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APEM Group

Great Ocean Road Coastal Trail
Flora and fauna assessment

FINAL REPORT

Prepared for World Trail Pty Ltd and The Department of Energy, Environment and Climate Action (DEECA)

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Biosis offices

NEW SOUTH WALES

Albury
Phone: (02) 6069 9200
Email: albury@biosis.com.au

Newcastle
Phone: (02) 4911 4040
Email: newcastle@biosis.com.au

Sydney
Phone: (02) 9101 8700
Email: sydney@biosis.com.au

Western Sydney
Phone: (02) 9101 8700
Email: sydneyoffice@biosis.com.au

Wollongong
Phone: (02) 4201 1090
Email: wollongong@biosis.com.au

VICTORIA

Ballarat
Phone: (03) 5304 4250
Email: ballarat@biosis.com.au

Melbourne (Head Office)
Phone: (03) 8686 4800
Email: melbourne@biosis.com.au

Wangaratta
Phone: (03) 5718 6900
Email: wangaratta@biosis.com.au

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Prepared by:	Sam Trollope Erin Baldwin Zahlia Payne
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Contents

Tables

Figures

Photos

Summary

Biosis Pty Ltd was commissioned by World Trail Pty Ltd (World Trail) on behalf of the Department of Environment, Energy, and Climate Action (DEECA) to undertake a flora and fauna assessment of proposed alignments of the Great Ocean Road Coastal Trail (GORCT). The ecological assessment will contribute to determining the final walking trail alignment, with cultural heritage assessments and planning approvals also part of this project. Preliminary assessments have also been undertaken, which included an ecological desktop assessment, a heritage desktop assessment and a geotechnical report, resulting in the development of concept designs and multiple ground-truthed iterations culminating with ground-truthed route 3 (GTR 3), which forms the assessed alignment in this flora and fauna assessment.

The proposed network of walking trails includes a mixture of existing trails (existing walking trails, management vehicle tracks, footpaths and beach) that will be connected by sections of new trail proposed for construction. Sections of informal trail have been incorporated into the network where possible to minimise impacts on natural and cultural values. Existing informal trails are mostly in poor condition and are considered as new trails for the purposes of planning and construction as works will be required in these areas. The proposed mix of trails aligned on existing trails and roads represents a significant opportunity to reduce the project's overall impacts on environmental values.

The detailed ecological investigation commenced in May 2022 once the centreline of Ground-truthed Route 1 (GTR 1) had been marked out with flagging tape by the trail designers. Towards the end of this assessment, two revisions were made to the trail alignment as a result of advice from the Geotechnical Risk Assessment and public feedback. Subsequently, the alignment was updated in response to those assessments and consultation as Ground-truthed Route 2. Further amendments were made to the alignment in 2023/24 removing optional trails upon finalisation of bridges and in response to further feedback on the management and locations of known plant disease (*Phytophthora cinnamomi*) infestations, these changes were incorporated into ground-truthed route 3 (GTR 3). New sections of trail incorporated into GTR 3, that were previous unassessed, were investigated in March 2024. Targeted surveys for threatened flora species listed under the *Environment Protection and Conservation Act 1999* (EPBC Act) were also completed during 2023 and 2024. GTR 3 is approximately 75.5 kilometres in length and is comprised of 41.9 kilometres of existing trails and the proposed construction of 34.4 kilometres of new trail. This ecological investigation involved detailed flora and fauna assessments of the GTR 3 network (Fairhaven to Grey River), including:

- Mapping of Ecological Vegetation Classes (EVCs) along the assessment corridor.
- Recording of all native and introduced flora along the assessment corridor.
- Mapping of all large trees according to EVC benchmarks along the assessment corridor.
- Characterising fauna habitat types and quality.
- Bird surveys and forest owl surveys.
- Remote camera traps surveys.
- Documenting land management issues and existing threatening processes.
- Targeted flora surveys for EPBC Act listed species.

Ecological values

Key ecological values identified within the GTR 3 assessment corridor and broader landscape (i.e. project area; see glossary for definition of terms) are as follows:

- The project area crosses two bioregions with distinct environmental conditions, vegetation communities and species assemblages (the Otway Plain and the Otway Ranges bioregions).
- Two EVCs occur in the Otway Plain bioregion composed of three condition state-s:
  - EVC 21 – Shrubby Dry Forest, Bioregional Conservation Status (BCS) of least concern.
  - EVC 48 – Heathy Woodland, BCS of least concern.
- Eight EVCs occur in the Otway Ranges bioregion composed of 15 condition states:
  - EVC 16 – Lowland Forest, BCS of depleted.
  - EVC 18 – Riparian Forest, BCS of least concern.
  - EVC 21 – Shrubby Dry Forest, BCS of least concern.
  - EVC 22 – Grassy Dry Forest, BCS of depleted.
  - EVC 45 – Shrubby Foothill Forest, BCS of least concern.
  - EVC 48 – Heathy Woodland, BCS of least concern.
  - EVC 161 – Coastal Headland Scrub, BCS of depleted.
  - EVC 201 – Shrubby Wet Forest, BCS of least concern.
- Forest, woodland and coastal scrub vegetation that supports a suite of habitat elements including large trees, fallen timber, rocks, tussock-forming grasses, major river systems with minor tributaries, seasonally wet areas and structurally-complex understorey.
- Populations of Wrinkled Buttons *Leiocarpa gatesii*, Swamp Antechinus *Antechinus minimus maritimus,* Broad-toothed Rat *Mastacomys fuscus mordicus*, Gang-gang Cockatoo *Callocephalon fimbriatum,* Long-nosed Potoroo *Potorous tridactylus tridactylus* and Yellow-bellied Glider *Petaurus australis* listed under the EPBC Act and *Flora and Fauna Guarantee Act 1988* (FFG Act).
- Blue-winged Parrot *Neophema chrysostoma* population, listed under the EPBC Act.
- Populations of threatened flora species listed under the FFG Act: Brooker's Gum *Eucalyptus brookeriana* and Southern Blue-gum *Eucalyptus globulus* subsp. *globulus*.
- Populations of threatened fauna species listed under the FFG Act: Grey Goshawk *Accipiter novaehollandiae*, Otway Black Snail *Victaphanta compacta*, Otway Burrowing Crayfish *Engaeus fultoni*, Rufous Bristlebird (Otway) *Dasyornis broadbenti caryochrous*, White-bellied Sea-Eagle *Haliaeetus leucogaster* and Powerful Owl *Ninox strenua.*
- Potential habitat for a further 49 threatened species:
  - Listed under EPBC Act: Anglesea Grevillea *Grevillea infecunda*, Green-striped Greenhood *Pterostylis chlorogramma*, Spiral Sun-orchid *Thelymitra matthewsii*, Australian Grayling *Prototroctes maraena*, White-throated Needletail *Hirundapus caudacutus*, Southern Bent-winged Bat *Miniopterus orianae bassanii*, Diamond Firetail *Stagonopleura guttata*, Latham's Snipe *Gallinago hardwickii*, Grey-headed Flying-fox *Pteropus poliocephalus*, Southern Brown Bandicoot *Isoodon obesulus*.
  - Listed under FFG Act: 32 flora species and 16 fauna species (see Section 4.2.1)

- Waterways, aquatic habitats and major river systems.

Based on the recommendations provided by Biosis from the results of fauna assessments undertaken in 2022, further consideration and targeted survey were recommended for threatened fauna, including Swamp Antechinus, Broad-toothed Rat, and Otway Burrowing Crayfish *Engaeus fultoni*. Documents detailing the results of recent small mammal surveys undertaken by the Wild Otways Initiative, and recommendations and discussion relevant to these species were provided to Biosis by DEECA (Barwon South West) in April 2024. These reports and results have been reviewed by Biosis and incorporated into the results and recommendations sections of this report, where appropriate. No further targeted surveys for threatened fauna are recommended.

Targeted surveys for threatened EPBC Act listed flora were undertaken over separate weeks in August, September, and December 2023 for species that had suitable habitat within the study area. Targeted surveys were undertaken for the following flora species listed under the EPBC Act:

- Wrinkled Buttons
- Anglesea Grevillea *Grevillea infecunda*
- Green-striped Greenhood *Pterostylis chlorogramma*
- Spiral Sun-orchid *Thelymitra matthewsii*.

Wrinkled Buttons was recorded during the Flora and Fauna assessment in 2022, and further populations were recorded during the December 2023 targeted surveys. No other EPBC Act listed flora were recorded during the field assessments.

Government legislation and policy

An assessment of the project in relation to key biodiversity legislation and policy is provided and summarised below.

Legislation / policy	Relevant ecological feature on site	Permit / approval required	Notes
EPBC Act	**Flora** Wrinkled Buttons recorded in assessment corridor.	The project is considered unlikely to have a significant impact on Wrinkled Buttons. However, for legal certainty, it is recommended that a referral under the EPBC Act is submitted.	Targeted surveys were undertaken in August 2023 for: • Green-striped Greenhood • Spiral Sun-orchid A targeted survey was undertaken in September 2023 for: • Anglesea Grevillea • Spiral Sun-orchid A targeted survey was undertaken December 2023 for: • Wrinkled Buttons No EPBC Act listed species were recorded during the August 2023 and September 2023 surveys. Populations of Wrinkled Buttons were recorded within the assessment corridor during the

Legislation / policy	Relevant ecological feature on site	Permit / approval required	Notes
			December 2023 targeted surveys. Significant Impact Criteria assessments (SIC) have been prepared for the EPBC Act listed species (Appendix 3 Flora species - EPBC Significant Impact Criteria assessments).
	<u>Fauna</u> The following fauna were recorded in the project area: • Long-nosed Potoroo • Yellow-bellied Glider • Gang-gang Cockatoo • Blue-winged Parrot • Swamp Antechinus (Wild Otways Initiative) • Broad-toothed Rat (Wild Otways Initiative) Potential habitat for seven other fauna species: • Australian Grayling • Diamond Firetail • Grey-headed Flying-fox • Latham's Snipe • Southern Bent-winged Bat • Southern Brown Bandicoot • White-throated Needletail	The project is considered unlikely to have a significant impact on threatened fauna. However, for legal certainty, it is recommended that a referral under the EPBC Act is submitted.	Broad-toothed Rat and Swamp Antechinus were detected in the project area and nearby the proposed trail alignment by targeted surveys undertaken by the Wild Otways Initiative in 2023. The investigation by DEECA and the Wild Otways Initiative concluded that the proposed trail alignment is considered low risk and impact to the species, subject to the incorporation of a 25 metre boardwalk at the mouth of Grey River to mitigate direct impacts to known habitat. Most canopy trees will be avoided during trail construction and any selective removal or trimming of trees for safety reasons is likely to be minor in nature. Habitat suitable for Blue-winged Parrot, Gang-gang Cockatoo, Yellow bellied Glider and Grey-headed Flying-fox will not be significantly impacted. Six large trees are proposed for removal at the locations of large swing bridge abutments, however this tree removal is not likely to significantly impact threatened fauna. Impacts to potential Latham's Snipe habitat, including creek edges and estuaries is minimal and the trail alignment makes use of existing walking trails throughout most areas of suitable habitat.

Legislation / policy	Relevant ecological feature on site	Permit / approval required	Notes
			Blue-winged Parrot is unlikely to be significantly impact by the trail construction. While the works will result in the removal of potential foraging habitat that may be used by the species, this level of impact is unlikely to result in species decline. Trails in proximity to important habitat for Southern Bent-wing Bat have been excluded from the trail network. White-throated Needletail is unlikely to be impacted as this species is primarily aerial. Diamond Firetail is unlikely to frequently utilise the project area and impacts to this species are highly unlikely.
	Ecological Communities The following ecological communities were predicted to occur in the project area: • Assemblages of species associated with open-coast salt-wedge estuaries of western and central Victoria ecological community. • Giant Kelp Marine Forests of South East Australia. • Natural Damp Grassland of the Victorian Coastal Plains. • Subtropical and Temperate Coastal Saltmarsh. • White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland.	The project is unlikely to significantly impact on these listed Threatened Ecological Communities. However, for legal certainty, it is recommended that a referral under the EPBC Act is submitted.	No threatened ecological communities are likely to be significantly impacted by the project.
FFG Act	87 protected flora species were recorded in the assessment corridor. The following listed species were also recorded in addition to those mentioned above:	Protected Flora Permit required. Actions required to avoid and minimise impacts on listed species.	Site is public land therefore the FFG Act applies. The project proponent as a public authority must also consider their obligations under the Public Authority Duty.

Legislation / policy	Relevant ecological feature on site	Permit / approval required	Notes
	• Brooker's Gum • Southern Blue-gum • Paper flower (broader project area only) Six fauna species were recorded and potential habitat for a further 19 fauna species. Recorded species are: • Grey Goshawk • Powerful Owl • Rufous Bristlebird • White-bellied Sea Eagle • Otway Black Snail • Otway Burrowing Cray		
Planning & Environment Act	All indigenous vegetation to be removed, destroyed or lopped.	Planning permit required to lop or remove native vegetation. Crown Land exemption may be available to the project. The purpose of the Crown land exemption is to enable DEECA and Parks Victoria to manage Crown land without needing to obtain a planning permit to remove, destroy or lop native vegetation. This exemption is implemented through DEECA's *Procedure for the removal destruction or lopping of native vegetation on Crown land* (DELWP 2018) and would negate the need for native vegetation offsets if it is applied. However, counter balancing measures are required.	Permit application needs to address provisions of the relevant overlays. A permit application will need to respond to the application requirements and decision guidelines within the ESO, LSO and LSIO. Under the Procedure to remove, destroy or lop native vegetation on Crown land compensatory native vegetation offsets would not be required, however counter balancing measures are required. Losses of biodiversity value are counterbalanced with improvements to native vegetation and biodiversity. Such activities include increases to the condition, extent or security of native vegetation. If the Crown Land exemption is not applicable, a planning permit will be required under Clause 52.17. Best practice environmental management on public land requires avoidance, minimisation and offsetting of native

Legislation / policy	Relevant ecological feature on site	Permit / approval required	Notes
			vegetation in accordance with the *Guidelines for the removal, destruction or lopping of native vegetation*.
CaLP Act	10 Noxious weeds 2 declared pest animals	N/A	Comply with requirements to control/eradicate
Environment Effects Act	Removal of native vegetation and threatened species habitat impacts	An EES referral is not triggered by criteria relating to biodiversity alone when assessing impacts against GTR 3. Partial clearing of mostly understorey vegetation results in 8.9194 ha from least concern, and depleted EVCs is unlikely to have regional or state significant environmental impacts. The project does have the potential to be referred under the EE Act once consideration of heritage and/or social impacts are assessed.	The Ministerial guidelines are not binding, and the decision as to whether an EES is required is ultimately at the discretion of the Minister for Planning. An EES may be triggered once consideration of social impacts and impacts to cultural heritage are assessed.
National Parks Act	Trails intersect two management zones: • Conservation • Conservation and Recreation	Consent is required under Section 27 of the Act.	Consult with Parks Victoria to determine conditions and consent.
Crown Land (Reserves) Act	Crown land	Consultation between GORCAPA and DEECA required to determine specific recommendations.	N/A
Reference Areas Act	The following reference areas are in close proximity to the project area: • Olangolah Creek Reference Area • Aquila Creek Reference Area • Painkalac Creek Reference Area	GTR 3 does not intersect these reference areas. No further approvals required.	Ensure future iterations of the trail alignment avoid reference areas.
Water Act	Designated waterways	Corangamite Catchment Management Authority (CMA) Works on Waterway permit required for trail sections that cross designated waterways.	Seek waterway determination from Corangamite CMA / regional water authority and comply with their guidelines and permit requirements.

Legislation / policy	Relevant ecological feature on site	Permit / approval required	Notes
Fisheries Act	Potential impact to five protected aquatic species.	No permit required if mitigation measures are strictly adhered to, and no habitat or biota are destroyed.	Providing mitigation measures outlined in this report are adhered to, the potential for protected aquatic biota as listed above, to be injured, damaged or destroyed is considered to be negligible and no permit is required from DEECA.
Environment Protection Act 2017	Multiple crossing of unnamed tributaries and declared waterways.	N/A	Adhere to the mitigation measures outlined in this report, particularly waterway crossings with elevated structures and sediment control.

Guidelines for the removal, destruction or lopping of native vegetation (the Guidelines)

Based on the current design and estimated works footprints, the proposed trail development will require the removal of 8.9194 hectares of native vegetation, including six large trees, from within location category 3. Therefore, if a planning permit is required it will be assessed on the detailed assessment pathway. The strategic biodiversity value score of the native vegetation to be removed ranges between 0.515 – 1.000. In relation to the permit trigger under Clause 52.17, native removal could be undertaken through reliance on the Crown Land exemption in Clause 52.17-7 of the Victoria Planning Provisions. This exemption is implemented through DEECA's *Procedure for the removal destruction or lopping of native vegetation on Crown land* (DELWP 2018). In this scenario, native vegetation offsets would not be required, however counter balancing measures would be required.

Avoid and minimise statement

The following design principles and measures have been adopted across the project design phase and will underpin the construction and operation phases to adequately describe and quantify biodiversity impacts and to ensure these impacts are avoided and minimised:

- Detailed project planning including feasibility studies, desktop constraints assessment, terrain modelling and an initial trail mark-out and later assessments that aimed to micro-site around potential areas of high ecological value. This process resulted in the reduction in the length of proposed trails, and the removal of some trails from the proposed alignment due to potential impacts to threatened flora and fauna species, and to sensitive EVCs.
- Aligning 41.9 kilometres of the trail network on exiting trails (i.e. formal walking trails and management vehicle tracks).
- Aligning 6.7 kilometres of the trail network on informal trails (i.e. unsanctioned walking trails that have been illegally constructed. Note that this trail type has been included in the vegetation loss calculations).
- Ensuring trail styles and construction methods only require the removal of understorey vegetation so the forest canopy and sub-canopy will remain intact.

- Designing trails to follow land contours and take advantage of flat spurs and ridges, where possible, minimising the need for major soil excavation.
- Using the design principle of elevating all waterway crossings and EVCs sensitive to hydrological changes (i.e: EVC 201 – Shrubby Wet Forest) to minimise disturbance of aquatic habitats and to reduce ongoing point sources for sedimentation of local waterways.
- Committing to the principle of pre-construction micro-siting to achieve avoidance of key habitat features for threatened fauna, avoid threatened flora species populations, minimise disturbance of wildlife habitat, minimise indirect impacts on significant trees and minimise impacts on waterways, other watercourses, springs and soaks.
- Committing to the development of a weed management plan to monitor and control weeds along the trail network.
- Committing to a strategy to monitor and control the spread of *Phytophthora cinnamomi* along the trail network.
- Engaging a professional arborist at the design stage to review existing conditions for trees in the project area; and provide sensitive construction techniques that can be applied to ensure encroachment into tree protection zones and structural root zones does not lead to the long-term decline of forest trees.
- Siting of trails to **avoid** areas of high ecological value, including:
  - Avoid incorporating trails that pass near Southern-bent Wing-bat non-breeding caves and roost sites into the trail network.
  - Avoid siting new trails that intersect high quality remnants of EVC 6 – Sand Heathland and EVC 48 – Heathy Woodland. These EVCs contain a high proportion of threatened flora and fauna habitat in the project area. The trail has been realigned in GTR 2 to occur on existing trails.
  - Avoid siting trails that intersect with critical small mammal refuges and heavy *Phytophthora* dieback disease infestation near Coalmine Creek.
- Siting and construction of trails to **minimise** impacts to the extent possible on areas of high ecological value, including:
  - Minimising impacts on Hooded Plover by reducing the length of trails sited on beaches.
  - Micro-site the trail to avoid populations of the EPBC Act listed Wrinkled Buttons.
  - Elevating trails that intersect with critical small mammal habitat corridors.
  - Incorporation of a 25 metre boardwalk design to reduce and mitigate impacts on threatened small mammals at the mouth of the Grey River.
- Minimising trail development near estuaries and coastal wetlands.
- Further micro-siting will be undertaken to avoid ecological features and threatened flora populations (i.e. in EVC 48 – Heathy Woodland)

A summary of trails removed/realigned from the concept and initial design versions of the trail network is provided below.

Trail number	Trail design version	Comments / rationale
Trails: • 4 • 22_Alt • 29_Alt	Concept Alignment 1	Removal of trails aligned along beach from the network to avoid impacts on breeding habitat for Hooded Plover.
Trails: • 1_Alt • 3	Concept Alignment 2	Removal of trails from network to avoid areas of high quality EVC 48 - Heathy Woodland and EVC 6 - Sand Heathland. Trails have been realigned in GTR 2 to use existing walking trails and management vehicle tracks.
Trails: • 16_Alt • 20_Alt • 21_Alt • 22_Alt • 23_Alt • 24_Alt	Concept Alignment 2	These trails have been removed from the trail network as a result of advice from DEECA, to avoid potential impacts on Southern Bent-wing Bat non-breeding and roosting caves.
Trail: 5_Alt	Concept Alignment 2	Realignment of trail to avoid intersecting critical refuge habitat for small mammals and to avoid intersecting heavy infestation of Phytophthora dieback disease. The trail has been suitably realigned away from sand dunes which function as the critical refuge habitat.
Trails: • 2 • 3 • 4 • 5 • 6	Ground-truthed Route 1	Removal of trails from formal network to avoid areas of high quality EVC 48 - Heathy Woodland. Section was realigned to use existing trails further north.
Trails: • 14 • 15 • 19 • 41	Ground-truthed Route 2	Realignment of these trails to avoid high risk *Phytophthora cinamonni* areas and incorporate existing trails as replacement as much as possible. Boardwalks and boot hygiene stations will also be installed at critical areas.

If a planning permit is required and the Crown land Procedure does not apply to this project, the offset requirements would be 0.432 general habitat units and 7.525 species habitat units for the following species:

- Wrinkled Buttons - 6.501 species habitat units.
- Coast Correa - 0.865 species habitat units.
- Otway Black Snail - 0.024 species habitat units.
- Southern Blue-gum - 0.135 species habitat units.

The general offset must be within the Corangamite Catchment Management Authority; Surf Coast Shire Council or Colac Otway Shire Council municipal districts, and must have a minimum strategic biodiversity value score of 0.676. The offset must also protect six large trees.

Recommendations

The design of the proposed trails and associated works has given consideration to avoiding and minimising ecological impacts by undertaking feasibility and ecological constraints assessments of trail concepts. Further refinement of the trail construction method and investigation of design responses, such as elevated structure/bridge footing types, will be undertaken during the project approvals process. These additional steps will ensure impacts are comprehensively minimised.

Key impact avoidance and minimisation strategies, and mitigation measures include:

Project specific recommendations

- Develop a weed control strategy that monitors weed invasion along the trail, at a minimum:
  - Within key threatened species habitat (i.e. Wrinkled Buttons habitat, and small mammal refuge habitat at the Coalmine Creek intersect).
  - Along tracks that extend through major weed infestations.
- Incorporate/develop the following mitigation strategies to prevent the spread *of Phytophthora cinnamomi*:
  - Control *Phytophthora* dieback disease infestations that occur along the trail network with a Phosphite fungicide.
  - Protect Austral Grass-tree from adverse drainage during construction and operation of trail to reduce impact of *Phytophthora cinnamomi*.
  - Develop a *Phytophthora* dieback disease monitoring strategy that:
    - Documents the extent of existing infestations.
    - Conducts annual assessment of all known infections that records: the extent of infestations, and the effectiveness of treatment strategies implemented.
    - Monitors susceptible EVCs along the trail network for new infestations to be included in future monitoring and treatment programs.
  - Incorporate hygiene stations to reduce the spread of weeds and pathogens into the trail network. Critical areas for positioning hygiene stations include:
    - At the fronts of *Phytophthora* dieback disease that are intersected by the trail. This is to contain the infection to the existing area and prevent further spread along the trail.
    - At entry and exit point where the trail intersects with EVC 45 – Heathy Woodland or EVC 6 – Sand Heathland that are susceptible to *Phytophthora cinnamomi* (note: EVC 6 was not recorded within GTR 3 alignment).
- Create a trail Construction and Environment Management Plan that mitigates the spread of soil pathogens and diseases, such as *Phytophthora cinnamomi* and Myrtle Wilt. Such plans should detail:
  - Strict hygiene methods to be implemented during trail construction.
  - On-going monitoring to assess the spread of *Phytophthora cinnamomi* and Myrtle Wilt.
  - All environmental controls and mitigation measures covering vegetation removal prescriptions/seasonality, work site delineation, weed/pathogen hygiene, sediment control and unexpected finds protocols and salvage protocols.

- Construct elevated boardwalks, to reduce impacts on hydrology and/or soil compaction, and threatened fauna associated with these habitats including Otway Burrowing Crayfish and Otway Black Snail, when the walking trail intersects:
  - Ephemeral waterways and minor tributaries.
  - EVC 201 – Shrubby Wet Forest.
- Adhere to construction methodology outlined in Axiom Tree Management (2022) to reduce impacts on trees through the implementation of tree protection measures.
- Microsite the trail during construction in EVC 48 – Heathy Woodland to reduce impacts on cryptic FFG Act listed flora (such as Orchids and other graminoids listed in section 3.5.2).
- Microsite the trail through recorded populations of Wrinkled Buttons to avoid direct impacts (i.e. Alternate Trail 2, Alternate Trail 3, Trail 19, Trail 42, Trail 49, Trail 60, Trail 61, Trail 62, and Trail 63).
- Protect critical refuge habitat for small to medium sized ground-dwelling mammals by:
  - Aligning trail to avoid areas of critical refuge habitat (i.e trail 15 is appropriately aligned above refuge habitat and no other critical refuge habitat is intersected by GTR 3).
  - Avoid impacts to vegetation functioning as a corridor to the refuge habitat (elevate trail 43 as it crosses Coalmine Creek so that the grass and shrub layer are not impacted).
  - Confirmed incorporation of a 25 metre boardwalk at the mouth of Grey River to mitigate direct impacts to known habitat for small mammals, including the threatened Broad-toothed Rat and Swamp Antechinus.
  - Use appropriate fencing, that enables small mammal passage, however discourages pedestrians from leaving trail at the Coalmine Creek intersect.
  - Install hygiene stations for *Phytophthora cinnamomi* in consultation with the Corangamite Catchment Management Authority (CCMA).
  - Consider improving habitat and protecting environmental values by:
    - Improving the vegetation for small mammals at Coalmine Creek habitat corridor in consultation with the CCMA.
    - Installing interpretive signage that emphasises the importance of habitat along the trail for threatened species (i.e. small mammals) and the importance of remaining on the trail to preserve those habitats.
- Undertake woody weed removal prior to constructing trail 70. Microsite the trail once Sweet Pittosporum has been removed to avoid / minimise disturbance to the high-quality understorey within EVC 161 – Coastal Headland Scrub (particularly within the Moderate and High condition states).
- Micro-site bridge abutments, where possible, to locate outside of TPZs, particularly of large trees and Southern Blue-gum.
- Micro-site the trail alignment to avoid and minimise impacts to Otway Burrowing Crayfish in accordance with the recommendations provided by DEECA's Barwon South West and GORCT Project team. Fifteen likely hotspots have been identified within the alignment based on habitat suitability, 10 of which are on proposed new trails (DEECA & GORCT Project Team 2024). Locations of the hotspots should be incorporated into the project's CEMP. The following recommendations to avoid and minimise impacts to the species must occur at the 10 identified locations (see Figure 6 of the GORCT Technical Survey Outcomes – Flora and Fauna):

- Conduct a site survey to identify crayfish burrows, to be undertaken by a suitably qualified ecologist experienced in the identification of crayfish burrows.
- At locations where burrows are identified, micro-site trail construction to avoid burrows and minimise damage. Chemical use, soil compaction and disturbance or organic litter ground cover should be avoided at these locations.
- Construction teams will be trained by the project ecologist in the identification of potential crayfish habitat and burrows during the construction induction. It is not intended to provide species-specific training but to educate construction teams in the general identification of potential burrow sites and appropriate management of impacts (e.g. avoidance of deep excavation).
- It is recommended that a suitably qualified and experience ecologist is on site to supervise trail construction at hotspots where burrows may be located. Ecologist supervision at these locations may also assist to minimise impacts to other threatened fauna such as the Otway Black Snail, given the overlap in habitat suitability including a preference for moist environments nearby creeks and streams.
- If burrows cannot be avoided, a suitably qualified ecologist much salvage and relocate individuals excavated from burrows. Potential burrows sites that cannot be avoided should be excavated carefully by hand or excavator. If individuals are identified, the crayfish should be moved to the nearest suitable habitat.
- Elevate trails that intersect suitable habitat, minimise and reduce soil disturbance and compaction.
- Hand-build trails at locations of suitable habitat to reduce the size and impact of disturbance.
- Apply mitigation measures at higher order stream crossings that avoid sedimentation and sediment mobilisation in accordance with the Australian Platypus Conservancy - Platypus Contingency Plans for Capital Works Programs.

General recommendations

General trail construction and maintenance recommendations include:

- Avoiding the direct removal of canopy trees along trails, particularly large hollow-bearing trees, through the micro-siting of the trail.
- Undertaking necessary pre-construction site visits with contractors prior to any works commencing to ensure all high value areas are avoided and protected.
- Restricting disturbance to track margins in areas where existing trails are present.
- To the fullest extent practicable, minimise disturbance to any native vegetation, including aquatic vegetation, within the project area. This may include the demarcation of areas of native vegetation to be retained during works.
- Adhering to the construction corridors, maintenance zones and permanent vegetation removal footprints outlined in this report.
- Implementing best practice trail design, construction and sediment management practices.
- Minimising the impacts of construction by 'building from the trail' and from within the construction footprint.

- Implementing strict weed and pathogen hygiene protocols during construction and operation of trails.
- Any plant or equipment used should be washed down and cleaned prior to and following use to reduce the translocation risk of weed species.
- Engage a suitably qualified arborist to advise on the management of trees during the construction phase of the project. The project arborist should induct workers prior to commencing trail construction works on:
  - Basic tree functions and impacts from trail.
  - Construction guidelines for working close to trees.
  - Procedure when roots are damaged and native vegetation offsets are required.
- Should instream or riparian works be proposed, undertake biological and physicochemical monitoring of waterways to be impacted in accordance with *The Environment Protection Act 2017*, the Environment Protection Regulations 2021 and Environment Reference Standards (ERS) introduced from 1 July 2021. Biological and physicochemical monitoring should be undertaken in appropriate locations and seasons prior to and following any proposed instream / riparian zone works to determine if there has been any negative impact on the health of waterways as a result of the project.
- The results of this assessment should be incorporated into the future stages of project design, by ensuring the flora and fauna mapping information is incorporated into, or used alongside detailed design and construction phases.

1. Introduction

1.1 Project background

Biosis Pty Ltd was commissioned by World Trail Pty Ltd (World Trail) on behalf of the Victorian Government Department of Environment, Energy and Climate Action (DEECA) to undertake a flora and fauna assessment of proposed alignments of the Great Ocean Road Coastal Trail (GORCT). The ecological assessment will contribute to determining the final walking trail alignment, with cultural heritage assessments and planning approvals also part of this project.

In early 2022, Biosis completed an ecological desktop assessment and rapid field assessment that examined the flora and fauna values of the project area along concept alignment 2 (Biosis 2022a). The assessment included a review of approximately 90 kilometres of a concept trail that provides a link between the Surf Coast Walk and the Great Ocean Walk; predictive modelling to identify areas that contained ecological constraints and values; and a site assessment to validate the ecological values and constraints identified. The network of trails includes a mixture of existing trails (existing walking trails, management vehicle tracks, footpaths and beach) as well as sections of new trail (includes sections of informal trails). Sections of informal trail have been incorporated into the network where possible to minimise impact. They are mostly in poor condition and are considered as new trails for the purposes of planning and construction. The proposed mix of trail on existing tracks and roads represents a significant opportunity to reduce the project's overall impacts on environmental values. A range of supporting infrastructure including a hiker campground, lookouts and bridges have been incorporated into the trail alignment and form part of this ecological assessment.

Ecological, heritage and geotechnical assessments were considered as well as public consultation to refine the concept alignment and provide an alignment that was marked out on the ground and which formed the basis for a detailed ecological assessment of Ground-truthed route 1 (GTR 1). This alignment was marked out using flagging tape by World Trail designers in April through to June 2022. It represented a reduction in length and refinement of the alignment to reduce the impact on threatened flora and fauna and cultural heritage, as well as improving trail safety from geotechnical advice. The ecological assessment of GTR 1 occurred in May 2022 and targeted surveys for threatened flora listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) were conducted during 2023 and 2024. Small revisions of the trail due to specialist geotechnical advice resulted in a Ground-truthed Route 2 alignment that included safer trail options. Further refinement of the preferred trail alignment occurred in 2024. This included small changes to the trail to avoid high risk areas including *Phytophthora cinnamomi* following consultation with local specialists and removal of superfluous trails due to the confirmation of bridge crossings and contained in Ground-truthed route 3 (GTR 3). All unassessed sections of trail forming the GTR 3 alignment were assessed in March 2024. This report presents the detailed ecological assessment of the entire GTR 3 alignment (Fairhaven to Grey River: segments 1- 5).

Ground-truthed route 3 consists of a network of 75.5 kilometres, including using 41.9 kilometres of existing trails and the construction of 34.4 kilometres of new trail. The detailed ecological investigation commenced once the centreline had been marked out with tape. These involved detailed flora and fauna assessments of the trail network, including:

- Mapping of Ecological Vegetation Classes (EVCs) along the assessment corridor.
- Recording of all native and introduced flora along the assessment corridor.
- Mapping of all large trees according to EVC benchmarks along the assessment corridor.

- Characterising fauna habitat types and quality.
- Bird surveys and forest owl surveys.
- Remote camera traps surveys.
- Documenting land management issues and existing threatening processes.
- Targeted flora surveys for EPBC Act listed flora species.
- Review of technical fauna reports relating to the project area.

The location of GTR 3 is predominantly in National Parks and public reserves resulting in the presence of a number of ecological constraints along the trail alignment that were identified in the early 2022 desktop assessment. For this detailed assessment, the impact footprint is defined as an area 1.25 metre either side of the proposed trail centreline (i.e. 2.5 metre wide impact footprint). This footprint will allow for the final 1 metre wide constructed trail surface and all associated earthworks and drainage works required during construction. The impact footprint is herein referred to as the 'construction corridor'. An area 10 metres either side of the trail centre line was assessed in detail during field investigations, this area is referred to as the 'assessment corridor'. The broader landscape in which the trail network sits is referred to as the 'project area'.

The project area was not assessed in detail but fauna surveys were undertaken in the broader area to characterise fauna diversity and habitat types. This report has been updated to include the results and recommendations of several fauna surveys undertaken by relevant expert groups. Key documents containing specialist advice were provided to Biosis on 9 April 2024, with information reviewed and endorsed by DEECA. The vegetation survey addressed the sections of proposed trail where direct impacts to vegetation are required to constructed trails or crossings. These include: sections of trails that link existing trails and would require new construction; and on informal existing trails that require vegetation removal to meet trail construction specifications.

1.2 Trail construction methods and possible impacts

Trails and structures will be constructed by small machinery and by hand resulting in a range of possible impacts on native vegetation, threatened species populations as well as habitat, soils and waterways. The construction method is described in the infrastructure section of the Planning and Design Report, and the following impacts have been identified for the purpose of this ecological impact assessment:

- Removal of native vegetation in the 2.5 metre wide trail construction corridor, noting that the final trail width is unlikely to be more than 1 metre wide so vegetation will be allowed to regenerate either side of the new trails.
- Removal of native vegetation where swing bridges will be located for the construction of abutments and guy-cable anchors.
- Disturbance or removal of rare or threatened plants, noting efforts have been made to realign trails around known populations or potential habitat of threatened species.
- Removal of threatened fauna habitat, especially for species that rely on understorey shrubs, ground layer vegetation, surface rock or coarse woody debris.
- Impacts on tree protection zones, noting that no canopy trees or large trees will be directly removed/felled for trail construction. There may be encroachment into tree protection zones (TPZs) of large trees at these locations, however direct removal of large trees will be avoided.
- Disturbance of riparian zones for installation of elevated structures.

- Soil disturbance and altered drainage patterns resulting in sediment mobilisation that may enter local drainage lines and waterways, noting design responses for managing soil erosion risks proposed in the project masterplan.
- Possible local disturbance to wildlife through increased human presence in forested areas, especially nesting and roosting sites for large forest owls and arboreal mammals.
- Increased risk of weed introduction and spread, noting mitigation strategies recommended here and incorporated into the project masterplan.
- Increased risk of pathogen spread, particularly *Phytophthora cinnamomi*, noting mitigation strategies recommended here and incorporated into the project masterplan.

1.3 Scope of assessment

The objectives of the flora and fauna investigation are to:

- Assist in finalising proposed trail locations through general ecological advice at the design and assessment stages.
- Review databases relating to flora and fauna (terrestrial and aquatic) issues relevant to the project area, including the Victorian Biodiversity Atlas (VBA) and EPBC Act Protected Matters Search Tool (PMST).
- Conduct a detailed field assessment of the flora and fauna values present within the project area.
- Identify and map Ecological Vegetation Classes, large trees and threatened flora and fauna species.
- Identify and broadly map high threat weed infestations along the proposed trail alignments.
- Identify and map visual signs of *Phytophthora cinnamomi* infection.
- Assess the potential for the project area and assessment corridor to support habitat for threatened species.
- Undertake vegetation quality assessments.
- Review the implications of relevant biodiversity legislation and policy, including Guidelines for the removal, destruction, or lopping of native vegetation (DELWP 2017).
- Assess potential impacts and discuss mitigation options relevant to trail design and siting.
- Recommend any further assessments of the project area that may be required (such as targeted searches for listed species).
- Undertake targeted survey and/or assessment of the following EPBC Act-listed flora species:
  - Wrinkled Buttons *Leiocarpa gatesii*
  - Anglesea Grevillea *Grevillea infecunda*
  - Green-striped Greenhood *Pterostylis chlorogramma*
  - Spiral Sun-orchid *Thelymitra matthewsii*
- Review and incorporate the results and recommendations of relevant documents provided to Biosis by DEECA (Barwon South West) in April 2024.

1.4 Location of the project area

The project area is located on Victoria's south-western coastline between Fairhaven and Grey River, approximately 100 kilometres south-east of Melbourne (Figure 1). It encompasses 9,206 hectares of public land. The alignment intersects many zones, these are addressed in the planning desktop assessment (Biosis 2022b).

The project area is within the:

- Otway Plain Bioregion and the Otway Ranges Bioregion.
- Otway Coast River Basin.
- Corangamite Catchment Management Authority (CMA) management area.
- Surf Coast Shire and Colac Otway Shire.

The trail alignment (GTR 3) traverses several Crown land tenures including (Figure 2):

- The Great Otway National Park managed by Parks Victoria (accounting for the majority of the trail network).
- Multiple coastal reserves:
  - Lorne - Queenscliff Coastal Reserve
  - Cumberland River Coastal Camping Reserve
  - Kennett River Coastal Reserve
  - Kennett River Water Frontage
  - Lorne Coastal Reserve
  - Lily Pond Bushland Reserve
  - Queens Park (managed by DEECA)
  - Wye River Coastal Reserve
  - Wye River Water Frontage.

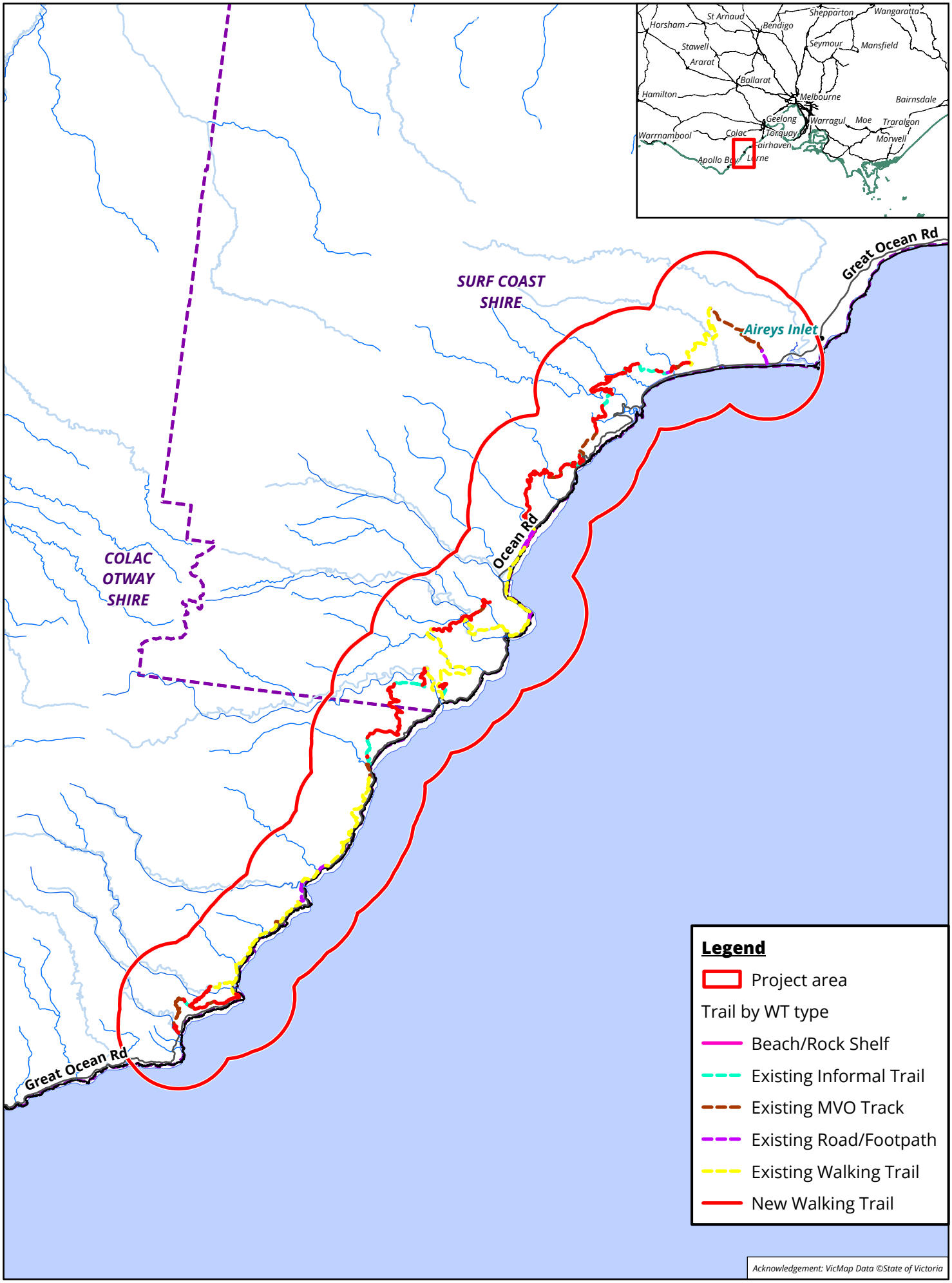

Figure 1 Location of the study area - Great Ocean Road Coastal Trail, Victoria

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Date: 03 June 2024 ,
Prepared for: ST, Prepared by: MK, Last edited by: mknudsen
Layout: 35990_F1_locality
Project: P:\35800s\35871\Mapping\35990_GORT_WT_Ecology_Figures.aprx

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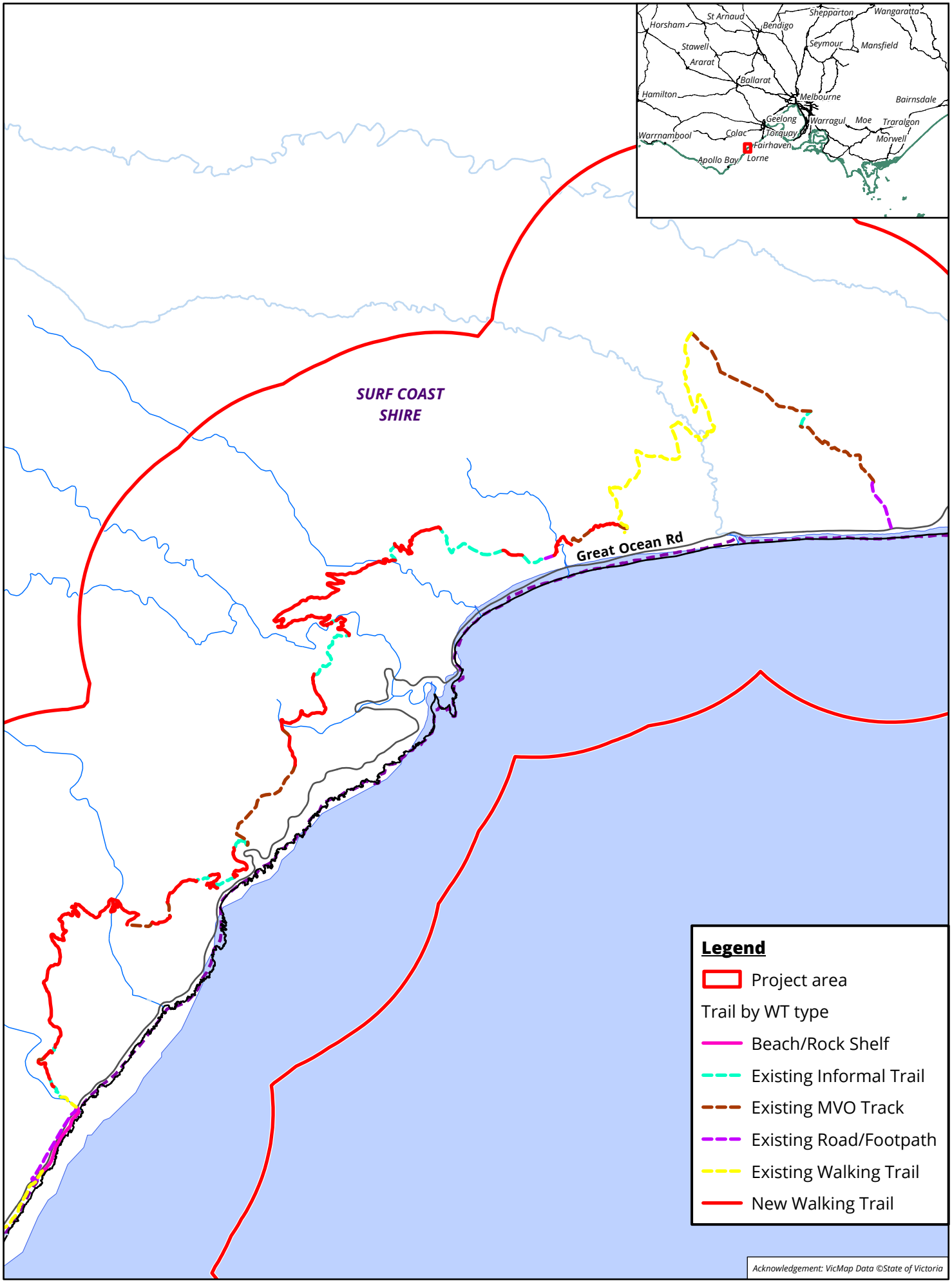

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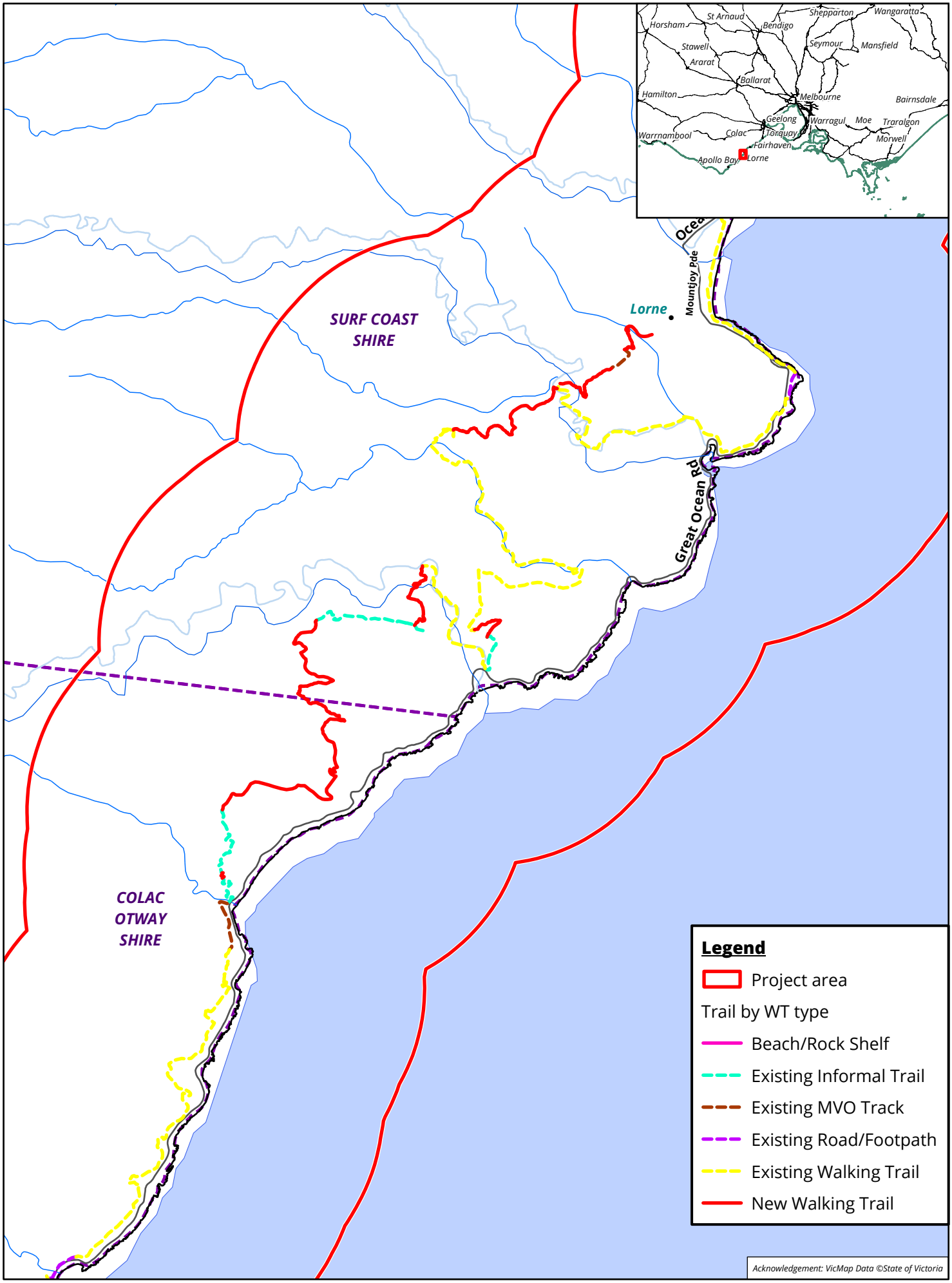

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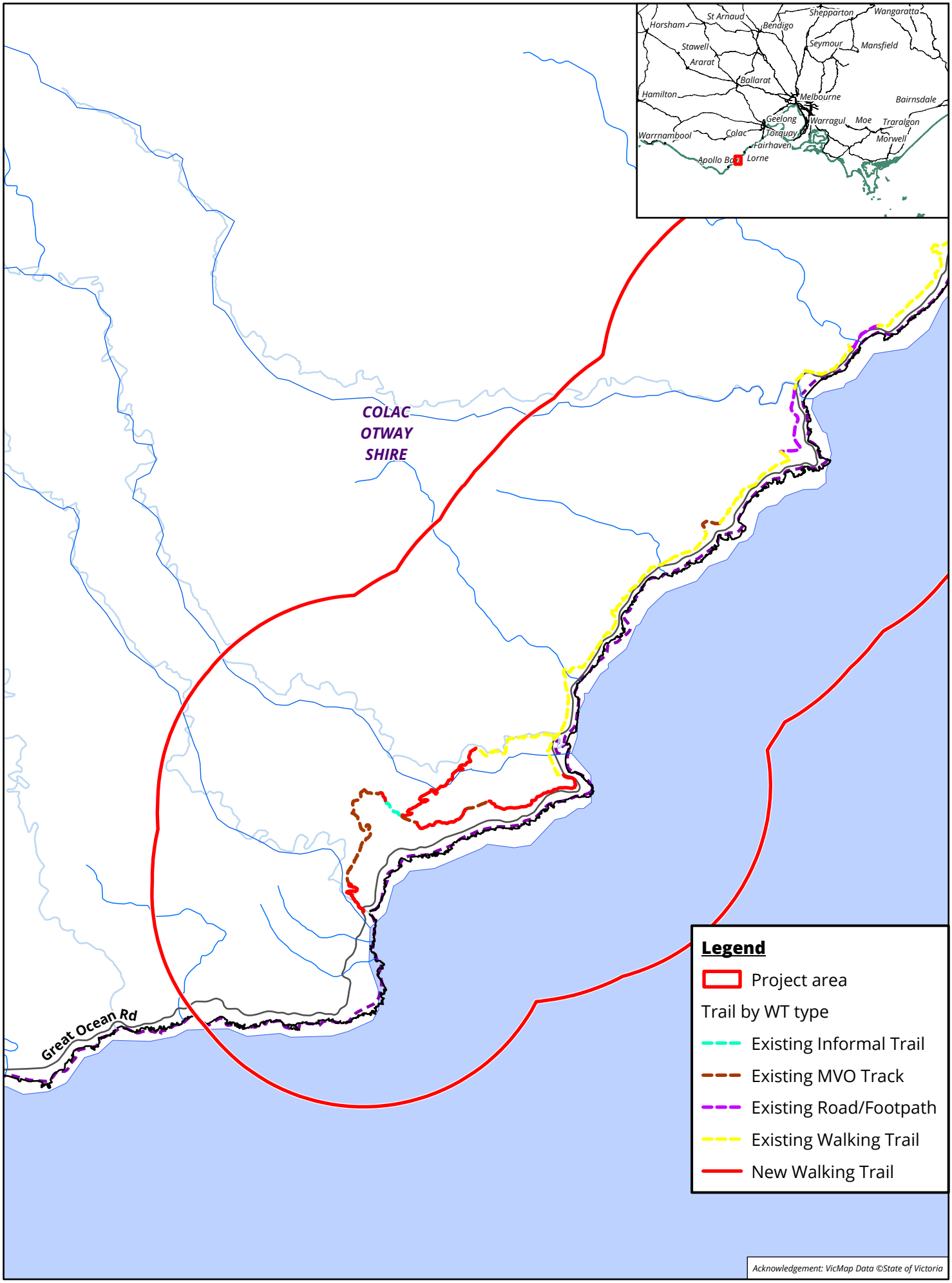

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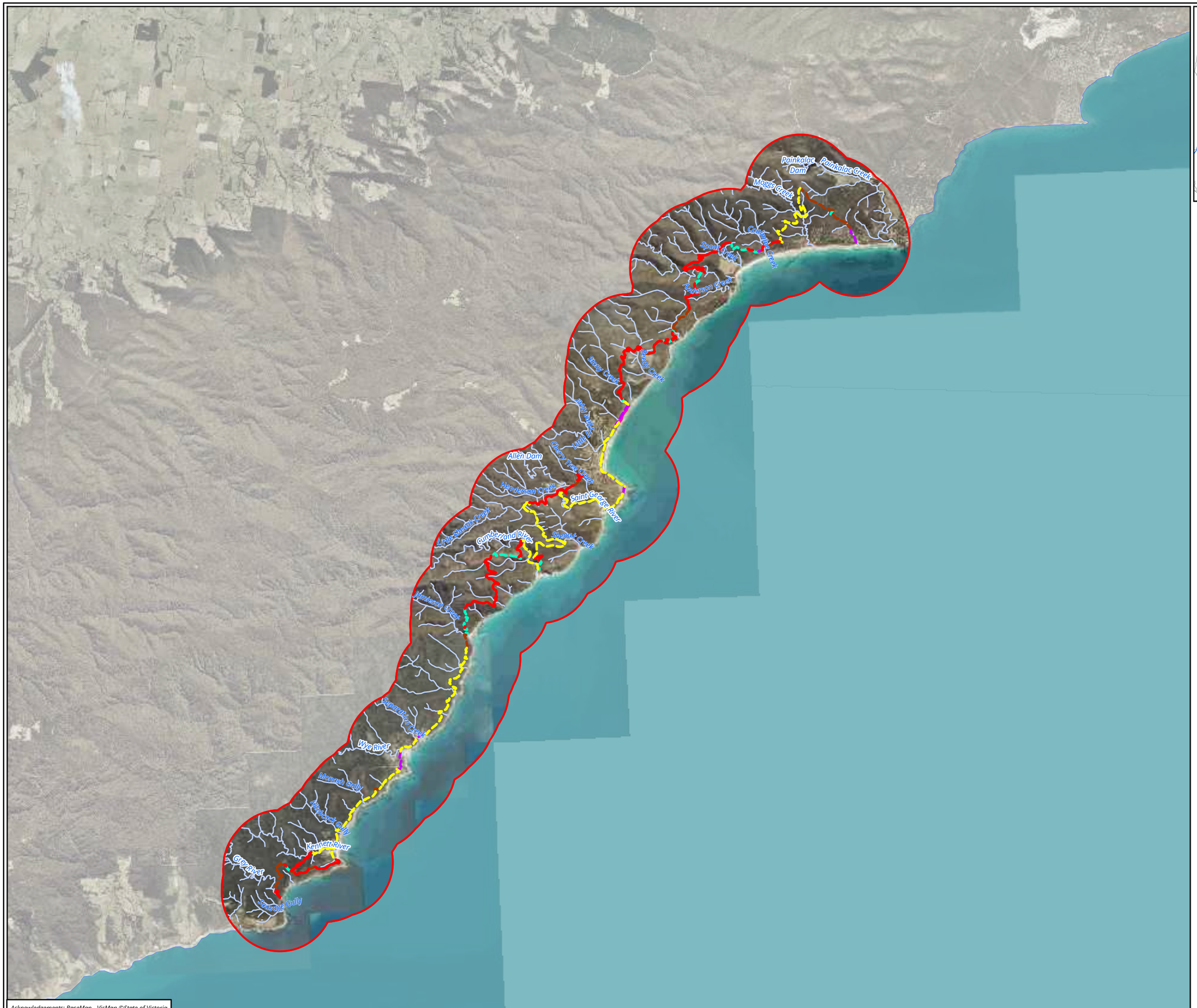

Legend

- Project area
- Beach/Rock Shelf
- Existing Informal Trail
- Existing MVO Track
- Existing Road/Footpath
- Existing Walking Trail
- New Walking Trail

Figure 2.1 Land tenure and conservation areas within the study area

0 1,000 2,000 3,000 4,000 5,000

Metres

Scale: 1:130,000 @ A3

Coordinate System: GDA 1994 VICGRID94

biosis

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Acknowledgements: BaseMap - VicMap ©State of Victoria

Matter: 35990,
Date: 03 June 2024,
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Layout: 35990_F3_Land
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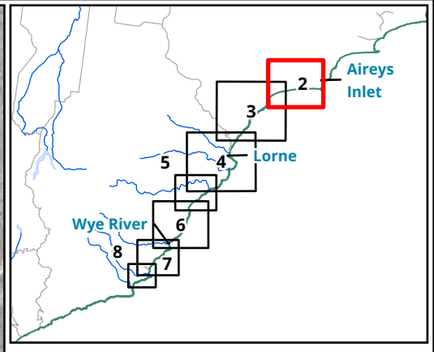

Legend

- Project area
- Existing Informal Trail
- Existing MVO Track
- Existing Road/Footpath
- Existing Walking Trail
- New Walking Trail

Land category

- Commonwealth land
- National parks and nature conservation reserves
- Other conservation reserves
- Other public land

Figure 2.2 Land tenure and conservation areas within the study area

0 225 450 675 900 1,125

Metres

Scale: 1:20,000 @ A3

Coordinate System: GDA 1994 VICGRID94

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N

Matter: 35990,
Date: 03 June 2024,
Prepared for: ST, Prepared by: MK, Last edited by: mknudsen
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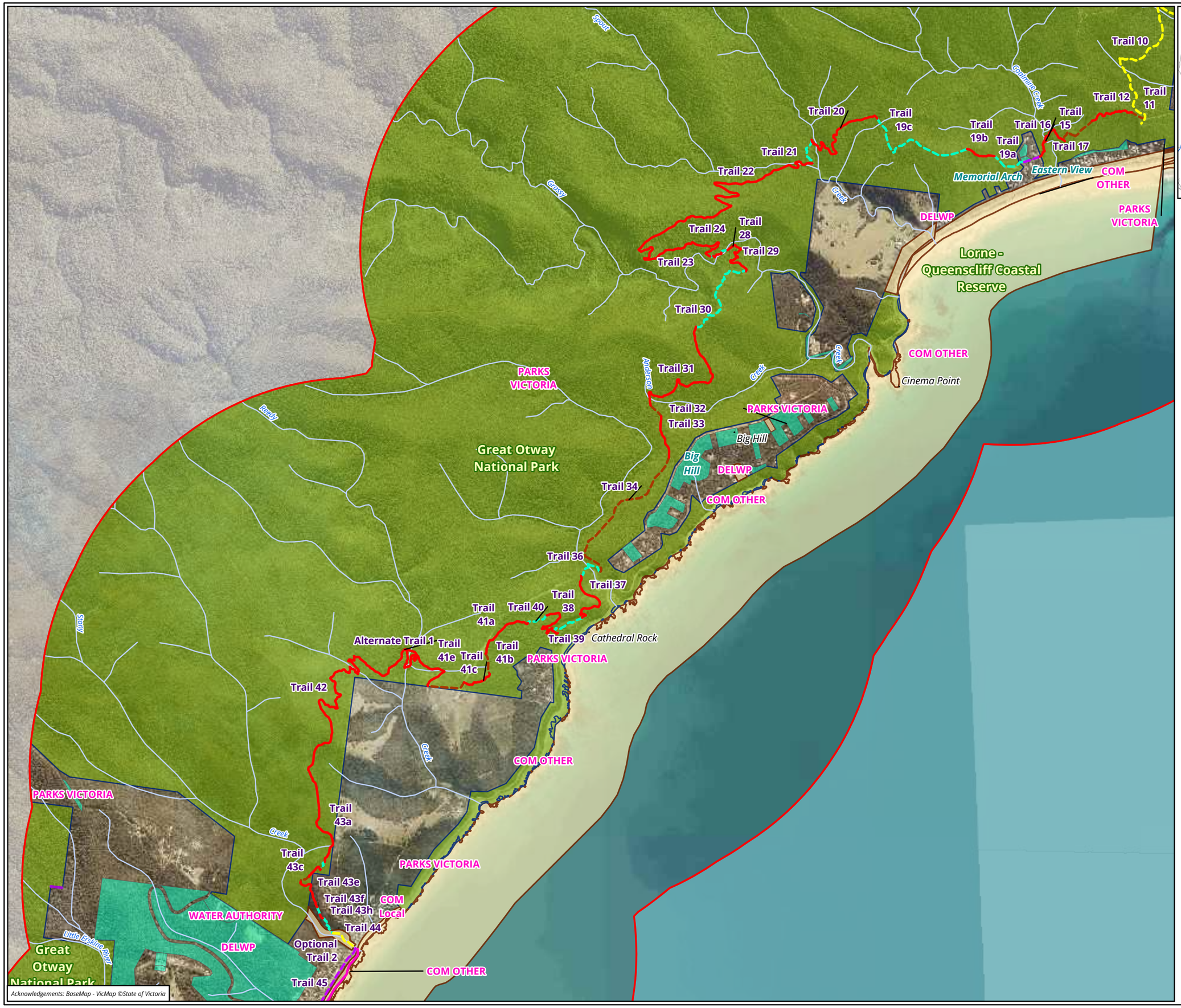

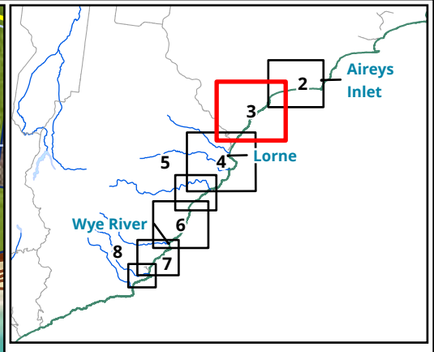

Legend

- Project area
- Beach/Rock Shelf
- Existing Informal Trail
- Existing MVO Track
- Existing Road/Footpath
- Existing Walking Trail
- New Walking Trail

Land category

- National parks and nature conservation reserves
- Other conservation reserves
- Other public land
- State forest

Figure 2.3 Land tenure and conservation areas within the study area

0 280 560 840 1,120 1,400

Metres

Scale: 1:25,000 @ A3

Coordinate System: GDA 1994 VICGRID94

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Matter: 35990,
Date: 03 June 2024,
Prepared for: ST, Prepared by: MK, Last edited by: mknudsen
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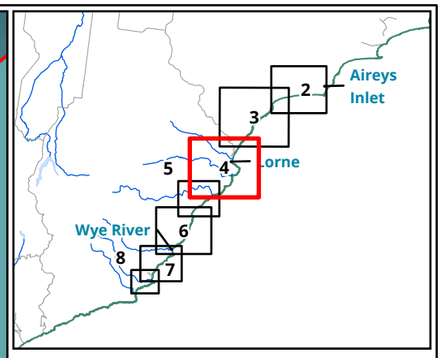

Legend

- Project area
- Beach/Rock Shelf
- Existing Informal Trail
- Existing MVO Track
- Existing Road/Footpath
- Existing Walking Trail
- New Walking Trail

Land category

- Commonwealth land
- National parks and nature conservation reserves
- Other conservation reserves
- Other public land
- State forest

Figure 2.4 Land tenure and conservation areas within the study area

0 280 560 840 1,120 1,400

Metres

Scale: 1:25,000 @ A3

Coordinate System: GDA 1994 VICGRID94

biosis

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Date: 03 June 2024,
Prepared for: ST, Prepared by: MK, Last edited by: mknudsen
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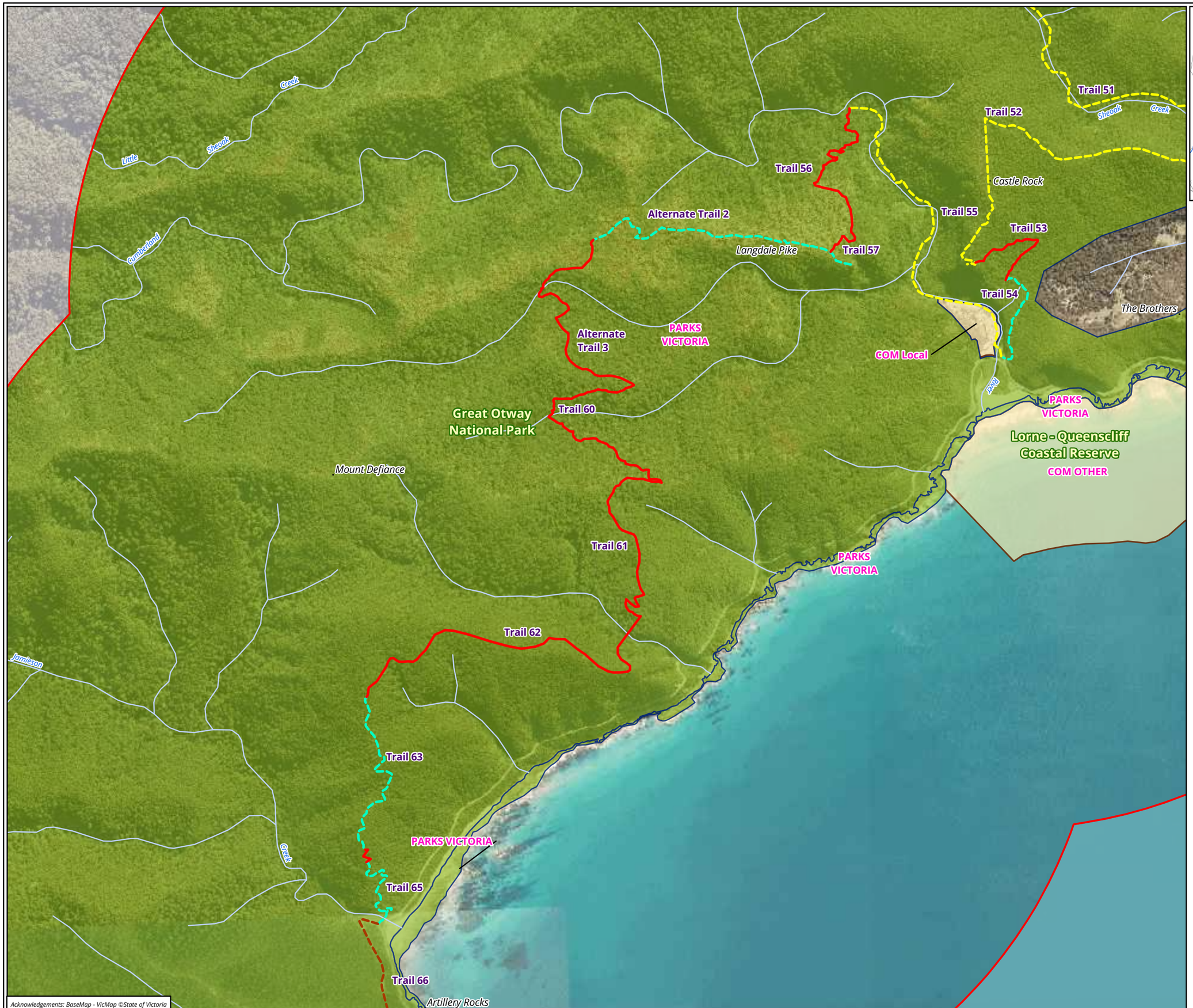

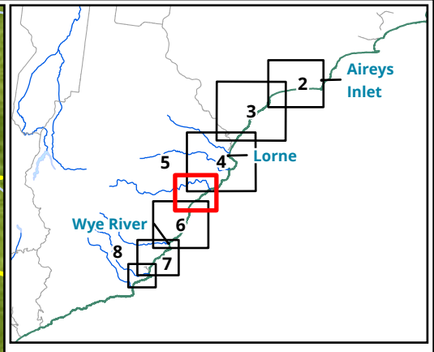

Legend

- Project area
- Existing Informal Trail
- Existing MVO Track
- Existing Walking Trail
- New Walking Trail

Land category

- National parks and nature conservation reserves
- Other conservation reserves

Figure 2.5 Land tenure and conservation areas within the study area

0 170 340 510 680 850

Metres

Scale: 1:15,000 @ A3

Coordinate System: GDA 1994 VICGRID94

N

Matter: 35990,
Date: 03 June 2024,
Prepared for: ST, Prepared by: MK, Last edited by: mknudsen
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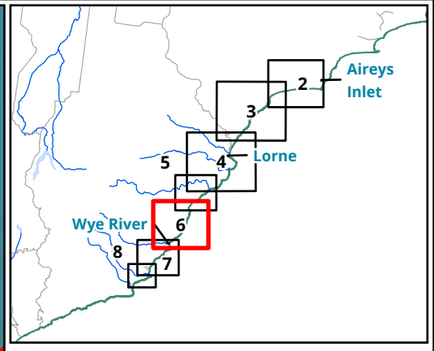

Legend

- Project area
- Existing Informal Trail
- Existing MVO Track
- Existing Road/Footpath
- Existing Walking Trail
- New Walking Trail

Land category

- National parks and nature conservation reserves
- Other conservation reserves
- Other public land

Figure 2.6 Land tenure and conservation areas within the study area

0 225 450 675 900 1,125

Metres

Scale: 1:20,000 @ A3

Coordinate System: GDA 1994 VICGRID94

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N

Matter: 35990,
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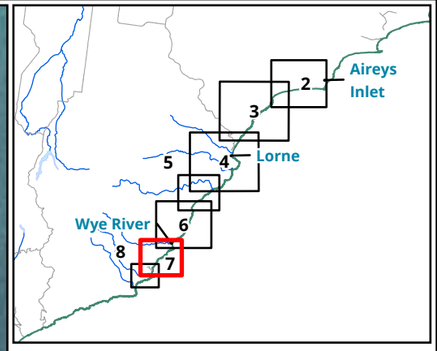

Legend

- Project area
- Existing MVO Track
- Existing Road/Footpath
- Existing Walking Trail
- New Walking Trail

Land category

- National parks and nature conservation reserves
- Other conservation reserves
- Other public land

Figure 2.7 Land tenure and conservation areas within the study area

0 170 340 510 680 850

Metres

Scale: 1:15,000 @ A3

Coordinate System: GDA 1994 VICGRID94

biosis

N

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Date: 03 June 2024,
Prepared for: ST, Prepared by: MK, Last edited by: mknudsen
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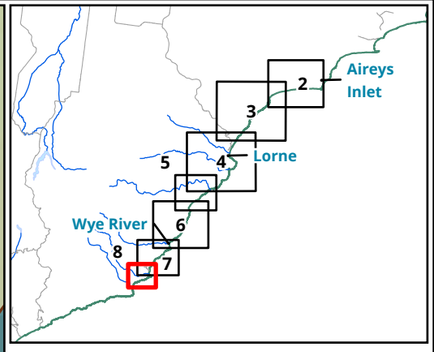

Legend

- Project area
- Existing Informal Trail
- Existing MVO Track
- Existing Walking Trail
- New Walking Trail

Land category

- National parks and nature conservation reserves
- Other conservation reserves
- Other public land

Figure 2.8 Land tenure and conservation areas within the study area

0 110 220 330 440 550

Metres

Scale: 1:10,000 @ A3

Coordinate System: GDA 1994 VICGRID94

biosis

N

Matter: 35990,
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1.5 Project area details and definitions

Table 1 and Table 2 below outline key project terms, abbreviations and their definitions.

Table 1 Project terms and definitions

Term	Definition
Search area	The project area buffered outwards by 10 kilometres. This area is used to conduct the database review of biodiversity values.
Project area	All indicative trail alignments buffered outwards by 2 kilometres. The area where ecological values are reviewed and described at a landscape scale for desktop assessment purposes. See Figure 1.
Assessment corridor	A 20 metre wide assessment corridor along all trails (i.e. 10 metres either side of the trail centreline) where biodiversity data will be collected (e.g. vegetation and tree mapping). The use of an assessment corridor provides for the informed re-alignment of the trail to avoid or minimise impacts to biodiversity as required.
Impact footprint	A 2.5 metre wide corridor (1.25 metre either side of the trail centreline) along the entire indicative trail alignment where vegetation removal and soil disturbance is likely to occur to construct trails.
Ground-truthed route 3 (GTR 3)	The basis for the assessment within this report. All trail numbers used in this report refer to GTR 3 unless otherwise specified. A centreline representing the proposed alignment of the walking trail. The indicative trail alignment is used as a basis for existing conditions surveys and impact assessment but does not necessarily represent the exact alignment of the trail once constructed. In areas of high environmental significance micro-siting will be used to avoid or minimise impacts to biodiversity along the trail alignment.
Micro-siting	This term refers to the positioning of a section of trail by technical experts (ecologists, trail builders, other consultants) to avoid, or reduce impacts to key ecological values or to avoid hazards (such as dead trees). The trail alignment is walked and inspected, during design and/or prior to construction, making minor changes to the alignment within the 20 metre assessment corridor. Key values and hazards to consider and/or avoid using micro-siting include: • Threatened flora populations and ecological communities • Critical habitat elements for threatened fauna • Large trees and their structural root zone • Hazardous trees (dead or senescing) • High threat weed infestations • Known soil/plant pathogen infestations • Riparian zones and waterways.

Table 2 Project abbreviations and acronyms

Abbreviation	Definition
BCS	Bioregional Conservation Status
CaLP Act	*Catchment and Land Protection Act 1994*
CEMP	Construction Environmental Management Plan
CMA	Catchment Management Authority
CTRC	Cool Temperate Rainforest Community
DCCEEW	Department of Climate Change, Energy, the Environment and Water (Federal)
DEECA	Victorian Government Department of Environment, Energy and Climate Action
EE Act	*Environment Effects Act 1978*
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
EVC	Ecological Vegetation Class
FFG Act	*Flora and Fauna Guarantee Act 1988*
GORCT	Great Ocean Road Coastal Trail
IBRA	Interim Biogeographic Regionalisation for Australia
PMST	Protected Matter Search Tool
TEC	Threatened Ecological Community

2. Methods

2.1 Database review

In order to provide a context for the project area, information about flora and fauna from within 10 kilometres of the project area (the 'local area') was obtained from relevant biodiversity databases, many of which are maintained by the Victorian Government Department of Environment, Land, Water and Planning (DELWP) or the Australian Government Department of Climate Change, Energy, the Environment and Water (DCCEEW). Aquatic fauna records were searched for the Otway Coast Basin, which has two catchments: Gellibrand River and Otway Coast. Records from the following databases were collated and reviewed:

- DEECA's Victorian Biodiversity Atlas (VBA), including the 'VBA_FLORA25, FLORA100 & FLORA Restricted' and 'VBA_FAUNA25, FAUNA100 & FAUNA Restricted' datasets.
- DCCEEW's Protected Matters Search Tool for matters protected by the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Other sources of biodiversity information were examined including:

- DEECA's NatureKit mapping tool.
- DEECA's Habitat Importance maps.
- DEECA's Native Vegetation Information Management (NVIM) system.
- DEECA's Ensym NVR Tool Support team was provided with site-based spatial information in order to generate a Native Vegetation Removal Report for the project area.
- Planning Scheme overlays relevant to biodiversity based on http://planningschemes.dpcd.vic.gov.au.

2.2 Definitions of threatened species or communities

Threatened species or communities include those species or communities that are listed under the EPBC Act and/or FFG Act. The conservation status of a species or ecological community is determined by its listing status under Commonwealth or State legislation / policy (Table 3).

Table 3 Conservation status of threatened species and ecological communities

Conservation status	
National	Listed as nationally critically endangered, endangered or vulnerable under the EPBC Act
State	Listed as extinct, extinct in the wild, critically endangered, endangered, vulnerable or conservation dependent in Victoria under the FFG Act

Lists of threatened species generated from the databases are provided in Appendix 1 (flora) and Appendix 2 (fauna) and the species have been assessed to determine their likelihood of occurrence based on the process outlined below.

2.3 Determining likelihood of occurrence of threatened species

Likelihood of occurrence indicates the potential for a species or ecological community to occur regularly within the assessment corridor. It is based on expert opinion, information in relevant biodiversity databases

and reports, and an assessment of the habitats on site. Likelihood of occurrence is ranked as negligible, low, medium, high or recorded. The rationale for the rank assigned is provided for each species in Appendix 1 (flora) and Appendix 2 (fauna). Those species for which there is little or no suitable habitat within the project area are assigned a likelihood of low or negligible and are not considered further.

Only those species listed under the EPBC Act or the FFG Act (hereafter referred to as ' threatened species') are assessed to determine their likelihood of occurrence. The habitat value for threatened species is calculated by the Habitat Importance Modelling produced by DEECA (DELWP 2017a). Where threatened species are recorded in the project area this is noted in Appendix 1 (flora) and Appendix 2 (fauna).

Threatened species which have at least medium likelihood of occurrence are given further consideration in this report. The need for targeted survey for these species is also considered.

2.4 Site investigation

2.4.1 Flora assessment

The detailed flora assessment was undertaken by a team of ecologists that included Matt Looby, Sam Trollope, Sarah Hilliar, Sam Bodycomb and Molly Farquharson. The flora assessment took place during the following weeks:

- 23 May to 27 May 2022 (GTR 1).
- 20 June to 24 June 2022 (GTR 1).
- 13 March to 15 March 2024 (GTR 3 – new sections of trail only).

A list of flora species was collected and will be submitted to DEECA for incorporation into the Victorian Biodiversity Atlas (VBA). Planted species have not been recorded unless they are naturalised. A total of approximately 350 hours was spent surveying the assessment corridor along 34.4 kilometres of new trail.

Native vegetation is defined in the Victoria Planning Provisions as 'plants that are indigenous to Victoria, including trees, shrubs, herbs, and grasses' (Clause 73.01).

The Guidelines classify native vegetation into two categories (DELWP 2017a):

- A **patch** of native vegetation (measured in hectares) is either:
  - An area of native vegetation, with or without trees, where at least 25% of the total perennial understorey cover is native plants.
  - An area with three or more native canopy trees where the drip line (i.e. the outermost boundary of a tree canopy) of each tree touches the drip line of at least one other tree, forming a continuous canopy.
  - Any mapped wetland included in the *Current wetlands map,* available in DEECA systems and tools.

Patch vegetation is classified into ecological vegetation classes (EVCs). An EVC contains one or more floristic (plant) communities and represents a grouping of broadly similar environments. Definitions of EVCs and benchmarks (condition against which vegetation quality at the site can be compared) are determined by DEECA.

- A **scattered tree** is defined as a native canopy tree that does not form part of a patch of native vegetation.

A canopy tree is a mature tree that is greater than three metres in height and is normally found in the upper layer of a vegetation type. Ecological vegetation class descriptions provide a list of the typical canopy species. A scattered tree is defined as either small or large, and is determined using the large tree benchmark for the relevant EVC. The extent of a small scattered tree is the area of a circle with a 10 metre radius (i.e. 0.031 hectares), while the extent of a large scattered tree is a circle with a 15 metre radius (i.e. 0.070 hectares). A condition score is applied to each scattered tree based on information provided by DEECA's NVIM.

All large trees within the assessment corridor were mapped. This is in accordance with the standard practice for mapping large trees according to EVC benchmark in native vegetation patches. Biosis ecologists collected data on large tree variables such as diameter at breast height (within 5 to 10 centimetre size classes), tree species, tree health, stem count and presence of hollows. The hollow-bearing status of each benchmark large tree was assessed rapidly from ground observations and where there was doubt regarding the presence of tree hollows a 'no value' result was applied to the large tree in question.

Vegetation Quality Assessment (VQA) sampling was undertaken for representative patches of native vegetation of the same EVC and condition state identified in the assessment corridor. Samples were collected in 0.25 hectare quadrats or within the full extent of the habitat zone. The VQA score was then applied to vegetation of the same EVC and condition state throughout the assessment and construction (impact) corridor. Sampling was stratified based on the area of each EVC and condition state within the assessment corridor. This method aimed to sample over 20 percent of each EVC and condition state within the construction corridor. This assessment is consistent with DEECA's habitat hectare method (DSE 2004) and the Guidelines (DELWP 2017a).

For the purposes of this assessment the limit of the resolution for identification of a patch of native vegetation was taken to be 0.001 habitat hectares (Hha). That is, if a discrete patch native vegetation was present with sufficient cover but its condition and extent would not have resulted in the identification of at least 0.001 habitat hectares, the vegetation patch of vegetation was not mapped or included in the assessment.

Where relevant, notes were made on specific issues such as noxious weed infestations, evidence of management works, current grazing impacts and the regeneration capacity of the vegetation.

Species nomenclature for flora follows the VBA.

2.4.2 Targeted flora surveys

The targeted survey was undertaken by a team of botanists that included Sam Trollope, Sarah Hilliar, Hayley Sime, Joshua Orchard, Abi van der Linden, and Michael Bodnarcuk of Biosis. The flora targeted surveys took place during the following weeks:

- 24 August to 25 August 2023
- 18 September 2023
- 4 December 2023 to 7 December 2023
- 13 March 2024 to 15 March 2024.

The targeted surveys included the four EPBC Act listed species listed in Table 4. Surveys were scheduled to align with peak flowering times identified in VicFlora (2024). Precise survey weeks were further refined through consultation with local experts, reference checks of known populations near to the study area, surveys for the same species in other parts of Victoria and monitoring of other database records (including iNaturalist).

FFG Act listed flora were searched for simultaneously as incidental observations.

Table 4 List of EPBC Act threatened flora species forming part of targeted surveys

Common name	Scientific name	EPBC Act conservation status	FFG Act conservation status	Extent of potential habitat within the study area	Flowering period*
Anglesea Grevillea	*Grevillea infecunda*	VU	en	EVC 48 Heathy Woodland, primarily within the Otway plain Bioregion and the North eastern extent of the Otway Ranges Bioregion in the project area (Eastern View, Moggs Creek and Fairhaven)	October-December
Wrinkled Buttons	*Leiocarpa gatesii*	VU	cr	Ridge lines and exposed slopes of EVC 21 Shrubby Dry Forest across the entire project area.	December-April
Green-striped Greenhood	*Pterostylis chlorogramma*	VU	en	High to moderate quality remnants of EVC 16 Lowland Forest and EVC 48 Heathy Woodland, primarily between Eastern View and Fairhaven.	July-September
Spiral Sun-orchid	*Thelymitra matthewsii*	VU	en	High to moderate quality remnants of EVC 48 Heathy Woodland, primarily between Eastern View and Fairhaven.	August-September

*flowering time according to Vicflora 2024

The following methods were used when conducting the targeted flora surveys:

- Two botanists systematically surveyed the assessment corridor, spaced 5 metres apart, where it intersected with suitable habitat following (DoE 2013a).
- Suitable habitat generally corresponded with the habitat described in Table 4 and in their respective Significant Impact Criteria assessments (Appendix 3). Survey effort intensified in areas where micro-habitat was deemed particularly suitable for a given species.
- If populations of targeted threatened flora were encountered, the location was mapped using a GPS-enabled tablet and an estimate of population size was made.
- Many of the target species are cryptic and only readily identifiable when flowering, which occurs at particular times of the year depending on environmental conditions. Surveys were timed to target the peak flowering periods for all species. Where possible, surveys were conducted when a nearby known population of the target species was flowering, to maximise the likelihood of detecting target species.
- During targeted surveys, if plants that were yet to flower were encountered, which have the potential to be the target species, the location of such plants were recorded, so that these locations could be revisited during follow-up survey, with the aim of re-visiting during flowering to allow for positive identification.

2.4.2.1 Detectability

Surveys to investigate the presence or absence of seasonal flora require careful consideration of the suitable habitat and flowering times for the species. The *Survey Guidelines for Australia's Threatened Orchids* (DoE 2013a) outline the best practice by which surveys should be conducted for the target orchid species. These resources indicate that peak detectability for the target species is during flowering (and they include indications of typical flowering times). The methods and advice outlined in these documents were used in order to conduct surveys to achieve the highest probability of detecting the target species.

2.4.2.2 Reference sites

Where there are known populations of the target species within close proximity to the study area, an accessible reference site was selected and the botanists undertaking surveys checked whether the known population was above ground and flowering or finished flowering at the time the survey was conducted. Table 5 lists reference sites visited during the targeted surveys for threatened flora, including observations made during the visit on whether plants were found and flowering status.

Table 5 Reference sites visited during targeted flora surveys 2023

Flora species	Reference site	Coordinates	Source	Date of visit	Observations
Anglesea Grevillea	Gum Flats Road, Wensleydale	-Lat -38.3635 Long 144.0723	VBA record	18 Sep 2023	Many plants were found at the reference site. None were in flower however this species is a perennial shrub and readily detectable and identifiable with vegetative material (i.e. leaves).
Wrinkled Buttons	Coalmine Track, Eastern View	Restricted record	Found during initial FFA assessment	4 and 7 Dec 2023	Several individuals found in full flower.
Green-striped Greenhood	Mullungdung Nature Conservation Reserve	Lat -38.4352, Long 146.87880	VBA record	24 Aug 2023	No accessible records near the project area, species observed in flower in Gippsland region.
Spiral Sun-orchid	Gum Flats Road, Wensleydale	Lat -38.36299 Long 144.10469	VBA record	18 Sep 2023	Multiple individuals located. Species was in flower.

VBA = Victorian Biodiversity Atlas. Locations of some reference sites were taken from the VBA database (i.e. those marked as VBA record in the above table).

2.4.3 Mapping vegetation removal and tree protection zones

Based on the trail construction methods outlined in the project masterplan, it is proposed to remove understorey vegetation only during construction of the trail surface. Most canopy forming trees and immature trees according the EVC benchmark will be avoided during a construction. Vegetation removal within the construction footprint includes the 1 metre built trail surface and a 0.75 metre construction buffer either side of the trail surface to allow for earthworks and drainage. Vegetation removal is therefore assessed using a 2.5 metre wide footprint and applied along the length of each trail. For forest and woodland vegetation, a partial clearing score has been applied to calculate native vegetation offset requirements as outlined in the Guidelines (DELWP 2017) and Assessors Handbook (DELWP 2018). All treeless vegetation types

have had a full clearing score applied (i.e. EVC 161- Coastal Headland Scrub). For areas where infrastructure is proposed, such as large swing bridges full, clearing has been applied where it impacts native vegetation.

Where small-scale elevated structures are proposed, the vegetation under these structures has been 'deemed lost' and included in offset calculations by applying the 2.5 metre wide construction corridor as outlined above, although recent examples from other walking trail projects in Victoria and NSW demonstrate that such vegetation is likely to persist under structures that allow rainfall and light to penetrate to the ground.

Where large scale, swing bridges are proposed across steep-sided ravines, the vegetation beneath has not been deemed lost, as the height of the bridge is not anticipated to significantly impact the vegetation below. Instead, a construction footprint is applied for each abutment supporting the bridge at either end:

- 20 x 25 metre construction zone.
- 5 x 5 metre for wind guy cable anchor blocks (four per abutment).
- 2.5 x 5 metre vegetation loss along the initial span of the bridge

Tree Protection Zone (TPZ) impacts of trees within the trail assessment corridor have been assessed by an independent arborist (Axiom Tree Management 2022). This assessment indicates that TPZ impacts are likely to be minimal, provided construction recommendations are followed that protect root systems and tree trunks. This assessment is based on a review of existing trails built through similar terrain and vegetation types in the local area and the limited to negligible tree health impacts that have resulted from trails in other parts of Victoria. Therefore, TPZ impacts have not been included in the vegetation removal footprint for trail construction but have been considered for the construction of the larger infrastructure such as the abutments of the swing bridges. Impacts here are likely to require more extensive ground disturbance than trail construction. Further information about construction methods will be included in the Planning and Design report.

2.4.4 Fauna assessment

The project area and broader search area of the original GTR 1 alignment was investigated by Project Zoologist Erin Baldwin (former Biosis staff member) and Zoologist Zahlia Payne (with assistance from Research Assistant Karthika Jayakumar) between the 26 and 29 April and 17 and 18 May 2022 to determine its values for fauna. These were determined primarily on the basis of the types and qualities of habitat(s) present. The GTR 1 project area originally included an addition two segments (6 and 7) which extended from Grey River to Skenes Creek before the project area was refined to GTR 3 (segments 1 -5). The results from the fauna surveys which occurred in the broader project area (i.e. nocturnal surveys, bird surveys, and remote cameras) have been retained in this report as they characterise the broader project area.

The fauna assessment included nocturnal surveys for arboreal mammals and forest owls, bird surveys and the deployment of 30 remote cameras to maximise the detection of threatened and/or cryptic vertebrate fauna groups.

Methods related to these survey techniques are described in further detail below.

Nocturnal surveys

Two nights of nocturnal surveys were undertaken to record nocturnal fauna species such as owls, possums, gliders and frogs within the GTR 1 and 2 project areas across a combination of dry and wet forest types. Nocturnal surveys used a combination of spotlighting from a vehicle and transects on foot, listening for bird and frog calls and the use of playback to elicit responses from owl species with potential to occur in the project area.

Bird surveys

Five bird survey sites were chosen to target a range of different habitat types within the GTR 1 and 2 project area. Bird surveys were undertaken at each survey site either in the morning and/or afternoon following the Birds Australia 2 hectare 20 minute bird survey method to maximise the number of species recorded. Birds were detected and identified visually and/or by calls. The location of bird survey sites within the GTR 1 project area are shown in Figure 3.

Remote cameras

Remote cameras were primarily used in the current survey to target ground-dwelling mammal species. However, this survey technique can also be useful to detect reptiles and birds. Two remote camera types were utilised during the survey, including 20 Reconyx™ HC600 HyperFire Infra Red trail cameras and 10 Reconyx™ HF2X HyperFire 2 (which were predominantly placed in suitable habitat within the proposed alignment south of the Great Ocean Road to detect the threatened species Swamp Antechinus).

Thirty remote cameras were typically deployed in pairs, 100 metres apart, across a diversity of ecological vegetation classes within the GTR 1 and 2 project areas. The exception is two cameras, which were deployed singly within the same environment due to a lack of trees suitable for camera attachment. The locations of remote cameras deployed within the GTR 3 project area over the survey period are shown in Figure 3.

Precise camera locations are found in Appendix 5. The various iterations of the alignment have resulted in a refinement of the project area, as a result, only 13 of these cameras now occur within the GTR 3 project area. Cameras were attached to a tree trunk approximately 40 centimetres above ground level in order to target ground dwelling species. Cameras were deployed facing a lure station containing standard mammal bait (oats, peanut butter, golden syrup and truffle oil) located approximately 2 meters from the remote camera to lure animals within the camera's sensor range. The range and capture position of the camera was trialled and reviewed on a handheld camera following each attachment prior to programming.

All cameras were programmed to take three photos per trigger event, with no delay between triggers. All remote cameras were set to a 'high' sensitivity and programmed to operate continuously over the entire period in which they were deployed. All cameras were deployed between 26 and 27 April 2022 and collected on the 17 and 18 May 2022, with the exception of two cameras (Camera 50 and Camera 51) which were collected during detailed botanical assessment of the assessment corridor within GTR 1 on the 21 June 2022.

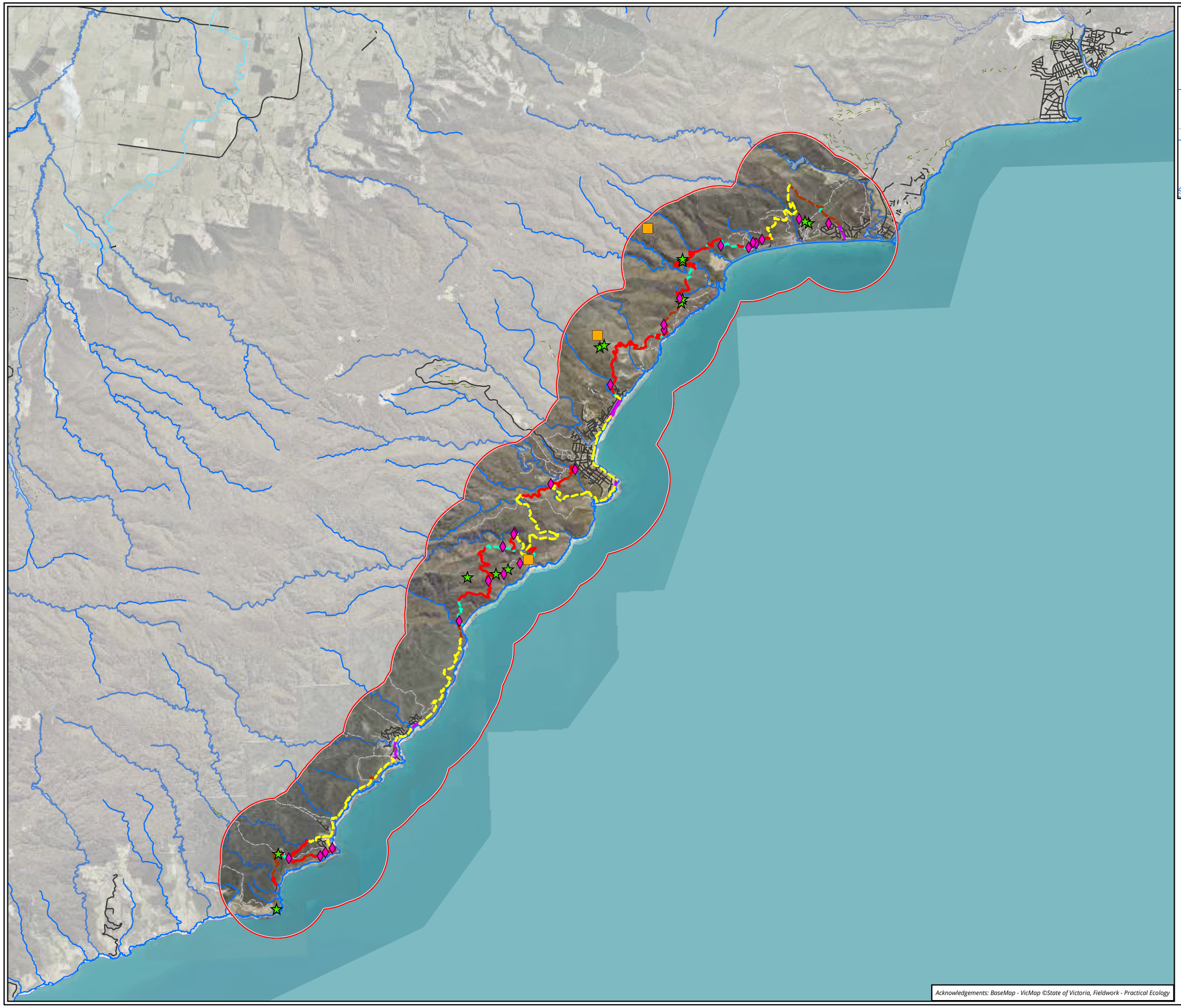
2.4.4.1 Additional fauna surveys and expert recommendations

Based on the recommendations provided by Biosis from the results of fauna assessments undertaken in 2022, further consideration and targeted survey were recommended for two EPBC and FFG Act listed fauna, Swamp Antechinus *Antechinus minimus maritimus* and Broad-toothed Rat *Mastacomys fuscus mordicus*, and one FFG Act listed fauna, the Otway Burrowing Crayfish *Engaeus fultoni.* The following documents relevant to these species were provided by to Biosis by DEECA (Barwon South West) in April 2024 and have been reviewed and incorporated into the subsequent results and recommendations sections where appropriate:

- GORCT Fauna Technical Survey Outcomes March 2024 (DEECA & GORCT Project Team 2024).
- Great Ocean Road Coastal Trail: *Phytophthora* dieback Management Plan: Great Ocean Road Coastal Trail construction and operations management of the threat from Phytophthora dieback (State of the Environment Pty Ltd 2023).
- Barwon South West Environmental Work Standards (DEECA 2024).
- Barwon South West – Biodiversity Risk Register (DEECA 2023a).

- Recovery management guidelines for the threatened Swamp antechinus, Ant*echinus minimus maritimus* in the Otways (Wild Otways Initiative 2023a).
- Recovery management guidelines for the threatened Broad tooth rat, *Mastacomys fuscus mordicus* in the Otways (Wild Otways Initiative 2023b).

The information provided in these documents has been reviewed and endorsed by DEECA's Barwon South West Biodiversity Officer and the Barwon South West Program Manager - Natural Environment.



Legend

- Project area
- Bird survey location
- VQA locations
- Camera location

Trail alignment

- Beach/Rock Shelf
- Existing Informal Trail
- Existing MVO Track
- Existing Road/Footpath
- Existing Walking Trail
- New Walking Trail

Figure 3.1 Survey effort in the project area

0 1,000 2,000 3,000 4,000

Metres

Scale: 1:130,000 @ A3

Coordinate System: GDA 1994 VICGRID94

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Matter: 35990,
Date: 06 June 2024,
Prepared for: ST, Prepared by: MK, Last edited by: mknudsen
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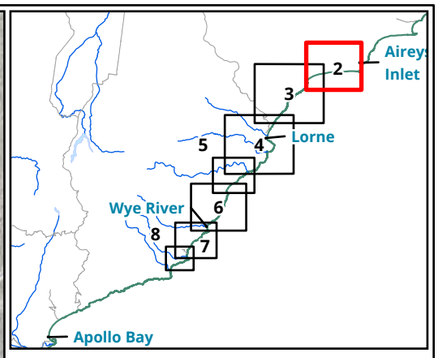

Legend

- Project area
- VQA locations
- Camera location

Trail alignment

- Existing Informal Trail
- Existing MVO Track
- Existing Road/Footpath
- Existing Walking Trail
- New Walking Trail

Figure 3.2 Survey effort in the project area

0 200 400 600 800

Metres

Scale: 1:20,000 @ A3

Coordinate System: GDA 1994 VICGRID94

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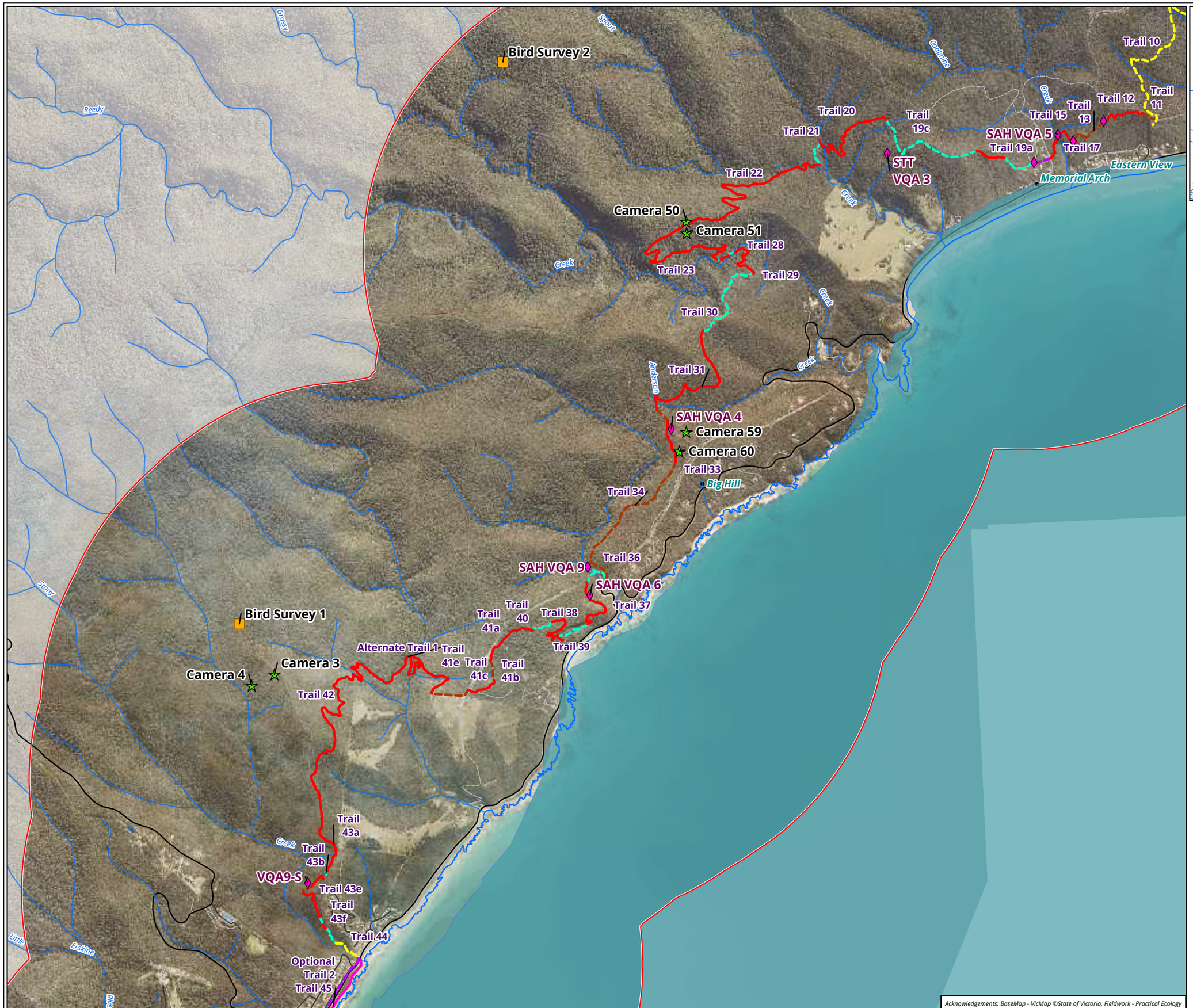

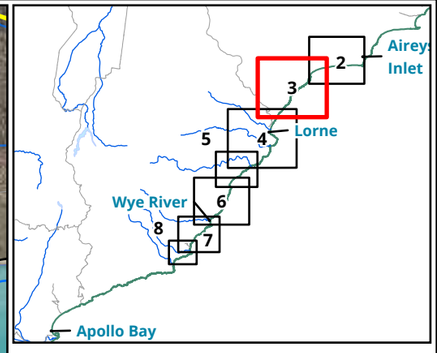

Legend

- Project area
- Bird survey location
- VQA locations
- Camera location

Trail alignment

- Beach/Rock Shelf
- Existing Informal Trail
- Existing MVO Track
- Existing Road/Footpath
- Existing Walking Trail
- New Walking Trail

Figure 3.3 Survey effort in the project area

0 250 500 750 1,000

Metres

Scale: 1:25,000 @ A3

Coordinate System: GDA 1994 VICGRID94

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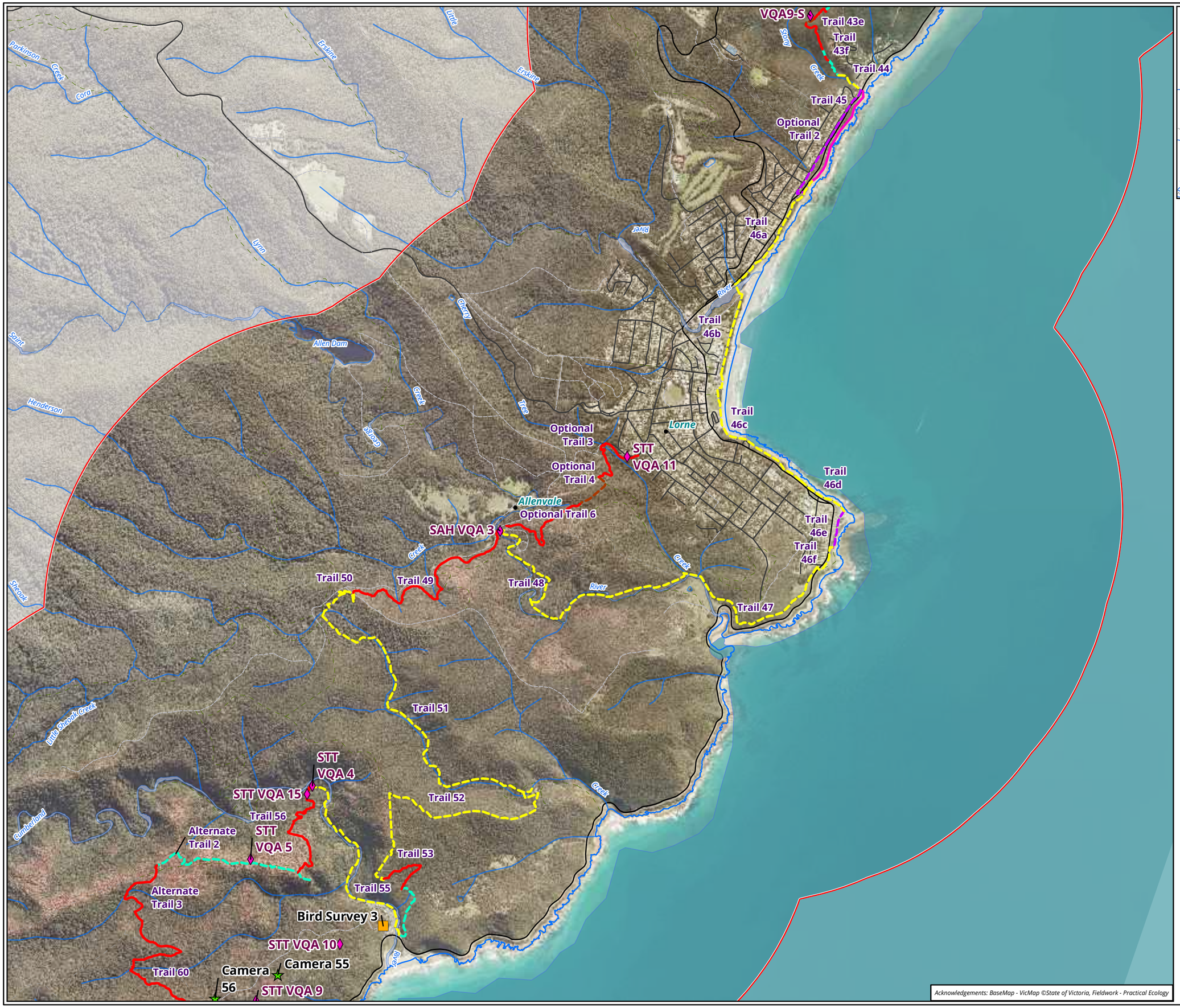

Legend

- Project area
- Bird survey location
- VQA locations
- Camera location

Trail alignment

- Beach/Rock Shelf
- Existing Informal Trail
- Existing MVO Track
- Existing Road/Footpath
- Existing Walking Trail
- New Walking Trail

Figure 3.4 Survey effort in the project area

0 250 500 750 1,000

Metres

Scale: 1:25,000 @ A3

Coordinate System: GDA 1994 VICGRID94

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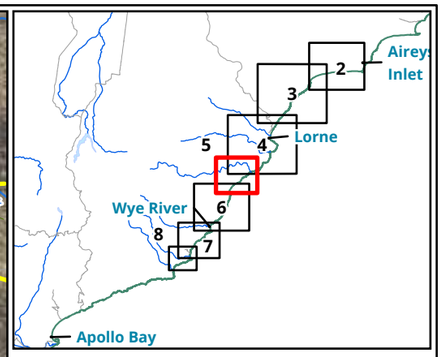

Legend

- Project area
- Bird survey location
- VQA locations
- Camera location

Trail alignment

- Existing Informal Trail
- Existing MVO Track
- Existing Walking Trail
- New Walking Trail

Figure 3.5 Survey effort in the project area

0 150 300 450 600

Metres

Scale: 1:15,000 @ A3

Coordinate System: GDA 1994 VICGRID94

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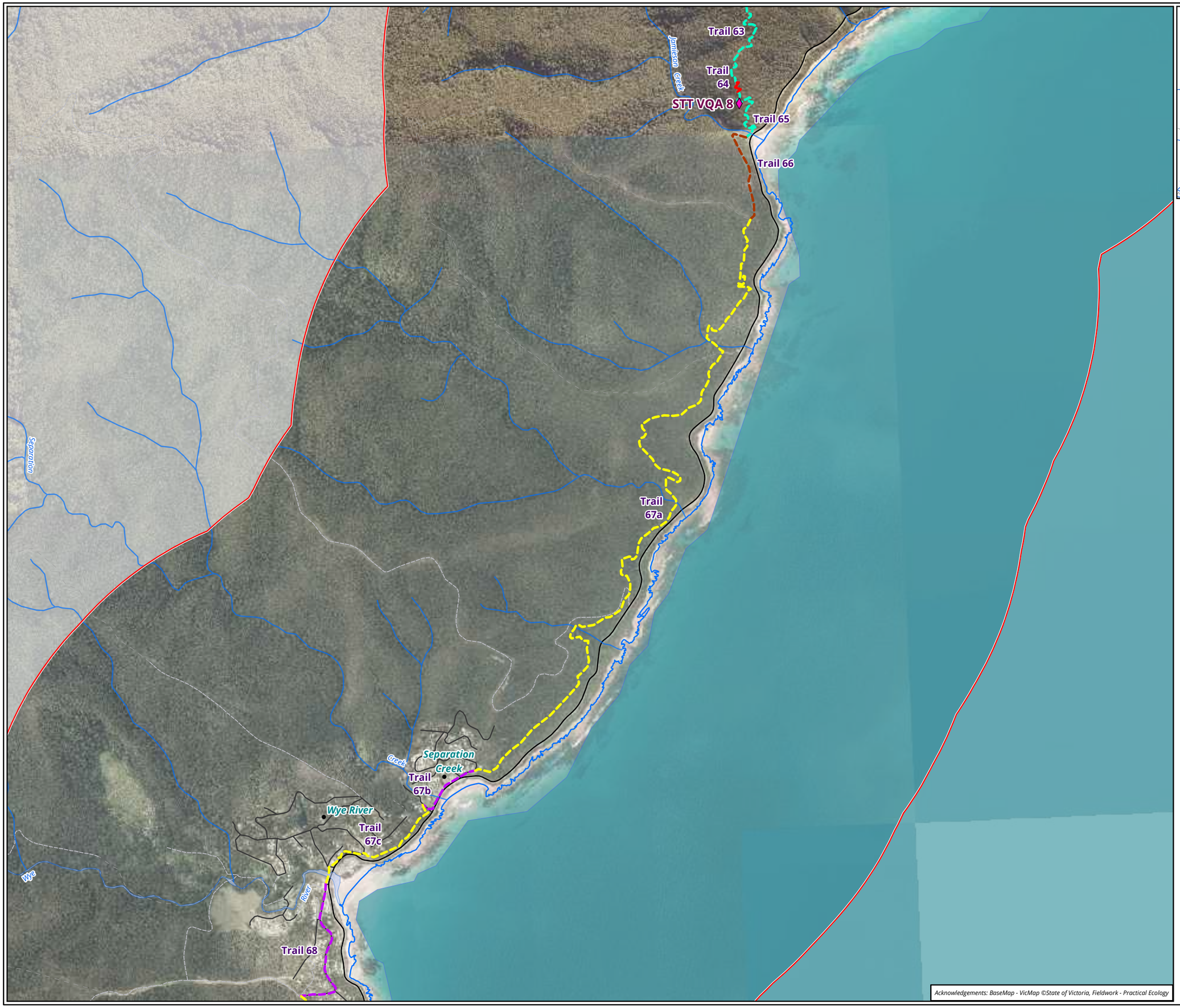

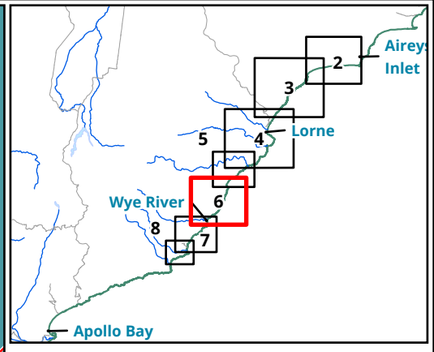

Legend

- Project area
- VQA locations

Trail alignment

- Existing Informal Trail
- Existing MVO Track
- Existing Road/Footpath
- Existing Walking Trail
- New Walking Trail

Figure 3.6 Survey effort in the project area

0 200 400 600 800

Metres
Scale: 1:20,000 @ A3
Coordinate System: GDA 1994 VICGRID94

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Date: 06 June 2024,
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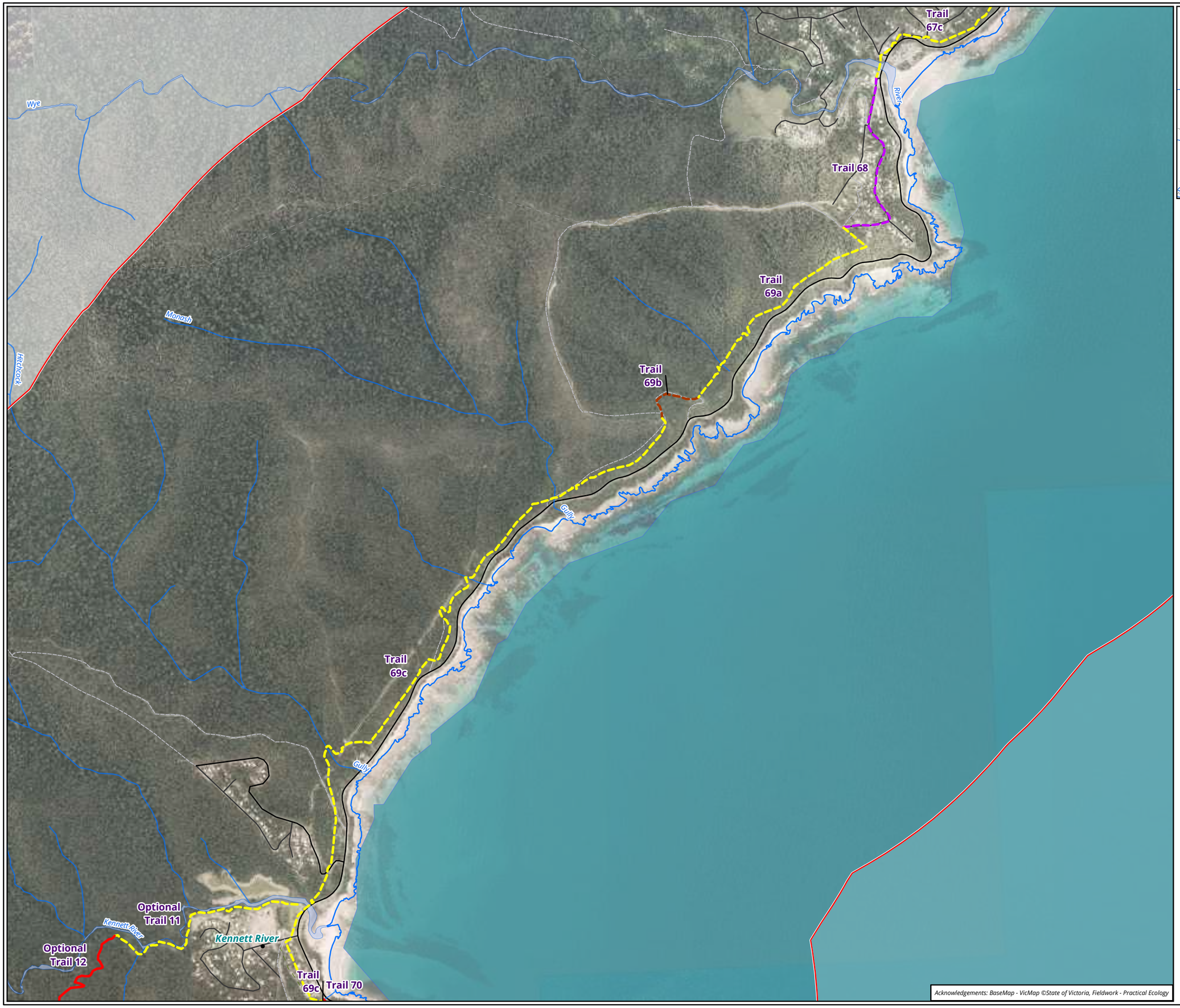

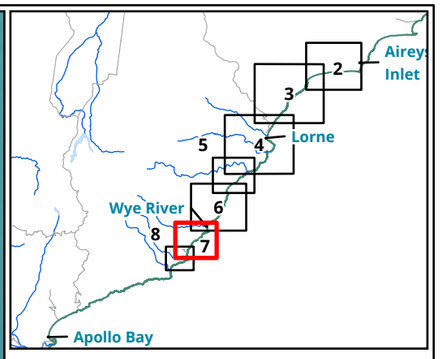

Legend

- Project area
- VQA locations

Trail alignment

- Existing MVO Track
- Existing Road/Footpath
- Existing Walking Trail
- New Walking Trail

Figure 3.7 Survey effort in the project area

0 150 300 450 600

Metres

Scale: 1:15,000 @ A3

Coordinate System: GDA 1994 VICGRID94

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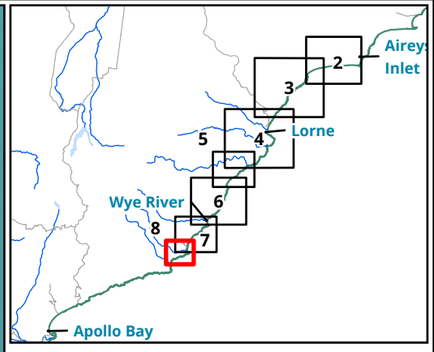

Legend

- Project area
- VQA locations
- Camera location

Trail alignment

- Existing Informal Trail
- Existing MVO Track
- Existing Walking Trail
- New Walking Trail

Figure 3.8 Survey effort in the project area

0 100 200 300 400

Metres

Scale: 1:10,000 @ A3

Coordinate System: GDA 1994 VICGRID94

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2.4.5 Permits

Biosis undertakes flora and fauna assessments under the following permits and approvals:

- Wildlife Authorisation issued by DEECA under the *Victorian Wildlife Act 1975* (Permit Number 10010193)
- Permit to Take/Keep Protected Flora issued by DEECA under the *Flora and Fauna Guarantee Act 1988* (FFG Act) (Permit Number 10010194)
- Permit to Take Protected Fish issued by DEECA under the *Flora and Fauna Guarantee Act 1988* (FFG Act) (Permit Number 10010195)
- Permit to Conduct Research in areas managed by the Parks Victoria issued by DEECA under the *National Parks Act 1975*, *Crown Land (Reserves) Act 1978* and *Parks Victoria Act 2018* (Permit Number 10010071)
- Permit to catch and release fish issued by the Victorian Fisheries Authority under the *Victorian Fisheries Act 1995* (Permit Number RP 1220, Personal File Number 13041)
- Approvals 18.21 and 20.21 issued by the Wildlife and Small Institutions Animal Ethics Committee of the Victorian Government Department of Economic Development, Jobs, Transport and Resources (DEDJTR)
- Scientific Procedures Fieldwork Licence issued by DEDJTR's Wildlife and Small Institutions Animal Ethics Committee (Licence Number 20020).

2.4.6 Expert consultation

During this ecological assessment, World Trail and Biosis contacted local experts to discuss and identify biodiversity values that may be impacted by the construction of the proposed walking trail. The intent of meetings was to identify local biodiversity values and propose mitigation measures for their protection. Specific consultation included:

- Site meeting at Coalmine Creek with World Trail, Dr Barbara Wilson, Dr Mark Garkaklis and Corangamite CMA (small mammal refuges (Wilson & Garkaklis 2020) and *Phytophthora cinnamomi*).
- Consultation with Biosis and Dr Barbara Wilson (small mammal refuges, and mitigation measures).
- Consultation with Biosis and Dr Mark Garkaklis (*Phytophthora cinnamomi* and the Phytophthora dieback disease, and the vectors, mitigation methods and Priority Protection Areas (Wilson et al. 2020)).

2.5 Qualifications

Ecological surveys provide a sampling of flora and fauna at a given time and season. There are a number of reasons why not all species will be detected at a site during survey, such as low abundance, patchy distribution, species dormancy, seasonal conditions, and migration and breeding behaviours. In many cases these factors do not present a significant limitation to assessing the overall biodiversity values of a site.

The flora and fauna assessment was conducted across multiple seasons. The detailed flora assessment occurred in late autumn/early winter, which is not an optimal time for survey. Many flora species do not have any reproductive material available for identification to the species level. The survey effort is considered sufficient to assess the general values of the project area and undertake biodiversity impact assessments that are required. It is also deemed sufficient for the detection of habitat for threatened flora species, and in some cases, their identification, which will help inform future targeted surveys and trail alignment changes.

Weather conditions were mostly fine during the detailed flora assessment with one day of poor conditions (i.e. drizzle) during the May survey. All trail alignments that were labelled as 'new trail' or 'existing informal trail' as defined by the World Trail Pty Ltd georeferenced alignment were walked. One section beneath a proposed bridge was not assessed as the height was deemed in excess of impacting the vegetation and habitat below. Here the vegetation was assessed until the edge of the gorge (trail 58). Furthermore, late design changes to GTR 1 resulted in the following trails not being assessed: alternate 4 to alternate 8.

The location of remote camera traps and owl/bird surveys were limited due to poor condition of roads after heavy rainfall. The timing of surveys was suitable for mammals, however diurnal bird surveys were conducted outside of the optimal time of year (spring) and time of day (sunrise/early morning). Incidental observations were recorded to capture any potential missing species data.

Native Vegetation Removal Reports are prepared through DEECA's NVIM system or requested through DEECA's Ensym NVR Tool Support team. Biosis supplies relevant site-based spatial information as inputs to DEECA and we are entirely reliant on DEECA's output reports for all assessment pathway applications. Biosis makes every effort to ensure site and spatial information entered into the NVIM, or supplied to DEECA, is an accurate reflection of proposed native vegetation removal. The Native Vegetation Removal Report can be viewed in Appendix 8.

2.6 Legislation and policy

The implications for the project were assessed in relation to key biodiversity legislation and policy including:

- Matters listed under the EPBC Act, associated policy statements, significant impacts guidelines, listing advice and key threatening processes.
- Threatened taxa, communities and threatening processes listed under Section 11 of the FFG Act and associated action statements, final recommendation reports and listing advice.
- *Planning and Environment Act 1987* including the Guidelines for the removal, destruction or lopping of native vegetation (DELWP 2017a).
- *Procedure for the removal, destruction or lopping of native vegetation on Crown land* (DELWP 2018).
- The Surf Coast and Colac Otway Planning Schemes.
- *National Parks Act 1975.*
- *Reference Areas Act 1978.*
- *Heritage Rivers Act 1992.*
- Noxious weeds and pest animals lists under the *Catchment and Land Protection Act 1994* (CaLP Act).
- *Environment Effects Act 1978.*
- *Fisheries Act 1995.*
- *Water Act 1989.*
- *Environment Protection Act 2017.*

Other pieces of legislation relating to biodiversity, and are addressed in the project planning approvals strategy (Biosis 2022c), include:

- *Marine and Coastal Act 2018.*
- *Great Ocean Road and Environs Protection Act 2020*.

2.7 Mapping

World Trail Pty Ltd supplied the georeferenced centreline trail alignment (GTR 1, GTR 2 and GTR 3), and all trails were marked with orange flagging tape by the trail designers before Biosis' detailed field work. Biosis applied a 10 metre buffer (termed: assessment corridor) to the centreline to define the area relevant for the detailed assessment.

Mapping was conducted using hand-held GPS-enabled tablets and aerial photo interpretation. The accuracy of this mapping is therefore subject to the accuracy of the tablets (generally ± 3 to 7 metres depending on terrain and tree canopy cover) and dependent on the limitations of aerial photo rectification and registration.

Mapping has been produced using a Geographic Information System (GIS). Electronic GIS files which contain our flora and fauna spatial data are available to incorporate into design concept plans. However this mapping may not be sufficiently precise for detailed design purposes.

3. Results

This section summarises the key ecological values identified within the assessment corridor and broader GTR 3 project area and assessment corridor, where relevant.

The ecological features of the project area and assessment corridor are described below, summarised in Table 6 and mapped in Figure 5. Species recorded during the flora and fauna assessment are listed in Appendix 1 (flora) and Appendix 2 (fauna). Unless of particular note, these species are not discussed further. Those species recorded or predicted to occur in the local area are also provided in those appendices, along with an assessment of the likelihood of the species occurring within the project area.

3.1 Landscape context

The Otway Plain

The Otway Plain bioregion occurs at the north-east end of the project area around Fairhaven. This bioregion is characterised by sloping coastal plains occurring from the coastline to 200 metres in elevation (VRO 2022). The region has a temperate climate, dominated by westerly winds and receives an average annual rainfall ranging between 552 – 899 millimetres (VRO 2022). However, the Otway ranges to the south-west of the Otway Plain in the project area creates a rain shadow effect which significantly decreases the amount of precipitation around the Anglesea area (RBGV 2021a).

While much of the vegetation has been cleared and replaced with land uses for cropping and settlement (Royal Botanic Gardens Victoria 2022), there are a number of notable public reserves that contain the majority of native vegetation and habitat within the project area. These reserves include the Great Otway National Park and a number of coastal reserves such as Fairhaven Coastal Reserve and Boonah Coastal Reserve. Other nearby marine and coastal conservation reserves include the Eagle Rock Marine Sanctuary and the Lorne – Queenscliff Coastal Reserve.

Vegetation of the Otway Plain in the project area, consists largely of coastal heathlands that are dominated by Tea-tree *Leptospermum* spp. The community grades into woodland dominated by Swamp Gum *Eucalyptus ovata*, Brown Stringybark *E. baxteri* or Messmate *E. obliqua*, all with a heath-dominated understorey. Dry sclerophyll forests are also present, co-dominated by Swamp Gum and Brown Stringybark. The major waterway is Painkalac Creek which feeds into saltmarsh wetlands dominated by Beaded Glasswort *Sarcocornia quinqueflora* and Sea Rush *Juncus kraussii* on the mud flats (Royal Botanic Gardens Victoria 2022).

The Otway Ranges

The Otway Ranges bioregion includes the majority of the project area, starting at the western extent of the Otway Plain until the south-west end of the project area at Grey River. The landscape here is characterised by steep topography on the southern coastal fall of the ranges, although terrain immediately adjacent to the coast can be gentler slopes (VRO 2022).

The climate is associated with the topography of the ranges, but primarily consists of hot, dry summers and cool, wet winters. Rainfall is more frequent in winter and spring, the wettest regions of the Otway Ranges experiencing annual rainfall greater than 1800 millimetres (Pitt 1981).

In the project area, vegetation within the Otway Ranges Bioregion is largely comprised of forests and woodlands. These vegetation types include Cool Temperate Rainforest that is widespread in the region, however has declined markedly since European settlement (Royal Botanic Gardens of Victoria 2022). This

vegetation community is usually co-dominated by Myrtle Beech *Nothofagus cunninghamii* and Blackwood *Acacia melanoxylon* occurring in gullies. Wet sclerophyll forest is the dominant vegetation within the project area and is comprised of a tall canopy (exceeding 40 metres high). A variety of Eucalyptus species dominate this community, often driven by moisture levels. Wet sclerophyll forests are widespread throughout the region, occurring on the high rainfall slopes of the Otway Ranges (Royal Botanic Gardens of Victoria 2022).

The majority of vegetation cover throughout this part of the project area is continuous native vegetation forming part of the Great Otway National Park, broken up around settlements along the coastline.

3.2 Flora and vegetation

The project area is located on public land, primarily across conservation reserves such as the Great Otway National Park and various coastal conservation reserves. The area supports extensive tracts of native vegetation with all major structural components intact. Introduced flora were primarily recorded near settlements and areas of frequent human use such as adjacent to car parks, viewing platforms, picnic areas and roads. Introduced flora are discussed in more detail in Section 3.7.

The majority of the project area occurs on moderate to steep slopes that are largely excluded from public use. Evidence of unsanctioned dirt bike trails are scattered throughout the project area, as well as official management vehicle trails. The landscape has been subjected to differing fire regimes as a result of prescribed burning and natural bushfires. Sections of heathland within the Otway Plain are subjected to regular burning regimes, and the forested communities present in the Otway Ranges have been burnt less regularly. Although, it was evident that some forested areas were undergoing post-fire generation at different stages of recovery. Recent prescribed burns were evident around Lorne as well as bush fire recovery predominantly on the ridges west of the Cumberland River. The result is mosaic of vegetation types with various condition responses to the natural and prescribed burn regimes. Consequently, understorey shrubs can be over represented in some EVCs and dominant in regenerating communities three to five years post-burn, making the transition between EVCs more complex and difficult to detect.

A range of EVCs were recorded across the assessment area, their distribution largely driven by aspect and topography. Within the Otway Plain, heathy EVCs dominate the landscape. The vegetation communities are generally open woodland with a low canopy height. The most dominant EVCs within the assessment corridor are EVC 48 – Heathy Woodland and EVC 21 – Shrubby Dry Forest. Canopy species include Red Ironbark *Eucalyptus tricarpa*, Messmate Stringybark *Eucalyptus obliqua* and Southern Blue-gum *Eucalyptus globulus*. The understorey species within the Otway Plain are largely comprised of heathy species such as Austral Grass-tree *Xanthorrhoea australis*, Erect Guinea-flower *Hibbertia riparia* and Horny Cone-bush *Isopogon ceratophyllus*. Grasses are usually dominant as well, including Silvertop Wallaby-grass *Rytidosperma pallidum*.

The Otway Ranges Bioregion features characteristically steep topography intersected with major river systems. The vegetation communities are comprised mainly of tall wet forests supporting a mixed canopy of Southern Blue-gum, Mountain Grey-gum *Eucalyptus cypellocarpa*, Scentbark *Eucalyptus aromaphloia* and Messmate Stringybark. The ridges and drier slopes usually support EVC 21 - Shrubby Dry Forest which grades into EVC 45 – Shrubby Foothill Forest on the sheltered and lower slopes. The distinguishing features between the two EVCs is the composition of understorey shrubs. Shrubby Dry Forest is dominated by Fabaceae including Large-leaf Bush-pea *Pultenaea daphnoides*, Prickly Bush-pea *Pultenaea forsythiana* and Narrow-leaf Wattle *Acacia mucronata* subsp. *longifolia*. Whereas EVC 45 - Shrubby Foothill Forest is characterised by a denser shrub layer comprised of a mesic species, usually Musk Daisy-bush *Olearia argophylla* Snowy Daisy-bush *Olearia lirata* and Blanket Leaf *Bedfordia arborescens*.

Other EVCS occurring throughout the Otway Ranges include EVC 201 - Shrubby Wet Forest occupying sheltered gullies and is dominated by ferns such as Water Ferns *Blechnum* spp. and Rough Tree-fern *Cyathea*

australis. EVC 18 – Riparian Forest occupies the margins of the major river and creek systems. EVC 16 – Lowland Forest is also present in the damper, sheltered gullies at higher elevations on gentle slopes, and supports a varied shrub layer with heathy influences and a tall canopy of Messmate Stringybark. EVC 22 – Grassy Dry Forest is dominated by Common Tussock-grass *Poa labillardierei* and a canopy of scattered Southern Blue-Gum. This EVC was recorded in single location east of Lorne. EVC 48 – Heathy Woodland is largely confined to north-east of the Otway Range. EVC 161 – Coastal Headland Scrub is the dominant EVC along the coastline. It is a generally a treeless community with a very dense cover of shrubs and grasses on rocky headlands.

In summary, the flora and vegetation assessment recorded within the assessment corridor includes:

- Two EVCs within the Otway Plain Bioregion:
  - EVC 21 – Shrubby Dry Forest.
  - EVC 48 – Heathy Woodland.
- Eight EVCs within the Otway Ranges Bioregion:
  - EVC 16 – Lowland Forest.
  - EVC 18 – Riparian Forest.
  - EVC 21 – Shrubby Dry Forest.
  - EVC 22 – Grassy Dry Forest.
  - EVC 45 – Shrubby Foothill Forest.
  - EVC 48 – Heathy Woodland.
  - EVC 161 – Coastal Headland Scrub.
  - EVC 201 – Shrubby Wet Forest.
- 245 indigenous plant species (Appendix 1).
- 53 introduced plant species (including 10 noxious weed species, Appendix 1).
- Four threatened plant species (Appendix 1):
  - *Eucalyptus brookeriana* Brooker's Gum (FFG Act listed).
  - *Eucalyptus globulus* subsp. *globulus* Southern Blue-gum (FFG Act listed).
  - *Leiocarpa gatesii* Wrinkled Buttons (EPBC and FFG Act listed).
  - *Thomasia petalocalyx* Paper Flower (FFG Act listed).

Photos of EVCs and vegetation condition states are provided in Appendix 6. EVC descriptions are presented in Table 6.

3.2.1 Fauna and habitat types

Sixty-five native fauna species were recorded within the project area during the present assessment. A list of these species is provided in Appendix 2 (fauna), along with an assessment of the likelihood of occurrence of threatened species.

A diversity of habitat types occur in the project area within or nearby the assessment corridor. These habitat types are broadly described in the below sections, along with the predicted, recorded or known presence of locally common and threatened fauna.

Hollow-dependent fauna, sedentary fauna or fauna with relatively defined ecological niches and / or small home ranges are considered most likely to be impacted by the project due to their ecology and habitat requirements and the nature of the proposed activities, which may involve habitat loss and disturbance. These species, recorded or considered to have a medium or higher likelihood to occur within the assessment corridor, are summarised in Table 7.

Wet forests

Wet forest types such as EVC 45 - Shrubby Foothill Forest and EVC 201 - Shrubby Wet Forest dominate the project area and GTR 3 assessment corridor; predominantly occurring at higher elevations in the wettest parts of the range where they are sheltered from coastal winds. These EVCs consist of a medium to tall dense or scattered eucalypt forest over a variety of mid and understories comprised of shrubs, ferns, tree-ferns, graminoids and/or herbs.

Dense mid and groundstoreys of wetter forest types provide habitat for a diversity of ground-dwelling mammals including potential habitat for threatened species Long-nosed Potoroo *Potorous tridactylus tridactylus* and Broad-toothed Rat. These dense mid and groundstorey environments also provide habitat for a variety of locally common bird species, as well as threatened and/or migratory species such as Rufous Fantail *Rhipidura rufifrons* and Rufous Bristlebird *Dasyornis broadbenti*.

Tree canopies of Mountain Ash *Eucalyptus regnans*, Messmate Stringybark and Mountain Grey Gum provide nesting, perching and/or seasonal foraging resources (nectar and/or source of insects) for a diversity of common birds, including threatened and/or migratory species such as Gang-gang Cockatoo *Callocephalon fimbriatum*, Grey Goshawk *Accipiter novaehollandiae* and Satin Flycatcher *Myiagra cyanoleuca*.

A number of canopy trees throughout the project areas of GTR 3 and the project area were observed to contain hollows. These ecological features provide roosting and/or nesting opportunities for a range of common hollow-dependent birds, such as threatened species Powerful Owl *Ninox strenua* and Masked Owl *Tyto novaehollandiae*, arboreal mammals, i.e. Yellow-bellied Glider *Petaurus australis,* and microbats.

Seasonally wet depressions containing an abundance of logs and forest leaf litter provide habitat for reptiles and invertebrates, including threatened species; Southern Toadlet *Pseudophryne semimarmorata*, Otway Black Snail *Victaphanta compacta* and Otway Burrowing Crayfish..

Dry forests

Drier forest habitat types such as Shrubby Dry Forest and Grassy Dry Forest occur on exposed aspects such as ridge-lines and medium to steep upper slopes within the project area and nearby the GTR 3 assessment corridor. Both EVCs are dominated by a low to medium height of forest eucalypts, with Shrubby Dry Forest comprised of a medium to low shrub layer and Grassy Dry Forest dominated by a high diversity of drought-tolerant grasses and herbs.

Consistent with wetter forest types, the dense midstorey and groundstoreys of Shrubby Dry Forest provide habitat for a diversity of ground-dwelling mammals and birds, including potential habitat for Long-nosed Potoroo, Rufous Fantail and Rufous Bristlebird.

Tree canopies of Southern Blue Gum within drier forest types provide preferred habitat for Koala *Phascolarctos cinereus* and were observed to contain hollows. These ecological features may provide habitat for a diversity of locally common avifauna including threatened species such as the Barking Owl *Ninox connivens*. Open ground layers comprised of a high diversity of drought-tolerant grasses and herbs provide habitat and basking opportunities for a diversity of locally common reptiles.

Heath and heathy woodlands

Heath and heathy woodland types including EVC 6 - Sand Heathland and EVC 48 - Heathy Woodland predominantly occur in adjacent patches within the eastern section of the project area and nearby the GTR 3 assessment corridor. Both the midstorey and ground layer of Sand Heathland and Heathy Woodland are extensive and rich in sedges, grasses, low shrubs and herbs, providing a dense cover for a diversity of ground or mid-storey dwelling mammals including Swamp Antechinus *Antechinus minimus maritimus*, White-footed Dunnart *Sminthopsis leucopus*, Southern Brown Bandicoot *Isoodon obesulus*, Broad-toothed Rat and Long-nosed Potoroo.

The dense mid and groundstorey environment also provides habitat for a variety of locally common birds, reptiles and frogs and may provide habitat for threatened and/or migratory species such as Rufous Bristlebird, Chestnut-rumped Heathwren *Calamanthus pyrrhopygius*, Southern Toadlet and Bibron's Toadlet *Pseudophryne bibronii*. Heathy woodland was observed to provide habitat for the threatened Blue-winged Parrot *Neophema chrysostoma*, which are likely to also occur throughout a variety of woodland and forest habitats in the project area.

Coastal scrub and woodlands

Coastal Dune Scrub occurs on exposed foredunes and secondary dunes, along costal escarpments within the southern boundary of the GTR 3 project area. This EVC is characterized by a mosaic of grassland shrubs heavily influenced by coastal processes including wind, sand deposition and salt spray. In adjacent areas where soil moisture is higher in depressions associated with shallow water tables, a rich ground layer of herbs of grasses occurs under an overstorey of Manna Gum *Eucalyptus viminalis*, consistent with Damp-sands Herb-rich Woodland.

Coastal scrub and woodland environments provide habitat for a diversity of fauna including Swamp Antechinus, Southern Brown Bandicoot and White-footed Dunnart.

Aquatic habitats

The project area contains a diversity of freshwater aquatic and riparian habitats consisting of numerous creeks, rivers, drainage lines, seasonal gullies, damp depressions and coastal wetlands.

Riparian systems are known to have a strong connection with instream systems and are sensitive to indicators of environmental change. The majority of rivers, streams and creeks within the project area are surrounded by Riparian Forest or Coastal Dune Scrub. The limited modification of terrestrial riparian habitat is highlighted by limited disturbance or modification to channel and instream habitats, which were observed to contain a diversity of flow conditions and depths (fast-shallow, slow-shallow, fast-deep) and instream structural complexity.

Stream habitat consists of both the underwater habitat provided by the shape of the stream channel (channel habitat) and the aquatic habitat provided within the stream channel (or instream habitat). Slow-flow, backwater, semi-permanent or permanent instream pool/run environments within rivers, streams and creeks within the project area are likely to contain significant areas of overhanging vegetation, root cover, submerged rocks, woody debris, leaf packs and detritus. These habitat features are likely to provide habitat for a diversity of locally common species of frogs, fish, mammals (e.g. Rakali *Hydromys chrysogaster*), sensitive macroinvertebrates (e.g. Stoneflies and Caddisflies) as well as FFG Act listed threatened species Platypus *Ornithorhynchus anatinus* and Otway Bush Yabby *Geocharax tasmanicus*.

Boulders and rocky outcrops situated within riparian zones of waterway are likely to provide roosting sites for a diversity of birds and basking sites for reptiles, whilst fallen leaf litter and bark within and adjacent to rivers,

creeks, drainage lines, wetlands and damp areas provide habitat for FFG Act listed species Otway Burrowing Crayfish (a terrestrial species that is reliant on subsurface riparian water).

Wetlands located within forested and undisturbed environments observed nearby or within the assessment corridor were observed to contain macrophytes and provide high quality foraging and breeding habitat for a diversity of locally common waterbirds, fish and frogs. The threatened Latham's Snipe *Gallinago hardwickii* are known to regularly occur nearby the project area at Painkalac Creek, Aireys Inlet. Latham's Snipe may occasionally occur in estuarine and freshwater wetland habitat such as Erskine River and Kennett River during their non-breeding season.

Some sections of the indicative trail alignments within the assessment corridor are adjacent to larger rivers and creeks which connect with estuarine and marine environments. Diadromous species such as the EPBC Act listed Australian Grayling *Prototroctes maraena* and FFG Act listed Australian Mudfish *Neochanna cleaveri* have been recorded within a number of these larger waterways.

Coastal beaches

Coastal environments within the GTR 3 project area include sandy beaches, escarpment cliffs and intertidal areas. Sandy beaches and rock pools provide habitat for a diversity of locally common raptors, sea or shorebirds including threatened species White-bellied Sea-eagle *Haliaeetus leucogaster* and Hooded Plover *Thinornis cucullatus*.

Table 6 Summary of vegetation and habitat types within the assessment corridor

Vegetation or habitat type	Description	Location	Fauna habitat and significant values
Otway Plain Bioregion			
EVC 21 - Shrubby Dry Forest (**Photo 3**) **Bioregional Conservation Status (BCS):** Least Concern **Significant Ecological Community:** No	**Condition State:** High **Description:** Tall, dry forest to 30 m tall. The characteristic canopy trees include Red Ironbark, and Messmate Stringybark. The understorey supports a diversity of taxa including Varnish Wattle *Acacia verniciflua* and Prickly Moses *Acacia verticillata*. The ground flora is sparse and consist of Honey-pots *Acrotriche serrulata* and other heath species. The grass and herb component consists of Common Raspwort *Gonocarpus tetragynus,* Pennywort *Hydrocotyle* spp., and Hairy Rice-grass *Tetrarrhena distichophylla.* Open areas of Inter-tussock spaces are comprised of leaf litter and a diversity of mosses.	Usually occupying drier slopes and ridges.	Habitat for the following threatened and/or migratory fauna: • Long-nosed Potoroo • Southern Brown Bandicoot Habitat for the following threatened flora: • Wrinkled Buttons

Vegetation or habitat type	Description	Location	Fauna habitat and significant values
EVC 48 – Heathy Woodland (Photo 4) **Bioregional Conservation Status (BCS):** Least Concern **Significant Ecological Community:** No	**Condition State:** High **Description:** Low woodland dominated by Messmate Stringybark and Brown Stringybark. The understorey is characterised by abundant Austral Grass-tree, and a diverse range of heaths including Erect Guinea-flower and Bundled Guinea-flower *Hibbertia fasciculata* var. *prostrata.* **Condition State:** Moderate **Description**: As for high condition state, however the mid layer (shrubs and heaths) has been removed to function as a strategic fuel break. Scattered weeds are present in low densities and include Bluebell Creeper *Billardiera heterophylla*, and Flatweed *Hypochaeris radicata.*	Low to mid-slopes, a common EVC of the Otway Plains, particularly along the coast.	Provides suitable habitat for a wide range of threatened flora and fauna including: • Dense Leek-orchid • Green-striped Greenhood • Spiral Sun-orchid • Paper Flower (recorded) • Blue-winged Parrot • Long-nosed Potoroo • Broad-toothed Rat • Chestnut-rumped Heathwren • White-footed Dunnart • Southern Brown Bandicoot • Swamp Antechinus • Southern Toadlet • Rufous Bristlebird • Other FFG Act listed species (Table 8)

Vegetation or habitat type	Description	Location	Fauna habitat and significant values
The Otway Ranges Bioregion			
EVC 16 Lowland Forest **(Photo 5)** **Bioregional Conservation Status (BCS):** Depleted **Significant Ecological Community:** No	**Condition State:** High **Description:** Forest to 25 m tall, usually dominated by Messmate Stringybark, and often accompanied by Scent Bark and Blue Gum. The understorey is characterised by scattered shrubs and heaths including Prickly Moses and Common Heath. The ground layer consists of Thatch Saw-sedge *Gahnia radula* and a range of herbs including orchid species Small Mosquito-orchid *Acianthus pusillus* and Greenhoods *Pterostylis* spp. on a rich loamy soil.	Elevated ridges and saddles.	Habitat for the following threatened and/or migratory fauna: • Long-nosed Potoroo • Swamp Antechinus • Rufous Fantail • Satin Flycatcher • Gang-gang Cockatoo • White-footed Dunnart • Grey Goshawk • Powerful Owl • Masked Owl Suitable habitat for the following threatened flora species: • Green-striped Greenhood
EVC 18 – Riparian Forest **(Photo 6)** **Bioregional Conservation Status (BCS):** Least Concern **Significant Ecological Community:** No	**Condition State:** High **Description:** Tall forest to 40 m tall dominated by Manna Gum *Eucalyptus viminalis* spp. *viminalis* with mesic sub-canopy or tall understorey species that include Blackwood *Acacia melanoxylon* and Hazel Pomaderris *Pomaderris aspera*. Understorey also supports ground ferns and a range of graminoids such as Spiny-headed Mat-rush *Lomandra longifolia* and Tall Sedge *Carex appressa.* **Condition State:** Low **Description:** Similar to high condition	Usually adjacent to major river systems and large tributaries.	Habitat for the following threatened and/or migratory fauna: • Otway Black Snail • Otway Burrowing Crayfish • Platypus • Long-nosed Potoroo • Swamp Antechinus • Broad-toothed Rat • Spot-tail Quoll • Rufous Fantail • Satin Flycatcher • Gang-gang Cockatoo • Grey Goshawk • Powerful Owl

Vegetation or habitat type	Description	Location	Fauna habitat and significant values
	state, however, the mid storey may have been removed through historical clearing and the ground flora is largely comprised of weeds such as Sweet Vernal *Anthoxanthum odoratum* and White Arum-lily *Zantedeschia aethiopica.*		• Masked Owl
EVC 21 – Shrubby Dry Forest **Bioregional Conservation Status (BCS):** Least Concern **Significant Ecological Community:** No	**Condition State:** High **Description:** Tall, dry forest to 30 m tall. The characteristic canopy trees include Red Ironbark, and Scent Bark. The understorey supports a diversity of taxa from Fabaceae but usually Prickly Bush-pea and Large-leaf Bush-pea. The ground flora is floristically diverse however has high inter-tussock space comprised of leaf litter and mosses. Ground flora species consist of Honey-pots, Common Heath and a large variety of herbs including Ivy-leaf Violet *Viola hederacea*, Raspwort and Kidney Weed. Some sections had been burnt within the last 5 years and are experiencing post-fire recovery. These areas had very dense understorey of Hop Wattle *Acacia stricta*, Large-leaf Bush-pea and Hop Goodenia *Goodenia ovata*. **Condition State:** Moderate **Description:** As for high condition state, however the understorey consisted of a	Usually along the ridges and drier slopes of the ranges, particularly those with a north or west aspect.	The EPBC Act listed Wrinkled Buttons was recorded in the high quality habitats of this EVC. Habitat for the following threatened and/or migratory fauna: • Long-nosed Potoroo • Southern Brown Bandicoot • Powerful Owl • Barking Owl

Vegetation or habitat type	Description	Location	Fauna habitat and significant values
	higher proportion of high threat weeds that include Sweet Pittosporum *Pittosporum undulatum* and Boneseed *Chrysanthemoides monilifera.*		
EVC 22 – Grassy Dry Forest (Photo 7) **Bioregional Conservation Status (BCS):** Depleted **Significant Ecological Community:** No	**Condition State:** Moderate **Description:** Tall forest with a Southern Blue-gum canopy. This EVC had a dominance of Common Tussock-grass as the understorey species. Scattered shrubs occurred through including Shrubby Spurge *Phyllanthus gunnii* and Sticky Boobialla *Myoporum petiolatum*. Weeds included scattered Sweet Pittosporum and Boneseed, and abundant Panic Veldt-grass *Ehrharta erecta* and herbaceous weeds.	Elevated drier aspects and ridges.	Habitat for the threatened Blue-winged Parrot and Powerful Owl.
EVC 45 – Shrubby Foothill Forest (Photo 8) **Bioregional Conservation Status (BCS):** Least Concern **Significant Ecological Community:** No	**Condition State:** High **Description:** A tall forest dominated by a range of canopy species including Messmate Stringybark, Mountain Grey-gum and Southern Blue-gum. Understorey to 5 m dominated by mesic shrubs including Hop Goodenia, Musk Daisy-bush, and Snowy Daisy-bush. The ground layer is usually dominated by a mix of graminoides including Forest Wire-grass *Tetrarrhena juncea* and Weeping Grass *Microlaena stipoides* var. *stipoides.*	Mid to low, sheltered slopes, particularly with a southern or eastern aspect. Distributed broadly across the project area.	Habitat for the following threatened and/or migratory fauna: • Long-nosed Potoroo • Swamp Antechinus • Rufous Fantail • Yellow-bellied Glider • Satin Flycatcher • Gang-gang Cockatoo • Grey Goshawk • Powerful Owl • Masked Owl • Barking Owl • Southern Toadlet

Vegetation or habitat type	Description	Location	Fauna habitat and significant values
	Condition State: Moderate **Description:** As for high condition state, except the patch contains a higher proportion of weeds (usually Boneseed and Sweet Pittosporum) contributing to approximately 20% Projective Foliage Cover (PFC). **Condition State:** Low **Description:** This condition state has been significantly modified. The key canopy species are present (Mountain Grey-gum and Messmate Stringybark). The mid-storey has been removed and the ground flora has been slashed to function as a strategic fuel break. Weeds have colonised the majority of the ground flora and is now comprised of Blue Periwinkle *Vina major*, English Ivy *Hedera helix* and Cocksfoot.		Habitat for the following threatened flora: • Western Peppermint • Dwarf Silver-wattle (particularly around Lorne) Threatened flora recorded: Wrinkled Buttons (at the higher elevations of the high condition state where the EVC grades to EVC 21 – Shrubby Dry Forest)
EVC 48 – Heathy Woodland **Bioregional Conservation Status (BCS):** Least Concern **Significant Ecological Community:** No	**Condition State:** High **Description:** as for Otway Plain description. **Condition State:** Moderate **Description:** as above however with a higher proportion of weeds including Flatweed and Large Quaking-grass *Briza maxima.*	Low to mid-slopes, of the Otway ranges. Primarily around Eastern View.	Provides suitable habitat for a wide range of threatened flora and fauna including: • Dense Leek-orchid • Green-striped Greenhood • Spiral Sun-orchid • Blue-winged Parrot • Long-nosed Potoroo • Chestnut-rumped Heathwren • White-footed Dunnart

Vegetation or habitat type	Description	Location	Fauna habitat and significant values
			• Southern Brown Bandicoot • Swamp Antechinus • Southern Toadlet • Rufous Bristlebird • And many FFG Act listed flora (Table 8)
EVC 161 – Coastal Headland Scrub (Photo 9) **Bioregional Conservation Status (BCS):** Depleted **Significant Ecological Community:** No	**Condition State:** High **Description:** Low shrubland to 4m tall, includes Drooping Sheoak *Allocasuarina verticillata*, Common Boobialla *Myoporum insulare*, Coast Beard-heath *Leucopogon parviflorus* and Tree Everlasting *Ozothamnus ferrugineus* with occasion Eucalypts such as Messmate Stringybark and Coast Manna-gum *Eucalyptus viminalis* subsp. *pryoriana*. The ground layer is diverse and characterised by Common Tussock-grass and a variety of lilies, herbs and forbs including Milkmaids *Burchardia umbellata,* Southern Tick-trefoil *Desmodium gunnii,* and Clustered Everlasting *Chrysocephalum semipapposum.* **Condition State:** Moderate **Description:** As for high condition state, however, the proportion of woody weeds increases such as Sweet Pittosporum and Panic Veldt Grass.	On exposed rocky headlands and steep slopes adjoining the coastline.	Provides suitable habitat for a wide range of threatened flora and fauna including: • Blue-winged Parrot • Swamp Antechinus • Long-nosed Potoroo • Southern Brown Bandicoot • White-footed Dunnart • Chestnut-rumped Heathwren • Rufous Bristlebird

Vegetation or habitat type	Description	Location	Fauna habitat and significant values
	Condition State: Low **Description:** as above, however the native ground layer is largely absent and the shrub layer has a dominance of invasive woody weeds, particularly dense patches of Sweet Pittosporum.		
EVC 201 – Shrubby Wet Forest (Photo 10) **Bioregional Conservation Status (BCS):** Least Concern **Significant Ecological Community:** No	**Condition State:** High **Description:** Tall forest with a canopy of Messmate Stringybark or Mountain Grey Gum. Ground ferns dominate the understorey including Water Fern and Rough Tree-fern. It comprises a higher diversity and cover of herbs including Forest Starwort *Stellaria flaccida* and Geraniums *Geranium* spp. due to increased light reaching the forest floor.	Gullies in lower areas near the coast and slopes in elevated higher rainfall areas.	Habitat for the following threatened and/or migratory fauna: • Otway Black Snail • Otway Burrowing Crayfish • Long-nosed Potoroo • Rufous Fantail • Rufous Bristlebird • Gang-gang Cockatoo • Grey Goshawk • Powerful Owl • Masked Owl • Southern Toadlet
Predominantly introduced vegetation	Cover of woody species such as Sweet Pittosporum and ground covers dominated by Sweet Vernal Grass dominate heavily disturbed areas.	Under powerline easement and along roadsides where native vegetation has been cleared.	Provides habitat for common bird species and known to be utilised by Southern Brown Bandicoot and Rufous Bristlebird. May provide foraging habitat for threatened Blue-winged Parrot.

Vegetation or habitat type	Description	Location	Fauna habitat and significant values
Riparian and aquatic habitats	The assessment corridor contains a small number of wetlands and intercepts numerous rivers and creeks (e.g. Cumberland River, Coalmine Creek, Spout Creek, Cherry Tree Creek).	Broadly across the project area	The creeks provide habitat for frogs, reptiles, fish, waterbirds including the threatened Latham's Snipe, Platypus and the Rakali. They also provide flyways and foraging habitat for microbats. Instream aquatic habitats traversed by the assessment corridor may provide habitat for the following threatened species: • Platypus • Otway Bush Yabby

3.3 Threatened species and ecological communities

Threatened species recorded or predicted to occur within 10 kilometres of the project area or from the relevant catchment (aquatic species) are listed in Appendix 1 (flora) and Appendix 2 (fauna) and displayed in Figure 6. An assessment of the likelihood of these species occurring in the project area and an indication of where within the site (i.e. which habitats or features of relevance to the species) is included. A summary of those species recorded or with a medium or higher likelihood of occurring in the project area is provided in Table 7. Species that have undergone targeted surveys and no longer have a medium to high likelihood of occurrence within the study area have been excluded from Table 7.

Table 7 Summary of EPBC and FFG Act listed species most likely to occur in the project area

Species name	Listing status	Area of value within the project area
Wrinkled Buttons (recorded by Biosis) (Photo 11)	Endangered under EPBC Act Critically endangered under FFG Act	Recorded within the assessment corridor from Moggs Creek to the south-west of Cumberland River area where populations were the greatest. Occurs primarily within EVC 21 – Shrubby Dry Forest across the project area.
Latham's Snipe	Vulnerable under EPBC Act	The species has been regularly recorded nearby the project area at Painkalac Creek, Aireys Inlet. Latham's Snipe may occasionally occur in estuarine and freshwater aquatic or wetland habitat such as Erskine River and Kennett River during their non-breeding season.
Gang-gang Cockatoo (recorded by Biosis)	Endangered under EPBC Act Endangered under FFG Act	Recorded within Shrubby Foothill Forest within the assessment corridor. May forage on Eucalypts and nest in tree hollows throughout assessment corridor, particularly in Wet Forest and Heathy Woodland.
Yellow-bellied Glider (recorded by Biosis)	Vulnerable under EPBC Act Vulnerable under FFG Act	Recorded within Shrubby Foothill Forest within the assessment corridor. Likely utilising Eucalypts and tree hollows throughout the assessment corridor.
White-throated Needletail	Vulnerable under EPBC Act Vulnerable under FFG Act	Individuals or flocks may regularly fly over assessment corridor on a regular basis. Some individuals may roost within densely treed environments within the assessment corridor on rare occasion.
Blue-winged Parrot (recorded by Biosis)	Vulnerable under EPBC Act	Recorded within the assessment corridor in Moggs Creek and Fairhaven areas. Individuals utilise a broad range of habitats and may forage in woodland, forest and scrub, and nest in tree hollows throughout assessment corridor. The species primarily breeds in Tasmania though a subset of the population breeds in southern Victoria (Commonwealth of Australia 2023).

Species name	Listing status	Area of value within the project area
Diamond Firetail	Vulnerable under the EPBC Act Vulnerable under the FFG Act	May infrequently occur within drier woodlands and heaths such Heathy Woodland present within the eastern sections of the assessment corridor.
Swamp Antechinus	Vulnerable under EPBC Act Vulnerable under FFG Act	Recorded by the Wild Otways Initiative at Grey River and along Coalmine Creek approximately 125 metres of trail alignment (Wild Otways Initiative 2023c), as well as more broadly in the region around Aireys Inlet and Painkalac Creek, and Moggs Creek (DEECA & GORCT Project Team 2024). May also be present in Riparian Forest (at lower elevations), Coastal Dune Scrub, Sand Heathland or Heathy Woodland within the assessment corridor.
Long-nosed Potoroo (recorded by Biosis)	Vulnerable under EPBC Act Vulnerable under FFG Act	Recorded on remote cameras deployed within the GTR 3 alignment. May occur throughout wetter forest types (e.g. Wet Forest, Shrubby Foothill Forest, etc.) as well as Coastal Dune Scrub intercepting the assessment corridor. High likelihood of occurring adjacent to Coalmine Creek, an identified refuge area for small mammal species (Wilson & Garkaklis 2020).
Broad-toothed Rat	Endangered under EPBC Act Vulnerable under FFG Act	Recorded from the existing trail alignment along Saint George River (Wild Otways Initiative 2023c). Assumed to occur adjacent to Coalmine Creek given the habitat suitability, though the species was not detected here by the Wild Otways Initiative surveys due to survey limitations (DEECA & GORCT Project Team 2024). May also regularly or occasionally occur in sedge or grass dominated drainage lines intercepting the assessment corridor.
Southern Brown Bandicoot	Endangered under EPBC Act Endangered under FFG Act.	May occur within Coastal Dune Scrub, Sand Heathland or Heathy Woodland intercepting the assessment corridor. High likelihood of occurring adjacent to Coalmine Creek, an identified refuge area for small mammal species (Wilson & Garkaklis 2020).
Grey-headed Flying-fox	Vulnerable under EPBC Act Vulnerable under FFG Act	Individuals may forage on flowering Eucalypts within assessment corridor on a regular basis.
Southern Bent-winged Bat	Critically endangered under EPBC Act Critically endangered under FFG Act	Likely to undertake nightly foraging overing assessment corridor on a regular basis. However, no roost or maternity caves occur within assessment corridor.

Species name	Listing status	Area of value within the project area
Australian Grayling	Vulnerable under EPBC Act Endangered under FFG Act	Diadromous species recorded within the estuaries of a number of rivers and creeks within GTR 3 project area. Individuals may occur within aquatic environments of a number of streams intercepted by the assessment corridor on occasion.
Grey Goshawk (recorded by Biosis)	Endangered under FFG Act	Recorded in the project area during fauna assessments. Likely to occur within wetter forest types (e.g. Wet Forest, Shrubby Foothill Forest, etc.) intercepting the assessment corridor, particularly in Riparian Forest.
White-bellied Sea-eagle (recorded by Biosis)	Endangered under FFG Act	Recorded during bird surveys within the broader GTR 1 project area. May forage over assessment corridor on regular basis, particularly in areas above Coastal Dune Scrub.
Barking Owl	Critically endangered under FFG Act	May forage, roost or nest within dry forest and woodland types, including Heathy Woodland, particularly in the eastern section of the assessment corridor (e.g. Airey's Inlet).
Powerful Owl (recorded by Biosis)	Vulnerable under FFG Act	Recorded during nocturnal surveys within the broader GTR 1 project area. May forage, roost or nest throughout forested environments within the broader assessment corridor.
Masked Owl	Vulnerable under FFG Act	May forage, roost or nest throughout forested environments within the assessment corridor.
Chestnut-rumped Heathwren	Vulnerable under FFG Act	May occur within Heathy Woodland present within the eastern sections of the assessment corridor.
Rufous Bristlebird (recorded by Biosis)	Vulnerable under FFG Act	Recorded within Coastal Dune Scrub and Shrubby Foothill Forest within the assessment corridor. May occur throughout a variety of EVCs intercepting the project area, where dense undergrowth is present.
White-footed Dunnart	Vulnerable under FFG Act	May occur within Sand Heathland, Heathy Woodland, Coastal Dune Scrub or Lowland Forest intercepted by the assessment corridor. High likelihood of occurring adjacent to Coalmine Creek, an identified refuge area for small mammal species.
Platypus	Vulnerable under FFG Act	May be present within numerous creeks and streams intercepted by the assessment corridor.
Eastern Bent-winged Bat	Critically endangered under FFG Act	The distribution of the Southern Bent-wing Bat and the Eastern Bent-wing Bat overlap in western Victoria. This species may forage over treed environments within the assessment corridor on a regular basis.

Species name	Listing status	Area of value within the project area
Brown Toadlet	Endangered under FFG Act	May occur in damp areas within open forests and woodland types within the eastern sections of the assessment corridor, such as Lowland Forest, Heathy Woodland and Sand Heathland.
Southern Toadlet	Endangered under FFG Act	May be present within damp areas throughout the assessment corridor, in Heathy Woodland, Shrubby Foothill Forest, Lowland Forest and Wet Forest.
Australian Mudfish	Endangered under FFG Act	May be present within numerous creeks and streams intercepted by the assessment corridor.
Otway Black Snail (Recorded by Biosis)	Endangered under FFG Act	Recorded on numerous occasions in EVC 201 - Wet Forest within the broader GTR 1 project area during assessment. May occur within EVC 18 – Riparian Forest and EVC 201 - Shrubby Wet Forest intersecting the GTR 3 trail alignment.
Otway Bush Yabby	Endangered under FFG Act	May be present within numerous creeks and streams intercepted by the assessment corridor.
Otway Burrowing Crayfish	Vulnerable under FFG Act	May occur throughout wetter forest types (e.g. EVC 201 Wet Forest, EVC 18 - Riparian Forest, etc.) intercepted by the assessment corridor >100 m in altitude within GTR 3 project area. Likely occurrence at 15 habitat hotspots identified along the trail alignment, including 10 hotspot locations along proposed new trails (DEECA & GORCT Project Team 2024).

A further 28 FFG Act listed flora species were either recorded or have a medium to high likelihood of occurring within the project area. Table 8 below summarises the key habitat types which support them.

Table 8 Summary of FFG Act listed flora most likely to occur in project area

Habitat type	Suitable habitat
Heathy woodland / Forests with heathy understorey	• Wiry Bossiaea • Angahook Pink-fingers • Robust Spider-orchid • Large White Spider-orchid • Slender Pink-fingers • Naked Beard-orchid • Top Bog-sedge • Nodding Baeckea • Hoary Rapier-sedge • Elegant Leek-orchid • Large Plume-orchid • Blotched Sun-orchid • Winter Sun-orchid • Pallid Sun-orchid • Merran's Sun-orchid • Paper Flower (recorded) • Tufted Grass-tree • Parsley Xanthosia • Southern Xanthosia
Dry forests	• Western Peppermint • Dwarf Silver-wattle (particularly around Lorne)
Damp / wet forests	• Brooker's Gum (recorded) • Southern Blue-gum (recorded) • Madeira Moss • Satinwood
Coastal sand dune / saltmarsh	• Salt Lawrencia • Coast Fescue • Dune Poa

3.3.1 DEECA habitat importance modelling for threatened species

To support decision making under the Guidelines, DEECA has produced maps for Victoria showing the modelled extent of habitat for most threatened species. These maps are called 'habitat importance maps' and they assign a 'habitat importance score' to a location based on the importance of that location in the landscape as habitat for a particular threatened species, in relation to other suitable habitat for that species (DELWP 2017a).

Under the Guidelines, these maps form the basis for determining the impact of potential native vegetation removal on threatened species. The maps only apply where a proposal to remove native vegetation is considered on detailed assessment pathway. The habitat importance scores are used to calculate the type and extent of biodiversity offsets required for native vegetation removal that impacts on individual threatened species habitat.

A summary of those species for which habitat is modelled in the assessment corridor is provided in the Native Vegetation removal report by DEECA (Appendix 7). A list of threatened species recorded in the project area is provided in Appendix 1 (flora) and Appendix 2 (fauna).

Determination of the requirement for a species offset based on the extent of impact to one or more rare or threatened species is addressed in Section 5.

3.3.2 Threatened ecological communities

Five EPBC Act listed threatened ecological communities (TECs) were predicted to occur, or are known to occur within the project area. These include:

- Assemblages of species associated with open-coast salt-wedge estuaries of western and central Victoria ecological community.
- Giant Kelp Marine Forests of South East Australia.
- Natural Damp Grassland of the Victorian Coastal Plains.
- Subtropical and Temperate Coastal Saltmarsh.
- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland.

Of these, only Assemblages of species associated with open-coast salt-wedge estuaries of western and central Victoria ecological community, and Subtropical and Temperate Coastal Saltmarsh are likely to be intersected by the trail alignment. Where the intersect occurs, existing bridges and roads are proposed to be included as part of the trail network. Further impacts to these TECs are therefore considered to be minor. Additionally, trail construction methodologies will occur under a site specific Construction Environmental Management Plan (CEMP) that outlines mitigations methods to reduce impacts on riparian systems and prevent downstream impacts. A significant impact is unlikely to occur on these TECs.

Two FFG Act listed threatened ecological communities were predicted to occur within the project area:

- Cool Temperate Rainforest Community (CTRC).
- Coastal Moonah (*Melaleuca lanceolata* subsp. *lanceolata*) Woodland Community.

Cool Temperate Rainforest Community was not recorded within the assessment corridor of GTR 3. It is likely to occur in the higher elevations within the sheltered gullies west of Lorne. Any future variations of the trail alignment that extend into that area will require consideration of the occurrence and impacts on this TEC.

Coastal Moonah Woodland Community is likely to intersect with the proposed trail alignment (GTR 3). However, existing trails are proposed for incorporating into the trail network through these sections. A significant impact on this TEC is not anticipated.

3.4 Other ecological values

Refuge areas for ground-dwelling mammals provide important habitat and resources to reduce the risk of local extinction, in areas with restricted or unfavourable conditions. Several refuge areas have been identified throughout the Otway Ranges by Corangamite Catchment Management Authority. Within the assessment corridor, vegetation adjacent to Coalmine Creek is considered a refuge area as it supports a number of threatened species, including Swamp Antechinus, Southern Brown Bandicoot, Long-nosed Potoroo and White-footed Dunnart. Habitat found here is also likely to support Broad-toothed Rat.

3.5 Targeted survey results

3.5.1 Flora

A summary of the results for the 2023 surveys for threatened flora is provided in Table 11. Further detail is provided below.

Table 11 Summary of targeted surveys of threatened flora

Scientific name	Common name	EPBC Act conservation status	FFG Act conservation status	Recorded (yes/no)
Anglesea Grevillea	*Grevillea infecunda*	VU	en	No
Wrinkled Buttons	*Leiocarpa gatesii*	VU	cr	**Yes**
Green-striped Greenhood	*Pterostylis chlorogramma*	VU	en	No
Spiral Sun-orchid	*Thelymitra matthewsii*	VU	en	No

Notes to table: Cr – critically endangered; En, e – endangered; VU, v – vulnerable

3.5.1.1 Anglesea Grevillea, Green-striped Greenhood and Spiral Sun-orchid

Targeted surveys were conducted at the appropriate time of year and with sufficient survey effort for Anglesea Grevillea, Green-striped Greenhood and Spiral Sun-orchid, we now conclude that these species are unlikely to be present within the assessment corridor of GTR 3. Their respective likelihoods of occurrence have been amended to low. It is unlikely that there is a significant population of any of these species within the proposed trail alignment.

3.5.1.2 Wrinkled Buttons (EPBC vulnerable)

Wrinkled Buttons is a perennial, rhizomatous herb growing up to 30 centimetres tall with narrow leaves along a white cottony stem (Photo 1). The plant has a yellow button-like flower, consisting of many small tubular florets. It is confined to a small area between Anglesea and Lorne. It responds well to fire and soil disturbance (DSE 2006a), which is consistent with the findings of this report. It had frequently colonised vehicle management tracks and was observed actively growing in a mineral fire break that had been recently graded with heavy machinery (Photo 2).

Approximately nine populations of Wrinkled Buttons were found along GTR 3, Table 9 summarises the population sizes recorded within the assessment corridor of each trail (Figure 6).

Table 9 Summary of Wrinkled Buttons populations recorded within the GTR 3 assessment corridor

Trail name	Population size (number of individual plants)
Alternate Trail 2	33
Alternate Trail 3	10
Trail 19c	10
Trail 42	36
Trail 49	3
Trail 60	7
Trail 61	102
Trail 62	50-100

Trail name	Population size (number of individual plants)
Trail 63	8

This species was recorded in EVC 21 - Shrubby Dry Forest and occasionally into exposed sections of EVC 45 - Shrubby Foothill Forest. Individuals were found in flower (Photo 1). Population extent along GTR 3 is provided in Figure 6.

3.5.2 FFG Act listed flora

It is also a requirement of the project to consider FFG Act listed species, the following species are likely to occur within the assessment corridor, including:

- Wiry Bossiaea
- Dwarf Silver-wattle
- Angahook Pink-fingers
- Robust Spider-orchid
- Large White Spider-orchid
- Slender Pink-fingers
- Naked Beard-orchid
- Top Bog-sedge
- Brooker's Gum
- Western Peppermint
- Southern Blue-gum
- Otway Grey-gum
- Nodding Baeckea
- Dwarf Brooklime
- Salt Lawrencia
- Hoary Rapier-sedge
- Satinwood
- Coast Fescue
- Dune Poa
- Elegant Leek-orchid
- Large Plume-orchid
- Blotched Sun-orchid
- Coast Twin-leaf
- Winter Sun-orchid
- Pallid Sun-orchid
- Merran's Sun-orchid
- Paper Flower
- One-flower Early Nancy
- Tufted Grass-tree
- Parsley Xanthosia
- Southern Xanthosia

For perennial state listed species including Wiry Bossiaea, Dwarf Silver-wattle, Western Peppermint, Southern Blue-gum, Otway Grey-gum, Satinwood and Paper Flower, residual impacts are low as these species would most likely have been detected during the detailed ecological assessment in 2022 or during targeted surveys in 2023 and 2024. For example, Paper Flower was recorded in EVC 48 - Heathy Woodland during the detailed assessment in 2023, that alignment has subsequently been removed from the proposed trail network. Southern Blue-gum was recorded frequently across the GTR 3 assessment corridor (Figure 6), and Brooker's Gum was recorded in two instances.

For the remaining state listed herbs, graminoids and orchids, residual impacts remain a risk as most of these species are small, cryptic or transient in nature. There is some probability these species occur in the assessment corridor and were not detected by field surveys between 2022 and 2024. To manage this risk of residual impacts trail micro-siting will be used and impacts in key habitats, these include EVC 48 – Heathy Woodland which is likely to support the vast majority of those species.

3.6 Further survey recommendations

No further surveys are recommended for EPBC Act threatened flora.

No further surveys are recommended for threatened fauna. Advice provided by the Wild Otways Initiative in March 2024 determined that no further surveys were required to assess presence of the EPBC Act listed Swamp Antechinus and Broad-toothed Rat in relation to the GORCT alignment. It has been determined that

existing population and habitat data obtained by the Wild Otways Initiative was sufficient to determine the project's impacts (DEECA & GORCT Project Team 2024). Specialist advice regarding Otway Burrowing Crayfish was also obtained internally from DEECA's Natural Environment Program (NEP) and Biodiversity teams. Given the difficulty of identifying this species, it was recommended that all crayfish burrows should be assumed to belong to the Otway Burrowing Crayfish. Trail construction works are required to micro-site works to avoid impacts to this species (DEECA & GORCT Project Team 2024). Further discussion on recommendations to avoid and minimise impacts to Otway Burrowing Crayfish are summarised in section 6.3.

3.7 Weeds

As part of the project, it was deemed important to conduct a weed risk assessment for all invasive species encountered along GTR 3. All weeds recorded during fieldwork by Biosis were scrutinised for their level of risk and the likely pathways of spread and invasion. It is important to note that the assessment also included Australian native species which are growing well out of their natural range and are considered environmental weeds such as Early Black Wattle *Acacia decurrens*, Coast Wattle *Acacia longifolia* subsp. *sophorae*, Sallow Wattle *Acacia longifolia* and Sweet Pittosporum. Most of the weeds recorded occur at existing disturbed sites within the project area such as vegetation adjoining car parks, along roadsides and the coast, and close to settlements, private properties and power lines. Trail alignments away from disturbed areas are generally weed free, that is that weed species represent < 1% projected foliage cover. Larger infestations were encountered, particularly consisting of Sweet Pittosporum (Photo 12) and Boneseed (Photo 13) and were mapped accordingly (Figure 4). These heavier infestations are notable as left uncontrolled they are likely to provide significant source locations of weed infestations and are therefore should be considered as a significant threat on the adjoining vegetation communities. It should be noted that detailed weed mapping was not undertaken outside of the assessment corridor as the intent is to manage potential weed spread associated with the project through appropriate construction and operation. Consequently, weed infestations are likely to be larger than represented by the mapping as their precise extent was not recorded.

Areas with the highest weed cover and potential source locations for weed invasion include:

- Riparian zones of Coalmine Creek and Spout Creek, Eastern View (trails 14-17 and 21).
- Trail 19, large Sweet Pittosporum infestation occupying a gully. The trail does not pass through the weed zone, however the infestation is visually evident from the trail that extends south towards the coast.
- Trail 20, traverses a heavy Boneseed infestation that is otherwise inaccessible to public access.
- Trail 43, as the trail nears Stony Creek, passes through significant Sweet Pittosporum and Boneseed infestations.
- Trail 70 passes through a very dense and extensive Sweet Pittosporum infestation.

Of the 54 weed species recorded in the project area and assessment corridor (Appendix 1) there are four species classified as Restricted under the CaLP Act. These plants are prohibited from sale, but the classification imposes little requirements on landowners to eradicate or control this weed. There are also six weed species which are listed under the CaLP Act as Regionally Controlled weeds. Under the Act, landowners have a responsibility to take all reasonable steps to prevent the growth and spread of these weeds on their land, and therefore these species need special consideration, in terms of actions to prevent their introduction and spread during project works, and for reducing the extent of infestations where they are already present. In accordance with the requirements of the CaLP Act, all reasonable precautions must also be taken to ensure that any soil and equipment is free from noxious weed seeds and other vegetative material prior to transporting any soil and equipment to and from the site.

3.7.1 Weed invasion pathways assessment

Weed risk assessment

To determine the level of risk for each weed species, we referred to the risk ratings for the weed species according to DEECA's Advisory List of Environmental Weeds in Victoria (Arthur Rylah Institute 2018). This list was developed by DEECA to help land managers determine the relative risks posed by different environmental weeds and the urgency for managing the higher risk species in Victoria's natural areas. Rankings for weeds in the list were developed based on the species stage in its invasion process (early / new invaders given higher priority), the impact potential of species on natural areas, and each species' potential rate of spread (White et al. 2018). This assessment was fit for purpose and provided clear risk ratings for the 56 weed species recorded in the project area or assessment corridor.

Table 10 shows the final risk ratings for each weed species. There are 17 species considered Very High risk, 18 are High risk, 10 are Moderately High risk, 10 are Medium risk and one species is considered Lower risk. The respective risk level of weed species should be used to guide land manager efforts to:

- Take actions to prevent introductions of the highest risk species during project construction works and as part of trail use and ongoing maintenance.
- Take actions to eradicate small populations of high risk species.
- Implement actions to prevent the spread of high risk weeds into clean areas.
- Undertake works to reduce the size of large infestations of the highest risk species.

Means of spread

The means by which weeds can spread were listed for each weed species. Resources used to determine the biology of each weed and its most common means of spread included the CABI Invasive Species Compendium, Atlas of Living Australia Weed Profiles, HerbiGuide, and other online resources. Many species spread exclusively by seeds and these species can be controlled by limiting the opportunities for these plants to set seed, controlling (depleting) the existing seed bank, and by limiting the movement of seed for populations that do get the opportunity to set seed. Some weeds produce by seed and also by vegetative means, such as stolons and via detached root or branch fragments. These species require additional consideration, to ensure controls are in place to limit seed production and spread, but also limit the chance that plant or soil disturbance may contribute to the movement of plant material which may also result in new populations of these weed species.

Invasion pathways

The main pathways that the weed species tend to arrive in new sites were also listed. The pathways were based on the 17 invasion pathways developed by Sindel et al. (2009). The 17 pathways fall under the three categories; deliberate human spread, accidental human spread and natural pathways of spread. Awareness of these weed spread pathways will assist land managers to consider these pathways and help limit the introduction of these weeds into news areas, for example via community education and increased monitoring for new introductions. The outcomes of the invasion pathways assessment is provided in Table 10.

Table 10 Weed risk and invasions pathway assessment for species recorded in the project area or assessment corridor

Species name	Common name	CaLP Act Status	DEECA Environmental weeds Advisory list 'Risk Ranking' ((Arthur Rylah Institute 2018))	Means of spread	Invasion pathways (Sindel et al 2009)
Acacia longifolia* subsp. *longifolia	Sallow Wattle		**Very High**	Seeds	Water; machinery; construction; waste disposal; ornamental
Agapanthus praecox* subsp. *orientalis	Agapanthus		**Very High**	Seeds; vegetative root fragments	Wind; water; human; machinery; construction; waste disposal; ornamental
Asparagus scandens	Asparagus Fern	R	**Very High**	Seeds/fruit; vegetative tubers	Ornamental; birds; animals; water; waste disposal
Billardiera fusiformis	Bluebell Creeper		**Very High**	Seeds/fruit; vegetative root fragments	Animals; birds; machinery; construction; waste disposal
Cenchrus clandestinus	Kikuyu		**Very High**	Seeds; vegetative stolons and rhizomes	Wind; water; animals; human; machinery; construction; waste disposal
Coprosma repens	Mirror Bush		**Very High**	Seeds	Animals; birds; machinery; construction; waste disposal; ornamental
***Cotoneaster* spp.[1]**	Cotoneaster		**Very high**	Seeds; vegetative fragments	Animals; birds; machinery; construction; waste disposal
Ehrharta erecta	Panic Veldt-grass		**Very High**	Seeds	Wind; water; animals; human; machinery; construction; waste disposal
Foeniculum vulgare	Fennel	RC	**Very High**	Seeds; vegetative fragments	Water; animals; birds; human; machinery; construction; waste disposal
Genista monspessulana	Montpellier Broom	RC	**Very High**	Seeds	Water; animals; birds; human; machinery; construction; waste disposal

Species name	Common name	CaLP Act Status	DEECA Environmental weeds Advisory list 'Risk Ranking' ((Arthur Rylah Institute 2018))	Means of spread	Invasion pathways (Sindel et al 2009)
Hedera helix	English Ivy		**Very High**	Seeds/fruit; vegetative fragments	Ornamental; wind; water; birds; animals; machinery; construction; waste disposal
Ilex aquifolium	English Holly		**Very High**	Seeds/fruit; vegetative fragments	Ornamental; wind; water; birds; animals; machinery; construction; waste disposal
Oxalis incarnata	Pale Wood-sorrel		**Very High**	Vegetative bulbs	Wind; water; birds; machinery; construction; waste disposal
Oxalis pes-caprae	Soursob	RC	**Very High**	Vegetative bulbs	Wind; water; birds; machinery; construction; waste disposal
Ranunculus repens	Creeping Buttercup		**Very High**	Seeds	Ornamental; water; machinery; construction; waste disposal
***Watsonia* spp.**[1]	Watsonia		**Very high**	Vegetative tuber	Water; human; machinery; construction; waste disposal; ornamental
Zantedeschia aethiopica	White Arum-lily		**Very High**	Seeds; vegetative root fragments	Water; birds; animals; construction; waste
Acacia decurrens	Early Black-wattle		**High**	Seeds	Water; machinery; construction; waste disposal; ornamental
Agrostis capillaris	Brown-top Bent		**High**	Seeds	Wind; water; animals, human; machinery; construction
Allium triquetrum	Angled Onion	R	**High**	Seeds; vegetative bulbs	Animals; human; machinery; construction; waste disposal; ornamental
Anthoxanthum odoratum	Sweet Vernal-grass		**High**	Seeds	Wind; water; birds; animals; human; machinery; construction

Species name	Common name	CaLP Act Status	DEECA Environmental weeds Advisory list 'Risk Ranking' ((Arthur Rylah Institute 2018))	Means of spread	Invasion pathways (Sindel et al 2009)
Chrysanthemoides monilifera	Boneseed	RC	**High**	Seeds	Water; animals; birds; human; machinery; construction; waste disposal
Cynosurus echinatus	Rough Dog's-tail		**High**	Seeds	Wind; human; machinery; construction; waste disposal
Cytisus scoparius	English Broom	RC	**High**	Seeds	Wind; water; animals; birds; human; machinery; construction; waste disposal
Dactylis glomerata	Cocksfoot		**High**	Seeds	Wind; human; machinery; construction; waste disposal
Euphorbia paralias	Sea Spurge		**High**	Seeds	Wind; water; human; machinery; construction; waste disposal
Helminthotheca echioides	Ox-tongue		**High**	Seeds	Wind; human; machinery; construction; waste disposal
Holcus lanatus	Yorkshire Fog		**High**	Seeds	Wind; water; birds; animals; human; machinery; construction; waste disposal
Oxalis purpurea	Large-flower Wood-sorrel		**High**	Vegetative bulbs	Wind; water; birds; machinery; construction; waste disposal
Pittosporum undulatum	Sweet Pittosporum		**High**	Seeds/fruit	Ornamental; water; birds; animals; machinery; construction; waste disposal
Rubus anglocandicans	Common Blackberry	RC	**High**	Seeds/fruit; vegetative fragments	Ornamental; water; birds; animals; machinery; construction; waste disposal
***Rumex* spp. (naturalised)**[1]	Dock (naturalised)		**High**	Seeds	Animals; birds; human; machinery; construction; waste disposal

Species name	Common name	CaLP Act Status	DEECA Environmental weeds Advisory list 'Risk Ranking' ((Arthur Rylah Institute 2018))	Means of spread	Invasion pathways (Sindel et al 2009)
Sporobolus africanus	Rat-tail Grass		**High**	Seed	Wind; water; animals; human; machinery; construction; waste disposal
Trifolium subterraneum	Subterranean Clover		**High**	Seeds; vegetative stolons/fragments;	Water; birds; animals; machinery; construction; waste disposal
Vinca major	Blue Periwinkle		**High**	Seeds	Wind; human; machinery; construction; waste disposal
***Aira* spp.**[1]	Hair Grass		**Moderately High**	Seeds	Wind; water; human; machinery; construction; waste disposal
Briza maxima	Large Quaking-grass		**Moderately High**	Seeds	Water; wind; animals; machinery; construction
Centaurium erythraea	Common Centaury		**Moderately High**	Seeds	Ornamental; wind; water; animals; human; machinery; construction; waste disposal
Cirsium vulgare	Spear Thistle	RC	**Moderately High**	Seeds	Wind; water; animals; human; machinery; construction
Hypochaeris radicata	Flatweed		**Moderately High**	Seeds	Ornamental; wind; water; birds; animals; human; machinery; construction; waste disposal
Lysimachia arvensis	Pimpernel		**Moderately High**	Seeds	Ornamental; water; birds; animals; human; machinery; construction; medicinal; waste disposal

Species name	Common name	CaLP Act Status	DEECA Environmental weeds Advisory list 'Risk Ranking' ((Arthur Rylah Institute 2018))	Means of spread	Invasion pathways (Sindel et al 2009)
Physalis peruviana	Cape Gooseberry		**Moderately High**	Seeds; vegetative fragments	Wind; water; animals; birds; human; machinery; construction; waste disposal
Senecio jacobaea	Ragwort	RC	**Moderately High**	Seeds	Ornamental; water; birds; animals; human; machinery; construction; medicinal; waste
Sonchus oleraceus	Common Sow-thistle		**Moderately High**	Seeds	Wind; human; machinery; construction; waste disposal
***Vulpia* spp.**[1]	Fescue		**Moderately high**	Seeds	Wind; human; machinery; construction; waste disposal
Arctotheca calendula	Cape Weed		**Medium**	Seeds	Wind; water; animals, human; machinery; construction
Cyperus eragrostis	Drain Flat-sedge		**Medium**	Seeds; vegetative fragments	Water; birds; animals; human; machinery; construction; waste disposal
Erigeron bonariensis	Flaxleaf Fleabane		**Medium**	Seeds	Wind; human; machinery; construction; waste disposal
Lagurus ovatus	Hare's-tail Grass		**Medium**	Seeds	Wind; animals; human; machinery; construction; waste disposal
Paspalum dilatatum	Paspalum		**Medium**	Seeds; vegetative rhizomes	Wind; water; animals; birds; human; machinery; construction; waste disposal; ornamental
Plantago lanceolata	Ribwort		**Medium**	Seeds	Wind; water; birds; animals; human; machinery; construction; waste disposal

Species name	Common name	CaLP Act Status	DEECA Environmental weeds Advisory list 'Risk Ranking' ((Arthur Rylah Institute 2018))	Means of spread	Invasion pathways (Sindel et al 2009)
Plantago major	Greater Plantain		**Medium**	Seeds	Wind; water; birds; animals; human; machinery; construction; waste disposal
Prunella vulgaris	Self-heal		**Medium**	Seeds; vegetative stolons	Ornamental; wind; water; birds; animals; human; machinery; construction; waste disposal
Solanum nigrum	Black Nightshade		**Medium**	Seeds/fruits	Ornamental; water; birds; animals; machinery; construction; waste disposal
***Vicia* spp.**[1]	Vetch		**Medium**	Seed	Wind; human; machinery; construction; waste disposal
Cupressus sempervirens.	Cypress		**Lower**	Seeds/fruit	Wind; machinery; construction; waste disposal; ornamental

[1] For taxa not identified to species, a risk ranking score has been applied through consideration of the DEECA weed advisory 'risk ranking' for those species listed under the genus and assessing the most appropriate rank given the location of taxa and vegetation type within the project area.

3.8 Pathogens

The following pathogens are relevant to the project:

- *Phytophthora cinnamomi*.
- Myrtle Wilt *Chalara australis* – a fungal pathogen that infects and kills mature Myrtle Beech trees. This pathogen has been recorded throughout the Central Highlands and in the Yarra Ranges National Park (Parks Victoria 2002).
- Chytrid Fungus *Batrachochytrium dendrobatidis* – a fungal pathogen that infects and kills amphibians.

Myrtle Wilt

Myrtle Wilt is a fatal fungal disease that affects mature Myrtle Beech. The disease poses a significant threat to Cool Temperate Rainforests in Victoria. Myrtle Wilt develops when the fungal pathogen *Chalara australis* infects a stand of Myrtle Beech via stem or root wounds. The pathogen is considered indigenous to Australia. Studies in 1991 showed Myrtle Wilt to be present throughout the range of Myrtle Beech-dominated Cool Temperate Rainforest, although some stands of uninfected rainforest exist in the Strzelecki Ranges of South Gippsland (DSE 2005).

The disease is spread through air- and water-borne spores. Once infected, pathogen can be spread from one Myrtle Beech individual to others within a stand via underground root grafts (Packham 1994), thereby creating patches of dead trees. It is responsible for the death of large numbers of mature Myrtle Beech trees in some parts of Victoria (DSE 2009a).

Myrtle Wilt is considered by Parks Victoria (2009) to have reached epidemic levels in the Great Otway National Park. Of particular concern stated in the Great Otway National Park and Otway Forest Park Management Plan is the movement of the disease into Cool Temperate Rainforest vegetation communities by any unnecessary soil disturbance.

No evidence of Myrtle Wilt was recorded during the field assessment of GTR 3 as no Myrtle Beech trees or Cool Temperate Rainforest vegetation was recorded.

Phytophthora cinnamomi

Phytophthora cinnamomi is a soil-borne plant pathogen (now understood to not be a fungus) which can infect and kill a large range of native plant species (Wilson et al. 2020). It has previously been recorded in the broader landscape area including in the following national heritage places: the Great Otway National Park and the Great Ocean Road and Scenic Environs, and in the nearby Anglesea Heath (DEE 2018). Long term studies have documented changes in the structure and composition of flora (DEE 2018), and subsequent impacts on fauna, particularly small mammals (Wilson 1990). The Great Otway National Park and Otway Forest Park Management Plan (Parks Victoria & DSE 2009) has stated that this disease is present within some of its coastal headland and woodland sites and is spread by the movement of soil or water, or by gravel on machinery, vehicles, boots, bicycles and animals. A review by Gibson *et al*. (2002) indicated that 8% of the flora species within the Great Otway National Park are considered to be susceptible to this plant disease.

Current projects within the Otways have identified Priority Protection Areas where the use of Phosphite treatments have been applied to minimise the spread of *Phytophthora cinnamomi*. Research is also being undertaken in these areas to understand the rate of spread and transmission vectors and determine vulnerable areas. Consultation from local experts indicated that the current trail design avoids the Priority Protection Areas.

Phytophthora cinnamomi was detected at seven locations within the assessment corridor of GTR 3 (Figure 4). The trails where this pathogen was observed were all situated within a localised area of EVC 48 – Heathy Woodland within the Otway Ranges Bioregion. The expression of the pathogen was most evident on Austral Grass-tree *Xanthorrhoea australis* (Photo 14) which noted a visual decline in the health of infected plants. Trails that recorded evidence of this pathogen include:

- Trail 14 (1 infestations).
- Trail 15 (1 infestations).
- Trail 19 (2 infestations).
- Trail 41 (3 infestations).

Recommendations

To prevent the spread of *Phytophthora cinnamomi* along the trail network, an emphasis on containing current infestations and protecting susceptible plants and communities should include:

- The installation of hygiene stations at all access points where the trail intersects with EVC 48 – Heathy Woodland.
- Install a section of elevated boardwalk along trail 19 that passes through a high risk of *Phytophthora cinnamomi* area.
- Treatment of *Phytophthora* dieback disease infestations along the trail network with Phosphite fungicide.
- Protect Austral Grass-tree from adverse drainage during construction and operation of trail to reduce impact of *Phytophthora* dieback disease.
- Create a trail CEMP that mitigates the spread of soil pathogens and diseases, such as *Phytophthora cinnamomi*, Myrtle Wilt and Chytrid Fungus. Such plans should detail:
  - Strict hygiene methods to be implemented during trail construction.
  - On-going monitoring to assess the spread of *Phytophthora cinnamomi* and Myrtle Wilt.
- Develop a *Phytophthora cinnamomi* monitoring strategy that:
  - Documents the extent of existing infestations.
  - Conducts annual assessment of all known infections that records: the extent of infestations, and the effectiveness of treatment strategies implemented.
  - Monitors susceptible EVCs along the trail network for new infestations to be included in future monitoring and treatment programs.

Effective management measures should also be implemented to control the spread and introduction of other pathogens and weed species. This should be incorporated into the proposed hygiene stations as indicated above, but also include the following:

- Implementing strict weed and pathogen hygiene protocols during construction and operation of trails.
- Any plant or equipment used should be washed down and cleaned prior to and following use to reduce the translocation risk of weed species.
- Develop a weed control strategy that monitors weed invasion along the trail, at a minimum:

- Within key threatened species habitat (i.e. Wrinkled Buttons habitat; and small mammal refuge habitat at the Coalmine Creek intersect).
- Along tracks that extend through major weed infestations.

4. Biodiversity legislation and government policy

This section provides an assessment of the project in relation to key biodiversity legislation and government policy. This section does not describe the legislation and policy in detail. Where available, links to further information are provided.

4.1 Commonwealth

4.1.1 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act applies to developments and associated activities that have the potential to significantly impact on Matters of National Environmental Significance (MNES) protected under the Act.

Link for further information including a guide to the referral process is available at: http://www.environment.gov.au/epbc/index.html.

MNES relevant to the project are summarised in Table 11. It includes an assessment against the EPBC Act policy statements published by the Australian Government which provide guidance on the practical application of EPBC Act.

Table 11 Assessment of project in relation to the EPBC Act

MNES	Project specifics	Assessment against significant impact guidelines
EPBC Act listed species	Twenty-two EPBC Act listed flora species and 81 EPBC Act listed fauna species have been recorded or predicted to occur in the project search area. The likelihood of these species occurring in the project area is assessed in Appendix 1(flora) and Appendix 2 (fauna).	The following species have been recorded or are considered to have a medium or greater likelihood of occurring within the assessment corridor: **Flora** • Wrinkled Buttons (recorded) Prior to targeted surveys, the following species were also deemed likely to occur in the assessment corridor: • Anglesea Grevillea • Green-striped Greenhood • Spiral Sun-orchid These species were not detected during targeted surveys and their likelihood of occurrence has been amended to low. Their respective Significant Impact Criteria assessments have been updated in Appendix 3. The remaining threatened flora species predicted to occur within the study area are not likely to occur within the disturbance footprint and the proposed works are unlikely to constitute a significant impact. Assessments against the Significant Impact Criteria (DoE 2013b) have been prepared for all flora species listed above (Appendix 3).

MNES	Project specifics	Assessment against significant impact guidelines
		Fauna • Latham's Snipe • Blue-winged Parrot (recorded) • Diamond Firetail • Gang-gang Cockatoo (recorded) • Australian Grayling • Broad-toothed Rat • White-throated Needletail • Southern Bent-winged Bat • Grey-headed Flying-fox • Southern Brown Bandicoot • Long-nosed Potoroo (recorded) • Swamp Antechinus • Yellow-bellied Glider (recorded) Assessments against the Significant Impact Criteria (DoE 2013b) have been prepared for all species listed above (Appendix 4). It has been concluded that if the avoidance, minimisation and mitigation measures recommended in this report and associated documents endorsed by DEECA Barwon South West (see section 2.4.4.1) are strictly implemented, and based on design changes already made as represented in GTR 3, a significant impact is unlikely for these fauna species.
EPBC Act listed ecological communities	Five EPBC Act listed ecological communities have been recorded or predicted to occur in the project search area.	Of these the following are not likely to occur in the project area: • Giant Kelp Marine Forests of South East Australia. • Natural Damp Grassland of the Victorian Coastal Plains. • White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland. The following ecological communities are likely to occur in the project area, however, are not likely to be significantly impacted by the project (Table 17): • Assemblages of species associated with open-coast salt-wedge estuaries of western and central Victoria ecological community. • Subtropical and Temperate Coastal Saltmarsh.
Migratory species	Sixty-eight migratory species have been recorded or predicted to occur in the project search area (Appendix 4).	While some of these species would be expected to use habitat within the assessment on occasion, and some of them may do so regularly or may be resident, it does not provide important habitat for an ecologically significant proportion of any of these species.
Wetlands of international importance (Ramsar sites).	The project area is identified as being within the catchment of one Ramsar sites: Port Phillip Bay (Western Shoreline) and Bellarine Peninsula.	The project area does not drain directly into this Ramsar site and the project is not likely to result in a significant impact.

The project is unlikely to have a significant impact on MNES, including flora, fauna and threatened ecological communities listed under the EPBC Act. However, for legal certainty, it is recommended that a referral under the EPBC Act is submitted.

4.1.2 Significant Impact Assessments

Significant impact assessments were undertaken for the following EPBC Act threatened species that are likely to be impacted by the project. These are presented in Appendix 3 and Appendix 4.

- Wrinkled Buttons
- Anglesea Grevillea
- Green-striped Greenhood
- Spiral Sun-orchid
- Australian Grayling
- Blue-winged Parrot
- Broad-toothed Rat
- Diamond Firetail
- Grey-headed Flying Fox
- Latham's Snipe
- Southern Brown Bandicoot
- Southern Bent-winged Bat
- Long-nosed Potoroo
- Swamp Antechinus
- White-throated Needletail
- Yellow-bellied Glider.

Significant impact assessments have been retained in this report for the following species and updating following results of no detection during targeted surveys:

- Anglesea Grevillea
- Green-striped Greenhood
- Spiral Sun-orchid

4.2 State

4.2.1 Flora and Fauna Guarantee Act 1988 (FFG Act)

The FFG Act is the key piece of Victorian legislation for the conservation of threatened species and communities and for the management of potentially threatening processes. Under the FFG Act a permit is required from DEECA to 'take' protected flora species. Permit exemptions under the FFG Act generally apply to the non-commercial removal of protected flora from private land, unless there is 'critical habitat' that has been declared on the land. Authorisation under the FFG Act is required to collect, kill, injure or disturb listed fish on private or public land.

Link for further information: https://www.environment.vic.gov.au/conserving-threatened-species/victorias-framework-for-conserving-threatened-species

The FFG Act defines public land as *Crown land or land owned by, or vested in, a public authority,* while private land is defined as *any land other than public land.* A public authority is defined in the FFG Act as a body established for a public purpose by or under any Act and includes:

- an Administrative Office
- a Government Department
- a municipal council
- a public entity
- a State-owned enterprise.

The project area is on Crown Land or land owned by or vested in a public authority and is therefore public land for the purposes of the FFG Act. Therefore, if flora protected or threatened flora under the FFG Act is required to be removed as part of the project, a protected flora permit will be required. This will be determined as part of the project's final biodiversity impact assessments.

In addition to the requirement for a protected flora permit, it is a requirement of the FFG Act that a public authority, in performing its functions, must consider the objectives of the FFG Act and the impact on biodiversity. Public authorities are also required to consider the Biodiversity 2037 targets (DELWP 2017b), action statements, critical habitat determinations and management plans made under the FFG Act.

Results

Eighty-seven protected flora species and six threatened fauna species listed under the FFG Act only were recorded within the assessment area of GTR 3 (Table 15). No FFG Act threatened communities were recorded within the assessment corridor of GTR 3.

The following FFG Act listed species were recorded within the assessment corridor:

- Brooker's Gum *Eucalyptus brookeriana*:
  - Eleven trees were identified within the assessment corridor near Kennett River (trails: alternative 9 and trail 72). Only 2 trees are within the GTR 3 assessment corridor as alternate trail 9 has been removed from the trail network.
  - Trail 72 can be micro-sited to avoid direct removal of the species.
  - If avoidance of TPZ's through micro-siting is unachievable, then trail construction methodologies will follow construction guidelines identified in the Arborists report (Axiom Tree Management 2022). Providing that these mitigation measures are adhered to, it is anticipated that Brooker's Gum will not be adversely impacted by the project.
- Southern Blue-gum *Eucalyptus globulus* subsp. *globulus*:
  - Southern Blue-gum occurred in mixed populations with Gippsland Blue-gum *Eucalyptus globulus* subsp. *pseudoglobulus.* Determining the taxonomy of specific trees in this situation was problematic due to the uncertainty around the precise source of the reproductive material observed on the ground (i.e. buds and fruit). Consequently, Southern Blue-gum was mapped as *Eucalyptus globulus* unless the sufficient evidence was available to classify the species to subspecies level. Precise numbers of the FFG Act listed Southern Blue-gum are difficult to quantify, instead it is possible to determine broader distribution along GTR 3.

  - Southern Blue-gum was recorded within EVC 21 – Shrubby Dry Forest and EVC 45 – Shrubby Foothill Forest between Eastern View and Kennett River.
  - Impacts based on GTR 3 will result in significant TPZ incursions to six Southern Blue-gum at locations of the bridge abutments. These trees will be deemed lost unless consultation with a suitably qualified arborist can determine otherwise. There may also be opportunity for the construction design to avoid impacts to Southern Blue-gum through micro-siting works outside of TPZs once the final alignment has been confirmed. Furthermore, no trees will be directly impacted by the construction of the trail and will be avoided by micro-siting the trail around large trees. If trail construction occurs within the trees TPZ, then construction guidelines identified in the Arborists report (Axiom Tree Management 2022) will need to be followed. Providing that these mitigation measures are adhered to, it is anticipated that Southern Blue-gum will not be adversely impacted by the project.

- Paper Flower *Thomasia petalocalyx*:
  - Two plants were identified adjacent to trail 4, within EVC 48 – Heathy Woodland. This section of trail has subsequently been removed from the proposed trail route and is not part of GTR 3.
- Grey Goshawk *Accipiter novaehollandiae*, Powerful Owl *Ninox strenua*, Rufous Bristlebird *Dasyornis broadbenti caryochrous*, White-bellied Sea Eagle *Haliaeetus leucogaster,* Otway Black Snail and Otway Burrowing Crayfish:
  - Each species was observed within the project area, with the exception of Otway Burrowing Crayfish which is assumed present based on the occurrence of crayfish burrows.
  - Further surveys are not required due to the high mobility of Grey Goshawk, Powerful Owl, Rufous Bristlebird and White-bellied Sea-eagle, and the low likelihood of an impact within the large extent of surrounding available habitat. Hollow-bearing trees will be avoided by construction techniques and the micro-siting of trails.
  - Impacts to Otway Burrowing Crayfish and Otway Black Snail have been reduced with the avoidance of Wet Forest EVC within the GTR 3, and will be further minimised by utilising existing walking trails, and constructing boardwalks and bridges over creek lines. Adverse impacts will be further mitigated through micro-siting trails and salvage and relocation (see section 6.3).

4.2.2 Catchment and Land Protection Act 1994 (CaLP Act)

The CaLP Act identifies and classifies certain species as noxious weeds or pest animals, and provides a system of controls on noxious species.

Declared noxious weeds identified in the project area are listed in Appendix 1 and established pest animals are listed in Appendix 2.

The proponent must take all reasonable steps to eradicate regionally prohibited weeds, prevent the growth and spread of regionally controlled weeds, and prevent the spread of and as far as possible eradicate established pest animals. The State is responsible for eradicating State prohibited weeds from all land in Victoria.

Link for further information: http://agriculture.vic.gov.au/agriculture/pests-diseases-and-weeds.

Refer to section 3.7 for further information.

4.2.3 Planning and Environment Act 1987 (incl. Planning Schemes)

The *Planning and Environment Act 1987* controls the planning and development of land in Victoria, and provides for the development of planning schemes for all municipalities.

Of particular relevance to the development proposal are controls relating to the removal, destruction or lopping of native vegetation contained within the Surf Coast and the Colac Otway Planning Scheme (the Scheme), including permit requirements. The Scheme (Clause 73.01) defines 'native vegetation' as 'Plants that are indigenous to Victoria, including trees, shrubs, herbs, and grasses'. It is an objective of Clause 12.01-2 of the State Planning Policy Framework (Native Vegetation Management) that removal of native vegetation results in no net loss in the contribution made by native vegetation to Victoria's biodiversity.

Clause 52.17 (Native Vegetation) requires a planning permit to remove, destroy or lop native vegetation including some dead native vegetation. The Crown land exemption under Clause 52.17-7 may apply to the project. If the Crown Land exemption was applied to the project, there would be no requirement to obtain native vegetation offsets, however counter balancing measures would be required to improve the condition, extent or security of native vegetation or biodiversity values.

Decision guidelines that must be considered by the referral or responsible authority are contained in Section 7 of the Guidelines, and referred to in Clause 52.17-4. Clause 52.17 does not apply if a Native Vegetation Precinct Plan corresponding to the land is incorporated in the Scheme. It should be noted that where native vegetation does not meet the definition of a patch or scattered tree, as described in Section 3.2, the Guidelines do not apply. However, a permit may still be required to remove, destroy or lop native vegetation under the provisions of the Scheme.

Clause 65.02 requires consideration of native vegetation retention in a subdivision application and siting of open space areas.

Under Clause 66.02 a permit application to remove, destroy or lop native vegetation is required to be referred to DEECA as a recommending referral authority if any of the following apply:

- the class of application is on the detailed assessment pathway
- a property vegetation precinct plan applies to the site or
- the native vegetation is on Crown land occupied or managed by the Responsible Authority.

If a permit is required, the application will be referred to DEECA as the vegetation to be removed on Crown land managed by the Responsible Authority and by DEECA. The need for a permit to remove native vegetation may also be triggered by zones and overlays within the Scheme. The location of the overlays in relation to the project area can be determined via the following link: http://planningschemes.dpcd.vic.gov.au.

Further approval pathways are provided in the project planning approvals strategy (Biosis 2022c) that address permit requirements under the relevant overlays.

Victoria's Guidelines for the removal, destruction or lopping of native vegetation

The Guidelines are incorporated into the Victoria Planning Provisions and all planning schemes in Victoria (DELWP 2017a). The Guidelines replaced the previous incorporated document titled *Permitted clearing of native vegetation – Biodiversity assessment guidelines* (DEPI 2013) on 12 December 2017.

The purpose of the Guidelines is to guide how impacts to biodiversity should be considered when assessing a permit application to remove, destroy or lop native vegetation. The objective for the guidelines in Victoria is 'No net loss to biodiversity as a result of the removal, destruction or lopping of native vegetation'.

A detailed assessment of the implications for the project under the Guidelines is provided in Section 5 of this report. Under the Guidelines, there are three assessment pathways for assessing an application for a permit to remove native vegetation: basic, intermediate and detailed.

A detailed determination of the assessment pathway for the planning application relevant to the proposed development is provided in Section 5.2. In summary, the planning application for removal of native vegetation must meet the requirements of, and be assessed in, the detailed assessment pathway.

4.2.4 Environment Effects Act 1978

The *Environment Effects Act 1978* establishes a process to assess the environmental impacts of a project. If applicable, the Act requires that an Environment Effects Statement (EES) be prepared by the proponent. The EES is submitted to the Minister for Planning and enables them to assess the potential environmental effects of the proposed development.

The general objective of the assessment process is *to provide for the transparent, integrated and timely assessment of the environmental effects of projects capable of having a significant effect on the environment* (DEECA 2023b).

The 'Ministerial Guidelines for Assessment of Environmental Effects under the Environment Effects Act 1978' (DEECA 2023b) provide a range of criteria that can be used to determine whether an EES may be required for a project. These criteria relate to individual potential environmental effects and a combination of (two or more) potential environmental effects.

An assessment of the project (GTR 3) against the individual and combined potential effects criteria based on the level of proposed native vegetation removal, EVC bioregional conservation status, impacts on FFG Act listed species and impacts on wetlands indicates the project has the potential to trigger a referral to the Minister for Planning for an EES determination (Table 12). The removal of 8.9194 hectares of understorey vegetation for the trails from least concern and depleted EVCs has low potential to have regional or State significant environmental impacts.

The Ministerial guidelines are not binding, and the decision as to whether an EES is required is ultimately at the discretion of the Minister for Planning.

Table 12 Assessment of the project against the individual and combined EES referral criteria

EES referral criteria	Project impact and response
Individual types of effects	
Potential removal, destruction or lopping of 10 hectares or more of native vegetation, that consists of, or comprises a combination of: • **an ecological vegetation class (EVC) classified as endangered; or** • **an EVC that is classified as vulnerable (with a condition score of 0.5 or more) or rare (with a condition score of 0.6 or more); and** • **that is not authorised for removal under an approved forest management plan or fire protection plan**	This criterion is not triggered as: • The 8.9194 hectares of understorey native vegetation proposed for removal in a narrow (2.5 m wide) trail construction corridor within National Parks and conservation reserves does not include an endangered EVC. • The removal of understorey native vegetation proposed for removal does not include a vulnerable EVC. • The project is not part of a forest operation or fire protection planning in Victoria.
Potential clearing of an area determined as 'critical habitat' under the *Flora and Fauna Guarantee Act 1988*.	This criterion is not triggered by the project. The project area is not covered by areas declared as critical habitat under the FFG Act.

EES referral criteria	Project impact and response
Potential for loss of a significant proportion (e.g. 1 percent or greater) of known remaining habitat or population of a threatened species within Victoria.	This criterion is not triggered by the project. Key threatened species recorded in the project area: • Wrinkled Buttons (EPBC and FFG Act listed) • Long-nosed Potoroo (EPBC and FFG Act listed) • Swamp Antechinus (EPBC and FFG Act listed) • Blue-winged Parrot (EPBC Act listed) • Gang-gang Cockatoo (EPBC Act listed) • Yellow-bellied Glider (EPBC Act listed) • Otway Black Snail (FFG Act listed) • Otway Burrowing Cray (FFG Act listed) • Brooker's Gum (FFG Act listed) • Southern Blue-gum (FFG Act listed) • Paper flower (FFG Act listed) • Grey Goshawk (FFG Act listed) • Rufous Bristlebird (Otway) (FFG Act listed) • White-bellied Sea-Eagle (FFG Act listed) • Powerful Owl (FFG Act listed) Of the species listed above, Wrinkled Buttons, Otway Burrowing Cray and Otway Black Snail are likely to have restricted habitat distribution across Victoria. An assessment is made below: **Wrinkled Buttons** Wrinkled Buttons distribution is restricted to the South East Coastal Plain IBRA Bioregion, preferring EVC 45 – Shrubby Dry Forest. The extent of possible habitat can therefore be equated to 1,018.38 ha. The impact from the proposed trail (GTR 3) is 2.8 hectares of EVC 45 – Shrubby Dry Forest which represents 0.27% of potential Wrinkled Buttons habitat. **Otway Black Snail and Otway Burrowing Cray** Key habitat for these species is Cool Temperate Rainforest and EVC 201 Shrubby Wet Forest within the Otway Ranges. This equates to a potential habitat area of 32,715 ha. The trail (GTR 3) does not intersect with Cool Temperate Rainforest but will impact 0.317 ha of EVC 201 which represents 0.001% of available habitat for Otway Black Snail and Otway Burrowing Cray.
Potential long-term change to the ecological character of a wetland listed under the Ramsar Convention or in 'A Directory of Important Wetlands in Australia'.	This criterion has very low potential to be triggered as the project area is very remote from listed Ramsar sites and will not directly impact on a DIWA wetland. The nearest DIWA wetland is the Lake Connewarre State Wildlife Reserve, located 38 km north-east of the project area.
Potential for extensive or major effects on the use and environmental values of water resources due to changes in water quality, water	This criterion has very low potential to be triggered as all creek and waterways crossings will be small clear span elevated structures to avoid impacts on the beds and banks of streams

EES referral criteria	Project impact and response
availability, stream flows, water system function, or regional groundwater levels, or the health or biodiversity of aquatic, estuarine or marine ecosystems, over the long term.	(freshwater aquatic habitats). Strict sediment control and trail design responses will be put in place to manage soil erosion and waterway sedimentation risks. Furthermore, where the trail crosses estuaries that have modelled or recorded threatened communities listed under the EPBC Act will utilise existing bridges that are in place. These sites have been heavily disturbed through previous land management and will not be impacted further.
Potential extensive or major effects on the health, safety or well-being of a human community, due to emissions to air or water or chemical hazards or displacement of residences.	This criterion is not considered applicable due to the low impact nature of the project (i.e. trail construction).
Potential for greenhouse gas emissions exceeding 200,000 tonnes of carbon dioxide equivalent per annum (direct and indirect) attributable to the operation of the facility.	This criterion is not considered applicable due to the low impact nature of the project (i.e. trail construction with small machinery).
A combination of potential environmental effects	
Potential removal, destruction or lopping of 10 hectares or more of native vegetation, unless it is authorised for removal under an approved forest management plan or fire protection plan.	This criterion is unlikely to be triggered as: • Vegetation removal in the narrow (2.5 m wide) trail construction corridor is for understorey strata only and the canopy will be retained. Therefore, the 8.9194 ha trail footprint is not complete native vegetation loss in relation to the 10 ha trigger for the criterion.
Matters listed under the *Flora and Fauna Guarantee Act 1988*: • **potential loss of a significant area of a listed ecological community; or** • **potential loss of a genetically important population of an endangered or threatened species (listed or nominated for listing), including as a result of loss or fragmentation of habitats; or** • **potential significant effects on habitat values of a wetland supporting migratory bird species.**	This criterion is unlikely to be triggered as: • Vegetation proposed for removal to construct the trail and bridges does not form part of a threatened community that is listed under the FFG Act. • Residual impacts to FFG Act listed species are likely to be localised and of low impact and not result in the loss of a genetically important population of an endangered or threatened species. • No wetlands will be impacted by the project.
Potential for extensive or major effects on landscape values of regional importance, especially: • **where recognised by a planning scheme overlay;** • **declared as a distinctive area and landscape under the Planning and Environment Act 1987; or** • **within or adjoining land reserved under the *National Parks Act 1975*.**	This criterion has not been assessed. It is out of scope of the Ecological assessment.

EES referral criteria	Project impact and response
Potential for extensive or major effects to the environment due to changes in land stability, disturbance of acid sulphate soils or project induced soil erosion over the short or long term.	This criterion has not been assessed. It is out of scope of the Ecological assessment. Refer to the Geotechnical report.
Potential for extensive or major effects on social or economic well-being due to direct or indirect displacement of non-residential land use activities.	This criterion has not been assessed. It is out of scope of the Ecological assessment.
Potential for extensive displacement of residents or severance of residents' access to their community resources.	This criterion has very low potential to be triggered as the project area is all on public land and will not displace residents or restrict access to public land. The project is likely to improve access opportunities for a broader range of public land users.
Potential for significant effects on the amenity of a substantial number of residents, due to extensive or major, long-term changes in visual, noise and traffic conditions.	This criterion has very low potential to be triggered as the project area is on remote public land with few neighbouring properties. Project construction will be low impact operations restricted to public land will involve trail building in forested areas that are well-screened from adjacent residences. Noise, dust and traffic increases are likely to be minimal and may impact a very small number of local residences during construction and operation.
Potential for extensive or major effects on Aboriginal cultural heritage values protected under the *Aboriginal Heritage Act 2006*.	This criterion has not been assessed. It is out of scope of the Ecological assessment.
Potential for extensive or major effects on cultural heritage places and sites listed on the Victorian Heritage Register or the Victorian Heritage Inventory under the *Heritage Act 2017*.	This criterion has not been assessed. It is out of scope of the Ecological assessment.

Based on the above self-assessment of GTR 3, it is possible that the project will have a significant environment effect. It is considered that the proposed GORCT Project does not meet the referral criteria for a single potential environment effect or combined potential environmental effects. At this stage, GTR 3 meets one criteria under combined environmental effects (requiring two criteria to be met before referral is triggered). It is possible that other criteria are triggered, such as on cultural heritage and social impacts that were not considered in the current assessment. Once these considerations have been made, a decision will be made on whether a referral under the EE Act is triggered and if an EES is likely to be required.

It is noted that the only way to get legal certainty on whether nor not an EES is required for a project is to submit an EES referral and have the Minister for Planning determine if an EES is required.

4.2.5 National Parks Act 1975

The *National Parks Act 1975* makes provision for National and other parks and for their management, the appointment of a Director of National Parks and the appointment of a National Parks Advisory Council and park advisory committees. The primary purpose of the *National Parks Act 1975* is for the preservation and protection of the natural environment.

The Great Otway National Park Management Plan (Parks Victoria & DSE 2009) specifies five management zones including: Reference Area, Conservation, Conservation and Recreation, Special Protection and Multiple Use.

The areas subject to proposed trail development in the national park are within the Conservation Zone and the Conservation and Recreation Zone. It is likely that the development of the GORCT within the Great Otway National Park requires consent from Parks Victoria (PV) subject to Section 27 of the NP Act. Advice is provided within the approvals strategy report.

4.2.6 *Crown Land (Reserves) Act 1978* (Crown Land Reserves Act)

Our previous assessment concluded that GORCAPA are the relevant committee responsible for protecting, enhancing and developing coastal Crown land under the Crown Land Reserves Act (Biosis 2022b).

It is our understanding that any specific recommendations relating to the protection of Coastal Crown Land (as per the Crown Land Reserves Act) will be discussed between GORCAPA and DEECA.

4.2.7 *Reference Areas Act 1978* (Reference Areas Act)

The following Reference Areas were located in proximity to GTR 3:

- Olangolah Creek Reference Area – Tanybryn, Victoria
- Aquila Creek Reference Area – Benwerrin, Victoria
- Painkalac Creek Reference Area – Boonah, Victoria

Review of the GTR 3 alignment indicates that the trail does not intersect with these reference areas. DEECA will need to ensure that any new iterations of the GORCT continues to avoid these reference areas.

4.2.8 Fisheries Act 1995

The *Fisheries Act 1995* provides a legislative framework for the regulation, management and conservation of Victorian fisheries including aquatic habitats.

A person must not take, injure, damage, destroy or release any protected aquatic biota. Protected aquatic biota includes all species of the family Syngnathidae (seahorses, sea dragons and pipefish), and any fish or aquatic invertebrate or community that is listed under the FFG Act.

Protected aquatic biota that may be impacted upon by the development include:

- Australian Grayling
- Australian Mudfish
- Otway Bush Yabby
- Otway Burrowing Crayfish.

Providing mitigation measures outlined in this report are adhered to, the potential for protected aquatic biota as listed above, to be injured, damaged or destroyed is considered to be negligible and no permit is required from DEECA.

4.2.9 Water Act 1989

The primary purpose of the *Water Act 1989* is to provide a framework for the allocation and management of surface water and groundwater throughout Victoria. It provides a principal mechanism for maintenance of ecosystem functions including those of aquatic ecosystems. Under By-Laws created by the relevant Authority under the Act, the authorities regulate the works within and in the vicinity of waterways.

The proposed trail (GTR 3) will involve construction or maintenance activities that affect beds and banks of waterways, riparian vegetation or quality or quantity of water of the following designated waterways:

- Anderson Creek
- Cherry Tree Creek
- Coalmine Creek
- Cumberland River
- Erskine River
- Grassy Creek
- Grey River
- Hitchcock Gully
- Jamieson Creek
- Kennett River
- Moggs Creek
- Monash Gully
- Reedy Creek
- Saint George River
- Separation Creek
- Sheoak Creek
- Spout Creek
- Stony Creek
- Wye River

Works within the assessment corridor will require a permit from the Corangamite Catchment Management Authority. Guidelines and application forms are available from CMAs online: https://ccma.vic.gov.au/floodplains/works-on-waterways-application-form/

4.2.10 Environment Protection Act 2017: Environmental Reference Standards

The Environment Protection Act 2017 provides a legal framework for the systematic and strategic management of potential and realised environmental impacts. The Environment Protection Act 2017, the Environment Protection Regulations 2021 and Environment Reference Standards (ERS) introduced from 1 July 2021 provide a regulatory framework designed to prevent harm by eliminating or minimising risks of harm to human health and the environment.

Under the regulatory changes, SEPP (Waters) will not continue as a subordinate instrument under the EP Act, and its formal statutory role ended on 1 July 2021. Much of the content of SEPP (Waters) has been saved under the Environment Protection Transitional Regulations 2021 for a period of 2 years after the commencement of the Environment Protection Regulations 2021. As SEPP (Waters) contributes to the state of knowledge and provides guidance on compliance with the General Environmental Duty (GED), the policy remains relevant to the protection and management of Victoria's water environments, including surface waters, estuarine and marine waters and groundwaters.

While not being saved under the Environment Protection Transitional Regulations 2021, the following clauses of SEPP (Waters) applicable to the project remain relevant as they provide guidance for compliance with the GED under the Environment Protection Act 2017:

Clause 42 – Construction activities:

- Minimise soil erosion, land disturbance and discharge of sediment and other pollutants to surface waters
- Where construction activities impinge on surface waters, construction managers need to monitor affected surface waters to assess whether beneficial uses are being protected

Clause 45 – Native vegetation protection and rehabilitation:

- Minimise the removal of and rehabilitate native vegetation within or adjacent to surface waters

The ERS requires that aquatic ecosystem values be protected. Environmental quality objectives and indicators are defined to protect beneficial uses (i.e. the uses and values of the water environment) and an attainment program provides guidance on protection of the beneficial uses. Impacts to surface water quality as a result

of the project must not result in changes that exceed background levels and/or the water quality objectives specified for the Uplands B segment to protect surface water uses and values.

To ensure that direct and indirect (e.g. runoff) impacts to surface water quality do not exceed the background levels and/or water quality objectives, it is recommended that a site-specific Constructional Environmental Management Plan be prepared, which includes all EPA approved erosion control measures. These temporary control measures should be inspected during rainfall events to ensure controls are able to prevent/minimize offsite discharges and longer term impacts. Sediment control measures selected should also reflect the level of protection required to protect the ecological values within the creeks downstream of the project area.

Link to further information: http://www.gazette.vic.gov.au/gazette/Gazettes2021/GG2021S245.pdf

5. Victoria's Guidelines for the removal, destruction or lopping of native vegetation

The Guidelines were introduced in December 2017. They set out and describe the application of Victoria's statewide policy in relation to assessing and compensating for the removal of native vegetation in order to achieve the objective of 'no net loss to biodiversity as a result of the removal, destruction or lopping of native vegetation'.

This objective is to be achieved through Victoria's planning system using an assessment approach that relies on strategic planning and the permit and offset system. The key policy for achieving no net loss to biodiversity is the three-step approach of avoid, minimise and offset:

- **Avoid** the removal, destruction or lopping of native vegetation to ensure that the important biodiversity values of native vegetation continue to be delivered into the future.
- **Minimise** impacts resulting from the removal of native vegetation that cannot be avoided.
- Provide an **offset** to compensate for the biodiversity impact resulting from the removal of native vegetation.

The strategic and site level steps taken during the design of the development to minimise biodiversity impacts resulting from the removal of native vegetation are outlined below. A detailed avoid and minimise statement in accordance with DEECA's Assessors Handbook is provided for the project:

- Detailed project planning including feasibility studies, desktop constraints assessment, terrain modelling and an initial trail mark-out and later assessments that aimed to micro-site around potential areas of high ecological value. This process resulted in the reduction in the length of proposed trails, and the removal of some trails from the proposed alignment due to potential impacts to threatened flora and fauna species, and to sensitive EVCs.
- Aligning 41.9 kilometres of the trail network on exiting trails (i.e. formal walking trails and management vehicle tracks).
- Aligning 6.7 kilometres of the trail network on informal trails (i.e. unsanctioned walking trails that have been illegally constructed. Note that this trail type has been included in the vegetation loss calculations).
- Ensuring trail styles and construction methods only require the removal of understorey vegetation so the forest canopy and sub-canopy will remain intact.
- Designing trails to follow land contours and take advantage of flat spurs and ridges, where possible, minimising the need for major soil excavation.
- Using the design principle of elevating all waterway crossings and EVCs sensitive to hydrological changes (i.e: EVC 201 – Shrubby Wet Forest) to minimise disturbance of aquatic habitats and to reduce ongoing point sources for sedimentation of local waterways.
- Committing to the principle of pre-construction micro-siting to achieve avoidance of key habitat features for threatened fauna, avoid threatened flora species populations, minimise disturbance of wildlife habitat, minimise indirect impacts on significant trees and minimise impacts on waterways, other watercourses, springs and soaks.

- Committing to the development of a weed management plan to monitor and control weeds along the trail network.
- Committing to a strategy to monitor and control the spread of *Phytophthora cinnamomi* along the trail network.
- Engaging a professional arborist at the design stage to review existing conditions for trees in the project area; and provide sensitive construction techniques that can be applied to ensure encroachment into tree protection zones and structural root zones does not lead to the long-term decline of forest trees.
- Siting of trails to **avoid** areas of high ecological value, including:
  - Avoid incorporating trails that pass near Southern-bent Wing-bat non-breeding caves and roost sites into the trail network.
  - Avoid siting new trails that intersect high quality remnants of EVC 6 – Sand Heathland and EVC 48 – Heathy Woodland. These EVCs contain a high proportion of threatened flora and fauna habitat in the project area. The trail has been realigned in GTR 2 to occur on existing trails.
  - Avoid siting trails that intersect with critical small mammal refuges and heavy *Phytophthora* dieback disease infestation near Coalmine Creek.
- Siting and construction of trails to **minimise** impacts to the extent possible on areas of high ecological value, including:
  - Minimising impacts on Hooded Plover by reducing the length of trails sited on beaches.
  - Micro-site the trail to avoid populations of the EPBC Act listed Wrinkled Buttons.
  - Elevating trails that intersect with critical small mammal habitat corridors.
  - Incorporation of a 25 metre boardwalk design to reduce and mitigate impacts on threatened small mammals at the mouth of the Grey River.
- Minimising trail development near estuaries and coastal wetlands.

DEECA has provided biodiversity information tools to assist with determining the assessment pathway associated with the removal of native vegetation and the contribution that native vegetation within the project area makes to Victoria's biodiversity.

All planning permit applications to remove native vegetation are assigned to an assessment pathway determined by the extent and location of proposed native vegetation removal. The assessment pathway will dictate the information to be provided in a planning permit application and the decision guidelines the responsible authority (e.g. Council) and/or DEECA as a referral authority will use to assess the permit application.

The biodiversity information tools have two components:

Site-based information

The site-based information is observable at a particular site. Biosis has collected the requisite site-based information for the assessment against the Guidelines.

Landscape scale information

Landscape scale information requires consideration of information beyond the site. This information is managed by DEECA and can be accessed via the NVIM.

The following section summarises the results of the site-based assessment and the outputs generated by the Native Vegetation Removal Report, which identifies the assessment pathway on which the planning application will be assessed. The full Native Vegetation Removal Report can be viewed in Appendix 7.

5.1 Proposed removal of native vegetation

The extent of native vegetation patches, the location of large trees within patches and any scattered trees were mapped within the project area Figure 7) and the condition was assessed in relation to standard methods provided by DSE (2004) and pre-determined EVC benchmarks: https://www.environment.vic.gov.au/biodiversity/bioregions-and-evc-benchmarks.

The proposed removal of native vegetation was assessed in accordance with the concept design provided and ground checked by World Trail. The trails will remove 8.9194 hectares of native vegetation, all of which is considered patch vegetation (Figure 7). Six large trees within patches are proposed to be removed. Spatial data (shapefiles) of proposed vegetation removal were submitted to DEECA's native vegetation support team, who provided a Native Vegetation Removal Report for the project. This is provided in Appendix 7 and summarised in the following sections.

5.1.1 Habitat hectares

A continuous area of the same EVC is termed a 'habitat zone'. Different habitat zones exists where there are different EVCs present and/or discrete (non-continuous) patches of the same EVC. A separate vegetation quality assessment was conducted for each habitat zone. The vegetation quality assessment score was multiplied by the extent of the habitat zone to give a value in habitat hectares.

Multiple habitat zones were identified. The results of the vegetation quality assessment are provided in Appendix 6.

A total of 1,740 large trees occur within patches of native vegetation within the assessment corridor. The locations of large trees within patches are shown in Figure 7 and the circumference of each large tree marked for removal is provided in Appendix 6.

5.2 Determining the assessment pathway

Applications to remove native vegetation are categorised into one of three assessment pathways: basic, intermediate or detailed. Two factors are used to determine the assessment pathway for a permit application, the **location** and **extent** of the native vegetation proposed to be removed. Location has been divided into three possible categories by DEECA, and has been pre-determined by DEECA for all locations in Victoria. The location of a particular site is determined using the *location map* available in the Native Vegetation Information Management (NVIM) system (http://nvim.depi.vic.gov.au).

The extent of native vegetation proposed to be removed determines the assessment pathway by considering the following:

- The total area (hectares) of native vegetation (including any patches and scattered trees) proposed to be removed
- Whether any large trees are proposed to be removed, either as scattered trees or occurring in patches.

It is proposed to remove greater than 0.5 hectares of native vegetation and six large trees from within location category 3, therefore the project must meet the requirements of, and be assessed in, the detailed assessment pathway. These requirements are provided in Appendix 6.

5.3 Offset requirements

In order to ensure a gain to Victoria's biodiversity that is equivalent to the loss resulting from the proposed removal of native vegetation, compensatory offsets are required where Clause 52.17 applies to the project. Losses and gains are measured in general or species habitat scores or units. The offset must also include at least one large tree for every large tree removed.

For a detailed assessment pathway project, the species-general offset test will determine if a general offset, species offset or combination of both is required.

The results of the species-general offset test are provided in Appendix 7 and summarised in Table 13.

Table 13 Summary of DEECA Native Vegetation Removal Report

Attribute	Outcome	Notes
Location category	3	High location risk
Native vegetation removal extent	8.9194 hectares	Including 6 large trees
Assessment pathway	Detailed	Location 3 and removal of > 0.5 hectares of native vegetation
Strategic Biodiversity Value Score	0.515 – 1.000	Range for multiple habitat zones
Modelled habitat for threatened species	Yes	Modelled habitat for 129 species (Appendix 7)
Offset type	General and species	
Offset multiplier	1.5 X – General 2 X - Species	
Offset amount: general habitat units (GHU)	0.432 general habitat units	
General offset vicinity		The offset site must be located within the same Catchment Management Authority boundary or municipal district as the native vegetation to be removed.
General offset minimum Strategic Biodiversity Value Score	0.676	
Offset amount: Species habitat units	7.525 species habitat units	• 6.501 species units of habitat for Wrinkled Buttons • 0.865 species units of habitat for Coast Correa • 0.024 species units of habitat for Otway Black Snail • 0.135 species units of habitat for Southern Blue-gum
Large tree attributes	6 large trees	The offset must include protection of at least one large tree for every large tree to be removed.

5.4 Proposed offset strategy

Consultation with DEECA, Parks Victoria and GORCAPA concluded that the Crown land exemption is only able to be used by the relevant authority for land which is under their own management (For example, DEECA is only able to use the Crown land exemption on land which is under management by DEECA).

The Crown Land exemption may be available to the project (see Section 4.2.3). This exemption is implemented through DEECA's *Procedure for the removal destruction or lopping of native vegetation on Crown land* (DELWP 2018) and would negate the need for native vegetation offsets. A planning permit will be required under Clause 52.17 if this exemption is not applied to the project.

Once the final design has been determined, and if offsets are required (depending on whether exemptions are followed), there are a number of options to secure the required offsets to compensate for the losses of native vegetation and threatened species habitat.

5.4.1 First Party Offset

Based on the offset site security standards detailed on page 28 of DEECA (2017a), the offset owner will be required to enter into a security agreement with a relevant statutory body that meets the following security standards:

- Contains a legally enforceable provision
- Has no termination date
- Is registered on the land title.

An offset management plan will need to be developed and this area will need to be actively managed for a nominated 10 year period and then maintained as an offset in perpetuity.

5.4.2 Third party offset credit purchase

The proponent may be able to purchase the offset credits from the Victorian native vegetation credit register if suitable offsets are available.

6. Key ecological values and recommendations

This section identifies the key ecological features of the assessment corridor, provides an outline of potential implications of the proposed walking trail on those values and includes recommendations to assist World Trail and DEECA to avoid, mitigate and offset impacts on biodiversity.

The location of the Great Ocean Road trail network, largely within National Parks and conservation reserves, has resulted in an alignment that contains a diverse array of ecological values. Then proponent, DEECA, and the project team have demonstrated consideration of these values throughout the early stages of project planning by actively engaging in analysis of site values, formulating design responses and selecting alignments that minimised impacts on significant ecological features where possible.

This report outlines the potential impacts of the proposed trail network and contains recommendations to minimise and mitigate these impacts at the design, construction and operational stages of the project.

6.1 Ecological values

Key ecological values identified within the assessment area and broader habitat are as follows:

- The project area crosses two bioregions with distinct environmental conditions, vegetation communities and species assemblages (the Otway Plain and the Otway Ranges).
- Two EVCs in the Otway Plain bioregion composed of three condition states:
  - EVC 21 – Shrubby Dry Forest, Bioregional Conservation Status (BCS) of least concern.
  - EVC 48 – Heathy Woodland, BCS of least concern.
- Eight EVCs in the Otway Ranges bioregion composed of 15 condition states:
  - EVC 16 – Lowland Forest, BCS of depleted.
  - EVC 18 – Riparian Forest, BCS of least concern.
  - EVC 21 – Shrubby Dry Forest, BCS of least concern.
  - EVC 22 – Grassy Dry Forest, BCS of depleted.
  - EVC 45 – Shrubby Foothill Forest, BCS of least concern.
  - EVC 48 – Heathy Woodland, BCS of least concern.
  - EVC 161 – Coastal Headland Scrub, BCS of depleted.
  - EVC 201 – Shrubby Wet Forest, BCS of least concern.
- Forest, woodland and coastal scrub vegetation that supports a suite of habitat elements including large trees, fallen timber, rocks, tussock-forming grasses, major river systems with minor tributaries, seasonally wet areas and structurally-complex understorey.
- Populations of Wrinkled Buttons, Gang-gang Cockatoo, Yellow-bellied Glider, Broad-toothed Rat, Swamp Antechinus and Long-nosed Potoroo listed under the EPBC Act and FFG Act.
- Blue-winged Parrot population listed under the EPBC Act.

- Populations of threatened flora species listed under the FFG Act: Brooker's Gum and Southern Blue-gum, and Paper flower.
- Populations of threatened fauna species listed under the FFG Act: Otway Burrowing Crayfish, Otway Black Snail, Grey Goshawk, Rufous Bristlebird (Otway), White-bellied Sea-Eagle, and Powerful Owl.
- Potential habitat for threatened species:
  - Listed under EPBC Act: three flora species including Anglesea Grevillea, Green-striped Greenhood, Spiral Sun-orchid. Seven fauna species including Australian Grayling, White-throated Needletail, Southern Bent-winged Bat, Grey-headed Flying-fox, Latham's Snipe, Diamond Firetail, and Southern Brown Bandicoot.
  - Listed under FFG Act: 32 flora species. Sixteen fauna species, six of which are also listed under the EPBC Act (section 4.2.1).
- Waterways and aquatic habitats, major river systems include:
  - Anderson Creek
  - Brown Creek
  - Coalmine Creek
  - Cumberland River
  - Erskine River
  - Grassy Creek
  - Grey River
  - Hitchcock Gully
  - Jamieson Creek
  - Kennett River
  - Moggs Creek
  - Monash Gully
  - Reedy Creek
  - Saint George River
  - Separation Creek
  - Sheoak Creek
  - Spout Creek
  - Stony Creek
  - Wye River

6.2 Summary of potential impacts

Construction of the trail network (GTR 3) is likely to result in the following impacts:

- Up to 8.9194 hectares of native vegetation removal for trails (understorey) and abutments of three swing bridges (full removal). Impacts are summarised below:
  - Otway Plain Bioregion
    - 0.08898 hectares of EVC 48 - Heathy Woodland (condition state: High)
  - Otway Ranges Bioregion
    - 0.30065 hectares of EVC 16 - Lowland Forest (condition state: High)
    - 0.04707 hectares of EVC 18 - Riparian Forest (condition state: Low)
    - 0.14982 hectares of EVC 18 - Riparian Forest (condition state: High)
    - 0.08018 hectares of EVC 21 - Shrubby Dry Forest (condition state: Moderate)
    - 2.70722 hectares of EVC 21 - Shrubby Dry Forest (condition state: High)
    - 0.06536 hectares of EVC 45 - Shrubby Foothill Forest (condition state: Low)
    - 0.65459 hectares of EVC 45 - Shrubby Foothill Forest (condition state: Moderate)
    - 3.91578 hectares of EVC 45 - Shrubby Foothill Forest (condition state: High)
    - 0.01281 hectares of EVC 48 - Heathy Woodland (condition state: Moderate)
    - 0.13565 hectares of EVC 48 - Heathy Woodland (condition state: High)
    - 0.10033 hectares of EVC 161 - Coastal Headland Scrub (condition state: Low)
    - 0.17106 hectares of EVC 161 - Coastal Headland Scrub (condition state: Moderate)
    - 0.07997 hectares of EVC 161 - Coastal Headland Scrub (condition state: High)
    - 0.31700 hectares of EVC 161 - Shrubby Wet Forest (condition state: High)
- The loss of six large trees (including four FFG Act listed Southern Blue-gum) for construction of the bridge abutments.
- Potential impacts to threatened species may occur, most of which are temporary in nature (e.g. during the construction phase), or of a relatively minor scale due to the linear nature of the impact and the restriction of the impact to understorey habitat, these include:
  - Disturbance to habitat of four EPBC Act listed flora species predicted to occur within the trail corridor including: Wrinkled Buttons, Anglesea Grevillea, Green-striped Greenhood, and Spiral Sun-orchid.
  - Disturbance to habitat of 13 EPBC Act listed fauna species: Gang-gang Cockatoo, White-throated Needletail, Swamp Antechinus, Long-nosed Potoroo, Broad-toothed Rat, Southern Brown Bandicoot, Grey-headed Flying-fox, Southern Bent-winged Bat, Yellow-bellied Glider, and Australian Grayling, Latham's Snipe, Blue-winged Parrot and Diamond Firetail.
  - Disturbance to habitat for 38 listed FFG Act flora species (Table 8).

- Disturbance to confirmed or potential habitat for 27 listed FFG fauna species, 11 of which are also listed under the EPBC Act (Table 7).

- Disturbance to sensitive EVCs that rely on the existing hydrology and ground disturbance remaining intact (i.e. EVC 201 – Shrubby Wet Forest which has a high ground fern component including Soft Tree-fern and Water Fern).
- Potential spread of noxious and/or high threat weeds into areas of high quality remnant vegetation.
- Potential spread of pathogens, particularly *Phytophthora cinnamomi* .

The following key legislative considerations have been identified:

- Based on the proposed walking trail network within the project area, construction descriptions and information provided to Biosis, the project is unlikely to have a significant impact on MNES list under the EPBC Act. However, due to the high-profile nature of the project and public interest, it is recommended that DEECA refers the project to the federal Minister of the Environment for legal certainty for assessment under the EPBC Act.
- There is also potential for the works to have minor and localised effects that will be short-term to medium term (e.g. effects will be measurable in weeks or months) on:
  - Australian Grayling
  - Blue-winged Parrot
  - Broad-toothed Rat
  - Gang-gang Cockatoo
  - Grey Headed Flying-fox
  - Long-nosed Potoroo
  - Southern Bent-winged Bat
  - Southern Brown Bandicoot
  - Swamp Antechinus
  - White-throated Needletail
  - Yellow Bellied Glider
- In accordance with Clause 52.17 of the Victoria Planning Provisions a permit to remove, destroy or lop native vegetation, including some dead native vegetation, may be required and under Clause 66.02 this permit will be referred to DEECA as the referral authority. However, the Crown land exemption at Clause 52.17-7 may apply to this project.
- An FFG Act permit to 'take' protected flora species and impact on threatened flora from public land will be required, as 79 protected flora species, several listed flora and fauna species and one listed community were recorded within the assessment corridor.
- A works on waterways permit from Corangamite CMA may be required and Corangamite CMA should be consulted on the status of waterways and tributaries within the assessment corridor.
- An EES referral may be required as the project has the potential to have regional or State significant environmental impacts.

A summary of potential implications for trail development and recommendations to minimise impacts of the project is provided in Table 14.

Table 14 Summary of key ecological values, potential implications of constructing the trail and recommendations to minimise ecological impacts.

Ecological feature (Figure 5 and Figure 6)	Implications of development	Recommendations
Native vegetation	The permanent removal of 8.9194 hectares of mostly understorey vegetation. The application will be assessed on the detailed assessment pathway. Proportional impacts to native vegetation above the species offset threshold for four species: • Southern Blue-gum • Otway Black Snail • Coast Correa • Wrinkled Buttons.	Where native vegetation removal is unavoidable then minimise impacts in accordance with No Net Loss policy. Refer to Section 5. Identify and implement appropriate offsets for vegetation losses as outlined in Section 5.3 by establishing and registering the Crown land offset site. Implement the trail rehabilitation component of the CEMP to assist trail rehabilitation during and post-construction. This should detail measures such as placement of cut material and soil sods along trail edges to reduce erosion and encourage natural regeneration. Undertake ongoing weed control as required. Micro-site trail alignment where Wrinkled Buttons have been recorded to avoid direct impacts.
Significant species and ecological communities	Impacts on significant species and communities and their habitat (see above).	• Avoid the removal of hollow-bearing trees. • Avoid impacts to Sand Heathland and Heathy Woodland, which may provide important habitat for Southern Brown Bandicoot, Swamp Antechinus, Long-nosed Potoroo, Southern Toadlet, Brown Toadlet, and White-footed Dunnart. • Implement a site-specific Construction Environmental Management Plan (CEMP) to manage erosion and pollutants during construction to prevent impacts to threatened species Australian Grayling, Platypus, Australian Mudfish and Otway Bush Yabby. • Micro-site works areas to avoid removal of trees containing raptor nests and/or tree hollows, which provide habitat for threatened forest owls and diurnal raptors such as Grey Goshawk. • Micro-site trail alignment to avoid Otway Burrowing Crayfish burrows in accordance with recommendations provided by DEECA's Barwon South West and GORCT Project team (DEECA & GORCT Project Team 2024). • Minimise impacts to potential Otway Black Snail habitat where new trails intersect with Riparian Forest and Shrubby Wet Forest. Install boardwalks

Ecological feature (Figure 5 and Figure 6)	Implications of development	Recommendations
		at these locations if possible to minimise impacts, and avoid disturbing key habitat features such as deep leaf litter around the base of trees and tree-ferns. • Undertake construction works outside of threatened bird nesting and fledging seasons, to avoid impacts to Rufous Bristlebird, Diamond Firetail and Chestnut-rumped Heathwren. • Stage trail construction works to occur outside of the key breeding period for Swamp Antechinus (May to August) and Broad-toothed Rat (October to March) to mitigate impacts on breeding success. This should occur at locations where they were detected, trail construction works should be limited to spring. • Implement a site-specific Fauna Management Plan to ensure suitable salvage techniques and mitigation measures are applied during construction to avoid and/or minimize the death and/or injury of individuals of threatened species.
Aquatic habitat features	Loss of, or alterations to, riparian and in-stream habitat within and in the vicinity of the assessment corridor (e.g. downstream) via: direct removal, notable hydrological changes, deterioration in water quality (including pollution event) and, sedimentation.	• Design trail and construction methods to minimise removal of riparian vegetation and avoid instream works via the use of clear span elevated structures. • Comply with the General Environmental Duty (GED) of the EP Act 2017, by taking all reasonable steps to prevent or minimise risks so as to avoid environmental damage (e.g. pollution of nearby waterways). • Implement a site-specific CEMP to ensure appropriate sediment control measures are put in place to ensure run-off during construction does not impact surrounding streams and creeks. Control measures implemented should reflect the level of protection required to protect nearby ecological values and ensure that any impacts as a result of the project do not result in changes that exceed background levels and/or objectives; as outlined in Part Five, Division Three (Surface Waters) of the Environmental Reference Standards. • Avoid instream works. • Utilise the most sensitive short term (i.e. during construction) and long term sediment control methods available for all works located in within and in the vicinity of all flowing and all mapped waterways (including ephemeral first order tributaries). • Design the trails to direct runoff through a buffer of vegetation (preferably > 30 m in width) rather than directly into waterways defined above.

Ecological feature (Figure 5 and Figure 6)	Implications of development	Recommendations
Other habitat features	• Refuge areas for ground-dwelling mammals. • Large trees and fallen logs.	• Avoid areas identified as refuge areas for ground-dwelling mammals. • Avoid the removal of large fallen logs and timber whenever possible.
Habitat connectivity	Small scale fragmentation of habitat connectivity for vertebrate and invertebrate fauna species.	Design all waterway crossings in accordance with relevant guidelines from the CMA and in accordance with guidelines for fish friendly waterway crossings (Witheridge 2002, Fairfull & Witheridge 2003). For minor ephemeral tributaries, boardwalks and grates should suffice or larger waterways, appropriate full span bridges should be used.

6.3 Avoidance strategies and mitigation recommendations

Key impact avoidance and minimisation strategies, and mitigation measures include:

Project specific recommendations

- Develop a weed control strategy that monitors weed invasion along the trail, at a minimum:
  - Within key threatened species habitat (i.e. Wrinkled Buttons habitat, and small mammal refuge habitat at the Coalmine Creek intersect).
  - Along tracks that extend through major weed infestations.
- Incorporate/develop the following mitigation strategies to prevent the spread of *Phytophthora cinnamomi* :
  - Control *Phytophthora* dieback disease that occur along the trail network with a Phosphite fungicide.
  - Protect Austral Grass-tree from adverse drainage during construction and operation of trail to reduce impact of *Phytophthora* dieback disease .
  - Develop a *Phytophthora cinnamomi* monitoring strategy that:
    - Documents the extent of existing infestations.
    - Conducts annual assessment of all known infections that records: the extent of infestations, and the effectiveness of treatment strategies implemented.
    - Monitors susceptible EVCs along the trail network for new infestations to be included in future monitoring and treatment programs.
  - Incorporate hygiene stations to reduce the spread of weeds and pathogens into the trail network. Critical areas for positioning hygiene stations include:
    - At the fronts of *Phytophthora* dieback disease infestations that are intersected by the trail. This is to contain the infection to the existing area and prevent further spread along the trail.
    - At entry and exit point where the trail intersects with EVC 45 – Heathy Woodland or EVC 6 – Sand Heathland that are susceptible to *Phytophthora cinnamomi* (note: EVC 6 was not recorded within the GTR 3 assessment corridor).
- Create a trail Construction and Environment Management Plan that mitigates the spread of soil pathogens and diseases, such as *Phytophthora cinnamomi* and Myrtle Wilt. Such plans should detail:
  - Strict hygiene methods to be implemented during trail construction.
  - On-going monitoring to assess the spread of *Phytophthora cinnamomi* and Myrtle Wilt.
  - All environmental controls and mitigation measures covering vegetation removal prescriptions/seasonality, work site delineation, weed/pathogen hygiene, sediment control and unexpected finds protocols and salvage protocols.
- Construct elevated boardwalks, to reduce impacts on hydrology and/or soil compaction, and threatened fauna associated with these habitats including Otway Burrowing Crayfish and Otway Black Snail, when the walking trail intersects:
  - Ephemeral waterways and minor tributaries.

- EVC 201 – Shrubby Wet Forest.

- Adhere to construction methodology outlined in Axiom Tree Management (2022) to reduce impacts on trees through the implementation of tree protection measures.
- Microsite the trail during construction in EVC 48 – Heathy Woodland to reduce impacts on cryptic FFG Act listed flora (such as Orchids and other graminoids listed in section 3.5.2).
- Microsite the trail through recorded populations of Wrinkled Buttons to avoid direct impacts (i.e. Alternate Trail 2, Alternate Trail 3, Trail 19, Trail 42, Trail 49, Trail 60, Trail 61, Trail 62, and Trail 63).
- Protect critical refuge habitat for small to medium sized ground-dwelling mammals by:
  - Aligning trail to avoid areas of critical refuge habitat (i.e trail 15 is appropriately aligned above refuge habitat and no other critical refuge habitat is intersected by GTR 3).
  - Avoid impacts to vegetation functioning as a corridor to the refuge habitat (elevate trail 43 as it crosses Coalmine Creek so that the grass and shrub layer are not impacted).
  - Confirmed incorporation of a 25 metre boardwalk at the mouth of Grey River to mitigate direct impacts to known habitat for small mammals, including the threatened Broad-toothed Rat and Swamp Antechinus.
  - Use appropriate fencing, that enables small mammal passage, however discourages pedestrians from leaving trail at the Coalmine Creek intersect.
  - Install hygiene stations for *Phytophthora cinnamomi* in consultation with the Corangamite Catchment Management Authority (CCMA).
  - Consider improving habitat and protecting environmental values by:
    - Improving the vegetation for small mammals at Coalmine Creek habitat corridor in consultation with the CCMA.
    - Installing interpretive signage that emphasises the importance of habitat along the trail for threatened species (i.e small mammals) and the importance of remaining on the trail to preserve those habitats.
- Undertake woody weed removal prior to constructing trail 70. Microsite the trail once Sweet Pittosporum has been removed to avoid / minimise disturbance to the high-quality understorey within EVC 161 – Coastal Headland Scrub (particularly within the Moderate and High condition states).
- Micro-site bridge abutments, where possible, to locate outside of TPZs, particularly of large trees and Southern Blue-gum.
- Micro-site the trail alignment to avoid and minimise impacts to Otway Burrowing Crayfish in accordance with the recommendations provided by DEECA's Barwon South West and GORCT Project team. Fifteen likely hotspots have been identified within the alignment based on habitat suitability, 10 of which are on proposed new trails (DEECA & GORCT Project Team 2024). Locations of the hotspots should be incorporated into the project's CEMP. The following recommendations to avoid and minimise impacts to the species must occur at the 10 identified locations (see Figure 6 of the GORCT Technical Survey Outcomes – Flora and Fauna):
  - Conduct a site survey to identify crayfish burrows, to be undertaken by a suitably qualified ecologist experienced in the identification of crayfish burrows.

- At locations where burrows are identified, micro-site trail construction to avoid burrows and minimise damage. Chemical use, soil compaction and disturbance or organic litter ground cover should be avoided at these locations.
- Construction teams will be trained by the project ecologist in the identification of potential crayfish habitat and burrows during the construction induction. It is not intended to provide species-specific training but to educate construction teams in the general identification of potential burrow sites and appropriate management of impacts (e.g. avoidance of deep excavation).
- It is recommended that a suitably qualified and experience ecologist is on site to supervise trail construction at hotspots where burrows may be located. Ecologist supervision at these locations may also assist to minimise impacts to other threatened fauna such as the Otway Black Snail, given the overlap in habitat suitability including a preference for moist environments nearby creeks and streams.
- If burrows cannot be avoided, a suitably qualified ecologist much salvage and relocate individuals excavated from burrows. Potential burrows sites that cannot be avoided should be excavated carefully by hand or excavator. If individuals are identified, the crayfish should be moved to the nearest suitable habitat.
- Elevate trails that intersect suitable habitat, minimise and reduce soil disturbance and compaction.
- Hand-build trails at locations of suitable habitat to reduce the size and impact of disturbance.
- Apply mitigation measures at higher order stream crossings that avoid sedimentation and sediment mobilisation in accordance with the Australian Platypus Conservancy - Platypus Contingency Plans for Capital Works Programs.

General recommendations

General trail construction and maintenance recommendations include:

- Avoiding the direct removal of canopy trees along trails, particularly large hollow-bearing trees, through the micro-siting of the trail.
- Undertaking necessary pre-construction site visits with contractors prior to any works commencing to ensure all high value areas are avoided and protected.
- Restricting disturbance to track margins in areas where existing trails are present.
- To the fullest extent practicable, minimise disturbance to any native vegetation, including aquatic vegetation, within the project area. This may include the demarcation of areas of native vegetation to be retained during works.
- Adhering to the construction corridors, maintenance zones and permanent vegetation removal footprints outlined in this report.
- Implementing best practice trail design, construction and sediment management practices.
- Minimising the impacts of construction by 'building from the trail' and from within the construction footprint.
- Implementing strict weed and pathogen hygiene protocols during construction and operation of trails.

- Any plant or equipment used should be washed down and cleaned prior to and following use to reduce the translocation risk of weed species.
- Engage a suitably qualified arborist to advise on the management of trees during the construction phase of the project. The project arborist should induct workers prior to commencing trail construction works on:
  - Basic tree functions and impacts from trail.
  - Construction guidelines for working close to trees.
  - Procedure when roots are damaged and native vegetation offsets are required.
- Should instream or riparian works be proposed, undertake biological and physicochemical monitoring of waterways to be impacted in accordance with *The Environment Protection Act 2017*, the Environment Protection Regulations 2021 and Environment Reference Standards (ERS) introduced from 1 July 2021. Biological and physicochemical monitoring should be undertaken in appropriate locations and seasons prior to and following any proposed instream / riparian zone works to determine if there has been any negative impact on the health of waterways as a result of the project.
- The results of this assessment should be incorporated into the future stages of project design, by ensuring the flora and fauna mapping information is incorporated into, or used alongside mapping.

A number of standard precautions and mitigations relevant to the protection of fish habitat are provided in Witheridge (2002), these should be considered and deployed as relevant. Further recommendations specific to the construction of bridges and protection of aquatic habitats include:

- Silt curtains or a coffer dam should be deployed around aquatic work sites where required, to protect against any impacts to water quality. In addition to standard erosion and sediment control measures.
- If the stockpiling of sediment is required it should be located as far away from the waterway as possible and managed so that it is secure against flooding, to at least the 1 in 10 year flood interval.
- Any runoff from stockpiled sediment must be managed to prevent any sediment entering the waterway.
- Instream works should be avoided. If they cannot be avoided, then they should be limited low flow periods wherever possible and undertaken during calm weather conditions.
- Appropriate erosion and sediment controls that take into account works near creeks and their floodplains should be employed to protect against any impacts to water quality or indirect impacts to retained vegetation.
- Any sections of creek banks that are impacted or modified by the proposed works should be reformed or remediated to resemble the pre-works condition and form wherever possible.
- Minimise soil transportation within, into or out of the project area to reduce the spread of weeds.

Biosis recommends that these strategies be conferred through to the detailed design and construction phase of the project, and that the appointed construction contractor be accountable for achieving a high level of environmental compliance consistent with the environmental management framework in the project masterplan and an endorsed CEMP that is subject to regular third-party compliance monitoring.

6.4 Next steps

The following steps are relevant to finalising the biodiversity impact assessment and approvals process for the project:

- Determine if offsets are available and develop an offset strategy or determine counter balancing measures if the Crown Land exemption is applied (following DEECA's *Procedure for the removal destruction or lopping of native vegetation on Crown land*).
- Refer the project to the federal Minister of the Environment for assessment under the EPBC Act for legal certainty.

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Appendices

Appendix 1 Flora

The following abbreviations and symbols are relevant to this Appendix:

Code	Meaning	Reference
National listings (EPBC Act)		
EX	Extinct	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)
CR	Critically endangered	
EN	Endangered	
VU	Vulnerable	
PMST	Protected Matters Search Tool	
State listings (FFG Act and DEECA Advisory List)		
x	Extinct	Victorian *Flora and Fauna Guarantee Act 1988* (FFG Act)
cr	Critically endangered	
e	Endangered	
v	Vulnerable	
t	Threatened	
P	Protected (public land only)	
Weed status (CaLP Act, DCCEEW Weeds of National Significance and DEECA Advisory List[1])		
SP	State prohibited species	Victorian *Catchment and Land Protection Act 1994* (CaLP Act)
RP	Regionally prohibited species	
RC	Regionally controlled species	
R	Restricted species	
Other		
#	Native species outside its natural range	Victorian Biodiversity Atlas (VBA)

[1] The DEECA Advisory List for Rare or Threatened Plants was revoked in 2021 and are superseded by the current list of threatened species under the FFG Act 1988.

A1.1 Flora species recorded from the assessment corridor

Table 15 Flora species recorded from the assessment corridor

Status	Scientific Name	Common Name
Indigenous species		
	Acacia dealbata	Silver Wattle
P	*Acacia gunnii*	Ploughshare Wattle
	Acacia leprosa var. *magna*	Otway Wattle
P #	*Acacia longifolia*	Sallow Wattle
P #	*Acacia longifolia* subsp. *longifolia*	Sallow Wattle
P #	*Acacia longifolia* subsp. *sophorae*	Coast Wattle
P	*Acacia mearnsii*	Black Wattle
	Acacia melanoxylon	Blackwood
P	*Acacia mucronata* subsp. *longifolia*	Narrow-leaf Wattle
P	*Acacia myrtifolia*	Myrtle Wattle
P	*Acacia oxycedrus*	Spike Wattle
P	*Acacia stricta*	Hop Wattle
P	*Acacia suaveolens*	Sweet Wattle
P	*Acacia ulicifolia*	Juniper Wattle
P	*Acacia verniciflua* s.s.	Varnish Wattle
P	*Acacia verticillata*	Prickly Moses
	Acaena novae-zelandiae	Bidgee-widgee
P	*Acianthus caudatus*	Mayfly Orchid
P	*Acianthus pusillus*	Small Mosquito-orchid
P	*Acianthus* spp.	Mosquito Orchid
P	*Acrotriche serrulata*	Honey-pots
P	*Acrotriche* spp.	Ground Berry
P	*Adiantum aethiopicum*	Common Maidenhair
	Ajuga australis	Austral Bugle
	Allocasuarina misera	Slender Sheoak
	Allocasuarina spp.	Sheoak
	Allocasuarina verticillata	Drooping Sheoak
	Alyxia buxifolia	Sea Box
	Amperea xiphoclada var. *xiphoclada*	Broom Spurge
	Asperula conferta	Common Woodruff
	Asperula oblanceolata	Otway Woodruff
	Asperula spp.	Woodruff
P	*Asplenium flabellifolium*	Necklace Fern
	Austrostipa spp.	Spear Grass
	Banksia integrifolia subsp. *integrifolia*	Coast Banksia
	Banksia marginata	Silver Banksia
P	*Bedfordia arborescens*	Blanket Leaf

Status	Scientific Name	Common Name
	Billardiera mutabilis	Common Apple-berry
	Billardiera spp.	Apple Berry
P	*Blechnum* spp.	Water Fern
	Bossiaea prostrata	Creeping Bossiaea
P	*Brachyscome multifida*	Cut-leaf Daisy
	Bromus spp.	Brome
P	*Brunonia australis*	Blue Pincushion
	Bulbine spp.	Bulbine Lily
	Burchardia umbellata	Milkmaids
	Bursaria spinosa subsp. *spinosa*	Sweet Bursaria
P	*Caladenia carnea* s.s.	Pink Fingers
P	*Caladenia* spp.	Caladenia
P	*Caleana* s.l.	Duck Orchid
P	*Calocephalus lacteus*	Milky Beauty-heads
P	*Calochlaena dubia*	Common Ground-fern
	Cardamine spp.	Bitter Cress
	Carex appressa	Tall Sedge
P	*Cassinia longifolia*	Shiny Cassinia
	Cassytha glabella	Slender Dodder-laurel
	Cassytha melantha	Coarse Dodder-laurel
	Cassytha pubescens s.s.	Downy Dodder-laurel
	Cassytha spp.	Dodder Laurel
	Caustis flexuosa s.s.	Curly Wig
	Chamaescilla corymbosa var. *corymbosa*	Blue Stars
P	*Cheilanthes austrotenuifolia*	Green Rock-fern
P	*Chrysocephalum apiculatum* s.s.	Common Everlasting
P	*Chrysocephalum semipapposum*	Clustered Everlasting
	Clematis aristata	Mountain Clematis
	Clematis microphylla s.s.	Small-leaved Clematis
	Comesperma volubile	Love Creeper
	Coprosma quadrifida	Prickly Currant-bush
P	*Coronidium scorpioides* s.s.	Button Everlasting
P	*Correa alba*	White Correa
P	*Correa lawrenceana*	Mountain Correa
P	*Correa reflexa*	Common Correa
P	*Correa reflexa* var. *reflexa*	Common Correa
	Crassula spp.	Crassula
P	*Cyathea australis*	Rough Tree-fern
P	*Cymbonotus preissianus*	Austral Bear's-ear
	Cynoglossum australe	Australian Hound's-tongue
	Cyperaceae spp.	Sedge

Status	Scientific Name	Common Name
	Cyperus spp.	Flat Sedge
	Daviesia brevifolia	Leafless Bitter-pea
	Desmodium gunnii	Southern Tick-trefoil
	Dianella admixta	Black-anther Flax-lily
	Dianella longifolia s.l.	Pale Flax-lily
	Dianella revoluta s.l.	Black-anther Flax-lily
	Dianella revoluta var. *revoluta s.l.*	Black-anther Flax-lily
	Dianella spp.	Flax Lily
	Dianella tasmanica	Tasman Flax-lily
	Dichondra repens	Kidney-weed
P	*Dicksonia antarctica*	Soft Tree-fern
	Dillwynia spp.	Parrot Pea
	Drosera auriculata	Tall Sundew
	Drosera spp.	Sundew
	Echinopogon spp.	Hedgehog Grass
	Einadia nutans	Nodding Saltbush
P	*Epacris impressa*	Common Heath
	Eucalyptus aromaphloia	Scentbark
	Eucalyptus baxteri s.l.	Brown Stringybark
e, r	*Eucalyptus brookeriana*	Brooker's Gum
	Eucalyptus cypellocarpa	Mountain Grey-gum
e, r	*Eucalyptus globulus* subsp. *globulus*	Southern Blue-gum
	Eucalyptus globulus subsp. *pseudoglobulus*	Gippsland Blue-gum
	Eucalyptus obliqua	Messmate Stringybark
	Eucalyptus radiata s.l.	Narrow-leaf Peppermint
	Eucalyptus radiata subsp. *radiata*	Narrow-leaf Peppermint
	Eucalyptus tricarpa	Red Ironbark
	Eucalyptus tricarpa subsp. *tricarpa*	Red Ironbark
	Eucalyptus viminalis	Manna Gum
	Eucalyptus viminalis subsp. *pryoriana*	Coast Manna-gum
	Eucalyptus viminalis subsp. *viminalis*	Manna Gum
P	*Euchiton* spp.	Cudweed
	Exocarpos cupressiformis	Cherry Ballart
	Ficinia nodosa	Knobby Club-sedge
	Gahnia radula	Thatch Saw-sedge
	Gahnia sieberiana	Red-fruit Saw-sedge
	Gahnia spp.	Saw Sedge
	Galium ciliare subsp. *terminale*	Hairy Bedstraw
	Geranium spp.	Crane's Bill
P	*Glossodia major*	Wax-lip Orchid
	Glycine clandestina	Twining Glycine

Status	Scientific Name	Common Name
	Glycine spp.	Glycine
	Gonocarpus humilis	Shade Raspwort
	Gonocarpus spp.	Raspwort
	Gonocarpus tetragynus	Common Raspwort
	Goodenia lanata	Trailing Goodenia
	Goodenia ovata	Hop Goodenia
	Goodia lotifolia s.s.	Common Golden-tip
	Gynatrix pulchella s.s.	Hemp Bush
	Hackelia latifolia	Forest Hound's-tongue
	Hackelia suaveolens	Sweet Hound's-tongue
	Hakea ulicina	Furze Hakea
	Hedycarya angustifolia	Austral Mulberry
	Hibbertia acicularis	Prickly Guinea-flower
	Hibbertia fasciculata var. *prostrata*	Bundled Guinea-flower
	Hibbertia riparia	Erect Guinea-flower
	Hibbertia spp.	Guinea Flower
	Hydrocotyle foveolata	Yellow Pennywort
	Hydrocotyle laxiflora	Stinking Pennywort
	Hydrocotyle spp.	Pennywort
P	*Hymenophyllum cupressiforme*	Common Filmy-fern
	Hypericum gramineum	Small St John's Wort
	Hypolaena fastigiata	Tassel Rope-rush
	Isopogon ceratophyllus	Horny Cone-bush
	Juncus procerus	Tall Rush
	Juncus spp.	Rush
	Kennedia prostrata	Running Postman
	Kennedia spp.	Coral Pea
	Lachnagrostis filiformis s.s.	Common Blown-grass
P	*Lagenophora stipitata* s.s.	Blue Bottle-daisy
VU, cr, P, v	*Leiocarpa gatesii*	Wrinkled Buttons
	Lepidosperma sieberi	Sandhill Sword-sedge
	Lepidosperma spp.	Sword Sedge
	Leptospermum continentale	Prickly Tea-tree
	Leptospermum laevigatum	Coast Tea-tree
	Leptospermum lanigerum	Woolly Tea-tree
	Leptospermum myrsinoides	Heath Tea-tree
	Leptospermum scoparium	Manuka
P	*Leucopogon parviflorus*	Coast Beard-heath
P	*Leucopogon virgatus*	Common Beard-heath
P	*Lindsaea linearis*	Screw Fern
	Lomandra filiformis	Wattle Mat-rush

Status	Scientific Name	Common Name
	Lomandra filiformis subsp. *coriacea*	Wattle Mat-rush
	Lomandra filiformis subsp. *filiformis*	Wattle Mat-rush
	Lomandra longifolia	Spiny-headed Mat-rush
	Lomandra longifolia subsp. *exilis*	Cluster-headed Mat-rush
	Lomandra longifolia subsp. *longifolia*	Spiny-headed Mat-rush
	Lomandra nana	Dwarf Mat-rush
	Lomatia fraseri	Tree Lomatia
	Lomatia ilicifolia	Holly Lomatia
	Luzula meridionalis var. *flaccida*	Common Woodrush
	Melaleuca lanceolata	Moonah
	Microlaena stipoides var. *stipoides*	Weeping Grass
P	*Microsorum pustulatum* subsp. *pustulatum*	Kangaroo Fern
	Myoporum insulare	Common Boobialla
	Myoporum petiolatum	Sticky Boobialla
	Notelaea ligustrina	Privet Mock-olive
P	*Olearia argophylla*	Musk Daisy-bush
P	*Olearia axillaris*	Coast Daisy-Bush
P	*Olearia erubescens*	Moth Daisy-bush
P	*Olearia lirata*	Snowy Daisy-bush
P	*Olearia myrsinoides*	Silky Daisy-bush
P	*Olearia ramulosa*	Twiggy Daisy-bush
P	*Olearia ramulosa* var. *ramulosa*	Twiggy Daisy-bush
P	*Olearia* spp.	Daisy Bush
P	*Olearia teretifolia*	Cypress Daisy-bush
P	*Orchidaceae* spp.	Orchid
	Oxalis exilis	Shade Wood-sorrel
	Oxalis perennans	Grassland Wood-sorrel
P	*Ozothamnus ferrugineus*	Tree Everlasting
P	*Ozothamnus* spp.	Everlasting
	Patersonia fragilis	Short Purple-flag
	Pelargonium spp.	Stork's Bill
	Persicaria spp.	Knotweed
	Persoonia juniperina	Prickly Geebung
	Phragmites australis	Common Reed
	Phyllanthus gunnii	Shrubby Spurge
	Pimelea axiflora	Bootlace Bush
	Pimelea humilis	Common Rice-flower
	Pittosporum bicolor	Banyalla
#	*Pittosporum undulatum*	Sweet Pittosporum
	Plantago spp.	Plantain
	Plantago varia	Variable Plantain

Status	Scientific Name	Common Name
	Platylobium obtusangulum	Common Flat-pea
	Poa ensiformis	Sword Tussock-grass
	Poa labillardierei	Common Tussock-grass
	Poa labillardierei var. *labillardierei*	Common Tussock-grass
	Poa morrisii	Soft Tussock-grass
	Poa sieberiana	Grey Tussock-grass
	Poa tenera	Slender Tussock-grass
P	*Polystichum proliferum*	Mother Shield-fern
P	*Polystichum* spp.	Shield Fern
	Pomaderris aspera	Hazel Pomaderris
	Poranthera microphylla s.s.	Small Poranthera
P	*Prostanthera lasianthos*	Victorian Christmas-bush
P	*Prostanthera melissifolia*	Balm Mint-bush
	Pteridium esculentum subsp. *esculentum*	Austral Bracken
P	*Pterostylis longifolia* s.l.	Tall Greenhood
P	*Pterostylis melagramma*	Tall Greenhood
P	*Pterostylis* spp.	Greenhood
P, k	*Pterostylis tasmanica*	Southern Plume-orchid
	Pultenaea daphnoides	Large-leaf Bush-pea
	Pultenaea forsythiana	Prickly Bush-pea
	Rhagodia candolleana subsp. *candolleana*	Seaberry Saltbush
	Rubus parvifolius	Small-leaf Bramble
	Rytidosperma pallidum	Silvertop Wallaby-grass
	Rytidosperma racemosum var. *racemosum*	Slender Wallaby-grass
	Rytidosperma setaceum	Bristly Wallaby-grass
	Rytidosperma spp.	Wallaby Grass
	Sambucus gaudichaudiana	White Elderberry
	Samolus repens	Creeping Brookweed
	Schoenus tesquorum	Soft Bog-sedge
P	*Senecio linearifolius*	Fireweed Groundsel
P	*Senecio odoratus*	Scented Groundsel
P	*Senecio pinnatifolius* var. *lanceolatus*	Lance-leaf Groundsel
P	*Senecio* spp.	Groundsel
P	*Sigesbeckia orientalis* subsp. *orientalis*	Indian Weed
	Solanum spp.	Nightshade
P	*Solenogyne dominii*	Smooth Solenogyne
	Spyridium parvifolium	Dusty Miller
	Stackhousia monogyna s.l.	Creamy Stackhousia
	Stellaria flaccida	Forest Starwort
	Stellaria pungens	Prickly Starwort
	Stellaria spp.	Starwort

Status	Scientific Name	Common Name
P	*Stylidium graminifolium* s.l.	Grass Triggerplant
P	*Stylidium* spp.	Trigger Plant
P	*Styphelia humifusa*	Cranberry Heath
	Tetragonia implexicoma	Bower Spinach
	Tetragonia tetragonioides	New Zealand Spinach
	Tetrarrhena distichophylla	Hairy Rice-grass
	Tetrarrhena juncea	Forest Wire-grass
	Tetratheca ciliata	Pink-bells
P	*Thelymitra* spp.	Sun Orchid
e, r	*Thomasia petalocalyx*	Paper Flower
P	*Thysanotus* spp.	Fringe Lily
	Typha spp.	Bulrush
	Veronica calycina	Hairy Speedwell
	Veronica gracilis	Slender Speedwell
	Veronica plebeia	Trailing Speedwell
	Veronica spp.	Speedwell
	Viola hederacea sensu Entwisle (1996)	Ivy-leaf Violet
	Wahlenbergia spp.	Bluebell
P	*Xanthorrhoea australis*	Austral Grass-tree
P	*Xanthorrhoea minor* subsp. *lutea*	Small Grass-tree
P	*Xanthorrhoea* spp.	Grass Tree
	Xanthosia spp.	Xanthosia
Introduced species		
	Acacia decurrens	Early Black-wattle
	Agapanthus praecox subsp. *orientalis*	Agapanthus
	Agrostis capillaris var. *capillaris*	Brown-top Bent
	Aira spp.	Hair Grass
R	*Allium triquetrum*	Angled Onion
	Anthoxanthum odoratum	Sweet Vernal-grass
R	*Asparagus* spp.	Asparagus
	Billardiera heterophylla	Bluebell Creeper
	Briza maxima	Large Quaking-grass
	Cenchrus clandestinus	Kikuyu
	Centaurium erythraea	Common Centaury
RC	*Chrysanthemoides monilifera*	Boneseed
R	*Cirsium vulgare*	Spear Thistle
	Coprosma repens	Mirror Bush
	Cotoneaster spp.	Cotoneaster
	Cupressus spp.	Cypress
	Cynosurus echinatus	Rough Dog's-tail
	Cyperus eragrostis	Drain Flat-sedge

Status	Scientific Name	Common Name
RC	*Cytisus scoparius*	English Broom
	Dactylis glomerata	Cocksfoot
	Ehrharta erecta	Panic Veldt-grass
	Erigeron bonariensis	Flaxleaf Fleabane
	Euphorbia paralias	Sea Spurge
RC	*Foeniculum vulgare*	Fennel
RC	*Genista monspessulana*	Montpellier Broom
	Hedera helix s.l.	English Ivy
	Helminthotheca echioides	Ox-tongue
	Holcus lanatus	Yorkshire Fog
	Hypochaeris radicata	Flatweed
	Ilex aquifolium	English Holly
	Lagurus ovatus	Hare's-tail Grass
	Lysimachia arvensis	Pimpernel
	Oxalis incarnata	Pale Wood-sorrel
R	*Oxalis pes-caprae*	Soursob
	Oxalis purpurea	Large-flower Wood-sorrel
	Paspalum dilatatum	Paspalum
	Physalis peruviana	Cape Gooseberry
	Plantago lanceolata	Ribwort
	Plantago major	Greater Plantain
	Prunella vulgaris	Self-heal
	Ranunculus repens	Creeping Buttercup
RC	*Rubus anglocandicans*	Common Blackberry
	Rumex spp. (naturalised)	Dock (naturalised)
RC	*Senecio jacobaea*	Ragwort
	Solanum nigrum s.l.	Black Nightshade
	Sonchus oleraceus	Common Sow-thistle
	Sporobolus africanus	Rat-tail Grass
	Trifolium subterraneum	Subterranean Clover
	Vicia spp.	Vetch
	Vinca major	Blue Periwinkle
	Vulpia spp.	Fescue
	Watsonia spp.	Watsonia
	Zantedeschia aethiopica	White Arum-lily

A1.2 Listed flora species

The following table includes threatened flora species that have potential to occur within the project area. The list of threatened species is sourced from the VBA and PMST (accessed on 23 April 2024). Where years are specified for the most recent database records, these refer to records from the VBA unless otherwise specified. Where no year is specified, the PMST has predicted that the species has potential to occur. A proportion of the flora habitat descriptions have been reproduced with permission from the Royal Botanic Gardens Victoria (RBGV 2020).

Table 16 Threatened flora species recorded or predicted to occur within 10 km of the project area

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in study area	Rationale for likelihood ranking
		EPBC	FFG					
National significance								
Amphibromus fluitans	River Swamp Wallaby-grass	VU		2012	PMST	Swampy areas, mainly along the Murray River between Wodonga and Echuca with scattered records from southern Victoria.	**Low**	No local records with 5 km of project area, however suitable swampy/riparian habitat present.
Astelia australiana	Tall Astelia	VU	e		PMST	Cool temperate rainforest in gullies on undulating, upland plateaus; typically in association with Myrtle Beech Nothofagus cunninghamii.	**Low**	No suitable habitat and no nearby records.
Caladenia concolor	Crimson Spider-orchid	VU	e		PMST	Open, grassy understorey in Box Ironbark and dry foothill forests.	**Low**	Limited suitable habitat in assessment corridor. No local records.
Dianella amoena	Matted Flax-lily	EN	cr		PMST	Lowland grassland and grassy woodland, on well-drained to seasonally waterlogged fertile sandy loam soils to heavy cracking clays.	**Low**	Limited suitable habitat in assessment corridor. No local records.

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in study area	Rationale for likelihood ranking
		EPBC	FFG					
Eucalyptus strzeleckii	Strzelecki Gum	VU	cr		PMST	Ridges, slopes and along the banks of streams on deep, fertile loam soils that are seasonally waterlogged; less commonly found on undulating or flat terrain.	**Low**	Suitable habitat within the assessment corridor, however there are no local records within 20 kms.
Glycine latrobeana	Clover Glycine	VU	v		PMST	Grasslands and grassy woodlands, particularly those dominated by Kangaroo Grass.	**Negligible**	No current records nearby, no suitable habitat.
Grevillea infecunda	Anglesea Grevillea	VU	e	2022	PMST	Dry sclerophyll forest and woodland, primarily on sandy or gravelly soils.	**Before TS: Medium After TS: Low**	Recent record near Fairhaven, suitable habitat present however not recorded during targeted surveys.
Lachnagrostis adamsonii	Adamson's Blown-grass	EN	e		PMST	Low-lying, seasonally wet or swampy areas of plains communities, often in slightly saline conditions.	**Low**	Swampy habitats within study area. However, no records nearby.
Leiocarpa gatesii	Wrinkled Buttons	VU	cr	2022	PMST	Typically within dry open forest on hillsides in association with Messmate Eucalyptus obliqua.	**Recorded**	Recorded within EVC 21 Shrubby Dry Forest, primarily along ridges around around Cumberland

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in study area	Rationale for likelihood ranking
		EPBC	FFG					
								River and north east of Lorne.
Lepidium aschersonii	Spiny Peppercress	VU	e		PMST	Heavy clay soils near salt lakes on the volcanic plains; disjunct records near Lake Omeo.	**Negligible**	No suitable habitat, no local records.
Lepidium hyssopifolium	Basalt Pepper-cress	EN			PMST	Basalt plains grassland and woodland communities.	**Negligible**	No records within the local catchment, no suitable habitat.
Pimelea spinescens subsp. *spinescens*	Spiny Rice-flower	CR	cr		PMST	Primarily grasslands featuring a moderate diversity of other native species and inter-tussock spaces, although also recorded in grassland dominated by introduced perennial grasses.	**Negligible**	No records within the local catchment, no suitable habitat.
Prasophyllum correctum	Gaping Leek-orchid	EN	cr	1995		Well-drained sandy soils in Central Gippsland Plains Grassland, Forest Red Gum Grassy Woodland, and She-oak Grassy Woodland communities.	**Low**	Suitable habitat in Heathy Woodland around Fairhaven, however the record is very old.
Prasophyllum frenchii	Maroon Leek-orchid	EN	e	1934		Grassland and grassy woodland environments on sandy or black clay loam soils, that are generally damp but well drained.	**Low**	Suitable habitat in shrubby dry forest near Fairhaven. However, the record is very old.

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in study area	Rationale for likelihood ranking
		EPBC	FFG					
Prasophyllum spicatum	Dense Leek-orchid	VU	cr	2001	PMST	Heath and heathy woodlands.	**Low**	Suitable coastal heath habitat however, closest record is > 10 km from assessment area and over 20 years old.
Pterostylis chlorogramma	Green-striped Greenhood	VU	e	2013	PMST	Heathy woodland; more specific habitat requirements are poorly known.	**Before TS: Medium After TS: Low**	Suitable heath/shrubby vegetation communities around Fairhaven, recent records from that area. Not recorded during targeted surveys.
Pterostylis cucullata	Leafy Greenhood	VU			PMST	[NOTE: Consultant to check FFG listed subspecies is present in likelihood table] Sand dune scrubs in coastal areas, and inland on slopes and river flats in moist foothill and montane forests.	**Low**	Suitable Teatree / Coastal Moonah scrub within trail alignment. However, records are >30 km away, towards Apollo Bay and no new trails pass through suitable habitat.

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in study area	Rationale for likelihood ranking
		EPBC	FFG					
Senecio macrocarpus	Large-headed Fireweed	VU	cr		PMST	Grassland, shrubland and woodland habitats on heavy soils subject to waterlogging and/or drought conditions in summer.	**Negligible**	No suitable habitat, no recent records within catchment.
Senecio psilocarpus	Swamp Fireweed	VU			PMST	Seasonally inundated herb-rich swamps, growing on peaty soils or volcanic clays.	**Negligible**	No suitable habitat, no records within catchment.
Thelymitra matthewsii	Spiral Sun-orchid	VU	e	2016	PMST	Typically on well-drained soils on slightly elevated sites, but also on coastal sandy flats. Often in open situations following disturbance.	**Before TS: Medium After TS: Low**	Recent records north of Fairhaven, suitable habitat within Heathy Woodland and Sand Heathland EVCs. Species not recorded during targeted surveys.
Thelymitra orientalis	Slender Plum-orchid	CR	cr		PMST	Few records, all in the west of the state. Growing on damp heathy flats usually in peaty white sands.	**Low**	Limited suitable habitat, no local records, confined to western Victoria.
Xerochrysum palustre	Swamp Everlasting	VU	cr		PMST	Sedge-swamps and shallow freshwater marshes and swamps in lowlands, on black cracking clay soils.	**Low**	Limited suitable habitat within assessment corridor, however no recent records

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in study area	Rationale for likelihood ranking
		EPBC	FFG					
								within project area.
State significance								
Acacia howittii	Sticky Wattle		v	2013		Moist forest. Natural occurrences are confined to South Gippsland and Central Highlands.	**N/A**	Outside of natural range, local plants are likely to be derived from planted specimens
Acacia nanodealbata	Dwarf Silver-wattle		v	2013		A range of vegetation communities including wet forests, dry forests, heathy woodlands and grassy woodlands.	**High**	Recent records around Lorne and Kennet River
Acacia verticillata subsp. *ruscifolia*	Broad-leaf Prickly Moses		e	2020		Mostly recorded in the Wilsons Promontory area with isolated records around Apollo Bay. Specific habitat requirements are poorly known.	**Low**	Suitable habitat in project area, however closest records are > 30 km away from round Apollo Bay.
Asplenium appendiculatum subsp. *appendiculatum*	Ground Spleenwort		cr	1988		Largely co-extensive in Victoria with Asplenium aethiopicum, i.e. sandstone in the Victoria Range and basalt in southwest Victoria. A. appendiculatum also grows on granite on Mt Mueller (near Mt Baw Baw) and on Wilsons Promontory.	**Low**	Old nearby records, and none within coastal habitat types.

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in study area	Rationale for likelihood ranking
		EPBC	FFG					
Asterophora mirabilis	Grey Jockey		e	2013		A small parasitic fungus, that inhabits the cooler gullies of cool temperate rainforest.	**Low**	Recent records in the local area, however mostly recorded in the higher slopes of the Otway Range.
Australina pusilla subsp. *pusilla*	Small Shade-nettle		e	2020		In Victoria, known only from Otway Range and the catchment of Sealers Cove on Wilsons Promontory.	**Low**	No local records, the closest is > 20 kms from the assessment corridor.
Billardiera scandens s.s.	Velvet Apple-berry		e	1983		Common in heathland, woodland and forests from near sea level to the subalps.	**Low**	No recent records within catchment
Bossiaea cordigera	Wiry Bossiaea		e	2021		Moist habitats in heathland, heathy woodland and open-forest.	**Medium**	Recent records nearby, some suitable habitat adjoining trail alignment.
Burnettia cuneata	Lizard Orchid		e	1983		Usually on acidic, low-nutrient soils which are frequently waterlogged and dominated by Scented Paperbark Melaleuca squarrosa.	**Negligible**	No recent records within the Otway Range.
Caladenia flavovirens	Christmas Spider-orchid		cr	1980		Heathy woodland and moist foothill forest.	**Negligible**	Old records within project area, possibly extinct around Lorne.

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in study area	Rationale for likelihood ranking
		EPBC	FFG					
Caladenia maritima	Angahook Pink-fingers		cr	2020		Coastal woodland dominated by Messmate Eucalyptus obliqua, with a heathy understorey.	**Medium**	Suitable heathy habitat around Fairhaven
Caladenia oenochila	Wine-lipped Spider-orchid		cr	2000		Foothill forest and heathy woodland in low hills.	**Low**	Species is now considered restricted to foothills around Melbourne
Caladenia valida	Robust Spider-orchid		cr	2011		Coastal or near coastal heaths and heathy woodland.	**Medium**	Suitable heathy habitat around Fairhaven, recent nearby records.
Caladenia venusta	Large White Spider-orchid		e	2018		Heath and heathy woodlands primarily in coastal areas, extending inland in Western Victoria.	**Medium**	Suitable heathy habitat around Fairhaven, recent nearby records.
Caladenia vulgaris	Slender Pink-fingers		v	2011		Scattered across southern Victoria where sometimes locally common in heathland and coastal scrub on moisture-retentive sandy soils.	**High**	Suitable heathy habitat around Fairhaven and recent records along existing sections of the trail alignment.
Callitriche brachycarpa	Short Water-starwort		e	1903		Sites subject to inundation.	**Low**	No recent records nearby.
Calochilus imberbis	Naked Beard-orchid		cr	2002		Mainly found in heath, heathy woodlands and lowland forests.	**Medium**	Recent records around Lorne. Suitable heathy

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in study area	Rationale for likelihood ranking
		EPBC	FFG					
								habitat within project area.
Calyptrochaeta brownii	Brown's Mitre-moss		e	2002		An uncommon moss that can occupy soil, rocks, tree ferns and tree trunks. Prefers wet sclerophyll forest and cool-temperate rainforest.	**Low**	Recent records within project area however, no suitable rainforest habitat in project area.
Calystegia soldanella	Sea Bindweed		e	2008		Coastal sand dunes.	**Low**	One, recent record near Apollo Bay
Chaetospora turbinata	Top Bog-sedge		v	2011		Of localised occurrence in its 4 disjunct localities in Victoria (Grampians, Anglesea, Cape Liptrap and Howe Range east of Mallacoota), occurring on moist, usually coarse, sandy soils, in open woodland and heath.	**Medium**	Recent records from Anglesea. Suitable habitat within the heathy EVCs around Fairhaven.
Chlorovibrissea bicolor	Two-tone Vibrissea		e	2014		Small fungus that grows on logs, in running water. Prefers wet forests.	**Low**	Recent record west of Lorne, but limited suitable habitat within assessment area.
Comesperma polygaloides	Small Milkwort		cr	1980		Grasslands on the western basalt plains; less commonly in grassy woodlands between Bendigo and the Wimmera.	**Low**	Limited suitable habitat within the project area, single old record around Anglesea.

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in study area	Rationale for likelihood ranking
		EPBC	FFG					
Convolvulus crispifolius	Silver Bindweed		v	2006		In Victoria, apparently confined to the far north-west where found on sand-dunes, often only appearing after fire. A more easterly record from near Shepparton needs checking.	**Low**	One record nearby, habitat most suitable is the heathy EVCs around Fairhaven.
Corybas fordhamii	Swamp Pelican-orchid		e	1991		Scattered distribution across Victoria, usually found in swampy Melaleuca squarrosa heathland and swamps.	**Low**	Suitable habitat present, however records within project area are old.
Corymbia maculata	Spotted Gum		v	2009		In Victoria, naturally confined to a small population near Mt Tara in the east of the state.	**N/A**	Outside of natural range, local plants are likely to be derived from planted specimens.
Cyathea cunninghamii	Slender Tree-fern		cr	2017		Deep loamy humus soils on the banks of sheltered gullies in wet, hilly regions.	**Low**	Limited suitable habitat, not associated with coastal habitats.
Dipodium pardalinum	Spotted Hyacinth-orchid		e	2017		Scattered in higher rainfall parts of western Victoria.	**Low**	Suitable habitat around Fairhaven. Old records within project area, primarily around Anglesea.

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in study area	Rationale for likelihood ranking
		EPBC	FFG					
Echinodium hispidum	Madeira Moss		v	2005		Found in the Antarctica/subantarctic or Southern Ocean.	**Medium**	Recent records in project area, suitable gully habitat throughout impact area.
Eucalyptus brookeriana	Brooker's Gum		e	2020		Moist forest communities in valleys and on hills and ridges, often in association with E. obliqua.	**Recorded**	Recent records around Lorne, suitable habitat along alignment. Recorded south west of Lorne.
Eucalyptus diversifolia subsp. *megacarpa*	Coast Gum		v	1999		Restricted to the Cape Nelson area in Victoria.	**Low**	Suitable habitat along alignment, old record north of Fairhaven.
Eucalyptus falciformis	Western Peppermint		v	2009		Sandy soils in forest, woodland or heath communities on hillslopes and plains.	**High**	Recent records within project area, Fairhaven to Lorne. Suitable coastal heathy habitat present.

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in study area	Rationale for likelihood ranking
		EPBC	FFG					
Eucalyptus globulus subsp. *globulus*	Southern Blue-gum		e	2018		Damp forest communities. Restricted to South Gippsland and the Otway Ranges.	**Recorded**	Suitable habitat throughout project area, recent records between Fairhaven and Lorne. Recorded along GTR 3, primarily between Eastern View and Kenner River.
Eucalyptus kitsoniana	Bog Gum		cr	2016		Damp alluvial soils or boggy flats.	**Low**	Suitable habitat within the assessment corridor, however there is only a single record from Anglesea area.
Eucalyptus litoralis	Otway Grey-gum		e	2023		Apparently restricted to coastal areas from Anglesea to Aireys Inlet, growing on shallow, sandy soils on low ridges and slopes.	**High**	Suitable habitat around Fairhaven. However population is largely restricted to outside project area.

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in study area	Rationale for likelihood ranking
		EPBC	FFG					
Eucalyptus yarraensis	Yarra Gum		cr	2011		Valley flats and along stream on soils subject to periodic inundation or waterlogging.	**Low**	Not associated with coastal habitats, limited suitable habitat along alignment. Old records within area.
Euryomyrtus ramosissima subsp. *prostrata*	Nodding Baeckea		e	2021		Confined to heath and heathy woodlands in coastal environments, with disjunct occurrences in the Grampians.	**Medium**	Suitable coastal heathy habitat, recent records north of Fairhaven.
Fissidens dealbatus	Nerveless Pocket-moss		e	1952		A genus of moss that usually occur in wet fern gullies.	**Low**	Very old record in project area, limited suitable habitat within impact area.
Goodia pubescens	Silky Golden-tip		e	1985		Wet and dry sclerophyll forests.	**Low**	Old records near project area, none near current alignment.
Gratiola pumilo	Dwarf Brooklime		e	2003		Seasonally inundated depressions, typically river flats and lake margins, on alluvial soils.	**Medium**	Suitable habitat present along watercourses, few records from local area. However, record in local area is > 20 years old.

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in study area	Rationale for likelihood ranking
		EPBC	FFG					
Hakea decurrens subsp. *platytaenia*	Coast Needlewood		e	2006		Currently recorded only from windswept coastal heaths on Wilsons Promontory and in the Mallacoota area, but possibly more widespread in similar sites.	**Low**	Suitable habitat within the assessment corridor, however there is only a single record from Anglesea area.
Hymenodontopsis bifaria	Umbrella Thyme-moss		cr	1975		Found in the Antarctica/subantarctic or Southern Ocean.	**Low**	Very old record in the project area, limited suitable habitat within impact area.
Isolepis wakefieldiana	Tufted Club-sedge		e	1988		Scattered in cooler areas of Victoria, on floodplains and forests.	**Low**	Old records inland from the coast.
Lachnagrostis rudis subsp. *rudis*	Rough Blown-grass		e	1974		Uncommon, occurs in moist, shaded forests and swamp margins near the coast.	**Low**	Suitable habitat within project area, however the record is very old.
Lastreopsis hispida	Bristly Shield-fern		e	2022		Shaded, wet mountain gullies occurring on deep loamy and organic soils or rotting logs.	**Low**	Few records in local area, mainly around Lorne. Limited suitable habitat in project area.

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in study area	Rationale for likelihood ranking
		EPBC	FFG					
Lawrencia spicata	Salt Lawrencia		e	2013		Fringe habitats of coastal saltmarsh communities.	**Medium**	Recent record around Fairhaven, limited suitable coastal saltmarsh habitat in project area.
Lepidosperma canescens	Hoary Rapier-sedge		e	2013		Sandy heaths and woodland.	**Medium**	Suitable heathy habitat around Fairhaven. Majority of records are > 20 years.
Leptospermum turbinatum	Shiny Tea-tree		e	1995		Rocky terrain, particularly sandstone and granitic outcrops, over sandy or gravelly soils.	**Low**	Outside of natural range. Very few records from the local area, > 20 years.
Lobelia beaugleholei	Showy Lobelia		v	1974		Black loamy soils (rarely red clays) on waterlogged sites near swamps and other wetlands.	**Low**	Not associated with coastal habitats, limited suitable habitat within project area. Old records within project area.

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in study area	Rationale for likelihood ranking
		EPBC	FFG					
Melaleuca armillaris subsp. *armillaris*	Giant Honey-myrtle		e	2020		Near coastal heath/scrub, rocky coast and foothill outcrops.	**N/A**	Outside of natural range for this species. Specimens likely to be planted or progeny form cultivated stock.
Monotoca glauca	Currant-wood		e	2018		High rainfall areas on infertile sandy soils in open-forest, heathy woodland, wet closed scrub and on the margins of cool-temperate rainforest.	**Low**	Suitable habitat within project area, however all records are > 10 km from project area.
Nematolepis squamea subsp. *squamea*	Satinwood		v	2018		Primarily in wet tall forest and damp gullies of the Otways, but with isolated occurrences in drier forests elsewhere in the State.	**Medium**	Recent records in local area, suitable habitat in gullies within project area, particularly between Lorne and Apollo Bay.
Notogrammitis angustifolia subsp. *nothofageti*	Beech Finger-fern		e	1988		Wet forests in sheltered mountain gullies. Grows on rocks, logs or trunks of trees and shrubs (but rarely on tree ferns).	**Low**	Old records within local area around Apollo Bay. Limited suitable habitat.
Olearia pannosa subsp. *cardiophylla*	Velvet Daisy-bush		e	1906		Coastal woodland and inland in dry open-forest on shallow rocky soil.	**Low**	Old records around Anglesea. Suitable habitat around Fairhaven.

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in study area	Rationale for likelihood ranking
		EPBC	FFG					
Pellaea nana	Dwarf Sickle-fern		e	1988		Occurs in moist forest, often among rocks or on rock faces.	**Low**	Limited suitable habitat, not associated with coastal habitats. Old records around the Apollo Bay area
Phlegmariurus varius	Long Clubmoss		cr	1988		Tall erect, branching moss to 30 cm high. Victorian specimens primarily growing out of rocky crevices.	**Low**	Very old records within project are, west of Apollo Bay. Limited suitable habitat within assessment corridor.
Pimelea hewardiana	Forked Rice-flower		e	1906		Rocky ground in gullies and mallee shrubland; only recorded in the western half of the State.	**Low**	Very old record from Anglesea area. Limited suitable habitat along alignment.
Poa billardierei	Coast Fescue		e	2012		Coastal dunes.	**Medium**	Recent records in the local area, suitable sandy habitat within coastal dune systems.

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		EPBC	FFG					
Poa poiformis var. *ramifer*	Dune Poa		e	2010		Scattered areas along the coast.	**Medium**	Few records in local area, however suitable sandy habitat present within coastal dune systems.
Prasophyllum barnettii	Elegant Leek-orchid		e	2001		Apparently endemic to Victoria where confined to the Otway Ranges and adjacent coastal areas between Anglesea and Princetown. Grows in dense shrubby or heathy forest on well-drained sandy soils.	**Medium**	Recent records from Anglesea area. Suitable habitat around Fairhaven.
Prasophyllum lindleyanum	Green Leek-orchid		e	1995		Fertile soils in woodland or scrubby heath.	**Low**	Old records > 20 years around Anglesea and Apollo Bay. Suitable heathy habitat present around Fairhaven.
Pteris epaleata	Netted Brake		e	1770		Deep, loamy soils in damp, shaded mountain gullies.	**Negligible**	Very old records around Apollo Bay. No suitable habitat (Beech forests) along alignment.

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Pterostylis unicornis	Large Plume-orchid		cr	2011		Endemic to Victoria where apparently confined to heathland and heathy woodland in the Anglesea area, on well-drained sandy soils.	**Medium**	Suitable heathy habitat around Fairhaven. Recent records in the Anglesea area.
Pultenaea canaliculata	Coast Bush-pea		e	1909		Coastal dunes and limestone cliffs.	**Negligible**	Suitable habitat long the coastal dune systems, however old records from the Otway region.
Pultenaea dargilensis	Dargile Bush-pea		cr	1989		Box-ironbark forest in the Heathcote-Graytown National Park.	**Negligible**	No suitable habitat, old record > 20 years from the Anglesea area.
Pultenaea prolifera	Otway Bush-pea		e	1979		Restricted to eastern Victoria in dry or moist forests.	**Low**	Suitable heathy habitat in the project area, however the record is > 20 years, south of Fairhaven.
Pultenaea reflexifolia	Wombat Bush-pea		v	1770		Restricted to a few small areas of dry forest west of Melbourne in Gisborne, Barkstead and Lerderderg areas with an isolated, very old record from Apollo Bay.	**Negligible**	Very old isolated record from Apollo Bay. Limited suitable habitat.

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in study area	Rationale for likelihood ranking
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Roepera billardierei	Coast Twin-leaf		e	2018		Dunes and limestone cliffs in scrubby vegetation.	**Medium**	Very few records in the project area. Recent record from Anglesea. Suitable coastal dune habitat in project area.
Schoenus melanostachys	Black Bog-sedge		v	1980		Occurs in damp areas fringing springs and watercourses, often openings in near-coastal or lowland forest, from about Cann River eastwards.	**Low**	Suitable habitat along watercources present, however the record is old >20 years and the species occurs primarily in far eastern Victoria.
Solanum linearifolium	Mountain Kangaroo Apple		e	1973		In Victoria, apparently restricted to montane forests in the east (between Omeo and Mt Tingaringy), often appearing following disturbance or bushfire.	**Negligible**	No suitable habitat, old record inland from the coast.
Sticherus tener s.s.	Tasman Fan-fern		e	1973		Deep loamy soils of gullies, riverbanks and shaded, mountain slopes. Also disturbed sites, such as road cuttings and eroded banks in wetter areas.	**Low**	Limited suitable habitat along the concept trail. Very old record from the Apollo Bay area.

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in study area	Rationale for likelihood ranking
		EPBC	FFG					
Tetraphidopsis pusilla	Arc Moss		e	1956		Moss species prefering cool temperate rainforest gulllies.	**Low**	Very old record south of Apollo Bay. Limited suitable habitat within project area.
Thelymitra benthamiana	Blotched Sun-orchid		e	2021		Found mostly in heathland, heathy woodlands and open forests on well-drained sand and clay loams.	**High**	Recent record, south of Fairhaven. Suitable habitat within the project area.
Thelymitra hiemalis	Winter Sun-orchid		cr	2002		Brown Stringybark Eucalyptus baxteri or Promontory Peppermint E. willisii woodland, typically with a heathy understorey.	**Medium**	Old records, >20 years, north of Fairhaven. Suitable heathy habitat within assessment corridor.
Thelymitra pallidiflora	Pallid Sun-orchid		cr	2011		Apparently endemic to south-central Victoria in grassy and heathy woodlands on sandy soils.	**Medium**	Recent records from the Anglesea area. Suitable heathy habitat within the assessment corridor.

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in study area	Rationale for likelihood ranking
		EPBC	FFG					
Thelymitra X merraniae	Merran's Sun-orchid		cr	2002		Heathlands, woodlands and open forests, commonly in depressions or low-lying areas around swamps.	**High**	Records from the Fairhaven area are all > 20 years. Suitable heathy habitat along trail alignment.
Thismia rodwayi	Fairy Lanterns		e	2010		Damp humus and leaf-litter in deeply shaded tall forests and fern gullies.	**Low**	Recent, single record inland ranges from Lorne. However, limited suitable habitat along trail alignment.
Thomasia petalocalyx	Paper Flower		e	2021		In Victoria scattered in drier forests, heathy woodland and coastal heaths west of Port Phillip Bay, apparently restricted to Wilsons Promontory in the east.	**Recorded**	Recent record around Fairhaven. Suitable heathy habitat. Recorded along GTR 2, however this trail section has been removed from the alignment.
Trachyloma planifolium	Trachyloma		e	2002		Growing on tree trunks, predominantly in cool temperate rainforest and in wet fern gullies.	**Low**	Recent records within project area, however, limited suitable habitat within assessment corridor.