MNES significant impacts are entirely economic but no details are given – e.g., how much extra will it cost, will this bankrupt the proponent? No comparative analysis for the economic loss of MNES is provided. It assumes loss of MNES endangered species is OK because it will cost the proponent just a bit more. This is very lackadaisical thinking and not in line with the principles and requirements of the EPBC Act. CE, E and V species are protected BECAUSE they are critically endangered and vulnerable.'*

Response: Section 5.2.1.3 'Investigation of an alternative pipeline route' of the Colac Pipeline Upgrade Preliminary Documentation Response describes the consideration that was given to an alternate/new pipeline route when considering the replacement strategy for the Colac Pipeline. As referenced throughout section 5.2.1.3, an alternative alignment would result in poorer environmental outcomes, in addition to other non-environmental considerations such as cost, and hydraulic capacity. As an example, text from the Preliminary Documentation Response reads "Undertaking construction through vegetation in a new, longer pipeline alignment would likely result in a significantly larger area of native vegetation loss and other potential impacts, with consequently poorer environmental impacts".

The impact to the MNES from this action is proportional to the degree of native vegetation removal proposed for the action, which forms existing habitat for these MNES. The extent of native vegetation coverage in the geographical area surrounding the existing reservoirs and pipeline is extensive. Whether the native vegetation be located within Great Otway National Park, Otway Forest Park, Road Reserve or Private Property, it will all contain suitable habitat for the MNES in question. It is therefore a reasonable assumption that larger native vegetation removal for an alternate pipeline route to the existing route would have a significantly greater impact on the MNES.

Furthermore, the existing Colac Pipeline, which is on a very direct route between the reservoirs and Colac Water Treatment Plant, is already located in an existing cleared corridor. This corridor is typically 10 metres wide and is predominately cleared of vegetation that would be considered suitable habitat to the MNES. Due to the theoretical way native vegetation must be mapped and reported, it results in the native vegetation and, in turn, habitat impact calculations being skewed toward assuming the existing 10-metre-wide clearing does not currently exist. It is important to note that an alternate pipeline route would almost certainly involve clearing new corridors through existing areas of high-quality native vegetation. It is therefore a reasonable assumption that this would result in a significantly poorer outcome for the MNES in question, compared to the approach to replace the existing pipeline predominately within the existing clearing, as is being proposed under this action. Excessive impacts on native vegetation and therefore to MNES, as well as practical aspects of designing and constructing a pipeline in a completely new corridor were considered of paramount importance, alongside cost.

A high-level consideration to diverting the existing pipeline on an alternate route showed that it would not achieve better outcomes from environmental, economic, engineering and social perspectives. As such, spending additional time and cost to consider this option in more detail would not be justified.

13. Glossary

Table 40 defines acronyms and key terms used within this report.

Table 40 Summary of key terms

Term	Definition
AAV	Aboriginal Affairs Victoria
ACM	Asbestos Containing Material
Action area	The action area comprises the area where activities associated with the proposed action (i.e., the Colac Pipeline Upgrade Project) will occur, predominantly a 10-m-wide construction corridor.
AHD	Australian Height Datum
CaLP Act	<i>Victorian Catchment and Land Protection Act 1994</i>
CCMA	Corangamite Catchment Management Authority
CEMP	Construction Environmental Management Plan
CFA	Country Fire Authority
CHMP	Cultural Heritage Management Plan
CMA	Catchment Management Authority
DAWE	The former Commonwealth Department of Agriculture, Water and the Environment
DCCEEW	The Commonwealth Department of Climate Change, Energy, the Environment and Water
DEECA	Victorian Department of Energy, Environment and Climate Action
DELWP	The former Victorian Department of Environment, Land, Water and Planning
DEPI	The former Victorian Department of Environment and Primary Industries
DSEWPaC	The former Commonwealth Department of Sustainability, Environment, Water, Population and Communities
EMO	Erosion Management Overlay
EMS	Environmental Management System
EPA	Environment Protection Authority
EPBC Act	<i>Commonwealth Environment Protection and Biodiversity Conservation Act 1999</i>
ESD	Ecologically Sustainable Development
ESO	Environmental significance overlay
EVC	Ecological Vegetation Class
FFG Act	<i>Victorian Flora and Fauna Guarantee Act 1988</i>
FFMVic	Forest Fire Management Victoria
FP-SR	First Peoples – State Relations
Fuel break	A strip of land where vegetation has been permanently modified to reduce rate of spread and intensity of fire for the direct protection of assets and/or to assist fire control
FZ	Farming Zone
GHD	GHD Pty Ltd
GONP	Great Otway National Park
Ha	hectare
km	kilometre
LUAA	Land Use Activity Agreement
m	metre

Term	Definition
Matters of National Environmental Significance (MNES)	The Matters of National Environmental Significance (MNES) are matters protected under national environmental law. <ul style="list-style-type: none"> – Listed threatened species and communities – Listed migratory species – Ramsar wetlands of international importance – Commonwealth marine environment – World heritage properties – National heritage places – The Great Barrier Reef Marine Park – Nuclear actions – A water resource, in relation to coal seam gas development and large coal mining development
mm	millimetre
OFP	Otway Forest Park
OtP	Otway Plain (bioregion)
Otr	Otway Ranges (bioregion)
PAAT	Project Approvals Assessment Tool
PAMs	Passive Acoustic Monitors
PCRZ	Public Conservation and Recreation Zone
PMST	Protected Matters Search Tool
Population of a species	Defined under the EPBC Act as an occurrence of the species in a particular area. In relation to critically endangered, endangered or vulnerable threatened species, occurrences include but are not limited to: <ul style="list-style-type: none"> – A geographically distinct regional population, or collection of local populations, or – A population, or collection of local populations, that occurs within a particular bioregion
Proposed action	The proposed action comprises the Colac Pipeline Upgrade and encompasses all activities associated with the development and operation of the infrastructure.
Ramsar wetland	A 'declared Ramsar wetland' is an area that has been designated under Article 2 of the Ramsar Convention or declared by the minister to be a declared Ramsar wetland under section 16 of the EPBC Act. The 'ecological character' is the combination of the ecosystem components, processes and benefits/ services that characterise the wetland at a given point in time. The phrase 'at a given point in time' refers to the time of designation for the Ramsar List.
RAP	Registered Aboriginal Party
SEP	Site Environmental Plan
SFB	Strategic Fuel Breaks
Significant impact	A 'significant impact' is an impact which is important, notable, or of consequence, having regard to its context or intensity. Whether or not an action is likely to have a significant impact depends upon the sensitivity, value, and quality of the environment, which is impacted, and upon the intensity, duration, magnitude and geographic extent of the impacts. All of these factors are to be considered when determining whether an action is likely to have a significant impact on MNES.
Significant impact criteria	The 'significant impact criteria' for each MNES are intended to assist in determining whether the impacts of a proposed action on any MNES are likely to be significant impacts.
TMP	Traffic Management Plan
SLO	Significant Landscape Overlay
Species habitat unit (SHU)	Measure of loss and gain in biodiversity value of native vegetation for a particular rare or threatened species. Used to measure offset amount and gain generated at an offset site (DELWP, 2018)
Study area	The term study area refers to a broader region surrounding the action area (i.e., includes areas that are outside the proposed action area). The study area for this assessment includes the action area and a 10 km buffer.

Term	Definition
Study site	The study site is approximately 34.12 ha and incorporates the vehicle access track (Pipeline Road) and a 15-m-wide section on both sides of the track from the commencement of the intact remnant vegetation. The ecological impact report (Attachment 6) and revised targeted survey report (Attachment 2) refer to the study site. The study site includes the existing pipeline corridor of varying width (5 to 12 m wide) consisting of vehicle track and mostly slashed verge on both sides of the track, as well as intact vegetation of the Great Otway National Park and Otway Forest Park. The width of the intact vegetation surveyed varies depending on the width of the pipeline corridor.
SWIFFT	State Wide Integrated Flora and Fauna Team
TPZ	Tree Protection Zone
UN	United Nations
VAHR	Victorian Aboriginal Heritage Register
VBA	Victorian Biodiversity Atlas
VIC	Victoria

14. Key Information Sources

Multiple sources of information were used throughout this report (refer to section 15 for references), ranging from publications, online resources and government policies and guidelines. Where online sources were used, the integrity of the information was tested by using sources from reputable publishers. Where online sources were used for government policies and guidelines, these were sourced directly from the relevant Department's official website to ensure the most up to date documents were used.

The Government guidelines, plans and policies considered in this report include:

- DAWE, 2022a. Conservation Advice for *Callocephalon fimbriatum* (Gang-gang Cockatoo). Commonwealth Department of Agriculture, Water and the Environment
- DAWE, 2022b. Conservation Advice for *Petaurus australis australis* (yellow-bellied glider (south-eastern)). Commonwealth Department of Agriculture, Water and the Environment, Canberra
- DAWE, 2022c. Conservation Advice for *Potorous tridactylus trisulcatus* (southern long-nosed potoroo). Commonwealth Department of Agriculture, Water and the Environment, Canberra
- DoE, 2013b. *Matters of National Environmental Significance – Significant impact guidelines 1.1 – Environment Protection and Biodiversity Conservation Act 1999*. Department of the Environment, Canberra.
- DEECA, 2019. *Taking and Using Water*
- DELWP (Vic.), 2018. Assessor's handbook-Applications to remove, destroy or lop native vegetation. Victorian Department of the Environment, Land, Water and Planning; Melbourne
- DELWP (Comm.), 2016. *National Recovery Plan for the Spotted-tailed Quoll *Dasyurus maculatus**. Commonwealth Department of the Environment, Land, Water and Planning; Canberra
- DSEWPaC, 2011. Draft referral guidelines for the endangered southern brown bandicoot (eastern), *Isoodon obesulus obesulus*. Commonwealth Department of Sustainability, Environment, Water, Population and Communities, Canberra
- DSEWPaC, 2012. EPBC Act Environmental Offset Policy. Commonwealth Department of Sustainability, Environment, Water, Population and Communities, Canberra
- DEPI, 2014. Advisory List of Rare or Threatened Plants in Victoria – 2014. Victorian Department of Environment and Primary Industries, Melbourne
- TSSC, 2016a. Conservation Advice *Antechinus minimus maritimus* Swamp Antechinus (coastal Victoria and far south-eastern South Australia). Canberra: Department of the Environment
- TSSC, 2016b. Conservation Advice *Isoodon obesulus obesulus* — Southern Brown Bandicoot (eastern), Southern Brown Bandicoot (south-eastern). Department of Agriculture, Water and the Environment
- TSSC, 2020. Conservation Advice *Dasyurus maculatus maculatus* (southeastern mainland population) Spotted-tailed Quoll, south eastern mainland. Canberra: Department of Agriculture, Water and the Environment

15. References

- ABS, 2021. 2021 Census. A WWW page accessed 03/04/2023 at <https://abs.gov.au/census/find-census-data/quickstats/2021/217031472> . Australian Bureau of Statistics. Canberra.
- Abzeco, 2023. 245 Distillery Creek Road, Aireys Inlet *Environment Protection & Biodiversity Conservation Act 1999* (2022/09343) Long-nosed Potoroo *Potorous tridactylus tridactylus* (South-East Mainland) Offset Management Plan.
- ANGAIR, 2023. Orchids of the Anglesea and Aireys Inlet District flowering times. A WWW page accessed at <https://angair.org.au/knowledge-bank/orchids-in-the-district>
- Atlas of Living Australia (ALA), 2022. Atlas of Living Australia. [online] Available at: <https://www.ala.org.au/>
- Atlas of Living Australia (ALA), 2023. *Pterostylis cucullate* R. Br. [online] [bie.ala.org.au](https://bie.ala.org.au/species/https://id.biodiversity.org.au/taxon/apni/51412090). Available at: <bie.ala.org.au/species/https://id.biodiversity.org.au/taxon/apni/51412090>
- Austin, C., Tuft, K., Ramp, D., Cremona, T., & Webb, J. (2016). Bait preference for remote camera trap studies of the endangered northern quoll (*Dasyurus hallucatus*). *Australian Mammalogy*. 39. 10.1071/AM15053.
- Australian Government, 2021. *Environment Protection and Biodiversity Conservation Act 1999*. Available at www.legislation.gov.au/Details/C2021C00182
- Bachmann, M., & Van Weenen, J., 2001. *Distribution and Status of the Swamp Antechinus, Antechinus Minimus Maritimus (Marsupialia: Dasyuridae) in South Australia*. Nature Conservation Society of South Australia.
- Barrett, G., A. Silcocks, S. Barry, R. Cunningham & R. Poulter, 2003. *The New Atlas of Australian Birds*. Melbourne, Victoria: Birds Australia.
- Barwon Water, 2017. Colac Pipeline Upgrade - Project W1406 - Business Case. Version 5 Final. Prepared by Inside Infrastructure, Adelaide, on behalf of Barwon Region Water Corporation.
- Belcher, C., 2000. The Range, Status and Distribution of the Spot-tailed Quoll (*Dasyurus maculatus*) in the Otway Ranges, unpublished report to Dept. Natural Resources & Environment for West Victoria Regional Forest Agreement, February 2000.
- Belcher, C., 2006. Genetic Status of the Spotted-tailed Quoll, *Dasyurus maculatus*, in south-west Victoria, report to Glenelg Hopkins Catchment Management Authority.
- Biosis, 2022. Colac Pipeline Upgrade, Great Otway National Park, Barongarook, Kawarren and Barramunga – Cultural Heritage Management Plan 16600. 8 February 2022. Prepared for Barwon Region Water Corporation.
- Biosis, 2023. EPBC Act referral 2022/09343 Colac Pipeline Upgrade – Sections 19, 20, 21, 23 & 25i: Offset Management Plan: [REDACTED] Kawarren. Prepared for Barwon Region Water Corporation.
- Blakers, M., S.J.J.F. Davies & P.N. Reilly, 1984. *The Atlas of Australian Birds*. Melbourne, Victoria: Melbourne University Press.
- Cameron M., Loyn R.H., Oliver D. & Garnett S.T., 2021. Gang-gang Cockatoo *Callocephalon fimbriatum*. In The Action Plan for Australian Birds 2020. (Eds, Garnett S.T. and Baker, G.B.). CSIRO Publishing, Melbourne.
- Carter Digital, 2022. Gang-gang Cockatoo | BirdLife Australia. [online] [birdlife.org.au](https://birdlife.org.au/bird-profile/gang-gang-cockatoo). Available at: birdlife.org.au/bird-profile/gang-gang-cockatoo.
- Carthew SM, 2004. Distribution and conservation status of possums and gliders in South Australia, in RL Goldingay and SM Jackson (eds) *The Biology of Australian Possums and Gliders*. Surrey Beatty and Sons, Chipping Norton, New South Wales. 63-70.
- Clemann, N. & G.R. Gillespie, 2004. Draft Recovery Plan for *Litoria raniformis* 2004-2008. Commonwealth Department of the Environment and Heritage, Canberra.
- Colac Otway Shire Council, 2022. *Program to recommence to nudge Grey-headed Flying Foxes*. [online] www.colacotway.vic.gov.au. Available at: <https://www.colacotway.vic.gov.au/News-media/Council-to->

recommence-program-to-nudge-Grey-headed-Flying-Foxes-away-from-heritage-trees [Accessed 25 May 2022].

- Commonwealth of Australia, 2012. *Environment Protection and Biodiversity Conservation Act 1999* – Environment Assessment Manual – Implementing Chapter 4. Canberra.
- DAWE, 2009. *Pteropus poliocephalus* — *Grey-headed Flying-fox*. [online] Environment.gov.au. Available at: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=186. Department of Agriculture, Water and the Environment
- DAWE, 2019a. Australian Wetlands Database, Port Phillip Bay (Western Shoreline) and Bellarine Peninsula, DAWE. Department of Agriculture, Water and the Environment.
- DAWE, 2019b. Australian Wetlands Database, Western District Lakes. Department of Agriculture, Water and the Environment.
- DAWE, 2022. *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* Protected Matters Search Tool (PMST). Available at: www.dcceew.gov.au/environment/epbc/protected-matters-search-tool. Department of Agriculture, Water and the Environment
- DAWE, 2021a. Consultation on Species Listing Eligibility and Conservation Actions. *Callocephalon fimbriatum* (Gang-gang Cockatoo). Department of Agriculture, Water and the Environment.
- DAWE, 2021b. Consultation on Species Listing Eligibility and Conservation Actions. *Petaurus australis australis* (Yellow-bellied Glider (south-eastern)). Department of Agriculture, Water and the Environment.
- DAWE, 2022a. Conservation Advice for *Callocephalon fimbriatum* (Gang-gang Cockatoo). Available at www.environment.gov.au/biodiversity/threatened/species/pubs/768-conservation-advice-02032022.pdf. Department of Agriculture, Water and the Environment.
- DAWE, 2022b. Conservation Advice for *Petaurus australis australis* (yellow-bellied glider (south-eastern)). Available at www.environment.gov.au/biodiversity/threatened/species/pubs/87600-conservation-advice-02032022.pdf. Department of Agriculture, Water and the Environment.
- DAWE, 2022c. Conservation Advice for *Potorous tridactylus trisulcatus* (southern long-nosed potoroo). [online]. Available at www.environment.gov.au/biodiversity/threatened/species/pubs/86367-conservation-advice-02032022.pdf. Department of Agriculture, Water and the Environment
- DCCEEW, 2023. Offsets mitigation hierarchy. A WWW page accessed 19/04/2023 at <https://www.dcceew.gov.au/environment/epbc/approvals/offsets/guidance/mitigation-hierarchy>. Commonwealth Department of Climate Change, Energy, the Environment and Water, Canberra.
- DEECA, 2019. *Taking and Using Water*. A WWW page accessed 03/05/2023 at www.water.vic.gov.au/water-for-agriculture/taking-and-using-water. Victorian Department of Energy, Environment and Climate Action, Melbourne.
- DELWP, 2018. Assessor's handbook-Applications to remove, destroy or lop native vegetation. Department of Environment, Land, Water and Planning, Victorian Government
- DELWP, 2022. VicPlan. Heritage data. A WWW page accessed 20/07/2022 at mapshare.vic.gov.au/vicplan/. Department of the Environment, Land, Water and Planning
- DELWP, 2016. National Recovery Plan for the Spotted-tailed Quoll *Dasyurus maculatus*. Australian Government, Canberra.
- DEPI, 2013. Action Statement No. 254, Long-nosed Potoroo *Potorous tridactylus* - Flora and Fauna Guarantee Act 1988
- DEPI, 2014. Advisory List of Rare or Threatened Plants in Victoria - 2014. Victorian Department of Environment and Primary Industries, East Melbourne, Victoria
- DEWHA, 2010, Survey Guidelines for Australia's Threatened Birds. Guidelines for detecting mammals listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999. Commonwealth of Australia 2010

- DSEWPC, 2011 Survey Guidelines for Australia's Threatened Mammals. Guidelines for detecting mammals listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999. Commonwealth of Australia 2011
- Diete R. L., Meek P. D., Dixon K. M., Dickman C. R., Leung L. K.-P. (2016) Best bait for your buck: bait preference for camera trapping north Australian mammals. *Australian Journal of Zoology* 63, 376-382.
- DoE, 2013a. Draft survey guidelines for Australia's threatened Orchids. Guidelines for detecting orchids listed as 'Threatened' under the *Environment Protection and Biodiversity Conservations Act 1999*. Commonwealth Department of the Environment, Canberra.
- DoE, 2013b. *Matters of National Environmental Significance – Significant impact guidelines 1.1* Environment Protection and Biodiversity Conservation Act 1999. Available at: https://www.agriculture.gov.au/sites/default/files/documents/nes-guidelines_1.pdf. Commonwealth Department of the Environment, Canberra.
- DoE, 2022. *Dasyurus maculatus maculatus* (SE mainland population) in Species Profile and Threats Database, Department of the Environment, Canberra. A WWW page accessed 14/07/2022 at: www.environment.gov.au/sprat. Commonwealth Department of the Environment, Canberra.
- DSE, 2009. *National Recovery Plan for Fifteen Threatened Orchids in South-eastern Australia*. Duncan, M., Pritchard, A. and Coates, F. Department of Sustainability and Environment.
- DSE, 2011. Approved Survey Standards: Long-footed Potoroo *Potorous longipes*, Date: 2 May 2011. Version 1.0
- DSEWPC, 2011. Draft referral guidelines for the endangered southern brown bandicoot (eastern), *Isodon obesulus obesulus*. EPBC Act policy statement. Available from: <http://www.environment.gov.au/epbc/publications/southern-brown-bandicoot.html>. Department of Sustainability, Environment, Water, Population and Communities, Canberra.
- DSEWPC, 2012. Department of Sustainability, Environment, Water, Population and Communities (2012). EPBC Act Environmental Offset Policy, October 2012. Available from: www.dcceew.gov.au/environment/epbc/publications/epbc-act-environmental-offsets-policy
- Eby, P. & Lunney, D., 2002. Managing the Grey-headed Flying-fox as a threatened species in NSW. In: *Proceedings of the Royal Zoological Society of New South Wales*. Mosman, Sydney: Royal Zoological Society of New South Wales.
- Edgar, R., 1983. In R. Strahan (ed.), *Complete Book of Australian Mammals*, Angus & Robertson, Sydney, p.18.
- Eyre T.J., 2004. Distribution and conservation status of the possums and gliders of southern Queensland, in RL Goldingay and SM Jackson (eds) *The Biology of Australian Possums and Gliders*. Surrey Beatty and Sons Chipping Norton, New South Wales. 1-25.
- Eyre T.J. & Goldingay R.L., 2003. Use of sap trees by the Yellow-bellied Glider near Maryborough in south-east Queensland. *Wildlife Research* 30, 229-236.
- Eyre T.J. & Smith A.P., 1997. Floristic and structural habitat preferences of Yellow-bellied Gliders (*Petaurus australis*) and selective logging impacts in southeast Queensland, Australia. *Forest Ecology and Management* 98, 281-295.
- FFMvic, 2021. Strategic Fuel Breaks Program. A WWW page accessed 3/05/2022 at <https://www.ffm.vic.gov.au/bushfire-fuel-and-risk-management/strategic-fuel-breaks-program>. <https://www.ffm.vic.gov.au/bushfire-fuel-and-risk-management/joint-fuel-management-program> Forest Fire Management Victoria. A division of the Victorian Department of Energy, Environment and Climate Action, Melbourne.
- FFMvic, 2022. Joint Fuel Management Program (JFMP). A WWW page accessed 3/05/2022 at Joint Fuel Management Program (JFMP) (ffm.vic.gov.au). Forest Fire Management Victoria. A division of the Victorian Department of Energy, Environment and Climate Action, Melbourne.
- Frankham, G. J., Handasyde, K. A., Norton, M., Murray, A., & Eldridge, M. D., 2014. Molecular detection of intra-population structure in a threatened potoroid, *Potorous tridactylus*: conservation management and sampling implications. *Conservation Genetics*, 15(3), 547-560.

- Frankham, G. J., Handasyde, K. A., & Eldridge, M. D., 2016. Evolutionary and contemporary responses to habitat fragmentation detected in a mesic zone marsupial, the long-nosed potoroo (*Potorous tridactylus*) in south-eastern Australia. *Journal of Biogeography*, 43(4), 653-665.
- GHD, 2021. Colac Pipeline Upgrade (W1426) Ecological Impacts. Prepared for Barwon Region Water Corporation.
- GHD, 2022a. Colac Pipeline Upgrade EPBC Self-Assessment. Prepared for Barwon Region Water Corporation.
- GHD, 2022b. EPBC Referral 2022/09343 – Review of potential impacts on the EPBC-listed Greater Glider (*Petauroides volans*). Technical Memorandum.
- GHD, 2023a. Targeted surveys for Yellow-bellied Glider and Gang-gang Cockatoo – Colac Pipeline Project Survey report (Revised). Prepared for Barwon Region Water Corporation.
- GHD, 2023b. Proposed Offset Site [REDACTED] Kawarren Targeted fauna and vegetation survey report. Prepared for Barwon Region Water Corporation.
- GHD, 2023c. Proposed Offset Site 245 Distillery Creek Road Aireys Inlet Targeted fauna and vegetation survey report. Prepared for Barwon Region Water Corporation.
- GHD, 2023d. Offset strategy: Colac Pipeline Upgrade. Prepared for Barwon Region Water Corporation.
- Goldingay, R.L. and Kavanagh, R.P. 1991. The Yellowbellied Glider: a review of its ecology, and management considerations. Pp. 365-375 in *Conservation of Australia's Forest Fauna*, edited by D. Lunney. Royal Zoological Society of New South Wales, Mosman. The Yellowbellied Glider: a review of its ecology, and management considerations, *Conservation of Australia's Forest Fauna* (pg. 365-375).
- Goldingay, R. L., Taylor, B. D., & Ball, T., 2011. Wooden poles can provide habitat connectivity for a gliding mammal. *Australian Mammalogy*, 33(1), 36-43.
- Goldingay R.L., McHugh D. & Parkyn J.L., 2017. Population monitoring of a threatened gliding mammal in subtropical Australia. *Australian Journal of Zoology* 64, 413-420
- Hero, J-M., M. Littlejohn & G. Marantelli., 1991. *Frogwatch Field Guide to Victorian Frogs*. Melbourne, Victoria: Department of Conservation and Environment. Available from: <http://frogs.org.au/frogs/index.html>.
- Higgins, P.J. (ed.), 1999. *Handbook of Australian, New Zealand and Antarctic Birds. Volume Four - Parrots to Dollarbird*. Melbourne: Oxford University Press.
- Incoll R.D., Loyn R.H., Ward S.J., Cunningham R.B. & Donnelly C.F., 2001. The occurrence of gliding possums in old-growth forest patches of Mountain Ash (*Eucalyptus regnans*) in the Central Highlands of Victoria. *Biological Conservation* 98, 77-88.
- Johnston, P. G., 2008.. Long-nosed potoroo. *The Mammals of Australia*. (Eds van Dyck, S., and Strahan, R.J.) pp, 302-304.
- Jones M. E., Rose R. K., and Burnett S., 2001. *Dasyurus maculatus*. In 'Mammalian Species No. 676', 1–9. (American Society of Mammalogists.)
- Kavanagh, R. P., 1987a. Foraging behaviour of the yellow-bellied glider, *Petaurus australis* (Marsupialia: Petauridae), near Eden, New South Wales. *Australian Mammalogy* 10, 37–39.
- Kavanagh, R. P., 1987b. Forest phenology and its effect on foraging behaviour and selection of habitat by the yellow-bellied glider, *Petaurus australis* Shaw. *Australian Wildlife Research* 14, 371–384.
- Kavanagh, R.P. & Bamkin, K.L., 1995. Distribution of nocturnal forest birds and mammals in relation to the logging mosaic in south-eastern New South Wales, Australia. *Biological Conservation* 71, 41-53.
- Kavanagh, R.P. & Stanton, M., 1998. Nocturnal forest birds and arboreal marsupials of the southwestern slopes, New South Wales. *Australian Zoologist* 30, 49-466.
- Littlejohn, M.J., 1963. Frogs of the Melbourne area. *Victorian Naturalist*. 79:296-304.
- Littlejohn, M.J., 1982. Amphibians of Victoria. *Victorian Yearbook*. 85:1-11.

- Mahony, M., 1999. Review of the declines and disappearances within the bell frog species group (*Litoria aurea* species group) in Australia. In: A. Campbell, ed. Declines and disappearances of Australian frogs. 81-93. Canberra: Environment Australia.
- Mansergh, I.M., 1984. The status distribution and abundance of *Dasyurus maculatus* (Tiger Quoll in Australia with particular reference to Victoria. *Aust Zool.* 21(2):109-122.
- Mansergh, I. M., 1995. Spot-tailed Quoll, *Dasyurus maculatus*. Pp. 51-52 In *Mammals of Victoria*. Ed. P. W. Menkhorst. Oxford University Press, Melbourne.
- NSW Department of Environment and Conservation (NSW DEC) (2005a). Southern Bell Frog (*Litoria raniformis*) Draft Recovery Plan. Sydney, NSW Department of Environment and Conservation (DEC). Available from: www.environment.nsw.gov.au/resources/nature/recoveryplanDraftSouthernBellFrog.pdf.
- Palmer, G., 2019. *Wildlife of the Otways and Shipwreck Coast*. CSIRO PUBLISHING.
- Paull, D.J., D.J. Mills & A.W. Claridge, 2013. Fragmentation of the Southern Brown Bandicoot *Isoodon obesulus*: Unraveling Past Climate Change from Vegetation Clearing. *International Journal of Ecology*. Article ID 536524.
- PV and DSE, 2009. *Caring for Country — The Otways and You*. Great Otway National Park and Otway Forest Park Management Plan. (Revised 2019). Parks Victoria and the Victorian Department of Sustainability and Environment, Melbourne
- Rees, M., Paull, D.J. & Carthew, S.M., 2007. Factors influencing the distribution of the Yellow-bellied Glider (*Petaurus australis australis*) in Victoria, Australia. *Wildlife Research* 34, 228-233.
- Robley, A., Gormley A., Triggs, B., Albert, R., Bowd, M., Hatfield. C., McDonald, R., Rowe, C., Scott, K., and Smith, A., 2014. Glenelg Ark 2005–2013: Evidence of the Benefits for Native Mammals of Sustained Fox Control. Arthur Rylah Institute for Environmental Research Technical Report Series. Department of Environment and Primary Industries, Heidelberg, Victoria
- Robley, A., Moloney, P., Stringer, L. and Donald, S., 2020 Glenelg Ark 2005–2019: Long-term predator and native mammal response to predator control. Arthur Rylah Institute for Environmental Research Technical Report Series. Department of Environment and Primary Industries, Heidelberg, Victoria
- Robley, A., Moloney, P.D. and Le Duc, E., 2022. Glenelg Ark—2020 monitoring and evaluation update. Arthur Rylah Institute for Environmental Research Technical Report Series No. 340. Department of Environment, Land, Water and Planning, Heidelberg, Victoria.
- Seebeck, J.H., 1981. Potorous tridactylus (Kerr) (Marsupialia: Macropodidae): its distribution, status and habitat preferences in Victoria. *Australian Wildlife Research*. 8: 285-306.
- Shields, J. & Crome, F., 1992. 'Parrots and Pigeons of Australia: The National Photographic Index of Australian Wildlife.' (Collins Angus and Robertson: Sydney.)
- State Wide Integrated Flora and Fauna Team (SWIFFT), 2022a. *Spot-tailed Quoll*. [online] www.swifft.net.au. Available at: https://www.swifft.net.au/cb_pages/sp_spot-tailed_quoll.php.
- State Wide Integrated Flora and Fauna Team (SWIFFT), 2022b. *Swamp Antechinus*. [online] www.swifft.net.au. Available at: www.swifft.net.au/cb_pages/sp_swamp_antechinus.php.
- Stevens, M., Rudolph, G., Christian, F., and Frey, S., 2010. Pilot survey for Long-nosed Potoroo and Southern Brown Bandicoot using remote camera in the Grampians National Park, February to April 2009. Field Report 3. Unpublished.
- Tidemann, C.R., 1998. Grey-headed Flying-fox, *Pteropus poliocephalus*, Temminck, 1824. In: Strahan, R., ed. *The Mammals of Australia*. Frenchs Forest: New Holland Publishers Pty Ltd.
- TSSC, 2006. Commonwealth Listing Advice on White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland. Available from: <http://www.environment.gov.au/biodiversity/threatened/communities/box-gum.html>. In effect under the EPBC Act from 18-May-2006. Threatened Species Scientific Committee, Canberra.
- TSSC, 2016a. Conservation Advice *Antechinus minimus maritimus* Swamp Antechinus (coastal Victoria and far south-eastern South Australia). Available from: <http://www.environment.gov.au/biodiversity/threatened/species>

- /pubs/83086-conservation-advice-05052016.pdf. In effect under the EPBC Act from 05-May-2016. Threatened Species Scientific Committee, Department of the Environment. Canberra.
- TSSC, 2016b. Conservation Advice *Isoodon obesulus obesulus* — Southern Brown Bandicoot (eastern), Southern Brown Bandicoot (south-eastern). Available from: <http://www.environment.gov.au/biodiversity/threatened/species/pubs/68050-conservation-advice-05052016.pdf>. In effect under the EPBC Act from 02-May-2016. Threatened Species Scientific Committee, Department of Agriculture, Water and the Environment. Canberra.
- TSSC, 2020. Conservation Advice *Dasyurus maculatus maculatus* (southeastern mainland population) Spotted-tailed Quoll, south eastern mainland. Available from: <http://www.environment.gov.au/biodiversity/threatened/species/pubs/75184-conservation-advice-01092020.pdf>. In effect under the EPBC Act from 01-Sep-2020. Threatened Species Scientific Committee, Department of Agriculture, Water and the Environment. Canberra.
- Treelogic, 2021. Arboricultural Assessment and Report, Colac Otway Pipeline. 6 April 2021 Treelogic Reference. 011304. Prepared for GHD Pty Ltd.
- United Nations, 2023. Intergenerational Equity. United Nations - Department of Economic and Social Affairs Public Institutions. [Online] Available at <publicadministration.un.org/en/Intergovernmental-Support/Committee-of-Experts-on-Public-Administration/Governance-principles/Addressing-common-governance-challenges/Intergenerational-equity#:~:text=What%20is%20it%3F,term%20needs%20of%20future%20g>
- van Weenen, J., Ellis, M., Menkhorst, P., Burbidge, A., Copley, P., Denny, M., ... & Morris, K., 2008. The IUCN Red List of Threatened Species 2008.
- Van der Ree R., Ward, S.J. and Handasyde, K.A., 2004. Distribution and conservation status of possums and gliders in Victoria, in RL Goldingay & SM Jackson (eds), The Biology of Australian Possums and Gliders. Surrey Beatty and Sons Chipping Norton, New South Wales. 91-110.
- VBA, 2016. Victorian Biodiversity Atlas. Department of Environment, Land, Water and Planning, Victoria.
- VBA, 2022. Victorian Biodiversity Atlas. Department of Environment, Land, Water and Planning, Victoria
- VBA, 2023. Victorian Biodiversity Atlas. Department of Environment, Land, Water and Planning, Victoria
- VicFlora, 2023a. *Pterostylis cucullate*, Leafy Greenhood. [online] Available at: <https://vicflora.rbg.vic.gov.au/flora/taxon/d692fd19-8e70-4fb0-a7fa-3acd516431f6>
- VicFlora, 2023b. *Pterostylis chlorogramma*. [online] Available at: <https://vicflora.rbg.vic.gov.au/flora/taxon/c78519e2-4099-4eb7-8007-35dde25e13e6>
- Watt, A., 1993. Conservation status and draft management plan for *Dasyurus maculatus* and *D. hallucatus* in southern Queensland. Report for Queensland Department of Environment and Heritage and The Department of the Environment, Sport and Territories, October:1–132.
- Whisson D.A., McKinnon F., Lefoe M., Rendall A.R., 2021. Passive acoustic monitoring for detecting the Yellowbellied Glider, a highly vocal arboreal marsupial. PLoS ONE 16(5): e0252092. <https://doi.org/10.1371/journal.pone.0252092>
- Wilson, B. A., Aberton, J. G., & Reichl, T., 2001. Effects of fragmented habitat and fire on the distribution and ecology of the swamp antechinus (*Antechinus minimus maritimus*) in the eastern Otways, Victoria. Wildlife Research, 28(5), 527-536.
- Wilson, B. A., & Bachmann, M. R., 2008. Swamp Antechinus *Antechinus minimus*. Mammals of Australia, 93-94.
- Woinarski J.C.Z., Burbidge A.A. & Harrison P.L., 2014. The Action Plan for Australian Mammals 2012. CSIRO publishing, Collingwood.
- Zhuang-Griffin, L., 2015. *Assessment of the status of the endangered swamp antechinus (Antechinus minimus maritimus) in the eastern Otways: factors influencing decline*. B. Sc (Doctoral dissertation, Honours thesis, School of Life and Environmental Sciences, Deakin University, Burwood, Vic., Australia).

Attachments

Attachment 1

Colac Pipeline Upgrade – EPBC Self-Assessment Report (GHD, 2022)

Attachment 2

**Targeted Surveys for Yellow-bellied Glider
and Gang-gang Cockatoo – Colac Pipeline
Project – Survey Report (Revised)**

Attachment 3

**Colac Otway Shire planning permit
PP259/2021-1, 2 August 2022**

Attachment 4

**Map of Eastern Maar Native Title claim
area**

Attachment 5

**Cultural Heritage Management Plan
(CHMP) 16600, 8 February 2022**

**(provided to DCCEEW; redacted from the
public version of this report due to
cultural sensitivities)**

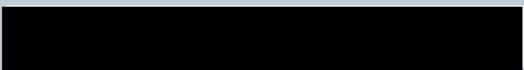
Attachment 6

Ecological Impact Report (GHD, 2021)

Attachment 7

Greater Glider memo (GHD, 2022)

Attachment 8

Proposed Offset Site 
Kawarren – Targeted fauna and vegetation
survey report (GHD, 2023)

Attachment 9

Proposed Offset Site 245 Distillery Creek Road, Aireys Inlet – Targeted fauna and vegetation survey report (GHD, 2023)

Attachment 10

**Offset Strategy for the Colac Pipeline
Upgrade Project**

Attachment 11

Proposed Offset Site [REDACTED]

Kawarren – Offset Management Plan

Attachment 12

**Proposed Offset Site 245 Distillery Creek
Road, Aireys Inlet – Offset Management
Plan**

Attachment 13

Barwon Water environmental policy

Attachment 14

Submission from Member of the Public



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