Hexham Wind Farm

Chapter 27

Matters of National Environmental Significance

WIND PROSPECT

27.1 Overview

Matters of National Environmental Significance (MNES) are specific environmental values that are protected and managed at a Commonwealth level under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). They represent the highest level of protection under Australian law, recognising their cultural, historic, and ecological significance. There are nine legislated categories of MNES, being:

- World Heritage properties
- National Heritage places
- wetlands of international importance (Ramsar wetlands)
- listed threatened species and ecological communities
- listed migratory species
- Commonwealth marine areas
- The Great Barrier Reef Marine Park
- nuclear actions (including uranium mining)
- a water resource, in relation to coal seam gas and large coal mining developments.

The project was referred to the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) under the EPBC Act in March 2022 (EPBC Act Referral Number: 2022/09287). On 31 August 2022 the Commonwealth Minister for the Environment determined the project is a 'controlled action' due to the potential for impacts to listed threatened species and communities (sections 18 and 18A of the EPBC Act) and listed migratory species (sections 20 and 20A of the EPBC Act). Migratory species are those protected under international agreements, described in Section 27. of this chapter, and include birds that travel between countries as part of their natural life cycle.

This chapter describes relevant MNES within and surrounding the project site and assesses whether the project has the potential to result in a significant impact to those environmental values, as defined by the Significant Impact Guidelines 1.1 - Matters of National Environmental Significance (DoE, 2013). This chapter is based on the findings of the ***Flora and Fauna Assessment*** (Appendix D) and the ***Bat Assessment*** (Appendix C2), both prepared by Nature Advisory. Other impacts to biodiversity and habitat, including native vegetation and threatened species and communities not protected under the EPBC Act, are presented in Chapter 8 – ***Biodiversity and habitat.***

A **significant impact** in relation to MNES is an impact that is important, notable, or of consequence, considering its context or integrity.

These are determined in relation to significant impact criteria set for threatened species and communities based on their conservation status.

The assessment identified the presence or potential occurrence of multiple MNES within the investigation areas, including:

- two listed threatened flora species
- three listed threatened ecological communities
- ten listed migratory bird species
- two listed threatened bird species
- two listed threatened bat species
- one listed threatened reptile species
- one listed threatened frog species
- one listed invertebrate species.

In addition, one individual flora specimen was observed that was unable to be identified at a species-level due to a lack of flowering material. It is understood that specimen could be an additional threatened flora species, listed under the EPBC Act.

Potential impacts to MNES have been assessed across various pathways including habitat loss, disturbance and collision risk. The project design incorporates avoidance and minimisation measures and, where residual impacts remain, offset requirements have been calculated in accordance with the EPBC Act Environmental Offsets Policy (DSEWPaC, 2012). Targeted MNES-specific management controls will also be implemented during project construction and operation to minimise potential impacts, including habitat buffers, seasonal scheduling of specific construction activities, protection zones, curtailment strategies and the establishment of nest boxes where breeding locations cannot be avoided.

Potential significant impacts were identified for two ecological communities (Natural Temperate Grassland of the Victorian Volcanic Plain and Grassy Eucalypt Woodland of the Victorian Volcanic Plain) and one fauna species (Striped Legless Lizard), with all other MNES assessed as unlikely to be significantly impacted. The findings summarised in this chapter will inform an approval decision under the bilateral agreement between the Commonwealth and the State of Victoria. Offsets will be used to compensate for significant impacts to MNES in accordance with the EPBC Act Environmental Offsets Policy (DSEWPaC, 2012).

27.2 EES objectives and key issues

The EES scoping requirements specify the following evaluation objective and key issues, outlined in Table 27.1, relevant to MNES that have guided this assessment.

Table 27.1 EES evaluation objective and key issues

Evaluation objective	
Biodiversity and habitat: *To avoid, and where avoidance is not possible, minimise potential adverse effects on biodiversity values within and near the site including native vegetation, listed threatened species and ecological communities, and habitat for these species. Where relevant, offset requirements are to be addressed consistent with state and Commonwealth policies.*	
Key issues	• Direct loss or degradation of native vegetation and associated listed ecological communities, including those listed as threatened under the EPBC Act and/or the FFG Act. • Direct loss or degradation of habitat for migratory or threatened flora and fauna listed under the EPBC Act and/or the FFG Act. • Disturbance and/or degradation of adjacent or nearby habitat that may support listed threatened or migratory species or other protected flora, fauna or ecological communities • Disturbance and increased mortality risk to flora and fauna species listed under the EPBC Act and/or FFG Act. • Indirect habitat loss or degradation resulting from other effects, such as edge effects, surface hydrological changes, groundwater drawdown, noise, vibration, light or the introduction of weeds/ pathogens. • Disruption to the movement of fauna between areas of habitat across the broader landscape, including between roosting, breeding and potential foraging sites for the Southern Bent-wing Bat and Grey-headed Flying-fox. • The availability of suitable offsets for the loss of native vegetation and habitat for listed threatened species under the EPBC Act and/or FFG Act. • Potential collision risk for protected bird and bat species with project infrastructure, including with wind turbine blades. • Potential impacts on groundwater dependent ecosystems. • Potential cumulative effects on relevant listed threatened and migratory species and communities of flora and/or fauna, in particular, but not limited to, Brolga, Southern Bent-wing Bat, Grey-headed Flying-fox, White-throated Needletail and Black Falcon from the project in combination with the construction and operations of other energy facilities. • Potential for the project to have significant impact on wetland systems, including, but not limited to, Seasonal Herbaceous Wetlands (EPBC Act listed community), and the ability for wetland systems to support habitat for flora species listed under the FFG Act and EPBC Act.

27.3 Legislation, policy and guidelines

The key legislation, policies and guidelines relevant to Matters of National Environmental Significance (Appendix D – ***Flora and Fauna Assessment*** and Appendix C2 – ***Bat Assessment***) are summarised in Table 27.2 below.

Table 27.2 Relevant legislation, policies and guidelines

Legislation, policy and guidelines	Description	Relevance to the project
Commonwealth		
Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)	The EPBC Act provides a framework for the protection and management of defined matters of national environmental significance (MNES). Under the EPBC Act there are nine MNES. Two of the nine MNES are relevant to the project. These are: • nationally threatened species and threatened ecological communities • migratory species.	The project was referred to the Department of Climate Change, Energy, the Environment and Water (DCCEEW) under the EPBC Act on March 2022 (EPBC 2022/09287). On 31 August 2022, the Commonwealth Minister for the Environment determined that the project is a 'controlled action' as it may have a significant impact on the following MNES: • listed threatened species and communities (sections 18 and 18A) • listed migratory species (sections 20 and 20A). It was determined the project would be assessed under the bilateral agreement between the Commonwealth and State of Victoria. Under this agreement, the Victorian Minister for Planning's assessment of the environmental effects of the project (i.e., based on this EES) would be provided to the Commonwealth Minister for the Environment to inform the approval decision in relation to the EPBC Act. Further information on the EPBC Act assessment process is outlined in Chapter 3 – ***Legislation and policy framework***.
International Agreements Protecting Migratory Birds	Australia is a party to several international agreements that aim to protect migratory bird species. These include: • Japan – Australia Migratory Bird Agreement (JAMBA) • China – Australia Migratory Bird Agreement (CAMBA) • Republic of Korea – Australia Migratory Bird Agreement (ROKAMBA) • Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention). These agreements are implemented through the EPBC Act, which lists migratory species protected under these conventions.	The project may impact listed migratory bird species protected under these international agreements. As such, these agreements were considered in the assessment of potential impacts to migratory species under the EPBC Act. The EPBC referral and controlled action determination reflect Australia's obligations under these agreements.

Legislation, policy and guidelines	Description	Relevance to the project
EPBC Act Environmental Offsets Policy (DSEWPaC, 2012)	This policy guides the use of environmental offsets under the EPBC Act to compensate for significant residual impacts on MNES that cannot be avoided or mitigated. It sets out principles for effective offsets, including that they must deliver a conservation gain, be in proportion to the level of impact, and be targeted, measurable, and time bound.	The project's potential residual impacts on MNES, including listed threatened species and migratory species, were considered in accordance with the EPBC Act Environmental Offsets Policy. Where significant residual impacts have been identified, offset measures are proposed to ensure compliance with the policy's requirements.
Other guidelines		
Significant Impact Guidelines 1.1 – MNES, EPBC Act (Significant Impact Guidelines) (DoE, 2013)	The Significant Impact Guidelines outline criteria against which a project is assessed to determine whether it is likely to have a significant impact on MNES.	Potential impacts to MNES from the project were considered in accordance with the Significant Impact Guidelines.
Policy statements / Nationally threatened species guidelines	Policy statements and species guidelines relevant to the project include: • National Recovery Plan for the Southern Bent-wing Bat *Miniopterus orianae bassani* (DELWP, 2020a) • National Recovery Plan for the Grey-headed Flying-fox *Pteropus poliocephalus* (DAWE, 2021) • EPBC Act Policy Statement 3.21 - Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species (DoEE, 2017). • Significant impact guidelines for the critically endangered spiny rice-flower (*Pimelea spinescens* subsp. *spinescens*) (DEWHA, 2023) • Significant impact guidelines for the vulnerable growling grass frog (*Litoria raniformis*) (DEWHA, 2009) • Referral guidelines for the vulnerable striped legless lizard, *Delma impar* (DSEWPaC, 2011a) • Referral guideline for management actions in Grey-headed and Spectacled flying-fox camps (DoE, 2015b)	These statements and guidelines were considered as part of the significant impact assessment process for relevant threatened species.

Legislation, policy and guidelines	Description	Relevance to the project
Survey guidelines	Survey guidelines relevant to the project include: • Referral guideline for 14 birds listed as migratory species under the EPBC Act (DoE, 2015a). • Survey guidelines for Australia's threatened reptiles (DSEWPC, 2011b) • Survey guidelines for Australia's threatened bats (DEWHA, 2010).	These survey guidelines provide advice on survey techniques for specific threatened species and give guidance on DCCEEW's expectations on surveys. They were considered when designing targeted surveys for MNES.
Onshore Wind Farm Guidance - Best practice approaches when seeking approval under Australia's national environmental law - Draft (DCCEEW, 2024a)	This guidance document outlines best practice for planning and assessing onshore wind farm projects under the EPBC Act. It provides advice on survey requirements and management plans for nationally threatened bird and bat species.	Attachment V - ***Bat and Avifauna Management Plan*** has been prepared in accordance with the draft Onshore Wind Farm Guidance (DCCEEW, 2024a).

27.4 Investigation area

Three investigation areas for MNES were considered to account for all phases of the project, including the transportation of materials. These included:

- The 'project site investigation area', which includes current and previously proposed infrastructure locations, with buffers applied around access tracks, cable trenches, and wind turbines to assess potential impacts and support design development.
- The 'transport route investigation area', which includes two potential oversize and overmass vehicle transport routes connecting to the project site from Geelong and Portland, as well as a Combined Transport Route option, assessed to inform route selection.
- The 'roadside upgrade investigation area', which includes roadside locations proposed for upgrade as part of the project, dependent on the transport route chosen.

For detailed definitions and descriptions of the investigation areas used throughout this EES, refer to Chapter 8 – ***Biodiversity and Habitat***. This chapter outlines the spatial extent and purpose of each area, including buffers applied and the rationale for their inclusion in ecological assessments.

Database searches for potential MNES included the project site plus a buffer area of at least 10 kilometres from the project site boundary, referred to as the 'investigation region'. An overview of the project site and the location of transport route options is shown in Figure 27.1.

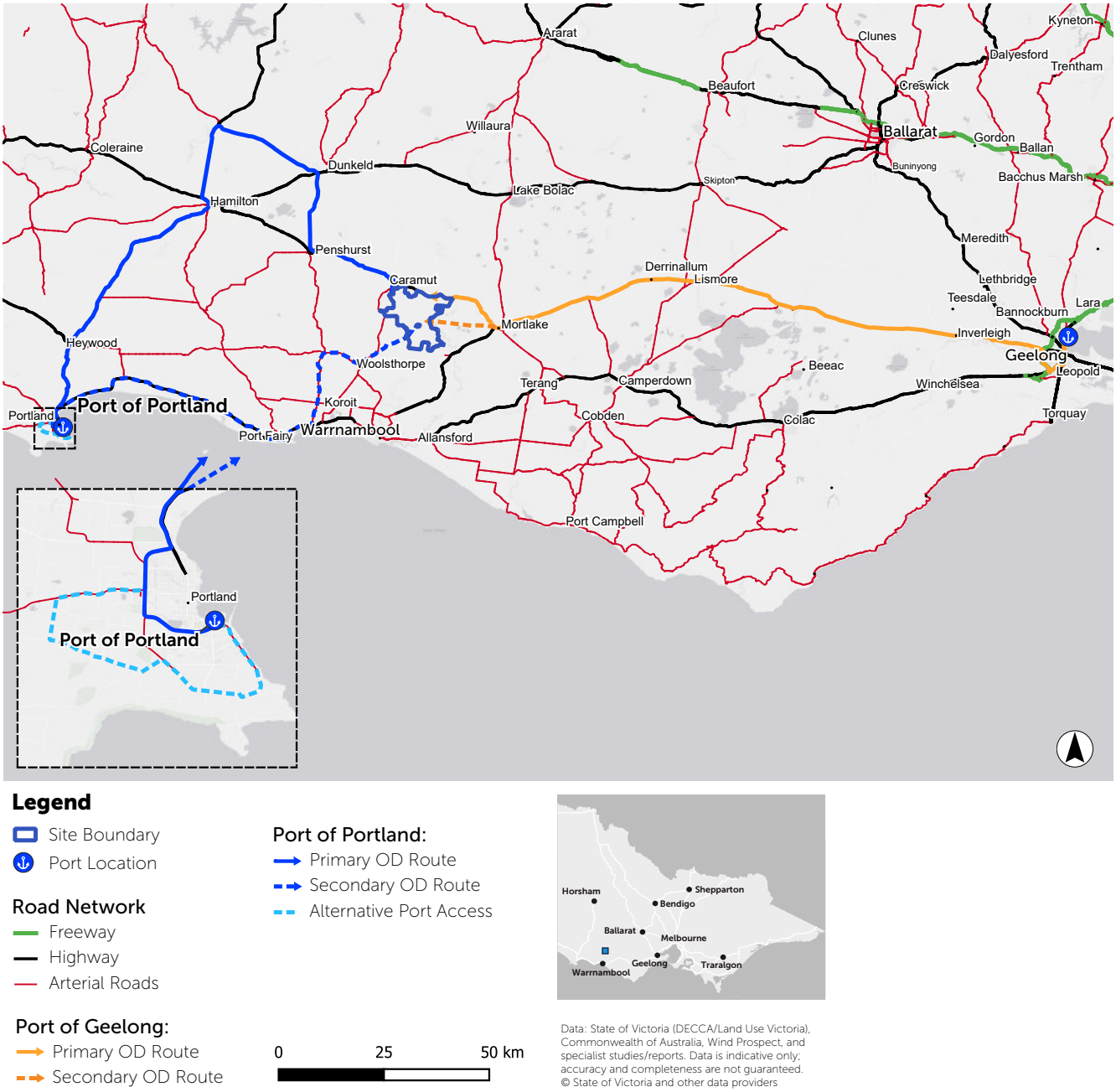

Figure 27.1 Overview of the project site and proposed transport routes

27.5 Method

The presence of MNES across the project site and surrounding areas, including threatened species and ecological communities and listed migratory species, was characterised through a combination of desktop information and field-based surveys. These investigations are described in the following sections.

The MNES assessment was also informed by the assessments detailed in Chapter 8 - ***Biodiversity and habitat***.

27.5.1 Desktop review

The preliminary likelihood of occurrence for MNES was assessed based on a desktop review of the Commonwealth's Protected Matters Search Tool, in conjunction with findings of the native vegetation assessments undertaken by Ecology and Heritage Partners (EHP) and Nature Advisory. Species rated as 'likely to occur' were those that are considered to have a very high chance of occurring based on historical records in the investigation areas and the presence of suitable habitat. Species rated as having 'potential to occur' were those for which suitable habitat exists, but recent records of the species are scarce. These assessments are described in detail in Chapter 8 - ***Biodiversity and habitat***.

The **Protected Matters Search Tool** provides mapped locations of MNES such as World Heritage properties, National Heritage places, Ramsar wetlands, and Commonwealth marine areas. It also records the locations of sightings and known habitats of listed species and ecological communities, included migratory species based on verified data from government agencies, research institutions, and conservation bodies.

27.5.2 Targeted surveys and assessment

EPBC Act-listed threatened species and ecological communities assessed as potentially or likely to be present within the investigation areas, or those that are known to occur, were investigated further through targeted surveys and assessments. This also included the EPBC Act listed species of particular concern highlighted in the EES scoping requirements (i.e., Southern Bent-wing Bat, Grey-headed Flying-fox and White-throated Needletail). These surveys were undertaken to confirm the presence of MNES and characterise the extent and quality of threatened ecological communities and habitat, and the use of the investigation area by listed species.

Initial targeted assessments were undertaken by EHP and commenced in 2011. Surveys conducted by Nature Advisory were undertaken from 2018 onwards. This survey effort relevant to EPBC Act-listed threatened species and ecological communities is summarised in Table 27.3 below. Additional information on all surveys and assessments undertaken to assess biodiversity and habitat within the investigation areas is provided in Chapter 8 - ***Biodiversity and habitat*** and Chapter 9 - ***Bats.***

Table 27.3 Targeted surveys and assessments

Mnes (key species)	Assessment type and method
Listed flora species	
Fragrant Leek-orchid (*Prasophyllum suaveolens*)	**Targeted flora surveys** undertaken during the October-November detection period in 2018 and 2021, within identified areas of suitable habitat (EVC 132_61, particularly in roadside remnants dominated by Kangaroo Grass). Additional surveys undertaken for spring-flowering orchids in all areas of suitable habitat, comprising Heavier-soils Plains Grassland (EVC 132_61) and areas of Plains Grassy Woodland (EVC 55_61 and EVC 55_63) supporting a native ground layer. Areas proposed to be impacted (i.e. within the construction disturbance area or operational footprint) were inspected thoroughly along transects spaced 5 metres apart.

Mnes (key species)	Assessment type and method
Spiny Rice-flower (*Pimelea spinescens subsp. spinescens*)	**Targeted flora surveys** undertaken during the April-August detection period in 2025 within identified areas of suitable habitat (EVC 132_61). Targeted surveys in all areas of suitable habitat proposed to be impacted have been conducted during the detection period. Inspections were undertaken along transects spaced 5 metres apart.
Listed ecological communities	
Natural Temperate Grassland of the Victorian Volcanic Plain	**Detailed vegetation assessment** undertaken at all sites within the investigation areas that were found to support native vegetation or with the potential to support listed matters. These were undertaken within the project site investigation area in November 2018 and 2021. An updated native vegetation assessment was undertaken in June 2025, which also included the transport route and roadside upgrade investigation areas. Targeted surveys were also taken in Summer 2025 for potential occurrences of Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lower Plain ecological community, following a period of sufficient rainfall to enable assessment under the typical pattern of seasonal wetting and drying, required by wetland flora typical of this community (Threatened Species Scientific Committee, 2012). The extent of listed ecological communities was mapped through a through a combination of aerial photograph interpretation and ground-truthing using a hand-held GPS.
Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains	
Grassy Eucalypt Woodland of the Victorian Volcanic Plain	
Listed migratory species	
Common Greenshank (*Tringa nebularia*)	**Wetland habitat assessments** undertaken during spring and summer to assess their suitability as foraging habitat for migratory shorebirds. During these assessments all sightings of listed migratory shorebirds were recorded. Five two-day surveys were undertaken across December 2018, and January to March 2019. **Bird utilisation surveys** undertaken using a fixed-point survey method with an observation period of 15 to 20 minutes. These surveys were undertaken in Spring 2018, Summer 2019, Winter 2024, Spring 2024, Summer 2025, and Autumn 2025. Incidental observations of listed migratory species were also recorded during other surveys undertaken by EHP and Nature Advisory.
Common Sandpiper (*Actitis hypoleucos*)	
Curlew Sandpiper (*Calidris ferruginea*)	
Double-banded Plover (*Charadrius bicinctus*)	
Marsh Sandpiper (*Tringa stagnatilis*)	
Red-necked Stint (*Calidris ruficollis*)	
Sharp-tailed Sandpiper (*Calidris acuminata*)	
Latham's Snipe (*Gallinago hardwickii*)	
White-throated Needletail (*Hirundapus caudacutus*)	**Targeted bird utilisation surveys** using a fixed-point count method with an observation period of 45 minutes. These surveys were undertaken between December 2022 and March 2023.
Fork-tailed Swift (*Apus pacificus*)	**Bird utilisation surveys** undertaken using a fixed-point survey method with an observation period of 15 to 20 minutes. These surveys were undertaken in Spring 2018, Summer 2019, Winter 2024, Spring 2024, Summer 2025, and Autumn 2025.
Other listed fauna species	
Blue-winged Parrot (*Neophema chrysostoma*)	**Bird utilisation surveys** undertaken using a fixed-point survey method with an observation period of 15 to 20 minutes. These surveys were undertaken in Spring 2018, Summer 2019, Winter 2024, Spring 2024, Summer 2025, and Autumn 2025. Incidental observations of listed migratory species were also recorded during other surveys undertaken by EHP and Nature Advisory.

Mnes (key species)	Assessment type and method
Gang-gang Cockatoo (*Callocephalon fimbriatum*)	**Bird utilisation surveys** undertaken using a fixed-point survey method with an observation period of 15 to 20 minutes. These surveys were undertaken in Spring 2018, Summer 2019, Winter 2024, Spring 2024, Summer 2025, and Autumn 2025. **Habitat assessment** undertaken to assess the general faunal habitats present along the Portland and Geelong Transport Routes options, and their suitability for supporting foraging requirements of the species. These assessments were based on surveys undertaken by Nature Advisory.
Southern Bent-wing Bat (*Miniopterus orianae bassanii*)	**Targeted bat detector surveys** undertaken to record bat activity using ultrasonic microphones to record bat calls at different locations and heights across the project site. The presence of the Southern Bent-wing Bat was assessed through its unique call sequences. A total survey effort of 4,619 detector nights was undertaken across Spring 2010, Summer/Autumn 2011, Spring/Summer 2018, Summer/Autumn 2019, Summer/Autumn 2020 and Autumn 2023. **Habitat assessments** undertaken to assess the general faunal habitats present across the project site, and their suitability for supporting foraging requirements of the species. These assessments were based on surveys undertaken by Nature Advisory and EHP.
Grey-headed Flying-fox (*Pteropus poliocephalus*)	**Targeted field surveys** undertaken to determine the presence, number, and typical flight paths of Grey-headed Flying-fox at a temporary camp established and used seasonally in a pine plantation to the east of the project site in Summer/Autumn 2022 and 2023. **Acoustic recording** undertaken within the temporary Grey-headed Flying-fox camp to monitor their presence and departure in Autumn 2023. **Habitat assessments** undertaken to assess the general faunal habitats present across the project site, and their suitability for supporting foraging requirements of the species. These assessments were based on surveys undertaken by Nature Advisory and EHP.
Striped Legless Lizard (*Delma impar*)	**Habitat assessment** undertaken to determine the presence of suitable habitat within roadside reserves. No targeted field surveys were undertaken based on early advice from the Department of the Environment and Primary Industries (DEPI) (now the Department of Energy, Environment, and Climate Action (DEECA)) to assume presence within suitable habitat.
Growling Grass Frog (*Litoria raniformis*)	**Wetland and aquatic habitat assessment** undertaken during Spring 2011 and 2018 to assess their suitability as habitat for the Growling Grass Frog. This considered the presence and quality of key habitat components such as water permanence, aquatic and fringing vegetation, shelter availability, connectivity with other suitable habitats and signs of disturbance. During these assessments, Growling Grass Frog calls were opportunistically recorded.
Golden Sun Moth (*Synemon plana*)	**Targeted surveys** undertaken during Summer 2011/12 by EHP at the requirement of the Department of Environment and Primary Industries (now the DEECA), despite the low likelihood of occurrence identified through preliminary fauna surveys. **Habitat assessment** undertaken to assess the general faunal habitats present along the Portland and Geelong Transport Routes options, and their suitability for supporting the species. These assessments were based on surveys undertaken by Nature Advisory.

27.5.3 Significant impact assessment

Nature Advisory assessed the proposed project works against the Significant Impact Guidelines (DoE, 2013) to determine whether potential project impacts would be 'significant'.

This assessment considered the EPBC Act listed threatened species and communities included in the EES scoping requirements, as well as those recorded through targeted surveys and assessments or initially identified in the desktop review as potentially occurring within the investigation areas.

27.5.4 Offset management

Where a significant impact to an EPBC Act listed species or community was considered unavoidable, offset requirements will be calculated in accordance with the EPBC Act Environmental Offsets Policy (DSEWPaC, 2012) based on the detailed design of the project. Suitable offsets have been identified by Nature Advisory, as detailed in Appendix D - ***Flora and Fauna Assessment***.

Offsetting requirements for the removal, destruction or lopping of native vegetation are discussed separately in Chapter 8 - ***Biodiversity and habitat***.

Offset Requirements under the EPBC Act

Where significant residual impacts to MNES cannot be avoided or mitigated, environmental offsets may be required under the EPBC Act. These include **species offsets**, which must deliver a measurable benefit for listed threatened species or ecological communities, and **native vegetation offsets**, which compensate for the loss of habitat by protecting or enhancing vegetation of a similar type and condition.

27.6 Matters of National Environmental Significance

The project site is located within a rural landscape dominated by agriculture, including dryland cropping and sheep and cattle grazing, with scattered residences. Extensive historical clearing for farming has left patches of native vegetation largely confined to roadside reserves, watercourses and isolated patches within private properties. These remnant patches of native vegetation include native grasslands, wetlands, and woodlands.

The MNES relevant to this project, as confirmed by the Minister for Planning through the EES scoping requirements, are:

- Threatened species and ecological communities listed under the EPBC Act.
- Migratory species listed under the EPBC Act.

The existing ecological conditions within the investigation areas related to these MNES are summarised in the following sections. Existing conditions relating to other native flora, fauna and ecological communities are described in Chapter 8 - ***Biodiversity and habitat*** and comprehensively detailed in Appendix D - ***Flora and Fauna Assessment***.

27.6.1 Flora species

A desktop review of the Victorian Biodiversity Atlas records and Protected Matters Search Tool indicated that within the investigation region there were records of, or potential suitable habitat for, 31 flora species listed under the EPBC Act. Of these, two species were assessed as having the potential to occur within areas of remnant vegetation in the investigation areas: Fragrant Leek Orchid (*Prasophyllum suaveolens*) and Spiny Rice-flower (*Pimelea spinescens* subsp. *spinescens*). The presence of these species within the investigation areas and habitat requirements are discussed in the following sections. Additionally, targeted surveys undertaken in October 2025 identified a single *Dianella* individual, which could be identified to the species level due to a lack of flowering material. There is potential that this individual is a Matted Flax-lily (*Dianella amoena*), listed as Endangered under the EPBC Act. This individual will be re-examined and identified in the December 2025 surveys. However, regardless of its identification, this individual will not be impacted by the proposed construction disturbance area or operational footprint.

Fragrant Leek-orchid

The Fragrant Leek-orchid, listed as Endangered under the EPBC Act, is considered to have potential to occur within the project site investigation area. This species has been previously recorded within the investigation region along Caramut-Chatsworth Road, to the north of the project site, and suitable habitat has been identified within the project site investigation area. However, no individuals were recorded by Nature Advisory during targeted assessments. As such, it is considered unlikely to occur within the investigation areas.

Spiny Rice-flower

The Spiny Rice-flower (Figure 27.2), listed as Critically Endangered under the EPBC Act, was recorded incidentally during the native vegetation surveys in June 2025. Following this, targeted surveys for this species were undertaken from 8 to 10 July 2025 in areas of suitable habitat, identified as areas of Heavier-soils Plains Grassland (EVC 132_61) native vegetation, which is considered to provide sufficient species and structural diversity to support the Spiny Rice-flower. A population of Spiny Rice-flower was recorded within Habitat Zone 1N along Hamilton Highway, within the project site investigation area, consisting of approximately 158 individuals.

This species was deemed unlikely to occur within impact areas on private land due to a lack of suitable habitat, as much of the ground layer was highly modified and dominated by introduced pasture grasses.

Figure 27.2. **Spiny Rice-flower**
(Source: Nature Advisory)

27.6.2 Ecological communities

Desktop reviews identified the following five threatened ecological communities, listed under the EPBC Act, which have the potential to occur within the investigation areas:

- **Grassy Eucalypt Woodland of the Victorian Volcanic Plain** (Critically Endangered)
- **Natural Temperate Grassland of the Victorian Volcanic Plain** (Critically Endangered)
- **Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains** (Critically Endangered)
- **Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia** (Endangered)
- **White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland** (Critically Endangered).

Based on vegetation and flora assessments and a review of published descriptions and condition thresholds, two of these ecological communities were confirmed to occur within the project site investigation area, transport route investigation area and roadside upgrade investigation area: Natural Temperate Grassland of the Victorian Volcanic Plain (Figure 27.3) and Grassy Eucalypt Woodland of the Victorian Volcanic Plain (Figure 27.4).

Due to drought conditions and survey timing in Winter and Spring 2025, potential Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains could not be properly evaluated against the relevant listing advice. However, further evaluation was undertaken in the December 2025 surveys when the typical pattern of seasonal wetting and drying was evident, which confirmed that diagnostic criteria for this threatened ecological community was not met.

The presence of these ecological communities within the investigation areas is described in the following sections. No other threatened ecological communities were recorded during field-based surveys or have been assessed as having the potential to occur.

Natural Temperate Grassland of the Victorian Volcanic Plain

The Natural Temperate Grassland of the Victorian Volcanic Plain ecological community, listed as Critically Endangered under the EPBC Act, was recorded within all investigation areas in patches of Heavier-soils Plains Grassland (EVC 132_61). This included:

- **3.288 hectares** recorded within the project site investigation area, along Woolsthorpe-Hexham Road, Cooramook Lane and Hamilton Highway.
- **9.279 hectares** recorded within the transport route investigation area.
- **17.878 hectares** recorded within the roadside upgrade investigation area.

In total, **20.596 hectares** were identified (accounting for overlap between the investigation areas). All other patches of Heavier-soils Plains Grassland (EVC 132_61) did not to meet the condition thresholds for this community due to these either being too small or lacking the required dominant species cover.

Figure 27.33
Natural Temperate Grassland of the Victorian Volcanic Plain in Habitat Zone 4A on Woolsthorpe-Hexham Road
(*Source: Nature Advisory*)

Grassy Eucalypt Woodland of the Victorian Volcanic Plain

The Grassy Eucalypt Woodland of the Victorian Volcanic Plain ecological community, listed as Critically Endangered under the EPBC Act, was recorded within all investigation areas in areas of Plains Grassy Woodland (EVC 55_61). This included:

- **5.113 hectares** recorded within the project site investigation area, along Hexham-Ballangeich Road
- **5.559 hectares** recorded within the transport route investigation area.
- **11.138 hectares** recorded within the roadside upgrade investigation area.

In total, 11.318 hectares were identified (accounting for overlap between the investigation areas). This community was primarily recorded in areas of remnant native vegetation which included native trees, typically dominated by River Red Gum (*Eucalyptus camaldulensis*). All other patches of Plains Grassy Woodland (EVC 55_61) and High Rainfall Grassy Woodland (EVC 55_63), which can also support this ecological community, did not meet the condition thresholds for this community. This was due to them being too small or lacking sufficient native vegetation cover or the required density of species or large trees.

Figure 27.24
Grassy Eucalypt Woodland of the Victorian Volcanic Plain in Habitat Zone DA3 on Hexham-Ballangeich Road
(*Source: Nature Advisory*)

27.6.3 Fauna species

A desktop review of the Victorian Biodiversity Atlas records and Protected Matters Search Tool indicated that within the investigation region there were records of, or potential suitable habitat for, 43 fauna species listed under the EPBC Act. This includes migratory birds protected under international treaties, as well as threatened fauna species (some of which are also listed migratory species).

Of these, 16 were assessed as having the potential to occur within the investigation areas or were likely or known to occur. This included:

- **Migratory birds:** Common Greenshank, Curlew Sandpiper, Common Sandpiper, Double-banded Plover, Fork-tailed Swift, Latham's Snipe, Marsh Sandpiper, Red-necked Stint, Sharp-tailed Sandpiper and White-throated Needletail
- **Non-migratory birds:** Blue-winged Parrot, Gang-gang Cockatoo
- **Bats:** Southern Bent-wing Bat, and Grey-headed Flying Fox
- **Reptiles:** Striped Legless Lizard
- **Frogs:** Growling Grass Frog
- **Invertebrates:** Golden Sun Moth.

Of these, the Gang-gang Cockatoo and Golden Sun Moth were only considered as having the potential to occur, or being likely to occur, within the transport route and roadside upgrade investigation areas. The presence and habitat requirements of all species are discussed below.

Migratory birds

The project site contains a number of wetlands and waterbodies that have the potential to provide foraging habitat for migratory shorebird species listed under the EPBC Act. However, Nature Advisory determined that most of these were unsuitable due to dense vegetation growth, particularly along sections of Mustons Creek, and their ephemeral nature. Typically, these species require open shorelines and shallow open water or mud in which to forage. Latham's Snipe (listed as Vulnerable and Migratory under the EPBC Act) is an exception, with Mustons Creek and some of the muddy margins of a large (un-named) lake and large dam within the project site considered to provided habitat for this species.

Migratory shorebirds are a type of migratory bird that typically forage in coastal and inland wetlands. They depend on undisturbed, productive wetland habitats for feeding and roosting.

Despite limited suitable habitat, a number of migratory shorebirds were recorded during targeted surveys or incidentally recorded during other surveys undertaken by EHP and Nature Advisory. These included:

- one incidental recording of the **Common Sandpiper** (*Actitis hypoleucos*) during bat surveys in the Summer-Autumn 2020 survey period.
- one pair of **Double-banded Plover** *(Charadrius bicinctus)*, recorded in the permanent large lake central to the project site (Wetland No. 29405) during the February 2019 wetland habitat surveys.
- an incidental recording of the **Red-necked Stint** *(Calidris ruficollis)* during Brolga surveys. Eight were individuals previously recorded by EHP (2014).
- a small group (seven to eight birds) of **Sharp-tailed Sandpiper** *(Calidris acuminata)* recorded on the permanent large lake central to the project site (Wetland No. 29405) during the December 2018 wetland habitat surveys.
- one pair of **Latham's Snipe** *(Gallinago hardwickii)* recorded within vegetation along a seasonal expansion of Mustons Creek (Wetland No. 111) during January 2019 wetland habitat surveys.

None of these species were recorded in numbers that would constitute a significant population, indicating that the project site is used infrequently by protected migratory shorebirds and does not contain significant habitat.

Based on wetland habitat surveys, the following migratory shorebird species (not recorded within surveys) are considered likely or have the potential to occur within the project site:

- **Common Greenshank** (*Tringa nebularia*)
- **Curlew Sandpiper** (*Calidris ferruginea*)
- **Marsh Sandpiper** (*Tringa stagnatilis*)

Given these species were not recorded in surveys, this suggests they are unlikely to frequently use the area in or around the project site or be recorded in large numbers.

The presence of other migratory bird species (i.e. not migratory shorebirds) was also assessed. However, none were recorded within surveys. Two migratory insectivore species are considered likely or have the potential to occur within the project site:

- **White-throated Needletail** (*Hirundapus caudacutus*)
- **Fork-tailed Swift** (*Apus pacificus*).

These species are less dependent on wetland habitats for feeding and roosting, as they spend most of their life in flight where they forage for flying invertebrates, including termites, ants, beetles and flies. Three targeted surveys were undertaken for the White-throated Needletail between December 2022 and March 2023, a period during which the White-throated Needletail is known to occur in Victoria. Weather conditions during the surveys were conducive to observations, however there are limitations for human based surveys for this species due to its brief, variable and often weather dependent seasonal presence. These involved repeated fixed-point counts at 10 locations across the project site. Further detail on the targeted surveys undertaken is provided in Section 9.2 of Appendix D – ***Flora and Fauna Assessment***.

Non-migratory birds

The Blue-winged Parrot (*Neophema chrysostoma*), listed as Vulnerable under the EPBC Act, is known to occur within the project site and was incidentally recorded in flocks, singles and pairs by Nature Advisory during bird utilisation surveys. Several Blue-winged Parrot were recorded in 2024 and 2025 surveys, foraging on grasses and weeds growing on sides of farm tracks, in paddocks and near revegetation windbreaks in flocks, pairs and individually.

The project site is within the known breeding area for the species. However, it is unlikely that breeding occurs within the project site due to the absence of mature woodland (including hollow-bearing trees used for breeding) and the lack of records during the breeding season. Given the low number of individuals observed and the irregularity of sightings, it is considered unlikely that the Blue-winged Parrot frequently uses or regularly passes through the available habitat within the project site.

The Gang-gang Cockatoo (*Callocephalon fimbriatum*), listed as Endangered under the EPBC Act, is likely to occur along the Port of Portland Transport Route option. It has been recorded in roadside woodland near Cavendish, where suitable habitat is present. However, this species is unlikely to occur within the project site itself as it lies outside its natural distribution range and provides limited suitable habitat.

Bats

The Southern Bent-wing Bat (*Miniopterus orianae bassanii*), listed as Critically Endangered under the EPBC Act, is a cave roosting microbat species with limited distribution in south-eastern Australia. A total of 218 Southern Bent-wing Bat calls were recorded from 33 of the 128 targeted survey locations (i.e., 25% of survey locations) between 2010 and 2023, with an average of 0.05 calls per night. The survey location with the highest Southern Bent-wing Bat activity, which recorded 69 calls over seven bat detector nights, is no longer within the project site following a revision of the site boundary to avoid or limit impacts to the species and other environmental and social values. Design measures to avoid Southern Bent-wing Bat habitat are discussed further in Section 27.7.2. The design development of the project to avoid other environmental and social values is discussed in Chapter 5 - ***Project alternatives and design development***.

Grey-headed Flying-fox (*Pteropus poliocephalus*), listed as Vulnerable under the EPBC Act, is a megabat species that roosts in large groups, known as camps, which can support up to tens of thousands of bats. No Grey-headed Flying-fox calls were recorded at the survey locations between 2010 and 2023. However, a temporary camp was observed in the pine plantation to the east of the project site. Targeted surveys identified that this camp was active from late-Summer to mid-Autumn in 2022 and 2023, with audio recordings demonstrating that the colony left during April 2023. Other known camps are more than 30 kilometres from the project site.

Movements of the Grey-headed Flying-fox are largely driven by foraging opportunities, with major sources of food including blossoms of Eucalyptus, Corymbia, Melaleuca and Banksia. Within the project site food sources are limited to blossoms of remnant Eucalyptus and planted Sugar Gums, and seasonal fruit trees that may be planted around farmhouses.

Further detail on the occurrence of these bat species within the investigation areas is provided in Chapter 9 - ***Bats***.

Reptiles

Suitable habitat for the Striped Legless Lizard (*Delma impar*), listed as Vulnerable under the EPBC Act, is present within road reserves located throughout the project site investigation area. Suitable habitat for this species has also been identified along both the Port of Portland and Port of Geelong Transport Route option. As such, there is potential for the species to occur.

The Striped Legless Lizard prefers grassland habitats (typically with an absence of trees) and can shelter in grass tussocks, thick ground cover, soil cracks, spider burrows, or under rocks and other ground debris. It is known to occur in some areas dominated by introduced species, including areas used for grazing and pasture similar to the project site. However, it has not been recorded during targeted surveys. It is assumed that this species occurrence may also extend beyond the defined native vegetation 'patches', which require a minimum of 25% native vegetation cover to be defined.

Frogs

Growling Grass Frog (*Litoria raniformis*), listed as Vulnerable under the EPBC Act, can inhabit areas with permanent, still or slow flowing water with fringing and emergent vegetation in streams, swamps, lagoons or artificial wetlands. This species is known to occur within the project site and has been recorded at three locations along Mustons Creek. At these locations the species is assumed to use the habitat permanently throughout the year, with Mustons Creek connecting to the Hopkins River to the east of the project site where it forms a large, contiguous network of habitat. Suitable habitat for this species has also been identified along the Port of Geelong Transport Route option. As such, there is potential for the species to occur.

Several smaller tributaries of Mustons Creek within the project site may also provide habitat during the wet season and contribute to the wetland habitat network. In addition, a permanent large lake central to the project site (Wetland No. 29405) and associated dams may provide habitat, however most dams have a low habitat value for the species and have been impacted by livestock.

Invertebrates

Golden Sun Moth (*Synemon plana*), listed as Vulnerable under the EPBC Act, are supported by habitat that is, or has previously been, native grasslands or grassy woodlands. Suitable habitat for this species occurs within the project site investigation area, however targeted surveys undertaken did not detect this species. As such, it is considered unlikely to occur within the project site investigation area.

Suitable habitat for this species has also been identified along the Geelong Transport Route option. As such, there is potential for the species to occur in these areas. It is assumed that this species occurrence may also extend beyond the defined native vegetation 'patches', which require a minimum of 25% native vegetation cover to be defined.

27.7 Impact assessment

A detailed description of potential impact pathways relevant to biodiversity values, including native vegetation, and threatened species and ecological communities protected under Victorian and Commonwealth legislation, is provided in Chapter 8 – ***Biodiversity and habitat***. This also includes all measures that were introduced during the design refinement process to minimise potential impacts to these values, and management controls that are proposed to manage residual effects.

This chapter summarises the impacts relevant to MNES only as it informs the significant impact assessment, undertaken in accordance with the Significant Impact Guidelines (DoE, 2013).

27.7.1 Impact pathways

Development of the project has the potential to impact MNES during construction and operation through direct and indirect impacts to native vegetation and habitat from vegetation loss and degradation, disturbance from vehicle movements and human activity, and collisions with wind turbine blades. These impact pathways are discussed below.

Direct habitat and vegetation loss

Direct loss of MNES, specifically threatened flora species and ecological communities, may result from earthworks and physical disturbance. Vegetation removal may also result in the loss of habitat for threatened fauna species and migratory birds. Earthworks and physical disturbance resulting in direct impacts includes:

- vegetation removal, which may result in direct mortality to individual plants and/or habitat fragmentation (where previously contiguous areas of habitat are separated into smaller patches)
- excavation and trenching
- earthworks such as stockpiling or cut-and-fill material movements required to construct project infrastructure.

The shape, size and duration of physical disturbance (i.e., temporary or permanent) influences the degree to which MNES may be impacted.

Habitat and vegetation degradation (direct and indirect)

Threatened ecological communities and flora, or habitat for threatened fauna, may be degraded during construction due to:

- the spread of invasive species or pathogens transported by construction plant and equipment
- edge and barrier effects
- changes to surface water hydrology
- groundwater drawdown from operation of the on-site quarry and construction of turbine foundations where shallow groundwater is intercepted, affecting groundwater availability for groundwater dependent ecosystems
- deposition of eroded sediments into watercourses, reducing water quality and impacting riparian habitats
- contamination from accidental spills of hazardous materials.

Edge effects are ecological alterations linked with development of sudden, artificial edges of forest fragments. These changes can include greater exposure to sunlight and wind and altered vegetation structure and composition.

Barrier effects occur when there are barriers that cause habitat isolation and can reduce the ability to move through the landscape.

Disturbance from construction activities

During construction, vehicle movements, human activity and noise will increase significantly. This has the potential to disturb threatened fauna species and migratory birds listed under the EPBC Act and may:

- deter these species from using habitat areas, including a small proportion of grassland habitat that will be indirectly disturbed by construction activities
- cause behavioural changes due to increased light and noise levels, which may affect breeding and foraging success
- trigger distress responses due to unpredictable noise levels, such as that associated with turbine or infrastructure construction, or blasting at the on-site quarry.

Construction related traffic, plant, equipment, or associated infrastructure may also present a risk of collision for threatened fauna species listed under the EPBC Act, which may result in death or injury.

While disturbance will primarily occur during construction, a small amount of disturbance is also expected during project decommissioning. Operation of the project may also impact EPBC Act-listed fauna species through noise from wind turbines. However, this noise is typically continuous when the wind turbine blades are spinning and low in variability.

Collisions with wind turbines

The presence of wind turbine infrastructure during operation has the potential to impact MNES, specifically listed bat and bird species (including migratory birds) due to the risk of collision with rotating blades, which may result in injury or mortality.

Some species are particularly sensitive to turbine collisions based on their flight behaviour, for example, high-flying species or those with limited manoeuvrability. As such, the degree of impact will depend on the species affected.

In addition to direct collision risk, birds may change their behaviour and flight patterns in response to the presence of the project. Access to existing habitats may be restricted due to reluctance to fly through or over the wind farm (i.e., a barrier effect), and areas near turbines may be avoided altogether. Other disturbances, such as human activity or vehicle/machinery movements, are expected to reduce once construction activities are complete.

27.7.2 Design mitigation

The project has applied the mitigation hierarchy whereby the approach has been to firstly avoid potential impacts if possible and practical, then to minimise the severity of the impact, followed by the application of targeted mitigation and management measures.

Adoption of the mitigation hierarchy has included:

- **Avoid:** measures taken to avoid impacts from the outset using spatial placement of infrastructure away from ecological values (including MNES and habitat for MNES), or scheduling works to avoid impacts. Avoidance measures have focused on those areas that are important to terrestrial and aquatic biodiversity, particularly those areas that support rare or threatened species.
- **Minimise:** measures taken to reduce the duration, intensity and/or extent of impacts that cannot be completely avoided, as far as is practically possible. For example, limiting the number of watercourse crossings for access tracks to the minimal number needed to connect sectors of the project.
- **Offset:** measures taken to compensate for any residual, adverse impacts that cannot be avoided, minimised and/or rehabilitated or restored, in order to achieve no net loss or preferably a net gain of biodiversity. The project would offset any clearance of native vegetation.

From the earliest point in the project design, ecological considerations reflecting the potential and known presence of MNES have been built into the project geographic information system (GIS) as constraints. These constraints have been progressively refined as ecological field studies have been conducted and an improved understanding of the site has been achieved. The purpose of incorporating these constraints and buffers into the planning process was to ensure that potential impacts could be either avoided or minimised at the outset.

Other specific design measures that have been developed in response to key environmental features of the site relating to native vegetation, ephemeral wetlands, watercourses, and habitat features of threatened fauna and other MNES.

Measures incorporated through the project design process to avoid and/or minimise impacts to native vegetation, threatened ecological communities and listed flora species are discussed below. Where practicable, the project commits to further avoidance and minimisation efforts during the detailed design process.

Wetlands, watercourses and riparian zone buffers

A 100-metre buffer was applied around all wetlands mapped in the Victorian Wetland Inventory and watercourses (including Mustons Creek, Drysdale Creek and smaller drainage lines) and a 30-metre buffer around ephemeral drainage lines to exclude primary wind farm infrastructure (other than ancillary infrastructure). This area was selected as a means of:

- Limiting physical disturbance to wetlands, watercourses and their banks, and drainage lines.
- Limiting surface water runoff and sedimentation to wetlands, watercourses and drainage lines from construction work areas.

Wetlands, watercourses and riparian zones are known to be important habitats for MNES, including migratory shorebirds and the Growling Grass Frog. This includes the permanent large lake central to the project site (Wetland No. 29405) where Double-banded Plovers and Sharp-tailed Sandpipers were recorded, as well as an ephemeral expansion of Mustons Creek north of this (Wetland No. 111) where Latham's Snipe and Growling Grass Frog were recorded. At both of these locations, a 100-metre buffer to exclude project infrastructure has been applied. In most instances, turbines have been located at least 700 metres from wetland edges.

Watercourses and drains were defined using the VicMap Hydro data, which contains line features delineating hydrological features including channels, rivers and streams. Watercourse crossings for access tracks and electrical cables are needed to connect wind turbines and associated infrastructure and to provide access to infrastructure within the project site. As such, there are instances where the watercourse buffers are intersected by access tracks and electrical cables. Watercourse crossings were minimised through:

- siting of access tracks and cable routes
- design of permanent surface structures to maintain existing overland flow paths and not cause increased upstream flood levels
- design of waterway crossings to accommodate a 1 in 10 Average Recurrence Interval design criteria (i.e., 10% chance of a rainfall event of a certain magnitude is expected to occur or be exceeded in any given year).

Other key design measures for watercourse crossings are detailed in Chapter 12 - ***Surface water***.

Native vegetation and habitat avoidance

Native vegetation

Re-alignment and micro-siting of project infrastructure was undertaken during the design development, resulting in:

- most native vegetation within the project construction disturbance area being avoided
- a significant reduction (relative to earlier designs) of the amount of Grassy Eucalypt Woodland of the Victorian Volcanic Plain and Natural Temperate Grassland of the Victorian Volcanic Plain within the project construction disturbance area.
- a significant reduction (relative to earlier designs) of the amount of previously assumed Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains within the project construction disturbance area due to the removal of two laydown areas and co-location of cables and access tracks.

After initial native vegetation and threatened flora assessments along the transport routes and at locations of proposed road upgrades, the design was revised (where possible) to avoid and minimise impacts to native vegetation or threatened flora. This included a reduction of site access points through consolidation, in consultation with Ratio Traffic Consultants, resulting in a reduced impact (relative to earlier designs) to the Natural Temperate Grassland of the Victorian Volcanic Plain and Grassy Eucalypt Woodland of the Victorian Volcanic Plain threatened ecological communities along Hexham-Ballangeich Road. In total, approximately three kilometres of roadside impacts were avoided through this design modification.

As a result of design modifications along the transport routes and at locations of proposed road upgrades, only small areas of roadside habitats and threatened ecological communities are anticipated to be impacted. These impacted areas are located immediately adjacent to roadsides and therefore are generally more disturbed and degraded in comparison to retained vegetation. Areas of proposed threatened ecological community clearance and areas of avoided native vegetation clearance are shown in Figure 27.1 through Figure 2.57 of Appendix D – ***Flora and Fauna Assessment***.

The avoidance of native vegetation throughout the design process is further described in Chapter 5 - ***Project alternatives and design development***.

Bat habitat

A 269-metre buffer was proposed between the base of wind turbines and the edge of habitat features relevant to Southern Bent-wing Bat, based on the results of bat acoustic recordings and consideration of findings from other investigations (Appendix C2 – ***Bat Assessment***). However, it is not feasible to avoid all potential Southern Bent-wing Bat habitat throughout south-east Victoria using a 269-metre buffer. As such, in consultation with DEECA, a mitigation hierarchy (outlined below) was adopted to:

- avoid high quality habitat
- avoid areas with higher Southern Bent-wing Bat and Southern Bent-wing Bat-complex calls (i.e., observed echolocation calls with characteristics that could have been produced by Southern Bent-wing Bat, Little Forest Bat or Chocolate Wattled Bat)
- minimise turbine buffer overlays with medium and low quality Southern Bent-wing Bat habitat.

In total, 33 turbines were micro-sited using this method of avoidance. All turbines where the 269-metre buffer originally overlapped with permanent creek habitat were relocated to avoid such overlap, and in total there was a 93.6% reduction in the area where the buffer overlapped with any wetland habitat. Design measures to avoid and minimise impacts to bats are further discussed in Chapter 9 - ***Bats***.

Categories of avoidance

High priority avoidance: Creeks, wetlands, remnant native woodland, forestry plantations, and higher number of Southern Bent-wing Bat-definite or complex calls per night relative to other sites.

Medium priority avoidance: Planted windrows and eucalypts, farm dams, and medium number of Southern Bent-wing Bat-definite or complex calls per night relative to other sites.

Low priority avoidance: Scattered trees, isolated windrows (100 metres from other trees), and low/very low number of Southern Bent-wing Bat-definite or complex calls per night.

Migratory shorebirds

Wetlands across the project site were assessed to determine their habitat quality for supporting migratory shorebirds listed under the EPBC Act. To avoid and minimise potential impacts to these species, wind turbines have been sited away from wetlands considered to provide moderate to high-quality habitat for migratory shorebirds, as far as reasonably practicable. In most cases, turbines are located at least 700 metres from the edge of wetland areas.

Additionally, turbines have been positioned at least 100 metres from all major waterways, which may also provide habitat for migratory shorebirds including Latham's Snipe.

Minimum turbine blade height

A minimum tip height of 40 metres has been adopted for the project (i.e., all wind turbine blades would be at least 40 metres from ground level). This limit was selected to minimise potential collision risk with birds and bats, including the nationally threatened Southern Bent-wing Bat, Grey Headed Flying Fox and migratory birds.

This was informed by flight behaviour data gathered by Nature Advisory during 15 years of bird and bat surveys in south-west Victoria at a number of proposed and existing project sites, which shows decreasing potential for bird and bat strikes with increasing turbine blade height.

27.7.3 Environmental management measures

Where possible, design measures have been included to avoid potential impacts to MNES. To further minimise potential impacts, management controls would be implemented during construction and operation of the project. Committed management measures for all biodiversity values are outlined in Chapter 8 - ***Biodiversity and habitat***. Specific control measures relevant to MNES are outlined in Table 27.4.

Table 27.4 Biodiversity management measures relevant to MNES

Biodiversity impact	Project phase	Management measures	Number
Habitat and vegetation degradation (direct and indirect) Disturbance from construction activities	Construction	**Construction Environmental Management Plan – Biodiversity and biosecurity management** 1. Prior to the commencement of construction, develop and implement biodiversity and biosecurity management measures. These measures will be documented in the Construction Environmental Management Plan (EMM01), and include: a. showing the native vegetation to be removed and retained (including Vegetation Protection Zones, in accordance with EMM BH02) on all site plans b. designating entry and exit points from each property within the project site c. requiring biosecurity signage, with clear instructions and contact details, at all project site entry points d. requiring a site induction for all employees and visitors, including specific requirements in relation to: i. Native vegetation ii. Threatened ecological communities iii. Listed flora species, including Purple Blown Grass (Lachnagrostis semibarbata var. filifolia) iv. Listed fauna species known, likely, or with the potential to occur within the project site. e. requiring habitat restoration once impacts cease, in areas not required to support operation of the project f. establishing decontamination bays at all project site entries and between properties, where necessary, to prevent the spread of weeds across the project site g. measures to ensure any materials imported to the project site are free from biosecurity risks, including record keeping of all materials h. measures to avoid, minimise, and mitigate potential impacts on listed species i. measures to minimise the disturbance of banks, channels and nearby vegetation where essential wind farm infrastructure (e.g. access roads, or transport route swept paths) crosses a creek line or wetland identified as potential habitat of a listed aquatic fauna species. These works will preferably be undertaken during periods when the creek line or wetland is dry and if feasible, restored or enhanced to at least its pre-construction condition.	BH01

Biodiversity impact	Project phase	Management measures	Number
Habitat and vegetation degradation (direct and indirect)	Construction	**Construction Environmental Management Plan - Vegetation and tree protection zones** 1. Prior to the commencement of construction, establish appropriate vegetation / tree protection zones around areas of native vegetation and scattered native trees to be retained, where these occur within 20 metres of works. These zones will be established with marked using temporary fencing or bunting, and appropriately signposted as 'no-go' zones. 2. The location of vegetation / tree protection zones will be documented within the Construction Environmental Management Plan (EMM01) 3. All construction personnel will be appropriately briefed prior to works, and no construction personnel, machinery or equipment will be placed inside vegetation / tree protection zones, as defined in the Construction Environmental Management Plan (EMM01). 4. Machinery, earthworks, laydown areas and stockpiles will be located in areas that do not support native vegetation.	BH02
Direct habitat and vegetation loss Disturbance from construction activities	Construction	**Construction Environmental Management Plan – Salvage and relocation / translocation** 1. Prior to the commencement of construction activities within identified habitat areas proposed for removal, an ecologist or qualified fauna spotter-catcher will be engaged to undertaken habitat suitability surveys. These will inform the need to further targeted species surveys and any salvage/translocation to the nearest retained habitat. 2. A qualified wildlife handler will be engaged for any tree removal to search for any birds or mammals within hollows and relocate these or delay works until animals have safely finished breeding and left the habitat. a. If Golden Sun Moth are confirmed to be present, further avoid and minimise measures will be explored and include in the Construction Environmental Management Plan where practicable.	BH03

Biodiversity impact	Project phase	Management measures	Number

Direct habitat and vegetation loss	Construction	**Construction Environmental Management Plan – Offsets**
		
		1. Prior to the commencement of construction, offsets will be secured to compensate for unavoidable impacts to:
		   a. Native vegetation
		   b. Natural Temperate Grassland of the Victorian Volcanic Plain
		   c. Grassy Eucalypt Woodland of the Victorian Volcanic Plain
		   d. Habitat for Striped Legless Lizard (*Delma impar*)
		2. Offsets for unavoidable impacts to native vegetation under the Guidelines for the removal, destruction or lopping of native vegetation (Department of Environment, Land, Water and Planning, 2017c) will be sourced through the Native Vegetation Credit Register (NVCR). These offsets must meet the required general habitat units, strategic biodiversity value (SBV) thresholds, and large tree protection criteria.
		3. Offsets for unavoidable impacts to protected matters under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) will be secured (if not already secured) via conservation covenants or Section 69 Landowner Agreements, ensuring long-term protection and management.
		4. An Offset Management Plan will be developed and submitted to the Department of Climate Change, Energy, the Environment and Water (DCCEEW) for approval prior to the unavoidable impacts to protected matters under the EPBC Act. At a minimum, this will:
		   a. demonstrate compliance with the EPBC Act Environmental Offsets Policy (Department of Sustainability, Environment, Water, Population and Communities, 2012)
		   b. identify threats to offset values and outline management actions, including:
		      i. timing and frequency of actions
		      ii. responsible parties
		      iii. performance standards
		   c. include environmental objectives for each protected matter
		   d. provide access provisions for scientific research and monitoring
		   e. include a table mapping EPBC approval conditions
		   f. present a commitments table with references to responsible parties and actions
		   g. define monitoring protocols, including:
		      i. specific, measurable, attainable, relevant, time-based indicators
		      ii. thresholds for action
		      iii. adaptive management responses.
		   h. outline reporting and review mechanisms, including documentation standards
		   i. detail risk management strategies, including contingency measures for unforeseen adverse effects
		   j. include a long-term funding mechanism to support ongoing management.
			BH04

Biodiversity impact	Project phase	Management measures	Number
Direct habitat and vegetation loss Habitat and vegetation degradation (direct and indirect) Disturbance from construction activities	Construction Operation	**Blue-winged Parrot** 1. During construction, the following measures will be implemented to manage impacts to Blue-winged Parrot (*Neophema chrysostoma*): a. pre-clearance surveys of potential mature treed habitat to be removed during the breeding season (spring and summer) to identify active breeding locations b. avoidance of identified breeding sites until chicks have fledged c. installation of compensatory nest boxes where potential breeding habitat (hollow bearing trees) is removed d. monitoring of nest box usage to assess effectiveness. e. Nest box design will be developed in consultation with the BirdLife Bass Coast BWP Project.	BH06
Direct habitat and vegetation loss Habitat and vegetation degradation (direct and indirect) Disturbance from construction activities	Construction	**Gang-gang Cockatoo** 1. During construction, the following measures will be implemented to manage impacts to Gang-gang Cockatoo (*Callocephalon fimbriatum*): a. minimisation of tree and woody understorey removal in Cavendish swept path site b. revegetation of removed trees and woody understorey following the completion of construction activities in the area.	BH07
Direct habitat and vegetation loss Habitat and vegetation degradation (direct and indirect) Disturbance from construction activities	Construction	**Growling Grass Frog** 1. During construction, the following measures will be implemented to manage impacts to Growling Grass Frog (*Litoria raniformis*): a. scheduling the timing of creek crossing construction and underground cabling near Growling Grass Frog habitat between April and August when frog activity is low.in the summer months when the species is mostly in the water, active, and outside their wintering harbours, enabling them to move away from machinery.	BH08
Direct habitat and vegetation loss Habitat and vegetation degradation (direct and indirect) Disturbance from construction activities	Construction	**Striped Legless Lizard and Tussock Skink** 1. During construction, the following measures will be implemented to manage impacts to Striped Legless Lizard (*Delma impar*) and Tussock Skink (*Pseudemoia pagenstecheri*): a. prior to the removal of roadside grassland habitat, modifying the grassland (e.g., through slashing, relocation of surface rocks and debris, and placement of tiles outside these areas) to facilitate dispersal of these species. b. scheduling road upgrade works requiring grassland removal in warmer months, when these species are more active. This will enable them to move out of construction areas, and reduce the risk of direct mortality and disturbance.	BH10

Biodiversity impact	Project phase	Management measures	Number
Direct habitat and vegetation loss Habitat and vegetation degradation (direct and indirect) Disturbance from construction activities	Pre-construction	**Detailed drainage design** 1. Prior to the commencement of construction, develop the detailed drainage design in consultation with Glenelg Hopkins Catchment Management Authority to minimise impacts to surface waters and supported ecosystems, considering best practice design guidelines. 2. Design measures will include, but not be limited to: a. permanent surface structures designed to maintain existing overland flow paths and not cause increased upstream flood levels b. culverts installed parallel to the alignment of the banks of the waterway c. the use of a reduced-width construction right of way at watercourse crossings and aim to avoid any standing water d. micro-siting crossings of Mustons Creek to avoid deeper pools where practicable to prevent potential effects on Growling Grass Frog e. integrating culverts into access track design to allow for the diversion of flow paths below the roads.	SW01
Habitat and vegetation degradation (direct and indirect)	Construction	**Water Management Plan - Minimise impacts to groundwater discharge, recharge and flow** 1. Include construction activities and temporary works that may impact on groundwater discharge, surface permeability and groundwater flow would be included within the Water Management Plan. 2. Measures to minimise groundwater discharge, recharge and flow related impacts relating to these activities and works will include, but not be limited to: a. revegetation of disturbed areas b. backfilling cabling trenches using excavated material where possible, or material of a similar permeability where this is not possible c. micro-siting turbine foundation excavations and trenches to avoid unmapped springs and watercourses.	GW04-1
Habitat and vegetation degradation (direct and indirect)	Construction	**Construction Environmental Management Plan - Creek crossings** 1. Where essential wind farm infrastructure (e.g., access tracks and electrical cables) crosses a creek, measures for avoiding and minimising impacts will be documented in the Construction Environmental Management Plan (EMM01) prior to the commencement of construction, including: a. preferentially scheduling works during drier months of the year and lowest flow of the waterway where watercourse trenching is required b. avoiding undertaking of works when high rainfall events are expected c. maintaining adequate flow rates and water levels in waterway to be crossed (as determined in consultation with the relevant authorities) to minimise impacts on aquatic ecosystem and environmental values d. restoration of temporarily disturbed waterways and vegetation (removing any obstructions to waterway flow) as soon as practicable following the open cut trenching works to at least its pre-construction condition e. design measures to minimise future erosion in areas where trenching occurred (e.g., use of riprap made of stones to stabilise the waterway, geofabric to prevent erosion and scour until establishment of vegetation).	SW03

Biodiversity impact	Project phase	Management measures	Number
Habitat and vegetation degradation (direct and indirect)	Construction	**Sediment, Erosion and Water Quality Management Plan** 1. Prior to the commencement of construction, develop and implement a Sediment, Erosion and Water Quality Management Plan as a sub-plan to the Construction Environmental Management Plan (EMM01) in consultation with Glenelg Hopkins Catchment Management Authority in accordance with EPA Publication 1834.2: Civil construction, building and demolition guide. 2. Erosion and sediment control measures within the construction site will adopt a treatment train approach and include: a. monitoring surface water quality upstream and downstream of the works area during detailed planning, construction and operation phases to confirm control effectiveness and protection of environmental values b. phasing ground-disturbing works to periods of lower rainfall, where possible c. minimising vegetation clearance, particularly along drainage lines, waterways and steep slopes d. reinstating vegetation in accordance with EMM LS02 e. maintaining watercourse and wetland buffers (except at watercourse crossings) and implementing management controls for works near waterways in accordance with EPA Publication 1894: Managing soil disturbance f. installing primary, secondary and tertiary sediment control measures based on site-specific hazards, consistent with Publication 1893: Erosion, sediment and dust: treatment train g. designating areas for stockpiles prior to construction, ensuring stockpiles and batters have slopes no greater than 2:1 (horizontal/vertical) h. implementing stockpile management controls consistent with EPA Publication 1895: Managing stockpiles and establishing vegetation or grass on stockpiles to be left for longer periods i. stabilising exposed soils and applying soil disturbance controls in accordance with EPA Publication 1894: Managing soil disturbance j. installing sediment fencing to protect riparian zones where works occur within 30 metres of waterways k. installing sediment treatment controls (including around stockpiles) to adequately capture sediment loads l. restricting vehicle movements to designated roads and access areas m. directing stormwater through constructed lined channels or sediment basins to reduce runoff velocity n. developing contingency measures for works within waterways or floodplains, including controls to be implemented when storm events are forecast.	SW04

Biodiversity impact	Project phase	Management measures	Number
Collision with wind tubines	Operation	**Bat and Avifauna Management Plan** 1. Attachment V - Bat and Avifauna Management Plan has been prepared for the project in accordance with the following guidelines and will be implemented prior to the commencement of operation to minimise impacts to bat and avifauna species: a. Onshore Wind Farm Guidance – interim guidance on bird and bat management (Department of Agriculture, Water and the Environment, 2022) b. Onshore Wind Farm Guidance: Best practice approaches when seeking approval under Australia's national environment law (Department of Climate Change, Energy, the Environment and Water, 2024a). 3. Attachment V - ***Bat and Avifauna Management*** Plan outlines monitoring protocols and responsibilities, impact triggers for listed and non-listed bird and bat species, and operational procedures following occurrence of impact triggers including reporting requirements. Adaptive management measures to reduce impacts will be considered as part of the Bat and Avifauna Management Plan. 2. Attachment V - Bat and Avifauna Management Plan includes species-specific management strategies for the following species of concern to focus management efforts and improve mitigation effectiveness in response to impact triggers: a. Blue-winged Parrot (*Neophema chrysostoma*) b. White-throated Needletail (*Hirundapus caudacutus*) c. Fork-tailed Swift (*Apus pacificus*) d. Brolga (Grus rubicunda) e. Black Falcon (*Falco subniger*) f. Wedge-tailed Eagle (*Aquila audax*) g. Grey-headed Flying-fox (*Pteropus poliocephalus*) h. Southern Bent-wing Bat (Miniopterus orianae bassanii) i. Yellow-bellied Sheath-tailed Bat (*Saccolaimus flaviventris*) 3. Attachment V - Bat and Avifauna Management Plan outlines committed financial compensatory measures that would be implemented in response to a significant impact (above the relevant defined impact threshold) to species listed under the *Environment Protection and Biodiversity Conservation Act 1999* during project operation. 4. Key measures of Attachment V - Bat and Avifauna Management Plan are outlined in EMM BA01-1 through BA01-7. 5. The Bat and Avifauna Management Plan will be a sub-plan to the Operations Environmental Management Plan (EMM09).	BA01

Biodiversity impact	Project phase	Management measures	Number
		Bat and Avifauna Management Plan - Curtailment strategies 1. As detailed in the Bat and Avifauna Management Plan (BA01), the minimum required wind speed for night-time operation of moderate and higher-risk turbines (i.e., the night-time low windspeed cut-in) will be increased to 4.5 m/s during periods when Southern Bent-wing Bat are most actively moving across the landscape to reduce the risk of collision between wind turbines and the Southern Bent-wing Bat. 2. Curtailment conditions for each turbine will be outlined in the Attachment V - Bat and Avifauna Management Plan (BA01), and updated as required in response to monitoring undertaken as part of the Bat and Avifauna Management Plan. This includes temporary daytime curtailment of turbine(s) within a 300-metre buffer of active Black Falcon (*Falcon subniger*) and Wedge-Tailed Eagle (*Aquila audax*) nests identified during operation. 3. The Department of Energy, Environment and Climate Action will be consulted regarding specific parameters for each turbine to confirm adequacy and acceptability of these measures.	BA01-1
		Blade feathering 1. As detailed in the Bat and Avifauna Management Plan (BA01), 'feathering' (i.e., adjusting the angle of the rotor blades to limit rotation, typically to approximately one rotation per minute, when wind speeds are below the manufacturer's or adjusted cut-in speed, to prevent freewheeling) would be applied for all turbines to mitigate impacts to bats.	BA01-2
		Bat and Avifauna Management Plan - Acoustic deterrents 4. The feasibility of acoustic deterrent trials would be investigated, in consultation with the Department of Energy, Environment and Climate Action. This will be documented in Attachment V - Bat and Avifauna Management Plan (BA01).	BA01-3
		Bat and Avifauna Management Plan - Mortality monitoring 1. As detailed in Attachment V - Bat and Avifauna Management Plan (BA01), ongoing monitoring of blade strike mortality within the project site will be undertaken to inform adaptive management of the collision risk and assess the general mortality of listed and non-listed fauna.	BA01-4
		Bat and Avifauna Management Plan - Post-commissioning acoustic bat surveys 1. As detailed in Attachment V - Bat and Avifauna Management Plan (BA01), bat detector surveys will be undertaken for at least two years post-commissioning to collect further data on temporal activity patterns of Southern Bent-wing Bat and Yellow-bellied Sheath-tail Bat in the project site. 2. Consultation with the Department of Energy, Environment and Climate Action and the Southern Bent-wing Bat Recovery Team will be undertaken to determine the frequency, timing and duration of these surveys	BA01-5

Biodiversity impact	Project phase	Management measures	Number
		Bat and Avifauna Management Plan - Grey-headed Flying-fox monitoring 1. As detailed in the Bat and Avifauna Management Plan (BA01), a Grey-headed Flying-fox monitoring program will be undertaken for the first two years post-commissioning. This monitoring program will inform field surveys for this species and be based on: a. annual habitat suitability assessments in and around the project site b. annual reviews of relevant databases for current Grey-headed Flying-fox camp locations and numbers. c. regular discussions with wind farm personnel, landholders, and the Department of Energy, Environment and Climate Action/Department of Climate Change, Energy, the Environment and Water regarding the species presence, and assess its potential increase in prevalence within the site and its surroundings.	BA01-6

27.7.4 Residual impacts

Following the development of design measures and implementation of proposed management controls, a 'significant impact assessment' was undertaken for each EPBC Act-listed threatened ecological community, flora and fauna species recorded within the investigation areas, or assessed as having potential or being likely to occur, in accordance with the criteria of the Significant Impact Guidelines (DoE, 2013). The results of this assessment are summarised in Table 27.5.

Based on the findings of this assessment, significant impacts are anticipated to:

- **Natural Temperate Grassland of the Victorian Volcanic Plain**, of which 20.596 hectares are present within the investigation areas. Design mitigations have avoided impacts to between 19.991 and 20.011 hectares of this threatened ecological community dependent on the transport route used. As such, the residual significant impact that needs to be offset is the removal of between 0.585 and 0.605 hectares across the transport route, and roadside upgrade investigation areas. The significance of this impact has been assessed as low.
- **Grassy Eucalypt Woodland of the Victorian Volcanic Plain**, of which 11.318 hectares are present within the investigation areas. Design mitigations have avoided impacts to 11.071 hectares of this threatened ecological community. As such, the residual significant impact that needs to be offset is the removal of 0.247 hectares within the roadside upgrade investigation area. The significance of this impact has been assessed as low. All areas of Grassy Eucalypt Woodland of the Victorian Volcanic Plain within the project site investigation area have been avoided.
- **Striped Legless Lizard** (*Delma impar*), associated with the predicted removal of:
  - 0.3 hectares of potential habitat within the project site investigation area
  - 1.175 hectares of potential habitat within the roadside upgrade investigation area
  - between 0.241 and 0.534 hectares of potential habitat within the transport route investigation area, dependent on the transport route used.

The significance of this impact has been assessed as low to medium, depending on actual occurrence of this species.

Following the application of design mitigations and management controls, significant impacts are considered unlikely to impact the Gang-gang Cockatoo (*Callocephalon fimbriatim*), Growling Grass Frog (*Litoria raniformis*), Golden Sun Moth (*Synemon plana*), Southern Bent-wing Bat (*Miniopterus orianae bassanii*), and Grey-headed Flying-fox (*Pteropus poliocephalus*). No other species or communities listed under the EPBC Act are anticipated to have significant impacts.

Table 27.5 Significant impact assessment

Type of MNES	Relevant significant impact criteria	Assessment	Significance
Listed flora species			
ENDANGERED & CRITICALLY ENDANGERED			
Fragrant Leek-orchid (*Prasophyllum suaveolens*)	• Long-term decrease in the population size • Reduction of area of occupancy • Fragmentation of existing population into two or more populations • Affect habitat critical for survival of species	Targeted surveys undertaken within the detection period for the Fragrant Leek-orchid did not record any individuals within the investigation areas. As no populations are predicted to be directly impacted and the loss of potential habitat is limited, the project is not expected to lead to a decrease of the population size or fragment existing populations. If individuals are recorded in future surveys, they will be avoided where possible.	**Not anticipated to be significant**
Spiny Rice-flower (*Pimelea spinescens* subsp. *spinescens*)		Targeted surveys undertaken within the detection period for the Spiny Rice-flower recorded 158 individuals within the project site along Hamilton Highway, which have been avoided by the project. As no populations are predicted to be directly impacted and the loss of potential habitat is limited, the project is not expected to lead to a decrease of the population size or fragment existing populations. If individuals are recorded in future surveys, they will be avoided where possible.	**Not anticipated to be significant**
Listed ecological communities			
CRITICALLY ENDANGERED			
Natural Temperate Grassland of the Victorian Volcanic Plain	• Reduce the extent of an ecological community • Fragment or increase fragmentation of an ecological community	A total of 20.596 hectares of Natural Temperate Grassland of the Victorian Volcanic Plain was recorded across the project site investigation area, transport route investigation area, and roadside upgrade investigation areas. Of this, between 0.585 and 0.605 hectares will be removed within the transport route and roadside upgrade investigation areas, affecting between approximately 2.8% and 2.9% of the total population mapped within all investigation areas. Although this will reduce the extent of the community, it is unlikely to affect the overall viability of each habitat patch.	**Potential to be significant** 0.585 and 0.605 hectares to be removed.
Grassy Eucalypt Woodland of the Victorian Volcanic Plain		A total of 11.318 hectares of Grassy Eucalypt Woodland of the Victorian Volcanic Plain was recorded across the project site investigation area, transport route investigation area, and roadside upgrade investigation areas. Of this, 0.247 hectares will be removed within the roadside upgrade investigation area, affecting approximately 0.2% of the population mapped within all investigation areas. Although this will reduce the extent of the community, it is unlikely to affect the overall viability of each habitat patch.	**Potential to be significant** 0.247 hectares to be removed

Type of MNES	Relevant significant impact criteria	Assessment	Significance
Listed migratory species			
Common Greenshank (*Tringa nebularia*)	• Substantially modify, destroy or isolate an area of important habitat for a migratory species • Seriously disrupt the lifecycle of an ecologically significant proportion of the population of a migratory species (0.1% of flyway population)	The Common Greenshank was not recorded during targeted surveys and is considered unlikely to occur in nationally or internationally significant numbers. It is also unlikely to fly at heights within the Rotor Swept Area for sustained periods of time near wind turbines, and as such collision with wind turbine blades is unlikely. Construction of the project will result in the removal of approximately 6.122 hectares of wetland vegetation within the project site (Plains Grassy Wetland, Plains Sedgy Wetland and Aquatic Herbland), which is potential habitat for the Common Greenshank. Additionally, 0.008 hectares may require removal along the Geelong or Combined Transport Route options. This is approximately 16% of the wetland habitat mapped within the investigation areas. The wetland vegetation to be removed primarily consists of dense, grassy vegetation which does not provide suitable or high-quality habitat for most migratory shorebirds. Larger areas of suitable habitat will be available for the species, including DEECA mapped wetlands which are largely avoided, and along Muston's creek and Drysdale Creek.	Not anticipated to be significant
Common Sandpiper (*Actitis hypoleucos*)		One Common Sandpiper was recorded incidentally during the bat survey period. However, it is unlikely to occur in nationally or internationally significant numbers. It is also unlikely to fly at heights within the Rotor Swept Area for sustained periods of time near wind turbines, and as such collision with wind turbine blades is unlikely. Construction of the project will result in the removal of approximately 6.122 hectares of wetland vegetation within the project site (Plains Grassy Wetland, Plains Sedgy Wetland and Aquatic Herbland), which is potential habitat for the Common Sandpiper. Additionally, 0.008 hectares may require removal along the Geelong or Combined Transport Route options. This is approximately 16% of the wetland habitat mapped within the investigation areas. The wetland vegetation to be removed primarily consists of dense, grassy vegetation which does not provide suitable or high-quality habitat for most migratory shorebirds. Larger areas of suitable habitat will be available for the species, including DEECA mapped wetlands which are largely avoided, and along Mustons creek and Drysdale Creek.	Not anticipated to be significant

Type of MNES	Relevant significant impact criteria	Assessment	Significance
Curlew Sandpiper (*Calidris ferruginea*)		The Curlew Sandpiper was not recorded during targeted surveys and is unlikely to occur in nationally or internationally significant numbers. It is also unlikely to fly at heights within the Rotor Swept Area for sustained periods of time near wind turbines, and as such collision with wind turbine blades is unlikely. Construction of the project will result in the removal of approximately 6.122 hectares of wetland vegetation within the project site (Plains Grassy Wetland, Plains Sedgy Wetland and Aquatic Herbland), which is potential habitat for the Curlew Sandpiper. Additionally, 0.008 hectares may require removal along the Geelong or Combined Transport Route options. This is approximately 16% of the wetland habitat mapped within the investigation areas. The wetland vegetation to be removed primarily consists of dense, grassy vegetation which does not provide suitable or high-quality habitat for most migratory shorebirds. Larger areas of suitable habitat will be available for the species, including DEECA mapped wetlands which are largely avoided, and along Mustons creek and Drysdale Creek.	Not anticipated to be significant
Double-banded Plover (*Charadrius bicinctus*)		One pair of Double-banded Plover were recorded incidentally during the wetland habitat surveys. However, this species is unlikely to occur in nationally or internationally significant numbers. It is also unlikely to fly at heights within the Rotor Swept Area for sustained periods of time near wind turbines, and as such collision with wind turbine blades is unlikely. Construction of the project will result in the removal of approximately 6.122 hectares of wetland vegetation within the project site (Plains Grassy Wetland, Plains Sedgy Wetland and Aquatic Herbland), which is potential habitat for the Double-banded Plover. Additionally, 0.008 hectares may require removal along the Geelong or Combined Transport Route options. This is approximately 16% of the wetland habitat mapped within the investigation areas. The wetland vegetation to be removed primarily consists of dense, grassy vegetation which does not provide suitable or high-quality habitat for most migratory shorebirds. Larger areas of suitable habitat will be available for the species, including DEECA mapped wetlands which are largely avoided, and along Mustons creek and Drysdale Creek.	Not anticipated to be significant

Type of MNES	Relevant significant impact criteria	Assessment	Significance
Marsh Sandpiper (*Tringa stagnatilis*)		The Marsh Sandpiper was not recorded during targeted surveys and is unlikely to occur in nationally or internationally significant numbers. It is also unlikely to fly at heights within the Rotor Swept Area for sustained periods of time near wind turbines, and as such collision with wind turbine blades is unlikely. Construction of the project will result in the removal of approximately 6.122 hectares of wetland vegetation within the project site (Plains Grassy Wetland, Plains Sedgy Wetland and Aquatic Herbland), which is potential habitat for the Marsh Sandpiper. Additionally, 0.008 hectares may require removal along the Geelong or Combined Transport Route options. This is approximately 16% of the wetland habitat mapped within the investigation areas. The wetland vegetation to be removed primarily consists of dense, grassy vegetation which does not provide suitable or high-quality habitat for most migratory shorebirds. Larger areas of suitable habitat will be available for the species, including DEECA mapped wetlands which are largely avoided, and along Mustons creek and Drysdale Creek.	Not anticipated to be significant
Red-necked Stint (*Calidris ruficollis*)		Eight Red-necked Stints were recorded incidentally during the brolga surveys. However, this species is unlikely to occur in nationally or internationally significant numbers. It is also unlikely to fly at heights within the Rotor Swept Area for sustained periods of time near wind turbines, and as such collision with wind turbine blades is unlikely. Construction of the project will result in the removal of approximately 6.122 hectares of wetland vegetation within the project site (Plains Grassy Wetland, Plains Sedgy Wetland and Aquatic Herbland), which is potential habitat for the Red-necked Stint. Additionally, 0.008 hectares may require removal along the Geelong or Combined Transport Route options. This is approximately 16% of the wetland habitat mapped within the investigation areas. The wetland vegetation to be removed primarily consists of dense, grassy vegetation which does not provide suitable or high-quality habitat for most migratory shorebirds. Larger areas of suitable habitat will be available for the species, including DEECA mapped wetlands which are largely avoided, and along Mustons creek and Drysdale Creek.	Not anticipated to be significant

Type of MNES	Relevant significant impact criteria	Assessment	Significance
Sharp-tailed Sandpiper (*Calidris acuminata*)		A small group of Sharp-tailed Sandpipers was recorded incidentally during the brolga surveys. However, this species is unlikely to occur in nationally or internationally significant numbers. It is also unlikely to fly at heights within the Rotor Swept Area for sustained periods of time near wind turbines, and as such collision with wind turbine blades is unlikely. Construction of the project will result in the removal of approximately 6.122 hectares of wetland vegetation within the project site (Plains Grassy Wetland, Plains Sedgy Wetland and Aquatic Herbland), which is potential habitat for the Sharp-tailed Sandpiper. Additionally, 0.008 hectares may require removal along the Geelong or Combined Transport Route options. This is approximately 16% of the wetland habitat mapped within the investigation areas. The wetland vegetation to be removed primarily consists of dense, grassy vegetation which does not provide suitable or high-quality habitat for most migratory shorebirds. Larger areas of suitable habitat will be available for the species, including DEECA mapped wetlands which are largely avoided, and along Mustons creek and Drysdale Creek.	Not anticipated to be significant
Fork-tailed Swift (*Apus pacificus*)		The Fork-tailed Swift was not recorded during targeted surveys, however it is expected to visit the project site in late summer for brief occasions. It is known to fly at heights within the Rotor Swept Area and is relatively abundant and widespread compared to other migratory species, however recordings of collisions with wind turbine blades are rare. This species spends most of its life in flight, and loss of potential habitat within the project site is not anticipated to cause a significant impact.	Not anticipated to be significant

Type of MNES	Relevant significant impact criteria	Assessment	Significance
VULNERABLE & MIGRATORY			
Latham's Snipe (*Gallinago hardwickii*)	• Impacts on important habitat: • areas that support at least 18 individuals of this species • naturally occurring open freshwater wetland with vegetation cover nearby	One pair of Latham's Snipe were recorded incidentally during the wetland habitat surveys. However, this species is unlikely to occur in nationally or internationally significant numbers. Flight heights for this species are unknown, however it is unlikely to fly at heights within the Rotor Swept Area for sustained periods of time near wind turbines, and as such collision with wind turbine blades is unlikely. Construction of the project will result in the removal of approximately 6.122 hectares of wetland vegetation within the project site (Plains Grassy Wetland, Plains Sedgy Wetland and Aquatic Herbland), which is potential habitat for the Latham's Snipe. Additionally, 0.008 hectares may require removal along the Geelong or Combined Transport Route options. This is approximately 16% of the wetland habitat mapped within the investigation areas. The wetland vegetation to be removed primarily consists of dense, grassy vegetation which does not provide suitable or high-quality habitat for most migratory shorebirds. However, Latham's Snipe may use such areas opportunistically when shallowly inundated, noting that inundation at these sites is highly ephemeral. Larger areas of suitable habitat will be available for the species, including DEECA mapped wetlands which are largely avoided, and along Mustons creek and Drysdale Creek.	Not anticipated to be significant

Type of MNES	Relevant significant impact criteria	Assessment	Significance
White-throated Needletail (*Hirundapus caudacutus*)	• Substantially modify destroy or isolate an area of important habitat for a migratory species • Seriously disrupt the lifecycle of an ecologically significant proportion of the population of a migratory species (0.1% of flyway population is equivalent to 10 birds)	The White-throated Needletail was not recorded during targeted surveys. This species is known to fly at heights within the Rotor Swept Area. However, due to the lack of extensive woodlands in the region it is unlikely to occur frequently or in large numbers. This species spends most of its life in flight, and potential habitat within the project site is unlikely to represent important habitat for a significant proportion of the population for any length of time.	**Not anticipated to be significant**
Other listed fauna species			
VULNERABLE			
Blue-winged Parrot (*Neophema chrysostoma*)	• Long-term decrease in the size of an important population • Reduction of area of occupancy of an important population • Fragmentation of existing important population into two or more populations • Affect habitat critical for survival of species	The Blue-winged Parrot is known to occur and was recorded foraging within the project site. However, given the low number of individuals observed and the irregularity of records, it is considered unlikely that the species frequently uses available habitat within the project site or passes through the area. It is also considered unlikely that the species breeds within the project site due to the lack of mature woodlands and records within the breeding season (Spring/Summer). It is known to fly at heights within the Rotor Swept Area, and collisions with wind turbine blades have been recorded within Victoria. However, it is unlikely to be disturbed by operating turbines as the species is often observed foraging in their vicinity. Infrequent collisions are unlikely to result in a long-term decrease of the population size. No habitat critical to the survival of the Blue-winged Parrot is proposed to be removed, and the project will not reduce the area of occupancy or fragment any populations.	**Not anticipated to be significant**
Striped Legless Lizard (*Delma impar*)		Suitable habitat for the Striped Legless Lizard was recorded in all investigation areas within patches of Plains Grassland within roadsides of Woolsthorpe-Hexham Road and Hexham-Ballangeich Road, and some scattered areas of Plains Grassland and Plains Grassy Woodland. Following a precautionary approach, the species is assumed to be present. Construction of the project will result in the removal of 0.3 hectares of this potential habitat within the project site investigation area, 1.175 hectares within the roadside upgrade investigation areas, and between 0.241 and 0.4534 hectares within the transport route investigation areas. This may reduce the area of occupancy for an important population, and affect habitat critical for the survival of the species.	**Potential to be significant** 1.74 to 1.91 hectares of Plains Grassy Woodland and Plains Grassland habitat to be removed

Type of MNES	Relevant significant impact criteria	Assessment	Significance
Growling Grass Frog (*Litoria raniformis*)		The Growling Grass Frog is known to occur in three separate sections of Mustons Creek for most parts of the year, and several other smaller tributaries of Mustons Creek could provide habitat during the wet season. Construction of the project will result in the removal of approximately 6.122 hectares of wetland vegetation within the project site (Plains Grassy Wetland, Plains Sedgy Wetland and Aquatic Herbland), which is potential habitat for the Growling Grass Frog. Additionally, 0.008 hectares may require removal along the Geelong or Combined Transport Route options. All turbines and associated access tracks (apart from crossings) are located greater than 100 metres from Growling Grass Frog habitat along Mustons Creek. As such, the area of occupancy is unlikely to be reduced or fragmented.	Unlikely to be significant
Golden Sun Moth *(Synemon plana)*		Given the low number of records in the area and lack of observations during surveys undertaken, it is considered unlikely that an important population of Golden Sun Moth occurs at the project site investigation area. Construction of the project will result in the removal of 0.3 hectares of this potential habitat within the project site investigation area, 1.175 hectares within the roadside upgrade investigation areas, and between 0.241 and 0.4534 hectares within the transport route investigation areas. However, it is not anticipated that the relatively small degree of impacted habitat represents habitat critical to the survival of this species.	Unlikely to be significant

Type of MNES	Relevant significant impact criteria	Assessment	Significance
ENDANGERED & CRITICALLY ENDANGERED			
Gang-gang Cockatoo (*Callocephalon fimbriatum)*	• Reduction of area of occupancy of the species • Affect habitat critical for survival of species	The extent of habitat removal is likely to be very restricted (up to five roadside trees) and the removed trees and woody understory will be revegetated. No habitat critical to the survival of the Gang-gang Cockatoo is proposed to be removed, and the project will not reduce the area of occupancy or fragment any populations.	**Unlikely to be significant**
Southern Bent-wing Bat (*Miniopterus orianae bassanii*)	• Long-term decrease in the population size • Reduction of area of occupancy • Fragmentation of existing population into two or more populations • Affect habitat critical for survival of species	Most Southern Bent-wing Bat movements are expected to be closer to non-breeding caves, which are located at least 25 kilometres from the project site. As such, it is unlikely that high numbers of individuals would be within the project site regularly or for extended periods. Noting Southern Bent-wing Bat primarily flies at lower heights (between 0 and 30 metres), and given the infrequent Southern Bent-wing Bat calls recorded during surveys and the proposed minimum blade tip, if individuals were to cross the project site the risk of turbine collision is considered low.	**Unlikely to be significant**
Grey-headed Flying-fox (*Pteropus poliocephalus*)	• Long-term decrease in the size of an important population • Reduction of area of occupancy of an important population • Fragmentation of existing important population into two or more populations • Affect habitat critical for survival of species	The closest known Grey-headed Flying-fox roost is in the pine forest plantation east of the project site. No Grey-headed Flying-fox were observed flying in a westerly direction from this roost in field surveys, indicating that there are limited food resources within the project site that would attract the Grey-headed Flying-fox to the area. As such, it is considered unlikely that Grey-headed Flying-fox would visit the project site regularly to feed, however they may occasionally fly across the project site. It is unlikely that the project will lead to regular mortality of Grey-headed Flying-fox, and therefore significant impacts are also unlikely.	**Unlikely to be significant**

27.7.5 Offsets

Unavoidable impacts to MNES would be offset in accordance with the EPBC Act Environmental Offsets Policy (DSEWPaC, 2012). Proposed impacts requiring offsets are presented in Table 27.6 and discussed in detail in the ***Flora and Fauna Assessment*** (Appendix D). Offset calculations will be undertaken during the detailed design phase, through which the area of impact may be further reduced. Offset calculations will account for both the area and impact, and quality of habitat. .

The Offset Strategy for securing MNES offsets is provided in Section 14.4 of the ***Flora and Fauna Assessment*** (Appendix D) and summarised below. In accordance with EMM BH04, this will be further developed to include the location, size, condition, and environmental values of identified offset sites, as well as an Offset Management Plan that would detail how the offset will be secured, managed and monitored to meet the defined environmental outcomes.

Offset Strategy

Direct offsets for MNES that could potentially be significantly impacted by the project, presented in Table 27.6, will be obtained and legally protected in accordance with the Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy (DSEWPaC, 2012). Once identified, offset sites will be secured (if not already secured) with a conservation covenant registered on title under the *Victorian Conservation Trust Act 1972* or a Section 69 Landowner Agreement.

The suitability of prospective sites will be determined in accordance with the Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy (DSEWPaC, 2012), which will involve site assessment by ecologists and liaising with the Department of Climate Change, Energy, the Environment and Water to ensure the sites align with their requirements.

An Offset Management Plan will be developed for each chosen site, to the satisfaction of the Department of Climate Change, Energy, the Environment and Water, Trust for Nature, the Department of Environment, Energy and Climate Action, and the landowner, as appropriate. These plans will be implemented by the landowner of each site following purchase of the offsets and registration of the conservation covenant.

Each Offset Management Plan would include:

- environmental objectives related to protected matters, and commitments to achieve these
- management actions to be undertaken (including timing, responsible parties, and the standards to be achieved)
- a monitoring plan incorporating measurable performance indicators, triggers for proposed corrective actions, and review mechanisms to ensure compliance
- a description of the long-term funding mechanism for the offset.

These offsets will be secured by the proponent following approval of the project, as the finalisation of the project's design at the ultimate consent phase may present opportunities to further reduce impacts potentially resulting in less required offsets.

Refer to Chapter 8 - ***Biodiversity and habitat*** for information regarding native vegetation offsets under the *Flora and Fauna Guarantee Act 1988* (FFG Act).

Table 27.6 Project offset requirements

Mnes with potential significant impacts	Proposed area of impact	Offset availability
Natural Temperate Grassland of the Victorian Volcanic Plain	0.586 – 0.605 hectares	**Offset sites are currently available.** Additional offset locations being investigated.
Striped Legless Lizard (*Delma impar*)	1.74 – 19.91 hectares	**Offset sites are currently available**. Suitability of the sites will require further assessment
Grassy Eucalypt Woodland of the Victorian Volcanic Plain	0.247 hectares	**No offset sites currently available.** Offset sites are being investigated.

Potential offset site searches

Due to the lack of offsite sites currently available, Nature Advisory has been engaged to consider potential occurrences of both the Natural Temperate Grassland of the Victorian Volcanic Plain and Grassy Eucalypt Woodland of the Victorian Volcanic Plain on private land that could be secured as offsets. It is considered unlikely that the project site itself would support sufficient areas of either Natural Temperate Grassland of the Victorian Volcanic Plain or Grassy Eucalypt Woodland of the Victorian Volcanic Plain to use as an offset. However, a shortlist of six potential offset sites have been identified and verified through aerial imagery, StreetView (where available), and Nature Advisory's local knowledge.

Of these blocks, a potential Natural Temperate Grassland of the Victorian Volcanic Plain offset was identified in areas North of Carngham-Streatham Road/ Stockyard Hill Road, Stockyard Hill. This will ultimately require landholder outreach and further assessments to confirm suitability. However, if secured, it is anticipated that this additional option could provide all required Natural Temperate Grassland of the Victorian Volcanic Plain offsets.

Further investigations will be required to identify potential Grassy Eucalypt Woodland of the Victorian Volcanic Plain offsets. Additional searches for Natural Temperate Grassland of the Victorian Volcanic Plain offsets may also be required if the Stockyard Hill site is determined to be unsuitable or cannot be secured.

27.7.6 Cumulative impacts

Cumulative impacts to MNES are addressed in the Significant Impact Guidelines (DoE, 2013) based on the consideration of actions that will reduce the long-term viability of the community, important populations, and species as a whole.

Based on an assessment against these considerations, cumulative impacts may occur to the two threatened ecological communities assessed as being potentially significantly impacted by the project (i.e., Natural Temperate Grassland of the Victorian Volcanic Plain, and Grassy Eucalypt Woodland of the Victorian Volcanic Plain). However, cumulative impacts to these communities are considered minimal, as:

- the proposed area removal of each community is a small component of the total area recorded, or assumed to be present, within the investigation areas;
- impacts will be contained within the project disturbance area
- impacts to EPBC Act-listed communities will be offset in accordance with the EPBC Act Environmental Offsets Policy (DSEWPaC, 2012).

Review of the proposed, approved and operating wind farms within 25 kilometres of the project did not identify the potential for cumulative impacts to the Stiped Legless Lizard.

Potential cumulative impacts to MNES and other biodiversity values are further assessed in Chapter 26 - ***Cumulative effects.***

27.8 Conclusions

The potential presence of MNES within the investigation areas for the project has been assessed over a decade through targeted surveys and assessments. MNES that are either known or likely to occur within the investigation areas, or considered to have the potential to occur, include:

- two threatened flora species (one known to occur)
- three threatened ecological communities (two known to occur)
- ten listed migratory bird species, three of which are also threatened (four known to occur)
- two threatened bird species (both known to occur)
- two threatened bat species (both known to occur)
- one threatened reptile species
- one threatened frog species (known to occur)
- one threatened invertebrate species.

In addition, one threatened flora species was unable to be identified at a species-level due to a lack of flowering material. Although this has the potential to be a species listed under the EPBC Act, it is outside of the construction disturbance area and operational footprint and as such will not be impacted.

While the project was assessed as having the potential to impact a range of threatened ecological communities and species listed as MNES, the majority of these impacts were not considered to be significant in accordance the Significant Impact Guidelines (DoE, 2013). This conclusion was based primarily on the scale and nature of predicted impacts, the ecological value of the project site as habitat, and the implementation of proposed avoidance and management measures to avoid, minimise and/or mitigate potential harm.

The following impacts were determined to be significant:

- The removal of between 0.585 and 0.591 hectares of **Natural Temperate Grassland of the Victorian Volcanic Plain** across the project site, transport route, and roadside upgrade investigation areas. The significance of this impact has been assessed as low.
- The removal of 0.352 hectares of **Grassy Eucalypt Woodland of the Victorian Volcanic Plain** across the project site, transport route, and roadside upgrade investigation areas. The significance of this impact has been assessed as low.
- The removal of between 1.74 and 1.91 hectares of potential habitat for the Striped Legless Lizard *(Delma impar)* within the roadside upgrade investigation area. The significance of this impact has been assessed as low to moderate.

Where practicable, potential impacts to MNES have been avoided and minimised through the design of siting of project infrastructure. Unavoidable impacts will be mitigated through MNES-specific management controls including scheduling, habitat buffers, protection zones, and the establishment of nest boxes where breeding locations cannot be avoided. Where residual impacts remain, offsets will also be used to compensate for impacts to MNES in accordance with the Significant Impact Guidelines 1.1 - Matters of National Environmental Significance.