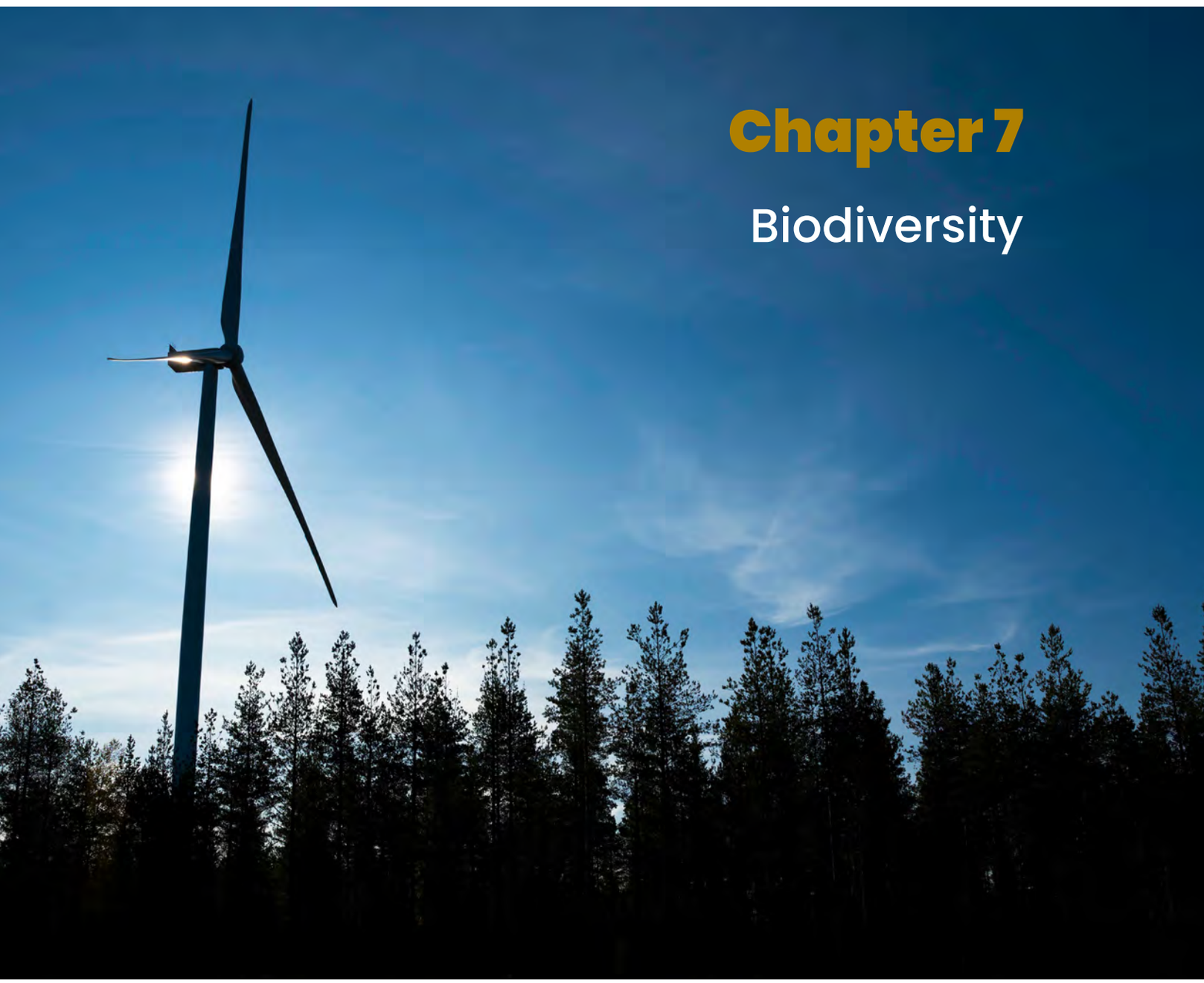


Chapter 7

Biodiversity

Acknowledgement of Country

Neoen Australia acknowledges the traditional custodians of the land in which we live, and pays its respects to their elders, past and present. The Gunditjmara are the original custodians of the Country on which the Project is located and we acknowledge them as the original custodians. We are committed to Aboriginal engagement and reconciliation and aim to bring Aboriginal and Torres Strait Islander people, local communities and the councils along for the journey to strengthen relationships and enhance local community outcomes.

Disclaimer

7 Biodiversity

This chapter describes the ecosystems, communities, flora, and fauna that make up the biodiversity within and around the Project. This chapter also outlines the potential impacts on biodiversity from construction and operation of the Project, as well as mitigation measures proposed to avoid, minimise, and manage potential adverse impacts, and in some cases invest in the protection of species.

This chapter summarises the outcomes of the **Flora and Fauna Existing Conditions and Impact Assessment (FFIA) (Appendix C)** and **Southern Bent-wing Bat Impact Assessment (SBWB Impact Assessment)** (**Appendix E**). Potential impacts on Brolga (*Antigone rubicunda*) have been assessed separately in **Chapter 8 *Brolga*** due to the specific survey and assessment requirements for the species as set out in the *Interim guidelines for the assessment, avoidance, mitigation and offsetting of potential wind farm impacts on the Victorian Brolga population* (DSE, 2012) (2011 Brolga Guidelines).

7.1 Terminology

The assessment of potential impacts on biodiversity and habitat considered the Project infrastructure and broader search and investigation areas. These terms are used throughout this chapter and define the geographic extent of the assessment as shown in **Figure 7.1**, and include:

- **Wind farm site** – The parcels of land on which the wind farm would be located, covering an area of approximately 8,318 hectares (ha).
- **Transmission line corridor** – The corridor of land in which the transmission line would be located, covering an area of up to 21 ha. The exact location of the transmission line within this corridor would be determined during detailed design of the Project.
- **Project** – the Kentbruck Green Power Hub. The Project includes the construction, operation and decommissioning of a wind farm with nameplate capacity of up to 600 megawatt (MW) and a 275 kilovolt (kV) transmission line with associated infrastructure.
- **Project Area** – The total area in which the Project would be developed. It comprises the wind farm site, the transmission line corridor and Heywood Terminal Station. The Project Area covers an area of approximately 8,350 ha.
- **Search Area** – The area used for collation of database records of flora and fauna, which includes the originally proposed Project Area plus a 10-kilometre (km) buffer.
- **Investigation Area** – The area in which field studies have been undertaken. This includes the Project Area plus areas surrounding the site where additional data collection was undertaken, including bird utilisation surveys, shorebird surveys, Brolga surveys and reference sites for threatened species. Where required, some field studies were undertaken more than 10 km from the Project Area, for example checking reference sites for threatened flora species.

7.2 Overview

The Project is located predominantly within a highly modified landscape including a commercial pine plantation and farmland, which is generally associated with low biodiversity value. The Project is positioned near several conservation reserves with high biodiversity values, including Lower Glenelg National Park, Discovery Bay Coastal Park, Cobboboonee National Park and the Glenelg Estuary and Discovery Bay Ramsar site (The Ramsar site). These conservation reserves provide habitat for a diverse range of species, including several threatened flying species (birds and bats) that are known to or may have potential to fly through the Project Area.

The Proponent has undertaken extensive research to understand and respond to the biodiversity and habitat values that are present within and around the Project Area. Understanding has been built through site surveys and desktop research, while responses have included site selection, Project design development (including iterative design development in response to the impact assessment findings), and development of management and mitigation measures (including adaptive management responses) to manage potential residual impacts and risks.

7.2.1 Methodology

To characterise existing conditions and provide context for the Project Area and surrounds, information about flora and fauna of the local area was obtained from relevant databases. A 10 km buffer was applied to the Project Area for the database and literature review. Database searches provide lists of species from the local area that have potential to occur on the site.

Stakeholder and community consultation was also undertaken during the scoping and assessment stages of the **FFIA (Appendix C)**. The outcomes of this consultation were used to determine appropriate assessment methodologies and establish the existing conditions in and around the Project Area.

Targeted surveys for flora and fauna species were informed by the database and literature review records and stakeholder and community consultation, as well as species identified in the *Scoping Requirements for Kentbruck Green Power Hub Environment Effects Statement* (the Scoping Requirements) as being most at risk of impact. The program of site investigations undertaken was designed to maximise the potential to obtain information on species and communities that were at risk of being impacted on by the Project.

The impact assessment methodology used in the **FFIA (Appendix C)** has been informed by the Scoping Requirements, and relevant policy, legislation, and guidelines. The approach taken involved:

- Identifying potential ecological receptors using existing information sources and targeted studies.
- Assessing the construction and operational activities of the Project to determine whether the Project would affect identified ecological receptors. The assessment included consideration of the magnitude, severity, extent, and duration of potential effects on ecological receptors. Potential impacts on matters of national environmental significance (MNES) that are protected under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) were assessed against significant impact guidelines.
- Following the assessment of potential impacts, the Project was reviewed to see whether there was opportunity to make changes to the Project that would avoid or minimise the identified impact.
- Assessing the revised Project to determine potential impacts when avoidance and/or minimisation measures were applied.
- Determining residual impacts and uncertainties, and development of management (including adaptive management) and mitigation measures that would apply during the construction and/or operation of the Project.

7.2.2 Existing conditions

Most of the wind farm site is located within a radiata pine (*Pinus radiata*) commercial timber plantation. Native vegetation is limited to road reserves, small remnant patches excluded from plantation development and regeneration of native understorey species in plantation areas. The wind farm site includes several areas of farmland, which have been cleared of native vegetation and are currently used primarily for dryland grazing by sheep and cattle. The cleared paddocks are dominated by introduced grasses, with scattered native species present close to adjacent areas of public land.

Much of the underground transmission line would be located beneath Boiler Swamp Road, which passes through Cobboboonee National Park and Cobboboonee Forest Park (the Parks). Boiler Swamp Road is an existing public road with a gravel surface that is regularly maintained to ensure public and park management vehicles can use it. The area surrounding Boiler Swamp Road supports high quality native vegetation. The remainder of the underground transmission line passes through predominantly cleared farmland used for grazing.

A total of 14 Ecological Vegetation Class (EVC)s were identified within the Project Area. No threatened ecological communities (TECs) are present within the Project Area. Wetlands within the Project Area include some small areas near the southern boundary of the wind farm site adjacent to Discovery Bay Coastal Park, wetlands within cleared farmland in the eastern portion of the wind farm site and wetlands near the underground transmission line through the Parks and near Heywood terminal station.

Four threatened flora species were recorded within the wind farm site. However, they are not within the wind farm infrastructure footprint. Several threatened flora species were identified in and near the transmission corridor along Boiler Swamp Road, however the majority of these threatened flora species are in remnant vegetation beyond the regularly maintained road formation. Numerous Apple Jack (*Eucalyptus splendens*) and Western Peppermint (*Eucalyptus falciformis*) trees are present within bushland adjacent to Boiler Swamp Road. No threatened ecological communities were recorded within the wind farm site or the transmission line route.

Site investigations recorded 24 threatened bird species within the Investigation Area, seven of which were recorded in the Project Area including Australasian Bittern *(Botaurus poiciloptilus)*, Brolga, Gang-gang Cockatoo *(Callocephalon fimbriatum)*, Rufous Bristlebird *(Dasyornis broadbenti braobenti),* White-throated Needletail *(Hirundapus caudacutus),* Blue-winged Parrot *(Neophema chrysostoma)* and White-bellied Sea-eagle *(Haliaeetus leucogaster)*. Southern Bent-wing Bat *(Miniopterus orianae bassanii)* (SBWB) was also recorded within the Project Area. There are previous records of several threatened mammal species in areas surrounding the Project Area. Southern Brown Bandicoot *(Isoodon obesulus obesulus)* and White-footed Dunnart *(Sminthopis leucopus)* were recorded in the Project Area. Two threatened reptile species were also recorded in the Project Area, the Striped Worm-lizard (*Aprasia striolata)* and Eastern Bearded Dragon *(Pogona barbata).*

7.2.3 Construction impact assessment

The main potential impact on biodiversity within the Project Area during construction would be removal of native vegetation, including habitat for threatened species. Construction of the wind farm requires direct removal of vegetation, to accommodate permanent and temporary infrastructure such as turbines, hard stands, access roads and the quarry. Construction of the transmission line does not require direct removal, but entails assumed losses due to trenching encroaching on Tree Protection Zones (TPZs).

Construction of the Project would require removal or assumed losses of 8.696 ha of native vegetation, including impacts on 228 large trees. 3.755 ha of this removal is for construction of the underground transmission line, however, the majority of this is due to major encroachment on TPZs and does not involve direct removal. The Project would also require the removal of 4.921 ha of native vegetation for construction of the wind farm.

Four threatened flora species were recorded in the wind farm site, and several threatened flora species listed as either vulnerable or endangered under the *Flora and Fauna Guarantee Act 1988* (VIC) (FFG Act) were recorded adjacent to the transmission line route in the Parks. Most of these threatened flora species along the transmission line route are in remnant vegetation beyond the regularly maintained road formation. There is some potential for One-flower Early Nancy *(Wurmbea uniflora)* to be present along the edges of the road formation as suitable habitat is present, which would result in direct impacts during construction. However, this species was not identified during surveys. Potential impacts on all threatened flora species will be managed by doing pre-construction surveys, marking, and protecting known locations and limiting construction activities to the road formation (see mitigation measure MM-BD01, MM-BD03, MM-BD06 and MM-BD07).

Numerous Apple Jack and Western Peppermint trees are present within bushland adjacent to Boiler Swamp Road. The Proponent has committed to avoid and minimise impacts on Apple Jack trees using a range of construction techniques, including directional drilling. As a result, Project infrastructure avoids impacts on Apple Jack trees.

Complete avoidance of more than 10% incursion into TPZs for Western Peppermint trees has not been possible when developing a construction methodology and design that meets the Project objectives, with potential for up to 83 trees of this species to be impacted. Further studies including root investigations beneath the road to confirm the conservative assessment of TPZ incursions will be undertaken (see mitigation measure MM-BD07).

Six threatened mammal species, including White-footed Dunnart, Southern Brown Bandicoot, Heath Mouse (*Pseudomys shortridgei*), Long-nosed Potoroo (*Potorous tridactylus trisulcatus*), Swamp Antechinus (*Antechinus minimus maritimus*), and Yellow-bellied Glider (*Petaurus australis*) have a medium or higher likelihood of occurring within or near the Project Area. However, the wind farm site is unlikely to support significant habitat for any of these threatened mammals due to its highly modified nature and is therefore not likely to impact on these species. The Parks provide habitat suitable for these threatened mammal species. While they may be present within the edges of the road alignment, disturbance would be confined to the short construction period, and potential impacts on TPZs of some adjacent trees is unlikely to impact on the broader populations within primary habitats. All six terrestrial mammal species are relatively abundant in the local area, and it is not likely that clearing impacts would significantly affect the viability of the populations of any of these terrestrial mammal species. Potential impacts will be managed by retaining extant native vegetation and implementing wildlife management measures outlined within the Flora and Fauna Management Plan (see mitigation measure MM-BD10).

Wetlands within the plantation are at least 650 metres (m) from any turbines or other wind farm infrastructure. The Project directly impacts on two Victorian Department of Energy, Environment and Climate Action (DEECA) mapped wetlands on farmland in the north-east of the wind farm site. Wind farm infrastructure through these mapped wetlands is limited to an internal underground 275 kV powerline and an access track which follows the northern boundary of the farmland. These impacts have been quantified in the native vegetation impact assessment. Indirect impacts to wetlands due to dewatering for turbine foundations has been avoided by relocation of turbines away from locations where turbine foundations could intersect with groundwater.

The Project would not impact directly or indirectly on TECs. The assessment found that the nearest examples of TECs were associated with the EPBC-listed Karst springs and associated alkaline fens of the Naracoorte Coastal Plain Bioregion. Known occurrences of this TEC within the Investigation Area include Lake Mombeong, which is located more than 1,500 m from the nearest wind farm infrastructure.

The Project is substantially confined to commercial pine plantations and farmland, and generally provides lower value habitat for threatened fauna, compared to adjacent areas of natural habitats. Terrestrial mammals, reptiles, and aquatic fauna are unlikely to be substantially affected by direct or indirect impacts from construction of the Project. Several mitigation measures will assist in ensuring impacts are negligible, including site inductions for construction staff, pre-construction surveys in areas of native vegetation, management of open trenches to minimise chances of animals being accidentally trapped, and measures for handling of any captured or injured wildlife will be put in place to minimise impacts on terrestrial mammals (see mitigation measure MM-BD10).

7.2.4 Operation impact assessment

Mortality of threatened birds and bats due to collision with turbines has been identified as the most significant potential ecological impact from operation of the Project. Some species of birds and bats are more susceptible to colliding with wind turbines, including those that are known to fly at the height of the wind turbine blades, and species that are not able to avoid wind turbines easily.

The Proponent adopted several design changes in response to the potential for birds and bats to collide with turbines, including removal of turbines from within 500 m of wetlands within the Ramsar site and within 300 m of other protected areas to reduce collision risk for bird and bat species that use these habitats. A 5 km buffer on known SBWB roosting caves was also applied, resulting in removal of several turbines in the west of the wind farm site. Turbines were also removed in farmland in the east of the wind farm site to minimise collision risk of species flying between sections of Cobboboonee National Park and minimise impacts on Brolgas. The minimum blade height of turbines was increased from 45 m above ground level to 60 m to avoid or minimise potential impacts on avifauna and bat species, particularly SBWB, which most frequently flies at heights less than 60 m. The external transmission line was also revised to be entirely underground to reduce collision risk for avifauna, particularly Brolga that use wetlands near Heywood Terminal Station. The Project is also committed to low wind speed curtailment and the implementation of a Bird and Bat Adaptive Management Plan (BBAMP) (see mitigation measure MM-BD12 and **Draft BBAMP Appendix AA).**

There is some potential for listed threatened bird species including Australasian Bittern, White-throated Needletail, South-eastern Red-tailed Black Cockatoo (*Calyptorhynchus banksii graptogyne*) and Orange-bellied parrot (*Neophema chrysogaster*) to fly over the site, and potentially collide with the wind turbines. For all these species, the pine plantation and farming land where wind turbines would be located is not in suitable habitat. Flights across the wind farm site are still possible, although for many of these species, it is unlikely those flights would, if they happen at all, occur at rotor-swept height. However, the **FFIA (Appendix C)** acknowledges that to varying degrees, collisions between listed threatened bird species and wind turbines are possible, and if they did occur, have the potential to cause a significant impact. The design adaptations described above, together with identified mitigation measures and the implementation of a rigorous adaptive BBAMP (see mitigation measure MM-BD12 and **Draft BBAMP (Appendix AA)**, will assist in ensuring that potential impacts are avoided and minimised.

During the field study program, Australasian Bittern were recorded on three occasions in the Investigation Area. Two of these recordings occurred in the Project Area (one flying over the north-east section of the wind farm site, and one heard calling at a wetland near the southern boundary). Based on the above and an understanding of the species' ecology, it is likely that such flights occur on an annual or seasonal basis, including multiple individuals occasionally moving across the wind farm site. They have been recorded to fly at heights of three to 200 m and may be at risk of colliding with wind turbines with the associated potential to impact on the size of the population. No mortalities of Australasian Bittern have been detected at monitoring of other Victorian wind farms (Moloney et al. 2019 and Symbolix, 2020). The wind turbine layout has responded to the studies of Australasian Bittern. No turbines would be located in the area where the Bittern was observed flying and the wetlands in the south of the wind farm site have a 500 m buffer from wind turbines applied. The BBAMP to be prepared for the Project includes specific commitments designed to further avoid and minimise potential impacts on Australasian Bittern, including further surveys to establish a baseline for monitoring, and developing contingencies to stop works if the species is observed to be engaging in breeding activities at breeding sites (see mitigation measure MM-BD11). Seasonal nocturnal low wind speed curtailment would be expected to further minimise potential collision risks for Australasian Bitterns flying during the curtailment periods (see mitigation measure MM-BD14).

White-throated Needletail was recorded on 21 occasions mostly during bird utilisation surveys (BUS), some of which were within the wind farm site. As a consequence of their annual migrations, White-throated Needletails are not at risk of any effects from the Project in the annual period from mid-April until mid-October when they are routinely absent from Australia. The species is primarily aerial, and roosting within Australia has been detected only rarely. The pine trees which occupy a large portion of the Project Area are unlikely to provide roosting habitat for the species given that the plantation pines are managed so that they do not form hollows, and the plantations are clear-felled on rotation. As such, it is not considered likely that the Project Area would represent important roosting habitat for the species, and the Project would not significantly impact habitat important to the species. A collision risk model was undertaken for White-throated Needletail, using the data from point counts obtained during Project surveys to evaluate the potential for turbine collisions. It is likely that some collisions by White-throated Needletails with Project turbines would occur, however, the population is considered unlikely to be significantly impacted by the Project.

The wind farm site is not suitable habitat for the South-eastern Red-tailed Black Cockatoo and no South-eastern Red-tailed Black Cockatoo were recorded during surveys. There are several past records of South-eastern Red-tailed Black Cockatoos in appropriate habitat close to the Project Area, primarily in Lower Glenelg National Park to the north of the wind farm site. It is likely that most flights by the species would be below rotor swept height of the Project's turbines and that flocking behaviour of South-eastern Red-tailed Black-Cockatoos would not exacerbate risk of collision with turbines at the Project. Overall, due to the lack of suitable habitat in the Project Area, the limited potential for the species to traverse the wind farm site, the likelihood that they will fly below the rotor swept height, and the likelihood that flocking behaviour would not exacerbate risk of collision, it is considered that turbine collisions would rarely occur, if ever. The wind farm site is unlikely to have a significant impact on the South-eastern Red-tailed Black Cockatoo population.

A single Orange-bellied Parrot was recorded by Biosis in the Investigation Area, but outside of the Project Area, which was the first record of the species in that area since 1993. The Project Area is within environments that are not suitable habitat for Orange-bellied Parrots. The species may occasionally fly over or through the wind farm site, however any such movements away from the species' preferred coastal environment into the Project Area are likely to be very rare. However, given the very small population and the conservation status of the species any mortality due to collision with turbines would be considered a high impact. Although no known flight height data is available for Orange-bellied Parrots, flight behaviour is expected to be similar to the related Blue-winged Parrot, suggesting that flights within rotor-swept height (above 60 m) are likely to be rare. The overall lack of suitable habitat for the species combined with the setbacks to suitable habitat and the high height of turbine rotors means that collisions with turbines are extremely unlikely to occur and the wind farm is unlikely to have significant impacts on the Orange-bellied Parrot population.

Acoustic bat-call surveys confirmed that SBWBs routinely fly within the wind farm site including areas occupied by pine plantations. Bat detectors recorded 1,254 (97% of total of 1,292 calls) calls at 1.5 m above ground and only one call was detected within the rotor-swept area, at the upper detector 84 m above ground level. The call data indicates that majority of SBWB flight activity at the wind farm site occurs close to the ground and that an extremely small proportion of SBWB flights occur within rotor-swept height. Therefore, the risk of collisions with turbines is likely to be low because of the relative rarity of fights within the rotor-swept area. It is considered that turbine collisions at the wind farm site are unlikely to result in a long-term decrease in the size of the overall population of the subspecies due to low levels of activity within the rotor swept height, the temporal activity and the preference for bats to fly in lower wind speed conditions when rotor swept height is routinely expected to have unfavourable wind speeds. Low wind speed curtailment will also be implemented considering of seasonality, time of day, temperature and rainfall to further minimise potential collision risks for SBWB (see mitigation measure MM-BD14).

Mitigation measures will be implemented to mitigate the risk of bird and bat collision with turbines and transmission lines. A BBAMP will be developed to minimise turbine collision and ensure unexpected bird mortalities are responded to (see mitigation measure MM-BD12 and **Draft BBAMP Appendix AA**). All new overhead powerlines, including the transmission line, will be marked standard commercially available bird diverters to increase visibility to birds and minimise the risk of collision (see mitigation measure MM-BD16).

Overall, effects or mechanisms associated with development or operation of the Project have very little capacity to result in changes directly or indirectly to the Ramsar site provided that appropriate management measures are implemented. The Project is considered unlikely to have a significant impact on the Ramsar site as per the EPBC Act significant impact criteria. The Project is not likely to have impacts that would reach or exceed any of the defined Resource Condition Targets or Limits of Acceptable Change associated with the Ramsar site.

7.3 EES evaluation objective

The specific environmental matters to be investigated and documented in the Project's Environment Effects Statement (EES) are set out in the Scoping Requirements. The Scoping Requirements provide evaluation objectives that describe the desired outcomes to be achieved for each of the matters being addressed in this EES.

The following draft evaluation objective is relevant for the biodiversity impact assessment:

- **Biodiversity and habitat** – To avoid or minimise potential adverse effects on biodiversity values within the project site and its environs, including native vegetation, listed species and ecological communities other protected species and habitat for these species.

This chapter and the biodiversity impact assessments in the **FFIA (Appendix C), Brolga Impact Assessment (Appendix D)** and **SBWB Impact Assessment** (**Appendix E**) address the Project's biodiversity matters in response to the Scoping Requirements.

7.4 Environment effects statement scoping requirements

The Scoping Requirements also identify key issues or risks that the project poses to achieve the draft evaluation objective for biodiversity and habitat matters:

- Potential for significant effects and their acceptability on SBWB South-eastern Red-tailed Black Cockatoo, Australasian Bittern, White-throated Needletail and Orange-bellied Parrot.
- Potential for significant effects and their acceptability on key threatened and listed fauna species including but not limited to those listed in Appendix A of the Scoping Requirements.
- Potential cumulative effects on key threatened and listed fauna species including but not limited to those listed in Appendix A from the project in combination with other projects.
- Disruption to the movement of fauna (both day and night) between areas of habitat across the broader landscape, including but not limited to movement between nearby conservation areas such as Discovery Bay Coastal Park, Lower Glenelg National Park and Long Swamp.

- Direct or indirect loss, disturbance and/or degradation of listed or other protected species and nearby habitat that may support listed species or other protected flora, fauna or ecological communities.
- Disturbance and increased risk of mortality for protected bird and bat species arising from project infrastructure, including collision with wind turbine blades and transmission lines.
- Potential for adverse effects on the ecological character and biodiversity values of the Ramsar site (including those listed in Appendix A of the Scoping Requirements).
- The availability of suitable offsets for the loss of native vegetation and habitat for listed threatened species under the FFG Act and EPBC Acts.

The Scoping Requirements relevant to biodiversity and habitat are set out in full in Table 1, Section 1.4 of the **FFIA (Appendix C).**

Table A1 at Appendix A to the Scoping Requirements also includes listed species that are known to occur locally and may be impacted by the project. These species were considered as part of the **FFIA (Appendix C).**

7.5 Independent peer reviews

Department of Transport and Planning (DTP) (formerly DELWP) commissioned independent peer reviews of select species/species groups. The details of the peer review are set out in Appendix 11 of the **FFIA** (**Appendix C)** and consisted of:

- Selected threatened birds; undertaken by Richard Loyn (Eco Insights)
- Southern Bent-wing Bat; undertaken by Emmi van Harten.

The independent peer reviews were conducted in two stages. The first stage of each peer review focused on proposed approaches and methodology. The second stage of each peer review focussed on the impact assessment findings.

The independent peer reviews are included in Appendix 11 of the **FFIA (Appendix C)**. Detailed responses to the findings of each of the DTP commissioned peer reviews are provided in Appendix 11 of the **FFIA (Appendix C)** (for selected threatened birds), and Appendix 8 of the **SBWB Impact Assessment (Appendix E).** This chapter summarises the assessment outcomes of the above reports and therefore incorporates any changes to the assessment or mitigation in response to the peer review comments.

7.6 Assessment methodology

This section describes the methods used to determine the existing conditions and assess potential impacts on biodiversity values. A detailed description of the methods used in the assessment is provided in Section 3 of the **FFIA** (**Appendix C**) and in Sections 4 to 34 of the **FFIA (Appendix C)** where methods were specific to ecological values.

7.6.1 Likelihood of occurrence

Database searches provide lists of species from the local area that have potential to occur on the site. Where database records of state and nationally significant species exist from the local area, but these species are not identified during field survey, it is necessary to consider the likelihood that they occur on the site. Likelihood of occurrence is a broad categorisation to indicate the potential for a species to occur within the site and is based on expert opinion, information in relevant biodiversity databases and reports, and an assessment of the habitats on site.

The **FFIA (Appendix C)** determined likelihood of occurrence using a ranking system, with each species or ecological communities likelihood of occurrence ranked as negligible, low, medium, or high. Species for which there is little or no suitable habitat within the Project Area were assigned a low or negligible likelihood of occurrence.

7.6.2 Database and literature review

To provide context for the impact assessment, information about flora and fauna of the local area was obtained from relevant databases. The database and literature review was undertaken for the Search Area (Project Area plus a 10 km buffer). **Table 7.1** describes the key information sources used in the database and literature review.

Table 7.1: Key Information sources used in the desktop review

Description
• DEECA's Victorian Biodiversity Atlas (VBA) datasets • Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) Protected Matters Search Tool for matters protected by the EPBC Act • BirdLife Shorebird 2020 • BirdLife BirdData • eBird • Sheldon 2004 south-west Victorian Brolga flocking database. Other sources of biodiversity information were examined including: • DEECA's NatureKit mapping tool • DEECA's Habitat Importance maps • DEECA's Native Vegetation Information Management (NVIM) system • Planning Scheme overlays relevant to biodiversity based on https://planningschemes.delwp.vic.gov.au/ • Non-government databases including the Atlas of Living Australia • Local knowledge provided by agency staff, landholders, and an ornithologist • Multiple published and unpublished documents used in the assessment are listed in References.

7.6.3 Stakeholder and community consultation

Stakeholder and community consultation was also undertaken during the scoping and assessment stages of the **FFIA (Appendix C)**. Consultation included:

- Meetings between the Proponent and regulatory agencies such as DTP Impact Assessment Unit (who administer the environment effects statement process) and DEECCA Barwon South West Region.
- Presentations to Technical Reference Group meetings as part of the EES process.
- Meetings with subject matter experts, including representatives from DEECA Arthur Rylah Institute in respect to the assessment of specific matters.
- Meetings with members of the community and community organisations, including local environment groups and individuals with potentially valuable information about the ecology of the site and surrounds. Follow up consultation was held with local bird experts, relating to Brolga and Australasian Bittern, the records of which have been considered in the impact assessment process.
- Meetings with landholders in the Project Area.
- Attendance at several community consultation events hosted by the Proponent in townships representing major communities around the Project, including at Portland and Mount Richmond.

The outcomes of this consultation were used to inform the determination of appropriate assessment methodologies and for establishing the existing conditions in and around the Project Area.

7.6.4 Site investigations

The following sections provide a summary of the site investigations undertaken for the **FFIA (Appendix C)** and **SBWB Impact Assessment (Appendix E).**

The program of site investigations undertaken was designed to maximise the potential to obtain information on species and communities that were identified in the Scoping Requirements as being most at risk of impact. This involved timing surveys to coincide with specific times when targeted species were likely to be present and/or most likely to be detected, and the use of methods that also have the best potential to detect relevant species.

Targeted surveys for flora and fauna species were informed by the database and literature review records and stakeholder and community consultation. Surveys were undertaken in accordance with relevant Commonwealth and State survey guidelines. Although the field survey programs were focused on identifying threatened flora and fauna species, all observations of common (non-threatened) species were also recorded. The Investigation Area for each targeted survey or field investigation varied and was based on the nature of the species being investigated.

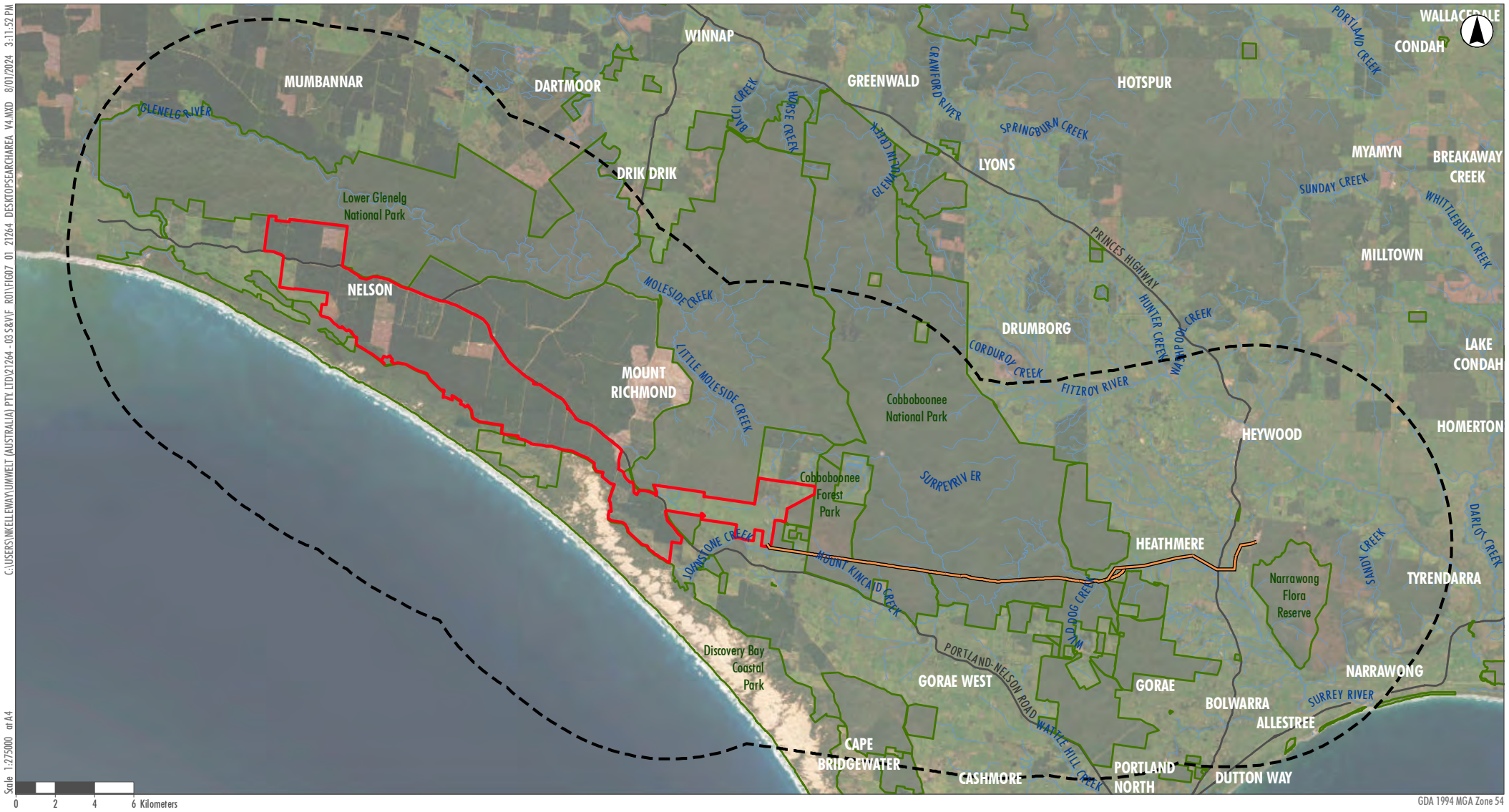


FIGURE 7.1

Desktop Search Area

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

7.6.4.1 Native vegetation and habitat

Vegetation and habitat mapping was done through field surveys, aerial imagery, and publicly available vegetation mapping. Vegetation mapping was conducted within the Project Area, including a buffer area of 100 m beyond the construction footprint, with a focus on:

- Compiling lists of native and introduced flora and fauna species occurring in mapped areas, and in the broader Investigation Area.
- Determining EVCs, including identifying which areas of native vegetation would require (if impacted) planning permission and offsets.
- Identification of areas where native vegetation corresponds with TECs listed under the FFG Act and/or the EPBC Act.
- Assessment of the likelihood that areas of mapped vegetation provide potential habitat for threatened species.

The 100 m buffer was not used in select locations where the construction footprint is deliberately narrow to avoid impacts on adjacent vegetation, such as along Boiler Swamp Road where it bisects the Parks

The vegetation and habitat mapping were used to refine the project design to avoid and minimise disturbance to native vegetation and habitat where possible. See **Section 7.8** for further information on design development of the Project including refinements to the project design to avoid or minimise impacts on native vegetation.

A Vegetation Quality Assessment (VQA) was undertaken for all patches of native vegetation identified in the Project Area. This assessment is consistent with DEECA's habitat hectare method (DSE 2004) and the *guidelines for the removal, destruction or lopping of native vegetation* (Native Vegetation Guidelines) (DELWP 2017a). Species nomenclature for flora follows the Victorian Biodiversity Atlas (VBA). All species observed during the surveys were recorded and added to the database for the project. A list of species recorded within the Project Area is provided in Appendix 2 (Table A2.1) of the **FFIA (Appendix C).**

Flora and native vegetation surveys were undertaken for the Project Area between May 2020 and August 2022. Surveys of the transport route from Port of Portland to the Project Area were undertaken in May 2023. See Section 4.1 of the **FFIA (Appendix C)** for further details.

Flora surveys

Where impacts to vegetation could not be avoided, these areas were subject to further assessment, including targeted flora surveys for EPBC and FFG listed threatened species in areas of habitat that have the potential to be directly impacted by the Project. For some species this included reference site checks to ensure surveys were done when species would be expected to be detectable in the local area. Reference sites included locations where the species had been previously recorded, based on VBA records or other sources. Due to the seasonal variation in flowering periods, reference sites and potential impact areas were searched repeatedly, over multiple survey periods.

Although the field survey program was focussed on assessment of threatened flora and fauna species, all observations of common (non-threatened) species were collected and added to the database for the Project. Information on occurrence of common species was collected during BUS's, migratory waterbird surveys, wetland bird surveys, remote camera surveys, reptile tiling surveys, nocturnal surveys for owls and all other times while ecologists were onsite.

All flora surveys were carried out between May 2020 to October 2021 with additional surveys occurring for Apple Jack in 2022 and the transport route in 2023. During these periods, targeted surveys were undertaken for specific species (during appropriate detection periods) as outlined in **Table 7.2.**

Table 7.2: Targeted flora survey species

Species and Status	Potential survey areas	Survey methods	Survey Periods
EPBC Act listed species			
River Swamp Wallaby-grass (*Amphibromus fluitans)* EPBC: Vulnerable	Wetlands	Transect surveys in suitable habitat in spring (following inundation in winter)	August 2020 September 2020 October 2020 November 2020 December 2020
Limestone Spider-orchid (*Caladenia calcicole)* EPBC: Vulnerable FFG: Critically endangered	Limestone ridges supporting native vegetation (Limestone Ridge Woodland)	Reference site checks to confirm flowering. Area search using transects.	September 2020 October 2020 November 2020 December 2020

Species and Status	Potential survey areas	Survey methods	Survey Periods
Colourful Spider-orchid (*Caladenia colorata)* EPBC: Endangered FFG: Critically endangered	Heathy Woodland on sandy soils over limestone	Reference site checks to confirm flowering. Area search using transects.	August 2020 September 2020 October 2020
Mellblom's Spider-orchid (*Caladenia hastata)* EPBC: Endangered FFG: Critically endangered	Damp Heathland and Damp Heathy Woodland on aeolian sand deposits.	Reference site checks to confirm flowering. Area search using transects.	October 2020 November 2020
Ornate Pink-fingers (*Caladenia ornate)* EPBC: Vulnerable FFG: Endangered	Heathlands and grassy woodlands.	Reference site checks to confirm flowering. Area search using transects	October 2020 November 2020
Wrinkled Cassinia (*Cassinia rugata)* EPBC: Vulnerable FFG: Critically Endangered	Damp, low open forest or dense heathy scrub	Flowers February to April. Transect surveys in suitable habitat.	August 2020 September 2020 October 2020 November 2020 December 2020
Clover Glycine (*Glycine latrobeana)* EPBC: Vulnerable FFG: Vulnerable	Grasslands and grassy woodlands, particularly those dominated by Kangaroo Grass	Transect surveys in suitable habitat.	September 2020 October 2020 November 2020 December 2020
Square Raspwort (*Haloragis exalata var. exalata)* EPBC Act: Vulnerable	Damp riparian habitats	Transect surveys in suitable habitat	October 2020 November 2020 December 2020
Coast Ixodia (Ixodia achillaeoides subsp. Arenicola) EPBC: Vulnerable	Damp riparian habitats	Flowers October to March. Transect surveys in suitable habitat.	November 2020 December 2020
Maroon Leek-orchid (*Prasophyllum frenchii)* EPBC: Endangered FFG: Endangered	Grassland and grassy woodland environments on sandy or black clay loam soils that are generally damp but well drained.	Flowers October to November. Reference site checks to confirm flowering. Area search using transects.	October 2020 November 2020 December 2020
Dense Leek-orchid (*Prasophyllum spicatum)* EPBC: Vulnerable FFG: Critically endangered	Coastal and near-coastal heathlands and heathy woodlands on sandy soils that may be seasonally waterlogged.	Flowers early October to early November. Reference site to checks to confirm flowering. Area search using transects.	October 2020 November 2020 September 2024 (Heywood terminal station)
Green-striped Greenhood (*Pterostylis chlorogramma)* EPBC: Vulnerable FFG: Endangered	Heathy woodland; more specific habitat requirements are poorly known.	Flowers July to September. Reference site checks to confirm flowering. Area search using transects.	August 2020 September 2020
Swamp Greenhood (*Pterostylis tenuissima)* EPBC: Vulnerable	Swamp scrub with a dense canopy and open understorey, often on or beside animal tracks	Flowers between October and March. Reference site checks to confirm flowering. Area search using transects	October 2020 November 2020 December 2020
Swamp Fireweed (*Senecio psilocarpus)* EPBC: Vulnerable	Mostly grassy and sedgy wetlands.	Flowers between November and March. Most frequently recorded in November and December. Area search using transects.	November 2020 December 2020
Coast Dandelion (*Taraxacum cygnorum)* EPBC: Endangered FFG: Critically Endangered	Confined to woodlands and scrub on calcareous soils	Flowers October to December. Area search using transects.	October 2020 November 2020 December 2020

Species and Status	Potential survey areas	Survey methods	Survey Periods
Metallic Sun-orchid (*Thelymitra epipactoides)* EPBC: Endangered FFG: Endangered	Moist or dry sandy loams or loamy sands, primarily in coastal heaths, grasslands and woodlands	Flowers between September and November. Reference site checks to confirm flowering. Area search using transects.	September 2020 October 2020 November 2020
Swamp Everlasting (*Xerochrysum palustre)* EPBC: Vulnerable FFG: Critically endangered	Sedge-swamps and shallow freshwater marshes and swamps in lowlands, on black cracking clay soils	Flowers November to March. Area search using transects.	November 2020 December 2020
Additional FFG Act listed species			
Scented Spider-orchid (*Caladenia fragrantissima)* FFG: Critically endangered	Near-coastal heath or heathy woodland in sandy loam	Reference site checks to confirm flowering. Area search using transects.	September 2020 October 2020
Robust Spider-orchid (*Caladenia valida)* FFG: Critically endangered	Coastal or near coastal heaths and heathy woodland	Reference site checks to confirm flowering. Area search using transects.	September 2020 October 2020
Curly Sedge *(Carex tasmanica)* FFG: Endangered	Seasonally wet, heavy clay soils	Flowers in spring. Area search using transects.	September 2020 October 2020
Coast Helmet-orchid (*Corybas despectans*) FFG: Endangered	Raised clumps of ground in wet areas of swamp scrub, which have a dense overstorey of Woolly Tea-tree or Scented Paperbark	Reference site checks to confirm flowering. Area search using transects.	August 2020
Late Helmet-orchid (*Corybas sp. Aff. Diemenicus)* FFG: Critically endangered	Raised clumps of ground in wet areas of swamp scrub, which have a dense overstorey of Woolly Tea-tree or Scented Paperbark	Reference site checks to confirm flowering. Area search using transects.	September 2020 October 2020
Swamp Diuris (*Diuris palustris)* FFG: Endangered	Typically occurs in swampy depressions	Reference site checks to confirm flowering. Area search using transects	August 2020 September 2020 October 2020
Large-fruit Yellow Gum (*Eucalyptus leucoxylon subsp. Megalocarpa)* FFG: Critically endangered	Undulating low hills of thin loam over limestone in coastal Shrubland. Only known to occur close to Nelson.	Conspicuous species will be identified during vegetation mapping surveys. If required, targeted survey of habitat areas using transects	August 2020 September 2020 October 2020 November 2020 December 2020
Coastal Leek-orchid (*Prasophyllum littorale)* FFG: Critically endangered	Coastal scrub and heath on sand hills or headlands, in sand over moisture-retentive clays	Reference site checks to confirm flowering. Area search using transects	November 2020 December 2020
Small Sickle Greenhood (*Pterostylis lustra)* FFG: Endangered	In shaded, damp to wet areas along stream banks, in wet soaks and swamps.	Reference site checks to confirm flowering. Area search using transects	November 2020 December 2020
Leafy Greenhood (*Pterostylis cucullata subsp. Cucullate)* FFG: Endangered	Protected areas of stabilised coastal sand dunes within scrub communities with an open ground layer; occasionally in Coastal Manna Gum woodland	Reference site checks to confirm flowering. Area search using transects	August 2020 September 2020 October 2020
Winter Sun-orchid (*Thelymitra hiemalis)* FFG: Critically Endangered	Brown Stringybark *Eucalyptus baxteri* or Western Peppermint woodland, typically with a heathy understorey	Reference site checks to confirm flowering. Area search using transects	August 2020

Arborist assessment of trees along the underground transmission line route

An arborist was engaged to identify and map trees along the route of the underground transmission line beneath Boiler Swamp Road. This road bisects the Parks. The arborist assessment was completed from May 2021 to June 2021. The arborist assessment report is provided in Appendix 12 of the **FFIA (Appendix C).**

The Investigation Area for the arborist assessment consisted of 15 m either side of Boiler Swamp Road, for approximately 15 km. All trees within 15 m of the road edge were visually assessed, and trees were assessed in detail if there was potential for the trenching activity to impact on the TPZ. The impact area included a 1.5 m wide trench, centred on the middle of the road, plus any areas where additional excavation was specified, including cable junction pits.

The tree data collected by the arborist was used to identify any trees with a construction encroachment into the TPZ of more than 10%, in accordance with the Australian Standard for the Protection of Trees on development sites (AS4970-2009). For each tree potentially impacted, the loss area was either 0.071 ha (15 m radius) for large trees, or 0.031 ha (10 m radius) for other trees. It should be noted that the assessment of impacts in the arborist assessment is no longer relevant for the Project and has been superseded by the Flora and Fauna Impact Assessment.

Survey to map apple jack eucalyptus splendens

Following discussions with local Parks Victoria personnel, trees adjacent to Boiler Swamp Road were resurveyed in October 2022 to identify the presence of Apple Jack, which co-occurs with similar species previously mapped by the arborist including Rough-barked Manna Gum (*Eucalyptus viminalis* subsp. *cygnetensis*) and Western Peppermint.

This species was added to the list of threatened species under the FFG Act following the review of the act in 2021 and is now listed as Critically Endangered. The entire length of Boiler Swamp Road was re-surveyed, with the focus on trees which had the potential for some level of TPZ encroachment due to the construction works (predominantly excavation of the cable trench along Boiler Swamp Road). The **FFIA (Appendix C)** provides further detail on the targeted flora surveys, including timing, methods and guidelines used to inform the search and assessment of species known or likely to occur within the Investigation Area.

Determining native vegetation impacts

Native vegetation impact and offset requirements have been determined following relevant policy documents, including:

- Glenelg Shire Planning Scheme clause 52.17 – Native Vegetation.
- Victorian government *Guidelines for the removal, destruction or lopping of native vegetation* (DELWP 2017a).
- *The Assessor's Handbook: Applications to remove, destroy or lop native vegetation* (DELWP 2018).
- Australian Standard AS 4970-2009 Protection of trees on development sites

Determination of impacts involved compiling data from the vegetation mapping and quality assessment field stages, and overlaying areas where construction of infrastructure was required.

This process was undertaken several times, with many design changes implemented specifically to avoid and minimise impacts to native vegetation, including avoidance of threatened species locations, or areas of modelled habitat.

Design modifications undertaken throughout the process include:

- Micrositing of infrastructure, including cable alignments, turbine locations, transmission lines and access tracks to specifically avoid native vegetation.
- Micrositing of the cable trench alignment along Boiler Swamp Road to avoid impacting upon tree protection zones of the critically endangered tree species Apple Jack Eucalyptus splendens.
- Specification of directional drilling locations along Boiler Swamp Road, where impacts to Apple Jack tree protection zones could not be avoided via micrositing of the trench alignment.
- Specification of directional drilling locations to avoid impacts to waterways.
- Micrositing of the cable trench alignment through farmland areas, to avoid impacts to patch vegetation and wetlands.

Impacts were determined using DEECA tools, including: the EnSym Native Vegetation Regulations tool, which has now (as of 2024) been replaced by the DEECA Native Vegetation Regulation Map tool.

Impacts were determined as follows:

- For understorey vegetation (treeless), the area of loss corresponds with the intersection between the native vegetation patch and the Project Infrastructure, allowing sufficient area for constructability:
    - In the case of trenching for the transmission line outside of the Parks, a 9 m wide construction corridor was specified.
    - For woodland or forest vegetation (including trees and understorey vegetation), the area of loss included the intersection between the native vegetation patch and the Project Infrastructure, plus additional area to account for the loss of tree canopies that extend beyond the infrastructure.

- For trenching of the transmission line beneath Boiler Swamp Road, any trees determined to have more than 10% encroachment to their tree protection zones are included as assumed losses. Tree positions and diameter at breast height were sourced from the arborist's data, which was collected using sub-metre accuracy differential GPS. The area of loss was calculated as the size of canopy, based on the arborist's estimates of canopy diameter (assuming a circular canopy). Overlapping canopies were merged, to avoid double (or more) counting of the same loss areas. This loss area was included as 100% loss, which is a conservative approach, given the loss is 'assumed', and may not actually occur, and losses are limited to the canopy only (i.e. no loss of understorey). Additionally, the area of loss included in the calculations includes loss of canopies overhanging Boiler Swamp Road.
- The trench along Boiler Swamp Road is specified as 2.9 m wide and although the construction corridor is wider at 6.5 m no additional impacts are considered as the construction corridor will be limited to the formed road formation of Boiler Swamp Road.

7.6.4.2 Wetlands

Information on mapped wetlands was sourced from publicly available datasets (see **Table 7.1)** and aerial imagery.

Field assessment of wetlands was undertaken during vegetation mapping, flora surveys and targeted fauna surveys including for Brolga and other waterbirds. Site assessments were undertaken in October 2021 and August 2022 to provide additional information on wetlands within and near the Investigation Area, particularly in relation to habitat suitability for Brolga and TECs, including the EPBC Act listed Karst springs and associated alkaline fens of the Naracoorte Coastal Plain Bioregion. Difficult to access wetlands within adjacent areas of Lower Glenelg National Park and Kentbruck H50 Bushland Reserve were also inspected in October 2021 to characterise habitat suitability for a range of threatened species, including Australasian Bittern and Brolga.

7.6.4.3 Threatened fauna surveys

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

Although the field survey program was focussed on assessment of threatened flora and fauna species, all observations of common (non-threatened) species were collected and added to the database for the Project. A list of fauna species recorded within the Investigation Area during the targeted threatened fauna surveys is provided in Appendix 3 of the **FFIA (Appendix C).**

Following the initial fauna scoping surveys, database searches, and in accordance with the Scoping Requirements, a range of surveys were carried out for the following fauna species:

- Southern Bent-wing Bat (*Miniopterus orianae bassanii*), and other microbat species
- South-eastern Red-tailed Black Cockatoo (*Calyptorhynchus banksii graptogyne*)
- Orange-bellied Parrot (*Neophema chrysogaster*), with Blue-winged Parrot (*Neophema chrysostoma*) and Elegant Parrot (*Neophema chrysostoma*) captured in these surveys.
- Brolga (*Antigone rubicunda*) (Refer to **Chapter 8**)
- Australasian Bittern (*Botaurus poiciloptilus*) and other listed threatened water birds including Lewin's Rail (*Lewinia pectoralis*)
- White-throated Needletail (*Hirundapus caudacutus*)
- Fork-tailed Swift (*Apus pacificus*)
- Shorebirds, gulls and terns including various Migratory Shorebirds, non-migratory shorebirds
- Owls
- Eastern Ground Parrot (*Wallicus wallicus*)
- Rufous Bristlebird (Coorong) (*Dasyornis broadbenti braobenti*)
- Terrestrial and arboreal mammals
- Reptiles
- Growling grass frog (*Litoria raniformis*).

Site investigations to identify threatened fauna species were undertaken through the following:

- Australasian Bittern surveys (see **Figure 7.2**)
- Orange-bellied Parrot surveys (see **Figure 7.3**)
- Nocturnal surveys for owls (see **Figure 7.4**)
- Remote camera surveys for terrestrial mammals (see **Figure 7.5**)
- Tiling surveys for threatened reptile species (see **Figure 7.6**)

- Growling Grass Frog surveys (see **Figure 7.6**)
- Eastern Ground Parrot surveys (**Figure 7.7)**
- Bird utilisation surveys (see **Figure 7.8**)
- Migratory waterbird and wetland bird surveys (see **Figure 7.9**)
- Surveys for Southern Bent-wing Bat (see **Section 7.6.4.6** and **Figure 7.10**)

The specific survey methods for each species are described in detail in Sections 11 to 33 of the **FFIA** (**Appendix C**).

Monitoring and surveys for some threatened bird species (including Gang-gang Cockatoo, Little Eagle, White-bellied Sea Eagle (*Haliaeetus leucogaster*), Rufous Bristlebird (Coorong), Fork-tailed Swift, and White-throated Needletail) were undertaken during bird utilisation surveys rather than specific surveys targeted at these species. Targeted surveys for Grey-headed Flying-fox were not undertaken at the time of assessment as there were limited records of the species within the region.

Due to the unpredictable nature of the South-eastern Red-tailed Black Cockatoo movements and use of its range, surveys to document this species in the Project Area and its environs would offer a very limited basis for understanding how the birds might use the site over the life of the Project. For this reason, the primary approach to consideration of the species' likely use of the Project Area was to determine the occurrence of suitable habitat within and surrounding the Project Area. This approach was agreed to in consultation with DEECA Environment. BUS points provided capacity to detect South-eastern Black Cockatoo it was present when those surveys were undertaken.

Aquatic values have been assessed through a desktop assessment. Field assessment of aquatic fauna was not undertaken as no suitable habitat was identified within the Project Area. An exception to this is some locations on the Surrey River and the Wild Dog Creek which will be crossed by the transmission line route, where a visual assessment was undertaken, or incidental recordings taken.

Targeted surveys were conducted for Brolga which has been assessed separately under **Chapter 8 *Brolga***. SBWB surveys are described in **Section 7.3.2.5** and detailed in the **SBWB Impact Assessment** (**Appendix E**).

Legend

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

FIGURE 7.2

Australasian Bittern Survey Locations

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

FIGURE 7.3

Orange-bellied Parrot Survey Locations

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

C:\USERS\NKELLEWAY\UMWELT (AUSTRALIA) PTY. LTD\21264 - 03 S&V\F R01\FIG07 04 21264 OWLSURVEYLOCATIONS V4.MXD 8/01/2024 3:17:05 PM

Scale 1:300000 at A4

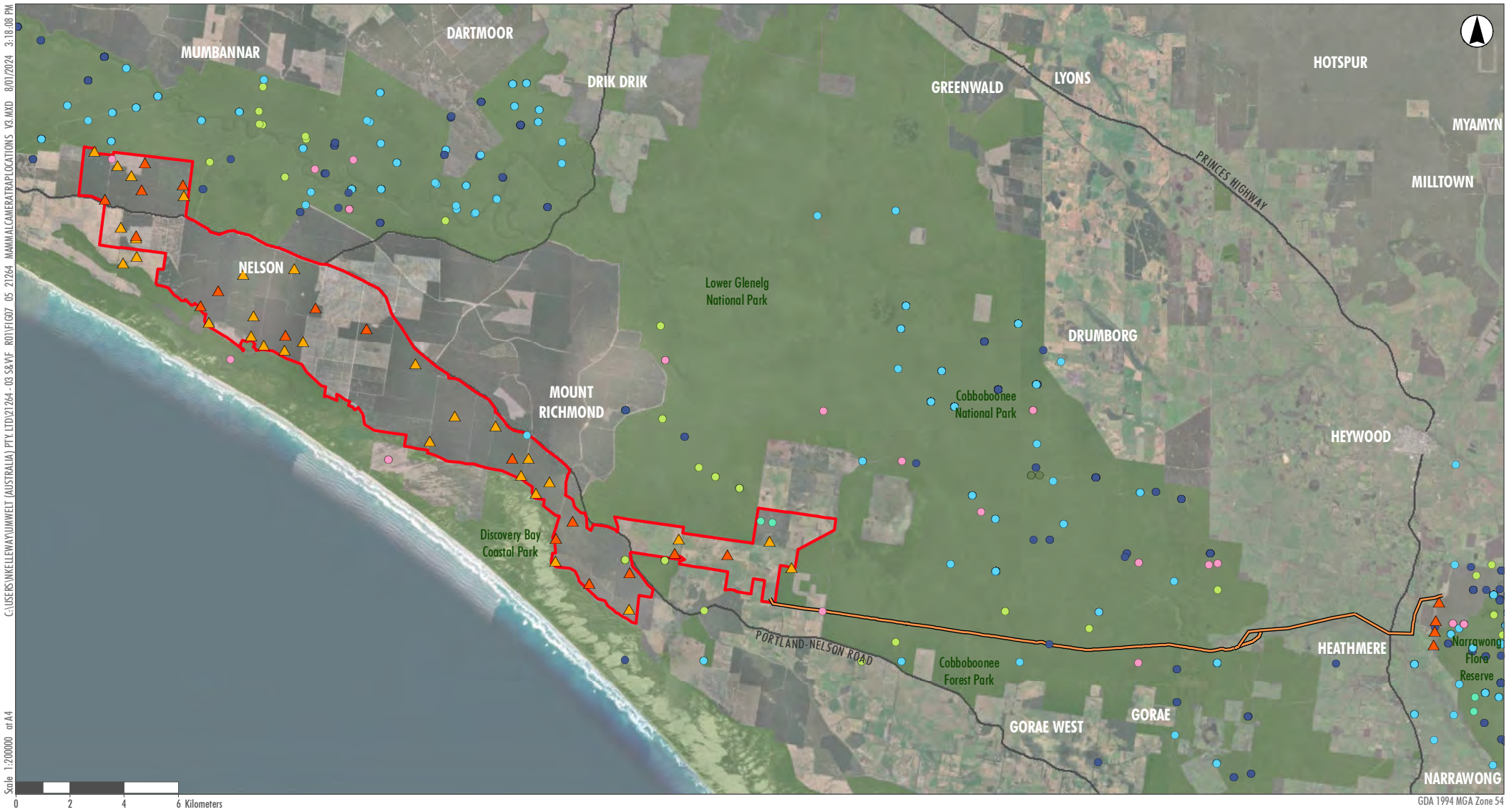
Legend

- Threatened Owl Survey Location
- Barking Owl (VBA)
- Masked Owl (VBA)
- Powerful Owl (VBA)
- Parks and Reserves
- Wind Farm Site
- Underground Transmission Line
- Roads

FIGURE 7.4

Owl Survey Locations

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



Legend

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

FIGURE 7.5

Mammal Camera Trap Locations

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

Legend

- Four-toed Skink Survey Location
- Growling Grass Frog Survey Location
- Reptile Survey Location
- Striped Worm-Lizard Survey Location
- Parks and Reserves
- Wind Farm Site
- Underground Transmission Line
- Roads

FIGURE 7.6

Reptile and Growling Frog Survey Locations

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

Legend

- Wind Farm Site
- Underground Transmission Line
- Parks and Reserves
- Roads
- Watercourses
- Eastern Ground Parrot Survey Location (Biosis)

Species Records

- Eastern Ground Parrot (VBA)
- Eastern Ground Parrot (BirdLife)
- Eastern Ground Parrot (eBird)

FIGURE 7.7

Eastern Ground Parrot survey locations

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

7.6.4.4 Bird utilisation surveys

BUS were undertaken in April, June, August, October and December 2020 and February 2021 to provide an understanding of the avifauna present in the Investigation Area and to inform collision risk modelling (CRM) for some bird species.

Replicate surveys were conducted across a ten-month period to representatively sample different seasons and capture the presence of migratory birds. Twenty-seven point count survey sites were selected across the Investigation Area. A point count is a tally of birds detected by sight and sound by an observer located a fixed position. For the purposes of representative sampling of habitats within the wind farm Project Area 13 point count locations were within plantation areas and natural woodland. However, most of those sites were positioned in clearings, recently harvested areas or adjacent to cleared land so that they afforded the opportunity to observe birds in the open sky and those using treed areas. Of the total of 27 point count sites, 17 were either in cleared agricultural land or within areas of plantation that provided views of the surrounding landscape.

Surveys were conducted three times at each point count site during each monitoring month. The three surveys were spread across 'morning' (start between 07:45 and 10:59), 'midday' (start between11:00 and 13:59) and 'afternoon' (start between 14:00 and 17:15), to capture the presence of the entire diurnal bird species assemblage at each site. Sky visibility extent was a factor in choosing BUS sites, however, as surveys needed to be conducted to sample present habitats, it is acknowledged that chosen BUS sites had varying levels of visibility.

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

A total of 418-point counts were carried out at 17 treatment sites (within the Project Area) and 10 control sites (outside the Project Area). Totals of between 14 and 18 replicate counts were undertaken at each site in the months mentioned above. The survey sites were representative of locations for turbines and sites of known threatened bird records. Refer to **Figure 7.8** for BUS point locations. During this collection of point count data, flights were counted regardless of if birds were alone or in flocks, measuring the time and airspace (the measure of flight flux) at which flights occurred. Birds being identified alone or in flocks was therefore immaterial to the performance of CRM. Empirical evidence from the CRM undertaken for the Project and globally have shown no indication that flocks of birds are at a greater risk of wind turbine collision than individuals.

7.6.4.5 Shorebirds, gulls and terns

Surveys for migratory species was undertaken in accordance with the EPBC Act Policy Statement 3.21 *Industry guidelines for avoiding assessing and mitigating impacts on EPBC Act listed migratory shorebirds species* (DoEE 2017).

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

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

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

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

Cain Hut Swamp (6) and Lake Sheepwash (7) survey locations are on the southern Project Area boundary. The rest of the survey locations are outside of the Project Area. Surveys were used to determine the species occurring in proximity to the wind farm site and the locations of key resources such as high productivity foraging areas and roost locations. These locations and the associated location numbers are shown in **Figure 7.9.**

A detailed description of the survey methods for shorebirds, gulls and terns if provided in Section 20.1 of the **FFIA (Appendix C)**.

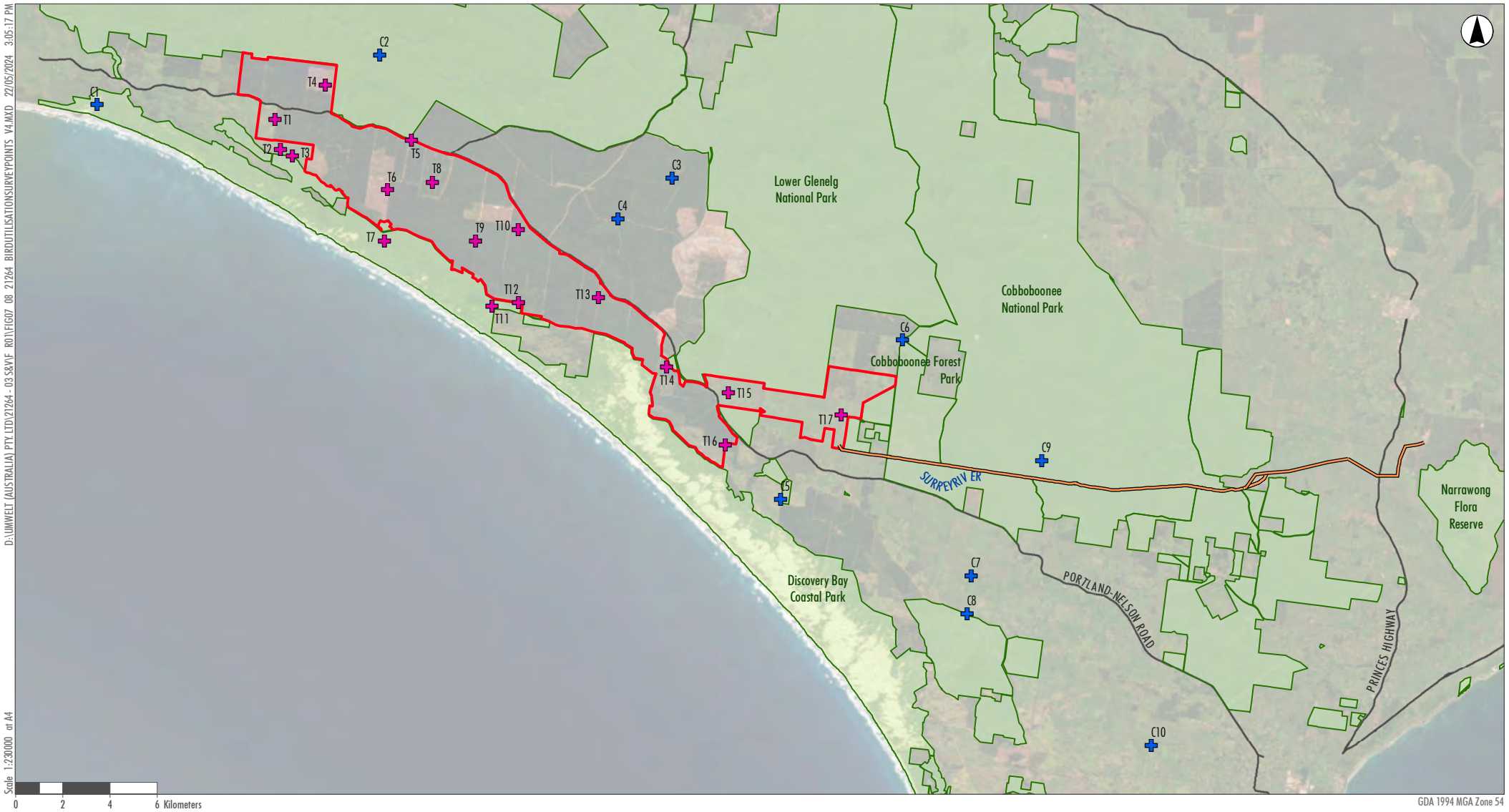


FIGURE 7.8

Bird Utilisation Survey Points

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

D:\UMWELT (AUSTRALIA) PTY. LTD\21264 - 03 S&WF R01\FIG07 09 21264 MIGRATORYSHOREBIRDSURVEYLOCATIONS V5.MXD 22/05/2024 3:06:49 PM

Scale 1:185000 at A4

Legend

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

Migratory Shorebird Survey Location

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

FIGURE 7.9

Migratory Shorebird Survey Locations

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

7.6.4.6 Bat surveys

Whilst assessments undertaken considered all relevant bat species within the Project Area, of particular interest is the SBWB. The SBWB is listed as critically endangered under both the EPBC Act and the FFG Act. Conservation Advice for the species was released by the Threatened Species Scientific Committee in June 2021, with a National Recovery Plan published in November 2020.

Acoustic surveys

The acoustic surveys were undertaken in two stages for this Project, as outlined in **Table 7.3**.

Table 7.3: Summary of southern bent-wing bat acoustic surveys undertaken for the project

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

** Not all detectors were recording for this whole period.*
*** Detectors were installed in late November 2019, and removed in mid-December 2020, so presentation of results is limited to the 12 months including December 2019 to November 2020*

Stage 1 preliminary surveys used 14 detectors at 10 ground locations and one meteorological monitoring mast (met mast) (with four detectors at different heights). The Stage 2 12-month survey program used 24 bat detectors, including eight stand-alone ground detectors and 16 detectors on four met masts, with each met mast having a detector at 1.5 m, 28 m, 56 m and 84 m above ground level. Refer to **Figure 7.10** for bat detector locations.

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

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

The mast locations and ground detector locations were chosen to offer the best capacity for results may help to quantify risk level for the future impact assessment because they:

- Measure call activity at a range of site types (forested, cleared, near-and-far from wetlands)
- Measure call activity at several locations spread horizontally across the site
- Measure call activity within rotor-swept height at multiple locations, although the height of the masts does not allow for the full range of rotor-swept height to be covered by detectors
- Allows for stratification data to be collected to see if there are patterns between height and number of calls detected
- Measure across all seasons in a single year and include multiple years of measurements at several locations.

Bat call analysis and manual checking

Bat calls were analysed using the automated identification software AnaScheme, which applies a conservative approach to identifying calls in that only clear, high-quality calls are assigned to a species. The system also counts recordings which match the criteria to be considered true bat calls but may be of insufficient quality to identify to species level. The Anascheme system is known to have an issue with false-positive identifications, whereby the system identifies data sequences as bat calls where they are clearly noise upon manual review, however, it does not generally overlook valid bat calls and false-negative errors are not an issue.

However, a proportion of bat calls may be unidentifiable to species level, due to poor quality of the recordings, such as calls that are detected towards the outer edge of the range of the detectors. This is an issue with all acoustic monitoring of bat calls, including both zero crossing and full spectrum recordings. In the case of SBWB, all calls that were flagged as potential SBWB calls were subject to confirmation via a manual checking process.

Potential SBWB calls assigned by AnaScheme were examined manually to classify calls into confidence classes. A total of 2,739 recordings were examined and assigned to the following categories:

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

Wind speed analysis

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

A detailed assessment methodology can be found in **Section 3** of the **SBWB Impact Assessment (Appendix E).**

Legend

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

Site Locations

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

FIGURE 7.10

Bat Detector Locations

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

7.6.5 Impact assessment methodology

The impact assessment methodology used in the **FFIA** (**Appendix C)** has been informed by the Scoping Requirements, and relevant policy, legislation, and guidelines. The approach taken involved:

- Identifying potential ecological receptors using existing information sources and targeted studies
- Assessing the construction and operational activities of the Project to determine whether the Project would affect identified ecological receptors. The assessment included consideration of the magnitude, severity, extent, and duration of potential effects on ecological receptors. Potential impacts on MNES that are protected under the EPBC Act were assessed against significant impact guidelines.
- Following the assessment of potential impacts, the Project was reviewed to see whether there was opportunity to make changes to the Project that would avoid or minimise the identified impact.
- Assessing the revised Project to determine potential impacts when avoidance and/or minimisation measures were applied.
- Determining residual impacts and uncertainties, and development management (including adaptive management) and mitigation measures that would apply during the construction and/or operation of the Project.

7.6.6 Limitations of the biodiversity assessment

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

The current flora and fauna assessment was conducted across all seasons within a 12-month period, with some groups also surveyed in the preceding 12-month period and some surveys (i.e. Brolga) extending into the following seasons. The survey program, including timing, has been designed to target key detectability periods for the species being assessed.

As with all studies of large complex investigation areas, there are several limitations that should be considered when reviewing the findings of the studies for the Project. These are set out in Section 3.10 of the **FFIA (Appendix C).**

7.7 Existing conditions

This section provides a summary of the existing flora and fauna conditions in the Project Area and surrounds, with a focus on native vegetation and habitat types, TECs, and threatened species.

7.7.1 Land use and landscape context

Most of the wind farm site is located within a radiata pine commercial timber plantation, owned and operated by Green Triangle Forest Plantation (GTFP). The plantation area includes a network of tracks, including some public roads and numerous smaller roads and tracks used for plantation access. The plantation is located on both sides of Portland–Nelson Road. The wind farm site is mostly within the plantation situated south of the Portland–Nelson Road, which is situated inland of Discovery Bay Coastal Park, approximately 2 to 3 km from the coast. Native vegetation is limited to road reserves, small remnant patches excluded from plantation development, and regeneration of native understorey species in plantation areas.

The Project Area also includes areas of Blue-gum *Eucalyptus globulus* plantations near the eastern end of the wind farm site. One blue gum plantation is situated between the GTFP Pine Plantation and Discovery Bay Coastal Park near Mount Richmond, and there is an extensive area of blue gum plantations in the north-eastern section of the Project Area, surrounded by Lower Glenelg National Park and Cobboboonee National Park. The blue gum plantations are more recently established than the pine plantations, and generally have a higher cover of regenerating native species in the understorey. Six turbines would be located in blue gum plantation in the south-east of the wind farm site.

The wind farm site includes several areas of farmland, mostly at the eastern end near Mount Kincaid. These farmland areas have been cleared of native vegetation and are currently used primarily for dryland grazing by sheep and cattle. The cleared paddocks are dominated by introduced grasses, with scattered native species present close to adjacent areas of public land.

The underground transmission line beneath Boiler Swamp Road passes through Cobboboonee National Park and Forest Park, which support high quality native vegetation. The remainder of the underground transmission line, between Cobboboonee Forest Park and the Heywood Terminal Station, passes through predominantly cleared farmland used for grazing. This portion of the transmission line is located adjacent to the north-west corner of a large patch of bushland including Mount Clay State Forest and Narrawong Flora Reserve. Native vegetation is limited to scattered trees, some wetlands, and remnant vegetation patches along road reserves and some degraded patches of trees within farmland.

The Project is situated in a region that includes some large conservation reserves, including Discovery Bay Coastal Park between the Project Area and the coastline, and Lower Glenelg National Park to the north (see **Figure 7.11**). Lower Glenelg National Park includes the highly significant Kentbruck Heath, one of Victoria's largest expanses of wet heathland, and is contiguous with other large conservation areas within Cobboboonee National Park and Forest Park. Portions of Discovery Bay Coastal Park and Lower Glenelg National Park, both north and south of the Project, are included in the Ramsar site.

Table 7.4 provides a summary of the vegetation and habitat types within the Project Area.

Table 7.4: Summary of vegetation and habitat types within the project area

Vegetation/Habitat Type	Summary
Pine plantations	The pine plantation consists of radiata pine of varying ages. Although initial establishment of the pine plantation involved almost complete clearance of native vegetation, some small patches and areas of recolonisation by native species exist. However, these areas are likely too small to provide important habitat for any mammal species but can be used by a diverse range of bird species. Mature pine plantation provides limited habitat value for native fauna. The younger plantations are structurally more complex, as they contain a denser shrub layer, of both younger pine trees and native coloniser shrubs. Plantation areas are subject to regular forestry activities, including rotational tree harvesting and thinning operations, vehicle movements, stockpiling of timber and slashing of and spraying of access tracks. These activities severely limit the potential habitat value of plantation areas for native flora and fauna.
Blue gum plantations	The Project Area includes several blocks of commercial blue gum plantations. These areas generally support higher cover and diversity of native understorey species. The blue gum plantations close to the dune system support similar species to the pine plantations. The blue gum plantations in the north-east of the wind farm site support a more diverse range of native understorey species, which have affinities with the adjacent areas of wet heathland Ecological Vegetation Class (EVC 8) and heathy woodland (EVC 48) within Lower Glenelg National Park. Blue gum plantations provide habitat for open-country and canopy foraging birds. White-footed Dunnarts (*Sminthopsis leucopus)* and Koalas (*Phascolarctos cinereus)* were observed foraging on blue gums within these plantations.
Farmland	The Project Area includes several areas of farmland, including in the western and eastern ends of the wind farm site and along the transmission line route near Heywood. These farmland areas have been mostly cleared of native vegetation and are currently used primarily for dryland grazing by sheep and cattle. Low lying, seasonally wet depressions and adjacent areas within farmland provide habitat for a range of wetland birds, including Australasian bittern, Brolga, herons, egrets, white-fronted chat and straw-necked Ibis. These farmland areas also provide habitat for common open-country birds including ravens, Australian Magpie, Magpie-lark, Australasian Pipit, Sulphur-crested Cockatoo and Galah. The area is also attractive to aerial foraging species such as Welcome Swallow and Tree Martin, and a range of raptor species also frequently occur, including Brown Falcon and Wedge-tailed Eagle.
Major public roads	Portland-Nelson Road is the main road between Portland and Nelson, dividing the wind farm site into northern and southern sections. Most of the road reserve is regularly slashed, however there are sections of remnant woodland and areas with planted trees that are not regularly slashed which has resulted in a dense growth of understorey native shrubs, including coast wattle and coast beard-heath. Isolated un-slashed areas along Portland-Nelson Road provide habitat for mobile species. The road itself also provides a movement corridor for native mammals and reptiles, potentially including threatened species.

Vegetation/Habitat Type	Summary
Parks and forests	A range of national parks, state forests and conservation reserves are located in proximity to the Project Area, as shown in **Figure 7.11**. Management of these reserves is guided by the Ngootyoong Gunditj Ngootyoong Mara South West Management Plan (Parks Victoria, 2015). These reserves include: • Discovery Bay Coastal Park (including part of the Ramsar site) • Lower Glenelg National Park (including part of the Ramsar site) • Cobboboonee National Park • Cobboboonee Forest Park • Mount Richmond National Park • Bushland Reserves and Flora Reserves. The underground transmission line would be constructed beneath Boiler Swamp Road through Cobboboonee National Park and Forest Park. Both parks support high quality lowland forests, with small areas of sedgy riparian woodland where roads cross waterways, including tributaries of the Surrey River. The Cobboboonee Forest is part of a very large area (> 50,000 ha) of almost continuous high quality native vegetation including the Lower Glenelg National Park. This area supports habitat for a diverse range of species, including many threatened species.
Local caves	DEECA has provided unpublished information regarding monitoring activities being undertaken at caves within 70 km of the Project Area, which are known to be used by bats such as the SBWB. The locations include: **Cave within Bat's Ridge Wildlife Reserve (roughly 20 km south of the Project Area)**: The cave is used year-round by SBWB. Numbers of bats are variable, but DEECA consider this cave one of the most significant non-breeding roosts in Victoria. Numbers observed at counts range from less than 100 to approximately 3,500, with counts of more than 1,000 being regularly observed. **Cashmore cave (near Bat's Ridge)**: DEECA state that this cave is used intermittently, but it can be used by relatively large numbers of SBWB. There does not appear to be a regular seasonal pattern of usage. **Sea cave west of Portland**: DEECA has recorded between 1,000 and 1,500 adult SBWB in this cave with more than 500 pups, confirming it as a breeding site. **Additional sea cave west of Portland**: This cave appears to be a non-breeding cave. It is not regularly monitored. **Lower Glenelg National Park (north of the Project Area)**: VBA records indicate that up to 281 bats have been recorded in these caves at one time. The exact location of these caves has not been made known to the Project team, and surveys of these caves were not conducted as part of this study. During the breeding season, most of the SBWB population congregates in two regularly used breeding caves, located near Naracoorte in South Australia (approximately 120 km north-west of the Project Area) and near Warrnambool in Victoria (approximately 75 km east of the Project Area). Breeding activity has also been observed annually since 2015 in a sea cave to the west of Portland and south-east of the Project Area, and this is now recognised as a third maternity cave (TSSC 2021). TSSC (2021) notes that there may be little migration of individuals between the Naracoorte and Warrnambool maternity caves, but that there may be interchange between those sites and the cave near Portland.

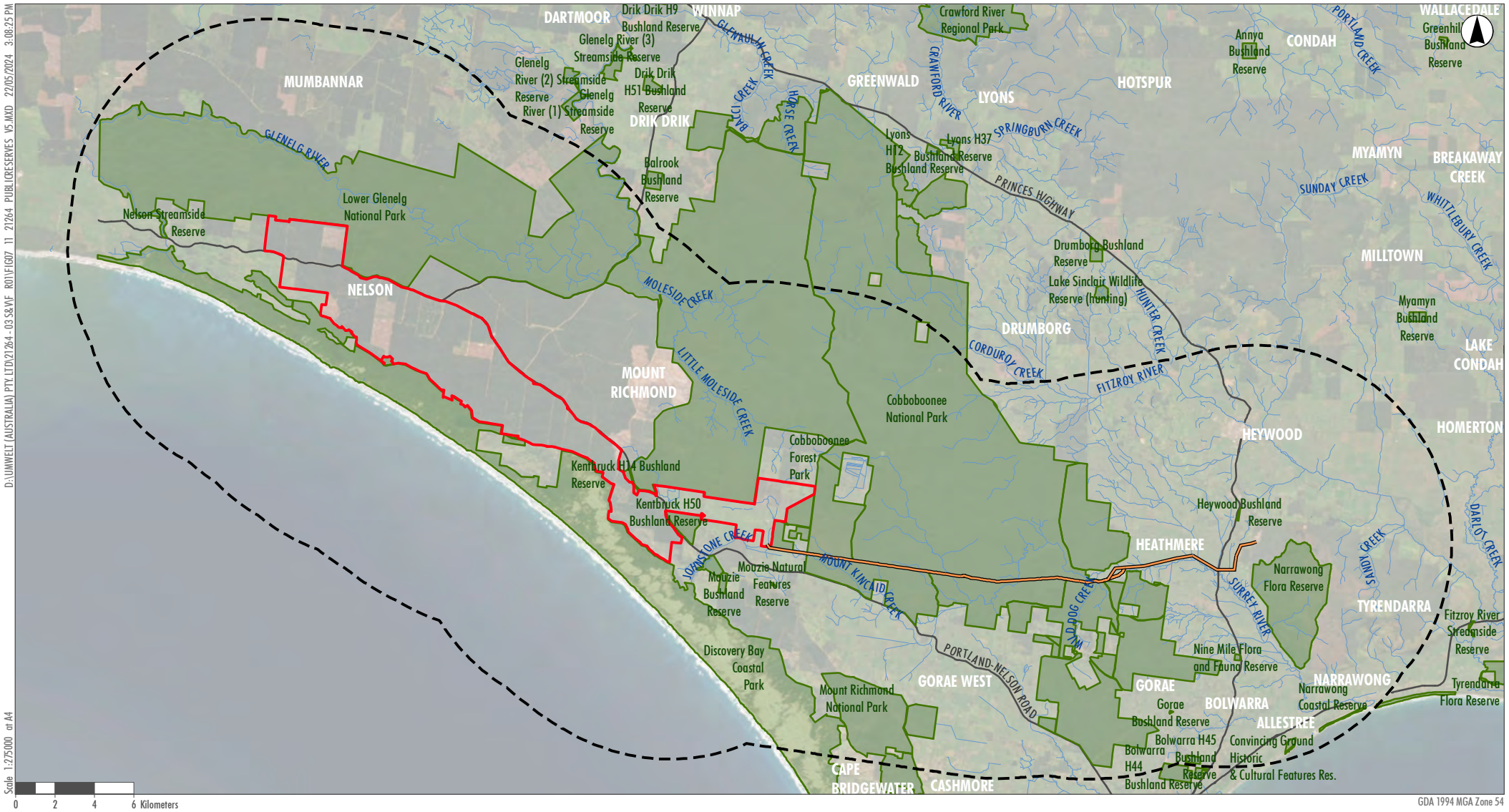


FIGURE 7.11

Public Reserves Near the Project Area

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

7.7.2 Wetlands

Wetlands identified within the Project Area include some small areas near the southern boundary of the wind farm site adjacent to Discovery Bay Coastal Park and wetlands within cleared farmland in the eastern portion of the wind farm.

There are also wetlands located within proximity/adjacent to the Project Area, including:

- Wetlands associated with the Ramsar site, specifically south of the wind farm site between the plantation boundary and Discovery Bay coastline. These include Black Swamp, Lake Mombeong, The Sheepwash, Cain Flat Swamp, and Long Swamp (see **Section 7.7.2.2** for more information about the Ramsar site).
- Near the underground transmission line through the Parks.
- Near Heywood Terminal Station.

Wetlands in and around the Project Area have been assessed for their ecological value and sensitivity to allow for an assessment of potential direct and indirect impacts as required by the Scoping Requirements. A summary of these wetlands is provided in **Table 7.5** and wetlands are shown in **Figure 7.12**.

The **FFIA** (**Appendix C**) contains more detailed descriptions about wetlands in and around the Project area (refer to Section 5 of the **FFIA** for further information about the wetlands discussed in **Table 7.5** and Section 8.2 of the **FFIA** for an overview of the Ramsar site).

Table 7.5: Wetlands within and adjacent to the project area

Wetlands	Description
Wetlands adjacent to Discovery Bay Coastal Park	Extensive areas of wetlands are present within Discovery Bay Coastal Park south of the Project Area. This wetland complex extends into the Project Area in the following locations: • Two small wetlands within the plantation, approximately 200 m from the Discovery Bay Coastal Park boundary, located between Lightbody Road and Quarry Road, to the north-west of Black Swamp • Three mapped wetlands within the Project Area near Lake Mombeong and The Sheepwash When surface water is present beneath the dense shrubs these wetlands may provide habitat for wetland birds that prefer the protection of dense, shrubby, and sedgy vegetation, including Australasian Bittern and crakes and rails. The dense vegetation and moist sandy soils around the margins of these wetlands also provide habitat for ground-foraging mammals. These wetlands have been considered when preparing the buffers along the southern boundary of the Project Area to ensure direct and indirect impacts on these wetlands and their biodiversity values are avoided.
Wetlands within farmland in the eastern portion of the Project	Farmland area includes two large DEECA mapped wetlands, and five smaller mapped wetlands. All mapped wetlands are noted to be 'Periodically Inundated – Seasonal or Intermittent'. Within the farmland, most of the area covered by these mapped wetlands does not support actual wetlands, due to minor variations in topography. These wetlands are structurally diverse, with areas of open water, emergent reeds and floating and submerged vegetation. They provide habitat for a range of wetland bird species as well as common frog species. An underground powerline and internal access road would intersect two of these wetlands.
Wetlands within Kentbruck Heath (Lower Glenelg National Park) and Kentbruck H50 Bushland Reserve	Three habitat types are present within these wetlands: open water with some submerged aquatic vegetation, emergent reed beds and areas of inundated shrubby vegetation. When water levels are high, water may extend for large distances into the surrounding wet heath vegetation. Areas of open water may be visited by ducks, and inundated shrubby vegetation may be used by crakes and rails, and the endangered Australasian Bittern. Due to the deep water and the surrounding inundated shrubs, these wetlands are generally unsuitable for wading birds, such as migratory waders, herons, egrets and Brolga although some limited wading habitat may be present during extended dry periods. The Project would not impact on these wetlands.
Wetlands along the transmission line between Cobboboonee National Park and the Heywood terminal station	Wetlands in this region ranged from areas of temporarily flooded pasture, through to seasonal wetlands with an assemblage of native aquatic plants. The transmission line also crosses the Surrey River, which supports Tall Marsh vegetation in some areas, dominated by Common Reed *Phragmites australis.* Shallow seasonal wetlands typically have high cover of native semi-aquatic grass. Deeper areas, such as natural drainage lines or constructed drainage channels, support Aquatic Herbland, with a diverse range of species.

Wetlands	Description
	As these wetlands are highly seasonal and located within farmland used for grazing, there is little development of perennial emergent or marginal vegetation. They provide temporary habitats, including areas of open water with some submerged plants, emergent marshland vegetation and areas of flooded introduced pasture. Brolga and Black Swan *Cygnus atratus* were recorded in several of these wetlands, utilising shallow marshland areas and other large wading birds are likely to be present. The transmission line alignment avoids wetlands through Cobboboonee National Park, Cobboboonee Forest Park and the farmland to Heywood Terminal Station. Directional drilling will be used to cross the Surry River.

7.7.2.1 Threatened wetland communities within the Project Area

Wetlands within the Project Area potentially meet the definition of two threatened ecological communities:

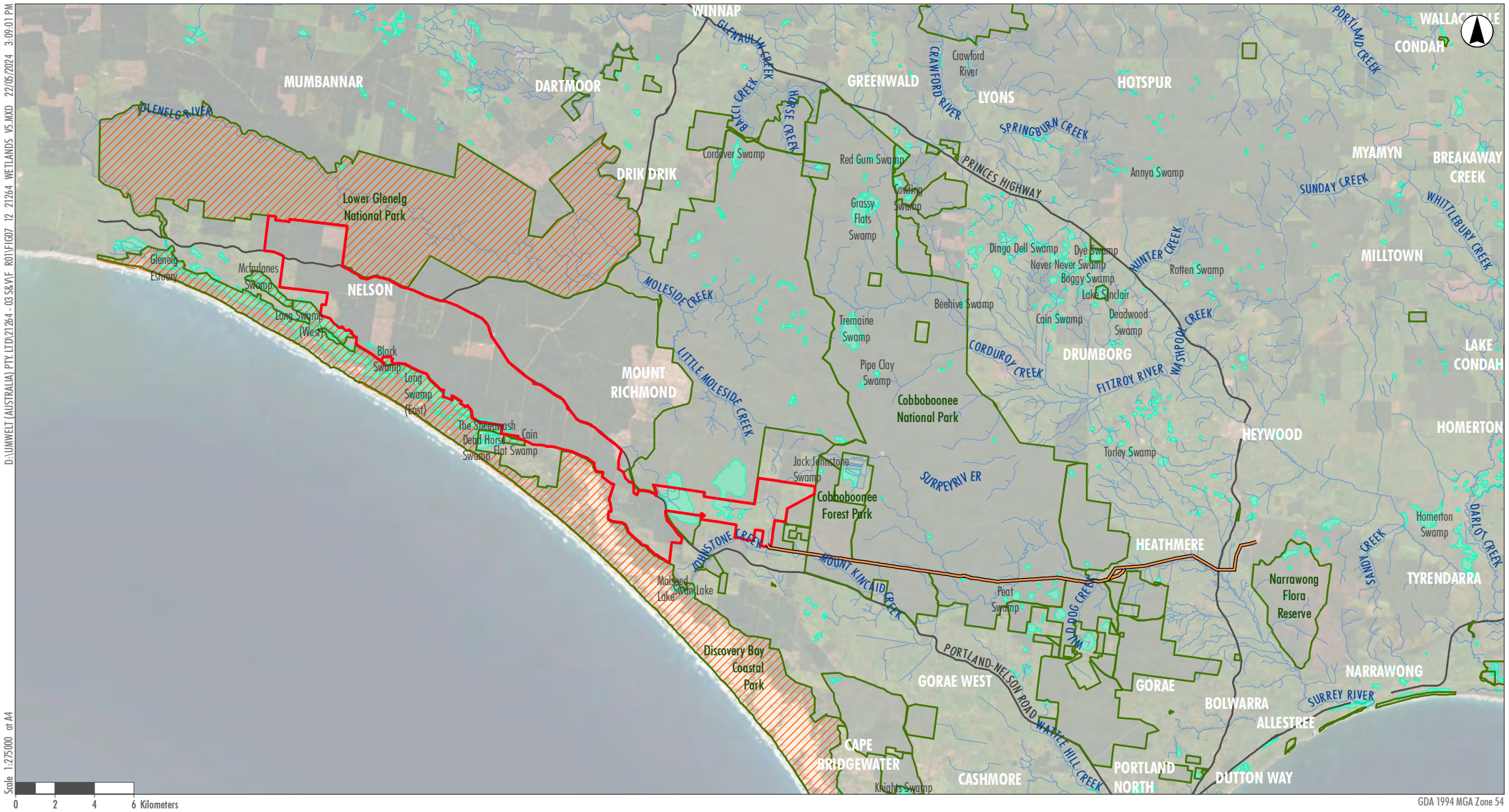
- Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains
- Karst springs and associated alkaline fens of the Naracoote Coastal Plain Bioregion.

The Seasonal Herbaceous Wetlands (SHW) community occurs on the Victorian Volcanic Plain Bioregion and Glenelg Plain Bioregion. Seasonal wetlands near the transmission line between Cobboboonee Forest Park and the Heywood Terminal Station have potential to satisfy the condition thresholds of the SHW community.

Wetlands on cleared farmland that was formally part of the Kentbruck Heath are not considered examples of this community, for the following reasons:

- The flora has some affinities with the SHW community, but also includes dense areas of species more typical of wet heathlands on sandy soils, including Tassel Cord-rush.
- The primary water source is groundwater, rather than rainwater.
- Soils are predominantly sandy, with peat deposits, rather than clay-based soils.

Occurrences of Karst springs and associated alkaline fens of the Naracoorte Coastal Plain Bioregion are limited to near coastal areas with limestone substrates, mostly at elevations of less than 2 m above sea level, with some occurrences potentially up to 25 m above sea level. As the Kentbruck plateau is approximately 100 m above sea level with Aeolian sands overlying basalt geology, wetlands within the farmland area (and Kentbruck Heath in general) do not satisfy the key diagnostic features for Karst springs and associated alkaline fens of the Naracoorte Coastal Plain Bioregion (DAWE 2020). Lake Mombeong is the nearest example of Karst springs and associated alkaline fens of the Naracoorte Coastal Plain Bioregion community to the Project Area.



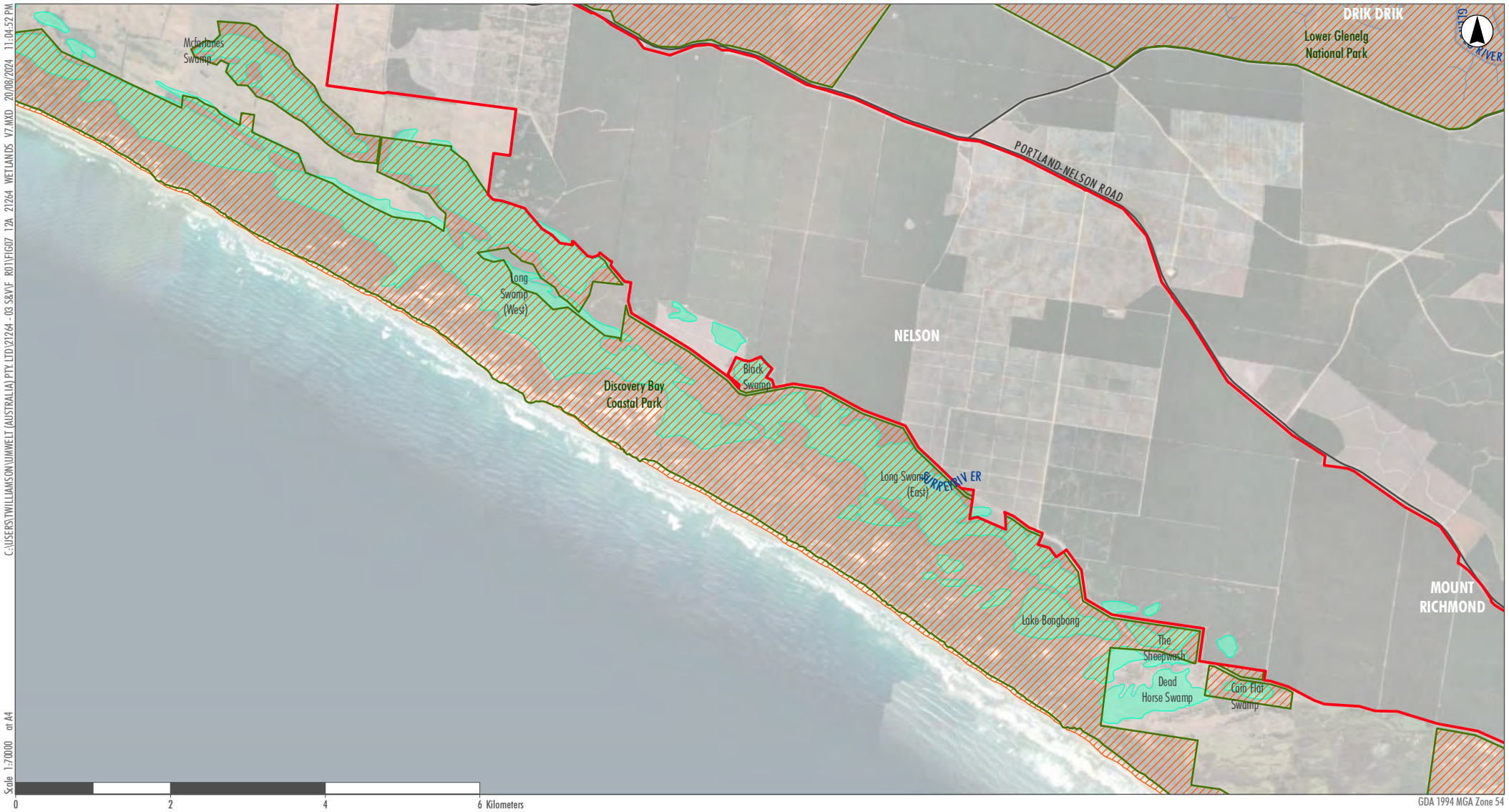
D:\UMWELT (AUSTRALIA) PTY LTD\21264 - 03 SR\MXD\FIG07 12 21264 WETLANDS V5.MXD 22/05/2024 3:09:01 PM

Scale 1:275000 at A4

FIGURE 7.12

Wetlands Near the Project Area

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



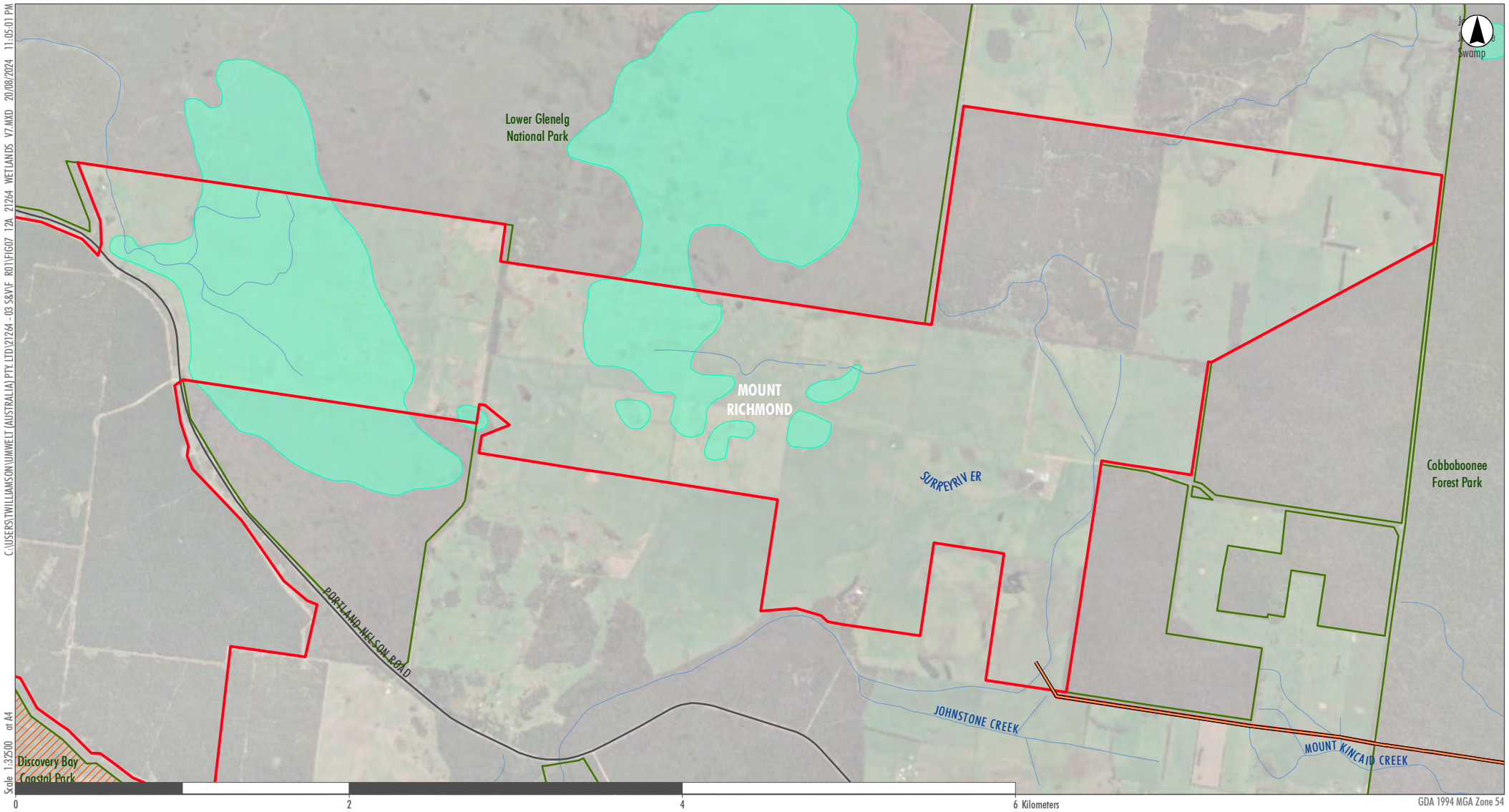
Legend

- Wind Farm Site
- Parks and Reserves
- RAMSAR Wetlands
- Wetlands
- Roads
- Watercourses

FIGURE 7.12A

Wetlands Near the Project Area

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



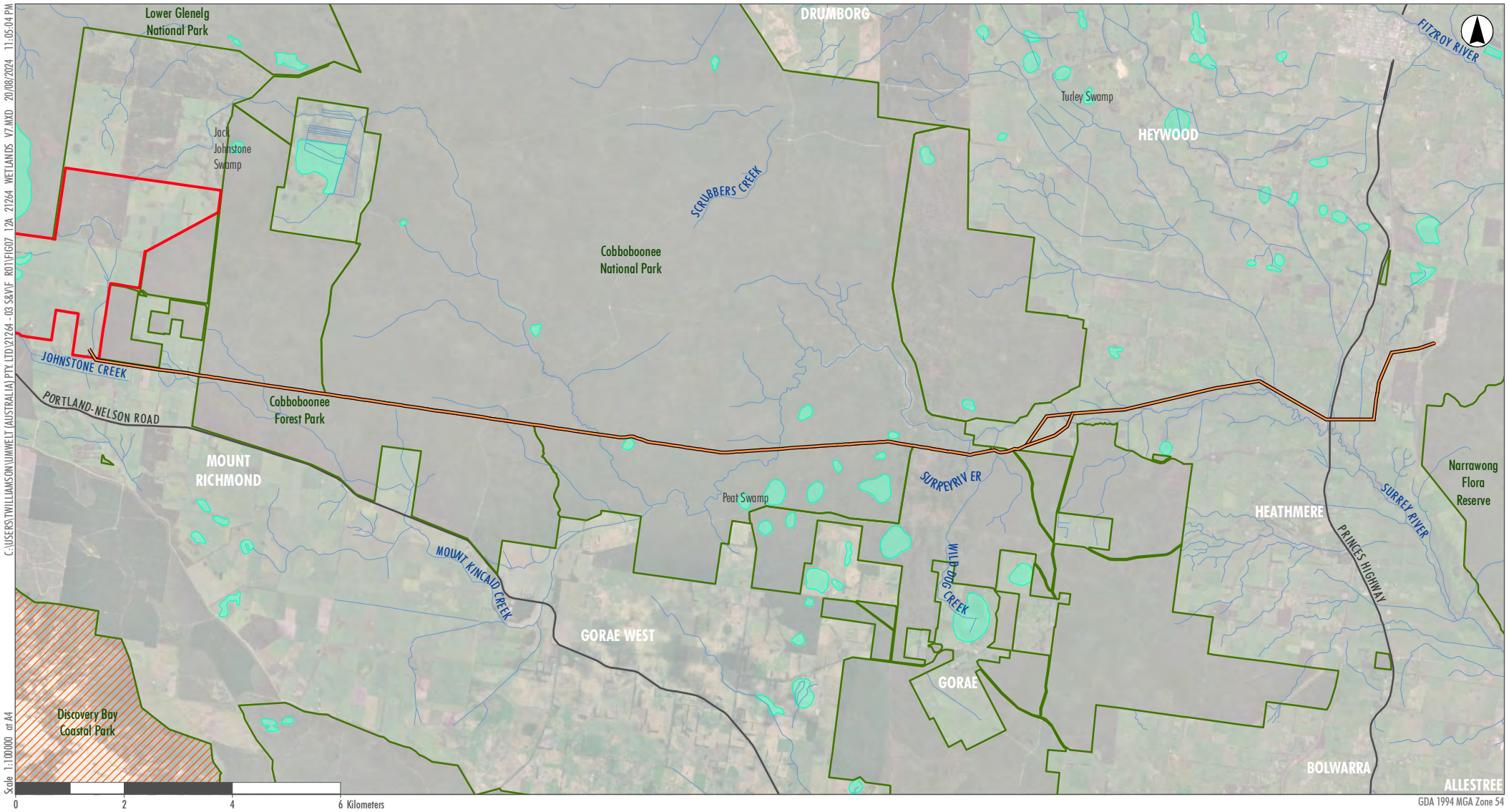
Legend

- Wind Farm Site
- Parks and Reserves
- RAMSAR Wetlands
- Wetlands
- Roads
- Watercourses

FIGURE 7.12B

Wetlands Near the Project Area

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



Legend

- Wind Farm Site
- Parks and Reserves
- RAMSAR Wetlands
- Wetlands
- Roads
- Watercourses

FIGURE 7.12C

Wetlands Near the Project Area

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

7.7.2.2 Glenelg Estuary and Discovery Bay Ramsar site

The Ramsar site provides relatively uninterrupted habitat for fauna along the coast between Nelson and Cape Bridgewater, supporting a diversity of coastal habitats such as dunes, heathlands, and wetlands.

The Ramsar status recognises the many species of shorebirds and wetland birds that migrate to and from the Glenelg Estuary, Discovery Bay shoreline and freshwater wetlands perched in the coastal dunes. These migrants may include internationally significant species from the northern hemisphere such as shorebirds, as well as local migrants that make use of the local area at different times of the year such as the Australasian Bittern. Species such as the Hooded Plover (*Thinornis cucullatus cucullatus)* make use of the Discovery Bay beaches for nesting.

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

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

7.7.3 Threatened ecological communities

Four TECs were identified during surveys within the Investigation Area:

- Assemblages of species associated with open-coast salt-wedge estuaries of western and central Victoria ecological community (Salt Wedge Estuary Community) – Endangered (EPBC Act)
- Karst springs and associated alkaline fens of the Naracoorte Coastal Plain Bioregion – Endangered (EPBC Act)
- Subtropical and temperate coastal saltmarsh – Vulnerable (EPBC Act)
- Coastal Moonah (Melaleuca lanceolata subsp. Lanceolata) Woodland Community – Threatened (FFG Act).

None of these communities are present within the Project Area, including the wind farm site or transmission line.

7.7.4 Ecological vegetation classes

The highly modified nature of the wind farm site (cleared farmland and plantations) provides very limited habitat for threatened species. Native vegetation in this area is limited to road reserves and regrowth of hardy species in previously cleared areas.

The Project Area span three bioregions: Glenelg Plain, Bridgewater and Victorian Volcanic Plain. The wind farm site is almost entirely located within the Glenelg Plain Bioregion, with the western end of the wind farm site, and areas south of the wind farm site within the Bridgewater bioregion. The transmission line is located within the Victorian Volcanic Plain Bioregion.

These bioregions are further divided into EVCs, which are classifications of groups of native plants (plant communities) that commonly grow together. Fourteen EVCs of varying quality were recorded within the Project Area across the three bioregions, as described in **Table 7.6**, and shown in **Figure 7.13.** Several of the same EVC numbers occur across the different bioregions, such as EVC 3, which occurs in both the Glenelg Plain Bioregion and the Bridgewater Bioregion.

Table 7.6: EVCs in the project area

EVC	Location in Project Area
Glenelg Plain Bioregion	
Coastal alkaline scrub (EVC 858)	• Road reserves within plantation in the wind farm site.
Damp sands herb-rich woodland (EVC 3)	• Road reserves within plantation in the wind farm site • Modified examples along Portland-Nelson Road reserve.
Heathy Herb-rich Woodland (EVC 179)	• Portland – Nelson road reserve (transport route).

EVC	Location in Project Area
Heathy woodland (EVC 48)	• Remnant vegetation along the northern boundary of the plantation in the wind farm site • Cobboboonee National Park, near the underground transmission line • Heywood Terminal Station at the eastern end of the underground transmission line.
Lowland forest (EVC 16)	• Road reserves • Cobboboonee National Park, near the underground transmission line along Boiler Swamp Road.
Wet heathland (EVC 8)	• Cleared farmland in areas that supported wet heathland prior to clearing.
Swamp scrub (EVC 53)	• Riparian areas including within Cobboboonee National Park, near the underground transmission line.
Damp heathy woodland (EVC 793)	• Transmission line route in farmland east of Cobboboonee Forest Park.
Herb-rich foothill forest (EVC 23)	• Eastern section of the Project Area, including Cobboboonee National Park and adjacent areas along Boiler Swamp Road.
Bridgewater Bioregion	
Coastal alkaline scrub (EVC 858)	• Road reserves within plantation in the wind farm site.
Damp sands herb-rich woodland (EVC 3)	• Road reserves within plantation in the wind farm site.
Victorian Volcanic Plain Bioregion	
Sedgy riparian woodland (EVC 198)	• Cobboboonee National Park, including several locations along Boiler Swamp Road.
Heathy woodland (EVC 48)	• Narrawong Flora Reserve and Mount Clay State Forest near the Heywood Terminal Station, near the underground transmission line.
Herb-rich foothill forest (EVC 23)	• Eastern section of the Project Area, including Cobboboonee National Park and adjacent areas.

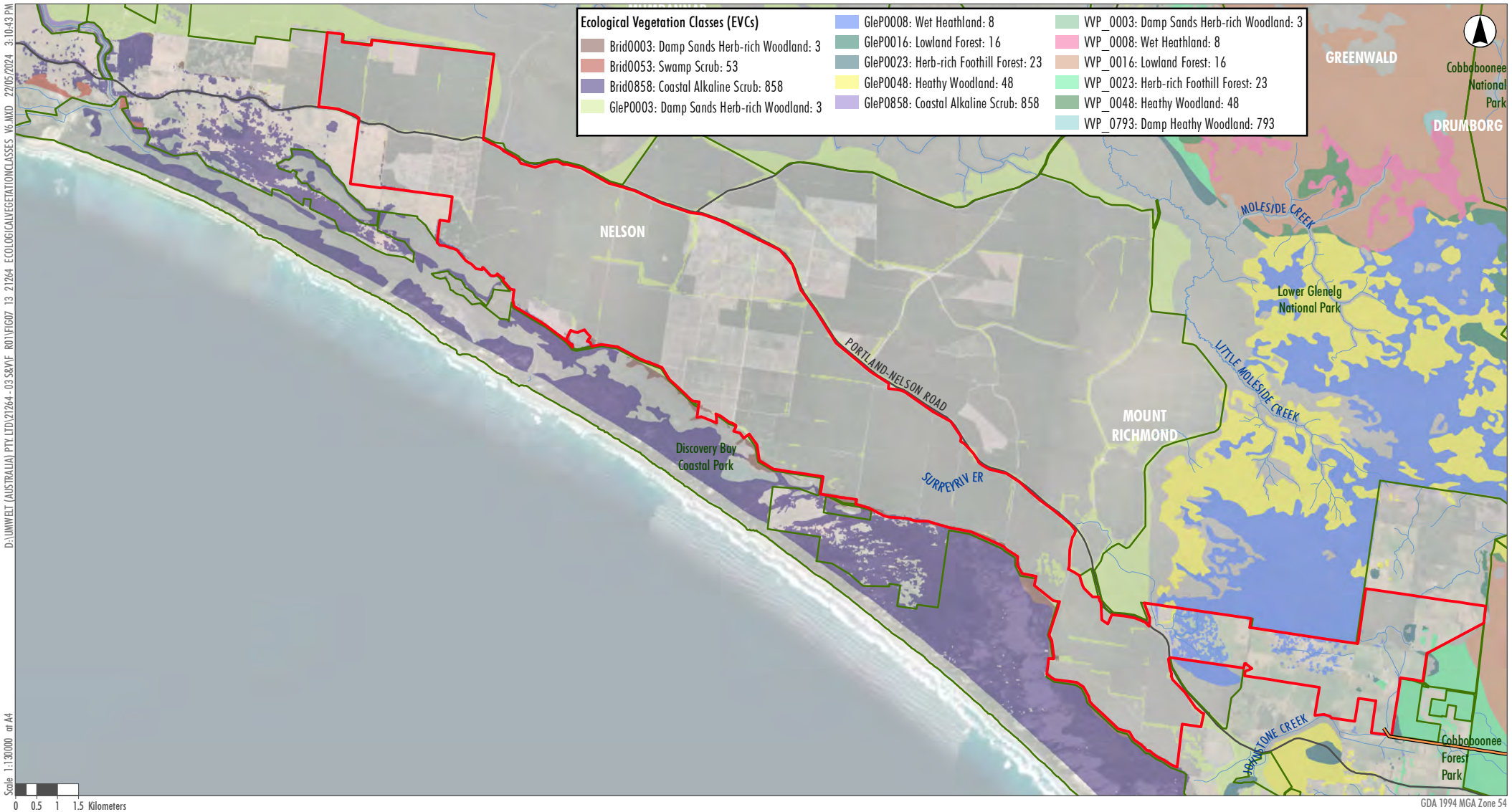
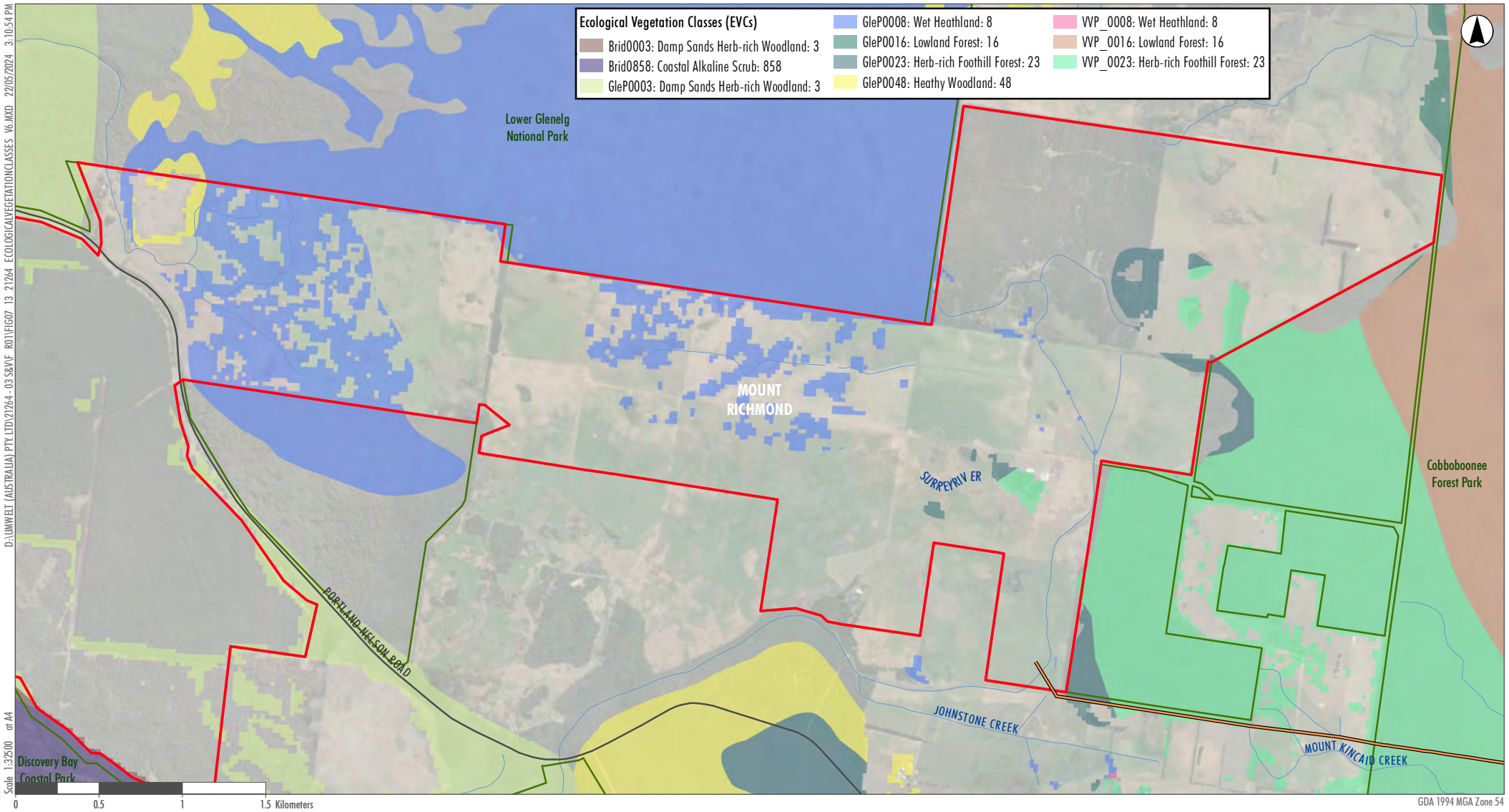


FIGURE 7.13A

Ecological Vegetation Classes (EVC)

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



Legend

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

FIGURE 7.13B

Ecological Vegetation Classes (EVC)

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

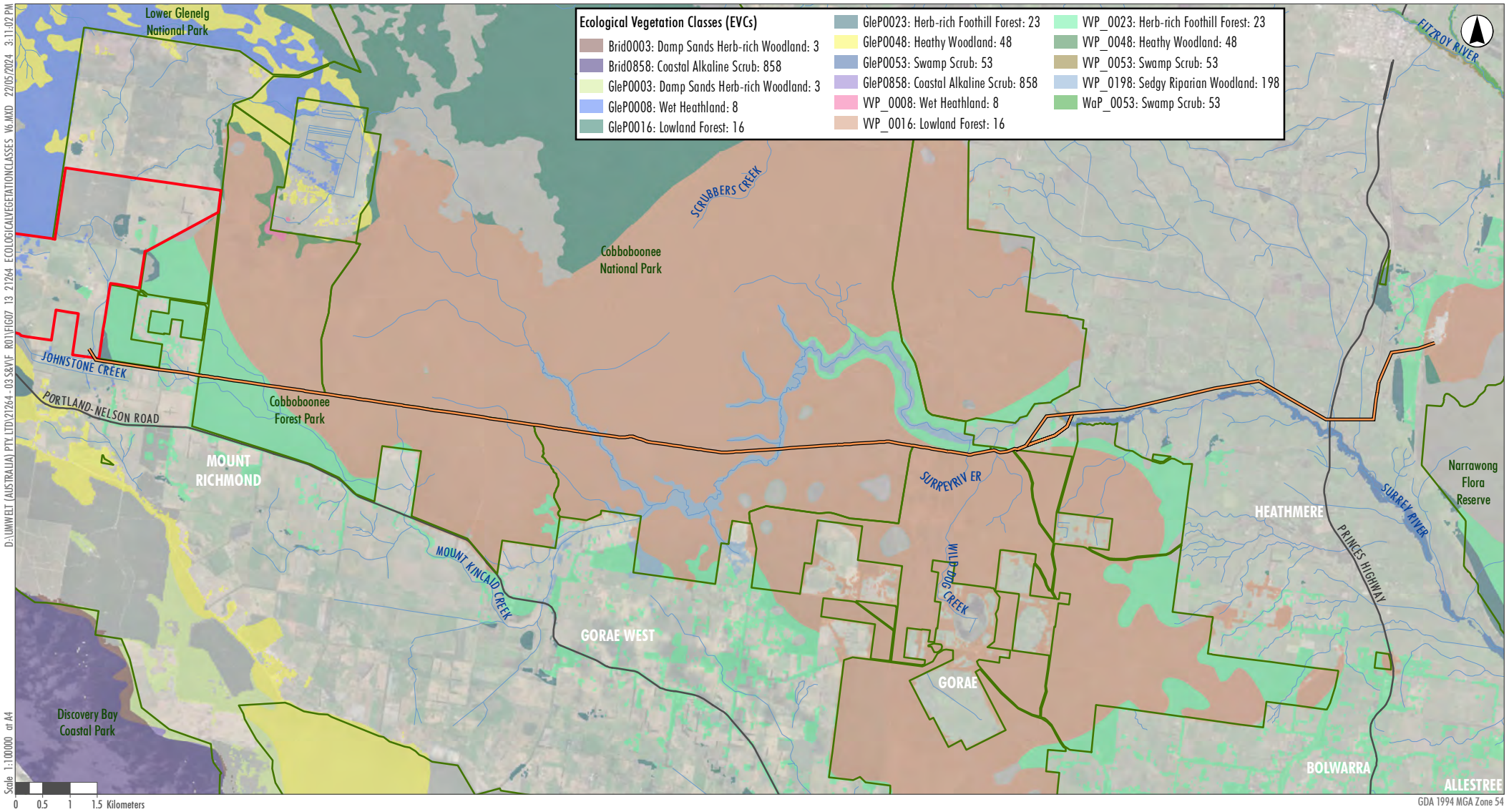


FIGURE 7.13C

Ecological Vegetation Classes (EVC)

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

7.7.5 Threatened flora species

Targeted surveys for listed threatened flora were undertaken in areas of habitat that have potential to be directly impacted by the Project (refer to **Figure 7.8**). **Table 7.7** provides an overview of the threatened flora species recorded in the Project Area during the targeted surveys. **Figure 7.14** and **Figure 7.15** show the location of recorded threatened flora species in the wind farm site and transmission line.

Table 7.7: Threatened flora species recorded in the Project Area

Threatened flora species	Conservation Status		Recorded presence		
	EPBC	FFG	WF	TL	
Small Sickle Greenhood *(Pterostylis lustra)*		EN		✓	Recorded in Sedgy Riparian Woodland along the banks of the Surrey River within Cobboboonee National Park, where the underground transmission line crosses the river on Boiler Swamp Road (the eastern crossing only). Impacts on these riparian areas should be avoided by directional drilling.
Dune Fan-flower *(Scaevola calendulacea)*		EN	✓		Recorded in several locations on road reserves within the plantation, including Johnsons Road, Portland–Nelson Road, Lake Mombeong Road, Dry Block Road, Carters Road, McLeans Road, Browns Road, and Wilsons Lower Road. Recorded locations are not impacted by the current wind farm design.
Hairy Boronia (*Boronia pilosa* subsp. *Torquate)*		EN		✓	Recorded within Lowland Forest near Boiler Swamp Road, between the two Surrey River crossings. This species is unlikely to be present within the regularly slashed and graded road verge.
Rough Daisy-bush *Olearia asterotricha)*		EN		✓	Recorded within Lowland Forest adjacent to Boiler Swamp Road, between the two Surrey River Crossings. It is recommended that these locations be marked and treated as no-go zones during construction.
Apple Jack (*Eucalyptus splendens)*		CR		✓	Recorded along Boiler Swamp Road through Cobboboonee National Park and Forest Park.
Western Peppermint (*Eucalyptus falciformis)*		VU	✓	✓	Recorded along Boiler Swamp Road through Cobboboonee Forest Park and Cobboboonee National Park, and in the eastern end of the wind farm site. Also recorded near Heywood Terminal Station. Western Peppermint is relatively common within the local area.
Wiry Bossiaea (*Bossiaea cordigera)*		EN		✓	Recorded close to the road formation at several locations along Boiler Swamp Road. It is recommended that these locations be marked and treated as no-go zones during construction.
Tiny Violet (*Viola sieberiana s.s)*		EN	✓	✓	Recorded at two locations adjacent to Boiler Swamp Road in the western part of the Cobboboonee Forest Park, adjacent to Boiler Swamp Road. Both locations were beyond the road formation. It is recommended that these locations be marked and treated as no-go zones during construction.
Western Golden-tip (*Goodia medicaginea)*		EN	✓		Recorded within the road reserve along Johnsons Road, at the far western end of the Project Area. It is recommended that these locations be marked and treated as no-go zones during construction.

WF = wind farm, TL = transmission line

Several additional threatened flora species listed under the EPBC Act and FFG Act were not identified in the targeted surveys, however, are either known to occur locally or have potential to occur within the Project Area. These are outlined in **Appendix 2.2** of the **Flora and Fauna Impact Assessment**.

FIGURE 7.14

Threatened Flora Within the Wind Farm Site

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

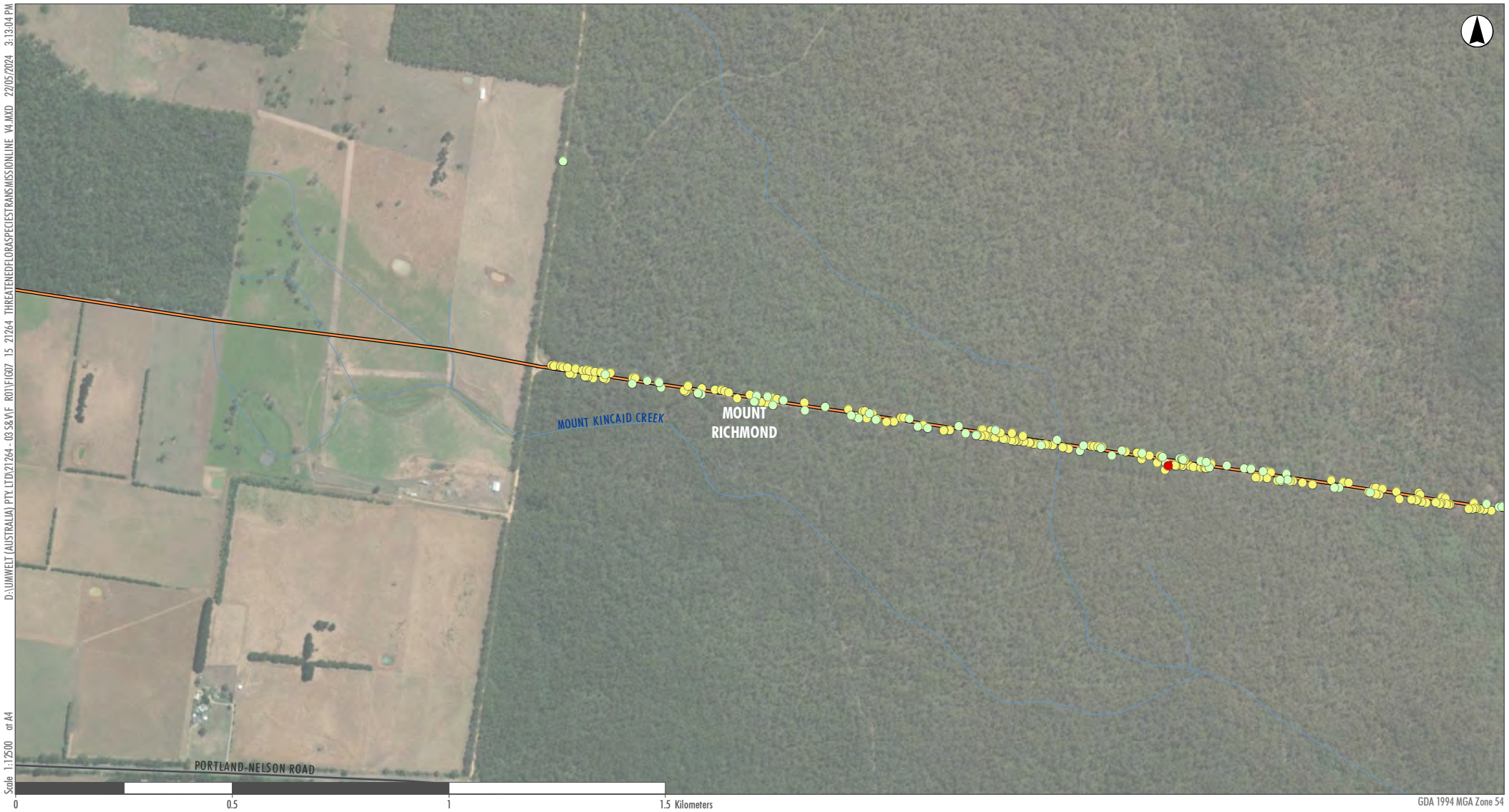


FIGURE 7.15A

Threatened Flora Species Along the Transmission Line

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

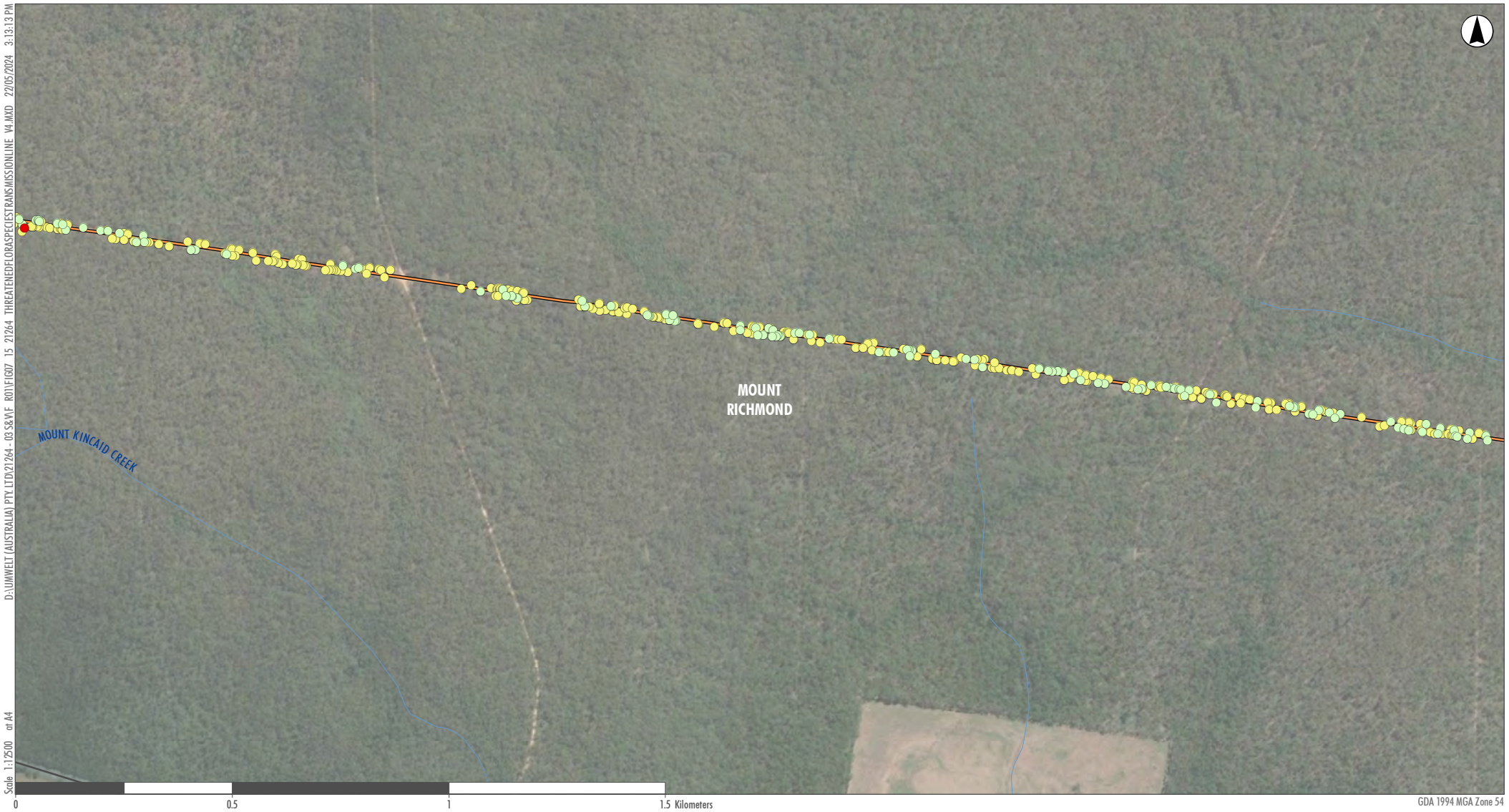


FIGURE 7.15B

Threatened Flora Species Along the Transmission Line

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

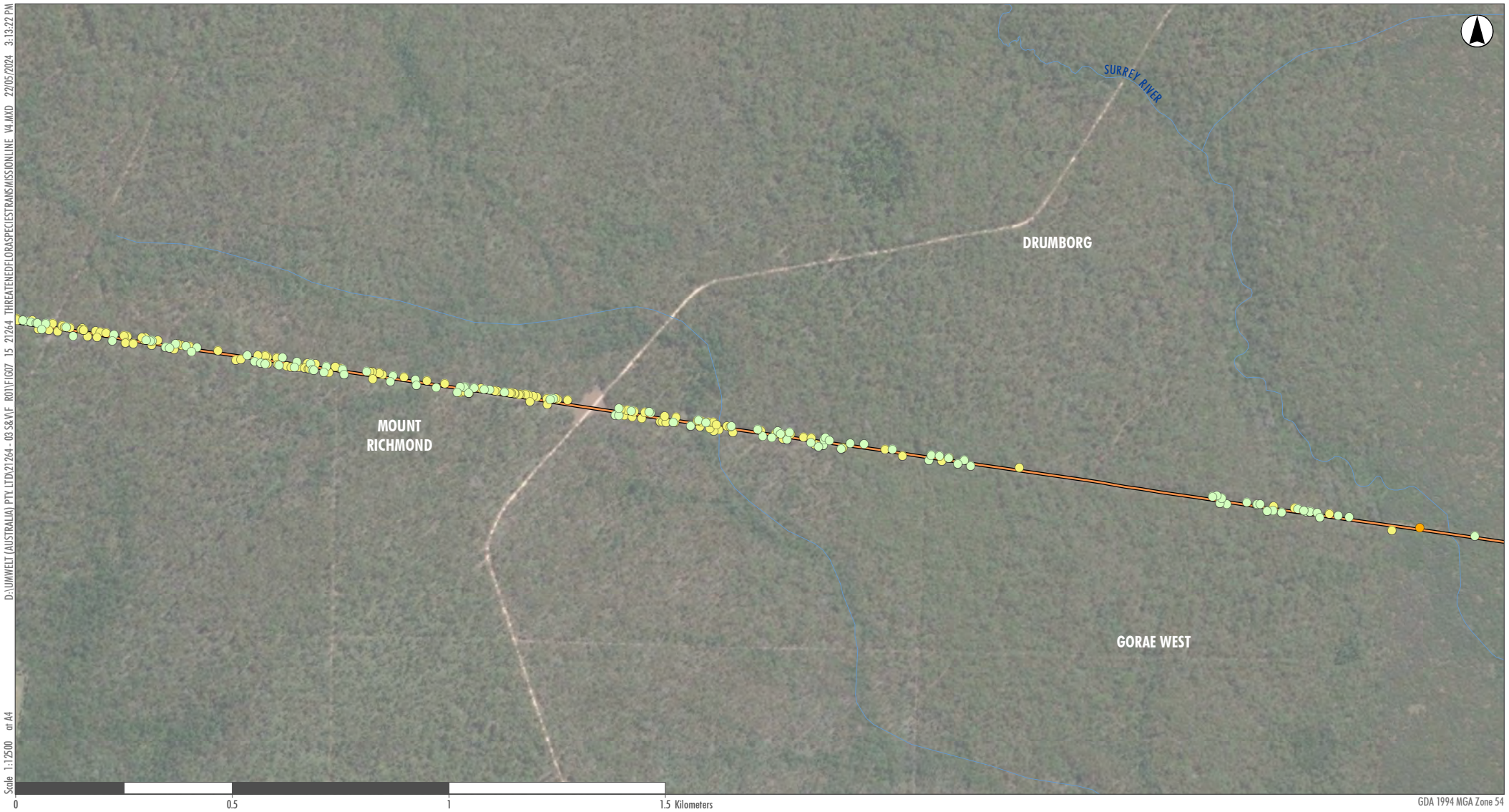


FIGURE 7.15C

Threatened Flora Species Along the Transmission Line

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

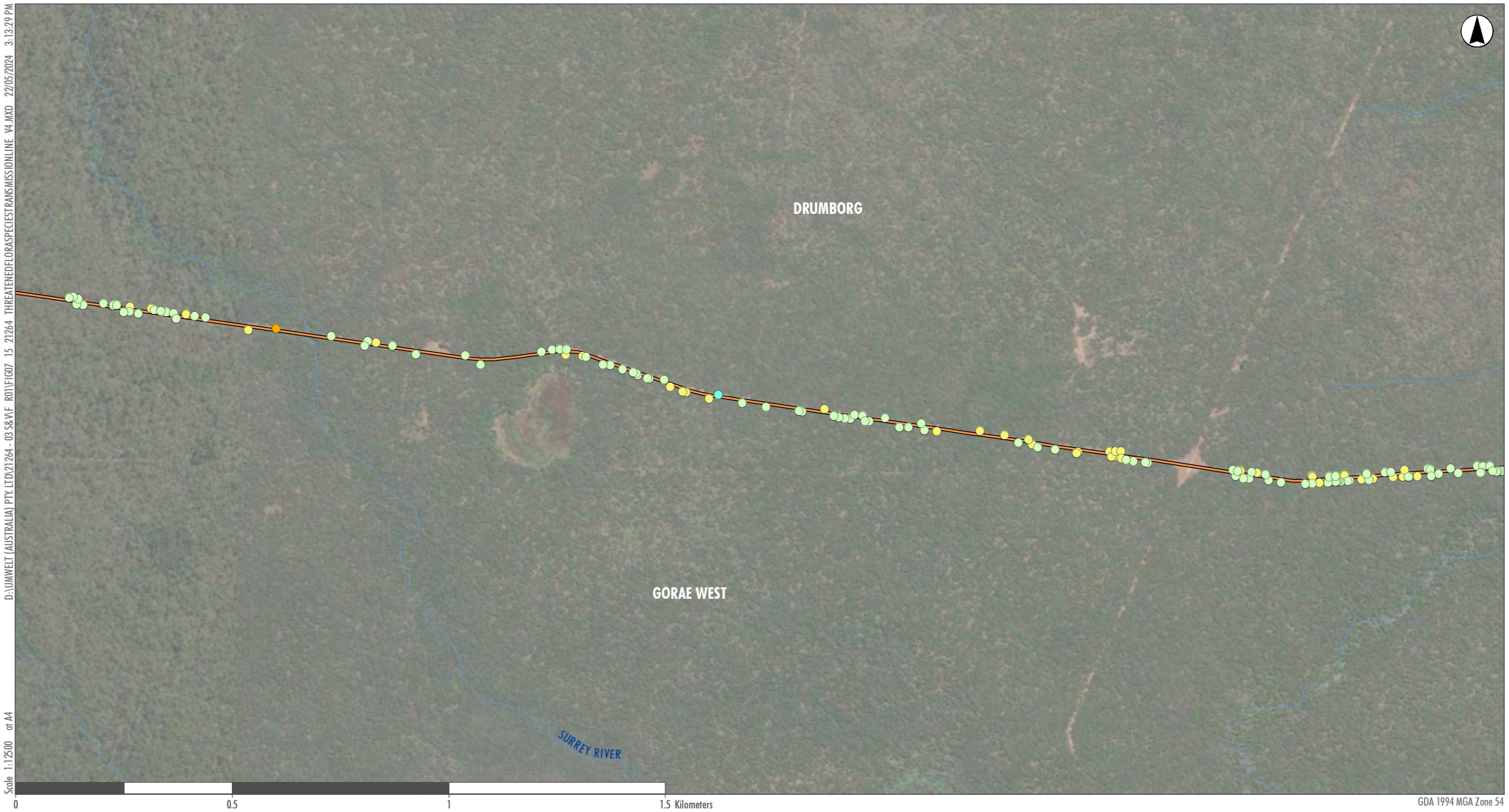


FIGURE 7.15D

Threatened Flora Species Along the Transmission Line

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

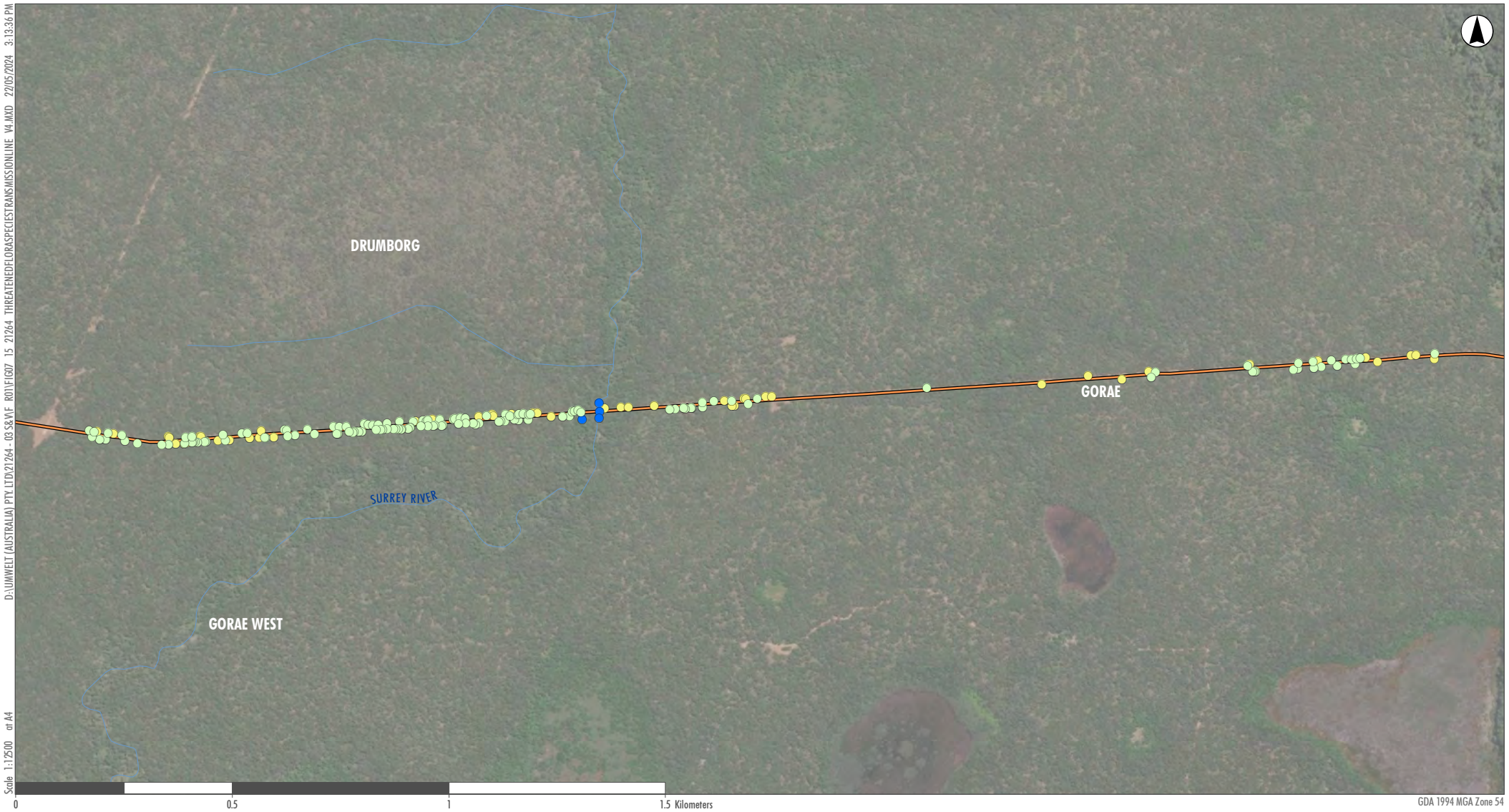


FIGURE 7.15E

Threatened Flora Species Along the Transmission Line

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

FIGURE 7.15F

Threatened Flora Species Along the Transmission Line

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

7.7.6 Threatened fauna species

The Project is substantially confined to commercial pine plantations and farmland, and generally provides lower value habitat for threatened fauna, compared to adjacent areas of natural habitats that are protected within Lower Glenelg National Park, Cobboboonee National Park and Forest Park, and Discovery Bay Coastal Park. Most pre-existing records of threatened fauna species are from outside the Project Area.

Field investigations undertaken for the Project recorded 29 threatened fauna species listed under the EPBC Act and FFG Act within the Investigation Area, as outlined in **Table 7.8**. Eleven of these were recorded within the Project Area.

Further details on threatened species listed under the EPBC Act and FFG Act that have been recorded or are predicted to occur in the Investigation Area and Project Area are detailed in **Appendix 3** of the **FFIA (Appendix C)**.

Table 7.8: Threatened fauna species recorded during project surveys

Threatened fauna species	Conservation Status		Recorded in the Project Area	Recorded in the Investigation Area	Recorded presence
	EPBC	FFG			
Bird species					
Caspian Tern (*Hydroprogne caspia*)		Vu		✓	Recorded within the Investigation Area. May fly over site rarely, however unlikely to inhabit the Project Area due to a lack of suitable habitat.
Grey Plover (*Pluvialis squatarola*)	Vu	Vu		✓	Recorded within the Investigation Area. May fly over site rarely, however unlikely to inhabit the Project Area due to a lack of suitable habitat.
Hooded Plover (*Thinornis rubricollis rubricollis*)		Vu		✓	Hooded plovers were recorded at Glenelg Estuary, Nobles Rocks and Swan Lake shorelines. The highest number recorded was eight individuals along the Swan Lake.
Bar-tailed Godwit *(Limosa lapponica)*	En	Vu		✓	Recorded within the Investigation Area. May fly over site occasionally, however unlikely to inhabit the Project Area due to a lack of suitable habitat.
Common Greenshank (*Tringa nebularia)*	En	En		✓	Recorded within the Investigation Area. May fly over site rarely, however unlikely to inhabit the Project Area due to a lack of suitable habitat.
Sharp-tailed Sandpiper	Vu			✓	See details of records in **Section 7.7.7.**
Latham's Snipe	Vu			✓	See details of records in **Section 7.7.7.**
Brolga (*Antigone rubicunda*)		En	✓	✓	Recorded at several locations within the Project Area. See **Chapter 8 Brolga** for further details.
Little Egret (*Egretta garzetta*)		En		✓	Recorded within the Investigation Area. May fly over site occasionally, however unlikely to inhabit the Project Area due to a lack of suitable habitat.
Eastern Great Egret (*Ardea alba modesta*)		Vu		✓	Recorded during bird utilisation surveys. Known from adjacent wetlands, likely to fly over site occasionally.
Australasian Bittern *(Botaurus poiciloptilus)*	En	Cr	✓	✓	This species was recorded 3 times, 2 of which were in the Project Area. One incidental record was observed flying across farmland on private property, Mt Kincaid Road Gorae West. Two male Australasian Bitterns were heard, with one at Lake Mombeong and the other at an adjacent wetland within the pine plantation (see **Figure 7.22** and **Figure 7.23**).

Threatened fauna species	Conservation Status		Recorded in the Project Area	Recorded in the Investigation Area	Recorded presence
	EPBC	FFG			
Magpie Goose (*Anseranas Semipalmata*)		Vu		✓	Recorded in coastal habitat within the Investigation Area. May fly over the site and use adjacent wetlands occasionally, however unlikely to inhabit the Project Area, due to lack of suitable habitat.
Hardhead (*Aythya australis*)		Vu		✓	Recorded at wetlands within the Investigation Area. Likely to fly over the site occasionally, however unlikely to inhabit the Project Area due to lack of suitable habitat.
Musk Duck (*Biziura lobata*)		Vu		✓	Recorded at wetlands within the Investigation Area. Likely to fly over the site occasionally, however unlikely to inhabit the Project Area due to lack of suitable habitat.
White-bellied Sea-eagle *(Haliaeetus leucogaster)*		En	✓	✓	One White-bellied Sea Eagle was recorded opportunistically in October 2021, flying at a height of 20 meters above the ground in cleared farmland the eastern portion of the wind farm site, adjacent to Cobboboonee National Park.
Powerful Owl (*Ninox strenua*)		Vu		✓	One Powerful Owl was recorded at the Blackwood Road call playback site near Portland
Orange-bellied Parrot (*Neophema chrysogaster*)	CR	Cr		✓	A single individual was recorded in the interdunal heathland vegetation adjacent to the beach south of Swan Lake.
Blue-winged Parrot (*Neophema chrysostoma*)	EN		✓	✓	Project investigations recorded Blue-winged Parrots 56 times at: • Six sites within the Project Area • Seven control sites (locations outside the Project Area).
Elegant Parrot (*Neophema elegans*)		Vu		✓	Recorded in the Investigation Area, but outside of the Project Area.
Ground Parrot (*Pezoporus wallicus*)		En		✓	Recorded within coastal heath within the Investigation Area, however unlikely to inhabit the Project Area due to lack of suitable habitat
White-throated Needletail *(Hirundapus caudacutus)*	VU	Vu	✓	✓	White-throated Needletail was recorded on 21 occasions. There were eight locations where the species was recorded within the wind farm site. Most observations were of individual birds or small groups (< 10), but there were two observations of large groups, including the incidental observation near Lake Mombeong (70 birds) and an observation of 90 birds, followed by eight birds, during a BUS count at site T3 near the far western section of the site in late February 2021.
Rufous Bristlebird (Coorong) (*Dasyornis broadbenti broadbenti*)		En	✓	✓	Rufous bristlebird was recorded 19 times during surveys between June and December 2020.

Threatened fauna species	Conservation Status		Recorded in the Project Area	Recorded in the Investigation Area	Recorded presence
	EPBC	FFG			
Gang-gang Cockatoo (*Callocephalon fimbriatum*)	EN		✓	✓	25 Gang-gang Cockatoos were recorded flying through the Investigation Area at three sites: • 5 at the edge of open farmland and native forest • 3 flying together at the edge of pine plantation and Blue Gum plantation • 17 at the edge of pine plantation and native forest.
Eastern Ground Parrot *(Pezoporus wallicus wallicus)*		En		✓	Calls were documented on three occasions during surveys within the Investigation Area
Mammals					
White-footed Dunnart (*Sminthopsis leucopus*)		Vu	✓	✓	Two White-footed Dunnarts were detected in Project surveys under roof tiles, under two different tile locations within the Blue Gum plantation near the eastern end of the Project.
Southern Brown Bandicoot (*isoodon obesulus obesulus*)	EN	En		✓	Southern Brown Bandicoot was detected from camera traps within Mount Clay State Forest
Bats					
Southern Bent-wing Bat (*Miniopterus orianae bassanii*)	CR	Cr	✓	✓	Recorded flying throughout Project Area and Investigation Area.
Reptiles					
Striped Worm-Lizard *(Aprasia striolata)*		En	✓	✓	Two juvenile Striped Worm-lizards were recorded along Johnsons Road and one adult was recorded along the roadside verge of Swan Lake.
Bearded Dragon *(Pogona barbata)*		Vu	✓	✓	Two were recorded within the Project Area along roadsides and other less disturbed portions of site.
Swamp Skink (*Lissolepis coventryi*)	EN	En		✓	Two adult Swamp Skinks were recorded at the southern end of Johnsons Road, approximately 200 m outside of the Project Area and is the exact location of a previous VBA record.

Several other threatened fauna species that have potential to occur within the Project Area and/or Investigation Area, or that are considered species of interest that were identified in the Scoping Requirements were surveyed for, however were not recorded. The following species mentioned in the Scoping Requirements were not recorded during targeted surveys, however, have been considered in the **FFIA** (**Appendix C**):

- South-Eastern Red-Tailed Black Cockatoo (*Calyptorhynchus banksii graptogyne*)
- Elegant Parrot (*Neophema elegans*)
- King Quail (*Coturnix chinensis*)
- Australian Painted Snipe (*Rostratula australis*)
- Lewin's Rail (*Lewinia pectoralis*)
- Australian Little Bittern (*Ixobrychus dubius*)
- Fork-tailed Swift (*Apus pacificus*)
- Little Eagle (*Hieraaetus morphnoides*)

- Masked Owl (*Tyto novaehollandiae*)
- Barking owl (*Ninox connivens)*
- Grey-headed Flying-fox (*Pteropus poliocephalus*)
- Glossy Grass Skink (*Pseudemoia rawlinsoni*)
- Growling Grass Frog (*Litoria raniformis*)
- Heath Mouse (*Pseudomys shortridgei*)
- Long-nosed Potoroo (*Potorous tridactylus trisulcatus*)
- Swamp Antechinus (*Antechinus minimus maritimus*).

7.7.6.1 Aquatic fauna

Appendix A of the Scoping Requirements identifies several threatened fish species that are known to occur locally and may be impacted by the project, as well as a number that are not threatened but were included in the list because they contribute to the ecological character of the Ramsar site. Appendix A to the Scoping Requirements also identifies one aquatic insect species (Ancient Greenling Damselfly Hemiphlebia mirabilis (listed as endangered under FFG Act as Hemiphlebia Damselfly)). This species is known to occur within Long Swamp, where it was first recorded in 2008 (see **Figure 7.12**).

Three additional threatened invertebrate species, one species of fish, one species of frog and one species of mammal that occur within or rely on aquatic environments (e.g. subsurface riparian moisture) have also been documented from the local area:

- Portland Burrowing Crayfish (*Engaeus strictifrons*) (FFG Act: endangered)
- Hairy Burrowing Crayfish (*Engaeus sericatus*) (FFG Act: vulnerable)
- Western Bush Yabby (*Geocharax falcata*) (FFG Act: endangered)
- Variegated Pygmy Perch (*Nannoperca variegata*) (EPBC Act: vulnerable, FFG Act: endangered)
- Southern Toadlet (*Pseudophryne semimarmorata*) (FFG Act: endangered)
- Platypus (*Ornithorhynchus anatinus*) (FFG Act: vulnerable).

The desktop assessment for aquatic fish species did not identify suitable habitat for the aquatic fish species listed in Appendix A of the Scoping Requirements within the Project Area, primarily due to an absence of substantial freshwater systems, estuaries, or brackish swamps.

Within the broader Investigation Area and outside of the Project Area, several wetlands including Long Swamp and Lake Mombeong support populations of threatened species including Yarra Pygmy Perch, Variegated Pygmy Perch, Little Galaxias and Ancient Greenling Damselfly (see **Figure 7.12**). Long Swamp and Lake Mombeong are internationally significant wetlands, with the occurrence of these threatened species identified as a component of their ecological character.

Suitable habitat within and in the vicinity of the Project site such as fallen leaf litter and bark within and adjacent to rivers, creeks, drainage lines, wetlands and damp areas were identified as likely to provide habitat for the FFG Act listed Portland Burrowing Crayfish and Hairy Burrowing Crayfish. Burrows of terrestrial Burrowing Crayfish were identified within damp depressions in farmland paddocks in the east of the wind farm site. These burrows potentially belong to the FFG Act listed species Portland Burrowing Crayfish (endangered) and Hairy Burrowing Crayfish (vulnerable).

A visual assessment of Surrey River and Wild Dog Creek was undertaken at the locations which would be crossed by the transmission line (see **Figure 7.12**). The middle reaches of Surrey River, both intersecting and falling to the south of the transmission line, were observed at various locations to contain a variety of slow-flow, semipermanent or permanent instream pool/run environments and instream structural complexity (e.g. macrophytes, root cover, submerged rocks, woody debris, leaf packs and detritus).

Wild Dog Creek is an ephemeral tributary of the Surrey River and is surrounded by a dense bed of fallen leaf litter. Wild Dog Creek likely provides habitat for the Southern Toadlet, which is listed under the FFG Act and has previously been recorded within Wild Dog Creek, including near to where the transmission line would intersect.

Southern Toadlet, Portland Burrowing Crayfish and Hairy Burrowing Crayfish may also occur within damp depressions at various other locations within the transmission line footprint.

7.7.7 Listed migratory species

Several listed threatened and non-threatened migratory and resident shorebirds including gulls and terns occur along the shoreline of the Discovery Bay National Park and the Glenelg River Estuary. Most of the roosting and foraging shorebirds recorded during the targeted surveys were observed at the Glenelg River Estuary, near the river mouth. No shorebirds were recorded in the Project Area. **Table 7.9** outlines the migratory species listed under the EPBC Act that were recorded during targeted surveys.

Table 7.9: Listed migratory shorebirds recorded during targeted surveys

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

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

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

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

7.7.8 Bird utilisation surveys

During the BUS assessment a total of 141 bird species were recorded within the Investigation Area, including 12 threatened or listed species (See **Table 7.10**). A full record of bird species recorded at each BUS point is provided in **Appendix 3, Table A3.4** of the **FFIA** (**Appendix C).**

The 10 most abundant species recorded throughout the survey were: Little Raven (1194 individuals), Galah (809), Australian Magpie (665), Common Starling (623, introduced), Welcome Swallow (573), Yellow-tailed Black Cockatoo (461), Silvereye (437), Red Wattlebird (330), Superb Fairy-wren (316) and Crimson Rosella (311).

Thirteen threatened bird species were recorded within the Project Area during the BUS or incidentally. An additional six bird species listed as migratory under the EPBC Act were also recorded. **Table 7.10** below shows all threatened species identified during the BUS including migratory species. Incidental records refer to observations made during general observations or during other species specific surveys. The location of these recordings/observations are also listed in this table, and shown in **Figure 7.8**.

Table 7.10: Threatened species identified during the BUS within the project area

Species	Conservation Status			Total observed	BUS sites of observation
	EPBC	FFG	EPBC Mi		
Blue-winged Parrot *(Neophema chrysostoma)*	VU			135	C1, C2, C4, C7, C8, C9, C10, T3, T9, T10, T11, T15, T17
Gang-gang cockatoo *(Callocephalon fimbriatum)*	EN			25 1 incidental record	C6, T14, T16
Bar-tailed Godwit *(Limosa lapponica)*	EN	VU	✓	5 incidental records	C1
Brolga *(Antigone rubicunda)*		EN		27 5 incidental records	C6, C7, T2, T6, T15, T17, T3
Rufous Bristlebird (Coorong subspecies) *(Dasyornis broadbenti broadbenti)*		EN		2 incidental records	T4
Eastern Great Egret (*Ardea alba modesta)*		VU		1	C1
Grey Plover (*Pluvialis squatarola)*		VU	✓	1 Incidental record	C1
Hardhead *(Aythya australis)*		VU		1 Incidental record	C1
Hooded Plover *(Thinornis cucullatus)*	VU	VU		1 Incidental record	C1
Plumed Egret *(Ardea intermedia plumifera)*		CR		1 1 Incidental record	C1, T11
Little Egret *(Egretta garzetta)*		EN		2 3 incidental records	C1, T11
Musk Duck *(Biziura lobata)*		VU		33 3 Incidental records	C1, C7, T11
White-throated Needletail *(Hirundapus caudacutus)*	VU	VU	✓	175 1 Incidental record	C1, C2, C6, T3, T5, T6, T7, T8, T10, T12
Crested Tern *(Thalasseus bergii)*			✓	268 2 Incidental records	C1, C6, C7
Red Knot *(Calidris canutus)*			✓	1 Incidental record	C1

Species	Conservation Status			Total observed	BUS sites of observation
	EPBC	FFG	EPBC Mi		
Red-necked (*Stint Calidris ruficolli)*			✓	85 1 Incidental record	C1
Sanderling (*Calidris alba)*			✓	4 4 Incidental records	C1
Sharp-tailed Sandpiper (*Calidris acuminata)*	VU		✓	1 Incidental record	C1
Short-tailed Shearwater (*Ardenna tenuirostris)*			✓	1 Incidental record	C3

EPBC Mi = Listed migratory species under the EPBC Act

7.7.9 Bat species

Several bat species were recorded during acoustic surveys (see **Figure 7.10**). One species listed under the EPBC Act and FFG Act was recorded (SBWB). The White-striped Free-tailed Bat (*Austronomus australis)* was most frequently recorded, with over 8,000 recordings from the 16 met mast mounted detectors across the survey period. Seven species of bats were detected within rotor swept height (84 m detectors), including the SBWB.

The following species were detected within rotor swept height (84 m detector), in decreasing order of number of recordings:

- White-striped Free-tailed Bat (*Austronomus australis*) (1663 recordings)
- Gould's Wattled Bat (*Chalinolobus gouldii*) (107 recordings)
- Free-tailed Bats (*Ozimops* spp.) (82 recordings)
- Inland Broad-nosed Bat (*Scotorepens balstoni*) (77 recordings)
- Large Forest Bat (*Vespadelus darlingtonia*) (8 recordings)
- Southern Forest Bat (*Vespadelus regulus*) (3 recordings)
- Southern Bent-wing Bat (*Miniopterus orianae bassanii*) (1 recording).

The remaining species' recorded in acoustic surveys were detected outside of the rotor swept height and included:

- Chocolate Wattled Bat (*Chalinolobus morio*)
- Eastern False Pipistrelle (Falsistrellus tasmaniensis)
- Long-eared bats (*Nyctophilus spp*. (Likely N. geoffroyi and N. gouldi))
- Little Forest Bat (*Vespadelus vulturnus*)
- Southern Myotis (*Myotis macropus*).

7.7.10 Southern bent-wing bat

The SBWB is listed as critically endangered under both the EPBC Act and the FFG Act. The SBWB is an obligate cave-dwelling bat (meaning that it relies on caves for roosting and breeding) with a distribution across south-east South Australia and south-west Victoria (see **Figure 7.18**). During the non-breeding season, SBWB individuals are distributed throughout the region, roosting in caves and rock crevices. There are 18 known roost caves in Victoria (TSSC 2021). Victorian caves are distributed across the south-west region, and the number and location of all sites is not fully understood. During the breeding season, most of the SBWB population congregates in two regularly used breeding caves, located near Naracoorte in South Australia and near Warrnambool in Victoria. Breeding activity has also been observed annually since 2015 in a sea cave to the west of Portland and south-east of the Project Area, and this is now recognised as a third maternity cave (TSSC 2021).

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

7.7.10.1 Survey results

SBWB recordings from the preliminary surveys carried out in December 2018 to April 2019 were recorded across all ground detectors (sites 1–10) and at the one met mast installed for these surveys, as shown in **Figure 7.10.**

The 12-month SBWB survey at the mast mounted detectors from December 2019 to December 2020 recorded SBWB calls at all met masts (see **Figure 7.10**), although not at all masts across all survey months. Call activity reduced in late autumn (May) and early winter (June), which is when foraging is less energetically beneficial in cold conditions, and SBWB enter periods of torpor (a state of inactivity) (TSSC 2021). Recent research suggests that some activity is maintained in the colder months, including movement between non-maternity caves (TSSC 2021).

Manual examination was undertaken of the 2,743 recordings identified by the automated process as either 'confirmed' or 'potential' SBWB calls. The manual identification process was limited to data collected during the 12-month survey (December 2019 to November 2020), the results of which are outlined in **Table 7.11**. Each call was categorised into one of the following:

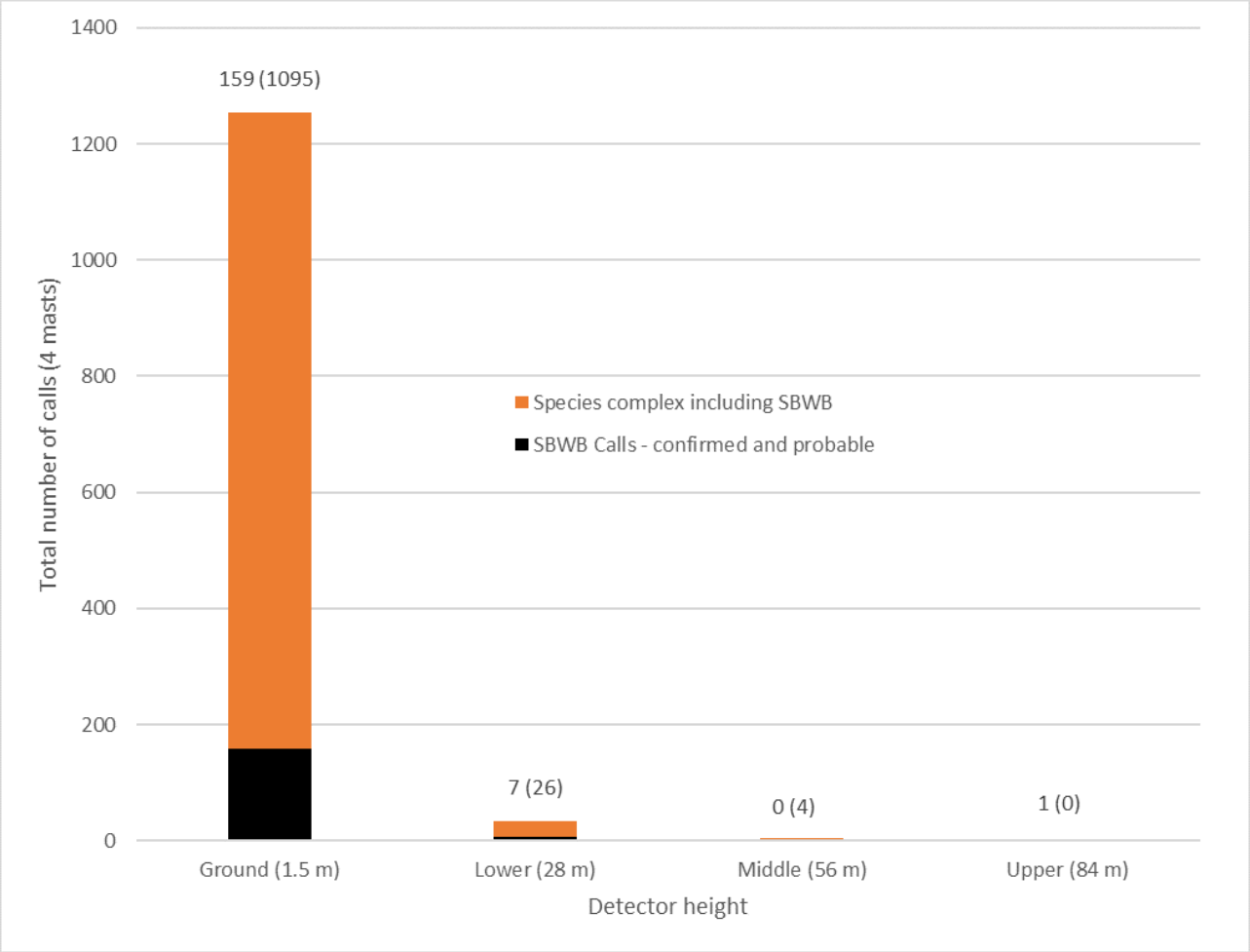
- Confirmed and Probable SBWB – these categories are generally grouped, as they represent recordings considered highly likely to be SBWB.
- Complex – a high proportion of calls identified in the automated identification process were, following manual examination, determined to belong to a species complex,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

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

Table 7.11: Manual checking of SBWB calls

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

At all four met masts, there were greatly reduced levels of call activity detected at the higher height-level detectors. The majority (1,254 calls, 97% of total confirmed, probable and complex calls) of calls were recorded on the ground detectors (1.5 m above ground) (159 of which are confirmed calls), with 33 calls recorded at the lower (28 m) detectors (7 of which are confirmed calls), 4 calls at the middle (56 m) detectors (0 of which are confirmed calls) and 1 call at the upper (84 m) detector (confirmed call) (see **Figure 7.16**).



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

Figure 7.16: Total number of confirmed SBWB calls recorded from mast mounted detector locations

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

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

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

The seasonal distribution of SBWB recordings is summarised in **Figure 7.17,** which shows the proportion of calls recorded within each month included in the survey. The results indicate activity peaks within late summer and early autumn (February and March) and again in spring (September to December), although activity levels in October were relatively low in comparison. Activity levels were relatively low throughout late autumn and winter (May to August), when foraging is less energetically beneficial in cold conditions, and SBWB enter periods of inactivity.

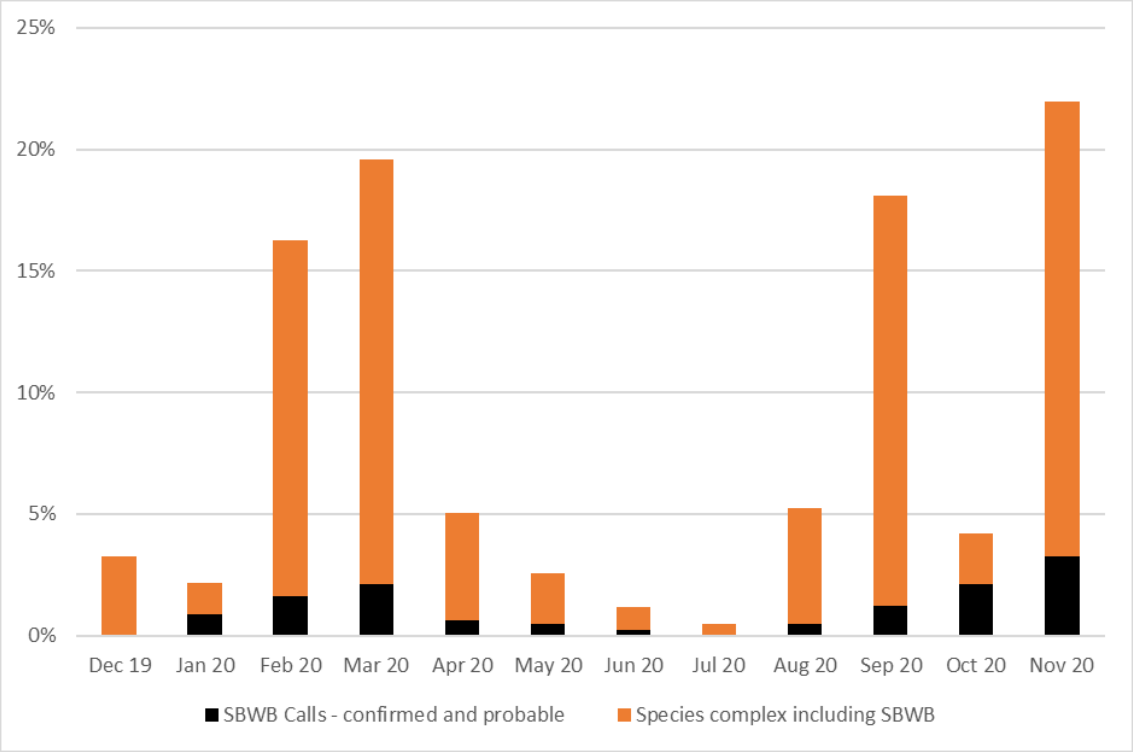
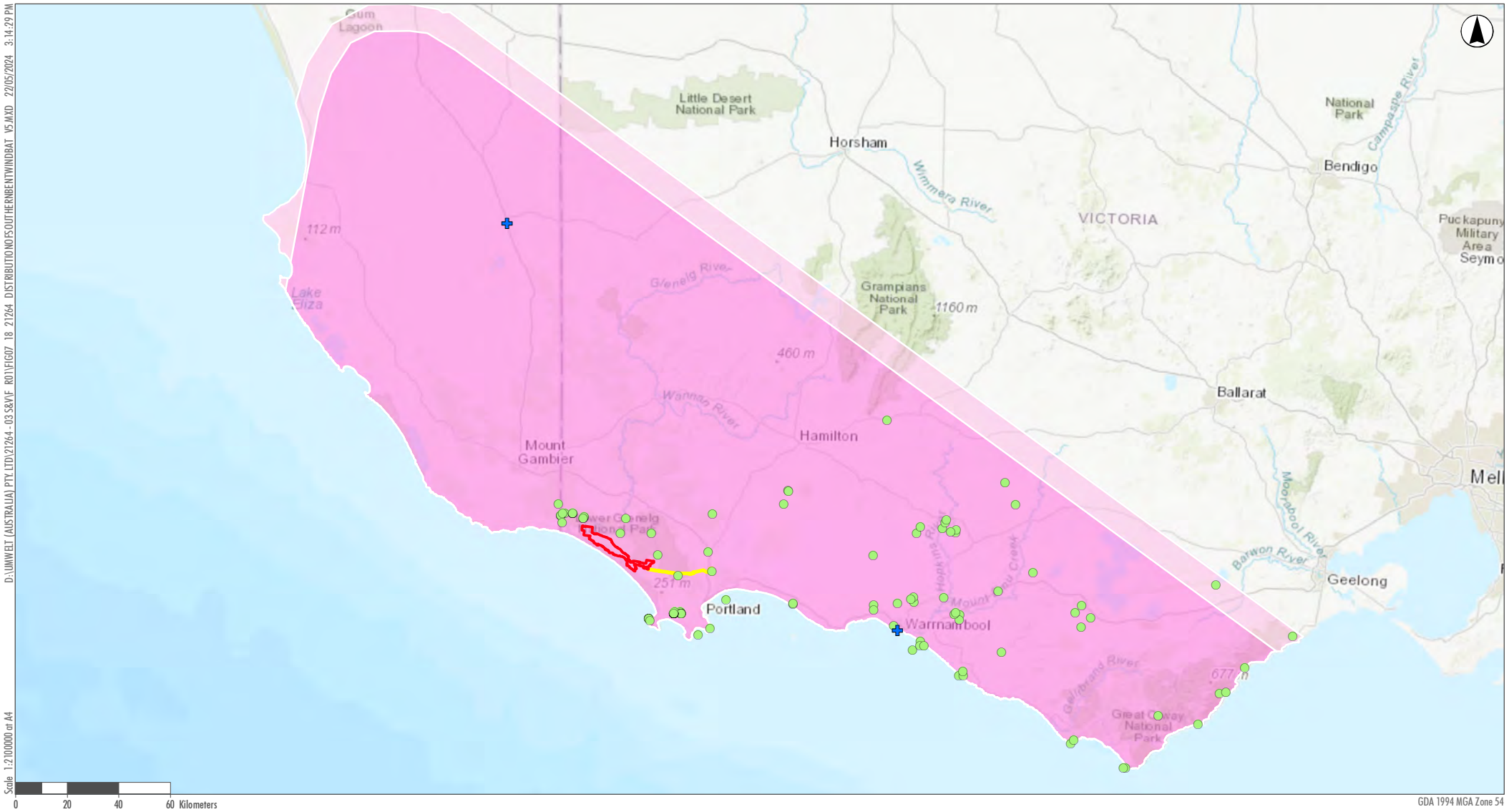


Figure 7.17: Temporal distribution of SBWB calls

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

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

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



D:\UMWELT (AUSTRALIA) PTY LTD\21264 - 03 S&VIF R01\FIG07 18 21264 DISTRIBUTIONOFSOUTHERNBENTWINDBAT V5.MXD 22/05/2024 3:14:29 PM

Scale 1:2100000 on A4

FIGURE 7.18

Distribution of Southern Bent-wing Bat

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

7.8 Avoidance and minimisation through design

The Proponent has sought to understand and respond to the biodiversity and habitat values that are present within and around the Project Area. Understanding has been gathered through research and surveys, and responses to that understanding include site selection, project design development (including iterative design development in response to the impact assessment findings), and development of management and mitigation measures (including adaptive management responses) to manage potential residual impacts and risks.

When the Proponent first identified the potential for a wind farm project at this location, environmental, heritage and social constraints from within and around the Project Area were recorded in a project-specific geographic information system (GIS). These constraints were layered over existing and proposed infrastructure, land uses and many other factors, to form a picture of the existing physical, heritage and social environment.

This constraints mapping has been used extensively through the Project's development life cycle and has been updated and refined as new information has been found through the impact assessments, and through consultation with stakeholders, Traditional Owners, and the community.

A summary of the avoidance and minimisation through design approach as it applies to biodiversity and habitat is provided in the following sections.

7.8.1 Site selection

This Project has been intentionally located on land that has been extensively disturbed to facilitate radiata pine forestry operations. Compared to other proposals, infrastructure within an existing pine plantation substantially avoids the potential to impact on native vegetation and habitat. Little in the way of remnant native vegetation was identified within the pine plantation during initial desktop and site investigations, and the monocultural treed environment was anticipated to provide less important habitat for listed or threatened species when compared to adjacent and surrounding land.

The proposal also avoids the need to create and/or augment a network of internal access tracks because these are already in place within the forestry operations, with many of the access roads highly suitable for transporting wind farm components due to their current use for forestry vehicles. This also extends to the access points from the primary road network, with many of these already existing and requiring only minor upgrades to accommodate the turning circles of wind farm equipment transport vehicles. For other wind farms, access tracks and access points are often major contributors to native vegetation losses due to remnant native vegetation often being isolated adjacent to roadways that need to be upgraded.

Selecting a pine plantation as a wind farm location also means that there is no prohibitive planning overlay on the site, as it's not a national park, state park, coastal park, or other high quality environmental and/or landscape location as identified by the Victorian Government[1], or on land identified in clause 52.32-2 of the Glenelg Planning Scheme (the Planning Scheme)[2].

7.8.2 Project design and development

As the Project progressed through early design iterations and an understanding of the biodiversity and habitat in and around the Project was developed, several sections of land that were included in the initial Project Area were removed. This included avoiding areas that were too close to adjacent conservation areas, or areas of land that contained possibly important wetlands that were connected to wetlands that make up the Ramsar site.

Ongoing studies have further informed the development of the design, including:

- Removal of turbines within 300 m of public land, including Lower Glenelg National Park and Cobboboonee National Park to reduce collision risk for bird and bat species that use these habitats.
- Removal of turbines within 500 m of wetlands within the Ramsar site to reduce turbine collision risk for bird and bat species that use habitat within the Ramsar site.
- Removal of turbines from areas within Brolga breeding buffers and movement corridors (see **Chapter 8 *Brolga*** for further details on Brolga). This includes a 900 m buffer on Long Swamp which is also known habitat for Australasian Bittern.
- Turbine free buffers have been applied to the area of the wind farm site within 5 km of SBWB roost sites.
- Removal/relocation of turbines where groundwater levels were estimated to be within 6 m of the ground surface to mitigate potential impacts on groundwater dependent ecosystems.

[1] Section 2.1.4 of the *Policy and planning guidelines for development of wind energy facilities in Victoria* (November 2021, DELWP)
[2] clause 52.32-2 52.32-2 of the Glenelg Planning Scheme

- The original turbine planning envelope included a blade tip height of between 45 m and 270 m above ground level. The minimum blade tip height was increased from 45 m to 60 m to minimise potential impacts on bird and bat species, with Project studies indicating most flights for recorded species were occurring at heights below 60 m.
- The transmission line has been designed to be underground and situated beneath an existing road (Boiler Swamp Road) to minimise potential impacts that would otherwise be associated with trenching through undisturbed land, such as areas of native vegetation.
- Avoiding impacts on Apple Jack root zones has been a priority in the design revisions, including micrositing of the trench within the road corridor for the transmission line and the selection of locations to be constructed via directional drilling (see mitigation measure MM-BD07)
- The construction methodology for the underground transmission line along Boiler Swamp Road has been developed to minimise impacts on native vegetation by utilising a specialised machine that excavates, lays the cable, and backfills the trench in a single pass within a narrow 2.9 m wide corridor.
- Earlier route options of the previously proposed overhead transmission line into Heywood Terminal Station was to run along the edge of Mt Clay State Forest, which provides habitat for small mammals. The overhead transmission line route was revised to avoid these areas and avoid impacts on small mammal habitat (and ultimately revised to be underground)
- This overhead section of transmission line in farming land between Cobboboonee Forest Park and Heywood Terminal Station was ultimately revised to be underground to avoid potential impacts on Brolga.
- The powerline that connects the collector substations to the main farm substation was initially proposed to be overhead. Due to Brolga habitat in the east of the wind farm site, it was changed to underground upon entry into the farmland east of Portland-Nelson Road. It was also moved to the northern boundary of the property to minimise direct impacts from excavation and other construction activities on the breeding wetlands.
- Any new overhead powerlines will be marked to increase visibility to brolgas and minimise the risk of collision (see mitigation measure MM-BD16).

7.9 Construction impacts

This section summarises the potential impacts on biodiversity and habitat during construction of the Project. The **FFIA (Appendix C)** considered potential direct and indirect impacts.

Potential construction impact pathways identified and assessed include:

- Direct loss of flora and habitat from vegetation removal, and assumed losses from potential impacts to tree protection zones
- Physical disturbance of flora and habitat from construction activities including earthworks
- Degradation of habitat and/or loss or harm to flora from indirect effects of construction activities, such as:
    - Erosion and sedimentation.
    - Contamination caused by accidental spills of materials that may cause harm.
    - Changes to the hydrological and hydrogeological environment. This may eventuate from construction in and around waterways and wetlands, from changes to groundwater quality or quantity due to drawdown resulting from ingress into excavations, or from other construction related activities with potential to change or harm surface and groundwater.
- Changes to the abundance and/or diversity of flora and fauna.

7.9.1 Native vegetation

The Project has been selected and developed in accordance with the avoid and minimise principles. This means that most of the native vegetation remaining within the Project Area is avoided. The wind farm site has been positioned within the pine plantation, blue gum plantations and cleared farmland, and has been designed with the objective of avoiding and minimising impacts on native vegetation. Impacts have been further reduced or avoided through project design and construction method selection such as removal or relocation of turbines within the wind farm layout and constructing sections of the transmission line underground.

Construction of the wind farm (including construction of permanent and temporary infrastructure such as turbines, hard stands, access roads and the quarry) requires some unavoidable vegetation removal. Construction of the transmission line along Boiler Swamp Road does not require direct removal of vegetation. There are some assumed losses of native vegetation due to trenching for the transmission line encroaching on TPZs of adjacent trees.

7.9.1.1 Native vegetation removal

Having designed to avoid as many impacts as possible, construction of the Project would impact on 8.696 ha of native vegetation to accommodate Project infrastructure and some road upgrades. 3.755 ha of this is associated with the underground transmission line, which includes 2.906 ha of assumed losses associated with TPZ incursions of greater than 10%. Native vegetation losses are shown in **Figure 7.19.**

Minimal removal of native vegetation is required within plantation areas. There are areas within the plantation where native understorey plants have recolonised since being cleared and since plantation establishment, including along private access tracks. Removal of this regrowth vegetation does not require planning approval, due to the 'regrowth' exemption under Clause 52.17 of the Planning Scheme. This clause specifies an exemption for the removal of native vegetation within a timber production plantation, as indicated on a Plantation Development Notice, provided the regrowth has occurred since establishment of the plantation. Plantation areas also include areas of remnant vegetation that pre-date plantation establishment (1950s to 1970s). These areas will be avoided. The regrowth exemption does not apply to public road reserves within plantation areas, and all native vegetation patches, as defined in the Guidelines for the removal, destruction or lopping of native vegetation (DELWP, 2017), along these roads have been mapped to inform the design and avoidance process.

During construction, areas of native vegetation within the wind farm site including scattered trees will be protected by temporary fencing if construction activities are to be conducted within 15 m of native vegetation (see mitigation measure MM-BD01). Fencing will be installed before construction work commences. Retained native vegetation within the Parks will be no-go areas identified during inductions for construction staff and daily toolbox talks. These areas will not be fenced during Project construction due to the continuous nature of native vegetation within the Parks. Trees not requiring direct removal will be protected in appropriately marked TPZs in accordance with AS 4970:2009 Protection of trees on development sites (see mitigation measure MM-BD04).

7.9.1.2 Native vegetation offsets

The offsets required for the Project to compensate for native vegetation loss are outlined in **Table 7.12**. The final offset strategy for the Project will be developed as a stand-alone technical document in consultation with public land managers and project stakeholders (see mitigation measure MM-BD02). The Proponent will secure the required native vegetation offsets via two pathways: purchases from the DEECA Native Vegetation Credit Register (NVCR) and purchasing one or more blocks of land near the Project Area.

One registered credit site listed within the NVCR has sufficient general units and large trees available. Desktop preliminary assessment has investigated the offset potential of three blocks of private land to date, which have the potential to completely provide or contribute to providing the species offset requirements required for the Project. These sites have potential to contribute to species offset requirements for Lax Twig-sedge, however, do not contain any modelled habitat for Hairy Boronia. The Proponent has had discussions with the landowners of the three blocks of land about the potential for offsets, however, the offsets won't be procured until prior to construction.

Species offsets for Hairy Boronia are triggered due to intersections between Project Infrastructure, the habitat importance model, and the two large, mapped wetlands on private farmland in the east of the Project Area. VicFlora notes that this species inhabits Heathlands and Heathy Woodlands on sandy soils. The species has been recorded within Herb-rich Foothill Forest and Heathy Woodlands. It is not a wetland species, suggesting there are errors in the habitat importance model or the wetland mapping. Removing these areas of modelled habitat would reduce the proportional impact on this species to under 0.005% and remove this species from the list of species requiring specific offsets. The process for reconciling this issue and finalising offset requirements for the Project will be done as part of preparation of the final offset strategy (see MM-BD02).

Table 7.12: Offsets required for the project

Attribute	Outcome
General offset amount (general habitat units)	0.5360 units
General offset vicinity	Glenelg Hopkins Catchment Management Authority or Glenelg Shire Council
General offset minimum Strategic Biodiversity Value Score	0.3280

Attribute	Outcome
Species offset amount (species units)	• 6.755 species units of habitat for Lax Twig-sedge *Baumea laxa* • 2.824 species units of habitat for Oval-leaf Logania *Logania ovata* • 6.009 species units of habitat for Scented Spider-orchid *Caladenia fragrantissima* • 5.725 species units of habitat for Leafy Greenhood *Pterostylis cucullate* subsp. *cucullata* • 2.542 species units of habitat for Hairy Boronia *Boronia pilosa* subsp. *pilosa*
Large tree offsets	228

7.9.1.3 Tree Protection Zones

It is expected that the transmission line would impact on several trees through encroachment on TPZs along Boiler Swamp Road. The TPZ is the area above and below ground at a given distance from the trunk to provide for the protection of the tree's roots and canopy during construction works. The TPZ includes the tree's structural root zone (SRZ). **Figure 7.20** shows a typical TPZ.

Legend

- Project Area
- Site Access Points
- Roads
- Parks and Reserves

Permanent Wind Farm Infrastructure

- Onsite Quarry
- Collector Substation
- Crane Hardstand

- Proposed Turbine Location
- 275 kV Powerline - Overhead
- 275 kV Powerline - Underground
- Internal Access Roads
- Underground Powerlines

Temporary Wind Farm Infrastructure

- Concrete Batch Plant
- Laydown Areas
- Site Compounds

Native Vegetation Removal

- Patch vegetation proposed to be removed (direct)
- Assumed native vegetation losses*

Ecological Vegetation Classes (EVCs)

- 3 Damp Sands Herb-rich Woodland
- 858 Coastal Alkaline Scrub

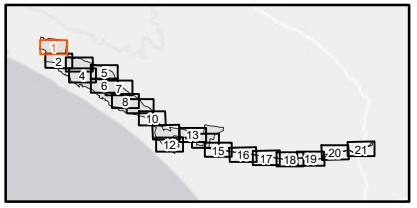
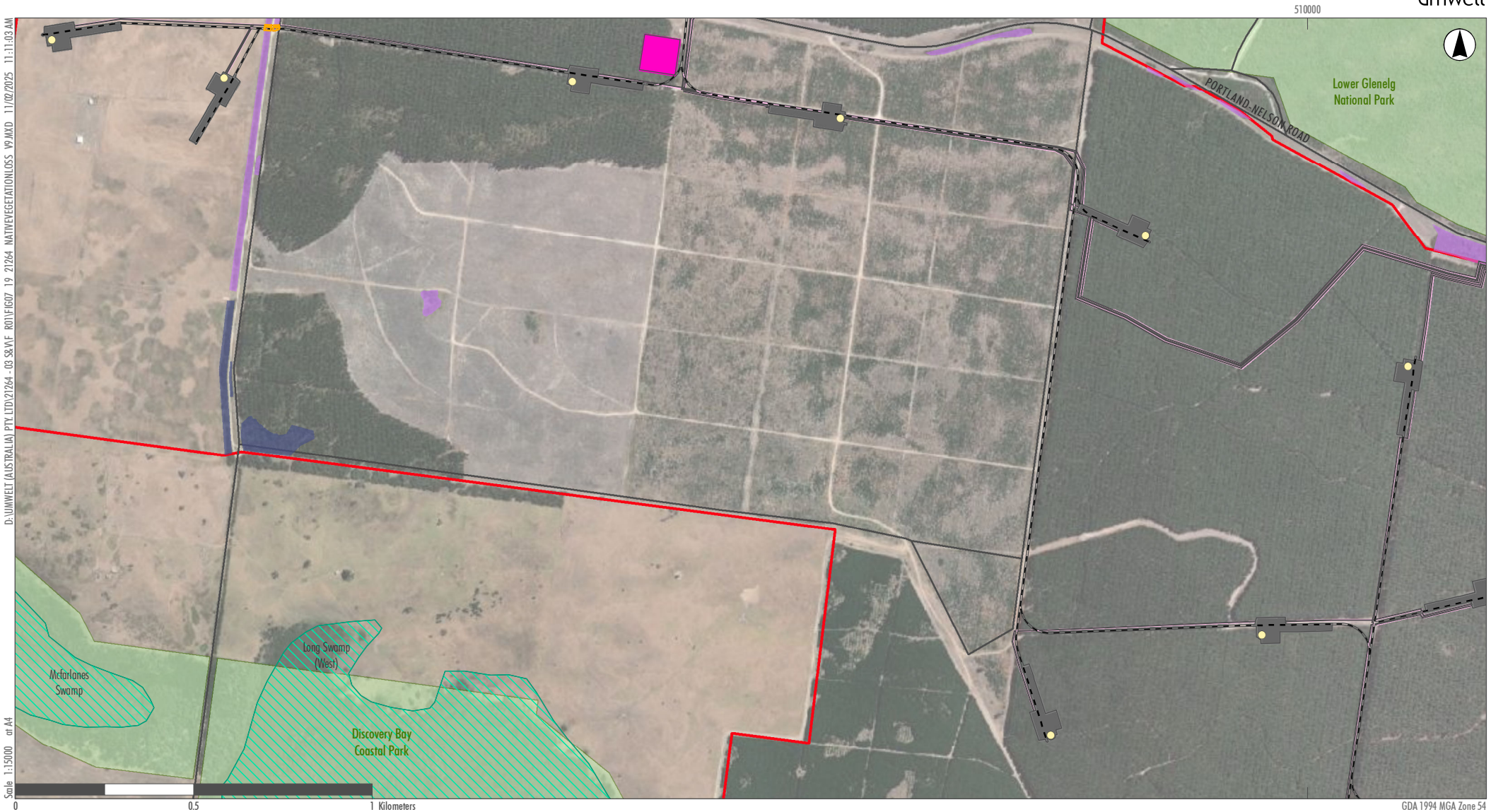


FIGURE 7.19A

Proposed Native Vegetation Removal in the Project Area

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

*native vegetation losses are assumed losses associated with encroachment into more than 10 percent of tree protection zones



Legend

- Project Area
- Site Access Points
- Roads
- Parks and Reserves
- Wetlands

Permanent Wind Farm Infrastructure
- Onsite Quarry
- Collector Substation
- Crane Hardstand

- Proposed Turbine Location
- 275 kV Powerline - Overhead
- 275 kV Powerline - Underground
- Internal Access Roads
- Underground Powerlines

Temporary Wind Farm Infrastructure
- Concrete Batch Plant
- Laydown Areas
- Site Compounds

Native Vegetation Removal
- Patch vegetation proposed to be removed (direct)
- Assumed native vegetation losses*

Ecological Vegetation Classes (EVCs)
- 3 Damp Sands Herb-rich Woodland
- 858 Coastal Alkaline Scrub

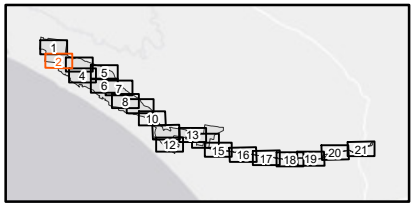


FIGURE 7.19B

Proposed Native Vegetation Removal in the Project Area

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

*native vegetation losses are assumed losses associated with encroachment into more than 10 percent of tree protection zones

Legend

- Project Area
- Site Access Points
- Roads
- Parks and Reserves

Permanent Wind Farm Infrastructure

- Onsite Quarry
- Collector Substation
- Crane Hardstand

- Proposed Turbine Location
- 275 kV Powerline - Overhead
- 275 kV Powerline - Underground
- Internal Access Roads
- Underground Powerlines

Temporary Wind Farm Infrastructure

- Concrete Batch Plant
- Laydown Areas
- Site Compounds

Native Vegetation Removal

- Patch vegetation proposed to be removed (direct)
- Assumed native vegetation losses*

Ecological Vegetation Classes (EVCs)

- 3 Damp Sands Herb-rich Woodland
- 858 Coastal Alkaline Scrub

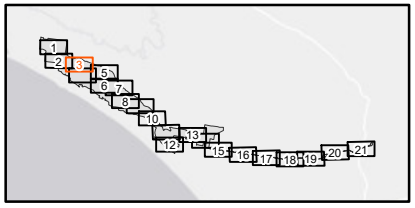
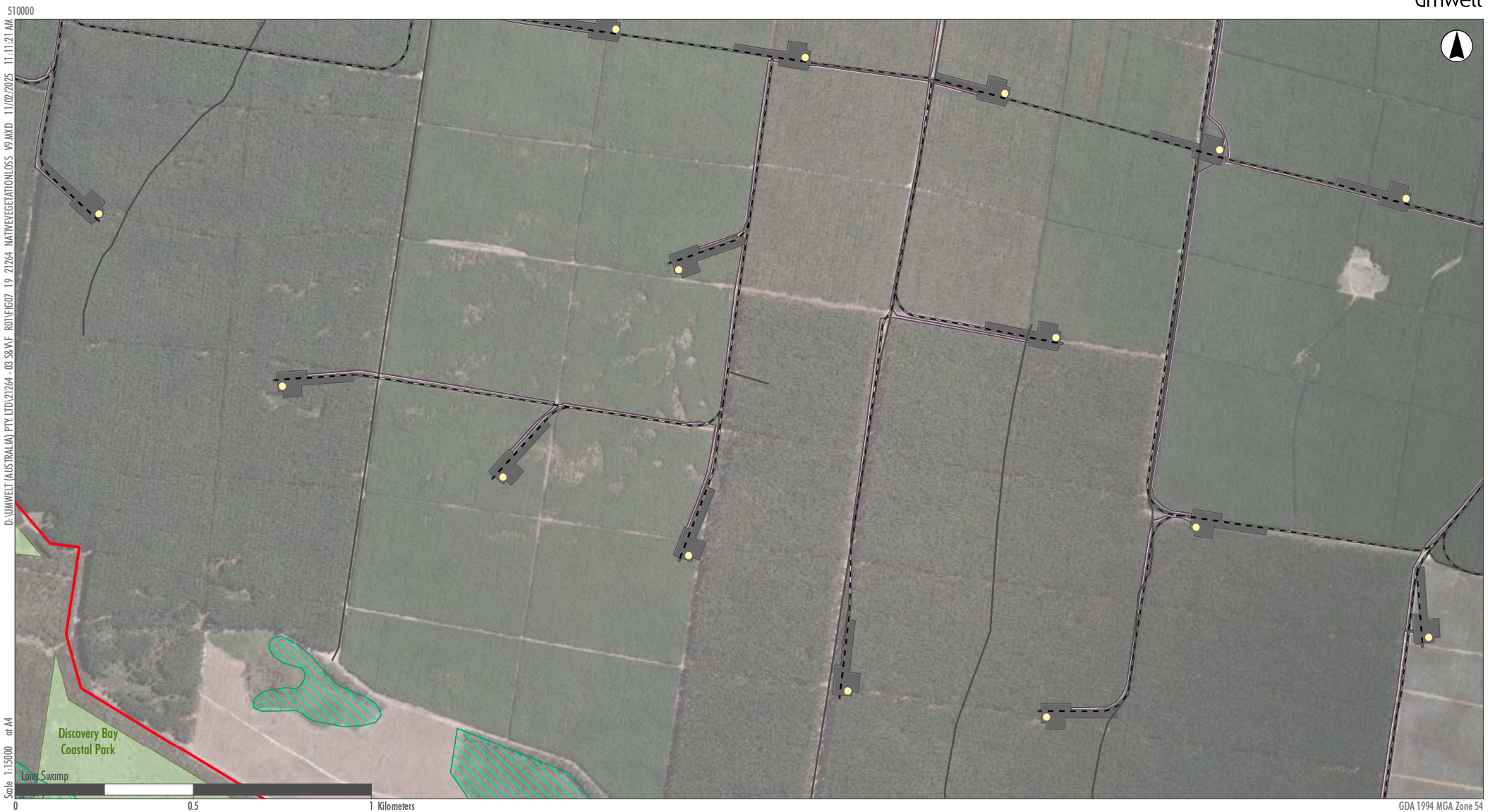


FIGURE 7.19C

Proposed Native Vegetation Removal in the Project Area

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

*native vegetation losses are assumed losses associated with encroachment into more than 10 percent of tree protection zones



Legend

- Project Area
- Site Access Points
- Roads
- Parks and Reserves
- Wetlands

Permanent Wind Farm Infrastructure
- Onsite Quarry
- Collector Substation
- Crane Hardstand

- Proposed Turbine Location
- 275 kV Powerline - Overhead
- 275 kV Powerline - Underground
- Internal Access Roads
- Underground Powerlines

Temporary Wind Farm Infrastructure
- Concrete Batch Plant
- Laydown Areas
- Site Compounds

Native Vegetation Removal
- Patch vegetation proposed to be removed (direct)
- Assumed native vegetation losses*

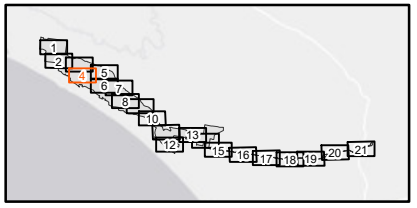
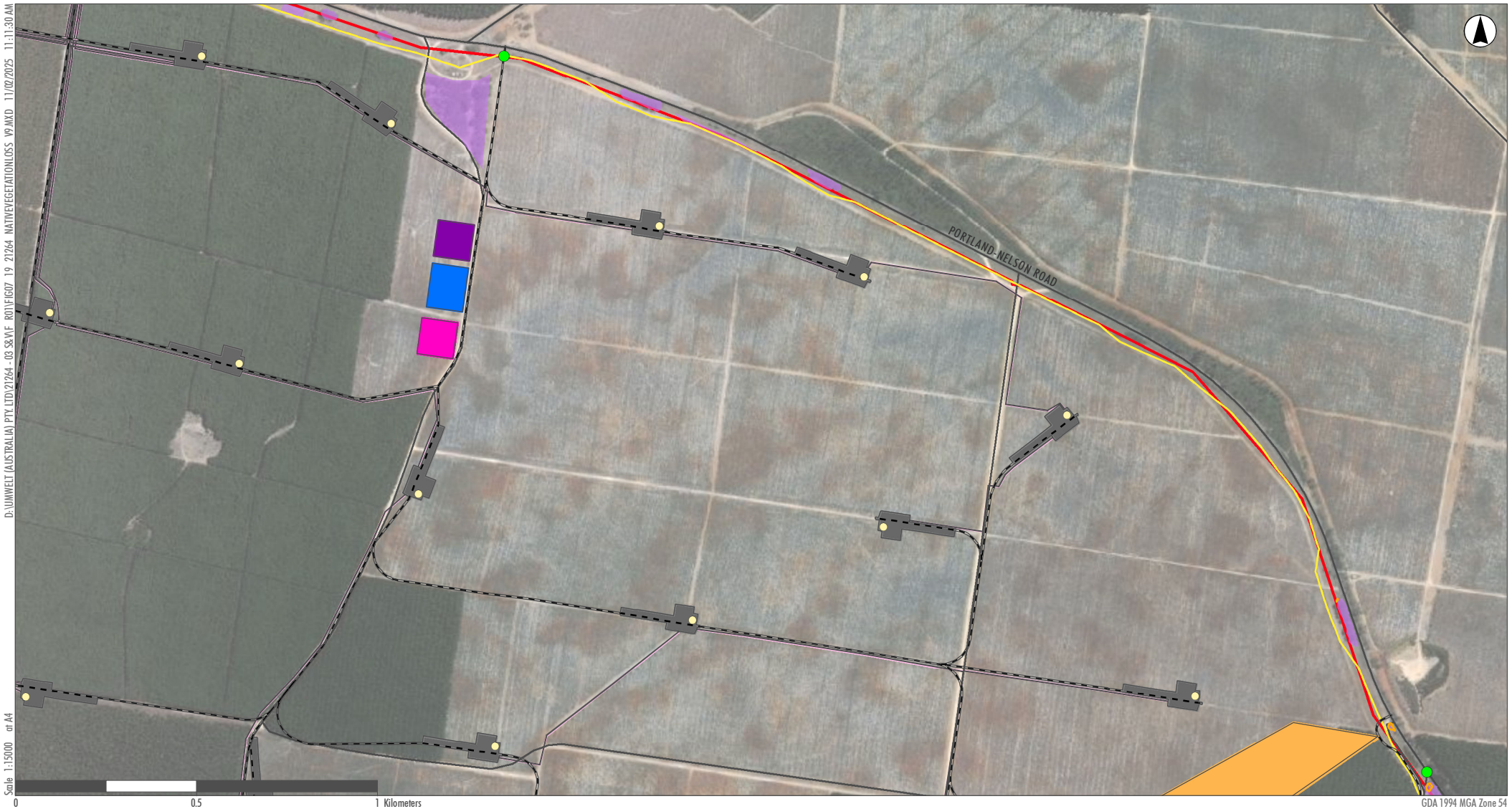


FIGURE 7.19D

Proposed Native Vegetation Removal in the Project Area

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

*native vegetation losses are assumed losses associated with encroachment into more than 10 percent of tree protection zones



Legend

- Project Area
- Site Access Points
- Roads
- Parks and Reserves

Permanent Wind Farm Infrastructure

- Onsite Quarry
- Collector Substation
- Crane Hardstand

- Proposed Turbine Location
- 275 kV Powerline - Overhead
- 275 kV Powerline - Underground
- Internal Access Roads
- Underground Powerlines

Temporary Wind Farm Infrastructure

- Concrete Batch Plant
- Laydown Areas
- Site Compounds

Native Vegetation Removal

- Patch vegetation proposed to be removed (direct)
- Assumed native vegetation losses*

Ecological Vegetation Classes (EVCs)

- 3 Damp Sands Herb-rich Woodland

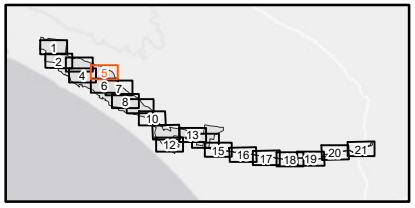
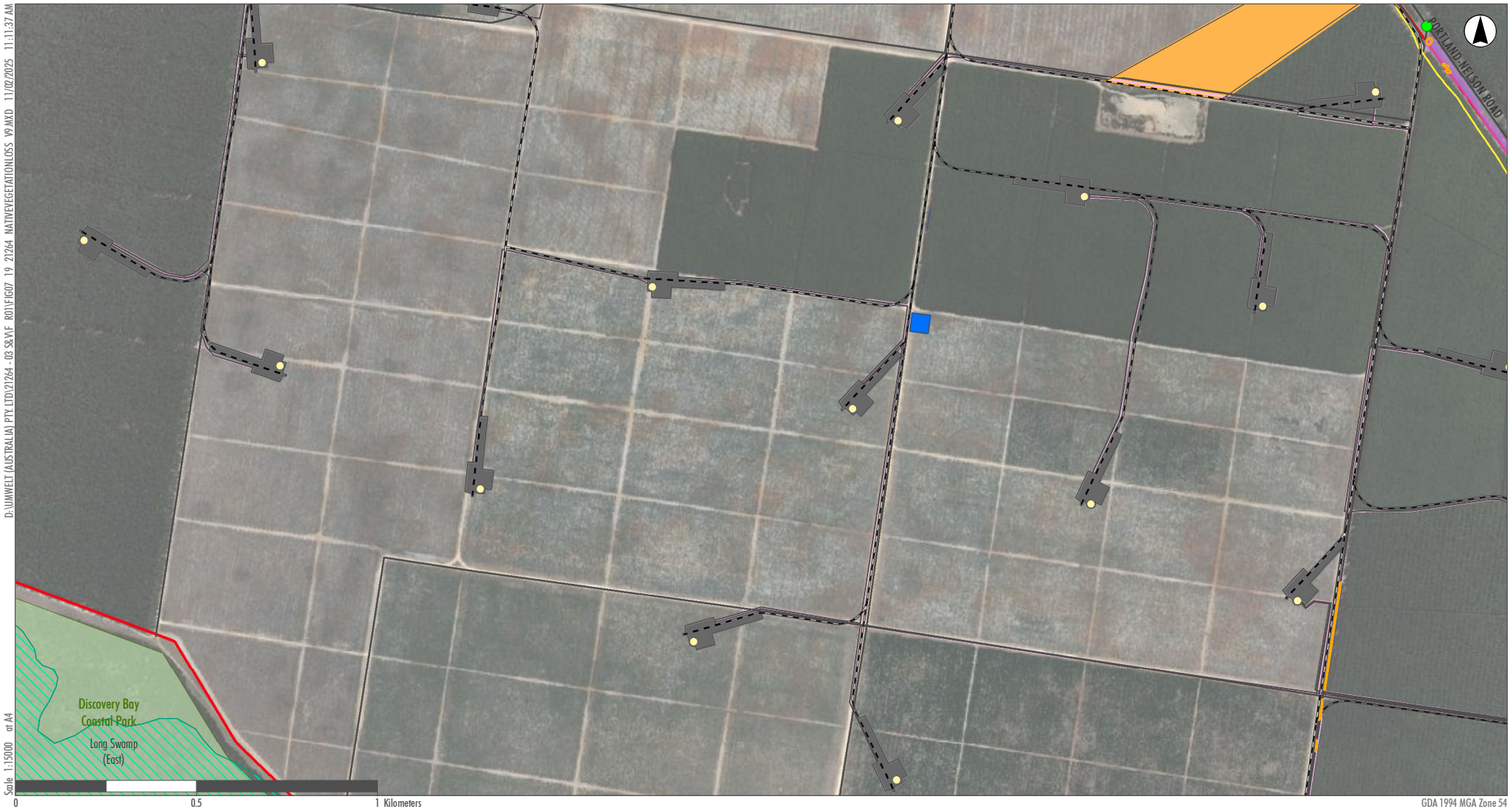


FIGURE 7.19E

Proposed Native Vegetation Removal in the Project Area

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

*native vegetation losses are assumed losses associated with encroachment into more than 10 percent of tree protection zones



Legend

- Project Area
- Site Access Points
- Roads
- Parks and Reserves
- Wetlands

Permanent Wind Farm Infrastructure

- Onsite Quarry
- Collector Substation
- Crane Hardstand

- Proposed Turbine Location
- 275 kV Powerline - Overhead
- 275 kV Powerline - Underground
- Internal Access Roads
- Underground Powerlines

Temporary Wind Farm Infrastructure

- Concrete Batch Plant
- Laydown Areas
- Site Compounds

Native Vegetation Removal

- Patch vegetation proposed to be removed (direct)
- Assumed native vegetation losses*

Ecological Vegetation Classes (EVCs)

- 3 Damp Sands Herb-rich Woodland
- 858 Coastal Alkaline Scrub

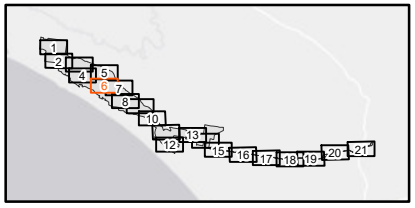
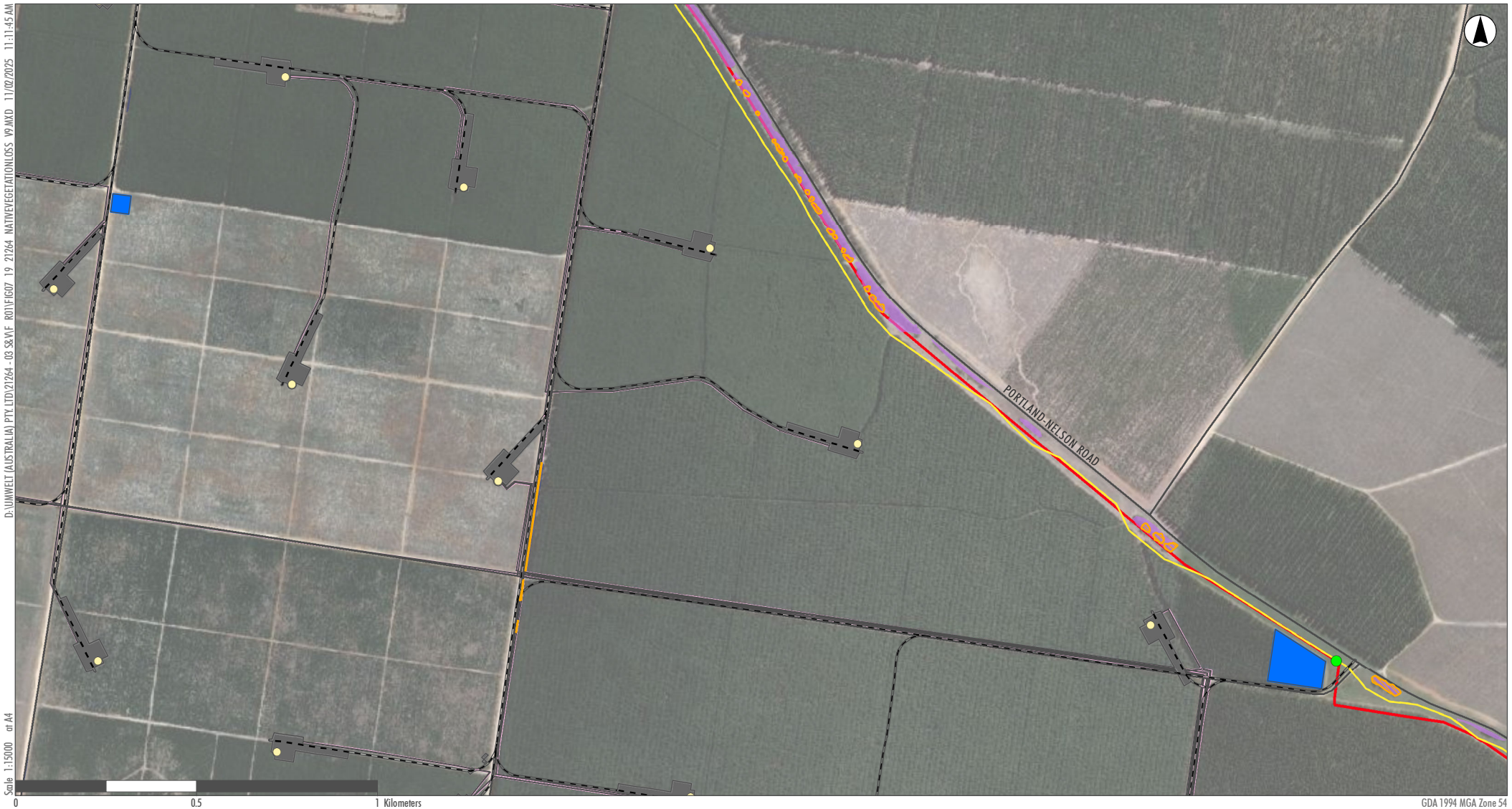


FIGURE 7.19F

Proposed Native Vegetation Removal in the Project Area

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

*native vegetation losses are assumed losses associated with encroachment into more than 10 percent of tree protection zones



Legend

- Project Area
- Site Access Points
- Roads
- Parks and Reserves

Permanent Wind Farm Infrastructure

- Onsite Quarry
- Collector Substation
- Crane Hardstand

- Proposed Turbine Location
- 275 kV Powerline - Overhead
- 275 kV Powerline - Underground
- Internal Access Roads
- Underground Powerlines

Temporary Wind Farm Infrastructure

- Concrete Batch Plant
- Laydown Areas
- Site Compounds

Native Vegetation Removal

- Patch vegetation proposed to be removed (direct)
- Assumed native vegetation losses*

Ecological Vegetation Classes (EVCs)

- 3 Damp Sands Herb-rich Woodland
- 858 Coastal Alkaline Scrub

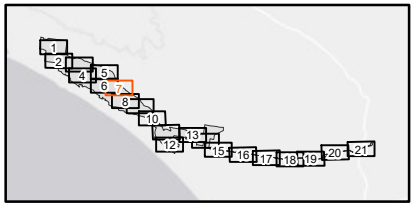


FIGURE 7.19G

Proposed Native Vegetation Removal in the Project Area

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

*native vegetation losses are assumed losses associated with encroachment into more than 10 percent of tree protection zones

Legend

- Project Area
- Site Access Points
- Roads
- Parks and Reserves
- Wetlands

Permanent Wind Farm Infrastructure

- Onsite Quarry
- Collector Substation
- Crane Hardstand

- Proposed Turbine Location
- 275 kV Powerline - Overhead
- 275 kV Powerline - Underground
- Internal Access Roads
- Underground Powerlines

Temporary Wind Farm Infrastructure

- Concrete Batch Plant
- Laydown Areas
- Site Compounds

Native Vegetation Removal

- Patch vegetation proposed to be removed (direct)
- Assumed native vegetation losses*

Ecological Vegetation Classes (EVCs)

- 3 Damp Sands Herb-rich Woodland
- 858 Coastal Alkaline Scrub

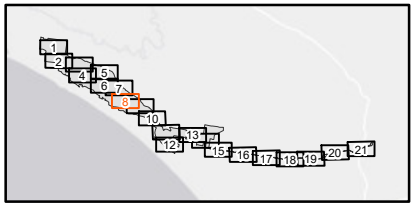
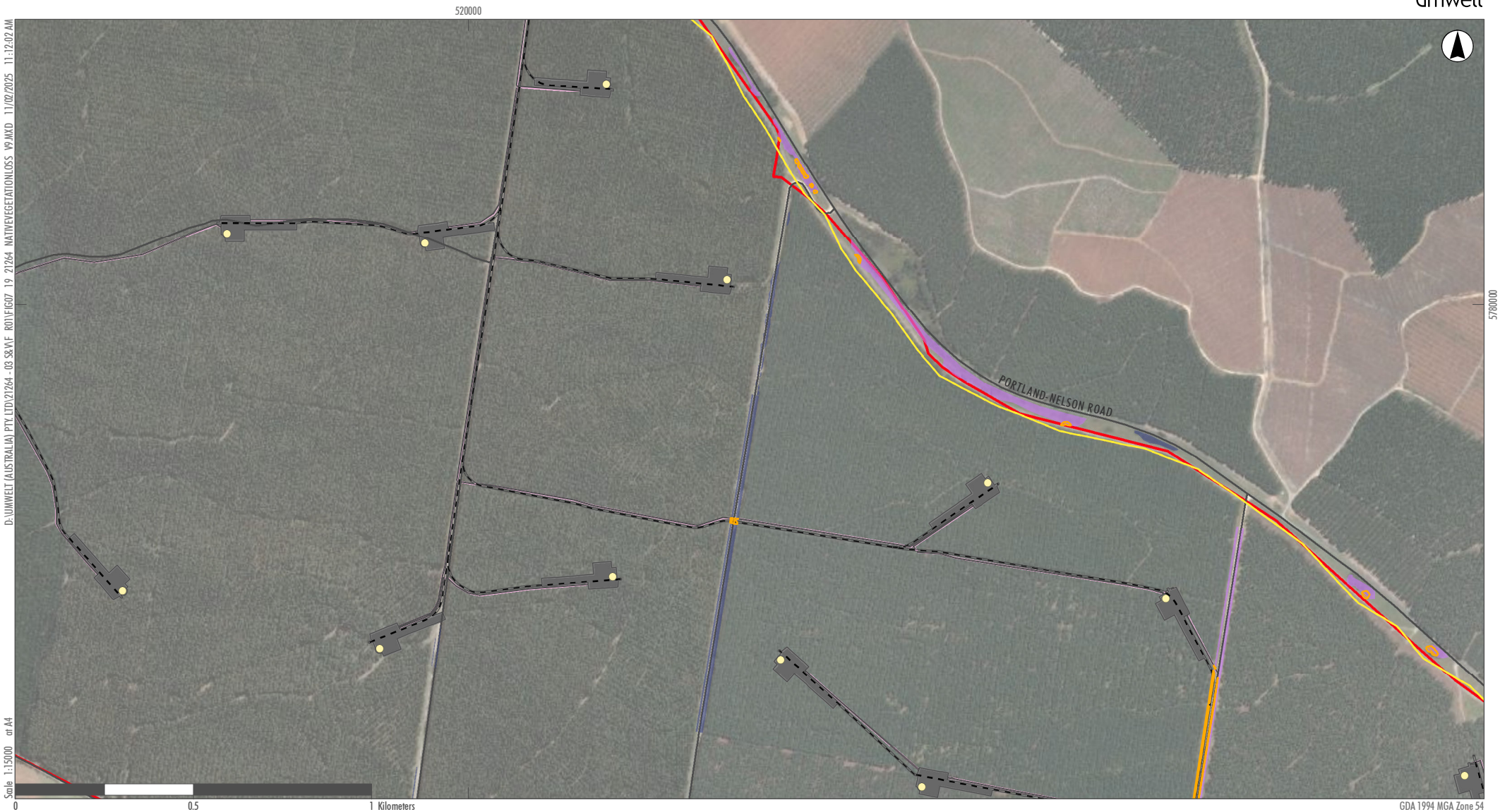


FIGURE 7.19H

Proposed Native Vegetation Removal in the Project Area

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

*native vegetation losses are assumed losses associated with encroachment into more than 10 percent of tree protection zones



Legend

- Project Area
- Site Access Points
- Roads
- Parks and Reserves

Permanent Wind Farm Infrastructure

- Onsite Quarry
- Collector Substation
- Crane Hardstand

- Proposed Turbine Location
- 275 kV Powerline - Overhead
- 275 kV Powerline - Underground
- Internal Access Roads
- Underground Powerlines

Temporary Wind Farm Infrastructure

- Concrete Batch Plant
- Laydown Areas
- Site Compounds

Native Vegetation Removal

- Patch vegetation proposed to be removed (direct)
- Assumed native vegetation losses*

Ecological Vegetation Classes (EVCs)

- 3 Damp Sands Herb-rich Woodland
- 858 Coastal Alkaline Scrub

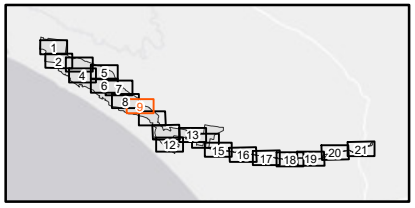


FIGURE 7.19I

Proposed Native Vegetation Removal in the Project Area

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

*native vegetation losses are assumed losses associated with encroachment into more than 10 percent of tree protection zones

Legend

- Project Area
- Site Access Points
- Roads
- Watercourses
- Parks and Reserves

Permanent Wind Farm Infrastructure

- Onsite Quarry
- Collector Substation
- Crane Hardstand

- Proposed Turbine Location
- 275 kV Powerline - Overhead
- 275 kV Powerline - Underground
- Internal Access Roads
- Underground Powerlines

Temporary Wind Farm Infrastructure

- Concrete Batch Plant
- Laydown Areas
- Site Compounds

Native Vegetation Removal

- Patch vegetation proposed to be removed (direct)
- Assumed native vegetation losses*

Ecological Vegetation Classes (EVCs)

- 3 Damp Sands Herb-rich Woodland
- 858 Coastal Alkaline Scrub

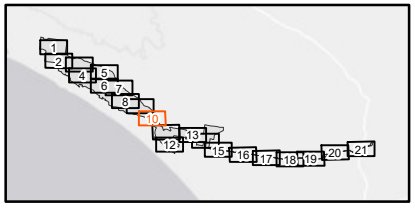
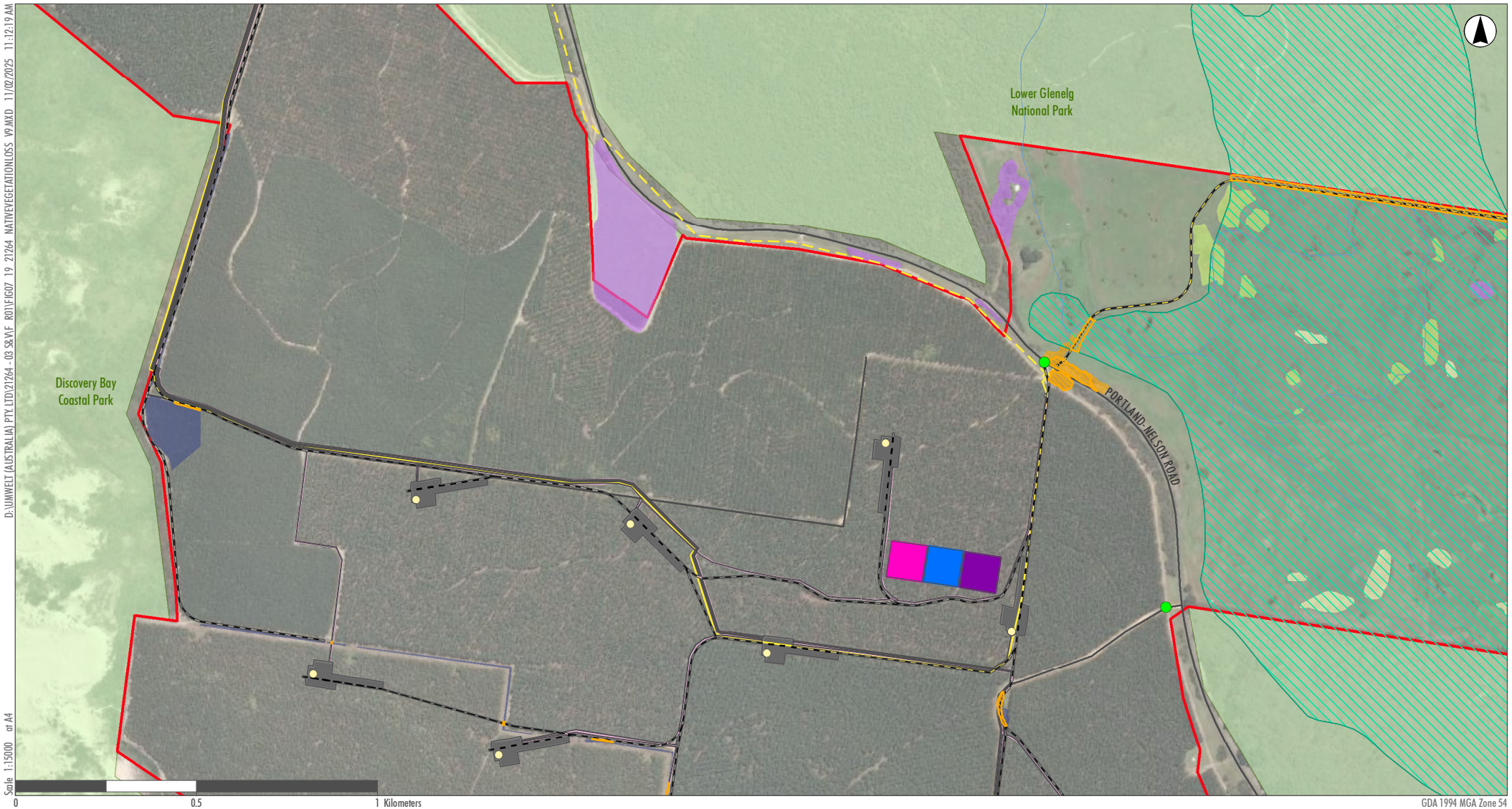


FIGURE 7.19J

Proposed Native Vegetation Removal in the Project Area

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

*native vegetation losses are assumed losses associated with encroachment into more than 10 percent of tree protection zones



Legend

- Project Area
- Site Access Points
- Roads
- Watercourses
- Parks and Reserves
- Wetlands

Permanent Wind Farm Infrastructure
- Onsite Quarry
- Collector Substation
- Crane Hardstand

- Proposed Turbine Location
- 275 kV Powerline - Overhead
- 275 kV Powerline - Underground
- Internal Access Roads
- Underground Powerlines

Temporary Wind Farm Infrastructure
- Concrete Batch Plant
- Laydown Areas
- Site Compounds

Native Vegetation Removal
- Patch vegetation proposed to be removed (direct)
- Assumed native vegetation losses*

Ecological Vegetation Classes (EVCs)
- 3 Damp Sands Herb-rich Woodland
- 8 Wet Heathland
- 48 Heathy Woodland
- 179 Heathy Herb-rich Woodland
- 858 Coastal Alkaline Scrub

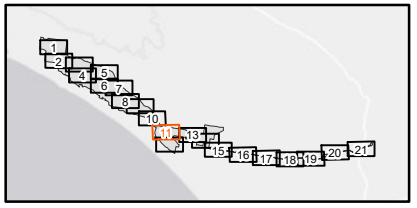


FIGURE 7.19K

Proposed Native Vegetation Removal in the Project Area

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

*native vegetation losses are assumed losses associated with encroachment into more than 10 percent of tree protection zones

Legend

- Project Area
- Site Access Points
- Roads
- Parks and Reserves
- Wetlands

Permanent Wind Farm Infrastructure
- Onsite Quarry
- Collector Substation
- Crane Hardstand

- Proposed Turbine Location
- 275 kV Powerline - Overhead
- 275 kV Powerline - Underground
- Internal Access Roads
- Underground Powerlines

Temporary Wind Farm Infrastructure
- Concrete Batch Plant
- Laydown Areas
- Site Compounds

Native Vegetation Removal
- Patch vegetation proposed to be removed (direct)
- Assumed native vegetation losses*

Ecological Vegetation Classes (EVCs)
- 858 Coastal Alkaline Scrub

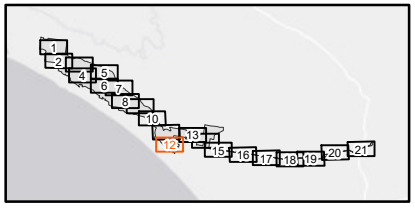
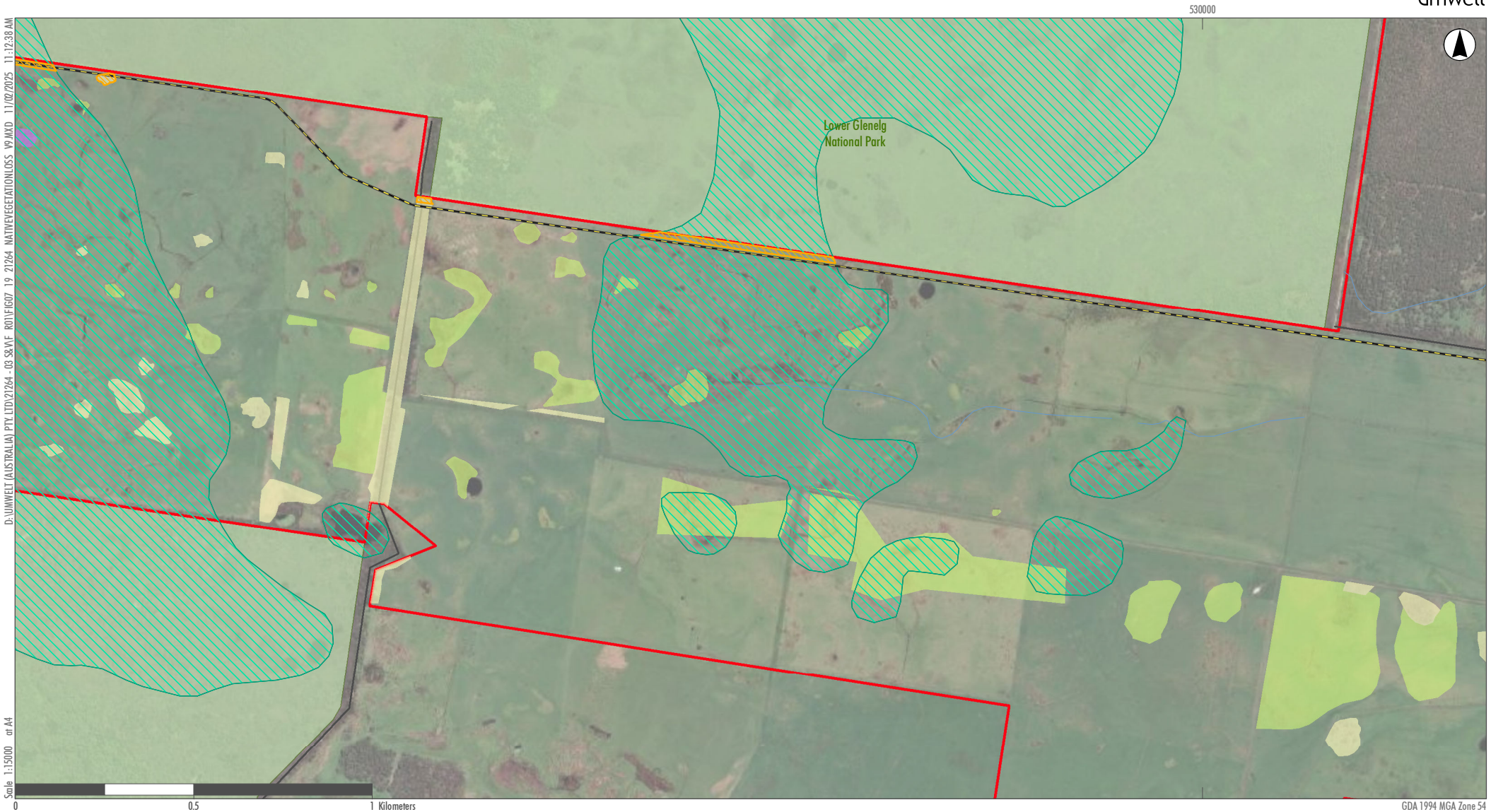


FIGURE 7.19L

Proposed Native Vegetation Removal in the Project Area

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

*native vegetation losses are assumed losses associated with encroachment into more than 10 percent of tree protection zones



Legend

- Project Area
- Site Access Points
- Roads
- Watercourses
- Parks and Reserves
- Wetlands

Permanent Wind Farm Infrastructure

- Onsite Quarry
- Collector Substation
- Crane Hardstand

- Proposed Turbine Location
- 275 kV Powerline - Overhead
- 275 kV Powerline - Underground
- Internal Access Roads
- Underground Powerlines

Temporary Wind Farm Infrastructure

- Concrete Batch Plant
- Laydown Areas
- Site Compounds

Native Vegetation Removal

- Patch vegetation proposed to be removed (direct)
- Assumed native vegetation losses*

Ecological Vegetation Classes (EVCs)

- 3 Damp Sands Herb-rich Woodland
- 8 Wet Heathland
- 48 Heathy Woodland

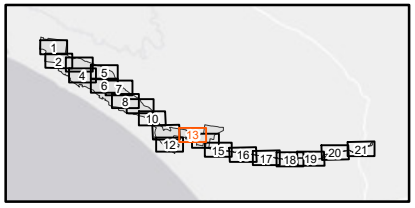
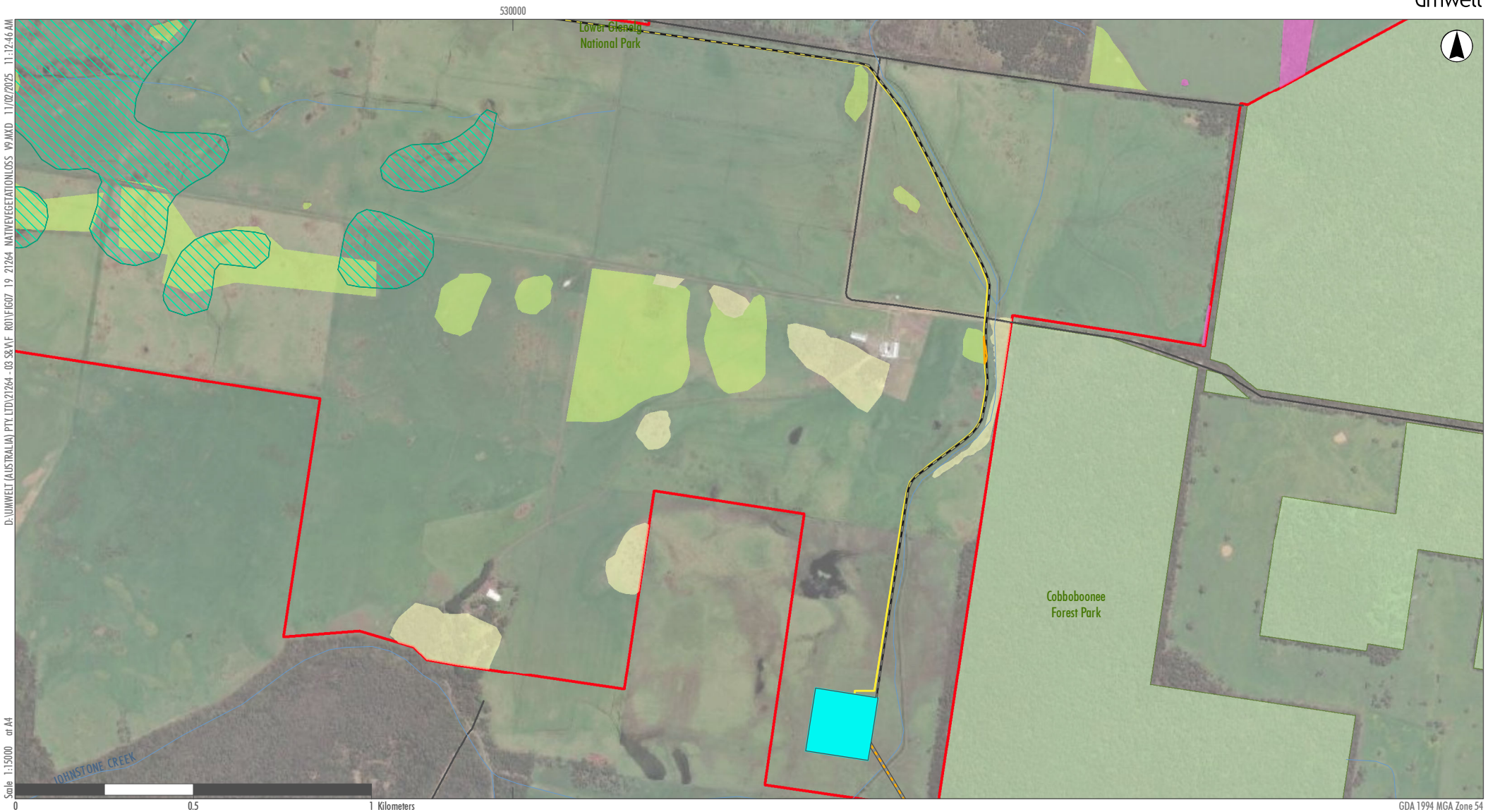


FIGURE 7.19M

Proposed Native Vegetation Removal in the Project Area

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

*native vegetation losses are assumed losses associated with encroachment into more than 10 percent of tree protection zones



Legend

- Project Area
- Site Access Points
- Roads
- Watercourses
- Parks and Reserves
- Wetlands

Permanent Wind Farm Infrastructure

- Onsite Quarry
- Collector Substation
- Crane Hardstand

- Proposed Turbine Location
- Underground Transmission Line
- 275 kV Powerline - Overhead
- 275 kV Powerline - Underground
- Internal Access Roads
- Underground Powerlines

Temporary Wind Farm Infrastructure

- Concrete Batch Plant
- Laydown Areas
- Site Compounds

Native Vegetation Removal

- Patch vegetation proposed to be removed (direct)
- Assumed native vegetation losses*

Ecological Vegetation Classes (EVCs)

- 8 Wet Heathland
- 23 Herb-rich Foothill Forest
- 48 Heathy Woodland

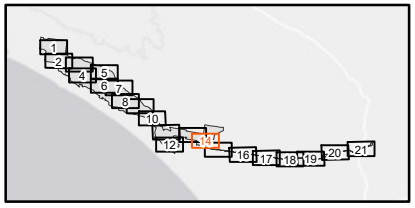


FIGURE 7.19N

Proposed Native Vegetation Removal in the Project Area

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

*native vegetation losses are assumed losses associated with encroachment into more than 10 percent of tree protection zones

Legend

- Project Area
- Site Access Points
- Roads
- Watercourses
- Parks and Reserves

Permanent Wind Farm Infrastructure
- Onsite Quarry
- Collector Substation
- Crane Hardstand

- Proposed Turbine Location
- Underground Transmission Line
- 275 kV Powerline - Overhead
- 275 kV Powerline - Underground
- Internal Access Roads
- Underground Powerlines

Temporary Wind Farm Infrastructure
- Concrete Batch Plant
- Laydown Areas
- Site Compounds

Native Vegetation Removal
- Patch vegetation proposed to be removed (direct)
- Assumed native vegetation losses*

Ecological Vegetation Classes (EVCs)
- 16 Lowland Forest
- 23 Herb-rich Foothill Forest
- 48 Heathy Woodland

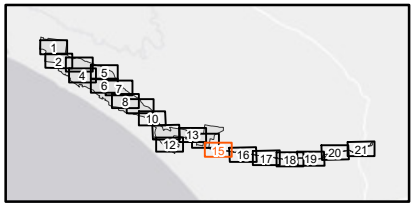


FIGURE 7.190

Proposed Native Vegetation Removal in the Project Area

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

*native vegetation losses are assumed losses associated with encroachment into more than 10 percent of tree protection zones

D:\UMWELT (AUSTRALIA) PTY LTD\21264 - 03 S&WF ROT\FIG07 19 21264 NATIVEVEGETATIONLOSS V9.MXD 11/02/2025 11:13:01 AM

Scale 1:15000 at A4

Legend

- Project Area
- Site Access Points
- Roads
- Watercourses
- Parks and Reserves

Permanent Wind Farm Infrastructure
- Onsite Quarry
- Collector Substation
- Crane Hardstand
- Proposed Turbine Location
- Underground Transmission Line
- 275 kV Powerline - Overhead
- 275 kV Powerline - Underground
- Internal Access Roads
- Underground Powerlines

Temporary Wind Farm Infrastructure
- Concrete Batch Plant
- Laydown Areas
- Site Compounds

Native Vegetation Removal
- Patch vegetation proposed to be removed (direct)
- Assumed native vegetation losses*

Ecological Vegetation Classes (EVCs)
- 16 Lowland Forest
- 23 Herb-rich Foothill Forest

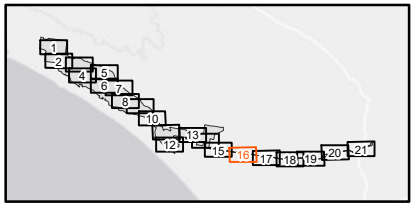


FIGURE 7.19P

Proposed Native Vegetation Removal in the Project Area

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

*native vegetation losses are assumed losses associated with encroachment into more than 10 percent of tree protection zones

Legend

- Project Area
- Site Access Points
- Roads
- Watercourses
- Parks and Reserves
- Wetlands

Permanent Wind Farm Infrastructure

- Onsite Quarry
- Collector Substation
- Crane Hardstand

- Proposed Turbine Location
- Underground Transmission Line
- 275 kV Powerline - Overhead
- 275 kV Powerline - Underground
- Internal Access Roads
- Underground Powerlines

Temporary Wind Farm Infrastructure

- Concrete Batch Plant
- Laydown Areas
- Site Compounds

Native Vegetation Removal

- Patch vegetation proposed to be removed (direct)
- Assumed native vegetation losses*

Ecological Vegetation Classes (EVCs)

- 16 Lowland Forest
- 198 Sedgy Riparian Woodland

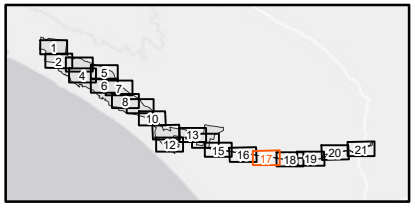


FIGURE 7.19Q

Proposed Native Vegetation Removal in the Project Area

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

*native vegetation losses are assumed losses associated with encroachment into more than 10 percent of tree protection zones

Legend

- Project Area
- Site Access Points
- Roads
- Watercourses
- Parks and Reserves
- Wetlands

Permanent Wind Farm Infrastructure

- Onsite Quarry
- Collector Substation
- Crane Hardstand

- Proposed Turbine Location
- Underground Transmission Line
- 275 kV Powerline - Overhead
- 275 kV Powerline - Underground
- Internal Access Roads
- Underground Powerlines

Temporary Wind Farm Infrastructure

- Concrete Batch Plant
- Laydown Areas
- Site Compounds

Native Vegetation Removal

- Patch vegetation proposed to be removed (direct)
- Assumed native vegetation losses*

Ecological Vegetation Classes (EVCs)

- 16 Lowland Forest
- 198 Sedgy Riparian Woodland

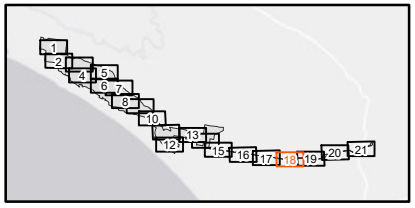


FIGURE 7.19S

Proposed Native Vegetation Removal in the Project Area

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

*native vegetation losses are assumed losses associated with encroachment into more than 10 percent of tree protection zones

Legend

- Project Area
- Site Access Points
- Roads
- Watercourses
- Parks and Reserves
- Wetlands

Permanent Wind Farm Infrastructure

- Onsite Quarry
- Collector Substation
- Crane Hardstand

- Proposed Turbine Location
- Underground Transmission Line
- 275 kV Powerline - Overhead
- 275 kV Powerline - Underground
- Internal Access Roads
- Underground Powerlines

Temporary Wind Farm Infrastructure

- Concrete Batch Plant
- Laydown Areas
- Site Compounds

Native Vegetation Removal

- Patch vegetation proposed to be removed (direct)
- Assumed native vegetation losses*

Ecological Vegetation Classes (EVCs)

- 16 Lowland Forest
- 23 Herb-rich Foothill Forest
- 125 Plain Grassy Wetland

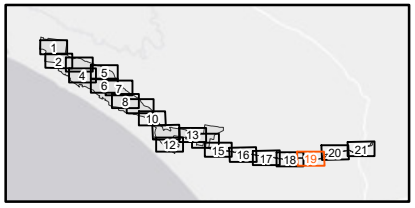
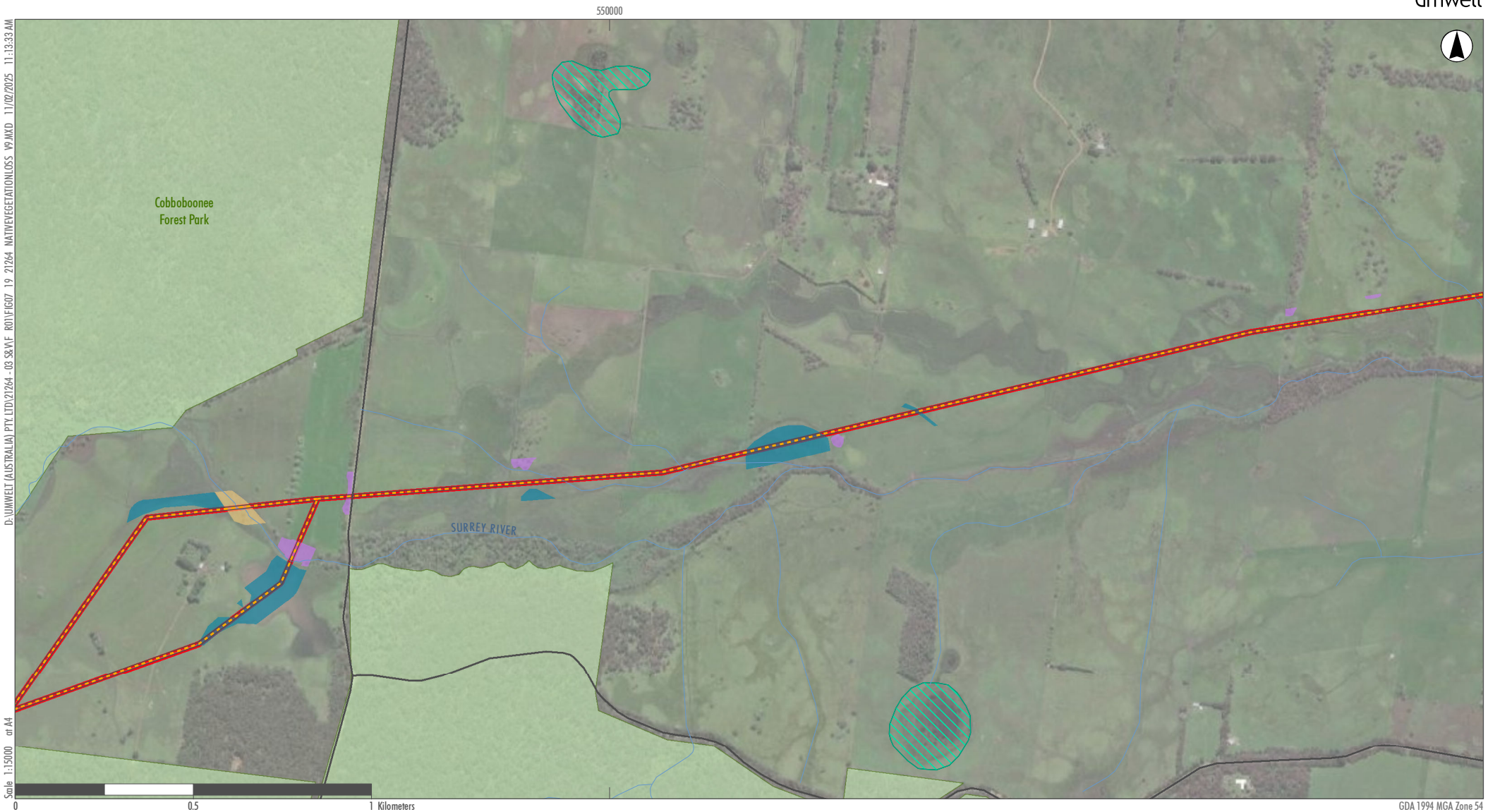


FIGURE 7.19R

Proposed Native Vegetation Removal in the Project Area

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

*native vegetation losses are assumed losses associated with encroachment into more than 10 percent of tree protection zones



Legend

- Project Area
- Site Access Points
- Roads
- Watercourses
- Parks and Reserves
- Wetlands

Permanent Wind Farm Infrastructure

- Onsite Quarry
- Collector Substation
- Crane Hardstand

- Proposed Turbine Location
- Underground Transmission Line
- 275 kV Powerline - Overhead
- 275 kV Powerline - Underground
- Internal Access Roads
- Underground Powerlines

Temporary Wind Farm Infrastructure

- Concrete Batch Plant
- Laydown Areas
- Site Compounds

Native Vegetation Removal

- Patch vegetation proposed to be removed (direct)
- Assumed native vegetation losses*

Ecological Vegetation Classes (EVCs)

- 3 Damp Sands Herb-rich Woodland
- 23 Herb-rich Foothill Forest
- 53 Swamp Scrub
- 125 Plain Grassy Wetland

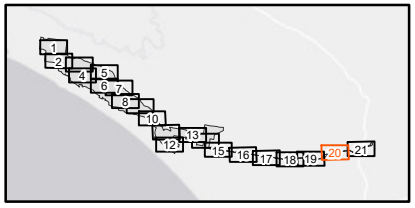


FIGURE 7.19T

Proposed Native Vegetation Removal in the Project Area

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

*native vegetation losses are assumed losses associated with encroachment into more than 10 percent of tree protection zones

Legend

- Project Area
- Site Access Points
- Roads
- Watercourses
- Parks and Reserves

Permanent Wind Farm Infrastructure
- Onsite Quarry
- Collector Substation
- Crane Hardstand

- Proposed Turbine Location
- Underground Transmission Line
- 275 kV Powerline - Overhead
- 275 kV Powerline - Underground
- Internal Access Roads
- Underground Powerlines

Temporary Wind Farm Infrastructure
- Concrete Batch Plant
- Laydown Areas
- Site Compounds

Native Vegetation Removal
- Patch vegetation proposed to be removed (direct)
- Assumed native vegetation losses*

Ecological Vegetation Classes (EVCs)
- 3 Damp Sands Herb-rich Woodland
- 23 Herb-rich Foothill Forest
- 48 Heathy Woodland

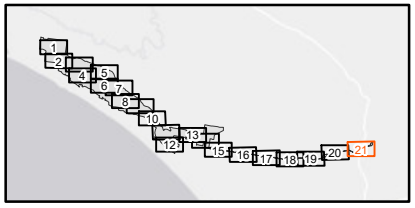


FIGURE 7.19U

Proposed Native Vegetation Removal in the Project Area

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

*native vegetation losses are assumed losses associated with encroachment into more than 10 percent of tree protection zones

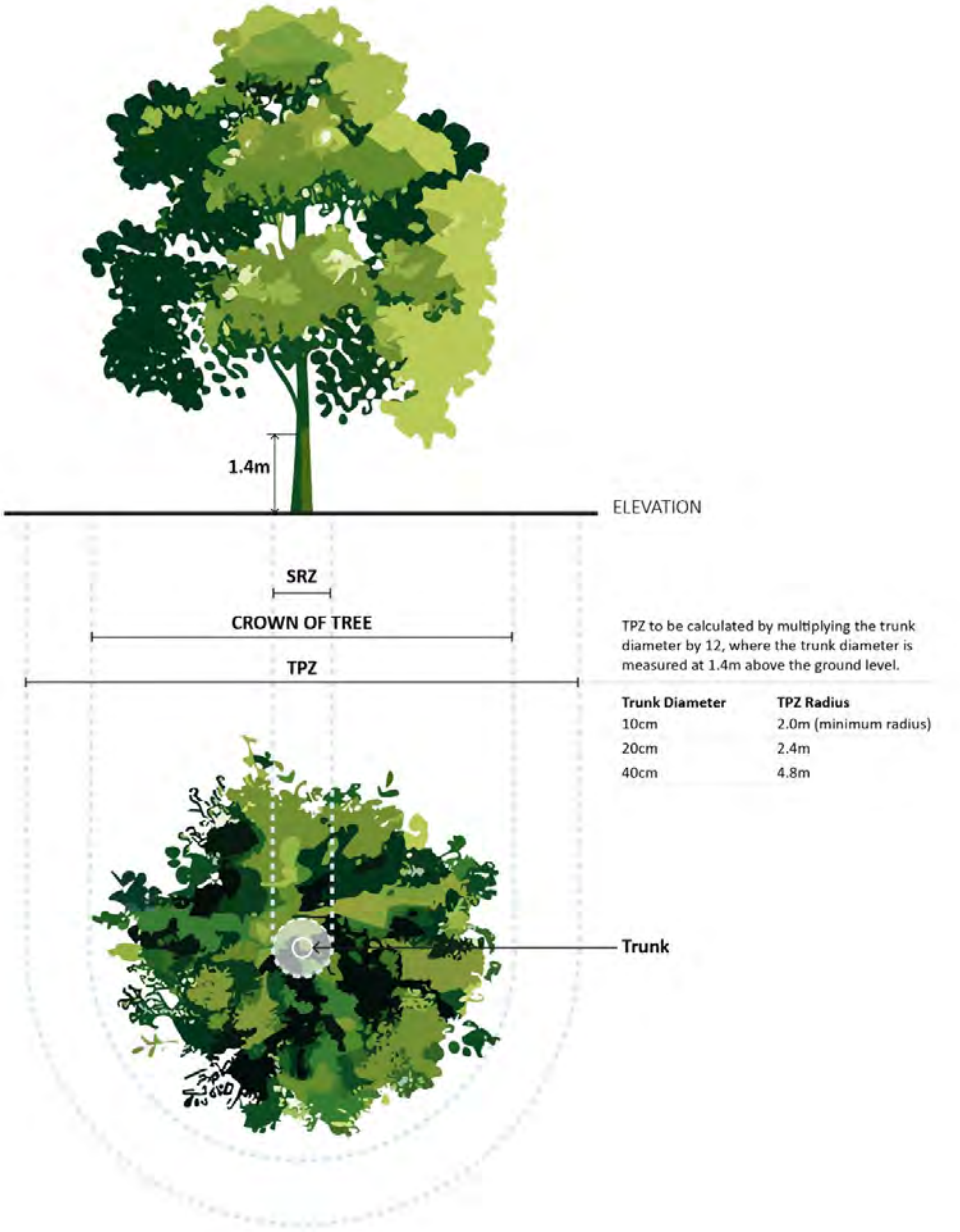


Figure 7.20 Indicative tree protection zone

Table 7.13 outlines which trees will have minor encroachment (proposed encroachment is less than 10% of the area of the TPZ and is outside the SRZ) or major encroachment (proposed encroachment is greater than 10% of the TPZ or includes any part of the SRZ) from trenching activities[3]. Trees subject to major encroachment are assessed as assumed losses in the vegetation impact calculations. No Apple Jack trees would be impacted through major encroachment.

Most tree roots will be within the top 600 mm, but there is potential for some roots to extend deeper than this. Detailed root investigations are required to accurately identify the depth of roots of Apple Jack trees within the soil profile. These root investigations will be done before construction of the transmission line section along Boiler Swamp Road starts (see MM-BD07). In accordance with AS 4970-2009, directional drilling at a depth of 600 mm or greater is an appropriate technique to avoid impacts on roots within TPZs of Apple Jack trees. It is therefore likely roots will be avoided if directional drilling at a depth of 600 mm or greater is maintained (see mitigation measure MM-BD04).

Tree health assessments will also be carried out along Boiler Swamp Road to compare potential changes in tree health and assess the extent of any tree deaths caused by construction of the transmission line (see MM-BD03). Tree health assessments will comprise:

- A pre-construction survey to benchmark tree health will be conducted to provide a benchmark assessment. This will involve assessment of tree health, structure and ULE (useful life expectancy).
- A post-construction survey will be conducted within 6 months of the completion of construction. The purpose of this assessment is survey for any immediate impacts on tree health, and to re-assess the level of TPZ Tree Protection Zone impacts, using accurate data on the actual extent of excavation.
- A further post-construction survey will be conducted between 24 and 30 months following completion of construction.

Table 7.13: Potential encroachment on TPZs or structural root zones (SRZs)

Canopy tree species	Major Encroachment >10% encroachment upon TPZ or SRZ encroached	Minor Encroachment <10% encroachment	Total number of live trees assessed
Western Peppermint *Eucalyptus falciformis*	83	156	526
Messmate Stringybark *Eucalyptus obliqua*	294	316	913
Swamp Gum *Eucalyptus ovata*	32	44	114
Apple Jack *Eucalyptus splendens*	0	157	417
Rough-barked Manna Gum *Eucalyptus viminalis* subsp. *cygnetensis*	15	26	70
Total	**424**	**699**	**2040**

[3] Encroachment was determined following the procedures outlined in the *Assessor's Handbook – applications to remove, destroy or lop native vegetation* (DELWP 2018), which specifies:

- TPZs and the level of encroachment are determined as specified in the Australian Standard (AS 4970-2009).
- TPZs are a minimum of 2 m radius and a maximum of 5 m radius, and are calculated by multiplying the stem diameter by 12.
- The Assessor's Handbook specifies that all trees with 'major encroachment' are 'assumed lost' and are included in native vegetation impact and offset calculations, unless a qualified arborist assesses that the tree will not be impacted. It is not practical for an arborist to undertake subsurface root investigations for the Project and as such all trees with major encroachment are considered assumed lost. Root investigations around individual trees may be undertaken during detailed design or construction phases.
- Trees with Minor Encroachment (< 10% of TPZ area), are not 'assumed lost', and do not need to be subject to further arboricultural investigations, provided the lost area of TPZ is compensated for elsewhere. In the case of linear trenching, TPZs of trees in adjacent forest are impacted by the loss of a circular segment, and all remaining parts of the TPZ will be undisturbed and unconstrained, and can therefore provide compensation for the lost area.

7.9.2 Threatened flora

Threatened flora species have potential to be impacted by direct removal, trenching, disturbance by vehicles or indirect disturbance as the result of changes in hydrological regimes, sedimentation, erosion, and pollution.

The highly modified nature of most of the wind farm site (cleared farmland and plantations) provides limited habitat for threatened flora species. Four FFG Act listed species were recorded within the wind farm site: Dune Fan-flower (endangered), Western Peppermint (vulnerable), Western Golden-tip (*Goodia medicaginea*) (endangered),and Tiny Violet (*Viola sieberiana*) (endangered) (see **Figure 7.14**). The recorded locations of these species are not within the construction footprint. Impacts within the wind farm site will be avoided by marking and protection of no-go areas during construction. However, the transmission line would impact on more than 10% of the TPZs of 83 Western Peppermint trees which have been incorporated in the vegetation impact calculations as assumed losses as described in **Section 7.9.1.**

Several threatened flora species were identified in and near the transmission corridor including Small Sickle Greenhood, One-flower Early Nancy, Hairy Boronia, Rough Daisy-Bush, Wiry Bossiaea, and Tiny Violet, all of which are listed under the FFG Act (see **Figure 7.15**). The majority of threatened flora species recorded along the transmission line route are in remnant vegetation beyond the regularly maintained road formation and are unlikely to be impacted if works are limited to the road formation. Impacts to these species can be avoided by conducting pre-construction surveys, marking and protecting any locations of threatened plants, limiting construction activities to the road formation and appropriate management of erosion and sedimentation (see mitigation measures MM-BD07, MM-BD08 and MM-SW02 in **Chapter 9 *Surface water, groundwater and groundwater dependent ecosystems***).

Numerous Apple Jack trees are present within bushland adjacent to Boiler Swamp Road where the transmission line would be constructed beneath the road (see mitigation measure MM-BD07). The Proponent has committed to avoiding impacts on these trees, using a range of construction techniques including directional drilling (see **Figure 7.21**). Further studies including root investigations beneath the road are also planned (see mitigation measure MM-BD07). As a result of this commitment, no losses of Apple Jack are included in the native vegetation impact calculations in **Section 7.9.1.**

The largest potential for the occurrence of unquantified impacts on threatened flora species relates to the removal of up to 1.26 hectares of Heathy Woodland to establish access into Heywood Terminal Station. Whilst the presence of several species (including Green-striped Greenhood and Dense Leek-orchid) is considered unlikely in the context of surveying efforts, their presence cannot be entirely ruled out.

Conservation reserves near the wind farm and transmission line support high quality native vegetation and provide habitat for several threatened species. Discovery Bay Coastal Park contains populations of species such as the scented spider orchid, coastal leek-orchid and coast helmet orchid within high quality areas of Coastal Alkaline Scrub (EVC 858). Some localised short term hydrological impacts beyond the wind farm during the construction have potential to occur from the excavation of the turbine bases and the intersection of the water table. However, the Project design has been revised and turbines have been removed from the north-east corner of the wind farm where groundwater intersection had potential to occur. Therefore, surrounding dune vegetation in Discovery Bay Coastal Park would not be subject to hydrological impacts.

Potential indirect impacts on threatened flora species from erosion or sedimentation will be mitigated through measures including pre-clearance surveys adjacent to construction areas to identify areas containing threatened plants requiring protection (see mitigation measure MM-BD08). Construction works will be limited to the construction footprint, particularly along Boiler Swamp Road (see mitigation measure MM-BD07). Industry standard measures for sediment and erosion control will be implemented, in accordance with the Project's Sediment Erosion and Water Quality Management Plan (see mitigation measures MM-SW01 and MM-SW02 in **Chapter 9 *Surface water, groundwater and groundwater dependent ecosystems***).

FIGURE 7.21A

Avoidance of Apple Jacks along the transmission line

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

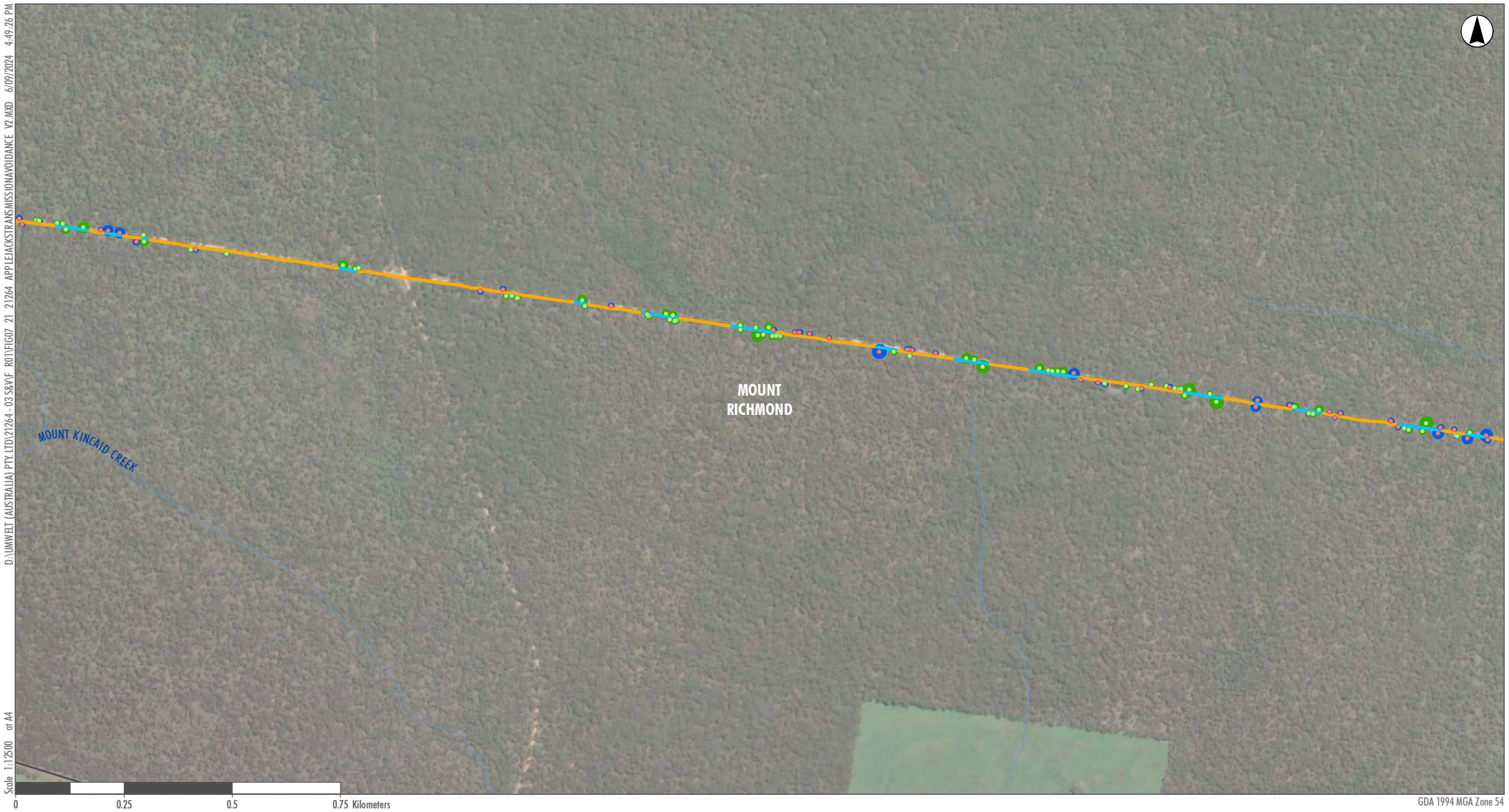


FIGURE 7.21B

Avoidance of Apple Jacks along the transmission line

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

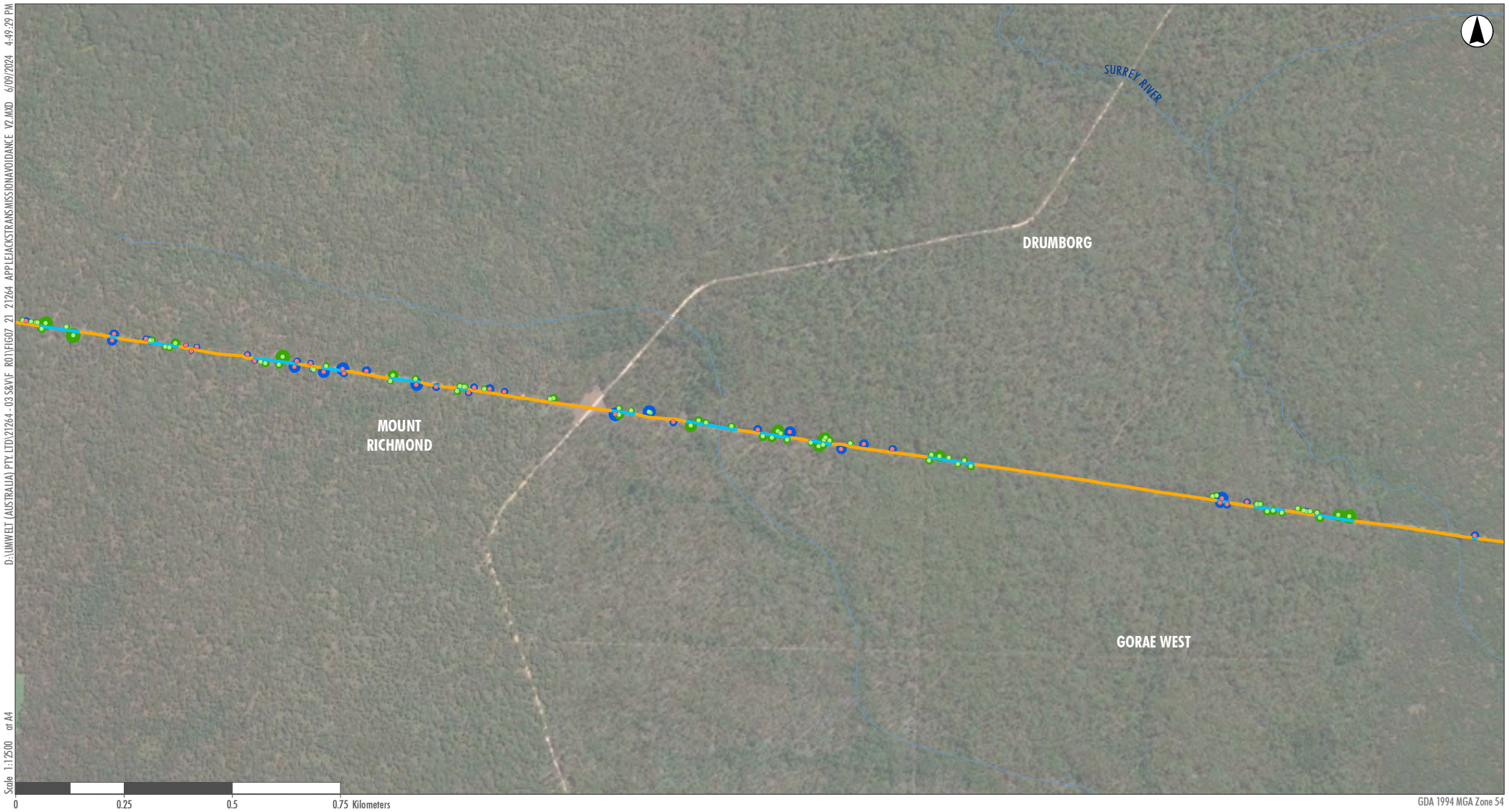


FIGURE 7.21C

Avoidance of Apple Jacks along the transmission line

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

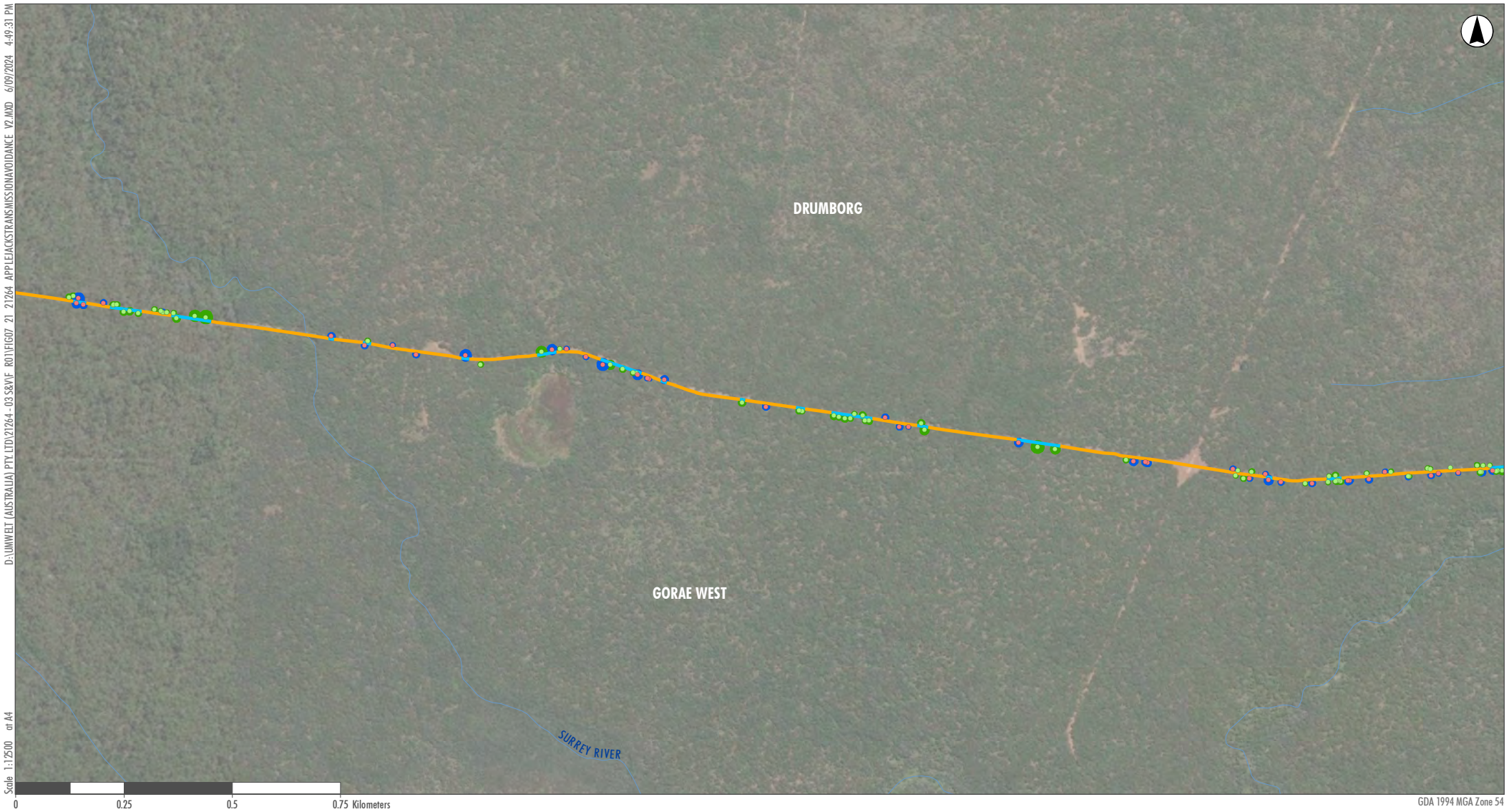


FIGURE 7.21D

Avoidance of Apple Jacks along the transmission line

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

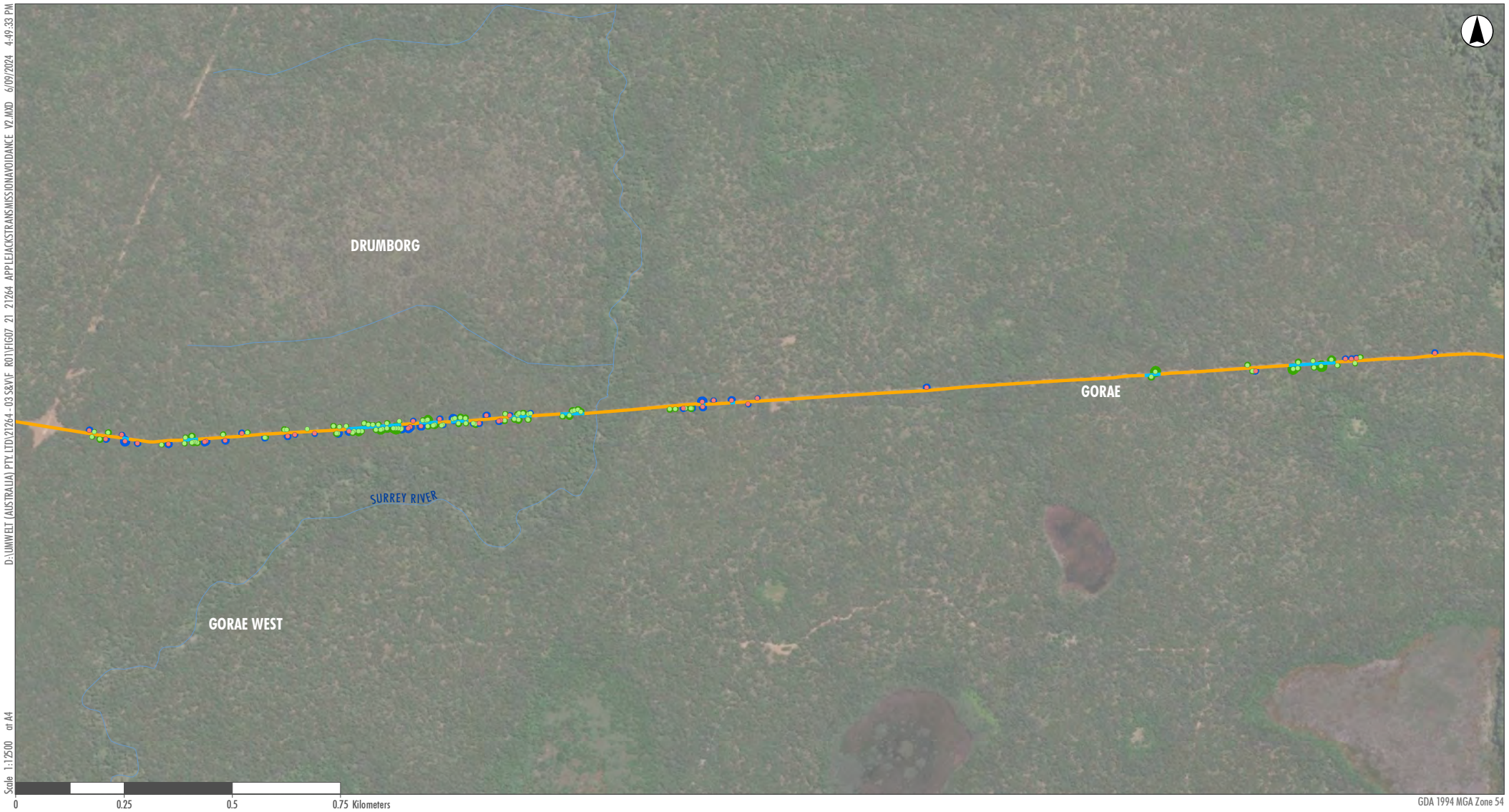


FIGURE 7.21E

Avoidance of Apple Jacks along the transmission line

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

FIGURE 7.21F

Avoidance of Apple Jacks along the transmission line

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

7.9.3 Wetlands

Wetlands have potential to be impacted by the construction of Project infrastructure, either resulting in the direct loss/impact on wetlands or through indirect impacts from a change in hydrology, sedimentation, erosion or pollution and potential disturbance of riparian vegetation surrounding wetlands which provides a protective buffer.

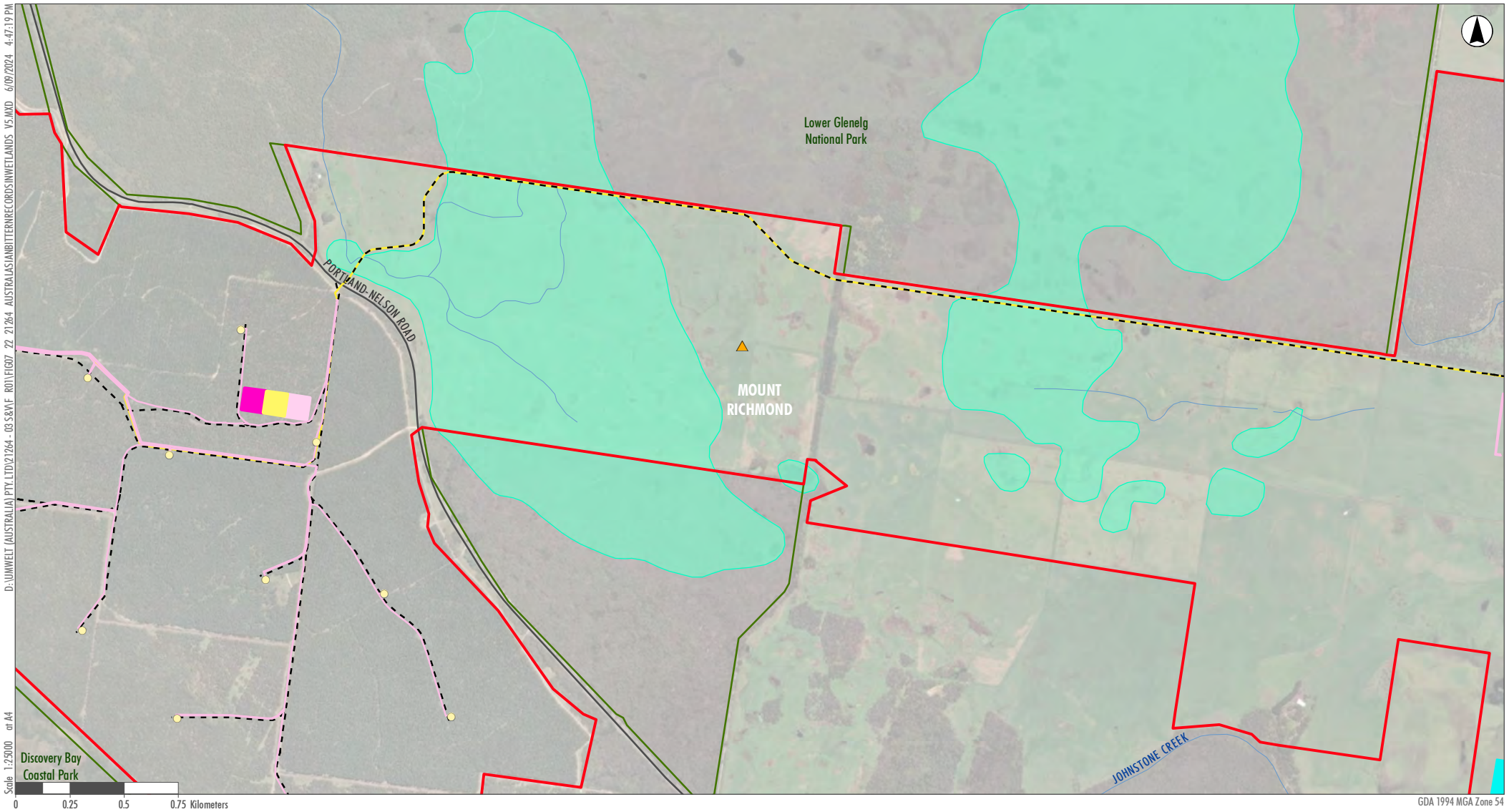
Wetlands within the plantation are at least 650 m from any turbines or other wind farm infrastructure. In addition, no turbines would be sited in locations where turbine foundations may intersect groundwater near the wetlands south of the plantation. Initial project design had turbines located close to the Ramsar site boundary, particularly along the southern boundary of the wind farm site where some turbines were within 200 m of the Ramsar site, and on private properties adjacent to the Ramsar site. Project design development resulted in turbines being removed/relocated to be at least 500 m from the wetlands within the Ramsar site (see **Chapter 4** ***Project Development***).

The Project directly impacts on two DEECA mapped wetlands on farmland in the north-east of the wind farm site, south of the Kentbruck Heath. The mapped areas are in cleared farmland and include numerous small depressions and channels with wetland values. Wind farm infrastructure through these mapped wetlands is limited to an internal underground 275 kV powerline and an access track which follows the northern boundary of the farmland adjacent to the southern boundary of the Kentbruck Heath. These impacts have been quantified in the native vegetation impact assessment, as impacts on mapped wetlands are included as areas of native vegetation in the assessment using the *Guidelines for the removal, destruction or lopping of native vegetation.* Where possible, access tracks and underground cabling will be micro sited to avoid individual wetland depressions during detailed design.

The primary pathway for indirect impacts on wetlands would be modifications to surface water upstream of wetlands, or significant modifications to groundwater hydrology, including groundwater drawdown during dewatering for turbine foundations. No turbine foundations were considered likely to intersect with groundwater in the Plantation Sub-area. Within the north-eastern Sub-area, several turbines had potential to intersect with aquatic GDEs (surface wetlands), but these turbines have since been removed from the project as part of the design response to the ecological assessment, and there are now no remaining turbines likely to intersect groundwater to the extent that surface wetlands would be impacted by temporary drawdown of the watertable.

Mitigation measures such as sediment devices (bunding and silt fencing) and trenching management will be implemented through a Sediment, Erosion and Water Quality Management Plan during construction which will aid in avoiding or minimising sedimentation and erosion impacts on these wetlands (see mitigation measures MM-SW01 and MM-SW02 in **Chapter 9** ***Surface water, groundwater and groundwater dependent ecosystems***).

The underground section of the transmission line beneath Boiler Swamp Road through the Parks does not interact with any wetlands. The remainder of the underground transmission line through farmland does not pass close to any significant wetlands and where possible will avoid wetland features such as depressions and drainage lines.



Legend

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

FIGURE 7.22

Wetlands and australasian bittern records in the north-east of the wind farm site

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

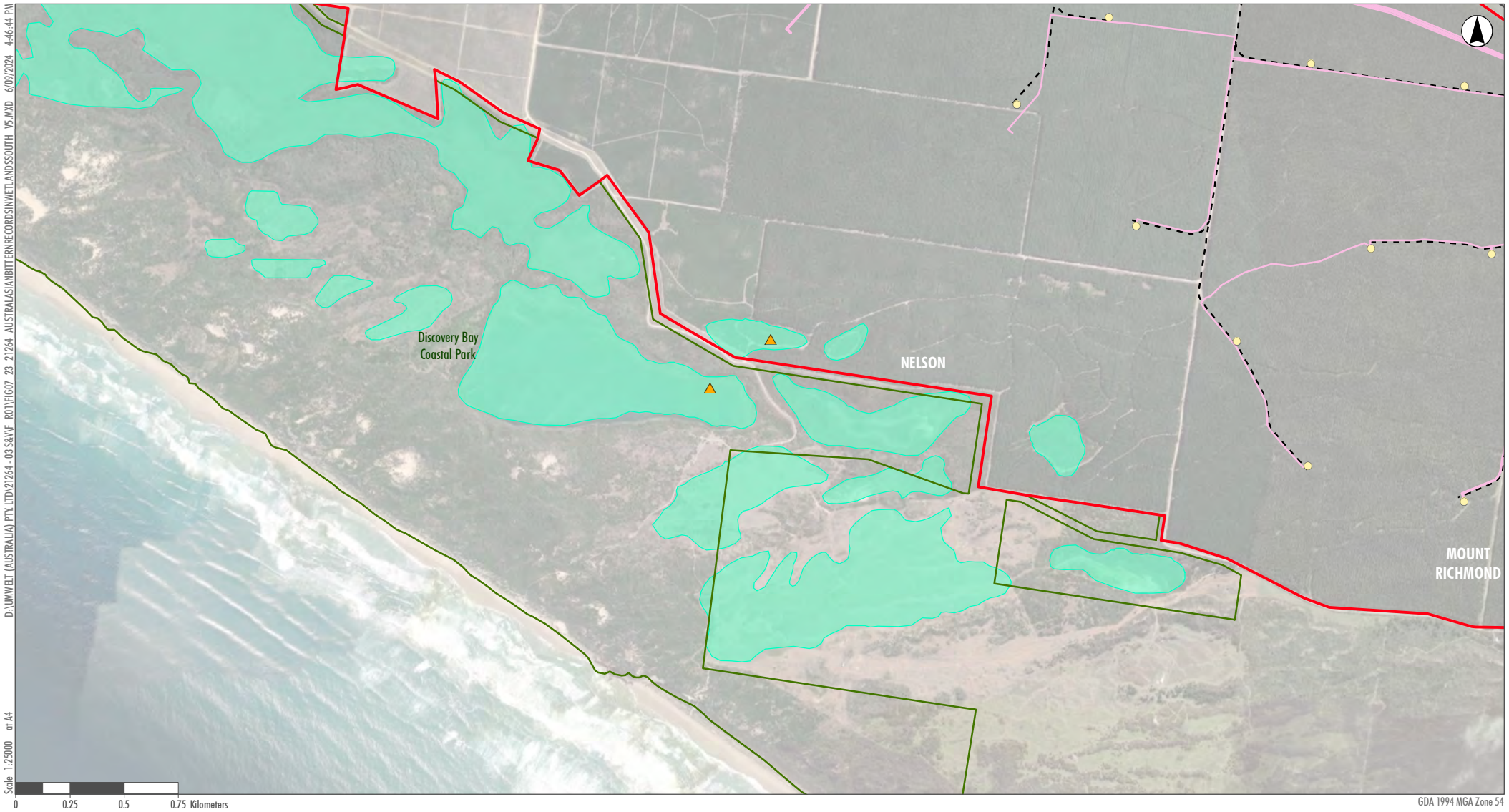


FIGURE 7.23

Wetlands and australasian bittern records in the south of the wind farm site adjacent to the Ramsar site

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

7.9.4 Threatened ecological communities

The Project would not impact directly or indirectly on TECs. The assessment found that the nearest examples of TECs were associated with the EPBC-listed Karst springs and associated alkaline fens of the Naracoorte Coastal Plain Bioregion. Known occurrences of this TEC within the Investigation Area include Lake Mombeong (outside the Project Area).

The conservation advice prepared for this TEC recommends a buffer zone of 1,220 m from the area of open water to protect occurrences of this TEC from potential adverse hydrological or pollution impacts. The open water area of Lake Mombeong is more than 1,500 m from the nearest wind farm infrastructure, outside the recommended buffer zone.

There is negligible potential for direct impacts on this TEC (the known occurrence and potential occurrences) due to the considerable separation distance from wind farm infrastructure. Potential indirect impacts on this TEC are unlikely given the separation distances and the nature of construction, which is unlikely to generate pollution or sediment-laden run-off. Mitigation measures such as sediment devices (bunding and silt fencing) and trenching management will be implemented through a Sediment, Erosion and Water Quality Management Plan during construction which will aid in avoiding or minimising potential indirect impacts on this TEC (see mitigation measures MM-SW01 and MM-SW02 in **Chapter 9** ***Surface water, groundwater and groundwater dependent ecosystems***).

The underground section of the transmission line crosses the Surrey River in two locations along Boiler Swamp Road. These locations are over 25 km upstream from the estuary section, where there are known occurrences of the assemblages of species associated with open-coast salt-wedge estuaries of western and central Victoria TEC. Direct impacts on Surrey River will be avoided using directional drilling (see mitigation measure MM-SW01, MM-SW02 and MM-SW04 in **Chapter 9**). Potential downstream indirect impacts are unlikely provided directional drilling is done in accordance with MM-SW04 and relevant measures to be set out in the Sediment, Erosion and Water Quality Management Plan (see mitigation measure MM-SW01 in **Chapter 9**).

7.9.5 Habitat removal for threatened species

The Project is substantially confined to commercial pine plantations and farmland, and generally provides lower value habitat for threatened fauna, compared to adjacent areas of natural habitats. The Project Area provides some suitable habitat for threatened mammal and reptile species, which are discussed in the following sections.

7.9.5.1 Terrestrial Mammals

Terrestrial mammals have potential to be impacted through direct mortality of individuals, or due to vegetation clearing and direct removal of habitat for the construction of Project infrastructure. There is also potential for construction noise and lighting to effect terrestrial mammals and their behaviour.

Only two threatened terrestrial mammal species were recorded during Project surveys, Southern Brown Bandicoot near the Heywood Terminal Station (see **Figure 7.25**) and the White footed Dunnart in the eastern end of the Project Area (see **Figure 7.24).**

Six threatened mammal species may occur within or near the Project Area, as they have all previously been recorded within 10 km of the Project Area and most of these records are from intact, contiguous habitat outside of the wind farm site. These species include White footed Dunnart, Heath Mouse, Southern Brown Bandicoot, Long-nosed Potoroo, Swamp Antechinus, and Yellow-bellied Glider. The wind farm site is unlikely to support significant habitat for any of these threatened mammals due to its highly modified nature, and pine plantations do not provide the required microhabitats to support these species. Strips of planted vegetation along Portland–Nelson Road may provide some of the structural ground elements required by these threatened mammals where native understorey has regenerated, however none of the species have been recorded using these roadside patches.

Although it is possible that Heath Mouse were recorded in several locations within the GTFP plantation (see **Figure 7.24**), areas of pine plantation are unlikely to provide high quality habitat for this species.

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

Earlier route options of the overhead transmission line into Heywood Terminal Station would have run along the edge of Mt Clay State Forest, which provides habitat for small mammals (see **Figure 7.25**). The overhead transmission line route was revised to avoid these areas and avoid impacts on small mammal habitat.

The transmission line was then further revised to be entirely underground, however, may result in a temporary loss of habitat through the removal of up to 1.26 ha of Healthy Woodland near Heywood Terminal station which provides

potential habitat for several terrestrial mammal species, however, does not comprise preferred tree species for Yellow-bellied Glider. Construction of the underground powerline beneath Boiler Swamp Road has the potential to lead to tree deaths from impacts on TPZs adjacent to the road which may be utilised by Yellow-bellied Gliders. However, any loss of tree life is unlikely to results in a significant impact on the species, due to the abundance of high quality habitat in the Project locality, including Cobboboonee Forest Part, Cobboboonee National Park, and portions of lower Glenelg National Park. The Project may involve minor clearing of roadside vegetation that may provide habitat for small mammal species, but these are unlikely to be significant impacts, due to the small amounts of clearance.

Increased road traffic, especially during construction may result in some increase in mortality. All six species are relatively abundant in the local area and it is not likely that clearing impacts would significantly affect the viability of the populations of any of these terrestrial mammal species. Any further potential impacts will be managed by retaining native vegetation and through wildlife management measures in the Flora and Fauna Management plan (see mitigation measures MM-BD01 and MM-BD10).

Mitigation measures such as site inductions for construction staff, pre-construction surveys in areas of native vegetation, management of open trenches to minimise chances of animals being accidentally trapped, and handling of any captured or injured wildlife will be put in place to minimise impacts on terrestrial mammals (see mitigation measures MM-BD08 and MM-BD10).

Legend

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

Survey Records (Biosis)

- Possible Heath Mouse (8)
- White-footed Dunnart (4)

FIGURE 7.24

Terrestrial mammal records in the wind farm site

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

Legend

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

FIGURE 7.25

Southern brown bandicoot record near the transmission line

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

7.9.5.2 Reptiles

Striped Worm-lizard and Eastern Bearded Dragon were both recorded in the Project Area, with the Swamp Skink (*Lissolepis coventryi*) also recorded in the Investigation Area outside of the Project Area (see **Figure 7.26**). Glossy Grass Skink (*Pseudemoia rawlinsoni*) was not recorded, but it may occur based on its distribution and presence of potentially suitable habitat within 10 km of the Project Area.

The Swamp Skink and Glossy Grass Skink are not likely to inhabit any portion of the wind farm site as it does not offer their required swamp habitats with dense indigenous vegetation. The Project does not entail loss of habitat for the Swamp Skink and neither construction nor operation of the Project is likely to result in direct impacts on the species.

The wind farm site is inhabited by Striped Worm-lizard, with the Eastern Bearded Dragon also recorded within the wind farm site along the Portland-Nelson Road reserve. Neither of these species are likely to inhabit areas of pine plantations themselves as they do not provide the microenvironments that support them. Pine plantations substantially limit solar radiation reaching the ground which is a requirement for basking by Eastern Bearded Dragons.

The Project has some potential to impact on Striped Worm-lizard and Eastern Bearded Dragon, specifically if road-widening and creation of turbine hardstands entails the removal of microhabitats for them. The majority of the road system is expected to remain in its present form and permit populations of these species to persist. Increased road traffic, especially during construction may result in some increase in mortality of Eastern Bearded Dragons. However, these species are quite widespread and relatively abundant in the region and it is unlikely that impacts would significantly affect the viability of the population of any of them.

Mitigation measures such site inductions for construction staff, pre-construction surveys in areas of native vegetation and management of trenches and handling of any captured or injured wildlife will be put in place to minimise impacts to reptiles (see mitigation measures MM-BD01, MM-BD08 and MM-BD10).

7.9.5.3 Aquatic fauna

Aquatic fauna species of interest (see **Section 7.7.6.1**) are generally considered unlikely to occur within the Project Area, primarily due to the lack of suitable habitat (e.g. substantial freshwater systems, freshwater wetlands, estuaries, brackish swamps, etc.) and scarcity of recent local records. However, as discussed in **Section 7.7.6.1** there is some potential for aquatic species of interest to occur within damp depressions and riparian zones within the wind farm site and within Surrey River and Wild Dog Creek, which would not be crossed by the transmission line.

There is potential for the permanent loss of habitat, death or injury of the FFG Act listed species Portland Burrowing Crayfish, Hairy Burrowing Crayfish and Southern Toadlet within the Project Area as a result of the construction of permanent and temporary infrastructure. These impacts will be avoided by micro siting of infrastructure or construction activity for the transmission line.

There is a negligible likelihood for permanent loss of habitat, death or injury of Yarra Pygmy Perch, Little Galaxias, Variegated Pygmy Perch, Platypus, Southern Shortfin Eel, Common Galaxias, Congolli (Tupong), Western Bush Yabby or Glenelg Spiny Crayfish, as the transmission line will be constructed by HDD beneath the Surrey River and Wild Dog Creek. No impacts on instream habitat are anticipated to occur.

There is potential for indirect impacts on FFG Act listed species Portland Burrowing Crayfish and Hairy Burrowing Crayfish during the construction of permanent and temporary infrastructure within the Project Area through the removal of vegetation, which can increase local erosion and damage nearby burrows as well as the use of heavy machinery or vehicles within burrowing crayfish habitat, which can compact soil and collapse shallow burrow systems. There is a low likelihood for indirect impacts associated with a decline in water quality during the construction of the Project. Appropriate setbacks (50 m) will be applied to all aquatic areas, which includes drilling locations for waterway crossing. Sediment devices (bunding and silt fencing) and trenching management will be implemented through a Sediment, Erosion and Water Quality Management Plan during construction which will aid in avoiding or minimising sedimentation and erosion impacts (see mitigation measures MM-SW01 and MM-SW02 in **Chapter 9 *Surface water, groundwater and groundwater dependent ecosystems***).

Numerous wetlands occur adjacent to the wind farm site. Some of these wetlands (Long Swamp and Lake Mombeong) support populations of threatened species Yarra Pygmy Perch, Variegated Pygmy Perch, Little Galaxias and Ancient Greenling Damselfly. However, construction of permanent and temporary infrastructure within the Project Area would have a negligible likelihood to result in a decline in water quality or reduction in their ecological character.

FIGURE 7.26

Threatened reptile records within the project area and investigation area

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

7.9.6 Noise and vibration

The construction of the Project, including earthworks, increased traffic and the construction of the wind farm and transmission line infrastructure would increase noise and vibration within the Project Area. Construction noise and vibration would be temporary and localised to areas where construction is occurring. There is some potential for construction noise to disturb nearby habitats for birds and terrestrial mammals. Setbacks between turbines and adjoining conservation areas including along the southern boundary adjacent to Discovery Bay Coastal Park and the northern boundary adjacent to Lower Glenelg National Park will assist in avoiding or minimising temporary construction noise and/or vibration impacts on sensitive habitat.

Construction along Boiler Swamp Road within the Parks is likely to cause noise and possibly vibration impacts that may disturb fauna. This may cause fauna to move away from or avoid these areas during the construction period. As construction progresses and the cable trench is reinstated, fauna is likely to repopulate adjacent habitat. On completion of construction, noise and vibration impacts would cease and the noise environment would revert to the existing ambient environment, comprising occasional vehicle use of the road.

7.9.7 Operational noise and lighting

Effects of operational noise, traffic and artificial light and hydrological impacts are expected to have a minimal impact on most threatened species outlined in this assessment. Shorebird species have the potential to be affected by operational noise, however due to the locality of the Project, this is not likely.

7.10 Operation impacts

Operation of the wind farm involves fixed infrastructure such as wind turbines that have a relatively small footprint on the landscape, taking up about two per cent of the Project area. The main way that biodiversity could be impacted once the Project is operating is via bird and/or bat collision with wind farm infrastructure, such as wind turbines and overhead powerlines. Collisions can result in injury or death.

The size, manoeuvrability, flight behaviour, and habitat preferences of birds and bats may make them more susceptible to colliding with wind turbines and other project infrastructure. The presence of wind turbines in the landscape may also change how some birds move in and around the Project Area – some birds may avoid the area once infrastructure is operating or be reluctant to fly across the area, which could alter or restrict access to habitat.

There is the potential for bats, who are nocturnal flyers, to collide with wind turbines and other Project infrastructure. Barotrauma may also cause deaths in bats, which occurs from air pressure differences near rotating wind turbine blades and the adjacent airspace.

Habitat disturbance from operational noise, lighting, and traffic movements may also occur, but is unlikely taking into consideration the site selection and design development responses outlined in **Section 7.8** that seek to create a buffer between habitat and Project infrastructure.

7.10.1 Potential bird and bat collisions

The key potential impact on birds and bats during Project operation is collisions with wind turbines. Species at risk are those known to fly through the Project Area within the rotor swept area of the wind turbines. The rotor swept area is the space in which the blades on a wind turbine rotate. The rotor swept area for the Project's turbines is from 60 m above ground to the tip height of 270 m above ground.

Investigations into the birds and bats that use the Project Area and surrounds indicated that the surrounding more suitable habitat is generally preferred. However, there is potential for birds and bats to use the wind farm site for foraging, or for local and seasonal movements, and this is reflected in the outcomes of the studies (see **Section 7.7.7**, **Section 7.7.8**, **Section 7.7.9** and **Section 7.7.10**). Brolga is also known to use areas around the Project Area. Consideration of Brolga including the development of turbine-free buffers specific to this species is set out in **Chapter 8 *Brolga.***

Comprehensive assessments of potential impacts on birds and bats are summarised in the following sections. The **FFIA (Appendix C)** includes further detail in relation to the potential use of the Project Area by birds and bats and associated impact assessment (refer to Section 11 to Section 27 of the **FFIA.**

The Project has responded to the bird and bat studies primarily through by ensuring wind turbines are setback from important habitat, including:

- No turbines within 500 m of wetlands within the Ramsar site
- No turbines within 300 m of public land, including Lower Glenelg National Park, and Cobboboonee National Park.

- No turbines within 5 km of SBWB roost sites.
- Increasing the minimum blade tip height from 45 m to 60 m, as Project studies indicate most flights for recorded species were occurring at heights below 60 m.

Turbine-free buffers around Brolga breeding wetlands on agricultural land would reduce potential collision risks for these birds (see **Chapter 8 *Brolga***).

The following sections provide a summary of the potential impacts of Project operation on threatened birds and bats recorded in Project surveys, as well as species that have potential to occur or are species of interest for the Project (as identified in the Scoping Requirements). Species recorded within the Project Area during project surveys are discussed first.

7.10.1.1 Australasian Bittern

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

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

One Australasian Bittern was recorded outside the Project Area but within the Investigation Area:

- One male calling at Lake Mombeong, recorded on the same evening as the male recorded calling within the Project Area at Wetland ID 20505.

Figure 7.22 and **Figure 7.23** shows where these records of Australasian Bittern occurred.

The series of wetlands including Lake Mombeong, Dead Horse Swamp, Black Swamp, McFarlanes Swamp and Long Swamp and the associated wetlands along the southern boundary of the pine plantation near Lake Mombeong and Nobles Rocks were identified as important habitat for Australasian Bittern (see **Figure 7.12**).

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

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

There is some uncertainty relating to how often Australasian Bitterns would fly across the wind farm site, as well as at what height they would fly (specifically whether those flights would occur at rotor swept height, putting them at risk of colliding with turbines).The assessment of potential impacts on Australasian Bittern in the **FFIA (Appendix C)** has used the precautionary principle, which is appropriate here because of these uncertainties.

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

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

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

An assessment of the significance of the potential impact on this species using the significant impact criteria for endangered and critically endangered species is included in Appendix 6 of the **FFIA** (**Appendix C)**. Likely significant impact is identified for two of the nine EPBC Act criteria:

- Lead to a long-term decrease in the size of a population.
- Interfere with the recovery of the species.

A Bird and Bat Adaptive Management Plan (BBAMP) (see mitigation measure MM-BD12 and **Draft BBAMP Appendix AA)** will be developed and implemented for the Project to minimise, manage and mitigate residual collision risk for several species arising from the operation of the wind farm (including the Australasian Bittern) and to ensure unexpected bird mortalities are responded to appropriately (see mitigation measure MM-BD11). GPS/satellite tracking of movements, and other monitoring technologies will also be considered to further inform potential adaptive management strategies specifically for the Australasian Bittern (see mitigation measure MM-BD11).

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

Additionally, an offset strategy will be developed in the case of a collision mortality to avoid significant impact on the population. This is further detailed in the BBAMP (see mitigation measure MM-BD12).

With the relocation of the Project's transmission line to be underground, any potential collision risk for Australasian Bittern with an overhead transmission line is no longer present. An overhead powerline would be located parallel to Portland-Nelson Road from the western part of the wind farm site where it transitions underground, at the eastern end of the wind farm site. If this powerline is below or at the height of the pine trees, it is unlikely to pose a collision risk to the Australasian Bittern. All new overhead powerlines will be marked with standard commercially available bird diverters to increase visibility to birds and minimise the risk of collision (see mitigation measure MM-BD16).

7.10.1.2 Southern Bent-Wing Bat

Acoustic bat-call surveys confirmed that SBWB fly within the wind farm site including areas occupied by pine plantations (see **Section 7.7.10**). These bats fly from caves within the local area or within the documented nightly flight range for the species which may be as great as 70 km (van Harten et al. 2019).

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

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

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

These temporal and wind speed factors have been considered in developing plans for turbine curtailment, as detailed in Section 7.1.3 of the **SBWB Impact Assessment (Appendix E)** and finalised in the BBAMP (see mitigation measure MM-BD12 and **Draft BBAMP Appendix A**). These factors are discussed in detail below in 'Impact Assessment Summary'.

Population Viability Analysis

A population viability analysis (PVA) was undertaken by Symbolix as part of this EES to investigate the potential effects of the Project on SBWB (refer to Appendix 3 of the **SBWB Impact Assessment** (**Appendix E**). PVA is a process and set of tools that is used to help predict population health and extinction risk into the future for a particular species. For the Project, PVA was used to predict what might happen to the SBWB population with and without the Project operating, using a pre-defined set of estimated annual wind farm mortalities over the life of the Project (ranging from zero, which could also represent a no-project scenario, to 500 mortalities annually).

Symbolix consulted with subject matter experts at DEECA during the initial stages of the PVA to agree the various inputs that went into the PVA model. It was agreed with DEECA that the PVA would consider the Portland sub-population of SBWB given the location of the Project, with the Portland maternity cave and other non-breeding caves being closer than other maternity caves that support different sub-populations (i.e., Warrnambool and Naracoorte). The Portland sub-population is estimated to have substantially fewer individuals than the larger Naracoorte (South Australia) and Warrnambool populations (see **Table 7.14**).

Table 7.14: Mean numbers of mature SBWB at the three known sub-populations as at 2019 (TSSC, 2021)

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

The population used in the PVA encompasses all age-classes (this is the population of 3,500 stipulated by DEECA). The PVA tests for effects on the extinction risk for this population of iteratively greater numbers of mortalities (between 2 and 500 extra deaths) per year. In this manner, the PVA covers potential deaths for all age-classes and regardless of whether they are actually due to collisions or other potential effects of the Project, such as deaths of orphaned pups.

The PVA presents the predicted trajectory of the Portland sub-population without and with the Project. The PVA results for the without project scenario show that even without wind farm mortalities, there is a substantial predicted decline in the Portland sub-population size, with declines of more than 50% within ten years, and almost 100% within 60 years (see **Figure 7.27** and **Table 7.15**).

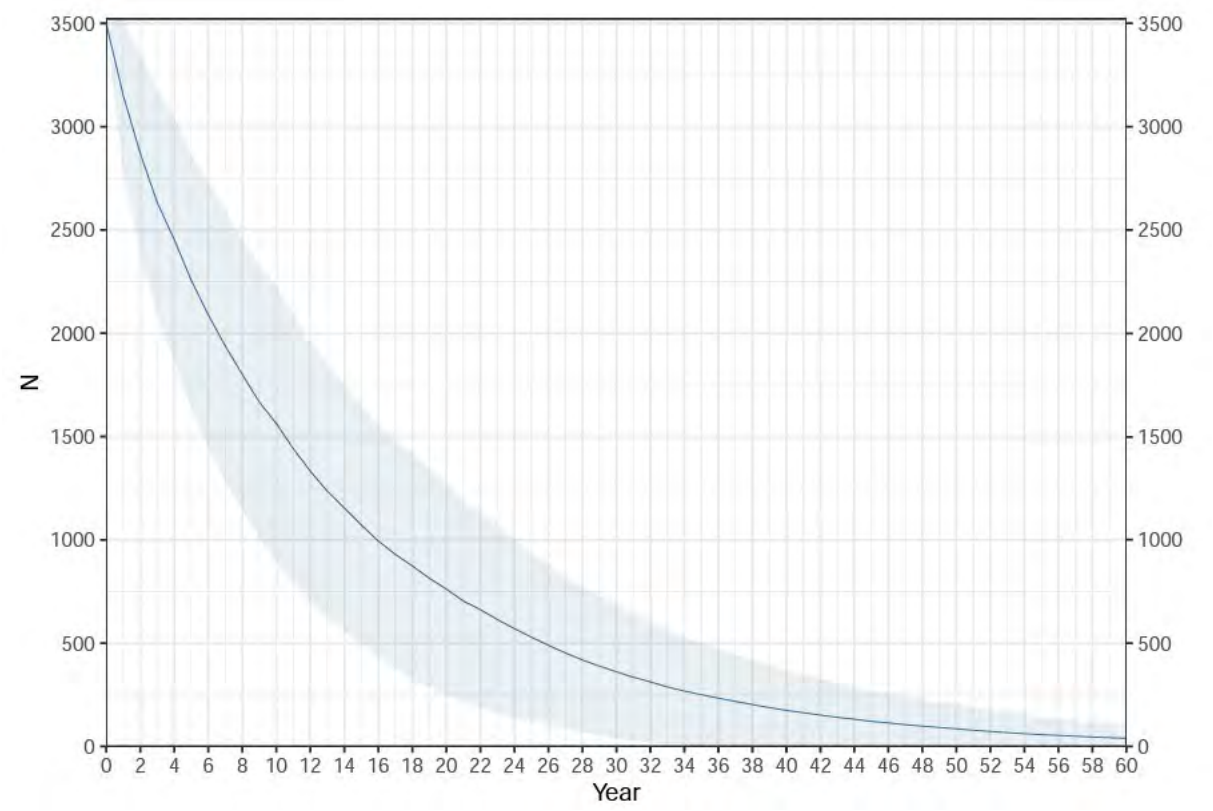


Figure 7.27: Population curve for Portland population. The mean and standard deviation are shown.

Table 7.15: Portland population size and percentage decline by year

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

Adding a range of predicted wind farm mortalities to the impact assessment PVA shows that with increasing numbers of wind farm mortalities the Portland sub-population declines more rapidly (see **Table 7.16**). The PVA indicates that if the number of wind farm mortalities is around 2 SBWB per annum there is no discernible difference in Portland sub-population outcomes after 30 years (the projected lifespan of the Project). Increasing the number of wind farm mortalities in the PVA model increases the predicted level of impact on the Portland sub-population of SBWB over 30 years (and beyond). The results of the PVA model in **Table 7.16** show that SBWB mortality in the range of 50 SBWB per year would have a substantive impact on the probability of extinction and shorten the predicted time frame for extinction of the Portland sub-population.

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

Table 7.16: Probability of SBWB population reaching zero for Portland sub-population by year with varying number of wind farm mortalities (Symbolix, 2021)

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

Annual wind farm mortalities	Probability of extinction (Portland sub-population)		
	10 years	30 years	60 years
100	2%	100%	100%
500	100%	100%	100%

Impact assessment summary

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

- The apparently low levels of SBWB activity at increasing height above the ground, including the apparently very low levels of their activity at the lower portions of wind turbine rotor-swept heights.
- That the species typically forages above the canopy, but can fly closer to the ground in more open areas (DELWP 2020)
- Substantially low use of the site during winter and possibly early summer, as well as during the latter part of the night when activity was also reduced (this has been determined using patterns of temporal activity of SBWB derived from the data collected during the Project studies).
- The preference of bats to fly in lower wind speed conditions (noting that the wind farm will not be operating at wind speeds less than 3.5 m per second) and that turbine rotor swept height is likely to routinely experience substantially greater wind speeds that appear to not be favourable for SBWB activity.

Internationally and in Australia microbats are known to collide with the blades of wind turbines and a small number of SBWBs have been found as collision victims at existing wind energy facilities in south-western Victoria (Moloney, Lumsden, & Smales 2019). Windfarms are listed as a threat in the Conservation Advice for SBWB (TSSC 2021), which states that 'any windfarms close to a roosting site could potentially have a major impact on that population'. As of October 2023, available evidence indicates a total of 22 SBWB fatalities due to collisions with turbines have been documented across wind farms in Victoria where carcass searches have been undertaken since 2003. All operational wind farms in the region have rotors that sweep down to approximately 30 m above the ground. The lower rotor ground clearance of those turbines is half the 60 m clearance height for the Project's turbines.

The Proponent has implemented several design changes and considerations which mitigate the potential for impacts on SBWB, including not locating turbines within 5 km of any roosting caves. The lower blade tip height of the turbines has also been raised to 60 m above ground level which will significantly reduce the risk collision. It is expected that SBWB collisions with turbines at the Project are likely to occur at a lower rate than is the case at existing wind farms where the species is known to have collided.

A BBAMP (see **Draft BBAMP Appendix AA**) will be developed and implemented, which will include protocols for monitoring and triggers for implementation of adaptive management, including increases in low wind speed curtailment and SBWB specific protocols (see mitigation measures MM-BD12, MM BD-13 and MM-BD14).

Low wind speed curtailment will be developed during finalisation of the BBAMP (see mitigation measure MM BD-14) and will include the parameters outlined in **Table 7.17.**

Table 7.17: Low wind speed curtailment parameters

Time period	Climate parameter	Environmental conditions in which turbines are to be curtailed
September to November	Time	30 minutes after sunset until 3 hours before sunrise
	Wind speed	Below 4.5 ms^{-1}
	Temperature	10°C or higher
	Humidity	Not raining (relative humidity < 95%)
February to March	Time	30 minutes after sunset until 3 hours before sunrise
	Wind speed	Below 4.5 ms^{-1}
	Temperature	10°C or higher
	Humidity	Not raining (relative humidity < 95%).

7.10.1.3 Other non-threatened microbat species

In addition to SBWB, a range of other microbat species were detected in acoustic surveys undertaken for the KGPH project, including:

- Gould's Wattled Bat *Chalinolobus gouldii*
- Chocolate Wattled Bat *Chalinolobus morio*
- Eastern False Pipistrelle *Falsistrellus tasmaniensis*
- Free-tailed Bats *Ozimops* spp.
- Southern Myotis *Myotis macropus*
- Long-eared bats *Nyctophilus* spp. (Likely N. *geoffroyi* and N. *gouldi*)
- White-striped Free-tailed Bat *Austronomus australis*
- Large Forest Bat *Vespadelus darlingtoni*
- Southern Forest Bat *Vespadelus regulus*
- Little Forest Bat *Vespadelus vulturnus*
- Inland Broad-nosed Bat *Scotorepens balstoni.*

None of these species are listed under either the FFG Act or the EPBC Act. Most microbats, including the above list, are known to collide with turbines based on carcass monitoring at Victorian wind farms.

The White-striped Freetail Bat was the most frequently recorded species in the acoustic survey program for the Project, with 1.8 detections per night, however it is noted that calls from this species are loud and low in frequency, compared with other microbats, resulting in higher detectability.

The White-striped Free-tailed Bat is a common and widespread species occurring across virtually all habitats in southern Australia, including alpine areas and urban areas. They are known to fly 50 m or more above ground level, which places them at risk of turbine collision. Recent carcass monitoring undertaken at windfarms indicates that considerable numbers of White-striped Freetail Bats have been killed at windfarms.

Collision with turbines is recognised as a localised threat to the species in south-western Victoria (Pennay 2019), however the ongoing threat of collision is unlikely to lead to an unacceptable impact on the species at the broader population level. This is consistent with an assessment from Pennay (2019), which states that these localised impacts are unlikely to cause significant decline in the species overall population.

7.10.1.4 White-throated Needletail

White-throated Needletails migrate annually, usually arriving in northern Australia during September and October, and sometimes in early November (Draffan, Garnett, & Malone 1983, Warham 1962). They usually spend much of the southern hemisphere spring in northern Australia and reach Victoria and Tasmania in December. Their northward migration back to their breeding areas in Siberia, China and Japan generally happens in March and April.

During surveys for the Project, White-throated Needletail was recorded on 21 occasions mostly during bird utilisation surveys (BUS) (see **Figure 7.8**). Most observations were of individual birds or small groups (less than 10), but there were two observations of large groups, including an incidental observation near Lake Mombeong (70 birds) and an observation of 90 birds, followed by eight birds. White-throated Needletail was recorded at 10 locations, seven of which were within the wind farm site, with a total of 152 flights observed. Of these, 43 flight heights were between 12 m and 45 m above ground and 109 were between 70 m and 300 m high.

A collision risk model was undertaken for White-throated Needletail to evaluate the potential for turbine collisions, using the data from point counts collected during Project surveys. The model assumed that White-throated Needletails may be present in the Project Area for three months every year, and that up to 2000 individuals may be present for the entire annual period of three months. The full set of assumptions used in the collision risk model for the White-throated Needletail is provided in Section 22.3.1 of the **FFIA (Appendix C)**.

Collision risk modelling requires estimates of the ability for the species being modelled to avoid obstacles (in this case, wind turbines) when on a collision course. White-throated Needletails are very agile when flying; this was used when comparing studies of avoidance for multiple other bird species, predominantly seabirds that are less agile than the White-throated Needletail and that have widely determined avoidance rates of between 0.95 (avoiding collisions 19 out of 20 times) and 0.99 (avoiding collisions 99 out of 100 times).

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

- 1.19 collisions per annum at 0.95 rotor avoidance rate
- 0.48 collisions per annum at 0.98 rotor avoidance rate
- 0.25 collisions per annum at 0.99 rotor avoidance rate.

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

The highest collision risk estimate for turbines proposed by the Project (1.19 collisions per annum at 0.95 rotor avoidance rate) is very far below either the 1% or 0.1% threshold. Even over a thirty-year project lifespan, that rate of collisions would equate to approximately 36 individuals which is still below those threshold levels.

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

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

D:\UMWELT (AUSTRALIA) PTY LTD\21264 - 03 S&VF ROTVFIG07 28 21264 WHITETHROATEDNEEDLETAILRECORDS V5.MXD 6/09/2024 4:44:30 PM

Scale 1:200000 at A4

FIGURE 7.28

Records of White-throated Needletail from Project surveys

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

7.10.1.5 South-eastern red-tailed black cockatoo

South-eastern Red-tailed Black Cockatoos occur as a single population with a range of around 1.8 million has across south-western Victoria and into South Australia (see **Figure 7.29**). About 30% of the range contains suitable habitat and is known to be used by South-eastern Red-tailed Black Cockatoos for foraging and breeding. South-eastern Red-tailed Black Cockatoos may form large flocks and can also occur as smaller groups of two to three individuals.

The National Recovery Plan for South-eastern Red-tailed Black Cockatoos (CoA 2006a in Biosis report) identifies the habitat that is critical to the survival of the subspecies. It includes important feeding trees, consisting of the seeds of two closely related eucalypts, Desert Stringybark *Eucalyptus arenacea* and Brown Stringybark *Eucalyptus baxteri*, and in the northern portion of the species range seasonally on the seeds of Buloke *Allocasuarina luehmannii*. South-eastern Red-tailed Black Cockatoos tend to feed on forest and scattered paddock trees within the range and on whichever stringbark species has most recently fruited.

Brown Stringybark is the primary food tree for South-eastern Red-tailed Black Cockatoos in the southern portion of its range, including the region of the Project (see **Figure 7.30**). It is a principal canopy species distributed broadly in natural woodlands including those in Lower Glenelg, Mount Richmond and Cobboboonee National Parks that lie to the north, east and south-east of the wind farm site. Section 11 of the **FFIA (Appendix C)** contains a detailed description of the ecology and habitat preferences of the South-eastern Red-tailed Black Cockatoos.

The availability of resources across the South-eastern Red-tailed Black Cockatoos range may vary annually and flocks and small groups of individuals may use the woodland habitats around the wind farm site.

South-eastern Red-tailed Black Cockatoo observations during the Project surveys were limited which prevented being able to document possible movements of this species through the Project Area. Since this flight information for the species is not available for the Project Area, collision risk modelling was not able to be carried out.

There is evidence that the species does use suitable habitat around the wind farm site, including data from the VBA and BirdLife Australia that includes records of the subspecies north of the wind farm site (including Lower Glenelg National Park), including a record from 2021 of a flock of 80 birds. The species is also reported in suitable habitat further east including scattered records around Mount Richmond National Park, Cobboboonee National Park and the Portland area.

There are also six locations with records of this species from Discovery Bay Coastal Park, south of the wind farm site, however there is little suitable habitat south of the wind farm site due to an absence of vegetation communities that support Brown Stringybark, and an associated lack of resources for foraging, drinking, roosting, and nesting.

South-eastern Red-tailed Black Cockatoos do not feed on pine seeds, meaning that most of the wind farm site is not suitable habitat for this species.

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

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

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

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

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

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

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

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

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

Most of the wind farm site is not suitable habitat for the South-eastern Red-tailed Black Cockatoos. Suitable areas of habitat are predominantly to the north and east of the Project Area. The portion of the transmission line between Cobboboonee Forest Park and Narrawong Flora Reserve / Mount Clay State Forest is proposed to be constructed underground, in an area of substantially cleared paddocks with some scattered trees as individuals and in patches. The eucalypt species present throughout most of this section do not provide key foraging or breeding habitat for South-eastern Red-tailed Black Cockatoos. Trenching of the final section of the transmission line, for access to the Heywood terminal station, involves impact on 1.26 ha of Heathy Woodland, which contains the preferred foraging species Brown Stringybark.

Although movements across the wind farm site may occasionally occur, the assessment found they are likely to be rare. The studies into flight heights for the species also suggest that flights across the wind farm site, if they did occur, are likely to be below rotor swept height.

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

A BBAMP will be developed to minimise the risk of turbine collision and ensure unexpected bird mortalities are responded to (see mitigation measure MM-BD12 and **Draft BBAMP Appendix AA**). Powerlines associated with the Project will also be marked with bird diverters to increase visibility of these lines for birds (see mitigation measure MM-BD16).

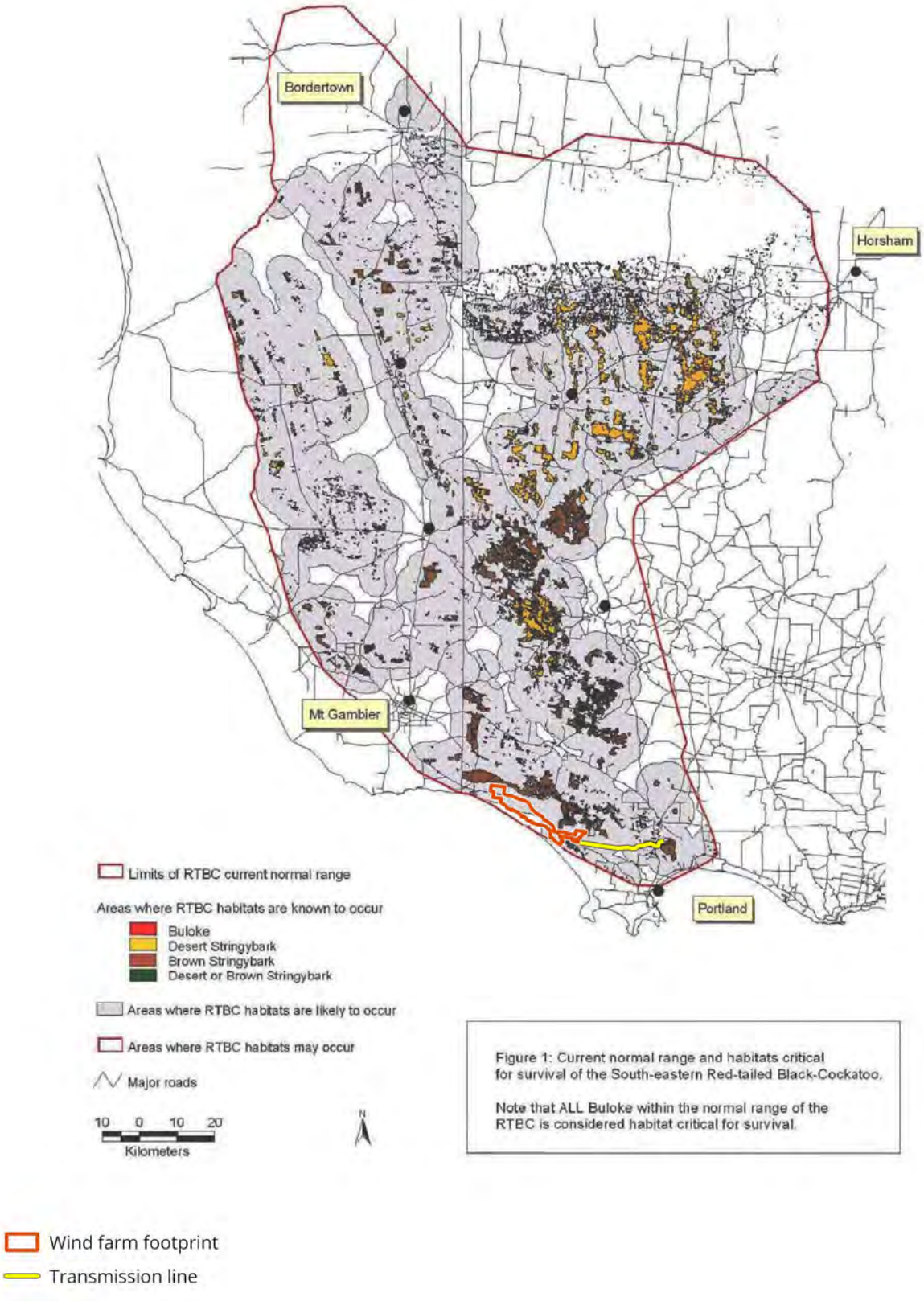


Figure 7.29: South-eastern red-tailed black cockatoo range

Legend

- Wind Farm Site
- Underground Transmission Line
- Roads
- Watercourses
- Red-tailed Black Cockatoo (BirdLife)
- Red-tailed Black Cockatoo (eBird)
- Red-tailed Black Cockatoo (VBA)
- Stringybark habitat (DELWP 2005)

FIGURE 7.30

South-eastern red-tailed black cockatoo habitat and previous existing records

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

7.10.1.6 Orange-bellied Parrot

Orange-bellied Parrots migrate from their breeding range in south-western Tasmania to coastal areas of the southern mainland and overwinter there for the period from March-April to October. The seasonal migratory behaviour of the species means that the Project would not pose any risk to it during the annual five to six months in which the population is in Tasmania.

Discovery Bay Coastal Park coastal zone contains suitable habitat for the species, and the species has been historically recorded near Nobles Rocks (1989, 1991, 1993) and Swan Lake (1987, 1991). One Orange-bellied Parrot was recorded by Biosis in the interdunal heathland vegetation adjacent to the beach south of Swan Lake, approximately 3 km south of the Project Area, on 29 May 2020 (see **Figure 7.31**). This was the first record of the species in that area since 1993.

All records of Orange-bellied Parrots from western Victoria are from locations that are very close to the coast. There are no records of the species north of Discovery Bay Coastal Park in the vicinity of the Project.

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

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

No records of Orange-bellied Parrot collisions with wind turbines have been reported from any wind farms in Victoria and Tasmania, despite extensive monitoring of bird collisions at many of these sites. It is possible that undetected collisions may have occurred as collision monitoring is a sampling process. Four instances of Orange-bellied Parrots colliding with man-made structures are known as summarised in the recent TASCAT assessment of the Robbins Island Wind Farm in Tasmania, one with a lighthouse more than 100 years ago and three incidents at a breeding site in Tasmania. Two of these incidents were birds hitting buildings and one was a dead bird found at the base of a small (8 m high) wind turbine used to provide power for buildings at the site.

No known flight height data is available for Orange-bellied Parrots. However, Blue-winged Parrots have very similar morphology and flight characteristics, and data for Blue-winged Parrot flights was collected as part of the Project investigations and during other studies in Tasmania. Most records of flight heights for Blue-winged Parrot were below 50 m above ground level at the locations surveyed. Given the similarities between the two species, the assessment found that most flights by Orange-belled Parrots would be below rotor swept height (i.e. below 60 m above ground level), if they were to occur within the wind farm site.

The transmission line for the Project would not present a collision risk as it is entirely underground. There is limited potential for the above-ground transmission line along Portland-Nelson Road to present a collision risk, however collisions with this line are extremely unlikely as the line is a considerable distance from any known or preferred habitat for Orange-belled Parrots.

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

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

Legend

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

FIGURE 7.31

Orange-bellied parrot records from project surveys

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

7.10.1.7 Blue-winged parrot

Project investigations recorded Blue-winged Parrots 56 times at:

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

115 flights were recorded across the 56 recordings of the species. Except for one observation of 15 birds at site T17 all the records were of between one and five parrots (see **Figure 7.8**).

All these records were of birds in flight. Half of all the observations of Blue-winged Parrots (28 records) were at site T15 and T17 in agricultural grazing land at the eastern part of the wind farm site, where turbines would not be sited. Incidental observations of approximately 50 Blue-winged Parrots were also made at the same location in late October 2021. One point count site (T9) where Blue-winged Parrots were observed six times is a large open area where pines have been harvested in the recent past. One record was at site T10 where Blue-winged Parrots were observed flying at 15 m above the ground from a track between more mature pines.

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

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

- 1.38 collisions per annum at 0.95 rotor avoidance rate
- 0.55 collisions per annum at 0.98 rotor avoidance rate
- 0.28 collisions per annum at 0.99 rotor avoidance rate.

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

Collision risk modelling for Blue-winged Parrot with turbines having a 60 m blade ground clearance suggests that at the lowest avoidance rate of 0.95, there might be an annual average of 1.4 collisions by the species. The assessment found that this number of collisions would not alter functioning or viability of the population and would not result in a significant impact.

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

The Conservation Advice for *Neophema chrysostoma* (blue-winged parrot) (TCCS 2023) states there are an estimated 10,000 mature Blue-winged Parrots, with a range between 7,500-15,000, and a mean generation time of 3.8 years. Despite uncertainty in the exact number Blue-winged Parrot, demographic principles (e.g. Krebs 1978) mean that the loss of 1.5 birds p.a. must be well within the natural variability in the species population mortality rate and would not affect functioning or viability of the population.

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

7.10.1.8 Shorebirds, gulls, and terns

Most of the wind farm site does not contain suitable habitat for shorebirds including all areas of plantation and most of the agricultural land. A small portion of agricultural land in the east of the wind farm site has ephemerally inundated areas that may occasionally be visited by some species. There is a record of Latham's Snipe from 2021 at this location. However, there are no longer turbines located in this section of the Project Area.

The main way that the Project could affect shorebirds is the potential for birds to collide with wind turbines.

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

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

There are two main types of flights that shorebirds make:

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

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

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

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

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

All wind turbines are more than 5 km from the key shorebird area at the Glenelg River Estuary, and around 2 km from shorebird habitat along the ocean beach. Turbine-free buffers around Brolga breeding wetlands in the north-east of the wind farm site would also limit the potential for collisions by birds that may use wetlands and surrounding land there. Long distance migratory flights of shorebirds are considered unlikely to be within rotor-swept height when (and if) birds fly across the wind farm, however this assessment is based on data from other locations, and there is no flight height data for these species available for the Investigation Area.

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

7.10.1.9 Owls

Surveys for owls undertaken from September to November 2020 recorded one Powerful Owl near Portland. Large hollow-bearing trees are an essential habitat feature for threatened Owl species. National parks immediately adjacent to the Project Area, such as Lower Glenelg National Park and Cobboboonee National Park, support large areas of remnant forest with large hollow-bearing trees, and have numerous records of Powerful Owl, Masked Owl, and Barking Owl.

Powerful Owl, Masked Owl and Barking Owl are not likely to be directly impacted by the Project. The Masked Owl may use the vegetated road verges and could potentially be at risk of powerline collisions at the powerline along Portland-Nelson Road. However, the species is expected to fly at, or below, canopy height while traversing or hunting in treed linear habitats and direct impact from powerline or turbine collisions is unlikely, as these will be higher than canopy height.

7.10.1.10 Rufous bristlebird

The Rufous Bristlebird (*Dasyornis broadbenti)* is a small primarily ground-dwelling bird found in coastal scrubland and forests in south-east Australia. The species is a weak flyer, spending most of the time on the ground, and prefers covered habitats to open areas.

Rufous Bristlebird was recorded 19 times during Biosis surveys between June and December 2020. It was also recorded several times in heathland vegetation surrounding the pine plantations during fauna surveys.

Rufous Bristlebirds are largely constrained to very specific habitat types that are outside the wind farm site and would not be impacted by the Project. Rotation of plantation pine harvesting will continue to provide small areas of young, dense pine tree that may be inhabited by the species during the appropriate successional stages of their growth. Over the majority of the wind farm site, pines are more mature and do not offer habitat for the species. There is no evidence that Rufous Bristlebirds might fly over or through the great majority of areas where Project infrastructure would be located.

There is also no evidence that they ever fly more than a few metres above the ground and this precludes any realistic potential for them to be involved in collisions with turbines or other Project infrastructure such as powerlines.

7.10.1.11 White-bellied sea eagle

A White-bellied Sea Eagle was recorded opportunistically during field assessments for the Project. It has been documented occasionally in the local area in the past as evidenced by records on relevant biodiversity databases. Most of the wind farm site is occupied by pine plantations that are not suitable habitat for White-bellied Sea Eagle. Movements by the species through such areas are likely to be made only by birds traversing these environments between areas of suitable habitat outside the Project Area. Cleared farmland and the airspace above commercial pine plantations may be used by individuals while foraging and/or while moving between coastal and inland areas.

In the DELWP investigation of fauna collisions with wind turbines in Victoria, Moloney et al. (2019) collated data from 15 operational wind farms at which carcass monitoring had been undertaken for an average of two years. One reported White-bellied Sea Eagle mortality from a turbine collision was observed. While this cannot provide an accurate indication of expected collisions for this species, it does indicate that collisions are likely to be a rare event, particularly where the site provides very little suitable habitat.

The rarity of sightings within pine plantation habitats away from the coast, where the majority of turbines would be sited, suggests that collisions are likely be infrequent events. There is unlikely to be a significant impact on this species.

7.10.1.12 Fork-tailed swift

Fork-tailed Swifts are listed as migratory and marine under the EPBC Act and are predominantly an aerial bird that migrates from north-east Asia to south-east Asia and Australia from September to April to avoid the northern hemisphere's winter.

No Fork-tailed Swifts were recorded during the Biosis surveys, however, it has been recorded in the area previously but not within the wind farm footprint. However, Fork-tailed Swift, similarly to the White-throated Needletail is a highly aerial species and is likely to move in the airspace between the coastal and inland areas and would be expected to fly through the Project Area where turbines and other infrastructure would be located.

Due to a lack of observations, CRM was not able to be undertaken for the Fork-tailed Swift. However, as the species is reported infrequently in the area, collisions are unlikely to annually reach or exceed 1% of the estimated population and would therefore not meet the impact threshold as outlined in DoE (2015).

7.10.1.13 Gang-gang cockatoo

A total of 25 Gang-gang Cockatoos were recorded flying through the Investigation Area during BUS at three sites: five at the edge of open farmland and native forest (BUS point C6), 3 flying together at the edge of pine plantation and Blue Gum plantation (BUS point T16), 17 at the edge of pine plantation and native forest (BUS point T14) (see **Figure 7.8**).Flight heights ranged from 5 m to 15 m above the ground, with the flock of 15 flying at a height of 10 m.

The pine plantations occupying the great majority of the wind farm component of the Project offer very limited resources for Gang-gang Cockatoos and, while they may travel through them on occasions, it is not considered to be suitable habitat that they would use routinely or frequently. The species are not anticipated to pass through the wind farm site very often or at heights that would put them at risk of turbine collision. The Project is therefore unlikely to constitute a significant impact on this species during operation.

7.10.1.14 Elegant parrot

Elegant Parrots mostly forage on the ground, and are found in a range of open habitats. Flight patterns for the species are similar to those of Blue-winged Parrot, with normal flight swift, directional, and at heights of up to 100 m.

Elegant Parrots are considered rare in the region and were not recorded during surveys undertaken by Biosis in 2020. While the species is highly mobile and may fly at heights where turbines pose a collision risk, considering the low reporting rate and that the area is not likely to support a significant population of the species, the wind farm is unlikely to pose a risk of significant impact on this species.

7.10.1.15 Eastern ground parrot

The Eastern Ground Parrot is highly cryptic and is best detected from its characteristic calls. Calls were documented by Biosis during surveys at Long Swamp in October 2020. Flight height for the species tend to be low and just above the height of the heathy vegetation they inhabit.

The Project Area does not provide suitable habitat for the species. Furthermore, the flight behaviour of Eastern Ground Parrots indicates that they routinely do not fly more than a few metres above the ground and this precludes any realistic potential for them to be involved in collisions with turbines or other project infrastructure. Eastern Ground Parrots are not likely to be directly impacted by the Project.

7.10.1.16 King quail

King Quail movement patterns are largely unknown. Similar to other quail species, King Quail are reluctant to fly with most flights low (up to 5 m) covering a distance of 10–30 m when the bird is disturbed (flushed from cover) (Marchant & Higgins 1993). The turbines are not considered to pose a collision risk, as the species is unlikely to fly at rotor swept area and is more likely to move low and short distances between suitable habitats in the wider area.

The species was not recorded during the targeted field surveys for other threatened species undertaken by Biosis in 2020 and is unlikely to inhabit the pine plantation and cleared farmland due to a lack of dense shrub and grass cover. It is somewhat possible that they may use the youngest pine class which provides dense foliage cover near the ground, and where many Rufous Bristlebirds were recorded during the Biosis surveys. However, King Quails may potentially utilise surrounding areas, which contain suitable habitat within the southern boundary of the wind farm site. This includes wetlands within the Discovery Bay Coastal Park heathlands and shrublands, heathland areas within the Cobboboonee National Park, as well as Kentbruck Heath.

The Project is considered unlikely to impact on King Quail for several reasons, including the flight behaviour of the species, likely infrequent occurrence within the Project area and lack of suitable habitat in areas where construction would occur.

7.10.1.17 Little eagle

Little Eagle was not detected during field assessments for the Project. It has been documented occasionally in the local area in the past as evidenced by records on relevant biodiversity databases. Due to a lack of suitable habitat throughout most of the Project Area, lack of contemporary records of the species and ongoing population declines, it is considered unlikely to regularly occur in the local area.

Collisions with powerlines are noted in the FFG Act nomination for the species as an additional threat. However, as it is considered unlikely to regularly occur in the local area, interactions with the transmission line are considered to be a very rare event.

The Project is considered unlikely to impact on Little Eagle.

7.10.2 Glenelg estuary and discovery bay Ramsar site impact assessment

The Project's turbine layout has undergone several major changes throughout the EES process. Initial wind farm designs had turbines located close to the Ramsar site boundary, particularly along the southern boundary of the wind farm site where some turbines were within 200 m of the Ramsar site, and on private properties adjacent to the Ramsar site. Turbines have since been removed/relocated from within 500 m of the wetlands within the Ramsar site to mitigate potential impacts on the wetlands and the biodiversity values they support.

There are specific criteria for assessing significance of impacts on Wetlands of International Importance (Ramsar sites) provided by the Commonwealth of Australia. This assessment is provided in **Table 7.18** below.

The ecological character definition (ECD) for the Ramsar site (DELWP 2017b) defines a set of critical components, processes and services (CPS) for the site. The ECD also defines a set of Limits of Acceptable Change (LAC) for the critical components, processes and services. As noted in the Ecological Character Descriptions (DELWP 2017d) Limits of Acceptable Change (LAC) do not constitute a management regime for the Ramsar site. The processes required to monitor and manage the wetland to maintain its integrity within the defined LAC are set out in a management plan (DELWP 2017c). The management plan identifies 15 priority values for each of three management units of the overall Ramsar site (freshwater wetlands, estuary, beach and dune fields). Three of the priority values are hydrological processes and the remaining 12 relate to biotic aspects. The management plan identifies a series of Resource Condition Targets to be maintained to ensure on-going integrity of the Ramsar wetland. These have been used to provide a focussed assessment of the Project and its potential effects on the Ramsar site and the ability for Resource Condition Targets to be achieved. If impacts will not exceed Resource Condition Targets, then they also will not exceed LACor meet the criteria for significant impacts under the EPBC Act.

Overall, effects or mechanisms associated with development or operation of the Project have very little capacity to result in changes directly or indirectly to the Ramsar site provided that appropriate management measures are implemented. The Project is considered unlikely to have a significant impact on the Ramsar site as per the EPBC Act significant impact criteria. The Project is considered to have no potential for impacts that will exceed definitions for the majority of Resource Condition Targets for the Ramsar site as detailed in **Table 7.18.**

Table 7.18: Assessment of the project against resource condition targets for the Ramsar Site

Critical CPS	Resource condition target	Assessment of projects
Hydrology	Maintain diversity of wetland types	The Project has a low to very low potential to alter hydrological regimes temporarily or permanently such that the diversity of wetland types might be affected.
Stratification	Maintain seasonal stratification in Glenelg Estuary	The Project has a low to very low potential to alter stratification in the Glenelg River estuary.
Vegetation type and extent	Maintain 2008 extent of freshwater vegetation communities	The Project would have no direct effects on freshwater vegetation communities of the Ramsar wetlands. The assessments for surface and groundwater indicates that there is a low to very low potential to alter hydrological regimes temporarily or permanently, there is no apparent hydrological pathway that might cause changes in the extent of freshwater vegetation communities. The physical distance between freshwater of Glenelg River and the closest points of the project area prevents the potential for indirect effects on freshwater vegetation communities there. Careful management of any construction dewatering and all other activities will be implemented to ensure no infiltration of sediments or pollution into dune slack wetlands can occur that might result in changes in the extent of freshwater vegetation communities
Fish diversity and abundance	Maintain fish diversity and abundance, and the following common species in all targeted surveys: • Australian Herring *Arripis georgianus* • Black Bream *Acanthopagrus butcheri* • Bridled Goby *Arenigobius bifrenatus* • Common Galaxias *Galaxias maculatus* • Estuary Perch *Percalates colonorum* • Flatheaded *Gudgeon Philypnodon grandiceps* • Scary's Tasmangoby *Tasmanogobius lasti* • Mulloway *Argyrosomus japonicus* • Pouched Lamprey *Geotria australis* • Sea Mullet *Mugil cephalus* • Southern Shortfin Eel *Anguilla australis*	The potential mechanisms that could alter fish diversity and abundance substantially relate to altered surface and groundwater regimes and to infiltration of sediment or pollutants. The Project has been assessed as to having low or very low potential to alter hydrological regimes temporarily or permanently. The physical distance between Glenelg River and its estuary and the closest point of the project area prevents the potential for indirect effects on fish in that system. Careful management of any construction dewatering will be implemented to ensure no infiltration of pollutants into dune slack wetlands can occur that might result in changes in the extent of fish diversity or abundance there.

Critical CPS	Resource condition target	Assessment of projects
	• Smallmouthed Hardyhead *Atherinosoma microstoma* • Southern Pygmy Perch *Nannoperca australis* • Spotted Galaxias *Galaxias truttaceus* • Southern Smelt *Retropinna* spp. • Tamar Goby *Afurcagobius tamarensis* • Tupong *Pseudaphritis urvillii* • Yellow-eye Mullet *Aldrichetta forsteri*	
Waterbird diversity and abundance	Maintain waterbird diversity (i.e. > 32 species regularly recorded). Maintain >1% of the population of Sanderling.	The Project has some potential for infrequent turbine collisions by waterbirds, however that is expected to occur rarely, and at a level that is not likely to affect the diversity of species nor to alter the % of Sanderling population using the Ramsar site.
Diversity of wetland types	Maintain extent and diversity of wetland types.	The Project has no potential to alter the extent or diversity of wetland types.
Physical habitat for waterbirds	See RCT for diversity of wetland types and vegetation types and extent.	The Project has no potential to alter the extent or diversity of wetland types nor the types or extent of vegetation communities.
Threatened species: plants	Maintain abundance of Maroon Leek-orchid (*Prasophyllum frenchii*) and Swamp Greenhood (*Pterosylis tenuissima*)	The Project has no potential to alter the abundance of Maroon Leek-orchid or Swamp Greenhood within the Ramsar site.
Threatened species: fish	Increased abundance by 10% of Yarra Pygmy Perch (*Nannoperca obscura)* at Long Swamp	The Project has no potential to reduce the abundance of Yarra pygmy perch in Long Swamp provided careful management of any construction to ensure no infiltration of pollutants into dune slack wetland can occur that might result a decrease in the Yarra pygmy perch population.
Threatened species: birds	Maintain presence and abundance of threatened bird species at the site: Australasian Bittern, Hooded Plover, Fairy Tern.	The Project is not expected to alter the presence of these species. Due to their habitat separation from the Project Area, Hooded Plover and Fairy Tern are considered very unlikely to be involved in turbine collision. Australasian Bittern is expected to fly across the wind farm component of the Project and to be at potential risk of turbine and powerline collision. While the Project is not considered to have potential to affect the presence of these species in the Ramsar site, the term ‘abundance’ is not defined. It is possible that rare collisions by Australasian Bitterns may occur which could affect their abundance in the Ramsar site. Hooded Plover and Fairy Tern are highly unlikely to interact with turbines and it is not likely that their abundance in the Ramsar site would be affected.
Threatened species:	Annual occurrence of Growling Grass Frog within the site	The Project has no potential to reduce the abundance of Growling Grass Frog within the Ramsar site. It is noted that surveys for the species undertaken for the Project did not detect it.

Critical CPS	Resource condition target	Assessment of projects
Growling Grass Frog		
Threatened species: Ancient Greenling	Maintain population of Ancient Greenling	The Project has no potential to reduce the abundance of Ancient Greenling provided careful management of any construction to ensure no infiltration of pollutants into dune slack wetlands can occur that might result a decrease in the Ancient Greenling population.
Ecological connectivity	Maintain ecological connectivity between habitats in the site	The Project has no potential to alter ecological connectivity between terrestrial and freshwater habitats in the Ramsar site. While a level of turbine collision risk may affect movements of some individual birds and bats, the great majority of the Project area will remain permeable to individual movements and to gene flow between habitats within the Ramsar site.

7.11 Cumulative impacts

Ideally, consideration of cumulative impacts on any receptor species would be evaluated based on the measure of change that might be experienced by its population. A 'population' approach is ecologically meaningful as it responds appropriately to the population sizes of different species.

The potential for cumulative effects of the Project on threatened mammal, reptile, and aquatic fauna species are considered to be negligible, relative to pre-existing loss of habitat.

There is potential for the Project contribute to cumulative impacts on some threatened avifauna species.

The cumulative impact assessment identified potential for the Project to contribute to cumulative impacts, in combination with other wind energy projects, on:

- Southern Bent-wing Bat
- Australasian Bittern
- Wedge-tailed Eagle
- White-throated Needletail.

Suitable habitat for SBWB occurs at most wind farms in south-west Victoria. Moloney *et al* (2019) estimated 0.1 fatalities per turbine per year (from 1 wind farm) based on 8 fatalities detected at 2 wind farms. These two wind farms have a minimum blade tip height of 28 m and 29 m above the ground, around half of the 60 m minimum blade tip height of the Project's turbines. Existing wind farms may be having a low, unquantified population-level effect, and the Project has potential to increase cumulative population-level impact for this species.

Most Victorian wind farms don't contain suitable habitat for Australasian Bittern, but widespread movements mean birds may occasionally pass through some Victorian wind farms. There are no known pre-existing impacts from wind farms on this species. As outlined in **Section 7.10.1.1**, the Project has the potential to result in a population-level impact if an Australasian Bittern was struck by a wind turbine, given the low population numbers for this species. Although no impacts have been documented or quantified, there is potential for additional mortalities at other wind farms and transmission lines (either associated or not associated with wind farms) within the species Victorian range, which could have a cumulative impact on the ongoing viability of the Australasian Bitterns population.

Although Wedge-tailed Eagle is not a threatened species, it is possible that cumulative effects of collisions may be having an unquantified population-level impact. The Project has some potential to contribute to this cumulative effect, however the rate at which the species was recorded at the wind farm site was substantially lower than those documented at other Victorian wind farms. This indicates that the species uses the site at a comparably low level, likely due to the pine plantation not providing suitable habitat. This is reflected in the low estimates of collision risk as shown in modelling undertaken for the species as part of the Project (see Section 35 of the **FFIA (Appendix C).**

White-throated Needletail are present in Australia during warmer months only, however they may occasionally fly over or through all Victorian wind farms. DELWP (Moloney et al. 2019) was unable to estimate total collision rate for White-throated Needletail at any wind farm in their investigation into existing data on bird and bat collisions at multiple Victorian wind farms. Existing wind farms may be having low, unquantified population-level effect, and the Project has some potential to increase cumulative population-level impact.

Recognising that there is residual uncertainty regarding abundance, movement patterns and flight heights of some species, unexpected collisions will be managed in accordance with the BBAMP (see mitigation measure MM-BD12 and **Draft BBAMP Appendix AA**).

A full qualitative assessment of potential for cumulative impacts on flora and fauna species has been provided in Section 34 of the **FFIA (Appendix C)**.

7.12 Mitigation measures

As outlined in **Section 7.8**, the Project has sought to understand and respond to the biodiversity and habitat values that are present within and around the Project Area. This has been done through site selection, project design development (including iterative design development in response to the impact assessment findings), and development of management and mitigation measures (including adaptive management responses) to manage potential residual impacts and risks. Several design changes have been made to avoid or minimise potential impacts, including turbine free buffers near sensitive areas and increasing the minimum blade tip height to reduce collision risk. Direct impacts on native vegetation have been avoided and minimised to the extent practicable, primarily through siting infrastructure in areas where remnant vegetation is not present.

Residual impacts on biodiversity values during construction and operation of the Project will be managed by measures, protocols, and processes to be documented in several environmental management plans including:

- Construction Environmental Management Plan (CEMP)
- Native Vegetation Plan (NVP) (see mitigation measure MM-BD01)
- Flora and Fauna Management Plan (FFMP) (see mitigation measure MM-BD10)
- Bird and Bat Adaptive Management Plan (BBAMP) (see mitigation measure MM-BD12 and **Draft BBAMP Appendix AA**)
- Site Rehabilitation Plan.

These plans are required under the Project's Incorporated Document (see **Planning Scheme Amendment Documents (Appendix Y)**.

Table 7.19 outlines the mitigation measures developed to avoid, minimise, and manage impacts on biodiversity values from construction and operation of the Project. These measures will be incorporated into the appropriate management plans.

Further investigation into the feasibility of using on-site radar and turbine shutdown protocols at times of the year when key species are most likely to be present, is being undertaken. These protocols will be included as part of the BBAMP if considered feasible (see mitigation measure MM-BD12 and **Draft BBAMP Appendix AA**).

Table 7.19: Biodiversity mitigation measures

MM ID	Mitigation measure	Relevant work area	Phase
MM-BD01	**Native Vegetation** Before any native vegetation is removed, a Native Vegetation Plan will be prepared in consultation with the Victorian Department of Energy, Environment and Climate Action and to the satisfaction of the responsible authority. The Native Vegetation Plan will: • Include a final Biodiversity Assessment Report or similar which identifies all losses being approved by this Incorporated Document and the associated offset requirements, in accordance with the Guidelines for the removal, destruction or lopping of native vegetation (DELWP 2017) • Identify: o Native vegetation to be removed o Any current mapped wetlands that are present on the site o All areas of native vegetation to be retained o Native tree protection zones of trees to be retained o Native vegetation protection zones (no-go zones) for native vegetation to be retained o Areas to be rehabilitated following disturbance activities o Measures to be used during construction to protect native vegetation to be retained including no-go areas and fencing. • Identify where construction activities are limited to zones or corridors to avoid or minimize impacts on native vegetation and habitat. • Provide measures to ensure that: o Activities within 'no-go zones' areas of native vegetation will be effectively protected and retained o Any tree or vegetation protection zone associated with the permitted use and/or development is adequately protected, except with the written consent of the Minister. for Planning. Specific measures to be included in the Native Vegetation Plan include: • Before development starts, all persons undertaking the vegetation removal or works on site must be made aware of all relevant permit conditions and associated statutory requirements or approvals. • Before development starts, a native vegetation protection fence must be erected around all patches of native vegetation and scattered trees to be retained on site. This fence will protect the tree by demarcating the tree protection zone and must be erected at a radius of 12 x the diameter at a height of 1.3 m to a maximum of 15 m but no less than 2 m from the base of the trunk of the tree. The fence must be constructed of star pickets/ chain mesh/ or similar. The fence must remain in place until all works are completed to the satisfaction of the responsible authority. • Except with the written consent of the responsible authority, within the area of native vegetation to be retained and any tree or vegetation protection zone associated with the permitted use and/or development, the following is prohibited: o Vehicular or pedestrian access; o Trenching or soil excavation; o Storage or dumping of any soils, materials, equipment, vehicles, machinery or waste products; o Entry and exit pits for the provision of underground services; and o Any other actions or activities that may result in adverse impacts on retained native vegetation.	All areas	Construction

MM ID	Mitigation measure	Relevant work area	Phase
	To prevent the spread of weeds and pathogens, all vehicles must be made free of soil, seed and plant material before being taken to the works site and again before being taken from the works site, during and on completion of the Project.		
MM-BD02	**Offsets** Appropriate offsets for vegetation losses will be acquired, in accordance with the Guidelines for the removal, destruction or lopping of native vegetation (DELWP 2017). A final offset strategy for the Project will be developed in consultation with public land managers and Project stakeholders including the Victorian Department of Energy, Environment and Climate Action. The number of trees assumed lost due to installation of the transmission line is currently greater than the likely losses due to over estimation of Tree Protection Zones (TPZ) encroachment. Over-estimating losses ensures secured offsets will account for minor design changes or unintended encroachment of TPZs and structural root zones during construction. The offset strategy will cover all anticipated offsets (including the potentially over-estimated offsets for predicted TPZ encroachment). It is intended to secure all offsets predicted as part of the impact assessments prior to vegetation removal in accordance with the Guidelines	All areas	Construction
MM-BD03	**Assessment of tree health along Boiler Swamp Road** The following surveys will be carried out on trees adjacent to Boiler Swamp Road to assess for tree health: • A pre-construction survey to benchmark tree health will be conducted to provide a benchmark assessment. This will involve assessment of tree health, structure and ULE (useful life expectancy). • A post-construction survey will be conducted within 6 months of the completion of construction. The purpose of this assessment is survey for any immediate impacts on tree health, and to re-assess the level of TPZ Tree Protection Zone impacts, using accurate data on the actual extent of excavation. • A further post-construction survey will be conducted between 24 and 30 months following completion of construction. The purpose of this assessment is to compare changes in tree health, and assess the extent of any tree deaths that can be attributed to the construction of the transmission line. If more offset credits were secured than what was needed, the reconciliation mechanism outlined in the Assessors Handbook (Appendix 8 - <https://www.environment.vic.gov.au/__data/assets/pdf_file/0022/91255/Assessors-handbook-Applications-to-remove,-lop-or-destroy-native-vegetation-V1.1-October-2018.pdf>) will be used to hold remaining credits for future impacts proposed by the project, or for selling credits on. The surplus credits can only be used if they match the offset requirements of any future impacts, such as minimum Strategic Biodiversity Values and with the consent of the Victorian Department of Energy, Environment and Climate Action/Glenelg Shire Council.	Transmission Line	Pre-construction Operation
MM-BD04	**Tree Protection Zones** Trees not requiring direct removal will be protected in appropriately marked Tree Protection Zones in accordance with AS 4970:2009 *Protection of trees on development sites*. In accordance with AS 4970:2009, directional drilling at a depth of 600 mm or greater will be undertaken to avoid impacts on roots within tree protection zones of Apple Jack trees adjacent to Boiler Swamp Road within Cobboboonee National Park and Cobboboonee Forest Park.	All areas	Construction

MM ID	Mitigation measure	Relevant work area	Phase
MM-BD05	**Tree pruning** Any tree pruning required will be undertaken by an experienced arborist to ensure unnecessary damage does not occur to the tree. Understorey vegetation will be protected during tree pruning. Any pruning to the canopy or major structural branches of any tree to be retained must be undertaken in accordance with Australian Standard 4373-2007 – *Pruning of Amenity Trees*.	All areas	Construction Operation
MM-BD06	**Weed and pest animal control** Best practice methods for weed and pest animal control, such as vehicle and machinery hygiene, will be implemented in collaboration with relevant landowners and land management authorities. These methods will be documented in the Biosecurity Management Plan, to be prepared as part of the Construction Environmental Management Plan. The Biosecurity Management Plan will be prepared to the satisfaction of the responsible authority and in consultation with Agriculture Victoria, and the Victorian Department of Energy, Environment and Climate Action and Parks Victoria where it relates to works associated with the underground transmission line in the Cobboboonee National Park and Cobboboonee Forest Park. The Biosecurity Management Plan must include: • Procedures to prevent biosecurity risks, which may include (but are not limited to): o The cleaning of all plant and equipment before transport onto and off the site. o The use of material/products on site which are free of invasive plants and animals. o A protocol for effective identification of biosecurity risks, early intervention to manage biosecurity risks, ongoing monitoring of biosecurity risks, trace-backs, and integrated control measures when entry, establishment or spread of specific risk targets is identified. o A requirement to comply with approved government or industry standards and procedures for the identification, prevention and management of biosecurity risks that apply from time to time. The Biosecurity Management Plan may be prepared in sections or stages.	All areas	Construction
MM-BD07	**Boiler Swamp Road** Construction activities for the underground transmission line along Boiler Swamp Road will be limited to the existing road formation. Root investigations will be undertaken before construction of the transmission line section along Boiler Swamp Road commences to assess presence and depth of roots beneath the road formation. The purpose of the root investigations is to inform the potential use of additional alternative impact avoidance techniques (such as Horizontal Directional Drilling (HDD)). HDD will be used to avoid impacts on Apple Jack (*Eucalyptus splendens*) trees adjacent to Boiler Swamp Road. The locations of the HDD sections must be generally in accordance with the locations shown in Figure 6c of the **Flora and Fauna Existing Conditions and Impact Assessment (Appendix C)**. A plan showing the locations of the final HDD sections must form part of the Native Vegetation Plan (see mitigation measure MM-BD01), which will be prepared to the satisfaction of the responsible authority before development starts. HDD will be done in accordance with AS 4970:2009 Protection of trees on development sites, including ensuring directional drilling is at a depth of 600 mm or greater to avoid potential impacts on roots within tree protection zones of Apple Jack trees.	Transmission Line	Construction

MM ID	Mitigation measure	Relevant work area	Phase
MM-BD08	**Pre clearance surveys** Pre clearance surveys will be undertaken prior to removal of native vegetation in areas with known occurrences of significant species, such as Dune Fan-flower (*Scaevola calendulacea*), One-flower Early Nancy (*Wurmbea dioica*), Hairy Boronia (*Boronia pilosa*), Wiry Bossiaea (*Bossiaea cordigera*), Rough Daisy-bush (*Olearia asterotricha*), Tiny Violet (*Viola sieberiana*), and Western Golden-tip (*Goodia medicaginea*). Pre-clearance surveys will also investigate the potential occurrence of threatened species including: • Heath Mouse (*Pseudomys shortridgei*) (within the plantation) • Striped Worm-lizard (*Aprasia striolata*) (within the plantation) • Eastern Bearded Dragon (*Pogona barbata*) (within the plantation) • Southern Toadlet (*Pseudophryne semimarmorata*) (drainage lines along Boiler Swamp Road) • Portland Burrowing Crayfish (*Engaeus strictifrons*) (wetlands in the north-east wind farm site) • Hairy Burrowing Crayfish (*Engaeus sericatus*) (wetlands in the north-east wind farm site) • Yellow-bellied Glider (*Petaurus australis australis*) (trees adjacent to Boiler Swamp Road). The focus of these surveys will be on trees with potential hollows. The surveys will be undertaken by an appropriately qualified and experienced ecologist and at an appropriate time of year for each species to maximise the probability of detection. Any known locations, or locations identified in pre-clearance surveys will be marked, and treated as no go-zones if the location is within 30 m of construction activities. If any threatened flora species are recorded within the previously unsurveyed areas, these areas will be avoided, and subsequently addressed within the Construction Environmental Management Plan for the Project, including updating mapping.	All areas	Construction
MM-BD09	**Rehabilitation of temporary disturbance areas** Temporary disturbance areas, such as those associated with the turbine laydown areas and construction compounds, will be rehabilitated as soon as possible following cessation of the disturbing activity. The sites will be planted with appropriate locally indigenous species, unless otherwise agreed with the landowner or land manager (e.g. disturbed areas of pine plantation would be returned to the forestry company for reintegration into their operations). Rehabilitated areas will be monitored, with adaptive management applied in locations where rehabilitation has involved planting of locally indigenous species to control weeds and ensure successful establishment of final vegetation type. Areas to be rehabilitated, and the rehabilitation arrangements as agreed with relevant landowners, will be detailed in the Project's Construction Environmental Management Plan.	All areas	Construction Operation
MM-BD10	**Flora and fauna management** A Flora and Fauna Management Plan will be prepared in consultation with the Victorian Department of Energy, Environment and Climate Action and to the satisfaction of the responsible authority. The Flora and Fauna Management Plan will include the following requirements: • Pre-clearance targeted flora and fauna surveys must be undertaken for flora species listed under the *Flora and Fauna Guarantee Act 1988 (*Vic) and the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) within areas requiring removal of native vegetation. • Pre-clearance surveys will be undertaken for native vegetation with	All areas	Construction

MM ID	Mitigation measure	Relevant work area	Phase
	known occurrences of listed species. • All habitat to be retained is to be clearly marked on construction drawings. • All habitat to be retained is to be clearly marked on the ground (e.g. with temporary fencing and flagging, as well as signage) where located in close proximity to the development footprint, and designated as 'no-go zones'. • Specific measures to be implemented to avoid, minimise and mitigate potential impacts on State and Commonwealth endangered species. • Measures to further minimise and mitigate impacts on native fauna during construction and habitat clearance. • Procedures for wildlife handling at locations requiring removal of native vegetation.		
MM-BD11	**Australasian Bittern** Any works, such as road construction, within Brolga (Antigone rubicunda) breeding buffers (as the majority of known and suitable habitat for Australasian Bittern (Botaurus poiciloptilus) is already within Brolga breeding buffers) will be conducted outside the Australasian Bittern breeding season (October to February). A pre-construction survey will be conducted in January, February, March, and April to confirm breeding has finished before any works are commenced, noting that Australasian Bittern breeding season extends to February. The following measures will also be implemented and will be documented in the Flora and Fauna Management Plan and/or the Bird and Bat Adaptive Management Plan: • Undertake surveys to identify presence and to estimate numbers of Australasian Bitterns in wetland habitats within proximity to the Project Area, to provide a baseline for monitoring. The locations and timing for surveys will be set out in the Flora and Fauna Management Plan and developed in consultation with the Victorian Department of Energy, Environment and Climate Action. • A contingency plan will be developed for stopping works within Brolga breeding buffers if Australasian Bitterns are observed, and the observation is confirmed by a qualified ecologist, within suitable breeding wetland habitat and engaging in breeding activity. • For nocturnal construction works that would occur within 200 m of potential Australasian Bittern habitat during the breeding season, investigate and implement measures to minimise light spill. • Develop an offset strategy to compensate for mortalities to avoid significant impact on the population as detailed in the Bird and Bat Adaptive Management Plan. GPS/satellite tracking of movements, and other monitoring technologies will also be considered to further inform potential adaptive management strategies for Australasian Bittern. Where these are identified as being available and effective, they will be included in the Bird and Bat Adaptive Management Plan to be prepared for the Project.	All areas	Pre-Construction Construction
MM-BD12	**Bird and Bat Adaptive Management Plan** A Bird and Bat Adaptive Management Plan (BBAMP) will be developed in consultation with the Victorian Department of Energy, Environment and Climate Action (DEECA) and to the satisfaction of the responsible authority. The BBAMP will be developed prior to construction commencing and will detail the objectives, strategies and activities for minimising bird and bat strike arising from operation of the wind farm, including Brolgas. The primary objective of the BBAMP will be to ensure operation of the Project does not result in net significant or lasting impacts on the viability or	Wind farm	Construction Operation

MM ID	Mitigation measure	Relevant work area	Phase
	conservation status of birds and bats. The BBAMP will minimise, manage and mitigate bird and bat mortality arising from the operation of the wind farm. The BBAMP will also aim to determine whether the presence, abundance and flight behaviours of species of concern are altered, relative to pre-construction levels, in response to the presence and operation of the wind farm. The Project will investigate employing smart turbine curtailment as part of the BBAMP to minimise bird and bat collisions through technologies that detect when a bird/bat is approaching a turbine rotor, and shuts down the turbine. These may include radar; optical and/or infra-red camera systems; animal call-recognition or a combination of such technologies. The BBAMP will contain: • A statement of the objectives and overall strategy for minimising bird and bat mortality through design and the operation of the wind energy facility. • A procedure for implementation of suitable mitigation measures for mortalities. • A comprehensive, science-based mortality monitoring program to monitor mortality of listed species and any other bat and avifauna species. The monitoring program must commence when the first turbine is commissioned or such other time as is approved by DEECA and continue for a duration of at least five years. The duration and timing of the monitoring plan may be altered with the written consent of the responsible authority and in consultation with DEECA. Outcomes of the monitoring will be reported to DEECA and be incorporated into the plan to ensure that the management actions are as effective as possible, with impact thresholds to trigger adaptive management responses. This program will: o Monitor for blade strikes and determine the effectiveness of mitigation and management measures, including carcass searches, carcass persistence trials and searcher efficiency trials. o Identify impact triggers for threatened and non-threatened species requiring a management response to reduce impacts. o Conduct surveys at a time interval and sampling frequency agreed to with DEECA Environment to ascertain: o The species, number, age, sex (where possible) and date of any listed species mortality and any other bat and avifauna species mortality. o Seasonal and yearly variation in the number of listed species mortality and any other bat and avifauna species mortality. o Whether further detailed investigations of any potential impacts on listed species and any other bat and avifauna species mortality are warranted. o Procedures for reporting strikes/mortalities of listed species to DEECA within 2 business days of becoming aware of any strike/mortality. o Procedures for reporting strikes/mortalities of bat and avifauna species other than listed species to DEECA Environment monthly. o Information on the efficacy of searches for carcasses of birds and bats, and, where practicable, information on the rate of removal of carcasses by scavengers so that correction factors can be determined to enable calculations of the likely total number of mortalities. o Measures to verify whether collision mortalities are within the range predicted during assessment of the Project and to identify ongoing improvement measures.		

MM ID	Mitigation measure	Relevant work area	Phase
	o Procedures for determining whether further detailed investigations of any potential impacts on native birds and bats are warranted. Any further detailed investigations required are to be undertaken in consultation with DEECA Environment. o Procedures for periodic reporting, within agreed timeframes, of the findings of the monitoring to DEECA Environment. Such reports must be made publicly available on the project website o A data sharing agreement to provide georeferenced, time stamped, data that is collected as part of the BBAMP. All data will be entered into a database to be maintained by the wind farm operator. Raw data will be available to relevant regulatory authorities on request. o Procedures for the regular removal of carcasses likely to attract raptors to areas near turbines. When the monitoring program required under the BBAMP is complete, the operator will submit a report to the Victorian Minister for Planning Minister for Planning and DEECA Environment, setting out the findings of the program. The report will be: • to the satisfaction of the responsible authority • made publicly available on the operator's website. The Independent Environmental Auditor (IEA) will undertake periodic independent review of the BBAMP content and ongoing monitoring of the plan's implementation to ensure it reflects current operational obligations, relevant legislation and policy (see mitigation measure MM-IA01). After considering the findings of the monitoring program and consulting with DEECA Environment, the responsible authority may direct further investigation of impacts on birds and bats. The further investigation must be undertaken to the satisfaction of the responsible authority and DEECA Environment. A framework BBAMP has been provided in Appendix 10 of the **Flora and Fauna Existing Conditions and Impact Assessment (Appendix C).**		
MM-BD13	**Southern Bent-wing Bat Management** The following measures will be included in the Bird and Bat Adaptive Management Plan (BBAMP) to manage potential impacts on Southern Bent-wing Bat: • The BBAMP must include intensive carcass monitoring across the wind farm, particularly in the early stages of operation. • Turbines selected for monitoring will consider stratification by habitat type (plantation and farmland), distribution throughout the wind farm site and proximity to known caves. • Frequency of monitoring will be at least monthly during the monitoring period, and the plan will consider pulse surveys during peak activity periods, including autumn and spring. • Within plantation areas the ideal searchable area for carcass searches will include both cleared areas (50 m radius) and areas under the pine canopy. This will need to be considered in the development of the search regime (including searcher efficiency and carcass retention trials) and mathematical approaches to extrapolating findings will need to be customised to the study. • The plan will specify a sequence of actions to be undertaken if Southern Bent-wing Bat (*Miniopterus orianae bassanii*) mortalities are recorded, including intensification investigations, and potentially low-wind speed curtailment of specific turbines.	Wind farm	Operation
MM-BD14	**Seasonal Nocturnal Low wind speed curtailment**	Wind farm	Operation

MM ID	Mitigation measure	Relevant work area	Phase
	Seasonal nocturnal low wind speed curtailment for Southern Bent-wing Bat will be developed during finalisation of the Bird and Bat Adaptive Management Plan and include: • Daily timing: 30 minutes following sunset to 3 hours before sunrise. • Seasonal timing: September-November and February-April (5 months). • Climatic conditions: Temperatures above 10°C and not raining. • Cut-in wind speed: 4.5 m/second. Seasonal nocturnal low wind speed curtailment will be included in the BBAMP.		
MM-BD15	**Southern Bent-wing Bat Recovery and Funding** The Proponent has made a commitment for a $1,000,000 annual recovery fund for the operational life of the Project (30 years), which is to focus on Southern Bent-wing Bat recovery actions, but also to have the ability to assist in recovery actions for other species. Recovery actions will be workshopped with the Southern Bent-wing Bat recovery team and other relevant conservation organisations. The *National Recovery Plan for the Southern Bent-wing Bat Miniopterus orianae bassanii* (DELWP 2020) and the *Conservation Advice Miniopterus orianae bassanii Southern Bent-wing Bat* (TSSC 2021) detail proposed recovery actions, which includes a range of research to address knowledge gaps relating to understanding population dynamics, movement behaviour and mitigation approaches.	Wind farm	Operation
MM-BD16	**Improved powerline visibility** The overhead powerline along Portland-Nelson Road will be marked with standard commercially available bird diverters to increase visibility to birds and bats. Overhead powerlines along Portland-Nelson Road will be marked with diverters visible at night to avoid and minimise Australasian Bittern collisions as this species is most likely to move over the wind farm between dusk and dawn when moving seasonally between inland and coastal habitats.	Wind farm	Operation

7.13 Conclusion

This chapter has considered potential impacts and their associated effects on ecological features in and around the Project Area, such as protected areas and the species of flora and fauna are known or anticipated to be present.

Extensive field studies have been undertaken between 2019 and 2023 to provide baseline information on habitats and flora and fauna. Surveys included assessments of native vegetation, targeted surveys for significant flora and fauna, bird utilisation surveys, and deployment of bat detectors at multiple locations and at multiple heights.

Most of the wind farm site is within highly disturbed forestry and agricultural land, with little in the way of remnant ecological value including native vegetation and important habitat. The pine and blue gum plantations are regularly managed and harvested and are bisected by an extensive access track network that receives regular use. The adjacent agricultural land is used for grazing and occasional cropping purposes and although largely devoid of ecological value, does contain some ephemeral depressions which provide habitat for species such as Brolga. Adjacent conservation areas including Discovery Bay Coastal Park, Lower Glenelg National Park, and Cobboboonee National Park, provide important habitat for many protected species, including flora and fauna. Protected species and/or suitable habitat for protected species has been identified in these surrounding areas during the Project studies, including Australasian Bittern, Southern Bent-wing Bat, Orange-bellied Parrot, and several migratory shorebirds. Some of these species are less common or have a listing status at Commonwealth and State-levels that afford them important consideration when assessing the potential for Project impacts.

The transmission line connecting the Project to the electricity grid would be installed beneath a road that traverses the Parks, as well as cleared agricultural land. The conservation areas adjacent to the road provide habitat for several protected flora and fauna species, some of which were identified during Project surveys or via consultation with land managers Parks Victoria and DEECA.

Without design refinements and mitigation there was varying levels of potential for impacts on important biodiversity values. This included direct impacts on listed flora and fauna and habitats, particularly wetland habitats in the north-east corner of the wind farm site and on vegetation adjacent to Boiler Swamp Road.

A summary of the potential impacts on flora, fauna and habitats is provided in **Table 7.20**.

The **FFIA (Appendix C)** also identifies residual uncertainties. These are also included in **Table 7.20**. The residual uncertainties have been analysed and have informed the preparation of mitigation measures to be incorporated into the various management plans that will be prepared for the Project, including a Construction Environmental Management Plan, Operational Environmental Management Plan, and Bird and Bat Adaptive Management Plan. This includes commitments by the Proponent to carry out monitoring of key species such as Australasian Bittern to further inform adaptive management responses if required.

In addition, and in response to the low but apparent potential for SBWB to collide with wind turbines, the Proponent is committing to implementing seasonal nocturnal low wind speed curtailment, with the following parameters (to be confirmed via development of the Bird and Bat Adaptive Management Plan):

- Daily timing: 30 minutes following sunset until 3 hours before sunrise
- Seasonal timing: September-November and February to March (5 months)
- Climatic conditions: when temperature is above 10^{o}C and when it is not raining.
- Cut-in wind speed: 4.5 m/s.

Following an iterative design refinement process and the development of responsive mitigation and adaptive management responses, no significant residual effects on biodiversity are expected.

Table 7.20: Summary of flora and fauna impacts

Ecological value	Potential impact pathways	Key avoidance and mitigation measures	Summary of potential residual impacts
Native vegetation and habitat	• Minor vegetation removal required throughout Project Area. • Indirect impacts to trees for construction of the underground transmission line.	• Constructing the wind farm within disturbed environments (pine and blue gum plantations, cleared agricultural land). • Locating sensitive parts of the transmission line beneath an existing road. • Using existing public roads, access tracks, and ingress/egress points from the main road network with limited need for upgrades. • Avoiding identified native vegetation and DEECA mapped wetlands where possible.	Impacts on 8.696 ha of native vegetation including: • 3.755 ha of losses along the transmission line, which includes 2.906 ha of assumed losses associated with TPZ incursions of greater than 10%. • 4.920 ha of direct removal of native vegetation associated with the wind farm site and road upgrades.
Threatened flora species	• Direct removal required for construction. • Indirect impacts on threatened tree species (Apple Jack and Western Peppermint) due to installation of the underground transmission line along Boiler Swamp Road.	• Construction of the wind farm within disturbed environments (farmland and pine plantation). • Avoidance of identified native vegetation and threatened flora species. • Pre-construction targeted surveys. • Avoidance and minimisation of impacts on threatened tree species along the transmission line route through the use HDD and exploration of other lesser impact construction methods.	• Species recorded near the construction footprint will be avoided during detailed design. • Major encroachment on TPZs of 83 Western Peppermint along Boiler Swamp Road.
Threatened ecological communities	• Direct vegetation/ habitat removal • Hydrological modification due to surface works or groundwater drawdown	• Construction of the wind farm within disturbed environments (farmland and pine plantation). • Exclusion of turbines within 300 m of conservation reserves and 500 m of wetlands within the Ramsar Site. • Exclusion of turbines where groundwater levels in the plantation are predicted to be within 6 m of the ground surface. • Exclusion of wind farm infrastructure within the recommended buffer zone of 1,220 m of open water in the Karst wetlands TEC (Lake Mombeong).	• Project is unlikely to impact on any TECs directly or indirectly.

Ecological value	Potential impact pathways	Key avoidance and mitigation measures	Summary of potential residual impacts
Wetlands	• Direct vegetation/ habitat removal • Hydrological modification due to surface works or groundwater drawdown	• Avoidance of identified native vegetation and DEECA mapped wetlands where possible. • Exclusion of turbines within 500 m of wetlands in the Ramsar site, or where groundwater levels in the plantation are predicted to be within 6 m of the ground surface where dewatering would be required for turbine foundations.	• Construction planned within DEECA mapped wetlands in farmland in the north-eastern section of the wind farm site. Losses are included in the native vegetation assessment.
Terrestrial and arboreal mammals	• Direct habitat removal for construction • Increases in road traffic during construction and operation	• Construction of the wind farm within disturbed environments (farmland and pine plantation). • Minimal disturbance to areas of native understorey vegetation.	• Minor habitat removal and increases in road traffic may result in some direct impact on small mammal species. • Very low likelihood of population level impacts, due to minimal removal of understorey vegetation habitat.
Threatened reptiles	• Direct habitat removal required for construction	• Construction of the wind farm within disturbed environments (farmland and pine plantation). • Minimal disturbance to areas of native understorey vegetation. • Exclusion of turbines within 300 m of conservation reserves.	• Minor loss of habitat along some roadsides due to track widening may impact on Striped Worm-lizard and Eastern Bearded Dragon. • Impacts expected to be minor and not affecting viability of local population.
Aquatic fauna	• Direct habitat removal • Hydrological modification due to surface works or groundwater drawdown.	• Avoidance of direct impacts on aquatic habitats. • Avoidance of indirect impacts on aquatic habitats by surface or groundwater hydrological changes.	• The Project is unlikely to impact on threatened fish. • Potential minor impacts on Southern Toadlet, Portland Burrowing Crayfish and Hairy Burrowing Crayfish from transmission line construction, unlikely to be population level impacts.
Australasian Bittern	• Collision with turbines or transmission lines.	• Construction of the wind farm within non-preferred environments for this species (farmland and pine plantation). • Locating the transmission line underground. • Minimum blade sweep height of turbines to be greater than 60 m above ground level.	• Using the precautionary principle, potential for population level impacts due to likely collisions during the seasonal/migratory movements between coastal wetlands south of the Project and inland wetlands.

Ecological value	Potential impact pathways	Key avoidance and mitigation measures	Summary of potential residual impacts
		• Exclusion of turbines within 300 m of conservation reserves. • Exclusion of turbines within farmland between conservation reserves and the Kentbruck Heath. • Turbine exclusion areas from Brolga breeding habitat wetlands. • Construction within Brolga breeding habitat wetland buffers to be undertaken outside of the Australasian Bittern breeding season. • Adaptive Bird and Bat Management Plan (BBMP).	
Southern Bent-wing Bat	• Mortality due to collision with turbines or transmission lines.	• Construction of the wind farm within disturbed environments (farmland and pine plantation). • Exclusion of turbines within 300 m of conservation reserves. • Locating the transmission line underground. • Minimum blade sweep height of turbines to be greater than 60 m above ground level. • Low wind speed curtailment during key activity periods. • Adaptive Bird and Bat Management Plan (BBMP).	• Risk of collision is very low and resultant mortality should remain below the thresholds noted in the PVA that would otherwise accelerate extinction risk.
White-throated Needletail	• Collision with turbines or transmission lines.	• Construction of the wind farm within non-preferred environments for this species (farmland and pine plantation). • Locating the transmission line underground. • Minimum blade sweep height of turbines to be greater than 60 m above ground level. • Adaptive Bird and Bat Management Plan (BBMP).	• Collision risk modelling predicts 1.19 collisions per annum at 0.95 avoidance rate. This is not expected to constitute a significant impact (< 0.1% of the population).
South-eastern Red-tailed Black Cockatoo	• Habitat loss (transmission line). • Collision with turbines or power lines.	• Construction of the wind farm within non-preferred environments for this species (farmland and pine plantation). • Locating the transmission line underground. • Minimum blade sweep height of turbines to be greater than 60 m above ground level. • Exclusion of turbines within 300 m of conservation reserves.	• Some loss of potential foraging trees due to indirect impacts on TPZs for construction of the underground transmission line. • Flights within the Project Area are considered rare and it is also considered rare for flights within the rotor swept area.

Ecological value	Potential impact pathways	Key avoidance and mitigation measures	Summary of potential residual impacts
		• Adaptive Bird and Bat Management Plan (BBMP).	• The Project is unlikely to have a significant impact on the species.
Orange-bellied Parrot	• Collision with turbines or powerlines	• Construction of the wind farm within non-preferred environments for this species (farmland and pine plantation). • Locating the transmission line underground. • Minimum blade sweep height of turbines to be greater than 60 m above ground level. • Exclusion of turbines within 300 m of conservation reserves. • Adaptive Bird and Bat Management Plan (BBMP).	• Movements through the Project Area, away from preferred coastal environments are likely to be infrequent. • Flights within rotor swept height are rare. • Collision with turbines considered extremely unlikely to occur.
Blue-winged Parrot	• Collision with turbines or powerlines	• Construction of the wind farm within non-preferred environments for this species (farmland and pine plantation). • Locating the transmission line underground. • Minimum blade sweep height of turbines to be greater than 60 m above ground level. • Exclusion of turbines within 300 m of conservation reserves. • Adaptive Bird and Bat Management Plan (BBMP).	• Collision risk modelling predicts 1.38 collisions per annum at 0.95 rotor avoidance rate.
Other threatened waterbirds / Shorebirds, gulls and terns	• Collision with turbines or transmission lines.	• Construction of the wind farm within non-preferred environments for this species (farmland and pine plantation). • Locating the transmission line underground. • Minimum blade sweep height of turbines to be greater than 60 m above ground level. • Exclusion of turbines within 300 m of conservation reserves. • Exclusion of turbines within farmland between conservation reserves and the Kentbruck Heath. • Adaptive Bird and Bat Management Plan (BBMP).	• Some potential for threatened waterbird collisions but population level impacts highly unlikely. • Potential for rare collisions by some shorebirds, gulls and terns, however it is unlikely that the project will have population level significant impacts on these species.
Owls	• Impacts on habitat along transmission line.	• Construction of the wind farm within disturbed environments (farmland and pine plantation). • Locating the transmission line underground.	• Low likelihood of regular mortalities due to collision, unlikely to result in population level impacts.

Ecological value	Potential impact pathways	Key avoidance and mitigation measures	Summary of potential residual impacts
	• Collision with turbines or power lines.	• Exclusion of turbines within 300 m of conservation reserves. • Minimum blade sweep height of turbines to be greater than 60 m above ground level. • Adaptive Bird and Bat Management Plan (BBMP).	• Relatively minor impacts on habitat trees in areas of extensive habitat.
Rufous Bristlebird	• Collision with turbines or power lines. • Habitat disturbance	• Construction of the wind farm within disturbed environments (farmland and pine plantation). • Minimal disturbance to areas of native understorey vegetation. • Exclusion of turbines within 300 m of conservation reserves. • Minimum blade sweep height of turbines to be greater than 60 m above ground level. • Adaptive Bird and Bat Management Plan (BBMP).	• Very low likelihood of population level impacts, due to abundance of the species in the area, habitat requirements and flight behaviour.
White-bellied Sea Eagle	• Collision with turbines or transmission lines	• Construction of the wind farm within disturbed environments (farmland and pine plantation). • Exclusion of turbines within 300 m of conservation reserves. • Locating the transmission line underground. • Minimum blade sweep height of turbines to be greater than 60 m above ground level. • Adaptive Bird and Bat Management Plan (BBMP).	• Collisions possible, but likely to be rare events, as the species is uncommon in the area and unlikely to make regular flights over farmland and pine plantation. • Unlikely to be a significant impact on this species.
Fork-tailed Swift	• Collision with turbines or transmission lines.	• Minimum blade sweep height of turbines to be greater than 60 m above ground level. • Adaptive Bird and Bat Management Plan (BBMP).	• Significant impact unlikely as the species is infrequently recorded within the Project Area.

Ecological value	Potential impact pathways	Key avoidance and mitigation measures	Summary of potential residual impacts
Gang-gang Cockatoo	• Habitat loss (transmission line). • Collision with turbines or power lines.	• Construction of the wind farm within non-preferred environments for this species (farmland and pine plantation). • Locating the transmission line underground. • Minimum blade sweep height of turbines to be greater than 60 m above ground level. • Exclusion of turbines within 300 m of conservation reserves. • Adaptive Bird and Bat Management Plan (BBMP).	• Flights through the Project Area are possible, but are likely to be concentrated in the eastern section of the Project Area where no turbines or overhead lines are proposed. • Flights within rotor-swept area (above 60 m) are also possible but rare or highly unlikely, as the species usually flies within the tree canopy. • Unlikely to be a significant impact on this species.
Elegant Parrot	• Collision with turbines or powerlines	• Construction of the wind farm within non-preferred environments for this species (farmland and pine plantation). • Locating the transmission line underground. • Minimum blade sweep height of turbines to be greater than 60 m above ground level. • Exclusion of turbines within 300 m of conservation reserves. • Adaptive Bird and Bat Management Plan (BBMP).	• Impacts unlikely due to the very low reporting rate within the Project Area. • Potential for occasional movements through the wind farm, between coastal habitats and inland heathlands.
Eastern Ground Parrot	• Collision with turbines or transmission lines.	• Construction of the wind farm within non-preferred environments for this species (farmland and pine plantation). • Locating the transmission line underground. • Minimum blade sweep height of turbines to be greater than 60 m above ground level. • Exclusion of turbines within 300 m of conservation reserves. • Exclusion of turbines within farmland between conservation reserves and the Kentbruck Heath. • Adaptive Bird and Bat Management Plan (BBMP).	• Unlikely to be impacted, as species the species is not expected to frequently fly at rotor-swept height.
King Quail	• Collision with turbines or transmission lines.	• Construction of the wind farm within non-preferred environments for this species (farmland and pine plantation).	• Unlikely to be impacted, as species the species is not expected to frequently fly at rotor-swept height.

Ecological value	Potential impact pathways	Key avoidance and mitigation measures	Summary of potential residual impacts
		• Locating the transmission line underground. • Minimum blade sweep height of turbines to be greater than 60 m above ground level. • Exclusion of turbines within 300 m of conservation reserves. • Exclusion of turbines within farmland between conservation reserves and the Kentbruck Heath. • Adaptive Bird and Bat Management Plan (BBMP).	
Little Eagle	• Collision with turbines or transmission lines	• Construction of the wind farm within disturbed environments (farmland and pine plantation). • Exclusion of turbines within 300 m of conservation reserves. • Locating the transmission line underground. • Minimum blade sweep height of turbines to be greater than 60 m above ground level. • Adaptive Bird and Bat Management Plan (BBMP).	• Unlikely to be a significant impact on this species.
Glenelg Estuary and Discovery Bay Ramsar site	• Hydrological modification due to surface works or groundwater drawdown. • Collisions for key species	• Exclusion of turbines within 500 m of wetlands in the Ramsar site, or where groundwater levels in the plantation are predicted to be within 6 m of the ground surface where dewatering would be required for turbine foundations. • Minimum blade sweep height of turbines to be greater than 60 m above ground level.	• Construction or operation of the Project have very little capacity to directly or indirectly result in changes to the Ramsar site with appropriate management measures implemented. • Unlikely to have a significant impact on the Ramsar site as per the EPBC Act significant impact criteria. • No potential for impacts that will exceed definitions for the majority of Resource Condition Targets for the Ramsar site.

NEOEN

Melbourne

Level 7
99 King Street
Melbourne, VIC 3000

P. 1800 966 206
E. contact@kentbruckgreenpowerhub.com.au

umwelt
Environmental & Social Consultants

Melbourne

Suite 2, Level 27
530 Collins Street
Melbourne 3000

P. 1300 793 267
E. info@umwelt.com.au
W. umwelt.com.au