Appendix X

MNES Report

KENTBRUCK GREEN POWER HUB

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MNES Report

FINAL

Prepared by
Umwelt (Australia) Pty Limited
on behalf of
Neoen Australia Pty Ltd

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This report was prepared using Umwelt's ISO 9001 certified Quality Management System.

Acknowledgement of Country

Umwelt would like to acknowledge the traditional custodians of the country on which we work and pay respect to their cultural heritage, beliefs, and continuing relationship with the land. We pay our respect to the Elders – past, present, and future.

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1.0 Introduction

Neoen Australia Pty Ltd (Neoen) is proposing a renewable energy development, known as the Kentbruck Green Power Hub (the Project), which comprises a wind energy facility (wind farm) and associated infrastructure, including collector substations and power lines for the wind farm, and a new transmission line connecting the wind farm to the existing electricity network.

On 25 August 2019, the Victorian Minister for Planning (the Minister) determined under the *Environment Effects Act 1978* (VIC) (EE Act) that an Environment Effects Statement (EES) would be required for the Project due to the potential for significant environmental effects.

The Project was referred to the Commonwealth Minister for the Environment and Water (the Commonwealth Minister) on 7 November 2019.

On 7 November 2019, the Commonwealth Minister declared the Project to be a 'controlled action' under section 75 of the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) due to the potential for significant environmental impacts on Matters of National Environmental Significance (MNES). The controlled action decision was determined due to potential impacts on the following MNES:

- Ramsar wetlands.
- Listed migratory species.
- Listed threatened species and communities.

The decision on the referral also identifies the assessment approach for assessing potential impacts on the MNES identified in the decision as being the assessment Bilateral Agreement with Victoria. Bilateral Agreements allow each state or territory to assess proposed actions (projects or developments) on behalf of the Commonwealth Government. They remove the need for a separate assessment, reducing duplication. The Commonwealth Minister uses the Minister's environmental assessment report on the EES to inform the final decision about whether to approve the action.

Neoen submitted a request to the Commonwealth Minister to vary the Project on 12 September 2022. The variation request was accepted by the Commonwealth Minister on 21 October 2022. The purpose of the variation request was to remove the proposed battery storage facility (BSF), which was included as part of the Project in the original referral and subsequent decision. The BSF was removed from the Project in 2022 as Neoen considered that the Victorian electricity network imminently required wind resources from the Project more so than a BSF at the Project's location. The variation request also notified the Commonwealth Minister of the removal of 39 turbines in response to a range of different issues and constraints identified throughout the EES process, reducing the total number of turbines from 159 to 118. The number of turbines has since been further reduced to 105.

This report presents an assessment of the potential impacts of the Project on MNES protected under the EPBC Act. It has been written as a standalone component of the EES to assist the Commonwealth Minister in the assessment of potential impacts on MNES associated with the Project. The following EPBC Act policy documents were considered in the impact assessment for the Project:

- Matters of National Environmental Significance (MNES). Significant impact guidelines 1.1 ((DEWHA, 2013)).
- EPBC Act Policy Statement 2.3 – Wind farm industry. Australian Government Department of the Environment, Water, Heritage and the Arts 2009 ((DEWHA, 2009)).
- EPBC Act Policy Statement 3.14 – Significant Impact Guidelines for the vulnerable growling grass frog (*Litoria raniformis*) ((DEWHA, 2009)).
- EPBC Act Policy Statement 3.21 – Industry Guidelines for Avoiding, Assessing and Mitigating impacts on EPBC Act listed Migratory Shorebird Species ((DoE, 2015)).
- Draft referral guideline for 14 migratory birds listed under the EPBC Act. Australian Government ((DoE, 2015)).
- EPBC Act – Draft referral guidelines for the endangered southern brown bandicoot (eastern), *Isoodon obesulus obesulus*. ((DSEWPC, 2011)).

The EPBC Act stipulates several other mandatory considerations that the Australian Government Minister for the Environment must consider when making a decision on whether to approve an action that may affect a matter of national environmental significance. These are set out under the following sections of the Act:

- s138 in relation to the Ramsar Convention
- s139 in relation to threatened species
- s140 in relation to migratory species.

Of specific relevance to this impact assessment, these include:

- Australia's obligations under the Ramsar Convention.
- Recovery plans, threat abatement plans and approved conservation advices for threatened species and ecological communities.
- Australia's obligations under international conventions and agreements to protect listed migratory species. These are the Bonn Convention, the China–Australia Migratory Bird Agreement (CAMBA); the Japan Australia Migratory Bird Agreement (JAMBA) and the Republic of Korea–Australia Migratory Bird Agreement (ROKAMBA).

These have been referenced, as applicable, in the assessment of the significance of impacts on each matter of national environmental significance considered here.

This report compiles the findings of various investigations and impact assessments that have been prepared for the EES, including:

- Flora and Fauna Existing Conditions and Impact Assessment (Appendix C).
- Southern Bent-wing Bat Impact Assessment (Appendix E).

- Surface Water Impact Assessment (Appendix F).
- Groundwater Impact Assessment (Appendix G).
- Groundwater Dependent Ecosystem Impact Assessment (Appendix H).

These impact assessments are summarised in Chapter 7 *Biodiversity* and Chapter 9 *Surface water, groundwater and groundwater dependent ecosystems* of the EES.

1.1 Matters of national environmental significance

The EPBC Act provides a framework for the protection and management of the Australian environment, including the biodiversity and national and culturally significant places. Any action which would have a significant impact on an MNES must be referred to the Commonwealth Minister. There are nine MNES:

- World heritage properties.
- National heritage places.
- Wetlands of international importance (listed under the Ramsar Convention).
- Listed threatened species and ecological communities.
- Migratory species protected under international agreements.
- Commonwealth marine areas.
- The Great Barrier Reef Marine Park.
- Nuclear actions (including uranium mines).
- A water resource, in relation to coal seam gas development and large coal development.

1.2 Controlled action decision

Under the EPBC Act, if the Commonwealth Minister decides that a project has, will have, or is likely to have a significant impact on a MNES, the project becomes a 'controlled action' that must be assessed and approved by the Commonwealth Minster before it can proceed. A significant impact is considered an impact that is 'important, notable of consequence, having regard to its context or intensity'. A set of 'significant impact criteria' is in place for each of the nine MNES to assist in determining whether the impacts of a proposed action on any MNES are likely to be significant.

The Project was determined a 'controlled action' due to the potential for significant impacts on the ecological character of the internationally significant Glenelg Estuary and Discovery Bay Ramsar site (the Ramsar site), listed threatened species and ecological communities, and listed migratory species.

The relevant controlling provisions for the Project are:

- Listed threatened species and communities (under Sections 18 and 18A of the EPBC Act).
- Listed migratory species (Sections 20 and 20A).
- Wetlands of international importance (Sections 16 and 17B).
- According to section 158A of the EPBC Act, the decision of 'controlled action' as under s75 will not be affected by a 'listing event' in relation to the above MNES that occur after the decision is made.

The EES process is accredited under the Bilateral Assessment Agreement between the Commonwealth and Victorian Governments, allowing the Minister to make an assessment of potential impacts on MNES on behalf of the Commonwealth. Once the Minister makes an assessment of the Project under the EE Act, the Commonwealth Minister will determine whether the Project is approved. To determine whether the Project would be likely to have a significant impact on MNES, the magnitude, severity, extent and duration of potential impacts have been assessed in accordance with the Significant Impact Guidelines developed by the Commonwealth.

1.2.1 Listed threatened species and communities

The EPBC Act provides for the listing of nationally threatened native species and ecological communities, native migratory species, and marine species. Threatened species refers to those species that are considered threatened, including species that are listed as 'vulnerable', 'endangered' or 'critically endangered' under the EPBC Act.

The EPBC Act protects Australia's native species and ecological communities by providing for:

- Identification and listing of species and ecological communities as threatened.
- Development of conservation advice and recovery plans for listed species and ecological communities.
- Development of a register of critical habitat.
- Recognition of key threatening processes.
- Where appropriate, reducing the impacts of these processes through threat abatement plans.

1.2.2 Listed migratory species

Migratory species are those animals that migrate to Australia and its external territories or pass though or over Australian waters during their annual migrations, such as species of birds, mammals or reptiles.

Listed migratory species are those listed in the:

- Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention).
- China-Australia Migratory Bird Agreement.
- Japan-Australia Migratory Bird Agreement.

- Republic of Korea-Australia Migratory Bird Agreement.
- Species listed under these international agreements that Australia is a party to are protected under the EPBC Act.

1.2.3 Wetlands of international importance

A Ramsar wetland is an area designated under Article 2 of the Ramsar Convention or a wetland declared by the Commonwealth Minister to be a Ramsar wetland under the EPBC Act.

The Ramsar Convention encourages the designation of sites containing representative, rare or unique wetlands, or wetlands that are important for conserving biological diversity. Once designated, these sites are added to the Convention's List of Wetlands of International Importance and become known as Ramsar sites.

By designating a wetland as a Ramsar site, countries agree to establish and oversee a management framework aimed at conserving the wetland and ensuring its wise use. Wise use under the Convention is broadly defined as maintaining the ecological character of a wetland.

1.3 Terminology

This assessment of the potential impacts of the Project on MNES protected under the EPBC Act considered the Project infrastructure and broader search and investigation areas. These terms are used throughout this report and define the geographic extent of the assessment as shown in **Figure 1.1**, and includes:

- **Wind farm site** – the parcels of land on which the wind farm would be located, covering an area of approximately 8,318 hectares (ha).
- **Transmission line corridor** – the corridor of land in which the transmission line would be located, covering an area of up to 21 ha. The exact location of the transmission line within this corridor would be determined during detailed design of the Project.
- **The Project** – the Kentbruck Green Power Hub project including the wind farm, transmission line and associated infrastructure.
- **Project Area** – the total area in which the Project would be developed, including the wind farm site and transmission line corridor, of approximately ha.
- **Search Area** – the area used for collation of database records of flora and fauna, which includes the originally proposed Project Area plus a 10-kilometre (km) buffer.
- **Investigation Area** – the area in which field studies have been undertaken. This includes the Project Area plus areas surrounding the site where additional data collection was undertaken, including bird utilisation surveys (BUS), shorebird surveys, Brolga (*Antigone rubicunda*) surveys and reference sites for threatened species. Where required, some field studies were undertaken more than 10 km from the Project Area, for example checking reference sites for threatened flora species.

1.4 Project overview

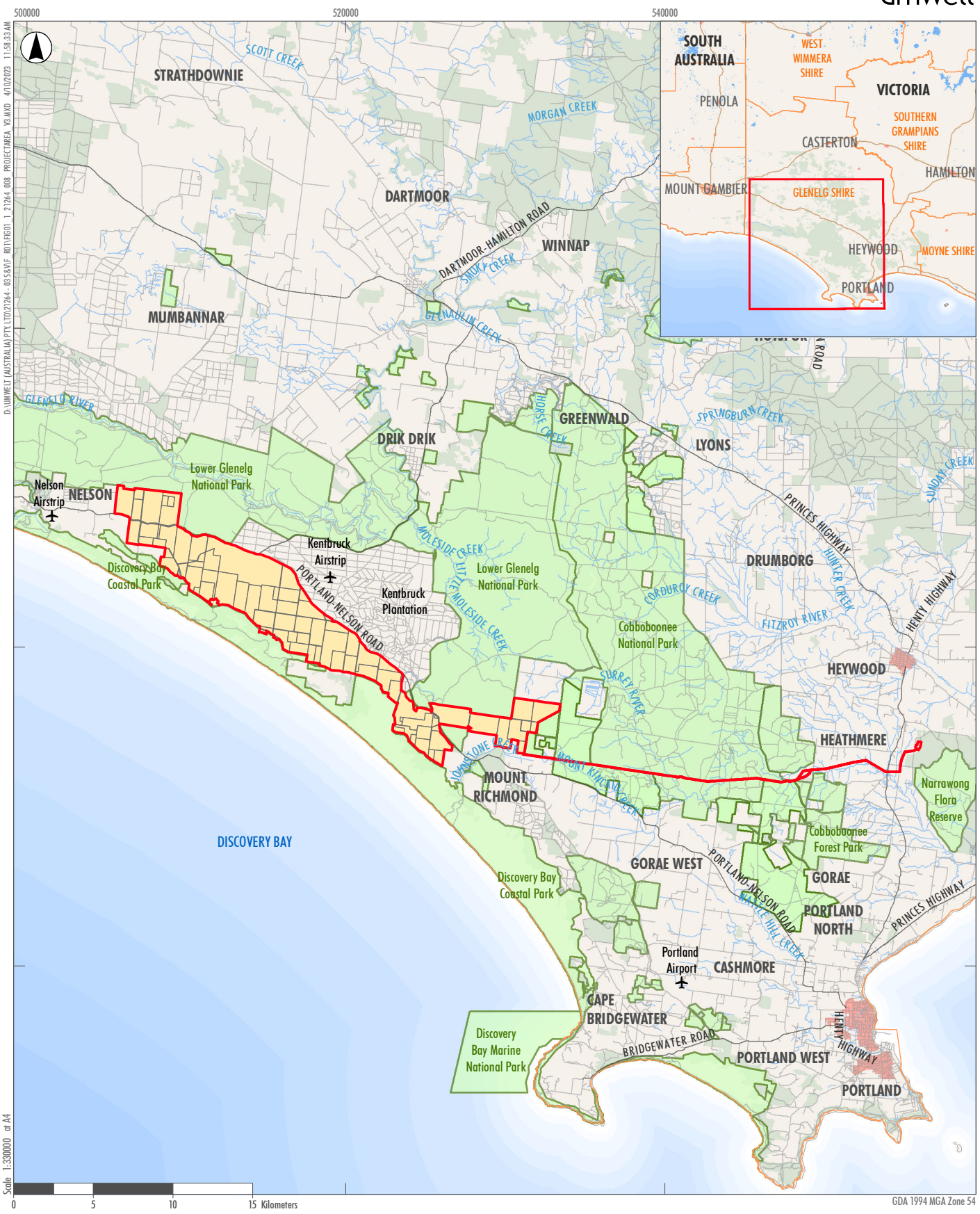
Neoen is proposing a renewable energy development comprising a wind farm and associated infrastructure, including collector substations and powerlines for the wind farm, and a new transmission line connecting the wind farm to the existing electricity network. The wind farm would be mostly located in an actively managed and harvested pine plantation in south-west Victoria, between Portland and Nelson, in the Glenelg Shire Council Local Government Area (Glenelg LGA).

The Project would involve two main components:

- A wind farm of up to 600 megawatts (MW) comprising up to 105 wind turbines with a maximum tip height of 270 metres (m) above ground level.
- A new 275 Kilovolt (kV) transmission line, which would connect the Project to the existing electricity transmission network. The proposed transmission line route measures approximately 26.6 km in length and would extend underground for 7.8 km from the main wind farm substation near the eastern boundary of the wind farm site to the existing Heywood Terminal Station.
- A limestone quarry to provide material for hardstands and for upgrades to existing access roads or construction of new access roads.

The Project is anticipated to deliver approximately 2,000 gigawatt-hours (GWh) of renewable electricity to the National Electricity Market (NEM).

An overview of the Project Area and location is shown in **Figure 1.1**.



Legend

- Project Area
- Involved Properties
- Parks and Reserves
- Local Government Areas
- Roads
- Watercourses

FIGURE 1.1

Site Context and Project Area

Image Source: ESRI Basemap (2021) Data source: Geoscience Australia; DELWP (2021)

2.0 Assessment methodology

This section describes the methodology used to assess potential impacts on MNES. **Section 2.1** outlines the assessment methodology for listed threatened species and ecological communities and listed migratory species, and **Section 2.2** outlines the assessment methodology for Ramsar wetlands.

The assessment involved the following:

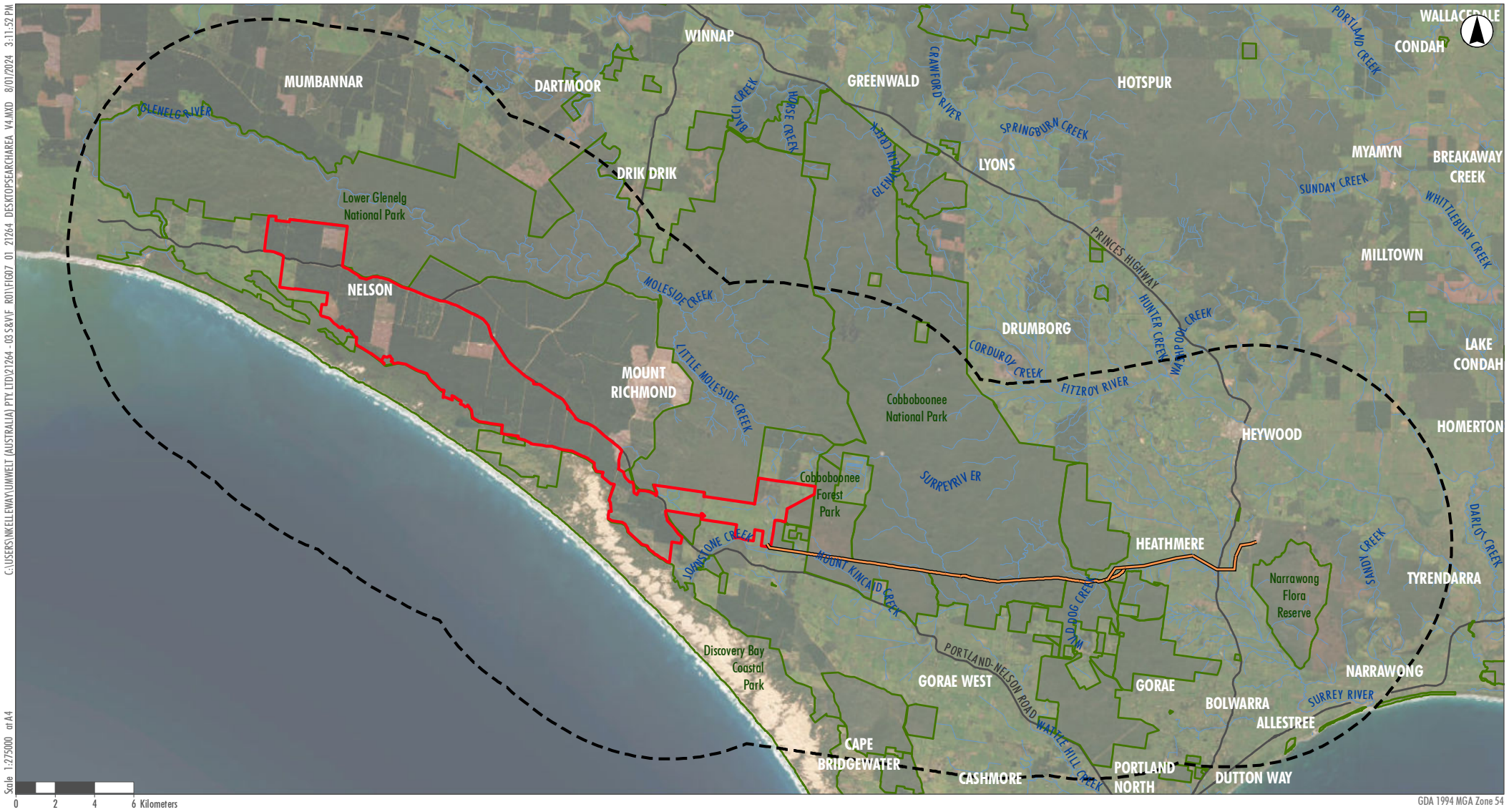
- A desktop assessment of relevant databases and a literature review of published and unpublished reports to provide context on the existing conditions.
- Field investigations to determine the likelihood of species to be present and/or impacted by the Project.
- Field investigations to characterise groundwater across the Project Area, including potential interactions with the Ramsar site.
- Targeted surveys of threatened species and ecological communities considered likely to be present and/or impact by the Project.
- Assessment of potential impacts of the Project against the Significant Impact Guidelines.

2.1 Listed threatened and migratory species and threatened ecological communities

2.1.1 Desktop assessment and literature review

To provide context for this assessment, a database and literature review was conducted to collect information about the flora and fauna within the Project Area and the surrounding 10 km (the Search Area) (see **Figure 2.1**). The following databases were reviewed as part of the **Flora and Fauna Existing Conditions and Impact Assessment (Appendix C)** to determine the likelihood of MNES presence:

- Protected Matters Search Tool (PMST) for MNES (accessed by Biosis on 8 July 2022) (Department of Agriculture, Water and the Environment, 2022).
- Native Vegetation Information Management (NVIM) system (Department of Environment, Land, Water and Planning, 2022).
- Glenelg Planning Scheme (the Planning Scheme) overlays relevant to biodiversity (Glenelg Shire Council, 2022).
- Non-government databases including the Atlas of Living Australia (Atlas of Living Australia, 2022).
- Local knowledge provided by agency staff and landholders (Biosis, 2022).
- Multiple published and unpublished documents (Biosis, 2022).



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Scale 1:275000 at A4

FIGURE 2.1

Desktop Search Area

Image Source: ESRI Basemap (2021) Data source: DELWP (2021); Biosis (2022)

2.1.2 Flora surveys

Flora surveys were carried out between May 2020 and October 2022 on the following dates:

- 4–8 May 2020
- 26 August 2020
- 15–18 September 2020
- 6–9 and 12–15 October 2020
- 9–13 November
- 10–12 March 2021
- 26–29 October 2021
- 12 August 2022
- 27–28 October 2022.

These surveys targeted threatened species protected under Commonwealth and State legislation. They also involved flora surveying activities including vegetation mapping, inspecting the proposed wind turbine locations, and assessing the quality of vegetation that may be impacted by the wind farm and transmission line infrastructure. The targeted species surveys were informed by the specific species and ecological communities identified in the *Scoping Requirements for Kentbruck Green Power Hub Environment Effects Statement* (Scoping Requirements) and desktop assessment.

Mapping was conducted using hand-held GPS-enabled tablets and aerial photo interpretation. The accuracy of the mapping is therefore subject to the accuracy of the tablets (generally ± 7 m) and dependent on the limitations of aerial photo rectification and registration.

Targeted surveys for threatened flora species focused on species listed under the EPBC Act. They were undertaken in areas of habitat identified in the vegetation surveys that could be directly impacted by the Project. This included areas where alternative locations were being considered for some Project components such as the transmission line route. Surveys were conducted using accepted methods, following appropriate survey guidelines where available, as detailed in **Table 2.2**.

For some species this included reference site checks to ensure surveys were conducted when species would be locally detectable. Reference sites included locations where the species had been recorded on the databases. Most reference sites were located within large, high-quality areas of habitat, including Discovery Bay Coastal Park, Lower Glenelg National Park, Mount Richmond National Park, Cobboboonee National Park, Bats Ridge Wildlife Reserve and Point Danger Coastal Reserve.

Due to seasonal variation in flowering periods, reference sites and potential impact areas were searched repeatedly, over multiple survey periods, as indicated in **Table 2.1**. These surveys involved walking transects through the vegetation and searching for any of the listed species with potential to occur in the relevant habitat type.

Table 2.1 Survey program for flora species listed under the EPBC Act

EPBC Act listed species and status	Potential survey areas	Survey methods and timing	Relevant survey guidelines
River Swamp Wallaby-grass (*Amphibromus fluitans*) **Vulnerable (VU)**	Wetlands	Transect surveys in suitable habitat. Surveyed in August 2020, September 2020, October 2020, November 2020, December 2020.	No specific guidelines.
Limestone Spider-orchid (*Caladenia calcicole*) **Vulnerable (VU)**	Limestone ridges supporting native vegetation - (Limestone Ridge Woodland)	Reference site checks to confirm flowering. Area search using transects. Surveyed in September 2020, October 2020, November 2020, December 2020	Recovery plan – (Dickson CR, 2010) Survey guidelines (Department of the Environment and Energy, 2013)
Colourful Spider-orchid (*Caladenia colorata*) **Endangered (EN)**	Heathy Woodland on sandy soils over limestone	Reference site checks to confirm flowering. Area search using transects. Surveyed in August 2020, September 2020, October 2020.	No recovery plan. Survey guidelines (Department of the Environment and Energy, 2013)
Mellblom's Spider-orchid (*Caladenia hastata*) **Endangered (EN)**	Damp Heathland and Damp Heathy Woodland on Aeolian sand deposits	Reference site checks to confirm flowering. Area search using transects. Surveyed in October 2020 and November 2020.	Recovery plan – (Todd JA, 2000) Survey guidelines (Department of the Environment and Energy, 2013)
Ornate Pink-fingers (*Caladenia ornate*) **Vulnerable (VU)**	Heathland and grassy woodlands	Reference site checks to confirm flowering. Area search using transects. Surveyed in October and November 2020	Recovery plan – (Duncan M, 2009) Survey guidelines (Department of the Environment and Energy, 2013)
Wrinkled Cassinia *(Cassinia rugata)* **Vulnerable (VU)**	Damp, low open forest or dense heathy scrub	Transect surveys in suitable habitat. Surveyed in August 2020, September 2020, October 2020, November 2020, December 2020.	Recovery plan – (O & Walsh, National Recovery Plan for the Wrinkled Cassinia Cassinia rugata, 2006) No specific survey guidelines.
Clover Glycine *(Glycine latrobeana)* **Vulnerable (VU)**	Grasslands and grassy woodlands, particularly those dominated by Kangaroo Grass	Transect surveys in suitable habitat Surveyed in September, October, November and December 2020	Recovery plan - (O & G, National Recovery Plan for Clover Glycine Glycine latrobeana, 2010) No specific survey guidelines.
Square Raspwort *(Haloragis exalata* var. *exalata)* **Vulnerable (VU)**	Damp riparian habitats	Transect surveys in suitable habitat Surveyed in October, November, December 2020	No recovery plan No specific survey guidelines

EPBC Act listed species and status	Potential survey areas	Survey methods and timing	Relevant survey guidelines
Coast Ixodia ***(Ixodia achillaeoides* subsp. *Arenicola)*** **Vulnerable (VU)**	Low coastal shrublands on exposed limestone headlands, often on steeply sloped sites	Transect surveys in suitable habitat. Surveyed in November and December 2020	Recovery plan – (O, National Recovery Plan for the Coast Dandelion Taraxacum cygnorum, 2010b)
Maroon Leek-orchid (*Prasophyllum frenchii*) **Endangered (EN)**	Grassland and grassy woodland environments on sandy or black clay loam soils that are generally damp but well drained	Reference site checks to confirm flowering. Area search using transects Surveyed in October, November, December 2020	Recovery plan – Duncan (2010a) Survey guidelines (Department of the Environment and Energy, 2013)
Dense Leek-orchid (*Prasophyllum spicatum*) **Vulnerable (VU)**	Coastal and near-coastal heathlands and heathy woodlands on sandy soils that may be seasonally waterlogged	Reference site checks to confirm flowering. Area search using transects Surveyed in October and November 2020	Recovery plan – Duncan (2010b) Survey guidelines (Department of the Environment and Energy, 2013)
Green-striped Greenhood ***(Pterostylis chlorogramma)*** **Vulnerable (VU)**	Heathy woodland; more specific habitat requirements are poorly known	Reference site checks to confirm flowering. Area search using transects Surveyed in August and September 2020	Survey guidelines (Department of the Environment and Energy, 2013)
Swamp Greenhood (*Pterostylis tenuissima*) **Vulnerable (VU)**	Swamp scrub with a dense canopy and open understorey, often on or beside animal tracks	Reference site checks to confirm flowering. Area search using transects Surveyed in October, November, December 2020	Recovery plan – (Dickson CR, 2010) Survey guidelines (Department of the Environment and Energy, 2013)
Swamp Fireweed (*Senecio psilocarpus*) **Vulnerable (VU)**	Grassy and sedgy wetlands	Area search using transects. Surveyed in November and December 2020	No recovery plan. No specific survey guidelines.
Coast Dandelion ***(Taraxacum cygnorum)*** **Endangered (EN)**	Confined to woodlands and scrub on calcareous soils	Area search using transects. Surveyed in October, November, and December 2020	Recovery plan – (Carter O. &., 2010) No specific survey guidelines.
Metallic Sun-orchid ***(Thelymitra epipactoides)*** **Endangered (EN)**	Moist or dry sandy loams or loamy sands, primarily in coastal heaths, grasslands and woodlands	Reference site checks to confirm flowering. Area search using transects Surveyed in September, October, and November 2020	Recovery plan – (Coates F, 2003) Survey guidelines – (Department of the Environment and Energy, 2013)
Swamp Everlasting (*Zerpchrysum palustre*) **Vulnerable (VU)**	Sedge-swamps and shallow freshwater marshes and swamps in lowlands, on black cracking clay soils	Area search using transects. November and December 2020	Recovery plan – Carter and Walsh (2011)

2.1.3 Fauna surveys

The fauna survey program was designed to detect threatened species known or likely to occur in the Investigation Area based on database and literature review records. The survey program, including the level of survey effort, applied to these surveys was developed with consideration of the listing status of species, likelihood of occurrence, susceptibility to impacts from the project and availability of appropriate techniques. Neoen and Biosis consulted with the Victorian Department of Energy, Environment and Climate Action (DEECA) (formerly DELWP) in 2018 and 2019 to determine which threatened and migratory species and ecological communities require investigation, as well as to obtain and refine methods and efforts for various surveys.

Monitoring and surveys for some threatened bird species (including Fork-tailed Swift (*Apus pacificus*) and White-throated Needletail (*Hirundapus causacutus*)) were undertaken during BUS rather than specific surveys targeted at these species.

Details on the targeted surveys for fauna species listed under the EPBC Act are provided below (**Table 2.2**).

Table 2.2 Survey program for fauna species listed under the EPBC Act

EPBC Act listed species and status	Survey areas	Survey methods and timing	Relevant survey guidelines
Southern bent-wing Bat (*Miniopterus orianar bassanii)* **Critically Endangered (CR)**	Green Triangle Forest Products Plantation, HVP Plantation, Mount Richmond Park and Discovery Bay Park	Passive echolocation conducted in November and December 2018 and February to April 2019. Acoustic monitoring program conducted between December 2019 to December 2020. Manual checking of bat calls.	Recovery plan – (Lumsden, 2015) Survey guidelines for Australia's threatened birds
South-eastern Red-tailed Black Cockatoo (*Calyptorhynchus banksia graptogyne)* **Endangered (EN)**	Mount Richmond, Cobboboonee National Park that lies to the north and east of the Project Area, Lower Glenelg National Park	BUS points. A total of 418 20-minute point counts at 17 sites in the Project Area and 10 control sites in the broader Investigation Area. Surveys were undertaken in February, April, June, August, October, and December 2020.	Recovery plan - (Department of Environment and Water Resources, 2007) Survey guidelines for Australia's threatened birds
Orange-bellied Parrot (*Neophema chrysogaster)* **Critically Endangered (CR)**	Noble Rocks, Swan Lake and coastal heath within the Investigation Area	Walking along the beach parallel to dunes with suitable coastal heath habitat, and across dune habitat. Scanning for species and listening for calls. Surveys were conducted in May, June, July, and August 2020. BUS point counts at potential survey areas were also used to identify Blue-winged Parrot.	Recovery plan - (Department of Environment, 2016) Survey guidelines for Australia's threatened birds
Blue-winged Parrot (*Neophema chrysostoma)* **Vulnerable (VU)**			
Australasian Bittern (*Botaurus poiciloptilus)* **Endangered (EN)**	Wetland south of Swan Lake, Wetland at Mount Richmond, Wetland Harolds Track, Lake Mombeong, Little Creek, Quarry Road, Wetlands along Long Swamp	Surveys within suitable foraging habitat, and call-broadcast surveys Surveys were conducted in December 2018, February 2019, October 2020 and November 2020.	Draft national recovery plan – (Department of Environment and Energy, 2019) Survey guidelines for Australia's threatened birds

EPBC Act listed species and status	Survey areas	Survey methods and timing	Relevant survey guidelines
White-throated Needletail (*Hirundapus caudacutus)* **Vulnerable (VU) and Migratory**	Swan Lake, Cain Hut Swamp, The Sheepwash, Lake Mombeong, Glenelg Estuary, Noble Rocks Shorelines	BUS point counts at potential survey areas. Scanning airspace documenting location and height of any individuals detected. Surveys were conducted between April 2020 and February 2021.	No recovery plan Survey guidelines for Australia's threatened birds
Fork-tailed Swift (*Apus pacificus)* **Marine and Migratory**	BUS point counts were located at representative sites within the wind farm site and in adjacent land.	BUS point counts at potential survey areas. Surveys were conducted between April 2020 and February 2021.	Survey guidelines for Australia's threatened birds
<u>Shorebirds, gulls and terns</u> **Migratory shorebirds including:** • **Curlew Sandpiper (*Calidris ferruginea)* (CR)** • **Eastern Curlew (*Numenius madagascariensis)* (CR*)*** • **Red Knot (*Calidris canutus)* (EN).** **Non-migratory shorebirds including** • **Hooded Plover (*Thinornis cucullatus)* (VU).** **Terns including** • **Fairy Tern (*Stenula nereis nereis*) (VU).**	Glenelg Estuary, Swan Lake, Swan Lake shoreline, Noble Rocks shoreline	High tide and low tides within the same survey period were conducted were conducted February, July, November and December.	EPBC Act Policy Statement 3.21—Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species (DoE, 2015)
Terrestrial mammals, including: • **Heath Mouse (*Pseudomys shortridge)i* (EN)** • **Southern Brown Bandicoot (*Isoodon obesulus obesulus)* (EN)** • **Long-nosed Potoroo (*Potorous tridactylus trisulcatus) (*VU)** • **Swamp Antechinus (*Antechinus minimus maritimus)* (VU).**	Farmland, bluegums, pine plantation, areas of native vegetation, recently cleared native vegetation and roadsides	Camera surveys were conducted between May 2020 and June 2020, with a second deployment between October 2020 and November 2020. Hair sampling funnel traps were also deployed during October and November surveys.	Survey guidelines for Australia's threatened mammals (DEWHA 2011a)

EPBC Act listed species and status	Survey areas	Survey methods and timing	Relevant survey guidelines
Growing Grass Frog ***(Litoria raniformis)*** **Vulnerable (VU)**	Inhabits wetlands and sometimes waterways which support suitable habitat in the form of fringing, emergent and floating vegetation. Surveys were undertaken at bodies of water close to the Project Area.	Call playback and listening (for male calls) surveys were supplemented by spotlighting. Surveys were carried out in November 2018 and February 2019, during a minimum of two nights by two zoologists at each wetland.	Significant impact guidelines for the vulnerable Growling Grass Frog (DEWHA 2009b).
Swamp Skink (*Lissolepis coventryi*) **Endangered (EN)**	At the location of a historical Victorian Biodiversity Atlast (VBA) record at the southern end of Johnsons Road, and other swampy areas with potential habitat throughout the Project Area.	Twenty-three rows of 15 tiles (345 tiles) spaced 10 m apart were deployed in July 2020 and each was checked on three separate occasions: once in October, November and December. This was to survey for all threatened reptile species. A total of four hours was spent searching for Swamp Skink at the survey areas identified to the left.	Survey guidelines for Australia's threatened reptiles (DEWHA 2011b).

2.1.3.1 Bird utilisation surveys

BUS were undertaken in April, June, August, October and December 2020 and February 2021 to provide an understanding of the avifauna presence in the Investigation Area and to inform collision risk modelling for a range of species.

Replicate surveys were conducted across a ten-month period to representatively sample different seasons and capture the presence of migratory birds. Twenty-seven point count survey sites were selected across the Investigation Area. A point count is a tally of birds detected by sight and sound by an observer located a fixed position. Surveys were conducted three times at each point count site during each monitoring month. The three surveys were spread across 'morning' (start between 07:45 and 10:59), 'midday' (start between11:00 and 13:59) and 'afternoon' (start between 14:00 and 17:15), to capture the presence of the entire diurnal bird species assemblage at each site.

Point count surveys were conducted for 20 minutes by a zoologist, with the observer allowing an additional 5 minutes of time for birds to settle prior to commencing each survey. During the point count the observer recorded all birds sighted and associated variables including behaviour, flight height and distance from the observer. In addition to data collected during the 20-minute surveys, species heard during the survey and seen during the 5 minutes prior to the survey were also recorded.

A total of 418-point counts were carried out at 17 treatment sites (within the Project Area) and 10 control sites (outside the Project Area). Totals of between 14 and 18 replicate counts were undertaken at each site in the months mentioned above. The survey sites were representative of locations for proposed turbines and sites of known threatened bird records. Refer to **Figure 2.2** for BUS point locations.

During the BUS a total of 141 bird species were recorded including 12 threatened or listed species. Four threatened bird species listed under the EPBC Act were recorded during the surveys being:

- Gang-gang Cockatoo (*Callocephalon fimbriatum*)
- Bar-tailed Godwit (*Limosa lapponica)*
- Hooded Plover (*Thinornis cucullatus*)
- White-throated Needletail (*Hirundapus caudacutus).*

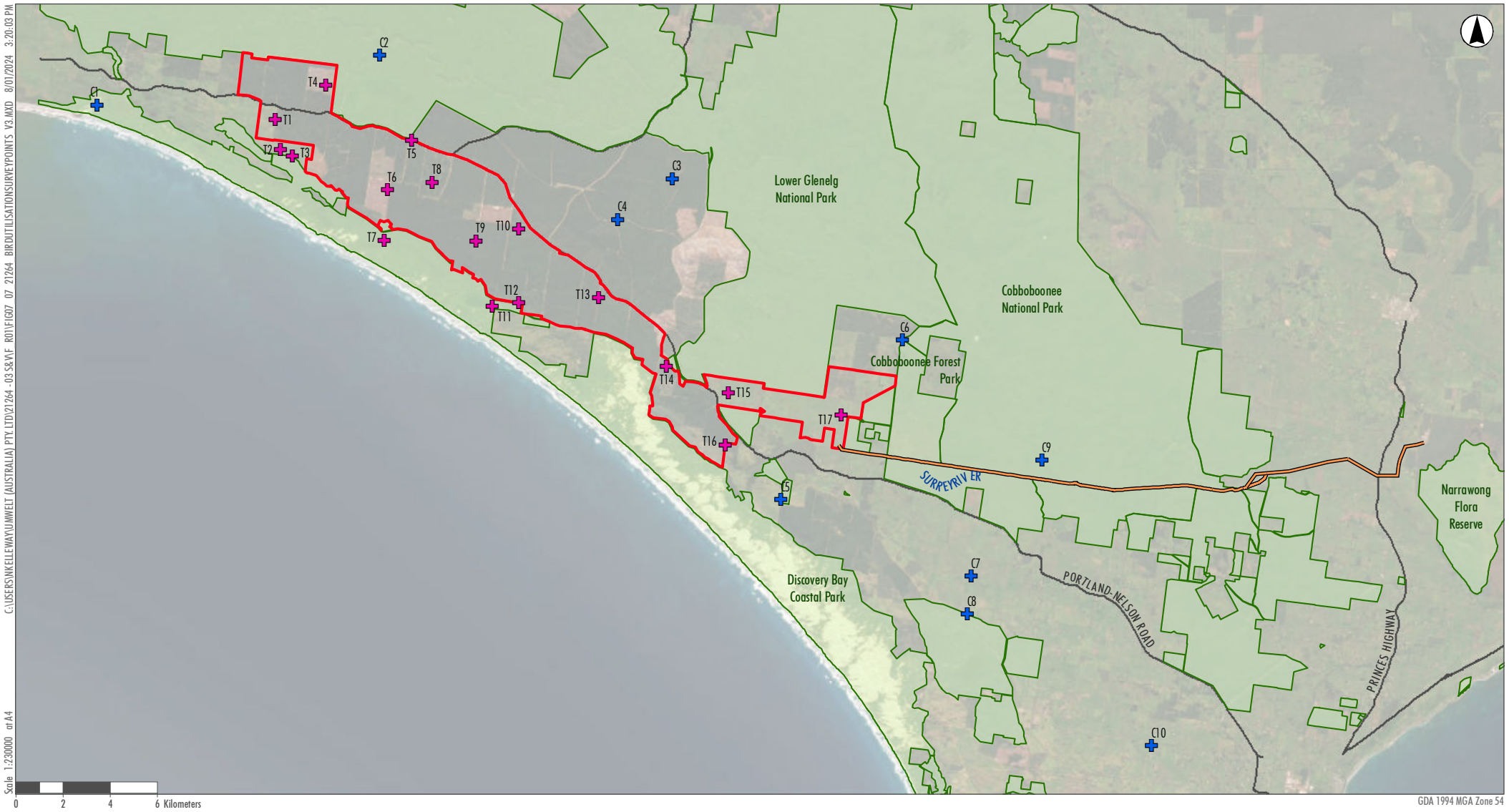


FIGURE 2.2

Bird Utilisation Survey Points

Image Source: ESRI Basemap (2021) Data source: DELWP (2021); Biosis (2022)

2.1.3.2 Southern bent-wing bat

The acoustic surveys were undertaken in two stages for the Project, as outlined in **Table 2.3**.

Table 2.3 Southern Bent-wing Bat Acoustic Surveys

Stage	Timing	No. ground locations	No. met masts	Mast detector heights				Total no. detectors
				1.5 m	28 m	56 m	84 m	
Stage 1 Preliminary surveys	November 2018 to April 2019	10	1	✓	✓	✓	✓	14
Stage 2 12-month Surveys	December 2019 to December 2020*	8	4 (including 1 used in Stage 1)	✓	✓	✓	✓	24

** Detectors were installed in late November 2019, and removed in mid December 2020, so presentation of results is limited to the 12 months including December 2019 to November 2020.*

Stage 1 preliminary surveys used 14 detectors at 10 ground locations and one meteorological monitoring mast (met mast) (with four detectors at different heights). The Stage 2 12-month survey program used 24 bat detectors, including eight stand-alone ground detectors and 16 detectors on four met masts, with each met mast having a detector at 1.5 m, 28 m, 56 m and 84 m above ground level. Refer to **Figure 2.3** for bat detector locations.

As the met mast location used for the preliminary surveys (Mast 3) was within a cleared plantation coupe near to Lake Mombeong it was proposed, in consultation with Lindy Lumsden (DEECA – Arthur Rylah Institute for Environmental Research), that the three other met masts for the stage 2 12-month survey should be located within the following sites:

- One site within mature pines close to a wetland which would not be harvested during the study (Mast 4).
- One site within mature pines distant from any wetland which would not be harvested during the study (Mast 2).
- One site that might be in a movement corridor near wetlands but away from pines. The objective of this site would be to act as a control site representing Southern Bent-wing Bat (SBWB) usage in a zone of preferred local habitat away from turbines (Mast 1).

Bat call analysis and manual checking

Bat calls were analysed using the automated identification software AnaScheme, which applies a conservative approach to identifying calls in that only clear, high-quality calls are assigned to a species. The system also counts recordings which match the criteria to be considered true bat calls but may be of insufficient quality to identify to species level. Potential SBWB calls assigned by AnaScheme were examined manually to classify calls into confidence classes.

A total of 2,739 recordings were examined and assigned to the following categories:

- Confident SBWB.
- Probable SBWB.
- Species complex including SBWB and Vespadelus spp..
- Unlikely to be SBWB.
- Poor quality recording with insufficient information for identification.
- Noise (not bat calls).

The AnaScheme system is known to have an issue with false-positive identifications, whereby the system sometimes attempts to identify data sequences that, upon manual review, are clearly noise. This is particularly an issue with low frequency bat species. To overcome this issue, a combination of manual checking and use of an additional system (Anabat Insight) was used. Anabat Insight includes a filtering algorithm that is very effective at eliminating noise files. The Anabat Insight filtering was conducted for all recordings from mast-based detectors, to improve the accuracy of the height and wind speed analysis.

However, a proportion of bat calls may be unidentifiable to species level, due to poor quality of the recordings, such as calls that are detected towards the outer edge of the range of the detectors. This is an issue with all acoustic monitoring of bat calls, including both zero crossing and full spectrum recordings. Some manual checking was undertaken to attempt to quantify the proportion of bat calls that were of insufficient quality for identification.

Wind speed analysis

Wind speed data were derived from the four met masts for the period of the microbat surveys, to enable investigation of patterns between bat activity and wind speed, and to provide an assessment of the frequency distribution of wind speed throughout the study, using both 24-hour data and data from night time only. Wind data were extracted for the period from 1 December 2019 to 31 December 2020.

C:\USERS\NKELLEWAY\UMWELT (AUSTRALIA) PTY LTD\V21264 - 03 S&V\F R01\FIG07 09 21264 BATDETECTORLOCATIONST V5.MXD 8/01/2024 3:23:14 PM

Scale 1:175000 at A4

Legend

- Underground Transmission Line
- Wind Farm Site
- Parks and Reserves
- Roads
- Watercourses

Site Locations

- Ground Detector
- Met Mast
- Preliminary (2018 - 2019) Monitoring Site

FIGURE 2.3

Bat Detector Locations

Image Source: ESRI Basemap (2021) Data source: DELWP (2021); Biosis (2022)

2.1.3.3 South-eastern red-tailed black cockatoo

The South-eastern Red-tailed Black Cockatoo population has an unpredictable nature of movements and use of its range. Biosis (2022) noted that surveys to document the species in the Investigation Area would offer a limited basis for understanding how the birds might use the area over the life of the Project. As such, the approach adopted by Biosis to investigate the species' likely use of the area was based on the identification of suitable habitat in the Investigation Area. Potentially suitable habitat to be surveyed was identified using existing records from VBA and Birdlife Australia, of the species in the region and existing mapping of habitat tree species. This approach was agreed to in consultation with DEECA Environment Portfolio. BUS points provided capacity to detect South-eastern Black Cockatoo it was present when those surveys were undertaken.

2.1.3.4 Orange-bellied parrot and blue-winged parrot

Because the coastal habitat of Orange-bellied Parrot is also used by Blue-winged Parrot and the two species may occur together, targeted surveys for Orange-bellied Parrot also targeted and documented Blue-winged Parrots. BUS were also used to record Blue-winged Parrot.

Desktop investigations used VBA data base to gain an understanding of previous records within the Investigation Area and the broader region.

Surveys were conducted in accordance with the Commonwealth *survey guidelines for Australia's threatened birds: Guidelines for detecting birds listed as threatened under the EPBC Act* (DEWHA, 2010), specifically the provisions outlined for orange-bellied parrot surveys.

Surveys were undertaken in May, June, July, and August 2020 when the species is known to be on the mainland. Surveys were located near Noble Rocks and Swan Lake, within coastal heath habitat near historical, orange-bellied parrot records. Given the extent of potentially suitable habitat and lack of recent records and knowledge of roost and foraging sites, Biosis (2022) applied a combined approach of DEWHA (2017) survey effort recommendations, involving surveys during the first two hours of daylight and the last two hours of daylight. Survey location as well as previous sightings for the species are shown in **Figure 2.4**. These times periods are when birds are most active and therefore most readily found (DEWHA, 2010).

FIGURE 2.4

Orange-bellied Parrot Survey Locations

Image Source: ESRI Basemap (2021) Data source: DELWP (2021); Biosis (2022)

2.1.3.5 Australasian bittern

Surveys for the Australasian Bittern were conducted during the species' known breeding season, with call-broadcast surveys undertaken at suitable habitat within the Investigation Area in December 2018, February 2019, October 2020 and November 2020 (see **Table 2.4** and **Figure 2.5**). These surveys included call playback, active searching, and call playback for both species, focusing on permanent wetlands with dense aquatic and emergent vegetation within the Investigation Area. No surveys were conducted during the non-breeding season as the aim of the investigations was to survey when the species is most likely to be detected, in spring during the breeding season when males are calling.

Observational and call-broadcast surveys were undertaken for the Australasian bittern as per the Survey Guidelines for Australia's threatened birds (DEWHA, 2010). Australasian bitterns breed between October and March. The peak of male bittern calling is 30 minutes before sunrise followed by two hours around sunset during the breeding season.

BUS point counts which targeted the Australasia Bittern, Little Bittern, Baillon's Crake and Lewin's Rail were undertaken at representative sites within the Investigation Area, and suitable habitat within the region which includes Swan Lake, Cain Hut Swamp, Lake Mombeong and Noble Rocks (Biosis, 2022).

Table 2.4 Australasian bittern surveys

Date	Location
27/11/2018	Wetland south of Swan Lake; Wetland 1 Mt. Richmond; Wetland 2 Mt. Richmond; Wetland Harolds Track, Mt. Richmond.
28/11/2018	Lake Mombeong; Little Creek, Quarry Road, Mt. Richmond.
5/02/2019	Wetland 2 Mt. Richmond; Wetland Harolds Track, Mt. Richmond; Swan Lake.
6/02/2019	Wetland Harolds Track, Mt. Richmond; Swan Lake; Small wetland east of Lake Mombeong.
7/02/2019	Small wetland east of Lake Mombeong.
13/10/2020	South-west edge of Long Swamp; Southern edge of Long Swamp; Eastern edge of Long Swamp; Wetland 1 north of Lake Mombeong; Wetland 2 north of Lake Mombeong; Wetland 3 north of Lake Mombeong.
14/10/2020	Private property, Mount Kincaid Rd; Swan Lake; Intersection of Kentbruck Settlement Rd and Blacks Rd.
15/10/2020	Lake Mombeong; Small wetland east of Lake Mombeong; Small wetland north of Lake Mombeong.
24/11/2020	Swan Lake.

2.1.3.6 White-throated needletail

The VBA database was used to identify previous location of the White-throated Needletail within the Investigation Area and the broader region.

White-throated Needletail migrate from the northern hemisphere to Australia for their non-breeding season and are annually present in south-eastern Australia between November and March–April. The *Conservation Advice Hirundapus caudacutus White-throated Needletail* (TSSC, 2019) notes that it is difficult to systematically survey for the species in Australia. It also suggests that surveying of the species is difficult due to its high mobility, but any surveys that are between October and April in northern and eastern Australia and between December to March for south eastern Australia.

BUS point counts were undertaken at representative sites within the Investigation Area (see **Figure 2.2**). During all point counts between in April, June, August, October and December 2020 as well as in February 2021. Observers scanned all airspace for the species and documented the locations and height of any birds detected.

Legend

- Australasian Bittern Survey Location
- Australasian Bittern (VBA)
- Wind Farm Site
- Underground Transmission Line
- Parks and Reserves
- Roads

FIGURE 2.5

Australasian Bittern Survey Locations

Image Source: ESRI Basemap (2021) Data source: DELWP (2021); Biosis (2022)

2.1.3.7 Migratory shorebirds

This section covers all species of waders, terns and gulls listed under provisions of the EPBC Act for international migratory species shorebirds threatened and listed under the EPBC Act include the Red Knot (*Calidris canutus*), Hooded Plover (*Thinornis cucullatus*) and Fairy Tern (*Sternula nereis*). The Red-capped Plover is not a threatened species, however it is included as it is a species that forms part of the ecological character description of the Ramsar site. A number of listed threatened and migratory waders, terns and gulls have been recorded within 10 km of the Project Area.

Surveys for migratory shorebirds were undertaken in accordance with the EPBC Act Policy Statement 3.*21 Industry guidelines for avoiding assessing and mitigating impacts on EPBC Act listed migratory shorebirds species* (DoE, 2015).

The main shorebird survey locations for the field surveys were selected using knowledge of important habitats and Ramsar sites, database records and access — Glenelg River Estuary and accessible non-tidal areas within Discovery Bay Coastal Park, which includes the whole or portions of Swan Lake, Dead Horse Swamp, The Sheepwash, and Lake Mombeong and associated wetlands.

An existing body of data (Shorebird2020, VBA, BirdData and eBird) demonstrates the use of Glenelg River estuary by a suite of shorebirds, terns and gulls and the beaches of Discovery Bay by Hooded Plover, Sanderling, and species of terns and gulls. Vegetated interdunal swamps and areas of damp pasture are known habitats for Latham's Snipe. A suite of accessible wetlands deemed most likely to contain suitable shorebird habitat inland from the coast were included in the field surveys. These inland wetlands were included to understand potential habitat use and movements between these and the shoreline, through low tide and high tide counts.

Targeted surveys for migratory and threatened bird were undertaken in January, February, June, October, November and December 2020 and in January 2021 at the following locations:

- Swan Lake (1)
- Discovery Bay Coastal Park shoreline (2)
- Lake Mombeong (3) and nearby unnamed wetlands (4, 5)
- Cain Hut Swamp (6)
- Lake Sheepwash (7)
- Nobles Park shoreline (8)
- Glenelg Estuary (9), including saltmarsh and Oxbow Lake surveyed from Beach Road.

Cain Hut Swamp (6) and Lake Sheepwash (7) survey locations are on the southern Project Area boundary. The rest of the survey locations are outside of the Project Area. Surveys were used to determine the species occurring in proximity to the wind farm site and the locations of key resources such as high productivity foraging areas and roost locations. These locations and the associated location numbers are shown in **Figure 2.6**.

Legend

- Underground Transmission Line
- Wind Farm Site
- Parks and Reserves
- Roads

Migratory Shorebird Survey Location

1. Swan Lake
2. Discovery Bay Coastal Park Shoreline
3. Lake Mombeong (3) and Nearby Unnamed Wetlands (4,5)
6. Cain Hut Swamp
7. Lake Sheepwash
8. Nobles Park Shoreline
9. Glenelg Estuary, Including Saltmarsh and Oxbow Lake Surveyed from Beach Road

FIGURE 2.6

Migratory Shorebird Survey Locations

Image Source: ESRI Basemap (2021) Data source: DELWP (2021); Biosis (2022)

2.1.3.8 Terrestrial mammals

Remote cameras were used to identify small terrestrial mammals at multiple locations across the Investigation Area (see **Figure 2.7**). An initial camera survey was conducted between May 2020 and June 2020, with a second deployment running between October 2020 and November 2020 that covered new target areas. The focus of the surveys was to identify locations within the disturbance footprint of the Project (including the wind farm and transmission line) that may be potentially suitable habitat for threatened mammal species.

Surveys for arboreal mammals were not undertaken because, at the time of the field investigations no arboreal mammals of the local area were listed as threatened. Since that time the Yellow-bellied Glider has been listed under both the EPBC Act and the FFG Act. Its habitat preferences are well known and there are substantial records of the species from appropriate habitat within the Investigation Area.

Threatened mammal species previously recorded within, or in the vicinity of, the Project Area with a medium likelihood of occurrence include:

- Heath Mouse (*Pseudomys shortridgei)* (Endangered)
- Long-nosed Potoroo (*Potorous tridactylus trisulcatus)* (Vulnerable)
- Southern Brown Bandicoot *(Isoodon obesulus obesulus)* (Endangered)
- Swamp Antechinus (*Antechinus minimus maritimus)* (Vulnerable)
- Yellow-bellied Glider (*Petaurus australis)* (Vulnerable).

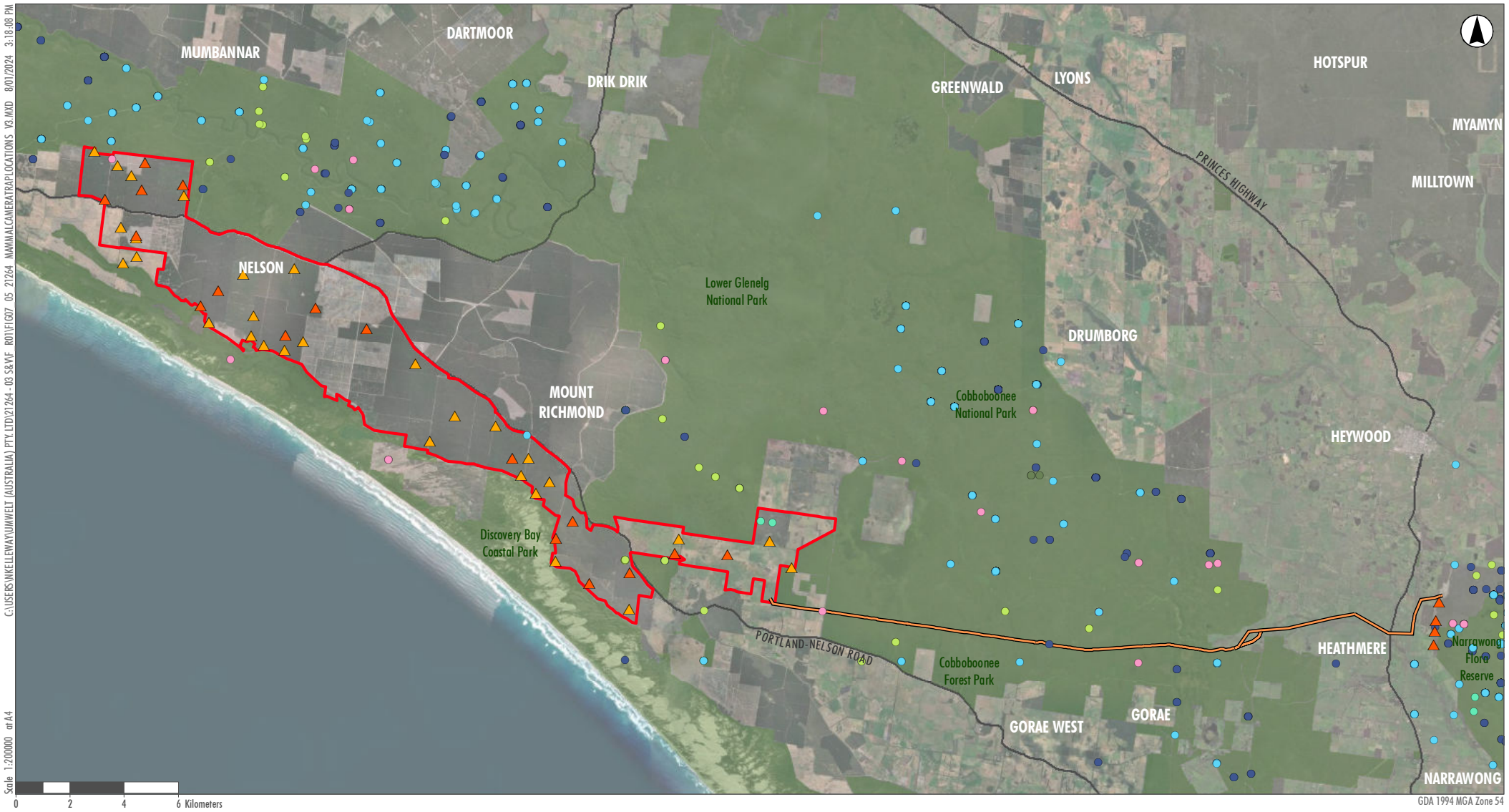
On the basis of pre-existing records and preferred habitats, these species were considered as potentially occurring within the Investigation Area, and the survey method was designed to detect them, although the methods used had capacity to also detect a range of other mammal species. Each camera trap during the May to June and October to November survey periods was deployed for a minimum of 30 days and nights.

Camera traps were baited with a standard bait (rolled oats, peanut butter and honey) as described in the *Survey guidelines for Australia's threatened mammals* (DEWHA 2011a) with the inclusion of truffle oil for the Long-nosed Potoroo.

Vertical configuration (camera facing down) has been shown to increase the detection probability and ease the identification for Southern Brown Bandicoots and Long-nosed Potoroo (Smith & Coulson 2012). A total of eight vertical cameras were deployed during the May to June survey, and nine during the October to November survey.

White-flash cameras can assist with identification of species, particularly for identifying the Heath Mouse in the Project Area. During the May to June deployment a total of five white-flash cameras were deployed next to an infra-red camera within pine planation, Blue Gum plantation and farmland sites. These locations were selected as they were most likely to detect threatened mammal species, based on nearby records, presence of potential habitat, and being along edges adjacent to intact habitat.

The *Survey guidelines for Australia's threatened mammals* (DEWHA 2011a) recommend that camera trap surveys should be complemented with another survey technique. In addition, the specific survey guidelines for the Long-nosed Potoroo recommend using spotlighting, cage trapping or hair surveys in addition to using camera traps to survey for the species. Hair sampling funnel traps were deployed at the camera trap sites during the October to November surveys. Two hair traps were pegged to the ground at each camera site, 10 meters north and south of the camera trap. The hair samples were collected with the cameras and professionally analysed.



Legend

- Camera Trap Location - May-June 2020 Deployment
- Camera Trap Location - September-October 2020 Deployment
- Heath Mouse
- Long-nosed Potoroo
- Southern Brown Bandicoot
- Spot-tailed Quoll
- Swamp Antechinus
- White-footed Dunnart
- Parks and Reserves
- Wind Farm Site
- Underground Transmission Line
- Roads

FIGURE 2.7

Mammal Camera Trap Locations

Image Source: ESRI Basemap (2021) Data source: DELWP (2021); Biosis (2022)

2.1.3.9 Growling grass frog

Surveys for the species were conducted in accordance with methods set out in *Significant impact guidelines for the vulnerable Growling Grass Frog* (DEWHA 2009b). For this species call playback and listening (for male calls) surveys were supplemented by spotlighting. Surveys were carried out in November 2018 and February 2019, during a minimum of two nights by two zoologists at various wetlands (see **Figure 2.8**).

Targeted surveys did not detect Growling Grass Frog, and we observed minimal habitat within the site that could be considered suitable habitat for the species.

2.1.3.10 Swamp skink

No species-specific survey guidelines exist for the Swamp Skink. However, the *Survey guidelines for Australia's threatened reptiles* (DEWHA 2011b) outline general recommendations, which were followed.

A combination of methods was used to maximise the probability of detecting the species based on knowledge of the species' behaviour and ecology, and discussions with Garry Peterson from DEECA (formerly DELWP). Methods used for surveying for the species included roof tiles, active searching, and visual searching in suitable habitats, focusing on areas most likely to be impacted by the Project. This included potential locations within the disturbance footprint of the Project and key areas of suitable microhabitats identified through vegetation and other fauna surveys across the Project Area.

Twenty-three rows of 15 tiles (345 tiles) spaced 10 m apart were deployed in July 2020 (see **Figure 2.8**) and each was checked on three separate occasions: once in October, November, and December. A total of four hours was spent searching for Swamp Skink, at the location of a 1980 VBA record of a Swamp Skink at the southern end of Johnsons Road, or at other swampy areas with potential habitat for the species throughout the Project Area. The time of year (late-spring to early-summer) was ideal for conducting these surveys because it coincides with the primary activity and breading season of the species.

Legend

- Growling Grass Frog Survey Location
- Reptile Survey Location
- Parks and Reserves
- Wind Farm Site
- Underground Transmission Line
- Roads

FIGURE 2.8

Reptile and Growling Frog Survey Locations

Image Source: ESRI Basemap (2021) Data source: DELWP (2021); Biosis (2022)

2.2 Ramsar wetlands

The Ramsar site was gazetted as a Wetland of International Significance in August 2018. The Ramsar site comprises of three main systems (DELWP, 2017):

- The Long Swamp wetlands, Bridgewater lakes, and other freshwater systems along approximately 50 km of the Discovery Bay Coastal Park.
- The Glenelg Estuary and associated Oxbow Lake and streamside reserve along the with the western part of the Lower Glenelg National Park from the South Australian border to Nelson – Winnap Road.
- The dune fields and beach down to the low water mark along the Discovery Bay Coastal Park from the South Australian Border to Discovery Bay Road.

The Ramsar site is mapped as a Groundwater Dependent Ecosystem (GDE) in the GDE Atlas.
A hydrogeological conceptualisation of the Ramsar site was undertaken in 2020 (CDM Smith, 2020) to characterise the relationships between groundwater and surface water features of the Ramsar sites.
This conceptualisation was based on:

- Results from gauging and sampling of 12 groundwater wells installed as part of the Groundwater Impact Assessment, from April 2021 March 2022.
- A groundwater supply investigation undertaken in February and March 2022 to assess potential effects of groundwater extraction for water supply, as part of the Groundwater Impact Assessment. A test bore (TB01) was installed, and a 24-hour pumping test was undertaken.
- A further seven-day pumping test at TB01 (installed as part of the groundwater supply investigation) was undertaken by CDM Smith as part of the GDE Impact Assessment.

This hydrogeological conceptualisation was used to assess the potential impacts on the Ramsar site from construction activities associated with the Project, including groundwater dewatering from trenches and turbine foundations, and groundwater extraction for water supply.

A significant impact assessment was undertaken in accordance with the Significant Impact Guidelines (DEWHA, 2013). This assessment was informed by the **Flora and Fauna Impact Assessment (Appendix C)** and the **Groundwater Dependent Ecosystem Impact Assessment (Appendix G)**.

3.0 Listed threatened species and ecological communities

3.1 Vegetation and habitat

Vegetation and habitat within the Investigation Area consists of pine plantation, remnant vegetation within the pine plantation, blue-gum plantations, National and State parks, farmland, public roads and tracks, and internal pine plantation tracks. Fourteen ecological vegetation classes (EVCs) were recorded within the Project Area (see **Table 3.1**).

Up to 8.696 ha of native vegetation would be impacted by the Project. **Table 3.1** details the EVCs that were recorded within the Project Area which may be directly impacted (e.g. through clearance for Project infrastructure).

Table 3.1 Ecological vegetation classes recorded within the project area

EVC and condition	Location within Project Area
Glenelg Plain Bioregion	
Coastal Alkaline Scrub (EVC 858) *Low to high quality*	Road reserves along the southern boundary of the pine plantation
Damp Sands Herb-rich Woodland (EVC 3) *Low to high quality*	Road reserves within plantation in the wind farm site Modified examples along Portland-Nelson Road reserve
Heathy Herb-rich Woodland (EVC 179) *Low to moderate quality*	Portland – Nelson road reserve (transport route)
Heathy Woodland (EVC 48) *Moderate to high quality*	Remnant vegetation along the northern boundary of the plantation in the wind farm site Cobboboonee National Park, near the underground transmission line Heywood Terminal Station at the eastern end of the underground transmission line
Lowland Forest (EVC 16) *Moderate to high quality*	Road reserves Cobboboonee National Park, near the underground transmission line along Boiler Swamp Road
Wet Heathland (EVC 8) *Low quality*	Cleared farmland in areas that supported wet heathland prior to clearing
Swamp Scrub (EVC 53) *High quality*	Riparian areas including within Cobboboonee National Park, near the underground transmission line
Damp Heathy Woodland (EVC 793) *Moderate quality*	Transmission line route in farmland east of Cobboboonee Forest Park
Herb-rich Foothill Forest (EVC 23) *High quality*	Eastern section of the Project Area, including Cobboboonee National Park and adjacent areas along Boiler Swamp Road
Bridgewater Bioregion	
Coastal alkaline scrub (EVC 858) *Low quality*	Road reserves within plantation in the wind farm site

EVC and condition	Location within Project Area
Damp sands herb-rich woodland (EVC 3) *Low quality*	Road reserves within plantation in the wind farm site
Victorian Volcanic Plain Bioregion	
Sedgy Riparian Woodland (EVC 198) *High quality*	Cobboboonee National Park, including several locations along Boiler Swamp Road
Heathy woodland (EVC 48) *High quality*	Narrawong Flora Reserve and Mount Clay State Forest near the Heywood Terminal Station, near the underground transmission line
Herb-rich foothill forest (EVC 23) *High quality*	Eastern section of the Project Area, including Cobboboonee National Park and adjacent areas

3.2 Threatened ecological communities

The PMST identified seven nationally listed threatened ecological communities (TECs) that have potential to occur within the Investigation Area. Three EPBC Act listed TECs were recorded in the broader Investigation Area:

- Assemblages of species associated with open-coast salt-wedge estuaries and central Victoria ecological community (Salt Wedge Estuary Community).
- Karst springs and associated alkaline fens of the Naracoorte Coastal Plain Bioregion.
- Subtropical and Temperate Coastal Saltmarsh.

Potential examples of Karst springs and associated alkaline fens of the Naracoorte Coastal Plain Bioregion TEC were recorded within the Project Area.

A summary of these TECs is provided in **Table 3.2**.

Table 3.2 Occurrence of threatened ecological communities in the investigation area

TEC	EPBC Act status	Known/Likelihood of occurrence	Presence in the Investigation Area
Salt Wedge Estuary Community	Endangered	Not present within the Project Area	This TEC is present within the Glenelg River estuary and east of the Investigation Area in the Surrey River estuary. The Project Area is located more than 5 km from Glenelg River estuary where this community occurs.
Karst springs and associated alkaline fens of the Naracoorte Coastal Plain Bioregion	Endangered	Potential examples of TEC within the Project Area	Known occurrences within the Investigation Area include Lake Mombeong within Discovery Bay Coastal Park. Wetlands that are predominantly surface water fed, including dune slack wetland systems, are not considered part of the ecological community. This excludes most of the Long Swamp dune slack wetland system from the TEC listing. Two potential examples of the Karst springs and associated alkaline fens of the Naracoorte Coastal Plain Bioregion TEC were identified in the Project Area, north of Lake Mombeong.
Subtropical and Temperate Coastal Saltmarsh	Vulnerable	Not present within the Project Area	This TEC is present near the Glenelg River estuary mouth, associated with Oxbow Lake. The Project Area is located more than 4.5 km from Oxbow Lake where this community occurs.

3.2.1 Impact assessment

The Project would not impact directly or indirectly on TECs. The assessment found that the nearest examples of TECs were associated with the Karst springs and associated alkaline fens of the Naracoorte Coastal Plain Bioregion. Known occurrences of this TEC within the Investigation Area include Lake Mombeong (outside the Project Area), and two small wetlands north of Lake Mombeong (inside the Project Area). The small wetlands within the Project Area were identified as being potential examples of this TEC and did not contain areas of open water.

The conservation advice prepared for this TEC recommends a buffer zone of 1,220 m from the area of open water to protect occurrences of this TEC from potential adverse hydrological or pollution impacts. The open water area of Lake Mombeong is more than 1,500 m from the nearest wind farm infrastructure, outside the recommended buffer zone. The two small wetlands that represent potential examples of this TEC are more than 1000 m from the nearest wind farm infrastructure, and although this is just inside the recommended buffer zone, these wetlands did not contain open water.

There is negligible potential for direct impacts on this TEC (the known occurrence and potential occurrences) due to the considerable separation distance from wind farm infrastructure. Potential indirect impacts on this TEC are unlikely given the separation distances and the nature of construction, which is unlikely to generate pollution or sediment-laden run-off. Mitigation measures such as sediment devices (bunding and silt fencing) and trenching management will be implemented through a Sediment, Erosion and Water Quality Management Plan during construction which will aid in avoiding or minimising potential indirect impacts on this TEC (see mitigation measure MM-SW01).

The underground section of the transmission line crosses the Surrey River in two locations along Boiler Swamp Road. These locations are over 25 km upstream from the estuary section, where there are known occurrences of the assemblages of species associated with open-coast salt-wedge estuaries of western and central Victoria TEC. Direct impacts on Surrey River will be avoided using directional drilling (see mitigation measure MM-SW01). Potential downstream indirect impacts are unlikely provided directional drilling is done in accordance with MM-SW01 and relevant measures to be set out in the Sediment, Erosion and Water Quality Management Plan (see mitigation measure MM-SW01).

3.2.2 The Karst springs and associated alkaline fens of the Naracoorte coastal plain bioregion

A significant impact assessment (**Table 3.3**) was undertaken in accordance with the Significant Impact Guidelines (DEWHA, 2013). The assessment did not identify any impact pathway between the Project and the known occurrence of the TEC.

Table 3.3 Significant impact assessment: Karst springs and associated alkaline fens of the Naracoorte coastal plain bioregion

Significant Impact Criteria	Assessment
Reduce the extent of an ecological community	**Unlikely.** Within the Investigation Area, the TEC is only known from Lake Mombeong, outside the Project Area and more than 1.5 km any turbine locations. All turbine foundations in the Plantation sub-area will avoid intersecting groundwater. As a result, no impact pathway between the Project and the occurrence of the TEC has been identified and a reduction in extent of the TEC as a result of the project is unlikely. The GDE impact assessment (CDM Smith 2023) concluded that aquatic GDEs associated with the Ramsar Site (including examples of this TEC) are outside the predicted drawdown extent.
Fragment or increase of an ecological community, or example by clearing vegetation for roads or transmission lines	**Unlikely.** Within the Investigation Area, the TEC is only known from Lake Mombeong, outside the Project Area. All occurrences are more than 1.5 km from any proposed turbine locations. All turbine foundations in the Plantation sub-area will avoid intersecting groundwater. As a result, no impact pathway between the Project and the occurrence of the TEC has been identified and fragmentation of the TEC as a result of the project is unlikely.
Adversely affect habitat critical to the survival of an ecological community	**Unlikely.** There is no definition for habitat critical to the survival of the TEC. All occurrences of the TEC are more than 1.5 km from any turbine locations. All turbine foundations in the Plantation sub-area will avoid intersecting groundwater. No impact pathway between the Project and the occurrence of the TEC has been identified, therefore the project is unlikely to adversely affect habitat critical to the survival of the TEC.
Modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns	**Unlikely.** Based on current turbine locations, which are at least 1.5 km from the documented occurrence of the TEC at Lake Mombeong, and that turbine foundation excavations in the Plantation sub-area will avoid intersecting groundwater, no impact pathway between the Project and the occurrence of the TEC has been identified and the Project is unlikely to modify or destroy abiotic factors necessary for the survival of the TEC.

Significant Impact Criteria	Assessment
Cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting	**Unlikely.** The project is unlikely to result in any changes to flora or aquatic fauna species composition, as the nearest wind farm infrastructure is more than 1.5 km from any occurrences of the community no changes are expected to surface or groundwater hydrological regimes. There is some potential for mobile fauna, such as wetland birds and bats, that may occupy areas of the TEC to be impacted by turbine collisions, however the magnitude of these collisions is unlikely to be sufficient to cause a substantial change in the fauna species composition of the TEC.
Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to: • assisting invasive species, that are harmful to the listed ecological community, to become established, or • causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community	**Unlikely.** The project would adopt best practice controls regarding handling of weeds, pathogens, chemicals and pollutants, and all construction and operation activities are limited to areas more than 1.5 km from Lake Mombeong The construction and operation of the Project is unlikely to result in any increase to invasive animal populations.
Interfere with the recovery of an ecological community	**Unlikely.** There is no recovery plan in place for the TEC. Identified key threats to the TEC include hydrological changes, vegetation clearance and invasive species. As described above the Project is unlikely to result in surface or groundwater hydrological changes that would impact on the TEC and no direct vegetation clearance is required. The Project is also unlikely to result in increases to any invasive species, provided best practice construction methodologies and environmental controls are in place.

The assessment determined that, based on the application of avoidance and mitigation measures detailed in **Section 6.0**, the Project is unlikely to result in a significant impact to the TEC.

3.3 Threatened flora

The Flora and Fauna Impact Assessment identified 17 flora species listed under the EPBC Act as potentially occurring within the Project Area, however no threatened flora were recorded in the Project Area. Six species were recorded at reference sites outside of the Project Area within the surrounding Investigation Area.

Table 3.4 provides an overview of the likelihood of occurrence as identified for each species. The highly modified nature of most of the Project Area (cleared farmland and plantation) provides little habitat suitable for the propagation and persistence of threatened flora species, except in reserve areas. Native vegetation was found to be limited to road reserve and areas of regrowth of hardy species in previously cleared areas.

Table 3.4 Threatened flora listed under the EPBC Act likely to occur

Species	EPBC Act Status	Likelihood of occurrence	Suitable habitat
River Swamp Wallaby-grass (*Amphibromus fluitans)*	Vulnerable	Medium	Two records of this species within the Project Area; one within wetland habitat in 1989, and the other in the wind farm site in 2009 within 20 km of the windfarm footprint. The species was not recorded during Project surveys.
Green-striped Greenhood (*Pterostylis chlorogramma)*	Vulnerable	Medium	There are two 1993 records of the species from Mt Clay State Forest and a single record from 2007, less than 10 km from the transmission line.
Square Raspwort (*Haloragis exlata)*	Vulnerable	Recorded in Investigation Area	This species was found during Project surveys at a reference location within 10 km of the wind farm footprint near Moleside Creek within Lower Glenelg National Park.
Swamp Greenhood (*Pterostylis tenuissima)*	Vulnerable	Recorded in Investigation Area	There are four recent records of this species in the Investigation Area (recorded in 2002, 2008 twice, and 2018) and eight records that predate 1990. Flowering specimens of this species were found during the December 2020 phase of the survey at a reference location within 10 km of the wind farm footprint south of Nelson, confirming survey timing was within flowering window of local populations.
Swamp Everlasting (*Zerochrysum palustre)*	Vulnerable	Medium	There are five records within 20 km of the wind farm footprint from 2009 and 2010. No suitable wetland habitat was mapped within the Project Area.
Wrinkled Casinia (*Cassinia rugata)*	Vulnerable	Recorded in Investigation Area	Suitable habitat for this species within the Investigation Area includes bushland in Cobboboonee National Park close to the Surrey River and its tributaries. There are several records of this species in the north-eastern section of Cobboboonee National Park within 5 km of the transmission line from between 1980 and 2012. The species was found at a reference location during the recent Biosis surveys in Cobboboonee National Park, approximately 10 km north of the transmission line, within the investigation area.
Mellblom's Spider-orchid (*Calendenia hastata)*	Endangered	Recorded in Investigation Area	Suitable habitat for this species in the Investigation Area includes roadsides and other less-disturbed areas, in remnant patches of coastal heath or heathy woodlands and on margins of wet depressions. A record of this species from 2002 is located within 5 km of the wind farm site and a further three records are within 10 km. The species was found at a reference location during the recent survey in the Point Danger Coastal Reserve in Portland but was not located within the Investigation Area.

Species	EPBC Act Status	Likelihood of occurrence	Suitable habitat
Ornate Pink-fingers (*Caladenia ornate)*	Vulnerable	Recorded in Investigation Area	Suitable habitat for this species within the Investigation Area includes roadsides and other less-disturbed portions of the area, in remnant patches of heathy or grassy woodlands. Three records from 2003 are located within 5 km of the wind farm footprint and a further three records are within 10 km. This species was found at a reference location during the Project surveys in the Point Danger Coastal Reserve, in Portland, but was not located within the Project Area.
Maroon Leek-orchid (*Prasophyllum fenchii)*	Endangered	Medium	Suitable habitat for this species within the Project Area includes roadsides and other less-disturbed portions of the area, in grassland and grassy woodland environments. Four records from between 2008 and 2018 are located within 5 km of the wind farm site.
Coast Danelion (*Taraxacum cyhnorum)*	Vulnerable	Recorded in Investigation Area	Suitable habitat for this species within the Project Area includes roadsides and other less-disturbed portions of the area, on calcareous soils. Several records from between 2010 and 2012 are located within 10 km of the wind farm footprint. This species was found during Project surveys at a reference location approximately 4 km north of Nelson.
Coast Ixodia (*Ixodia achillaeoides)*	Vulnerable	Low	This species was found during the recent surveys in the Kentbruck H14 Bushland Reserve, adjacent to Portland-Nelson Road close to the Project Area.
Limestone Spider-orchid (*Calendia calcicole)*	Vulnerable	Medium	Suitable habitat for this species within the Project Area includes roadsides and other less-disturbed portions of the area, on sandy soils over limestone. A single record from 1994 is located within 10 km of the wind farm footprint near the Palpara Plantation, near the Victorian State border.
Clover Glycine (*Glycine latrobeana)*	Vulnerable	Medium	Suitable habitat for this species within the Project Area includes roadsides and other less-disturbed areas, in remnant patches of grassland or grassy woodland. Several records of the species are within 10 km of the wind farm footprint, the most recent being in 2015 in Lower Glenelg National Park.
Metallic Sun-orchid (*Thelymitra epipactoides)*	Endangered	Medium	Suitable habitat for this species within the Project Area includes roadsides and other less-disturbed areas, on sandy loams or loamy sands, primarily in coastal heaths, grasslands and woodlands. Two records of the species from 1980 and 2000 are in the Lower Glenelg National Park, within 10 km of the wind farm footprint.

Species	EPBC Act Status	Likelihood of occurrence	Suitable habitat
Colourful Spider-orchid (*Caladenia colorata)*	Endangered	Medium	Suitable habitat for this species within the Project Area includes roadsides and other less-disturbed areas, on calcareous sands and sandy loams. Several records of the species from 2000 and 2003 are within 10 km of the wind farm footprint.
Dense Leek-orchid (*Prasophyllum spicatum)*	Vulnerable	Medium	Several records of this species are within 10 km of the wind farm footprint with the most recent record from 2009 in the Cobboboonee National Park. The species was not found at reference sites.
Swamp Fireweed (*Senecio psilocarpus)*	Vulnerable	Medium	Several records of the species are within 20 km of the wind farm footprint, with the most recent from 2014. Limited habitat for the species is present within the Project Area.

The Project would not have a direct impact on any threatened flora species by clearing due to their lack of occurrence in the Project's construction and operational footprints. Potential indirect impacts could be caused any hydrological works, this however is unlikely to be an impact. In the surrounding and close to the Project Area are conservation reserves that support high quality native vegetation and provide habitat for several significant species. Several of these species are listed as threatened under the EPBC Act.

Any indirect impacts arising during construction of the Project would be able to be managed through standard management measures implemented as per the Project's Construction Environmental Management Plan (CEMP). This includes conducting pre-construction surveys, marking and protecting any locations of threatened plants, limiting construction activities to the road formation and appropriate management of erosion and sedimentation (see mitigation measure MM-BD01, MM-BD08 and MM-SW01). Mitigation and management measures recommended to be throughout the duration of the Project are detailed in **Section 6.0**.

3.4 Threatened fauna

A total of nine fauna species listed as threatened under provisions of the EPBC Act were recorded during field investigations undertaken for the Project, as outlined in **Table 3.5**. A further six species are considered to have a medium or high likelihood of occurring within the Project Area and surrounds. The South-eastern Red-tailed Black Cockatoo is considered to have a low likelihood of occurrence, however, has been considered in this assessment as it is a species of concern.

The highly modified nature of most of the Project Area (cleared farmland and plantation) provides little habitat suitable for many of the threatened fauna species. By comparison, adjacent areas of natural habitats for fauna that are protected within Lower Glenelg National Park, Cobboboonee National Park and Discovery Bay Coastal Park, the Project Area generally provides lower value habitat for threatened fauna.

Table 3.5 Threatened fauna species listed under the EPBC Act that are likely to occur

Species	EPBC Act Status	Recorded in the Project Area	Recorded in the Investigation Area	Recorded Presence/Likelihood of occurrence
Gang-gang Cockatoo ***(Callocephalon fimbriatum)***	Endangered	✓	✓	25 Gang-gang Cockatoos were recorded flying through the Investigation Area at three sites, two of which are in the Project Area: • 5 at the edge of open farmland and native forest (Investigation Area) • 3 flying together at the edge of pine plantation and Blue Gum plantation (Project Area) • 17 at the edge of pine plantation and native forest (Project Area).
South-eastern Red-tailed Black Cockatoo ***(Calyptorhynchus banksia graptogyne)***	Endangered			Low likelihood of occurrence. Suitable habitat for the species is present nearby in Lower Glenelg National Park.
Southern Bent-wing Bat ***(Miniopterus orianae bassanii)***	Critically Endangered	✓	✓	Recorded flying through the Project Area and Investigation Area.
Orange-bellied Parrot ***(Neophema chrysogaster)***	Critically Endangered		✓	A single individual was recorded in the interdunal heathland vegetation adjacent to the beach south of Swan Lake.
Blue-winged Parrot ***(Neophema chrysostoma)***	Endangered	✓	✓	Project investigations recorded Blue-winged Parrots 56 times at: • Six sites within the Project Area. • Seven control sites (locations outside the Project Area).
Australasian Bittern ***(Botaurus poiciloptilus)***	Endangered	✓	✓	This species was recorded 3 times, 2 of which were in the Project Area. One incidental record was observed flying across farmland on private property, Mt Kincaid Road Gorae West. Two male Australasian Bitterns were heard, with one at Lake Mombeong and the other at an adjacent wetland within the pine plantation (see **Figure 3.5**).

Species	EPBC Act Status	Recorded in the Project Area	Recorded in the Investigation Area	Recorded Presence/Likelihood of occurrence
White-throated Needletail ***(Hirundapus caudacutus)***	Vulnerable, migratory	✓	✓	White-throated Needletail was recorded on 21 occasions. There were eight locations where the species was recorded within the wind farm site. Most observations were of individual birds or small groups (< 10), but there were two observations of large groups, including the incidental observation near Lake Mombeong (70 birds) and an observation of 90 birds, followed by eight birds, during a BUS count at site T3 near the far western section of the site in late February 2021.
Fork-tailed Swift ***(Apus pacificus)***	Marine, migratory			Medium likelihood of occurrence. Limited suitable habitat, but possibly some can be found within the Project Area.
Heath Mouse ***(Pseudomys shortridgei)***	Endangered			Possible Heath Mouse was recorded in several locations within the Green Triangle Forest Products (GTFP) plantation, however areas of pine plantation are unlikely to provide high quality habitat for this species.
Southern Brown Bandicoot (*Isoodon obesulus)*	Endangered		✓	Southern Brown Bandicoot was detected from camera traps within Mount Clay State Forest.
Long-nosed Potoroo *Potorous (tridactylus trisulcatus)*	Vulnerable			Medium likelihood of occurring. Suitable habitat nearby; may utilise limited portions of site with native vegetation.
Swamp Antchinus (*Antechinus minimus maritimus)*	Vulnerable			Medium likelihood of occurring. Suitable habitat nearby; may utilise limited portions of site with native vegetation.
Grey-headed Flying-fox (*Pteropus poliocephalus)*	Vulnerable			Medium likelihood of occurrence. Distribution and abundance in western Victoria is increasing; may fly over site occasionally.
Growling Grass Frog ***(Litoria raniformis)***	Vulnerable			Medium likelihood of occurrence - Suitable habitat nearby however no habitat suitable within Project Area.
Swamp Skink ***(Lissolepis coventryi)***	Endangered		✓	Two adult Swamp Skinks were recorded at the southern end of Johnsons Road, approximately 200 m outside of the Project Area and is the exact location of a previous VBA record.

3.4.1 Southern bent-wing bat

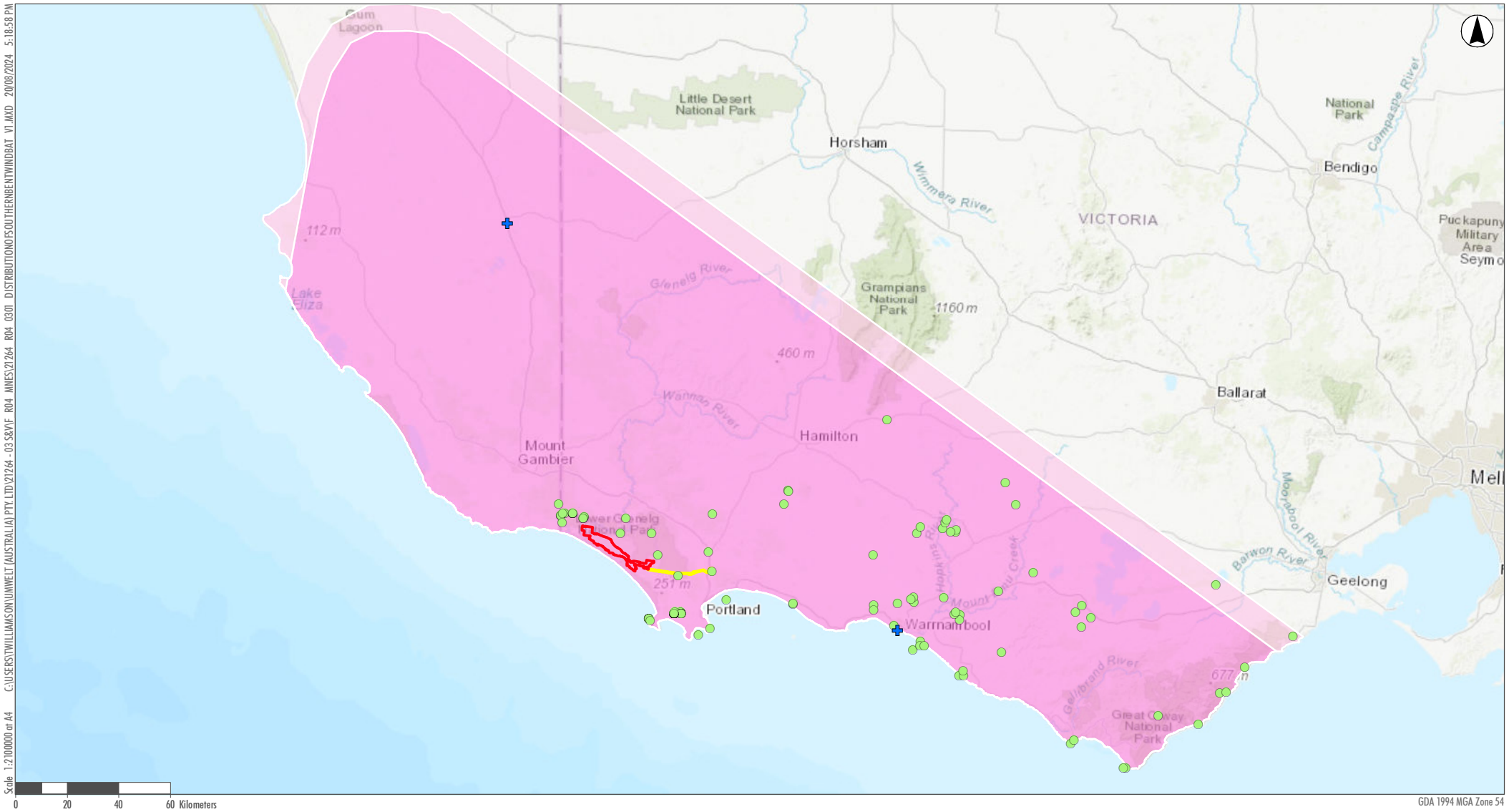
3.4.1.1 Existing conditions

The SBWB is listed as 'critically endangered' under the EPBC Act and the Advisory List of Threatened Vertebrate Fauna in Victoria (Biosis, 2022). A National Recovery Plan for the SBWB was issued in 2020 (DELWP, 2020) and Conservation Advice for the species was published in mid-June 2021 (TSSC, 2021).

The SBWB is recognised as a subspecies of the common bent-wing bat. The SBWB a medium sized, insectivorous, obligate cave-dwelling bat. As a cave dwelling species, the distribution of the species largely represents the distribution of caves in the south-west of Victoria and south-east South Australia.

The SBWB is an obligate cave-dwelling bat (meaning that it relies on caves for roosting and breeding) with a distribution across southeast South Australia and south-west Victoria (see **Figure 3.1**). During the non-breeding season, SBWB individuals are distributed throughout the region, roosting in caves and rock crevices. There are 18 known roost caves in Victoria (TSSC 2021). Victorian caves are distributed across the south-west region, and the number and location of all sites is not fully understood. During the breeding season, most of the SBWB population congregates in two regularly used breeding caves, located near Naracoorte in South Australia and near Warrnambool in Victoria. Breeding activity has also been observed annually since 2015 in a sea cave to the west of Portland and southeast of the Project Area, and this is now recognised as a third maternity cave (TSSC 2021).

The National Recovery Plan (NRP) for the SBWB notes that due to the severe decline in numbers of the SBWB, all populations are considered important. The NRP also confirms that populations are centred on the two regularly used maternity caves and their associated non-breeding caves, being the Warrnambool maternity cave and Portland maternity cave, plus various caves used as non-breeding roosting sites in southwest Victoria, including in the Lower Glenelg, Bats Ridge, Portland, Byaduk Caves, Yambuk, Grassmere, Panmure, Pomborneit and Otways areas.



Scale 1:2100000 on A4 C:\USERS\TWILLIAMSON\UMWELT (AUSTRALIA) PTY. LTD\21264 - 03 S&WF R04 MNES\21264 R04 0301 DISTRIBUTIONOFSOUTHERNBENTWINDBAT V1.MXD 20/08/2024 5:18:58 PM

FIGURE 3.1

Distribution of Southern Bent-wing Bat

Image Source: ESRI Basemap (2021) Data source: DELWP (2021); Biosis (2022)

Survey results

SBWB recordings from the preliminary surveys carried out in December 2018 to April 2019 were recorded across all ground detectors (sites 1–10) and at the one met mast installed for these surveys, as shown in **Figure 2.3.**

The 12-month SBWB survey at the mast mounted detectors from December 2019 to December 2020 recorded SBWB calls at all met masts (see **Figure 2.3**), although not at all masts across all survey months. Call activity reduced in late autumn (May) and early winter (June), which is when foraging is less energetically beneficial in cold conditions, and SBWB enter periods of torpor (a state of inactivity) (TSSC 2021). Recent research suggests that some activity is maintained in the colder months, including movement between non-maternity caves (TSSC 2021).

Manual examination was undertaken of the 2,743 recordings identified by the automated process as either 'confirmed' or 'potential' SBWB calls. The manual identification process was limited to data collected during the 12-month survey (December 2019 to November 2020), the results of which are outlined in **Table 3.6**. Each call was categorised into one of the following:

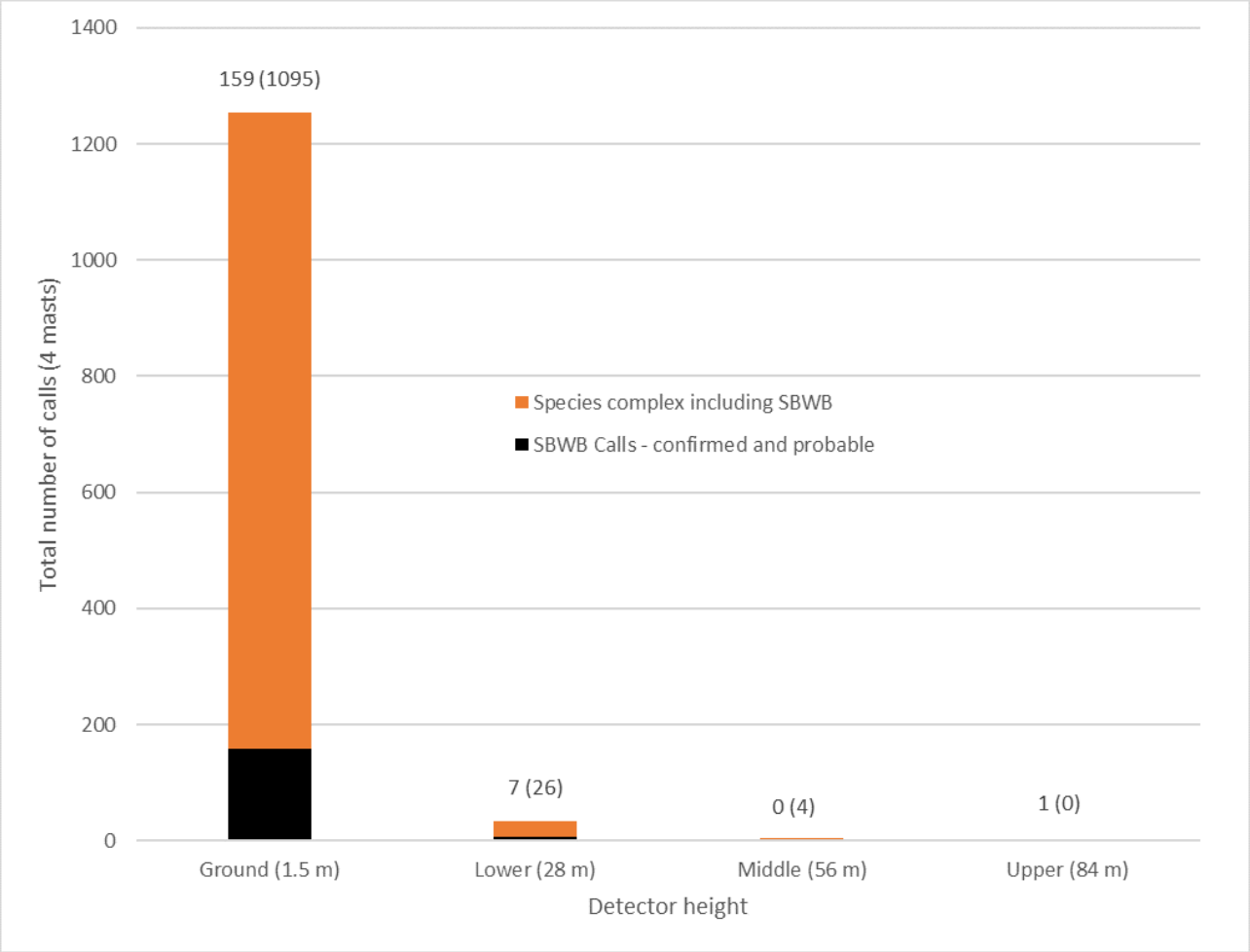
- Confirmed and Probable SBWB – these categories are generally grouped, as they represent recordings considered highly likely to be SBWB.
- Complex – a high proportion of calls identified in the automated identification process were, following manual examination, determined to belong to a species complex, which includes SBWB and other species including *Vespadelus* spp. These identifications are included separately in the tables and graphs, as an unknown number of them may be SBWB.
- Unlikely, poor quality and noise files are excluded from further analysis as these are considered unlikely to be recordings of SBWB activity.

Of these 2,743 recordings, 20 were confidently identified as SBWB, 290 were identified as probable SBWB and a further 2,107 were assigned to a species complex that includes SBWB. The species complex also includes forest bat species *Vespadelus* sp. which have similar and overlapping call characteristics with SBWB. The remaining records were either considered unlikely to be SBWB (144), of insufficient quality to be identified or noise (not bat calls).

Table 3.6 Manual checking of SBWB calls

Automated identification	Manual Identification (likelihood of SBWB)						Total
	Confident	Probable	Complex	Unlikely	Poor Quality	Noise	
SBWB	8	116	756	23	55	6	**964**
Potential SBWB	12	174	1351	121	120	1	**1779**
Total	20	290	2107	144	175	7	**2743**
% total	1%	11%	77%				
Cumulative %	1%	11%	88%				

At all four met masts, there were greatly reduced levels of call activity detected at the higher height-level detectors. The majority (1,254 calls, 97 % of total confirmed, probable and complex calls) of calls were recorded on the ground detectors (1.5 m above ground), with 33 calls recorded at the lower (28 m) detectors (7 of which are confirmed calls), 4 calls at the middle (56 m) detector and 1 call at the upper (84 m) detector (confirmed call) (see **Figure 3.2**).



Number of calls shown represent the total of confirmed and probable SBWB calls. Number is parentheses show the total number of call identified as the species 'complex' that includes SBWB.

Figure 3.2 Total number of confirmed SBWB calls recorded from mast mounted detector locations

SBWB were recorded at all 12 ground monitoring locations across the wind farm site. The detector with the highest numbers of recorded calls (site 18) is in the west of the Project Area, close to the southern edge of Lower Glenelg National Park, approximately 4 km south of the Glenelg River. The nearest turbine is approximately 1.5 km south of site 18. Detected call activity levels at site 18 were significantly higher (more than double) than at any other site. Other ground-based detectors with relatively high numbers of calls include site 25 (also in the west of the Project Area), site 31 (in the east) and site 39 (near the centre of the site).

Lowest call activity levels were recorded at sites 37 and 38, near the centre of the wind farm site on Browns Road. These sites are approximately 1 km north of the southern boundary of the Project Area (north of Discovery Bay Coastal Park), and 3 km west of the closest section of Lower Glenelg National Park (the Kentbruck Heath).

SBWB were recorded throughout the time of darkness, but in general highest activity levels were recorded in the first few hours following sunset. This post sunset activity peak is seen in many microbat species and is likely due to warmer air temperatures and higher abundance of insects early in the night.

Bat call data was also correlated with observed wind speeds at detector heights and at wind turbine hub height. It is useful to compare this data in order to assess bat behaviour in averaged wind speeds and therefore operational status of the wind turbines.

This analysis could only be undertaken where extrapolated wind speed could be calculated, including three of the four detectors at 28 m, and the higher mast-based detectors at 56 m and 84 m at all four masts. Only 11 recordings of SBWB were detected at these locations, and as a result little information is available to enable correlations between wind speed and activity levels. Except for one SBWB detection at 10–11 m/s, all detections were at wind speeds of less than 9 m/s.

SBWB recordings from all detectors were also correlated to wind speed recorded at 80 m high on a single met mast. As most recordings of the species calls were from ground-level detectors where wind speeds are likely to be 2–4 m/s slower than they are at 80 m above the ground, this analysis only provides an indication of the potential relationship between wind speed and activity. Nonetheless, the results clearly demonstrate a decline in measures of call activity even close to the ground when wind speed at 80 m reached 7–8 m/s and the decline continued until there was virtually no activity at wind speeds of 13–14 m/s.

The details and analysis of SBWB recordings are provided in Section 4 of the **SBWB Impact Assessment (Appendix E)**.

3.4.1.2 Impact assessment

Wind turbine collision risk

Acoustic bat-call surveys confirmed that SBWB fly within the wind farm site including areas occupied by pine plantations. These bats fly from caves within the local area or within the documented nightly flight range for the species which may be up to 70 km (van Harten et al. 2019).

The 12 month-survey period for SBWB found that SBWB occurred at all detector sites, with most calls being recorded at the detectors closest to the ground. Call activity had a higher concentration in the north-west of the wind farm site, possibly due to this site's proximity to the nearest known cave used by the species. Section 3.5 of the **SBWB Impact Assessment (Appendix E**) of the EES recognises that the acoustic monitoring for bats has limitations which may affect how these results can be interpreted, however the evidence from call data indicates that most SBWB flight activity at the wind farm site occurs close to the ground and substantially below rotor swept height of turbines.

Using the results of the flight height assessment for the SBWB within the Project Area, the risk of collisions with turbines, including the potential for barotrauma has been determined as being low because of the relative rarity of flights within the rotor-swept height zone of the Project's turbines.

As for all bat species, the potential for SBWB to collide with turbines is confined to the hours of their nocturnal activity. For the year surveyed, levels of call activity were low during the months of December and January and again in May to August. It is considered likely that this reflects an annual routine, in particular that the species is less active during the cooler months. It can be expected that any possible risk of turbine collisions may be low during the latter half of the night and at the lowest during winter. Data obtained by the Project surveys also suggest that SBWB call activity peaked at wind speeds between 5 and 7 m/s and activity virtually ceased at wind speeds of 12 to 14 m/s.

These temporal and wind speed factors have been considered in developing plans for turbine curtailment, to be detailed in the Bird and Bat Adaptive Management Plan (BBAMP) (see mitigation measure MM-BD12). These factors are discussed in detail below in 'Impact Assessment Summary'.

Population viability analysis

A population viability analysis (PVA) was undertaken by Symbolix as part of the EES, to investigate the potential effects of the Project on SBWB. For the Project, the PVA was used to predict what might happen to the SBWB population with and without the Project operating, using a pre-defined set of estimated annual wind farm mortalities over the life of the Project (ranging from zero, which could also represent a no-project scenario, to 500 mortalities annually).

Symbolix consulted with subject matter experts at DEECA during the initial stages of the PVA to agree the various inputs that went into the PVA model. It was agreed with DEECA that the PVA would consider the Portland sub-population of SBWB given the location of the Project, with the Portland maternity cave and other non-breeding caves being closer than other maternity caves that support different sub-populations (i.e., Warrnambool and Naracoorte). The Portland sub-population is estimated to have substantially fewer individuals than the larger Naracoorte (South Australia) and Warrnambool populations (see **Table 3.7**).

Table 3.7 Mean numbers of mature SBWB at the three known sub-populations as at 2019 (TSSC, 2021)

Sub-population	Mean sub-population size
SA Naracoorte	27,265
Vic Warrnambool	15,550
Vic Portland	1,445
Total	**44,260**

The PVA presents the predicted trajectory of the Portland sub-population without and with the Project. The PVA results for the without project scenario show that even without wind farm mortalities, there is a substantial predicted decline in the Portland sub-population size, with declines of more than 50% within ten years, and almost 100% within 60 years (see **Figure 3.3** and **Table 3.8**).

The population used in the PVA encompasses all age-classes (this is the population of 3500 stipulated by DEECA). The PVA tests for effects on the extinction risk for this population of iteratively greater numbers of mortalities (between 2 and 500 extra deaths) per year. In this manner, the PVA covers potential deaths for all age-classes and regardless of whether they are actually due to collisions or other potential effects of the Project, such as deaths of orphaned pups.

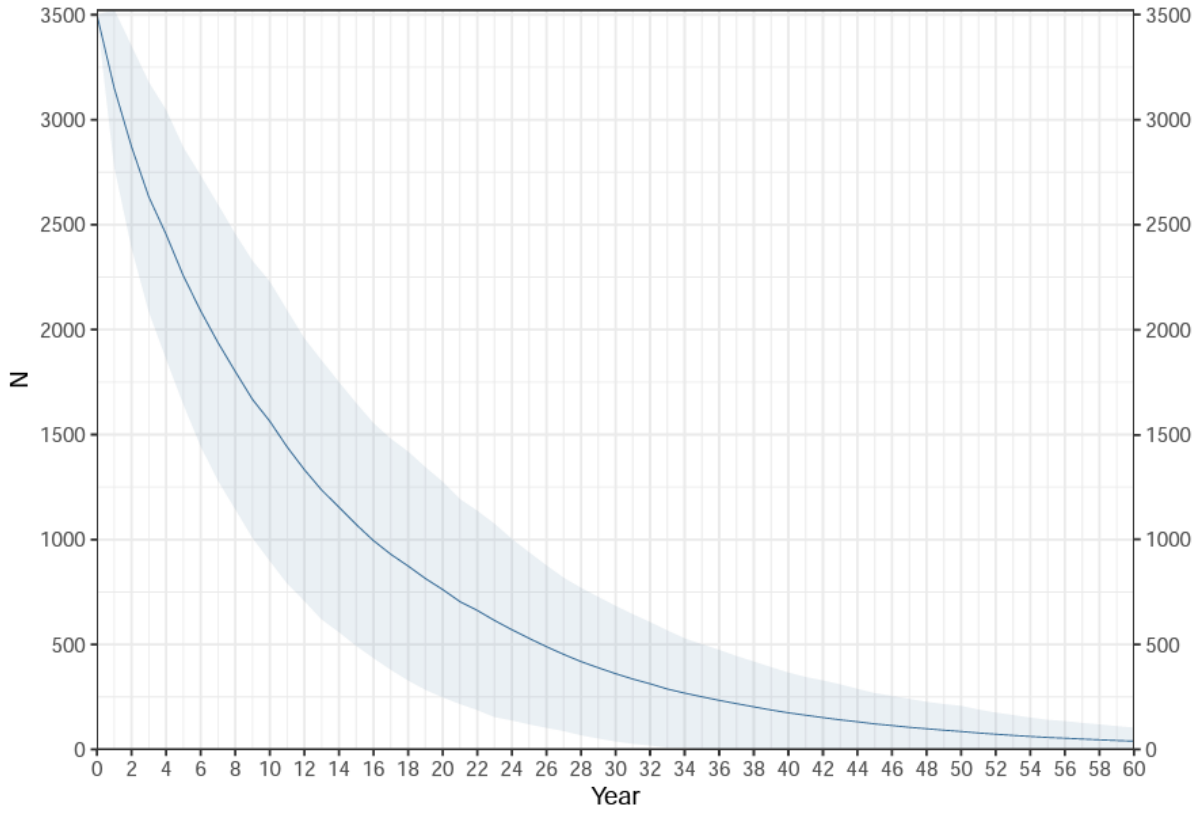


Figure 3.3 Population curve for Portland population. The mean and standard deviation are shown.

Table 3.8 Portland population size and percentage decline by year

10 year	30 year	60 year
1,507 (57%)	260 (93%)	20 (99%)

Adding a range of predicted wind farm mortalities to the impact assessment PVA shows that with increasing numbers of wind farm mortalities the Portland sub-population declines more rapidly (see **Table 3.9**). The PVA indicates that if the number of wind farm mortalities is around 2 SBWB per annum there is no discernible difference in Portland sub-population outcomes after 30 years (the projected lifespan of the Project). Increasing the number of wind farm mortalities in the PVA model increases the predicted level of impact on the Portland sub-population of SBWB over 30 years (and beyond). The results of the PVA model in

Table 3.9 shows that SBWB mortality in the range of 50 SBWB per year would have a substantive impact on the probability of extinction and shorten the predicted time frame for extinction of the Portland sub-population.

The PVA considers a single scenario only, with input parameters developed in consultation with DEECA species experts. The PVA does not make allowance for any positive impact of recovery actions.

Table 3.9 Probability of SBWB population reaching zero for Portland sub-population by year with varying number of wind farm mortalities (Symbolix, 2021)

Annual wind farm mortalities	Probability of extinction (Portland sub-population)		
	10 years	30 years	60 years
0	0%	0%	13%
2	0%	0%	17%
10	0%	16%	49%
50	0%	94%	99%
100	2%	100%	100%
500	100%	100%	100%

Impact assessment summary

The information collected during SBWB investigations for the Project has been used in conjunction with relevant literature to determine the potential for the Project to impact on the species. The assessment concluded that turbine collisions are unlikely to result in a long-term decrease in the size of the SBWB population, due to:

- The apparently low levels of SBWB activity at increasing height above the ground, including the apparently very low levels of their activity at the lower portions of wind turbine rotor-swept heights.
- Substantially low use of the site during winter and possibly early summer, as well as during the latter part of the night when activity was also reduced (this has been determined using patterns of temporal activity of SBWB derived from the data collected during the Project studies).
- The preference of bats to fly in lower wind speed conditions (noting that the wind farm will not be operating at wind speeds less than 3.5 m per second) and that turbine rotor swept height is likely to routinely experience substantially greater wind speeds that appear to not be favourable for SBWB activity.

Internationally and in Australia microbats are known to collide with the blades of wind turbines and a small number of SBWB have been found as collision victims at existing wind energy facilities in south-western Victoria (Moloney, Lumsden, & Smales 2019). Windfarms are listed as a threat in the Conservation Advice for SBWB (TSSC 2021), which states that 'any windfarms close to a roosting site could potentially have a major impact on that population'.

As of October 2023, available evidence indicates a total of 22 SBWB fatalities due to collisions with turbines have been documented across wind farms in Victoria where carcass searches have been undertaken since 2003. Data for these are collated from (Moloney, Lumsden, & Smales, 2019), (Symbolix, 2020), (Bennett, et al.)), DEECA (Forest, Fire and Regions Group) submission to Mount Fyans Wind Farm Planning Permit Application Planning Panel (2023) and Biosis records. This information is for the number of SBWB fatalities that have been detected during search regimes. Search regimes are sampling exercises and are not designed to detect every carcass and the sampling is influenced by the portion of turbines searched; the frequency of searches, the efficiency of searchers and the rate at which scavengers or other factors may remove carcasses. For these reasons, mortality searches are undertaken in accordance with a rigorous design that maximises capacity to incorporate these variables into subsequent estimates of total fatalities.

Neoen has implemented several design changes and considerations which mitigate the potential for impacts on SBWB, including not locating turbines within 5 km of any roosting caves. The lower blade tip height of the turbines has also been raised to 60 m above ground level which will significantly reduce the risk of collision. SBWB are less likely to hit turbines at the Project because the lower blades are higher above the ground, compared to existing wind farms where the species has collided.

A BBAMP will be developed and implemented, which will include protocols for monitoring and triggers for implementation of adaptive management, including monitored low wind speed curtailment trials and SBWB specific protocols (see mitigation measures MM-BD12 and MM-BD13).

Low wind speed curtailment will be developed during finalisation of the BBAMP and will include (see mitigation measure MM-14):

- Dailing timing: 30 minutes following sunset to 3 hours before sunrise.
- Seasonal timing: September-November and February-March (5 months).
- Climatic conditions: minimum temperature and rainfall conditions to be determined.
- Cut-in wind speed: 4.5 m/s.

Assessment against the Significant Impact Guidelines

An assessment of significance has been conducted for this SBWB and is provided below in **Table 3.10**.

Table 3.10 Significant impact assessment for the southern-bent wing-bat

Significant impact criteria	Assessment
Lead to a long-term decrease in the size of a population	**Unlikely**. The principal potential risk to the species is collision with turbines. The species flights are generally expected to be below turbine rotor heights as evidenced by survey results. While occasional collisions may occur the potential for the project to lead to a long-term decrease in the population size is low. The PVA has evaluated the impact of a range of additional mortality scenarios on the Portland sub-population.
Reduce the area of occupancy of the species	**Unlikely.** The site contains habitat for the species. Existing land use and vegetation of the site will remain substantially unchanged. The Project is not likely to lead to a reduction in the area occupied by the species.
Fragment an existing population into two or more populations	**Unlikely**. As the Project would not entail substantive alterations to existing habitats, there are no effects or mechanisms that might fragment the existing population.
Adversely affect habitat critical to the survival of a species	**Unlikely**. The Project would not adversely affect habitat critical to the survival of the species. No critical habitat is defined for the species. Lower Glenelg, Bats Ridge, Portland, Mt Gambier and coastal sea cliffs are noted as supporting Important Populations. The wind farm site does not contain any caves.
Disrupt the breeding cycle of a population	**Possible**. There is some potential that individuals roosting (and raising young) at the Portland maternity site may forage within the wind farm site, and therefore be at risk of collision.

Significant impact criteria	Assessment
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	**Unlikely**. The Project has no potential to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species habitat	**Unlikely**. The Project does not include any known mechanisms that would result in the establishment of invasive species that are not already present in the environment.
Introduce disease that may cause the species to decline	**Unlikely**. The Project does not include any known mechanism that would result in introduction of any disease that is not already present in the environment.
Interfere with the recovery of the species	**Unlikely**. Wind farm developments are noted as a Threat in the Recovery Plan (DELWP 2020). Wind farm related risks are noted to include cave destruction during construction, mortalities due to collisions, and altered access to foraging areas. Mortalities due to collision are considered unlikely to be significant and there will be no cave impacts or altered access to foraging areas. The Project is not likely to interfere with the recovery of the species. The Project is a potential source of funding to assist with recovery actions.

3.4.2 Australasian bittern

3.4.2.1 Existing conditions

The Australasian Bittern is listed as 'Endangered' under the EPBC Act and listed as 'threatened' under the FFG Act. The species is a large, stocky, thick necked, heronlike bird (Threatened Species Scientific Committee, 2019).

The species occur from south-east Queensland to south-east South Australia as far as the Adelaide region, southern Eyre Peninsula, Tasmania and in the south-west of Western Australia (Threatened Species Scientific Committee, 2019). In Victoria the species mostly occurs within the southern coastal areas and in the Murray River region of central northern Victoria. The Australasian bitterns occurs mainly in freshwater and rarely in estuaries or tidal wetlands.

The Australasian Bittern inhabits freshwater terrestrial wetlands and may also occur in estuarine and tidal wetlands and river mouths (Marchant & Higgins 1990). Water depth of preferred wetlands is up to 0.3 m, which include shallower areas for foraging along edges, and vegetation cover of 0.5–3.5 m height (Department of the Environment and Energy 2019).

Three Australasian Bitterns were recorded during the Project surveys, two of which were within the Project Area:

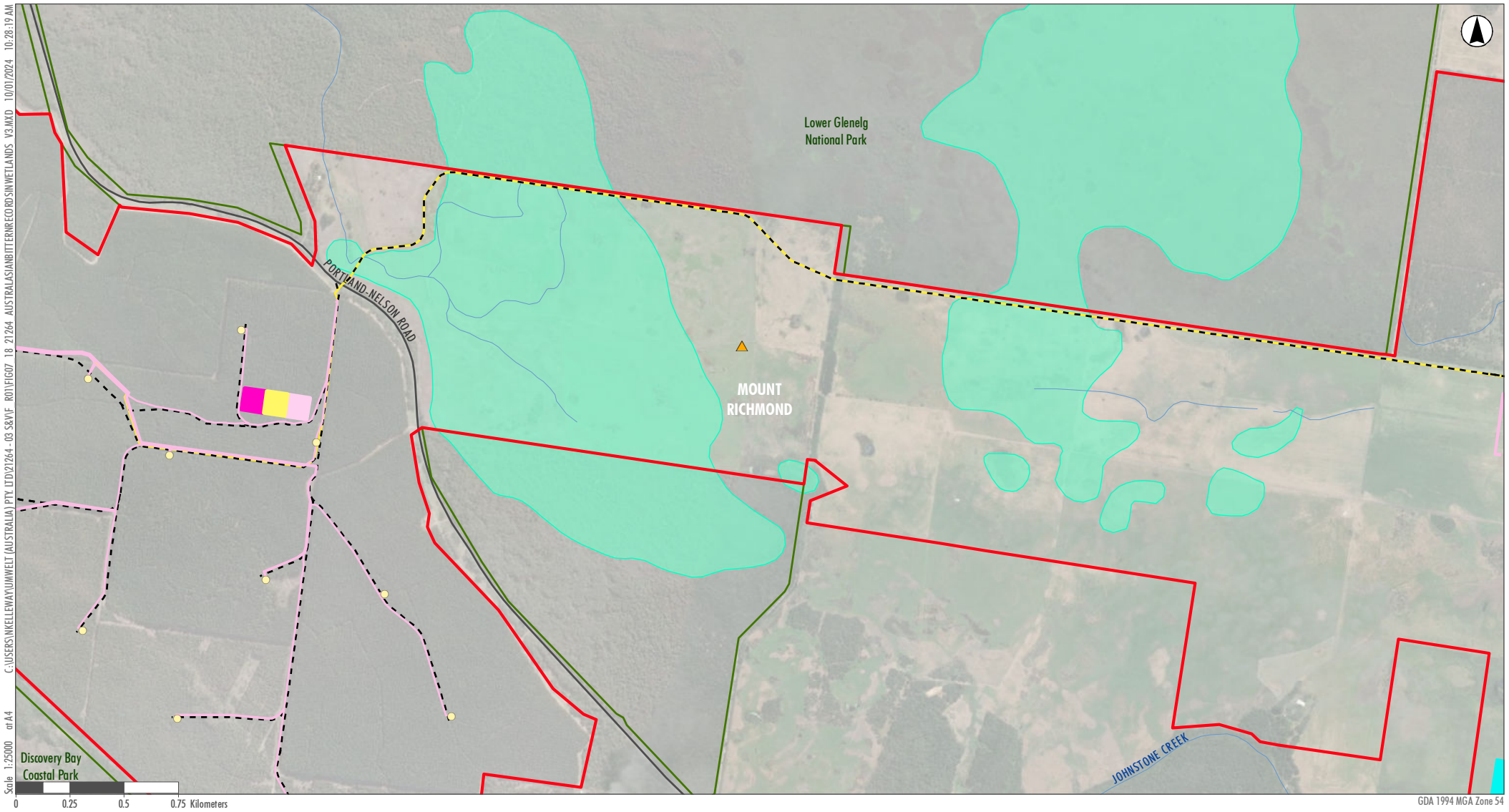
- An incidental observation of a single individual flying north-east within the Project Area at a private property at Mt Kincaid Road, Gorae West. This sighting was made after dusk.
- One male calling at a wetland north of Lake Mombeong within the Project Area (Wetland ID 20505).

- One Australasian Bittern was recorded outside the Project Area but within the Investigation Area:
    - One male calling at Lake Mombeong, recorded on the same evening as the male recorded calling within the Project Area at Wetland ID 20505.

Figure 3.4 and **Figure 3.5** shows where these records of Australasian Bittern occurred.

The series of wetlands including Lake Mombeong, Dead Horse Swamp, Black Swamp, McFarlanes Swamp and Long Swamp and the associated wetlands along the southern boundary of the pine plantation near Lake Mombeong and Nobles Rocks were identified as important habitat for Australasian Bittern (see **Figure 3.5**).

Australasian Bittern is resident and present year-round in the Portland area and at Long Swamp. Population estimates for Australasian Bittern are that there are between 37 and 119 in the Long Swamp and Pick Swamp, directly south and west of the Project Area. The population could be as high as 228 based on the wetland area available within 10 km. Importantly, not all these individuals would be likely to move between the coast and inland wetlands.



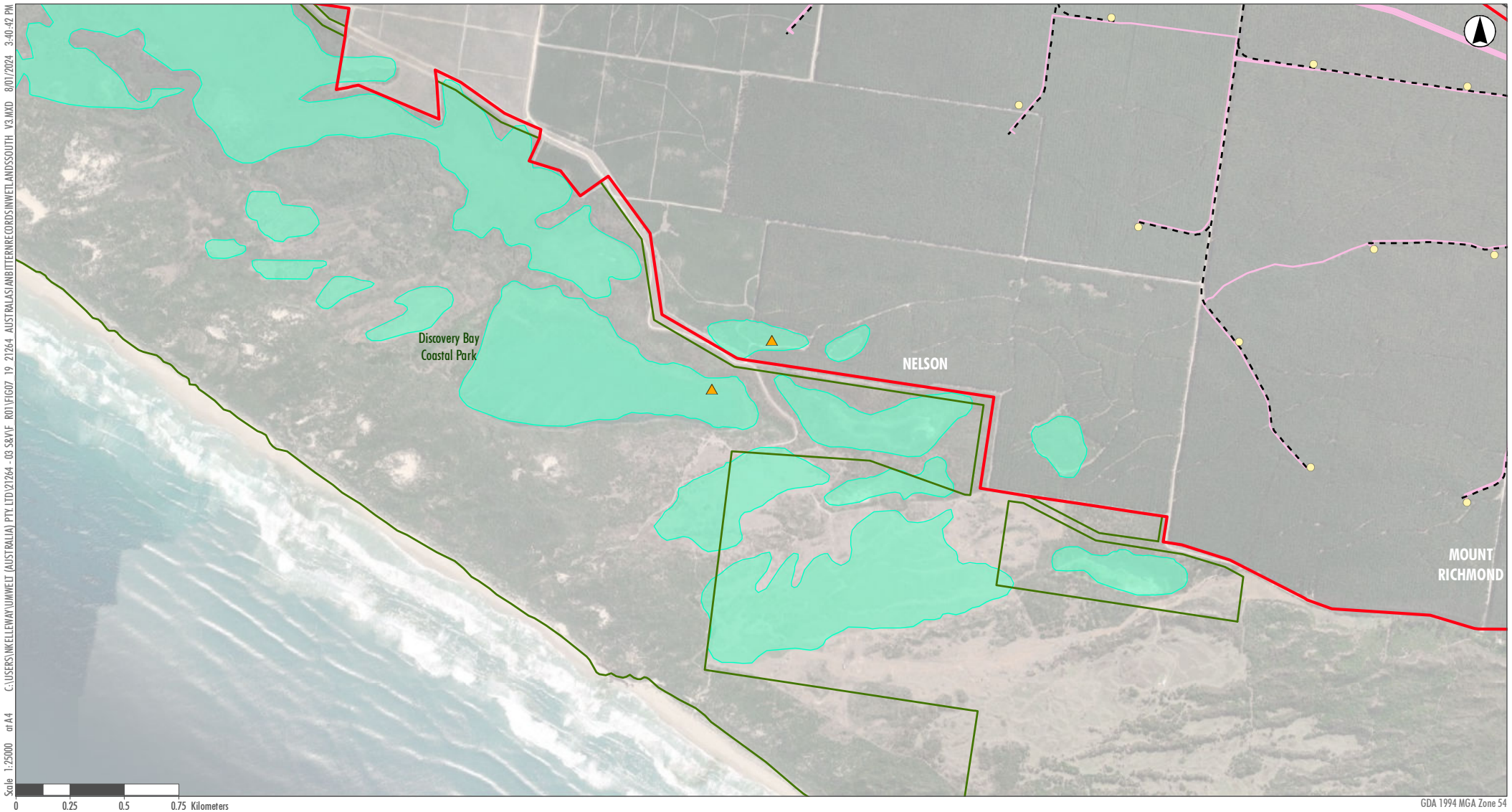
Legend

- Wind Farm Site
- Underground Powerlines
- 275 kV Powerline - Underground
- Internal Access Roads
- Proposed Turbine Location
- Collector Substation
- Site Compounds
- Laydown Areas
- Concrete Batch Plant
- Parks and Reserves
- Wetlands
- Roads
- Watercourses
- Australasian Bittern (Biosis)

Image Source: ESRI Basemap (2021) Data source: DELWP (2021); Biosis (2022)

FIGURE 3.4

Australasian Bittern Records in Wetlands in the North-east Wind Farm Site



Legend

- Wind Farm Site
- Biodiversity Impact Assessment Study Area
- Proposed Turbine Location
- Internal Access Roads
- Underground Powerlines
- Parks and Reserves
- Wetlands
- Roads
- Australasian Bittern (Biosis)

Image Source: ESRI Basemap (2021) Data source: DELWP (2021); Biosis (2022)

FIGURE 3.5

Australasian Bittern Records in Wetlands South of the Wind Farm Site

3.4.2.2 Impact assessment

Habitat removal and disturbance

There would be no direct impacts on wetland habitat, including breeding habitat for the Australasian Bittern.

Buffers on wetlands within the Ramsar site would mean potential indirect impacts on these wetland habitats would be avoided. There is limited potential for indirect impacts on DEECA mapped wetlands in the north-east of the wind farm site, and it is assessed that mitigation measures such as sediment devices (bunding and silt fencing) and trenching management will be implemented through a Sediment, Erosion and Water Quality Management Plan during construction will avoid or minimise potential indirect impacts on wetlands (see mitigation measure MM-SW01).

In addition to the above, more specific mitigation measures for the Australasian Bittern will be implemented. Surveys will be undertaken prior to construction to identify the presence of the species in wetland habitats within proximity to the Project Area to provide for baseline monitoring which will be utilised during the operation of the Project (see mitigation measure MM-BD11).

Neoen has already committed to incorporating 900 m buffer into their Project design near Long Swamp and associated wetlands bordering the southern edge of the Project Area as a measure to avoid and minimise impacts on Brolga (see **Chapter 8 *Brolga***). Suitable habitat for the Australasian bittern is included within this buffer. This is comparable to the 1,000 m distance from breeding sites to turbines suggested for the Eurasian Bittern (Busch et al. 2017) (see mitigation measure MM-BD11).

Additionally, an offset strategy will be developed in the case of a collision mortality to avoid significant impact to the population. This is further detailed in the BBAMP (see mitigation measure MM-BD11).

Wind turbine collision risk

There is some potential for Australasian Bitterns to collide with wind turbines. Investigations into collisions with turbines at other wind farm sites indicate that no mortalities of Australasian Bittern have been detected at monitoring of other Victorian wind farms (Moloney et al. 2019 and Symbolix, 2020).

No dinural flights were recorded during BUS to enable collision risk modelling. However, Australasian Bitterns have been recorded to fly at heights of three to 200 m and may be at risk of collision when flying at rotor swept height. Given the distribution of potential and known habitat south, north and east of the Project Area, the likely local and seasonal movements across the wind farm site, and the known occurrence of mature and juvenile Australasian Bitterns in the wetlands surrounding the Project Area, a portion of Australasian Bitterns using the local wetlands are expected to fly across the pine plantation where turbines would be located.

There is some uncertainty relating to how often Australasian Bitterns would fly across the wind farm site, as well as at what height they would fly (specifically whether those flights would occur at rotor swept height, putting them at risk of colliding with turbines). Additionally, there is insufficient information available to conduct a PVA for the Australasian Bittern, and no PVA exists for the species. The assessment of potential impacts on Australasian Bittern in the **Flora and Fauna Existing Conditions and Impact Assessment (Appendix C)** has used the precautionary principle, which is appropriate here because of these uncertainties.

Based on the available information, and the level of uncertainty on the number of movements across the wind farm site, the assessment found that the Project could lead to a long-term decrease in the size of the population and interfere with the recovery of the species The severity of existing threats in the Threatened Species Strategy Year 3 Scorecard (NESP TSRH 2019) is considered negligible with declines of less than 1% of the population. Using this criterion, 1 % of the lower bound Australian population estimate of 247 individuals for the species equates to 2 to 3 individuals and using the upper bound of 796 equates to 8 individuals.

The assessment of potential impacts found that it is possible that 1% of the lower and upper bound Australian population estimates (between 2 and 8 individuals) could collide with wind turbines within the lifetime of the Project, indicating the Project is likely to have some impact on individual mortality and potentially an impact on the size of the population. Because there is little information available relating to the population viability of the Australasian Bittern. The assessment was not able to determine the magnitude of this potential impact on the species, including whether it would affect the population of Australasian Bitterns in the long term. However, the assessment adopted the precautionary principle in light of this uncertainty in concluding that the Project could lead to a long-term decrease in the size of the population and interfere with the recovery of the species.

Based on the findings of the **Flora and Fauna Existing Conditions and Impact Assessment (Appendix C)**, Neoen has implemented several design changes and measures to assist in the mitigation of potential impacts on Australasian Bittern from the operation of the Project.

More generally, a BBAMP will be developed and implemented for the Project to minimise, manage and mitigate remaining residual collision risk for several species arising from the operation of the wind farm (including the Australasian Bittern) and to ensure unexpected bird mortalities are responded to appropriately (see mitigation measure MM-BD12). A Bat and Avifauna Management Plan will also be developed relating to operational management of the wind farm. GPS/satellite tracking of movements, and other monitoring technologies will also be considered to further inform potential adaptive management strategies specifically for the Australasian Bittern (see mitigation measure MM-BD11). Emerging technologies such as thermal camera systems to trigger a turbine shut-down if the species is detected near a turbine may be appropriate for the Australiasian Bittern.

Locating the Project's transmission line underground removes any potential collision risk for Australasian Bittern with an overhead transmission line. An overhead powerline is proposed to be located parallel to Portland-Nelson Road from the western part of the wind farm site where it transitions underground, at the eastern end of the wind farm site. If this powerline is below or at the height of the pine trees, it is unlikely to pose a collision risk to the Australasian Bittern. All new overhead powerlines will be marked with standard commercially available bird diverters to increase visibility to birds and minimise the risk of collision (see mitigation measure MM-BD16).

Assessment against the Significant Impact Guidelines

An assessment of significance has been conducted for this Australasian Bittern and is provided below in **Table 3.11**.

Table 3.11 Significant impact assessment for Australasian bittern

Significant Impact Criteria	Assessment
Lead to a long-term decrease in the size of a population	**Likely**. The main risk to the Australasian Bittern is collision with turbines and the overhead powerline. Suitable wetland habitat for the species occurs to the south, east and north of the Project Area and the species is known to move locally between wetlands and seasonally between the coastal wetlands and inland wetlands in Victoria and New South Wales. Individuals would be expected to occasionally fly across the Project Area and may collide with wind turbines and overhead power lines. Uncertainty exists on the number of individuals that may fly across the wind farm, the number, frequency as well as height of such flights. Satellite tracking has shown that long-distance movements can occur at night. The species also moves locally, at dusk (as observed during the Biosis surveys) and may be less able to avoid barriers such as wind turbines and power lines than diurnally moving species. The most robust population estimate is 37–119 in the Long Swamp and Pick Swamp, directly south and west of the Project Area, but could be as high as 228 based on the wetland area available within 10 km. Not all of these individuals would be likely to move between the coast and inland wetlands, as the species is resident within the search area. Based on the available information, and the level of uncertainty on the number of movements across the wind farm, the project may have a low to moderate likelihood that it will lead to a long-term decrease in the size of the population. The severity of existing threats in (NESP TSRH, 2019) is considered negligible with declines of <1 % of the population. Using the same criteria, 1% of the lower bound Australian population estimate of 247 individuals for the species this is 2–3 individual and using the upper bound of 796 is 8 individuals. It is conceivable this number of individuals may collide with turbines or overhead powerlines within the lifetime of the project, indicating the project is likely to have some impact on individual mortality. It is difficult to ascertain if any such impact would affect the population in the long term but using the precautionary principle, we consider it is a possibility.
Reduce the area of occupancy of the species	**Unlikely**. The Project is unlikely to impact directly on the Australasian Bittern wetland habitat. No information exists on potential disturbance effects of turbines on Australasian Bittern, or other bittern species', habitat use or breeding. Indirect disturbance may potentially reduce occupancy at wetlands but likelihood of this is considered remote to low, particularly if turbines are not adjacent to wetland habitat, where the species' breeding activity has been recorded.
Fragment an existing population into two or more populations	**Unlikely**. The Project would not remove wetland habitat and is unlikely to fragment an existing population into two or more populations.
Adversely affect habitat critical to the survival of a species	**Unlikely**. Any wetland habitat where the species is known or likely to occur and any location with suitable habitat outside the above area that may be periodically occupied by the species is defined as critical habitat. No direct impacts to wetland habitats are predicted, as long as no impact is predicted for groundwater levels, surface water run-off, or sedimentation, which might affect wetland quality.

Significant Impact Criteria	Assessment
Disrupt the breeding cycle of a population	**Unlikely**. The wetlands with known Australasian Bittern breeding activity are outside of the Project Area, except for a wetland north of Lake Mombeong (wetland ID 20505) where Biosis recorded breeding activity. Therefore, the Project is unlikely to disrupt the breeding cycle of a population.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	**Unlikely**. No direct impacts to wetlands are predicted, as long as no impact is predicted for groundwater levels, surface water runoff, or sedimentation, which might affect wetland quality.
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species habitat	**Unlikely**. The invasive species listed as a threat to the Australasian Bittern include pigs, horses, goats, deer, foxes, cats, rats and pigs (CoA 2019). The project would not involve actions that would increase or introduce risk from invasive species that is already not present.
Introduce disease that may cause the species to decline	**Unlikely**. No diseases are listed as a threat to the Australasian Bittern (CoA 2019). The Project does not include any known mechanism that would result in introduction of any disease that is not already present in the relevant environment.
Interfere with the recovery of the species	**Likely**. A number of recovery actions are currently under way for the Australasian Bittern, although the formal recovery plan remains in draft. These include wetland habitat restoration by Nature Glenelg Trust (Long Swamp and Pick Swamp), the Glenelg Hopkins Catchment Management Authority Coastal Connections Project, the North Central Catchment Management Authority, habitat creation and enhancement in the Riverina rice fields, and environmental water allocations within the Murray-Darling Basin. The project would not impact on the species' habitat, or wetland habitats subject to these recovery actions. Some individuals benefiting from these recovery actions may potentially collide with wind turbines and power lines, resulting in at least some impact on the recovery efforts at these locations.

3.4.3 South-eastern red-tailed black cockatoo

3.4.3.1 Existing conditions

No South-eastern Red-tailed Black Cockatoos were recorded during Project surveys.

The South-eastern Red-tailed Black Cockatoo is listed as Endangered under the EPBC Act. The species is endemic to the south-east of Australia and occurs as a single population in an overall area of approximately 18,000 km^2 of south-western Victoria and adjacent South Australia. The range is bounded by Keith, Lucindale and Mt Gambier in South Australia, and Portland, Casterton, Toolondo, Natimuk, Dimboola, Nhill and Kaniva in Victoria (see **Figure 3.6**). About 30 % of the range contains suitable habitat and is known to be used by South-eastern Red-tailed Black Cockatoos for foraging and breeding. South-eastern Red-tailed Black Cockatoos may form large flocks and can also occur as smaller groups of two to three individuals.

The National Recovery Plan for South-eastern Red-tailed Black Cockatoos identifies the habitat that is critical to the survival of the subspecies. It includes important feeding trees, consisting of the seeds of two closely related eucalypts, Desert Stringybark (*Eucalyptus arenacea)* and Brown Stringybark (*Eucalyptus baxteri)*, and in the northern portion of the species range seasonally on the seeds of Buloke (*Allocasuarina luehmannii)*. South-eastern Red-tailed Black Cockatoos tend to feed on forest and scattered paddock trees within the range and on whichever stringbark species has most recently fruited.

South-eastern Red-tailed Black Cockatoos require very old, large, hollow eucalypts for nesting. Over 95% of known nest sites are within 2 km, and all are within 5 km, of blocks of stringybark that are greater than 5 ha in area. The birds prefer hollows in dead trees (81 %), but also use live trees. Nests are most often found in farmland with scattered live and dead Red Gums. The breeding season starts in September and nests with eggs are frequently found up to December, however, they may nest successfully in any season.

Brown Stringybark is the primary food tree for South-eastern Red-tailed Black Cockatoos in the southern portion of its range, including the region of the Project (see **Figure 3.7**). It is a principal canopy species distributed broadly in natural woodlands including those in Lower Glenelg, Mount Richmond and Cobboboonee National Parks that lie to the north, east and south-east of the wind farm site.

The commercial pine plantations and cleared agricultural land occupying majority of the Project Area are not suitable habitats for the South-eastern Red-tailed Black Cockatoo. There are several past records of South-eastern Red-tailed Black Cockatoos in appropriate habitat close to the Project Area, which are substantially concentrated in Lower Glenelg National Park to the north of the wind farm site. The primary food tree in the region for the species is Brown Stringybark (see **Figure 3.7**), which is a dominant canopy species within the national park. **Figure 3.7** also shows Brown Stringybark habitat to the south of the Project Area in the Mount Richmond area.

South-eastern Red-tailed Black Cockatoos do not feed on pine seeds, which is an important factor in consideration of their potential usage of pine plantations in the Project Area. There is a very small number of previous records from the Project Area itself and from Discovery Bay Coastal Park to the south of the Project Area, as the vegetation in this area is not suitable habitat for the species.

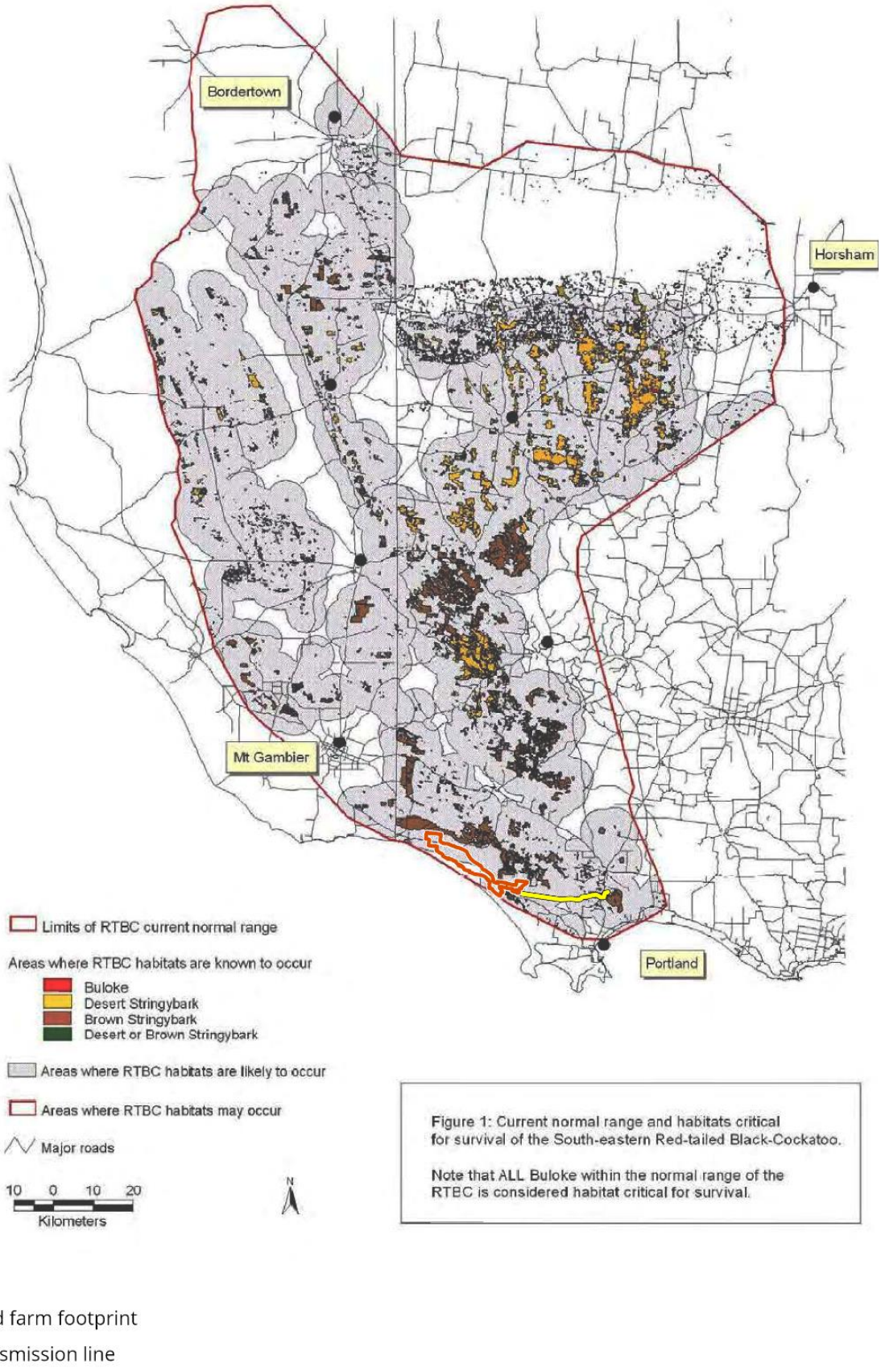


Figure 3.6 South-eastern red-tailed black cockatoo range

BirdLife Australia has co-ordinated annual counts of South-eastern Red-tailed Black Cockatoos since 1998. A single record of two red-tailed black cockatoos was made during a point count on 28 October 2020, outside the Project Area on the eastern side of the Glenelg River estuary. BirdLife Australia notes that in early 2020 the majority of the population was in the northern part of the range, especially in the Wimmera region, and that it is likely the birds were taking advantage of the good seed crop available to them in Desert Stringybark which occurs in that part of the species range (Birdlife, 2022).

The 2021 co-ordinated count included two occasions where Red-tailed Black Cockatoos were recorded within 10 km of the Project Area, and one closer to Portland. This included a flock of 80 individuals at Lower Glenelg National Park, approximately 4 km from the wind farm site. In the 2022 count, none of the flocks were recorded within 10 km of the Project Area. There were 25 sightings in the 2023 count, mostly located in the central part of the species' range in the Casterton and Edenhope areas (over 50 km from the Project Area). It is apparent that the population may be substantially present or absent from the vicinity of the Project for months or years when fruiting of Brown Stringybark is not sufficient to support the birds. The resource availability across the species' range may vary annually and flocks and small groups of individuals may use the woodland habitats surrounding the pine plantations where most of the turbines would be located. There will be periods during the operational life of the Project when risk of impact is negligible simply because the birds are absent from the local area, but the level of risk may vary annually depending on which part of their range has the most suitable food resources. Overall, the local region forms a valuable part of the species range and provides habitat resources for feeding, nesting and roosting, however the great majority of the Project Area does not offer habitat for the species.

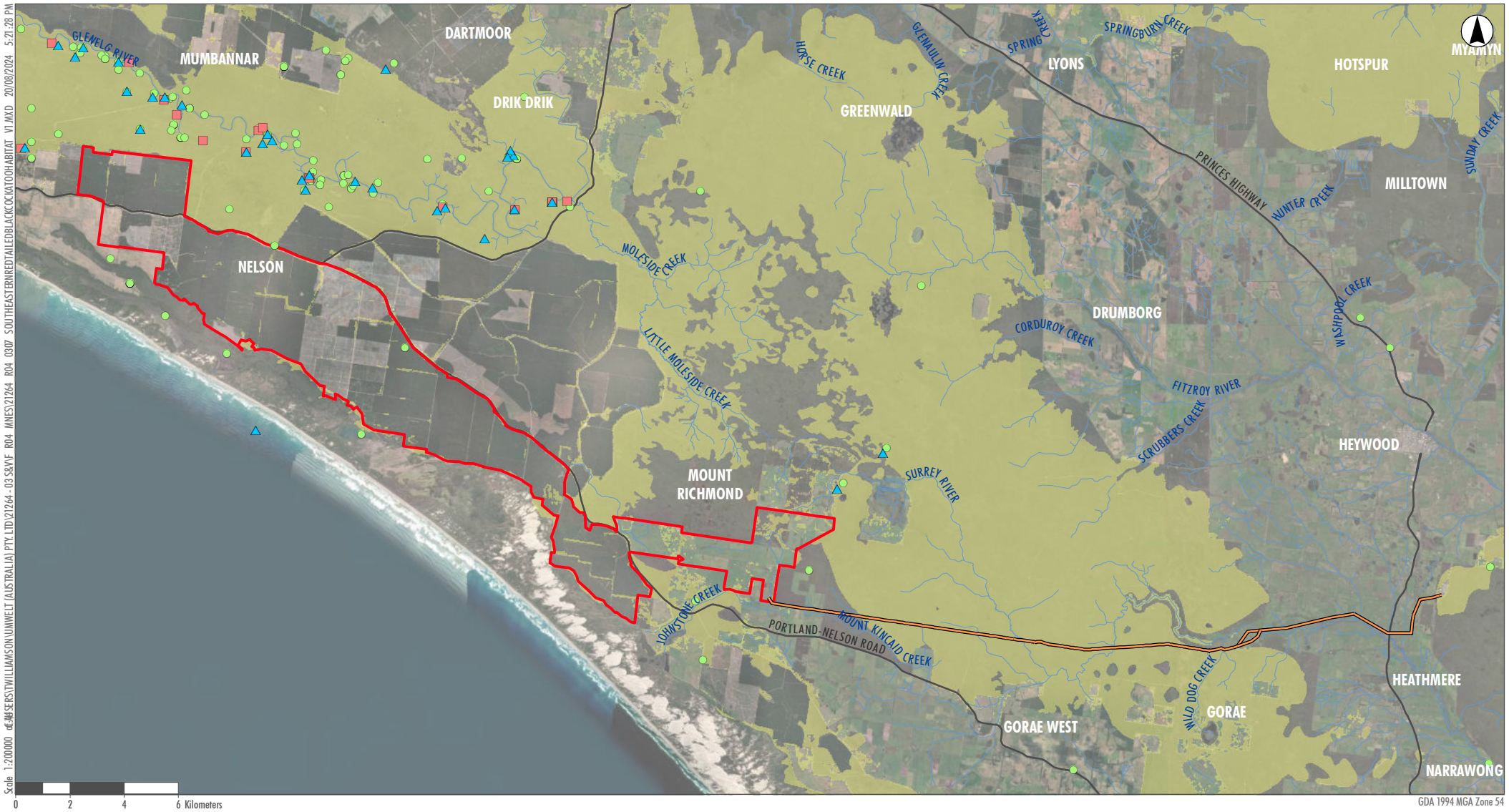


FIGURE 3.7

South-eastern Red-tailed Black Cockatoo Habitat

Image Source: ESRI Basemap (2021) Data source: DELWP (2021); Biosis (2022)

3.4.3.2 Impact assessment

Vegetation removal

A minor loss of habitat critical to the survival of the South-eastern Red-tailed Black Cockatoo (as defined in CoA 2006a) is proposed relating to the where the underground transmission line is proposed to be constructed in an alignment of approximately 200 x 3 m where some Brown Stringybark trees occur near the Heywood Terminal Station.

Some trees would be indirectly impacted due to tree protection zone incursion which many include potential food tree removal. Extensive foraging habitat exists in the landscape, however any potential loss of this habitat would have minimal impact on the species and negligible impact on the extent of its habitat.

Wind turbine collision

As the wind farm site consists of pine plantation and cleared agricultural land, there is no suitable habitat present for the South-eastern Red-tailed Black Cockatoo. The distribution of suitable habitat in the surrounding area suggests that their flights through the wind farm site are likely to be rare as there is little incentive for the species to traverse the site.

Movements of this species through the wind farm site are likely to be made by birds that are traversing between areas of suitable habitat outside the Project Area. These movements would only occur when the species is within the southern part of the species' range (within the Kentbruck area).

As shown in **Figure 3.7**, the species' recovery plan shows some Brown Stringybark habitat mapped as occurring to the south of the Project Area, in the Mount Richmond area. Movements between suitable habitats including Mount Richmond and the Cobboboonee National Park and Cobboboonee Forest Park are unlikely to present a collision risk for the species as no turbines are proposed in the intervening landscapes (north-east of Portland-Nelson Road, at the eastern end of the wind farm site).

Flights heights for the species were assessed in 2020 by observing South-eastern Red-tailed Black Cockatoos where the species was resident at the time. The habitat type was like the natural woodlands that occur in the Kentbruck area.

The flight height study considered about 3,600 documented flights and found:

- Around 99 % of flights over open paddocks were between the ground and 39 m above the ground.
- Around 99 % of flights over woodlands, which had a maximum canopy height of between 15 and 25 m, were between the ground and 29 m above the ground.
- The highest flight was about 54 m above the ground.

The study did not record any flight heights as high as the lowest blade tip height of the proposed wind turbines for the Project (60 m above ground level).

The species is known to fly at heights above those that were documented in the study. For instance, the species may fly up from foraging or drinking in response to approach from aerial predators such as Wedge-tailed Eagles. Flights responses to predators are not expected to occur frequently within the pine plantation of the wind farm site, as the pine plantation is low value habitat for both South-eastern Red-tailed Black Cockatoos and potential predators such as Wedge-tailed Eagles.

Based on the studies undertaken for the Project, most South-eastern Red-tailed Black Cockatoos flights are anticipated to be below rotor swept height of the proposed turbines (below 60 m above ground level).

South-eastern Red-tailed Black Cockatoos are known to fly in flocks during the non-breeding season. Studies of other cockatoo species that are more common at wind farm sites in western Victoria and that also fly in flocks were reviewed as part of the assessment. There is no known evidence of birds in flocks experiencing multiple collisions. In some cases, flying in flocks may prove to be advantageous as it potentially improves the ability for the flying birds to detect and respond to potential threats, such as wind turbines within their flight path. The assessment concluded that the flocking behaviour of the species is unlikely to increase the risk of collisions with the Project's wind turbines.

Most of the wind farm site is not suitable habitat for the South-eastern Red-tailed Black Cockatoos. Suitable areas of habitat are predominantly to the north and east of the Project Area. Although movements across the wind farm site may occasionally occur, the assessment found they are likely to be rare. The studies into flight heights for the species also suggest that flights across the wind farm site, if they did occur, are likely to be below rotor swept height.

Given the protected nature of the species, collisions with turbines have the potential to be significant to the overall viability of the population. However, based on the studies undertaken and relevant literature, the likelihood of South-eastern Red-tailed Black Cockatoos flying across the site at rotor swept height is low. The Project is therefore unlikely to have significant impacts on the South-eastern Red-tailed Black Cockatoo population.

A BBAMP will be developed to minimise the risk of turbine collision and ensure unexpected bird mortalities are responded to (see mitigation measure MM-BD12). Adaptive management approaches will be adopted into the BBAMP, including investigating the feasibility of using on-site radar/camera systems and turbine shut-down protocols.

Powerlines associated with the Project will also be marked with bird diverters to increase visibility of these lines for birds (see mitigation measure MM-BD16).

Assessment against the Significant Impact Guidelines

An assessment of significance has been conducted for the South-eastern Red-tailed Black Cockatoo and is provided below in **Table 3.12**.

Table 3.12 Significant impact assessment for south-eastern red-tailed black cockatoo

Significant impact criteria	Assessment
Lead to a long-term decrease in the size of a population	**Unlikely**. The principal potential risk to the species is collision with turbines. Habitat within the Project Area is not considered to be suitable for the species, although red-tailed black cockatoos might rarely fly through the site. They were not recorded during BUS onsite. The species flights are generally expected to be below turbine rotor heights. Due to lack of habitat and flight behaviour, it is considered that such collisions are unlikely to occur. The potential for the Project to lead to a long-term decrease in the size of the population is unlikely.
Reduce the area of occupancy of the species	**Unlikely**. The Project Area contains no habitat for red-tailed black cockatoos. Existing land use and vegetation of the site will remain substantially unchanged. The project is not likely to lead to a reduction in the area occupied by the species.
Fragment an existing population into two or more populations	**Unlikely**. As the Project would not entail substantive alterations to existing habitats, there are no effects or mechanisms that might fragment existing population of south-eastern red-tailed black cockatoos.
Adversely affect habitat critical to the survival of a species	**Unlikely**. The Project Area substantially does not contain habitat for South-eastern Red-tailed Black Cockatoos. The project may entail minor loss of habitat critical to the survival of the subspecies (as defined in CoA 2006a) where the underground export powerline is proposed to be constructed in an alignment of approximately 200 x 3 m where some Brown Stringybark trees occur near the Heywood substation.
Disrupt the breeding cycle of a population	**Unlikely**. Red-tailed Black Cockatoos breeds in hollow eucalypts outside the project area. The Project is not likely to affect the breeding cycle of the species.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	**Unlikely**. The Project Area contains no habitat suitable for red-tailed black cockatoos. The Project has no potential to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species habitat	**Unlikely**. The Project does not include any known mechanism that would result in establishment of invasive species that are not already present in the relevant environment.
Introduce disease that may cause the species to decline	**Unlikely**. The Project does not include any known mechanism that would result in introduction of any disease that is not already present in the relevant environment.
Interfere with the recovery of the species	**Unlikely**. The Project is not likely to interfere with the recovery of the species. There are no threat mechanisms or recovery actions noted in the recovery plan that are relevant to the species at the Project Area.

3.4.4 Orange-bellied parrot

3.4.4.1 Existing conditions

The Orange-bellied Parrot is a small, migratory ground parrot. The species is listed as 'Critically Endangered' under the EPBC Act and is also listed as a threatened species in each state in which it occurs (NSW, South Australia, Tasmania and Victoria). There are about 50 Orange-bellied Parrots remaining in the wild, with the population supplemented by a captive breeding program of around 320 individuals.

Orange-bellied Parrots migrate from Tasmania to coastal Victoria and South Australia overwinter for the period from March-April to October (Department of Environment, 2016). When on the mainland they typically stay within 3 km of the coastline. Their breeding range has declined significantly and breeding typically only occurs at Melaleuca in south-west Tasmania (Department of Environment, 2016). Requiring a mosaic of eucalypt forest, rainforest and fire dependent moorland and sedgeland plains for breeding habitat.

The migration route includes the coast of western Tasmania and Kin Island. Non-breeding pairs are usually found along the coast of South Australia and Victoria. The non-breeding range does extend into NSW however sightings there are now rare.

Most of the records of the species from the mainland are from within 2 km of the coast, with recent records up to 10 km inland. The species may thus be present in the region of the Project Area annually between March-April and October. The species uses coastal saltmarsh and heathland vegetation communities on the mainland. Discovery Bay Coastal Park coastal zone contains suitable habitat for the species, and the species has been historically recorded near Nobles Rocks (1989, 1991, 1993) and Swan Lake (1987, 1991).

A single, Orange-bellied Parrot was recorded in the interdunal heathland vegetation adjacent to the beach south of Swan Lake, approximately 3 km south of the Project Area, on 29 May 2020 (see **Figure 3.8**). The individual was identified through the unique call and then following visual spotting of the bird (Biosis, 2022). This is the first records of the species in the area since 1993.

The great majority of the Project Area is within environments that are not suitable habitat for Orange-bellied Parrots. All records of Orange-bellied Parrots from western Victoria are from locations in very close proximity to the coast and, in the local area there are no records of the species north of Discovery Bay Coastal Park.

Legend

- Wind Farm Site
- Underground Transmission Line
- Parks and Reserves
- Roads
- Watercourses
- Orange-bellied Parrot Records (Biosis)
- Flight Path

FIGURE 3.8

Orange-bellied Parrot Records

Image Source: ESRI Basemap (2021) Data source: DELWP (2021); Biosis (2022)

3.4.4.2 Impact assessment

Wind turbine collision risk

No suitable habitat for the species exists in the wind farm site. However, because of the small size of the total current Orange-bellies Parrot population, any mortality due to collision with wind turbines would be considered a high impact. The primary concern for the species is associated with the potential for collisions with the wind turbine infrastructure.

The commercial pine and blue gum plantations that make up most of the wind farm site are not suitable habitat for Orange-belled Parrots. The species may occasionally fly across the plantation, including areas that have been recently harvested. Orange-bellied Parrots may also occasionally fly over or forage in the weedy, low-lying agricultural portions of the wind farm site, although much of this land does not contain turbines due to the presence of turbine-free buffers for Brolga. Flights away from the species preferred coastal environments would be rare as there is little in the way of preferable habitat north of Discovery Bay Coastal Park. The seasonal migratory behaviour of the species means that the Project would not pose any risk to it during the annual 5–6 month period in which the population is in Tasmania.

Wind turbines are not expected to present as barriers to movement of the Orange-bellied Parrots. There are several operational projects in Tasmania and Victoria that are either within migration pathways or the narrow coastal zone of preferred habitat for this species, and there has been no discernible effect on the movement of these species as a result.

No records of Orange-bellied Parrot collisions with wind turbines have been reported from any wind farms in Victoria and Tasmania, despite extensive monitoring of bird collisions at many of these sites. It is possible that undetected collisions may have occurred as collision monitoring is a sampling process. Four instances of Orange-bellied Parrots colliding with man-made structures are known as summarised in the recent TASCAT assessment of the Robbins Island Wind Farm in Tasmania, one with a lighthouse more than 100 years ago and three incidents at a breeding site in Tasmania.

No known flight height data is available for Orange-bellied Parrots. However, Blue-winged Parrots have very similar morphology and flight characteristics, and data for Blue-winged Parrots flights have been collated during point counts of the Project, with a total of 115 Blue-winged Parrot flights documented. Of those, 111 were between the ground and 50 m high, while four flights were between 60 and 80 m high. Given the similarities between the two species, the assessment found that most flights by Orange-belled Parrots would be below rotor swept height (i.e. below 60 m above ground level), if they were to occur within the wind farm site.

The transmission line proposed for the Project would not present a collision risk as it is entirely underground and is located a considerable distance from any known or preferred habitat for Orange-bellied Parrots.

Population numbers for Orange-belled Parrots are at critically low levels. Any mortality of the species caused by the Project would therefore constitute a significant impact. However, the assessment concluded that the Project is unlikely to have a significant impact on the species given the lack of suitable habitat and the proposed height of the rotor swept area having regard to the probable heights that Orange-belled Parrots would fly at if they were to traverse the wind farm site.

A BBAMP will be developed and implemented to minimise the risk of turbine collision and ensure unexpected bird mortalities are responded to (see mitigation measure MM-BD12). Overhead powerlines will also be marked using bird diverters, which will increase visibility of these lines for birds (MM-BD16).

Assessment against the Significant Impact Guidelines

An assessment of significance has been conducted for the Orange-bellied Parrot and is provided below in **Table 3.13**.

Table 3.13 Significant impact assessment for Orange-bellied parrot

Significant impact criteria	Assessment
Lead to a long-term decrease in the size of a population	**Unlikely**. The potential risk for orange-bellied parrot is considered to relate to the potential for collisions with wind turbines. As habitat within the Project Area is not suitable for the species it is considered that such collisions are unlikely to occur, particularly given the narrow habitat preferences for this species. An individual, Orange-bellied Parrot was recorded in near coastal habitat during targeted surveys for this project, which is consistent with the distribution of suitable habitat in southwest Victoria. The potential for the project to lead to a long-term decrease in the size of the population is negligible.
Reduce the area of occupancy of the species	**Unlikely**. The Project Area contains no known potential habitat for Orange-bellied Parrots. Existing land use and vegetation of the site will remain substantially unchanged. The Project is not likely to lead to a reduction in the area occupied by the species substantially unchanged. The Project is not likely to lead to a reduction in the area occupied by the species.
Fragment an existing population into two or more populations	**Unlikely**. Existing wind energy facilities suggest that they do not present barriers to movement by the species. As the Project Area is on the landward side of habitat suitable for the species it is also not likely that the Kentbruck project has any capacity to disrupt movements by the species. As the species is confined to a narrow coastal zone and the Project would not entail substantive alterations to existing habitats, there are no effects or mechanisms that might fragment existing populations of orange-bellied parrots.
Adversely affect habitat critical to the survival of a species	**Unlikely**. The Project Area contains no known potential habitat for Orange-bellied Parrots. The Project is not likely to adversely affect habitat critical to the survival of the species
Disrupt the breeding cycle of a population	**Unlikely**. Orange-bellied parrots breed only in Tasmania. The Project has no capacity to affect the breeding cycle of the species.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	**Unlikely**. The site contains no known or potential habitat for Orange-bellied Parrots. The Project has no potential to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species habitat	**Unlikely**. The Project does not include any known mechanism that would result in establishment of invasive species that are not already present in the relevant environment.

Significant impact criteria	Assessment
Introduce disease that may cause the species to decline	**Unlikely**. The Project does not include any known mechanism that would result in introduction of any disease that is not already present in the relevant environment.
Interfere with the recovery of the species	**Unlikely**. The Project is unlikely to interfere with the recovery of the species. Under Barriers to migration and movement the species Recovery Plan (DEWLP, 2021) notes that, 'Barriers may include wind energy turbines, powerlines and associated infrastructure. The impacts of these barriers may be greatest where they occur on migration routes, where a large portion of the population may be exposed to the barrier during a key life stage. Wind resources suitable for wind farms are located along the migratory route and non-breeding range, increasing the likelihood of the birds 'being exposed to wind farm developments'. We consider it is unlikely that the species moves further inland from the current coastal environment it is known to inhabit and therefore the proposed wind farm and associated infrastructure is unlikely to form a barrier to movement. Under Section 3.5 'Guide for decision makers' of (DELWP, 2016) they note that new infrastructure developments that 'create disturbance that interrupts foraging' as an action that may have a significant impact on the species. Our assessment is that the species is unlikely to be impacted indirectly by the Project from the presence of the wind farm.

3.4.5 Blue-winged parrot

3.4.5.1 Existing conditions

The Blue-winged Parrot was listed as 'vulnerable' under the EPBC Act as of March 2023. Conservation Advice for the species was published in 2023 ((Commonwealth of Australia, 2023).

The Blue-winged Parrot is a small olive-coloured parrot with characteristic blue wings. The species is closely related to the Orange-bellied Parrot and the two species may occur as mixed flocks. As such, targeted surveys for the Orange-bellied Parrot also targeted the Blue-winged Parrot. The Blue-winged Parrot is found throughout south-eastern Australia, occupying coastal, subcoastal, and inland regions.

Project investigations recorded Blue-winged Parrots 56 times at:

- Six sites within the Project Area
- Seven control sites (locations outside the Project Area).

115 flights were recorded across the 56 recordings of the species. Except for one observation of 15 birds at site T17 all the records were of between one and five parrots (see **Figure 2.2**). All these records were of birds in flight. Half of all the observations of Blue-winged Parrots (28 records) were at site T15 and T17 in agricultural grazing land at the eastern part of the wind farm site, where turbines are not proposed. Incidental observations of approximately 50 Blue-winged Parrots were also made at the same location in late October 2021. One point count site (T9) where Blue-winged Parrots were observed six times is a large open area where pines have been harvested in the recent past. One record was at site T10 where Blue-winged Parrots were observed flying at 15 m above the ground from a track between more mature pines.

Out of the 115 flights recorded, 111 records found Blue-winged Parrots flying at heights between the ground and 50 m high and four records at heights between 60 and 90 m.

3.4.5.2 Impact assessment

Collision risk

Collision risk modelling was done as part of the Project assessment. The model found the potential for the following number of Blue-winged Parrot collisions per annum for all turbines within the wind farm site:

- 1.46 collisions per annum at 0.95 rotor avoidance rate
- 0.60 collisions per annum at 0.98 rotor avoidance rate
- 0.31 collisions per annum at 0.99 rotor avoidance rate.

Because so few flights were recorded within turbine rotor-swept height, the modelling primarily shows the risk of Blue-winged Parrots colliding with stationary components of turbines, including the tower. The model has an assumed avoidance rate of 0.99 for these non-moving components as it's expected Blue-winged Parrots would be more readily able to avoid these when compared to moving components such as wind turbine blades.

Comparative modelling was also undertaken to assess whether the model predicted more collisions if the lower blade sweep height of the wind turbines was lower (45 m from the ground, compared to 60 m). The collision risk model for this scenario indicated the potential for the following numbers of Blue-winged Parrot collisions per annum:

- 2.49 collisions per annum at 0.95 rotor avoidance rate
- 1.00 collisions per annum at 0.98 rotor avoidance rate
- 0.50 collisions per annum at 0.99 rotor avoidance rate.

These results reflect the findings of the Project investigations which found that Blue-winged Parrot flights within the wind farm site occurred primarily below 60 m above the ground.

Collision risk modelling for Blue-winged Parrot with turbines having a 60 m blade ground clearance suggests that at the lowest avoidance rate of 0.95, there might be an annual average of 1.5 collisions by the species. Conservation Advice for Blue-winged Parrot ((DCCEEW, 2023)), 'Survey and monitoring priorities' and 'Information and research priorities' list various current uncertainties about population and demographic functions of the species. These uncertainties make it evident that PVA is not feasible but it estimates there are about 10,000 mature individuals ((Holdsworth M, 2021)) with minimum and maximum plausible population estimates of 7,500 and 15,000 and mean generation time of 3.8 years. Using those values, fundamental demographic principles (e.g. (Krebs C. J., 2013)), mean that the loss of 1.5 birds per annum must be well within the natural variability in the species population mortality rate and could not affect viability of the population.

The assessment also considered a Victorian investigation of fauna collisions with wind turbines in Victoria (Moloney, Lumsden, & Smales, 2019) to assess the potential for Blue winged Parrot collisions with wind turbines. The investigation collated data from 15 operational wind farms where carcass monitoring had been undertaken for an average of two years. All of these wind farms are within the distributional range of the Blue-winged Parrots and seven of them are within proximity of the coast where the species is frequently recorded. No records of Blue-winged Parrot collisions with turbines were reported from any wind farm in the investigation.

A BBAMP will be developed and implemented to minimise the risk of turbine collision and ensure unexpected bird mortalities are responded to (see mitigation measure MM-BD12). Overhead powerlines will also be marked using bird diverters, which will increase visibility of these lines for birds (MM-BD16).

Assessment against the Significant Impact Guidelines

An assessment of significance has been conducted for the Blue-winged Parrot and is provided below in **Table 3.14.**

Table 3.14 Significant Impact Assessment for the Blue-winged Parrot

Significant impact criteria	Assessment
Lead to a long-term decrease in the size of a population	**Unlikely.** The potential for impacts on Blue-winged Parrot is considered to relate to collisions with wind turbines. While some collisions may occur their number and frequency are expected to be lower than thresholds for a significant impact defined by the EPBC Significant Impact Guideline 1.1. The potential for the Project to lead to a long-term decrease in the size of the population is unlikely.
Reduce the area of occupancy of the species	**Unlikely.** The Project entails no mechanism by which the area of occupancy by the species might be affected. The Project is not likely to lead to a reduction in the area occupied by the species
Fragment an existing population into two or more populations	**Unlikely**. The species is partially migratory and highly mobile. The Project entails no effects or mechanisms that might fragment the populations of Blue-winged Parrot.
Adversely affect habitat critical to the survival of a species	**Unlikely**. The Conservation Advice for Blue-winged Parrot (Commonwealth of Australia 2023) defines habitat critical to the survival of a species. It includes: "*Foraging and staging habitats found from coastal, sub-coastal and inland areas, right through to semi-arid zones including: grasslands, grassy woodlands and semi-arid chenopod shrubland with native and introduced grasses, herbs and shrubs*." The Project Area contains some portions that meet these criteria, primarily confined to areas of grazing pasture. The removal of minor areas of grazing pasture for access tracks and turbine hardstands are not considered sufficient to adversely affect habitat critical to the survival of the species.
Disrupt the breeding cycle of a population	**Unlikely.** The great majority of the Project Area supports no habitat suitable for breeding by Blue-winged Parrots. Without any defined 'important population' the project is considered not to have capacity to disrupt the breeding cycle of the population.

Significant impact criteria	Assessment
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	**Unlikely**. The Project does not entail activities that have potential to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species habitat	**Unlikely**. The Project would not entail mechanisms for the potential introduction or establishment of invasive species harmful to Blue-winged Parrots.
Introduce disease that may cause the species to decline	**Unlikely**. The Project would not entail mechanisms with potential for introduction or establishment of disease that might affect Blue-winged Parrots.
Interfere with the recovery of the species	**Unlikely**. The scale of possible effects of the project on the species is not likely to interfere with the recovery of the species.

3.4.6 White-throated needletail

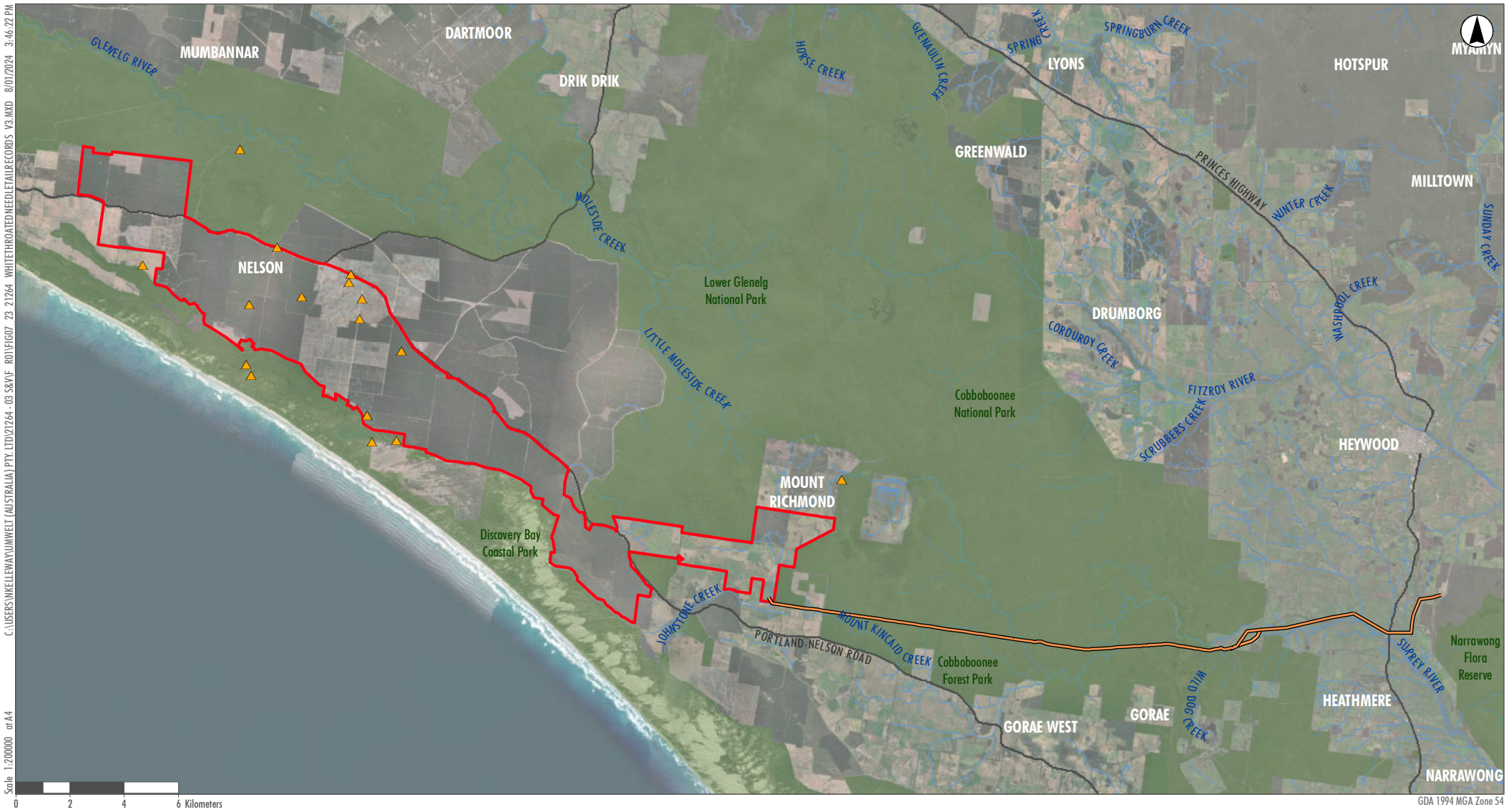
3.4.6.1 Existing conditions

The White-throated Needletail is listed as 'Vulnerable' and as a migratory species under the EPBC Act. The species is a large swift with a thickset, cigar-shaped body, stubby tail and long pointed wings. The white-throated needle tail migrates from the northern hemisphere to Australia for their non-breeding season and are annually present in south-eastern Australia between October-November and March to April. While in Australia the species spends majority of its time in the air and are not tied to any land-based habitat type. The mostly aerial species is found from heights of less than 1 m up to more than 1000 m above the ground (Coventry, 1989). The species roosts in trees amongst dense foliage in the canopy or in hollows, but knowledge of roosting sites is generally poor.

The Conservation Advice for White-throated Needletail (TSSC, 2021) explains that it is difficult to survey this species across Australia and that there are some recorded turbine collisions in Australia. A recent study (MK, 2021) found a decline in the species from 2011-2020 shown through a reduction in flock size and argues that wind turbine collisions in Australia may be a large contributing factor. There are numerous pre-existing database records for the White-throated Needletail from the local area. During surveys for the Project, White-throated Needletail was recorded on 21 occasions mostly during BUS. Most observations were of individual birds or small groups (< 10), but there were two observations of large groups, including the incidental observation near Lake Mombeong (70 birds) and an observation of 90 birds, followed by eight birds.

They were recorded at 10 locations, seven of which were within the wind farm site, with a total of 152 flights observed. Of these, 43 flight heights were between 12 and 45 m above ground and 108 were between 70 and 300 m high (see **Figure 3.9**).

The BUS observations were made at eight locations over three days in late February 2021, including five locations within the wind farm site. With the exception of three observations of groups of birds during a single BUS count at site C6, all observations were in the western portion of the Project Area, west of Lake Mombeong.



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Scale 1:200000 at A4

FIGURE 3.9

White-throated Needletail Records

Image Source: ESRI Basemap (2021) Data source: DELWP (2021); Biosis (2022)

3.4.6.2 Impact assessment

The Project does not entail the removal of any treed environment that might provide roosting habitat for White-throated Needletails. Roosting by the species has been detected extremely rarely in Australia and Vanderduys et al (2024) list seven records including their own, since 1902. The pines that occupy the great majority of the site are very unlikely to provide roosting habitat for the species. The pines are managed so that they do not form hollows and their upper foliage (needles) is upright and not likely to be suitable as roosting substrate. In addition, all of the exotic plantations across the site are clear felled on rotation. Even if the Project area was to be used for roosting, in the context of treed environments across the species range in eastern Australia, the study site could not represent a limiting resource and availability of roosting habitat is not noted in the literature as a cause of decline.

Collisions by the species with wind turbines have been documented in Australia ((Hull & Muir, 2013), (TSSC, 2019)) and that is considered to be the most likely potential cause of impact by the Project on the species.

Wind turbine collision risk

While the Project does not involve the removal of any treed environmental that might provide roosting habitat for the white-throated needletail, there is the possibility that some individuals may collide with the wind turbine infrastructure.

As a consequence of their annual migrations White-throated Needletails are not at risk of any effects from the Project in the annual period from mid-April until mid-October when they are routinely absent from Australia. They usually arrive in northern Australia during September and October, and sometimes in early November (Draffan, Garnett, & Malone 1983, Warham 1962).

A collision risk model was undertaken for White-throated Needletail, using the data from point counts obtained during Project surveys to evaluate the potential for turbine collisions. Where input values entailed necessary assumptions due to uncertainties, an attempt was made to err, if at all, toward over-estimation of potential risk. The species may fly during the hours of daylight and at night, although this is not quantified for south-eastern Australia. The modelling allowed for birds to be in flight for 20 hours of every 24 hours at the same rate as they were detected during point counts. The model assumed that the species may be present in the Project Area for three months of every year, and that up to 2000 individuals may be present for the entire annual period of three months. This is considered to be conservative and the maximum number observed during investigations for the Project was a flock of 90 birds. In the model, the size of the potential population that may interact with turbines simply provides a maximum of mortalities that can occur per annum.

Capacity for White-throated Needletails to avoid collisions with turbines is not known with certainty but the species is very agile in the air and studies of multiple other bird species (largely seabirds that are generally less agile than the White-throated needletail) have routinely determined that rotor avoidance rates of between 0.95 and 0.999 are applicable (British Trust for Ornithology 2012, Johnston et al. 2014). Note that an avoidance rate of 0.95 equates to the situation in which a bird that is otherwise on a collision course will avoid a collision in 19 of 20 instances, while a rate of 0.99 equates to avoidance of collisions in 99 of 100 flights that were on a collision course. In light of uncertainty about actual avoidance capacity of White-throated needletails, collision risk modelling projections were calculated for avoidance rates of 0.95, 0.98 and 0.99.

Collision risk modelling projections were calculated for avoidance rates of 0.95, 0.98 and 0.99. The collision risk modelling indicated the following potential number of collisions per annum for the entire Project for White-throated Needletail:

- 1.12 collisions per annum at 0.95 rotor avoidance rate
- 0.45 collisions per annum at 0.98 rotor avoidance rate
- 0.25 collisions per annum at 0.99 rotor avoidance rate.

Based on the results of the collision risk model and the Project studies, the assessment determined that it is likely that some collisions by White-throated Needletails with Project turbines would occur. The number of collisions is unlikely to annually reach or exceed 1% (considered internationally important) or 0.1% (considered nationally important) of the estimated White-throated Needletail population.

A BBAMP will be developed to minimise turbine collision and ensure unexpected bird mortalities are responded to (see mitigation measure MM-BD12).

While the species are known to occasionally collide with overhead transmission lines, the relatively short distance of the overhead powerline along Portland Nelson Road represents a low potential for the species to collide. It would be unlikely to have any measurable effect on the population. The overhead powerline will be marked using commercially available bird diverters to increase visibility to birds and minimise the risk of collision (see mitigation measure MM-BD16).

Assessment against the Significant Impact Guidelines

An assessment of significance has been conducted for the White-throated Needletail against the significant impact criteria for vulnerable species and is provided in **Table 3.15.** An assessment of significance has also been conducted for migratory shorebirds at **Table 4.2.**

Table 3.15 Significant impact assessment for White-throated Needletail

Significant impact criteria	Assessment
Lead to a long-term decrease in the size of a population	**Unlikely.** The potential for impacts on White-throated Needletail is considered to relate to the potential for collisions with wind turbines. While some collisions may occur their number and frequency is expected to be lower than thresholds for significant impacts defined by the species-specific EPBC Referral Guideline. The potential for the Project to lead to a long-term decrease in the size of the population is unlikely. It is likely that some collisions by White-throated Needletails with turbines at the Kentbruck wind farm will occur. However, the number of collisions are unlikely to annually reach or exceed 1% of the estimated population and in that respect the White-throated Needletail population is not considered likely to be significantly impacted directly by the Project.
Reduce the area of occupancy of the species	**Unlikely.** The aerial behaviour of White-throated Needletails means they are not reliant on any particular terrestrial environment other than roost sites. The project entails no mechanism by which the area of occupancy by the species might be affected. The Project is not likely to lead to a reduction in the area occupied by the species.

Significant impact criteria	Assessment
Fragment an existing population into two or more populations	**Unlikely.** The Project entails no effects or mechanisms that might fragment the populations of White-throated Needletail.
Adversely affect habitat critical to the survival of a species	**Unlikely**. The site contains no habitat critical to the survival of White-throated Needletails. The Project is not likely to adversely affect habitat critical to the survival of the species
Disrupt the breeding cycle of a population	**Unlikely**. White-throated Needletails breed exclusively in the northern hemisphere. The Project has no capacity to disrupt the breeding cycle of the population.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	**Unlikely.** The aerial behaviour of White-throated Needletails means they are not reliant on any particular terrestrial environment other than roost sites. The Project has no potential to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species habitat	**Unlikely.** There are no known invasive species that are harmful to White-throated Needletails and the Project would not entail mechanisms for the potential introduction or establishment of invasive species
Introduce disease that may cause the species to decline	**Unlikely.** The Project would not entail mechanisms with potential for introduction or establishment of disease that might affect White-throated Needletails.
Interfere with the recovery of the species	**Unlikely.** The Project is not likely to interfere with the recovery of the species. There is no recovery plan for this species, however DAWE note that the conservation advice (TSSC, 2019) provides sufficient direction to implement priority actions, mitigate against key threats and enable recovery. TSSC (2019) notes Australian evidence of collisions with wind turbines, but further classes this as low in severity and as affecting a small number of birds.

3.4.7 Gang-gang cockatoo

3.4.7.1 Existing conditions

The Gang-gang Cockatoo is a small, visually distinctive cockatoo found throughout south-east Australia. The species has been recorded in temperate sclerophyll forests and woodlands, subalpine Snow Gum woodlands and urban parks and gardens in New South Wales and Victoria, with occasional records in eastern South Australia (Higgins 1999). The species has recently been listed as Endangered under the EPBC Act, following significant population decline, resulting from large scale habitat loss from bushfires in 2019/2020 (DAWE 2022).

Biosis recorded a total of 25 flights by Gang-gang Cockatoos through the Project Area at three sites during BUS surveys (**Figure 2.2**). Five birds (an individual and two pairs) were recorded flying at the edge of open farmland and native forest in August 2020 and February 2021 (BUS point C6). Three were recorded flying together at the edge of pine plantation and Blue Gum plantation in February 2021 (BUS point T16). Seventeen (one pair, and a flock of 15) were recorded flying at the edge of pine plantation and native forest in February 2021 (BUS point T14). Flight heights ranged from 5 to 15 m above the ground, with the flock of 15 flying at a height of 10 meters.

Two hundred and seventy-eight records of Gang-gang Cockatoo occur within the wider Project Area. Two records located in native forest within the Cobboboonee National Park were listed as breeding. A flock of 50 birds was recorded feeding in Hawthorn bushes along the Fitzroy River at Heywood, between March and April 2001 (Farnes 2019). Of all these records, four are from within pine plantations or on roadsides among pine plantations. In part, this maybe an artefact of observers concentrating efforts in native vegetation, but it is also the case that pine plantations are traversed frequently by bird observers when they travel to prime sites in Discovery Bay Coastal Park.

The pine plantations occupying the great majority of the wind farm component of the Project offer very limited resources for Gang-gang Cockatoos and, while they may travel through them on occasions, it is not considered to be suitable habitat that they would use routinely or frequently. Experience with the species suggests that the species infrequently flies in the height zone (above 60 m) of the rotor-swept span of turbines proposed for the Project.

3.4.7.2 Impact assessment

Gang-gang Cockatoo was not considered to be a 'species of interest' (and hence not a 'species of concern') by DELWP (Lumsden et al. 2019). As of 2018, the species had not been reported to have collided with wind turbines at any wind farm in Victoria (Moloney et al. 2019) and the Project is not aware of any subsequent records. The Project does not entail removal of any vegetation that is suitable habitat for Gang-gang Cockatoo. Furthermore, the species is not expected to enter or pass through the wind farm site at heights that would place it at risk of turbine collisions and as Gang-gang Cockatoos are quite slow in flight the risk of colliding with the overhead powerlines is very low.

Assessment against the Significant Impact Guidelines

An assessment of significance has been conducted for the Gang-gang Cockatoo and is provided below in **Table 3.16.**

Table 3.16 Significant impact assessment for sgang-gang cockatoo

Significant impact criteria	Assessment
Lead to a long-term decrease in the size of a population	**Unlikely**. The principal potential risk to the species is collision with turbines. Habitat within the Project Area is not considered to be suitable for the species, although Gang-gang Cockatoos might rarely fly through the site. The species flights are generally expected to be below turbine rotor heights. Due to lack of habitat and flight behaviour, it is considered that such collisions are unlikely to occur. The potential for the Project to lead to a long-term decrease in the size of the population is unlikely.

Significant impact criteria	Assessment
Reduce the area of occupancy of the species	**Unlikely**. Existing land use and vegetation of the site will remain substantially unchanged, and removal of vegetation will entail no habitat for Gang-gang Cockatoos, other than some tree impacts for the construction of the underground section of the transmission line. The Project is not likely to lead to a reduction in the area occupied by the species.
Fragment an existing population into two or more populations	**Unlikely**. As the project would not entail substantive alterations to existing habitats, there are no effects or mechanisms that might fragment existing population of Gang-gang Cockatoos.
Adversely affect habitat critical to the survival of a species	**Unlikely**. The site contains no habitat critical to survival of Gang-gang Cockatoos. The project would not adversely affect habitat critical to the survival of a species.
Disrupt the breeding cycle of a population	**Unlikely**. Gang-gang Cockatoos breed in hollow eucalypts outside the Project Area. The project is not likely to affect the breeding cycle of the species.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	**Unlikely**. The very limited values of habitat for Gang-gang Cockatoos on the project site is such that the project has no potential to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species habitat	**Unlikely**. The Project does not include any known mechanism that would result in establishment of invasive species that are not already present in the relevant environment.
Introduce disease that may cause the species to decline	**Unlikely**. The Project does not include any known mechanism that would result in introduction of any disease that is not already present in the relevant environment.
Interfere with the recovery of the species	**Unlikely**. The Project is not likely to interfere with the recovery of the species. There are no threat mechanisms or recovery actions noted in the recovery plan that are relevant to the species at the Project site.

3.4.8 Fork-tailed swift

3.4.8.1 Existing conditions

Fork-tailed Swift is listed as marine and migratory under the EPBC Act. Fork-tailed Swifts are a predominantly aerial bird that migrate from north-east Asia to south-east Asia and Australia from September to April to avoid the northern hemisphere's winter. The species is usually seen in flocks, and are widespread throughout Victoria, sparsely distributed, preferring inland plains, coastal cliffs, beaches, saltmarshes and have been occasionally recorded over pine plantations, islands and out to sea (Higgins 1999).

No Fork-tailed Swifts were recorded during Project surveys, however, has been recorded in the area previously. The Fork-tailed Swift, similarly to the White-throated Needletail is a highly aerial species and is likely to move in the airspace, between the coastal and inland areas and would be expected to fly through the Project Area where turbines and other infrastructure are proposed.

3.4.8.2 Impact assessment

Wind turbine collision

The Project woulld not involve removal of roosting habitat for the Fork-tailed Swift. The species is likely to fly at turbine height and be at similar risk of collision to that of White-throated Needletail. However, the species has been reported much less frequently than the White-throated Needletail within and surrounding the Project Area and it is thus considered to be less at risk of impact. Due to a lack of observations, CRM was not able to be undertaken for the Fork-tailed Swift. It is likely that some collisions by Fork-tailed Swifts with project turbines at will occur, but this is considered to be very infrequent and if it occurs, is likely to affect a small number of individuals, with no significant population impacts on the species. The number of collisions is unlikely to annually reach or exceed 1% of the estimated population and therefore this will not exceed the impact threshold specified in the Referral guideline for 14 birds listed as migratory species under the EPBC Act (DoE 2015).

Based on the above conclusions, an assessment against the significant impact criteria was not undertaken.

3.4.9 Terrestrial and arboreal mammals

3.4.9.1 Existing conditions

Only one threatened mammal species was recorded during Project surveys, Southern Brown Bandicoot (Endangered) near the Heywood Terminal Station (see **Figure 3.11**). Other threatened with a medium likelihood of occurrence include:

- Heath Mouse (*Pseudomys shortridgei)* (Endangered)
- Long-nosed Potoroo (*Potorous tridactylus trisulcatus)* (Vulnerable)
- Swamp Antechinus (*Antechinus minimus maritimus)* (Vulnerable).
- Yellow-bellied glider (*Petaurus australis)* (Vulnerable).

All species have been previously recorded within 10 km of the Project Area and the majority of these records are from intact, contiguous habitat outside of the wind farm site.

The Mount Clay State Forest and Narrawong Flora Reserve, provides suitable habitat for these species.

The wind farm site is unlikely to support significant habitat for any of these threatened mammals due to its highly modified nature, and pine plantations do not provide the required microhabitats to support these species. Strips of planted vegetation along Portland–Nelson Road may provide some of the structural ground elements required by these threatened mammals where native understorey has regenerated, however none of the species have been recorded using these roadside patches. Although it is possible that Heath Mouse were recorded in several locations within the GTFP plantation (see **Figure 3.10**), areas of pine plantation are unlikely to provide high quality habitat for this species.

3.4.9.2 Impact assessment

Habitat removal and disturbance

The broader area of Cobboboonee National Park provides habitat suitable for all of these threatened mammal species. While they may be present within the edges of the road alignment, disturbance will be confined to the short construction period, and potential impacts on tree protection zones of some adjacent trees is unlikely to impact on the broader populations within primary habitats throughout the National Park. Cleared agricultural land in the east of the transmission line route does not represent high quality habitat for any of the threatened mammal species and the underground transmission line will have no measurable effect on any of these species.

Earlier route options of the overhead transmission line into Heywood Terminal Station proposed to run along the edge of Mt Clay State Forest, which provides habitat for small mammals (see **Figure 3.11**). The overhead transmission line route was revised to avoid these areas and avoid impacts on small mammal habitat. The transmission line was then further revised to be entirely underground, however, may result in a temporary loss of habitat through the removal of up to 1.26 ha of Healthy Woodland near Heywood Terminal station which provides potential habitat for several terrestrial mammal species, however, does not comprise preferred tree species for Yellow-bellied Glider. Construction of the underground powerline beneath Boiler Swamp Road has the potential to lead to tree deaths from impacts on TPZs adjacent to the road which may be utilised by Yellow-bellied Gliders. However, any loss of tree life is unlikely to result in a significant impact on the species.

The Project may involve minor clearing of roadside vegetation that may provide habitat for small mammal species, but these are unlikely to be significant impacts, due to the small amounts of clearance. Increased road traffic, especially during construction may result in some increase in mortality. All species are relatively abundant in the local area and it is not likely that clearing impacts will significantly affect the viability of the populations of any of these terrestrial mammal species. Any further potential impacts will be managed by retaining native vegetation and implementing wildlife management measures (see mitigation measures MM-BD01 and MM-BD10).

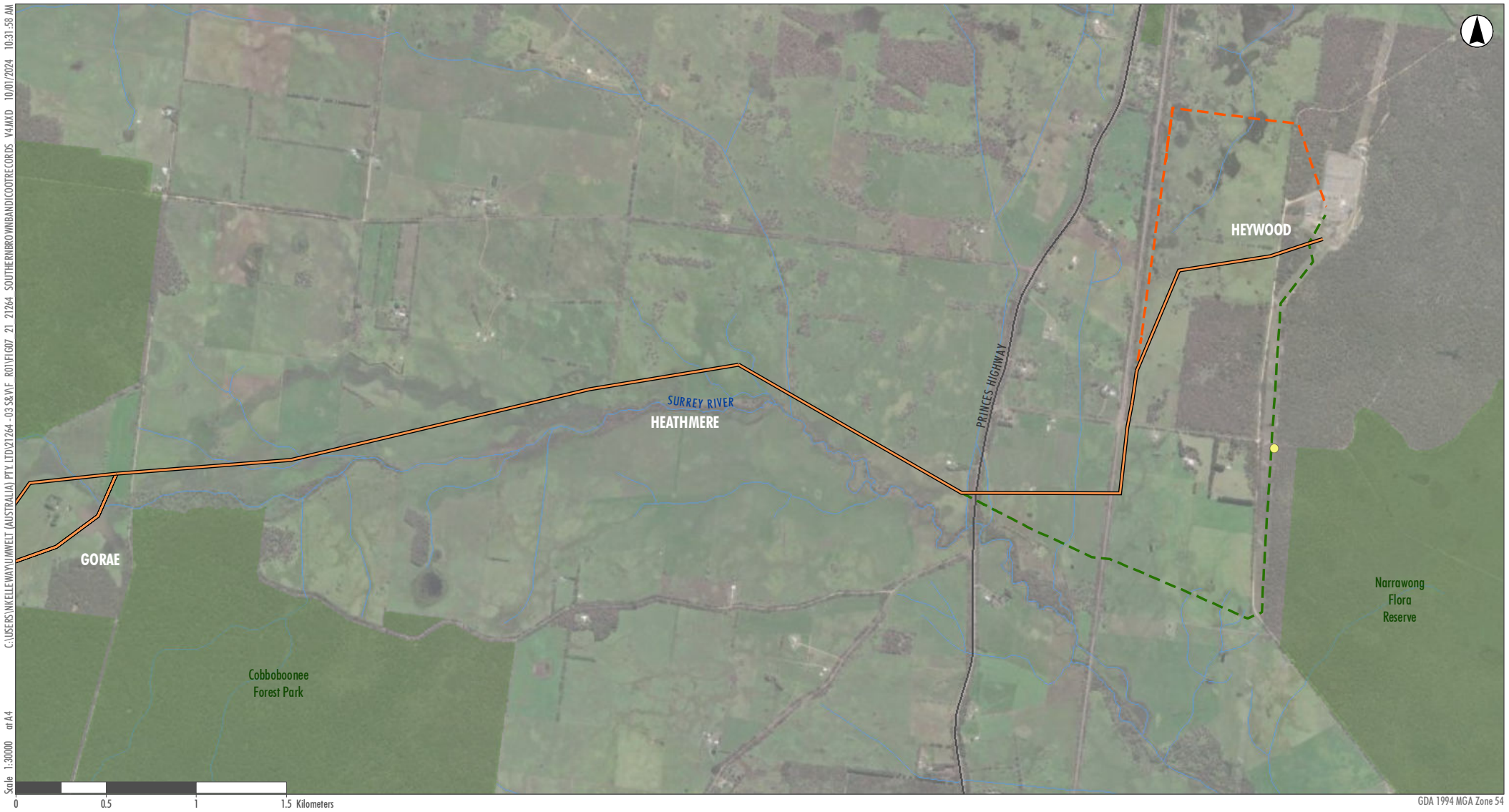
Mitigation measures such as site inductions for construction staff, pre-construction surveys in areas of native vegetation, management of open trenches to minimise chances of animals being accidentally trapped, and handling of any captured or injured wildlife will be put in place to minimise impacts on terrestrial mammals (see mitigation measure MM-BD10).

An assessment against the significant impact criteria has been undertaken for each species and is provided in the following sections.

FIGURE 3.10

Terrestrial Mammal Species Records within the Wind Farm Site

Image Source: ESRI Basemap (2021) Data source: DELWP (2021); Biosis (2022)



Legend

- Southern Brown Bandicoot Records (Biosis) (1)
- Underground Transmission Line
- Southern Option
- Northern Option
- Roads
- Watercourses
- Parks and Reserves

FIGURE 3.11

Southern Brown Bandicoot Records

Image Source: ESRI Basemap (2021) Data source: DELWP (2021); Biosis (2022)

3.4.9.3 Heath mouse

Possible Heath Mouse hair records were obtained from hair tubes and cameras within the pine plantation. It is therefore possible that Heath Mouse may be more widely distributed within pine plantation habitat of the Project Area.

Assessment against the Significant Impact Guidelines

An assessment of significance has been conducted for the Heath Mouse and is provided below in **Table 3.17.**

Table 3.17 Significant impact assessment for heath mouse

Significant impact criteria	Assessment
Lead to a long-term decrease in the size of a population	**Unlikely.** The Project is not likely to have any effect on the population of Heath Mouse. There is no likelihood of a long-term decrease in the size of the population. Probable Heath Mouse detections were noted from camera trapping and hair tube samples in several locations within the pine plantation. Presence within pine plantation habitat suggests that this species is likely to be locally common within the Investigation Area.
Reduce the area of occupancy of the species	**Unlikely.** Existing land use and vegetation of the site will remain substantially unchanged. The Project is not likely to lead to a reduction in the area occupied by the species.
Fragment an existing population into two or more populations	**Unlikely.** As the Project would not entail substantive alterations to existing habitats, there are no effects or mechanisms that might fragment the existing population of Heath Mouse.
Adversely affect habitat critical to the survival of a species	**Unlikely**. The Project would not affect existing land use and vegetation of the site will remain substantially unchanged. The very great majority of the project site is occupied by introduced pine plantations and is not preferred habitat for the species. The Project would not adversely affect habitat critical to the survival of the species.
Disrupt the breeding cycle of a population	**Unlikely**. The Project is not likely to result in an impact on the breeding of Heath Mouse.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	**Unlikely.** The Project would not entail substantive alterations to any existing habitats for Heath Mouse. The Project has no potential to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline. Further design of the transmission route will determine the scale of potential impacts.
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species habitat	**Unlikely.** The Project does not include any known mechanism that would result in establishment of invasive species that are not already present in the relevant environment.
Introduce disease that may cause the species to decline	**Unlikely.** The Project does not include any known mechanism that would result in introduction of any disease that is not already present in the relevant environment.
Interfere with the recovery of the species	**Unlikely.** As outlined in responses above, the project is not likely to interfere with the recovery of the species. The conservation advice for the species (Threatened Species Scientific Committee 2016b) notes habitat loss, fragmentation and modification as current threats. Further design of the transmission route will determine the scale of potential impacts.

3.4.9.4 Southern brown bandicoot

Southern Brown Bandicoot was detected in Project surveys from a camera trap within Mount Clay State Forest near Heywood Terminal Station.

Assessment against the Significant Impact Guidelines

An assessment of significance has been conducted for the Southern Brown Bandicoot and is provided below in **Table 3.18.**

Table 3.18 Significant impact assessment for southern brown bandicoot

Significant impact criteria	Assessment
Lead to a long-term decrease in the size of a population	**Unlikely.** The Project is not likely to have any effect on the population of Southern Brown Bandicoots. There is no likelihood of a long-term decrease in the size of the population. The site and Project Area supports little to no habitat for the species and no habitat is proposed to be affected, except for minimal loss of poor quality habitat along road reserves.
Reduce the area of occupancy of the species	**Unlikely.** Existing land use and vegetation of the site will remain substantially unchanged. The Project is not likely to lead to a reduction in the area occupied by the species.
Fragment an existing population into two or more populations	**Unlikely.** As the Project would not entail substantive alterations to existing habitats, there are no effects or mechanisms that might fragment the existing population of Southern Brown Bandicoots.
Adversely affect habitat critical to the survival of a species	**Unlikely**. The Project would not affect existing land use and vegetation of the site will remain substantially unchanged. The very great majority of the project site is occupied by introduced pine plantations and is not preferred habitat for the species. The Project would not adversely affect habitat critical to the survival of the species.
Disrupt the breeding cycle of a population	**Unlikely**. The Project is not likely to result in an impact on the breeding of Southern Brown Bandicoots.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	**Unlikely.** The Project would not entail substantive alterations to any existing habitats for Southern Brown Bandicoots. The project has no potential to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline. Further design of the transmission route will determine the scale of any potential impacts.
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species habitat	**Unlikely.** The Project does not include any known mechanism that would result in establishment of invasive species that are not already present in the relevant environment.
Introduce disease that may cause the species to decline	**Unlikely.** The Project does not include any known mechanism that would result in introduction of any disease that is not already present in the relevant environment.
Interfere with the recovery of the species	**Unlikely.** As outlined in responses above, the Project is not likely to interfere with the recovery of the species. There is no recovery plan.

3.4.9.5 Long-nosed potoroo

Assessment against the Significant Impact Guidelines

An assessment of significance has been conducted for the Long-nosed Potoroo and is provided below in **Table 3.19.**

Table 3.19 Significant impact assessment for long-nosed potoroo

Significant impact criteria	Assessment
Lead to a long-term decrease in the size of a population	**Unlikely.** The Project is not likely to have any effect on the population of Long-nosed Potoroo. There is no likelihood of a long-term decrease in the size of the population. It was not recorded in targeted survey, however suitable habitat exists in Mount Clay State Forest and Narrawong Flora Reserve. The Project Area supports little to no habitat for the species, except for adjacent to/within Narrawong Flora Reserve where the species is known from previous records. The transmission line alignment has been modified, and this section (adjacent to Narrawong Flora Reserve) is no longer planned.
Reduce the area of occupancy of the species	**Unlikely.** Existing land use and vegetation of the site will remain substantially unchanged. The Project is not likely to lead to a reduction in the area occupied by the species.
Fragment an existing population into two or more populations	**Unlikely.** As the Project would not entail substantive alterations to existing habitats, there are no effects or mechanisms that might fragment the existing population of Long-nosed Potoroo.
Adversely affect habitat critical to the survival of a species	**Unlikely**. The Project would not affect existing land use and vegetation of the site will remain substantially unchanged. The very great majority of the project site is occupied by introduced pine plantations and is not preferred habitat for the species..
Disrupt the breeding cycle of a population	**Unlikely**. The Project is not likely to result in an impact on the breeding of Long-nosed Potoroo.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	**Unlikely.** The Project would not entail substantive alterations to any existing habitats for Long-nosed Potoroo. The Project has no potential to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline. Further design of the transmission route will determine the scale of potential impacts.
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species habitat	**Unlikely.** The Project does not include any known mechanism that would result in establishment of invasive species that are not already present in the relevant environment.
Introduce disease that may cause the species to decline	**Unlikely.** The Project does not include any known mechanism that would result in introduction of any disease that is not already present in the relevant environment.
Interfere with the recovery of the species	**Unlikely.** As outlined in responses above, the Project is not likely to interfere with the recovery of the species. The conservation advice for the species (Threatened Species Scientific Committee 2019) notes habitat loss, fragmentation and degradation as current threats. Further design of the transmission route will determine the scale of potential impacts.

3.4.9.6 Swamp antechinus

Assessment against the Significant Impact Guidelines

An assessment of significance has been conducted for the Swamp Antechinus and is provided below in **Table 3.20.**

Table 3.20 Significant impact assessment for swamp antechinus

Significant impact criteria	Assessment
Lead to a long-term decrease in the size of a population	**Unlikely.** The Project is not likely to have any effect on the population of Swamp Antechinus. There is no likelihood of a long-term decrease in the size of the population. It was not recorded in targeted survey, however suitable habitat exists in Mount Clay State Forest and Narrawong Flora Reserve, however the transmission line is no longer planned to pass through this area.
Reduce the area of occupancy of the species	**Unlikely.** Existing land use and vegetation of the site will remain substantially unchanged. The project is not likely to lead to a reduction in the area occupied by the species.
Fragment an existing population into two or more populations	**Unlikely.** As the Project would not entail substantive alterations to existing habitats, there are no effects or mechanisms that might fragment the existing population of Swamp Antechinus.
Adversely affect habitat critical to the survival of a species	**Unlikely**. The Project would not affect existing land use and vegetation of the site will remain substantially unchanged. The very great majority of the Project Area is occupied by introduced pine plantations and is not preferred habitat for the species.
Disrupt the breeding cycle of a population	**Unlikely**. The Project is not likely to result in an impact on the breeding of Swamp Antechinus.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	**Unlikely.** The Project would not entail substantive alterations to any existing habitats for Swamp Antechinus. The Project has no potential to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline. Further design of the transmission route will determine the scale of potential impacts.
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species habitat	**Unlikely.** The Project does not include any known mechanism that would result in establishment of invasive species that are not already present in the relevant environment.
Introduce disease that may cause the species to decline	**Unlikely.** The Project does not include any known mechanism that would result in introduction of any disease that is not already present in the relevant environment.
Interfere with the recovery of the species	**Unlikely.** As outlined in responses above, the Project is not likely to interfere with the recovery of the species. There is no recovery plan, however the species conservation advice (Threatened Species Scientific Committee 2016a) notes habitat loss and fragmentation as severe across the species' distribution and that protection of habitat is a primary conservation action. Further design of the transmission route will determine the scale of potential impacts.

3.4.9.7 Yellow-bellied glider

Assessment against the Significant Impact Guidelines

An assessment of significance has been conducted for the Yellow-bellied Glider and is provided below in **Table 3.21**.

Table 3.21 Significant Impact Assessment for yellow-bellied glider

Significant impact criteria	Assessment
Lead to a long-term decrease in the size of a population	**Unlikely.** The western Victoria populations including the one local to the Project, are considered to be populations important to the survival of the taxon. The potential for loss of a small number of preferred tree species (which may occur for construction of the underground transmission line only) is not likely to result in a long-term decrease in the size of the population is unlikely.
Reduce the area of occupancy of the species	**Unlikely**. The potential for loss of a small number of preferred tree species (which may occur for construction of the underground transmission line only) is not likely to lead to a reduction in the area occupied by the species.
Fragment an existing population into two or more populations	**Unlikely.** The Project entails no effects or mechanisms that might fragment the populations of Yellow-bellied Glider.
Adversely affect habitat critical to the survival of a species	**Unlikely.** The potential for loss of a small number of preferred tree species (which may occur for construction of the underground transmission line only) does not entail impacts upon habitat critical to survival of the taxon, as defined in Conservation Advice for Yellow-bellied Glider.
Disrupt the breeding cycle of an important population	**Unlikely**. The great majority of the Project Area supports no habitat suitable for breeding by Yellow-bellied Glider and the potential for loss of a small number of preferred tree species (which may occur for construction of the underground transmission line only) is not likely to include large hollow-bearing nest trees. The Project is considered not to have capacity to disrupt the breeding cycle of the population.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	**Unlikely.** The Project does not entail activities that have potential to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species habitat	**Unlikely.** The Project would not entail mechanisms for the potential introduction or establishment of invasive species harmful to Yellow-bellied Gliders.
Introduce disease that may cause the species to decline	**Unlikely.** The Project would not entail mechanisms with potential for introduction or establishment of disease that might affect Yellow-bellied Gliders
Interfere with the recovery of the species	**Unlikely.** The scale of possible effects of the Project on the species is not likely to interfere with the recovery of the species.

3.4.10 Grey-headed flying-fox

3.4.10.1 Existing conditions

Grey-headed Flying-fox is listed as vulnerable under the EPBC Act. Grey-headed Flying-foxes have been expanding their distribution across Victoria in recent decades with roost-camps increasingly appearing from the east of the state to sites in the west. No survey was undertaken for this species as at the time of carrying out targeted surveys as there were limited records in the region. VBA records include observations of one or two individuals near Portland between 1998 and 2013. Recently records from a national satellite tracking study have been added to public databases and there are several records of Grey-headed Flying-fox to the north and west of the Project Area. A camp of approximately 1,500 Grey-headed Flying-foxes was also recorded in a pine plantation near Millicent (South Australia) in 2019 approximately 50 km north-west of the Project Area.

3.4.10.2 Impact assessment

The wind farm present a minor risk to Grey-headed Flying-fox given that currently there is no habitat likely to attract the species to fly over the wind farm site. There remains some residual risk of the pine plantation being used as a temporary camp, or moving through and above the tree canopy when transiting between camps in Victoria and South Australia, however this is also less likely due to a lack of more permanent water and current absence of camps in proximity to the Project.

If a camp were to establish within species' the nightly foraging range from the Project Area, there is a possibility that individuals may fly through the Project Area and may be at risk of collision. However, given the size of the population, it is considered highly unlikely that the Project would result in collisions which would constitute a significant impact on the population.

Based on the above conclusions, an assessment against the significant impact criteria was not undertaken.

3.4.11 Growling grass frog

Growling Grass Frog inhabits wetlands and sometimes waterways which support suitable habitat in the form of fringing, emergent and floating vegetation. With the exception of there being one database record for the species, no habitat suitable for Growling Grass Frog has been identified anywhere within the Project Area, including along the underground section of the transmission line route (see **Figure 3.12**). Surveys for Growling Grass Frog were undertaken at bodies of freshwater that exist close to the Project Area as the species can travel overland between suitable wetlands and there is some possibility that individuals might occasionally enter the Project Area. Due to the lack of suitable waterbodies within the Project Area this is considered to be a low probability.

3.4.11.1 Impact Assessment

The Project has the potential to directly impact on Growling Grass Frog Habitat. However, no suitable habitat will be directly impacted on by the Project.

This species has the potential to impacted on primarily from sedimentation and erosion impacts from the dewatering of turbine foundations during construction. However, mitigation measures such as sediment devices (bunding and silt fencing) and trenching management will be implemented through a Sediment, Erosion and Water Quality Management Plan during construction which will aid in avoiding or minimising these potential indirect impacts on these wetlands (see mitigation measure MM-SW01).

Assessment against the Significant Impact Guidelines

An assessment of significance has been conducted for the Growling Grass Frog and is provided below in **Table 3.22.**

Table 3.22 Significant impact assessment for growling grass frog

Significant impact criteria	Assessment
Lead to a long-term decrease in the size of a population	**Unlikely**. The Project is not likely to have any effect on a population of Growling Grass Frog. The Project Area does not contain habitat suitable for the species. It was not detected during targeted surveys and it is unlikely to be present there. The species has been recorded in some wetlands within Discovery Bay Coastal Park. The separation distances between project infrastructure and those wetlands and implementation of construction methods to minimise any contamination from pumped groundwater is such that Growling Grass Frogs and their habitats are not likely to be impacted by the Project. There is no likelihood of a long-term decrease in the size of an important population of the species.
Reduce the area of occupancy of an important population	**Unlikely**. The Project Area contains no known or potential habitat for Growling Grass Frog. Suitable habitats in the wider vicinity are not likely to be affected. The Project is not likely to lead to a reduction in the area occupied by the species.
Fragment an existing population into two or more populations	**Unlikely.** The Project entails no effects or mechanisms that might fragment existing populations of Growling Grass Frog.
Adversely affect habitat critical to the survival of a species	**Unlikely.** The Project Area contains no known potential habitat for Growling Grass Frog. Suitable habitats in the wider vicinity are not likely to be affected. The Project is not likely to adversely affect habitat critical to the survival of the species.
Disrupt the breeding cycle of an important population	**Unlikely.** The Project Area contains no known potential breeding habitat for Growling Grass Frog. The Project is not likely to disrupt the breeding cycle of the population.
Modify destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	**Unlikely.** The Project Area contains no known or potential habitat for Growling Grass Frog. Suitable habitats in the wider vicinity are not likely to be affected. The Project has no potential to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	**Unlikely.** In the absence of habitat within the Project Area, the Project is not likely to result in invasive species that are harmful to Growling Grass Frogs becoming established in the species' habitat population. The Project would not entail mechanisms that do not already exist for the potential introduction or establishment of invasive species into any nearby habitats for Growling Grass Frog.

Significant impact criteria	Assessment
Introduce disease that may cause the species to decline	**Unlikely.** In the absence of habitat within the Project Area, the Project is not likely to result in introduction of disease to Growling Grass Frog. The Project would not entail mechanisms that do not already exist for the potential introduction or establishment of disease to any nearby habitats for Growling Grass Frog.
Interfere with the recovery of the species	**Unlikely.** The Project is not likely to interfere with the recovery of the species.

3.4.12 Swamp skink

3.4.12.1 Existing conditions

Two Swamp Skinks were recorded at the southern end of Johnson's Road (outside of the Project Area). While this observation was not within the Project Area, it is approximately 200 m outside of the boundary and is the exact location of a previous VBA record of a Swamp Skink from 1980 (see **Figure 3.12**).

Low-lying areas supporting appropriate vegetation in the immediate vicinity of the Project are likely to be inhabited by Swamp Skinks. However, the Swamp Skink is not likely to inhabit any portion of the wind farm site as it does not offer their required swamp habitats with dense indigenous vegetation.

Legend

- Wind Farm Site
- Underground Transmission Line
- Parks and Reserves
- Roads
- Watercourses

Species Records (Biosis)

- Eastern Bearded Dragon (3)
- Striped Worm-Lizard (3)
- Swamp Skink (1)

FIGURE 3.12

Threatened Reptile Records within the Wind Farm Site

Image Source: ESRI Basemap (2021) Data source: DELWP (2021); Biosis (2022)

3.4.12.2 Impact assessment

Assessment against the Significant Impact Guidelines

An assessment of significance has been conducted for the Swamp Skink and is provided below in **Table 3.23**.

Table 3.23 Significant impact assessment for swamp skink

Significant impact criteria	Assessment
Lead to a long-term decrease in the size of a population	**Unlikely**. Suitable wetland habitat for the species occurs adjacent to, but outside of the Project Area. The Project does not entail loss of habitat and set-back distances mean that the size(s) of local population(s) are not likely to be affected.
Reduce the area of occupancy of an important population	**Unlikely**. Suitable wetland habitat for the species occurs adjacent to, but outside of the Project Area. The project does not entail loss of habitat and the area(s) occupied by local population(s) are not likely to be affected.
Fragment an existing population into two or more populations	**Unlikely.** The Project would not remove suitable wetland habitat and it does not have potential to fragment an existing population into two or more populations.
Adversely affect habitat critical to the survival of a species	**Unlikely.** Habitat critical to survival of the species is defined in the species Conservation Advice (DCCEEW 2023). No habitat critical to survival of the species will be affected by the Project.
Disrupt the breeding cycle of an important population	**Unlikely.** The Project would not remove suitable wetland habitat and it does not have potential to disrupt the breeding cycle of a population of the species.
Modify destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	**Unlikely.** The Project would not destroy or remove suitable wetland habitat. Design of the Project, including set-back distances, and management measures during construction are planned to prevent modification, isolation or decrease in availability or quality of any habitat for the species.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	**Unlikely.** A number of invasive species that threaten the Swamp Skink are listed in the species Conservation Advice (DCCEEW 2023). The Project would not involve actions that would increase or introduce risk from invasive species that are not already present.
Introduce disease that may cause the species to decline	**Unlikely.** The vegetation at many sites occupied by Swamp Skinks is subject to infestation by *Phytophthera cinnamomi*. This pathogen has capacity to degrade Swamp Skink habitat. The Project Area is not significantly susceptible to the pathogen and appropriate measures to prevent its introduction or spread will be used in accordance with an environmental management plan, especially during construction. The Project does not include any other known mechanism that would result in introduction of any disease that is not already present in the relevant environment.
Interfere with the recovery of the species	**Unlikely.** The Project does not include any actions that have potential to interfere with the recovery of the species.

4.0 Listed migratory species

4.1 Existing conditions

Several listed threatened and non-threatened migratory and resident shorebirds including gulls and terns occur along the shoreline of the Ramsar Site. There is limited suitable habitat for most migratory shorebirds within the Project Area. Wetland habitat within the Investigation Area is candied to a few locations to the south of the southern boundary of the wind farm site.

Most of the roosting and foraging shorebirds recorded during the targeted surveys were observed at the Glenelg River Estuary, near the river mouth. None were recorded in the Project Area. **Table 4.1** outlines the migratory species listed under the EPBC Act that were recorded during targeted surveys. The locations of these recordings are shown on **Figure 2.6.**

Table 4.1 Listed migratory species recorded during targeted surveys

Month / Tide	Species	Location	Count
January 2020 (Low tide)	Bar-tailed Godwit	Glenelg Estuary	9
	Common Greenshank		1
	Curlew Sandpiper		2
	Red-necked Stint		279
	Sanderling		6
	Sharp-tailed Sandpiper		50
February 2020 (High Tide)	Red-necked Stint	Glenelg Estuary	29
July 2020 (High Tide)	Bar-tailed Godwit	Glenelg Estuary	4
	Double-banded Plover		53
	Red-necked Stint		36
	Double-banded Plover	Swan Lake shoreline	1
	Sanderling		115
November 2020 (Low Tide)	Red-necked Stint	Nobles Rocks shoreline	30
	Sanderling		630
November 2020 (High Tide)	Red-necked Stint	Glenelg Estuary	829
	Sharp-tailed Sandpiper		12
December 2020 (Low Tide)	Bar-tailed Godwit	Glenelg Estuary	1
	Red-necked Stint	Glenelg Estuary	850
	Sharp-tailed Sandpiper	Glenelg Estuary	9
	Sanderling	Noble Rocks Shoreline	1
December 2020 (High Tide)	Red-necked Stint	Glenelg Estuary	465
	Sharp-tailed Sandpiper		11
January 2021 (Low Tide)	Red-necked Stint	Glenelg Estuary	610
	Sharp-tailed Sandpiper		11

The following listed migratory terns and gulls were also recorded during Project surveys, the majority of which were from the Glenelg Estuary:

- Caspian Tern *Hydroprogne caspia*
- Common Tern *Sterna hirundo*
- Crested Tern *Thalasseus bergii*
- Fairy Tern *Sternula nereis*
- Little Tern *Sternula albifrons*
- Whiskered Tern *Chlidonias hybridus*
- Pacific Gull *Larus pacificus*
- Latham's Snipe *Gallinago hardwickii*.

Of these migratory terns and gulls, only Latham's Sipe and Whiskered Tern were recorded in the Project Area (the rest were recorded outside of the Project Area). Latham's Snipe is an exception to most migratory shorebirds, as it occurs inland, extending as far as alpine regions of Victoria.

The species that use the ocean beach of Discovery Bay and dune slacks are most likely to pass over the wind farm on departure and perhaps arrival. They are Sanderling, and to a lesser extent, Eastern Curlew (not recorded during surveys), Red-necked Stint, Fairy Tern, Whiskered Tern (as indicated by database records) and Latham's Snipe.

4.2 Impact assessment

4.2.1.1 Habitat removal

For the very great majority of shorebird species, suitable habitats in the region are located along the relatively narrow coastal zone adjacent to the wind farm area and to its west and south-east. For these species there are no known local areas of suitable habitat inland of the wind farm area and there is little if any reason for these birds to fly across or through it in the course of routine activities.

Habitats for shorebirds are substantially on the Discovery Bay beaches and at Glenelg River estuary. At its closest to the southern wind farm property boundary, shorebird habitat along the beach is greater than 1 km distant and, due to application of a 300-m-wide turbine-free buffer on the landward side of the boundary, will be further from the closest wind turbines and no disturbance to these habitats will occur.

4.2.1.2 Wind turbine collision

The wind farm component of the Project consists of commercial pine and blue gum plantations that provide no habitat for migratory shorebirds. This area provides almost no resources for migratory shorebirds. mall portion of agricultural land in the eastern extremity of the wind farm site includes some ephemerally inundated areas that may occasionally be visited by some species. Latham's Snipe was recorded there in November 2021. The Project entails no loss of habitat for shorebirds.

The primary concern for shorebirds is whether they fly over or through the wind farm and to what extent wind turbines would present a collision risk if these flights were to occur.

Point counts for birds were done as part of the Project investigations at multiple sites, including within the Project Area and at nearby control sites. During the point count surveys, no shorebirds were recorded flying over or within the Project Area. However, although the Project Area is not suitable habitat for shorebirds, there is still the potential that occasional day time and nighttime flights over the Project Area may occur.

There are two main types of flights that shorebirds make:

- Biannual long-distance journeys, with most species that occur in Australia spending the non-breeding portion of the year (spring-autumn) here and the breeding season in the northern hemisphere.
- Flights by year-round resident species and by migratory species when they're in Australia, including flights between foraging areas and flights to favoured loafing and roost locations.

The potential for collisions with turbines is different for each flight type.

For migration flights, shorebirds leaving areas of habitat south of the Project Area are likely to gather into flocks and then fly steeply to gain height, to take advantage of the high prevailing winds. Migratory shorebirds inhabiting Australia typically fly at altitudes of 1,000–5,000 m during migration (Geering, Agnew, & Harding 2007). For the species that migrate to the northern hemisphere, it is probable that they fly north across Australia. They are therefore likely to fly at relatively high altitude across the wind farm site at the commencement of their northward migrations. Shorebirds that use the Glenelg River Estuary would not be expected to cross the wind farm site as a northward flight from there would avoid turbines. Shorebirds that use the ocean beach of Discovery Bay and dune slacks would fly over the wind farm site on departure and perhaps arrival.

The number of species that might pass over the site on migration flights would be limited to the few species that were observed to use ocean beaches south of the wind farm site. Migration departure flights that occur once per year for migratory species are likely to pass high above the height of turbines.

To determine whether shorebirds are at risk of colliding with Project wind turbines during local flights, the assessment considered the geographic distribution of suitable habitats for both resident species and migratory species (when they're in Australia). The assessment found that suitable habitats for shorebirds around the Project are along the relatively narrow coastal zone south, west, and south east of the Project Area. Suitable habitat for shorebirds was not identified within the wind farm site, meaning that local flights into or across the wind farm site would be expected to be uncommon.

A turbine-free buffer extending 300 m around the Ramsar site , and 500 m turbine- free buffer from wetlands in the Ramsar site has been applied in design of the Project to minimise the turbine collision risk for bird species with habitat in the public reserves and Ramsar site wetlands that may fly across the wind farm site. Turbine-free buffers of various dimensions, as determined as per the 2011 Brolga Guidelines (DSE, 2012) and informed by current scientific evidence, have also been implemented as part of the Project's design to avoid and minimise potential impacts on breeding and non-breeding Brolga habitat and potential collisions. Turbine-free movement corridors have also been implemented, and, although they are not required under the 2011 Brolga Guidelines, were applied to protect movement pathways known to be used by Brolgas and other birds in the area to further reduce collision risk.

Latham's Snipe is an exception to the majority of migratory shorebirds. It is uses densely vegetated low-lying areas of coastal and freshwater environments including marshes and the damp fringes of dams and drainage lines. It occurs inland, extending as far as alpine regions of Victoria. The interdunal wetlands within Discovery Bay Coastal Park are suitable habitats for Latham's Snipe, although there are no database records of the species there, and it is likely to fly over or through the wind farm area occasionally. As noted above, Latham's Snipe was recorded in agricultural land in the east of the wind farm site in November 2021. Substantial turbine-free buffers in that area will serve to limit the potential for collisions by Latham's Snipe that may use wetlands and surrounding land there.

Based on the extensive assessments of shorebirds that are known to use habitats around the Project Area, the assessment concluded that there is limited potential for shorebirds to collide with wind turbines. This is due to the lack of suitable habitat for these species in the wind farm site that would be cause for local flights to put these species at risk, and the nature of long-distance flight arrival and departures, with most occurring at elevations substantially higher than wind turbines. The assessment found that it is unlikely that the Project would have a significant impact on the viability of shorebird populations.

4.2.1.3 Assessment against the Significant Impact Guidelines

An assessment of significance has been conducted for migratory shorebirds and is provided below in **Table 4.2**.

Table 4.2 Significant impact assessment for migratory shorebirds

Significant impact criteria	Justification
Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species	**Unlikely.** The Project has no realistic capacity to substantially modify, destroy or isolate an area of important habitat for a migratory species. The great majority of the wind farm component of the Project is commercial pine and Blue Gum plantations that provide no habitat for any shorebird species. A number of listed threatened and migratory waders, terns and gulls have been recorded within 10 km of the Project Area. The Ecological Character Description for the Ramsar Site (DELWP 2017d) lists 43 taxa known from the Ramsar Site. In the local area, important habitat for migratory shorebirds (as defined by EPBC policy statement 3.21) is all included within the Ramsar Site. An existing body of data demonstrates the use of Glenelg River estuary by a suite of shorebirds, terns and gulls and the beaches of Discovery Bay by Hooded Plover, Sanderling, occasional Eastern Curlew and species of terns and gulls. Vegetated interdune swamps ('slacks') and areas of damp pasture are known habitats for Latham's Snipe.
Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species	**Unlikely.** The Project does not include any known mechanism that would result in establishment of invasive species that is harmful to migratory species becoming established that are not already present in any important habitat for migratory species.
Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species	**Unlikely.** The Project does not include any known mechanism that would seriously disrupt any part of the lifecycle of an ecologically significant proportion of the population of any migratory species. While rare collisions by some shorebird species may occur, it is considered unlikely that the Project would have significant impacts that would affect the viability of the population of any shorebird species.

5.0 Glenelg Estuary and Discovery Bay Ramsar site

There is one Ramsar wetland within proximity to the Project Area. The Ramsar site is located along the north-western and southern boundaries of the wind farm site (see **Figure 1.1**. The Ramsar site was gazetted as a Wetland of International Significance in August 2018 and comprises the western part of Lower Glenelg National Park from the South Australian border to the Nelson - Winnap Road, most of the Discovery Bay Coastal Park and the Nelson Streamside Reserve (DELWP, 2017b). Both the National Park and Coastal Park are managed by Parks Victoria in partnership with local stakeholders (DELWP, 2017b).

The Ramsar site covers an area of approximately 22,289 ha and comprises three main systems (DELWP, 2017):

- Freshwater wetlands of several types that lie in a group behind the dune system, along approximately 50 km of the Discovery Bay Coastal Park. The system that lies to the south of the wind farm site is the Long Swamp complex, which includes Sheepwash Lagoon, Cains Hut Swamp, Lake Mombeong (also known as Lake BungBung), Black Swamp, McFarlanes Swamp, and Eel Creek. The Long Swamp Complex is connected to the Glenelg Estuary at Oxbow Lake via Eel Creek.
- The Glenelg River estuary, which is a seasonally closed salt wedge estuary that extends from the river mouth upstream for approximately 75 km to near Dartmoor. **Figure 5.1** shows the Glenelg River estuary nearest to Nelson, west of the wind farm site. A portion of this estuary (67.9 km) is also included within the EPBC Act listed endangered threatened ecological community (TEC): *Assemblages of species associated with open-coast salt-wedge estuaries of western and central Victoria ecological community.*
- The dune fields and beach down to the low water mark along the Discovery Bay Coastal Park from the South Australian Border to Discovery Bay Road.

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FIGURE 5.1

Glenelg Estuary

Image Source: ESRI Basemap (2021) Data source: DELWP (2021); Geoscience Australia (2021); Aurecon (2021)

5.1 Existing conditions

5.1.1 Overview

The Ramsar site protects a diverse range of vegetation and habitat types including:

- The Glenelg River salt wedge estuary extending from the river mouth upstream for approximately 75 km to near Dartmoor. A portion of this estuary (67.9 kilometres) is also included within the EPBC Act listed (endangered) community: *Assemblages of species associated with open-coast salt-wedge estuaries of western and central Victoria ecological community.*
- Wetlands near the estuary mouth, including Oxbow Lake.
- Beach and dune systems within Discovery Bay Coastal Park.
- Freshwater wetlands within and behind the dune system, including the Long Swamp Complex (Sheepwash Lagoon, Cains Hut Swamp, Lake Mombeong, Black Swamp, McFarlanes Swamp and several unnamed lagoons) and Bridgewater Lakes.

Several of the wetlands within the Ramsar site are also listed under the EPBC Act as occurrences of the threatened ecological community: *Karst springs and associated alkaline fens of the Naracoorte Coastal Plain Bioregion*, and the Glenelg River estuary is included in the EPBC Act listing of the salt wedge estuary community: *Assemblage of species associated with open-coast salt-wedge estuaries of western and central Victoria*.

The Glenelg Estuary and Discovery Bay Ramsar site provides a variety of habitats for waterbirds including:

- Beaches provide sandy shores for breeding of Australian resident shorebirds such as Red-capped Plover, Little Tern Sternula albifrons, Hooded Plover and Pied Oystercatcher Haematopus longirostris. Intertidal areas provide feeding habitat for shorebirds that also utilise the foredunes for roosting.
- Saltmarsh can also be used by several bird species for roosting, foraging and nesting.
- Freshwater wetlands, including open water areas, provide loafing habitat for ducks and swans, and protection during annual moult of primary flight feathers. The vegetated freshwater marshes are the preferred habit of the Australasian Bittern and a number of large Australian wading birds such as herons. Black Swans build nest mounds in emergent vegetation as do a number of other species, with important habitats ranging from tree hollows to large trees over water and dense reed beds.
- Shorebird and other water bird habitat areas provide habitat for 24 bird species listed under international migratory agreements.

5.1.2 Critical components, processes and services

The Ecological Character Description (ECD) of the Ramsar site (DELWP 2017) defines the ecosystem components, processes, benefits, and services of the wetland at a given point in time.

Critical components include:

- Hydrology.
- Vegetation – type and extent.
- Fish – diversity and abundance.
- Waterbirds – diversity and abundance.

The ECD identifies a single critical process: stratification of the Glenelg Estuary, which is considered important for ecosystem services and critical for successful recruitment of estuarine fish species.

Critical ecosystem services identified in the ECD include:

- Diversity of wetland types.
- Special geomorphic features including dune slacks (damp or wet hollows within the coastal dune fields).
- Habitat for waterbirds.
- Habitat for threatened wetland species and ecosystems.
- Ecological connectivity.

The ECD also defines a set of Limits of Acceptable Change (LAC) for the critical components, processes and services. These are presented fully in Table 21 of the ECD (DELWP 2017b). In summary, the LAC relate to:

- Preservation of hydrological regime to allow permanent wetlands to remain inundated, and the estuary mouth to not remain closed for three or more consecutive years.
- Preservation of defined extents for vegetation types, including Coastal Saltmarsh and tall marshes.
- Continued representation of a diversity and abundance of fish life history strategies (estuarine, marine migrants and freshwater).
- Continued presence of defined waterbird guilds.
- Preservation of the diversity of wetland types and physical habitats for waterbirds.
- Ongoing presence of key threatened species:
    - Maroon Leek-orchid *Prasophyllum frenchii*
    - Swamp Greenhood *Pterostylis tenuissima*
    - Yarra Pygmy Perch *Nannoperca obscura*
    - Hooded Plover *Thinornis cucullatus*
    - Growling Grass Frog *Litoria raniformis*
    - Ancient Greenling Damselfly Hemiphlebia mirabilis.
- Preservation of ecological connectivity relating to the estuary opening.

The stated purposes of the ECD for the Glenelg Estuary and Discovery Bay Ramsar site (DELWP 2017d) include that they are:

To assist the administration of the EPBC Act, particularly:

a. To determine whether an action has, will have or is likely to have a significant impact on a listed Ramsar wetland in contravention of sections 16 and 17B of the EPBC Act; or

b. To assess the impacts that actions referred to the Minister under Part 7 of the EPBC Act have had, will have or are likely to have on a listed Ramsar wetland.

To assist any person considering taking an action that may impact on a listed Ramsar wetland whether to refer the action to the Minister under Part 7 of the EPBC Act for assessment and approval.

The ECD achieves its stated objectives by providing a benchmark of the site's critical components, processes and services at the time of preparation of the ECD. This allows changes in those aspects to be measured and evaluated over time.

The ECD for the Ramsar site (DELWP 2017b) sets out specific parameters for Limits of Acceptable Change for the Ramsar wetlands and Resource Condition Targets for it are also defined. Discussion of them is provided here for their descriptions of natural values. The Commonwealth DCCEEW advise that they are not appropriate for use in impact assessment for the Project.

The ECD also defines a set of Limits of Acceptable Change (LAC) for the critical components, processes and services of the Ramsar wetland (DELWP, 2017). These are presented fully in Table 21 of the ECD (DELWP 2017). In summary, the LAC relate to:

- Preservation of hydrological regime to allow permanent wetlands to remain inundated, and the estuary mouth to not remain closed for three or more consecutive years.
- Preservation of defined extents for vegetation types, including Coastal Saltmarsh and tall marshes.
- Continued representation of a diversity and abundance of fish life history strategies (estuarine, marine migrants and freshwater).
- Continued presence of defined waterbird guilds.
- Preservation of the diversity of wetland types and physical habitats for waterbirds.
- Ongoing presence of key threatened species:
    - Maroon Leek-orchid *Prasophyllum frenchii*
    - Swamp Greenhood *Pterostylis tenuissima*
    - Yarra Pygmy Perch *Nannoperca obscura*
    - Hooded Plover *Thinornis cucullatus*
    - Growling Grass Frog *Litoria raniformis*
    - Ancient Greenling Damselfly *Hemiphlebia mirabilis*.
- Preservation of ecological connectivity relating to the estuary opening.

The stated purposes of the ECD for the Glenelg Estuary and Discovery Bay Ramsar site (DELWP 2017d) include that they are:

To assist the administration of the EPBC Act, particularly:

a. To determine whether an action has, will have or is likely to have a significant impact on a listed Ramsar wetland in contravention of sections 16 and 17B of the EPBC Act; or

b. To assess the impacts that actions referred to the Minister under Part 7 of the EPBC Act have had, will have or are likely to have on a listed Ramsar wetland.

To assist any person considering taking an action that may impact on a listed Ramsar wetland whether to refer the action to the Minister under Part 7 of the EPBC Act for assessment and approval.

The ECD achieves its stated objectives by providing a benchmark of the site's critical components, processes and services at the time of preparation of the ECD. This allows changes in those aspects to be measured and evaluated over time.

The ECD for the Ramsar site (DELWP 2017) sets out specific parameters for Limits of Acceptable Change for the Ramsar wetlands and Resource Condition Targets for it are also defined. Discussion of them is provided here for their descriptions of natural values. The Commonwealth DCCEEW advise that they are not appropriate for use in impact assessment for the Project.

The ECD makes the following points that should be considered when developing and assessing the LAC for the critical components, processes and services of the Ramsar site:

- Limits of Acceptable Change are a tool by which ecological change can be measured. However, Ecological Character Descriptions are not management plans and Limits of Acceptable Change do not constitute a management regime for the Ramsar site.
- Exceeding or not meeting Limits of Acceptable Change does not necessarily indicate that there has been a change in ecological character within the meaning of the Ramsar Convention. However, exceeding or not meeting Limits of Acceptable Change may require investigation to determine whether there has been a change in ecological character.
- While the best available information has been used to prepare the Ecological Character Description and define Limits of Acceptable Change for the site, a comprehensive understanding of site character may not be possible as in many cases only limited information and data is available for these purposes. The Limits of Acceptable Change may not accurately represent the variability of the critical components, processes, benefits or services under the management regime and natural conditions that prevailed at the time the site was listed as a Ramsar wetland.
- Users should exercise their own skill and care with respect to their use of the information in this Ecological Character Description and carefully evaluate the suitability of the information for their own purposes.
- Limits of Acceptable Change can be updated as new information becomes available to ensure they more accurately reflect the natural variability (or normal range for artificial sites) of critical components, processes, benefits or services of a Ramsar wetland.

The ECD and the Management Plan for Glenelg Estuary and Discovery Bay Ramsar site set out a hierarchical, or sequential framework in which the effect of potential changes can be assessed against the defined Resource Condition Targets. In turn, these can be considered relative to their consequences for established Limits of Acceptable Change.

The rationale adopted for consideration of potential impacts of the Project on the Glenelg Estuary and Discovery Bay Ramsar site is to evaluate them against Resource Condition Targets set out in the Management Plan. If changes will not exceed Resource Condition Targets, then they also will not exceed Limits of Acceptable Change. This assessment is presented in **Table 5.1**.

Table 5.1 Assessment of the Project against Resource Condition Targets for the Glenelg Estuary and Discovery Bay Ramsar site

Critical CPS	Resource Condition Target	Assessment of Project
Hydrology	Maintain diversity of wetland types.	The Project has been assessed (AECOM 2024a, AECOM 2024b) as having low to very low potential to alter hydrological regimes temporarily or permanently such that the diversity of wetland types might be affected. No wind farm infrastructure is planned within 300 metres of the Ramsar site boundary, or 500 metres of wetlands within the Ramsar site.
Stratification	Maintain seasonal stratification in the Glenelg Estuary.	The Project has been assessed (AECOM 2024a, AECOM 2024b) as having low to very low potential to alter stratification in the Glenelg River estuary.
Vegetation type and extent	Maintain 2008 extent of freshwater vegetation communities.	The Project will have no direct effects on freshwater vegetation communities of the Ramsar wetlands. In light of the assessments of surface water and groundwater that indicate there is low to very low potential to alter hydrological regimes temporarily or permanently, there is no apparent hydrological pathway that might cause changes in the extent of freshwater vegetation communities. The physical distance between freshwater of Glenelg River and the closest points of the Project Area prevents the potential for indirect effects on freshwater vegetation communities there. Careful management of any construction dewatering and all other activities should be implemented to ensure no infiltration of sediments or pollution into dune slack wetlands can occur that might result in changes in the extent of freshwater vegetation communities.
Fish diversity and abundance	Maintain fish diversity and abundance, and the following common species in alltargeted surveys: Australian Herring *Arripis georgianus* Black Bream *Acanthopagrus butcheri* Bridled Goby *Arenigobius bifrenatus* Common Galaxias *Galaxias maculatus* Estuary Perch *Percalates colonorum* Flatheaded Gudgeon *Philypnodon grandiceps* Scary's Tasmangoby *Tasmanogobius lasti* Mulloway *Argyrosomus japonicus* Pouched Lamprey *Geotria australis*	Potential mechanisms that could alter fish diversity and abundance substantially relate to altered surface water and groundwater regimes and to infiltration of sediment or pollutants. The Project has been assessed (AECOM 2024a, AECOM 2024b) as having low to very low potential to alter hydrological regimes temporarily or permanently. The physical distance between Glenelg River and its estuary and the closest point of the Project Area prevents the potential for indirect effects on fish in that system. Careful management of any construction dewatering should be implemented to ensure no infiltration of pollutants into dune slack wetlands can occur that might result in changes in the extent of fish diversity or abundance there. Refer to Section 34 for further details regarding aquatic species.

Critical CPS	Resource Condition Target	Assessment of Project
	Sea Mullet *Mugil cephalus* Southern Shortfin Eel *Anguilla australis* Smallmouthed Hardyhead *Atherinosoma microstoma* Southern Pygmy Perch *Nannoperca australis* Spotted Galaxias *Galaxias truttaceus* Southern Smelt *Retropinna* spp. Tamar Goby *Afurcagobius tamarensis* Tupong *Pseudaphritis urvillii* Yellow-eye Mullet *Aldrichetta forsteri*	
Waterbird diversity and abundance	Maintain waterbird diversity (i.e. > 32 species regularly recorded). Maintain > 1% of the population of Sanderling.	Potential for effects on shorebirds are addressed separately in this report (see Section 21). The Project has some potential for infrequent turbine collisions by waterbirds, however that is expected to occur rarely, and at a level that is not likely to affect the diversity of species or alter the percentage of the Sanderling population using the Ramsar site.
Diversity of wetland types	Maintain extent and diversity of wetland types.	The Project has no potential to alter the extent or diversity of wetland types.
Physical habitat for waterbirds	See RCT for Diversity of wetland types and Vegetation type and extent.	The Project has no potential to alter the extent or diversity of wetland types nor the types or extent of vegetation communities.
Threatened species: plants	Maintain abundance of Maroon Leek-orchid *Prasophyllum frenchii* and Swamp Greenhood *Pterostylis tenuissima.*	The Project has no potential to alter the abundance of Maroon Leek-orchid or Swamp Greenhood within the Ramsar Site.
Threatened species: fish	Increase abundance by 10% of Yarra Pygmy Perch *Nannoperca obscura* at Long Swamp.	The Project has no potential to affect the abundance of Yarra Pygmy Perch (Section 34) in Long Swamp provided careful management of any construction to ensure no infiltration of pollutants into dune slack wetlands can occur that might result a decrease in the population.

Critical CPS	Resource Condition Target	Assessment of Project
Threatened species: birds	Maintain presence and abundance of threatened bird species at the site:Australasian Bittern, Hooded Plover, Fairy Tern.	The Project is not expected to alter the presence of these species. Due to their habitat separation from the Project Area, Hooded Plover and Fairy Tern are considered very unlikely to be involved in turbine collisions. Australasian Bittern is expected to fly across the wind farm component of the project and to be at potential risk of turbine and transmission line collision and the Project may have a significant impact on the Australasian Bittern population. Refer to Section 19 and Appendix 6 for more information.
Threatened species: Growling Grass Frog	Annual occurrence of Growling Grass Frog within the site.	The Project has no potential to reduce the abundance of Growling Grass Frog within the Ramsar site. It is noted that surveys for the species undertaken for the Project did not detect it. Refer to Section 33 for more information.
Threatened species: Ancient Greenling	Maintain population of Ancient Greenling.	The Project has no potential to reduce the abundance of Ancient Greenling provided careful management of any construction to ensure no infiltration of pollutants into dune slack wetlands can occur that might result in a decrease in the population.
Ecological connectivity	Maintain ecological connectivity between habitats in the site.	The Project has no potential to alter ecological connectivity between terrestrial and freshwater habitats in the Ramsar site. While a level of turbine collision risk may affect movements of some individual birds and bats, the great majority of the Project Area will remain permeable to individual movements and to gene flow between habitats within the Ramsar site. Potential for the wind farm to create a barrier effect is discussed in relation to Orange-bellied Parrot (Section 13.3.1) and Blue-winged Parrot (Section 14.3.1).

5.2 Impact assessment

The EPBC Act establishes a framework for managing Ramsar listed wetlands through the Australian Ramsar Management Principles. All actions and mitigation measures relating to the Ramsar site must be consistent with the Australian Ramsar management principles, which are set out in Schedule 6 of the EPBC Regulations, and with Australia's obligations under the Ramsar Convention.

5.2.1 Criteria for assessment of impacts

Ramsar sites are a matter of national environmental significance under provisions of the EPBC Act. The Project was referred under the EPBC Act and was determined to be a controlled action, with Ramsar wetlands as one of the controlling provisions.

For the purposes of the EPBC Act a set of specific criteria for assessing significance of impacts for Wetlands of International Importance (Ramsar sites) is provided by the Commonwealth of Australia (2013). Those criteria are considered to fully address Australia's obligations under the Ramsar Convention.

The Commonwealth DCCEEW advise that Limits of Acceptable Change and Resource Condition Targets for the Glenelg Estuary and Discovery Bay Ramsar site are not appropriate for use in impact assessment for the Project.

A significant impact assessment was undertaken in accordance with the EPBC Act Significant Impact Guidelines 1.1 – Matters of National Environmental Significance (DEWHA, 2013) (see **Table 5.2**). The assessment determined that, based on the application of avoidance and mitigation strategies, the Project is unlikely to result in a significant impact on the Ramsar site.

Table 5.2 Significant impact assessment for the Ramsar site

Significant impact criteria	Assessment
Is there a real chance or possibility that the Project would result in:	
Areas of the wetland being destroyed or substantially modified	**Unlikely**. No Project activities are being undertaken within the Ramsar site. No areas of the wetland will be directly impacted by Project construction activities. Based on the current turbine layout that includes a setback of at least 500 m from the Ramsar site, and that foundation excavations will avoid intersecting groundwater in the plantation sub-area (see MM-GW01), destruction or substantial modification of the wetland via direct or indirect impacts (i.e., altered hydrological regime) is unlikely to occur as a result of the Project.
A substantial and measurable change in the hydrological regime of the wetland, for example, a substantial change to the volume, timing, duration and frequency of ground and surface water flows to and within the wetland	**Unlikely**. No Project activities are being undertaken within the Ramsar site. Turbine foundations within the Plantation sub-area are not anticipated to intersect groundwater based on findings of the **Groundwater Impact Assessment (Appendix G)** (AECOM, 2021), therefore no drawdown impact pathways to the wetland have been identified from this sub-area (see MM-GW01). In the Northeastern sub-area, turbines have been removed, however, there is potential for groundwater intersection from trenching. Given the relatively short duration of dewatering activities and the distance between infrastructure and the Ramsar site (at least 4 km) as well as Johnstone Creek, which flows into the Ramsar Site (at least 800 m), there is unlikely to be an impact pathway to the wetland from this sub-area.

Significant impact criteria	Assessment
	Given the setback of at least 500 m between turbines it is unlikely that the Project would lead to a substantial and measurable change in the hydrological regime of the wetland. A groundwater dependent ecosystem monitoring and management plan will be developed prior to construction commencing (see MM-GD01). The plan will include measures to ensure the hydraulic gradient to the Glenelg Estuary and Discovery Bay Ramsar site is maintained throughout the life of the groundwater extraction (construction – 2 years) and during system recovery (additional 2 years) via a monitoring plan with triggers and a set of contingencies.
The habitat or lifecycle of native species, including invertebrate fauna and fish species, dependent upon the wetland being seriously affected	**Unlikely**. Project activities are not being undertaken within the Ramsar site. Turbine foundations within the Plantation sub-area are not anticipated to intersect groundwater based on findings of the **Groundwater Impact Assessment (Appendix G)** (AECOM, 2021), therefore no drawdown impact pathways to the wetland have been identified. Based on the above, and that no turbine foundations are located within 500 m of the Ramsar site, it is unlikely that the habitat or lifecycle of native species that are dependent upon wetlands in the Ramsar site, including invertebrate fauna and fish species, would be seriously affected by the Project.
A substantial and measurable change in the water quality of the wetland – for example, a substantial change in the level of salinity, pollutants, or nutrients in the wetland, or water temperature which may adversely impact on biodiversity, ecological integrity, social amenity or human health	**Unlikely**. Project activities are not being undertaken within the Ramsar site. There are limited impact pathways to the Ramsar site in the Plantation sub-area given the absence of waterways and that there are no drawdown impact pathways to the wetland. Further, there is low potential for acid sulfate soils (ASS) to occur within the Plantation sub-area. ASS is known to occur within the Northeastern sub-area and will be managed through and acid sulfate soil manahement plan There is potential in some areas for overland flow to impact on downstream wetlands. Overland flow would generally need to traverse at least 500 m to create a surface water impact pathway between Project infrastructure and the Ramsar site. The Project would result in an increase in permeability of <2 % across the Project Area, thus having a negligible effect on increasing or changing overland flow. For the reasons above, the Project is unlikely to result in a substantial
An invasive species that is harmful to the ecological character of the wetland being established (or an existing invasive species being spread) in the wetland.	**Unlikely**. Project activities are not being undertaken within the Ramsar site. The Project would employ best practice construction methodologies and environmental controls to minimise the potential for the mobilisation of invasive species downstream to the Ramsar wetland off-site. As a result, the Project is not anticipated to result in the establishment or exacerbation of invasive species that may be harmful to the ecological character of the wetland.

6.0 Mitigation and management measures

Mitigation and management measures will be implemented across the Project, those relevant to MNES and the Ramsar site are listed in **Table 6.1**.

Table 6.1 Mitigation and management measures for potential impacts on MNES

MM ID	Mitigation Measure	Work Area	Phase
Biodiversity			
MM-BD01	**Native Vegetation** Before any native vegetation is removed, a Native Vegetation Plan will be prepared in consultation with the Victorian Department of Energy, Environment and Climate Action and to the satisfaction of the responsible authority. The Native Vegetation Plan will: • Include a final Biodiversity Assessment Report or similar which identifies all losses being approved by this Incorporated Document and the associated offset requirements, in accordance with the Guidelines for the removal, destruction or lopping of native vegetation (DELWP 2017). • Identify: ○ Native vegetation to be removed. ○ Identify where construction activities are limited to zones or corridors to avoid or minimize impacts on native vegetation and habitat. ○ Any current mapped wetlands that are present on the site. ○ All areas of native vegetation to be retained. ○ Native tree protection zones of trees to be retained. ○ Native vegetation protection zones (no-go zones) for native vegetation to be retained. ○ Areas to be rehabilitated following disturbance activities. ○ Measures to be used during construction to protect native vegetation to be retained including no-go areas and fencing. • Identify where construction activities are limited to zones or corridors to avoid or minimise impacts on native vegetation and habitat. • Provide measures to ensure that: ○ Activities within 'no-go zones' areas of native vegetation will be effectively protected and retained. ○ Any tree or vegetation protection zone associated with the permitted use and/or development is adequately protected, except with the written consent of the Minister.	All areas	Construction

MM ID	Mitigation Measure	Work Area	Phase
	Specific measures to be included in the Native Vegetation Plan include: • Before development starts, all persons undertaking the vegetation removal or works on site must be made aware of all relevant permit conditions and associated statutory requirements or approvals. • Before development starts, a native vegetation protection fence must be erected around all patches of native vegetation and scattered trees to be retained on site. This fence will protect the tree by demarcating the tree protection zone and must be erected at a radius of 12 x the diameter at a height of 1.3 m to a maximum of 15 m but no less than 2 m from the base of the trunk of the tree. The fence must be constructed of star pickets/ chain mesh/ or similar. The fence must remain in place until all works are completed to the satisfaction of the responsible authority. • Except with the written consent of the responsible authority, within the area of native vegetation to be retained and any tree or vegetation protection zone associated with the permitted use and/or development, the following is prohibited: ○ Vehicular or pedestrian access. ○ Trenching or soil excavation. ○ Storage or dumping of any soils, materials, equipment, vehicles, machinery or waste products. ○ Entry and exit pits for the provision of underground services. ○ Any other actions or activities that may result in adverse impacts on retained native vegetation. To prevent the spread of weeds and pathogens, all vehicles must be made free of soil, seed and plant material before being taken to the works site and again before being taken from the works site, during and on completion of the Project.		
MM-BD02	**Offsets** Appropriate offsets for vegetation losses will be acquired, in accordance with the Guidelines for the removal, destruction or lopping of native vegetation (DELWP 2017) (Guidelines). A final offset strategy for the Project will be developed in consultation with public land managers and Project stakeholders including the Victorian Department of Energy, Environment and Climate Action.	All areas	Planning

MM ID	Mitigation Measure	Work Area	Phase
	The number of trees assumed lost due to installation of the transmission line is currently greater than the likely losses due to over estimation of Tree Protection Zones (TPZ) encroachment. Over-estimating losses ensures secured offsets will account for minor design changes or unintended encroachment of TPZs and structural root zones during construction. The offset strategy will cover all anticipated offsets (including the potentially over-estimated offsets for predicted TPZ encroachment). It is intended to secure all offsets predicted as part of the impact assessments prior to vegetation removal in accordance with the Guidelines.		
MM-BD03	**Assessment of tree health along Boiler Swamp Road** The following surveys will be carried out on trees adjacent to Boiler Swamp Road to assess for tree health: • A pre-construction survey to benchmark tree health will be conducted to provide a benchmark assessment. This will involve assessment of tree health, structure and ULE. • A post-construction survey will be conducted within 6 months of the completion of construction. The purpose of this assessment is survey for any immediate impacts on tree health, and to re-assess the level of Tree Protection Zone impacts, using accurate data on the actual extent of excavation. • A further post-construction survey will be conducted between 24 and 30 months following completion of construction. The purpose of this assessment is to compare changes in tree health and assess the extent of any tree deaths that can be attributed to the construction of the transmission line. If more offset credits were secured than what was needed, the reconciliation mechanism outlined in the Assessors Handbook (Appendix 8 - https://www.environment.vic.gov.au/__data/assets/pdf_file/0022/91255/Assessors-handbook-Applications-to-remove,-lop-or-destroy-native-vegetation-V1.1-October-2018.pdf)) will be used to hold remaining credits for future impacts proposed by the project, or for selling credits on. The surplus credits can only be used if they match the offset requirements of any future impacts, such as minimum Strategic Biodiversity Values and with the consent of the Victorian Department of Energy, Environment and Climate Action/Glenelg Shire Council.	Transmission line	Pre-construction, Operations
MM-BD04	**Tree Protection Zones** Trees not requiring direct removal will be protected in appropriately marked Tree Protection Zones in accordance with AS 4970:2009 Protection of trees on development sites. In accordance with AS 4970:2009, directional drilling at a depth of 600 millimetres or greater will be undertaken to avoid impacts on roots within tree protection zones of Apple Jack trees adjacent to Boiler Swamp Road within Cobboboonee National Park and Cobboboonee Forest Park.	All areas	Construction

MM ID	Mitigation Measure	Work Area	Phase
MM-BD05	**Tree pruning** Any tree pruning required will be undertaken by an experienced arborist to ensure unnecessary damage does not occur to the tree. Understorey vegetation will be protected during tree pruning. Any pruning to the canopy or major structural branches of any tree to be retained must be undertaken in accordance with Australian Standard 4373-2007 – *Pruning of Amenity Trees.*	All areas	Construction, Operation
MM-BD06	**Weed and pest animal control** Best practice methods for weed and pest animal control, such as vehicle and machinery hygiene, will be implemented in collaboration with relevant landowners and land management authorities. These methods will be documented in the Biosecurity Management Plan, to be prepared as part of the Construction Environmental Management Plan. The Biosecurity Management Plan will be prepared to the satisfaction of the responsible authority and in consultation with Agriculture Victoria, and the Victorian Department of Energy, Environment and Climate Action and Parks Victoria where it relates to works associated with the underground transmission line in the Cobboboonee National Park and Cobboboonee Forest Park. The Biosecurity Management Plan must include: • Procedures to prevent biosecurity risks, which may include (but are not limited to): ○ The cleaning of all plant and equipment before transport onto and off the site. ○ The use of material/products on site which are free of invasive plants and animals. ○ A protocol for effective identification of biosecurity risks, early intervention to manage biosecurity risks, ongoing monitoring of biosecurity risks, trace-backs, and integrated control measures when entry, establishment or spread of specific risk targets is identified. ○ A requirement to comply with approved government or industry standards and procedures for the identification, prevention and management of biosecurity risks that apply from time to time. The Biosecurity Management Plan may be prepared in sections or stages	Transmission Line	Construction
MM-BD07	**Boiler Swamp Road** Construction activities for the underground transmission line along Boiler Swamp Road will be limited to the existing road formation.	Transmission line	Construction

MM ID	Mitigation Measure	Work Area	Phase
	Root investigations will be undertaken before construction of the transmission line section along Boiler Swamp Road commences to assess presence and depth of roots beneath the road formation. The purpose of the root investigations is to inform the potential use of additional alternative impact avoidance techniques (such as Horizontal Directional Drilling (HDD)). HDD will be used to avoid impacts on Apple Jack (Eucalyptus splendens) trees adjacent to Boiler Swamp Road. The locations of the HDD sections must be generally in accordance with the locations shown in Figure 6cof the **Flora and Fauna Existing Conditions and Impact Assessment (Appendix C)**. A plan showing the locations of the final HDD sections must form part of the Native Vegetation Plan (see mitigation measure MM-BD01), which will be prepared to the satisfaction of the responsible authority before development starts. HDD will be done in accordance with AS 4970:2009 *Protection of trees on development sites*, including ensuring directional drilling is at a depth of 600 millimetre or greater to avoid potential impacts on roots within tree protection zones of Apple Jack trees.		
MM-BD08	**Pre clearance surveys** Pre clearance surveys will be undertaken prior to removal of native vegetation in areas with known occurrences of significant species, such as Dune Fan-flower (*Scaevola calendulacea*), One-flower Early Nancy (*Wurmbea dioica*), Hairy Boronia (*Boronia pilosa*), Wiry Bossiaea (*Bossiaea cordigera*), Rough Daisy-bush (*Olearia asterotricha*), Tiny Violet (*Viola sieberiana*), and Western Golden-tip (*Goodia medicaginea*). Pre-clearance surveys will also investigate the potential occurrence of threatened species including: • Heath Mouse (*Pseudomys shortridgei*) (within the plantation). • Striped Worm-lizard (*Aprasia striolata*) (within the plantation). • Eastern Bearded Dragon (*Pogona barbata*) (within the plantation). • Southern Toadlet (*Pseudophryne semimarmorata*) (drainage lines along Boiler Swamp Road). • Portland Burrowing Crayfish (*Engaeus strictifrons*) (wetlands in the north-east wind farm site). • Hairy Burrowing Crayfish (*Engaeus sericatus*) (wetlands in the north-east wind farm site). • Yellow-bellied Glider (*Petaurus australis australis*) (trees adjacent to Boiler Swamp Road). The focus of these surveys will be on trees with potential hollows. The surveys will be undertaken by an appropriately qualified and experienced ecologist and at an appropriate time of year for each species to maximise the probability of detection.	All areas	Construction

MM ID	Mitigation Measure	Work Area	Phase
	Any known locations, or locations identified in pre-clearance surveys will be marked, and treated as no go-zones if the location is within 30 m of construction activities. If any threatened flora species are recorded within the previously unsurveyed areas, these areas will be avoided, and subsequently addressed within the Construction Environmental Management Plan for the Project, including updating mapping.		
MM-BD09	**Rehabilitation of temporary disturbance areas** Temporary disturbance areas, such as those associated with the turbine laydown areas and construction compounds, will be rehabilitated as soon as possible following cessation of the disturbing activity. The sites will be planted with appropriate locally indigenous species, unless otherwise agreed with the landowner or land manager (e.g. disturbed areas of pine plantation would be returned to the forestry company for reintegration into their operations). Rehabilitated areas will be monitored, with adaptive management applied in locations where rehabilitation has involved planting of locally indigenous species to control weeds and ensure successful establishment of final vegetation type. Areas to be rehabilitated, and the rehabilitation arrangements as agreed with relevant landowners, will be detailed in the Project's Construction Environmental Management Plan.	All areas	Construction Operation
MM-BD10	**Flora and fauna management** A Flora and Fauna Management Plan will be prepared in consultation with the Victorian Department of Energy, Environment and Climate Action and to the satisfaction of the responsible authority. The Flora and Fauna Management Plan will include the following requirements: • Pre-clearance targeted flora and fauna surveys must be undertaken for flora species listed under the *Flora and Fauna Guarantee Act 1988* (Vic) and the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) within areas requiring removal of native vegetation. • Pre-clearance surveys will be undertaken for native vegetation with known occurrences of listed species. • All habitat to be retained is to be clearly marked on construction drawings. • All habitat to be retained is to be clearly marked on the ground (e.g. with temporary fencing and flagging, as well as signage) where located in close proximity to the development footprint, and designated as 'no-go zones.' • Specific measures to be implemented to avoid, minimise and mitigate potential impacts on State and Commonwealth endangered species. • Measures to further minimise and mitigate impacts on native fauna during construction and habitat clearance. • Procedures for wildlife handling at locations requiring removal of native vegetation.	All areas	Construction

MM ID	Mitigation Measure	Work Area	Phase
MM-BD11	**Australasian Bittern** Any works, such as road construction, within Brolga (*Antigone rubicunda*) breeding buffers (as the majority of known and suitable habitat for Australasian Bittern (*Botaurus poiciloptilus*) is already within Brolga breeding buffers) will be conducted outside the Australasian Bittern breeding season (October to February). A pre-construction survey will be conducted in January, February, March, and April to confirm breeding has finished before any works are commenced, noting that Australasian Bittern breeding season extends to February. The following measures will also be implemented and will be documented in the Flora and Fauna Management Plan and/or the Bird and Bat Adaptive Management Plan: • Undertake surveys to identify presence and to estimate numbers of Australasian Bitterns in wetland habitats within proximity to the Project Area, to provide a baseline for monitoring. The locations and timing for surveys will be set out in the Flora and Fauna Management Plan and developed in consultation with the Victorian Department of Energy, Environment and Climate Action. • A contingency plan will be developed for stopping works within Brolga breeding buffers if Australasian Bitterns are observed, and the observation is confirmed by a qualified ecologist, within suitable breeding wetland habitat and engaging in breeding activity. • For nocturnal construction works that would occur within 200 m of potential Australasian Bittern habitat during the breeding season, investigate and implement measures to minimise light spill. • Develop an offset strategy to compensate for mortalities to avoid significant impact on the population as detailed in the Bird and Bat Adaptive Management Plan. GPS/satellite tracking of movements, and other monitoring technologies will also be considered to further inform potential adaptive management strategies for Australasian Bittern. Where these are identified as being available and effective, they will be included in the Bird and Bat Adaptive Management Plan to be prepared for the Project.	All areas	Pre-Construction, Construction
MM-BD12	**Bird and Bat Adaptive Management Plan** A Bird and Bat Adaptive Management Plan (BBAMP) will be developed in consultation with the Victorian Department of Energy, Environment and Climate Action (DEECA) and to the satisfaction of the responsible authority. The BBAMP will be developed prior to construction commencing and will detail the objectives, strategies and activities for minimising bird and bat strike arising from operation of the wind farm, including Brolgas.	Wind farm	Operation

MM ID	Mitigation Measure	Work Area	Phase
	The primary objective of the BBAMP will be to ensure operation of the Project does not result in net significant or lasting impacts on the viability or conservation status of birds and bats. The BBAMP will minimise, manage and mitigate bird and bat mortality arising from the operation of the wind farm. The BBAMP will also aim to determine whether the presence, abundance and flight behaviours of species of concern are altered, relative to pre-construction levels, in response to the presence and operation of the wind farm. The Project will investigate employing smart turbine curtailment as part of the BBAMP to minimise bird and bat collisions through technologies that detect when a bird/bat is approaching a turbine rotor, and shuts down the turbine. These may include radar; optical and/or infra-red camera systems; animal call-recognition or a combination of such technologies. The BBAMP will contain: • A statement of the objectives and overall strategy for minimising bird and bat mortality through design and the operation of the wind energy facility. • A procedure for implementation of suitable mitigation measures for mortalities. • A comprehensive, science-based mortality monitoring program to monitor mortality of listed species and any other bat and avifauna species. The monitoring program must commence when the first turbine is commissioned or such other time as is approved by DEECA and continue for a duration of at least five years. The duration and timing of the monitoring plan may be altered with the written consent of the responsible authority and in consultation with DEECA. Outcomes of the monitoring will be reported to DEECA and be incorporated into the plan to ensure that the management actions are as effective as possible, with impact thresholds to trigger adaptive management responses. This program will: ○ Monitor for blade strikes and determine the effectiveness of mitigation and management measures, including carcass searches, carcass persistence trials and searcher efficiency trials. ○ Identify impact triggers for threatened and non-threatened species requiring a management response to reduce impacts. ○ Conduct surveys at a time interval and sampling frequency agreed to with DEECA to ascertain: ▪ The species, number, age, sex (where possible) and date of any listed species mortality and any other bat and avifauna species mortality. ▪ Seasonal and yearly variation in the number of listed species mortality and any other bat and avifauna species mortality.		

MM ID	Mitigation Measure	Work Area	Phase
	▪ Whether further detailed investigations of any potential impacts on listed species and any other bat and avifauna species mortality are warranted. ○ Procedures for reporting strikes/mortalities of listed species to DEECA within 2 business days of becoming aware of any strike/mortality. ○ Procedures for reporting strikes/mortalities of bat and avifauna species other than listed species to DEECA monthly. ○ Information on the efficacy of searches for carcasses of birds and bats, and, where practicable, information on the rate of removal of carcasses by scavengers so that correction factors can be determined to enable calculations of the likely total number of mortalities. ○ Measures to verify whether collision mortalities are within the range predicted during assessment of the Project and to identify ongoing improvement measures. ○ Procedures for determining whether further detailed investigations of any potential impacts on native birds and bats are warranted. Any further detailed investigations required are to be undertaken in consultation with DEECA. ○ Procedures for periodic reporting, within agreed timeframes, of the findings of the monitoring to DEECA. Such reports must be made publicly available on the project website. ○ A data sharing agreement to provide georeferenced, time stamped, data that is collected as part of the BBAMP. All data will be entered into a database to be maintained by the wind farm operator. Raw data will be available to relevant regulatory authorities on request. ○ Procedures for the regular removal of carcasses likely to attract raptors to areas near turbines. When the monitoring program required under the BBAMP is complete, the operator will submit a report to the Victorian Minister for Planning and DEECA, setting out the findings of the program. The report will be: • to the satisfaction of the responsible authority • made publicly available on the operator's website. The Independent Environmental Auditor (IEA) will undertake periodic independent review of the BBAMP content and ongoing monitoring of the plan's implementation to ensure it reflects current operational obligations, relevant legislation and policy (see mitigation measure MM-IA01).		

MM ID	Mitigation Measure	Work Area	Phase
	After considering the findings of the monitoring program and consulting with DEECA, the responsible authority may direct further investigation of impacts on birds and bats. The further investigation must be undertaken to the satisfaction of the responsible authority and DEECA. A framework BBAMP has been provided in Appendix 10 of the **Flora and Fauna Existing Conditions and Impact Assessment (Appendix C).**		
MM-BD13	**Southern Bent-wing Bat Management** The following measures will be included in the Bird and Bat Adaptive Management Plan (BBAMP) to manage potential impacts on Southern Bent-wing Bat: • The BBAMP must include intensive carcass monitoring across the wind farm, particularly in the early stages of operation. • Turbines selected for monitoring will consider stratification by habitat type (plantation and farmland), distribution throughout the wind farm site and proximity to known caves. • Frequency of monitoring will be at least monthly during the monitoring period, and the plan will consider pulse surveys during peak activity periods, including autumn and spring. • Within plantation areas the ideal searchable area for carcass searches will include both cleared areas (50 metre radius) and areas under the pine canopy. This will need to be considered in the development of the search regime (including searcher efficiency and carcass retention trials) and mathematical approaches to extrapolating findings will need to be customised to the study. • The plan will specify a sequence of actions to be undertaken if Southern Bent-wing Bat (*Miniopterus orianae bassanii*) mortalities are recorded, including intensification investigations, and potentially low-wind speed curtailment of specific turbines.	Wind farm	Operation
MM-BD14	**Seasonal Nocturnal Low wind speed curtailment** Seasonal nocturnal low wind speed curtailment for Southern Bent-wing Bat will be developed during finalisation of the Bird and Bat Adaptive Management Plan (BBAMP) and include: • Daily timing: 30 minutes following sunset to 3 hours before sunrise. • Seasonal timing: September-November and February–-April (5 months). • Climatic conditions: Temperatures above 10°C and not raining. • Cut-in wind speed: 4.5 m/second.	Wind farm	Operation

MM ID	Mitigation Measure	Work Area	Phase
	Seasonal nocturnal low wind speed curtailment will be included in the BBAMP.		
MM-BD15	**Southern Bent-wing Bat Recovery and Funding** Neoen has made a commitment for a $1,000,000 annual recovery fund for the operational life of the Project (30 years), which is to focus on Southern Bent-wing Bat recovery actions, but also to have the ability to assist in recovery actions for other species. Recovery actions will be workshopped with the Southern Bent-wing Bat recovery team and other relevant conservation organisations. The *National Recovery Plan for the Southern Bent-wing Bat Miniopterus orianae bassanii* (DELWP 2020) and the *Conservation Advice Miniopterus orianae bassanii Southern Bent-wing Bat* (TSSC 2021) detail proposed recovery actions, which includes a range of research to address knowledge gaps relating to understanding population dynamics, movement behaviour and mitigation approaches.	Wind farm	Operation
MM-BD16	**Improved powerline visibility** The overhead powerline along Portland-Nelson Road will be marked with standard commercially available bird diverters to increase visibility to birds and bats. Overhead powerlines along Portland-Nelson Road will be marked with diverters visible at night to avoid and minimise Australasian Bittern collisions as this species is most likely to move over the wind farm between dusk and dawn when moving seasonally between inland and coastal habitats.	Wind farm	Operation
Surface Water			
MM-SW01	**Dewatering** • Water collected from excavated areas will be recycled and reused for construction activities such as dust suppression. • Dewatering activities will be managed in accordance with the Dewatering Plan in the CEMP. The plan will adopt a management hierarchy that prioritises the prevention of discharges into surface waters as far as is reasonably practicable. The relevant suggested measures outlined in Environment Protection Authority (EPA) Victoria Publication: 1834: *Civil Construction, Building and Demolition Guide* (2020) will also be incorporated into the CEMP. • Water resulting from dewatering activities will be tested for potential contaminants. • Ponded stormwater and rainwater collected in excavations may be suitable for onsite treatment, reuse or discharge, subject to water quality testing results. • Water from excavated areas will not be discharged into or within 50 m of a watercourse, drainage pathway or wetland without prior treatment.	All areas	Construction

MM ID	Mitigation Measure	Work Area	Phase
	• Where deemed suitable, discharge of collected water to land will be to areas of low gradient to avoid soil erosion or sedimentation of land or water. Discharges to land will also avoid areas that are saturated or at risk of becoming inundated. • Sediment control devices will be used where required, to remove suspended soils and dissipate flow. These devices may include sediment fences or basins. Groundwater that is contaminated by acid sulfate soils will be tested and discharged or disposed in accordance with protocols outlined in mitigation measure MM-CA03.		
MM-SW02	**Surface water run-off** • A water quality monitoring and adaptive management program will be implemented to ensure the effectiveness of controls that are implemented to mitigate potential risks to surface waters, and detail additional and/or improved measures that would be implemented should those controls fail or are not effective to eliminate or minimise risks of harm to surface waters. • Monitoring of surface waters will be conducted upstream and downstream of works areas prior to construction, during construction and post-construction at the appropriate frequency (i.e., weekly during watercourse crossings works) to understand any changes to environmental values in line with EPA publication 1896: *Working within or adjacent to waterways.* • All construction works will be carried out in accordance with industry best practice guidelines including the IECA Best Practice Erosion, Sediment Control Guidelines and EPA Publication 1834 *Civil Construction, Building and Demolition Guide*, EPA Publication 1894: *Managing Soil Disturbance*, and EPA Publication 1895: *Managing stockpiles.* • A Project-wide Construction Environmental Management Plan will be developed and implemented, incorporating a Sediment, Erosion and Water Quality Management Plan (SEWQMP) for all work areas. The SEWQMP will outline the erosion and sediment mitigation measures to be implemented for each work area. Erosion and sediment control measures will include: ○ Sediment control devices such as bunding or silt fences around stockpiled material, earthworks and disturbed areas. ○ Clean water diversion around disturbed or unvegetated areas. The SEWQMP will be developed in consultation with the Glenelg Hopkins Catchment Management Authority and Environment Protection Authority Victoria.	All areas	Construction

MM ID	Mitigation Measure	Work Area	Phase
MM-SW05	**Fuel and chemical spills** • The storage of fuels and chemicals will comply with the requirements of the *Dangerous Goods (Storage and Handling) Regulations (2022), EPA Guideline 1698; Liquid Storage and Handling Guidelines and EPA Publication 1834; Civil Construction, Building and Demolition Guide.* • Fuels and chemicals stored on site will be minimised. • Fuels or other potentially contaminating material will not be stored in areas that are subject to inundation (e.g. floodplains), and at least 50 m from sensitive receptors, such as waterways, wetlands and drainage pathways. • Fuel storage facilities will be bunded. • Spill kits will be available at locations where machinery/plant are operating and at refuelling points and fuel and chemical storage locations. • Spills of hazardous materials will be rendered safe and, where required, collected and transported by licenced contractors for disposal at appropriately licenced facilities, including cleaning materials, absorbents and contaminated soils. • Staff training will include spill management procedures. • Refuelling of vehicles, plant and equipment (excluding handheld machines) will be undertaken in a designated refuelling area with appropriate measures to contain spills. • Refuelling of vehicles, plant and equipment will not occur within 50 m of a watercourse, drainage pathway or wetland. • Measures to manage and monitor fuel and chemical spills will be incorporated into the Hazardous Substance Management Plan, which will form part of the Construction Environmental Management Plan and Operation Environmental Management Plan.	All areas	Construction Operation
MM-SW09	**Surface water monitoring and contingency plan** The Sediment, Erosion and Water Quality Management Plan will outline the surface water monitoring and contingency measures for the construction phase, including a monitoring program (including, as a minimum, visual monitoring during construction activities and consideration of weather conditions) of sediment management measures, and a complaint investigation and response plan.	All areas	Construction

MM ID	Mitigation Measure	Work Area	Phase
	This contingency plan will be aligned with industry best practice guidelines and will consider a broad range of measures that will be adopted during the event of an exceedance or failure of a mitigation measure. Aspects of the contingency plan would consider the following: • methods to prevent water entering excavations • controls to be implemented when a storm event is forecast • measures to ensure that waterways and floodplains retain sufficient flood detention capacity to moderate peak water flows • a flood warning system • clean up procedures, including disposal of excess water • notification of relevant authorities if unplanned incidents occur that could pose a risk to the environment.		
Groundwater			
MM-GW01	**Turbine Location** To minimise the risk of final foundation locations intersecting groundwater, turbine locations will avoid areas with an inferred depth to groundwater of less than 6 metres below ground surface.	Wind farm site	Design, construction
Groundwater Dependent Ecosystems			
MM-GD01	**GDE Monitoring and Management Plan** A groundwater dependent ecosystem (GDE) Monitoring and Management Plan will be developed prior to construction commencing in collaboration with the Catchment Management Area, Southern Rural Water, and the Victorian Department of Energy, Environment and Climate Action and to the satisfaction of the responsible authority. The GDE Monitoring and Management Plan will include: • At least daily groundwater level data collection (via data loggers) in pairs of target bores along the swamp edge and inland to measure changes to hydraulic gradient. Key bores include pairs MW05 and MW06, and MW07 and MW08. • At least daily groundwater levels data collection (via data loggers) in two “background” bores to measure natural variations so that any deviations from natural variations in the target bores can be identified. Key background bores would be MW01 and MW09.	Wind farm site	Construction

MM ID	Mitigation Measure	Work Area	Phase

	• Monitoring of these bores will begin at least 12 months before pumping commences so that baseline conditions (and natural variations in hydraulic gradient) can be determined.
	• Before pumping commences, target trigger levels will be developed (based on the seasonal baseline condition monitoring) so that changes to the hydraulic gradient outside of natural variations triggers contingency measures, such as temporary cessation of pumping, reduction in pumping volumes or introduction of an intermittent pumping schedule, to be determined prior to pumping commencing.
	• Measures to ensure the hydraulic gradient to the Glenelg Estuary and Discovery Bay Ramsar site is maintained throughout the life of the groundwater extraction (construction – 2 years) and during system recovery (additional 2 years) via a monitoring plan with triggers and a set of contingencies. Ensure that assumptions underpinning the GDE Monitoring and Management Plan are updated as pumping progresses if drawdown varies from predictions.
	• Assessment against trigger levels and comparison of drawdown vs predicted drawdown will happen at a minimum biannual frequency.
	  ○ At least daily groundwater level data collection (via data loggers) in MB01 to compare actual drawdown values to predicted drawdown. In the first 6 months of pumping the actual compared to predicted will be assessed at a minimum monthly basis so that the predictions can be validated and updated. After this period, biannual assessment in line with the target and background bore assessments.
	  ○ Data loggers will be downloaded at a minimum of quarterly frequency and validation manual water level readings taken so that dataloggers errors can be noticed and corrected in a timely manner.		

MM-CA03	**Acid Sulfate Soil Management Plan** A detailed Acid Sulfate Soil Management Plan (ASSMP) will be developed in conjunction with the Construction Environmental Management Plan and implemented to manage Acid sulfate soils (ASS) and any associated waters.	All areas	Construction

7.0 Conclusion

This report has identified and assessed the potential impacts on MNES according to the Significant Impact Guidelines. The Project was determined to be a 'Controlled Action' based on the Potential significant impacts on the following MNES matters:

- Ramsar wetlands.
- Listed migratory species.
- Listed threatened species and communities.

Detailed flora and fauna surveys have been conducted in order identify any potential significant impacts of the Project on MNES. A program of surveys was conducted to gain an understanding of the existing condition and threatened species that may be present within the Investigation Area.

Vegetation and habitat mapping was undertaken for the Project to further inform the targeted flora and fauna surveys. Project surveys were conducted, and the following EPBC listed species were either recorded, or have potential to occur within and surrounding the Project Area:

- Karst springs and associated alkaline fens of the Naracoorte coastal plain bioregion
- Southern Bent-wing Bat
- South-eastern Red-tailed Black Cockatoo
- Gang-gang Cockatoo
- Orange-bellied Parrot
- Blue-winged Parrot
- Australasian Bittern
- Fork-tailed Swift
- Migratory shorebirds
- White-throated Needletail
- Terrestrial and arboreal mammals
- Grey-headed Flying-fox
- Growling Grass Frog
- Swamp Skink.

These surveys informed the existing conditions of the Project Area and surround which identified several potential impacts of the Project to MNES. Potential impacts include vegetation removal and habitat disturbance, noise and vibration during construction and potential collisions with wind farm infrastructure.

Potential impacts to threatened species and communities was assessed through assessment of significance in accordance with the Commonwealth guidelines.

The Ramsar site was also investigated as a part of the Project due to its proximity to the Project Area. Potential indirect impacts on the Ramsar site has been identified as sedimentation or degradation of the quality of surface water entering the Ramsar site from the wind farm site, spill of fuels or other liquid pollutants impacts on the water quality of nearby waterways, and ultimately downstream into the Ramsar site, and extraction of groundwater as a water source during construction which results in drawdown of the water table, affecting the Ramsar site. The assessment determined that, based on the application of avoidance and mitigation strategies, the Project is unlikely to result in a significant impact to the Ramsar site.

Potential impacts MNES will be mitigated and managed through a number of mitigation measures implemented throughout various stages of the Project. These mitigation measures including a Construction Environmental Management Plan, Operational Environmental Management Plan, Native Vegetation Plan, Flora & Fauna Management Plan and a Bird and Bat Adaptive Management Plan. Additional management measures that will be implemented across the Project include strategic stockpile placement, retention of native vegetation, tree protection zones and tree pruning, disturbance site rehabilitation, turbine buffer zones, micro-siting of turbine foundations, native vegetation audits, powerline visibility measures, weed and pest animal control, wildlife management, preclearance surveys and terrestrial fauna management.

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