Terrestrial Ecology Baseline Study – Marinus Link (Final)

Marinus Link Pty Ltd

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DOCUMENT TRACKING

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Glossary

Term	Meaning
Ecotone	A transitional area of vegetation between two different plant communities.
EE Act	*Environment Effects Act 1978.* Victorian legislation that requires the environmental effects of certain works to be assessed.
EES	Environment Effects Statement.
ELA	Eco Logical Australia Pty Ltd.
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999.* Key piece of national legislation to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places.
EVC	Ecological Vegetation Class.
FFG Act	*Flora and Fauna Guarantee Act 1988.* Key piece of Victorian legislation for the conservation of threatened species and communities and for the management of potentially threatening processes.
Local vicinity	Up to 10 km from study area, often used as a reference area to establish the likely presence of ecological values within the study area.
MNES	Matter of National Environmental Significance as defined under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.
Nationally significant	A Matter of National Environmental Significance (MNES) listed as critically endangered, endangered or vulnerable under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.
NVIM	Native Vegetation Information Management system.
PMST	Protected Matters Search Tool.
State significant	Listed as critically endangered, endangered or vulnerable in Victoria on a Department of Environment, Land, Water and Planning Advisory List (Department of Sustainability and Environment 2009; Department of Sustainability and Environment 2013; Department of Environment and Primary Industries 2014a). Listed as threatened under the Victorian *Flora and Fauna Guarantee Act 1988*.
VBA	Victorian Biodiversity Atlas.
VROTS	Vulnerable, rare or threatened species listed on the Department of Environment, Land, Water and Planning's Advisory Lists, including: Rare or Threatened Plants 2014; Threatened Vertebrate Fauna 2013; and Threatened Invertebrate Fauna 2009.

Abbreviations

The following abbreviations adopt Marinus Link Pty Ltd's naming conventions and the abbreviations used in the Australian Energy Market Operators' (AEMO) network diagrams. Abbreviations for new electricity transmission network infrastructure proposed as part of the Marinus Link project have been nominated by Tetra Tech Coffey.

Abbreviation	Meaning
CB	Cranbourne, as defined by AEMO network diagrams.
HB	Heybridge, as defined by Coffey.
HVAC	High voltage alternating current.
HVDC	High voltage direct current.
HW	Hazelwood, as defined in AEMO network diagrams.
kV	kilo volt or 1,000 volts.
Rxx	Route and number.

Key terms

Term	Description
Area of Disturbance	The area surrounding the route alignment in which physical disturbance of all above and below ground features may occur during construction and/or operation of the project.
Local vicinity	An area within a 10 km radius of the study area
Route alignment	The preliminary alignment upon which the survey and study areas are based.
Study area	The area over which all assessments have been completed to determine the likelihood of ecological values occurring within the survey area.
Survey area	The corridor in which the final route alignment is likely to occur.

Executive summary

BACKGROUND

Marinus Link Pty Ltd (MLPL) is investigating the feasibility of a second electricity interconnector between Tasmania and Victoria to export current and future renewable energy resources, particularly hydroelectric power and wind energy to the mainland. The interconnector will be known as Marinus Link.

To support this investigation, MLPL has commissioned a feasibility and business case assessment for the Marinus Link interconnector. Eco Logical Australia (ELA) and Entura have been engaged by Tetra Tech Coffey, on behalf of MLPL, to undertake baseline terrestrial ecology studies of the Victorian and Tasmanian routes for Marinus Link. This report presents the findings of the baseline terrestrial ecology studies for Marinus Link only.

A detailed analysis of route options has been completed with the proposed Marinus Link route identified as Heybridge (Tasmania) to greater Hazelwood area (Victoria).

The objectives of the baseline terrestrial ecology studies are to:

- Identify existing terrestrial ecology values within the study area.
- Provide advice on alterations to the alignment or design to avoid impacts on these values.
- Inform preparation of referrals (or equivalent) to the Tasmanian, Victorian and Commonwealth governments.
- Define the scope of further assessment required to complete approvals documentation for Marinus Link.

METHODS

The nominated areas for the project are based on the preliminary route alignments provided by Tetra Tech (and endorsed by MLPL) in both Tasmania and Victoria.

The baseline terrestrial ecology study involved the following steps:

- A desktop review to identify ecological values which may occur within the study area including drawing information from biological databases, spatial datasets, aerial imagery and relevant guidelines, standards and scientific literature.
- A preliminary field reconnaissance of both the Tasmanian and Victorian routes undertaken from publicly accessible locations (i.e., public roads and public reserves) in September 2018. The assessment identified the general landscape character across the routes, and where visible, the presence and extent of vegetation communities and potential habitat for threatened flora and fauna.
- An analysis of the likelihood of ecological values occurring within the survey area, based on information gathered through the desktop review and preliminary field reconnaissance. For those values known or considered likely to occur, a preliminary impact assessment was conducted. The analysis considered impacts both with and without management measures in place, and considered thresholds and criteria defined under state and Commonwealth regulations and relevant to a desktop assessment.

- A review of implications under relevant state and Commonwealth legislation based on the outcomes of the likelihood and impact analysis.

PRELIMINARY BASELINE CHARACTERISATION

Within Tasmania, the project is restricted to the terrestrial foreshore crossing and Heybridge converter station on a partially cleared parcel of land adjacent to Bass Highway to the west of Blythe River south.

Notable ecological values identified within the study area include:

- Dry forest, woodland and scrub associated with the low rises to the south of the converter station. This vegetation provides habitat for a range of species including reptiles, mammals and birds, including state and in nationally listed species such as *Sarcophilus harrisii* (Tasmanian devil) and *Aquila audax fleayi* (wedge-tailed eagle).
- On the banks and floodplain of the nearby Blythe River intact patches of swamp and wet forest communities, such as the Nature Conservation Act listed *Melaleuca ericifolia* (swamp forest) and the Nature Conservation Act listed Freshwater sedgeland and rushland, are likely to occur. These environs may also provide habitat for state listed flora species such as *Baumea gunnii* (slender twigsedge). Aquatic environs of the river provide habitat for fish, crustacea, frogs and associated plant communities. Nationally significant species which have populations recorded within or near this waterway include the EBPC Act listed *Prototroctes maraena* (Australian grayling), *Engaeus yabbimunna* (Burnie burrowing crayfish) and *Astacopsis gouldii* (giant freshwater crayfish).
- The dune and beach system at the mouth of Blythe River which supports native coastal scrub vegetation.

Within Victoria, the route falls within the Gippsland Plain and Strzelecki Ranges bioregions, and the South Gippsland Shire and City of Latrobe local government areas. Native vegetation has been significantly cleared across much of the southern and central sections of the route, giving way to large pastoral properties supporting small, fragmented patches of woodlands and scattered trees along road reserves, property boundaries and creek lines. As the route moves into the Strzelecki Ranges, woody vegetation cover increases, before giving way to dense plantations of both native and introduced species in the ranges north of Mirboo North. Upon leaving the foothills on the northern side of the ranges, the route returns to pastural land interspersed with fragmented woodlands through the undulating plains of the Latrobe Valley.

Notable ecological values identified in the Victorian study area include:

- The dune and beach system on the shores of Waratah Bay, which supports a narrow band of intact native vegetation which may provide habitat for coastal species such as the state significant *Exocarpos syrticola* (coast ballart) and *Calystegia soldanella* (sea bindweed), as well as suitable habitat for EPBC Act listed migratory species (wader species) including *Thinornis r. rubricollis* (hooded plover).
- Coastal native forests and heathy woodlands which may provide habitat for the state listed *Pseudophryne semimarmorata* (southern toadlet) and EPBC Act listed *Antechinus minimus maritimus* (swamp antechinus), and wet habitats (swamp scrub, wetlands etc) that may provide habitat for threatened skinks (state significant species *Lissolepis coventryi* [swamp skink] and *Pseudemoia rawlinsoni* [glossy grass skink]). These environs may also provide habitat for numerous

flora species including orchids such as the EPBC Act listed green-striped greenhood *Pterostylis chlorogramma* (green-striped greenhood)*, Pterostylis cucullata* (leafy greenhood) and *Thelymitra matthewsii* (spiral sun-orchid).

- Waterways and waterbodies intersecting the survey area, which provide habitat for fish, crustacea, frogs and associated plant communities. EPBC Act listed species which have populations recorded within or near intersecting waterways and riparian vegetation include *Galaxiella pusilla* (dwarf galaxias), *Prototroctes maraena* (Australian grayling), *Litoria raniformis* (growling grass frog) and *Amphibromus fluitans* (river swamp wallaby-grass).
- Forested gullies, creek lines and road reserves through the Strzelecki Ranges north of Mirboo North, which are likely to contain closed forest and provide critical resources such as hollow-bearing trees for gliders, owls, and possums, along with nesting and foraging habitat for other birds. Species with potential to occur in these habitats include EPBC Act listed *Petauroides volans* (southern greater glider), *Ninox connivens* (barking owl), *Ninox strenua* (powerful owl), and *Pteropus poliocephalus* (grey-headed flying-fox), as well as the EPBC Act listed *Eucalyptus Strzelecki* (Strzelecki gum) and *Flora and Fauna Guarantee Act 1988* (FFG Act) listed *Cyathea cunninghamii* (slender tree fern). Some vegetation may also qualify as the FFG Act listed Warm Temperate Rainforest ecological community.
- Roadside and woodland remnants in the Latrobe Valley, which are likely to contain habitat for grassy woodland and grassland species such as the EPBC Act listed *Dianella amoena* (matted flax-lily) and *Eucalyptus Strzelecki* (Strzelecki gum), as well as the potential to support the EPBC Act and/or FFG Act listed Gippsland Red Gum Grassy Woodland or FFG Act listed Gippsland Plains Grassland ecological communities.

PROPOSED MANAGEMENT MEASURES

Avoidance and mitigation measures are recommended to manage potential project impacts on environmental values, including threatened species and ecological communities. These management measures are based on the following hierarchy:

1. Avoid direct and indirect adverse impacts.
2. Mitigate and manage any unavoidable direct and indirect adverse impacts.
3. Implement remediation and rehabilitation of impacted areas to promote long-term recovery.
4. Offset any residual significant impacts.

The route alignment used for this study is the product of a preliminary route analysis and selection process to avoid environmentally sensitive areas, including large tracts of remnant vegetation and habitat, parks and reserves, and wetlands. Further refinement of the route has occurred based on the preliminary desktop assessment of ecological values and other factors outside the scope of this study. Potential impacts will be further avoided through refinement of the route and construction methods, including re-alignment, micro-siting, use of horizontal directional drilling or boring, and work scheduling. These refinements will be informed by detailed field surveys (still to be undertaken).

Finally, a range of industry standard mitigation and management strategies have been proposed to reduce the magnitude and effect of unavoidable direct and indirect adverse impacts to MNES, state

listed species and communities, native vegetation, flora and fauna, and other ecological values. These measures will be implemented at relevant stages of the project including prior to, during, and post-construction.

Following the application of measures to avoid and mitigate impacts to state and Commonwealth listed species and ecological communities, including MNES, any residual significant impacts to the species/communities would be required to be offset in accordance with relevant policies. This will include the *EPBC Act environmental offsets policy*, the Tasmanian *State Permanent Forest Estate Policy (PFEP)* and the Victorian *Guidelines for the removal, destruction or lopping of native vegetation.*

PRELIMINARY IMPACT ASSESSMENT

A preliminary impact assessment has been undertaken based on the information gathered through the desktop assessment and field reconnaissance and the Area of Disturbance (AoD), defined by the converter station footprints and the construction corridor centred on the conceptual route alignment. Given the limitations associated with this information, and in particular the absence of detailed field surveys, a precautionary approach has been used to determine potential impacts to ecological values within the survey area. A detailed project design and the results of further site-based investigations are therefore required prior to the completion of a final impact assessment. This may result in a change to the final number and quantum of impacts, which are likely to be less than are presented in this report.

The first part of the preliminary impact assessment considered potential impacts on significant species and communities without implementation of proposed management measures (with the exception of the initial route selection and refinement undertaken to date). This pre-management analysis was undertaken to ensure further detailed studies take into consideration the potential for impacts to all values considered likely to occur within the survey area, irrespective of management measures.

To inform referral requirements under the EPBC Act and *Environment Effects Act 1978* (EES Act), a second impact analysis was undertaken on Matters of National Environment Significance (MNES) and remotely mapped native vegetation based on successful implementation of the recommended management measures. To the extent possible without detailed field surveys, the analysis considered the feasibility of management measures to reduce impacts on MNES and vegetation below the significant impact thresholds outlined under relevant state and national legislation and guidelines. Due to the lack of available information, state significant matters were not considered in the secondary impact analysis.

A summary of values that may potentially be impacted by the project under either unmanaged and managed scenarios are provided in the Table below.

Values	Victoria	Tasmania
Vegetation	Potential removal of 14 hectares of native vegetation (of which 5 ha is classified as an Endangered EVC), along with 44 scattered trees *with* implementation of management measures.	Potential removal of approximately 0.5 hectare of native vegetation *with* implementation of management measures.
Significant communities	No nationally significant communities are considered likely to be impacted *with* the implementation of proposed management measures. Three FFG Act listed communities, may be impacted *without* implementation of management measures.	No nationally or state significant communities are considered likely to be impacted *with* implementation of management measures.
Nationally significant species	Potential for significant impact *with* implementation of management measures: • *Amphibromus fluitans* (river swamp wallaby-grass) • *Eucalyptus strzeleckii* (Strzelecki gum) • *Petauroides volans* (southern greater glider) • *Thinornis r. rubricollis* (hooded plover) Additional species with potential for a significant impact *without* implementation of management measures: • *Dianella amoena* (matted flax-lily) • *Litoria raniformis* (growling grass frog) • *Galaxiella pusilla* (dwarf galaxias) • *Prototroctes maraena* (Australian grayling)	No nationally significant species are considered likely to be impacted.
State significant species	An additional 14 FFG Act and/or DELWP advisory list species not listed above are considered at risk of significant impact *without* implementation of management measures. An analysis of impacts with implementation of management measures has not been undertaken for these species.	No TSP Act listed species are considered at risk of significant impact.

IMPLICATIONS

The following legislative and regulatory implications are proposed based on the analysis of information collected during desktop assessments and preliminary field reconnaissance. As a result, a precautionary approach has been adopted in the assessment of potential impacts to ecological values. Whilst certain approval processes may commence prior to detailed field investigations, a final impact analysis will not be completed until all values have been sufficiently identified and described onsite and the project footprint and construction approach finalised in detail. The following implications are therefore provided to inform project planning and design, and will be refined through further investigations and discussions with regulators.

Legislation	Implications
Environment Protection and Biodiversity Conservation Act 1999 (Cth)	The *Environment Protection Biodiversity Conservation Act 1999* (EPBC Act) is Commonwealth legislation that regulates the protection of Matters of National Environmental Significance (MNES) throughout Australia. **Preliminary findings:** Based on the preliminary assessment, there is potential for four nationally (EPBC Act) listed threatened species (i.e. MNES) to be significantly impacted by the project in Victoria assuming the implementation of management measures. No MNES are considered likely to be significantly impacted in Tasmania. Uncertainty still exists around the species' occurrence within the survey area and feasibility of management actions to avoid and minimise impacts. **Recommendations:** In the absence of further detailed assessments, it is recommended that a referral under the *Environment Protection and Biodiversity Conservation Act 1999* covering all matters of national significance likely to be significantly impacted by the proposed project be submitted. **Further studies:** Detailed habitat condition surveys are required to confirm the extent of habitat for listed species and communities. Where there is potential for impacts to habitat, targeted surveys may be required to determine presence or absence of the species within the survey area and inform an impact assessment in accordance with relevant EPBC Act significant impact guidelines.
Threatened Species Protection Act 1995 (Tas)	The Tasmanian *Threatened Species Protection Act 1995* (TSP Act) provides for the protection of threatened flora and fauna in Tasmania. **Preliminary findings:** Based on the preliminary assessment, there are no TSP Act listed species likely to be impacted in Tasmania, assuming the effective implementation of management measures. **Recommendations:** Submit application for development approval based on findings of further technical studies (e.g., habitat condition surveys). Where threatened species cannot be avoided, a 'permit to take' will be required. **Further studies:** Detailed habitat condition surveys are required to confirm the extent of suitable habitat and refine the impact analysis and implications. Where there is potential to impact suitable habitat, targeted surveys may be required to determine presence or absence of the species within the survey area.
Nature Conservation Act 2002 (Tas)	The *Nature Conservation Act 2002* (NC Act) provides for the conservation and protection of the fauna, flora and geological diversity in Tasmania and for the declaration of national parks and other reserved land. **Preliminary findings:** State significant communities are not likely to be impacted in Tasmania assuming the effective implementation of management measures. **Recommendations:** If required, submit application for development approval based on findings of further technical studies (e.g. vegetation condition surveys). **Further studies:** Detailed vegetation condition surveys are required to confirm the extent of threatened native vegetation communities and refine the impact analysis and implications.
Environment Effects Act 1978	The Environment Effects Act requires the preparation of an Environment Effects Statement (EES) for activities considered to have, or to be capable of having, a significant effect on the environment. **Preliminary findings:** Potential impacts to values considered under the EE Act include: • Clearing of 14 ha of native vegetation and 44 scattered trees. • Potential long-term loss of a significant proportion of known remaining habitat or population for six species threatened in Victoria. • Potential impacts to 14 FFG Act listed species. **Recommendations:** Based on the preliminary impact assessment the project triggers some of the criteria for an EES. A referral should be submitted to the Minister for Planning under the EE Act. **Further studies:** Detailed vegetation and habitat condition surveys are required to confirm the extent of native vegetation and habitat for threatened species and refine the impact analysis and

Legislation	Implications
	implications. Where suitable habitat may be impacted, targeted surveys may be required to determine presence or absence of the species within the survey area.
Planning and Environment Act 1987 (Vic)	The *Planning and Environment Act 1987* governs the use, development, and protection of land in Victoria. **Preliminary findings**: Based on the preliminary impact assessment, the project will result in the clearing of 14 ha of native vegetation and 44 scattered trees. **Recommendations:** Complete detailed studies to determine the nature and extent of vegetation clearance. Once final impacts are determined, prepare a Native Vegetation Removal report and determine offset requirements under Victoria's permitted clearing regulations. **Further studies:** Detailed vegetation condition surveys are required to confirm the extent of native vegetation across the survey area.
Flora and Fauna Guarantee Act 1988 (Vic)	The FFG Act regulates the protection and management of biodiversity in Victoria, including the conservation of threatened species and communities and the management of threatening processes. **Preliminary findings**: Based on the preliminary assessment, six FFG Act listed threatened species are may be impacted by the project in Victoria. **Recommendations:** Undertake detailed assessments on Crown Land to determine the nature of impacts to listed species and whether a protected flora permit is required for their removal. **Further studies:** Detailed habitat condition surveys are required to confirm the extent of suitable habitat and refine the impact analysis and implications. Where suitable habitat is at risk of significant impact, targeted surveys may be required to determine presence or absence of the species within the survey area.
Wildlife Act 1975 (Vic)	The *Wildlife Act 1975* protects and manages wildlife (fauna) in Victoria. **Preliminary findings**: Habitat for native fauna is likely to occur throughout the survey area, particularly in association with native vegetation, coastal areas and water features. **Recommendations:** Consider management measures to avoid or minimise impacts to fauna habitat through detailed project design and construction management. **Further studies:** Detailed habitat condition surveys are required to confirm the extent of fauna habitat and refine the impact analysis and implications.

Based on the above implications, the following additional technical studies are recommended:

- Vegetation condition assessments (Tasmania and Victoria)
- Habitat condition assessments (Tasmania and Victoria)
- Vegetation clearance surveys (Tasmania)
- Tree census (Victoria)
- Nest and den checks (Tasmania)
- Targeted surveys for threatened species and ecological communities (Victoria)

1. Introduction

1.1 Background

Marinus Link Pty Ltd (MLPL) is conducting a feasibility and business case assessment for a second Bass Strait electricity interconnector, known as Marinus Link. Eco Logical Australia and Entura have been engaged by Tetra Tech Coffey, on behalf of the proponent to undertake baseline terrestrial ecology studies of the onshore sections of the route in Victoria and Tasmania.

This report presents the combined findings of the Tasmanian and Victorian studies undertaken by Entura and Eco Logical Australia respectively.

1.2 Objectives

The objectives of the initial baseline terrestrial ecology study are to:

- Identify existing terrestrial ecology values within the survey area.
- Provide advice on alterations to the alignment or design to avoid impacts on these values.
- Inform preparation of referrals (or equivalent) to the Tasmanian, Victorian and Commonwealth governments.
- Define the scope of further assessment required to inform the environmental and planning assessment of Marinus Link.

1.3 Scope of works

Eco Logical Australia and Entura have been engaged to undertake an analysis of the environmental sensitivities in the terrestrial environments of Tasmania and Victoria for Marinus Link. This analysis involved a comprehensive desktop assessment to characterise terrestrial ecological values and inform a preliminary impact assessment. Some limited field surveys were also undertaken to address specific environmental sensitivities.

Specifically, the following tasks were undertaken:

- A detailed desktop assessment to review relevant biological databases, modelling and literature.
- Limited and rapid field assessments to broadly characterise ecological values in the survey area and assess specific environmental sensitivities.
- A preliminary determination of the likelihood of ecological values (e.g., vegetation communities, threatened species, etc.) occurring within the survey area based on desktop information.
- An estimation of native vegetation extent and potential removal in the survey area based on desktop resources.
- A preliminary impact assessment on values considered likely to occur within the survey area based on desktop resources.
- Identification of legislative implications based on the findings of the preliminary impact assessment.
- Recommendations for further studies and mitigation measures.

2. Project description

This section details the need for the project and describes the project components.

2.1 Need for project

Tasmania is a participant in the National Electricity Market (NEM) with energy trading between Tasmania and other mainland states and territories in the NEM. This is made possible by Basslink, a 600 megawatt (MW) high voltage direct current (HVDC) interconnector between George Town in Tasmania and Loy Yang in Victoria. Available capacity on the interconnector is highly utilised to export renewable generation and import low cost baseload power.

Tasmania has significant renewable energy resource potential, particularly hydroelectric power and wind energy. The potential size of the resource exceeds both the Tasmanian demand and the capacity of Basslink. The growth in renewable generation in mainland states and territories participating in the NEM, coupled with the retiring of baseload coal-fired generators, is reducing the availability of dispatchable generation. Tasmania's existing and potential renewable resources are a valuable source of dispatchable generation that could benefit electricity supply in the NEM. Marinus Link will allow for the continued trading, transmission and distribution of electricity within the NEM.

Marinus Link

MLPL is proposing to construct a high voltage direct current (HVDC) electricity interconnector between Tasmania and Victoria, to be known as Marinus Link. It will stretch from Tasmania, across the Bass Strait to Victoria, up to and including the converter station(s) in each of the states as shown in (Figure 1.1).

In Tasmania, a converter station will be located at Heybridge near Burnie at a 10 hectare (ha) site on the corner of Bass Highway and Minna Road. The converter station will facilitate the connection of Marinus Link to the Tasmanian transmission network at 220 kilovolt (kV) alternating current. Converter stations comprise transformers, switchgear, closed stormwater runoff systems with oil inceptors, a control room and a large building containing the HVAC/HVDC converter technology.

There will be two subsea cable landfalls at Heybridge with the cables extending from the converter station across the Bass Strait to Waratah Bay in Victoria. The preferred option for shore crossings is horizontal directional drilling (HDD) to about 1 kilometre (km) offshore where the cables would then be trenched, where geotechnical conditions permit. If geotechnical conditions are not favourable, open trenching or a hybrid method comprising short HDD and trenching will be used to construct the crossings.

Approximately 250 km of subsea HVDC cable is required to cross Bass Strait. The preferred technology for Marinus Link is two 750 megawatt (MW) symmetrical monopoles using ±320 kV, cross-linked polyethylene insulated cables and voltage source converter technology. Each symmetrical monopole will comprise two identical size power cables and a fibre-optic communications cable. The cables will be laid at a distance of up to approximately 2 km apart.

In Victoria, a single shore crossing will be located at Waratah Bay with an underground cable for approximately 90 km to the converter station site near the Hazelwood area in the Latrobe Valley. The

route crosses the Waratah Bay–Shallow Inlet Coastal Reserve. From the land-sea joint the land cable will run northwest to the Tarwin River valley which it follows north to the Strzelecki Ranges. The route crosses the ranges between Dumbalk and Mirboo North before descending to the Latrobe Valley where it turns northeast to Hazelwood. There are two potential converter stations sites, one in the Driffield area adjacent to existing forestry plantations, and one adjacent to the Hazelwood Terminal Station.

Land cables will be laid 0.5 metre (m) apart in trenches with a nominal width of 2 m and minimum depth of 1.5 m. Where the symmetrical monopoles are to be accommodated in separate trenches, the trenches will be at least 1 m apart and up to 3.5 m apart depending on the easement configuration. The land cables will be directly laid in the trenches or installed in conduits in the trenches. A linear strip up to 20 m wide will be disturbed in laying the land cables. Temporary access and temporary laydown areas will be required. Where possible existing roads and tracks will be used for access, for example, farm access tracks or plantation forestry tracks.

Land cables will be installed in ducts under sealed roads using horizontal boring and in ducts under major watercourses using HDD, where geotechnical conditions permit. A larger area (up to 1 ha either side of the feature) is required to construct road and watercourse crossings using HDD.

Figure 1.1
Marinus Link overview

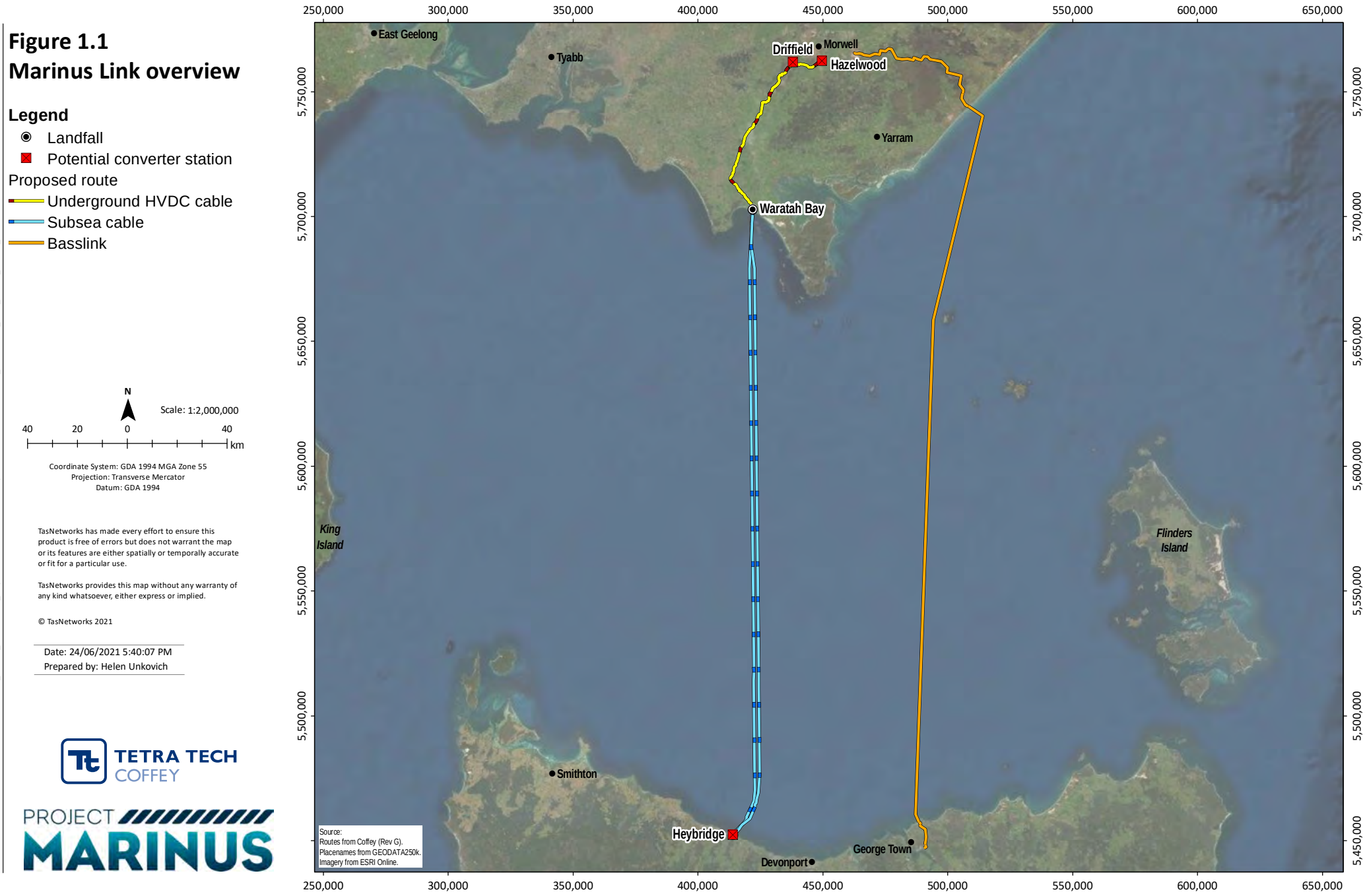
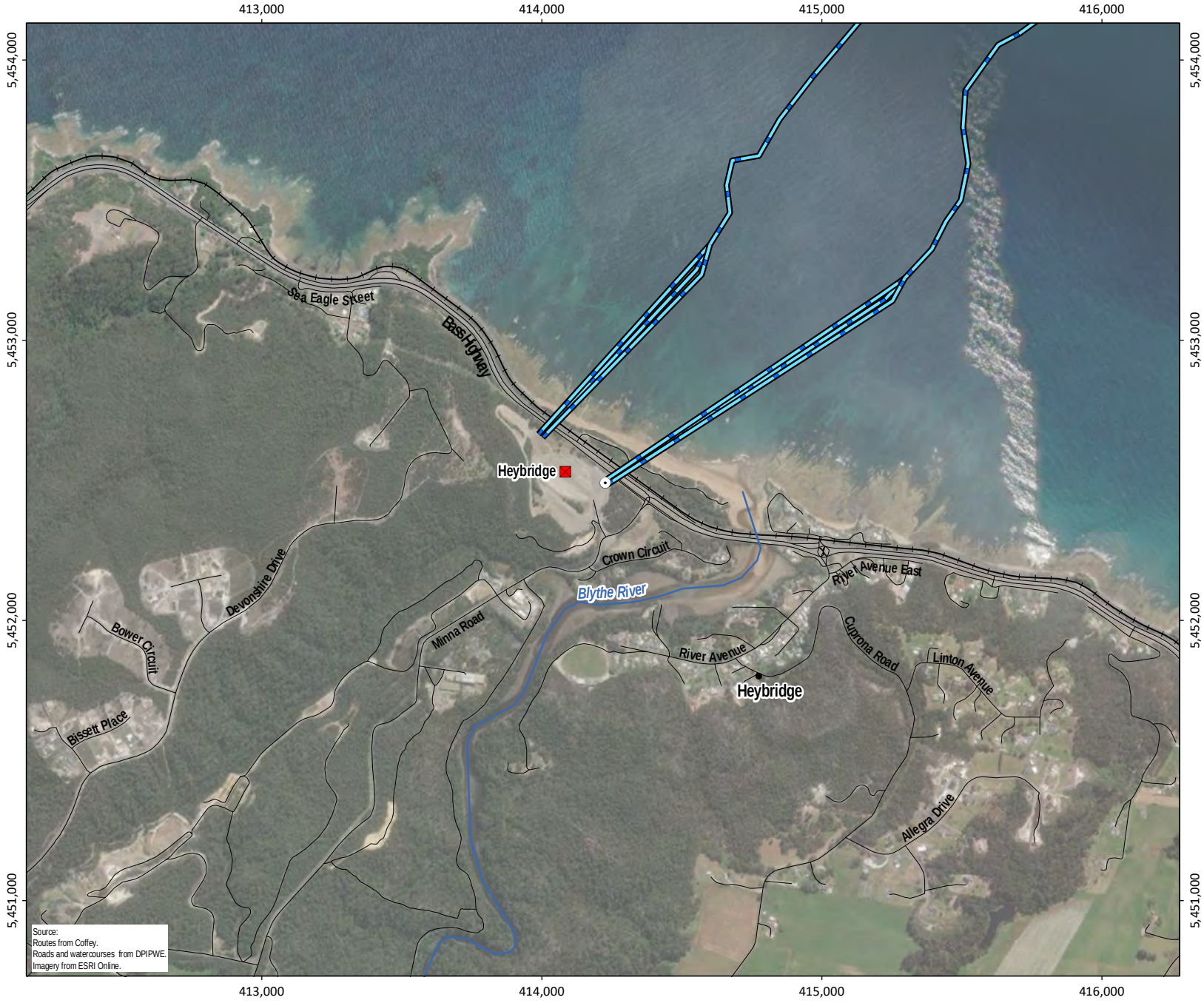


Figure 2
Marinus Link route
Tasmania



Legend

- Landfall
- Potential converter station

Proposed route

- Subsea cable
- Road
- Railway
- Major watercourse

N

Scale: 1:20,000

0.4 0.2 0 0.4 km

Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator
Datum: GDA 1994

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Prepared by: Helen Unkovich

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PROJECT MARINUS

Figure 3.1
Marinus Link route
Victoria (Waratah Bay)

Legend

- Landfall

Proposed route

- Subsea cable
- Underground HVDC cable
- Major road
- Major watercourse

N

Scale: 1:125,000

2.5 1.25 0 2.5 km

Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator
Datum: GDA 1994

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PROJECT MARINUS

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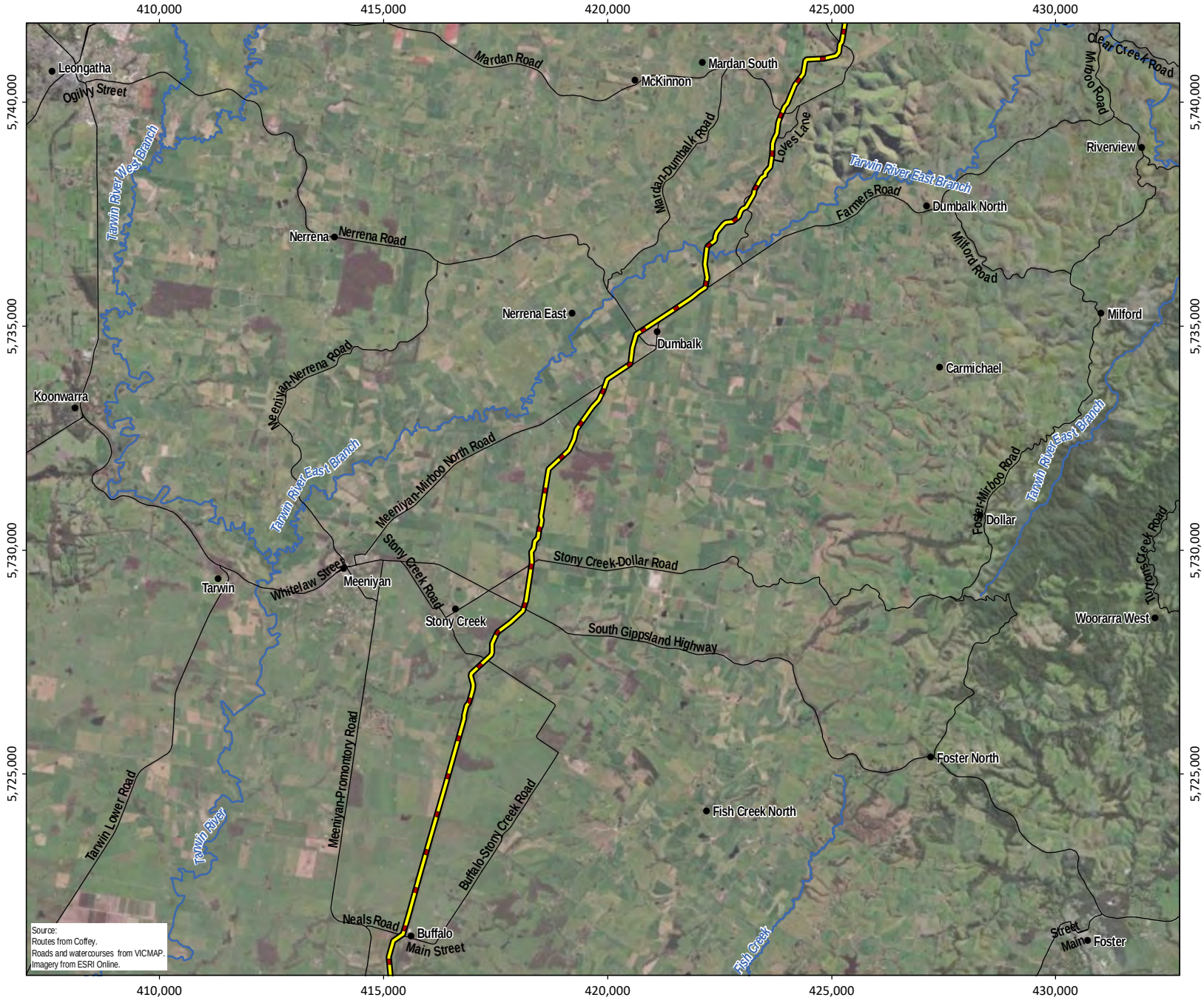
Figure 3.2
Marinus Link route
Victoria (Tarwin Valley)



Legend

Proposed route

Underground HVDC cable

Major road

Major watercourse

N

Scale: 1:125,000

2.5 1.25 0 2.5 km

Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator
Datum: GDA 1994

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Prepared by: Helen Unkovich

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Figure 3.3
Marinus Link route
Victoria (Latrobe Valley)

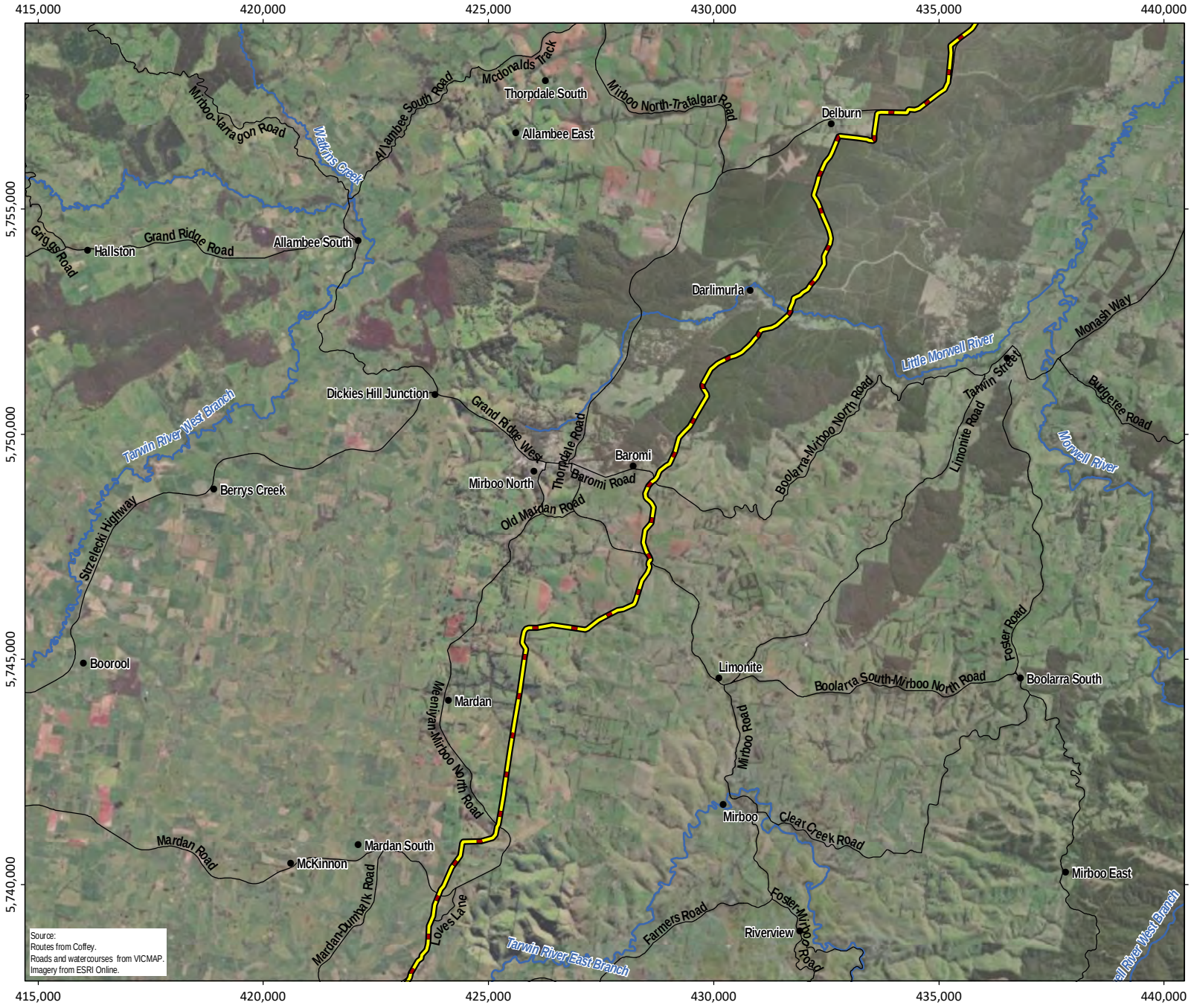
Legend

Proposed route

Underground HVDC cable

Major road

Major watercourse



N

Scale: 1:125,000

2.5 1.25 0 2.5 km

Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator
Datum: GDA 1994

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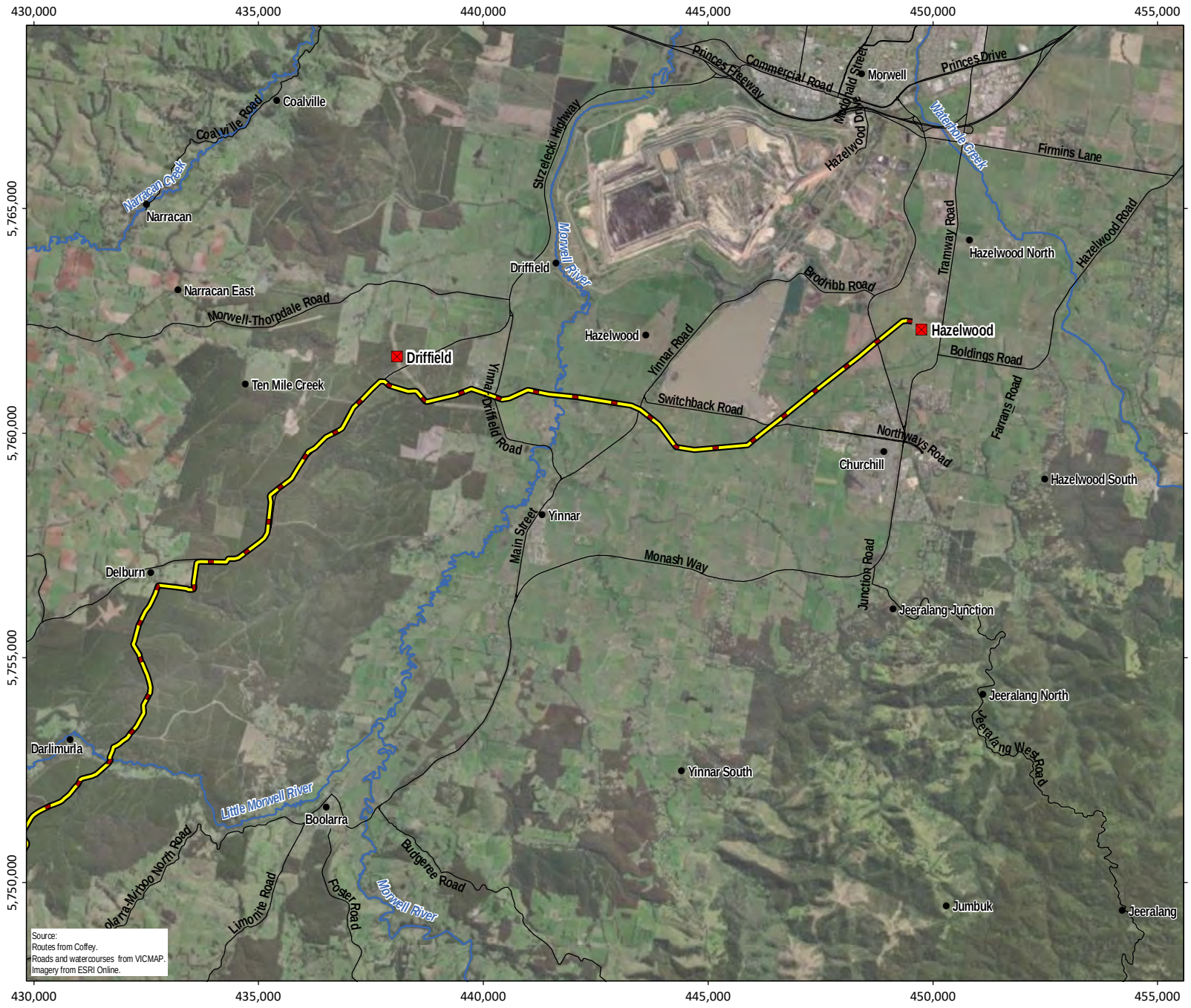
Prepared by: Helen Unkovich

TETRA TECH COFFEY

PROJECT MARINUS

Figure 3.4
Marinus Link route
Victoria (Hazelwood)



3. Methods

3.1 Nominated areas

The nominated areas for this assessment are based on the terrestrial route alignments and infrastructure footprints for the project provided by Tetra Tech Coffey (and endorsed by MLPL) in both Tasmania and Victoria. Based on these designs, the following areas have been established for the purpose of informing the terrestrial ecology assessments:

- Survey area – the corridor encompassing the conceptual route alignment and infrastructure footprint and in which the final route alignment and associated infrastructure will occur. The survey area varies by section and construction method, as follows:
    - Tasmania – the 10 ha converter station site at Heybridge and associated foreshore crossing.
    - Victoria – a 220 m wide corridor, centred on the conceptual route alignment of underground cable sections extending from the shore crossing at Waratah Bay to the greater Hazelwood area, including the proposed converter station site/s.
- Study area – an area sufficient to allow a determination of a likelihood of occurrence of an ecological value within the survey area. This equates to a 5 - 10 km search radius depending on the nature of the landscape and the values in question.
- Area of Disturbance (AoD) – the area in which works are likely to occur and therefore result in impacts to ecological values, consisting of:
    - A 20 m to 36 m wide corridor generally centred on the conceptual route alignment. Where vegetation or habitat is considered likely to be impacted and lost, the AoD has been sited to avoid impacts where possible.
    - The building footprint associated with the two proposed converter stations (16 ha Hazelwood, 6 ha Heybridge).
    - The building footprint associated with the proposed transition station at Waratah Bay (approximately 70 m by 50 m compound).
    - Includes conceptual access tracks, assuming a maximum 10 m wide corridor.
    - Excludes laydown areas, temporary construction camps, etc. as design and location is currently unknown.
    - Excludes foreshore crossings at both Waratah Bay and Heybridge due to the proposed use of Horizontal Directional Drilling (HDD) or other trenchless construction methods at these locations (where geotechnical conditions permit).
    - Excludes areas where HDD or other trenchless construction methods is proposed at targeted crossing sites such as waterways, sealed roads, and areas of roadside vegetation (where geotechnical conditions permit).
    - Includes larger areas (up to 1 ha) at entry and exit points of proposed HDD sites, to accommodate spatial requirements of drilling equipment.
    - Excludes any pre-construction activities including geotechnical investigations.

The AoD was defined to inform an assessment against referral criteria for an Environment Effects Statement (EES) under the Victorian *Environment Effects Act 1978* (EE Act) including those related to

losses in native vegetation and endangered Ecological Vegetation Class (EVC). This approach provides a conservative estimate of the area of impact by assuming the presence of native vegetation and threatened species based on desktop information. Impacts to values immediately adjacent to the AoD will be mitigated during detailed design through micro-siting of the alignment and other controls (e.g. no-go zones) to avoid values such as large trees.

3.2 Database and literature review

A desktop review was completed to identify ecological values which may occur within the survey areas and gather associated supporting information.

Database and literature sources reviewed as part of this work are listed in Table 1.

Note that species that are Listed Marine species under the EPBC Act were not considered as part of the terrestrial assessment even though they appeared in the PMST searches as these listings apply to species in Commonwealth waters, however there are no Commonwealth waters in the Tasmanian or Victorian survey areas. Oceanic marine species that also appeared in the PMST searches were not included in the terrestrial assessment as they will not be affected by Marinus link works that occur on land. Separate marine ecology desktop assessments have been completed to determine potential impacts to oceanic marine species, including those that appear within the PMST searches.

Table 1. Database sources and relevant literature reviewed

Tasmania	Victoria
Natural Values Atlas (NVA)	Commonwealth PMST
Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) Protected Matters Search Tool (PMST)[1]	Victorian Biodiversity Atlas[2]
TASVEG mapping.	Nature Kit[3] and Native Vegetation Information Management (NVIM) system[4]
Publicly available aerial imagery, including current and historical images from Google Earth and ESRI.	Visualising Victoria's Biodiversity[5].
Relevant state environmental legislation and regulations, including the *Threatened Species Protection Act 1995* and *Nature Conservation Act 2002*.	The Department of Environment, Land, Water and Planning (DELWP) 2017 Native Vegetation spatial layers, including Location Risk and Strategic Biodiversity Value maps, and habitat importance and vegetation extent/condition models.
	Publicly available aerial imagery, including current and historical images from Google Earth and ESRI.
	Relevant state environmental legislation and regulations, including *Planning and Environment Act 1987*, *Flora and Fauna Guarantee Act 1988* and *Environment Effects Act 1978*.

[1] http://www.environment.gov.au/epbc/protected-matters-search-tool - accessed 10 December 2018
[2] https://vba.dse.vic.gov.au/vba/#/ - accessed 10 December 2018
[3] http://maps.biodiversity.vic.gov.au/viewer/?viewer=NatureKit - accessed 10 December 2018
[4] https://nvim.delwp.vic.gov.au/ - accessed 10 December 2018
[5] http://www.vvb.org.au/vvb_map.php - accessed 10 December 2018

3.3 Preliminary site surveys

3.3.1 Tasmania

An initial field reconnaissance was undertaken by Entura in September 2018. The reconnaissance was limited to verifying the vegetation communities and identifying potential habitats for threatened flora and fauna in areas where there was public access, i.e., public roads and public reserves. The data obtained during the field reconnaissance combined with aerial imagery was used to update the available vegetation mapping (TASVEG) for those parts of the survey area that were accessible.

In addition, a survey to verify the presence of *Eudyptula minor* (little penguin) was also undertaken at the coastal crossing point west of the Blythe River mouth. Although *Eudyptula minor* are not listed as threatened under the EPBC or TSP Acts, the species and their burrows are protected in Tasmania under the *Nature Conservation Act 2002*. *Eudyptula minor* is also a listed marine species and therefore must be considered in the assessment of activities in Commonwealth waters. *Eudyptula minor* is a species of local interest and has led to conservation efforts in the Burnie and Lillico regions in northwest Tasmania. Some conservation efforts include protecting the established penguin rookeries, including the installation of fences for dog control, to prevent penguins venturing onto the Bass Highway and railway line and artificial burrows at Cooee Beach and Lillico Beach by the Cooee to Camdale Coastcare Group and Friends of Lillico Penguins CARes Group.

The *Eudyptula minor* surveys were undertaken between the 21 and 23 of November 2018 on the beaches at the proposed shore crossing location at Heybridge. Surveys included burrow searches, burrow occupancy surveys and evening observations for returning penguins.

3.3.2 Victoria

A reconnaissance of the proposed interconnector route was conducted by Eco Logical Australia between 12 and 14 September 2018. The surveys involved:

- Documenting the general nature of native vegetation and landscape character along the route alignment.
- Identifying potential habitat for threatened flora and fauna species where possible.

Assessments were conducted from public land where access could be obtained by vehicle. As a result, parts of the route were not inspected or only observable at a distance. In such instances, aerial imagery and the desktop review was used to extrapolate potential values.

A two-day survey for threatened shorebirds and *Thinornis rubricollis rubricollis* (hooded plover) and its habitat was also undertaken on 17 and 18 November 2018 (see Appendix 5). The field survey was conducted to assess habitat for threatened shorebirds at landfall locations and undertake one seasonal survey for the threatened *Thinornis r. rubricollis* and potential nesting sites during the “hooded plover Biennial Count period”. The field surveys were conducted in line with EPBC Act guidelines and policy statements (i.e., Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species).

3.4 Analysis

3.4.1 Likelihood of occurrence

The likelihood of occurrence is a determination of the potential for threatened flora, fauna or ecological communities to be present and for threatened flora and fauna to make significant use of the survey area. The ranking of a species or ecological communities as having either no, low, medium, or high likelihood, or as being present, is determined by:

- assessing information collated through the database and literature review
- assessing species habitat requirements (including surrounding habitat connectivity)
- making field observations of habitat (where possible based on the limited survey time).

The results of the likelihood of occurrence analysis, including a rationale for each value, are provided in Appendix 2 and 3 for Tasmania and Victoria, respectively. The determinations of a species' likelihood provided are not absolute, rather they represent a species' potential to occur in the survey area.

Threatened species and ecological communities determined to have a medium or high likelihood of occurrence, or known to be present, have been incorporated into the impact assessment to inform the baseline characterisation and satisfy regulatory requirements.

3.4.2 Impact assessment

A preliminary impact assessment has been undertaken based on the information gathered through the desktop assessment and field reconnaissance and the AoD. The first part of the preliminary impact assessment considered potential impacts on significant species and communities without implementation of proposed management measures (with the exception of initial route selection and refinement undertake to date).

To inform referral requirements under the EPBC Act and *Environment Effects Act 1978* (EES Act), a second impact analysis was undertaken on Matters of National Environment Significance (MNES) and remotely-mapped native vegetation based on successful implementation of the recommended management measures.

3.4.3 Native vegetation

Native vegetation in Victoria was remotely mapped using aerial photography informed by photographs and data gathered during the field survey. Mapping identified patches and scattered trees where possible, with the Department of Environment, Land, Water and Planning's (DELWP) Ecological Vegetation Class dataset used to classify vegetation type and conservation status for each patch and tree.

Considering the management measures proposed, the AoD was used to calculate the extent of impacts on native vegetation (patches and trees) in Victoria. Where avoidance is considered feasible through micro-siting, realignment or horizontal directional drilling, the associated patch or tree has been excluded from the impact analysis. This was possible across much of the route, particularly in areas where the vegetation is fragmented by agriculture. Where the route is constrained by vegetation on either side of the alignment, or insufficient information was available to determine the feasibility of management measures, vegetation has been considered lost as outlined below.

Only vegetation within the AoD has been assumed to be impacted. Indirect impacts to vegetation or habitat adjacent but not within the AoD will be mitigated through construction controls such as no-go zones, soil compaction protection, speed/weight limits etc. Where vegetation within the AoD has been assumed to be lost, an additional 7.5 m buffer has been applied to the vegetation to account for the increased extent of vegetation removal where trees may be impacted (i.e. tree protection zones).

The extent of native vegetation impacted in Tasmania was calculated based on the area of native vegetation visible in aerial imagery that was within the AoD.

3.5 Limitations and assumptions

This assessment was designed and undertaken with the purpose of informing ecological constraints for route selection and environmental and planning referrals. It is based primarily on desktop and conceptual project design information and may not include all ancillary project areas such as access tracks or laydown sites. As a result, it is insufficient to inform a detailed impact assessment and further studies are required.

This initial assessment of the presence of threatened ecological communities, flora and fauna (with the exception of *Eudyptula minor* and shorebirds in Victoria) was limited to a review of the available data with no systematic field validation or survey. Therefore, the reliability of the results is constrained by the accuracy of the existing vegetation mapping, the survey effort for flora and fauna species and publicly available records.

Surveys were undertaken to detect the presence of *Eudyptula minor* at the proposed shore crossing, and there is greater confidence in the locations of this species in relation to the shore crossing in Tasmania. Similarly, a habitat and shorebird survey undertaken at Waratah Bay in Victoria, informed the assessment of suitable habitat presence for threatened shorebirds, including *Thinornis r. rubricollis*. Nonetheless, these surveys were not exhaustive and further investigation and survey effort will likely be required for these and other threatened flora and fauna species.

The preliminary impact assessment in this report assumes that management measures detailed in Section 4.3 will be implemented where practicable and all relevant industry standards, guidelines and policies for managing and mitigating impacts on significant environmental values, including MNES, will inform the detailed Fauna and Flora Management Plan and Environmental Management Plan. These plans will set out management measures for the project. The proposed management measures detailed in Section 4.3 are not exhaustive and it is assumed that such plans will be developed to address potential impacts on all sensitive environmental value and site-specific issues.

4. Preliminary baseline characterisation

This chapter characterises the terrestrial environment of Marinus Link including:

- The Tasmanian section consisting of the Heybridge converter station site and shore crossing, and
- The Victorian section consisting of the shore crossing at Waratah Bay and onshore route from Waratah Bay to the Hazelwood area.

4.1 Tasmania

The converter station site and associated foreshore supports several small patches of remnant native vegetation (coastal forest and scrub) with a total area of approximately 6 hectares. There are no listed EPBC Act vegetation communities mapped within the survey area; however, the *Nature Conservation Act 2002* (NC Act) listed *Melaleuca ericifolia* (swamp forest) is mapped within the study area on the east bank of the Blythe River, and a patch of NC Act listed Freshwater Aquatic Sedgeland and Rushland (ASF), was identified during the survey on the northern shore of the Blythe River at the confluence of a small creek, immediately to the south of the survey area.

One previous record of the Tasmanian *Threatened Species Protection Act 1995* (TSP Act) listed *Baumea gunnii* (slender twigsedge) was identified from east of the Blythe River near Heybridge (Appendix 2). It is therefore likely to be found in suitable wet habitats to the immediate south of the survey area.

Several fauna species have been identified as being present or likely to be present within vegetation immediately adjacent to the survey area at Heybridge (Appendix 2):

- The threatened mammal species, *Dasyurus maculatus* subsp. *maculatus* (spotted-tailed quoll; vulnerable), *Dasyurus viverrinus* (eastern quoll; endangered), *Perameles gunnii* (eastern barred bandicoot; vulnerable); and *Sarcophilus harrisii* (Tasmanian devil; endangered). These species are listed under the EPBC Act with *Dasyurus maculatus* subsp. *maculatus* (rare) and *Sarcophilus harrisii* (endangered) also listed under the TSP Act (Appendix 2).
- Three bird species listed under the EPBC Act and TSP Act: *Aquila audax fleayi* (wedge-tailed eagle) and *Ceyx azureus* subsp. *diemenensis* (Tasmanian azure kingfisher), listed as endangered under both EPBC and TSP Acts, and *Tyto novaehollandiae castanops* (Masked owl), listed vulnerable under EPBC Act and endangered under TSP Act).
- One bird species listed under the TSP Act, *Haliaeetus leucogaster* (white-bellied sea eagle; vulnerable).

Table 2 below lists significant ecological values considered moderately likely to occur within the Tasmanian survey area, including the total potential area (hectares) of native vegetation.

Table 2. Summary of significant ecological values considered likely to occur in the Tasmanian survey area, or in habitat immediately adjacent

Category	Ecological Value
Vegetation	Up to 3 hectares of native vegetation within the converter station site. Up to 3 hectares of native vegetation within the coastal foreshore.
EPBC Act listed communities	No nationally significant communities detected in survey area.
State significant communities	Potential occurrence of NC Act listed vegetation communities in adjacent habitat: • *Melaleuca ericifolia* swamp forest (NME) • Freshwater Aquatic Sedgeland and Rushland (ASF)
EPBC Act listed flora species	Potential occurrence of nationally significant flora not expected.
EPBC Act listed fauna species	Potential occurrence of EPBC Act listed fauna species in adjacent habitat: • *Aquila audax fleayi* (wedge-tailed eagle) • *Ceyx azureus* subsp. *diemenensis* (Tasmanian azure kingfisher) • *Dasyurus maculatus subsp. maculatus* (spotted-tailed quoll) • *Dasyurus viverrinus* (eastern quoll) • *Perameles gunnii* (eastern barred bandicoot) • *Sarcophilus harrisii* (Tasmanian devil) • *Tyto novaeholldandiae castanops* (masked owl)
EPBC Act listed migratory	Potential occurrence of EPBC Act listed migratory fauna species in adjacent habitat: • *Hirundapus caudacutus* (white-throated needletail) • *Myiagra cyanoleuca* (satin flycatcher)
State significant flora (not listed under EPBC Act)	Potential occurrence of TSP Act listed flora species in adjacent habitat: • *Baumea gunnii* (slender twigsedge) •
State significant fauna (not listed under EPBC Act)	Potential occurrence of TSP Act listed fauna species in adjacent habitat: • *Haliaeetus leucogaster* (white-bellied sea eagle)
Raptor nests	None determined.
Watercourses	Close to survey area: Blythe River
Sensitive wetlands	Close to survey area: Freshwater Aquatic Sedgeland and Rushland (ASF) on northern shore of Blythe River, Un-named wetlands on Blythe River (ID 12601, 12602)
Parks and reserves	Close to survey area: Blythe River Conservation Area, Un-named Conservation Covenant (ID 10267)

4.2 Victoria

The Victorian route falls within the Gippsland Plain and Strzelecki Ranges bioregions, and the South Gippsland Shire and City of Latrobe local government areas.

Native vegetation has been largely cleared in areas dominated by large pastoral properties, with only small, fragmented patches of remnant and planted woodlands and scattered trees remaining along road reserves, property boundaries and creek lines. Whilst fragmented, woodland vegetation on private property is still a prominent feature of the landscape, it provides important corridors connecting the numerous small reserves and larger parks scattered throughout the region. As the route traverses the foothills of the Strzelecki Ranges, woody vegetation cover increases, particularly along roadsides, creeks and gullies. Eventually, this agricultural landscape gives way to dense plantations of both native and introduced species in the ranges north of Mirboo North. Whilst most of this area is managed plantation, there are some larger patches and narrow corridors of native vegetation along creek lines and harvesting buffers. Upon leaving the foothills on the northern side of the ranges, the route returns to pastural land interspersed with fragmented woodlands through the undulating plains of the Latrobe Valley.

The Department of Environment, Land, Water and Planning's (DELWP) pre-1750 Ecological Vegetation Class model dataset indicates the route's survey area and local vicinity would have once supported at least 13 EVCs (Table 3). An analysis of vegetation type and extent found an estimated 233 hectares of native vegetation within the Waratah Bay to Hazelwood survey area and 444 scattered native trees.

Based on the preliminary field surveys and distribution modelling, small isolated patches of grassland and woodland in the Latrobe Valley may qualify as the EPBC Act listed *Gippsland Red Gum (Eucalyptus tereticornis* subsp. *mediana) Grassy Woodland and Associated Native Grassland*, as well as the Flora and Fauna Guarantee Act (FFG Act) listed *Forest Red Gum Grassy Woodland Community* and/or *Central Gippsland Plains Grassland.* The FFG Act listed *Warm Temperate Rainforest (East Gippsland Alluvial Terraces) Community* is also considered likely to occur where the route traverses the Strzelecki Ranges. Other listed vegetation communities with a modelled distribution in the survey area, including the EPBC Act listed *Natural Damp Grassland of the Victorian Coastal Plain* and *Subtropical and Temperate Coastal Saltmarsh* are considered unlikely to occur within the survey area as a result of past vegetation clearance and changed land use in coastal areas which may have once supported these communities.

The desktop assessment identified 35 flora species considered to have a moderate or high likelihood of occurring within the survey area (Appendix 3). This includes seven species listed under the EPBC Act, two species listed on the FFG Act and 26 species listed on DELWP's advisory list for rare or threatened flora (Appendix 3). Areas of notable habitat which may support state and nationally significant flora species include:

- Roadside and woodland remnants in the Latrobe Valley, which are likely to contain habitat for grassy woodland and grassland species such as the EPBC Act listed *Dianella amoena* (matted flax-lily) and *Eucalyptus Strzelecki* (Strzelecki gum) (Figure 3.5).
- Forested gullies, creek lines and road reserves through the Strzelecki Ranges north of Mirboo North, which are likely to contain closed forest and favour species which prefer damp or wet conditions, including the FFG Act listed *Cyathea cunninghamii* (slender tree fern) (Figures 3.4 and 3.5).

- Large patches of damp heathy woodlands and lowland forest in reserves or roadsides south of Meeniyan and particularly in the hills surrounding Waratah Bay (Figure 3.1). Where relatively undisturbed, these woodland or low forest vegetation communities may support a diversity of species including orchids such as the EPBC Act listed green-striped greenhood *Pterostylis chlorogramma* (green-striped greenhood)*, Pterostylis cucullata* (leafy greenhood) and *Thelymitra matthewsii (*spiral sun-orchid).
- The dune system on the shores of Waratah Bay, which supports a narrow band of intact remnant vegetation including grasslands and low shrublands which may provide habitat for coastal species such as the state significant *Exocarpos syrticola* (coast ballart) and *Calystegia soldanella* (sea bindweed) (Figures 3.1).

The desktop assessment identified 70 significant fauna species considered to have a moderate or high likelihood of occurring within the survey area (Appendix 3). This includes 13 species listed on the EPBC Act, 32 species listed on the FFG Act (along with one nominated species), and 59 species listed on DELWP's advisory list for rare or threatened fauna (Appendix 3). Of the 13 EPBC Act listed species, three species are considered to have a high likelihood of occurrence, namely *Petauroides volans* (southern greater glider), *Thinornis r. rubricollis* (hooded plover) and *Prototroctes maraena* (Australian grayling) based on the number and location of records and suitable habitat within the study area.

Areas of notable habitat which may support state and nationally significant fauna species include:

- Large tracts of forests associated with plantations between Mirboo North and Hazelwood, which provide critical resources such as hollow-bearing trees for owls, possums, and gliders, and nesting and foraging habitat for other birds. Species with potential to occur in these habitats include *Ninox connivens* (barking owl), *Ninox strenua* (powerful owl), *Petauroides volans* (southern greater glider) and *Pteropus poliocephalus* (grey-headed flying-fox).
- Waterways and waterbodies intersecting the survey area, which provide habitat for fish, crustacea and frogs. Species which have populations recorded within or near intersecting waterways and riparian vegetation include *Galaxiella pusilla* (dwarf galaxias), *Prototroctes maraena* (Australian grayling), and *Litoria raniformis* (growling grass frog).
- Coastal forests and heathy woodlands which provide habitat for *Pseudophryne semimarmorata* (southern toadlet) and *Antechinus minimus maritimus* (swamp antechinus) and wet habitats (swamp scrub, wetlands etc) that may provide habitat for threatened skinks *Lissolepis coventryi* swamp skink and *Pseudemoia rawlinsoni* (glossy grass skink).
- Dunes and beaches (Sandy Point Beach) at Waratah Bay that provides habitat for migratory species (wader species) including *Thinornis r. rubricollis* (hooded plover).

Other areas of high ecological value include native vegetation remnants on roadsides and rail lines.

Table 3 below lists significant ecological values considered likely to occur in the Victorian survey area including the total area (hectares) of Ecological Vegetation Classes.

Table 3. Summary of significant ecological values considered likely to occur in the Victorian routes survey area

Value	Ecological Values
Vegetation	Endangered EVCs: • Damp Forest (EVC 29) – 19 ha • Herb-rich Foothill Forest (EVC 23) – 68 ha • Swamp Scrub (EVC 53) – 22 ha • Swampy Riparian Woodland (EVC 83) – 9 ha • Plains Grassy Woodland (EVC 55) – 4 ha • Plains Grassy Forest (EVC 151, Strzelecki Ranges bioregion) – 3 ha • Shrubby Foothill Forest (EVC 45) – 1 ha Vulnerable EVCs: • Damp Heathy Woodland/Lowland Forest Mosaic (EVC 1106) – 56 ha • Lowland Forest (EVC 16) – 34 ha • Plains Grassy Forest (EVC 151, Gippsland Plain bioregion) – 3 ha Depleted EVCs: • Wet Forest (EVC 30) – 10 ha • Coastal Dune Scrub/Coastal Dune Grassland Mosaic (EVC 1) – 5 ha Least concern EVCs: • Estuarine Wetland (EVC 10) - <1 ha Scattered trees: 444
EPBC Act listed communities	Gippsland Red Gum (*Eucalyptus tereticornis* subsp. *mediana*) Grassy Woodland and Associated Native Grassland
EPBC Act listed flora species	*Amphibromus fluitans* (river swamp wallaby-grass), *Caladenia orientalis* (eastern spider orchid), *Dianella amoena* (matted flax-lily), *Eucalyptus strzeleckii* (Strzelecki gum), *Prasophyllum spicatum (dense leek-orchid), Pterostylis chlorogramma* (green-striped greenhood), *Pterostylis cucullata* (leafy greenhood), *Thelymitra matthewsii* (spiral sun orchid)
EPBC Act listed fauna species	*Antechinus minimus maritimus* (swamp antechinus), *Botaurus poiciloptilus* (Australiasian bittern), *Calidris canutus* (red knot), *Charadrius leschenaultii (greater sand plover), Galaxiella pusilla* (dwarf galaxias), *Litoria raniformis* (growling grass frog), *Myiagra cyanoleuca* (satin flycatcher), *Numenius madagascariensis* (eastern curlew), *Petauroides volans* (southern greater glider), *Prototroctes maraena* (Australian grayling), *Pteropus poliocephalus* (grey-headed flying-fox), *Sternula nereis* (fairy tern), *Thinornis r. rubricollis* (hooded plover)
EPBC Act listed migratory species	*Actitis hypoleucos* (common sandpiper), *Ardea ibis* (cattle egret), *Ardea modesta* (eastern great egret), *Calidris acuminata* (sharp-tailed sandpiper), *Calidris alba* (sanderling), *Calidris canutus* (red knot), *Calidris ruficollis* (red-necked stint), *Charadrius bicinctus* (double-banded plover), , *Charadrius mongolus* (lesser sand plover), *Charadrius ruficapillus* (red-capped plover), *Gallinago hardwickii* (Latham's snipe), *Haliaeetus leucogaster* (white-bellied sea-eagle), *Hirundapus caudacutus* (white-throated needletail), *Limosa lapponica* (bar-tailed godwit), *Merops ornatus* (rainbow bee-eater), *Myiagra cyanoleuca* (satin flycatcher), *Numenius madagascariensis* (eastern curlew), *Pandion haliaetus* (osprey), *Pluvialis fulva* (pacific golden plover, *Rhipidura rufifrons* (rufous fantail), *Sternula albifrons* (little tern), *Thalasseus bergii* (crested tern), *Tringa stagnatilis* (marsh sandpiper)
State significant communities	Forest Red Gum Grassy Woodland Community Central Gippsland Plains Grassland Warm Temperate Rainforest (East Gippsland Alluvial Terraces) Community

Value	Ecological Values
State significant flora species (not listed under EPBC Act)	**FFG Act listed only species:** *Craspedia canens* (grey billy-buttons), *Cyathea cunninghamii* (slender tree fern) **DELWP Advisory listed only species:** *Acacia uncifolia* (Coast Wirilda), *Adriana quadripartita* (coast bitter-bush), *Argentipallium dealbatum* (silver everlasting), *Burnettia cuneata* (lizard orchid), *Caladenia vulgaris* (slender pink-fingers), *Callitriche umbonate* (Winged Water-starwort), *Calystegia soldanella* (Sea Bindweed), *Chiloglottis jeanesii* (mountain bird-orchid), *Cladium procerum* (leafy twig-rush), *Corybas aconitiflorus (*spurred helmet-orchid), *Corybas fimbriatus* (fringed helmet-orchid), *Cyathea* X *marcescens* (skirted tree fern), *Desmodium varians* (slender tick-trefoil), *Eucalyptus fulgens* (Green Scentbark), *Eucalyptus globulus* subsp. *globulus* (Southern Blue-gum), *Eucalyptus kitsoniana* (bog gum), *Eucalyptus yarraensis* (yarra gum), *Exocarpos syrticola* (Coast Ballart), *Geranium solanderi var. solanderi s.s.* (Austral Crane's-bill), *Marsilea mutica* (Smooth Nardoo), *Monotoca glauca* (currant wood), *Poa billardierei* (Coast Fescue), *Pomaderris oraria* subsp. *oraria,* (Bassian Pomaderris), *Pterostylis alveata* (Coastal Greenhood), *Pterostylis grandiflora* (cobra greenhood), *Pterostylis pedoglossa* (Prawn Greenhood), *Sowerbaea juncea* (rush lily), *Stackhousia spathulate,* (Coast Stackhousia), *Tmesipteris elongata* (slender fork fern), *Tmesipteris ovata* (oval fork fern), *Tmesipteris parva* (small fork fern)
State significant species (not listed under EPBC Act)	**FFG Act and DELWP advisory listed species:** *Accipiter novaehollandiae* (grey goshawk), *Ardea alba* (eastern great egret), *Ardea intermedia* (intermediate egret), *Ardea plumifera* (plumed egret), *Calamanthus pyrrhopygiu* (chestnut-rumped heathwren), *Charadrius mongolus* (lesser sand plover), *Climacteris affinis* (white-browed treecreeper), *Egretta garzetta* (little egret), *Engaeus phyllocercus* (Narracan burrowing crayfish), *Euastacus neodiversus* (South Gippsland spiny crayfish), *Falco subniger* (black falcon), *Gelochelidon nilotica macrotarsa* (gull-billed tern), *Haliaeetus leucogaster* (white-bellied sea-eagle), *Hieraaetus morphnoides* (little eagle), *Hydroprogne caspia* (Caspian tern), *Ixobrychus dubius (*Australian little bittern), *Larus pacificus* (pacific gull), *Lewinia pectoralis* (Lewin's rail), *Lissolepis coventryi* (swamp skink), *Myrmecia sp. 17* (bullant), *Ninox connivens* (barking owl), *Ninox strenua* (powerful owl), *Ornithorhynchus anatinus* (Platypus), *Oxyura australis* (blue-billed duck), *Porzana pusilla* (Ballion's crake), *Saccolaimus flaviventris* (yellow-bellied sheathtail bat), *Sminthopsis leucopus* (white-footed dunnart), *Sternula albifrons* (little tern), *Tyto novaehollandiae* (masked owl) **DELWP advisory listed only species:** *Actitis hypoleucos* (common sandpiper), *Ceyx azureus*(azure kingfisher), *Anas rhynchotis* (Australiasian shoveler), , *Aythya australis* (hardhead), *Biziura lobate* (musk duck), *Calidris alba* (sanderling), *Cercartetus nanus* (eastern pygmy-possum), *Chlidonias* (white-winged black tern), *leucopterus Circus assimilis* (spotted harrier), *Engaeus hemicirratulus* (Gippsland burrowing crayfish), *Gallinago hardwickii* (Latham's snipe), *Haematopus fuliginosus* (sooty oystercatcher), *Hirundapus caudacutus* (white-throated needletail), *Nannoperca sp. 1* (Flinders pygmy perch), *Nycticorax caledonicus* (nakeen night heron), *Platalea regia* (royal spoonbill), *Pluvialis fulva* (pacific golden plover), *Pseudemoia rawlinsoni* (glossy grass skink), *Pseudophryne semimarmorata* (southern toadlet), *Spatula rhynchotis* (Australasian shoveler), *Sterna striata* (white-fronted tern), *Tringa nebularia* (common greenshank), *Tringa stagnatilis* (marsh sandpiper), *Varanus varius* (lace monitor)
Watercourses	Number of waterways intersected by classification: • High: 2 (Morwell River and Tarwin River east branch) • Moderate: 2 (Little Morwell River and Fish Creek) • Low: 66 (including four named creeks: Stony Creek, Eel Hole Creek, Buffalo Creek, Berrys Creek)

Value	Ecological Values
Lakes and water bodies	Waterbodies intersected by the routes: • The floodplain at the confluence of the Morwell River and Middle Creek, which includes numerous small billabongs and plains which retain water after flood events. • The floodplain associated with the small creek west of Sandy Point, on the plains behind the Waratah Bay dunes. Once likely to be a mixture of open marsh and scrub, this area has been converted to pasture and provides limited habitat values unless in flood. • Six additional small in-stream ponds or dams, particularly in the steep foothills between Dumbalk and Mirboo North.
Sensitive wetlands	No Ramsar wetlands within the study area. No wetlands of importance within survey area.
Parks and reserves	**Cape Liptrap Coastal Park** – located 16 km to the west of Waratah Bay and the route. This area comprises coastal heathlands and sand dunes. **Shallow Inlet Marine Coastal Park** – located 3 km to the east of the survey area. This area comprises estuarine and coastal habitats. **Waratah Bay - Shallow Inlet Coastal Reserve** – Stretching along the coast from Waratah Bay to shallow inlet, incorporating the coastal portion of the survey area. Coastal dune and beach habitats **Wilsons Promontory National Park** – Located approx. 13 km southeast of the route in the south. Comprises coastal heathland, swamp scrub, estuarine and coastal habitats. **Bald Hills Creek WR** – 13km northwest from Waratah Bay and the route. Comprises open woodland, swamp scrub and shallow wetland habitats. **Great Southern Rail Trail reserve** – A linear reserve which crosses the route near Fish Creek. **Mirboo North Regional Park** – Multiple reserves, closest area located 6 km west of the route in the Darlimurla area. Comprises damp to wet tall forest habitats and temperate rainforest.

4.3 Potential project impacts and management measures

Major infrastructure projects have the potential to impact on ecological values in a variety of different ways. Impacts may occur during or after construction, and may be 'direct' in nature, such as the removal of a tree, or 'indirect', such as the release of sediment into waterways and the associated impacts to habitat downstream. In developing management measures, it is therefore important to consider all potential sources of impacts a project of this nature may have. Potential sources are listed in Table 4.

Avoidance and mitigation measures are recommended to reduce project impacts on environmental values, including threatened species and ecological communities. These management measures are based on the following hierarchy:

1. Avoid direct and indirect adverse impacts.
2. Mitigate and manage any unavoidable direct and indirect adverse impacts.
3. Offset any residual significant impacts.

Table 4. Potential project impacts

Construction	Operational
• Vegetation clearing for excavation of trenches for construction, access tracks, laydown and storage areas	• Minimal clearance of vegetation to maintain areas that require permanent access, e.g., access tracks • Fauna injury/mortality from maintenance and inspection vehicles/machinery

Construction	Operational
• Indirect impacts reducing the vigour and reproductive capacity of vegetation or habitats, resulting in a long-term decline or loss over time. • Fauna injury and/or mortality through direct disturbance, interactions with vehicles/machinery and/or entrapment in trenches • Pest species incursion (plants and animals) • Disturbance from dust, noise, vibration and light through the operation of plant and equipment during construction • Erosion from exposed and disturbed ground, with runoff into waterbodies and subsequent sedimentation • Changes in water quality due to erosion/sedimentation and/or changes to hydrology where the cable crosses watercourses • Contamination from spills and leaks of hazardous materials used in construction (e.g., diesel, chemicals).	• Ongoing edge effects, e.g., weeds and pest incursions, particularly within areas of permanent vegetation removal • Dust emissions and fire ignition risk from vehicles • Permanent fragmentation of habitat associated with above-ground infrastructure (e.g. converter stations) • Disturbance of fauna or flora through persistent lighting associated with above-ground infrastructure.

Findings from detailed ecological surveys (still to be conducted) should be used to inform the final location of route alignments and associated work areas to avoid areas of high environmental sensitivity. Where such areas are unavoidable, the disturbance area should be minimised to the greatest extent practicable. Final impact assessments, informed by field assessments, will be required which will detail final and project-specific mitigation measures and subsequent residual impacts.

The route alignment used for this study is the product of a detailed route analysis and selection process to avoid environmentally sensitive areas including large areas of remnant vegetation and habitat, parks and reserves, and wetlands.

Most potential impacts can be avoided through micro-siting of the final alignment so there is greater separation distance from vegetation/habitat, particularly where the route runs parallel to native vegetation associated with roads and tracks.

4.4 Avoidance measures

The final route alignment and siting of supporting infrastructure are still to be finalised. The following general avoidance measures are recommended during the final design phase of the project:

- Findings from ecological surveys (including this report) should be used to preferentially site infrastructure to avoid areas of high environmental sensitivity, primarily areas of known MNES. Where such areas are unavoidable, the disturbance area should be minimised to the greatest extent practicable.
- Areas of existing disturbance free of vegetation or habitat constraints (such as existing tracks or clearings) should be utilised to site infrastructure, to the extent practicable, to reduce disturbance to native vegetation.

- Micro-siting of transmission infrastructure should be undertaken to avoid key habitat features such as hollow bearing trees (particularly those that may provide denning or roosting habitat), TPZs and significant ecological communities.

- Where geotechnical conditions and/or site conditions permit, trenchless construction methodologies such as horizontal directional drilling (HDD), could be considered to avoid highly sensitive areas, including where populations of threatened species or threatened communities are confirmed to be present, and where impacts may be considered significant by regulators and/or result in adverse environmental approval outcomes (e.g., high offset liabilities).

4.4.1 Realignment

Realignment of the route will be considered in situations where impacts are considered unacceptable and the current route alignment is relatively unconstrained. Realignments will include consideration of land use, landownership, landowner requirements, construction methods and transmission infrastructure integrity. Localised changes to the route (e.g., within or adjacent to the existing AoD) will be considered under micro-siting below.

4.4.2 Micro-siting

Micro-siting involves small-scale adjustments to the route to avoid localised features such as existing assets or trees. Micro-siting is used to take advantage of areas of existing disturbance or degraded vegetation to minimise impacts on terrestrial ecology. In addition, the construction right of way can be narrowed for short distances to address such constraints.

Based on the above, direct impacts to vegetation and/or habitat are assumed to be avoidable in instances where:

- a minimum 7.5 m separation distance can be achieved between the edge of the AoD and the edge of native vegetation (canopy) or TPZs can be demonstrated to be avoided in accordance with *Australian Standard 4970-2009 Protection of trees on development sites*.

Mitigation of impacts via micro-siting is assumed to apply to direct impacts only, with indirect impacts such as those associated with sediment and noise, requiring further consideration. The feasibility of micro-siting based on current information is unknown for several locations along the alignment such as between Mirboo North and Yinnar–Driffield Road in Victoria where there are considerable constraints due to steep topography and native vegetation on both sides of the current AoD. These constraints limit options to avoid impacts through minor adjustments to the AoD.

4.4.3 Horizontal Directional Drilling or Boring

Where technically feasible, HDD may be used to drill beneath suitable features such as waterways, utilities or infrastructure and/or vegetated areas. HDD requires the excavation of an exit pit on the opposite side to where the drilling rig is set up to contain drilling fluids used to assist in the drilling process. A smaller entry pit approximately half the size of the exit pit is excavated on the drilling rig side for the same reason as described above. A curved bore hole is then drilled so it passes at a minimum of two metres below the hard invert of the drains/creeks, or at least 0.6 metres below any vegetation (i.e., outside the TPZ). The transmission cable is then pulled through the duct installed in the bore hole. The drilling fluids that are used to assist the process are monitored through the logging of fluid inputs and returns.

Alternatively, directional boring may be used to cross shorter distances requiring greater structural support. This will involve excavation of two pits on either side of the feature down to the depth required. A hole will be bored between the two pits with an encasing pipe pulled into the hole immediately behind the bore head to ensure full ground support at all times. The pits holes will be backfilled and ground surface reinstated.

Environmental Management Plans (EMP) to be prepared for the project will include requirements for managing the impacts of HDD or boring operations undertaken as part of the project. Detailed field surveys and assessments will inform decisions on the feasibility of using HDD to avoid or reduce impacts.

4.4.4 Work scheduling

To avoid impacts to threatened flora during sensitive life-stages (e.g. breeding, nesting, etc.), time restrictions will be implemented. These may include:

- Avoidance of all or specific work activities over a season (e.g., spring) or species life stage (e.g., breeding or nesting).
- Avoidance of all or specific work activities during a particular time of day (e.g., night-time).

Recommended time restrictions on activities to manage impacts on MNES are detailed in Table 5 below.

Table 5. Recommended time restrictions to manage impacts on MNES

Species	Avoided works period	Relevant locations/times
Wedge-tail Eagle and other threatened raptors	July to January inclusive	Nest locations
Growling Grass Frog	November and March	Waterbodies where present
Hooded Plovers	August to March	Shore crossing; night-time
Migratory Waders	Summer	Shore crossing

4.5 General management and mitigation measures

Management and mitigation measures will be required to avoid and reduce impacts on ecological values, including state and EPBC Act listed species and communities. These will be implemented at relevant stages of the project including prior to, during, and post-construction.

A Flora and Fauna Management Plan and Construction and Environment Management Plan will define management measures to be implemented as part of the project and will be developed at a future point in time. Management measures will be in accordance with industry and regulatory standards, state and Commonwealth policy guidance on impact mitigation, and will be developed in consultation with the relevant regulatory authority.

A range of industry standard mitigation and management strategies are proposed to reduce the magnitude and effect of unavoidable direct and indirect adverse impacts to MNES, state listed species and communities, native vegetation, flora and fauna, and other ecological values. These are listed below under relevant sub-headings and may be refined as the alignment is refined, and further impact assessments are carried out. These are not exhaustive and site-specific mitigation measures will be required to address threats to ecological values (including MNES) within the project context.

4.5.1 General

General management measures will include:

- Pre-clearing survey to relocate fauna species and habitat features prior to clearing.
- Establishment of Vegetation Protection Zones (no-go) and flagging of all sensitive features.
- Sediment and erosion controls, signage and site inductions.
- Implementation of soil management protocols.
- Implementation of hygiene protocols for disease and weeds.
- Rehabilitation of disturbed sites, including weed management.
- A weed and pest management plan will be developed and implemented.
- A water management plan will be developed and implemented.
- A bushfire hazard and risk assessment will be developed and implemented.

4.5.2 Vegetation and flora

Suggested specific actions that may be adopted to assist in reducing impacts to flora and vegetation from the project are described in Table 6.

Table 6. Flora and vegetation control measures

Activity	Control measure
Induction	Induct all staff about the appearance and conservation significance of threatened flora species, to facilitate identification and avoidance.
Clearing	Undertake a pre-clearing assessment to identify presence of any threatened plant species within the AoD
	Where threatened flora species are identified in pre-clearance surveys, avoid impacts where practicable through micro-siting.
	Establish and maintain a Graphical Information System (GIS) Environmental Database to identify the location of any identified Threatened flora, significant flora and sensitive vegetation communities (e.g. Endangered EVCs, EPBC Act listed communities).
	Clearly demarcate approved areas for native vegetation clearing prior to clearing works commencing.
	Clearly demarcate threatened or significant flora identified proximal to, but outside (within 10 m of) the construction footprint and avoid disturbance where possible.
	Keep vegetation clearing to the minimum amount necessary to allow access or approved works.
	Avoid clearing tall trees along the edges of the AoD where practicable and safe to do so and/or prune branches (where feasible) rather than felling.
	Trim overhanging branches using the 'three-cut method' to prevent bark stripping
	Use previously cleared areas where possible for laydown and turn around points.
	Do not burn vegetation.
Stockpiles	Stockpile cleared vegetation separately to soils.
	Manage vegetation stockpiles to avoid erosion and sediment laden runoff entering waterways.
Reinstatement	Following respreading of topsoil (completed in accordance with appropriate controls), respread stockpiled cleared vegetation over the disturbed area.

Activity	Control measure
Records	Keep records to document the details of clearing conducted to facilitate reporting in accordance with relevant approvals.

4.5.3 Fauna

Suggested specific actions that may be adopted to assist in reducing impacts to fauna and their habitats from the project and are identified in Table 7.

Table 7. Terrestrial fauna control measures

Activity	Control measure
Timing of construction	Ensure construction activities involving excavations occur in dry conditions, as much as possible.
Induction	Ensure all personnel complete an induction prior to mobilisation to site.
Timing of construction	Undertake clearing in stages to allow for the progressive movement of fauna into areas outside the proposed disturbance area.
Pre-clearance	Conduct a pre-clearance survey prior to ground disturbance and vegetation clearing to identify key fauna habitats.
Vegetation Clearing	Avoid clearing known occurrences and habitat of threatened fauna, as far as practicable, including the retention of habitat trees.
Trenches	Ensure the maximum length of the open trench does not exceed the length capable of being practically inspected and cleared by teams of fauna spotters/catchers.
	Place fauna shelters at intervals of not greater than 500 m.
	Place fauna ramps and/or earth plugs at both ends of trenches, at intervals not exceeding 1 km.
	Conduct trench inspections for fauna and clearance within five hours of sunrise and before sunset, unless backfilled, in which case inspection shall precede backfilling, as identified below.
	Do not commence works on the trench until trench inspections have been completed for the section or area intended for works.
	Ensure construction crews inspect trenches half an hour prior to backfilling and if trapped fauna are present, a fauna handler will be notified and engaged to assist, prior to backfilling.
	Conduct trench inspections on rostered days off and in any other scheduled breaks in construction.
Fauna	Conduct all fauna handling only by a licensed fauna handler.
Ducts	Inspect and clear ducts to ensure no fauna entrapment prior to pulling cables.
	Cap ducts at the end of each day to prevent fauna entry.
Vehicle movement	Impose vehicle speed limits on construction vehicles to minimise the risk of fauna strike and limit driving at dawn and dusk.
Records	Keep records documenting the details of clearing conducted to facilitate reporting in accordance with relevant approvals.

4.5.4 Weeds and disease

Suggested specific actions that may be adopted to assist in reducing impacts of weeds and disease to environmental values from the project and are identified in Table 8. The control measures for weeds

apply to all Weeds of Nationals Significance (WONS) and declared and noxious weeds listed under the Victorian Catchment and Land Protection Act 1994 (CaLP Act). Management measures for disease should refer to national standards for hygiene control including *Hygiene protocols for the control of diseases in Australian frogs* (Murray *et al.* 2011) and Management of *Phytophthora cinnamomi* for Biodiversity Conservation in Australia: Part 2 National Best Practice Guidelines (O'Gara *et al.* 2005).

Table 8. Weed and disease control measures

Activity	Control measure
Planning	Assess operations for the likelihood of introducing and spreading weeds and disease.
	Schedule activity for periods with the highest likelihood of dry soil conditions.
	Schedule activity in uninfected areas before moving to infected areas.
	Implement appropriate disease monitoring programs for new outbreaks of disease, spread of existing infestations and effectiveness of disease management procedures and prescriptions.
Inductions	Induct all staff regarding the appearance and significance of weeds and diseases of concern, with potential to occur in the AoD.
	Define clear roles and responsibilities for staff and contractors in weed and disease management procedures and prescriptions.
Pre-clearance	Conduct a pre-clearance inspection prior to ground disturbance for WONs and CaLP listed weeds.
Existing weeds	Establish and maintain a GIS Environmental Database of existing weed or disease presence in the interconnector corridor.
Access restriction	Restrict access of vehicles and personnel to areas of known weed or disease infestation and to formed roads and tracks where practicable.
	Minimise access points to disease and weed infested areas and control unauthorised access.
	Restrict access to disease infested areas where practicable and during wet weather.
Inspections	Regularly inspect the AoD to identify and assess weed prevalence, especially after rain events.
	Supervise staff, contractors and volunteers to ensure compliance with weed and disease management procedures and prescriptions.
	Inspect watercourses and riparian vegetation for weeds of concern near watercourse crossings.
New weeds	Remove new weed infestations destroy them as soon as practicable.
Weed control	Ensure weed control takes place prior to seed set and is carried out in all areas affected by the project.
Operational procedures	Ensure all soil, topsoil, rehabilitation materials and vehicle movements into the AoD complies with Clean on Entry procedures.
	Conduct construction activities in dry conditions, where practicable. Ovoid wet or muddy areas during activities where practicable. Minimise activities that cause soil disturbance.
	Avoid the introduction of plants for revegetation. Consider direct seeding or regeneration of vegetation by fire as an alternative. If introduction is unavoidable ensure testing is undertaken for soil borne diseases and weeds.
Vehicle washdown/hygiene station	Establish hygiene stations at intervals along the AoD, in proximity to areas of known weed infestations and/or weed risk.
	Establish vehicle washdowns on accessible, flat areas that do not run into waterways.

Activity	Control measure
	Ensure that the requirement for hygiene stations applies at all times throughout construction where topsoil movement is occurring.
	Remove all soil off vehicles, machinery, and footwear that have come into contact with mud or water off-site and sterilise with a fungicide (such as disinfectant containing benzalkonium chloride) in washdown bay and thoroughly rinse with clean water. This will prevent the spread of chytrid fungus (a disease of frogs) and *Phytophthora cinnamomi*.
Topsoil management	Stockpile topsoil in areas with similar weed risk and not with topsoil from lower weed risk areas.
Drainage	Ensure water is not discharged into uninfected areas or is directed to the lowest point of the landscape.
	Minimise the amount of water used on the site.
Disposable	Ensure infested material is disposed of hygienically.

4.5.5 Dust emissions

Suggested specific actions that may be adopted to assist in reducing impacts of dust emissions to environmental values from the project and are identified in Table 9.

Table 9. Air emission control measures

Activity	Control measure
Prevention of dust emissions	Plan the construction schedule to minimise the elapsed time between clearing, trenching and reinstatement.
Vehicle movements	Apply speed and access restriction to vehicle movements.
Stockpiles	Locate and manage stockpiles to avoid impacts to sensitive values.
Dust control	Implement appropriate dust controls (including but not limited to water carts, non-toxic stabilisers, vehicle covers, or other) throughout construction as required to prevent and minimise dust impacts to sensitive values and the surrounding environment.

4.5.6 Noise and vibration

Suggested specific actions that may be adopted to assist in reducing impacts of noise and vibration to environmental values from the project and are identified in Table 10.

Table 10. Noise and vibration control measures

Activity	Control measure
Blasting (if required)	Prepare a blast management plan to reduce noise and vibration impacts of blasting (if required).
Noise generating equipment	Select and maintain equipment to minimise noise emissions as far as practicable.
	Use noise abatement devices (e.g. mufflers, silencers and screens) where practicable.
	Locate semi-fixed noise generating equipment (e.g. generators, compressors and campsite equipment) as far as practicable from sensitive values.
Scheduling of activities	Schedule noise generating activities to ensure compliance with relevant noise regulations.
Vibration generating equipment	Select equipment to minimise vibration impacts to vibration sensitive sites.

4.5.7 Erosion and sediments

Suggested specific actions that may be adopted to assist in reducing impacts of erosion and sediments to environmental values from the project and are identified in Table 11**.**

Table 11. Soils and sediment control measures

Activity	Control measure
Planning	Plan all waterway crossings to be constructed during the driest time of the year (i.e. January to April).
	Prepare an Erosion and Sediment Control plan by a suitably qualified personal and implement the plan.
Erosion	Restrict vehicle access to potentially unstable ground (i.e., scree slopes, riparian zones, creeks, drainage lines, etc.), except where crossing is unavoidable.
	If erosion is identified, construct erosion and sediment control structures, such as sediment traps or drainage controls. Use the most applicable Erosion and Sediment Control Guidelines.
	Strategically locate stockpiles so as not to impede surface water flows or stock movements.
	Restore the beds of watercourses to the original gradient and the bank to the natural contours post disturbance
	Grade and shape backfill trench crown as closely as practicable to pre-existing contours and flow patterns of riverbed and riparian zone.
	Reinstate banks in a manner that minimises erosion potential and does not alter natural streamflow.
Soil quality	Stockpile topsoil, subsoil and trench spoil disturbed during earthworks separately such that the soil profile may be maintained during backfilling.
	Stockpile topsoil and subsoil excavated from the bed of a watercourse separately and returned to the bed of the watercourse.
	Store stockpiles within the approved construction footprint as close as practicable to the source location
	Cap stockpiles at a maximum height to be negotiated during project approvals.
	Locate stockpiles to avoid creek and drainage line banks and associated vegetation.
	Do not stockpile soil where it has the potential to result in sedimentation of riparian zones or surface water (e.g. on slopes that drain immediately to a creek or drainage line). Use topsoil containment measures, e.g., berms and sediment fencing, as necessary
	Stockpile topsoil and subsoil where it can be easily recovered and not be lost by wind/water erosion.
Induction	Induct all staff regarding control measures.
Rehabilitation	Within the disturbance footprint, grade topsoil to an appropriate depth
	Following the completion of earthworks, return trench spoil subsoil and topsoil in that order such that the soil profile is reinstated.
	Following back fill and respreading, rip topsoil to prevent compaction.
	Ensure no windrows remain following the completion of back fill and respreading.

4.5.8 Surface water

Suggested specific actions that may be adopted to assist in reducing impacts to surface waters from the project and are identified in Table 12.

Table 12. Surface water and groundwater control measures

Activity	Control measure
Vehicle access	Limit vehicle access to riparian zones and creekline banks.
Fuel and maintenance	Do not store fuel or hydrocarbons, or conduct refuelling or vehicle or machinery maintenance within, 50 m of a watercourse.
Scheduling of construction	Monitor weather forecasts to avoid construction of watercourse crossings during wet conditions.
Surface water diversions	If construction in wet conditions cannot be avoided, install temporary diversion berms or drains. Carry out restoration of natural surface water as possible after completion of cable installation and backfilling.
Erosion control	Implement erosion control measures as required.
Physical disturbance of watercourses	If required, select drilling methods to minimise disturbance to banks, riparian vegetation and surface water, and ensure compliance with regulatory requirements and guidance.
Restoration	Restore the bed of any watercourse intersected to the original gradient and restore the bank to the natural contours, post-construction.
Dewatering	If required, undertake dewatering using a method that minimises the area of impact including to surrounding water bodies.

4.5.9 Spills

Suggested specific actions that may be adopted to assist in reducing impacts of spills to environmental values from the project and are identified in Table 13.

Table 13. Hazardous materials control measures

Activity	Control measure
Induction and training	Include spill prevention and response methods in the overall site induction.
	Adequately train all personnel involved in hazardous materials handling.
Management of hazardous materials	Maintain a Material Safety Data Sheet (MSDS) manifest and inventory at all storage locations. Ensure MSDSs for all stored hazardous materials are readily accessible.
	Ensure all chemicals used during operations are transported, stored, handled and disposed of in accordance with statutory requirements, codes of practice and industry standards (AS1940).
	Transport dangerous goods by an appropriately licensed contractor, in accordance with relevant regulatory requirements.
	Minimise hazardous material use where practicable.
	Store the minimum practicable volume of hazardous materials on-site.
	Store hazardous materials in sealed, labelled containers with appropriate secondary containment away from watercourses.
Storage and refuelling locations	Ensure hazardous materials storage and refuelling stations are appropriately designed, located and sized containment facilities to prevent the release of spilt substances to the environment and ensure compliance with regulatory requirements.

Activity	Control measure
Spill response kit	Make available appropriate spills kits in vehicles, refuelling vehicles, at each construction camp, and to supervisors.
Secondary containment	Ensure small plant (e.g., diesel-powered dewatering pumps, generators, lighting towers, etc) has appropriate secondary containment
Maintenance	Ensure that hazardous materials storage and refuelling equipment is provided and maintained in good working order.
	Undertake plant and equipment maintenance in appropriately equipped areas away from watercourses.
Waste	Appropriately contain and dispose contaminated materials, such as absorbent pads and soil, in accordance with regulatory requirements at an approved waste management facility.

4.6 Offset

Following the application of measures to avoid and mitigate impacts to state and Commonwealth listed species, including MNES, any residual significant impacts to species/communities would be required to be offset in accordance with relevant policies. Under the EPBC Act, the relevant policy is the EPBC Act environmental offsets policy (DSEWPC, 2012). This policy provides guidance on the role of offsets and how a proposed offset is assessed to be considered suitable. In Victoria, the Native vegetation removal regulations (and associated guidelines) under the *Planning and Environment Act 1987* is the main planning mechanism under which impacts on native vegetation removal are assessed and offset. More specifically, the *Guidelines for the removal, destruction or lopping of native vegetation* (the Guidelines) provides specific guidance on how impacts are assessed, and offsets obtained.

In Tasmania, there are no formal offset requirements under Tasmanian planning legislation (*Land Use Planning and Approvals Act 1993*). Mitigation measures that are accompanied by a planning approval may include measures that could include protecting habitat on the property on which development occurs. However, the Forest Practices Authority can use offsets under forest practices plans to compensate for the loss for the loss of a known site or habitat for threatened species or to compensate for the conversion of native forest or threatened native vegetation in accordance with s. 19(1AA) of the *Forest Practices Act 1985* and clause 6.2 of the State Permanent Forest Estate Policy (PFEP). In general, the FPA applies a one to five ratio for an 'area offset', (i.e., a loss of one hectare will require an offset of five hectares on a 'like for like' basis). An offset could be required as part of planning approval if there is native vegetation clearing for Marinus Link, particularly for communities listed as threatened under the NC Act.

5. Preliminary impact assessment

A preliminary impact assessment was completed based on information gathered through the desktop assessment and field reconnaissance. The first part of the impact analysis considered potential impacts on significant species and communities without implementation of proposed management measures, with the exception of avoidance measures undertaken as part of the initial route selection and refinement completed prior to 2021. This analysis was undertaken to inform project design and further survey requirements.

A second impact analysis was undertaken to determine referral requirements under the EPBC Act and EES Act, namely on MNES and remotely-mapped native vegetation. This analysis assumed the successful implementation of the recommended management measures and represents the likely residual project impacts. To the extent possible without detailed field surveys, the analysis considered the feasibility of management measures to reduce impacts on MNES and vegetation below the significant impact thresholds outlined under relevant state and national legislation and guidelines. A precautionary approach has been used to determine potential impacts to ecological values within the survey area, with impacts considered likely unless sufficient information is available to suggest otherwise.

This section summarises potential impacts of Marinus Link on the terrestrial environment within the AoD for Tasmania (i.e., the converter station building footprint) and Victoria (i.e., the 20 m alignment corridor, transition station, and Hazelwood converter station footprint).

5.1 Tasmania

The AoD includes 0.45 ha of native vegetation. This estimate has been made based on aerial imagery and has not been verified by field assessments.

No potential impacts were identified for nationally listed vegetation communities. There are two state listed threatened vegetation communities within the study area however both are considered unlikely to occur within the AoD.

Given vegetation and habitat removal is limited to small, fragmented patches within the proposed converter station site, it is considered unlikely that nationally or state-listed species will be impacted by the proposed works given the past industrial use of the site. However, there is the potential for significant fauna species to be indirectly impacted where permanent dens or nests may occur in habitat immediately adjacent to the AoD (Appendix 4). This includes the nationally listed *Sarcophilus harrisii*, *Dasyurus maculatus* subsp. *maculatus, Tyto novaehollandiae castanops* and *Aquila audax fleayi,* and state listed *Haliaeetus leucogaster*. Therefore, it is recommended that surveys be conducted for den and nest sites in vegetation immediately adjacent to the survey area (i.e. within 100m).

Impacts to vegetation and habitat associated with the foreshore and beach are considered to be negligible due to the installation of the cable via HDD from the converter station site to approximately 1 km offshore.

See Table 14 below for a summary of the potential impacts to state and nationally significant values.

Further field surveys are recommended to verify the presence and extent of vegetation and habitat and verify these findings.

Table 14. Summary of ecological values potentially impacted - Tasmania (without management measures implemented)

Values	Impacts
Vegetation	0.45 ha of native vegetation removal required for converter station infrastructure. Verification of vegetation communities to be removed will be required, in addition to vegetation cleared outside existing easements.
Nationally significant communities	No nationally significant communities identified.
State significant communities	Potential impacts to state significant communities are considered unlikely.

Values	Impacts
Nationally significant flora	Potential impacts to nationally significant flora are considered unlikely.
Nationally significant fauna	Potential impacts to nationally significant fauna are considered unlikely, however surveys of habitat immediately adjacent survey area recommended
State significant flora	Potential impacts on state significant flora species are considered unlikely.
State significant fauna	Potential impacts to state significant fauna species are considered unlikely, however surveys of habitat immediately adjacent survey area recommended.

5.2 Victoria

This section discusses the potential impacts associated with the Victorian route from Waratah Bay to the Hazelwood area.

The impact assessment considered threatened ecological communities and flora and fauna species known or likely to occur within the survey area (Appendix 4). Given the uncertainty around the nature and location of these potential values and the construction methods to be implemented for the project, a conservative approach was taken for the initial impact analysis. This was based on installation of the underground cable without managements measures, with the exception of horizontal directional drilling of coastal vegetation at Waratah Bay (see Section 3.5).

The seven flora species that are considered likely to be significantly impacted without implementation of management measures include:

- The EPBC Act listed *Dianella amoena* (matted flax-lily), *Eucalyptus strzeleckii* (Strzelecki gum) and *Amphibromus fluitans* (river swamp wallaby-grass). *Dianella amoena* has been recorded at numerous locations throughout the Latrobe Valley, including more than 17 individuals near the intersection of the route and McFarlane Road. Likewise, 86 records of *Eucalyptus strzeleckii* were identified between the Latrobe Valley and Dumbalk, with large populations occurring near Darlimurla and Meeniyan, as well as along the Morwell River (as a result of plantings associated with the Hazelwood West Field Project). This species is widespread through this region and will almost certainly be encountered along the proposed route. *Amphibromus fluitans* has been recorded from several localities in south Gippsland, including Meeniyan and east of Yinnar. This species has the potential to occur at discrete locations along much of the route, including waterways and waterbodies in the Tarwin Valley, Strzeleckii Ranges and Latrobe Valley.
- The FFG Act and DELWP advisory listed *Cyathea cunninghamii* (slender tree fern), which has been recorded frequently in the northern sections of the route, likely in association with wet forest and gullies. This species also has the potential to occur further south, including wet heathy woodlands found around Waratah Bay.
- The DELWP advisory list included *Eucalyptus fulgens* (green scentbark), *Eucalyptus kitsoniana* (bog gum) and *Eucalyptus yarraensis* (yarra gum). Like *Eucalyptus strzeleckii*, these species have been recorded frequently throughout the study area and are considered likely to be encountered along the route. Both *Eucalyptus fulgens* and *Eucalyptus yarraensis* occur in large numbers immediately north of the route in the Latrobe Valley, with *Eucalyptus kitsoniana* found in the south, between Meeniyan and Waratah Bay.

The fifteen fauna species that are considered likely to be significantly impacted without implementation of management measures include:

- EPBC Act listed *Petauroides volans* (southern greater glider) has been frequently recorded to west and east of the survey area in the Mirboo North region in forest habitats relatively contiguous with those within the survey area.
- EPBC Act listed fish species including *Galaxiella pusilla* (dwarf galaxias) and *Prototroctes maraena* (Australian grayling) have populations recorded within intersecting waterways.
- EPBC Act listed *Litoria raniformis* (growling grass frog) has populations recorded in waterbodies and associated riparian vegetation at points along the alignment.
- EPBC Act listed *Thinornis r. rubricollis* (hooded plover) which has been recorded within the study at Waratah Bay and nesting sites within 1 km of the study area.
- FFG Act and DELWP advisory listed *Engaeus phyllocercus* (Narracan burrowing crayfish), *Euastacus neodiversus* (South Gippsland spiny crayfish), *Engaeus hemicirratulus* (Gippsland burrowing crayfish), *Nannoperca sp. 1* (Flinders pygmy perch), *Lissolepis coventryi* (swamp skink), *Pseudophryne semimarmorata* (southern toadlet), *Myrmecia* sp. 17 (bullant) and *Pseudemoia rawlinsoni* (glossy grass skink) which are recorded within the search area, have highly restricted distributions and foraging ranges, and largely associated with riparian/wet habitats and larger forest/woodland patches in Mirboo North and Waratah Bay.
- FFG Act and DELWP advisory listed species *Ninox connivens* (barking owl), and *Ninox strenua* (powerful owl) dependent on critical resources such as hollow-bearing trees and potential to occur within larger forest patches of habitat in Mirboo North and Waratah Bay areas.

Overall, likely areas of significant habitat for threatened fauna species include forest habitats located around plantations between Mirboo North and Hazelwood, waterways and waterbodies intersecting the survey area, and coastal forest, scrub, and beaches at Waratah Bay (particularly for threatened and EPBC Act listed migratory species).

Potential impacts to native vegetation were determined by overlaying the remotely mapped native vegetation dataset (including both patches and trees) with the AoD, then determining if avoidance is possible. Where the project had the potential to result in the removal of vegetation (see Section 4.4.3), the extent of removal was calculated by EVC and bioregional conservation status (the latter being shown in Table 17).

Based on the conservative assessment of the AoD (including impacts where HDD or avoidance may be possible), an estimated 13.8 hectares of native vegetation and 44 scattered trees will be removed as part of the project. This would include the removal of 5.1 hectares of vegetation belonging to an Endangered EVC.

Vegetation removal is estimated to primarily occur within constrained sections through the Strzelecki Ranges and where the alignment is located situated within vegetated road reserves (e.g. along Mirboo North-Meeniyan Road north of Tarwin River East Branch). The potential removal of vegetation within the AoD represents an estimated 6% of the vegetation within the broader 220 m-wide survey area.

Where an EVC is considered synonymous with an ecological community listed under the FFG Act or EPBC Act (based on the relevant community descriptions), the impact assessment has assumed the removal of vegetation will also result in the removal of those listed communities. In reality, the extent of the ecological community is likely to be less than that of the corresponding EVCs, however this cannot be confirmed until further detailed assessment is completed to confirm whether vegetation meets the condition thresholds of a listed community.

Based on this analysis, ecological communities considered likely to be impacted include one EPBC Act listed community, 'Gippsland Red Gum (*Eucalyptus tereticornis* subsp. *mediana*) Grassy Woodland and Associated Native Grassland' and three FFG listed communities ('Forest Red Gum Grassy Woodland', 'Central Gippsland Plains Grassland' and 'Warm Temperate Rainforest-East Gippsland Alluvial Terraces') (Table 5 and Table 17).

Table 15 provides a summary of the potential for impacts to ecological values without the implementation of mitigation measures as defined in Section 4.3. Primary forms of mitigation include avoidance of habitat impacts through micro-siting and trenchless technologies (e.g. under boring).

Table 15. Summary of ecological values potentially impacted (without implementation of management measures) - Victoria

Category	Ecological values
Vegetation	Estimated vegetation removal: • 5.13 ha of Endangered EVC • 7.86 ha of Vulnerable EVC • 0.82 ha of Depleted EVC • 44 scattered trees
Significant communities	Potential for significant impacts (moderate to high likelihood) to: • EPBC Act listed Gippsland Red Gum (*Eucalyptus tereticornis* subsp. *mediana*) Grassy Woodland and Associated Native Grassland community • FFG Act listed Forest Red Gum Grassy Woodland community • FFG Act listed Central Gippsland Plains Grassland community • FFG Act listed Warm Temperate Rainforest (East Gippsland Alluvial Terraces) community • Endangered EVCs (see Table 3)
Nationally significant species	Potential for significant impacts (moderate to high likelihood) to eight EPBC Act listed species without mitigation measures implemented: • *Dianella amoena* (matted flax-lily) • *Amphibromus fluitans* (river swamp wallaby-grass) • *Eucalyptus strzeleckii* (Strzelecki gum) • *Galaxiella pusilla* (dwarf galaxias) • *Litoria raniformis* (growling grass frog) • *Petauroides volans* (southern greater glider) • *Prototroctes maraena* (Australian grayling) • *Thinornis r. rubricollis* (hooded plover)
State significant species	Potential for significant (unmitigated) impacts to fifteen FFG Act and/or DELWP advisory list species (not included above): • *Cyathea cunninghamii* (slender tree fern) • *Craspedia canens* (grey billy-buttons) • *Eucalyptus fulgens* (green scentbark)

Category	Ecological values
	• *Eucalyptus kitsoniana* (bog gum) • *Eucalyptus yarraensis* (yarra gum) • *Monotoca glauca* (currant-wood) • *Engaeus phyllocercus* (Narracan burrowing crayfish) • *Euastacus neodiversus* (South Gippsland spiny crayfish) • *Ninox connivens* (barking owl) • *Myrmecia* sp. 17 (bullant) • *Lissolepis coventryi* (swamp skink) • *Ninox strenua* (powerful owl) • *Engaeus hemicirratulus* (Gippsland burrowing crayfish) • *Nannoperca* sp. 1 (Flinders pygmy perch) • *Pseudemoia rawlinsoni* (glossy grass skink) • *Pseudophryne semimarmorata* (southern toadlet)

5.3 Matters of National Environmental Significance

Several MNES protected under the EPBC Act have been assessed as having a moderate to high likelihood of being significantly impacted by the project (Table 14 and Table 15). These potential impacts are assessed in further detail below against relevant EPBC Act impact criteria and in consideration of mitigation measures that can be applied to avoid and minimise impacts on MNES, as described in general terms in Section 4.3.

Note that measures to avoid and minimise impacts are only considered in general terms in this assessment and further detail on the nature of project (e.g. construction activities) and the extent and character of MNES in the survey area and AoD will be required to verify these determinations. An assessment of impacts on MNES is summarised in Table 16 below.

DIANELLA AMOENA AND GIPPSLAND RED GUM GRASSY WOODLAND COMMUNITY

The endangered *Dianella amoena* flora species and critically endangered Gippsland Red Gum (*Eucalyptus tereticornis* subsp. *mediana*) Grassy Woodland and Associated Native Grassland community are both listed under the EPBC Act and are considered likely to occur within roadsides and remnant woodland patches within the Latrobe Valley and northern foothills of the Strzelecki Range. Suitable habitat includes grassy woodland, or derived native grasslands, which have experienced limited modification as a result of changed land management (e.g., vegetation clearance or grazing). *Dianella amoena* has a broad range across Victoria and is particularly associated with native grasslands and woodlands of the Victorian Volcanic Plains and Gippsland Plains often restricted to small linear remnants along roadsides, public land, and less disturbed grassland and woodland remnants.

One area considered likely to support either or both of these MNES is McFarlane Road, an unused Crown road reserve immediately to the west and patches of native vegetation associated with the Morwell River (including isolated ox-bows). McFarlane Road supports an important population of *Dianella amoena* which based on known records extends through the survey area.

Due to the relatively isolated nature of *Dianella amoena* populations and restricted dispersal potential (reliant on threatened native bees) unmitigated construction could result in the removal of habitat and individuals resulting in a 'long-term decrease in the size of a population', 'reduction in the area of

occupancy of the species' and/or 'introduce invasive species that are harmful to the species'. Therefore, unmitigated works may result in a significant impact to *Dianella amoena.*

Similarly, clearance of areas of remnant vegetation may lead to irreversible loss of already fragmented and degraded patches of the Gippsland Red Gum (*Eucalyptus tereticornis* subsp. *mediana*) Grassy Woodland and Associated Native Grassland community. Remnants of this community are highly fragmented across much of its range, particularly in the Gippsland Plains where much of the original lowland vegetation has been removed for agricultural purposes, with most remnants restricted to roadside vegetation and small pockets on public land or reserves. The unmitigated action has potential to have impacts along several roadsides where this community (of unknown quality and extent) may be present and further fragment and reduce the extent of this threatened ecological community. Relevant EPBC Act criteria for significant impacts include 'reduce the extent of an ecological community' and/or 'fragment or increase fragmentation of an ecological community'.

EPBC Act: There are no species-specific referral guidelines and the relevant significant impact criteria are defined under 'endangered' species in the *Matters of National Environmental Significance - Significant impact guidelines 1.1 Environment Protection and Biodiversity Conservation Act 1999.* EPBC Policy Statement 3.22 provides guidance on what qualifies as the listed Gippsland Red Gum Grassy Woodland community.

The desktop assessment has indicated that should these values be present within the study area, they will be restricted to narrow corridors associated with roadsides, waterways or unused road reserves which are roughly perpendicular in alignment to the proposed route. As a result, avoidance and minimising of impacts on remnants of this community is considered feasible through a combination of realignment, micro-siting and/or boring or HDD. Remaining locations where vegetation is intersected (as detailed above), micro-siting and/or boring could be applied to avoid and/or minimise impacts on this community and *Dianella amoena*. With these management measures applied, impacts are likely to be avoided or minimised to the extent that the project is unlikely to have a significant impact on either *Dianella amoena* and/or the Gippsland Red Gum (*Eucalyptus tereticornis* subsp. *mediana*) Grassy Woodland and Associated Native Grassland community.

To verify the presence and extent of these values within the study area, vegetation condition survey and targeted species survey are recommended (see Section7). Note that condition assessments are required to determine if (any) native vegetation meets the definition for this listed community.

EUCALYPTUS STRZELECKII (STRZELECKI GUM)

The vulnerable *Eucalyptus strzeleckii* is listed under the EPBC Act and considered likely to occur within vegetated roadsides and small woodland patches from the southern-most foothills of the Strzelecki Ranges, south of Meeniyan, through to and including the Latrobe Valley in the north. The species endemic to the Strzelecki Ranges, in the Gippsland area of Victoria and extends north to Neerim South and south to the Foster area, east to the Woodside-Yarram area, and west to Western Port Bay-Bass River area (Department of Environment and Energy SPRAT profile). Suitable habitat for this species includes deep soils in hilly, often wet sites, in areas of high annual rainfall and the banks of watercourses or on river flats where soils are seasonally waterlogged. Population estimates from 2006 indicate the species numbers are between 3322–4517, though small occurrences of the species throughout its range may increase the population to 5000–15 000 (DoEE SPRAT profile).

Eucalyptus strzeleckii was the most numerous of all threatened species identified in the desktop assessment and is considered to have a high likelihood of occurring at numerous locations along the route. Areas known to support important populations near the route include; woodland reserves and roadsides around Meeniyan and Koonwarra and remnant forests north of Mirboo North, particularly near Little Morwell River.

The AoD is located adjacent to or intersects areas of habitat likely to support either individual *Eucalyptus strzeleckii* trees or more significant populations. As a result, there is a considerable potential to impact on an unknown number of individuals near Stony Creek, the Lower Tarwin East Branch, the Little Morwell River valley where remnant vegetation has been retained along minor drainage lines. This impact may be considered significant as it could 'lead to a long-term decrease in the size of an important population of a species', 'reduce the area of occupancy of an important population' and/or 'adversely affect habitat critical to the survival of a species.'

EPBC Act: There are no species-specific referral guidelines and the relevant significant impact criteria are defined under Vulnerable species in the *Matters of National Environmental Significance - Significant impact guidelines 1.1 Environment Protection and Biodiversity Conservation Act 1999.* The restriction of *Eucalyptus strzeleckii* to isolated and discrete remnants (e.g., roadsides and small reserves) south of Mirboo North means avoidance of all areas supporting suitable habitat and/or populations is considered realistic through a combination of realignment, micro-siting and/or boring/horizontal directional drilling (HDD). As a result, the project, with management measures applied is considered unlikely to result in significant impacts to this species south of Mirboo North.

In contrast, much of the route through the Strzelecki Ranges, between Mirboo North and the Latrobe Valley is heavily constrained due to the steep terrain and high cover of native vegetation, often on both sides of the proposed alignment. The viability of avoidance and minimisation measures through this section of the route is therefore uncertain and further investigations, including undertaking a detailed tree census, are recommended. Consequently, there is potential for residual impacts of the project to be considered a significant impact to this species.

AMPHIBROMUS FLUITANS (RIVER SWAMP WALLABY-GRASS)

Amphibromus fluitans is listed as vulnerable under the EPBC Act and is considered likely to occur within the study area. Recent records occur at several localities in South Gippsland, including Meeniyan and east of Yinnar. Suitable habitat includes permanent and semi-permanent waterbodies (particularly swamps, lagoons, billabongs, dams and roadside ditches) which experience regular inundation and/or seasonally fluctuating water levels.

Whilst habitat could occur in discrete locations along much of the route, the preliminary analysis identified a high likelihood of the species occupying waterways intersecting the route in the Latrobe Valley and Strzelecki Ranges, as well as small dams and lakes in hills south of Mirboo North.

Without management measures implemented, the project has the potential to either directly impact populations where the alignment intersects areas of suitable habitat or indirectly through the sedimentation or pollution of wetlands or introduction of weeds. Given the highly localised nature of this species, the potential for significant impacts to important populations cannot be ruled out.

Management measures such as realignment, micro-siting and HDD, along with appropriate construction controls, will be effective at managing most of the localised impacts to this species across the study area. However, should large populations be identified in steep gullies or undulating terrain, particularly south of Mirboo North and through the Strzelecki Ranges, the viability of mitigation measures cannot be confirmed until further investigations are completed. The possibility of mitigated works having a significant impact on a large, important population can therefore not be ruled out at this stage.

EPBC Act: There are no species-specific referral guidelines and the relevant significant impact criteria are defined under Vulnerable species in the *Matters of National Environmental Significance - Significant impact guidelines 1.1 Environment Protection and Biodiversity Conservation Act 1999.* Assessed against EPBC Act criteria, the project may have a significant impact on *Amphibromus fluitans* as a result of 'a long-term decrease in the size of an important population of a species', 'reduce the area of occupancy of an important population', 'introduction of invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat' or 'adversely affect habitat critical to the survival of a species'. Further information on population size and distribution in the survey area and AoD is required to determine whether management measures can avoid significant impacts on the species.

ORCHIDS

The baseline study identified six orchid species listed under the EPBC Act, including *Caladenia orientalis* (endangered), *Prasophyllum frenchii* (endangered), *Prasophyllum spicatum* (critically endangered), *Pterostylis chlorogramma* (vulnerable), *Pterostylis cucullata* (vulnerable) and *Thelymitra matthewsii* (vulnerable). Records for these species are sporadic throughout the region and the moderate likelihood of occurrence of these species is a conservative estimate in the absence of detailed habitat studies. Despite this, all tend to be associated with coastal or near costal environments in South Gippsland supporting high-quality grasslands, heathlands, woodlands, forests or coastal scrub, often in damp and/or protected sites. Notable populations of one or more of these species have been recorded from Wilson's Promontory and further east at Yarram.

The occurrence of these species in coastal scrub associated with the Waratah Bay foreshore, or woodland remnants between the coast and Meeniyan cannot therefore be ruled out based on the evidence available.

Whilst the route has relatively limited interaction with remnant vegetation through its southern most section (Waratah Bay to Meeniyan), impacts to these species, should they occur along the edge of native vegetation or in unidentified grassland remnants, may be possible as a result of direct clearance, or indirect sedimentation or weed introduction. It is reasonable to assume however, that the mitigation options proposed, including realignment, micro-siting or HDD, in addition to effective construction measures, will effectively manage any risks associated with these species and therefore avoid significant impacts.

EPBC Act: There are no species-specific referral guidelines and the relevant significant impact criteria are defined under Vulnerable or Endangered species in the *Matters of National Environmental Significance - Significant impact guidelines 1.1 Environment Protection and Biodiversity Conservation Act 1999*. Assessed against the relevant EPBC criteria, it is considered unlikely that the project, undertaken

with appropriate management measures, will have a significant impact on *Caladenia orientalis, Prasophyllum frenchii, Pterostylis chlorogramma, Pterostylis cucullata* and *Thelymitra matthewsii.*

PETAUROIDES VOLANS (SOUTHERN GREATER GLIDER)

Petauroides volans is an arboreal nocturnal marsupial restricted to Eastern Australia and eucalypt forests and woodland. During diurnal hours it shelters in large hollow-bearing trees and typically are higher in abundance in tall montane wet forests where large old trees and hollows are plentiful. Home ranges are relatively small (1-4 ha) and have poor dispersal ability, largely limited by their gliding distance as animals rarely venture to the ground or disperse across non-native forest, which makes the species sensitive to habitat clearing and fragmentation, and logging and wildfire. Current population size is estimated to be 100,000 distributed across Eastern Australia.

Suitable habitat for *Petauroides volans* has the potential to occur in the Mirboo North area and is intersected by the cable route. Populations of *Petauroides volans* are known approximately 1 km to the west of the alignment in Mirboo North Regional Park, adjacent forest and woodland, and further to the east near Ashfords Road between Stony Creek and Morwell River. The survey area supports similar vegetation types and some sections are contiguous with those supporting known *Petauroides volans* populations. The species is sensitive to fragmentation due to poor dispersal capabilities (determined by its gliding distance), small home range size, and reliance of hollow-bearing large trees, which are rare in the landscape. Narrow corridors potentially connect known populations and suitable habitat.

There is a potential to impact the species through loss of large hollow-bearing trees and loss of functional ecological connectivity between populations through gaps in habitat created by clearance for the underground cable. The species is particularly sensitive to gaps in habitat, with gliding distance determining whether gaps in forest canopy are an effective barrier to movement.

Management measures are required to reduce impacts on connectivity among populations and critical habitat elements (hollow-bearing trees) for the species. It is feasible that management measures including micro-siting (such as small-scale realignment and narrowing of the AoD for short sections) and artificial structures can mitigate significant impacts on movement (e.g., gliding poles) and habitat loss along the route; although, these would need to be considered in detail and construction constraints may limit the viability of these measures. Based on desktop vegetation mapping existing habitat connectivity would appear to be relatively poor but the existence of functioning wildlife corridors cannot be ruled out without field studies.

EPBC Act: There are no species-specific referral guidelines for *Petauroides volans* and relevant significant impact criteria are defined under vulnerable species in the *Matters of National Environmental Significance - Significant impact guidelines 1.1 Environment Protection and Biodiversity Conservation Act 1999*. The project has potential to have a significant impact on the species through the following criteria: 'a long-term decrease in the size of an important population of a species', 'reduce the area of occupancy of an important population', and 'fragment an existing important population into two or more populations'.

There is insufficient information to determine whether management measures can mitigate potential significant impacts on *Petauroides volans,* particularly in relation to functional connectivity among populations. Consequently, there is potential for significant impacts and further field investigations are required. Further studies are proposed to establish the distribution and size of populations, the

significance and quality of habitat within the survey area, and the status of existing ecological connectivity among populations in the surrounding landscape matrix of the Mirboo North area. This information will be used to determine whether the project will have a significant impact on an important population of *Petauroides volans*.

GALAXIELLA PUSILLA (DWARF GALAXIAS) AND *PROTOTROCTES MARAENA* (AUSTRALIAN GRAYLING)

Galaxiella pusilla is a small freshwater fish endemic to South-Eastern Australia and is listed as vulnerable under the EPBC Act. On mainland Australia, the species' range extends from the Mitchell River Basin in Central Gippsland in Victoria to the Cortina Lakes, near the Coorong in South Australia. Typically, habitat includes well vegetated, slow flowing, still, shallow temporary or permanent freshwater habitats including swamps, drains and backwaters of streams and creeks. Some wetlands be may partially or completely dry during summer. Populations are fragmented and patchy across the landscape and the species has suffered declines in abundance due to habitat loss and modification. The diadromous freshwater fish *Prototroctes maraena* is listed as vulnerable under the EPBC Act and can be found in coastal rivers in South-Eastern mainland Australia and Tasmania. Threats include barriers to migration, pathogens, and predation by exotic fish species.

There is potential for *Galaxiella pusilla* and *Prototroctes maraena* populations to be present in a number of waterways south of Buffalo to Morwell. These include Morwell River, Eel Hole Creek, Stony Creek, Little Morwell River, Berrys Creek, Tarwin River East Branch, and Fish Creek. These species have been recorded at several locations along the Tarwin River East Branch although not within the immediate vicinity of the survey area. The project (without management measures) has potential to impact these species through loss and modification to instream aquatic and riparian habitats, and introduction of disease and pollutants during the construction phase. Management measures including a combination of micro-siting, HDD/boring (major rivers), and construction measures can avoid and minimise significant impacts on these species.

EPBC Act: There are no species-specific referral guidelines for *Galaxiella pusilla* and *Prototroctes maraena*. Relevant significant impact criteria are defined under vulnerable species in the *Matters of National Environmental Significance - Significant impact guidelines 1.1 Environment Protection and Biodiversity Conservation Act 1999*. With management measures implemented at locations verified by field assessment to have potential to support a population upstream or downstream, the project is unlikely to have a significant impact on the species.

Surveys are recommended to identify suitable habitat for the species and determine if populations are present within proximity of the survey area, particularly the Tarwin River East Branch.

LITORIA RANIFORMIS (GROWLING GRASS FROG)

Litoria raniformis is a large native frog dependent on a combination (matrix) of aquatic and terrestrial habitat for foraging, breeding, and shelter. It occurs in permanent or seasonally inundated waterbodies including swamps, lakes, ponds, farm dams, and irrigation channels, and is mostly associated with waterbodies supporting surrounding, fringing, and dense emergent vegetation. Submerged and floating vegetation is important for breeding while rocks and/or logs surrounding waterbodies provide shelter, basking, and hibernating opportunities during winter months. Fringing and surrounding terrestrial vegetation provide for foraging and dispersal events.

There are 29 records of the species within 10 km of the route and potential habitat is in proximity of the route in the form of permanent and ephemeral waterbodies such as farm dams, rivers, creeks, and lakes between Waratah Bay and Hazelwood. Specific locations include Fish Creek, Stony Creek, Tarwin River East Branch, Berrys Creek, Little Morwell River, Morwell River and Eel Hole Creek, and dams near Buffalo, Dumbalk-Stony Creek Road, South Gippsland Highway and Waratah Road.

There is potential for impacts on *Litoria raniformis* to occur through the clearing or degradation of aquatic and (mostly) terrestrial habitat for trenches, tracks, and/or easements, spread of disease (Chytrid fungus) and pests during construction, pollution, and (temporary) disruption of dispersal.

Based on analysis of aerial imagery, only a small number (<10) of relatively small farm dams/wetlands and waterway habitats have potential to be impacted. The impact footprint for each intersecting waterbody will be small and management measures have a high viability of avoiding impacts on populations (where confirmed present) during and after the construction phase. Management measures including micro-siting boring (rivers), hygiene (disease) protocols (Phillott *et al*. 2010), pest control and reinstatement of terrestrial and/or aquatic habitat (for an important population). All are highly feasible in helping avoid and minimise significant impacts along the route. Consequentially, where management measures are implemented, a significant impact on terrestrial habitat or populations is not considered likely.

EPBC Act: Specific impact guidelines have been developed for *Litoria raniformis*: 'Significant impact guidelines for the vulnerable growling grass frog (*Litoria raniformis*), nationally threatened species and ecological communities - EPBC Act policy statement 3.14' (Commonwealth of Australia 2009). These provide guidance on how to assess impacts, undertake surveys, and assess habitat. The referral guidelines advise that any 'viable population is considered to be an important population for the persistence and recovery of the (species)'. Viable populations are defined as not isolated from other populations or waterbodies. An assessment (and surveys) is proposed to determine whether a population is considered viable e.g., effectively isolated considering the species dispersal capabilities (up to 10 km) and the distribution of terrestrial and aquatic habitat in the landscape.

With management measures implemented to avoid and minimise impacts on important populations (where present), the project is unlikely to exceed significant impact thresholds including the permanent removal or degradation of terrestrial habitat (within 200 m of waterbody), a decrease in habitat quality, alteration in hydrology, or introduction of predatory fish such that it lowers population recruitment, survival, dispersal or key ecological functions of the species. The project is not likely to exceed thresholds for the isolation and fragmentation of population including reducing dispersal opportunities and ecological connectivity among populations and suitable habitat such as the availability of waterbodies or habitat corridors. Also, the project will not create physical barriers to movement and impacts will be largely temporary in nature and is unlikely to interfere with recovery plan objectives including 'secur(ing) extant populations of Southern Bell Frogs' or 'address(ing) known or predicted threatening processes' as detailed in the 'National Recovery Plan for the Southern Bell Frog *Litoria raniformis'* (Clemann and Gillespie 2012).

Habitat and populations surveys are proposed to determine whether important (viable) populations of *Litoria raniformis* occur within the survey area and adjacent areas (within 200 m). Any surveys for

populations and habitat should be completed in accordance with standards set out under the relevant EPBC Act significant impact guidelines.

THINORNIS R. RUBRICOLLIS (HOODED PLOVER - EASTERN)

Thinornis r. rubricollis is a small, rare plover (shorebird) found in coastal habitats along the Victorian coastline and mostly associated with broad, sandy high-energy beaches (Dennis and Ball 2013). They forage singly or in pairs at all levels of the beach and at all tide levels including at the water's edge and amongst seaweed feeding on invertebrates, bivalves and small crustaceans. Foraging and breeding ranges are largely contained within a 1 km stretch of coastline which are defended by pairs during breeding (Maguire et al. 2014). Females lay their eggs in shallow scrapes in the sand or amongst dry seaweed on the exposed beach or adjacent dunes. The highest densities of these birds in Victoria occur on broad-shallow beaches with abundant beach-washed seaweed, backing dunes, and low human activity.

There is a single record (1999) of *Thinornis r. rubricollis* in the survey area at Sandy Point Beach (Waratah Bay) and two more recent observations have been made within 200 m of the survey area boundary. Numerous records of *Thinornis r. rubricollis* have been made along Sandy Point Beach and Waratah Bay although most are located approximately 3 km to the east and west of the survey area. Suitable (but not optimal) habitat exists within the survey area for foraging and nesting, although high levels of human and domestic pet (dog) activity and less optimal habitat (sparse seaweed and flotsam and limiting backing dune) reduce the significance of the site. Cape Liptrap Coastal Reserve to the west and Shallow Inlet Marine and Coastal Park and beaches of Wilsons Promontory support more significant breeding habitats and a greater proportion of the *Thinornis r. rubricollis* population. Nonetheless, the survey area likely provides foraging, and occasional nesting opportunities for the species, but also functions as a movement corridor between more significant areas of habitat along this section of coastline.

The method for the shore crossing at Waratah Bay will likely be HDD with a maximum nominal distance of 1,000 m horizontal. Drilling will occur behind the dunes of Waratah Bay and exit beyond the 10 m water mark. Where this method can be applied, there will be no direct impacts on *Thinornis r. rubricollis*. Construction activities associated with trenching (and to a lesser degree HDD) include noise, offshore lighting, and increased human activity. Construction activities may have impact on foraging, nesting (breeding), and movements. Where geotechnical conditions are unsuitable for HDD (although this is considered unlikely at Waratah Bay), open cut trenching or a combination of HDD/horizontal bore and open cut trenching will be used to construct the shore-crossing. Depending on the duration and scale of construction (trenching) activities, movements (both foraging and breeding associated) between important populations and habitat of Waratah Bay and breeding activities could be significantly affected.

EPBC Act: *Thinornis r. rubricollis* is listed as vulnerable and migratory under the EPBC Act. There are no adopted Recovery Plans or species-specific referral guidelines for *Thinornis r. rubricollis* and relevant significant impact criteria are defined under vulnerable species in the *Matters of National Environmental Significance - Significant impact guidelines 1.1 Environment Protection and Biodiversity Conservation Act 1999*. Main threats to the species include habitat loss while current conservation action is focused on reducing human-induced pressures on nesting sites. No critical areas of habitat have been designated under state or Commonwealth guidelines although the study area is unlikely to be considered under as

such (see above discussion and Appendix 5). However, the population in Waratah Bay is likely to be considered an important population based on its contribution to the total global population size.

Although no direct significant impacts on nesting (breeding) are likely to occur within the survey area there may be significant impacts on movements and dispersal along Sandy Point Beach and between important areas of habitat and among populations at Waratah Bay. Depending on the construction method (e.g. trenching) and associated activities (e.g., lighting and noise), the project has potential to have a significant impact on the species through the following criteria: 'disrupt the breeding cycle of an important population'. Where trenching is not required, the project is unlikely to have a significant impact on the species.

Recommended management measures include undertaking construction activities outside the breeding period, applying controls (limits) on noise and lighting, minimising the construction period, conducting construction monitoring for nesting and activity (if applicable), and minimising disturbance of habitat and impact on animal movements from trenching (if applicable). Where appropriate management measures are implemented, there is unlikely to be a significant impact on *Thinornis r. rubricollis*.

MIGRATORY SPECIES

Twenty-three species listed as migratory under the EPBC Act were considered to have a medium to high likelihood of occurrence within the survey area. Most of these species are shorebird species, associated with the shore habitats of Waratah Bay and Sandy Point Beach and other adjacent habitats such as Shallow Inlet. The survey area provides suitable habitat for a range of migratory shorebirds including listed species such as *Actitis hypoleucos* (Common Sandpiper) which was observed as a flock of approximately 200 birds during a survey in November 2018 (see Appendix 5). Other shore species such as *Haliaeetus leucogaster* (White-bellied Sea-Eagle) and *Pandion haliaetus* (Osprey) may make occasional use of the study area. Other migratory species such as the *Rhipidura rufifrons* (Rufous Fantail) and *Myiagra cyanoleuca* (Satin Flycatcher) are likely to occur in patches of native forest and woodland within the study area.

EPBC Act: Relevant guidelines for assessing impacts on migratory species include the policy documents Matters of National Environmental Significance - Significant impact guidelines 1.1 Environment Protection and Biodiversity Conservation Act 1999 and the Significant impact guidelines for 36 migratory shorebird species Migratory species (DEWHA 2009). Also of relevance is the Draft Referral guideline for 14 birds listed as migratory species under the EPBC Act (DE 2015) and the Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species (DEE 2017).

The survey area has not been identified as an international important site for listed migratory shorebirds in accordance with criteria set out under the relevant significant impact guidelines and is not directly contiguous with one. However, Sandy Point Beach in Victoria is likely to support 'at least 15 shorebird species' and may also satisfy other criteria for consideration as 'important habitat' - under the relevant referral guidelines - should it be considered contiguous habitat with Shallow Inlet, namely 'supporting' at least 2000 migratory birds. Although the site has potential to be considered 'important habitat', the project is unlikely to result in significant impacts with management measures implemented, principally the use of trenchless technology to avoid impacts on shore habitats. With management measures implemented, the project is also unlikely to results in the loss of any substantial area of habitat or result

in habitat degradation, increased disturbance, or direct mortality such that it will lead to a substantial reduction in shorebirds use.

The survey area supports limited areas of habitat likely to be considered 'important' for listed migratory species under the relevant draft referral guidelines (DE 2015). Even so, the project is also unlikely to substantially (exceed 1% threshold) modify, destroy or isolate an area of important habitat for migratory bird species or seriously disrupt the lifecycle of an ecologically significant proportion of one or more listed migratory species.

5.3.1 Summary

Based on a desktop biodiversity assessment, there is potential for EPBC Act listed communities, threatened species and migratory species to occur within the survey area (Appendix 4).

A preliminary assessment of impacts on MNES by the project identified one threatened ecological community and 8 listed threatened species in Victoria with potential to be significantly impacted by the project without management (mitigation) measures implemented (see Appendix 4). No MNES are considered likely to be impacted by the project in Tasmania.

A subsequent assessment considered the implementation of management measures to avoid and minimise impacts on MNES (Section 4.3). Table 16 below details the preliminary assessment of likely impacts on MNES pre- and post-mitigation. Recommendations are provided for each species/community in the form of avoidance and minimisation measures, along with proposed further studies to confirm preliminary determinations to meet impact assessment guidelines for threatened species and communities. Note these impact assessments and recommendations are based on desktop information and as such have limitations in their reliability in the absence of field studies.

Management measures detailed in Table 16 are general in nature and field surveys and further specific details on the project (e.g., construction activities) and feasibility of mitigation measures in specific circumstances and locations will inform more detailed recommendations on avoiding and minimising impacts on specific MNES. Further assessment in accordance with relevant EPBC Act impact and referral guidelines will be required to fully characterise the significance of impacts on MNES and inform management measures. A Flora and Fauna Management Plan and Environment Management Plan for the project will detail all management measures relating to vegetation, communities, and flora and fauna species including MNES.

For most of these species and communities it was considered feasible that management measures could reduce residual impacts to a level that the project is unlikely to have a significant impact on EPBC Act listed species or communities. For four species, the feasibility of management measures to reduce impacts or the relative magnitude of impacts are uncertain, and a significant impact cannot be ruled out at this preliminary stage without further information. These species are:

- *Amphibromus fluitans* (river swamp wallaby-grass)
- *Eucalyptus strzeleckii* (Strzelecki gum)
- *Petauroides volans* (southern greater glider)
- *Thinornis r. rubricollis* (hooded plover)

In cases where there is uncertainty on the significance of impacts on a MNES, referral to the Department of Agriculture, Water and the Environment is recommended. See Section 6.1 for further discussion and recommendations.

Table 16. Preliminary MNES impact assessment

State	Protected Matter	Likelihood of Significant Impact (pre-mitigation)	Likelihood of Significant Impact (post-mitigation)	Preliminary Significant Impact Determination	Recommendations
NATIONALLY SIGNIFICANT COMMUNITIES					
Victoria	Gippsland Red Gum (*Eucalyptus tereticornis* subsp. *mediana*) grassy woodland and associated native grassland	Moderate	Low	Significant impact unlikely	• Undertake field assessments to verify if any native vegetation meets community definition as detailed in EPBC Act policy statement 3.22. • Avoid and minimise impacts on remnants of this community through micro-siting and other management measures and when siting associated infrastructure e.g., camps, access tracks.
NATIONALLY SIGNIFICANT FLORA SPECIES					
Victoria	*Amphibromus fluitans* (river swamp wallaby-grass)	Moderate	Moderate	Potential for significant impact	• Complete habitat condition assessments and, where required, undertake targeted flora surveys in accordance with EPBC Act survey guidelines to determine population extent and size within the AoD. • Investigate micro-siting options and other measures to avoid populations and assess significance of impacts against significant impact criteria for Vulnerable species in the Matters of National Environmental Significance - Significant impact guidelines 1.1 Environment Protection and Biodiversity Conservation Act 1999. • Considering that impacts on this species are uncertain, an EPBC Act referral is recommended.
	Caladenia orientalis (eastern spider orchid)	Moderate	Low	Significant impact unlikely	• Complete habitat condition assessments and, where required, undertake targeted flora surveys in accordance with EPBC Act survey guidelines to determine population extent and size within the AoD. • Based on the results of the assessments, avoid orchid populations through micro-siting and other management measures. • Impacts to this species are considered manageable and an EPBC referral is unlikely to be required.
	Dianella amoena (matted flax-lily)	High	Low	Significant impact unlikely	• Complete habitat condition assessments and, where required, undertake targeted flora surveys in accordance with EPBC Act survey guidelines to determine population extent and size within the AoD. • Avoid populations through micro-siting and other management measures.

State	Protected Matter	Likelihood of Significant Impact (pre-mitigation)	Likelihood of Significant Impact (post-mitigation)	Preliminary Significant Impact Determination	Recommendations
					• Assess residual impacts against significant impact criteria for Vulnerable species in the *Matters of National Environmental Significance - Significant impact guidelines 1.1 Environment Protection and Biodiversity Conservation Act 1999*. • Impacts to this species are considered manageable and an EPBC Act referral is unlikely to be required.
	Eucalyptus strzeleckii (Strzelecki gum)	High	Moderate	Potential for significant impact	• Undertake detailed tree census to determine location of *Eucalyptus strzeleckii* in and adjacent (up to 17m) to the AoD. • Investigate micro-siting options and other measures to avoid trees. • Assess significance of impacts against significant impact criteria for Vulnerable species in the Matters of National Environmental Significance - Significant impact guidelines 1.1 Environment Protection and Biodiversity Conservation Act 1999. • Considering that impacts on this species are uncertain, an EPBC Act referral is recommended.
Victoria	*Prasophyllum frenchii* (maroon leek-orchid)	Low	Low	Significant impact unlikely	As for *Caladenia orientalis*
	Prasophyllum spicatum (dense leek-orchid)	Low	Low	Significant impact unlikely	As for *Caladenia orientalis*
	Pterostylis chlorogramma (green-striped greenhood)	Low	Low	Significant impact unlikely	As for *Caladenia orientalis*
	Pterostylis cucullata (leafy greenhood)	Low	Low	Significant impact unlikely	As for *Caladenia orientalis*
	Thelymitra matthewsii (spiral sun-orchid)	Low	Low	Significant impact unlikely	As for *Caladenia orientalis*
NATIONALLY SIGNIFICANT FAUNA SPECIES					

State	Protected Matter	Likelihood of Significant Impact (pre-mitigation)	Likelihood of Significant Impact (post-mitigation)	Preliminary Significant Impact Determination	Recommendations
Victoria	*Galaxiella pusilla* (dwarf galaxias)	Moderate	Low	Significant impact unlikely	• Complete habitat condition assessments and, where required, undertake targeted surveys in accordance with EPBC Act survey guidelines to determine population extent and size within or upstream/downstream of the AoD (particularly within the Tarwin River East Branch). • Where populations are confirmed present or very likely to occur, avoid and minimise impacts through HDD and other management measures including controls on pollution/sedimentation (water quality), bank and in-stream habitat impacts, and disease. • Impacts to this species are considered manageable and an EPBC referral is unlikely to be required.
	Litoria raniformis (growling grass frog)	Moderate	Low	Significant impact unlikely	• Complete habitat condition assessments and, where required, undertake targeted surveys in accordance with EPBC Act policy statement 3.14 to determine population extent and size within or near (200 metres) the AoD. • Where populations are confirmed present, avoid and minimise impacts through micro-siting and other management measures including controls on disease spread, water quality/flow, and impacts on both terrestrial and aquatic habitat and ecological connectivity, dispersal, and breeding. Avoid construction activities during breeding period. • Impacts to this species are considered manageable and an EPBC referral is unlikely to be required.
	Petauroides volans (southern greater glider)	High	Moderate	Potential for significant impact	• Complete habitat condition assessments and, where required, undertake targeted surveys in accordance with EPBC Act guidelines to determine population extent and size within or near the AoD. • The feasibility of management measures will be investigated once the reliance of local populations on the study area is better understood. • Given there is insufficient information on *Petauroides volans* populations, suitable habitat, and current ecological connectivity within and adjacent to the AoD, an EPBC Act referral is recommended.
	Prototroctes maraena (Australian grayling)	Moderate	Low	Significant impact unlikely	As for *Galaxiella pusilla*

State	Protected Matter	Likelihood of Significant Impact (pre-mitigation)	Likelihood of Significant Impact (post-mitigation)	Preliminary Significant Impact Determination	Recommendations
	Thinornis r. rubricollis (hooded plover)	Moderate	Low (HDD) – Moderate (trenching required)	Potential for significant impact – *only where trenching is required*	• Use trenchless technology (such as HDD) where feasible to complete shore crossing to avoid significant impacts on *Thinornis r. rubricollis*. Consider options to reduce the extent and duration of trenching activities where this construction method is required. • Additional management measures include undertaking construction activities outside the breeding period, controls (limits) on noise and lighting, minimising the construction period, monitoring for nesting and activity (if applicable), and minimising disturbance of habitat and impact on animal movements from trenching (if applicable). • There are unlikely to be significant impacts on *Thinornis r. rubricollis* where HDD is feasible and complimentary management measures are implemented. • Considering that impacts on this species are currently uncertain, an EPBC Act referral is recommended.

6. Implications

This section addresses implications for the project under relevant Commonwealth and state legislation and potential requirements for approvals, permits, and further studies. A preliminary assessment was also undertaken against referral criteria under the Commonwealth EPBC Act and Victorian *Environment Effects Act 1978*.

6.1 Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection Biodiversity Conservation Act 1999* (EPBC Act) is Commonwealth legislation that protects Matters of National Environmental Significance (MNES). Where a development or activity has the potential to have a significant impact on a MNES, a referral is made to the Department of Agriculture, Water and the Environment. An action must be referred if it 'has, will have or is likely to have a significant impact' on a Matter of National Environmental Significance. The Department of the Environment and Energy provides guidelines on assessing whether a proposed action is likely to have a significant impact on an MNES and whether a referral is likely to be required. The Minister or delegate determines whether the activity can proceed with no further assessment by the Commonwealth, or whether it will be a controlled action for which assessment is required.

Matters of National Environmental Significance (MNES) include:

- World Heritage properties
- National Heritage places
- Great Barrier Reef marine park
- Nationally listed threatened species and ecological communities
- Listed migratory species
- Ramsar wetlands of international importance
- Commonwealth marine areas
- Nuclear actions (including uranium mining).
- A water resource, in relation to coal seam gas development and large coal mining development

Based on this preliminary assessment, impacts on four nationally (EPBC Act) listed threatened species are uncertain. These are:

- *Amphibromus fluitans* (river swamp wallaby-grass)
- *Eucalyptus strzeleckii* (Strzelecki gum)
- *Petauroides volans* (southern greater glider)
- *Thinornis r. rubricollis* (hooded plover)

Without further information on these species' occurrence within the survey area and feasibility of management actions to avoid and minimise impacts at this preliminary stage are uncertain. Considering this uncertainty, it is recommended that an EPBC Act referral be made to the Australian Government

Department of the Environment and Energy to determine whether the project requires formal assessment and approval under the EPBC Act. Further approvals may be required as part of the referral process and if the project is assessed to have a significant impact on MNES by the Minister for the Environment and Energy (the Minister). This may include the requirement for further assessments, as well as actions to avoid, minimise or offset impacts on MNES.

In addition, whilst considered unlikely, indirect impacts to *Sarcophilus harrisii* (Tasmanian devil), *Dasyurus maculatus* subsp. *maculatus* (spotted-tailed quoll), *Dasyurus viverrinus* (eastern quoll), *Tyto novaehollandiae castanops* (masked owl) and *Aquila audax fleayi* (wedge-tailed eagle) may occur should permanent nest or dens sites occur in habitat immediately adjacent to the Heybridge survey area. Surveys of this vegetation is recommended to confirm absence of these sites.

6.2 Threatened Species Protection Act 1995 (Tas)

The Tasmanian *Threatened Species Protection Act 1995* (TSP Act) provides for the protection of threatened flora and fauna. Under the Act, a person must not knowingly kill, catch, damage or collect a listed species without a permit. Interim protection orders are declared by the Minister for the Environment to conserve a habitat of a listed threatened species on private or Crown land and are enforceable even if the order is inconsistent with a planning scheme. Land management plans are implemented to protect threatened species on private or Council-owned land.

The preliminary flora and fauna assessment has identified that there are flora and fauna listed as threatened under the TSP Act that could potentially occur in vegetation immediately adjacent to the Heybridge converter station site. The high priority threatened flora and fauna species (e.g., devils, quolls, eagles) are also listed under the EPBC Act list and are therefore captured under the recommended mitigation measures for the EPBC Act listed species.

6.3 Nature Conservation Act 2002 (Tas)

The *Nature Conservation Act 2002* (NC Act) provides for the conservation and protection of the fauna, flora and geological diversity in Tasmania and for the declaration of national parks and other reserved land.

The destruction of any little penguin burrows during the construction of the beach crossing may require a permit under the NC Act.

Schedule 3A of the NC Act lists the native vegetation communities in Tasmania that are considered to be threatened. These communities are protected from clearance and conversion under the *Forest Practices Act 1985* and are also afforded higher levels of protection under some local government planning schemes.

Based on the preliminary assessment, two NC Act listed communities warrant further consideration:

- Freshwater aquatic sedgeland and rushland (ASF)
- *Melaleuca ericifolia* swamp forest (NME).

Under a Tasmanian approval process a vegetation assessment will be required to identify the presence of threatened vegetation communities listed under the NC Act. The vegetation assessment would be included in the development approval documentation along with mitigation measures which will include

avoidance where possible through micro siting or identify the requirement for an approval to clear threatened native vegetation.

Conservation covenants are administered under the NC Act to indicate that land has long-term conservation values. They are registered with the Recorder of Titles and run with the land. As such, once registered, the covenant is enforceable between the parties and any future owner of the land. Covenants can be amended or revoked subject to approval by the Crown Lands Minister and with consent of the landowner. Revocation may be in the form of acquisition of land with the intention for development, and hence contrary to the purpose of a covenant. Where the landowner has received compensation under the agreement, the covenant can only be amended or revoked after 30 days of public notice. There is one conservation covenant that is potentially affected by the project on a land parcel within the AoD of the cable section of the Heybridge to Blythe River mouth route. If this property cannot be avoided, then any requirement to clear vegetation would require negotiation with the landowner and the Crown Lands Minister.

6.4 Environment Effects Act 1978 (Vic)

The *Environment Effects Act 1978* (Vic) (EE Act) requires the preparation of an Environment Effects Statement (EES) for activities considered to have, or to be capable of having, a significant effect on the environment. Triggers for an EES are set out as referral criteria in the Ministerial Guidelines for Assessment of Environment Effects.

Based on the preliminary impact assessment, the project is likely to trigger the following biodiversity-related referral criteria:

- Individual criteria (i.e. those with the individual potential for impacts of regional or state significance), including:
    - *Potential long-term loss of a significant proportion of known remaining habitat or population of a threatened species within Victoria.* Whilst there is currently insufficient information to inform whether these criteria are likely to be triggered (e.g. habitat extent), an impact assessment (Appendix 4) identified the potential for a significant impact on six (6) species. These were:
        - *Eucalyptus strzeleckii* (Strzelecki gum)
        - *Petauroides volans* (southern greater-glider)
        - *Thinornis r. rubricollis* (hooded plover)
        - Three native crayfish *Engaeus hemicirratulus* (Gippsland burrowing crayfish), *Engaeus phyllocercus* (Narracan burrowing crayfish), *Euastacus neodiversus* (South Gippsland spiny crayfish).
- Combined criteria (i.e., those that require a combination of two or more before an impact of regional or State significance is likely to occur), including:
    - Potential clearing of 10 ha or more of native vegetation, unless authorised under an approved *Forest Management Plan* or *Fire Protection Plan*. Based on the preliminary analysis an estimated 13.8 ha of native vegetation, along with 44 scattered trees, could be impacted by the proposed construction in a managed construction scenario.

- Matters listed under the *Flora and Fauna Guarantee Act 1988*, including the potential loss of: a significant area of a listed ecological community; a genetically important population of an endangered or threatened species or critical habitat. There is a moderate to high likelihood that at least two listed communities and more than five FFG Act listed species may be impacted along both routes in Victoria:
  - *Dianella amoena* (matted flax-lily)
  - *Eucalyptus strzeleckii* (Strzelecki gum)
  - *Petauroides volans* (southern greater-glider)
  - *Thinornis r. rubricollis* (hooded plover)
  - *Engaeus phyllocercus* (Narracan burrowing crayfish).

  Considering the limited range extent and population size of *Engaeus phyllocercus* and *Eucalyptus strzeleckii*, there is a high likelihood of the survey area could support a genetically important population of either or both species. Whilst there is no declaration of critical habitat within the survey areas, this may change as a result of further investigations and therefore cannot be ruled out as a trigger. Further investigation including field (habitat) assessments are required to determine this.

Based on available information, the project is likely to trigger a requirement for an EES based on either the single or multiple criteria.

6.5 Planning and Environment Act 1987 (Vic)

The *Planning and Environment Act 1987* governs the use, development, and protection of land in Victoria. The Act provides an integrated framework for planning policies and considerations across local, regional and state levels of governance and land use. These are incorporated through the Victorian Planning Provisions (VPP) and enacted under the municipal planning scheme through legal instruments such as planning permits and precinct plans.

One such policy that is enacted through the planning scheme is the Victorian native vegetation removal regulations, which are designed to protect Victoria's biodiversity from uncontrolled clearing. Under Clause 52.17 of the Victorian Planning Provisions (VPP), a permit is required to remove, destroy or lop native vegetation on sites greater than 0.4 hectares; unless an exemption applies, or the work is undertaken in accordance with a Precinct Structure Plan (PSP) as set out under Clause 52.16 of the VPP.

The process for determining impacts when native vegetation is removed is set out under the *Guidelines for the removal, destruction or lopping of native vegetation* (the 'Guidelines'). They apply a risk-based approach using the extent, quality and landscape scale importance of vegetation to determine its significance and therefore the assessment pathway under which the application must be considered and associated approval conditions.

In addition to the regulation of native vegetation removal under Clause 52.16 or 52.17, the Planning and Environment Act also regulates impacts to biodiversity via planning zones, overlays, and local laws.

Based on the preliminary analysis an estimated 13.8 ha of native vegetation, along with 44 scattered trees, could be impacted by the proposed construction of the project in a managed construction scenario.

This will involve an application for a permit to remove native vegetation in accordance with Clause 52.17 of the local planning scheme, including information on the nature of the vegetation being removed, the significance in a local and regional context and the offset requirements. Offsets would be required in accordance with the Guidelines.

6.6 Flora and Fauna Guarantee Act 1988 (Vic)

The FFG Act regulates the protection and management of biodiversity including the conservation of threatened species and communities and the management of threatening processes.

Permits are required to take, remove, or disturb listed and/or protected flora species, listed communities and fish on public land. Listed fauna species are also protected under controls contained in the *Wildlife Management Act 1975*.

Those parts of the survey area on Crown land (e.g., road reserves, parks, public institutions etc) will be subject to protected flora controls under Division 2 of Part 5 of the FFG Act. Given several protected flora species are considered likely to occur within the survey area, a protected flora permit under the FFG Act will likely be required. This will require quantifying the extent of impacts to protected flora through habitat condition assessments and targeted surveys and an impact assessment.

6.7 Wildlife Act 1975 (Vic)

The *Wildlife Act 1975* protects and manages wildlife (fauna) in Victoria. The purpose of the act is to provide procedures for the protection and conservation of wildlife, the prevention of wildlife extinction, sustainable use and access to wildlife, and prohibit and regulate interactions with wildlife.

The *Wildlife Act 1975* regulates interactions with wildlife including both native and non-native terrestrial species, and is the main legislation determining licensing relating to wildlife along the FFG Act 1988 for threatened and protected taxa.

The Wildlife Regulations 2013 provides for changes in licensing for the possession, use and trade of wildlife and further instruments for protecting wildlife under Part 2 – Protection of Wildlife including that a 'Person not to damage, disturb or destroy any wildlife habitat' under Section 42 of the regulations.

If trees are felled, fauna monitoring and salvage of hollow-dependent fauna or nesting birds may be required by the responsible authority. This work should be undertaken by a suitably qualified ecologist/zoologist with appropriate permits under the *Wildlife Act 1975* and *FFG Act 1988*.

6.8 Catchment and Land Protection Act 1994 (Vic)

The *Catchment and Land Protection Act 1994* (CaLP Act) is the main legislative instrument for preventing land degradation and defining catchment planning and land management responsibilities.

The act has provisions for pest animals and noxious weeds and sets out requirements for landowners (including the Crown) in relation to these matters and land management practices. Under the act,

landowners have responsibilities set out for different categories of weeds which are listed by species in a 'declared list of noxious weeds'. These categories include State Prohibited Weeds, Regionally Prohibited Weeds, Regionally Controlled Weeds, and Restricted Weeds.

Landowners have responsibility to take all reasonable steps to control and prevent the spread and growth of Regional Controlled noxious weed species on their land and roadsides which adjoin their land. Appropriate weed control measures should be incorporated into the Construction Environmental Management Plan for any proposed works within the study sites.

7. Conclusion and recommendations

7.1 Tasmania

Based on the desktop review and field survey, the Tasmanian section has the potential to impact small areas of native vegetation. Overall, the initial desktop assessment of likelihood of occurrence and impact has not identified any threatened species or communities that are likely to be significantly affected by the project in Tasmania. However, it has identified the following notable threatened species and communities that warrant further studies to verify their presence and confirm the desktop review assessment which indicates they will not be significantly impacted:

- Two state NC Act listed communities:
    - *Melaleuca ericifolia* swamp forest (NME).
    - Freshwater aquatic sedgeland and rushland (ASF)
- EPBC Act listed threatened fauna *Aquila audax fleayi* (wedge-tailed eagle), *Sarcophilus harrisii* (Tasmanian devil), *Dasyurus maculatus maculatus* (spotted-tailed quoll), *Dasyurus viverrinus* (eastern quoll), and the TSP Act listed *Haliaeetus leucogaster* (white-bellied sea-eagle).

A summary of the key values and implications for the Tasmanian survey area is provided in Table 17.

Table 17. Summary of implications for Tasmanian survey area

Values impacted	Implications (with mitigation)	Additional assessment
Native vegetation	**EIA process** – may be an integrated process with EPA if project levels warrant a Level 2 under EMPC Act or Project of State Significance under *State Policies and Projects Act 1993*. **LUPA Act process** - vegetation clearance for works other than those of minor environmental impact in accordance with *Electricity Supply Industry Regulations 2008*. **FPA permit** - removal of >1 ha of native vegetation. **NCA process** - Reserve Activity Assessments for works within Crown land managed by Parks and Wildlife Services).	**Studies:** Vegetation condition survey **Location:** Survey area
Threatened vegetation communities	**EPBC Act referral** - if significant impact on a MNES. Significant impacts on listed threatened community considered unlikely. **FPA/MOU** - the proponent's FPA/MOU requires offsets for clearance of threatened vegetation communities.	**Studies:** Vegetation condition survey **Location:** Survey area
Threatened species	**EPBC Act referral** - if significant impact on a MNES. Significant impacts on listed threatened species considered unlikely. **TSP Act** (impact on threatened flora and fauna)	**Studies:** Nest and den checks **Location:** Vegetation immediately adjacent to the survey area.

7.2 Victoria

Based on the desktop review and field survey, the Victorian alignment has the potential to intersect with numerous areas of native vegetation and threatened species habitats (Appendix 3). Of particular note is the northern section through the Strzelecki Ranges and into the Latrobe Valley, and to a lesser extent the southern-most sections as it intersects woodlands and dune systems in the Waratah Bay area respectively. Based on the vegetation assessment, approximately half of the vegetation with the potential to be impacted is classified as endangered in Victoria, including a small portion of which may qualify as the EPBC Act listed *Gippsland Red Gum (Eucalyptus tereticornis subsp. mediana) Grassy Woodland and Associated Native Grassland* and/or FFG Act listed community.

Based on the likelihood of occurrence assessment, this vegetation has the potential to provide habitat for multiple state and nationally significant species, with 22 having the potential to be impacted unless further mitigation is considered (Appendix 4). Of these, the following are notable and warrant careful consideration through the design, planning and approval processes:

- The EPBC Act listed *Dianella amoena* (matted flax-lily) which has been recorded at numerous locations throughout the Latrobe Valley, and is likely to occur within roadsides or unmanaged pastures.
- The EPBC Act listed *Eucalyptus strzeleckii* (Strzelecki gum) which occurs throughout the survey area and has the potential to occur along many of the narrow roads which the alignment follows between Dumbalk and the Latrobe Valley.
- *Amphibromus fluitans* has been recorded from several localities near the survey area, including Meeniyan and east of Yinnar. This species has the potential to occur at discrete locations along much of the route, minor waterways and waterbodies.
- The state significant *Cyathea cunninghamii* (slender tree fern), *Eucalyptus fulgens* (green scentbark), *Eucalyptus kitsoniana* (bog gum) and *Eucalyptus yarraensis* (Yarra gum).
- The EPBC Act listed *Petauroides Volans* (southern greater glider) which has potential to occur within forests between Mirboo North and Hazelwood and is sensitive to habitat loss and fragmentation (ecological connectivity).
- EPBC Act listed *Thinornis r. rubricollis* (hooded plover) and EPBC Act listed migratory shorebirds likely to occur at Waratah Bay.
- EPBC Act listed *Galaxiella pusilla* (dwarf galaxias), *Prototroctes maraena* (Australian grayling) and *Litoria raniformis* (growling grass frog); and FFG listed *Nannoperca* sp. 1 (Flinders pygmy perch) associated with waterbodies.
- FFG Act and DELWP advisory listed species with highly localised populations and/or restricted distributions including *Engaeus phyllocercus* (Narracan burrowing crayfish), *Euastacus neodiversus* (South Gippsland spiny crayfish), *Engaeus hemicirratulus* (Gippsland burrowing crayfish), *Lissolepis coventryi* (swamp skink), *Pseudophryne semimarmorata* (southern toadlet), and *Pseudemoia rawlinsoni* (glossy grass skink).

Other sensitive areas that were identified and will need careful consideration in design of the final alignment are listed in Table 2 (Tasmania) and Table 3 (Victoria).

Based on these potential impacts, the following approvals are likely to be required:

- A referral under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth)
- A referral under the *Environment Effects Act 1987* (Vic)
- Planning approval under the *Planning and Environment Act 1987* (Vic)
- A permit under the *Flora and Fauna Guarantee Act 1987* (Vic)

A summary of the key values and implications (with mitigation) identified is provided in Table 18.

Based on the potential impacts identified, a list of preliminary mitigation measures is provided in Section 4.3. These measures are designed to reduce the quantum and significance of impacts across the survey area through the design process. They will need to be complemented with targeted measures focusing on specific values identified through detailed technical studies, that will be implemented at either the design, construction or post-construction stages.

Table 18. Summary of implications for Victorian routes

Values impacted	Implications (with mitigation)	Further assessment
Native vegetation	**Native vegetation regulations** - a planning permit under the *Environment and Planning Act 1987* for the removal of native vegetation. **EES referral** - referral under the *Environment Effects Act 1987* for potential impacts to more than 10 hectares of vegetation classified as an endangered Ecological Vegetation Class.	**Studies:** Vegetation/habitat condition survey, tree census **Location:** Survey area
Threatened vegetation communities	**EPBC Act referral** – if significant impact on a MNES. Significant impacts on listed community considered unlikely with mitigation measures implemented. **FFG Act** – a permit under the *Flora and Fauna Guarantee Act 1987* may be required for potential impacts to three (3) listed communities where they occur on public land (unless impacts considered under an EES process). **EES Act** - a referral under the *Environment Effects Act 1987* for potential impacts to three (3) listed communities.	**Studies:** Vegetation condition survey **Location:** Survey area
Threatened species	**EPBC Act referral** - if significant impact on a MNES. Potential significant impacts on four listed species. **FFG Act** – a permit under the *Flora and Fauna Guarantee Act 1987* is required for the removal or translocation of any protected (including listed) flora species and listed fish species on public land (unless impacts are otherwise considered under an EES process). There are three flora species currently listed under the FFG Act with a fourth currently under nomination. **EES Act** - a referral under the *Environment Effects Act 1987* for potential impacts to six (6) threatened species.	**Studies:** Habitat condition survey Targeted flora and fauna surveys **Location:** Survey area (habitat condition) Areas of suitable habitat (targeted surveys)

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Appendices

Appendix 1 Maps

Figure 5
Biodiversity
Tasmania

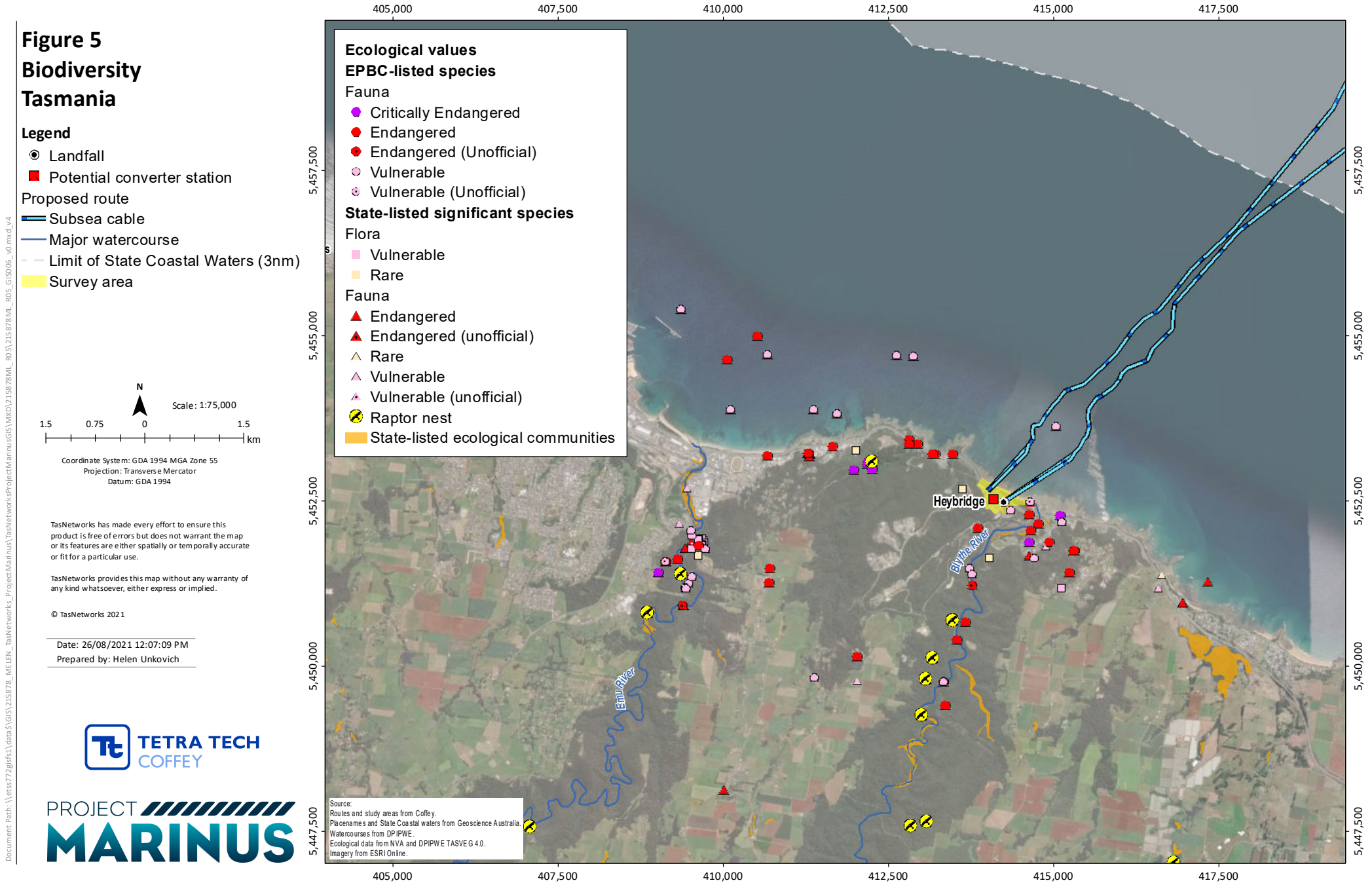


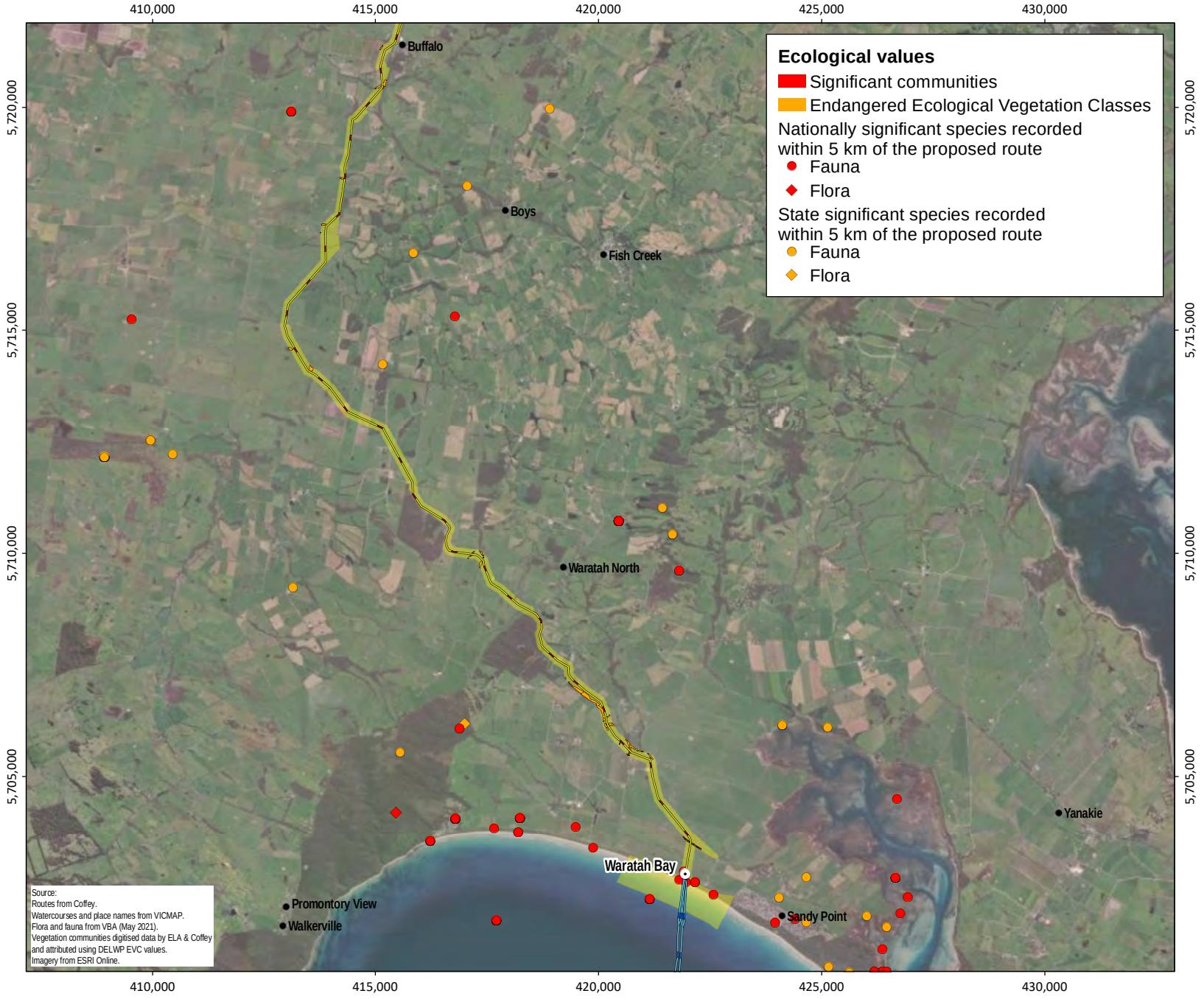
Figure 6.1
Biodiversity
Victoria (Waratah Bay)

Legend

- Landfall

Proposed route

- Subsea cable
- Underground HVDC cable
- Survey area



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Datum: GDA 1994

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Prepared by: Helen Unkovich

TETRA TECH COFFEY

PROJECT MARINUS

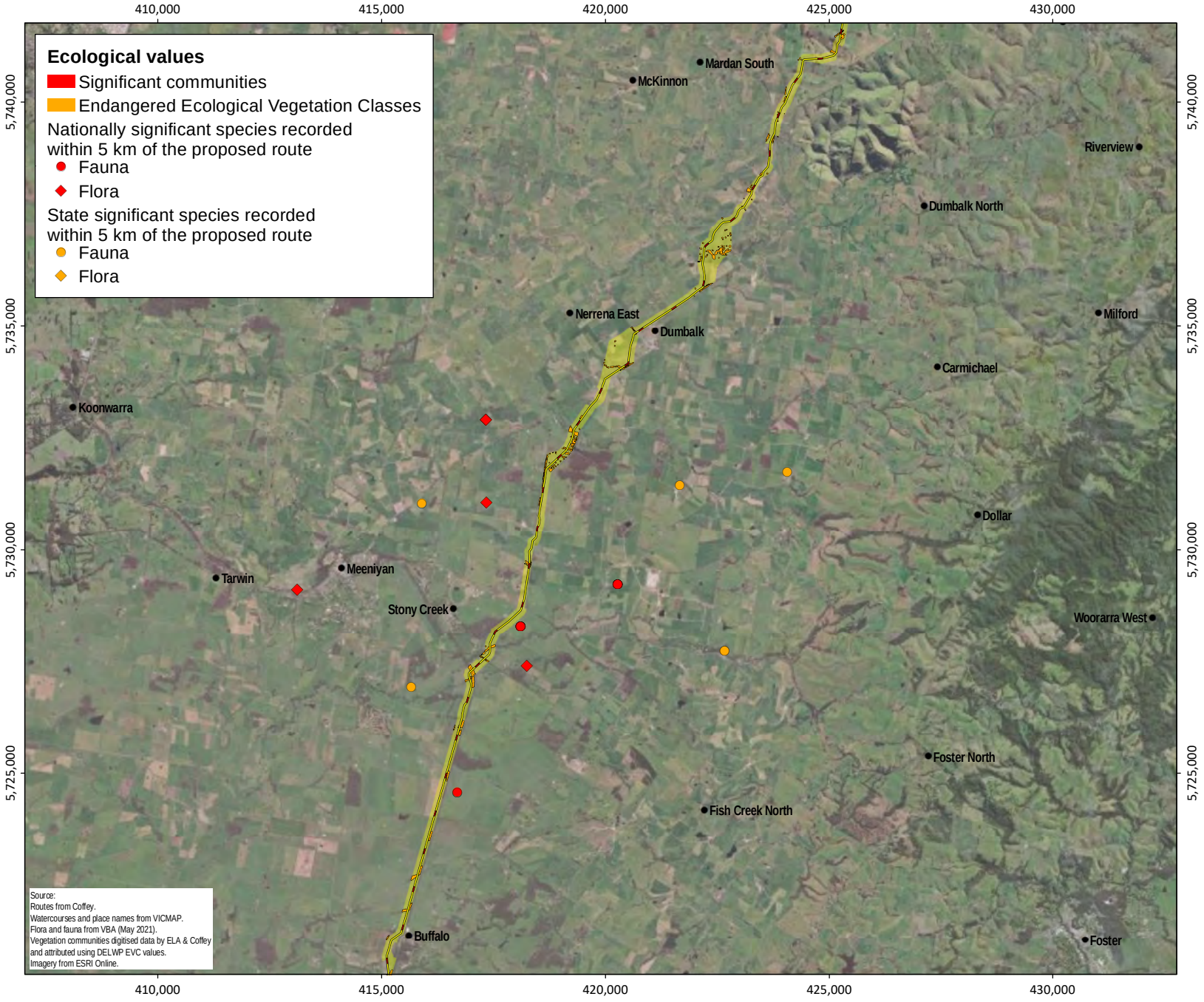
Figure 6.2 Biodiversity Victoria (Tarwin Valley)

Legend

Proposed route

Underground HVDC cable

Survey area



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TETRA TECH COFFEY

PROJECT MARINUS

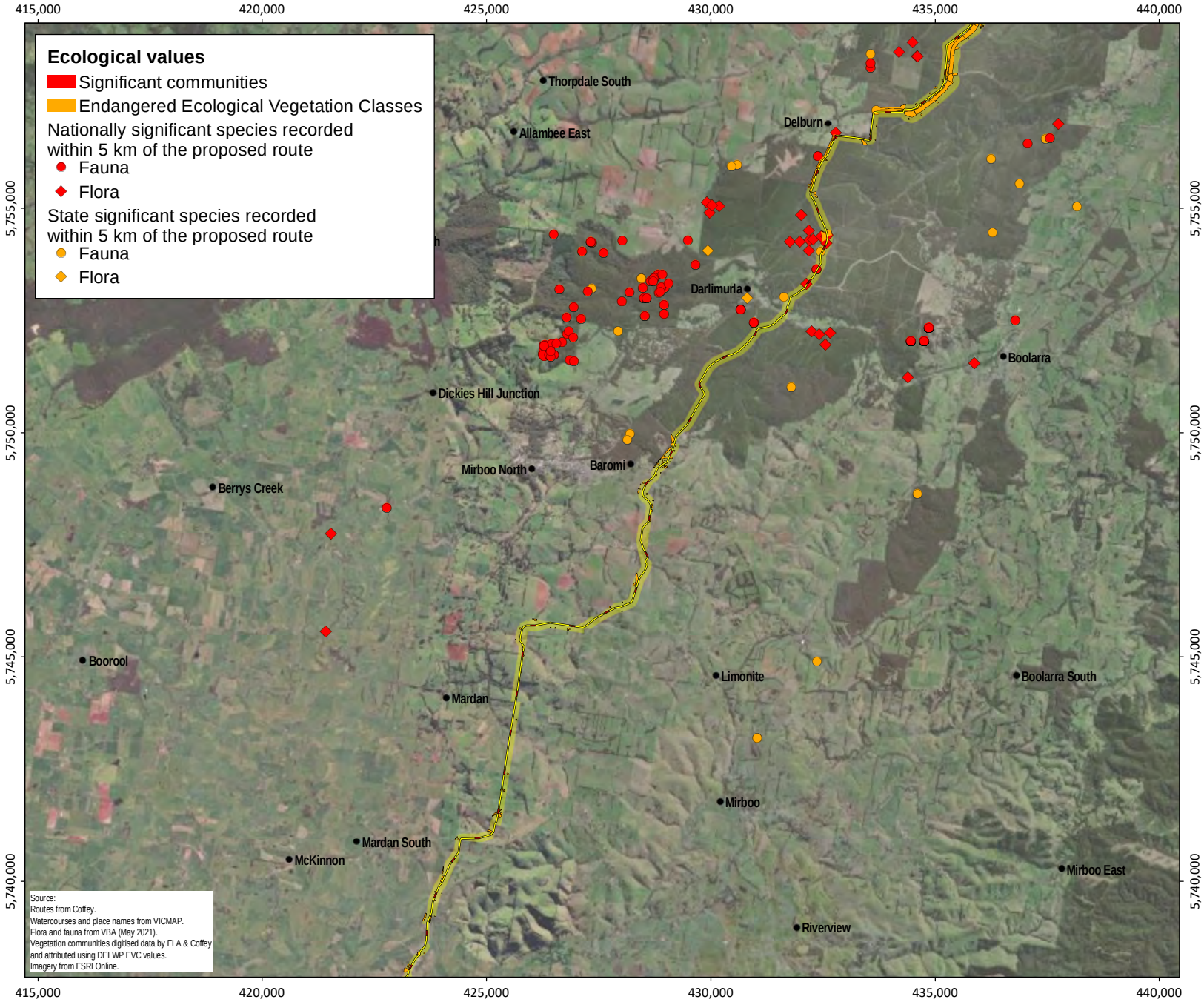
Figure 6.3
Biodiversity
Victoria (Latrobe Valley)

Legend

Proposed route

Underground HVDC cable

Survey area



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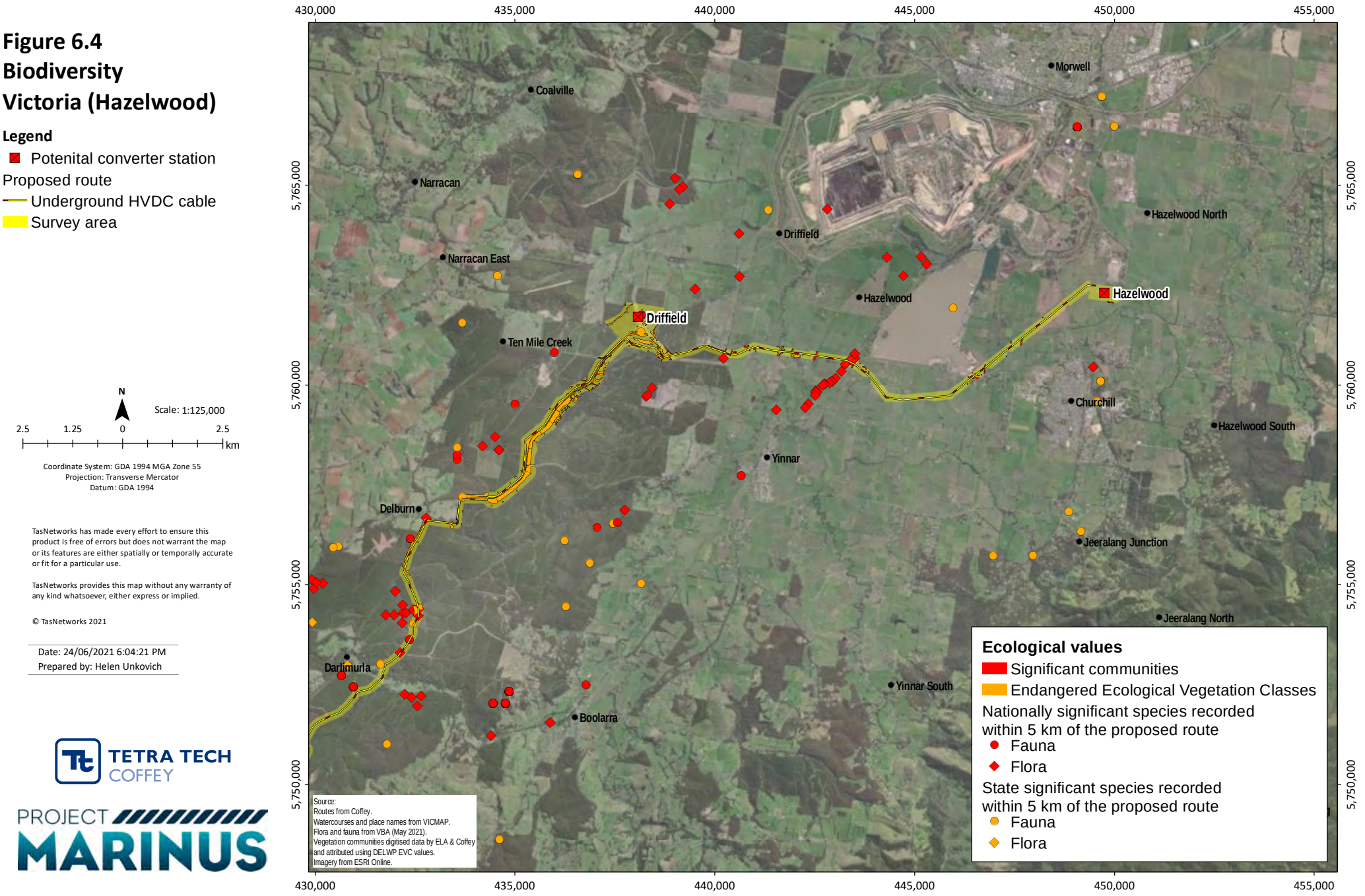
TETRA TECH COFFEY

PROJECT MARINUS

Figure 6.4
Biodiversity
Victoria (Hazelwood)



Appendix 2 Likelihood of occurrence tables for Tasmania

Terms

Likelihood of occurrence	TSP Act	EPBC Act	Protected Matters Search Tool
FLORA **Present**: Recorded within the study area in the last ten years. **High**: High likelihood of occurrence. Recent records of the species in the local vicinity (i.e. within the last 10 years); and/or, the study area contains high quality suitable habitat. **Moderate**: Moderate likelihood of occurrence. Previous records of the species in the local vicinity; and/or, the study area contains moderate quality suitable habitat. **Low:** Low likelihood of occurrence. Limited previous records of the species in the local vicinity; and/or, the study area contains poor or limited habitat. May also be considered low if other environmental factors, such as the fragmented or isolated nature of the habitat, are present. **None**: No suitable habitat and/or outside species range. **FAUNA** **Present:** Known resident of the study area based on site observations, recent database records (i.e. within last ten years) or expert advice. **High**: Recent records of the species in the local vicinity (i.e. within the last 10 years); and/or, the study area contains high quality or critical/ preferred habitat. **Moderate**: Previous records of the species in the local vicinity; and/or, the study area contains moderate quality or seasonal habitat. **Low**: Limited previous records of the species in the local vicinity; and/or, the study area contains habitat the species may use opportunistically or en-route to areas of preferred habitat. **None**: No suitable habitat and/or outside species range.	Extinct Critically endangered Endangered Vulnerable Rare	**EX:** Extinct **CR:** Critically endangered **EN:** Endangered **VU:** Vulnerable **CD:** Conservation dependent	**PMST-K:** Species or species habitat known to occur within area **PMST-L**: Species or species habitat likely to occur within area **PMST-M:** Species or species habitat may occur within area **PMST-F**: Foraging, feeding or related behaviour likely to occur within area

Table 2A. Significant fauna (Tasmania)

Scientific name	Common name	TSP Act	EPBC	EPBC Migratory	Count (sum)	Last record	Source	Likelihood of Occurrence	Habitat	Rationale
Actitis hypoleucos	Common Sandpiper		Migratory				PMST	Low	Occurs in a wide range of inland and coastal wetlands. Mainly associated with estuaries and large coastal mudflats.	No records from within study area and no suitable habitat within survey area.
Apus pacificus	Fork-tailed Swift		Migratory				PMST	Low	Primarily an aerial species which forages in flight and may occasionally land.	Modelled distribution. Primarily an aerial species which occasionally lands. Unlikely to significantly use the study area.
Ardea ibis	Cattle Egret		Migratory				PMST	Low	Widespread in south-eastern Australia. Found in grasslands, farmland, woodlands and wetlands. Often occurs with cattle and other stock.	Modelled distribution. No suitable habitat within study area.
Aquila audax fleayi	Wedge-tailed eagle	Endangered	Endangered				NVA	Moderate	Large brown-black eagle with feathered legs. Occurs across Tasmania in forested habitats. Nesting habitat is large tracts (more than 10 ha) of eucalypt or mixed forest (Threatened Species Section 2006).	Recorded in study area however no known nests within 1 km of survey area. Potential for suitable habitat immediately adjacent to survey area.
Astacopsis gouldi	Giant freshwater crayfish	Vulnerable	Vulnerable				NVA	Low	A large slow-growing and long-lived freshwater crayfish that can weigh up to 3 kg. The species is endemic to rivers, lakes and streams of northern Tasmania (Threatened Species Scientific Committee 2017).	Recorded in study area however no records within 1 km and no suitable habitat within survey area.

Scientific name	Common name	TSP Act	EPBC	EPBC Migratory	Count (sum)	Last record	Source	Likelihood of Occurrence	Habitat	Rationale
Botaurus poiciloptilus	Australasian Bittern		Endangered				PMST	Low	Coastal and sub-coastal areas in extreme south-western mainland Australia, south-eastern mainland Australia and Tasmania. Inhabits wetlands and swamps with tall aquatic vegetation. Occasionally occurs in rice fields and saltmarshes.	No records within study area and no suitable habitat within survey area.
Calidris acuminata	Sharp-tailed Sandpiper		Migratory				PMST	Low	Inhabits shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation.	No records within study area and no suitable habitat within survey area.
Calidris canutus	Red knot		Endangered	Migratory			PMST	Low	Uncommon species that occurs on Intertidal mudflats, sandflats sheltered sandy beaches, estuaries, bays, inlets, lagoons, harbours, sandy ocean beaches, rock platforms, coral reefs, terrestrial saline wetlands near the coast, sewage ponds and saltworks. Rarely inland lakes or swamps.	No records from within study area
Calidris ferruginea	Curlew Sandpiper		Critically endangered	Migratory			PMST	Low	Relatively common winter visitor to coastal bays and inlets and are widespread in near-coastal wetlands, and inland in suitable habitats. They inhabit Littoral and estuarine habitats, including intertidal mudflats, non-tidal swamps, lakes and lagoons on the coast and	No records from within study area
Calidris melanotos	Pectoral Sandpiper		Migratory				PMST	Low	Rare winter visitor to Tasmania. Occurs in a wide range of inland and coastal wetlands. Mainly associated with estuaries and large coastal mudflats.	No records from within study area and no suitable habitat within survey area.
Ceyx azureus subsp. diemenensis	Tasmanian azure kingfisher	Endangered	Endangered				NVA	Moderate	A small brightly coloured kingfisher with a long slender black bill and red legs (Threatened Species Section 2012). The head, neck, and back are deep blue, and the breast is orange-red. This species inhabits the forested margin of rivers.	There are records within study area. There are records within 5km (near Heybridge) and potential for suitable habitat within riparian vegetation to immediate south of survey area.
Dasyurus maculatus subsp. maculatus	Spotted-tailed quoll	Rare	Vulnerable				NVA	Moderate	A medium-sized carnivorous marsupial found in wet forest and coastal habitats across Tasmania (DELWP 2016).	There are records within near Heybridge and potential for suitable habitat to occur in the survey area.
Dasyurus viverrinus	Eastern quoll		Endangered				NVA	Moderate	A small carnivorous marsupial whose preferred habitat includes inhabits dry grassland and forest mosaics which are bounded by agricultural land (Threatened Species Scientific Committee 2015).	There are records within study area. Potential for suitable habitat immediately adjacent to survey area.
Engaeus yabbimunna	Burnie burrowing crayfish	Vulnerable	Vulnerable				NVA	Low	A small grey-blue freshwater crayfish which is less than 10 cm in length (Threatened Species Scientific Committee 2016). They inhabit stream banks and seepages with remnant riparian vegetation within the Burnie area and the area around Mt Hicks and at Ridgeley. They dig burrows that generally intersect the water table so that they can keep moist. They are rarely ever seen outside their burrows.	No suitable habitat within the survey area.

Scientific name	Common name	TSP Act	EPBC	EPBC Migratory	Count (sum)	Last record	Source	Likelihood of Occurrence	Habitat	Rationale
Gallinago hardwickii	Latham's Snipe			Migratory			PMST	Low	Found across Tasmania where it occupies a range of wetland habitats, including open freshwater wetlands with low, dense vegetation; including freshwater swamps, flooded grasslands or heathlands. Also occurs in modified habitats such as pasture, irrigation channels, drainage ditches and near human activity e.g. roadsides and railways.	No records from study area and no suitable habitat within survey area.
Haliaeetus leucogaster	White-bellied sea-eagle	Vulnerable					NVA	Moderate	Large grey and white sea-eagle. Nesting habitat is forest with old growth eucalypts within 5 km of the coast (nearest coast including shores, bays, inlets and peninsulas), rivers, lakes or farm dams (Threatened Species Section 2006).	Records within study area along Blythe River however there are no known nests within 1 km of the project area. Potential for suitable habitat immediately adjacent to survey area.
Hirundapus caudacutus	White-throated Needletail		Vulnerable	Migratory			PMST	Low	Primarily an aerial species which forages in flight and may occasionally land.	Modelled distribution. Primarily an aerial species which occasionally lands. Unlikely to significantly use the study area.
Lathamus discolor	Swift parrot	Endangered	Endangered				NVA	Low	A small bright green parrot with red under the wings and a red face (Threatened Species Scientific Committee 2016). Breeding range (foraging and nesting habitat) is mostly within 10 km of the coast (including shores, bays, inlets or peninsulas) predominantly in eastern and South Eastern Tasmania, although there is breeding in some years on the central north and north western coast of Tasmania. Foraging habitat is *Eucalyptus globulus* dry and wet forest and *E. ovata* forest. Nesting habitat is forest with large eucalyptus trees with hollows in close proximity to foraging habitat.	There are records within study area and however no potential habitat in the survey area.
Limosa lapponica baueri	Bar-tailed Godwit		Vulnerable				PMST	Low	Relatively common winter visitor to Tasmania where it intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons, bays, seagrass beds, saltmarsh, sewage farms and and brackish wetlands near coasts, sandy ocean beaches, rock platforms, and coral reef-flats. Rarely inland wetlands, paddocks and airstrips.	No records from study area and no suitable habitat within survey area.
Limosa lapponica menzbieri	Northern Siberian Bar-tailed Godwit,		Critically endangered				PMST	Low	Relatively common winter visitor to Tasmania where it intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons, bays, seagrass beds, saltmarsh, sewage farms and and brackish wetlands near coasts, sandy ocean beaches, rock platforms, and coral reef-flats. Rarely inland wetlands, paddocks and airstrips.	No records from study area and no suitable habitat within survey area
Myiagra cyanoleuca	Satin flycatcher			Migratory			PMST	Low	Inhabit heavily vegetated gullies in eucalypt-dominated forests and taller woodlands, and on migration, occur in	No suitable habitat within the survey area.

Scientific name	Common name	TSP Act	EPBC	EPBC Migratory	Count (sum)	Last record	Source	Likelihood of Occurrence	Habitat	Rationale
									coastal forests, woodlands, mangroves and drier woodlands and open forests	
Numenius madagascariensis	Eastern Curlew	Endangered	Critically endangered				PMST	Low	Small numbers regularly visit Tasmania. Inhabits coastal estuaries mudflats and islands.	No records from within study area and no suitable habitat within the survey area.
Perameles gunnii	Eastern barred bandicoot		Vulnerable				NVA	Moderate	A small marsupial with long pink nose and large ears and characteristic pale bars across its hindquarters (DEWHA 2008a). Occurs in a range of agricultural habitats across Tasmania where improved pasture is interspersed with patches of native bush.	There are records in the study area (near Burnie) and potential for suitable habitat in the survey area.
Prototroctes maraena	Australian grayling	Vulnerable	Vulnerable		22	22/03/2004	NVA	Low	Dark green to dark grey fish with silvery sides and a dark mid-lateral stripe to 30 cm. An anadromous species where fish are born in freshwater, then migrate to the ocean as juveniles where they grow into adults before migrating back into freshwater to spawn (Fulton 1990).	No suitable habitat in survey area.
Sarcophilus harrisii	Tasmanian devil	Endangered	Endangered				NVA	Moderate	A medium-sized carnivorous marsupial that inhabits forest, woodland and agricultural areas across Tasmania (DEWHA 2009).	There are records within 5km (near Heybridge) and potential for suitable habitat immediately adjacent to survey area.
Sternula albifrons	Little Tern			Migratory				Low	Prefers sheltered coastal environments, including on mudflats in bays, lagoons, inlets and estuaries.	Modelled distribution. No records from within study area.
Sternula nereis nereis	Fairy tern	Vulnerable	Vulnerable				NVA	Low	A small grey and white tern; 22 to 27 cm in length with long, narrow wings and a bright orange bill (Threatened Species Scientific Committee 2011). Inhabits coasts and offshore islands including beaches, bays, estuaries and lagoons (Higgins and Davies 1996).	There are two historic records from Burnie area (1981). Unlikely to occur available suitable nesting habitat is semi-urban subject to high levels of disturbance.
Thinornis r. rubricollis	Hooded plover (eastern)		Vulnerable				NVA	Low	A stocky, medium-sized wading bird about 20 cm long. Both males and females are similar and have a black 'hood' and a white 'collar' across the back of the neck. Occurs around the coast of Tasmania on ocean beaches where they may be observed singly, in pairs, family groups or flocks (Department of the Environment. 2014).	There are no records in study area and limited suitable habitat within the survey area. The beaches along the north coast between Deloraine and Burnie are subject to high levels of human disturbance.
Tringa nebularia	Common Greenshank			Migratory			PMST	Low	Inhabits a range of coastal and inland wetlands including estuaries, mudflats lakes and swamps.	No records from study area and no suitable habitat within the survey area.
Tyto novaehollandiae castanops	Masked owl	Endangered	Vulnerable				NVA	Moderate	A large owl with white disc face that occurs in lowland areas generally below 660 m where it inhabits native forests and woodlands as well as agricultural areas with a mosaic of native vegetation and pasture (DEWHA 2010). Nests in hollows in large old trees.	No nest trees known however potential for suitable habitat immediately adjacent to survey area.

Table 2B. Significant flora (Tasmania)

Scientific name	Common name	TSP Act	EPBC	Count (sum)	Last record	Source	Likelihood of Occurrence	Habitat	Rationale
Baumea gunnii	Slender twigsedge	Rare		1		NVA	Moderate	Perennial sedge to 70 cm that inhabits wet moors, creeks and riverbanks and can extend into poorly-drained sedgy/ grassy forest and woodland (Threatened Species Section 2016a).	Suitable wet habitats unlikely to occur within the survey area, however records from habitat immediately adjacent to the south.
Barbarea australis	Native Wintercress	Endangered	Endangered			PMST	Low	Riparian species occurring along 10 river systems from Northern Tasmania to the south and central highlands. Occurs in shallow, alluvial silt deposited rock slabs, rocky ledges, or between large cobbles (Threatened Species Section 2010c).	No records from study area and no suitable habitat.
Caladenia caudata	Tailed Spider-orchid	Vulnerable	Vulnerable			PMST	Low	Occurs in heathy and grassy open eucalypt forest and woodland in coastal and near coastal areas.	No records from study area and no suitable habitat.
Caladenia pusilla	Tiny fingers	Rare				NVA	Low	Small pink spider orchid to 10 cm tall. Occurs in coastal and near coastal areas in the North West and North East Tasmania and on King Island and Cape Barren Island (Jones et al. 1999). Grows in heathland and open forest.	One historic record west of Heybridge. Suitable habitat unlikely to occur.
Caladenia patersonii	Patersons spider-orchid	Vulnerable				NVA	Low	Spider orchid 25 to 35 cm tall with a wiry and densely hairy stalk bearing one or two flowers. The flower is up to 10 cm across and is commonly creamy white. It occurs in low shrubby heathland in moist to well-drained sandy and clay loam.	One historic record from 1978 to the west of Heybridge. Limited suitable habitat. Unlikely to occur.
Epilobium pallidiflorum	Showy willowherb	Rare				NVA	Low	A perennial herb to 120 cm high that grows in wet places including natural wetlands, margins of swamp forests and wet areas in forests (Threatened Species Section 2016b).	Scattered occurrences throughout the study area. Suitable habitat unlikely.
Glycine latrobeana	Clover Glycine	Vulnerable	Vulnerable			PMST	Low	A small prostrate perennial herb up to 10 cm tall which resembles clover. Occurs in dry forest and woodland and native grasslands (Threatened Species Unit 2003).	No records from study area and no suitable habitat.
Hypolepis distans	Scrambling ground-fern	Endangered	Endangered			PMST	Low	Occurs in scrubland, swamp forest, sedgeland, wet or mixed eucalypt forest.	No records from study area and no suitable habitat.
Leucochrysum albicans subsp. tricolor	White Sunray	Endangered	Endangered			PMST	Low	Occurs in coastal and mountain areas in Tasmania on temperate in grassy habitats on clay loam soils.	No records from study area and no suitable habitat.
Pterostylis ziegleleri	Grassland Greenhood	Vulnerable	Vulnerable			PMST	Low	Ranges from lowland coastal regions in north west, north and east and midlands. Occurs on low slopes of sand dunes and grassy dune swales in coastal areas (Threatened Species Section. 2009).	No records from study area and no suitable habitat.
Senecio psilocarpus	Swamp Fireweed	Endangered	Endangered			PMST	Low	Occurs in swampy habitats including broad valley floors, edges of farm dams, herb-rich native grassland in a broad swale between stable sand dunes, adjacent to wetlands in native grassland, herbaceous marshland and low-lying lagoon systems (DPIPWE, 2011).	No records from study area and no suitable habitat.

Scientific name	Common name	TSP Act	EPBC	Count (sum)	Last record	Source	Likelihood of Occurrence	Habitat	Rationale
Thelymitra jonesii	Sky-blue Sun-orchid	Rare				NVA	Low	Occurs In moist coastal heath on sandy to peaty soils and in *Eucalyptus obliqua* forest in deep loam soil over dolerite	No records from study area and no suitable habitat.

Appendix 3 Likelihood of occurrence tables for Victoria

Terms

Likelihood of occurrence	DELWP Advisory list	FFG Act	EPBC Act	Protected Matters Search Tool
FLORA **Present**: Recorded within the study area in the last ten years. **High**: High likelihood of occurrence. Recent records of the species in the local vicinity (i.e. within the last 10 years); and/or, the study area contains high quality suitable habitat. **Moderate**: Moderate likelihood of occurrence. Previous records of the species in the local vicinity; and/or, the study area contains moderate quality suitable habitat. **Low:** Low likelihood of occurrence. Limited previous records of the species in the local vicinity; and/or, the study area contains poor or limited habitat. May also be considered low if other environmental factors, such as the fragmented or isolated nature of the habitat, are present. **None**: No suitable habitat and/or outside species range. **FAUNA** **Present:** Known resident of the study area based on site observations, recent database records (i.e. within last ten years) or expert advice. **High**: Recent records of the species in the local vicinity (i.e. within the last 10 years); and/or, the study area contains high quality or critical/ preferred habitat. **Moderate**: Previous records of the species in the local vicinity; and/or, the study area contains moderate quality or seasonal habitat. **Low**: Limited previous records of the species in the local vicinity; and/or, the study area contains habitat the species may use opportunistically or en-route to areas of preferred habitat. **None**: No suitable habitat and/or outside species range.	**ex:** Extinct **rx:** Regionally extinct **ew:** Extinct in the wild **en:** Endangered **vu:** Vulnerable **nt:** Near threatened r: Rare **k:** Poorly known **dd:** Data deficient	**L:** Listed **N:** Nominated **X:** Rejected **I:** Invalid or ineligible **D:** Delisted	**EX:** Extinct **CR:** Critically endangered **EN:** Endangered **VU:** Vulnerable **CD:** Conservation dependent	**PMST-K:** Species or species habitat known to occur within area **PMST-L**: Species or species habitat likely to occur within area **PMST-M:** Species or species habitat may occur within area **PMST-F**: Foraging, feeding or related behaviour likely to occur within area

Table 3A. Significant fauna (Victoria)

Scientific name	Common name	Advisory list	FFG	EPBC	EPBC Migratory	Count (sum)	Last record	Source	Likelihood of Occurrence	Habitat	Rationale (with location)
Accipiter novaehollandiae	Grey Goshawk	vu	L			9	13/03/2017	VBA	Moderate	Mainly wet forests in the Otway Ranges but also woodlands, dry forests, and farmland in the Strzelecki Ranges, Gippsland Plains and Otway Plains.	Suitable foraging habitat along Morwell River and recent records nearby.
Actitis hypoleucos	Common Sandpiper	vu			Ma, Mi	2	2/12/2006	VBA	Moderate	Occurs in a wide range of inland and coastal wetlands. Mainly associated with estuaries and large coastal mudflats.	Muddy edges at cooling pond, small wetlands, and flooded pasture may be used intermittently as foraging habitat.
Ceyx azureus	Azure Kingfisher	nt				11	20/02/2017	VBA	Moderate	Well-vegetated wetlands, estuaries, mangroves, lakes, and waterways where waters are slow flowing.	Suitable foraging habitat along Morwell River and other waterways, and recent records nearby.

Scientific name	Common name	Advisory list	FFG	EPBC	EPBC Migratory	Count (sum)	Last record	Source	Likelihood of Occurrence	Habitat	Rationale (with location)
Antechinus minimus maritimus	Swamp Antechinus	nt	L	VU		3	17/05/1980	VBA	Moderate	Mainly occurs in damp areas with dense vegetation at about 1−2 m above ground level, including dense wet heathlands, tussock grasslands, sedgelands, damp gullies, swamps and some shrubby woodlands. Found in Coastal Victoria as far east as Wilson's Promontory.	Potential occurrence in larger patches of native woodlands and forests near coast.
Anthochaera phrygia	Regent Honeyeater	ce	L	EN	Ma	0	na	PMST	None	Mainly occurs in box-ironbark forests and woodlands in northern Victoria.	Outside species primary range.
Apus pacificus	Fork-tailed Swift				Ma, Mi	NA	NA	PMST	Low	Primarily an aerial species which forages in flight and may occasionally land.	Modelled distribution. Primarily an aerial species which occasionally lands. Unlikely to significantly use the study area.
Arctocephalus forsteri	Long-nosed Fur Seal	vu				1	1/10/1925	VBA	None	Coastal and continental shelf waters in southern Australia.	Historical records only.
Ardea ibis	Cattle Egret			Ma				PMST	Moderate	Widespread in south-eastern Australia. Found in grasslands, farmland, woodlands and wetlands. Often occurs with cattle and other stock.	Modelled distribution. Suitable habitat within farmland throughout the study area.
Ardea modesta	Eastern Great Egret	vu	L			115	05/12/2011	VBA	Moderate	Widespread in Australia. Inhabits swamps and marshes, grasslands, margins of rivers and lakes, salt pans, estuarine mudflats and other wetland habitats.	Most records are associated with more heavily vegetated wetlands although one record is associated with the nearby Hazelwood Cooling Pond. This species may infrequently use Eel Hole Creek or when flooded, agricultural land, and vegetated margins of waterways within study area.
Ardea intermedia plumifera	Plumed Egret	en	L			6	4/07/1981	VBA	Moderate	Mostly an inhabitant of the shallows in terrestrial wetlands, and prefers freshwater swamps, billabongs, floodplains and wet grasslands with dense aquatic vegetation. It is only occasionally seen in estuarine or intertidal habitats.	Potentially suitable habitat along watercourses and small waterbodies within study area.
Arenaria interpres	Ruddy Turnstone	vu				2	28/01/2005	VBA	Low	Widespread within Australia during its non-breeding period of the year. It is found in most coastal regions, with occasional records of inland populations. It strongly prefers rocky shores or beaches where there are large deposits of rotting seaweed.	Only moderate levels of seaweed and no rocky platforms within study area at Waratah Bay beach.
Aythya australis	Hardhead	vu				166	19/11/2018	VBA	Moderate	Found in freshwater swamps and wetlands and occasionally in sheltered estuaries. They are rarely seen on land and tend to roost on low branches and stumps near the water. They prefer deep, fresh open water and densely vegetated wetlands for breeding.	Potentially suitable habitat in waterbodies with deep water and dense reed beds in the study area.

Scientific name	Common name	Advisory list	FFG	EPBC	EPBC Migratory	Count (sum)	Last record	Source	Likelihood of Occurrence	Habitat	Rationale (with location)
Biziura lobata	Musk Duck	vu				25	05/12/2011	VBA	Moderate	Found in south-western and south-eastern mainland Australia and Tasmania. Inhabits terrestrial wetlands, estuaries and sheltered inshore waters, preferring deep water with plenty of aquatic vegetation.	Potential suitable habitat in waterbodies with deep water and dense reed beds in the study area.
Botaurus poiciloptilus	Australasian Bittern	en	L	EN		3	28/06/2003	VBA	Moderate	Coastal and sub-coastal areas in extreme south-western mainland Australia, south-eastern mainland Australia and Tasmania. Inhabits wetlands and swamps with tall aquatic vegetation. Occasionally occurs in rice fields and saltmarshes.	Potential habitat at Morwell River. Records from large wetland upstream of the Morwell River
Calamanthus pyrrhopygius	Chestnut-rumped Heathwren	vu	L			3	24/12/1998	VBA	Moderate	The South Eastern Australian subspecies (*Hylacola pyrrhopygia pyrrhopygia*) is found on the seaward and inland side of the Great Dividing Range. It inhabits heathlands and woodlands with dense shrub and ground-layer vegetation and is most commonly found in rocky areas.	Potential occurrence in areas of dense shrub cover.
Calidris acuminata	Sharp-tailed Sandpiper				Ma, Mi	0	na	PMST	Moderate	Widespread in most regions of Victoria, especially in coastal areas. Inhabits shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation.	Potential suitable habitat along waterways and smaller wetlands/waterbodies. High-energy beach at Waratah Beach not optimal habitat but may be used occasionally.
Calidris alba	Sanderling	nt			Ma, Mi	11	21/03/2008	VBA	High	Widespread records occur between Venus Bay and the Bellarine Peninsula. Inhabits coastal areas on low beaches of firm sand, near reefs and inlets, along tidal mudflats and lagoons; rarely recorded in near-coastal wetlands.	Observed at Waratah Bay within study area.
Calidris canutus	Red Knot	en		EN	Ma, Mi	1	19/10/1980	VBA	Moderate	Common in all the main suitable habitats around the coast of Australia. Intertidal mudflats, sandflats sheltered sandy beaches, estuaries, bays, inlets, lagoons, harbours, sandy ocean beaches, rock platforms, coral reefs, terrestrial saline wetlands near the coast, sewage ponds and saltworks. Rarely inland lakes or swamps.	Potential habitat at Waratah beach. High-energy beach at Waratah beach not optimal habitat but may be used occasionally.
Calidris ferruginea	Curlew Sandpiper	en			Ma, Mi	11	21/03/2008	VBA	Low	In Victoria, they are widespread and common in coastal bays and inlets and are widespread in near-coastal wetlands, and inland in suitable habitats such as the Kerang area, Mildura, and western districts. They inhabit Littoral and estuarine habitats, including intertidal mudflats, non-tidal swamps, lakes and lagoons on the coast and sometimes inland.	High-energy beach at Waratah Beach not optimal habitat and few recent records in landscape.

Scientific name	Common name	Advisory list	FFG	EPBC	EPBC Migratory	Count (sum)	Last record	Source	Likelihood of Occurrence	Habitat	Rationale (with location)
Calidris ruficollis	Red-necked Stint				Ma, Mi	NA	NA	PMST	High	Coastal species which occurs in sheltered inlets, bays, lagoons, estuaries, intertidal mudflats and protected sandy or coralline shores. Occasionally occur in saltworks, sewage farms, saltmarsh, shallow wetlands, lakes, swamps, riverbanks, dams, flooded paddocks or damp grasslands.	Modelled distribution. Recent historical records at Waratah Bay.
Calidris tenuirostris	Great Knot	en	L	CE	Ma, Mi	NA	NA	PMST	Low	Nonbreeding migratory species that occurs in intertidal mudflats and sandflats in sheltered coasts, including bays harbours and estuaries.	Modelled distribution. No historical records within 50 km of the study area.
Calyptorhynchus lathami	Glossy Black-Cockatoo	vu	L			2	31/08/1974	VBA	Low	Most Victoria records occur in East Gippsland. Open forest and woodlands of the coast and the Great Dividing Range where stands of sheoak occur.	Historical records only. Unlikely to be significant areas of habitat within survey area.
Cercartetus nanus	Eastern Pygmy-possum	nt				3	27/03/2000	VBA	Moderate	Found in South-eastern mainland Australia and Tasmania. Occupies rainforest, sclerophyll forest (including Box-Ironbark), woodland and heath.	Potentially suitable habitat present in forested blocks between Mirboo and Hazelwood and patches of forest near Waratah Bay.
Charadrius bicinctus	Double-banded Plover				Mi	0	na	PMST	Moderate	Found in both coastal and inland areas on coastal beaches, mudflats, sewage farms, riverbanks, fields, dunes, upland tussock grasses and shingle.	Suitable habitat present at coastal landfall.
Charadrius leschenaultii	Greater Sand Plover	ce		VU	Ma, Mi	1	28/03/1984	VBA	Moderate	In Southern Australia it is mostly recorded in Corner Inlet, Western Port and Port Phillip Bay in Victoria. The species is almost entirely coastal, inhabiting littoral and estuarine habitats. They mainly occur on sheltered sandy, shelly or muddy beaches with large intertidal mudflats or sandbanks, as well as sandy estuarine lagoons, and inshore reefs, rock platforms, small rocky islands or sand cays on coral reef.	Potential habitat at Waratah beach. High-energy beach at Waratah beach not optimal habitat but may be used occasionally.
Charadrius mongolus	Lesser Sand Plover	cr	L		Ma, Mi	0	na	PMST	Moderate	Widespread in coastal regions within Australia. This species usually occurs in coastal littoral and estuarine environments. It inhabits large intertidal sandflats or mudflats in sheltered bays, harbours and estuaries, and occasionally sandy ocean beaches, coral reefs, wave-cut rock platforms and rocky outcrops. It also sometime occurs in short saltmarsh or among mangroves.	Potential habitat at Waratah beach. High-energy beach at Waratah beach not optimal habitat but may be used occasionally.
Charadrius ruficapillus	Red-capped Plover				Ma		na	PMST	Moderate	Widespread throughout Australia. Inhabits sandy beaches, saltmarshes, and saline wetlands and lakes.	Suitable habitat present at Waratah Beach.

Scientific name	Common name	Advisory list	FFG	EPBC	EPBC Migratory	Count (sum)	Last record	Source	Likelihood of Occurrence	Habitat	Rationale (with location)
Chelodina longicollis	Eastern Snake-necked Turtle	dd				4	1/12/2014	VBA	High	Widespread through drainage systems in eastern mainland Australia. It inhabits coastal and inland waterways, including freshwater swamps, billabongs, lagoons and slow-flowing rivers and creeks.	Records are associated with a wetland section upstream on Morwell River. Suitable habitat along intersecting waterbodies.
Chlidonias hybridus	Whiskered Tern	nt				2	9/04/1951	VBA	Low	Found throughout mainland Australia, except for central arid regions. Inhabits shallow freshwater wetlands and swamps, saline and brackish lakes, also in irrigated croplands.	No recent records and unlikely to be suitable habitat.
Chlidonias leucopterus	White-winged Black Tern	nt				1	27/04/2019	VBA	Moderate	Non-breeding migrant to Australia. Recorded in Port Phillip Bay, in Western Districts, Mid-Murray Valley and very occasionally in Gippsland. Inhabits tidal wetlands such as bays, estuaries and lagoons or sub-coastal terrestrial wetlands including swamps, lakes, rivers and reservoirs. Forages aerially over wetlands but roosts on the wetland edge.	Suitable habitat present along a tributary north of Waratah Beach. Recent record associated with Shallow Marine Coastal Inlet.
Cinclosoma punctatum	Spotted Quail-thrush	nt				3	6/06/1979	VBA	Low	Inhabits dry and moist forests, especially on rocky slopes with some grass tussocks and fallen timber, but also in undulating, gravelly box-ironbark forests.	No recent records but potential for suitable to be present in Mirboo section.
Circus assimilis	Spotted Harrier	nt				3	12/05/2013	VBA	Moderate	Widespread but sparsely distributed in mainland Australia. Grassy open woodland, inland riparian woodland, grassland, shrub steppe, agricultural land and edges of inland wetlands.	Suitable habitat present along watercourses and adjacent open grassy vegetation.
Climacteris affinis	White-browed Treecreeper	vu	L			1	19/10/2004	VBA	Moderate	Habitat includes grassy open woodland, inland riparian woodland, grassland, shrub steppe, agricultural land and edges of inland wetlands. In Victoria, White-browed Treecreepers are restricted to localised populations in regenerating native pine (*Callitris* spp.) and/or Buloke (*Allocasuarina luehmannii*) and Belah (*Casuarina pauper*) woodlands, or in fairly dense thickets of smaller shrubs, including Sugarwood (*Myoporum platycarpum*), Weeping Pittosporum (*Pittosporum phillyraeoides*), Small Cooba (*Acacia ligulata*), Umbrella Wattle (*A. osswaldii*) and Slender Hopbush *(Dodonaea viscosa*) spp.	Potential for areas of suitable habitat to be present in Mirboo and Waratah Bay section.
Dasyurus maculatus maculatus	Spot-tailed Quoll	en	L	EN		2	1/08/1962	VBA	Low	In Victoria, locations include East Gippsland, the Strzelecki Range, and Wilson's Promontory NP. In inhabits rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline.	Limited potential for occurrence in Mirboo Forest and coastal forest patches.

Scientific name	Common name	Advisory list	FFG	EPBC	EPBC Migratory	Count (sum)	Last record	Source	Likelihood of Occurrence	Habitat	Rationale (with location)
Dasyurus viverrinus	Eastern Quoll	re	L	EN		1	2/01/1900	VBA	None	The species now survives in several discrete areas of Victoria, including eastern Victoria (including north-eastern Victoria and lowland East Gippsland) and South Gippsland, in the Strzelecki Ranges. It inhabits Dry sclerophyll forest, scrub, heathland and cultivated land.	Regionally extinct.
Diomedea antipodensis	Antipodean Albatross				Mi	0	na	PMST	None	The Antipodean Albatross is endemic to New Zealand, but forages widely in open water in the south-west Pacific Ocean, Southern Ocean and the Tasman Sea. It is marine, pelagic and aerial.	Oceanic species, no suitable habitat.
Dromaius novaehollandiae	Emu	nt				7	14/02/2002	VBA	Low	They are found across most of Victoria, although they avoid densely populated areas and are generally absent from the central district. Its main habitats are sclerophyll forest and savanna woodland. These birds are rarely found in rainforest or very arid areas.	Nomadic species that is unlikely to make significant use of the study area.
Egretta garzetta	Little Egret	en	L			11	25/03/2005	VBA	Moderate	Found mainly in coastal and inland areas of northern, eastern and south-eastern Australia. It frequents tidal mudflats, saltwater and freshwater wetlands, and mangroves.	Suitable foraging habitat associated with waterbodies.
Engaeus hemicirratulus	Gippsland Crayfish	Burrowing	en			5	25/07/2017	VBA	Moderate	Occurs in south and central Gippsland in soils with a heavy clay component in wet or seepage areas. They can inhabit burrows that are not reliant on the water table and are also found some distance from a watercourse, e.g., on hillslopes.	Potential for suitable habitat where clay soils are present and several recent records.
Engaeus phyllocercus	Narracan Crayfish	Burrowing	en	L		12	4/02/2011	VBA	High	Occurs in the Warragul and Narracan districts. Typically found in the flood-bed regions of ferny gullies in wet sclerophyll forest and on creek banks.	Potential for suitable habitat to be present in Mirboo section and recent records locally.
Engaeus rostrogaleatus	Strzelecki Crayfish	Burrowing	en	L		6	8/06/1999	VBA	Low	Has a very restricted distribution along a 30 km section of the Eastern Strzelecki Ranges in South Gippsland at high altitudes generally above 400 m. Typically found in the flood-bed regions of ferny gullies in wet sclerophyll forest and on creek banks.	Study area outside known distribution. No streams with suitable vegetation e.g., mountain ash and tree ferns in study area.
Eretmochelys imbricata	Hawksbill Turtle			VU	Ma, Mi	2	21/06/2006	VBA	Low	In Victoria, likely to occur as far west as Bemm River. Marine, pelagic for first the 5 - 10 years, then found in tropical tidal and sub-tidal coral and rocky reef habitat.	Likely to be entirely restricted to waters off Waratah Bay.

Scientific name	Common name	Advisory list	FFG	EPBC	EPBC Migratory	Count (sum)	Last record	Source	Likelihood of Occurrence	Habitat	Rationale (with location)
Euastacus neodiversus	South Gippsland Spiny Crayfish	en	L			1	23/03/2012	VBA	Low	Occurs at Wilsons Promontory and the southern side of the Strzelecki Ranges. The species occurs in streams in sclerophyll forest where the streamside vegetation is dominated by Mountain Ash (*Eucalyptus regnans*), tree ferns (*Cyathea* spp) and Lilly Pilly (*Acmena smithii*).	Restricted to southern section of the Strzelecki Ranges and wet sclerophyll forest and coastal heath.
Falco hypoleucos	Grey Falcon	en	L	VU		NA	NA	PMST	Low	Primarily occurs inland in arid areas but can occur elsewhere in Australia. Prefers lightly timbered woodland and Acaica scrub.	Modelled distribution. Wide ranging but rare species. Limited historical records near the study area.
Falco subniger	Black Falcon	vu	N			8	30/01/2007	VBA	Moderate	Sparsely spread across most of Victoria. Inhabits woodland, shrubland and grassland, especially riparian woodland and agricultural land. It is often associated with streams or wetlands.	Suitable foraging habitat and recent records nearby.
Galaxiella pusilla	Dwarf Galaxis	en	L	VU		2	26/03/2012	VBA	Moderate	Occurs from the Mitchell River Basin in Central Gippsland, Victoria, to the Cortina Lakes, near the Coorong in South Australia. Typically occurs in well vegetated slow flowing, still, shallow temporary or permanent freshwater habitats including swamps, drains and backwaters of streams and creeks. Some wetlands be may partially or completely dry during summer.	Suitable habitat associated with rivers and creeks. Recent records further upstream.
Gallinago hardwickii	Latham's Snipe	nt		Ma, Mi		31	17/11/2014	VBA	Moderate	Found in all regions of Victoria except for the north-west. Occupies a range of habitats, though usually found in open freshwater wetlands with low, dense vegetation; including freshwater swamps, flooded grasslands or heathlands. Also occurs in modified habitats such as pasture, irrigation channels, drainage ditches and near human activity e.g. roadsides and railways.	Suitable foraging habitat and recent records nearby.
Gallinago megala	Swinhoe's Snipe			Mi			na	PMST	Low	Few definite records occur in Australia, but potential habitat occurs along much of the coast of Victoria. In Australia the species is found around edges of fresh and brackish wetlands. This includes swamps, billabongs, river pools, small streams and sewage ponds. They are also found in drying claypans and inundated plains.	No recent records and suboptimal habitat present.
Gallinago stenura	Pin-tailed snipe			Ma	NA	NA	NA	PMST	Low	Cryptic shorebird of wetlands, wet meadows, and both flooded and dry agricultural fields. Looks very similar to other snipe species.	Modelled distribution. Uncommon species in Victoria. Unlikely to use the study area.

Scientific name	Common name	Advisory list	FFG	EPBC	EPBC Migratory	Count (sum)	Last record	Source	Likelihood of Occurrence	Habitat	Rationale (with location)
Gelochelidon nilotica macrotarsa	Gull-billed Tern	en	L			3	26/07/1987	VBA	Moderate	Records for this species occur near much of the coast of Victoria. Known to inhabit freshwater swamps, brackish and salt lakes, beaches and estuarine mudflats, floodwaters, sewage farms, irrigated croplands and grasslands.	No recent records. May infrequently use the study area for foraging.
Grantiella picta	Painted Honeyeater	vu	L	VU		NA	NA	PMST	Low	Prefers forest/woodland, riparian woodlands of black box and river red gum, box-ironbark-yellow gum woodlands with mistletoe a high number of mature trees. Also occurs in acacia-dominated woodlands, paperbarks, casuarinas, callitris, and trees on farmland or gardens.	Modelled habitat. Strong holds for this species are in north-east and central Victoria. Very low number of historical records near the study area.
Haematopus fuliginosus	Sooty Oystercatcher	nt				28	11/03/2015	VBA	High	Occurs along the entire coast of Victoria. It prefers rocky shores but can be seen on coral reefs or sandy beaches near mudflats.	Suitable habitat at Waratah Bay and recent records.
Haliaeetus leucogaster	White-bellied Sea-Eagle	vu	L		Ma, Mi	24	23/01/2018	VBA	Moderate	Distributed along the coastline of mainland Australia and Tasmania. In eastern Australia it also extends inland along some of the larger waterways. Occurs near freshwater swamps, rivers, lakes, reservoirs, billabongs, saltmarsh and sewage ponds and coastal waters. Terrestrial habitats include coastal dunes, tidal flats, grassland, heathland, woodland, forest and urban areas.	Suitable foraging habitat along Morwell River and Waratah Bay and recent records nearby.
Heteroscelus brevipes	Grey-tailed Tattler	CR					na	PMST	Low	The species is rarely recorded in Victoria, but sightings have been reported in Gippsland and east of McLaughlans Beach. The largest populations in Victoria are located at Corner Inlet, west to Westernport and Port Phillip Bays. Often found on sheltered coasts with reefs and rock platforms or with intertidal mudflats. It can also be found at intertidal rocky, coral or stony reefs as well as platforms and islets that are exposed at low tide.	No recent records in study area and suboptimal habitat.
Hieraaetus morphnoides	Little Eagle	vu	L			21	10/08/2014	VBA	Moderate	Widespread species. Occurs primarily in wooded farmland and dry woodlands.	Suitable habitat along the whole route alignment. Particularly areas of open woodland and farmland. Unlikely to use dense forest.
Hirundapus caudacutus	White-throated Needletail	vu			Ma, Mi	106	04/08/2014	VBA	High	Widespread in Victoria. Occur most often over open forest and rainforest, as well as heathland, and remnant vegetation in farmland.	An aerial species that may make use of the study area for foraging. Areas of remnant heathland vegetation in south.

Scientific name	Common name	Advisory list	FFG	EPBC	EPBC Migratory	Count (sum)	Last record	Source	Likelihood of Occurrence	Habitat	Rationale (with location)
Hydroprogne caspia	Caspian Tern	nt	L			7	19/08/2007	VBA	Moderate	Occurs in most coastal regions of Victoria. Three significant regular breeding colonies are known in Victoria: Corner Inlet, Mud Island in Port Philip Bay and Mallacoota. Found near coastal offshore waters, beaches, mudflats, estuaries, rivers and lakes.	Suitable habitat at Waratah Bay beach and recent records.
Isoodon obesulus obesulus	Southern Brown Bandicoot	nt	L	EN		6	30/03/1978	VBA	Low	Primarily distributed in coastal regions in Victoria. Distribution of this subspecies includes the East Gippsland Lowlands, Gippsland Plain (Western section) and Wilson's Promontory. Inhabits heath or open forest with a heathy understorey on sandy or friable soils with dense ground cover and adjacent open areas for foraging.	No recent records nearby and unlikely to be suitable habitat present.
Ixobrychus dubius	Australian Little Bittern	en	L			2	19/11/2018	VBA	Moderate	East of Melbourne, isolated records occur near Marthavale and the Lake Curlip Wildlife Reserve. Mainly found in dense emergent vegetation in freshwater wetlands, especially in reedbanks and Typha, as well as in inundated shrub thickets; can occur in small wetlands.	Suitable habitat associated with cooling pond and may occur in small wetlands and vegetated waterways.
Larus pacificus	Pacific Gull	nt				78	12/02/2015	VBA	High	Distributed along the entire coast of Victoria. Prefers sandy or, less often, rocky coasts and sandy beaches. In eastern Australia, the Pacific Gull prefers areas that are protected from ocean swells such as estuaries, bays and harbours.	Suitable habitat at Waratah Bay beach and recent records.
Lathamus discolor	Swift Parrot	en	L	CR		2	1/01/1977	VBA	Low	A non-breeding winter migrant to the mainland from Tasmania. In Victoria, the over-wintering habitat of the Swift Parrot is eucalypt forests and woodlands consisting primarily of the winter-flowering Grey Box (*Eucalyptus microcarpa*), Red Ironbark (*Eucalyptus tricarpa*), Mugga Ironbark (*Eucalyptus sideroxylon*) (far north-east Victoria), Yellow Gum (*Eucalyptus leucoxylon*) and White Box (*Eucalyptus albens*).	No recent records. May infrequently use the study area for foraging.
Lewinia pectoralis	Lewin's Rail	vu	L			10	19/11/2018	VBA	Moderate	Found along the south east and eastern seaboard west to Kangaroo Island. Occupies dense cover (reeds, saltmarsh, tussocks) of coastal and near coastal wetlands; also wetlands in rainforests, woodlands and heathlands.	Potential habitat associated with vegetated waterbodies, waterways, and forests and woodland patches.
Limosa lapponica	Bar-tailed Godwit				Mi		na	PMST	Moderate	Widespread along the coast of Victoria; a few records inland. Inhabits intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons, bays, seagrass beds, saltmarsh, sewage farms and saltworks, saltlakes and brackish wetlands near coasts,	Suitable habitat at Waratah Bay beach and recent records.

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										sandy ocean beaches, rock platforms, and coral reef-flats. Rarely inland wetlands, paddocks and airstrips.	
Lissolepis coventryi	Swamp Skink	vu	L			1	13/11/2007	VBA	Moderate	Inhabits densely vegetated, wet environments throughout south-east Australia, including swamp margins, tea-tree thickets and tidal salt marshes.	Potentially suitable habitat associated with small Swamp Scrub remnants, swamps, and drains in low-lying areas.
Litoria aurea	Green and Golden Bell Frog	vu	R	VU		NA	NA	PMST	Low	Occurs in isolated coastal lowland areas in Gippsland, Victoria. Its southern most point is near Lake Wellington, west of Lakes Entrance. Prefers undisturbed habitats in the coastal plains and low foothills including lowland forest, Banksia woodland, wet heathland, riparian scrub complex, riparian forest, damp forest, shrubby forest, limestone box woodland but can also occur in cleared farmland (DEWHA, 2009). Breeding occurs in permanent and ephemeral ponds.	Modelled habitat. Species distribution is concentrated north of Sale in Victoria. No records near the study area.
Litoria raniformis	Growling Grass Frog	en	L	VU		29	15/11/2010	VBA	Moderate	Distributed across Victoria and absent from the north-west corner of the state and alpine areas. Previously widespread, the species persists in isolated populations including in the greater Melbourne area, south-west of Victoria, central Victoria and Gippsland. Inhabits still or slow-moving wetland systems such as lagoons, swamps, lakes and ponds with grassland habitat and emergent vegetation. Also found in farm dams, irrigation channels and disused quarries.	Recent records nearby and within study area. May occur in permanent and ephemeral waterbodies across the study area.
Macronectes giganteus	Southern Giant-Petrel	vu	L	EN	Ma, Mi	1	31/08/1974	VBA	None	The Southern Giant-Petrel is a marine species. Over summer, the species nests in small colonies amongst open vegetation on Antarctic and subantarctic islands. It can be seen off the coast of Victoria during the non-breeding season.	Oceanic species. No suitable habitat present.
Mastacomys fuscus mordicus	Broad-toothed Rat	en				0	na	PMST	None	Found in the alpine and subalpine heathlands of Victoria and southern NSW. In southern Victoria, the species occupies dense undergrowth in wet sedgelands.	No suitable vegetation types in study area.
Melanodryas cucullata	Hooded Robin	nt	L			1	12/06/1999	VBA	Low	Found all over mainland Australia. Inhabits lightly timbered woodland usually dominated by acacia and/or eucalypts.	No large native woodlands in study area.

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Merops ornatus	Rainbow Bee-eater			Ma		NA	NA	PMST	Moderate	Widespread within Australia, although southern populations migrate north from February and return in September. Often occurs in open forest, woodlands and shrublands near water. May also occur in wooded farmland, quarries and orchards.	Modelled distribution. May occasionally use wooded farmland and roadside vegetation throughout the study area.
Miniopterus schreibersii GROUP	Common Bent-wing Bat		L			3	18/12/1971	VBA	Low	Two subspecies in Victoria: M. s. *oceanensis* occurs along the east coast of Australia from Cape York to southern Victoria; M. s. *bassanii* is found in south-west Victoria and south-east South Australia. The species inhabits rainforest, wet and dry sclerophyll forest, monsoon forest, open woodland, paperbark forests and open grassland.	No recent records and only occasional use is likely.
Monarcha melanopsis	Black-faced Monarch				Ma, Mi	0	na	PMST	Low	In Victoria, it is largely confined to east Gippsland, where it is widespread south of 37 °S, and west to around the Mitchell River National Park. Mainly associated with rainforest habitats but may also occur in open eucalypt forests, dry sclerophyll forests and woodlands, gullies in mountain areas or coastal foothills, Brigalow scrub, coastal scrub, mangroves, parks and gardens.	Suboptimal habitat may be present in the AoD but no recent records in the survey area.
Motacilla flava	Yellow Wagtail				Ma, Mi	NA	NA	PMST	Low	Nonbreeding migratory species. Occurs in grassland habitat subject to inundation.	Modelled distribution. Migratory species within limited records across Victoria. Species is wide ranging but rare.
Myiagra cyanoleuca	Satin Flycatcher			VU	Ma, Mi	0	na	PMST	Moderate	In Victoria, the species is widespread in the south and east. Inhabits eucalypt-dominated forests, especially near wetlands, watercourses, and heavily vegetated gullies.	Suitable habitat represented in survey area.
Myrmecia sp. 17	Bullant	vu	L			1	20/02/2002	VBA	Moderate	Ants of this genus prefer to inhabit grasslands, forests, heath, urban areas and woodland. Nests are found in Callitris forest, Eucalyptus woodland and forests, Mallee scrub, in paddocks, riparian woodland, and wet and dry sclerophyll forests. They also live in dry sandplains and coastal plain.	Recent records nearby and suitable forest woodland habitat present.
Nannoperca sp. 1	Flinders Pygmy Perch	vu				31	15/06/2005	VBA	High	Records occur from eastern Victoria as far west as the Latrobe River. Typically occurs in lakes, ponds and slow-flowing rivers.	Many records associated with Morwell River and potential for suitable habitat within rivers and creeks within the AoD.

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Neophema chrysogaster	Orange-bellied Parrot	CR		CR	Ma, Mi	0	na	PMST	Low	Breeds in Tasmania and migrates in autumn to spend the winter on the mainland coast of south-eastern SA and southern Victoria. Winter habitat is mostly within 3 km of the coast in sheltered bays, lagoons, estuaries, coastal dunes and saltmarshes. Also occurs on small islands and peninsulas, saltworks, golf courses, low samphire herbland and taller coastal shrubland.	Narrow band of suboptimal habitat present at Waratah Bay.
Ninox connivens	Barking Owl	en	L			5	27/06/2005	VBA	Moderate	It is estimated that there are only 50 pairs left in Victoria. Inhabits woodland and open forest, including fragmented remnants and partly cleared farmland, wetland and riverine forest.	Suitable foraging habitat along rivers and creeklines and larger forest patches. Recent records nearby.
Ninox strenua	Powerful Owl	vu	L			32	27/12/2018	VBA	Moderate	Occurs mainly on the eastern side of the Great Dividing Range. Inhabits open forests and woodlands, as well as sheltered gullies in wet forests with dense understoreys, especially along watercourses. Occasionally found in open areas near forests such as farmland, parks and suburban areas and remnant bushland patches. Needs old growth trees to nest.	Suitable foraging habitat along rivers and creek lines associated with larger areas of native forests and woodlands. Recent records nearby.
Numenius madagascariensis	Eastern Curlew	vu		CR	Ma, Mi	15	05/12/2008	VBA	Moderate	A summer migrant to Australia. Inhabit Estuaries, bays, harbours, inlets and coastal lagoons, intertidal mudflats or sandflats, ocean beaches, coral reefs, rock platforms, saltmarsh, mangroves, freshwater/brackish lakes, saltworks and sewage farms.	Marginal habitat at Waratah Bay beach and recent records. May make infrequent use.
Numenius minutus	Little Curlew				Ma, Mi	NA	NA	PMST	Low	Migratory species which is widespread in northern Australia and scattered elsewhere. Occurs in wetlands and inundated grassy areas such as farmland and airfields.	Modelled distribution. Uncommon in Victoria. No historical records near the study area.
Numenius phaeopus	Whimbrel	vu			Ma, Mi	1	30/01/2007	VBA	Low	In Victoria it is commonly found at Corner Inlet, Westernport and Port Phillip Bays. Inhabits estuaries, mangroves, tidal flats, coral cays, exposed reefs, flooded paddocks, sewage ponds, grasslands, sports fields and lawns.	Marginal habitat at Waratah Bay beach and recent records. May make infrequent use.
Nycticorax caledonicus	Nankeen Night Heron	nt				25	19/11/2018	VBA	Moderate	Found throughout Australia, wherever there is permanent water. Roosts by day in large groups of leafy trees, typically near water, and disperses at night to forage in shallow fresh to (less commonly) saline water. Capable of colonising remote temporary wetlands when flooded.	Suitable foraging habitat along rivers and creek lines. Recent records nearby.

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Ornithorhynchus anatinus	Platypus	vu	L			13	5/02/2017		High	Prefers well vegetated freshwater creeks, slow-moving rivers, lakes joined by rivers, and built water storages such as farm dams. Builds burrows into riverbanks among tree roots.	Suitable habitat within creeks and rivers along the whole alignment. Recent records occur at Fish Creek, Mirboo North and Morwell River.
Oxyura australis	Blue-billed Duck	en	L			22	19/11/2018	VBA	Moderate	Widely distributed in Victoria; most large populations occur in northern and western Victoria. The species inhabits stable, deep, fresh well-vegetated wetlands for much of the year. These swamps often contain rushes or sedges, but lignum *Meuhlenbeckia* spp. or Melaleuca swamps are also used. In winter, flocks congregate on large, open, fresh to saline wetlands, including artificial areas such as sewage ponds.	A widely distributed species which has been recorded in the search region. Sub-optimal habitat, however, may make use of waterbodies in the north of the study area. .
Pachyptila turtur	Fairy Prion	vu				2	1/10/1978	VBA	None	A marine species. Often beachcast on the south-eastern coast of Australia and are commonly seen offshore over the continental shelf and over pelagic waters. Found in temperate and subantarctic seas. It sometimes forages over continental shelves and the continental slope but can come close inshore in rough weather.	Marine species, no suitable habitat.
Pandion haliaetus	Osprey				Ma, Mi	0	na	PMST	Moderate	Marine bird. The species is a rare vagrant in Victoria. It inhabits rocky shorelines, islands, reefs, mouths of large rivers, lagoons and lakes.	May make use of the shoreline at Waratah Beach. .
Pelecanoides urinatrix	Common Diving-Petrel	nt				1	31/08/1974	VBA	None	A marine species. Frequents coastal waters, mostly over depths of 50-180 m.	Restricted to marine environment
Petauroides volans	Southern Greater Glider	vu	L	VU		66	16/07/2018	VBA	High	Restricted to eastern Australia; in Victoria, occurs as far west as the Wombat State Forest. Typically found in highest abundance in taller, montane, moist eucalypt forests with relatively old trees and abundant hollows.	Numerous records near study area. Suitable habitat may be present in larger patches of forest between Mirboo North and Hazelwood in the northern section.
Pezoporus wallicus	Ground Parrot	en	L			3	19/03/1995	VBA	None	In south-central Victoria, it is found in Wilsons Promontory National Park. Further east, it occurs in Gippsland Lakes Coastal Park and, in the far east, in Croajingalong National Park. In Victoria, it inhabits closed coastal heathland and sedgeland. Heathlands are either dominated by graminoids or support a diversity of shrubs.	No suitable habitat present.

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Phalacrocorax fuscescens	Black-faced Cormorant	nt				5	11/02/2004	VBA	None	A marine species that can be seen in southern mainland Australia and Tasmania. It does not occur at terrestrial wetlands and is confined to inshore marine habitats.	No suitable habitat present.
Phalacrocorax varius	Pied Cormorant	nt				29	02/11/2010	VBA	Low	Found throughout mainland Australia. It inhabits marine habitats including estuaries, harbours and bays. It is also found in mangroves and on large inland wetlands in eastern Australia.	May make limited use of study area.
Platalea regia	Royal Spoonbill	nt				43	19/11/2018	VBA	Moderate	Found in shallow freshwater and saltwater wetlands, intertidal mud flats and wet grasslands. Both permanent and temporary inland waters are used when available in the arid zone. Will also use artificial wetlands such as sewage lagoons, salt fields, dams and reservoirs.	Suitable foraging habitat associated with Eel Hole Creek and flooded pasture north of Waratah Bay. Records largely associated with Shallow Inlet.
Plegadis falcinellus	Glossy Ibis	nt			Ma, Mi	1	01/01/1995	VBA	Low	Occasionally seen in eastern Victoria. Requires shallow water and mudflats, so is found in well-vegetated wetlands, floodplains, mangroves and rice fields.	Marginal suitable foraging habitat in rivers and irrigated agricultural fields, however there are no recent records. May make infrequent use of the study area.
Pluvialis fulva	Pacific Golden Plover	vu			Ma, Mi	8	05/12/2008	VBA	Moderate	Recorded at scattered sites in the south-east of Australia. Inhabits estuaries, mudflats, saltmarshes, mangroves, rocky reefs, inland swamps, ocean shores, paddocks, sewage ponds, ploughed land, airfields, playing fields.	Suitable habitat at Waratah Bay beach and recent records.
Porzana pusilla	Baillon's Crake	vu	L			6	23/12/2006	VBA	Moderate	Can be found in south-eastern Australia. Inhabits vegetated wetlands, usually with fresh or brackish water, including swamps, billabongs, lakes and reservoirs and temporarily inundated areas. They often prefer wetlands with floating aquatic vegetation.	Potential suitable habitat associated with Eel Hole Creek, and small wetlands, waterways, and swamps.
Potorous tridactylus	Long-nosed Potoroo	NT		VU		0	na	PMST	Low	In Victoria, the Long-nosed Potoroo (SE Mainland) occurs in six discrete regions (Seebeck 1981), including the South-western region, Grampians, Otways, Western Port, Wilsons Promontory and east Gippsland. Most commonly inhabits heath-woodland grading into heath dominated by *Eucalyptus obliqua* and *E. baxteri*, and sometimes *E. radiata*.	No records in local area and restricted occurrences across the state. Low likelihood of suitable heath habitat being present.
Prototroctes maraena	Australian Grayling	vu	L	VU		20	25/04/2018	VBA	High	Currently occurs in streams and rivers on the eastern and southern flanks of the Great Dividing Range. The species spends part of its lifecycle in freshwater and at least part of the larval and/or juvenile stages in coastal seas. Adults inhabit cool, clear, freshwater streams	Potential occurrence in waterways and recent records.

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										with gravel substrate and areas alternating between pools and riffle zones.	
Pseudalmenus chlorinda zephyrus	Silky Hairstreak Butterfly	vu	X			19	29/09/1950	VBA	Low	Requires old growth habitats with large mature Eucalyptus trees for pupation, *Acacia* sp. in the understory for larval food and the attendant ant species *Anonychomyrma biconvexa*.	Low number of historical records. Has not been recorded in over 60 years. No recent records of required ant species within the surrounding landscape.
Pseudemoia rawlinsoni	Glossy Grass Skink	vu				2	13/05/2008	VBA	Moderate	Found in the alpine regions of north-eastern Victoria and lowland areas in southern Victoria. Inhabits humid and densely vegetated swampy areas such as marshland and the margins of creeks, swamps and lakes.	Recent record nearby. Potential suitable habitat associated with edges of intersecting watercourses.
Pseudomys fumeus	Smoky Mouse	NT		EN		0	na	PMST	Low	In Victoria, known to occur in the south-east highlands area (the Central Highlands and the Victorian Alps) and the East Gippsland lowland area. Inhabits a wide variety of habitats, from heath to dry sclerophyll forest, especially along ridgetops with a heath understorey, and occasionally adjacent wetter habitats such as fern gullies.	Limited suitable records and no recent records.
Pseudomys novaehollandiae	New Holland Mouse	vu	L	VU		NA	NA	PMST	Low	Occurs in isolated sites within coastal plains east of Melbourne and Otway Plains near Anglesea (DSE, 2006). Occurs in heathlands, heathy woodlands, open forests and vegetated sand dunes (DSE, 2006).	Modelled habitat Disjunct species distribution. Nearest isolated historical records are 50 km away from the study area.
Pseudophryne semimarmorata	Southern Toadlet	vu				18	29/05/1977	VBA	High	Occurs in South-Eastern Australia. It can be found in sclerophyll forest, woodland, heaths and grasslands. It is usually found under litter, logs and rocks in damp areas.	Potential suitable woodland habitat and recent records associated with intersecting areas of woodland habitat in southern section near coast.
Pteropus poliocephalus	Grey-headed Flying-fox	vu	L	VU		4	12/04/2006	VBA	Moderate	Found throughout eastern Mainland Australia in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops.	Suitable foraging habitat present.
Rhipidura rufifrons	Rufous Fantail				Ma, Mi	0	na	PMST	Moderate	Found in south and central Victoria in wet sclerophyll forests, subtropical and temperate rainforests. It sometimes inhabits drier sclerophyll forests and woodlands.	Suitable habitat present. Limited to larger patches of forest and woodland and vegetated waterways.
Rostratula australis	Australian Painted-snipe	ce	L	EN	Ma	NA	NA	PMST	Low	Occurs in shallow fresh or brackish wetlands with permanent or semi-permanent water, cover of adjacent grasses and muddy edges. Also occurs in waterlogged grassland, sewage ponds and dams.	Modelled distribution. Limited historical records within 50 km of alignment.

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Saccolaimus flaviventris	Yellow-bellied Sheathtail Bat	dd	L			1	29/10/2018	VBA	Moderate	Occurs in a variety of habitats. Forages above the canopy but can also forage in treeless areas. Requires tree hollows for roosting and nesting.	This species is a rare visitor but may occasionally occur within wooded habitats.
Sminthopsis leucopus	White-footed Dunnart	nt	L			8	17/03/2000	VBA	Moderate	Found throughout south-eastern Australia in coastal dune vegetation, coastal forest, tussock grassland and sedgeland, heathland, woodland and forest.	Potential habitat in larger patches of forest near Waratah Bay.
Spatula rhynchotis	Australasian Shoveler	vu				61	05/12/2011	VBA	Moderate	Found throughout much of Victoria. Prefers permanent, well-vegetated wetlands but will use most freshwater habitats.	May make use of larger waterbodies within study area.
Stagonopleura guttata	Diamond Firetail	nt	L			1	17/12/1998	VBA	Low	Found throughout south-eastern mainland Australia. Inhabits grassy eucalypt woodlands, open forest, Mallee, Natural Temperate Grassland, secondary derived grassland, riparian areas and lightly wooded farmland.	Limited preferred habitat present.
Sterna striata	White-fronted Tern	nt				1	11/05/1986	VBA	Moderate	Occurs in coastal seas and exposed rocky coasts, often with islands or stacks; sometimes roosts on sandy beaches of sheltered coasts.	Suitable habitat at Waratah Bay beach and recent records.
Sternula albifrons	Little Tern	vu	L		Mi	3	08/07/2000	VBA	Moderate	Breeds in spring and summer along the entire east coast of Australia. Inhabits sheltered coastal environments, harbours, inlets and rivers.	High-energy beach at Waratah Beach not optimal habitat but may be used occasionally.
Sternula nereis	Fairy Tern	en	L	VU		4	03/07/2000	VBA	Moderate	Occurs along the coast of Victoria. Inhabits a variety of habitats including offshore, estuarine or lake islands, wetlands and mainland coastline. It nests on sheltered sandy beaches, spits and banks above the high tide line and below vegetation.	Suitable habitat at Waratah Bay beach and recent records.
Stictonetta naevosa	Freckled Duck	en	L			1	31/08/1974	VBA	Low	Found in south-eastern mainland Australia and Tasmania in inland wetlands, lignum swamps, and occasionally coastal wetlands.	No recent records and limited suitable habitat present.
Synoicus chinensis	King Quail	en	L			2	15/05/1901	VBA	None	Patchy distribution; most records from southern Australia, especially near major towns and cities, are probably escaped birds. Found in tropical and temperate shrublands and grasslands, towards coastal areas. They occur in very dense ground vegetation, such as grass, shrubs, ferns, herbs, at damp or swampy sites.	Historical records only.

Scientific name	Common name	Advisory list	FFG	EPBC	EPBC Migratory	Count (sum)	Last record	Source	Likelihood of Occurrence	Habitat	Rationale (with location)
Thalassarche carteri	Indian Yellow-nosed Albatross	vu	L	VU	Mi	1	31/08/1974	VBA	None	A marine bird. Forages mostly in the southern Indian Ocean but records also occur off the coast of Victoria. Mostly inhabits subtropical and warmer subantarctic waters.	Restricted to marine environment.
Thalassarche melanophris	Black-browed Albatross	vu		VU	Mi	3	16/10/1977	VBA	None	A marine bird. The species is common in the non-breeding period at the continental shelf and shelf-break of Victoria. It can tolerate a broad range of sea-surface temperatures, from 0–24º C. It forages around the breaks of continental and island shelves and across nearby underwater banks.	Restricted to marine environment.
Thalasseus bergii	Crested Tern				Ma	NA	NA	PMST	High	Widespread along the coastlines. Often occurs in estuaries and near-coastal environments. Also occasionally occurs inland in rivers and lakes.	Modelled distribution. Recorded during the shorebird field assessment along Sandy Point Beach.
Thinornis r. rubricollis	Hooded Plover	vu	L	VU		75	07/03/2018	VBA	High	Usually restricted to wide ocean beaches but have also been recorded near tidal bays and estuaries, rock platforms, rocky or sand-covered reefs, and small beaches in lines of cliffs. The species also uses near-coastal saline and freshwater lakes and lagoons.	Suitable habitat at Waratah Bay beach and recent records within the study area.
Thylogale billardierii	Rufous-bellied Pademelon	re	L			1	01/01/1830	VBA	None	Extirpated from Victoria. Inhabits dense vegetation adjacent to open patches, including paddocks and gardens, rainforest, wet sclerophyll forest, coastal heath and shrub, gullies and drier forest.	Regionally extinct.
Tringa glareola	Wood Sandpiper	vu		CR	Ma, Mi	1	10/01/1981	VBA	Low	Scattered records near Corner Inlet. Prefers shallow freshwater wetlands, ponds and pools with emergent reeds and grass. Also uses wetlands, such as swamps, billabongs, lakes, pools and waterholes; inundated grasslands; floodplains; irrigated crops; sewage ponds; reservoirs; large farm dams; bore drains; rarely brackish wetlands and saltmarsh.	Limited preferred habitat within study area and no recent records.
Tringa nebularia	Common Greenshank	vu				3	7/07/2007	VBA	Moderate	Widespread in coastal regions, mainly between Gippsland Lakes and Port Phillip Bay. Inhabits terrestrial wetlands (swamps, lakes, dams, rivers, creeks, billabongs, waterholes and inundated floodplains, claypans, saltflats, sewage farms and saltworks dams, inundated rice crops and bores) and sheltered coastal habitats (mudflats, saltmarsh, mangroves, embayments, harbours, river estuaries, deltas, lagoons, tidal pools, rock-flats and rock platforms).	Small wetlands and swamps within study area. Limited records associated with estuaries.

Scientific name	Common name	Advisory list	FFG	EPBC	EPBC Migratory	Count (sum)	Last record	Source	Likelihood of Occurrence	Habitat	Rationale (with location)
Tringa stagnatilis	Marsh Sandpiper	vu			Ma, Mi		na	PMST	Moderate	In Victoria, most records are found in Port Phillip Bay, but also in Gippsland. Inhabits swamps, lagoons, billabongs, saltpans, saltmarshes, estuaries, pools on inundated floodplains, intertidal mudflats, sewage farms and saltworks, reservoirs, waterholes, soaks, bore-drain swamps and flooded inland lakes.	Potential seasonal habitat in flooded pasture north of Waratah Bay beach.
Tyto novaehollandiae	Masked Owl	en	L			1	6/06/2006	VBA	Moderate	In Victoria, the strongholds of the Masked Owl appear to be in East Gippsland and the Otway Ranges, and to a lesser extent in the Central Highlands, Midlands and Portland areas. Can be found in areas of tall grass, including grass tussocks, swampy areas, grassy plains, swampy heath, and in cane grass or sedges on flood plains. Victorian Masked Owls occur along partially forested river flats near the coast, and may require open areas, such as clearings or forest edges, for foraging, as well as hollows, dense vegetation or caves for roosting.	Potentially suitable habitat present associated with larger patches of woodland and forest and surrounding farmland between Mirboo North and Hazelwood in northern section and Waratah North in the south.
Varanus varius	Lace Monitor	en				26	9/01/2013	VBA	High	Occur in well-timbered areas, from dry woodlands to cool temperate southern forests.	Suitable habitat present in larger patches of woodland and forest between Mirboo North and Hazelwood in northern section and Waratah North in the south.

Table 3B. Significant flora (Victoria)

Scientific name	Common name	Advisory list	FFG	EPBC	Count (sum)	Last record	Source	Likelihood of Occurrence	Habitat	Rationale (with location)
Acacia howittii	Sticky Wattle	r			2	04/03/2009	VBA	Low	Endemic to Victoria. Confined to the east, Macalister River near Mt Howitt, to Yarram and Tabberabbera. Moist forest habitat.	Known from one site to the north of the alignment. Potential habitat in Damp forest through Darlimurla and Mirboo North regions.
Acacia uncifolia	Coast Wirilda	r			1	22/12/1951	VBA	Moderate	On coastal dunes and near saltmarsh, on calcareous sand and sandy loam soils. Geelong and Wilsons Promontory (Vicflora).	Species largely confined to Wilsons Promontory in this region. Moderate likelihood of habitat found near coast in dunes and saltmarsh in southernmost section of route.
Acacia verticillata subsp. *ruscifolia*	Broad-leaf Prickly Moses	r			1	00.01.1900	VBA	Low	Wilsons Promontory and Sunday Island (Vicflora)	Restricted to Wilsons Promontory, last nearby record c 1900, unlikely habitat occurs in the study area.
Adriana quadripartita	Coast Bitter-bush	vu			0	NA	VBA (>10km, based on pers.obs. J. Garden)	Moderate	Apart from disjunct inland occurrences at Mt Arapiles and near Ouyen, apparently confined to coastal and near-coastal areas west from Wilsons Promontory.	Numerous recent records in very similar dune habitats in Cape Liptrap Coastal Park, around Venus Bay.
Allocasuarina media	Prom Sheoak	k			4	06/02/2006	VBA	Low	Found in low woodland on sandy soils, restricted to the north of Wilsons Promontory and Gembrook.	Known specifically from this area. Some damp heathy woodland located near coastline suitable, but habitat highly modified.
Amphibromus fluitans	River Swamp Wallaby-grass			VU	6	26/08/2003	VBA	High	Uncommon in the south of Victoria. Confined to permanent swamps.	Known to occur in waterways which cross the route in the north between Morwell River and Boolarra-Darlimurla area, suitable habitat may be present here. Potential habitat also in swamps and creeks of the southern sections of route.
Argentipallium dealbatum	Silver Everlasting	r			2	12/11/1983	VBA	Moderate	Near-coastal heathlands of the south-west.	Suitable habitat may be present in near coastal damp heath vegetation.
Avicennia marina subsp. australasica	Grey Mangrove	r			1	1/12/2002	VBA	None	Tidal mudflats in bays, estuaries and creek-mouths from Port Phillip bay to Corner Inlet	Records from nearby Corner Inlet, no suitable habitat present on sandy beach at Waratah Bay.
Banksia spinulosa var. cunninghamii	Hairpin Banksia		N		16	05/09/2006	VBA	High	Heathy woodlands and foothill open forests of eastern Victoria and on the south of the Great Dividing Range. Often locally common.	Known throughout the ranges which the route passes through in the northern section. Habitat may be present through and south of Darlimurla plantation area.
Billardiera scandens s.s.	Velvet Apple-berry	r			2	15/10/2012	VBA	Low	Occurs in dry open-forests and woodlands.	Potential for suitable habitat through Mirboo-Dumbalk area in lowland forest/damp forest pockets, however habitat likely highly modified.
Brachyscome salkiniae	Elegant Daisy	r			1	01/01/1967	VBA	Low	Woodlands and forests on sandy or loamy soil. Frequently found on river banks and flats. East Gippsland and west into the Latrobe Valley.	Potential suitable habitat Hazelwood area of alignment. In roadside retained woodland and near where Morwell River crosses the alignment.
Burnettia cuneata	Lizard Orchid	r			1	04/11/1983	VBA	Moderate	Occurs in dense, wet heathy vegetation in near-coastal areas.	Present in nearby cape Liptrap coastal park. Suitable habitat may occur in southern 40km of alignment in remnant damp forest.

Scientific name	Common name	Advisory list	FFG	EPBC	Count (sum)	Last record	Source	Likelihood of Occurrence	Habitat	Rationale (with location)
Caladenia aurantiaca	Orange-tip Finger-orchid	r			7	26/08/2003	VBA	Low	North-facing slopes. Grows in damp coastal to near-coastal heaths or heathy woodlands east of Melbourne (e.g. Cranbourne, Yarram, Cape Conran, Mallacoota) on well-drained sandy soils.	Potential to occur through damp forest and lowland forest to the North-west of the alignment in plantation area.
Caladenia australis	Southern Spider-orchid	k			1	21/09/2003	VBA	Low	Widespread in coastal and subcoastal heathy woodlands, usually on well-drained sandy soils.	Known from NP close by, however few records and habitat highly modified. Potential for habitat throughout foothill forest in Darlimurla plantation area.
Caladenia hildae	Honey Hood-orchid	r			1	11/09/2011	VBA	Low	Grows in open forests with shrubby or heathy understorey, on drier slopes and ridges. Generally known only from the mountains of eastern Victoria east from Licola to the border, one recent record from Jeeralang	Known only from one record in the region, which is outside the known range. Low likelihood of suitable habitat available.
Caladenia oenochila	Wine-lipped Spider-orchid	vu			1	21/09/1963	VBA	Low	Relatively common in moist, often grassy forest or woodland, often in shaded habitats.	Historic records close to the alignment. Potential habitat in moist forests through the southern half of the route.
Caladenia orientalis	Eastern Spider Orchid	e	L	EN	1	4/11/1983	VBA	Moderate	Coastal heathlands and heathy woodlands between the Mornington Peninsula and Yarram, on well-drained sandy soil. Also known from forest south of Moe, Yinnar South and Middle Tarwin	Potential suitable habitat located in coastal habitat in southern section of alignment, populations nearby at Cape Liptrap and Wilsons Promontory.
Caladenia tessellata	Thick-lipped Spider-orchid			VU	0	NA	PMST	Low	Confined to eastern Victoria. Found in near-coastal heathy woodlands to open forest, on well drained sandy soils.	Habitat may be present through damp forests in the northern section. Known from a National Park nearby, however few records and habitat in study area more highly modified.
Caladenia vulgaris	Slender Pink-fingers	r			2	11/11/1995	VBA	Moderate	Locally common in heathland and coastal scrub on moisture-retentive sandy soils.	Records close to the alignment along Stony Creek near Meeniyan in swamp scrub. Suitable habitat at likely present in vegetation patches and roadsides throughout the southern half of the route.
Callitriche umbonata	Winged Water-starwort	r			3	04/11/1983	VBA	Moderate	Scattered and uncommon, mainly in inland parts of Victoria, in damp and swampy places.	Recorded in swamp scrub nearby southern half of alignment, though not recent. Suitable habitat may occur in scattered remnant patches through this section.
Calystegia soldanella	Sea Bindweed	vu			2	17/03/2009	VBA	Low	A sand-binding trailer of coastal dune habitats. Mostly found eastward from Lakes Entrance. Isolated records further west near Wilsons Promontory and Walkerville.	Record nearby is the western-most point of this species' range. Low likelihood of habitat occurring in the southernmost 5km of alignment.
Cardamine paucijuga s.s.	Annual Bitter-cress	All infraspecific taxa included in Advisory List			1	28/10/1999	VBA	Low	Occurs in moist forest and riparian habitats.	Known from upstream in the waterways of the northern section of the study area, but very few records in the region. Last recorded in area in 1999

Scientific name	Common name	Advisory list	FFG	EPBC	Count (sum)	Last record	Source	Likelihood of Occurrence	Habitat	Rationale (with location)
Cardamine tenuifolia	Slender Bitter-cress	All infraspecific taxa included in Advisory List			1	01/01/1981	VBA	Low	Scattered across southern Victoria in swamps or streams.	Known from one site upstream. Low chance of suitable habitat with modification of waterways. Last record in 1997.
Ceratophyllum demersum	Hornwort	k			1	16/04/1989	VBA	Low	An unattached water plant, occurring in dense growths in fresh, still too slow-flowing shallow waters. Scattered throughout Victoria.	Distribution poorly known. Habitat may be present in any streams or shallow wetlands occurring along the route alignment.
Chiloglottis jeanesii	Mountain Bird-orchid	r			2	11/12/2002	VBA	Moderate	Localised in mountainous regions east of Melbourne (e.g. Dandenong Ranges, Toorongo, Baw Baw National Park) where sometimes locally common in fern gullies and wet sclerophyll forests.	Found in wet gullies which are likely to be highly modified throughout the region. Some gullies in the forested areas through Darlimurla plantation potential suitable habitat.
Chlorovibrissea bicolor	Two-tone Vibrissea	Rare			1	1/01/1976	VBA	Moderate	On logs in running water, in wet shaded fern gullies or rainforests of south-eastern Australia. The only species of Pin that fruits wholly or partially in running water.	Potential habitat in wet gullies which are likely to be highly modified throughout the region. Potential suitable habitat in gullies in the forested areas through Darlimurla plantation.
Cladium procerum	Leafy Twig-rush	r			1	11/03/1989	VBA	Moderate	Swamps and the margins of streams and lakes, near the coast. Tolerates low to moderate levels of salinity.	Found around Wilsons Promontory and nearby at Shallow Inlet. Potential habitat between the alignment and the western edge of shallow inlet.
Coprosma X tadgellii	Shining Coprosma x Snow Coprosma hybrid	r			1	4/09/1973	VBA	Low	A rare hybrid known in the literature only from Mount Hotham. Nearby record from Jeeralang Junction.	Given historic distribution it is unlikely the species is found in the local vicinity.
Corybas aconitiflorus	Spurred Helmet-orchid	r			2	05/07/2014	VBA	Moderate	Colonies grow in sheltered positions, on damp sand and under ferns and shrubs. Localised and uncommon in southern parts of eastern Victoria. Isolated westerly occurrence near Portland and Edenhope.	Habitat potential to occur through southern 40km of alignment, on sandy soils in vegetated areas.
Corybas fimbriatus	Fringed Helmet-orchid	r			3	03/06/2015	VBA	Moderate	Usually forming colonies on moist, shaded sandy soil near the coast and generally east of Western Port	Recorded near Shallow Inlet. Potential for habitat to occur close to the coastline in scrub or heath.
Craspedia canens	Grey Billy-buttons	en	L		24	23/11/2015	VBA	Low	Known only from grassland (often bordering swamps) at low altitude between c. Cranbourne and Traralgon.	Frequently recorded to the north of the northernmost point of the alignment. Retained patches of open woodland in this area may provide suitable habitat.
Cyathea cunninghamii	Slender Tree-fern	vu	L		8	13/02/2008	VBA	High	Confined to deep gullies in wet forests in Victoria, seldom common. Otway Range, Dandenong Ranges, Tarra-Bulga NP, Wilsons Promontory and Mt Drummer.	A gully species. Potential habitat in Darlimurla plantation and surrounding forest, and damp forest patches through Mirboo North.
Cyathea X marcescens	Skirted Tree-fern	vu			2	13/02/2008	VBA	Moderate	Thought to be a Hybrid of *C. australis* and *C. cunninghamii*. Distribution follows that of *C. cunninghamii*, deep gullies in wet forests.	A natural hybrid of *C. australis* and *C. cunninghamii*, potential to be present in locations where *C. cunninghamii* is also likely present.

Scientific name	Common name	Advisory list	FFG	EPBC	Count (sum)	Last record	Source	Likelihood of Occurrence	Habitat	Rationale (with location)
Cymbonotus lawsonianus	Bear's-ear	r			5	16/08/2009	VBA	Low	Scattered in woodland communities. Few eastern collections from d areas south of the Great Dividing Range	Known from Tarra-Bulga NP to the south. Habitat may occur in the northern half of the study area, in areas of forest and woodland.
Desmodium varians	Slender Tick-trefoil	k			9	26/08/2003	VBA	Moderate	Mainly found in woodland and open forest, in inland parts of eastern Victoria.	Well-distributed through adjacent Tarra-Bulga NP. Distribution poorly known. Suitable habitat may occur through the northern sections of the route, in woodland to forest.
Dianella amoena	Matted Flax-lily	en	L	EN	23	15/10/2012	VBA	High	Mostly confined to dry grassy woodland and grassland communities south of the Dividing Range.	Suitable habitat through east to middle section of study area. Recent records intersecting the route in the north.
Eucalyptus arenicola	Gippsland Lakes Peppermint	r			1	19/11/1991	VBA	None	Occurs in coastal and near-coastal areas in the Gippsland Lakes region in sandy soils.	Study area lies outside of described range of species. One occurrence falls into the search region and is the western-most record of the species. Habitat for the species is unlikely to occur within the study area.
Eucalyptus crenulata	Buxton Gum	en	L	EN	1	23/09/06	VBA	Low	Confined to swampy sites in foothills just north and south of the Great Dividing Range, near Buxton, Narbethong and Yarra Glen. Also sparingly established at Traralgon in Victoria.	Low chance of suitable habitat occurring in the route area in the north along roadsides. One record only in the search region.
Eucalyptus fulgens	Green Scentbark	r			16	19/02/2008	VBA	High	Occurring east from Healesville. Lowland forest. Grows on moist loam soils of valleys in the foothills	Many records within study area. Potential to exist on roadsides with retained vegetation through north of route, around Darlimurla-Hazelwood.
Eucalyptus globulus subsp. globulus	Southern Blue-gum	Rare			4	20/06/2018	VBA	Moderate	Indigenous stands known in Victoria from the area south of the Strzelecki Ranges, naturalised through southern Victoria.	Potential to exist on roadsides within retained vegetation through most of the route. Some stands may be planted.
Eucalyptus kitsoniana	Bog Gum	r			73	20/06/2018	VBA	High	Endemic to Victoria. Coastal lowlands from Yarram west to cape Otway and Mt Richmond. Also occurs at Wilson's Promontory, and nearby on Snake Island.	Many records within the area across southern 40km in particular. High likelihood of habitat occurring in any retained roadside vegetation and small patches here.
Eucalyptus strzeleckii	Strzelecki Gum	vu	L	VU	68	15/10/2012	VBA	High	Largely restricted to the western section of the Strzelecki Range, from Neerim South in the north, south to Foster, and with a few isolated records from the Otway ranges. Favours ridges, slopes and streambanks and deep fertile soils.	Records occurring within route in the north. Potential to occur along roadsides and small remnant patches in the north-west of the alignment.
Eucalyptus yarraensis	Yarra Gum	r			16	04/06/2011	VBA	High	Heavy clay soils on river flats and flood plains	Recent records to the north of the study area. Habitat likely to occur through Yinnar to Churchill, on the plains on roadsides and in retained vegetation patches.
Exocarpos syrticola	Coast Ballart	r			1	11/12/1983	VBA	Low	Confined to coastal dunes and cliffs on Wilsons Promontory, and scattered to the west. Locally common.	Habitat potential to occur on the coastal dunes in the study area, in the south. Locally common in Wilsons Promontory and potential for similar habitat to occur in the study area.

Scientific name	Common name	Advisory list	FFG	EPBC	Count (sum)	Last record	Source	Likelihood of Occurrence	Habitat	Rationale (with location)
Geranium solanderi var. solanderi s.s.	Austral Crane's-bill	vu			1	21/02/2006	VBA	Low	Damp to dry, usually sheltered sites in grassy woodlands, often along drainage lines or in seepage areas.	Known in records from herb-rich foothill forest in nearby NP. Low likelihood of this vegetation type occurring in the study area, but grassy woodland patches along alignment could provide suitable habitat.
Glycine latrobeana	Clover Glycine		L	VU		10km	PMST	None	Found across south-eastern Australia in native grasslands, dry sclerophyll forests, woodlands and low open woodlands with a grassy ground layer, on sand or loamy sand soils.	Outside of known range of species. No suitable habitat.
Grevillea chrysophaea	Golden Grevillea	r			2	01/09/03	VBA	Low	Grows in eucalypt woodland or heath in silty sand to sandy loam in the Brisbane Ranges (Anakie-Steiglitz area), and Gippsland in the area roughly enclosed by Traralgon, Woodside and Sperm Whale Head-Licola.	Known from across Tarra Bulga NP to the east of the study area. Suitable habitat may occur in retained woodland patches in the north of the alignment.
Grevillea rosmarinifolia	Rosemary Grevillea	All infraspecific taxa included in Advisory List			1	16/12/97	VBA	Low	Grows in open eucalypt forest or woodland or in riparian shrub associations, on rocky slopes or near creeks.	Known from one site to the north of the study area. Suitable may occur in woodlands and streamsides in the north of the route.
Isotoma tridens	Hypsela	k			1	17.02.03	VBA	Low	Occurs on lake and reservoir margins, and on the fringes of billabongs and creeks where the silty substrate bakes hard in summer.	Only known from one nearby wetland. Wetland areas in route alignment likely to be highly modified.
Juncus revolutus	Creeping Rush	r			6	08/03/1989	VBA	Low	Restricted to damp saline and sub saline communities near the coast. A small number of outlying populations occur around saline lakes on the volcanic plain.	Known from Shallow Inlet, eastern edge. Potential for suitable habitat on the western edge of Shallow Inlet, but unlikely to be within immediate study area, and last record c 30 years.
Lachnagrostis rudis subsp. rudis	Rough Blown-grass	r			4	11/03/1989	VBA	Low	Uncommon. Occurs in moist shaded forests, swamp margins near the coast. Scattered along coast from South Australian border to Lake Tyers.	Known from Shallow Inlet, eastern edge. Potential for suitable habitat on the western edge of Shallow Inlet. Last record c 30 years.
Lasiopetalum ferrugineum	Rusty Velvet-bush	All infraspecific taxa included in Advisory List			1	1/01/1970	VBA	None	Confined to rocky sites in the far east, Near Mt Kaye and lower Genoa River Gorge.	Outside the described range of the species. One record, 48 years old occurring near Darlimurla.
Leionema bilobum subsp. serrulatum	Toothed Leionema	r			5	01/09/1973	VBA	Low	Wet Sclerophyll Forest. Western Gippsland between Warburton and the Baw Baws.	Suitable habitat may be present in Wet Sclerophyll forest patches through Yinnar to Mirboo. Study area likely to be more highly modified than adjacent Nation Park where records found.
Lepidium hyssopifolium s.s.	Basalt Peppercress	en	L		0		PMST	Low	Occurs in grassy eucalypt woodland, low open Casuarina woodland with a grassy cover and tussock grassland (Leigh et al.1984)	Modelled distribution. Suitable habitat may occur in retained woodland patches in the north of the alignment however unlikely due to poor quality.

Scientific name	Common name	Advisory list	FFG	EPBC	Count (sum)	Last record	Source	Likelihood of Occurrence	Habitat	Rationale (with location)
Limonium australe	Yellow Sea-lavender	All infraspecific taxa included in Advisory List			2	18/03/2009	VBA	Low	Mangrove and Saltmarsh communities near Point Lonsdale, Westernport, Shallow Inlet and Corner Inlet.	Saltmarsh habitat adjacent to Shallow Inlet potential habitat for this species, section 5.
Limonium australe var. australe	Yellow Sea-lavender	r			5	1/12/2002	VBA	Low	Mangrove and Saltmarsh communities near Point Lonsdale, Westernport, Shallow Inlet and Corner Inlet.	Saltmarsh habitat adjacent to Shallow Inlet potential habitat for this species.
Marsilea mutica	Smooth Nardoo	k			1	15/10/1983	VBA	Moderate	Aquatic species which is found in farm dams and freshwater swamps. Not clear whether this species, which was first located in Gippsland, is indigenous or introduced.	Potential habitat within farm dams.
Monotoca glauca	Currant-wood	r			19	06/08/2014	VBA	High	Occurs on infertile sandy soils at sea-level or on near-coastal high-rainfall ranges. Grows in open-forest, heathy woodland, wet closed scrub and margins of cool-temperate rainforest.	Potential for suitable habitat in near-coastal forested areas, north of Waratah. Many recent records through adjacent near-coastal vegetation
Oxalis thompsoniae	Fluffy-fruit Wood-sorrel	k			1	27/10/1999	VBA	Low	Widespread but uncommon species, known from disturbed sites.	Few recent or nearby records, unlikely.
Pittosporum revolutum	Rough-fruit Pittosporum	r			1	9/03/2012	VBA	None	Uncommonly found in lowland dry forest, and warm temperate rainforest margins. Distributed from Cann River east to the NSW border. One disjunct population at Mt Nowa Nowa.	Outside the reported range of this species, no suitable habitat.
Platysace ericoides	Heath Platysace	r			2	01/09/2003	VBA	Low	Confined to the coastal plain and foothills mostly between Moe and Orbost, usually occurring in dry forest, often with shallow, rocky soils.	Edge of known range of this species. Low likelihood of habitat occurring in Hazelwood area.
Poa billardierei	Coast Fescue	r			2	13/05/1989	VBA	Low	Coastal sand dunes from near Nelson in the far south-west, to the NSW border. Scattered occurrences infrequently collected in recent times.	Potential habitat occurs on the coast in coastal dunes and scrub.
Pomaderris oraria subsp. oraria	Bassian Pomaderris	r			3	4/10/1993	VBA	Low	Occurs on low exposed dunes and in coastal scrub on deep siliceous sands on coasts between Cape Patterson and the Ninety Mile Beach.	Scattered records near coastline. Potential for habitat to occur through coastal scrub.
Potamogeton australiensis	Thin Pondweed	k			3	10/01/1981	VBA	Low	Occurs in still or slowing flowing fresh water, in heathland swamps and creeks, on muddy substrate.	Low likelihood of suitable wetlands through the study area, likely to be highly modified.
Prasophyllum frenchii	Maroon Leek-orchid			EN	0	10km	PMST	Moderate	Occurs in grassland, heathland and open forest on well-drained or water-retentive sand or clay loams.	Records at Wilsons Promontory. Suitable habitat may occur near coastline in heathy woodland.
Prasophyllum spicatum	Dense Leek-orchid	e		CR	0	10km	PMST	Moderate	Occurs in coastal heathland and near-coastal heathy forest on sandy soils	No records in search area. Suitable habitat may occur in southern half of alignment, in small patches of heathy forest.

Scientific name	Common name	Advisory list	FFG	EPBC	Count (sum)	Last record	Source	Likelihood of Occurrence	Habitat	Rationale (with location)
Pterostylis alveata	Coastal Greenhood	vu			1	18/04/1934	VBA	Low	Found mostly in near-coastal areas east of Melbourne in coastal woodland and scrub on stabilized dunes.	Suitable habitat may occur in near-coastal areas; however, only one record from region, 84 years ago.
Pterostylis chlorogramma	Green-striped Greenhood		L	VU		10km	PMST	Moderate	Grows in moist areas of heathy and shrubby forest, on well-drained soils.	No records in search area. Suitable habitat may occur in southern half of alignment, in small patches of heathy forest.
Pterostylis cucullata	Leafy Greenhood		L	VU		10km	PMST	Moderate	Widely distributed but disjunct, mostly occurring in small groups in coastal areas, sometimes near inland watercourses.	Population present nearby at Wilsons Promontory. Suitable habitat potential to occur in southern near-coastal section, and near Shallow Inlet.
Pterostylis fischii	Fisch's Greenhood	r			3	01/09/2003	VBA	Low	Near-coastal open forests and woodlands to montane woodlands, often among grass and bracken, on well-drained soils.	Nearby records from lowland forest in NP. West of the described range of the species. Potential suitable habitat through woodland sections of middle of route, and towards the coast.
Pterostylis grandiflora	Cobra Greenhood	r			6	4/05/2011	VBA	Moderate	Generally restricted and uncommon in near-coastal eastern Victoria, growing on moist, shady slopes in open-forest, on well-drained soil.	Recent records within route alignment. Potential for suitable habitat in roadside vegetation through alignment.
Pterostylis pedoglossa	Prawn Greenhood	vu			1	9/05/1970	VBA	Low	Scattered in coastal and near-coastal heath and grasstree plains east of Melbourne, often on moist peaty soils.	Known from Wilsons Promontory. Low potential for suitable coastal heath habitat in south of route near coast.
Pterostylis tenuissima	Swamp Greenhood	vu		VU		10km	PMST	Low	South-west Victoria and Wilsons Promontory and Cape Schanck in the east. Black peaty mum under dense cover of *Leptospermum lanigerum*.	Population present at Wilsons Promontory. Low potential for habitat along roadside vegetation in the near-coast section of study area.
Pterostylis x ingens	Sharp greenhood	r			1	01/01/1967	VBA	Low	Favours moist areas around swamps and stream banks on heavy soils.	A natural hybrid of two common species (P. falcata x P. nutans) which occur in the region. However, one record only from 1967.
Pultenaea juniperina s.s.	Prickly Beauty	r			1	15/01/2003	VBA	Low	Confined to heathland or heathy understorey in moist forest in the Grampians, with a disjunct occurrence near Tonimbuk.	Only one record within local vicinity. Limited potential for habitat through wet forest patches in Darlimurla area.
Ranunculus papulentus	Large river buttercup	Poorly known			1	1/02/1981	VBA	None	Occurs in seasonally wet areas, but ground usually dry or only moist at time of flowering. Uncommon in Victoria and known with certainty from Wlgulmerang-Benambra area, Natimuk and Braeside.	One nearby record only, 1981. Outside the described range of the species
Sambucus australasica	Yellow Elderberry	vu	L		1	9/03/2012	VBA	None	Confined to near-coastal warm-temperate rainforest communities between Orbost and the New South Wales border, very rare in Victoria.	Known from one record nearby, outside the species reported range. Habitat potential to occur near coast in pockets of damp forest.
Senecio psilocarpus	Swamp Fireweed	v		EN	0	10km	PMST	Low	Restricted to several sites in herb-rich winter-wet swamps throughout the south of the state, to the west of Sale. Grows on volcanic clays and peaty soils (Threatened Species Section 2011b).	No records from within study area and swampy wetland habitats unlikely within survey area.

Scientific name	Common name	Advisory list	FFG	EPBC	Count (sum)	Last record	Source	Likelihood of Occurrence	Habitat	Rationale (with location)
Sowerbaea juncea	Rush Lily	r			3	1/09/2003	VBA	Moderate	Locally common in damp, near-coastal heath and woodland communities. Marlo to NSW border, with disjunct occurrences in Wilsons Promontory and between Traralgon and Sale, to near Yarram.	Potential suitable habitat through coastal scrub and retained woodland patches. However, known from one population in Wilsons Promontory and a solitary record in the mid-section of the route.
Stackhousia spathulata	Coast Stackhousia	k			1	11/12/1983	VBA	Low	Foredunes of beaches, but patchily distributed and seldom common.	Potential suitable habitat in south of rote, on the foredunes of the coast.
Thelymitra epipactoides	Metallic Sun-orchid	e	L	EN	0	10km	PMST	Low	Found in coastal heathland, grassland and woodland, but extending further inland into similar habitats in the west of its range. On moist or dry sandy soils.	No records within study area and likely to be outside species range.
Thelymitra incurva	Swamp Sun-orchid	en	L		1	10/01/2000	VBA	Low	Heathlands and heathy woodlands, around the edges of grasstree plains. Often on disturbed sites, roadsides and gravel scrapes. Prefers moist coarse sandy and peaty loams.	One record nearby Mirboo North. This record is outside of usual reported range. Some potential for habitat in disturbed sites on roadsides through the middle third of the route.
Thelymitra matthewsii	Spiral Sun-orchid		L	VU		10km	PMST	Moderate	Widely distributed but rare, in coastal sandy flats or slightly elevated sites (to 400 m) in well-drained soils (sandy loams to gravelly limestone soils) in open forest. Plants colonise disturbed sites and slowly disappear as these sites stabilise.	Suitable habitat may be present in sandy soils in the southern 5km near-coastal habitats.
Tmesipteris elongata	Slender Fork-fern	vu			5	01/03/1983	VBA	Moderate	Known from few scattered localities in Victoria (Otway and Strzelecki Ranges, upper Tyers River, Wilsons Promontory) and rare. Epiphytic on Dicksonia antarctica.	An epiphyte of Dicksonia antarctica, which grows in the wet forest and gullies of Cape Liptrap coastal park on the south-western edge of the route, and through the Darlimurla and Mirboo regions.
Tmesipteris ovata	Oval Fork-fern	r			4	01/03/1983	VBA	Moderate	Localised in wet forest near Gembrook and Emerald, Morwell National Park, Wilsons Promontory and East Gippsland.	An epiphyte of Dicksonia antarctica, which grows in the wet forest and gullies of Cape Liptrap coastal park on the south-western edge of the alignment, and through the Darlimurla and Mirboo regions.
Tmesipteris parva	Small Fork-fern	r			6	5/10/1997	VBA	Moderate	On tree-ferns, occurring between Gembrook and Warburton and in east and south Gippsland.	A generalist epiphyte of tree ferns which are known to grow in the wet forest and gullies of Cape Liptrap coastal park on the south-western edge of the alignment, and through Darlimurla and Mirboo regions.
Utricularia uniflora	Single Bladderwort	Poorly known			2	1/01/1980	VBA	None	Grows in bogs and along rocky stream banks at low or moderate altitudes. Possibly confined to far East Gippsland.	Outside of described range of species. Known from records 35 years old.
Xanthosia leiophylla	Parsley Xanthosia	Rare			1	03.12.1978	VBA	Low	Known from sandy heathland and heathy woodland, mostly in the south-west. Also recorded at Wilsons Promontory.	Known only from one record in the region. Low likelihood of some suitable habitat near the coast.
Xanthosia tasmanica	Southern Xanthosia	r			1	19/04/2011	VBA	Low	Occurring mainly in coastal areas in heath on sand.	Known from Wilsons Promontory. Low likelihood of suitable sand heath habitat in the dune area.

Scientific name	Common name	Advisory list	FFG	EPBC	Count (sum)	Last record	Source	Likelihood of Occurrence	Habitat	Rationale (with location)
Xerochrysum palustre	Swamp Everlasting		L	VU		10km	PMST	None	Occurs in lowland swamps, usually on black cracking clay soils, scattered from near the South Australian border north-west of Portland to Bairnsdale district, but rare due to habitat depletion.	Few high-quality lowland swamps in the alignment to provide suitable habitat.

Appendix 4 Potential impacts to values considered likely to occur within the survey area

Table 4A. Potential impacts to significant ecological values in the survey area

State	Value	Likelihood of Occurrence		Location of potential habitat	Impact Assessment		
		Victoria	Tasmania		Likelihood of Significant Impact (pre-mitigation)	Impact Rationale	Likelihood of Significant Impact (post-mitigation)
				NATIONALLY SIGNIFICANT COMMUNITIES			
Victoria	Gippsland Red Gum (*Eucalyptus tereticornis* subsp. *mediana*) Grassy Woodland and Associated Native Grassland	H		May occur in isolated roadsides or remnant patches throughout the Latrobe Valley in the north of the route.	Moderate	Both alignments intersect several road reserves and small fragmented patches of vegetation which may support this community.	Low
				NATIONALLY SIGNIFICANT FLORA SPECIES			
	Amphibromus fluitans (river swamp wallaby-grass)	H		Known to occur in waterways which intersect the route in the Latrobe Valley and Strzelecki Ranges. Potential habitat also in swamps and creeks of the southern sections of routes.	Moderate	Both routes intersect numerous water bodies which have the potential to support the species in suitable habitat around their fringes or in adjoining areas.	Low
	Caladenia orientalis (Eastern Spider Orchid)	M		Coastal heathlands and heathy woodlands between the Mornington Peninsula and Yarram, on well-drained sandy soil. Also known from forest south of Moe, Yinnar South and Middle Tarwin	Low	Clearing of heathland and woodland suitable habitat likely to be minimal in southern parts of route due to fragmented and sparse cover.	Low
	Dianella amoena (matted flax-lily)	H		May occur in small, isolated roadsides or grassy remnant patches throughout the Latrobe Valley and the northern foothills of the Strzelecki Range. Numerous records along McFarlane Road which intersects both routes.	High	Both routes intersect grassland and grassy woodland habitats which are known to support this species. Also known to occur in modified (exotic) grassland communities where grazing is restricted.	Low
Victoria	*Eucalyptus strzeleckii* (Strzelecki gum)	H		Potential to occur along roadsides and small remnant patches from southern most foothills of the Strzelecki Ranges through to and including the Latrobe Valley in the north.	High	Route intersects woodland habitats which are likely to support this species.	Moderate
	Prasophyllum frenchii (maroon leek-orchid)	M		Potential for suitable habitat in near-coastal heathy woodlands surrounding Waratah Bay.	Low	Clearing of woodlands and suitable habitat likely to be minimal in southern parts of route due to fragmented and sparse cover.	Low
	Pterostylis chlorogramma (green-striped greenhood)	M		Potential for suitable habitat in near-coastal heathy woodlands surrounding Waratah Bay.	Low	Clearing of woodlands and suitable habitat likely to be minimal in southern parts of route due to fragmented and sparse cover.	Low
	Prasophyllum spicatum (dense leek-orchid)	M		Potential for suitable habitat in near-coastal heathy woodlands surrounding Waratah Bay.	Low	Clearing of woodlands and suitable habitat likely to be minimal in southern parts of route due to fragmented and sparse cover.	Low
	*Pterostylis cucullat*a (leafy greenhood)	M		Population present nearby at Wilsons Promontory and may occur within near-coastal vegetation at Waratah Bay or inland. Insufficient information to make determination.	Low	Clearing of woodlands and suitable habitat likely to be minimal in southern parts of route due to fragmented and sparse cover.	Low
	Thelymitra matthewsii (spiral sun-orchid)	M		Potential for suitable habitat in near-coastal forests surrounding Waratah Bay.	Low	Clearing of woodlands and suitable habitat likely to be minimal in southern parts of route due to fragmented and sparse cover.	Low
				NATIONALLY SIGNIFICANT FAUNA SPECIES			
	Antechinus minimus maritimus (swamp antechinus)	M		Potential occurrence in larger patches of native woodlands and forests near coast.	Low	Localised and limited clearing of suitable habitat for trenches, tracks and easement.	Low
Victoria	*Botaurus poiciloptilus* (Australasian bittern)	M		Single record associated with large wetland upstream of the Morwell River. May infrequently use the cooling pond.	Low	Disturbance and removal of suitable habitat. Localised and limited impacts likely.	Low
	Calidris canutus (red knot)	M		Suitable habitat along coast.	Low	Disturbance/habitat removal at Waratah Bay. Species likely to make limited use of study area.	Low

	Galaxiella pusilla (dwarf galaxias)	M	Suitable habitat associated with rivers and creeks. Recent records further upstream.	Moderate	Potential impacts on instream aquatic and riparian habitats.	Low
	Litoria raniformis (growling grass frog)	M	Recent records nearby and within study area. May occur in permanent and ephemeral waterbodies across the study area.	Moderate	Clearing of vegetation and impacts on wetland and waterbody habitats for trenches, tracks and easement clearing.	Low
Victoria	*Myiagra cyanoleuca* (satin flycatcher)	M	No heavily forested gullies in study area.	Low	Disturbance and removal of suitable habitat. Localised and limited impacts likely.	Low
	Numenius madagascariensis (eastern curlew)	M	Marginal habitat at Waratah Bay beach and recent records. May make infrequent use.	Low	Disturbance/habitat removal at Waratah Bay. Species likely to make limited use of study area.	Low
	Petauroides volans (southern greater glider)	H	Suitable habitat may be present in larger patches of forest between Mirboo North and Hazelwood in the northern section.	High	Clearing of suitable habitat for tracks and easement clearing impacts and loss of hollow-bearing trees and habitat fragmentation.	Low
	Prototroctes maraena (Australian grayling)	H	Potential occurrence in waterways and recent records.	Moderate	Potential impacts on instream aquatic and riparian habitats.	Low
	Pteropus poliocephalus (grey-headed flying-fox)	M	Suitable foraging habitat present.	Low	Clearing of suitable habitat for trenches, tracks and easement likely to be minimal.	Low
	Sternula nereis (fairy tern)	M	Suitable habitat at Waratah Bay beach and recent records.	Low	Disturbance/habitat removal at Waratah Bay. Species likely to make limited use of study area.	Low
	Thinornis r. rubricollis (hooded plover)	H	Suitable habitat at Waratah Bay beach and recent records within the study area.	Moderate	Clearing of suitable habitat for trenches and tracks and temporary disturbance during construction at Waratah Bay. Breeding activity has been recorded previously at Waratah Bay.	Low (HDD) – Moderate (trenching required)
	Aquila audax fleayi (wedge-tailed eagle)	M	Recorded in study area however no known nests within 1 km of survey area. Potential for suitable habitat immediately adjacent to survey area.	Low	Potential for indirect impacts due to construction activities on potential nest sites in adjacent habitat/vegetation.	Low
	Ceyx azureus subsp. *diemenensis* (Tasmanian azure kingfisher)	M	There are historic records from study area. Unlikely to be resident at this location.	Low	Construction works unlikely to impact riparian environs.	Low
	Dasyurus maculatus subsp. *maculatus* (Spotted-tailed quoll)	H	There are records at Shorewell Park behind Burnie and at Heybridge. Potential to utilise habitat immediately adjacent to the survey area.	Low	Potential for indirect impacts due to construction activities on potential den sites in adjacent habitat/vegetation.	Low
Tasmania	*Dasyurus viverrinus* (Eastern quoll)	M	There are records of eastern quoll in the vicinity of the routes south of Burnie and at Heybridge. Potential to utilise habitat immediately adjacent to the survey area.	Low	Potential for indirect impacts due to construction activities on potential den sites in adjacent habitat/vegetation.	Low
	Perameles gunnii (Eastern barred bandicoot)	M	Records at Somerset and Burnie. Potential to utilise habitat immediately adjacent to the survey area.	Low	Unlikely to nest in habitats immediately adjacent to survey area and therefore impacts considered low relative to other ground dwelling mammals.	Low
	Sarcophilus harrisii (Tasmanian devil)	M	There are records at Shorewell Park behind Burnie, and around the Blythe River south of Heybridge. Potential to utilise habitat immediately adjacent to the survey area.	Low	Potential for indirect impacts due to construction activities on potential den sites in adjacent habitat/vegetation.	Low
	Tyto novaehollandiae castanops (Masked owl)	M	No nest trees known and however potential for suitable habitat immediately adjacent to survey area.	Low	Potential for indirect impacts due to construction activities on potential nest sites in adjacent habitat/vegetation.	Low
			STATE SIGNIFICANT COMMUNITIES			
	Central Gippsland Plains Grassland Community	M	May occur in isolated roadsides or remnant patches throughout the Latrobe Valley in the north of the route.	Moderate	Both alignments intersect several road reserves and small fragmented patches of vegetation which may support this community.	Moderate
Victoria	Forest Red Gum Grassy Woodland Community	M	May occur in isolated roadsides or remnant patches throughout the Latrobe Valley in the north of the route.	Moderate	Both alignments intersect several road reserves and small fragmented patches of vegetation which may support this community.	Moderate
	Warm Temperate Rainforest (East Gippsland Alluvial Terraces) Community	M	Alluvial flats of ephemeral creeks and the floodplains through the Strzelecki Ranges.	Moderate	Both alignments intersect numerous areas of remnant vegetation associated with creeklines and valleys in the Strzelecki Ranges which may support this community.	Moderate

Tasmania	*Freshwater sedgeland and rushland (ASF)*		L	Recorded on the Blythe River near the survey area.	Low	Clearing of vegetation likely limited to disturbed vegetation or regrowth.	Low
	Melaleuca ericifolia swamp forest (NME)		L	There are mapped patches along the right bank of the Blythe River, east of the survey area.	Low	Clearing of vegetation likely limited to disturbed vegetation or regrowth .	Low
				STATE SIGNIFICANT FLORA SPECIES			
	*Acacia uncifolia (*Coast Wirilda)		M	On coastal dunes and near saltmarsh, on calcareous sand and sandy loam soils. Geelong and Wilsons Promontory (Vicflora).	Moderate	Clearing of suitable habitat for trenches, tracks and easement likely to be minimal.	Low
	Adriana quadripartita (coast bitter-bush)		M	Suitable habitat may be present in near coastal damp heath vegetation in south of alignment.	Moderate	Disturbance and removal of suitable habitat. Localised limited impacts likely.	Low
	Argentipallium dealbatum (silver everlasting)		M	Suitable habitat may be present in near coastal damp heath vegetation in south of alignment.	Low	Clearing of heathy woodlands and suitable habitat likely to be minimal in southern parts of route due to fragmented and sparse cover.	Low
Victoria	*Burnettia cuneata* (lizard orchid)		M	Present in nearby cape Liptrap coastal park. Suitable habitat may occur in southern 40km of alignment in remnant damp forest.	Low	Clearing of suitable habitat for trenches, tracks and easement likely to be minimal.	Low
	Caladenia vulgaris (slender pink-fingers)		M	Suitable habitat at likely present in vegetation patches and roadsides throughout the southern half of the route, particularly near Meeniyan.	Low	Clearing of suitable habitat for trenches, tracks and easement likely to be minimal.	Low
	Callitriche umbonate (winged water-starwort)		M	Recorded in swamp scrub nearby southern half of alignment, though not recent. Suitable habitat may occur in scattered remnant patches through this section.	Low	Clearing of suitable habitat for trenches, tracks and easement likely to be minimal.	Low
	Chiloglottis jeanesii (mountain bird-orchid)		M	Some gullies in the forested areas through Darlimurla plantation potential suitable habitat.	Low	Clearing of suitable habitat for trenches, tracks and easement likely to be minimal.	Low
	Chlorovibrissea bicolor (two-tone vibrissea)		M	Wet gullies in the forested areas through Darlimurla plantation potential suitable habitat.	Low	Clearing of suitable habitat for trenches, tracks and easement likely to be minimal.	Low
	Cladium procerum (leafy twig-rush)		M	Found around Wilsons Promontory and nearby at Shallow Inlet. Potential habitat between the alignment and the western edge of shallow inlet.	Low	Clearing of suitable habitat for trenches, tracks and easement likely to be minimal.	Low
	Corybas aconitiflorus (spurred helmet-orchid)		M	Habitat potential to occur through southern 40km of alignment, on sandy soils in vegetated areas.	Low	Clearing of suitable habitat for trenches, tracks and easement likely to be minimal.	Low
	Corybas fimbriatus (fringed helmet-orchid)		M	Recorded near Shallow Inlet. Potential for habitat to occur close to the coastline in scrub or heath.	Low	Clearing of suitable habitat for trenches, tracks and easement likely to be minimal.	Low
	Cyathea cunninghamii (slender tree fern)		H	A gully species. Potential habitat in Darlimurla plantation and surrounding forest, and damp forest patches in the south.	Moderate	Route intersects numerous wet gullies and creek lines containing remnant vegetation throughout the Strzelecki ranges.	Moderate
	Cyathea X marcescens (skirted tree fern)		M	A natural hybrid of C. australis and C. cunninghamii, potential to be present in locations where C. cunninghamii is also likely present.	Moderate	Route intersects numerous wet gullies and creek lines containing remnant vegetation throughout the Strzelecki ranges.	Moderate
	Desmodium varians (slender tick-trefoil)		M	Suitable habitat may occur through the northern sections of the route, in woodland to forest.	Low	Clearing of suitable habitat for trenches, tracks and easement likely to be minimal.	Low
Victoria	*Eucalyptus fulgens* (green scentbark)		H	Potential habitat on roadsides with retained vegetation through north of route, around Darlimurla-Hazelwood.	Moderate	Disturbance and removal of suitable habitat. Localised limited impacts likely.	Moderate
	Eucalyptus kitsoniana (bog gum)		H	High likelihood of habitat occurring in any retained roadside vegetation and small patches in southern 40km.	Moderate	Disturbance and removal of suitable habitat. Localised limited impacts likely.	Moderate
	Eucalyptus yarraensis (yarra gum)		H	Habitat likely to occur through Yinnar to Churchill, on the plains on roadsides and in retained vegetation patches.	Moderate	Disturbance and removal of suitable habitat. Localised limited impacts likely.	Moderate

	Exocarpos syrticola (coast ballart)	M		Habitat potential to occur on the coastal dunes in the study area, in the south. Locally common in Wilsons Promontory and potential for similar habitat to occur in the study area.	Moderate	Disturbance and removal of suitable habitat. Localised limited impacts likely	Moderate
	Geranium solanderi var. solanderi s.s. (austral crane's-bill)	M		Limited records in the vicinity. Grassy woodland patches along alignment may provide suitable habitat.	Low	Clearing of woodlands and suitable habitat likely to be minimal in southern parts of route due to fragmented and sparse cover.	Low
	Marsilea mutica (smooth nardoo)	M		Potential habitat within farm dams.	Low	Impacts on dam and still waterbodies likely to be minimal	Low
	Monotoca glauca (currant-wood)	H		Potential for suitable habitat in near-coastal forested areas surrounding Waratah Bay.	Low	Clearing of woodlands and suitable habitat likely to be minimal in southern parts of route due to fragmented and sparse cover.	Low
	Poa billardierei (coast fescue)	M		Potential habitat in coastal dunes and scrub in south of route.	Moderate	Disturbance and removal of suitable habitat. Localised limited impacts likely	Moderate
	Pomaderris oraria subsp. oraria (bassian pomaderris)	M		Potential for suitable habitat to occur through coastal scrub.	Moderate	Disturbance and removal of suitable habitat. Localised limited impacts likely	Moderate
	Pterostylis alveata (coastal greenhood)	M		Suitable habitat may occur in near-coastal areas. Despite only one record in study area from 1934, recent record from nearby Venus Bay in similar dune habitat means it may still persist in the area.	Moderate	Disturbance and removal of suitable habitat. Localised limited impacts likely	Moderate
	Pterostylis grandiflora (cobra greenhood)	M		Potential for suitable habitat in roadside vegetation through alignment.	Low	Clearing of woodlands and suitable habitat likely to be minimal due to fragmented and sparse cover.	Low
	Pterostylis pedoglossa (prawn greenhood)	M		Potential for suitable coastal heath habitat.	Moderate	Disturbance and removal of suitable habitat. Localised limited impacts likely	Moderate
	Sowerbaea juncea (rush lily)	M		Potential suitable habitat through coastal scrub and retained woodland patches south of Strzelecki Ranges.	Low	Clearing of woodlands and suitable habitat likely to be minimal due to fragmented and sparse cover.	Low
	Tmesipteris elongata (slender fork fern)	M		Wet forest and gullies from hills surrounding Waratah Bay through to the Darlimurla region.	Low	Clearing of woodlands and suitable habitat likely to be minimal due to fragmented and sparse cover.	Low
	Tmesipteris ovata (oval fork fern)	M		Wet forest and gullies from hills surrounding Waratah Bay through to the Darlimurla region.	Low	Clearing of woodlands and suitable habitat likely to be minimal due to fragmented and sparse cover.	Low
	Tmesipteris parva (small fork fern)	M		Wet forest and gullies from hills surrounding Waratah Bay through to the Darlimurla region.	Low	Clearing of woodlands and suitable habitat likely to be minimal due to fragmented and sparse cover.	Low
Tasmania	*Baumea gunnii* (Slender twigsedge)		M	Recorded on the Blythe River immediately south of the survey ara.	Low	Unlikely to be impacted despite close proximity due to no suitable habitat within AoD.	Low
				STATE SIGNIFICANT FAUNA SPECIES			
	Accipiter novaehollandiae (grey goshawk)	M		Suitable foraging habitat along Morwell River and recent records nearby.	Low	Clearing of suitable habitat for trenches, tracks, and easement likely to be minimal.	Low
	Actitis hypoleucos (common sandpiper)	M		Muddy edges at cooling pond, small wetlands, and flooded pasture may be used intermittently as foraging habitat.	Low	Disturbance of suitable habitat for trenches and tracks during construction at Waratah Bay.	Low
	*Ceyx azureu*s (azure kingfisher)	M		Suitable foraging habitat along Morwell River and other waterways, and recent records nearby.	Low	Clearing of suitable habitat for trenches, tracks, and easement likely to be minimal.	Low
	Anas rhynchotis (australasian shoveler)	M		Cooling pond may provide suitable foraging habitat. Recent records are nearby.	Low	Clearing of suitable habitat for trenches, tracks, and easement likely to be minimal.	Low
Victoria	*Ardea intermedia* (intermediate egret)	M		Potentially suitable habitat along watercourses and small waterbodies within study area.	Low	Clearing of suitable habitat for trenches, tracks, and easement likely to be minimal.	Low
	Ardea modesta (eastern great egret)	M		Most records are associated with more heavily vegetated wetlands although one record is associated with the nearby Hazelwood Cooling Pond. This species	Low	Clearing of suitable habitat for trenches, tracks, and easement likely to be minimal.	Low

		STATE SIGNIFICANT FAUNA SPECIES			
		may infrequently use Eel Hole Creek or when flooded, agricultural land, and vegetated margins of waterways within study area.			
	Ardea plumifera (plumed egret)	M	Potentially suitable habitat along watercourses and small waterbodies within study area.	Low	Clearing of suitable habitat for trenches, tracks, and easement likely to be minimal.	Low
	Aythya australis (hardhead)	M	Potentially suitable habitat in waterbodies with deep water and dense reed beds in the study area.	Low	Clearing of suitable habitat for trenches, tracks, and easement likely to be minimal.	Low
	Biziura lobata (musk duck)	M	Potential suitable habitat in waterbodies with deep water and dense reed beds in the study area.	Low	Clearing of suitable habitat for trenches, tracks, and easement likely to be minimal.	Low
	Calamanthus pyrrhopygius (chestnut-rumped heathwren)	M	Potential occurrence in areas of dense shrub cover.	Low	Clearing of suitable habitat for trenches, tracks, and easement likely to be minimal.	Low
	Calidris alba (sanderling)	H	Observed at Waratah Bay within study area.	Low	Disturbance of suitable habitat for trenches and tracks during construction at Waratah Bay.	Low
	Cercartetus nanus (eastern pygmy-possum)	M	Potentially suitable habitat present in forested blocks between Mirboo and Hazelwood and patches of forest near Waratah Bay.	Low	Clearing of suitable habitat for trenches, tracks, and easement is likely to low.	Low
	Charadrius mongolus (lesser sand plover)	M	Potential habitat at Waratah beach. High-energy beach at Waratah beach not optimal habitat but may be used occasionally.	Low	Temporary removal/disturbance of suitable habitat for trenches and tracks during construction at Waratah Bay.	Low
	Chelodina longicollis (eastern snake-necked turtle)	H	Records are associated with a wetland section upstream on Morwell River. Potentially suitable habitat along intersecting waterbodies.	Low	Clearing of suitable habitat for tracks and easement and impacts on riverine environment.	Low
	Chlidonias leucopterus (white-winged black tern)	M	Suitable habitat present along a tributary north of Waratah Beach. Recent record associated with Shallow Marine Coastal Inlet.	Low	Clearing of vegetation for tracks and easement clearing impacts nest sites. Proportional loss likely low.	Low
	Circus assimilis (spotted harrier)	M	Suitable habitat present along watercourses and adjacent open grassy vegetation.	Low	Clearing of vegetation for tracks and easement clearing impacts nest sites. Proportional loss likely low.	Low
Victoria	*Climacteris affinis* (white-browed treecreeper)	M	Potential for areas of suitable habitat to be present in Mirboo and Waratah Bay section.	Low	Clearing of suitable habitat for trenches, tracks, and easement likely to be minimal due to likely restricted occurrence of suitable habitat.	Low
	Egretta garzetta (little egret)	M	Suitable foraging habitat associated with waterbodies.	Low	Clearing of suitable habitat for trenches, tracks, and easement likely to be minimal.	Low
	Engaeus hemicirratulus (Gippsland burrowing crayfish)	M	Potential for suitable habitat where clay soils are present and several recent records.	Moderate	Clearing of suitable habitat for tracks and easement and impacts on burrow sites and riverine environment. Species with highly restricted distribution/range and sensitive to habitat loss.	Moderate
	Engaeus phyllocercus (Narracan burrowing crayfish)	H	Potential for suitable habitat to be present in Mirboo section and recent records locally. Study area on boundary of known distribution within a restricted area approximately 30 x 20 km in area.	Moderate	Clearing of suitable habitat for tracks and easement and impacts on burrow sites and riverine environment. Species with highly restricted distribution/range and sensitive to habitat loss.	Moderate
	Falco subniger (Black Falcon)		Suitable foraging habitat within open woodland and farmland.			
	Gallinago hardwickii (Latham's snipe)	M	Potential suitable habitat in temporarily inundated areas, swamps and creeks.	Low	Clearing of suitable habitat for trenches, tracks, and easement likely to be minimal.	Low
	Haematopus fuliginosus (sooty oystercatcher)	H	Suitable habitat at Waratah Bay and recent records.	Low	Disturbance of suitable habitat for trenches and tracks during construction at Waratah Bay.	Low
	Haliaeetus leucogaster (white-bellied sea-eagle)	M	Suitable foraging habitat along Morwell River and Waratah Bay and recent records nearby.	Low	Clearing of suitable habitat and disturbance/impact on nest sites for trenches, tracks, and easement.	Low
	Hieraaetus morphnoides (little eagle)	M	Suitable habitat along the whole route alignment. Particularly areas of open woodland and farmland.	Low	Clearing of suitable habitat and disturbance/impact on nest sites for trenches, tracks, and easement.	Low
	Hirundapus caudacutus (white-throated needletail)	H	Primarily an aerial species that will not significantly use the study area.	Low	Clearing of suitable habitat for trenches, tracks, and easement likely to be minimal.	Low

			STATE SIGNIFICANT FAUNA SPECIES			
	Hydroprogne caspia (caspian tern)	M	Suitable habitat at Waratah Bay beach and recent records.	Low	Clearing of suitable habitat for trenches, tracks, and easement likely to be minimal.	Low
	Ixobrychus dubius (Australian little bittern)	M	Suitable habitat associated with cooling pond and may occur in small wetlands and vegetated waterways.	Low	Clearing of suitable habitat for trenches, tracks, and easement likely to be minimal.	Low
	Larus pacificus (pacific gull)	H	Suitable habitat at Waratah Bay beach and recent records.	Low	Disturbance of suitable habitat for trenches and tracks during construction at Waratah Bay.	Low
	Lewinia pectoralis (Lewin's rail)	M	Potential habitat associated with vegetated waterbodies, waterways, and forests and woodland patches.	Low	Clearing of suitable habitat for trenches, tracks, and easement likely to be minimal.	Low
	Lissolepis coventryi (swamp skink)	M	Potentially suitable habitat associated with small Swamp Scrub remnants, swamps, and drains in low-lying areas.	Moderate	Clearing of suitable habitat for trenches, tracks, and easement. Species with highly restricted foraging range and sensitive to habitat loss and ground disturbance.	Moderate
	Myrmecia sp. 17 (bullant)	M	Recent records nearby and suitable forest and woodland habitat present.	Low	Clearing of suitable habitat for trenches, tracks, and easement likely to be minimal. Species sensitive to localised habitat loss.	Low
	Nannoperca sp. 1 (Flinders pygmy perch)	H	Many records associated with Morwell River.	Moderate	Clearing of suitable habitat and impacts aquatic environments	Moderate
Victoria	*Ninox connivens* (barking owl)	M	Suitable foraging habitat along rivers and creeklines and larger forest patches.	Moderate	Clearing of suitable habitat for trenches, tracks and easement impacts and impacts on roosting/nesting sites (hollow-bearing trees)	Moderate
	Ninox strenua (powerful owl)	M	Suitable foraging habitat along rivers and creeklines associated with larger areas of native forests and woodlands. Recent records nearby.	Moderate	Clearing of suitable habitat for trenches, tracks and easement impacts and impacts on roosting/nesting sites (hollow-bearing trees) and foraging resources.	Moderate
	Nycticorax caledonicus (nankeen night heron)	M	Suitable foraging habitat along rivers and creeklines. Recent records nearby.	Low	Clearing of suitable habitat for trenches, tracks, and easement likely to be minimal.	Low
	Oxyura australis (blue-billed duck)	M	A widely distributed species which has been recorded in the search region. Sub-optimal habitat, however, may make use of waterbodies in the north of the study area.	Low	Clearing of suitable habitat for trenches, tracks, and easement likely to be minimal.	Low
	Platalea regia (royal spoonbill)	M	Suitable foraging habitat associated with Hazelwood cooling pond and flooded pasture north of Waratah Bay. Records largely associated with Shallow Inlet.	Low	Clearing of suitable habitat for trenches, tracks, and easement likely to be minimal.	Low
	Pluvialis fulva (pacific golden plover)	M	Suitable habitat at Waratah Bay beach and recent records.	Low	Disturbance of suitable habitat for trenches and tracks during construction at Waratah Bay.	Low
	Porzana pusilla (Baillon's crake)	M	Potential suitable habitat associated with Eel Hole Creek, cooling pond, and small wetlands, waterways, and swamps.	Low	Clearing of suitable habitat for trenches, tracks, and easement likely to be minimal.	Low
	Pseudemoia rawlinsoni (glossy grass skink)	M	Recent record nearby. Potential suitable habitat associated with edges of intersecting watercourses.	Moderate	Highly localised populations sensitive to habitat removal.	Moderate
	Pseudophryne semimarmorata (southern toadlet)	H	Potential suitable woodland habitat and recent records associated with intersecting areas of habitat in southern section near coast (Waratah Bay).	Moderate	Highly localised populations sensitive to habitat removal.	Moderate
	Saccolaimus flaviventris (yellow-bellied sheathtail bat)	M	This species is a rare visitor but may occasionally occur within wooded habitats.	Low	Clearing of suitable habitat for trenches, tracks, and easement likely to be minimal.	Low
	Sminthopsis leucopus (white-footed dunnart)	M	Potential habitat in larger patches of forest near Waratah Bay.	Low	Clearing of suitable habitat for trenches, tracks, and easement likely to be minimal.	Low
	Spatula rhynchotis (australasian shoveler)	M	May make use of Hazelwood cooling pond and larger waterbodies within study area.	Low	Clearing of suitable habitat for trenches, tracks, and easement likely to be minimal.	Low
	Sterna striata (white-fronted tern)	M	Suitable habitat at Waratah Bay beach and recent records.	Low	Disturbance of suitable habitat for trenches and tracks during construction at Waratah Bay.	Low
	Sternula albifrons (little tern)	M	High-energy beach at Waratah Beach not optimal habitat but may be used occasionally.	Low	Clearing of suitable habitat for trenches, tracks, and easement likely to be minimal.	Low

			STATE SIGNIFICANT FAUNA SPECIES			
Victoria	*Tringa nebularia* (common greenshank)	M	Small wetlands and swamps within study area. Limited records associated with estuaries.	Low	Disturbance of suitable habitat for trenches and tracks during construction at Waratah Bay.	Low
	Tringa stagnatilis (marsh sandpiper)	M	Potential seasonal habitat in flooded pasture north of Waratah Bay beach.	Low	Disturbance of suitable habitat for trenches and tracks during construction at Waratah Bay.	Low
	Tyto novaehollandiae (masked owl)	M	Suitable habitat present in the form of larger patches of woodland and forest and surrounding farmland.	Low	Clearing of suitable habitat for trenches, tracks and easement impacts and impacts on roosting/nesting sites (hollow-bearing trees). However, no large areas of high-quality habitat are likely to be present in the study area.	Low
	Varanus varius (lace monitor)	H	Suitable habitat present in larger patches of vegetation in southern coastal and Mirboo North-Hazelwood sections.	Low	Clearing of suitable habitat for trenches, tracks, and easement and loss of hollow-bearing trees. Wide-ranging movements and proportional loss of habitat likely to be low.	Low
Tasmania	*Haliaeetus leucogaster* (White-bellied sea-eagle)	M	Records within study area along Blythe River however there are no known nests within 1 km of the project area. Potential for suitable habitat immediately adjacent to survey area.	Low	Potential for indirect impacts due to construction activities on potential nest sites in adjacent habitat/vegetation.	Low

Appendix 5 Victorian Shorebird and Hooded Plover Survey

INTRODUCTION

Thinornis r. rubricollis (Hooded Plover) is a small and rare plover (shorebird) found in coastal habitats along the Victorian coastline and mostly associated with broad sandy high-energy beaches (Dennis and Ball 2013). They forage singly or in pairs at all levels of the beach and at all tide levels including at the water's edge and amongst seaweed feeding on invertebrates, bivalves and small crustaceans. Foraging and breeding ranges are largely contained within a 1 km stretch of coastline which are defended by pairs during breeding (Maguire *et al.* 2014). Females lay their eggs in shallow scrapes in the sand or amongst dry seaweed on the exposed beach or adjacent dunes. The highest densities of birds in Victoria occur on broad-shallow beaches with abundant beach-washed seaweed, backing dunes, and low human activity.

A shorebird survey for migratory waders and threatened *Thinornis r. rubricollis* (Hooded Plovers) and nesting sites was undertaken in mid-November 2018. The aim of the survey was to observe any migratory waders, *Thinornis r. rubricollis,* or nests present, and characterise habitat along Sandy Point Beach.

METHODS

A two-day survey and habitat assessment for threatened shorebirds and Hooded Plovers was undertaken on 17 and 18 November 2018. The field survey was conducted to assess habitat for threatened shorebirds at landfall locations and conduct one seasonal survey for the threatened Hooded Plover and potential nesting sites. The survey was scheduled to occur during the Hooded Plover Biennial Count period and the breeding period of *Thinornis r. rubricollis*. and were conducted in line with EPBC Act guidelines and policy statements (i.e. *Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species*). An 8 km section of Sandy Point Beach was traversed on foot between the eastern extent of Sandy Point township to Moongana Street at Waratah Bay township to the west. Continuous visual scans (using binoculars and spotting scope) were undertaken for *Thinornis r. rubricollis*, nests, and other shorebirds along the shore/beach and adjacent dunes.

RESULTS

A number of shorebirds were recorded including, one large flock of DELWP advisory listed ('near threatened') Sanderlings (approx. 220 birds), one *Haematopus fuliginosus* (Sooty Oystercatcher), and four *Larus pacificus* (Pacific Gull). Other common species observed included numerous *Chroicocephalus novaehollandiae* (Silver Gull), three *Thalasseus bergii* (Crested Tern), one *Calyptorhynchus funereus* (Yellow-tailed Black-Cockatoo), and twelve *Hirundo neoxena* (Welcome Swallow).

No *Thinornis r. rubricollis* or nests were observed within the survey area during the course of the survey. There are three previous records of *Thinornis r. rubricollis* within and immediately adjacent to the survey area including a record as recently as 2017.

Sandy Point Beach is characterised by a wide shallow-slopping sandy beach and high-energy waves. Rocky platforms are restricted to the western end (outside the field study area) while some limited depositions of seaweed were observed at the high-tide mark. The beach is flanked by a narrow (<5m)

dune system ledge which is high (>2m) at the eastern end and gradually declines to the west (<1m high). Beyond the ledge, the dune rises steeply and is dominated by coastal shrubland and woodland.

DISCUSSION

Although no record was made during the current assessment, two recent (2006 and 2017) observations of *Thinornis r. rubricollis* have been made within 200 m of the survey area as well as an older observation directly within the survey area (1999). Other records have been made at the western end of Sandy Point Beach near the Waratah Bay caravan park and the eastern end adjacent to Shallow Inlet. Nest sites at Waratah Bay have also previously been recorded on the beach (60%) and dunes (40%) (Westen 2003) of Sandy Point Beach. Birdlife Australia's online portal shows records for *Thinornis r. rubricollis* along most of Waratah Bay with a gap on the western-most end and greater numbers of records at the eastern peninsula towards Wilsons Promontory. Relatively fewer records have been made between Fish Creek-Waratah Road and Sandy Point township. Note that a request to Birdlife Australia is required for full record details from their databases including year of record, and that this dataset contains a large number of records not represented in the Victorian Biodiversity Atlas.

Cape Liptrap Coastal Park, Waratah Bay - Shallow Inlet Coastal Reserve, and Shallow Inlet Marine and Coastal Park are all considered to support suitable habitat for the Hooded Plover. The Waratah Bay - Shallow Inlet Coastal Reserve area has been ranked as the 15th most significant of Parks Victoria's Hooded Plover sites, estimated to support 0.4% of the state's population in a Parks Victoria study. Substantial gaps have been noted in records for Hooded Plover in the western half of Waratah Bay (Maguire et al.). However, greater numbers of records and breeding sites are associated with Cape Liptrap Coastal Reserve, Shallow Inlet Marine and Coastal Park, and beaches of Wilsons Promontory. In particular, beaches within Wilsons Promontory National Park to the east are thought to support a large proportion of the Victorian population.

Dune nesting habitat is likely to be inaccessible near and immediately adjacent to Sandy Point Township *Thinornis r. rubricollis* due to the steep dune cliffs but improves moving westward. Accessible dunes for nesting further westward are relatively limited nonetheless due to their narrow width while limited beach seaweed and flotsam may reduce the suitability of this section of shore for nesting.

The survey was undertaken on the weekend and high levels of pedestrian activity were observed, particularly adjacent Sandy Point and Waratah Bay townships, and opposite the beach access at Fish Creek-Waratah Road. Numerous dogs were also being walked off-leash and were observed chasing shorebirds including a large flock of Sanderling. High levels of human and domestic dog activity at these locations may reduce the significance of Sandy Point Beach for shorebird and Hooded Plover foraging and nesting. Foraging activities are more likely to occur outside periods of pedestrian activity and sections of Sandy Point with lower levels of activity – generally the middle and far eastern sections. While Sandy Point Beach is likely to be used by *Thinornis r. rubricollis*, its significance may be reduced (and lower number of records maybe explained by) high levels human/animal disturbance and more limited protective seaweed/flotsam/dune sites for nesting and foraging.

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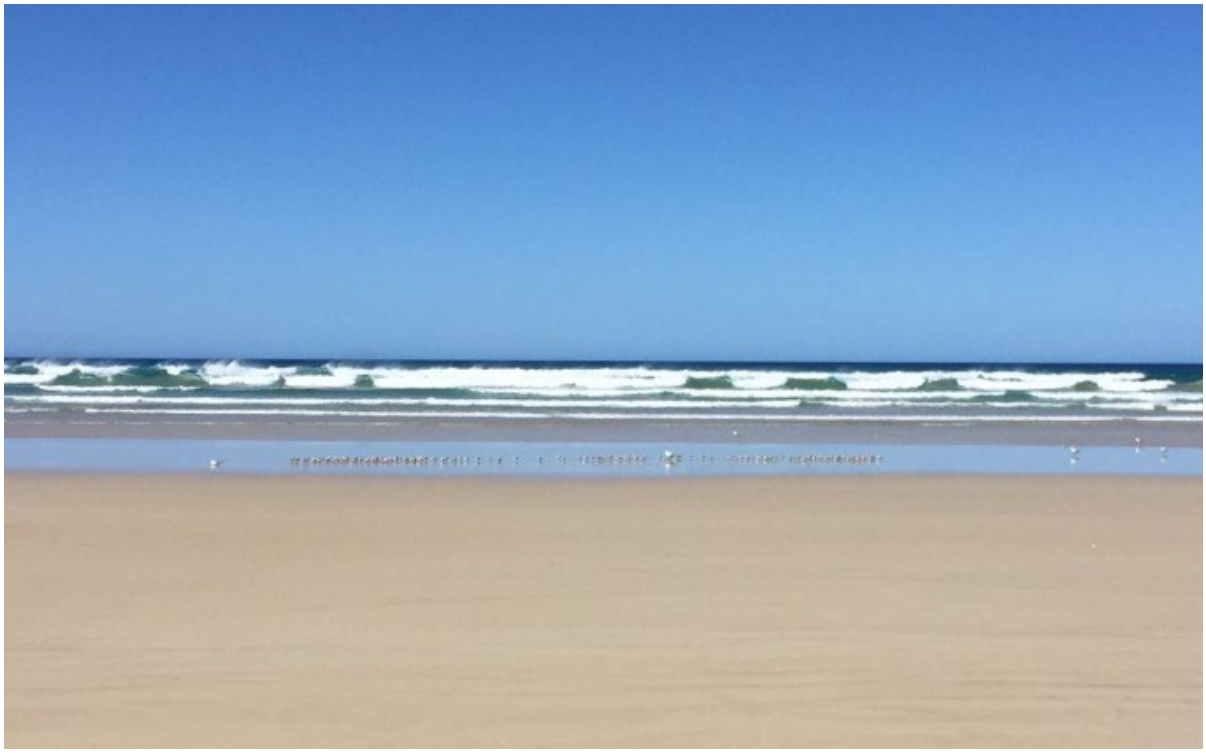

Plate 1. Sandy Point Beach (Waratah Bay) survey area – facing south – and flock of *Calidris alba* (sanderlings)

Plate 2. Sandy Point Beach (Waratah Bay) survey area – facing east

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