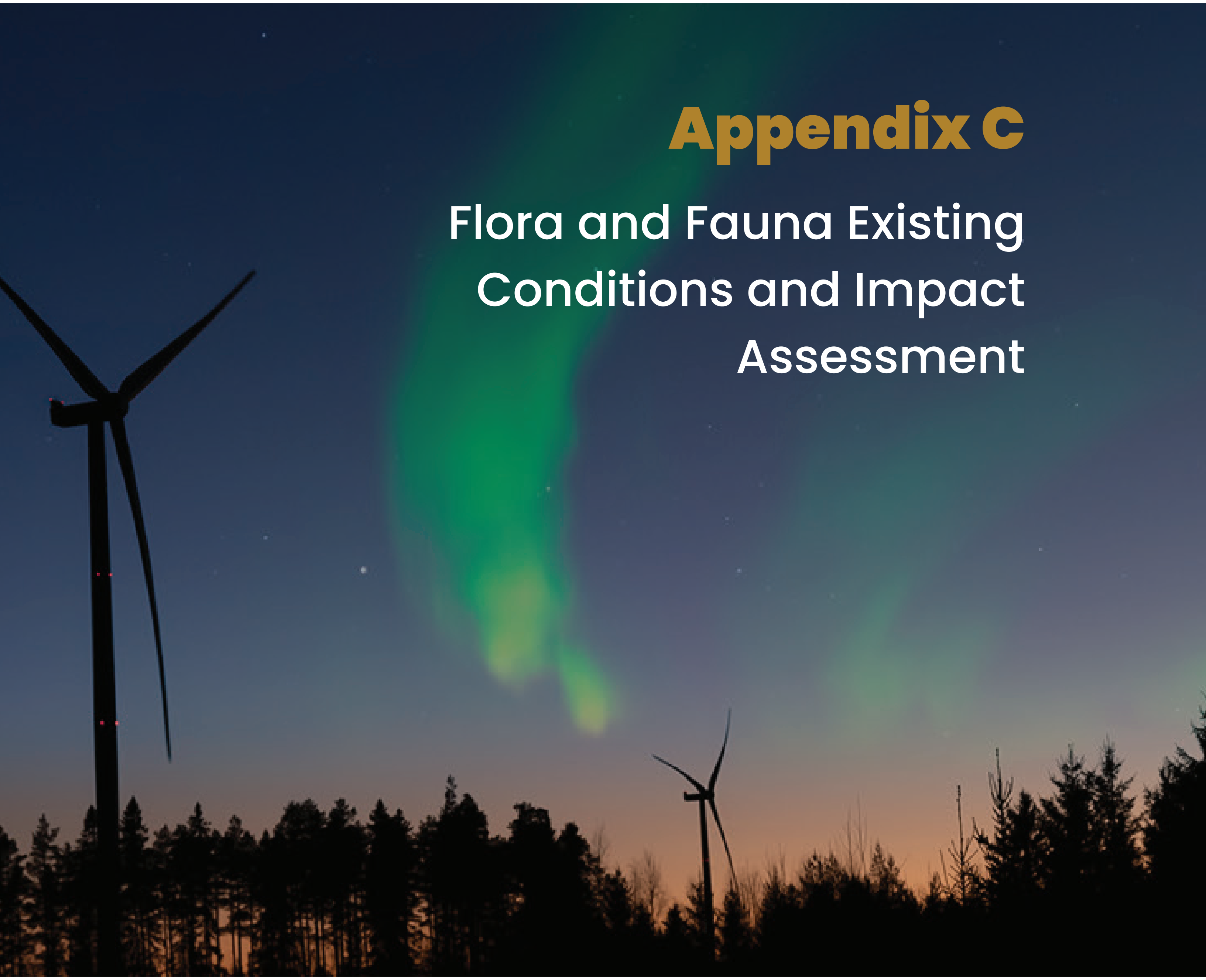

Appendix C

Flora and Fauna Existing Conditions and Impact Assessment

Kentbruck Green Power Hub

Kentbruck Green Power Hub

Environment Effects Statement Technical Report: Flora and Fauna Existing Conditions and Impact Assessment

Prepared for Neoen Australia Pty Ltd

2 December 2024

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Executive summary

Project overview

Biosis has been commissioned by Neoen Australia Pty Ltd to undertake flora and fauna assessments and impact assessment for the proposed Kentbruck Green Power Hub (KGPH, the Project). This information has been used to:

- Inform ongoing design of the Project in a responsive manner to avoid and minimise impacts on flora and fauna.
- Permit comprehensive assessment of any impacts associated with a fully developed project design.
- Provide this biodiversity technical report in response to the Environment Effects Statement (EES) Scoping Requirements for the Project.

The Project is located in south-west Victoria between Portland and Nelson in an area approximately 7,500 hectares. It comprises private land including farmland and the Green Triangle Forest Products (GTFP) pine plantation, and public land including road reserves and a proposed transmission line beneath an existing road through Cobboboonee National Park and Cobboboonee Forest Park.

The Project comprises a wind farm of approximately 600 MW capacity, consisting of up to 105 wind turbines and associated permanent and temporary infrastructure. The Project also includes a 275 kV transmission line, extending from the eastern boundary of the wind farm site to the Heywood Terminal Station.

Under the *Environment Effects Act 1978* (EE Act), the project requires an EES to be prepared to allow stakeholders to understand the likely environmental impacts of the project and how they are proposed to be managed. The Project is also a controlled action under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and is being assessed under the bilateral agreement between the State of Victoria and the Commonwealth. This report addresses matters of national and state environmental significance.

The biodiversity evaluation objective of the EES scoping requirements is "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."

Biosis was commissioned to prepare this biodiversity technical report (existing conditions and impact assessment) to inform the EES process. Three separate reports have been prepared, including this report on biodiversity values, a separate report on the critically endangered Southern Bent-wing Bat *Miniopterus orianae bassanii* and a separate report on the Brolga *Antigone rubicunda*.

This technical report presents the findings of existing conditions, investigations and impact assessments and forms part of the Environment Effects Statement.

Existing conditions

Methods

The existing conditions assessment involved a range of methods including background and desktop investigation using sources of publicly available biodiversity information, review and interrogation of natural resource and biodiversity spatial datasets, consultation with species experts and local individuals and groups, and collation of field data from project-specific technical studies between 2019 and 2023.

Landscape context

The Project Area spans portions of three bioregions: Glenelg Plain, Bridgewater and Victorian Volcanic Plain.

The majority of the wind farm site is located within a commercial Radiata Pine *Pinus radiata* timber plantation. The plantation area also includes a network of tracks, including some public roads and numerous smaller roads and tracks used for plantation access. The plantation is situated inland of Discovery Bay Coastal Park, approximately 2 to 3 kilometres from the coast. Extensive areas of native vegetation and habitat were cleared to establish the plantation, some of which was established on land previously cleared for farmland. Some colonisation by native understorey species is occurring within the plantation, particularly along the plantation fringe and adjacent to vegetated road reserves. There are small areas of remnant native vegetation within the plantation. These were not cleared during plantation establishment, mostly due to steep terrain, and are excluded from disturbance by forestry operations.

The Project Area also includes areas of Blue gum *Eucalyptus globulus* plantations near its eastern end. These plantations are more recently established than the pine plantations, and generally have more cover and diversity of regenerating native species in the understorey.

The Project Area 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. Cropping is also conducted in some areas. The cleared paddocks are dominated by introduced grasses, with scattered native species present including bracken, grasses, rushes and shrub species close to adjacent public land.

The project is situated in a region that includes some large conservation reserves, including Discovery Bay Coastal Reserve between the Project Area and the coastline, and Lower Glenelg National Park to the north of the Project Area. 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 Cobboboonee Forest Park. Portions of Discovery Bay Coastal Park and Lower Glenelg National Park, both north and south of the Project Area, are included in the internationally significant Glenelg Estuary and Discovery Bay Ramsar Site.

The proposed transmission line includes an underground section to be installed beneath an existing road through the Cobboboonee National Park and Cobboboonee Forest Park, and an underground section through predominantly cleared farmland, to provide a connection to the existing Heywood Terminal Station, which is located adjacent to the north-west corner of a large patch of bushland including Mount Clay State Forest and Narrawong Flora Reserve.

Vegetation type, extent, condition and threatened communities

The majority of the Project Area is situated in the GTFP pine plantation, where native vegetation is limited to road reserves, small remnant patches excluded from plantation development, and regeneration of native understorey species in plantation areas, particularly close to boundaries with surrounding native vegetation. Native vegetation within the GTFP plantation comprises degraded or regenerating examples of several Ecological Vegetation Classes (EVCs), including Coastal Alkaline Scrub, Damp Sands Herb-rich Woodland and Swamp Scrub.

Cleared farmland and blue-gum plantations in the northeast sub-area are located on land that would have, until relatively recently (early 1980s), supported a mosaic of Wet Heathland, Heathy Woodland and Swamp Scrub, with numerous small wetland depressions and associated EVCs. These EVCs are represented in adjacent conservation areas to the north (Lower Glenelg National Park) and south (Kentbruck H50 Bushland Reserve) of the cleared farmland and plantation areas.

The proposed underground transmission line beneath Boiler Swamp Road passes through Cobboboonee National Park and Cobboboonee Forest Park. This area supports high quality native vegetation, including Herb-rich Foothill Forest, Lowland Forest and Sedgy Riparian Woodland.

The remainder of the transmission line is also underground, between Cobboboonee National Park and the Heywood Terminal Station, where it passes through predominantly cleared farmland, where native vegetation is limited to scattered trees, some wetlands and remnant vegetation patches along road reserves and some modified patches of trees within farmland. EVCs present include Herb-rich Foothill Forest and Damp Sands Herb-rich Woodland.

The Investigation area is 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. Where required, some field studies were undertaken more than 10 kilometres from the Project Area. A number of threatened ecological communities are present in the Investigation Area, including some marine and estuarine communities that provide protection for EPBC Act listed Salt Wedge Estuaries, Giant Kelp Marine Forests and Temperate Coastal Saltmarsh. The Investigation Area also supports terrestrial threatened communities including woodlands, grasslands, and wetlands on volcanic substrates, and Coastal Moonah Woodlands on sandy soils associated with dune systems.

One EPBC Act listed threatened ecological community has been recorded within the Investigation Area:

- Karst springs and associated alkaline fens of the Naracoorte Coastal Plain Bioregion (endangered). This community is known to occur at Lake Mombeong, south of the Project Area.

Flora

The Investigation Area includes record of a large number of EPBC Act and *Flora and Fauna Guarantee Act 1988* (FFG Act) listed threatened species, due to the high quality of the conservation reserves within the area, the range of vegetation types represented and the high biodiversity of nutrient poor ecosystems such as sand dunes, heathy woodlands and wet heathlands. The recent revisions to the FFG Act, including adoption of the Common Assessment Method for determining threat level of species that were previously listed on the Advisory Lists, has resulted in numerous flora species being added to the FFG Act Threatened List during the course of the assessment. Many of these species were not included in the Project Scoping Requirements, and were not listed under the FFG Act when surveys were undertaken, and as a result may not all have been targeted in the field assessment program. These species have been considered in the report, however, in terms of likelihood of occurrence and potential for impacts.

Flora species were recorded during general vegetation mapping and quality assessment surveys, and targeted surveys for threatened species conducted on multiple occasions in 2020. These surveys focussed on the Project Area, particularly in areas where wind farm infrastructure is proposed, however surveys were also conducted beyond the Project Area, to check on reference locations for cryptic species. A total of 363 flora species were recorded during field investigations for the project, comprising 274 indigenous and 89 introduced species. Of the indigenous species, eight are listed as endangered (1) or vulnerable (7) under the EPBC Act, and 20 are listed as critically endangered (6), endangered (12), vulnerable (2) or under the FFG Act. Ninety-three FFG Act protected flora species were recorded, which includes the 20 listed threatened species.

Dune Fan-flower *Scaevola calendulacea* (FFG Act: endangered) was recorded in several locations on road reserves within the GTFP plantation, including Johnsons Road, Portland–Nelson Road, Lake Mombeong Road, Dry Block Road, Carters Road, McLeans Road, Browns Road and Wilsons Lower Road. Western Golden-top *Goodia medicaginea* (FFG Act: endangered) was recorded in the road reserve on Johnsons Road, at the western end of the plantation sub-area.

Several FFG Act listed species were recorded within native vegetation along Boiler Swamp Road, adjacent to the proposed underground transmission route, including Small Sickle Greenhood *Pterostylis lustra* (endangered), One-flower Early Nancy *Wurmbea uniflora* (vulnerable), Hairy Boronia *Boronia pilosa* subsp. *torquata* (endangered), Western Peppermint *Eucalyptus falciformis* (vulnerable) and Rough Daisy-bush *Olearia asterotricha* (endangered). Apple Jack *Eucalyptus splendens* (critically endangered) was recorded near Mount Richmond and along the proposed underground transmission route through Cobboboonee National Park and Cobboboonee Forest Park.

Fauna

Fauna surveys undertaken for the project include general surveys to determine the occurrence of species within broad habitat types, Bird Utilisation Surveys (BUS), and targeted surveys complying with relevant survey requirements for multiple threatened species or species groups including microbats (documented in a separate report), terrestrial mammals, Brolga *Grus rubicunda* (documented in a separate report), owls, Orange-bellied Parrot *Neophema chrysostoma*, Eastern Ground Parrot *Pezoporus wallicus*, Australasian Bittern *Botaurus poiciloptilus*, shorebirds, reptiles and Growling Grass Frog *Litoria raniformis.*

During the course of fieldwork for the Project, 214 species of fauna were recorded from the Investigation Area including 159 bird species (155 native species and 4 introduced species), 34 mammal species (25 native species and 9 introduced species), 15 native reptile species and 5 native frog species. Many of these species are known to be of cultural significance to the local traditional owners, and extensive engagement has been undertaken with the Gunditj Mirring Traditional Owner Aboriginal Corporation during the preparation of the Cultural Heritage Management Plan for the project.

The most abundant species recorded during bird utilisation surveys were Little Raven, Galah, Australian Magpie, Common Starling, Welcome Swallow, Yellow-tailed Black Cockatoo, Silvereye, Red Wattlebird, Superb Fairy-wren and Crimson Rosella.

The pine plantation generally provides poor quality habitat for native fauna, however a considerable number of bird species were recorded in plantation areas, particularly in locations adjacent to native vegetation. Brolga and Rufous Bristlebird (Coorong) *Dasyornis broadbenti broadbenti* were also recorded foraging within the pine plantation. Groups of White-throated Needletail *Hirundapus caudacutus* were recorded flying above the plantation on several occasions. Threatened terrestrial species found to inhabit this area include Heath Mouse *Pseudomys shortridgei* and Striped Worm-lizard *Aprasia striolata*.

Farmland areas supported a range of generalist (open country) and wetland bird species, as well as species flying through the farmland between bushland areas. Significant species recorded during the project within cleared farmland include Brolga, White-throated Needletail, Australasian Bittern, Musk Duck *Biziura lobata*, White-bellied Sea-Eagle *Haliaeetus leucogaster*, Latham's Snipe *Gallinago hardwickii* and Little Egret *Egretta garzetta*.

The Investigation Area, including surrounding conservation reserves such as Discovery Bay Coastal Park and Lower Glenelg National Park, provides habitat for a suite of significant bird species, including threatened species and migratory species. Some of these species have potential to fly through the Project Area and may be at risk of collision with turbines or above-ground powerlines. Potential impacts on these species, as well as some potentially at-risk non-threatened species, are considered in the impact assessment.

The proposed underground section of the transmission line passes underneath an existing road through a large area of high quality native vegetation within Cobboboonee National Park and Cobboboonee Forest Park. As the fauna values of these areas is relatively well understood, limited survey was conducted within this component of the project, and presence of many common and threatened species is assumed.

A desktop assessment was undertaken to assess aquatic fauna values, as the occurrence of species in local wetlands and streams is relatively well understood, and the potential for the project to directly or indirectly impact aquatic values was considered low provided avoidance and mitigation measures are applied.

Threatening processes

Twenty-nine FFG Act listed threatening processes and sixteen EPBC Act potentially threatening processes have been identified as likely to be already operating in the Project Area. The most relevant threatening processes relate to pest plant and animal invasion, habitat impacts and plant and animal pathogen infection and spread.

Avoid and minimise design principles

The project design has been altered in response to findings of the ecological technical studies and other EES studies or land access constraints.

The following design responses have been implemented to avoid and minimise potential impacts:

- Reduction in the extent of the wind farm Project Area. Several parcels of land that were shown in the Original Layout have been removed from the Project Area and will not be used for project infrastructure, including parcels to the south of the GTFP Plantation near the Glenelg Estuary and Discovery Bay Ramsar site. These reductions were due in part to responding to environmental constraints, including the turbine free buffers listed below, as well as other considerations as the project evolved.
- Exclusion of turbines from within 300 metres of boundaries with adjoining conservation reserves and other public land supporting native vegetation.
- Exclusion of turbines from within 500 metres of wetlands within the Glenelg Estuary and Discovery Bay Ramsar site.
- Exclusion or relocation of most turbines in areas where foundations may intersect groundwater near wetlands.
- Removal of the Cut-out Dam Road underground transmission line route option.
- Exclusion of turbines from sections of farmland and blue gum plantation in the east of the Project Area, in areas identified as breeding areas or movement corridors for Brolga.
- Narrowing of the transmission corridor component of the proposed alignment, to a single underground alignment. This has included consideration of avoiding areas of remnant vegetation.

- Undergrounding and relocating of the internal electricity network in the areas identified as breeding buffers or movement corridors for Brolga.
- Minimum blade sweep height of turbines to be at least 60 metres above ground level.
- Commitment to low wind speed curtailment as documented in the project BBAMP.

Impact assessment

The impact assessment is summarised in the following table, which outlines the key impact pathways, mitigation, residual impacts and areas with residual uncertainty for each ecological value relevant to the Project Area.

Summary of impact assessment

Ecological value	Key impact pathways	Key avoidance/mitigation measures	Summary of impact assessment	Residual uncertainty
Native vegetation and habitat	• Minor vegetation removal required throughout project area. • Indirect impacts to trees for construction of the KGPH.	• Construction of long section of transmission line beneath existing road. • Construction of the wind farm within disturbed environments – farmland and pine plantation. • Use of existing public roads, access tracks, and ingress/egress points from the main road network with limited need for upgrades. • Avoidance of identified native vegetation and DEECA mapped wetlands where possible.	• Project requires removal of 8.696 hectares of native vegetation, including 228 large trees. Much of this removal is due to conservative inclusion of potential impacts to tree protection zones for construction of the underground transmission line.	• Impacts based on conservative estimates of required clearances and impacts on tree protection zones. • Details of vegetation removal likely to change and be further reduced during the detailed design process. Impacts are however unlikely to exceed estimated extent given the conservative nature of assessments, in particular relating to impacts to tree protection zones.
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 metres of wetlands in the Ramsar site, or	• Construction planned within DEECA mapped wetlands in farmland in the north-eastern section of the Project Area. Losses are	• No significant information gaps.

Ecological value	Key impact pathways	Key avoidance/mitigation measures	Summary of impact assessment	Residual uncertainty
		where groundwater levels in the plantation are predicted to be within 6 metres of the ground surface where dewatering would be required for turbine foundations (see AECOM's (2023) Groundwater Impact Assessment). • Micrositing of transmission line poles to avoid direct impacts on wetlands.	included in the native vegetation assessment.	
Threatened flora species	• Direct removal required for construction of the KGPH. • Indirect impacts to threatened tree species (Apple Jack and Western Peppermint) related to installation of the underground transmission line along Boiler Swamp Road and near the Heywood terminal station.	• Construction of the wind farm within disturbed environments – farmland and pine plantation. • Avoidance of identified native vegetation and DELWP mapped wetlands where possible. • Pre-construction targeted surveys. • Avoidance of impacts upon threatened trees along the transmission route by directional drilling.	• Several species recorded in close proximity to proposed works to be avoided in the detailed design phase. • Impacts upon Apple Jack along the transmission route to be avoided by selection of construction methods.	• Targeted surveys were conducted in suitable habitats during a single year. There is potential for some occurrences to have been overlooked due to seasonal conditions, however this is considered unlikely.
Threatened ecological communities	• Direct vegetation/habitat removal.	• Construction of the wind farm within disturbed environments – farmland and pine plantation.	• Project is unlikely to directly or indirectly impact on any	• No significant information gaps.

Ecological value	Key impact pathways	Key avoidance/mitigation measures	Summary of impact assessment	Residual uncertainty
	• Hydrological modification due to surface works or groundwater drawdown.	• Exclusion of turbines within 300 metres of conservation reserves and 500 metres of wetlands within the Glenelg Estuary and Discovery Bay Ramsar Site. • Exclusion of turbines within 500 metres of Karst 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 (see AECOM's (2023) Groundwater Impact Assessment).	threatened ecological communities.	
Protected areas	• Direct vegetation/habitat removal. • Hydrological modification due to surface works or groundwater drawdown. • Collision risk for key component species.	• Exclusion of turbines within 300 metres of conservation reserves. • Exclusion of turbines within 500 metres of wetlands within the Glenelg Estuary and Discovery Bay Ramsar Site. • Exclusion of turbines within farmland between conservation reserves and the Kentbruck Heath.	• Project is unlikely to directly or indirectly impact on any protected areas.	• No significant information gaps.
South-eastern Red-tailed Black Cockatoo	• Habitat loss (transmission line).	• Construction of the wind farm within non-preferred environments for this species – farmland and pine plantation.	• Flights through the Project Area are possible, but are considered unlikely or	• Limited understanding of flight heights or

Ecological value	Key impact pathways	Key avoidance/mitigation measures	Summary of impact assessment	Residual uncertainty
	• Collision with turbines or power lines.	• Construction of a long section of the transmission line underground. • Minimum blade sweep height of turbines to be greater than 60 m above ground level. • Turbine exclusion areas adjacent to conservation reserves. • Choice of an underground transmission line for the entire external route. • Adaptive Bird and Bat Management Plan (BBMP).	rare events due to the lack of foraging or other resources within the great majority of the wind farm area and to the south and east of the Project Area. • Flights within rotor-swept area (above 60 m) are also possible but rare or highly unlikely.	movement patterns in the Project Area. • Flight height information sourced from a study of the sub-species from further north, in preferred habitat dominated by foraging tree species. • Insufficient data for collision risk modelling (CRM).
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. • Construction of a long section of the transmission line underground. • Minimum blade sweep height of turbines to be greater than 60 m above ground level. • Turbine exclusion areas adjacent to conservation reserves.	• 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	• Insufficient data for collision risk modelling (CRM) due to low numbers of observed flights.

Ecological value	Key impact pathways	Key avoidance/mitigation measures	Summary of impact assessment	Residual uncertainty
		• Choice of an underground transmission line for the entire external route. • Adaptive Bird and Bat Management Plan (BBMP).	usually flies within the tree canopy.	
Orange-bellied Parrot	• Collision with turbines or transmission lines.	• Construction of the wind farm within non-preferred environments for this species – farmland and pine plantation. • Minimum blade sweep height of turbines to be greater than 60 metres above ground level. • Turbine exclusion areas adjacent to conservation reserves. • Choice of an underground transmission line for the entire external route. • Adaptive BBMP.	• Movements through the Project Area, away from preferred coastal environments are likely to be infrequent. • Limited flight height information, but information for related and co-occurring species (Blue-winged Parrot) suggests that flights within rotor swept height are rare. • Any level of mortality would be considered a significant impact due to the critically low population. • Collision with turbines considered extremely unlikely to occur.	• Frequency of movements through the wind farm, between coastal habitats and inland heathlands. • Poorly understood flight height behaviour. • Insufficient data for CRM.

Ecological value	Key impact pathways	Key avoidance/mitigation measures	Summary of impact assessment	Residual uncertainty
Blue-winged Parrot	• Collision with turbines or transmission lines.	• Construction of most of the wind farm within non-preferred environments for this species –pine plantation. • Minimum blade sweep height of turbines to be greater than 60 metres above ground level. • Turbine exclusion areas adjacent to conservation reserves. • Choice of an underground transmission line for the entire external route. • Adaptive BBMP.	• Collision risk modelling predicts 1.38 collisions per annum at 0.95 rotor avoidance rate.	• No significant information gaps.
Elegant Parrot	• Collision with turbines or transmission lines.	• Construction of the wind farm within non-preferred environments for this species – farmland and pine plantation. • Minimum blade sweep height of turbines to be greater than 60 metres above ground level. • Turbine exclusion areas adjacent to conservation reserves. • Choice of an underground transmission line for the entire external route. • Adaptive 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.	• Frequency of movements through the wind farm, between coastal habitats and inland heathlands. • Poorly understood flight height behaviour. • Insufficient data for CRM.

Ecological value	Key impact pathways	Key avoidance/mitigation measures	Summary of impact assessment	Residual uncertainty
Eastern Ground Parrot	• Collision with turbines or transmission lines.	• Exclusion of turbines within farmland between conservation reserves and the Kentbruck Heath. • Construction of the wind farm within non-preferred environments for this species – farmland and pine plantation. • Minimum blade sweep height of turbines to be greater than 60 metres above ground level. • Turbine exclusion areas adjacent to conservation reserves. • Choice of an underground transmission line for the entire external route. • Adaptive BBMP.	• Unlikely to be impacted, as species the species is not expected to frequently fly at rotor-swept height.	• Potential for movements through the wind farm, between coastal habitats and inland heathlands. • Poorly understood flight height behaviour. • Insufficient data for CRM.
King Quail	• Collision with turbines or transmission lines.	• Exclusion of turbines within farmland between conservation reserves and the Kentbruck Heath. • Construction of the wind farm within non-preferred environments for this species – farmland and pine plantation. • Minimum blade sweep height of turbines to be greater than 60 metres above ground level.	• Unlikely to be impacted, as species the species is not expected to frequently fly at rotor-swept height.	• Limited understanding of population size, movement patterns or flight behaviour. • Insufficient data for CRM.

Ecological value	Key impact pathways	Key avoidance/mitigation measures	Summary of impact assessment	Residual uncertainty
		• Turbine exclusion areas adjacent to conservation reserves. • Choice of an underground transmission line for the entire external route. • Adaptive BBMP.		
Brolga	• Collision with turbines or transmission lines. • Disturbance to breeding activity.	• Design incorporates infrastructure exclusion buffers developed in accordance with the Interim Guidelines for Assessment, Avoidance, Mitigation and Offsetting of Potential Wind Farm Impacts on the Victorian Brolga Population 2011. • Minimum blade sweep height of turbines to be greater than 60 metres above ground level. • Marking of overhead powerlines, including the internal powerline along Portland-Nelson Road. • Choice of an underground transmission line for the entire external route. • Adaptive BBMP.	• Documented in separate report (Biosis 2023). • Direct impacts avoided through design of turbine free buffers.	• No significant information gaps apart from flight heights.

Ecological value	Key impact pathways	Key avoidance/mitigation measures	Summary of impact assessment	Residual uncertainty
Australasian Bittern	• Collision with turbines or overhead transmission lines.	• Exclusion of turbines within farmland between conservation reserves and the Kentbruck Heath. • Construction of the wind farm within non-preferred environments for these species – farmland and pine plantation. • Any construction within Brolga breeding habitat wetland buffers to be undertaken outside of the breeding season. • Minimum blade sweep height of turbines to be greater than 60 metres above ground level. • Turbine exclusion areas adjacent to conservation reserves and Brolga breeding habitat wetlands. • Underground transmission line for the entire external route. • Adaptive BBAMP.	• 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.	• Number of individuals and frequency of movements of birds between local habitats and the Riverina. • Poorly understood flight height behaviour. • Insufficient data for CRM. • No existing population viability analysis. Insufficient data for population viability analysis.
Other threatened waterbirds	• Collision with turbines or transmission lines.	• Exclusion of turbines within farmland between conservation reserves and the Kentbruck Heath.	• Some potential for collisions but population level impacts highly unlikely.	• Insufficient data for CRM.

Ecological value	Key impact pathways	Key avoidance/mitigation measures	Summary of impact assessment	Residual uncertainty
		• Construction of the wind farm within non-preferred environments for these species – farmland and pine plantation. • Minimum blade sweep height of turbines to be greater than 60 metres above ground level. • Turbine exclusion areas adjacent to conservation reserves. • Choice of an underground transmission line for the entire external route. • Adaptive BBMP.		
Shorebirds, gulls and terns	• Collision with turbines or transmission lines.	• Construction of the wind farm within non-preferred environments for these species – farmland and pine plantation. • Minimum blade sweep height of turbines to be greater than 60 metres above ground level. • Turbine exclusion areas adjacent to conservation reserves. • Choice of an underground transmission line for the entire external route. • Adaptive BBMP.	• Potential for rare collisions by some species, however it is unlikely that the project will have population level significant impacts on these species.	• Insufficient data for CRM.

Ecological value	Key impact pathways	Key avoidance/mitigation measures	Summary of impact assessment	Residual uncertainty
White-throated Needletail	• Collision with turbines or transmission lines.	• Construction of the wind farm within non-preferred environments for these species – farmland and pine plantation. • Minimum blade sweep height of turbines to be greater than 60 metres above ground level. • Choice of an underground transmission line for the entire external route. • Adaptive 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).	• Collision risk models depend on a range of input parameter assumptions which are documented in the report.
Fork-tailed Swift	• Collision with turbines or transmission lines.	• Minimum blade sweep height of turbines to be greater than 60 metres above ground level. • Adaptive BBMP.	• Significant impact unlikely as the species is infrequently recorded within the Project Area.	• Insufficient data for CRM.
Owls	• Collision with turbines or transmission lines. • Impacts on habitat trees along the transmission line.	• Construction of the wind farm within disturbed environments – farmland and pine plantation. • Minimum blade sweep height of turbines to be greater than 60 metres above ground level. • Turbine exclusion areas adjacent to conservation reserves.	• Low likelihood of regular mortalities due to collision, unlikely to result in population level impacts. • Relatively minor impacts on habitat trees in areas of extensive habitat.	• No nocturnal movement data. • Insufficient data for CRM.

Ecological value	Key impact pathways	Key avoidance/mitigation measures	Summary of impact assessment	Residual uncertainty
		• Choice of an underground transmission line for the entire external route. • Adaptive BBMP.		
Rufous Bristlebird (Coorong subspecies)	• Collision with turbines or transmission lines. • Habitat disturbance/loss.	• Construction of the wind farm within disturbed environments – farmland and pine plantation. • Minimum blade sweep height of turbines to be greater than 60 metres above ground level. • Minimal disturbance to areas of native understorey vegetation. • Turbine exclusion areas adjacent to conservation reserves. • Adaptive BBMP.	• Very low likelihood of population level impacts, due to abundance of the species in the area, habitat requirements and flight behaviour.	• No significant information gaps.

Ecological value	Key impact pathways	Key avoidance/mitigation measures	Summary of impact assessment	Residual uncertainty
Little Eagle	• Collision with turbines or transmission lines.	• Construction of the wind farm within disturbed environments – farmland and pine plantation. • Minimum blade sweep height of turbines to be greater than 60 metres above ground level. • Turbine exclusion areas adjacent to conservation reserves. • Choice of an underground transmission line for the entire external route. • Adaptive BBMP.	• Very low likelihood of population level impacts, as the species is infrequently recorded in the area.	• Insufficient data for CRM. Not recorded during the assessment.
White-bellied Sea Eagle	• Collision with turbines or transmission lines.	• Construction of the wind farm within disturbed environments – farmland and pine plantation. • Minimum blade sweep height of turbines to be greater than 60 metres above ground level. • Turbine exclusion areas adjacent to conservation reserves. • Choice of an underground transmission line for the entire external route. • Adaptive 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. • A single collision has been recorded at another wind farm, suggesting the species	• Insufficient data for CRM.

Ecological value	Key impact pathways	Key avoidance/mitigation measures	Summary of impact assessment	Residual uncertainty
			can fly at rotor swept height.	
Terrestrial and arboreal mammals	• Direct habitat removal required for construction of the KGPH. • Increases in road traffic during construction and operation of the KGPH.	• 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 to small mammal species. • Very low likelihood of population level impacts, due to minimal removal of understorey vegetation habitat.	• No significant information gaps.
Microbats (documented in a separate report)	• Mortality due to collision with turbines or transmission lines.	• Construction of the wind farm within disturbed environments – farmland and pine plantation. • Turbine exclusion areas adjacent to conservation reserves. • Minimum blade sweep height of turbines to be greater than 60 metres above ground level. • Choice of an underground transmission line for the entire external route.	• Potential for the project to contribute to significant impacts to Southern Bent-wing Bat, and to contribute to cumulative impacts.	• Documented in the SBWB impact assessment. • Key gaps include limited understanding of movement patterns and potential for flights above 80 m (maximum detector height surveyed).

Ecological value	Key impact pathways	Key avoidance/mitigation measures	Summary of impact assessment	Residual uncertainty
		• Low wind speed curtailment during key activity periods. • Adaptive BBMP.		
Grey-headed Flying-fox	• Collision with turbines or transmission lines. • Removal of foraging habitat.	• Construction of the wind farm within disturbed environments – farmland and pine plantation. • Turbine exclusion areas adjacent to conservation reserves. • Minimum blade sweep height of turbines to be greater than 60 metres above ground level. • Choice of an underground transmission line for the entire external route. • Adaptive BBMP.	• No known camps near the Project Area or foraging habitat that would attract bats to fly through the wind farm. • Minor risk of collision with turbines during the life of the project.	• Unknown potential for additional camps to be established near the Project Area during the life of the project.
Swamp Skink	• Direct habitat removal required for construction of the KGPH.	• Construction of the wind farm within disturbed environments – farmland and pine plantation. • Minimal disturbance of areas of native understorey vegetation. • Turbine exclusion areas adjacent to conservation reserves.	• 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.	• No significant information gaps.

Ecological value	Key impact pathways	Key avoidance/mitigation measures	Summary of impact assessment	Residual uncertainty
Other threatened reptiles	• Direct habitat removal required for construction of the KGPH. • Direct mortality due to increased traffic on local roads during construction and operation of the KGPH.	• Construction of the wind farm within disturbed environments – farmland and pine plantation. • Minimal disturbance of areas of native understorey vegetation. • Turbine exclusion areas adjacent to conservation reserves.	• Minor loss of habitat along some roadsides due to track widening may impact upon Striped Worm-lizard and Eastern Bearded Dragon. • Increased road traffic, especially during construction may result in some increase in mortality of Eastern Bearded Dragons. • Impacts expected to be minor and not affecting viability of local population.	• No significant information gaps.
Growling Grass Frog	• Direct habitat removal. • Hydrological modification due to surface works or groundwater drawdown.	• Avoidance of direct impacts on wetlands. • Avoidance of indirect impacts on wetlands by surface or groundwater hydrological changes.	• Low likelihood of impact.	• No significant information gaps.
Aquatic fauna	• Hydrological modification due to surface works or groundwater drawdown.	• Avoidance of direct impacts on aquatic habitats.	• The project is unlikely to impact on threatened fish.	• Burrowing Crayfish chimneys have been observed in low lying areas within farmland,

Ecological value	Key impact pathways	Key avoidance/mitigation measures	Summary of impact assessment	Residual uncertainty
		• Avoidance of indirect impacts on aquatic habitats by surface or groundwater hydrological changes.	• Potential minor impacts on Southern Toadlet, Portland Burrowing Crayfish and Hairy Burrowing Crayfish from transmission line construction, unlikely to be population level impacts.	but the species of crayfish has not been determined.
Protected (non-threatened) fauna	• Collision with turbines or transmission lines.	• Construction of the wind farm within disturbed environments – farmland and pine plantation. • Turbine exclusion areas adjacent to conservation reserves. • Minimum blade sweep height of turbines to be greater than 60 metres above ground level. • Adaptive BBMP.	• Collision risk modelling (CRM) undertaken for Yellow-tailed Black Cockatoo and Wedge-tailed Eagle predicts low numbers of annual mortalities.	• No significant information gaps. • Collision risk models depend on a range of input parameter assumptions which are documented in the report.

Mitigation and contingency

Key mitigation measures adopted to reduce collision impacts on birds and bats are:

- Site selection of the wind farm, to be located in modified habitats which are non-preferred environments for most bird and bat species.
- Minimum blade sweep height of turbines to be at least 60 metres above ground level, resulting in a reduction in collision risk for threatened bird and bat species.
- Turbine exclusion areas adjacent to conservation reserves and wetlands within the Ramsar site.
- Exclusions of turbines within farmland between conservation reserves and the Kentbruck Heath (within areas identified as Brolga breeding areas).
- Proposed construction of the external transmission line using underground construction methods, reducing the collision risk for threatened birds and bats.
- Commitment to low wind speed curtailment, as documented in the project BBAMP.

Recognising that there is residual uncertainty regarding abundance, movement patterns and flight heights of some species, unexpected collisions will be managed in accordance with an adaptive bird and bat management plan, submitted in draft form with the EES documentation and to be finalised in response to permit conditions if approval is granted to the project.

State offsets arise through the removal of native vegetation, which sometimes corresponds with modelled habitat for rare or threatened flora and fauna. State biodiversity offsets have been calculated in accordance with the *Guidelines for the removal, destruction or lopping of native vegetation*, which is an incorporated document within the Victoria Planning Provisions under Clause 52.17 of the Glenelg Planning Scheme. Native Vegetation Removal Reports were calculated for the proposed project design. The results of the species-general offset test indicate that species offsets will be required and evidence that these can be secured will need to be provided as part of project approvals.

In order to ensure the 'no net loss' objective of the *Guidelines for the removal, destruction or lopping of native vegetation* can be achieved for the project, the project must secure the following offsets.

- General offsets: 0.5360 general habitat units
- Species habitat units are required for six species:
  - Lax Twig-sedge *Baumea laxa*
  - Oval-leaf Logania *Logania ovata*
  - Scented Spider-orchid *Caladenia fragrantissima*
  - Leafy Greenhood *Pterostylis cucullata* subsp*. cucullata*

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. This final strategy will demonstrate how biodiversity offsets for the project can be secured and the strategy will be finalised prior to planning approval being granted.

Cumulative impacts

The Scoping Requirements for the KGPH Environment Effects Statement call for a consideration of the potential for the Project to contribute to a greater cumulative effect on biodiversity in combination with other wind energy projects or actions taking place or proposed in the region.

The cumulative impact assessment undertaken for the KGPH has identified potential for the project to contribute to cumulative impacts, in combination with other wind energy projects, upon:

- Southern Bent-wing Bat (assessment provided in Biosis (2024a))
- Australasian Bittern
- Wedge-tailed Eagle
- White-throated Needletail.

1. Introduction

1.1 Project background

Neoen is a developer and owner-operator with an established track record of constructing renewable energy projects throughout Australia.

Biosis has been commissioned by Neoen to undertake flora and fauna assessments and impact assessment for the proposed Kentbruck Green Power Hub (KGPH; the Project). This information will be used to:

- Inform ongoing design of the Project in a responsive manner to avoid and minimise impacts on flora and fauna.
- Permit a comprehensive assessment of any impacts that may be associated with a fully developed project design.
- Provide the biodiversity technical report in response to the Environment Effects Statement (EES) Scoping Requirements for the Project.

1.2 Description of the Project

The initial Project comprised of:

- A wind farm, consisting of up to 157 wind turbines and associated infrastructure.
- A battery storage, comprising a lithium-ion battery facility with up to 500-1,000MW hours of storage.
- A connection to the electricity grid via an overhead and/or underground transmission line connection.

The final Project as proposed would comprise:

- A wind farm of up to 600 MW, consisting of up to 105 wind turbines and associated permanent and temporary infrastructure.
- A new 275 kV transmission line, which would connect the Project to the existing AusNet electricity transmission network. The transmission line would extend from the eastern boundary of the wind farm site to the existing 275/500 kV Heywood Terminal Station. The transmission line would be up to 26.6 kilometres in length, and is proposed to be constructed as an underground facility, using trenching and directional drilling construction methods.

These project elements are located within close proximity of each other, as described in the following sections.

The Project is located around 330 kilometres west of Melbourne between Portland and Nelson, Victoria (Figure 1, Figure 1a,b,c).

The flora and fauna Project Area encompasses a wind farm site of approximately 7,500 hectares of private and public land including some road reserves, and a transmission line connection to the electricity grid. As noted in Section 1.2.2, two transmission line options were investigated. Option Two was removed as a viable option by Neoen in June 2021 and is therefore not considered during the impact assessment outlined in this report.

The Project Area is within the:

- Glenelg Plain, Bridgewater and Victorian Volcanic Plains Bioregions
- Glenelg River Basin
- Management area of the Glenelg Hopkins Catchment Management Authority (CMA)
- Glenelg Shire local government area.

1.2.1 Wind farm site

Portland–Nelson Road bisects the wind farm site in a generally east-west direction. The site is generally bound by plantation forestry to the north, highly modified grazing land to the east and west, Discovery Bay Coastal Park to the south, and the Lower Glenelg National Park and Cobboboonee National Park to the east and north-east (Figure 1a and b).

The proposed wind farm site is approximately 8,318 hectares in area and comprises 89 individual land parcels owned by 9 different landholders. The site is located primarily within an area that has been substantially modified and is used for commercial Radiata Pine softwood forestry production, with a small portion of land used for agricultural purposes (primarily grazing). The plantation area has an existing network of public and private roads.

At this stage, 4 MW to 8 MW wind turbines are proposed and will have the following features:

- Maximum hub height of 175 metres.
- Maximum rotor tip height of up to 270 metres.
- Maximum rotor diameter of 190 metres.
- Minimum lower blade sweep height of 60 metres.

1.2.2 Transmission line options

1.2.2.1 External powerline

Two transmission line connection options were considered while the ecological surveys were being undertaken: a route with underground lines (option one) and an overhead only route (option two). Both routes extend east of the proposed wind farm. The location of the routes considered are described below, and the preferred route (option 1) is shown in Figure 1b and 1c.

- Option One: underground route
  The Option One route generally extends between the eastern boundary of the proposed wind farm site and the existing Heywood Terminal Station located inside the western boundary of the Narrawong Flora Reserve / Mount Clay State Forest (on land owned by AusNet). This transmission line connection option is approximately 26.6 kilometres long. Within Cobboboonee National Park and Cobboboonee Forest Park, the transmission line would be located beneath Boiler Swamp Road (for a distance of approximately 17.6 kilometres) which bisects the Parks in an east to west direction. The underground section would be constructed within a 6.5 metre construction footprint, with cabling buried at a depth of approximately 1.25 metres beneath the existing road. Construction would be mostly via trenching, with horizontal directional drilling (HDD) used in several locations to avoid impacts on waterways, including the Surrey River. After exiting Cobboboonee Forest Park the underground line would continue for 1.2 kilometres through

freehold agricultural land to the Surrey River. To the east of the Surrey River, the transmission line would continue underground, either trenched or directionally drilled to avoid native vegetation and road and rail crossings, for 7.8 kilometres until its connection point to the Heywood Terminal Station.

- Option Two: Overhead only route
  The overhead route (also referred to as the 'Portland' Option or the 'Southern' Option) connects the project from the eastern end to the existing Heywood–Portland 500 kV transmission line, involving construction of a new Terminal Station. The line would pass through private property in the mount Richmond and Gorae West localities. A decision was made during field assessment for the project to discontinue the assessment of this option and focus on Option 1. This decision was made with consideration of land access, visual impact, vegetation removal and community concerns. As a result, only limited field-based ecological information is available for Option 2, in comparison with the detailed studies conducted for Option 1. A discussion of the options considered for the transmission line connection is provided in the EES and a summary of the ecological considerations along the two route options is provided in Appendix 15.

1.2.2.2 Onsite wind farm powerlines

The Project would involve the installation of up to 190 kilometres of underground powerlines (33 kV or 66 kV) connecting the wind turbines to the collector substations, and up to 27.8 kilometres of a high voltage powerline connecting the collector substations to the main substation. The high voltage powerline would likely be 275 kV (subject to detailed design), and would run overhead along Portland–Nelson Road from the western collector substation to the eastern collector substation. The powerline would then run adjacent to existing roads in the Green Triangle Forest Products (GTFP), pine plantation to a transition station at the Portland-Nelson Road / Sandy Hill Road intersection. From there it would pass beneath Portland–Nelson Road then continue underground to the main substation through agricultural land.

Neoen has undertaken a detailed options assessment of several transmission line options (Umwelt 2022). Biosis has participated in this options assessment process, including through provision and interpretation of information about baseline conditions and potential impacts on ecology.

1.2.3 Other project elements

The Project is proposed to include (but is not limited to):

- Internal site access tracks and upgrades to existing access points from the public road network.
- Hardstand areas at each turbine location, with a footprint of approximately 0.4 hectares.
- Three collector substations.
- Underground powerlines connecting the wind turbines to the collector substations.
- Overhead and underground electricity cabling (up to 275 kV) and a terminal station to provide connection to the 500 kV transmission line.
- Up to eight permanent meteorological monitoring masts (met masts).
- An operations and maintenance building.
- Temporary infrastructure including construction compounds, concrete batching plants, car parking, site buildings and amenities.
- A limestone quarry, to be located within the GTFP plantation on North Livingston Road. The quarry would require a Work Authority of approximately 18 ha, comprising approximately 9 ha of

extraction area, 3.5 ha of overburden and product stockpiles and 1ha of quarry office/parking infrastructure, with the remainder of the Work Authority being buffers. The quarry would be a traditional soft rock extraction operation and would not involve any drilling or blasting. The maximum depth of the extraction, including overburden, would be approximately 14 m.

1.2.4 Project alternatives and design evolution

The ecological database review and ecological survey program was initially designed to assess the Kentbruck Green Power Hub (KGPH) Project, as specified in the EES and EPBC referral documents. This included a Project Area with 157 turbines, two underground transmission line options (Boiler Swamp Road and Cut-out Dam Road), two overhead transmission line development envelopes and other project infrastructure. For the purpose of reference within these studies, this has been termed the "Original Layout".

During the course of the technical studies, the design of the KGPH has undergone several changes. These changes have been responses to the findings of technical studies undertaken including the ecological assessments, and have resulted in:

- Reductions to the Project Area
- Reduction in the number of proposed turbines
- Revisions to the proposed locations of turbines (including siting turbines to avoid specific areas within the site)
- Revisions to the transmission line options.

The following design responses have been implemented to avoid and minimise potential impacts:

- Reduction in the extent of the wind farm Project Area. Several parcels of land that were shown in the Original Layout have been removed from the Project Area and will not be used for project infrastructure, including parcels to the south of the GTFP Plantation near the Glenelg Estuary and Discovery Bay Ramsar site.
- Exclusion of turbines from within 300 metres of boundaries with surrounding conservation reserves and other public land supporting native vegetation.
- Exclusion of turbines from within 500 metres of wetlands within the Glenelg Estuary and Discovery Bay Ramsar site.
- Exclusion or relocation of turbines in areas where foundations may intersect groundwater near significant wetlands.
- Removal of the Cut-out Dam underground transmission line option.
- Exclusion of turbines from sections of farmland and blue gum plantation in the east of the Project Area, in areas identified as breeding buffers or movement corridors for Brolga. These turbine-free areas would also provide for movement between areas of potential habitat for other bird species that were observed in this area.
- Removal of the transmission line option involving vegetation removal along the boundary of Mount Clay State Forest.
- Undergrounding of the internal electricity network in the areas identified as breeding buffers or movement corridors for Brolga.
- Full undergrounding of the transmission line to the Heywood terminal station.

As a result of these changes, the current project layout (June 2022) has been reduced to 105 turbines.

Due to these design modifications, some ecological field assessments were undertaken in areas which are no longer components of the project. Results from these studies are presented in full in the existing conditions sections of this report, however the impact assessment focuses on the current Layout.

1.3 Terminology

The following terms are used throughout the report to define the geographic extents of the assessment (Figure 1a-c):

- **Wind farm** footprint– the area where wind farm infrastructure is planned, including turbines, hard stands, internal access roads, collector stations, reticulation and the terminal substation.
- **Transmission Line** – the transmission line corridor, extending from the terminal substation in the eastern end of the wind farm to the Heywood terminal station. This is now proposed to be entirely underground.
- **Project** – the Kentbruck Green Power Hub project, including the wind farm, transmission line and associated infrastructure.
- **Project Area** – includes title lots containing the wind farm and ancillary infrastructure, and the construction footprint of the transmission line. The Project Area covers an area of approximately 8,350 hectares.
- **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 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 kilometres from the Project Area, for example checking reference sites for threatened flora species.
- **Plantation sub-area** – the Green Triangle Forest Products (GTFP) pine plantation, including the areas to the south and north of Portland–Nelson Road, and areas of blue gum plantation in the east of the Project Area.
- **North-eastern sub-area** – the portion of the Project Area to the north-east of Portland–Nelson Road, primarily on farmland and blue gum plantation.

1.4 Scope of assessment

The primary objective of the studies and findings set out in this document is to address the scoping requirements for the Project EES by:

- Providing an understanding of the existing conditions of flora and fauna values within the Project Area and surrounding areas that might be affected by the project. This includes all components of the project, including the proposed locations of:
  - The wind farm infrastructure, including hardstands, roads, and permanent and temporary facilities.

- Quarry.
- Electrical substations and connection points.
- Electricity powerlines along connection routes.
- New roads and changed or upgraded roads and crossovers.
- Area or values on- or off-site that may be directly or indirectly subject to effects such as dust, noise, artificial light and changes to surface and groundwater due to construction, operation or decommissioning of the project.

- Considering potential impacts of the project on flora and fauna.
- Developing mitigation measures to avoid or minimise impacts on flora and fauna.
- Developing contingency measures to be implemented in the event of adverse residual effects (including ineffective mitigation) on flora and fauna values requiring further management.

Assessment of the Project encompasses all flora and fauna of terrestrial and freshwater ecosystems regardless of their conservation status. The significance of a species or ecological community is determined by its listing status under Commonwealth and/or State legislation (see also Section 3.2.1).

1.4.1 Environment Effects Statement Scoping Requirements

The final EES Scoping Requirements for the Kentbruck Green Power Hub were issued to Neoen in January 2020. A full copy of the scoping requirements is provided in Appendix 1.

The project was also referred to the Commonwealth under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The Project was determined to be a controlled action on 7 November 2019, requiring assessment and approval under the EPBC Act. The controlling provisions are:

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

The EES process is accredited to assess impacts on matters of national environmental significance (MNES) under the EPBC Act through the Bilateral Assessment Agreement between the Commonwealth and the State of Victoria.

Section 4.1 of the Scoping Requirements details the key issues and information requirements for the existing environment, likely effects, mitigation measures and performance objectives. The key issues and existing environment reporting requirements as set out in the EES scoping requirements are outlined in Table 1 below.

Table 1 Key issues and existing environment reporting requirements as set out in the EES Scoping Requirements

Aspect	Scoping requirement
Key issues	• Potential for significant effects and their acceptability on Southern Bent-wing Bat *Miniopterus schreibersii bassanii*, South-eastern Red-tailed Black Cockatoo *Calyptorhynchus banksii graptogyne*, Australasian Bittern *Botaurus poiciloptilus*, White-throated Needletail *Hirundapus caudacutus* and Orange-bellied Parrot *Neophema chrysogaster*. • 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.

Aspect	Scoping requirement
	• 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 Glenelg Estuary and Discovery Bay 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 Act.
Existing environment	• Characterise the type, distribution, and condition of biodiversity values within a suitable Investigation Area, comprising the project site and its environs, including native vegetation, terrestrial and aquatic habitat and habitat corridors or linkages. This includes identifying and characterising any ephemeral wetlands/habitat for threatened species and communities listed under the EPBC Act or FFG Act. • Identify and characterise any areas of native vegetation and groundwater dependent ecosystems that may be affected by groundwater drawdown or surface hydrological changes. • Identify the presence and movements of Southern Bent-wing Bats within and near the project site, including locations of roosting or breeding sites within movement distances from the project site, in consultation with the Department of Environment, Land, Water and Planning (DELWP). • Identify the presence of foraging and roosting habitat for South Eastern Red-tailed Black Cockatoo within the project site and broader locality in consultation with DELWP and the National Recovery Team for the species. • Describe the biodiversity values that could be directly or indirectly affected by the project, including: – Native vegetation and any ecological communities listed under the EPBC Act and FFG Act. – Presence of, or suitable habitats for, protected flora and fauna species (including migratory species), in particular species listed under the EPBC Act and FFG Act. – Potential use of the site and its environs for movement and/or foraging by protected fauna species including: Southern Bent-wing Bat, Red-tailed Black Cockatoo, Australasian Bittern, White-throated Needletail, Orange-bellied Parrot and Brolga. • Describe any existing threats to biodiversity values, including: – Direct removal of individuals or destruction of habitat. – Historic or ongoing disturbance or alteration of habitat conditions (e.g. habitat fragmentation, severance of wildlife corridors or habitat linkages, changes to water quantity or quality, fire hazards, etc. – Background threats that lead to the mortality of listed threatened fauna.

Aspect	Scoping requirement
	– The presence of any declared weeds, pathogens and pest animals within and in the vicinity of the Project Area. • Characterisation of the existing environment is to be informed by relevant databases, literature (and published data), community observations (including citizen science), appropriate targeted and/or seasonal surveys and modelling of the potential and actual presence of threatened species and communities consistent with Commonwealth and state survey guidelines, conservation advices and threatened species recovery plans. Where surveys do not identify a listed species or community, but past records and/or habitat analysis suggest that it may occur, a precautionary approach to the further investigation and assessment of its occurrence should be applied.
Likely effects	• Assess the direct and indirect effects of the project and feasible alternatives, including transport route upgrades and use, on native vegetation, listed ecological communities, and listed threatened and other protected flora species (especially those listed in Appendix A). • Assess the direct and indirect effects of the project and feasible alternatives, on listed threatened species, migratory species and other protected fauna species under the EPBC Act and FFG Act (especially those listed in Appendix A). • Assess the direct and indirect effects of the project and feasible alternatives, on the ecological character of the Glenelg Estuary and Discovery Bay declared Ramsar site. • Assess the direct and indirect effects of the project, on biodiversity values, including: – disturbance or alteration of habitat conditions (e.g. habitat fragmentation, severance of wildlife corridors or habitat linkages, displacement due to avoidance of project infrastructure, changes to water quantity or quality, hydrological changes to wetland function, fire hazards, etc.) – the ability of wetlands, including Glenelg Estuary and Discovery Bay Ramsar site, to support listed species and communities – the potential for birds and other fauna to be disturbed or disoriented by project effects such as noise, vibration, or lighting – direct removal of individuals or destruction of habitat – threats of mortality of locally occurring listed threatened fauna (including site and species specific risk-factors) – the presence and potential spread of any declared weeds, pathogens and pest animals within and in the vicinity of the Project Area. • Assess the potential cumulative effects on listed species of fauna, in particular Brolga and Southern Bent-wing Bat, from the project in combination with other projects, in particular nearby proposed, approved or operating wind energy facilities.
Mitigation measures	• Identify and describe potential alternatives, proposed design options and mitigation measures (including operational mitigation measures) and their effectiveness in avoidance or reduction of significant effects on any flora, fauna and/or ecological communities listed on the EPBC Act, FFG Act and other protected species or ecological character of the Ramsar site. Provide clear statements noting which avoidance or mitigation measure will be committed to. • Justify and describe the assumptions and level of uncertainty associated with the proposed measures achieving their desired outcomes. • Develop hygiene controls for vehicle and machinery movement to minimise the spread of pathogens and weeds.

Aspect	Scoping requirement
	• Describe the application of the three-step approach to avoiding the removal of native vegetation, minimising impacts from removal of native vegetation that cannot be avoided and providing offsets to compensate for the biodiversity impact from the removal of native vegetation.
Performance objectives	• Describe and evaluate proposed commitments to manage residual effects of the project on biodiversity values, including an outline of an offset strategy and offset management plan to secure appropriate offsets to satisfy both Commonwealth and state offset requirements. • Develop contingency measures to be implemented in the event of adverse residual effects (including ineffective mitigation) on flora and fauna values requiring further management.

Appendix A of the Scoping Requirements includes a list of species that are known to occur locally and which may be impacted by the Project. These are reproduced in Table 2 below.

Table 2 Species listed in Table A1 of the EES scoping requirements

Note: taxonomy and nomenclature has been updated for consistency with the Victorian Biodiversity Atlas (VBA). CR: Critically endangered; EN: Endangered; VU: Vulnerable; NT: near threatened

Species VBA nomenclature	EPBC Act (threatened)	EPBC Act (migratory)	Ramsar listing	FFG Act
Mammals				
Southern Bent-wing Bat *Miniopterus orianae bassanii*	CR		✓	CR
Southern Brown Bandicoot *Isoodon obesulus obesulus*	EN			EN
Heath Mouse *Pseudomys shortridgei*	EN			EN
Spot-tailed Quoll *Dasyurus maculatus maculatus*	EN			EN
Swamp Antechinus *Antechinus minimus maritimus*	VU			VU
Long-nosed Potoroo *Potorous tridactylus tridactylus*	VU			VU
Birds				
Curlew Sandpiper *Calidris ferruginea*	CR	✓	✓	CR
Eastern Curlew *Numenius madagascariensis*	CR	✓	✓	CR
Orange-bellied Parrot *Neophema chrysogaster*	CR			CR
Australasian Bittern *Botaurus poiciloptilus*	EN		✓	CR
Red-tailed Black-Cockatoo *Calyptorhynchus banksii graptogyne*	EN			EN

Species VBA nomenclature	EPBC Act (threatened)	EPBC Act (migratory)	Ramsar listing	FFG Act
Red Knot *Calidris canutus*	VU	✓		EN
White-throated Needletail *Hirundapus caudacutus*	VU	✓		VU
Hooded Plover *Thinornis cucullatus*	VU		✓	VU
Fairy Tern *Sternula nereis nereis*	VU		✓	CR
Caspian Tern *Hydroprogne caspia*		✓		VU
Sanderling *Calidris alba*		✓	✓	
Fork-tailed Swift *Apus pacificus*		✓		
Masked Owl *Tyto novaehollandiae*				CR
Ground Parrot *Pezoporus wallicus*				EN
Rufous Bristlebird (Coorong) *Dasyornis broadbenti broadbenti*				EN
Brolga *Grus rubicunda*				EN
Baillon's Crake ***Porzana pusilla***				
Powerful Owl *Ninox strenua*				VU
Lewin's Rail *Lewinia pectoralis*				VU
Red-capped Plover *Charadrius ruficapillus*			✓	
Frogs				
Growling Grass Frog *Litoria raniformis*	VU		✓	VU
Fishes				
Yarra Pygmy Perch *Nannoperca obscura*	EN		✓	VU
Black Bream *Acanthopagrus butcheri*			✓	
Southern Shortfin Eel *Anguilla australis*			✓	
Common Galaxias *Galaxias maculatus*			✓	

Species VBA nomenclature	EPBC Act (threatened)	EPBC Act (migratory)	Ramsar listing	FFG Act
Little Galaxias *Galaxiella toourtkoourt*			✓	EN
Mulloway *Argyrosomus japonicus*			✓	
Estuary Perch *Macquaria colonorum*			✓	
Tupong *Pseudaphritis urvillii*			✓	
Insects				
Ancient Greenling Damselfly *Hemiphlebia mirabilis*			✓	EN
Plants				
Maroon Leek-orchid *Prasophyllum frenchii*	EN		✓	EN
Colourful Spider-orchid *Caladenia colorata*	EN			CR
Mellblom's Spider-orchid *Caladenia hastata*	EN			CR
Metallic Sun-orchid *Thelymitra epipactoides*	EN			EN
Coast Dandelion *Taraxacum cygnorum*	VU			CR
Swamp Everlasting *Xerochrysum palustre*	VU			CR
Ornate Pink Fingers *Caladenia ornata*	VU			EN
Swamp Fireweed *Senecio psilocarpus*	VU			
Clover Glycine *Glycine latrobeana*	VU			VU
Green-striped Greenhood *Pterostylis chlorogramma*	VU			EN
Swamp Greenhood *Pterostylis tenuissima*	VU		✓	
Coast Ixodia *Ixodia achillaeoides* subsp. *arenicola*	VU			
Dense Leek-orchid *Prasophyllum spicatum*	VU			CR
Square Raspwort *Haloragis exalata* var. *exalata*	VU			
Limestone Spider-orchid *Caladenia calcicola*	VU			CR

Species VBA nomenclature	EPBC Act (threatened)	EPBC Act (migratory)	Ramsar listing	FFG Act
River Swamp Wallaby-grass *Amphibromus fluitans*	VU			

1.4.1.1 Evaluation objective

The evaluation objective for biodiversity and habitat is as follows:

> *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.*

Listed key issues include:

- *Potential for significant effects and their acceptability on key threatened and listed fauna species including but not limited to those listed in Appendix A.*
- *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.*

Listed effects for assessment include:

- *Assess the direct and indirect effects of the Project Area and feasible alternatives, on listed threatened, migratory and other protected fauna species under the EPBC Act and FFG Act (especially those listed in Appendix A).*
- Assess the direct and indirect effects of the project, on biodiversity values, including:
  - *Disturbance or alteration of habitat conditions (e.g. habitat fragmentation, severance of wildlife corridors or habitat linkages, displacement due to avoidance of project infrastructure, changes to water quantity or quality, hydrological changes to wetland function, fire hazards, etc.).*
  - *The potential for birds and other fauna to be disturbed or disoriented by project effects such as noise, vibration, or lighting.*
  - *Direct removal of individuals or destruction of habitat.*
  - *Threats of mortality of locally occurring listed threatened fauna (including site and species-specific risk-factors).*
  - *The presence and potential spread of any declared weeds, pathogens and pest animals within and in the vicinity of the Project Area.*

- *Assess the potential cumulative effects on listed species of fauna, in particular Brolga and Southern Bent-wing Bat, from the project in combination with other projects, in particular nearby proposed, approved or operating wind energy facilities.*

1.5 Interdependencies with other EES technical studies

A range of other technical studies are being undertaken for the Project. Where relevant, these studies have been consulted in preparing this assessment. Relevant studies include:

- Air quality – AECOM (June 2024)
- Groundwater – AECOM (June 2024)
- Surface water – AECOM (June 2024)
- Transport – AECOM (July 2024)
- Noise – Marshall Day Acoustics (July 2024)
- Landscape character and visual amenity – Green Bean Design (June 2024)
- Shadow flicker and blade glint – GHD (August 2024)
- Bushfire– Fire Risk Consultants (July 2024)
- Environmental Site Investigation – AECOM (July 2024)
- Groundwater dependent ecosystems impact assessment – CDM Smith (July 2024).

1.6 Document structure

Section 2 of this report describes the site context of the Project Area.

Section 3 presents general methods, relevant to a broad range of the ecological assessments undertaken.

Sections 4–35 provide specific methods, existing conditions and impact assessments for receptor features, including native vegetation (section 4), wetlands (section 5) threatened flora (section 6) threatened ecological communities (section 7), protected areas (section 8) and threatened fauna species or species groups (sections 11–30). Section 35 provides an assessment of impacts to selected non-threatened fauna species. Section 36 assesses cumulative impacts, and proposed mitigation measures are provided in Section 37.

Assessments for two species are presented in separate reports, due to the level of detail and complexity of analysis and reporting. These are:

- Southern Bent-wing Bat (Biosis 2024a)
- Brolga (Biosis 2024b).

1.7 Independent Peer Review

Independent peer reviews were commissioned by DELWP on two components of this ecological assessment:

- Avifauna (provided in Appendix 18)
- Southern Bent-wing Bat (provided in SBWB report)

The peer review process is detailed in Appendix 11, which provides a summary of the scope provided to the reviewers, including the review scope, a summary of the reviews and details of how recommendations provided by the reviewer have been incorporated into the ecological assessment.

2. Site context

2.1 Bioregions, landform and geology

Based on a review of desktop information, the Project Area spans three bioregions:

- Glenelg Plain (majority of the wind farm site)
- Bridgewater (southern sections of the wind farm site)
- Victorian Volcanic Plain (portions of the grid connection options).

Geomorphological Units for the Project Area are provided in the Glenelg Hopkins Catchment Management Region Geomorphological Units Map (Victorian Resources Online 2024). The Project Area includes the following main units:

- 6.1.4 – Western Plains: Volcanic derived plains with well-developed drainage and deep regolith (portions of the grid connection options).
- 6.2.1 – Western Plains: Sedimentary derived plains with ridges (portions of the grid connection and wind farm site in the eastern section).
- 6.2.3 – Western Plains: Sedimentary derived karst plains with depressions (majority of the wind farm site).
- 8.5.1 – Coast: Transgressive dunes: Sea level (coastal sections of the wind farm site).

The wind farm site is located within the Nelson land system. This land system is associated with hardened limestone dunes of the coastal plains. These low-profile dunes produce soils ranging from sandy loams to orange sands with pockets of acidic white sand.

2.2 Land use and landscape context

The following sections describe the land use and landscape context associated with the project (Figure 4d).

2.2.1 Pine plantations

The majority of the wind farm site is located within a commercial pine plantation, which is on freehold land and is operated by Green Triangle Forest Products (GTFP). The GTFP plantation includes Radiata Pine *Pinus radiata* coupes of various ages, and is actively managed for timber production. The plantation area also includes a network of tracks, including some public roads and numerous smaller private roads and tracks used for plantation access. The GTFP plantation is located on both sides of Portland–Nelson Road. The wind farm is mostly within the plantation situated south of the Portland–Nelson Road. The plantation is situated inland of Discovery Bay Coastal Park, approximately 2 to 3 kilometres from the coast.

Native vegetation and habitat have been cleared to establish the plantation, however there is colonisation by some native understorey species within the plantation, particularly along the plantation fringe or adjacent to vegetated road reserves.

There are also small areas of remnant native vegetation within the plantation (Appendix 4, Photo 7). These areas were not cleared during plantation establishment, mostly due to steep terrain, and are excluded from disturbance by forestry operations.

2.2.2 Blue gum plantations

The Project Area also includes areas of Blue-gum *Eucalyptus globulus* plantations near the eastern end of the site (Figure 1a and 1b, Figure 4d). 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.

2.2.3 Grazing land

The Project Area includes several areas of farmland, mostly at the eastern end of the Project Area near Mount Kincaid, and another section of farmland south of Portland–Nelson Road near Nelson. These farmland areas have been mostly cleared of native vegetation and are currently used primarily for dryland grazing by sheep and cattle. Cropping is also conducted in some areas. The cleared paddocks are dominated by introduced grasses, but may have scattered native species present, including bracken, grasses, rushes and shrub species close to adjacent public land.

2.2.4 Conservation reserves

Conservation reserves near the Project Area are shown in Figure 1a and b, and described in the detail in Section 8. Management of these reserves is guided by the Ngootyoong Gunditj Ngootyoong Mara South West Management Plan (Parks Victoria 2015).

Nearby conservation reserves include:

- Discovery Bay Coastal Park (including part of the Glenelg Estuary and Discovery Bay Ramsar site)
- Lower Glenelg National Park (including part of the Glenelg Estuary and Discovery Bay Ramsar site)
- Cobboboonee National Park and Cobboboonee Forest Park
- Mount Richmond National Park
- Bushland Reserves and Flora Reserves
- Other small reserves including:
  - Johnstones Creek Flora Reserve
  - Kentbruck H50 Bushland Reserve
  - Mouzie Bushland Reserve
  - Kentbruck H14 Bushland Reserve
  - Hedditch Hill Scenic Reserve.

2.2.5 Habitat connectivity and fauna movement

The Glenelg Estuary and Discovery Bay Ramsar site provides relatively uninterrupted connectivity for fauna along the coast between Nelson and Cape Bridgewater, supporting a diversity of coastal habitats such as dunes, heathlands and wetlands. Many species of shorebird and wetland birds migrate to and from the Glenelg Estuary, Discovery Bay shoreline and freshwater wetlands perched in the coastal dunes, recognised in the Ramsar status ascribed to this area. 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 Brolga and Australasian Bittern. Species such as Hooded Plover *Thinornis cucullatus* make use of the Discovery Bay beaches for nesting.

The heathland habitats which occur in a band between coastal habitats and the adjacent pine plantations as well as within Cobboboonee National Park, Cobboboonee Forest Park, and Lower Glenelg National Park, support a suite of species that are only found in heathland or are strongly linked to heathlands including Rufous Bristlebird, Ground Parrot, Heath Mouse and Southern Brown Bandicoot. These cryptic species rely on the dense cover provided by this habitat to survive, and their ongoing persistence locally is reliant upon the connectivity it provides. Movement locally is likely to occur between patches only for the most mobile of these species such as Rufous Bristlebird. Patches of remnant heathy habitat within the GTFP Plantation may also provide important strips or islands that provide movement for these species.

The dry forests and woodlands found in Cobboboonee National Park, Cobboboonee Forest Park, and Lower Glenelg National Park provide habitat for species such as Red-tailed Black-Cockatoo, Rufous Bristlebird, Powerful Owl, Barking Owl, Brown Treecreeper, Diamond Firetail, Hooded Robin, Southern Brown Bandicoot, Swamp Antechinus, Southern Bent-wing Bat, Smoky Mouse and Heath Mouse. This habitat provides connectivity for these species along the Glenelg River and important links exist from this habitat downstream to the coastal habitats at Nelson.

Kentbruck Heath occupies a southern portion of Lower Glenelg National Park broadly delineated by Kentbruck Road and pine plantations on the west, Inkpot Road on the north, Heath Road and Kentbruck Settlement on the east, and agricultural land on the south (Hore-Lacy 1970, p.). It includes a Reference Area (a highly protected zone within the park – listed under the *Reference Areas Act 1978*) and much of it is functionally inaccessible, especially during wetter portions of the year. The agricultural land south of Kentbruck Heath is the south-eastern extremity of the wind farm component of the Project. There is potential for some species of birds to fly across the agricultural land between Kentbruck Heath and coastal heath within Discovery Bay Coastal Park.

The GTFP pine plantations effectively provide an east-west running barrier to movement between the more wooded and riparian habitats to the north and coastal, heathland and wetland habitats to the south, with both the coastal and riparian wooded habitats meeting up at the Nelson Estuary. More mobile flying species such as Brolga, Red-tailed Black Cockatoo and Southern Bent-wing Bat can move over the pine plantation to access these habitats to the north and south, while other more sedentary and cryptic species are unlikely to move between areas separated by the plantations. Emus and large macropods (kangaroos and wallabies) were also regularly observed within the plantations. As stated above, some species that arrive in specific local habitats, such as migratory shorebirds and waterbirds, may fly over the plantations on arrival and departure, but would be unlikely to make use of plantations while resident nearby.

2.3 Existing threats

The wind farm portion of the Investigation Area has been cleared of native vegetation in the past and is currently used for either plantation forestry or grazing. This has resulted in a major reduction in the extent of native vegetation, and creation of an inhospitable barrier, for many species, between the coastal dune system and native vegetation further inland.

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.

Farmland areas are subject to ongoing grazing and agricultural activities. Some native vegetation has re-established, particularly in low-lying areas suitable for opportunistic native wetland plants (primarily Rushes *Juncus* spp.), although the type and composition of these modified wetlands is very different to what was likely to be present (based on examination of adjacent areas) prior to clearing. These areas are likely to have supported a mosaic of Wet Heathland, Heathy Woodland and small, heavily vegetated wetlands similar to those present within the Kentbruck Heath.

In addition to land clearance and fragmentation, other key threats to biodiversity values within the Investigation Area include:

- Climate change, potentially resulting in unsuitable climate envelopes for many species, modifications in hydrology and increased frequency and severity of extreme weather events, including drought, storms, and large-scale bushfires.
- Inappropriate burning regimes for fuel reduction and asset protection.
- Predation of native wildlife by foxes *Vulpes vulpes* and cats *Felis catus.*
- Native vegetation damage by introduced animals including rabbits, goats, pigs, and deer.
- Vegetation damage by overabundant native animal populations including macropods and koalas.
- Spread of introduced weeds and native species outside their natural range, including Sweet Pittosporum *Pittosporum undulatum*, Coast Wattle *Acacia longifolia* subsp. *sophorae* and Sallow Wattle *Acacia longifolia* subsp. *longifolia*.
- Hydrological modifications, including wetland drainage within farmlands, and inappropriate estuary openings.
- Impacts of traffic on native wildlife.

Many of these threatening processes, and a range of others, are listed under the EPBC Act and FFG Act and are summarised in Table 3. Where these are relevant to the Investigation Area, this is noted in Table 3. Threatening processes are excluded from the list if they are not relevant to Victoria, or are limited to ecosystems not present within the Investigation Area, such as marine and alpine environments. Some threatening processes are listed under both Acts, although there may be minor differences in the titles of the processes.

Table 3 Threatening processes listed under the FFG Act and/or EPBC Act
PTP: Potential Threatening Process (FFG Act), KTP: Key Threatening Process (EPBC Act).

Threatening process	FFG Act PTP	EPBC Act KTP	Relevance to project and Investigation Area
Introduced weeds			
Novel biota and their impact on biodiversity		✓	Relevant to all of Australia.
Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants		✓	Relevant to all of Australia, particularly near population centres.
Introduction and spread of *Spartina* to Victorian estuarine environments	✓		Spartina (*Sporobolus anglicus* and *Sporobolus* x *townsendii*) is not known to occur within the region.

Threatening process	FFG Act PTP	EPBC Act KTP	Relevance to project and Investigation Area
Invasion of native vegetation by Blackberry *Rubus fruticosus* L. agg.	✓		Blackberry is present within the Investigation Area, with infestations present within most land tenures, including riparian areas within public land.
Invasion of native vegetation communities by Tall Wheat-grass *Lophopyrum ponticum* (taxonomy recently updated to *Thinopyrum ponticum*)	✓	Nominated	*Thinopyrum ponticum* is known to be an aggressive invader of grasslands. Not known to occur within the Investigation Area.
Introduced pest animals			
Reduction in biomass and biodiversity of native vegetation through grazing by the Rabbit *Oryctolagus cuniculus*	✓	✓	Relevant to all of Australia.
Soil degradation and reduction of biodiversity through browsing and competition by feral goats (*Capra hircus*)	✓	✓	Feral goats are known to occur in SW Victoria.
Predation of native wildlife by the introduced Red Fox *Vulpes vulpes*	✓	✓	Red Fox is present within the region, and has been the target of extensive control programs within conservation reserves via the Glenelg Ark Project.
Predation of native wildlife by the cat *Felis catus*	✓	✓	Feral Cats are known to be present within the Investigation Area, and are likely to be impacting on populations of small native vertebrates, including birds and small mammals.
Predation, habitat degradation, competition and disease transmission by feral pigs		✓	Feral pigs are known to occur in SW Victoria.
Degradation and loss of habitats caused by feral Horses (*Equus caballus*)	✓		Not considered a major issue in SW Victoria.
Introduction of live fish into waters outside their natural range within a Victorian river catchment after 1770	✓		Includes European Carp and introduced salmonids.

Threatening process	FFG Act PTP	EPBC Act KTP	Relevance to project and Investigation Area
Reduction in biodiversity of native vegetation by Sambar (*Cervus unicolor*)	✓	Nominated (Feral Deer)	Feral deer known to be present in SW Victoria. Populations of feral deer appear to be increasing across most of Victoria.
The introduction and spread of the Large Earth Bumblebee *Bombus terrestris* into Victorian terrestrial environments	✓		Not considered a major issue in SW Victoria.
Threats to native flora and fauna arising from the use by the feral honeybee *Apis mellifera* of nesting hollows and floral resources	✓		Relevant to all of Victoria.
Overabundant native animals and native environmental weeds			
Reduction in biodiversity resulting from Noisy Miner (*Manorina melanocephala*) populations in Victoria	✓	✓	Relevant to all of Victoria.
Spread of *Pittosporum undulatum* in areas outside its natural distribution	✓		Major infestations of this species within forested areas within the Investigation Area.
Invasion of native vegetation by 'environmental weeds'	✓		Relevant to all of Victoria.
Loss of biodiversity as a result of the spread of Coast Wattle (*Acacia longifolia* subsp. *sophorae*) and Sallow Wattle (*Acacia longifolia* subsp. *longifolia*) into areas outside its natural range	✓		Problematic native weeds across most of the Investigation Area.
Disease and pathogens			
The spread of *Phytophthora cinnamomi* from infected sites into parks and reserves, including roadsides, under the control of a state or local government authority	✓	✓	Relevant to most of southern Victoria.
Use of *Phytophthora*-infected gravel in construction of roads, bridges and reservoirs	✓	✓	Relevant to most of southern Victoria.
Infection of amphibians with Chytrid Fungus, resulting in chytridiomycosis	✓	✓	Relevant to most of Australia.

Threatening process	FFG Act PTP	EPBC Act KTP	Relevance to project and Investigation Area
Psittacine Circoviral (beak and feather) Disease affecting endangered psittacine species		✓	Relevant to most of Australia, where populations of large Cockatoos and Parrots are present.
Human activity which results in artificially elevated or epidemic levels of Myrtle Wilt within Nothofagus-dominated Cool Temperate Rainforest	✓		No occurrences of *Nothofagus* within the Investigation Area.
Pollution and climate change			
Loss of terrestrial climatic habitat caused by anthropogenic emissions of greenhouse gases	✓	✓	Global issue.
The discharge of human-generated marine debris into Victorian marine or estuarine waters	✓	✓	Relevant to all of the Australian coastline.
Input of organotoxins to Victorian marine and estuarine waters	✓		Relevant to the Victorian coastline.
Input of petroleum and related products into Victorian marine and estuarine environments	✓		Relevant to the Victorian coastline.
Input of toxic substances into Victorian rivers and streams	✓		Relevant to all of Victoria.
Land clearance and habitat modification			
Land clearance		✓	National issue.
Habitat fragmentation as a threatening process for fauna in Victoria	✓		Relevant to all of Victoria.
Alteration to the natural flow regimes of rivers and streams	✓		Relevant to all of Victoria. Most minor waterways within the Investigation Area have relatively natural flow regimes. Flow within the Glenelg River is affected by Rocklands Reservoir.
Alteration to the natural temperature regimes of rivers and streams	✓		Mostly relates to outflows from large water storages. Not known to be an issue in SW Victoria.
Degradation of native riparian vegetation along Victorian rivers and streams	✓		Relevant to all of Victoria.

Threatening process	FFG Act PTP	EPBC Act KTP	Relevance to project and Investigation Area
Increase in sediment input into Victorian rivers and streams due to human activities	✓		Relevant to all of Victoria.
Loss of coarse woody debris from Victorian native forests and woodlands	✓		Relevant to all of Victoria.
Loss of hollow-bearing trees from Victorian native forests	✓		Relevant to all of Victoria.
Prevention of passage of aquatic biota as a result of the presence of instream structures	✓		Relevant to all of Victoria. Most waterways within the Investigation Area have relatively natural flow regimes.
Removal of wood debris from Victorian streams	✓		Relevant to all of Victoria.
Soil and vegetation disturbance resulting from marble mining	✓		No marble mining within Investigation Area.
Wetland loss and degradation as a result of change in water regime, dredging, draining, filling and grazing	✓		Relevant to all of Victoria.
Inappropriate fire regimes			
High frequency fire resulting in disruption of life cycle processes in plants and animals and loss of vegetation structure and composition	✓		Relevant to all of Victoria, particularly where high frequency control burning is applied for asset protection.
Inappropriate fire regimes causing disruption to sustainable ecosystem processes and resultant loss of biodiversity	✓		Relevant to all of Victoria, particularly where high frequency control burning is applied for asset protection.
Human activities including harvesting, fishing and agriculture			
Collection of native orchids	✓		South-west Victoria is known to have diverse native orchid flora, including many highly localised occurrences.
Incidental catch (or bycatch) of seabirds during longline fishing operations	✓	✓	May impact on some species that roost or nest within SW Victoria.

2.4 Planning context

The Project site is located within the Glenelg Shire and therefore subject to the provisions of the Glenelg Planning Scheme (the Planning Scheme). The Planning Scheme sets out the relevant planning policies that a Responsible Authority must consider when administering the use and development of land.

A summary of the relevant policies, zones and overlays is provided in the following sections. Further information regarding these planning policies is provided in EES Chapters 5 (Assessment and approvals framework) and 16 (Land Use Planning). The Project Land Use and Planning Impact Assessment is provided in Appendix Q (Land Use Planning Impact Assessment).

2.4.1 State and Local Planning Policy Framework

The State Planning Policy Framework (SPPF) comprises general principles for land use and development of land and outlines specific policies in relation to settlement, environment, housing, economic development, infrastructure and particular uses. The SPPF is the same in all Victorian planning schemes. The policies outlined in the SPPF must be taken into account when responsible authorities are assessing planning permit applications.

SPPF clauses relevant to biodiversity are:

- 12 Environmental and landscape values
- 12.01-1S Protection of biodiversity
- 12.01-2S Native vegetation management
- 12.02-1S Protection of coastal areas
- 12.02-2S Coastal Crown land
- 12.03 Water bodies and wetlands
- 12.03-1S River corridors, waterways, lakes and wetlands
- 12.05-1S Environmentally sensitive areas
- 13.04-2S Erosion and landslip
- 13.04-3S Salinity
- 14.02-1S Catchment planning and management

2.4.2 Local Planning Policy

The Glenelg Shire Council Municipal Strategic Statement (MSS) and Local Planning Policy Framework (LPPF) at Clause 21 and Clause 22 of the Planning Scheme cover key matters relating to the environment, landscape and heritage, environmental risk, natural resource management, economic development, transport and infrastructure. A detailed assessment of these clauses will be provided in the planning report(s) for the Project.

The LPPF clauses of relevance to biodiversity aspects of the Project are:

- 21.02-17 Environmental and landscape values
- 21.02-22 Coastal management

- 21.02-30 Environmental risks
- 21.02-43 Floodplains
- 21.02-43 Soil degradation
- 21.02-51 Natural resources management
- 21.02-56 Water

2.4.3 Planning Permit requirements for the Project

Detailed planning requirements, including maps of zones and overlays, will be provided in the EES chapter on land use and planning. A summary of relevant planning considerations is provided below.

Under Clause 53.32-2 a permit is required to use and develop land for a Wind Energy Facility. An assessment of the relevant zones and overlays that will apply to Project has been undertaken to identify additional permit triggers.

2.4.4 Zones

Components of the project are within the following zones:

- Farming Zone
- Road Zone
- Public Conservation and Resource Zone
- Rural Conservation Zone.

2.4.5 Overlays

Components of the project are subject to the following overlays relevant to biodiversity values:

- Bushfire Management Overlay
- Environmental Significance Overlay Schedule 1 – Coastal Areas
- Environmental Significance Overlay Schedule 3 – South-Eastern Red-Tailed black Cockatoo Habitat Areas.

2.4.6 Particular provisions

The following Particular Provisions are of relevance to the Project:

Clause 52.17 – Native Vegetation

The purpose of Clause 52.17 (Native Vegetation) is ‘to ensure that there is no net loss to biodiversity as a result of the removal, destruction or lopping of native vegetation. This is achieved by applying the following three step approach in accordance with the *Guidelines for the removal, destruction or lopping of native vegetation* (DELWP 2017a) (the Guidelines):

1. Avoid the removal, destruction or lopping of native vegetation.

2. Minimise impacts from the removal, destruction or lopping of native vegetation that cannot be avoided.

3. Provide an offset to compensate for the biodiversity impact if a permit is granted to remove, destroy or lop native vegetation.

Clause 52.32 – Wind Energy Facility

The purpose of Clause 52.32 (Wind Energy Facility) is to 'facilitate the establishment and expansion of wind energy facilities, in appropriate locations, with minimal impact on the amenity of the areas'. In accordance with Clause 52.32-2 (Use and Development of Land), a permit is required to use and develop land for a wind energy facility.

Clause 52.32 imposes restrictions on land with regard to development of wind energy facilities, and specifies details of information requirements for permit applications.

Further details regarding the planning process, and permit information requirements, is provided in the *Development of Wind Energy Facilities in Victoria – Policy and Planning Guidelines* (DELWP 2016a).

3. General methods

The following section outlines the methods used to determine the existing conditions within the Project Area as they relate to terrestrial and freshwater biodiversity and to assess potential impacts on ecological values identified in the Project Area.

3.1 Permits

Flora and fauna assessments undertaken by Biosis have been under provisions of the following permits and approvals:

- Research Permit/Management Authorisation and Permit to Take/Keep Protected Flora & Protected Fish issued by DELWP under the Victorian *Wildlife Act 1975* (Wildlife Act), FFG Act, *National Parks Act 1975* and *Crown Land (Reserves) Act 1978* (Permit Number 10008711).
- Permit to catch and release fish issued by the Victorian Fisheries Authority under the Victorian *Fisheries Act 1995* (Permit Number RP 1220, Personal File Number 13041).
- Approvals 30.17 and 19.18 issued by the Wildlife and Small Institutions Animal Ethics Committee of the Victorian Government Department of Economic Development, Jobs, Transport and Resources (DEDJTR).
- Scientific Procedures Fieldwork Licence issued by DEDJTR's Wildlife and Small Institutions Animal Ethics Committee (Licence Number 20020).

3.2 Definitions

3.2.1 Significant species

The conservation significance of a species or ecological community is determined by its listing status under Commonwealth or State legislation (Table 4).

Table 4 Criteria for determining significance of species and ecological communities

Significance	
National	Listed as critically endangered, endangered or vulnerable under the EPBC Act
State	Listed as critically endangered, endangered or vulnerable in Victoria under the FFG Act

Recent amendments to the FFG Act have removed duplication by establishing a single comprehensive list of threatened flora and fauna species. This will continue to be known as the FFG Act Threatened List. With the new comprehensive list now in effect, the Advisory lists have been revoked.

Appendix A of the EES Scoping Requirements provides an indicative list of species and ecological communities to be considered in assessment for the project (see Table 2, Section 1.4.1). It notes that the list is not necessarily definitive of all species or communities that may be relevant to investigations for the project. Appendix A of the EES Scoping Requirements includes some species that are not threatened but are included because they form part of the ecological character description of Glenelg Estuary and Discovery Bay Ramsar Site (DELWP 2017b). Those species and ecological communities are considered in this report.

Complete lists of species considered within this report are provided in Appendix 2 Flora (Flora) and Appendix 3 Fauna (Fauna).

3.2.2 Other protected species

In addition to provisions for threatened and migratory fauna listed under the EPBC Act and the FFG Act, all native mammals, birds, reptiles and amphibians in Victoria are protected by the *Wildlife Act 1975* regardless of their conservation status. Protected flora are native plants or communities of native plants that have legal protection under the FFG Act. A list of Protected Flora is published by DELWP (DELWP 2022). Protected Flora includes plant taxa listed as threatened under the FFG Act, plant taxa belonging to communities listed as threatened under the FFG Act, and plant taxa which are not threatened but require protection for other reasons. The latter two categories thus include protection of some plant taxa that are not threatened.

This report is substantially focussed on threatened taxa and ecological communities, but it encompasses the potential for the Project to influence all protected flora and fauna. It also considers those non-threatened bird species that have been assessed as potentially affected by the Project, particularly from a collision risk perspective.

Potential impacts of the Project on all protected flora are assessed as specified in Victoria's Guidelines for the removal, destruction or lopping of native vegetation (DELWP 2017a).

3.3 Determining likelihood of occurrence of significant and other protected species

Likelihood of occurrence indicates the potential for a species or ecological community to occur within the Project Area, or to travel through the Project Area. It is based on expert opinion, information in relevant biodiversity databases and reports, and an assessment of the habitats on site. Likelihood of occurrence is ranked as negligible, low, medium, high or recorded (by this study). The rationale for the rank assigned is provided for each species in Appendix 2 Flora and Appendix 3 Fauna. Those species for which there is little or no suitable habitat within the Project Area are assigned a likelihood of low or negligible and are not considered for impacts associated with the Project.

3.4 Consultation with government authorities

In late 2018 and early 2019 Neoen and Biosis consulted with officers of DELWP. The consultation has assisted to determine which threatened and migratory species and ecological communities require investigation and to obtain and refine methods and effort for the various studies. The consultation with DELWP included taxa that are MNES under provisions of the EPBC Act and taxa that are covered by Victorian legislation and policies.

Neoen and AECOM also met with officers of the Australian Government Department of Agriculture, Water and the Environment (DAWE) (now the Australian Government Department of Climate Change, Energy, the Environment and Water – DCCEEW) in early 2019 and consulted with them about the project and MNES that it might affect.

EES scoping requirements were formalised in January 2020.

As part of the EES process Technical Reference Group (TRG) meetings have been held and attended by Biosis and Neoen. Biosis has presented to and received feedback from the TRG. This feedback has been incorporated into the studies and surveys carried out for the existing conditions and impact assessment.

DELWP commissioned independent peer reviews for two components of the assessment – Southern Bent-wing Bat and avifauna. These reviews are summarised in Section 1.7 and Appendix 11.

Local experts from Parks Victoria also provided valuable information regarding locations of threatened flora species within areas of public land, including Cobboboonee Forest Park and Cobboboonee National Park, and assisted with locating some of these in the field.

3.5 Stakeholder and community consultation

Several community consultation events specifically for the EES have been held in townships around the Project, including Nelson, Mount Richmond, Portland and Heywood. These represent all the major communities around the project (see Chapter 6 EES for further detail).

These have consisted of open drop-in sessions, where discussions were held with members of the public, landowners from the vicinity of the project and other community members. Discussions included many aspects relating to flora and fauna of the Project Area. The EES chapter on community consultation provides details relating to the consultation activities undertaken for the project. Biosis has attended several of these events to present on the investigations and the findings of the existing conditions studies and impact assessment, including consultation events in December 2019 and August 2022.

Neoen has also provided regular updates on the status of biodiversity studies, and interim findings, via their website, including an open invitation for community input. The interim flora and fauna existing conditions report was made available to the public in late 2020.

Biosis undertook additional local community consultation in 2020 and 2021, particularly regarding threatened bird species including Brolga and Australasian Bittern. These consultations were targeted to areas with suitable Brolga habitat and overlapping infrastructure. Discussions also included a Portland Field Naturalists Club Inc. member and three landholders with suitable Brolga habitat. Community consultation undertaken for the Brolga assessment is detailed in Section 3.1.3. of the Brolga report.

The project also received written feedback from community conservation groups, relating to earlier versions of this report. This feedback provided useful information on threatened species (primarily bird) locations that were not yet available in public databases, and suggestions for other local groups and individuals that may have useful information. Follow up consultation was held with local bird experts, relating to Brolga and Australasian Bittern. These records have been added to mapping produced for this report, and have been considered in impact assessments. Several iterations of database searches have been undertaken since receiving this feedback, and many of these records are now also available via databases include the VBA and BirdData.

The project also interrogated databases from community conservation organisations, including the BirdLife Shorebird database, BirdData and eBird, Atlas of Living Australia and iNaturalist. Consultation undertaken regarding shorebirds within the investigation is summarised in Section 21.1. Publicly available data from species conservation and monitoring websites has also been sourced including South-eastern Red Tailed Black Cockatoo monitoring and monitoring of Grey-headed Flying Fox camps.

Results of discussions from community consultation for the threatened flora and fauna are incorporated in the existing conditions sections of this report, and in the separate brolga assessment report (Biosis 2024b). Incorporation of community based information resulted in a more complete understanding of which species should be considered in this assessment, and information on specific locations and areas of habitat.

3.6 Database and literature review

3.6.1 Information sources

In order to provide context for the Project Area for this assessment, information about flora and fauna from within 10 kilometres of the Project Area (the 'search area') was obtained from relevant biodiversity databases, many of which are maintained by DELWP and DCCEEW (Appendices 2 and 3). Flora and fauna records were not filtered based on record age, however time since the most recent record is considered in the assessment of likelihood of occurrence for each species (Appendix 1 and Appendix 2). Aquatic fauna records were searched for the Glenelg catchment. Records from the following databases were collated and reviewed:

- DELWP's VBA including the 'VBA_FLORA25, FLORA100 & FLORA Restricted' and 'VBA_FAUNA25, FAUNA100 & FAUNA Restricted' datasets, undertaken on 8 July 2022.
- DECCEW's Protected Matters Search Tool for matters protected by the EPBC Act (accessed on 8 July 2022).
- BirdLife Shorebird 2020, date of search 12 June 2022.
- BirdLife BirdData, date of search 4 February 2022. The first Atlas of Australian Birds data were excluded as all the data were associated with one of only two location coordinates, which is not meaningful for impact assessment purposes.
- eBird – date of search 29 June 2022.
- Sheldon 2004 south-west Victorian Brolga flocking database.

Other sources of biodiversity information were examined including:

- DELWP's NatureKit mapping tool
- DELWP's Habitat Importance maps
- DELWP's Native Vegetation Information Management (NVIM) system
- Planning Scheme overlays relevant to biodiversity based on https://planning-schemes.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.

3.7 Site investigations

For the purposes of assessing species and ecological communities, a program of investigations was undertaken that was specifically targeted to maximise the potential of obtaining information on particular species and communities identified in the EES scoping requirements as being most at risk of impact. This entailed timing of surveys to coincide with times when particular 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 taxa.

The study considered all geographic components of the Project that may affect vegetation but was particularly focussed on native vegetation.

This involved:

- Mapping of native vegetation, using field surveys, aerial imagery and publicly available vegetation mapping. Vegetation was mapped according to accepted standards, as described in DEWLP (2017a), DSE (2004) and AS 4970-2009 – *Australian Standard for Protection of trees on development sites*.
- Vegetation mapping was conducted within the Project Area available at the time, including a buffer area of 100 metres beyond the construction footprint. There are some exceptions to this 100-metre buffer, for example, within Cobboboonee National Park where the footprint is extremely narrow along Boiler Swamp Road.
- Mapping of potential habitat for threatened species where these habitats do not satisfy the definition of native vegetation (within the Guidelines) or are associated with non-native vegetation, including blue-gum and pine plantations and aquatic areas within farmland.
- Compilation of lists of native and introduced flora and fauna species occurring in mapped areas, and in the broader Investigation Area.
- Determination of Ecological Vegetation Classes (EVCs), including identifying which areas of native vegetation would require (if impacted) planning permission and offsets.
- Identification of areas where native vegetation corresponds with threatened ecological communities 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 vegetation and habitat mapping were used by the project team to further refine the project design to avoid and minimise disturbance to native vegetation and habitat where possible.

Areas where impacts cannot be avoided have been subject to further assessment, including:

- Vegetation Quality Assessment (DSE 2004).
- Targeted survey for threatened flora species in areas of identified potential impacted habitat.
- Targeted survey for threatened fauna species with potential to be directly impacted by habitat removal.
- Targeted survey for threatened fauna species in nearby habitat areas, with potential to be indirectly impacted by the Project. Note that systematic targeted surveys for threatened flora were not conducted in adjacent areas, due to the low likelihood of indirect impacts on

threatened fauna beyond the Project Areas. Some adjacent conservation reserves were visited to undertake reference checks for cryptic flora species.

The methods for the general and targeted flora and fauna assessments are outlined in Sections 4.1 and 6.1 below. 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 bird utilisation surveys, migratory waterbird surveys, wetland bird surveys, remote camera surveys, reptile tiling surveys, nocturnal surveys for owls and all other times while ecologists were onsite.

Targeted surveys for fauna species conducted during the investigation are described separately for each species or species group (Sections 11–35). 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.

A list of fauna species recorded within the Investigation Area during the targeted threatened fauna surveys is provided in Appendix 3 Fauna (Table A3.1).

Following the initial fauna surveys, and in accordance with the scoping requirements, targeted field surveys were carried out for the following fauna species:

- Southern Bent-wing Bat *Miniopterus orianae bassanii*
- South-eastern Red-tailed Black Cockatoo *Calyptorhynchus banksii graptogyne*
- Orange-bellied Parrot *Neophema chrysogaster*
- Brolga *Antigone rubicunda*
- 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: Migratory shorebirds including Curlew Sandpiper *Calidris ferruginea*, Eastern Curlew *Numenius madagascariensis*, Red Knot *Calidris canutus*, Sanderling *Calidris alba*; non-migratory shorebirds including Hooded Plover *Thinornis cucullatus* and Red-capped Plover *Charadrius ruficapillus*; terns including Fairy Tern *Sternula nereis nereis* and Caspian Tern *Hydroprogne caspia*
- Owls including Barking Owl *Ninox connivens*, Powerful Owl *Ninox strenua* and Masked Owl *Tyto novaehollandiae.*
- Eastern Ground Parrot *Pezoporus wallicus*
- Rufous Bristlebird (Coorong) *Dasyornis broadbenti broadbenti*
- Terrestrial mammals including Southern Brown Bandicoot *Isoodon obesulus obesulus*, Long-nosed Potoroo *Potorous tridactylus trisulcatus,* Heath Mouse *Pseudomys shortridgei* and Swamp Antechinus *Antechinus minimus maritimus*
- Growling Grass Frog *Litoria raniformis*

Survey methods and effort for each species are described in Sections 11–34.

Aquatic values have been assessed via desktop assessment, as detailed in Section 34. Aquatic species considered include Yarra Pygmy Perch *Nannoperca obscura*, Black Bream *Acanthopagrus butcheri*, Short-finned Eel *Anguilla australis*, Common Galaxias *Galaxias maculatus*, Little Galaxias *Galaxiella toourtkoourt*, Mulloway *Argyrosomus japonicus*, Estuary Perch *Macquaria colonorum*, Tupong *Pseudaphritis urvillii* and Ancient Greenling Damselfly *Hemiphlebia mirabilis*.

3.8 Taxonomy

Species names used throughout this report are consistent with the Victorian Biodiversity Atlas (VBA).

Where there are inconsistencies between the VBA naming and the naming used by the federal government for listing species under the EPBC Act, this is noted in the report.

3.9 Mapping

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

Mapping has been produced using a Geographic Information System (GIS). Electronic GIS files which contain flora and fauna spatial data generated through this assessment have been provided to Neoen to incorporate into design concept plans to assist with avoidance of impacts on significant species and ecological communities.

3.10 Personnel

Biosis staff involved in field surveys and their qualifications are listed in Table 5.

Table 5 List of Biosis staff involved in field surveys

Name	Position and qualifications	Field studies
Matt Gibson	Senior Ecologist, BappSc Vegetation Quality Assessments (VQA) Accredited Assessor.	Flora Southern Bent-wing Bat Bird utilisation survey Orange-bellied Parrot
Inka Veltheim	Senior Zoologist, BSc (Hons) PhD	Orange-bellied Parrot Bird utilisation survey Brolga Migratory shorebirds Terrestrial mammals Reptiles
Ian Smales	Principal Zoologist, MSc	Orange-Bellied Parrot Bird utilisation survey

Name	Position and qualifications	Field studies
Daniel Gilmore	Senior Zoologist, BconEcol (Hons)	Orange-Bellied Parrot Red-tailed Black Cockatoo Brolga Terrestrial mammals Ground Parrot / Australasian Bittern Reptiles
Mark Venosta	Senior Zoologist, BconEcol (Hons)	Brolga Migratory shorebirds Owls Ground Parrot / Australasian Bittern Terrestrial mammals
Katrina Sofo	Senior Zoologist, Menv, BSc	Bird utilisation survey Brolga Ground Parrot / Australasian Bittern
Kristin Campbell	Senior Zoologist, BenvSc (Hons)	Red-tailed Black Cockatoo Bird utilisation survey Ground Parrot / Australasian Bittern Owls Terrestrial mammals
Caitlin Potts	Project Zoologist, BenvSc (Hons)	Terrestrial mammals Southern Bent-wing Bat Bird utilisation survey Orange-bellied Parrot
Erin Baldwin	Project Zoologist, BenvSc	Terrestrial mammals Migratory shorebirds Brolga Reptiles Ground Parrot / Australasian Bittern
Jules Farquhar	Zoologist, BenvSc (Hons)	Orange-bellied Parrot Brolga Reptiles
Wyn Russell	Zoologist, BenvSc	Brolga Terrestrial mammals Reptiles Owls
John Muchan	Project Botanist, Beng (Hons) VQA Accredited Assessor.	Flora
Samantha Barron	Botanist, BappSc VQA Accredited Assessor	Flora
Georgina Zacks	Botanist, Benv (Hons) VQA Accredited Assessor	Flora Orange-bellied Parrot

Name	Position and qualifications	Field studies
Matt Jones	Research Assistant, BSc (EnvBio)	Orange-bellied Parrot Brolga Terrestrial mammals
Jack Fursdon	Technical Assistant, BSc (Hons)	Terrestrial mammals Owls Ground Parrot / Australasian Bittern

3.11 Limitations

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

The 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, including:

- Assessment of native vegetation and threatened flora has been limited to the Project Area and the transport route, as there is considered a very low likelihood of indirect impacts beyond these areas. Known locations of some threatened species outside the Project Area were subject to reference checks, but no detailed flora investigations have been undertaken in adjacent areas beyond the Project Area and transport route.
- Most surveys have been conducted within a 12-month period. This has resulted in coverage of all seasons but does not allow for assessment of species occurrence or movements in years with contrasting climatic conditions. For example, during the survey period most of the Red-tailed Black Cockatoo population was known to be inhabiting woodlands further north within the Wimmera, which did not allow for any assessment of movements or behaviour close to the Project Area. However, ecologists have investigated the Project Area between 2018 and 2022. As noted earlier, observations of listed and non-listed species were made whenever ecologists were on site, providing opportunity for incidental observations to be made outside of the times that targeted surveys were being undertaken. This provided opportunity for multi-year observations to be made.
- The assessment of aquatic values has been limited to a desktop assessment. This is in recognition of the current understanding of the distribution of threatened aquatic species within local waterways and the low likelihood of direct or indirect impacts on aquatic values resulting from the Project.

- Most fauna assessments were based on a stratified sampling approach, where representative survey sites were selected across the range of relevant habitat types. As a result, these surveys do not provide complete coverage of the Project Area. This limitation applies to the microbat survey, mammal camera and hair tube surveys, reptile tile surveys, bird utilisation surveys and threatened bird transect surveys.
- Some wetland locations outside the Project Area were practically inaccessible without causing substantial damage to vegetation and habitat or due to impassable roads. This included some of the wetlands within Discovery Bay Coastal Park and the Kentbruck Heath (Lower Glenelg National Park), which were surrounded by dense heathland/shrubland that extends into the wetlands, and within the Lower Glenelg National Park where roads were blocked by water during survey periods.
- Bird utilisation surveys were diurnal only. No information was collected regarding nocturnal bird movements. A key objective of these surveys was to record information on flight height, to be used in any collision risk assessments, and this information cannot be recorded at night. It is acknowledged that some species undertake nocturnal flights – this is discussed in the species-specific sections.
- Whilst the shorebird surveys mostly followed the EPBC Act Policy Statement 3.21 Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species, the surveys included the following limitations:
  - Survey coverage was focused and limited to accessible locations at Swan Lake foreshore, Nobles Rocks foreshore and the Glenelg River estuary.
  - The January 2020 survey period allowed for only one low tide survey within a 24-hour period over two days, which were undertaken at two locations – Swan Lake shoreline and the Glenelg River estuary (including ocean-side shoreline).
  - Nobles Rocks shoreline was added to the survey schedule in February 2020.
  - During the January 2021 survey only Nobles Rocks was surveyed at both low and high tide, and Swan Lake shoreline and the Glenelg River estuary at low tide only.
  - During the survey the Glenelg River estuary had numerous people using it over the public holiday weekend, which would have caused disturbance to birds using the estuary.

  Thus some shorebirds that were likely to be present may have been missed. Furthermore, maximum counts for many of the species from other sources were higher than maximum counts from the Project surveys. The impact assessment reflects the maximum documented presence of shorebirds, including all data sources from the Project surveys and other sources. Additionally, the survey effort in itself, together with current knowledge and data on shorebird use of the broader area, is considered sufficient to meet the objective of the EPBC Act guidelines to identify important habitat for migratory shorebirds:
  - Identification of 'important habitat' for migratory shorebirds is a key concept in determining the likelihood of significant impact from proposed actions. This policy statement is designed to assist with determination of important habitat and the likelihood of significant impacts from proposed actions.
- The DEPI Approved survey standards: Powerful Owl (2 May 2011 Version 1.0) (DSE 2011a) state that "Spring (late September to early November is an excellent time for locating sites

where breeding has been successful" and additionally cautions against call playback survey in autumn-winter (May to July) during the breeding season. The Biosis surveys were designed on this basis, including doing five replicates at each site as recommended in the survey standards. Likelihood of presence can be explicitly modelled when two or more call playback surveys are conducted. Although this was not modelled, we consider the survey effort sufficient for the impact assessment, and the species was detected at one of the eight sites. It is possible that the Powerful Owl may be occasionally present at the other sites, however we have assumed presence and potential flight across the wind farm in the impact assessment.

- Assessment of groundwater dependent ecosystems (GDEs) has been undertaken in the GDE impact assessment (CDM Smith 2024).
- Limitations specific to acoustic surveys for microbats are outlined in the Southern Bent-wing Bat report (Biosis 2024a).

3.12 Impact assessment

The approach taken for the consideration of impacts has been to first identify potential ecological receptors, including taxa and ecological communities, from a range of existing information sources and from targeted studies. The proposed design and information about the planned construction and operation of the Project have then been assessed to determine the likely capacity for the Project to affect identified ecological receptors.

Both the Final EES Scoping Requirements for the Project and the DELWP (2021a) Impact assessment guidelines require consideration of the magnitude, severity, extent and duration of potential effects on biodiversity values. To the extent that it has been possible to foresee these aspects of potential impacts, they have been described accordingly.

Efforts have been made to fill knowledge gaps, but various uncertainties remain, and they represent limitations on the impact assessment. Where relevant, identified uncertainties and other limitations are discussed in impact assessment accounts. Some limitations are due to factors associated with particular taxa, such as cryptic behaviours, very small and dispersed populations and known absence from the region during the course of investigations. Other limitations relate to limited information available from other disciplines and some aspects of the Project design that remain to be confirmed at the time of preparing this report.

Potential impacts on MNES protected under the EPBC Act are assessed against significant impact guidelines developed by the Commonwealth of Australia, to determine whether impacts are 'significant' as defined under the Act. The following EPBC Act policy documents were considered in the impact assessment for the Project:

- Matters of National Environmental Significance (MNES). Significant impact guidelines 1.1 (DoE 2013a).
- EPBC Act Policy Statement 2.3 – Wind farm industry. Australian Government Department of the Environment, Water, Heritage and the Arts 2009 (DEWHA 2009a).
- EPBC Act Policy Statement 3.14 – Significant Impact Guidelines for the vulnerable growling grass frog (*Litoria raniformis*) (DEWHA 2009b).
- EPBC Act Policy Statement 3.21 – Industry Guidelines for Avoiding, Assessing and Mitigating impacts on EPBC Act listed Migratory Shorebird Species (DoEE 2017).

- Draft referral guideline for 14 migratory birds listed under the EPBC Act. Australian Government Department of the Environment 2015 (DoE 2015).
- EPBC Act – Draft referral guidelines for the endangered southern brown bandicoot (eastern), *Isoodon obesulus obesulus*. Department of Sustainability, Environment, Water, Population and Communities 2011 (DSEWPC 2011a).

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

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

Of specific relevance to this impact assessment, these include:

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

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

Other resources used in consideration of potential impacts include:

- Scoping Requirements for Kentbruck Green Power Hub Environment Effects Statement. *Environment Effects Act 1978*. Department of Sustainability and Environment 2020 (DSE 2020).
- Development of Wind Energy Facilities in Victoria Policy and Planning Guidelines. Department of Environment, Land, Water and Planning 2019 (DELWP 2021b).
- Ministerial Guidelines for Assessment of Environmental Effects under the *Environment Effects Act 1978.* Department of Sustainability and Environment 2006 (DTP 2023).
- *Environment Effects Act 1978* Advisory Note. DELWP Impact Assessment Guidance. Use of impact assessment and risk assessment in environment effects statements. Department of Environment, Land, Water and Planning 2021 (DELWP 2021a).
- Ecological Character Description for Glenelg Estuary and Discovery Bay Ramsar Site. Department of Environment, Land, Water and Planning 2017 (DELWP 2017b).
- Glenelg Estuary and Discovery Bay Ramsar Site Management Plan. Department of Environment, Land, Water and Planning 2017 (DELWP 2017c).
- Lumsden L, Moloney P & Smales I 2019a. *Developing a science-based approach to defining key species of birds and bats of concern for wind farm developments in Victoria.* Arthur Rylah Institute for Environmental Research Technical Report Series No. 301. Department of Environment, Land, Water and Planning, Heidelberg, Victoria.

DELWP (Lumsden et al. 2019) used an expert elicitation process to provide an evaluation of potential risk of turbine collisions for multiple species of Victorian birds. However, the criteria used in that process included turbines would have dimensions that differ significantly from those proposed for the Project and the threatened status of species as per the *Advisory List of threatened vertebrate fauna in Victoria* (DSE 2013), which has been superseded by the Flora and Fauna guarantee Amendment Act 2019, and is no longer applicable. As a consequence, the Lumsden et al. (2019) assessment is not considered to be applicable to the Project.

4. Native vegetation and habitat

4.1 Methods

Flora surveys were undertaken between May 2020 and October 2021, as follows:

- 4–8 May 2020
- 26 August 2020
- 15–18 September 2020
- 6–9 October and 12–15 October 2020
- 9–13 November 2020
- 7–10 December 2020
- 10–12 March 2021
- 26–29 October 2021
- 12 August 2022.

Targeted surveys for threatened species were undertaken during these periods. Species were targeted in the appropriate detection periods, as outlined in Table 14. Other flora survey activities undertaken across the survey period included vegetation mapping, inspection of proposed turbine locations and vegetation quality assessments of potentially impacted vegetation within the wind farm and powerline alignments.

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

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

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

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

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

A canopy tree is a mature tree that is greater than three metres in height and is normally found in the upper layer of a vegetation type (DELWP 2017a). EVC descriptions provide a list of the typical canopy species. A scattered tree is defined as either small or large, and is determined using the large tree benchmark for the relevant EVC. The extent of a small scattered tree is the area of a circle with a 10 metre radius (i.e. 0.031 hectares), while the extent of a large scattered tree is a circle with a 15 metre radius (i.e. 0.070 hectares). A condition score is applied to each scattered tree based on information provided by DELWP's NVIM system.

A Vegetation Quality Assessment (VQA) was undertaken for all patches of native vegetation identified in the Project Area. This assessment is consistent with DELWP's habitat hectare method (DSE 2004) and the Guidelines (DELWP 2017a). For the purposes of this assessment the limit of the resolution for identification of a patch of native vegetation was taken to be 0.001 habitat hectares (Hha). That is, if a discrete patch native vegetation was present with sufficient cover but its condition and extent would not have resulted in the identification of at least 0.001 Hha, the vegetation patch of vegetation was not mapped in the assessment.

Species nomenclature for flora follows the Victorian Biodiversity Atlas (VBA). All species observed during the surveys have been 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).

4.1.1 Arborist assessment of the underground transmission line

An arborist was engaged to assess potential impacts on trees along Boiler Swamp Road through Cobboboonee National Park and Cobboboonee Forest Park for the construction of the proposed underground transmission line. Axiom Tree Management (ATM) undertook the assessment in May–June 2021. Their report is provided in Appendix 12.

The Investigation Area for the assessment consisted of 15 metres on either side of Boiler Swamp Road, for a distance of approximately 15 kilometres. All trees within 15 metres 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 tree protection zone (TPZ). The impact area included a 1.5 metres wide trench, centred on the middle of the road, plus any areas where additional excavation was specified, including cable junction pits. The design of the transmission line route has since changed and the impact assessment can be seen in Section 4.4.2,

The following information was recorded for each tree assessed:

- Location using differentially corrected GPS (+/- 1.0 metre accuracy)
- Tree species
- Diameter at breast height (DBH measured at 1.3 metres above ground level)
- Canopy dimensions (estimated)
- Health and structure ratings.

2037 trees were assessed in detail, including:

- Messmate Stringybark *Eucalyptus obliqua* (872 trees)
- Rough-barked Manna-gum *Eucalyptus viminalis* subsp. *cygnetensis* (619 trees) (refer to section 4.1.2 below)
- Western Peppermint *Eucalyptus falciformis* (FFG Act: vulnerable – 540 trees)
- Blackwood *Acacia melanoxylon* (5 trees)
- Cherry Ballart *Exocarpos cupressiformis* (1 tree)

To inform the vegetation impact assessment, the tree data was used by Biosis 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 impacted, the loss area was either 0.071 hectares (15 metre radius) for large trees, or 0.031 hectares (10 metre radius) for other trees.

4.1.2 2022 Survey to map Apple Jack *Eucalyptus splendens*

The October 2022 fieldwork was conducted to clarify the status and locations of Apple Jack *Eucalyptus splendens* adjacent to the proposed transmission line, following consultation with local Parks Victoria staff. This species was added to the list of threatened species under the *Flora and Fauna Guarantee Act 1988* (FFG Act) following the review of the act in 2021. It is now listed as Critically Endangered.

The survey involved visiting sites, guided by Parks Victoria, known to support Apple Jack and confirming the identification of this species, including key field characteristics to separate Apple Jack from co-occurring species or similar species, including Rough-barked Manna Gum *Eucalyptus viminalis* subsp. *cygnetensis* and Western Peppermint *Eucalyptus falciformis*.

Biosis re-surveyed the entire length of the road on 28 October 2022 to correctly re-attribute any misidentified trees. Notes were also made on observations of trees that had fallen since the arborists assessment in 2021. The arborist report, provided in Appendix 12, has since been updated with species identifications provided by Biosis. The arborist report has not been updated to reflect the final design methodology for Boiler Swamp Road and the assessment of Boiler Swamp Road on Native Vegetation can be found in Section 4.4.2.

4.1.3 2023 survey of proposed transport routes

Three potential routes have been proposed to transport wind farm equipment from the Port of Portland to the Western-most entrance of the windfarm. The proposed routes are as follows:

- Route A: Port of Portland to Rex J Andrews (RJA) storage. Suitable for loads under 5.3 metres (loaded height).
- Route B: Port of Portland to RJA storage. Suitable for loads over 5.3 metres (loaded height).
- Route C: Rej J Andrews storage to Kentbruck.

The proposed routes were surveyed by Rex J Andrews Pty Ltd (RJA) on 11 August 2022 to determine the suitability of roads and infrastructure for transporting wind farm equipment (RJA 2022). The survey and subsequent reports provided analysis on the areas where trucks and the swept path of equipment will utilise roadsides (most common around corners). Biosis undertook a survey of the proposed routes on 22-24 May 2023 to determine the extent of impacts to native vegetation. Each location where RJA modelled trucks and equipment may impact roadside vegetation were assessed. The location of native vegetation patches, scattered trees and large patch trees within the vicinity of projects truck or equipment swept pathways were mapped using a GPS enabled tablet. Vegetation Quality Assessments were undertaken in accordance with the methods in Section 4.1.

4.1.4 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. Biosis was involved throughout this process, through the provision of data and recommendations for avoidance of specific areas.

Design modifications undertaken throughout the process include (note these are further discussed in Section 4.4.6):

- 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 (NVR) tool, which has now (as of 2024) been replaced by the DEECA Native Vegetation Regulation Map (NVR 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.
- 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.

4.2 Existing conditions

Flora recorded within the Project Area during assessments are listed in Appendix 2 Flora. The results of the Arborists assessment are provided in Appendix 12.

4.2.1 Vegetation and fauna habitat

A summary of the vegetation and habitat types recorded within the Project Area is provided in Table 6.

Table 6 Summary of vegetation and habitat types within the Project Area

Site component, vegetation or habitat type	Description of flora and fauna values
Within wind farm	
Pine plantations	Plantations of Radiata Pine at a range of ages (Plates 3 to 5). Shading and high cover of pine needles on the ground generally suppress growth of understorey plants (Plate 3). Some areas, particularly near the edge of the plantation, include an understorey of recolonising native species such as Coast Wattle *Acacia longifolia* subsp. *sophorae,* Coast Beard-heath *Leucopogon parviflorus*, Seaberry Saltbush *Rhagodia candolleana* subsp. *candolleana*, Bidgee-widgee *Acaena novae-zelandiae* and Sword-sedges *Lepidosperma* spp. (Plate 6). Mature pine plantations provide limited habitat value for native fauna, due to the simplified structure, high level of shading and dense layer of pine needles, which suppresses growth of understorey plants. Younger plantations are more structurally complex, generally with a denser shrub layer, of both young pine trees and native coloniser shrubs. Native mammals such as Black Wallaby *Wallabia bicolor* and Red-necked Wallaby *Notamacropus rufogriseus banksianus* can make use of plantations, particularly around the edges near blocks of native vegetation. Commonly observed birds include Pied Currawong *Strepera graculina*, Yellow-tailed Black-Cockatoo *Calyptorhynchus funereus*, ravens, Australian Magpie *Gymnorhina tibicen*, Superb Fairy-wren *Malurus cyaneus*,

Site component, vegetation or habitat type	Description of flora and fauna values
	Crimson Rosella *Platycercus elegans*, Silvereye *Zosterops lateralis*, White-browed Scrub-wren *Sericornis frontalis* and Brown Thornbill *Acanthiza pusilla*. Wedge-tailed Eagle *Aquila audax* and other raptor species were observed flying above plantations, particularly younger plantations. Young plantations also provide habitat for open-country birds, such as Australasian Pipit *Anthus australis* and Striated Fieldwren *Calamanthus fuliginosus*. Emu *Dromaius novaehollandiae* were recorded relatively regularly within pine plantations. Olive Whistler *Pachycephala olivacea* was also recorded within the pine plantations. Threatened fauna recorded within pine plantations included Heath Mouse and Rufous Bristlebird.
Internal pine plantation tracks	The plantation area includes an extensive network of internal access tracks (private land), generally in a gridded pattern (Plate 7). Generally, these tracks are maintained by slashing or herbicide, and the ground cover is sparse or dominated by weed species. Narrow tracks are highly shaded with very little understorey growth. In some areas, these tracks support a similar suite of opportunistic native species to those within the plantation area. Habitat value along these tracks is limited due to regular slashing and/or spraying and disturbance caused by vehicles and stockpiling of cut logs.
Public roads within the plantation area	The plantation area also includes some public roads, managed by Glenelg Shire Council. Most of these roads run in a north-south direction from Portland–Nelson Road towards the Glenelg Estuary and Discovery Bay Ramsar site. These roads are generally wider than the internal plantation tracks, and in some cases (e.g. Johnsons Road – Plate 8, Dry Block Road, Mcleans Road and Browns Road) support areas of remnant native vegetation. Where native vegetation is present on these road reserves, it occurs as modified examples of Damp Sands Herb-rich Woodland (EVC 3). Species recorded in these areas include Coast Wattle, Coast Beard-heath, Sweet Bursaria *Bursaria spinosa*, Coast Sword Sedge *Lepidosperma gladiatum*, Slender Rice-flower *Pimelea linifolia*, Common Boobialla *Myoporum insulare*, Knobby Club-sedge *Ficinia nodosa*, Bidgee-widgee and Black-anther Flax-lily *Dianella revoluta* s.l. Where shrubs are present, these areas provide habitat for small understorey birds, including White-browed Scrubwren and Superb Fairy-wren. These areas also provide movement corridors for native mammals and reptiles.

Site component, vegetation or habitat type	Description of flora and fauna values
Remnant vegetation within the pine plantation	The initial establishment of the pine plantation involved almost complete clearance of the plantation area. There are, however, small patches of remnant vegetation (Plate 9) and some scattered trees including Drooping Sheoak *Allocasuarina verticillata* (Plate 10). The patch of vegetation shown in Plate 9 is likely present due to the steepness of the location making it unsuitable for plantation establishment. This location contains a modified example of Coastal Alkaline Scrub (EVC 858). Species present include Coast Beard-heath, Coast Wattle, Moonah *Melaleuca lanceolata*, Golden Wattle *Acacia pycnantha*, Seaberry Saltbush, Spear-grass *Austrostipa* spp., Bidgee-widgee and Austral Bracken. These small patches are likely to be too small to provide important habitat for any mammal species but can be used by a diverse range of bird species, including New Holland Honeyeater *Phylidonyris novaehollandiae*, Red-wattlebird *Anthochaera carunculata*, Silvereye, Yellow-faced Honeyeater *Caligavis chrysops*, White-browed Scrub-wren and thornbills.
Portland–Nelson Road	The Portland–Nelson Road reserve is included in the Project Area as a path for the internal transmission line, as well as the primary route for construction and maintenance traffic and the transport of wind farm equipment. For most of the Project Area the road passes through the pine plantation, but the road reserve also includes patches of remnant vegetation and scattered trees as well as cleared areas and areas of planted vegetation. Most of the road reserve is regularly slashed, but there are sections of remnant woodland, and areas with planted trees, mostly Southern Mahogany *Eucalyptus botryoides*. Sections with planted trees are not regularly slashed, resulting in a dense growth of understorey native shrubs, including Coast Wattle and Coast Beard-heath. Slashed areas are generally dominated by exotic species, but there are areas supporting a range of native grasses, including monospecific swards of Blady Grass *Imperata cylindrica*. Isolated un-slashed areas provide habitat for mobile species preferring a dense shrubby understorey. Portland–Nelson Road also provides a movement corridor for native mammals and reptiles, including potentially for threatened mammals.
Blue gum plantation	The Project Area includes several blocks of commercial blue gum plantation (Plate 11). These areas generally support a higher cover and diversity of native understorey species, potentially due to the lower level of shading and more recent establishment compared with pine plantations. Blue gum plantations close to the dune system (south of Portland–Nelson Road) support a similar suite of native species to the pine plantations, including Common Boobialla, Coast Beard-heath, Coast Wattle, Sea Box *Alyxia buxifolia*, Knobby Club-sedge, Seaberry Saltbush and Austral Bracken.

Site component, vegetation or habitat type	Description of flora and fauna values
	Blue gum plantations in the north-east of the wind farm site support a more diverse range of native understorey species, having affinities with the adjacent Wet Heathland (EVC 8) and Heathy Woodland (EVC 48) areas of Lower Glenelg National Park. Species present in these areas include Mitchell's Wattle *Acacia mitchellii*, Prickly Moses *Acacia verticillata*, Spike Wattle *Acacia oxycedrus*, Prickly Tea-tree *Leptospermum continentale*, Dusty Miller *Spyridium parvifolium*, Scented Paperbark *Melaleuca squarrosa*, Bundled Guinea-flower *Hibbertia fasciculata* var. *prostrata*, Broom Spurge *Amperea xiphoclada* var. *xiphoclada*, Red-fruit Saw-sedge *Gahnia sieberiana*, Tassel Cord-rush *Baloskion tetraphyllum* subsp. *tetraphyllum*, Dwarf Wire-lily *Laxmannia orientalis* and Hairy Rice-grass *Tetrarrhena distichophylla*. Blue gum plantations provide habitat for open-country and canopy foraging birds, including Australian Magpie, ravens, Silvereye, Yellow-faced Honeyeater and Red Wattlebird. Blue gum plantations can have structurally diverse understorey and shrub layers, suitable for White-browed Scrubwren, thornbills, Superb Fairy-wren, Grey Shrike-thrush *Colluricincla harmonica* and Eastern Yellow Robin *Eopsaltria australis*. White-footed Dunnarts *Sminthopsis leucopus* were recorded during the tile surveys and Koalas *Phascolarctos cinereus* were also observed foraging on Blue-gums within plantations to the north of Portland–Nelson Road. Breeding Brolgas were recorded within a wetland within the blue gum plantation north of Kentbruck Settlement Road and along Kentbruck Settlement Road.
Farmland	The wind farm area includes areas of farmland near the pine plantation, at the eastern and western ends (Plates 12 to 14). The land is used for dryland grazing, and most areas show signs of pasture improvement, being dominated by a range of introduced pasture grasses. Scattered native species are present in these areas, including Austral Bracken, Knobby Club-sedge and Rushes *Juncus* spp. Areas of farmland provide habitat for open-country birds including ravens, Australian Magpie, Magpie-lark *Grallina cyanoleuca*, Australasian Pipit, Sulphur-crested Cockatoo *Cacatua galerita* and Galah *Eolophus roseicapilla*. The open structure of farmland is attractive to aerial foraging species such as Welcome Swallow *Hirundo neoxena* and Tree Martin *Petrochelidon nigricans*, and a range of raptor species are also frequently observed, including Brown Falcon *Falco berigora* and Wedge-tailed Eagle. Farmland close to remnant native vegetation may also be visited by Blue-winged Parrot *Neophema chrysostoma* and Emu *Dromaius novaehollandiae*. 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 *Epthianura albifrons* and Straw-necked Ibis *Threskiornis spinicollis*. Farmlands also provide habitat for introduced species including Eurasian Skylark *Alauda arvensis*, Common Startling *Sturnus vulgaris* and European Goldfinch *Carduelis carduelis*.

Site component, vegetation or habitat type	Description of flora and fauna values
Powerline routes	
Underground sections	The external powerline route extends from the eastern end of the Wind Farm area to the Heywood terminal station, to the south of the Heywood township. The route includes sections of underground lines through farmland, and an underground section proposed to be constructed under an existing road (Boiler Swamp Road) through Cobboboonee Forest Park and Cobboboonee National Park (Plates 15–18). The entire section of Boiler Swamp Road assessed is located within the Victorian Volcanic Plain Bioregion. Cobboboonee National Park and Cobboboonee Forest Park (referred to as the Cobboboonee Forest) support high quality Lowland Forest (EVC 16), with small areas of Sedgy Riparian Woodland (EVC 198) where the roads cross waterways, including tributaries of the Surrey River. These EVCs are further described in Table 7. Some weed issues are evident, in particular infestations of Boneseed *Chrysanthemoides monilifera* subsp. *Monilifera* in the western sections of Cobboboonee Forest Park. 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. Significant species of note include Powerful Owl *Ninox strenua*, Rufous Bristlebird *Dasyornis broadbenti*, South-eastern Red-tailed Black Cockatoo *Calyptorhynchus banksii graptogyne*, Gang-gang Cockatoo *Callocephalon fimbriatum*, Southern Bent-wing Bat *Miniopterus orianae bassanii*, Swamp Antechinus *Antechinus minimus maritimus*, Heath Mouse *Pseudomys shortridgei* and Southern Brown Bandicoot *Isoodon obesulus obesulus*. Farmland between the Cobboboonee Forest and the terminal station provides habitat for common open-country birds including ravens, Australian Magpie, Magpie-lark, Australasian Pipit, Sulphur-crested Cockatoo and Galah. The open structure of farmland is 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. Low lying, seasonally wet depressions and adjacent areas within farmland provide habitat for a range of wetland birds including Brolga, herons, egrets, Ibis and several duck species.

4.2.2 Ecological Vegetation Classes

Components of the Project Area span three bioregions: Glenelg Plain, Bridgewater and Victorian Volcanic Plain. EVCs recorded during the flora assessment are presented in Table 7 and shown in Figure 4a. Where modified examples of EVCs were recorded, these are also summarised in Table 7 which also specifies the bioregional conservation status (BCS) of each EVC.

Table 7 Description of Ecological Vegetation Classes and condition states recorded within the Project Area (BCS denotes Biodiversity Conservation Status)

EVC and Condition State	Description of EVC within Project Area	Location
Coastal Alkaline Scrub EVC 858 Glenelg Plain Bioregion BCS: Endangered *High quality*	Low woodland to tall shrubland to 8 metres high with an overstorey characterised by Drooping Sheoak *Allocasuarina verticillata.* A prominent shrub layer is dominated by Golden Wattle *Acacia pycnantha,* Coast Wattle *Acacia longifolia* subsp. *sophorae* and Coast Beard-heath *Leucopogon parviflorus.* The understory is predominantly made up of native graminoids and herbs including Coast Flax-lily *Dianella brevicaulis*, Wallaby Grass *Rytidosperma* spp., Spear Grass *Austrostipa* spp. and Running Postman *Kennedia prostrata*. Introduced grasses and herbs are also present in the understory and include Yorkshire Fog *Holcus lanatus*, Brown-top Bent *Agrostis capillaris* and Great Brome *Bromus diandrus.*	Road reserves within the plantation sub-area.
Coastal Alkaline Scrub EVC 858 Glenelg Plain Bioregion BCS: Endangered *Moderate quality*	Dominated by a thick shrub layer of native shrub species including Coast Wattle and Blackwood *Acacia melanoxylon.* A sparse ground cover is characterised by Wallaby Grass and some scattered Bracken. Weed cover was low in this EVC and included Fescue *Vulpia* spp. and herb Patterson's Curse *Echium plantagineum*.	Road reserves within the plantation sub-area.
Coastal Alkaline Scrub EVC 858 Glenelg Plain Bioregion BCS: Endangered *Low quality*	Low quality Coastal Alkaline Scrub lacking a shrub layer. The species poor ground layer is dominated by Blady Grass *Imperata cylindrica* with Austral Stork's Bill *Pelargonium australe* and Grassland Wood-sorrel *Oxalis perennans* scattered throughout. Introduced species are present and include Couch *Cynodon dactylon* and Flatweed *Hypochaeris radicata.*	Road reserves within the plantation sub-area.
Damp Sands Herb-rich Woodland EVC 3 Glenelg Plain Bioregion BCS: Vulnerable *High quality*	An overstorey characterised by Manna Gum *Eucalyptus viminalis*, Swamp Gum *Eucalyptus ovata* and Western Peppermint *Eucalyptus falciformis.* The shrub layer is dominated by native species including Sweet Bursaria *Bursaria spinosa*, Prickly Moses *Acacia verticillata,* Blackwood and Silver Banksia *Banksia marginata*. A relatively thick ground cover is dominated by native herbs and graminoids including Weeping Grass *Microlaena stipoides* var. *stipoides,* Small Poranthera *Poranthera microphylla,* Milkmaids *Burchardia umbellata* and Common Rice-flower *Pimelea humilis*. Weed cover is low and includes Ribwort *Plantago lanceolata* and Common Centaury *Centaurium erythraea*.	Portland–Nelson Road reserve (transport route).

EVC and Condition State	Description of EVC within Project Area	Location
Damp Sands Herb-rich Woodland **EVC 3** Glenelg Plain Bioregion BCS: Vulnerable *Moderate quality*	A sparse overstorey of native Swamp Gum amongst the non-indigenous planted Southern Mahogany *Eucalyptus botryoides.* The mid-storey is characterised by native Blackwood, Coast Wattle and Coast Beard-heath, with some introduced Radiata Pine *Pinus radiata*. Weed cover is relatively high in this EVC with the ground layer characterised by both native and introduced grasses and herbs. Native species include Common Tussock-grass *Poa labillardierei*, Wallaby Grass, Spear Grass and Coast Flax-lily *Dianella brevicaulis.* Introduced species include Yorkshire Fog *Holcus lanatus*, Tall Fescue *Festuca arundinacea*, Kikuyu *Cenchrus clandestinus* and Ribwort.	Several patches along Portland–Nelson Road reserve (transport route)
Damp Sands Herb-rich Woodland **EVC 3** Glenelg Plain Bioregion BCS: Vulnerable *Low quality*	A grassy EVC with an absent overstorey and sparse native shrub layer. Characteristic shrub species include Coast Beard-heath, Golden Wattle and Coast Wattle. The ground layer is dominated by native and introduced graminoid and herb species. Native species include Blady Grass, Common Tussock-grass, Wallaby Grass, Spear Grass and Coast Flax-lily. Weed cover was relatively high and dominated by a variety of grasses including Yorkshire Fog, Rat-tail Grass *Sporobolus africanus,* Kikuyu and Cocksfoot *Dactylis glomerata.*	Road reserves within the pine plantation. Modified examples along Portland – Nelson road reserve (transport route)
Heathy Herb-rich Woodland **EVC 179** Glenelg Plain Bioregion BCS: Depleted *Low quality*	An overstorey of swamp gums and a sparse shrubby midstory. Graminoid and herb lifeforms are missing from these patches due to a moderate to high cover (25-50%) of weeds.	Portland – Nelson road reserve (transport route)
Heathy Herb-rich Woodland **EVC 179** Glenelg Plain Bioregion BCS: Depleted *Moderate quality*	Absent overstorey with a sparse, shrubby midstory. Graminoid and herb lifeforms are missing from these patches due to a moderate to high cover (25-50%) of weeds.	Portland – Nelson road reserve (transport route)
Heathy Woodland **EVC 48** Glenelg Plain Bioregion BCS: Least Concern *High quality*	An overstorey characterised by Brown Stringybark *Eucalyptus baxteri.* A sparse native shrub layer includes Silver Banksia, Heath Tree *Leptospermum myrsinoides*, Bundled Guinea-flower *Hibbertia fasciculata* var. *prostrata* and Beaked Hakea *Hakea rostrata.* The ground layer is dominated by native graminoid and herb species including Small Grass-tree *Xanthorrhoea minor* subsp. *lutea,* Spear Grass, Tassel Rope-rush *Hypolaena fastigiata,* Thatch Saw-sedge *Gahnia radula* and Pink-bells *Tetratheca ciliata.* Very low weed cover was observed within this EVC.	Cobboboonee National Park. Remnant vegetation along the northern boundary of the plantation.

EVC and Condition State	Description of EVC within Project Area	Location
Heathy Woodland **EVC 48** Glenelg Plain Bioregion BCS: Least Concern *Moderate quality*	An absent overstorey with a thick native shrub layer dominated by Silver Banksia, Heath Tree and Smooth Parrot-pea *Dillwynia glaberrima.* The mostly native ground cover is dominated by a range of graminoids and herbs including Wiry Spear-grass *Austrostipa muelleri,* Thatch Saw-sedge, Wallaby Grass and Rapier Sedge species *Lepidosperma* spp. Weeds cover is relatively low and includes Ribwort, Flatweed and Spear Thistle *Cirsium vulgare.*	Heywood Terminal Station.
Lowland Forest **EVC 16** Glenelg Plain Bioregion BCS: Least Concern *Moderate and high quality*	Open forest to 20 metres tall with an overstorey dominated by Messmate Stringybark *Eucalyptus obliqua.* The mid-storey is dominated by fern and shrub species including Bracken *Pteridium esculentum*, Silver Banksia, Prickly Current-bush *Coprosma quadrifida* and Coast Beard-heath. The ground layer is relatively dense and dominated by native herb, shrub and grass species. Characteristic species include Shade Raspwort *Gonocarpus humilis,* Sheep's Burr *Acaena echinata,* Common Flat-pea *Platylobium obtusangulum* var. *spinulosum,* Wiry Spear-grass and Blue Bottle-daisy *Lagenophora stipitata*. Weeds are present at low cover (<5% cover) and include Flatweed and Radiata Pine.	Road reserves and Cobboboonee National Park.
Wet Heathland **EVC 8** Glenelg Plain Bioregion BCS: Least Concern *Low quality*	A treeless EVC, characterised by the presence of Rush species *Juncus* spp. Weed cover is high (>50%) and includes Spear Thistle, Flatweed, Sweet Vernal-grass *Anthoxanthum odoratum* and Sheep Sorrel *Acetosella vulgaris*.	Cleared farmland in areas that supported Wet Heathland prior to clearing.
Swamp Scrub **EVC 53** Glenelg Plain Bioregion BCS: Vulnerable *High quality*	Closed scrub to 8 metres tall with a canopy dominated by Western Peppermint and Swamp Gum. A thick shrub layer is characterised by Coast Wattle, Spike Wattle *Acacia oxycedrus,* Prickly Moses *Acacia verticillata* and Scented Paperbark *Melaleuca squarrosa*. The thick ground cover is dominated by a range of native graminoids and herbs including Black-anther Flax-lily *Dianella revoluta* var. *revoluta,* Thatch Saw-sedge, Spiny-headed Mat-rush *Lomandra longifolia*, Tall Sundew *Drosera auriculata,* Bracken and Small Poranthera.	Riparian sites including within Cobboboonee National Park.
Damp Heathy Woodland **EVC 793** Glenelg Plain Bioregion BCS: Depleted *Moderate quality*	Woodland to 10 metres tall characterised by an overstorey of Swamp Gum and Western Peppermint. A dense heathy understorey is dominated by native shrubs including Coast Wattle, Blackwood, Common Cassinia *Cassinia aculeata* subsp. *aculeata,* Sweet Bursaria *Bursaria spinosa* and Coast Beard-heath *Leucopogon parviflorus.* The ground layer has a relatively high cover of weeds including Squirrel-tail Fescue *Vulpia bromoides*, Cleavers *Galium aparine*, Yorkshire Fog and English Ivy *Hedera helix*.	Transmission route.

EVC and Condition State	Description of EVC within Project Area	Location
Herb-rich Foothill Forest **EVC 23** Glenelg Plain Bioregion BCS: Vulnerable *High quality*	An open woodland to 25 metres tall characterised by an overstorey of Swamp Gum and Manna Gum. The shrub layer is dominated by native species including Blackwood, Coast Beard-heath, Sweet Bursaria and Hop Wattle *Acacia stricta.* The ground cover is characterised by native graminoid and herb species including Common Apple-berry *Billardiera mutabilis,* Buttercup *Ranunculus* spp., Kangaroo Grass *Themeda triandra* and Tussock Grass. Weeds cover is relatively low in this EVC and includes Ribwort and Flatweed.	Eastern section of the Project Area, including Cobboboonee National Park and adjacent areas.
Sedgy Riparian Woodland **EVC 198** Victorian Volcanic Plain Bioregion BCS: Vulnerable *High quality*	An overstorey characterised by Swamp Gum and a relatively thick shrub layer including Blackwood, Hazel Pomaderris *Pomaderris aspera,* Woolly Tea-tree *Leptospermum lanigerum* and Prickly Current-bush. The ground cover is dominated by native species including Sword Sedge *Lepidosperma* spp., Slender Tussock-grass *Poa tenera*, Tall Sedge *Carex appressa*, Hairy Pennywort *Hydrocotyle hirta* and Common Woodrush *Luzula meridionalis*. Weed cover is relatively low and includes Spear Thistle, Common Sow thistle *Sonchus oleraceus* and Wild Oat *Avena fatua.*	Cobboboonee National Park, including several locations along Boiler Swamp Road.
Heathy Woodland **EVC 48** Victorian Volcanic Plain Bioregion BCS: Vulnerable *High quality*	Low woodland to 10 metres tall with an overstorey characterised by Brown Stringybark and Western Peppermint. A diverse native shrub layer includes Silver Banksia, Blackwood, Prickly Tea-tree *Leptospermum continentale*, Heath Tea-tree *Leptospermum myrsinoides*, Common Flat-pea *Platylobium obtusangulum* and Smooth Parrot-pea *Dillwynia glaberrima.* Ground cover is dominated by Austral Bracken along with native herb and graminoid species including Scented Sundew *Drosera aberrans,* Small Grass-tree *Xanthorrhoea minor* subsp. *lutea*, Austral Grass-tree *Xanthorrhoea australis*, Wiry Spear-grass and Spiny-headed Mat-rush *Lomandra longifolia.*	Narrawong Flora Reserve and Mount Clay State Forest near the Heywood terminal station.
Herb-rich Foothill Forest **EVC 23** Victorian Volcanic Plain Bioregion BCS: Vulnerable *High quality*	A medium to tall open forest to 25"metre's high with a sparse tree layer and dense shrub cover. The overstorey is characterised by Swamp Gum and Manna Gum, with a small tree layer of Cherry Ballart *Exocarpos cupressiformis* and Blackwood. The native shrub layer includes Sweet Bursaria, Prickly Moses, Silver Banksia, Austral Indigo *Indigofera australis* and Guinea Flower *Hibbertia* spp. The diverse ground cover is dominated by a range of native species including Kidney-weed *Dichondra repens*, Hairy Speedwell *Veronica calycina*, Broad-leaf Stinkweed *Opercularia ovata,* Trailing Goodenia *Goodenia lanata* and Austral Bracken. Weeds are present in small numbers and include Ribwort, Flatweed and Sweet Vernal-grass.	Eastern sections of Boiler Swamp Road.

EVC and Condition State	Description of EVC within Project Area	Location
Damp Sands Herb-rich Woodland **EVC 3** Bridgewater Bioregion BCS: Vulnerable *Low quality*	An open woodland to 15 metres tall with an overstorey characterised by Manna Gum and Brown Stringybark. The relatively sparse shrub layer includes Honey-myrtle *Melaleuca* spp., Golden Wattle and Coast Beard-heath. The ground cover is composed of native herb and grass species including Spear Grass, Running Postman, Blady Grass and Bedstraw *Galium* spp. This EVC has a relatively high weed cover and includes Yorkshire Fog, Toowoomba Canary-grass *Phalaris aquatica,* Brown-top Bent *Agrostis capillaris* and Wild Oat.	Johnsons Road along the western boundary of the pine plantation.
Coastal Alkaline Scrub **EVC 858** Bridgewater Bioregion BCS: Least Concern *Low quality*	A naturally treeless vegetation with a dense shrub layer dominated by native species including Coast Wattle, Coast Daisy-Bush *Olearia axillaris*, Coast Beard-heath and Muntries *Kunzea pomifera*. The ground layer is dominated by native sedge, herb and grass species including Coast Sword-sedge *Lepidosperma gladiatum*, Tussock Grass, Spear Grass, Black-anther flax-lily and Crane's Bill *Geranium* spp. Weed cover is relatively low and includes Radiata Pine, Fescue and Great Brome *Bromus diandrus.*	Road reserves along the southern boundary of the pine plantation.

4.2.3 Ecological vegetation classes along the underground transmission route

Native vegetation on either side of Boiler Swamp Road includes three Ecological Vegetation Classes (EVCs), as summarised in Table 8. The entire section of Boiler Swamp road assessed is located within the Victorian Volcanic Plain Bioregion. The vegetation is of high quality and is part of a large block of land managed primarily for conservation. Some weed issues are evident, in particular infestations of Boneseed *Chrysanthemoides monilifera* in the western sections of Cobboboonee Forest Park.

Table 8 Ecological Vegetation Classes recorded adjacent to Boiler Swamp Road

EVC	Bioregional Conservation Status	Length (approx. km)	Description
Herb-rich Foothill Forest (EVC 23)	Vulnerable	13	An open woodland to 25 metres tall characterised by an overstorey of Apple Jack *Eucalyptus splendens*, Western Peppermint *Eucalyptus falciformis* and Messmate Stringybark *Eucalyptus obliqua*. The shrub layer is dominated by native species including Blackwood, Coast Beard-heath, Sweet Bursaria and Hop Wattle *Acacia stricta.* The ground cover is characterised by native graminoid and herb species including Common Apple-berry *Billardiera mutabilis,* Buttercup *Ranunculus* spp., Kangaroo Grass *Themeda triandra* and Tussock Grass. Weeds cover is relatively low and includes Ribwort and Flatweed.

EVC	Bioregional Conservation Status	Length (approx. km)	Description
Lowland Forest (EVC 16)	Least Concern	2.5	Open forest to 20 metres tall with an overstorey dominated by Messmate Stringybark *Eucalyptus obliqua.* Other eucalypts present include Apple Jack *Eucalyptus splendens*, Swamp Gum *Eucalyptus ovata* and Western Peppermint *Eucalyptus falciformis*. The mid-storey is dominated by fern and shrub species including Austral Bracken *Pteridium esculentum*, Silver Banksia, Prickly Current-bush *Coprosma quadrifida* and Coast Beard-heath. The ground layer is relatively dense and dominated by native herb, shrub and grass species. Character species include Shade Raspwort *Gonocarpus humilis,* Sheep's Burr *Acaena echinata,* Common Flat-pea *Platylobium obtusangulum,* Wiry Spear-grass and Blue Bottle-daisy *Lagenophora stipitata*. Weeds are present at low cover (<5% cover) and include Flatweed and Radiata Pine.
Sedgy Riparian Woodland (EVC 198)	Vulnerable	0.5	An overstorey characterised by Swamp Gum and a relatively dense shrub layer including Blackwood, Hazel Pomaderris *Pomaderris aspera,* Woolly Tea-tree *Leptospermum lanigerum* and Prickly Current-bush. The ground cover is dominated by native species including Sword Sedge *Lepidosperma* spp., Slender Tussock-grass *Poa tenera*, Tall Sedge *Carex appressa*, Hairy Pennywort *Hydrocotyle hirta* and Common Woodrush *Luzula meridionalis*. Weed cover is relatively low and includes Spear Thistle, Common Sow thistle *Sonchus oleraceus* and Wild Oat *Avena fatua.*

4.3 Tree species

Canopy tree species present along Boiler Swamp Road are listed in Table 9, with notes describing the spatial occurrence of these trees within the Investigation Area. Two of the species are listed under the *Flora and Fauna Guarantee Act 1988* (FFG Act). Both species were added to the FFG Act during the review of the Act in 2021. Further information on these species is provided below.

Table 9 Canopy trees along Boiler Swamp Road

Species	Status	Occurrence
Rough-barked Manna Gum *Eucalyptus viminalis* subsp. *cygnetensis*		Limited to the eastern end of Boiler Swamp Road. Most trees showing signs of heavy browsing by Koala.

Species	Status	Occurrence
Western Peppermint *Eucalyptus falciformis*	FFG Act: Vulnerable	Distributed throughout the length of the road, typically occurring on higher ground.
Messmate Stringybark *Eucalyptus obliqua*		The most abundant species in the area, distributed along the full length of the road.
Apple Jack *Eucalyptus splendens*	FFG Act: Critically Endangered	Distributed throughout the length of the road, typically on higher ground.
Swamp Gum *Eucalyptus ovata*		Distributed throughout the area, but generally concentrated at low points in the landscape, close to drainage lines.

Further information regarding threatened trees along the transmission route is provided in Section 6.

4.3.1 Victorian strategic biodiversity values

Planning permit applications for removal of native vegetation must include consideration of the *Guidelines for the removal, destruction or lopping of native vegetation* (the Guidelines) (DELWP 2017a). The Guidelines specify an assessment process that involves collection of site-based data and landscape scale data. Landscape scale data are provided in state-wide models (maps) including location category, strategic biodiversity score and habitat importance maps (models) for rare or threatened species.

4.3.1.1 Location category

Location category is a key state-wide layer for determining the assessment pathway of an application. All of Victoria is assigned to one of the following categories:

- Location 3 – includes locations where the removal of less than 0.5 hectares of native vegetation could have a significant impact on habitat for a rare or threatened species.
- Location 2 – includes locations that are mapped as endangered EVCs and/or sensitive wetlands and coastal areas.
- Location 1 – includes all remaining locations in Victoria.

The location categories mapped across the Project Area are shown in Figure 4b. The vast majority of the wind farm is mapped as Location 1, with very small areas of Location 3 close to the outer boundary, particularly in the farmland within the eastern section of the wind farm. Native vegetation adjacent to the proposed transmission route through Cobboboonee Forest Park and Cobboboonee National Park includes areas of Location 1 and Location 3.

4.3.1.2 Strategic biodiversity value

Strategic biodiversity value (SBV) is a numeric score (rank) of a location's contribution to Victoria's biodiversity, relative to other locations across the state. The score ranges between 0 and 100, and is used in calculating vegetation loss, gain and offset metrics. Higher scores indicate that locations have greater modelled biodiversity values compared with lower scores.

SBVs for the Investigation Area are shown in Figure 4c. The majority of the wind farm, including plantation areas, has a low modelled SBV, typically below 30. Sections of the farmland in the eastern section of the wind farm are modelled to have higher scores, up to approximately 80. Surrounding public land, such as Discovery Bay Coastal Park, Lower Glenelg National Park, Cobboboonee National Park and Cobboboonee State Forest generally have high modelled SBVs, typically greater than 60.

4.3.1.3 Habitat importance models

Habitat importance maps (HIMs) indicate areas that are predicted to support habitat for threatened species, listed on the Victorian *Flora and Fauna Guarantee Act 1988*. Habitat importance scores also range between 0 and 1. These models are used in determining loss and offset requirements, and can trigger a requirement for specific offsets if the proportional impact exceeds the species offset threshold.

The Project Area is modelled to provide habitat for numerous threatened species. These species are listed in Appendix 9.

4.4 Impact assessment

Construction and operation of the KGPH has potential to impact on native vegetation via several mechanisms:

- Direct removal of native vegetation for construction of permanent infrastructure, such as turbines, hard stands, access roads and transmission lines.
- Direct removal of plants for construction of temporary infrastructure, including temporary storage areas and road modifications for blade and turbine base transportation.
- Impacts on tree protection zones of trees due to trenching for transmission lines and cables.
- Disturbance by vehicles during construction of the transmission line.
- Indirect disturbance of native vegetation may also occur as a result of changes in hydrological regimes, sedimentation, erosion and pollution.

Impacts on native vegetation have been assessed as per Victoria's Guidelines for the removal, destruction or lopping of native vegetation (DELWP 2017a) and planning scheme clause 52.17 (Native Vegetation).

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

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

- **Avoid** the removal, destruction or lopping of native vegetation.
- **Minimise** impacts resulting from the removal of native vegetation that cannot be avoided.

- Provide an **offset** to compensate for the biodiversity impact resulting from the removal of native vegetation.

Potential impacts on native vegetation are discussed in general terms below in relation to the wind farm and the transmission line.

4.4.1 Wind farm

The wind farm site has been positioned within pine plantation, blue gum plantations and cleared farmland, with a specific objective of avoiding and minimising impacts on native vegetation.

Minimal removal of native vegetation will be required within plantation areas. The plantations include areas 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 planning scheme clause 52.17, which 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–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, along these roads have been mapped to inform the design/avoidance process. There are areas of native vegetation on public roads within plantations requiring clearance, potentially for turn in locations. Areas of native vegetation mapped on road reserves within the plantation are shown on Figure 4a.

The wind farm also includes areas of farmland within the far western edge of the site, and far eastern extent. Cleared farmland in the west is generally devoid of native vegetation, with the exception of areas of regrowth Bracken *Pteridium esculentum* (Figure 4a).

Prior to clearing, farmland in the east is likely to have supported a complex of Wet Heathland and Heathy Woodland, similar to adjacent areas within conservation reserves such as Kentbruck Heath. Low-lying areas within this farmland have been colonised by native Rushes *Juncus* spp. These areas have been mapped as modified examples of Wet Heathland and Heathy Woodland (Figure 4a). Wind farm infrastructure is likely to involve impacts on some of these vegetation patches, and there may be temporary hydrological impacts due to dewatering while turbine foundations are constructed. Additionally, several large wetlands have been mapped in this cleared farmland area according to the DELWP Current Wetlands Map. In a Guidelines assessment these mapped wetlands are treated as native vegetation and any ground disturbance must be included in loss and offset calculations.

Impacts on native vegetation have been assessed, as specified in the Guidelines, by overlaying project infrastructure on mapped native vegetation and determining where removal of vegetation is required. For the wind farm component of the Project, project elements involving losses include:

- Access tracks
- Underground cable reticulation
- Turbine hard stand areas
- Turbine locations (cleared to 50 metre radius)
- Collector substations
- Overhead powerlines between collector substations

- The proposed quarry.

The project also involves native vegetation impacts for the transport route, at several locations where intersections require modification for vehicle access, including turbine bases and rotor blades (These impacts are documented in Section 4.4.3).

4.4.2 Transmission line

The proposed transmission line involves the following sections:

1. Section 1: Underground section from the wind farm to Blacks Lane, passing through farmland.
2. Section 2: Underground section to be constructed beneath Boiler Swamp Road, through Cobboboonee National Park and Cobboboonee Forest Park. The underground line continues for approximately 1.3 kilometres through farmland after leaving Boiler Swamp Road.
3. Section 3: Underground section from 1.3 kilometres east of Boiler Swamp Road through farmland to near the Heywood Terminal Station.

Section 1 passes through farmland, and avoids impacts to native vegetation, except for two patches of Heathy Woodland (EVC 48) to the south of Cobboboonee Forest Park near Mount Kinkaid. The total area of impact in this section is 0.173 hectares, including six large trees (three Rough-barked Manna Gum *Eucalyptus viminalis* subsp. *cygnetensis* and three Swamp Gum *Eucalyptus ovata*).

Section 2 is proposed to be constructed beneath an existing road, with disturbance by construction vehicles limited to the existing road formation. Boiler Swamp Road is a regularly maintained road, where the road verge is subject to periodic grading. The road crosses the Surrey River in two locations, where directional drilling will be used to avoid impacts on the waterway. The underground section extends approximately 1.3 kilometres into farmland, before transitioning to an overhead line.

Section 3 passes through farmland containing scattered patches of trees with poor quality understorey. It is expected that tree impacts will be minimised by detailed design, including direct avoidance and directional drilling beneath patches of native vegetation. Unavoidable impacts, including 0.52 hectares of vegetation removal adjacent to the terminal station, have been included in the vegetation loss calculations.

4.4.2.1 Transmission line tree impacts (Section 2)

Neoen applied a detailed design process for Section 2 of the transmission line, to avoid impacts to native vegetation through minimising the construction corridor, so all works can be conducted within the formed road, and to avoid impacts to tree protection zones where possible. This design process prioritised the avoidance of Apple Jack *Eucalyptus splendens*, as this is listed as critically endangered under the FFG Act. Details of this process are provided in chapter 4 of EES (Project Development), and summarised in the 'avoid and minimise' statement below (Section 4.4.6).

Table 10 provides a summary of the tree species recorded along the road where the trench is proposed. The table specifies the number of trees with tree protection zones having major and minor encroachment caused by the trenching. Encroachment is defined in the Australian Standard for the Protection of trees on development sites (AS 4970-2009) as follows:

- Minor encroachment: proposed encroachment is less than 10% of the area of the TPZ (tree protection zone) and is outside the SRZ (structural root zone).

- Major encroachment: proposed encroachment is greater than 10% of the TPZ or includes any part of the SRZ. These trees are assessed as assumed losses in the vegetation impact calculations.

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

- Tree protection zones and the level of encroachment are determined as specified in the Australian Standard (AS 4970-2009).
- Tree protection zones are a minimum of 2 m radius and a maximum of 15 m radius, and are calculated by multiplying the stem diameter (DBH), measured at 1.4m, by 12. DBH of multi-stemmed trees is calculated as described in Appendix A of AS 4970-2009.
- The Assessor's Handbook specifies that all trees with 'major encroachment' (> 10% of the TPZ area), 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. This arborist assessment typically requires subsurface root investigations (excavation), which is not practical in this case, due to the large number of trees, and the additional ground disturbance that would be caused to understorey vegetation and the road structure. As a result, all trees with major encroachment are considered assumed lost. Root investigations around individual trees could be undertaken, on a case-by-case basis, to determine the impact to trees with specific values, however this would be best undertaken during detailed design or construction phases. Any such root investigations should be limited to the area beneath the road surface, to ensure that no understorey vegetation is unintentionally impacted.
- 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. This is explained in AS 4970-2009 Appendix D.

Table 10 Encroachment on tree protection zones (TPZs) or structural root zones (SRZs)

Canopy tree species	Major Encroachment >10% encroachment upon TPZ or SRZ encroached	Minor Encroachment < 10% encroachment upon TPZ	Total number of trees assessed
Western Peppermint ***Eucalyptus falciformis***	83	156	526
Messmate Stringybark ***Eucalyptus obliqua***	294	316	913
Swamp Gum ***Eucalyptus ovata***	32	44	114

Canopy tree species	Major Encroachment >10% encroachment upon TPZ or SRZ encroached	Minor Encroachment < 10% encroachment upon TPZ	Total number of trees assessed
Apple Jack ***Eucalyptus splendens***	0	157	417
Rough-barked Manna Gum ***Eucalyptus viminalis* subsp. *cygnetensis***	15	26	70
Total	**424**	**699**	**2040**

Regarding root depth, advice from the project arborist is that the majority of roots will typically be within the top 600 mm, but there is potential for some roots to extend deeper than this. Detailed root investigations would be required to accurately identify the depth of roots within the soil profile.

It is likely that roots will not extend to shallow depths below the road surface. These areas are generally avoided by tree roots due to compaction and reduced availability of resources including water, however this cannot be determined without root investigations.

A sample of sites could be assessed to determine if roots are present beneath the road, and at what depth. This can be done using water excavation to avoid damage to the roots. The road damage would need to be repaired. The findings would be used to determine the best method for trenching that will have the least impact on the trees, and it would also result in a large reduction in offsets.

According to AS 4970-2009, directional drilling at a depth of 600 mm or greater is an appropriate technique to avoid impacts on roots within tree protection zones of eucalyptus trees.

4.4.3 Transport route

The Transport route occurs predominantly along the Portland-Nelson Road and is proposed to utilise the road reserve in several areas.

The transport route proposes to impact several small, isolated patches of Herb rich Foothill Forest EVC 23, Damp Sands Herb rich Woodland EVC 179 and Coastal Alkaline Scrub EVC 858. Each of the impacted patches of native vegetation occur alongside agricultural land or plantations and, as a result, are highly modified. Introduced weeds such dominate the understorey and the mid storey is often sparse and lacks native species diversity.

A moderate to high quality patch of Heathy Herb rich Woodland is proposed to be impacted where several patches of native vegetation ranging in quality (low medium and high) occur within the road reserve. Many of the roadsides along the proposed transport routes are highly modified and dominated by introduced species. However patches of remnant and regenerated native vegetation occur in several areas.

Vegetation impacts for the transport route are included in the overall impacts provided in Section 4.4.4 and Table 11, and shown on Figure 4e.

4.4.4 Potential for direct impacts

A native vegetation removal scenario test, as required by (DELWP 2017a) has been produced for the wind farm and transmission line components of the project. The native vegetation removal scenario test is provided in Appendix 9.

The project requires the removal or assumed loss of 8.696 hectares of native vegetation, as summarised in Table 11. The offset specification is for 0.5360 general habitat units and species units for six threatened species.

Table 11 Summary of Native Vegetation Removal Report scenario test

Attribute	Outcome
Location category	3
Native vegetation removal extent	8.696 hectares
Large tree impacts	228
Assessment pathway	Detailed
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
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 cucullata* subsp. *cucullata*
Large tree offsets	228

A breakdown of native vegetation impacts for different components of the Project is provided in Table 12. This includes the area of impact within the wind farm, and three sections of the transmission line, including the Cobboboonee National Park, Cobboboonee Forest Park and other areas. Transport route impacts include sections of road reserve where modifications are required outside the main site boundary. Vegetation removal for entry points off Portland-Nelson Road, within the wind farm area, are included in the first row (Wind Farm).

Table 12 Summary of native vegetation removal for the wind farm, transmission line and transport route

Project component	Patch vegetation	
	Patch area (ha)	Large trees
Wind farm	4.920	1
Transmission line (Cobboboonee National Park)	1.921	145
Transmission line (Other areas)	1.834	82
Transmission line total	3.755	228
Transport route (off site)	0.021	0
Total	**8.696**	**228**

4.4.5 Potential for indirect impacts

Effects of construction and hydrological impacts are not likely to affect native vegetation beyond areas subject to direct clearance.

4.4.6 Avoid and Minimise Statement

The three step approach is the key policy in relation to the removal of native vegetation to achieve no net loss of biodiversity as a result of the removal, destruction or lopping of native vegetation (DELWP 2017a).

The three steps are:

- Avoid the removal, destruction or lopping of native vegetation.
- Minimise impacts from the removal, destruction or lopping of native vegetation that cannot be avoided.
- Provide an offset to compensate for the biodiversity impact from the removal, destruction or lopping of native vegetation.

Steps taken in the site selection and design of this project include:

- Locating the majority of the project in disturbed environments where native vegetation has been previously cleared, including commercial plantations and cleared farmland.
- Reductions in the extent of the project by application of turbine exclusion areas near conservation reserves, wetlands within the Ramsar site and wetlands identified as potential Brolga breeding habitat. Turbine exclusion areas are shown in Figure 37a.
- Removal of turbines from areas of the site where groundwater interactions with turbine foundations may impact upon nearby wetlands supporting native vegetation.
- Micro-siting turbine locations to avoid impacts to native vegetation mapped early in the design process.

- Making use of existing public road facilities for construction access and ongoing access during operation of the facility.
- Locating a long section of the external transmission line along an existing road, keeping construction disturbance to the formed road, and using micrositing and low-impact construction techniques (directional drilling) where required. Following the identification of extensive areas of Apple Jack *Eucalyptus splendens* (FFG Act: critically endangered) adjacent to Boiler Swamp Road within Cobboboonee National Park and Cobboboonee Forest Park, the design of the proposed underground transmission line was refined, with an objective to avoid impacts to Apple Jacks. This was done in consultation with Biosis, by altering the route alignment within the Boiler Swamp Road corridor to firstly minimise impacts through trench alignment and secondly to utilise HDD (at a planned depth of 1.25m below the road surface level) to avoid impacts on critically endangered species. This process has resulted in avoidance of major encroachment to all root zones of Apple Jack. Other eucalypt species root zones are impacted (>10% incursion), including 83 Western Peppermint (FFG Act: vulnerable) trees.
- Micrositing the transmission line through farmland areas to avoid impacts to patches of native vegetation and wetlands.
- Using directional drilling to avoid impacts to native vegetation where the transmission line crosses road and rail reserves supporting native vegetation.
- Implementation of best practice measures during construction and operation to avoid unintentional/indirect impacts to nearby native vegetation through hydrological impacts, sedimentation or spread of weeds.

4.4.7 Native vegetation offset strategy

The proponent intends to secure native vegetation offsets through a combination of purchases through the DEECA Native Vegetation Credit Register (NVCR) and purchase of one or more blocks of land in close proximity to the Project Area.

A summary of availability of general, large tree and specific offsets is provided below.

General offsets

Specification: 0.5360 general units and 228 large trees with a minimum strategic biodiversity score of 0.3280, located within the Glenelg Hopkins Catchment Management Authority area or the Glenelg Shire Council local government area.

Availability: One registered credit site listed within the NVCR (search date 15 August 2024) has sufficient general units and large trees available. Blocks to be purchased may also satisfy all or part of this requirement.

Specific offsets

Specification:

- 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 cucullata* subsp. *cucullata*

Availability:

The NVCR has registered sites that can provide the required specific offsets for:

- Oval-leaf Logania
- Leafy Greenhood

A preliminary desktop assessment has been undertaken to determine the offset potential of three blocks of private land the proponent is considering for purchase. Only portions of the blocks supporting native vegetation, based on examination of aerial photography, have been included in the potential offset area, and assumptions have been made regarding vegetation quality and potential gains that could be achieved through protection and management. These sites have potential to contribute to providing the species offset requirements for Lax Twig-sedge (Table 13). 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.

Table 13 Availability of species offsets

Species	Units required	NVCR availability (# registered sites)	Potential offset block 1	Potential offset block 2	Potential offset block 3
Lax Twig-sedge ***Baumea laxa***	6.855	0	5.962	16.37	0.803
Oval-leaf Logania ***Logania ovata***	2.824	2	6.045	16.359	0.803
Scented Spider-orchid ***Caladenia fragrantissima***	6.009	0	6.008	16.37	0.801
Leafy Greenhood ***Pterostylis cucullata* subsp. *cucullata***	5.725	3	5.975	16.37	

Species offsets for Hairy Boronia were triggered due to intersections between project infrastructure, the habitat importance model (HIM) and the two large mapped wetlands (wetland #20522 and #20532) on private farmland in the east of the project area.

The project team has liaised with DEECA regarding a request to remove the relevant section of the Hairy Boronia Habitat Importance Map, on the basis that the mapped wetland does not provide the required habitat characteristics for this species. DEECA has approved this request. The NVR report provided with this report still contains the requirement for Hairy Boronia offsets, however this will be updated prior to the hearing, which will result in a minor increase to the general offset specification.

5. Wetlands

The Project Area and surrounding area contain a range of wetlands, identified within the DELWP WETLAND_CURRENT dataset. Additional wetlands are also present that are not identified within the WETLAND_CURRENT dataset but were noted during site assessments. This section provides an assessment of wetlands both within the Project Area and in nearby areas, including nearby conservation reserves. Wetlands are also considered in report sections on native vegetation (Section 4), protected areas (Section 8), threatened ecological communities (Section 7) and in several threatened fauna sections.

5.1 Methods

Information on mapped wetlands has been sourced from the DELWP WETLAND_CURRENT GIS dataset, the DELWP Ecological Vegetation Class dataset (NV2005 EVC) 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 threatened ecological communities 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.

5.2 Existing conditions

Wetlands within the Project Area include some small areas near the southern boundary of the wind farm adjacent to Discovery Bay Coastal Park, wetlands within cleared farmland in the eastern portion of the wind farm, wetlands near the proposed underground transmission line through Cobboboonee Forest Park and Cobboboonee National Park, and wetlands near the proposed above ground transmission line to the Heywood terminal station. These wetlands are described in the following sections.

5.2.1 Wetlands within the Project Area adjacent to Discovery Bay Coastal Park

Extensive areas of wetlands are present within Discovery Bay Coastal Park (DBCP), south of the Project Area. This includes Black Swamp, Lake Mombeong, The Sheepwash, Cain Flat Swamp, Long Swamp and various unnamed wetlands within the dune system. This wetland complex extends into the Project Area in the following locations:

- Two small wetlands (#20636 and #20635) within the GTFP plantation, approximately 200 metres from the DBCP boundary, located between Lightbody Road and Quarry Road, to the north-west of Black Swamp (Figure 5a). These areas are noted in the WETLAND_CURRENT layer as type “unknown”. These mapped wetlands were inspected during aerial surveys for Brolga, and on foot in October 2021. Both areas were found to contain a dense shrubby understorey with a mixture of native and exotic species with affinities to EVC 858 Coastal Alkaline Scrub, including Coast Wattle *Acacia longifolia* subsp. *sophorae*, Seaberry Saltbush *Rhagodia candolleana* subsp. *candolleana*, Coast Beard-heath *Leucopogon parviflorus* and

Knobby Club-sedge *Ficinia nodosa* with some areas of planted Blue Gums. Some plants indicative of waterlogged situations were present, including Red-fruit Saw-sedge *Gahnia sieberiana*, and a small number of Woolly Tea-tree *Leptospermum lanigerum*, but no aquatic or semi-aquatic species were observed that would indicate the areas support wetland habitat values or areas of open water. No surface water was evident, to suggest these mapped wetlands are spring-fed, or would represent examples of the Karst springs and associated alkaline fens of the Naracoorte Coastal Plain Bioregion threatened ecological community (refer to Section 7). No wind farm infrastructure is planned within 650 metres of these mapped wetlands.

- Three mapped wetlands within the Project Area near Lake Mombeong and The Sheepwash (Figure 5a). These extend to approximately 450 metres from the boundary of DBCB and are noted in the DELWP WETLAND_CURRENT layer as being temporary freshwater swamp (#20505 – Photo 33), 'unknown' (#20508 – Photo 32) and 'unknown' (#20512 – Photo 34) wetland types. These wetlands have been excluded from plantation development and are surrounded by plantation management tracks. All three wetlands our covered in dense thickets of woody vegetation, dominated by Coast Wattle *Acacia longifolia* subsp. *sophorae*. Other species present include Kangaroo Apple *Solanum aviculare* and Bower Spinach *Tetragonia implexicoma*. Some Woolly Tea-tree Leptospermum lanigerum is also present, suggesting that some parts of the wetlands may be damp or occasionally inundated. No surface water was evident, to suggest these mapped wetlands are spring-fed, or would represent examples of the Karst springs and associated alkaline fens of the Naracoorte Coastal Plain Bioregion threatened ecological community (refer to Section 7). The wetlands are approximately 10–20 metres higher than the water level at nearby Lake Mombeong and The Sheepwash, which are known examples of this TEC. No wind farm infrastructure is planned within 1,000 metres of these wetlands.

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. An Australasian Bittern was heard calling from wetland #20505 in October 2020. The dense vegetation and moist sandy soils around the margins of these wetlands also provide habitat for ground-foraging mammals such as Southern Brown Bandicoot, Long-nosed Potoroo and Black Wallaby.

5.2.2 Wetlands within farmland in the eastern portion of the Project Area

The section of the wind farm to the east of Portland–Nelson Road includes an area of grazing and cropping land, surrounded by conservation reserves and blue gum plantations. The farmland included in the Project Area is located within the Victorian Glenelg Plain Bioregion, which is part of the Naracoorte Coastal Plain Bioregion referred to in Commonwealth threatened species documentation.

Most of this farmland has been recently cleared (1960s to 1980s). Prior to clearing this area supported similar vegetation to what is currently present in the species-rich 'Kentbruck Heath' in the surrounding conservation reserves, including Wet Heathland, Heathy Woodland and numerous small wetlands, where the primary water sources are groundwater and rainfall.

The Kentbruck Heath is on an elevated plateau, approximately 100–150 metres above sea level. The sandy loam soils (Gibbons & Downes 1964) are derived from aeolian sands (Hore-Lacy 1970), with a high accumulation of organic matter, including some development of peat in lake deposits. The water table is very close to the surface, and is at surface level for at least part of the year (Gibbons & Downes 1964). The underlying geology is basalt.

This farmland area includes two large DELWP mapped wetlands, and five smaller mapped wetlands (see Figure 5a). All mapped wetlands are noted to be 'Periodically Inundated – Seasonal or Intermittent':

- Wetland #20522 – 251.8 hectares
- Wetland #20532 – 271.6 hectares
- Wetland #20529 – 2.0 hectares
- Wetland #20530 – 2.8 hectares
- Wetland #20531 – 3.8 hectares
- Wetland #20534 – 4.6 hectares
- Wetland #20535 – 3.6 hectares

Wetland #20522 is located close to Portland–Nelson Road, and covers a large proportion of the western farmland paddock (Figure 5a). It extends south into Kentbruck H50 Bushland Reserve and north into the Kentbruck Heath within Lower Glenelg National Park (LGNP). Wetland #20532 is located further east, mostly within LGNP, extending southward into the Project Area to the east of Kentbruck H50 Bushland Reserve. Wetland #20529 includes a constructed dam near the north-east corner of Kentbruck H50 Bushland Reserve, and the remaining four wetlands, ranging in size from 2.8 – 4.6 hectares, are located within farmland to the south of wetland #20532.

The boundaries of mapped wetlands have been mapped approximately, to include numerous smaller depressions within LGNP and the cleared farmland. Prior to clearance the farmland is assumed to have supported similar wetlands to those within LGNP and Kentbruck H50 Bushland Reserve, within a mosaic of Wet Heathland and Heathy Woodland. Similar depressions are also present outside the area mapped for these wetlands, indicating that the mapping is approximate, and these areas could have been mapped with larger broad boundaries or smaller, more clearly defined areas. Within the farmland (and LGNP), most of the area covered by these mapped wetlands does not support actual wetlands, due to minor variations in topography.

Numerous small wetlands are present, however, mostly associated with drainage lines (Photo 22–23) or depressions (Plates 4–5) within the cleared paddocks. Leading up to the survey period (October 2021) there had been sufficient rainfall for these areas to have developed a high cover of submerged and emergent aquatic species. Generally, these wetlands within the cleared farmland support a different species composition to the adjacent wetlands surrounded by Wet Heathland in the conservation reserves, although there is a relatively high cover of Tassel Cord-rush *Baloskion tetraphyllum* in many of these wetlands, particularly close to the conservation reserves. Most native flora species present, however, are more typical of wetlands from the Western Volcanic Plain, and it is assumed many of these species have been introduced to the site by waterbirds.

Common native aquatic flora species present include emergent species such as Rushes *Juncus* spp., Common Spike-rush *Eleocharis acuta*, Reed Bent-grass *Deyeuxia quadriseta*, Common Swamp Wallaby-grass *Amphibromus nervosus* and Australian Sweet-grass *Glyceria australis*, floating species including Common Duckweed *Lemna disperma* and Pacific Azolla *Azolla rubra* and aquatic herbs including Swamp Crassula *Crassula helmsii* and White Purslane *Montia australasica*. The introduced Water-buttons *Cotula coronopifolia* was abundant in many of the wetlands.

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 including Black Swan *Cygnus atratus*, White-faced Heron *Egretta novaehollandiae*, Royal Spoonbill *Platalea regia*, Australian Wood Duck *Chenonetta jubata*, Chestnut Teal *Anas castanea* and Pied Stilt *Himantopus leucocephalus*. Wetland margins are habitat for Masked Lapwing *Vanellus miles*, White-fronted Chat *Epthianura albifrons* and Magpie Lark *Grallina cyanoleuca.* Swamp Harrier *Circus approximans* was frequently observed foraging in this area.

The wetlands provide breeding habitat for common frog species including Striped Marsh Frog *Limnodynastes peronii*, Spotted Marsh Frog *Limnodynastes tasmaniensis*, Common Froglet *Crinia signifera* and Southern Brown Tree Frog *Litoria ewingii*. Significant species recorded in these wetlands include the endangered Brolga *Antigone rubicunda* and Australasian Bittern *Botaurus poiciloptilus* and the migratory Latham's Snipe *Gallinago hardwickii*.

5.2.3 Wetlands within Kentbruck Heath (LGNP) and Kentbruck H50 Bushland Reserve

Several wetlands were inspected within the Kentbruck Heath, to the north of the Project Area, and Kentbruck H50 Bushland reserve to the south. Th wetlands were inspected on foot, to supplement existing information and aerial imagery, in order to characterise the wetlands and assess their potential to provide habitat for significant fauna species.

Mapped wetland #20522 extends into Kentbruck H50 Bushland Reserve, an area supporting a large area of Wet Heathland and Heathy Woodland. At the time of assessment large areas of Wet Heathland were inundated, and small areas of open water were present at low points (Photo 26). These open water areas appear to be permanent or semi-permanent, with a sharp demarcation between open water areas and surrounding Wet Heathland. These were fringed with a range of shrub species, and dense areas of Tassel Cord-rush *Baloskion tetraphyllum*. Some emergent patches of Rushes *Juncus* spp. were also present.

Wetlands inspected to the north within the Kentbruck Heath section of LGNP (Photo 27) were observed to be similar to those to the south within Kentbruck H50 Bushland Reserve. Surrounding species composition was similar, with Wet Heathland dominated by shrubby species, and dense cover of Tassel Cord-rush and Saw-sedges (Red-fruit Saw-sedge *Gahnia sieberiana* and Tall Saw-sedge *Gahnia clarkei*).

Three habitat types are present within these wetlands: open water with some submerged aquatic vegetation, and 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 (e.g. Australian Wood Duck *Chenonetta jubata*, Pacific Black Duck *Anas superciliosa* and Chestnut Teal *Anas castanea*). Inundated shrubby vegetation may be used by crakes and rails, and the endangered Australasian Bittern *Botaurus poiciloptilus.*

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.

5.2.4 Wetlands along the transmission line between Cobboboonee National Park and the Heywood terminal station

The proposed transmission line route passes through an area of cleared farmland between Cobboboonee National Park and the Heywood Terminal Station. This includes a small section of the Victorian Volcanic Plain Bioregion and a longer length through the Glenelg Plain Bioregion. A number of wetlands are present within this area, including both DELWP mapped wetlands and other wetlands not captured in the DELWP mapping. These wetlands are all on grazing land accessible to stock. Wetlands were inspected during wet conditions in October 2021, to characterise any wetlands close to the proposed transmission line and assess the potential for bird movements between wetlands that may result in collision risk. Wetlands ranged from areas of temporarily flooded pasture, through to seasonal wetlands with an assemblage of native aquatic plants (Photos 28–30). The transmission line also crosses the Surrey River, which supports Tall Marsh vegetation in some areas, dominated by Common Reed *Phragmites australis* (Photo 31).

Shallow seasonal wetlands typically have high cover of native semi-aquatic grass, Rushes *Juncus* spp. and Common Spike-rush *Eleocharis acuta* (Photo 28). Deeper areas, such as natural drainage lines or constructed drainage channels, support Aquatic Herbland, with a diverse range of species including Water-milfoil *Myriophyllum* spp., River Buttercup *Ranunculus inundatus*, Running Marsh-flower *Ornduffia reniformis* and Floating Pondweed *Potamogeton cheesemanii*.

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 *Antigone rubicunda* and Black Swan *Cygnus atratus* were recorded in several of these wetlands, utilising shallow marshland areas. Other large wading birds are likely to be present, including herons, egrets, spoonbills, and ibis. Areas of open water are visited by ducks including Australian Wood Duck *Chenonetta jubata*, Grey Teal *Anas gracilis*, Chestnut Teal *Anas castanea*, Pacific Black Duck *Anas superciliosa* and Australian Shelduck *Tadorna tadornoides*.

Wetland margins are habitat for Masked Lapwing *Vanellus miles*, White-fronted Chat *Epthianura albifrons* and Magpie Lark *Grallina cyanoleuca*.

The wetlands provide breeding habitat for common frog species including Striped Marsh Frog *Limnodynastes peronii*, Common Froglet *Crinia signifera* and Southern Brown Tree Frog *Litoria ewingii*.

5.2.5 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 Naracoorte Coastal Plain Bioregion

The Seasonal Herbaceous Wetlands (SHW) community occurs on the Victorian Volcanic Plain Bioregion and Glenelg Plain Bioregion (which falls within the Naracoorte Coastal Plain Bioregion).

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.

Seasonal wetlands on the Glenelg Plain Bioregion and Victorian Volcanic Plain Bioregion near the transmission line between Cobboboonee National Park and the Heywood Terminal Station have potential to satisfy the condition thresholds of the SHW community, and wetlands of over 0.5

hectares in size, or in clusters with total area greater than 0.5 hectares, would qualify for referral under the EPBC Act. It is recommended that the transmission line alignment be microsited to avoid direct impacts on these wetlands.

Karst springs and associated alkaline fens of the Naracoorte Coastal Plain Bioregion was listed under the EPBC Act on 15 December 2020 (DAWE 2020). This community is limited to the Gambier Karst Province within the Bridgewater subregion of the Naracoorte Coastal Plain IBRA Bioregion. Occurrences are limited to near coastal areas with limestone substrates, mostly at elevations of less than 2 metres above sea level, with some occurrences potentially up to 25 metres above sea level. As the Kentbruck plateau is approximately 100 metres 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 this community (DAWE 2020). Lake Mombeong is the nearest example of this community to the Project Area. Potential impacts on Lake Mombeong are addressed in Section 8.

5.3 Impact assessment

Construction and operation of the KGPH has potential to impact upon wetlands via several key mechanisms:

- Construction of permanent infrastructure within wetlands, such as turbines, hard stands and access roads.
- Construction of temporary infrastructure, including temporary storage areas and road modifications for blade and turbine base transportation.
- Indirect disturbance of wetlands, including important wetland flora and fauna species, may also occur as a result of change in hydrology, sedimentation, erosion or pollution.
- Disturbance of riparian vegetation and other vegetation surrounding wetlands that provides a protective buffer.

5.3.1 Wind farm

Wetlands within the Plantation sub-area are limited to locations in close proximity to the southern boundary of the Investigation Area (see Figure 5a). All of these wetlands are within the turbine exclusion areas along the southern boundary incorporated into the project design in response to the Brolga studies and the ecological significance of the Ramsar site. Turbine exclusion areas are shown in Figure 37a. As a result, all wetlands within the Plantation sub-area are at least one kilometre from any proposed turbines or other infrastructure. In addition, no turbines are proposed in locations where turbine foundations may intersect groundwater within the Plantation sub-area, and the Groundwater Impact Assessment recommends further mitigation to be put in place during construction to avoid impacts should turbines need to be microsited.

The North-east sub-area includes several DELWP Mapped wetlands, as described in Section 5.2 and shown in Figure 5a. These mapped wetlands are in cleared farmland, sometimes extending into adjacent areas of Lower Glenelg National Park (the Kentbruck Heath) and Kentbruck H50 Bushland Reserve. The mapped areas 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.

5.3.2 Transmission line

The entire length of the transmission line is proposed to be underground. The transmission line passes beneath Boiler Swamp Road, through Cobboboonee National Park and Cobboboonee Forest Park. This section of the transmission line does not interact with any wetlands. It is recommended that directional drilling be used in the three locations where the transmission line crosses the Surrey River.

The section of the transmission line extending through farmland to the Heywood terminal station is also proposed to be constructed underground. This section has been aligned to avoid wetlands.

5.3.3 Potential for direct impacts

The current design of the project involves direct impacts on two DELWP mapped wetlands on farmland to the south of the Kentbruck Heath (see Figure 5a, Figure 4el). These impacts are quantified in the native vegetation impact assessment, as impacts on mapped wetlands are included, as areas of native vegetation in the assessment using Victoria's *Guidelines for the removal, destruction or lopping of native vegetation* (Section 4.3).

5.3.4 Potential for indirect impacts

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. Potential dewatering impacts were considered in the GDE impact assessment for the project by CDM Smith (2024). No turbine foundations were considered likely to intersect with groundwater in the Plantation Sub-area. Within the North-eastern Sub-area, several proposed 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.

5.3.5 Conclusion

Direct impacts to wetlands are limited to two DELWP mapped wetlands on farmland to the south of the Kentbruck Heath, where an access track and internal underground transmission line is proposed.

Indirect impacts to wetlands due to dewatering for turbine foundations have been avoided by removal of turbines away from locations where turbine foundations could intersect with groundwater.

6. Threatened flora species

6.1 Methods

Targeted surveys for listed threatened flora were undertaken in areas of habitat that have potential to be directly impacted by the Project. This included several locations, such as the transmission line routes, where alternative locations were being considered. Surveys were conducted using accepted methods, following appropriate survey guidelines where available as detailed in Table 14.

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

Due to seasonal variation in flowering periods, reference sites and potential impact areas were searched repeatedly, over multiple survey periods, as indicated in Table 14. These surveys involved walking transects through the vegetation and searching for any of the listed species with potential to occur in the relevant habitat type.

The targeted survey program and methods focused on species listed under the EPBC Act and/or FFG Act (Table 14). Other species, for example species listed only under Advisory Lists (DSE 2009a, DSE 2013, DEPI 2014), were not specifically targeted, but were noted if recorded during general surveys or targeted surveys for other species.

Impacts on habitat for species listed as threatened (critically endangered, endangered or vulnerable) under the FFG Act were assessed using DELWP state-wide habitat models, following the process specified in the Guidelines (DELWP 2017a).

Table 14 Survey program – threatened flora

Status codes: CR Critically endangered, EN Endangered, VU Vulnerable

Species and status	Potential survey areas	Survey methods and timing	Relevant survey guidelines	Survey periods (time period when surveys were conducted)
EPBC Act listed species				
River Swamp Wallaby-grass ***Amphibromus fluitans*** **EPBC Act: VU**	Wetlands	Transect surveys in suitable habitat in spring (following inundation in winter).	No specific survey guidelines	August 2020 September 2020 October 2020 November 2020 December 2020
Limestone Spider-orchid ***Caladenia calcicola*** **EPBC Act: VU** **FFG Act: CR**	Limestone ridges supporting native vegetation (Limestone Ridge Woodland)	Mid-September to early November. Reference site checks to confirm flowering. Area search using transects.	Recovery plan – Dickson et al. (2010) Survey guidelines – DoEE (2013b).	September 2020 October 2020 November 2020 December 2020
Colourful Spider-orchid ***Caladenia colorata*** **EPBC Act: EN** **FFG Act: CR**	Heathy Woodland on sandy soils over limestone.	August to early October. Reference site checks to confirm flowering. Area search using transects.	Survey guidelines – DoEE (2013b). No recovery plan.	August 2020 September 2020 October 2020
Mellblom's Spider-orchid ***Caladenia hastata*** **EPBC Act: EN** **FFG Act: CR**	Damp Heathland and Damp Heathy Woodland on aeolian sand deposits.	October to November. Reference site checks to confirm flowering. Area search using transects.	Recovery plan – Todd (2000). Survey guidelines – DoEE (2013b).	October 2020 November 2020

Species and status	Potential survey areas	Survey methods and timing	Relevant survey guidelines	Survey periods (time period when surveys were conducted)
Ornate Pink-fingers ***Caladenia ornata*** **EPBC Act: VU** **FFG Act: EN**	Heathlands and grassy woodlands	November. Reference site checks to confirm flowering. Area search using transects.	Recovery plan – Duncan et. Al. (2009b). Survey guidelines – DoEE (2013b).	October 2020 November 2020
Wrinkled Cassinia ***Cassinia rugata*** **EPBC Act: VU** **FFG Act: CR**	Damp, low open forest or dense heathy scrub	Flowers February to April. Transect surveys in suitable habitat.	No specific survey guidelines. Recovery plan – Carter and Walsh (2006).	August 2020 September 2020 October 2020 November 2020 December 2020
Clover Glycine ***Glycine latrobeana*** **EPBC Act: VU** **FFG Act: VU**	Grasslands and grassy woodlands, particularly those dominated by Kangaroo Grass	September to December. Transect surveys in suitable habitat.	No specific survey guidelines. Recovery plan – Carter and Sutter (2010a).	September 2020 October 2020 November 2020 December 2020
Square Raspwort ***Haloragis exalata*** **var.** ***exalata*** **EPBC Act: VU**	Damp riparian habitats	Flowers October to March. Transect surveys in suitable habitat.	No recovery plan. No specific survey guidelines.	October 2020 November 2020 December 2020
Coast Ixodia ***Ixodia achillaeoides*** **subsp.** ***arenicola*** **EPBC Act: VU**	Low coastal shrublands on exposed limestone headlands, often on steeply sloped sites	Flowers November to January. Transect surveys in suitable habitat.	Recovery plan – Carter (2010b). No specific survey guidelines.	November 2020 December 2020
Maroon Leek-orchid ***Prasophyllum frenchii*** **EPBC Act: EN** **FFG Act: EN**	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.	Recovery plan – Duncan (2010c). Survey guidelines – DoEE (2013b).	October 2020 November 2020 December 2020

Species and status	Potential survey areas	Survey methods and timing	Relevant survey guidelines	Survey periods (time period when surveys were conducted)
Dense Leek-orchid ***Prasophyllum spicatum*** **EPBC Act: VU** **FFG Act: CR**	Coastal and near-coastal heathlands and heathy woodlands on sandy soils that may be seasonally waterlogged.	Flowers early October to early November. Reference site checks to confirm flowering. Area search using transects.	Recovery plan – Duncan (2010d). Survey guidelines – DoEE (2013b).	October 2020 November 2020 September 2024 (Heywood terminal station)
Green-striped Greenhood ***Pterostylis chlorogramma*** **EPBC Act: VU** **FFG Act: EN**	Heathy woodland; more specific habitat requirements are poorly known	Flowers July to September. Reference site checks to confirm flowering. Area search using transects.	Survey guidelines – DoEE (2013b).	August 2020 September 2020
Swamp Greenhood ***Pterostylis tenuissima*** **EPBC Act: VU**	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.	Recovery plan – Dickson *et. Al*.(2010). Survey guidelines – DoEE (2013b).	October 2020 November 2020 December 2020
Swamp Fireweed ***Senecio psilocarpus*** **EPBC Act: VU**	Grassy and sedgy wetlands, mostly.	Flowers between November and March. Most frequently recorded in November and December. Area search using transects.	No recovery plan. No specific survey guidelines.	November 2020 December 2020
Coast Dandelion ***Taraxacum cygnorum*** **EPBC Act: EN** **FFG Act: CR**	Confined to woodlands and scrub on calcareous soils	Flowers October to December. Area search using transects.	Recovery plan – Carter (2010e). No specific survey guidelines.	October 2020 November 2020 December 2020

Species and status	Potential survey areas	Survey methods and timing	Relevant survey guidelines	Survey periods (time period when surveys were conducted)
Metallic Sun-orchid ***Thelymitra epipactoides*** **EPBC Act: EN** **FFG Act: EN**	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.	Recovery plan – Coates et. Al. (2003). Survey guidelines – DoEE (2013b).	September 2020 October 2020 November 2020
Swamp Everlasting ***Xerochrysum palustre*** **EPBC Act: VU** **FFG Act: CR**	Sedge-swamps and shallow freshwater marshes and swamps in lowlands, on black cracking clay soils	Flowers November to March. Area search using transects.	Recovery plan – Carter and Walsh (2011b). No specific survey guidelines.	November 2020 December 2020
Additional FFG Act listed species				
Scented Spider-orchid ***Caladenia fragrantissima*** **FFG Act: CR**	Near-coastal heath or heathy woodland in sandy loam	September to October. Reference site checks to confirm flowering. Area search using transects.	No specific guidelines. Surveys followed guidelines specified in DoEE (2013b).	September 2020 October 2020
Robust Spider-orchid ***Caladenia valida*** **FFG Act: CR**	Coastal or near coastal heaths and heathy woodland	September to October. Reference site checks to confirm flowering. Area search using transects.	No specific guidelines. Surveys followed guidelines specified in DoEE (2013b).	September 2020 October 2020
Curly Sedge ***Carex tasmanica*** **FFG Act: EN**	Seasonally wet, heavy clay soils	Flowers in spring. Area search using transects.	No specific survey guidelines.	September 2020 October 2020

Species and status	Potential survey areas	Survey methods and timing	Relevant survey guidelines	Survey periods (time period when surveys were conducted)
Coast Helmet-orchid ***Corybas despectans*** **FFG Act: EN**	Raised clumps of ground in wet areas of swamp scrub, which have a dense overstorey of Woolly Tea-tree or Scented Paperbark	July to August Reference site checks to confirm flowering. Area search using transects.	No specific guidelines. Surveys followed guidelines specified in DoEE (2013b).	August 2020
Late Helmet-orchid ***Corybas* sp. aff. *diemenicus* (Coastal)** **FFG Act: CR**	Raised clumps of ground in wet areas of Swamp Scrub, which have a dense overstorey of Woolly Tea-tree or Scented Paperbark	September to October. Reference site checks to confirm flowering. Area search using transects.	No specific guidelines. Surveys followed guidelines specified in DoEE (2013b).	September 2020 October 2020
Swamp Diuris ***Diuris palustris*** **FFG Act: EN**	Typically occurs in swampy depressions	August to October. Reference site checks to confirm flowering. Area search using transects.	No specific guidelines. Surveys followed guidelines specified in DoEE (2013b).	August 2020 September 2020 October 2020
Large-fruit Yellow-gum ***Eucalyptus leucoxylon* subsp. *megalocarpa*** **FFG Act: CR**	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.	No specific survey guidelines.	August 2020 September 2020 October 2020 November 2020 December 2020
Coastal Leek-orchid ***Prasophyllum litorale*** **FFG Act: CR**	Coastal scrub and heath on sand hills or headlands, in sand over moisture-retentive clays	December to January. Reference site checks to confirm flowering. Area search using transects.	No specific guidelines. Surveys followed guidelines specified in DoEE (2013b).	November 2020 December 2020

Species and status	Potential survey areas	Survey methods and timing	Relevant survey guidelines	Survey periods (time period when surveys were conducted)
Small Sickle Greenhood ***Pterostylis lustra*** **FFG Act: EN**	In shaded, damp to wet areas along stream banks, in wet soaks and swamps	November to February. Reference site checks to confirm flowering. Area search using transects.	No specific guidelines. Surveys followed guidelines specified in DoEE (2013b).	November 2020 December 2020
Leafy Greenhood ***Pterostylis cucullata*** **subsp.** ***cucullata*** **FFG Act: EN**	Protected areas of stabilised coastal sand dunes within scrub communities with an open ground layer; occasionally in Coastal Manna Gum woodland	August to October. Reference site checks to confirm flowering. Area search using transects.	No specific guidelines. Surveys followed guidelines specified in DoEE (2013b).	August 2020 September 2020 October 2020
Winter Sun-orchid ***Thelymitra hiemalis*** **FFG Act: CR**	Brown Stringybark *Eucalyptus baxteri* or Western Peppermint *E. falciformis* woodland, typically with a heathy understorey.	June to August. Reference site checks to confirm flowering. Area search using transects.	No specific guidelines. Surveys followed guidelines specified in DoEE (2013b).	August 2020

6.2 Existing conditions

Pre-existing records of threatened species recorded within the Project Area, including a 10-kilometre buffer, are listed in Appendix 2, Table A2.2. The distribution of nationally significant species is provided in Figure 6b, and state significant species in Figure 6a.

Targeted surveys were conducted for the species in the following section. These surveys involved checking reference sites, where the species has been previously located, and searching within areas of potential habitat within or close to the Project Area. Surveys at reference sites were used to confirm survey timing was within the flowering window of local populations Listed flora species recorded during the surveys carried out for the Project are shown in Figure 6c.

Results of targeted flora surveys for EPBC Act and FFG Act listed species are as follows.

River Swamp Wallaby-grass *Amphibromus fluitans* (EPBC Act: Vulnerable) occupies swampy areas. Suitable habitat within the Project Area includes wetlands. There are two records of the species from 1989 within 10 kilometres from the wind farm footprint and a single record from 2009 within 20 kilometres from the wind farm footprint. Limited suitable habitat was present for this species, and it was not found during Project surveys. No reference site checks were conducted, as this species is relatively conspicuous.

Limestone Spider-orchid *Caladenia calcicola* (EPBC Act: vulnerable; FFG Act: critically endangered) occupies Heathy woodland on sandy soils over limestone. Suitable habitat within Project Area includes roadsides and other less-disturbed portions of site, on sandy soils over limestone. A single record from 1994 is within 10 kilometres of the wind farm footprint near the Palpara Plantation, near the Victorian State border and the species has also been recorded in Bats Ridge Wildlife Reserve to the east of the Project Area. This species was not found during Project surveys either within the project site, or at the reference sites within bats Ridge Wildlife Reserve.

Colourful Spider-orchid *Caladenia colorata* (EPBC Act: endangered; FFG Act: critically endangered) occupies heathy woodland on sandy soils over limestone. Suitable habitat within the Project Area includes roadsides and other less-disturbed areas, on calcareous sands and sandy loams. Several records of the species from 2000 and 2003 are within 10 kilometres of the wind farm footprint. This species was not found during Project surveys, either in the Project Area or suitable habitat near previous records within Discovery Bay Coastal Park.

Mellblom's Spider-orchid *Caladenia hastata* (EPBC Act: endangered; FFG Act: critically endangered) occupies dense coastal heath and heathy woodlands, commonly on the margins of swampy depressions. Suitable habitat within the Project Area includes roadsides and other less-disturbed areas, in remnant patches of coastal heath or heathy woodlands and on margins of wet depressions. A record of this species from 2002 is within 5 kilometres of the wind farm footprint and a further three records are within 10 kilometres. This species was found at a reference location during the Project surveys in the Point Danger Coastal Reserve, in Portland, but was not located within the Project Area.

Ornate Pink-fingers *Caladenia ornata* (EPBC Act: vulnerable; FFG Act: endangered) occupies heathy and grassy woodlands. Suitable habitat within the Project Area includes roadsides and other less-disturbed areas, in remnant patches of heathy or grassy woodlands. Three records from 2003 are within 5 kilometres of the wind farm footprint. This species was found at a reference location during the Project survey in the Point Danger Coastal Reserve, in Portland, but was not located in the Project Area.

Wrinkled Cassinia *Cassinia rugata* (EPBC Act: vulnerable; FFG Act: critically endangered) occupies damp, low open forests, or dense heathy scrub. Suitable habitat within the Project Area includes Cobboboonee National Park close to the Surrey River and its tributaries. There are several records of this species in the north-east section of Cobboboonee National Park within 5 kilometres of the transmission line between 1980 and 2012. This species was found at a reference location during Project surveys in Cobboboonee National Park, approximately 10 kilometres north of the transmission line. No individuals of this species were found within the Project Area.

Clover Glycine *Glycine latrobeana* (EPBC Act: vulnerable; FFG Act: vulnerable) occupies grasslands and grassy woodlands, particularly those dominated by Kangaroo Grass. Suitable habitat within the Project Area includes roadsides and other less-disturbed areas, in remnant patches of grassland or grassy woodland. Several records of the species are within 10 kilometres of the wind farm footprint, the most recent being in 2015 in Lower Glenelg National Park. This species was not found during the Project surveys.

Square Raspwort *Haloragis exalata* var*. exalata* (EPBC Act: vulnerable) occupies damp, riparian habitats. There is one record from 2007 of this species within 10 kilometres of the wind farm footprint and a further seven records that pre-date 1980. This species was found during Project surveys at a reference location within 10 kilometres of the wind farm footprint near Moleside Creek within Lower Glenelg National Park but was not located within the Project Area.

Coast Ixodia *Ixodia achillaeoides* subsp*. arenicola* (EPBC Act: vulnerable) occupies low coastal shrublands on exposed limestone headlands, often on steeply sloped sites. This species was found during Project surveys in Kentbruck H14 Bushland Reserve, adjacent to Portland–Nelson Road close to the Project Area.

Maroon Leek-orchid *Prasophyllum frenchii* (EPBC Act: endangered; FFG Act: endangered) occupies grassland and grassy woodland environments on sandy or black clay loam soils that are generally damp but well drained. Suitable habitat within the Project Area includes roadsides and other less-disturbed areas, in grassland and grassy woodland environments on sandy or black clay loam soils. Four recent records from 2008 and 2018 are within 5 kilometres of the wind farm footprint. This species was not found during the surveys at reference locations within nearby areas of Discovery Bay Coastal Park or within the Project Area.

Dense Leek-orchid *Prasophyllum spicatum* (EPBC Act: vulnerable; FFG Act: critically endangered) occupies coastal heathland and near-coastal heathy forest on sandy soils. Suitable habitat within the Project Area includes roadsides and other less-disturbed areas, on sandy soils. Several records of this species are within 10 kilometres of the wind farm footprint, the most recent record from 2009 in the Cobboboonee National Park. The three closest records were from mid-late November (2009, 1972, 1932). This species was not found during Project surveys, either at reference sites or within the project area. This is a conspicuous species with a tall flowering stem which is likely to remain visible for some time post flowering. VicFlora notes that flowering can occur after fire or other disturbances, and as a result may not be detectable in all years.

Green-striped Greenhood *Pterostylis chlorogramma* (EPBC Act: vulnerable; FFG Act: endangered) occupies heathy woodland environments. Suitable habitat within the Project Area includes roadsides and other less-disturbed areas. There are two 1993 records of the species from Mt Clay State Forest and a single record from 2007 (July and August), less than 10 kilometres from the transmission line. This species was not found during surveys at reference locations or within the Project Area, including intensive surveys within Mount Clay State Forest near the proposed transmission line easement, which has now been removed from the project.

Swamp Greenhood *Pterostylis tenuissima* (EPBC Act: vulnerable) occupies swamp scrub with a dense canopy and open understory, often on or beside animal tracks. There are four recent records (2002, 2008, 2008 and 2018) and eight records that predate 1990 within 10 kilometres of the wind farm footprint. Flowering specimens of this species were found during the December 2020 phase of the survey at a reference location within 10 kilometres of the wind farm footprint south of Nelson, confirming survey timing was within flowering window of local populations. This species was not found during surveys within the Project Area.

Swamp Fireweed *Senecio psilocarpus* (EPBC Act: vulnerable) occupies herb-rich winter-wet swamps on volcanic clays or peaty soils. Potential habitat for the species is present where waterways, including the Surrey River, cross Boiler Swamp Road. Several records of the species are within 20 kilometres of the wind farm footprint, the most recent from 2014. Limited habitat is present within the Project Area, and this species was not found during Project surveys, however the surveys were conducted during November and December, which may be before the species reaches peak flowering in the local area (January – February, D. Pitts pers. comm.). Potential riparian habitat near Boiler Swamp Road will not be impacted by the project, as impacts are avoided in these areas by directional drilling.

Coast Dandelion *Taraxacum cygnorum* (EPBC Act: endangered; FFG Act: critically endangered) occupies woodlands and scrub on calcareous soils. Suitable habitat within Project Area includes roadsides and other less-disturbed areas, on calcareous soils. Several recent records between 2010 and 2012 are within 10 kilometres of the wind farm footprint. This species was found during Project surveys at a reference location approximately 4 kilometres north of Nelson. This species was not found within the Project Area.

Metallic Sun-orchid *Thelymitra epipactoides* (EPBC Act: endangered; FFG Act: endangered) occupies moist or dry sandy loams or loamy sands, primarily in coastal heaths, grasslands and woodlands, but also in similar communities on drier inland sites. Suitable habitat in the Project Area includes roadsides and other less-disturbed areas, on sandy loams or loamy sands, primarily in coastal heaths, grasslands and woodlands. Two records from 1980 and 2000 of this species are from Lower Glenelg National Park (both in late October), within 10 kilometres of the wind farm footprint. This species was not found during Project surveys. No appropriate reference site was available to conduct a reference check, however this is a conspicuous species likely to be detectable within its flowering period.

Swamp Everlasting *Xerochrysum palustre* (EPBC Act: vulnerable; FFG Act: critically endangered) occupies sedge swamps and shallow freshwater marshes and swamps in lowlands, on black cracking clay soils. There are five records within 20 kilometres of the wind farm footprint from 2009 and 2010. No suitable wetland habitat was mapped within the Project Area. This species was not found during Project surveys.

FFG Act listed species were also searched for in suitable habitats during targeted surveys. The following FFG Act listed species (not listed under the EPBC Act) were considered.

- Coast Helmet-orchid *Corybas despectans* (endangered) – Species not detected during Project surveys. VicFlora notes that this species flowers in July and August. Most local records within Discovery Bay Coastal Park, to the south of the Project Area, are from July, but the species has also been detected in September and October. Searches of the area in the vicinity of these records in August, September and October failed to detect any flowering specimens, although leaves of *Corybas* spp. were observed. The species was not detected within the Project Area.
- Winter Sun-orchid *Thelymitra hiemalis* (critically endangered) – Species not detected during surveys, either at reference sites or within the Project Area. This species can flower between June and August (VicFlora). Surveys were conducted in August, but no surveys were

conducted in June or July. Previous records of the species are limited to the area around Mount Richmond and Cashmore, approximately 8 kilometres south of the proposed transmission line, and over 10 kilometres south-east of any other proposed infrastructure. Previous detections of the species have occurred in June, September and October. The species was not detected during reference check in the Mount Richmond area, or elsewhere within the Project Area.

- Coastal Leek-orchid *Prasophyllum litorale* (critically endangered) – Species was detected during surveys of reference locations within Discovery Bay Costal Reserve, to the south of the Project Area, south-west of the corner of Browns Road and South Road (Figure 6c). The species was detected in a location where there were numerous recent records, within Coastal Alkaline Scrub (EVC 858). These detections confirmed the survey timing was within the flowering window of local populations. The species was not recorded within the project area, including nearby road reserves within the GTFP Plantation area.
- Small Sickle Greenhood *Pterostylis lustra* (endangered) – Species was detected at two locations during surveys along the transmission line route approximately 10 kilometres west of Heathmere, within Cobboboonee National Park, where the Surrey River crosses Boiler Swamp Road, confirming survey timing was within the flowering window of local populations.
- Scented Spider-orchid *Caladenia fragrantissima* (critically endangered) – Species was detected during surveys at two reference locations within 10 kilometres of the wind farm in Discovery Bay Coastal Park, confirming survey timing was within the flowering window of local populations. The species was not detected during the surveys of the Project Area.
- Robust Spider-orchid *Caladenia valida* (critically endangered) – Species not detected during surveys. Previous records for this species within the Portland region are limited to areas around Mount Richmond and Cashmore, where the species was detected in late October (2005-2012). No specific reference checks were undertaken for this species, however it was not detected during reference checks for other orchids within the Bats Ridge Wildlife reserve and surrounding areas.
- Late Helmet-orchid *Corybas* sp. aff. *diemenicus* (Coastal) (critically endangered) – Species not detected during surveys of previously recorded locations in Discovery Bay Coastal Park, or within the Project Area. This species has been previously recorded in Discovery Bay Coastal Park to the south of the Project Area, in swamps dominated by Woolly Tea-tree *Leptospermum lanigerum*.
- Leafy Greenhood *Pterostylis cucullata* subsp. *cucullata* (endangered) – Species was detected during surveys at a reference location at Bridgewater Lakes in Discovery Bay Coastal Park, confirming survey timing was within the flowering window of local populations. The species was not detected during the surveys of the Project Area.
- Swamp Diuris *Diuris palustris* (endangered) – Species not detected during surveys within the Project area and it was not located at any reference sites. Recent (post 1950) records are limited to the area around Bats Ridge Wildlife Reserve, approximately 15 kilometres south of the proposed transmission line, and over 20 kilometres south-east of proposed turbine locations.
- Large-fruit Yellow-gum *Eucalyptus leucoxylon* subsp. *megalocarpa* (critically endangered) – Species not detected during surveys. This species is known to occur close to Nelson and

within western portions of Lower Glenelg National Park. This species was not detected within the Project Area.

- One-flower Early Nancy *Wurmbea uniflora* (vulnerable) was recorded on the slashed road edge along Cut Out Dam Road, which was surveyed as an option for the underground transmission line route (instead of Boiler Swamp Road), confirming survey timing was within the flowering window of local populations. There is potential for this species to also occur along Boiler Swamp Road, and it appears to be tolerant of regular slashing, however it is unlikely to survive road grading, which occurs relatively regularly along Boiler Swamp Road, as part of regular road maintenance activities.

As part of the recent amendments to the FFG Act, transitional provisions allowed DELWP to assess all species, including species previously only listed on the advisory lists, using the Common Assessment Method (CAM) for inclusion on the FFG Act Threatened List. This process has resulted in more than 1,300 species of flora and fauna being added to the FFG Threatened List across the State. A revised database search has been undertaken for this project, to highlight new inclusions on the Threatened List that occur within the Investigation Area, and also to detect any recently recorded species and to update the species likelihood assessment presented in Appendix 2.

Additional FFG Act listed species considered to have a medium or higher likelihood of occurrence within the Project Area are listed below, with notes on any records of these species made during Project surveys.

These species are:

- Broad-leaf Prickly Moses *Acacia verticillata* subsp. *ruscifolia* (endangered)
- Silver Everlasting *Argentipallium dealbatum* (endangered)
- Hairy Boronia *Boronia pilosa* subsp. *torquata* (endangered) –recorded within Lowland Forest near Boiler Swamp Road, between the two Surrey River crossings.
- Wiry Bossiaea *Bossiaea cordigera* (endangered) – recorded near Portland during reference site checks and along the proposed transmission line adjacent to where Boiler Swamp Road crosses the Surrey River. Four additional records of this species along Boiler Swamp Road were provided by Parks Victoria (David Pitts pers. com. 2024), and these are shown on Figure 6c.
- Lizard Orchid *Burnettia cuneata* (endangered)
- Large White Spider-orchid *Caladenia venusta* (endangered)
- Slender Pink-fingers *Caladenia vulgaris* (vulnerable)
- Tiny Midge-orchid *Corunastylis nuda* (vulnerable)
- Dwarf Boronia *Cyanothamnus nanus* var. *pubescens* (endangered)
- Spotted Hyacinth-orchid *Dipodium pardalinum* (endangered)
- Western Peppermint *Eucalyptus falciformis* (vulnerable) – recorded along Boiler Swamp Road through Cobboboonee Forest Park and Cobboboonee National Park. Also recorded near the Heywood Terminal Station. Western Peppermint is relatively common within the local area. Further information is provided in Section 6.3.2.

- Apple Jack *Eucalyptus splendens* (critically endangered) – recorded along Boiler Swamp Road through Cobboboonee Forest Park and Cobboboonee National Park. Surveys for the project, and consultation with local experts from Parks Victoria, have revealed this species is more widespread in the Cobboboonee Forest area than is indicated by existing database records. Further information is provided in Section 6.3.2.
- Bog Gum *Eucalyptus kitsoniana* (critically endangered)
- Tight Bedstraw *Galium curvihirtum* (vulnerable)
- Grampians Goodenia *Goodenia lineata* (vulnerable)
- Western Golden-tip *Goodia medicaginea* (endangered) – recorded within the road reserve along Johnsons Road, at the far western end of the Project Area
- Silky Golden-tip *Goodia pubescens* (endangered)
- Dwarf Brooklime *Gratiola pumilo* (endangered)
- Rough Blown-grass *Lachnagrostis rudis* subsp. *rudis* (endangered)
- Showy Lobelia *Lobelia beaugleholei* (vulnerable)
- Oval-leaf Logania *Logania ovata* (endangered)
- Lax Twig-sedge *Machaerina laxa* (endangered)
- Rough Daisy-bush *Olearia asterotricha* (endangered) – this species was recorded within Lowland Forest adjacent to Boiler Swamp Road, between the two Surrey River Crossings.
- Forked Rice-flower *Pimelea hewardiana* (endangered)
- Lacey River Buttercup *Ranunculus amplus* (critically endangered)
- Sand Fireweed *Senecio hispidissimus* (endangered)
- Tiny Violet *Viola sieberiana* s.s. (endangered) – recorded at two locations adjacent to Boiler Swamp Road in the western part of the Cobboboonee Forest, adjacent to Boiler Swamp road where the underground transmission line is proposed.
- One-flower Early Nancy *Wurmbea uniflora* (vulnerable) – recorded along Cut Out Dam Road, growing within the road formation, as noted above.
- Tufted Grass-tree *Xanthorrhoea caespitosa* (vulnerable)
- Southern Xanthosia *Xanthosia tasmanica* (endangered)

6.3 Impact assessment

Construction and operation of the KGPH has potential to impact on threatened flora species via several mechanisms:

- Direct removal of plants for construction of permanent infrastructure, such as turbines, hard stands and access roads.
- Direct removal of plants for construction of temporary infrastructure, including temporary storage areas and road modifications for blade and turbine base transportation.

- Impacts on tree protection zones of threatened tree species due to trenching for transmission lines and cables.
- Disturbance by vehicles during construction of the transmission line.
- Indirect disturbance of threatened plants may occur as a result of change in hydrology, sedimentation, erosion or pollution.

Flora species recorded during the investigations, including threatened flora, are listed in Appendix 2 and shown in Figure 6c. In this impact assessment, species are considered if they are listed as critically endangered (CR), endangered (EN) or vulnerable (VU) or under the EPBC Act and/or FFG Act. Recent amendments to the FFG Act, including the application of the common assessment method for determining conservation status, resulted in several species being added to the threatened list during 2021.

During the investigations, several threatened species were recorded at locations remote from the Project Area, primarily at sites that were surveyed as reference sites, to check on timing of flowering and detectability of certain species.

6.3.1 Wind farm

The highly modified nature of most of the wind farm site (cleared farmland, pine plantations and blue gum plantations) provides very limited habitat for threatened flora species. Native vegetation is limited to road reserves, some wetlands and regrowth of hardy species in previously cleared areas.

One FFG Act listed species was recorded within the wind farm site:

- Dune Fan-flower *Scaevola calendulacea* (FFG Act: endangered) was 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.

Dune Fan-flower is a conspicuous, mat forming species. These recorded locations are not impacted by the current design of the wind farm, and these records will be considered in any future design modifications or micrositing.

6.3.2 Transmission line

Several listed species were recorded within or near the transmission line corridor:

- Small Sickle Greenhood *Pterostylis lustra* (FFG Act: endangered) was recorded in Sedgy Riparian Woodland along the banks of the Surrey River within Cobboboonee National Park, where the proposed 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.
- One-flower Early Nancy *Wurmbea uniflora* (FFG Act: vulnerable) was recorded growing within the regularly graded and slashed road edge along Cut Out Dam Road, which was surveyed as one of the initial underground options. The record is close to the end of Boiler Swamp Road, in similar vegetation, and there is potential for this species to occur along Boiler Swamp Road. This species was not detected along Boiler Swamp Road.
- Hairy Boronia – *Boronia pilosa* subsp. *torquata* (FFG Act: endangered) was recorded adjacent to Boiler Swamp Road approximately 1.5 kilometres east of Blacks Road, within Lowland

Forest beyond the road formation. This species is unlikely to be present within the regularly slashed and graded road verge.

- Rough Daisy-bush *Olearia asterotricha* (FFG Act: endangered) was recorded adjacent to Boiler Swamp Road, between the two Surrey River crossings, within Lowland Forest beyond the road formation. It is recommended that these locations be marked and treated as no-go zones during construction.
- Wiry Bossiaea *Bossiaea cordigera* (FFG Act: endangered) was recorded at several locations along Boiler Swamp Road close to the road formation. It is recommended that these locations be marked and treated as no-go zones during construction.
- Tiny Violet *Viola sieberiana* spp. agg. (FFG Act: endangered) was recorded at two locations adjacent to Boiler Swamp Road in the western portion of the forest block. Both locations were beyond the road formation, but it is recommended that these locations be marked and treated as no-go zones during construction as a precaution.
- Apple Jack *Eucalyptus splendens* (FFG Act: critically endangered) is a mostly rough barked eucalypt with taxonomic affinities to the Manna Gum *Eucalyptus viminalis* group and the Scent-bark *Eucalyptus aromaphloia* group. VicFlora notes that the correct systematic placement of the taxon is as yet uncertain. Apple Jacks can be confidently distinguished from Rough-barked Manna Gum *Eucalyptus viminalis* subsp. *cygnetensis* by the shape of the juvenile leaf bases, and there are clear differences in the bark of the trees. Within the Investigation Area Manna Gums are also heavily browsed by Koalas, which is another key point of difference between the species.
  The type specimen of Apple Jack was collected by Kevin Rule In 1992, from a tree in the Portland–Nelson Road reserve at Mount Richmond. Prior to this (2022) survey, the species was only known to occur in a highly restricted area within near Mount Richmond, resulting in the Critically Endangered classification assigned during the review of the FFG Act in 2021. Similar trees, which may represent other subspecies of *Eucalyptus splendens*, have also been noted near Carpenter Rocks on the coast of South Australia, and at Moonlight Head along the Otway Ranges coastline. However, the Mount Richmond population is the only population of the species recognised within the Flora of Victoria.
  The presence of Apple Jack was overlooked in the early stages of the project studies, including the initial Arborists Assessment. Following consultation with local experts within Parks Victoria, Apple Jack was found to be abundant within the Cobboboonee Forest, with the species recorded along the full length of Boiler Swamp Road, and it is assumed to be widespread and abundant throughout the Cobboboonee Forest block (although surveys conducted for this project were limited to trees adjacent to the road). Avoiding impacts to Apple Jack root zones has been a priority in the design revisions undertaken, including micrositing of the trench within the road corridor, and selection of locations to be constructed via directional drilling.
- Western Peppermint *Eucalyptus falciformis* (FFG Act: vulnerable) is relatively widespread and common within the region. This peppermint species is part of a complex of species including *Eucalyptus dives*, *E. willisii*, *E. molyneuxii* and *E. arenicola*. It is widespread in far south-west Victoria, and also occurs as a common species within the Grampians and Otway/Anglesea areas. Within far south-west Victoria it is one of the dominant eucalypt species, occurring across a wide range of ecological vegetation classes, including those present throughout the Investigation Area. This species was recorded near the Heywood Terminal Station in Mount Clay State Forest, and is also present along Boiler Swamp Road through Cobboboonee Forest

Park and Cobboboonee National Park, where it was recorded during the arborist assessment and in the October 2022 assessment of the trees along the underground section of the transmission line. The proposed transmission line impacts on more than 10% of the tree protection zones of 83 Western Peppermint trees, and these have been incorporated in the vegetation impact calculations as assumed losses.

6.3.3 Transport route

The roadsides within the transport route are highly modified and support limited habitat for threatened flora. Native vegetation within the transport route is limited to small, fragmented patches of vegetation that are dominated by introduced weeds in the understorey. No threatened flora species have been recorded within the transport route or assessed with a medium or high likelihood of occurring. Vegetation impacts for the transport route, for example where clearance is required near intersections to allow for the movement of blades and turbine bases, are included in the vegetation impact calculations (Section 4.4.2).

6.3.4 Potential for direct impacts

It is expected that impacts on Dune Fan-flower within the wind farm area can be avoided during the design process, and by marking and protection of no-go areas during construction.

The majority of threatened 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. While One-flower Early Nancy was not recorded along the edges of Boiler Swamp Road, suitable habitat is present, and individuals of this species may be directly impacted by trenching along this road. Impacts on threatened ground flora recorded along the transmission line (One-flower Early Nancy, Hairy Boronia, Small Sickle Greenhood, Rough Daisy-bush, Wiry Bossiaea and Tiny Violet) 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.

Numerous Apple Jack *Eucalyptus splendens* and Western Peppermint *Eucalyptus falciformis* trees are present within bushland adjacent to Boiler Swamp Road where the transmission line is proposed to be constructed beneath the road. The proponent has committed to minimising impacts on these trees, using a range of construction techniques including directional drilling. The design has been modified to avoid impacts to Apple Jack, however 83 Western Peppermint trees may be impacted by greater than 10% incursion into tree protection zones. Further studies including root investigations beneath the road are also planned.

Several threatened flora species were not detected at reference sites during the surveys, and some species were added to the FFG Act threatened list after the completion of the field surveys, and were therefore not specifically targeted. While they were not specifically targeted, surveys were conducted throughout the Investigation Area focusing on areas of native vegetation over multiple seasons, so it is considered unlikely that important populations of these species have been overlooked.

Species that were not targeted, or were targeted but unable to be detected at reference sites, including the following:

- Coast Helmet-orchid *Corybas despectans* (FFG Act: endangered)
- Late Helmet-orchid *Corybas* sp. aff. *diemenicus* (Coastal) (FFG Act: critically endangered)
- Limestone Spider-orchid *Caladenia calcicola* (EPBC Act: vulnerable, FFG Act: critically endangered)

- Colourful Spider-orchid *Caladenia colorata* (EPBC Act: endangered, FFG Act: critically endangered)
- Maroon Leek-orchid *Prasophyllum frenchii* (EPBC Act: endangered, FFG Act: endangered)
- Dense Leek-orchid *Prasophyllum spicatum* (EPBC Act: vulnerable, FFG Act: critically endangered)
- Green-striped Greenhood *Pterostylis chlorogramma* (EPBC Act: vulnerable, FFG Act: endangered)
- Metallic Sun-orchid *Thelymitra epipactoides* (EPBC Act: endangered, FFG Act: endangered)
- Swamp Diuris *Diuris palustris* (FFG Act: endangered).

Several of these species have specific habitat requirements, and although they may be present within the Investigation Area, they are highly unlikely to be present in any habitats to be directly impacted. This includes Coast Helmet-orchid (coastal dunes), Late Helmet-orchid (near-coastal swamp scrubs) and Swamp Diuris (swampy depressions).

Likelihood of occurrence of other species within impact areas is considered low, due to lack of records or large distances from known populations, including Limestone Spider-orchid.

The highest potential for additional, unquantified impacts to threatened flora relate to the removal of up to 0.52 hectares of Heathy Woodland for access to the Heywood Terminal Station. Although considered unlikely in the context of the surveys undertaken, the presence of several species in this area cannot be completely ruled out, including Green-striped Greenhood and Dense Leek-orchid.

To further reduce the likelihood of unexpected direct impacts on threatened flora, the following mitigation actions are recommended (see also Section 37.3):

- Pre-construction surveys within and adjacent to areas of native vegetation to be directly impacted
- Any recorded threatened plants should be marked and protected, and communicated to construction personnel during inductions.

6.3.5 Potential for indirect impacts

Conservation reserves near the wind farm and transmission line support high quality native vegetation and provide habitat for several significant species. Discovery Bay Coastal Park supports high quality areas of Coastal Alkaline Scrub (EVC 858) which contains populations of species such as Scented Spider-orchid *Caladenia fragrantissima*, Coastal Leek-orchid *Prasophyllum litorale* and Coast Helmet-orchid *Corybas despectans*.

There is potential for erosion and sedimentation to occur downstream or downslope from construction activities, particularly the construction of the underground transmission line route, and this could impact upon nearby populations of threatened plants.

Recommendations to protect against unexpected impacts due to erosion and sedimentation include (see also Section 37.3):

- Pre-construction surveys adjacent to construction areas to identify any areas containing threatened plants requiring protection.
- Any recorded threatened plants should be marked and protected, and communicated to construction personnel during inductions.

- Works should be limited to the construction footprint, in particular the road formation along Boiler Swamp Road.
- All construction activities should follow current best practice for sedimentation and erosion prevention, which is particularly important on steep slopes or near waterways, and in wet conditions.

6.3.6 Conclusion

The majority of Project infrastructure is located in highly disturbed environments, including Pine Plantations and farmland and impacts to native vegetation and threatened flora habitats have been avoided through the design process.

Threatened species surveys were conducted in suitable habitat areas in multiple seasons, targeting flowering times for cryptic species. It is acknowledged that not all species could be detected at reference sites and there are several species that were added to the FFG Act threatened list after the surveys were undertaken and were thus not specifically targeted. Several of these species have specific habitat requirements, and although they may be present within the Investigation Area, they are highly unlikely to be present in any habitats to be directly impacted. Likelihood of occurrence of other species within impact areas is considered low, due to lack of records or large distances from known populations.

Known impacts to threatened species are limited to:

- Assumed loss of 83 Western Peppermint *Eucalyptus falciformis* (FFG Act: vulnerable) trees due to tree protection zone disturbance, for construction of the underground transmission line along Boiler Swamp Road.

Major encroachment on tree protection zones of Apple Jack *Eucalyptus splendens* (FFG Act: critically endangered) have been avoided via design modifications, including altering the alignment of the trenching within the road corridor, and using directional drilling where necessary.

Several other threatened flora species are known to occur along Boiler Swamp road, but these are all occurring beyond the road formation, and locations will be marked and treated as no-go zones. Additional pre-construction surveys are recommended to ensure locations of these species are recorded and protected during construction.

The highest potential for additional, unquantified impacts to threatened flora relate to the removal of up to 0.52 hectares of Heathy Woodland for access to the Heywood Terminal Station. Although considered unlikely in the context of the surveys undertaken, the presence of several species in this area cannot be completely ruled out, including Green-striped Greenhood and Dense Leek-orchid. Pre-construction surveys are recommended to allow for micrositing and avoidance of these species, if detected.

7. Threatened ecological communities

7.1 Existing conditions

Threatened ecological communities with potential to occur in the Investigation Area are outlined below and the locations of known occurrences of these communities is presented in Figure 7a.The likelihood of occurrence of these communities is provided in Appendix 2, Table A2.3.

7.1.1 EPBC Act threatened communities

The PMST (Appendix 14) has identified seven EPBC Act listed threatened ecological communities (TECs) as potentially present in the Investigation Area:

- Assemblages of species associated with open-coast salt-wedge estuaries of western and central Victoria ecological community (Salt Wedge Estuary Community)
- Giant Kelp Marine Forests of South East Australia
- Grassy Eucalypt Woodland of the Victorian Volcanic Plain
- Karst springs and associated alkaline fens of the Naracoorte Coastal Plain Bioregion
- Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains
- Natural Temperate Grassland of the Victorian Volcanic Plain
- Subtropical and Temperate Coastal Saltmarsh.

Salt Wedge Estuary Community (EPBC Act: Endangered) is present within the Glenelg River estuary and east of the Investigation Area in the Surrey River estuary. The ecological community is characterised by obligate estuarine taxa, with associated coastal, estuarine, brackish and freshwater taxa that may reside in the estuary for periods of time or visit the estuary for specific purposes such as reproduction, feeding, refuge or migration (DoEE 2018). The community is limited to Victoria, and the lower 67.9 kilometres of the Glenelg River is the western-most occurrence. The conservation advice (DoEE 2018) defines the extent of the community, and also specifies buffer zones which should be considered when determining likely significant impacts on the community. Buffer zones include:

- A lateral zone of at least 50 metres from the edge of the estuary.
- A radius of 1 kilometre of the estuary mouth, including the ocean, beach and dune areas.
- A groundwater buffer zone of at least 200 metres from the edge of the estuary.

The Project Area is located more than 5 kilometres from Glenelg River estuary where this community occurs.

Giant Kelp Marine Forests of South East Australia (EPBC Act: Endangered) occurs on rocky substrates at depths of greater than 8 metres, along the southern Australian coastline, including Tasmania (Threatened Species Scientific Committee 2012). This community is expected to be present in offshore marine habitats along the coastline of Discovery Bay Coastal Park. Detailed assessment of this community is not included in the current studies for the Project, due to the negligible likelihood of impacts resulting from the development and operation of the facility on offshore ecology.

Grassy Eucalypt Woodland of the Victorian Volcanic Plain (VVP) (EPBC Act: Critically Endangered) is limited to the Victorian Volcanic Plain, as defined in the Interim Biogeographical Regionalisation of Australia version 6 (DSEWPC 2011b), which is consistent with the current Victorian Bioregion map in the Portland region. There is a small section of the VVP to the west of Heathmere, which the transmission line route passes through. This community is typically dominated by River Red-gum *Eucalyptus camaldulensis*, but can have an overstorey of Manna Gum *Eucalyptus viminalis* or Swamp Gum *Eucalyptus ovata* in areas that receive more than 700 millimetres of rainfall per year. Manna Gum and Swamp Gum are both present in the area but are generally associated with EVCs that are not considered to represent this community. This community was not recorded within the Project Area.

Karst springs and associated alkaline fens of the Naracoorte Coastal Plain Bioregion (EPBC Act: Endangered) community was listed under the EPBC Act on 15 December 2020. Known occurrences within the Investigation Area include Lake Mombeong within Discovery Bay Coastal Park (DAWE 2020). The primary defining features of this community are the underlying limestone geology, karst fed (alkaline) freshwater springs, soaks, pools or streams and fringing fens which include herblands, peatlands, sedgelands and/or shrubland vegetation. The ecological community is part of a once extensive system of wetlands that occurred on low-lying areas over Gambier limestone bedrock near the coastal zone of the Otway Basin (Geoscience Australia 2018) in South Australia and western Victoria (Grimes, Mott, & White 1999). The community occurs between Portland in Victoria and Millicent in South Australia. Occurrences are limited to near coastal areas with limestone substrates, mostly at elevations of less than 2 metres above sea level, with some occurrences potentially up to 25 metres above sea level. A key diagnostic feature for the listed community is a hydrological regime that is predominantly groundwater fed, from the tertiary limestone aquifer (DAWE 2020). Wetlands that are predominantly surface water fed, including dune slack wetland systems, are not considered part of the ecological community. This excludes most of the Long Swamp dune slack wetland system from the TEC listing. No occurrences of this TEC are located within the Project Area.

Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains community can occur within the VVP bioregion and adjacent bioregions. No examples of this community were recorded in the Project surveys. Most wetlands within the Project Area are of types that are excluded from this community definition, including wetlands on limestone derived substrates, or shallow wetlands resulting from springs.

Natural Temperate Grassland of the Victorian Volcanic Plain can occur within the VVP bioregion and adjacent bioregions. There is some potential for this community to be present within farmland areas along the transmission line route, but the likelihood of occurrence is low due to the high rainfall and dominance of introduced species in most pastures. This community was not recorded within the Project Area.

Subtropical and Temperate Coastal Saltmarsh is present near the Glenelg River estuary mouth, associated with Oxbow Lake. Approximately 13 hectares of Coastal Saltmarsh EVC are present. The community is protected via the EPBC Act threatened community listing, and preservation of this 13 hectares area as Coastal Saltmarsh is specified as a "Limits of Acceptable Change" within the Glenelg Estuary and Discovery Bay Ramsar Site Ecological Character Definition (DELWP 2017b). The Project Area is located more than 4.5 kilometres from Oxbow Lake where this community occurs.

7.1.2 FFG Act threatened communities

The following ecological communities listed under provisions of the FFG Act may occur in proximity to the Project Area, but they are not considered likely to occur within areas requiring vegetation removal:

- Coastal Moonah (*Melaleuca lanceolata* subsp. *lanceolata*) Woodland Community
- Red Gum Swamp Community No. 1
- Victorian Temperate Woodland Bird Community (including Red-tailed Black Cockatoo)
- Western (Basalt) Plains Grassland Community
- Western Basalt Plains (River Red Gum) Grassy Woodland.

Stands of Moonah *Melaleuca lanceolata* occur within the vicinity of the Project Area, and the modelled potential distribution of this community is indicated in Figure 7a. The Coastal Moonah Woodland Community is open grassy woodland that is dominated by Moonah *Melaleuca lanceolata* ssp. *lanceolata* and found along parts of the Victorian coastline. Coastal Moonah Woodlands tend to occur on high-level dunes along the coast where soils are strongly alkaline and developed on moderately organic aeolian sands or on dune calcarenites. The community has a scattered distribution between Phillip Island and Lorne, with disjunct occurrences west of Portland. None of these patches of Moonah are within the project footprint. A small stand was recorded within the investigation area to the south of Plantation Road near the intersection with Johnsons Road. This location is outside the Project Area (Figure 4e.2), and is approximately 1 km from the nearest project infrastructure.

None of the other FFG Act threatened communities were recorded within or near the Project Area.

7.2 Impact assessment

Construction and operation of the KGPH has potential to impact upon threatened ecological communities via several key impact pathways:

- Direct removal of portions of threatened ecological communities for construction of permanent and temporary wind farm infrastructure.
- Indirect disturbance of threatened communities located away from infrastructure may occur due to alterations to surface or groundwater hydrology, sedimentation, erosion or pollution.
- Impacts on mobile fauna species, via collision, that provide important ecological functions within threatened ecological communities.

Five threatened ecological communities are present within the Investigation Area:

- Assemblages of species associated with open-coast salt-wedge estuaries of western and central Victoria (salt-wedge estuary community) (EPBC Act: Endangered)
- Karst springs and associated alkaline fens of the Naracoorte Coastal Plain Bioregion (EPBC Act: Endangered)
- Subtropical and Temperate Coastal Saltmarsh (EPBC Act: Vulnerable)
- Coastal Moonah (*Melaleuca lanceolata* subsp. *lanceolata*) Woodland Community (FFG Act: threatened).

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

The Subtropical and Temperate Coastal Saltmarsh community is limited to estuarine environments that are unlikely to be directly or indirectly impacted by the project, as the Glenelg Estuary is located approximately 5 kilometres west of the western extent of the wind farm.

The salt-wedge estuary community provides protection for salt-wedge estuaries and surrounding buffer zones that are important for maintaining water quality and hydrological flows. Buffer zones include upstream, downstream, lateral and groundwater zones. Two salt-wedge estuaries are relevant to the project: the Glenelg River and the Surrey River (DoEE 2018). The project is unlikely to result in hydrological changes that would impact on these estuaries.

Karst springs and associated alkaline fens of the Naracoorte Coastal Plain Bioregion is also considered in the groundwater dependent ecosystem impact assessment report (CDM Smith 2024). Note that the approved conservation advice for this community recommends a buffer zone of 1220 metres from the area of open water to protect occurrences of this community from adverse hydrological impacts or pollution. The open water area of Lake Mombeong is located more than 1,500 metres from the nearest wind farm infrastructure. The small wetlands within the Project Area to the north of Lake Mombeong, which are potential examples of this community, do not support areas of open water, and are more than 1,000 metres from the nearest wind farm infrastructure. Wetlands on farmland in the eastern section of the wind farm do not represent examples of this community (Section 5.2) (DAWE 2020).

Coastal Moonah Woodland is known to occur near the Bridgewater Lakes, with scattered occurrences on the dunes in Discovery Bay Coastal Park between the Bridgewater Lakes and Nelson. No occurrences of this community were recorded within the Project Area.

7.2.1 Wind farm

No threatened ecological communities are present within the wind farm area.

7.2.2 Transmission line

The transmission line is proposed to be underground to Heywood Terminal Station within an existing road alignment through Cobboboonee National Park (19 kilometres) and a shorter section at the eastern extremity of the wind farm and near Heywood through farmland (9 kilometres). The underground section crosses the Surrey River in two locations along Boiler Swamp Road. These locations are over 25 kilometres upstream from the estuary section where there is a known occurrence of the salt wedge estuary community, and direct impacts on the waterway at these locations will be avoided by directional drilling.

7.2.3 Potential for direct impacts

The project will not result in any direct removal of areas of these communities.

7.2.4 Potential for indirect impacts

Effects of construction and operational noise, artificial light and hydrological impacts are not likely to affect any of these threatened ecological communities. The closest occurrence of the Karst Spring community to the Project Area is at Lake Mombeong. Hydrological impacts on these areas have been avoided by design modifications, to ensure that no turbines are constructed in areas where the groundwater may be intersected by turbine foundations.

7.2.5 Conclusion

The Project is unlikely to directly or indirectly impact on any threatened ecological communities.

8. Protected areas

8.1 National parks and other conservation reserves

Conservation reserves near the Project Area are shown in Figures 1a-c, and described in the following sections. Management of these reserves is guided primarily by the Ngootyoong Gunditj Ngootyoong Mara South West Management Plan (Parks Victoria 2015) and the Glenelg Estuary and Discovery Bay Ramsar Site Management Plan (DELWP 2017).

Discovery Bay Coastal Park

The Project Area is located inland from Discovery Bay Coastal Park, which extends along the coastline between Cape Nelson in the east and Nelson in the west (Figure 1b-c). All sections of the Discovery Bay Coastal Park including and to the west of the Bridgewater Lakes are included within the Glenelg Estuary and Discovery Bay Ramsar Site (see Section 8.2).

Discovery Bay Coastal Park protects coastline and dune environments and contains wetlands and lakes including the Bridgewater Lakes, Lake Mombeong, The Sheepwash, Cain Hut Swamp, Long Swamp and the section of the Glenelg River estuary between the coast and the Nelson township. Most of the park supports Coastal Alkaline Scrub, which has a bioregional conservation status of 'Least Concern' within the Bridgewater Bioregion. The park also contains one of the largest expanses of bare mobile dunes in Victoria.

Lower Glenelg National Park

Lower Glenelg National Park is located to the north of the wind farm site. The park shares a boundary with the wind farm in several locations, including to the east of Nelson and near Mount Piccaninny in the east of the proposed wind farm. The Lower Glenelg National Park protects a diverse suite of values including Heathy Woodlands, Damp-Sands Herb-rich Woodland, Wet Heathland and the Glenelg River Estuary and riverine corridor.

The Kentbruck Heath, which spans both Lower Glenelg National Park and Cobboboonee National Park, is one of the largest areas of Wet Heathland in Victoria (Figure 1b-c).

A large section of Lower Glenelg National Park, to the west of the Winnap–Nelson Road, is included within the Glenelg Estuary and Discovery Bay Ramsar Site. This includes the Glenelg River and adjacent woodlands and heathlands.

The Glenelg River is included within the recently EPBC Act listed (endangered) community: *Assemblages of species associated with open-coast salt-wedge estuaries of western and central Victoria ecological community.* The lower 67.9 kilometres of the Glenelg River is included within the definition of this community. This entire length is located within Lower Glenelg National Park, with the exception of the short section where the river crosses into South Australia near Donovans.

Cave systems are known to be present surrounding and underneath the Glenelg River (White 1998).

Cobboboonee National Park and Cobboboonee Forest Park

Cobboboonee National Park was proclaimed as a National Park in 2008. Prior to that it was included within Cobboboonee State Forest. Other adjacent sections of the State Forest were proclaimed as Cobboboonee Forest Park. Cobboboonee National Park is continuous with the eastern section of Lower Glenelg National Park, effectively providing an extension to the area protected as National Park. These parks support extensive areas of Lowland Forest (EVC 16), Heathy Woodland (EVC 48), Herb-rich Foothill Forest (EVC 23) and Wet Heathland (EVC 8).

Cobboboonee National Park and Cobboboonee Forest Park are located to the east of the proposed wind farm. The transmission line route includes proposed underground cables beneath Boiler Swamp Road, which runs east to west through Cobboboonee National Park and Cobboboonee Forest Park (see Figure 1b-c).

Mount Richmond National Park

Mount Richmond National Park is located approximately 10 km to the south-east of the proposed wind farm (Figure 1c). This park contains extensive areas of Damp Sands Herb-rich Woodland (EVC 3), Heathy Woodland (EVC 48), Damp Heathy Woodland (EVC 793), Damp Heathland and Wet Heathland (EVC 8).

Bushland Reserves and Flora Reserves

Other small reserves close to the Project Area are shown on Figures1a-c and include:

- Johnstones Creek Flora Reserve
- Kentbruck H50 Bushland Reserve
- Mouzie Bushland Reserve
- Kentbruck H14 Bushland Reserve
- Hedditch Hill Scenic Reserve.

These reserves are located along Portland–Nelson Road, between the localities of Mount Richmond and Kentbruck.

Kentbruck H50 Bushland Reserve supports a mosaic of Damp Sands Herb-rich Woodland, Heathy Woodland, Heathy Herb-rich Woodland and Wet Heathland, with some small wetlands including areas of including areas of open water.

Johnstones Creek Flora Reserve, approximately 1 kilometre to the south-east of Kentbruck H50 Bushland Reserve, includes areas of Herb-rich Foothill Forest, Heathy Woodland and Damp Sands Herb-Rich Woodland. Mouzie Bushland Reserve, which adjoins Johnstones Creek Flora Reserve to the east, supports a similar suite of Ecological Vegetation Classes.

Hedditch Hill Scenic Reserve and Kentbruck H14 Bushland Reserve are located near Kentbruck, on the south-side of Portland–Nelson Road adjacent to Lower Glenelg National Park. These reserves contain areas of Damp Sands Herb-rich Woodland.

8.2 Glenelg Estuary and Discovery Bay Ramsar site

The Glenelg Estuary and Discovery Bay Ramsar site is located adjacent to the Project (Figure 1a-c). The Ramsar site includes the Glenelg River estuary and wetlands along the coastal dunes between Nelson and Cape Bridgewater. The boundary of the Ramsar site aligns with the boundary of the western portion of Lower Glenelg National Park (west of Winnap–Nelson Road) and the majority of Discovery Bay Coastal Park, from Nelson in the west to Bridgewater Lakes in the east. The site covers an area of approximately 22,289 hectares. The portion of the Glenelg River within South Australia is excluded from the Ramsar site.

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 kilometres to near Dartmoor. A portion of this estuary (67.9 kilometres) is also included within the EPBC Act listed (endangered) community: *Assemblages of species associated with open-coast salt-wedge estuaries of western and central Victoria ecological community.*
- Expansive wetlands near the estuary mouth, including Oxbow Lake.
- Beach and dune systems within Discovery Bay Coastal Park.
- Freshwater wetlands within and behind the dune system, including the Long Swamp Complex (Sheepwash Lagoon, Cains Hut Swamp, Lake Mombeong, Black Swamp, McFarlanes Swamp and several unnamed lagoons) and Bridgewater Lakes (Figure 1a, b).

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

The Glenelg Estuary and Discovery Bay Ramsar site provides a variety of habitats for waterbirds. The different wetland types and structural habitats of the site provide a mosaic for waterbirds including:

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

The Ecological Character Description (ECD) of the Ramsar site (DELWP 2017b) defines a set of critical components, processes and services (CPS) for the site.

Critical components include:

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

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

Critical ecosystem services identified in the ECD include:

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

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

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

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

> *To assist the administration of the EPBC Act, particularly:*
>
> a. *To determine whether an action has, will have or is likely to have a significant impact on a listed Ramsar wetland in contravention of sections 16 and 17B of the EPBC Act; or*
>
> b. *To assess the impacts that actions referred to the Minister under Part 7 of the EPBC Act have had, will have or are likely to have on a listed Ramsar wetland.*
>
> *To assist any person considering taking an action that may impact on a listed Ramsar wetland whether to refer the action to the Minister under Part 7 of the EPBC Act for assessment and approval.*

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

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

The ECD makes the following points that should be considered when developing and assessing Limits of Acceptable Change for the critical components, processes and services of a Ramsar wetland:

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

As noted in the Ecological Character Descriptions (DELWP 2017b) Limits of Acceptable Change 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). It provides a hierarchical risk-based mechanism using a likelihood and consequence matrix to identify threats, stressors and effects with the objective of managing them as required.

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.

The ECD (DELWP 2017b) and the Management Plan (DELWP 2017c) for Glenelg Estuary and Discovery Bay Ramsar site thus set out a hierarchical, or sequential framework in which the effect of potential changes can be assessed against the defined Resource Condition Targets. In turn, these can be considered relative to their consequences for established Limits of Acceptable Change.

The rationale adopted for consideration of potential impacts of the Project on the Glenelg Estuary and Discovery Bay Ramsar site is to evaluate them against Resource Condition Targets set out in the Management Plan (DELWP 2017c). If changes will not exceed Resource Condition Targets then they also will not exceed Limits of Acceptable Change .

Hydrological processes of the Project are addressed in detail in other technical studies. The assessment here is focussed on biotic values. Table 15 reproduces Table 11 from (DELWP 2017c) listing the Resource Condition Targets with comments (right-hand column) about potential for the Project to affect the values and management targets for them.

Table 15 Assessment of the Project against Resource Condition Targets for the Glenelg Estuary and Discovery Bay Ramsar site

Critical CPS	Resource Condition Target	Assessment of Project
Hydrology	Maintain diversity of wetland types.	The Project has been assessed (AECOM 2024a, AECOM 2024b) as having low to very low potential to alter hydrological regimes temporarily or permanently such that the diversity of wetland types might be affected. No wind farm infrastructure is planned within 300 metres of the Ramsar site boundary, or 500 metres of wetlands within the Ramsar site.
Stratification	Maintain seasonal stratification in the Glenelg Estuary.	The Project has been assessed (AECOM 2024a, AECOM 2024b) as having low to very low potential to alter stratification in the Glenelg River estuary.
Vegetation type and extent	Maintain 2008 extent of freshwater vegetation communities.	The Project will have no direct effects on freshwater vegetation communities of the Ramsar wetlands. In light of the assessments of surface water and groundwater that indicate there is low to very low potential to alter hydrological regimes temporarily or

Critical CPS	Resource Condition Target	Assessment of Project
		permanently, there is no apparent hydrological pathway that might cause changes in the extent of freshwater vegetation communities. The physical distance between freshwater of Glenelg River and the closest points of the Project Area prevents the potential for indirect effects on freshwater vegetation communities there. Careful management of any construction dewatering and all other activities should be implemented to ensure no infiltration of sediments or pollution into dune slack wetlands can occur that might result in changes in the extent of freshwater vegetation communities.
Fish diversity and abundance	Maintain fish diversity and abundance, and the following common species in 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* • 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*	Potential mechanisms that could alter fish diversity and abundance substantially relate to altered surface water and groundwater regimes and to infiltration of sediment or pollutants. The Project has been assessed (AECOM 2024a, AECOM 2024b) as having low to very low potential to alter hydrological regimes temporarily or permanently. The physical distance between Glenelg River and its estuary and the closest point of the Project Area prevents the potential for indirect effects on fish in that system. Careful management of any construction dewatering should be implemented to ensure no infiltration of pollutants into dune slack wetlands can occur that might result in changes in the extent of fish diversity or abundance there. Refer to Section 34 for further details regarding aquatic species.
Waterbird diversity and abundance	Maintain waterbird diversity (i.e. > 32 species regularly recorded). Maintain > 1% of the population of Sanderling.	Potential for effects on shorebirds are addressed separately in this report (see Section 21). The Project has some potential for infrequent turbine collisions by waterbirds, however that is expected to occur rarely, and at a level that is not likely to affect the diversity of species or alter the percentage of the Sanderling population using the Ramsar site.

Critical CPS	Resource Condition Target	Assessment of Project
Diversity of wetland types	Maintain extent and diversity of wetland types.	The Project has no potential to alter the extent or diversity of wetland types.
Physical habitat for waterbirds	See RCT for Diversity of wetland types and Vegetation type and extent.	The Project has no potential to alter the extent or diversity of wetland types nor the types or extent of vegetation communities.
Threatened species: plants	Maintain abundance of Maroon Leek-orchid *Prasophyllum frenchii* and Swamp Greenhood *Pterostylis tenuissima.*	The Project has no potential to alter the abundance of Maroon Leek-orchid or Swamp Greenhood within the Ramsar Site.
Threatened species: fish	Increase abundance by 10% of Yarra Pygmy Perch *Nannoperca obscura* at Long Swamp.	The Project has no potential to affect the abundance of Yarra Pygmy Perch (Section 34) in Long Swamp provided careful management of any construction to ensure no infiltration of pollutants into dune slack wetlands can occur that might result a decrease in the population.
Threatened species: birds	Maintain presence and abundance of threatened bird species at the site: Australasian Bittern, Hooded Plover, Fairy Tern.	The Project is not expected to alter the presence of these species. Due to their habitat separation from the Project Area, Hooded Plover and Fairy Tern are considered very unlikely to be involved in turbine collisions. Australasian Bittern is expected to fly across the wind farm component of the project and to be at potential risk of turbine and transmission line collision and the Project may have a significant impact on the Australasian Bittern population. Refer to Section 19 and Appendix 6 for more information.
Threatened species: Growling Grass Frog	Annual occurrence of Growling Grass Frog within the site.	The Project has no potential to reduce the abundance of Growling Grass Frog within the Ramsar site. It is noted that surveys for the species undertaken for the Project did not detect it. Refer to Section 33 for more information.
Threatened species: Ancient Greenling	Maintain population of Ancient Greenling.	The Project has no potential to reduce the abundance of Ancient Greenling provided careful management of any construction to ensure no infiltration of pollutants into dune slack wetlands can occur that might result in a decrease in the population.
Ecological connectivity	Maintain ecological connectivity between habitats in the site.	The Project has no potential to alter ecological connectivity between terrestrial and freshwater habitats in the Ramsar site. While a level of turbine collision risk may affect movements of some individual birds and bats, the great majority of the Project Area will remain permeable to individual movements and to gene flow between

Critical CPS	Resource Condition Target	Assessment of Project
		habitats within the Ramsar site. Potential for the wind farm to create a barrier effect is discussed in relation to Orange-bellied Parrot (Section 13.3.1) and Blue-winged Parrot (Section 14.3.1).

8.2.1 Impact assessment

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

Criteria for assessment of impacts

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

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

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

An assessment against each EPBC Act criterion for significant impacts on Wetlands of International Importance is provided in Appendix 6 Table A6.18. The assessment concludes that the Project is considered unlikely to have a significant impact on the Ramsar site as per the EPBC Act significant criteria for Wetlands of International Importance (Ramsar sites).

9. Fauna general findings/database search findings

Searches of databases for records from within 10 kilometres of the Project Area revealed a total of 456 terrestrial and freshwater fauna species. This includes vertebrates and identified invertebrates. Species that are wholly marine were excluded from consideration. Of the total, 427 species are native and 29 are introduced.

All fauna species recorded within the Project Area during assessments are listed in Appendix 3, Table A3.1.

9.1 Pre-existing threatened species records

All threatened species listed under the EPBC Act or FFG Act that have been recorded or are predicted to occur in the Investigation Area are detailed in Appendix 3 (fauna) along with an indication of the significant species detected during the course of the present investigations. Of a total of 36 fauna species listed as threatened under the EPBC Act, 30 have been recorded within 10 kilometres of the Project Area and the generally accepted distribution of a further six species includes the local area. Field investigations to date have recorded six EPBC Act-listed threatened species. Existing records also include 81 species from within 10 kilometres of the Project Area that are listed as threatened under the FFG Act. Fourteen of these species have been documented during investigations to date (Appendix 3, Table A3.1).

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

Species listed as migratory under the EPBC Act are protected under international agreements to which Australia is a signatory. Many migratory species are also listed as threatened under the EPBC Act and/or the FFG Act. Appendix 3 Table A3.3 includes a list of migratory species resulting from a data search of the Investigation Area using the EPBC Act Protected Matters Search Tool (PMST). It includes 56 species of birds. Databases (section 3.6) include records of 41 of those species within the search area and 15 that have potential to occur within the Investigation Area.

9.1.1 Overview of field survey findings

During the course of fieldwork for the Project, 213 species of fauna were recorded from the Project Area and broader Investigation Area (Appendix 3, Table A3.1), comprising:

- 158 species of birds (154 native species, 4 introduced species)
- 34 species of mammals (25 native species, 9 introduced species)
- 15 native reptile species
- 5 native frog species
- 1 native fish species

Most of these species were recorded during targeted surveys for specific species or groups, and details of the observations are provided in relevant sections throughout this report, the Southern Bent-wing Bat Assessment (Biosis 2024a) and the Brolga Assessment (Biosis 2024b).

Species commonly recorded within the broad habitat types (plantations, farmland, roadside vegetation etc.) are summarised in Table 6.

Bird species regularly encountered during bird utilisation surveys (BUS) are summarised in Section 10, and a full list is provided in Table A3.4.

10. Bird utilisation surveys

Bird utilisation surveys (BUS) were undertaken in April 2020, June 2020, August 2020, October 2020, December 2020 and February 2021 to provide an understanding of the avifauna within the Project Area and to inform any collision risk modelling undertaken.

10.1 Methods

The replicate surveys were conducted across a 10-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. The survey included 17 'treatment' sites (T1–T17) and 10 'control' sites (C1–C10), as shown in Figure 10a. The survey sites were representative of locations for proposed turbines and sites of known threatened bird records. The extent of sky visibility was a considered when selecting bird utilisation sites, however there was also a need to sample the habitats present, and it is acknowledged that not all sites had exactly equivalent visibility. 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 between 11:00 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.

A total of 418 point counts were carried out at 17 treatment sites (within the Project Area) and 10 control sites (outside the main Project Area) (Figure 10a). Totals of between 14 and 18 replicate counts were undertaken at each site in the months of February, April, June, August, October and December 2020.

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.

The pine plantation has active harvesting operations throughout the year. In some instances point count survey sites could not be accessed due to harvesting operations. When this occurred, the survey for the given point count was conducted on the nearest adjacent track.

Bird utilisation surveys were conducted in alternating months between April 2020 and February 2021. Each site was surveyed between 12 and 18 times, with flood waters cutting off access to C1 in April 2020.

Point counts are reliant on visual observations of birds in flight and thus cannot survey for crepuscular or nocturnal flights of birds. It is recognized that many birds are capable of flying during those periods and many do so routinely. Where collision risk modelling has been able to be applied to quantify this risk, allowance has been made for birds to be in flight for relevant portions of the 24-hour cycle. The relevant period is noted in relevant species accounts.

10.1.1 Counting of individual movements and movements of flocks

During point count data collection, flights are counted whether birds are alone or in flocks, so the frequency of flights measured in time and airspace (the measure of flight flux) provide the rate at which flights occur and are at risk of collision. So, whether the birds were alone or in a group is immaterial to the performance of the CRM. Empirical evidence from collision monitoring here and worldwide provides no indication that flocking species are involved in multiple collision events. Flocking is a mechanism evolved (at least in part) to facilitate greater vigilance to danger than an individual bird can apply. The evidence does not suggest birds in flocks are at greater risk of collisions.

10.2 Results

During the BUS assessment a total of 141 bird species were recorded including 12 threatened or listed species (Table 16). A full list of bird species recorded at each BUS point is provided in Appendix 3, Table A3.4.

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 during the surveys. As shown in Table 16, White-throated Needletail, Gang-gang cockatoo, Musk Duck *Biziura lobata* (FFG Act: vulnerable) and Brolga *Antigone rubicunda* (FFG Act: endangered) were mostly regularly observed.

Collision risk modelling (CRM) has been undertaken for four species for which sufficient data were available:

- White-throated Needletail (Section 22)
- Yellow-tailed Black Cockatoo (Section 35.2.1)
- Blue-winged Parrot (Section 14)
- Wedge-tailed Eagle (Section 35.2.2).

Table 16 Threatened and migratory bird species recorded during April 2020 to February 2021 BUS monitoring

VU: Vulnerable, EN: Endangered: CR: Critically endangered.

Species	Months observed	BUS sites of observations	Total seen	Incidental records during BUS	EPBC Act	FFG Act	Migratory
Blue-winged Parrot *Neophema chrysostoma*	February, April, June, August, October, December	C1, C2, C4, C7, C8, C9, C10, T3, T9, T10, T11, T15, T17.	135		VU		
Gang-gang cockatoo *Callocephalon fimbriatum*	February, August,	C6, T14, T16	25	1	EN		
Bar-tailed Godwit *Limosa lapponica*	June, August, December	C1		5	EN	VU	Yes
Brolga *Antigone rubicunda*	April, June, August, October, December, February (feather only)	C6, C7, T2, T6, T15, T17, T3	27	5		EN	
Rufous Bristlebird (Coorong subspecies) *Dasyornis broadbenti broadbenti*	August	T4		2		EN	
Eastern Great Egret *Ardea alba modesta*	June	C1	1			VU	
Grey Plover *Pluvialis squatarola*	December	C1		1		VU	Yes
Hardhead *Aythya australis*	February	C1		1		VU	

Species	Months observed	BUS sites of observations	Total seen	Incidental records during BUS	EPBC Act	FFG Act	Migratory
Hooded Plover *Thinornis cucullatus*	June	C1		1	VU	VU	
Plumed Egret *Ardea intermedia plumifera*	June, February	C1, T11	1	1		CR	
Little Egret *Egretta garzetta*	June, October, December, February	C1, T11	2	3		EN	
Musk Duck *Biziura lobata*	June, August, October, December, February	C1, C7, T11	33	3		VU	
White-throated Needletail *Hirundapus caudacutus*	June, February	C1, C2, C6, T3, T5, T6, T7, T8, T10, T12	175	1	VU	VU	Yes
Crested Tern *Thalasseus bergii*	February, June, August, December	C1, C6, C7	268	2			Yes
Red Knot *Calidris canutus*	December	C1		1			Yes
Red-necked Stint *Calidris ruficollis*	February, October	C1	85	1			Yes
Sanderling *Calidris alba*	February, December	C1	4	4			Yes
Sharp-tailed Sandpiper *Calidris acuminata*	December	C1		1			Yes

Species	Months observed	BUS sites of observations	Total seen	Incidental records during BUS	EPBC Act	FFG Act	Migratory
Short-tailed Shearwater *Ardenna tenuirostris*	October	C3		1			Yes

11. South-eastern Red-tailed Black Cockatoo

The South-eastern subspecies of the Red-tailed Black-Cockatoo *Calyptorhynchus banksii graptogyne* is listed as endangered under the EPBC Act and the FFG Act.

The South-eastern Red-tailed Black Cockatoo occurs as a single population in an overall area of approximately 1,800,000 hectares in south-western Victoria and adjacent South Australia (CoA 2006). The range is bounded by Keith, Lucindale and Mt Gambier in South Australia, and Portland, Casterton, Toolondo, Natimuk, Dimboola, Nhill and Kaniva in Victoria (see Figure 1 of the RTBC Conservation Advice). About 28% of the overall range contains suitable habitat and is known to be used by the population (Burnard & Hill 2002). The birds may occur widely within this range, and they breed across much of it. They are known to form large flocks but often also occur in smaller groups of two or three individuals (CoA 2006).

The following summarises the description of habitat critical to survival of the subspecies, as set out in the National Recovery Plan (CoA 2006). The subspecies is highly specialised, feeding primarily on 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* (Koch 2003). CoA (2006) notes that incidental foods in the birds' diet include the seeds of Desert Banksia *Banksia ornata* and Western Sheoak *Allocasuarina mackliniana*. The birds feed in blocks of forest and scattered paddock trees. They feed almost entirely on whichever stringybark species has fruited most recently (Attiwill 1960, Joseph 1982, Koch 2005), and marked periods of local food shortage between new seed crops may have a substantial effect on the birds' annual distribution, movements and nesting success (Newell, Millen, & White 2016,). Loss and degradation of key food tree species and fire that reduces availability of seed and/or nest hollows are believed to be key threats to the South-eastern Red-tailed Black Cockatoo (Burnard and Pritchard 2002, DENR 2014).

Brown Stringybark is the primary food tree for Red-tailed Black Cockatoos in the southern portion of its range, including the region of the Project. It is a principal canopy species distributed broadly in natural woodlands including those in Lower Glenelg, Mount Richmond and Cobboboonee National Parks that lie to the north, east and south-east of the wind farm site. The location of the project area in relation to the distribution of stringybark habitat, as documented in the recovery plan, is shown in Figure 11a, which also shows the overall range of the subspecies.

Red-tailed Black-Cockatoos usually roost in clumps of tall eucalypts of various species, and sometimes use the same site each night for many months (DELWP (2016b) and references therein).

Red-tailed Black-Cockatoos require very old, large, hollow eucalypts for nesting. Over 95% of known nest sites are within 2 kilometres, and all are within 5 kilometres, of patches of stringybark that are greater than 5 hectares in area. The birds prefer hollows in dead trees (81% of known nest sites are in dead trees), but also use live trees. Nests are most often found in farmland within scattered River Red-gum *Eucalyptus camaldulensis*.

Demographic structure of the South-eastern Red-tailed Black Cockatoo population is not fully understood and for some aspects, such as adult sex ratio and fecundity, entails a degree of inference (see below). However, the following is known. Both males and females reach sexual maturity at four years. Average life expectancy is not known but maximum life expectancy in the wild is believed to be at least 25 years (DENR 2014). Adults breed annually between September and February as monogamous pairs. Nesting can also commence as late as January or February if nesting failures occur earlier in the breeding season. The female generally lays one egg which is incubated for 30 days. The nestling period is 90 days and juveniles may be fed by their parents for up to 6 months after fledging.

BirdLife Australia has co-ordinated annual counts of South-eastern Red-tailed Black Cockatoos since 1998 (BirdLife Australia http://www.redtail.com.au/monitoring.html [accessed 31 May 2022]). During the counts the number of 'barred' birds and adult males have been counted. Barred birds include all birds with female-like plumage, including juveniles of both sexes. Adult character plumage starts to appear at about 2 years of age but is not fully established until 4 years of age (HANZAB). Thus counts of barred birds are considered to include all birds to at least 3 years of age. As the sex ratio of breeding aged birds is understood to be 50:50, the ratio of barred birds to adult males provides an indication of annual breeding success because the proportion of barred birds greater than 50% are assumed to be juveniles. In 20 years of monitoring (1999 – 2019), this percentage has always been higher than 50%, but it has had an overall trend of decline (BirdLife Australia http://www.redtail.com.au/monitoring.html [accessed 31 May 2022]).

The results of annual counts has also permitted analyses that indicate the increased numbers of Red-tailed Black Cockatoos detected over the 20 years of monitoring are likely to be due to improved methods and capacities to find and count birds rather than an increase in the population. The relative proportions of barred birds to adult males is similar to that of other subspecies of Red-tailed Black Cockatoos, which also suggests that the majority of the adult population is breeding (R. Hill pers. comm. 2020).

The population does not make routine annual movements but apparently moves throughout the range in response to changes in the availability of stringybark and Buloke seed. In some years, most birds occur in the northern part of the range as they feed on Buloke and Desert Stringybark, and in other years most occur in the southern part of the range where they feed on Brown Stringybark. Information from the South-eastern Red-tailed Black-Cockatoo Recovery Program and DEECA is that the great majority of the known population was in the Wimmera during the period of investigations for the Project.

In May 2019 the co-ordinated annual count recorded 1,193 birds. No co-ordinated search across all areas of suitable habitat was undertaken in 2020 due to COVID-19 restrictions, but a co-ordinated smaller event conducted by people who live within the species' range was undertaken. Taking into account sighting reports received in the week before and after the event, as well as several large flocks which were known but were not counted on the day, the number of birds counted was 1144 (Birdlife Australia 2021 http://www.redtail.com.au/results.html [accessed 31 May 2022]). In 2021, 1230 individuals were recorded and in 2022, 1143 individuals were recorded. The 2022 observations included flocks of 70–250 in the total count (BirdLife Australia 2022 http://www.redtail.com.au/results.html [accessed 6 July 2022]). In 2023 there were 25 sightings, with most birds observed in the Casterton and Edenhope areas. Four large flocks were sighed, ranging from 120 -285 birds. The average size of smaller flocks was 25 birds. The 2023 annual count resulted in an estimate of 1,204 birds (BirdLife Australia 2022 http://www.redtail.com.au/results.html [accessed 27 March 2024]).

11.1 Methods

In recognition of the unpredictable nature of the subspecies movements and use of its range, it was recognised that surveys to document the South-eastern Red-tailed Black Cockatoo 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. In early Project discussions DEECA (then DELWP) expressed this view with regard to this species as follows:

- The inherent risk of population-level impacts is unlikely to be further informed by the completion of any reasonable survey effort.
- Habitat assessments are unlikely to provide further insight as historic records already point to the fact that high numbers of this species occur within the vicinity of the Project Area at certain times and may move across the site.
- Given the highly dispersive nature of the species, no reasonable level of survey effort can dispute the risk of a significant proportion of the population flying across the Project Area over the life of the wind farm.

For this reason, the primary approach to consideration of the species' likely use of the Project Area has been to determine the occurrence of suitable habitat within and surrounding the Project Area. This was accomplished by consideration of pre-existing records of the birds from the local area and by determination of the presence and distribution of the habitat tree species which were investigated as a component of vegetation mapping. Nonetheless, timed bird utilisation point counts were undertaken at representative sites within the Project Area (Section 10) and adjacent land and these provided capacity to detect the subspecies if it was present when those surveys were undertaken. Sites within and close to the Project Area where South-eastern Red-tailed Black Cockatoos had been recorded in existing datasets were specifically included as point count sites. A total of 418 20-minute point counts were carried out at 17 treatment sites (within the Project Area) and 10 control sites (outside the main Project Area) (Figure 10a, Figure 11a). Totals of between 14 and 18 replicate counts were undertaken at each site in the months of February, April, June, August, October and December 2020. Full details of the bird utilisation surveys are provided in Section 10.

During the full range of fauna surveys undertaken throughout the study program, zoologists were on-site and in the local area in all months of the year for approximately 200 person-days. This provided substantial additional opportunity for detection of the species had they been present.

11.2 Existing conditions

There is a body of past records of South-eastern Red-tailed Black Cockatoos in appropriate habitat close to the Project Area. These are substantially concentrated in Lower Glenelg National Park to the north of the wind farm site. There is a very small number of previous records from the Project Area itself and from Discovery Bay Coastal Park to the south of the Project Area.

The VBA and BirdLife Australia data for the South-eastern Red-tailed Black Cockatoo from within the 10 kilometre Project Investigation Area include a cluster of records of the subspecies to the north of the wind farm with about 50 records from Lower Glenelg National Park (Figure 11a). There are two records from the very outer northern edge of pine plantations occupying the majority of the site and none from within it. There are five locations with records from Discovery

Bay Coastal Park or other locations to the south of the wind farm (1979, 1980, 1998, 2013 and 2015). Discovery Bay Coastal Park south of the Project Area contains very little prime habitat (Brown Stringybark Woodlands) for the species. However, it is an area of ornithological interest, and it is very likely that the species would have been recorded more frequently if it occurred there routinely.

The 2021 co-ordinated count included two records of Red-tailed Black Cockatoos within the 10 kilometre Project Investigation Area and one closer to Portland. Details of these are as follows (Figure 11a):

- One individual at Cobboboonee National Park, Fish Hole Road, Portland area (west of Heathmere, north of Cashmore). This record is 2 kilometres south of the transmission line corridor.
- Flock of 80 individuals at Lower Glenelg National Park, Nelson area, recorded flying south-east. This sighting is within 4 kilometres of the Project footprint.
- One individual at the Honeysuckle Horse Riding, Dry Creek, recorded flying east, approximately 11.5 kilometres north-west of the Project footprint.

The 2022 count information provides a summary but does not provide the details for each observation. In 2022, none of the flocks were recoded within the 10 kilometre Project Investigation Area (Figure 11a). The closest observations were:

- Flock of 150, approximately 18 kilometres north-west of the Project footprint, south of Princes Highway, between Mumbannar and the South Australian border, Victoria.
- Flock of 100, approximately 28 kilometres north-west of the Project footprint, between Glenelg Highway and Princes Highway.

Similarly, the 2023 count summary does not provide details of any observations within the project area, but notes that the birds were found across the middle of the range, with most observations from the Casterton and Edenhope areas. There were five sightings, totalling 323 birds, within the Glenelg Hopkins region.

Overall, the local region forms a valuable part of the species range and provides habitat resources for feeding, nesting and roosting, however the great majority of the Project Area does not offer habitat for the species. We have found no evidence or references to the subspecies roosting in plantation pines and the site of the wind farm does not contain open sources of freshwater where they might drink.

BiirdLife Australia (BirdLife 2022) notes that in early 2020 the majority of the population was in the northern part of the range, especially in the Wimmera region, and that it is likely the birds were taking advantage of the good seed crop available to them in Desert Stringybark which occurs in that part of the species range. In 2021, while the majority of documented observations remained in the northern portion of the range, South-eastern Red-tailed Black Cockatoos also occurred within the southern part of the range, including Nelson and Portland area, as noted above. Similarly, in 2022, the majority of the observations were in the northern part of the range, with fewer (albeit large) flocks sighted in the southern part of the species range. In the 2023 annual count there were 25 sightings, mostly located in the central part of the species' range in the Casterton and Edenhope areas. Four large flocks were sighed, ranging from 120 to 285 individuals per flock. A summary of the annual counts can be found at redtail.com.au.

11.3 Impact assessment

Construction and operation of the KGPH has potential to impact upon South-eastern Red-tailed Black Cockatoo via several mechanisms:

- Direct removal of habitat trees for construction of temporary and permanent infrastructure, such as turbines, hard stands and access roads.
- Impacts on habitat trees due to disturbance within tree protection zones of while trenching for transmission lines and cables.
- Direct mortality due to collisions with turbines or transmission lines.
- Displacement of breeding or foraging activity due to disturbance caused by construction and operation of wind farm infrastructure.

There are several sources of uncertainty associated with characterising the potential for impacts of the project on the South-eastern Red-tailed Black-Cockatoo population. The following aspects contribute to the uncertainty:

- The small size of the population and various aspects of its demography.
- Unpredictability of the birds' movements in the short or longer-term, across a total distribution of approximately 18,000 square kilometres (1.8 million hectares).
- Social behaviours in which the birds may variably occur as two or three individuals or in flocks of up to several hundred birds.
- Variable availability of nest sites and the consequent effects on local occurrence of the birds.
- Poor understanding of the routine heights at which the birds fly, as they relate to the dimensions of turbines and the consequent potential for collision risk.
- There is only one operational wind energy facilities within the core range of the South-eastern Red-tailed Black-Cockatoo, which does not appear to have undertaken any collision monitoring, and there is thus a lack of empirical experience for understanding how the species may respond to the presence of turbines. The Kiata wind farm is located between the Little Desert National Park and the Western Highway, within but near the northern edge of the range of the subspecies, and some preferred foraging trees are present in the area. However the facility has only been operational since late 2017, and there is no publicly available information regarding outcomes of collision monitoring, if undertaken. Lake Bonney and Canunda wind farms in South Australia and Murra Warra wind farm in Victoria are all close but outside the mapped distribution of the subspecies and habitat at those sites is not considered to be suitable.

As it is not feasible to precisely quantify the likely use of the Project Area by South-eastern Red-tailed Black-Cockatoos over the life of the Project, impact assessment is necessarily qualitative. Available information about the activities and behaviours of South-eastern Red-tailed Black Cockatoos have been considered when assessing the potential for the Project to impact the species.

Activity by the species functions at various spatial scales, as follows:

- Population-scale movements broadly within the overall distributional range that may occur over years or seasons.
- Local movements that may occur during daily activities while the birds are resident in an area during a particular breeding or non-breeding season. These may include daily movements between foraging, drinking and roost locations. As an indication of local movements, Hill (cited in Commonwealth of Australia, 2007) found the seasonal home ranges of eight birds radio-tracked over 2-11 months varied from 24 – 110 km^2 (minimum convex polygon method) with activity centres of 4.8 – 68 km^2 (95% kernel method).
- Heights at which the birds fly and how that may relate to risk posed by specific wind turbines.

Regarding population-scale movements, it is pertinent that the South-eastern Red-tailed Black-Cockatoo Recovery Program through BirdLife Australia, co-ordinates an extensive network of observers and annually documents the locations and counts of the subspecies. It is apparent that the population may be substantially present or absent from the vicinity of the Project for months or years when fruiting of Brown Stringybark is not sufficient to support the birds. For example, during 2020 a large portion of the known population was concentrated in the Edenhope area and it was confirmed by DEECA (then DELWP) staff and BirdLife Australia (annual count was undertaken on 2 May 2020) that the great majority of the known population were in the northern portion of the subspecies' range. The resource availability across the species' range may vary annually and flocks and small groups of individuals may use the woodland habitats surrounding the pine plantations where most of the turbines are proposed. In 2021 for example, a large flock of 80 birds used an area near Nelson and a single individual was recorded near Portland. There will be periods during the operational life of the Project when risk of impact is negligible simply because the birds are absent from the local area, but the level of risk may vary annually depending on which part of their range has the most suitable food resources.

The lack of South-eastern Red-tailed Black Cockatoos in the Kentbruck area during Project investigations prevented documentation of the birds' possible movements through the Project Area. The lack of flight data for the species in the Project Area precludes the possibility of undertaking a quantitative approach, such as turbine collision risk modelling.

Nonetheless, there is a body of evidence clearly demonstrating that, at times the population uses suitable habitat in close proximity to the site. The primary food tree in the region is Brown Stringybark and 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 and east of the wind farm site (Figure 1a-c; Figure 11a).

Data for the species from the local area from the VBA and BirdLife Australia include a concentration of records of the subspecies to the north of the wind farm site with about 50 records from Lower Glenelg National Park. This includes a recent record from the 2021 South-eastern Black-Cockatoo count (BirdLife 2022) of a flock of 80 birds. The species has been reported less frequently further east – with scattered records from near Mount Richmond National Park, Cobboboonee National Park, Bridgewater Lakes and the Portland area (Figure 11a). There are two records from the very outer northern edge of pine plantations occupying the majority of the Project Area and none from within it. There are six locations with records from Discovery Bay Coastal Park or other locations to the south of the wind farm area. Discovery Bay Coastal Park south of the Project Area primarily supports vegetation communities that do not include Brown Stringybark trees and it contains very little habitat for the species. However, it is an area of ornithological interest, and it seems likely the species would have been recorded more frequently if it occurred there routinely.

The highly restricted range of food resources of the subspecies is unusual. Other species of black cockatoos, including the congeneric Yellow-tailed Black Cockatoo *Calyptorhynchus funereus* and Carnaby's Black Cockatoo *Zanda latirostris*, utilise a broader range of food plants and have adapted to include the seeds of introduced pine species in their diets. The fact that South-eastern Red-tailed Black Cockatoos do not feed on pine seeds is an important factor in consideration of their potential usage of pine plantations in the Project Area. Given that other closely related species have adapted to include pine seeds in their diet, the possibility of this occurring at some point has been suggested (R. Loyn pers. comm.). If that was to occur, it might be assumed that the species could begin to use pine plantations, including those of the Project Area. However, were that to occur it would presumably open the very large tracts of such plantations in south-western Victoria and adjacent South Australia to the subspecies and this could be expected to provide a new, extensive, and reliable resource with potentially beneficial consequences to the subspecies.

11.3.1 Wind farm

The commercial pine plantations and cleared agricultural land occupying the great majority of the Project Area are not suitable habitats for South-eastern Red-tailed Black Cockatoos and 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.

The primary concern for South-eastern Red-tailed Black-Cockatoo from the wind farm is considered to relate to the potential for collisions with wind turbines and meteorology masts. The wind energy component of the project does not entail removal of any vegetation that is suitable habitat for the species. Therefore, turbine collision impacts are not expected to occur during construction of the wind farm and would be limited to the operational phase of the wind farm.

Potential use of the Project Area

The concentration of records of the species in the local area is within Lower Glenelg National Park (Figure 11a) which accords with Brown Stringybark being a dominant canopy species there. The great majority of the wind farm site is occupied by pine plantations that are not suitable habitat for South-eastern Red-tailed Black Cockatoos. Overall, the vegetation communities of Discovery Bay Coastal Park between the site and the ocean, are also not suitable habitat for the species. This includes a lack of resources for foraging, drinking, roosting and nesting by the subspecies. While the lack of habitat within the pine plantations means they are unlikely to be a focus of bird observers, data records for multiple species demonstrate that Discovery Bay Coastal Park is accessed by bird observers and such access entails passing through the pine plantations. Despite this, and a body of records from nearby, there are virtually no records of Red-tailed Black Cockatoos from the Investigation Area.

While the wind farm Project Area does not offer habitat for Red-tailed Black Cockatoos, it is feasible that they may traverse it occasionally when they are resident in the Kentbruck area, but the distribution of suitable habitat in the surrounding area (Figure 11a) suggests that their flights through the area of the proposed wind farm are likely to be rare. The distribution of potential stringybark habitat documented in the recovery plan (and reproduced in Figure 11a) shows some Brown Stringybark habitat to the south of the project area in the Mount Richmond area. Movements from the Kentbruck Heath or Cobboboonee forest into the Mount Richmond area are unlikely to be at risk of collision, as no turbines are proposed to be constructed within the farmland between these areas (no turbines to the north-east of the Portland Nelson Road).

Turbine collision risk

An investigation of the flight heights of South-eastern Red-tailed Black Cockatoos was undertaken by Biosis in 2020 for this and another project. Full details are provided in Appendix 7 of this report. It is recognised that the results may not be directly applicable to the Kentbruck environment, but the study represents the only available information about heights at which the species flies. It was necessarily undertaken where the species was resident at the time and was in natural woodlands that are structurally similar to those that exist in the Kentbruck area.

In summary, of 3639 documented flights by the species, 99% of all flights over open paddocks were between the ground and 39 metres high. Within woodlands, which had maximum canopy height of between approximately 15 and 25 metres, 99% of all flights were between the ground and 29 metres high and this appeared to be in response to the nature of flights that were primarily simply between trees in that environment. The highest flight documented was 54 metres above the ground. Flight heights greater than 5 metres above tree canopy height are considered to have a range of +/- 2m of the cited value (see Appendix 7). No flights recorded were as high as the 60 metre lowest blade tip-height of turbines proposed for the Project. Pine trees in the Kentbruck plantations reach an approximate maximum of 35 metres, but due to rotation and growth cycles plantation height may vary between ground level and 35 metres at any given location and time. There is no doubt that South-eastern Red-tailed Black Cockatoos have capacity to fly at greater heights than what is documented here and will do so at times. In particular, they may fly up from foraging or drinking in response to approach by aerial predators, especially Wedge-tailed Eagles. During the Biosis flight-height study, three instances, involving 88 flights by Red-tailed Black-Cockatoos, were recorded in which the birds were disturbed by the presence of a Wedge-tailed Eagle. In these cases, the cockatoos flew above the woodland tree canopy to maximum heights respectively, of 15, 20 and 30 metres above the ground. As a general rule, birds do not expend energy flying at greater height than is required to meet their natural behavioural and ecological demands. Flight responses to predators are not considered likely to occur routinely within the pine plantations of the wind farm area, because these areas do not support habitat for the subspecies and, because the majority of the Project area is also of low value as habitat for Wedge-tailed Eagles they were also found to use it at a low rate (see section 35.2.2).

Overall, it is likely that most flights by the species will be below rotor-swept height of turbines proposed for the Project (below 60 metres above ground level).

Biosis has recorded flights of the congeneric Yellow-tailed Black Cockatoo at the Project Area and at some operational wind farms in Victoria and Tasmania. Its habitat preferences are broader than those of the South-eastern Red-tailed Black-Cockatoo, but its general flight characteristics and morphology are similar. We are not aware of any records of Yellow-tailed Black Cockatoo collisions with wind turbines and none were recorded in a DEECA (then DELWP) review of documented bird and bat collisions with turbines at Victorian wind farms for the period from 2003 to 2018 (Moloney, Lumsden, & Smales 2019). Turbines at all existing wind energy facilities in Australia have blades that sweep substantially lower (generally between 25 and 30 metres from the ground) than the 60 metres lowest tip height of turbines proposed for the project. During bird utilisation point counts undertaken for the Project a total of 415 flights by Yellow-tailed Black Cockatoos were recorded at 12 sites within pine plantations. The records include two flights at 60 metres height with all other flights at lower heights.

In the non-breeding season Red-tailed Black Cockatoos often fly in flocks. Consideration of how that might affect their collision risk, in particular whether a collision event would be likely to involve multiple birds, is thus relevant. It is not possible to discount that possibility, but other cockatoo species are significantly more common at wind farm sites in western Victoria and also fly in flocks, often comprised of thousands of individuals. The review of bird and bat collision mortality spanning 15 years at Victorian wind farms (Moloney, Lumsden & Smales 2019) documented fatalities of two Sulphur-crested Cockatoos and seven 'corella/cockatoo'. All carcasses of these birds are understood to have been found as single individuals. As noted above, Yellow-tailed Black Cockatoos are not known to have been involved in any collisions at operational wind farms in south-eastern Australia. The international literature on bird collisions with wind turbines is clear that birds have very high capacity to detect turbines and avoid collisions with them and there is no known evidence of birds in flocks experiencing multiple collisions. One reason for birds to fly in flocks is because multiple individuals flying together increase the capacity of the entire flock to detect and respond to potential threats. It does not appear likely that flocking behaviour of Red-tailed Black-Cockatoos would exacerbate risk of collision with turbines at the proposed Project site over the life of the project.

Meteorology masts

There is no known information source for the risk of Red-tailed Black Cockatoos colliding with the guy wires of meteorology masts. Four masts have been in place on the site since late 2018. One of these in the far west of the site is planned to be relocated, but a total of four masts are planned to remain in operation at the wind farm. Some species of birds, particularly raptors are known to collide with met mast guy wires and an element of risk may exist for any Red-tailed Black Cockatoo flights if they were to enter the site and encounter a mast.

11.3.2 Transmission line

The transmission line is proposed to be entirely underground (total length of approximately 28.2 kilometres). Approximately 19 kilometres of this is below an existing road through native forest within Cobboboonee National Park and Cobboboonee Forest Park. Some trees will be indirectly impacted due to tree protection zone incursion, which may include potential food tree removal, however none of these species were preferred foraging species (Brown Stringybark *Eucalyptus baxteri*). Extensive foraging habitat exists in the landscape and any such potential loss is considered to be of minimal impact to the species and will result in negligible impact on the extent of habitat for South-eastern Red-tailed Black Cockatoos. Being underground, the transmission line will pose no collision risk for the species.

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. Despite this area being accessible along roads, there are no records of the species from this agricultural land. 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 to 0.52 hectares of Heathy Woodland, which contains the preferred foraging species Brown Stringybark (one Brown Stringybark tree within the impact area).

11.3.3 ESO 3 South-eastern Red-tailed Black Cockatoo Habitat Areas

Environmental Significance Overlay Schedule 2 (ESO3) within the Glenelg Planning Scheme applies to large sections of the Investigation Area, including most private land and plantation areas, Discovery Bay Coastal Park, Cobboboonee Forest Park and Mount Clay State Forest. The overlay also applies to sections of Lower Glenelg National Park, but most areas of National Parks, including Lower Glenelg

National Park, Cobboboonee National Park and Mount Richmond National Park and Narrawong Flora Reserve are excluded.

The objective of the overlay is:

To protect and conserve the critical habitat of the endangered South-eastern Red-tailed Black Cockatoo through the retention of live and dead hollow bearing trees within the bird's range and the retention of Brown Stringybark and Desert Stringybark trees within the bird's known feeding area.

The overlay specifies a planning permit requirement for the removal of any vegetation, subject to a range of exemptions.

Construction of the wind farm and transmission lines will require a permit addressing the requirements of ESO3. Key vegetation impacts to be considered includes assumed tree impacts, due to TPZ incursion, for construction of the underground transmission line along Boiler Swamp Road through Cobboboonee Forest Park and near the Heywood Terminal Station, where 0.52 hectares of Heathy Woodland is proposed to be impacted, including one Brown Stringybark tree. The total area of native vegetation impact in areas subject to ESO3 is 6.774 hectares, however this includes areas of treeless vegetation that do not provide habitat. The number of trees assessed as impacted, through impacts to tree protection zones, is 164.

11.3.4 Potential for direct impacts

The project may entail minor loss of habitat critical to the survival of the subspecies (as defined in CoA 2006a) where the underground export powerline is proposed to be constructed in an alignment of approximately 200 x 3 metres where Brown Stringybark trees occur near the Heywood substation. The proposed construction footprint involves the impact to one Brown Stringybark tree in this location.

The great majority of the Project Area is substantially unsuitable as habitat for South-eastern Red-tailed Black Cockatoos and suitable habitat is concentrated outside of it, to the north. There appears to be little incentive for the species to traverse the Project Area, although this may happen infrequently. It is also probable that the majority of any flights they might make through the wind farm will be below rotor-swept height (below 60 metres above ground level).

Using a 'likelihood and consequence' approach, it is apparent that the consequence of several South-eastern Red-tailed Black Cockatoos colliding with turbines could be significant to the population. However, the likelihood of numbers of the birds flying through the wind farm site would seem to be extremely low.

It is acknowledged that this assessment is necessarily based on circumstantial evidence and there is no ready means to obtain empirical information about South-eastern Red-tailed Black Cockatoo behaviours that might occur occasionally under specific conditions and which may place birds at some level of risk.

The lack of flight data for the South-eastern Red-tailed Black Cockatoo at the site means there is no capacity to use predictive modelling to quantify possible effects using methods like turbine collision risk modelling and consequent population viability analysis.

Overall, it is considered that collisions with turbines are unlikely to occur and that the wind farm component of the Project is unlikely to have direct significant impacts on the South-eastern Red-tailed Black Cockatoo population.

11.3.5 Potential for indirect impacts

Effects of construction and operational noise, traffic, artificial light and hydrological impacts on native vegetation outside the Project Area have all been considered. The project design does not include any such mechanisms that are likely to affect the species. The South-eastern Red-tailed Black Cockatoo population is considered unlikely to be impacted indirectly by the Project.

11.3.6 Significance of impacts under EPBC Act

An assessment for South-eastern Red-tailed Black Cockatoo against significant impact criteria for endangered and critically endangered species listed under the EPBC Act (DoE 2013a) is provided in Appendix 6 Table A6.1.

The Project is considered unlikely to have a significant impact on South-eastern Red-tailed Black Cockatoo as per the EPBC Act significant impact criteria.

11.3.7 Conclusion

When constructed and operated within the range of the sub-species, wind energy facilities have potential to impact upon South-eastern Red-tailed Black Cockatoo by habitat loss and collision with turbines or power lines. In common with other large parrots and cockatoos, South-eastern Red-tailed Black Cockatoos that survive to adulthood may be long-lived and as a natural consequence the species life-history strategy includes a low reproductive rate. Thus a mortality due to collision may be replaced relatively slowly, but since this is the species natural strategy, it is not likely to affect the long-term population function.

The KGPH Project is within the range of the sub-species, however it is proposed to be constructed in generally unpreferred habitat (pine plantation) and there are very few records of the sub-species to the south of the Project area, suggesting that flights through the area where turbines are proposed to be constructed are rare events. Observational studies on flight heights (from other parts of the sub-species' range) suggest that flights within rotor swept height (above 60m) are also likely to be rare events. The Project has been designed to avoid direct impacts to habitat, although there may be some loss of potential foraging trees due to indirect impacts on tree protection zones for construction of the underground transmission line.

Assessment of potential impacts against the relevant significant impact criteria for the sub-species suggests the construction and operation of the project is unlikely to constitute a significant impact.

12. Gang-gang Cockatoo

Gang-gang Cockatoo *Callocephalon fimbriatum* is listed as Endangered under the EPBC Act. It is not listed as threatened under the FFG Act.

The species is a small, visually distinctive cockatoo found throughout south-east Australia. The species has been recorded in temperate sclerophyll forests and woodlands, subalpine Snow Gum woodlands and urban parks and gardens in New South Wales and Victoria, with occasional records in eastern South Australia (Higgins 1999). The species was introduced to Kangaroo Island in 1940, and has formed a stable population, favouring riverine Sugar Gum *Eucalyptus cladocalyx* forests within secluded river valleys. The species was previously abundant on King Island, however, the population experienced significant decline, with only a few individuals recorded in the south of the island by the mid-1960s, and is now extinct from the island (Higgins 1999). The species has recently been listed as Endangered under the EPBC Act, following significant population decline, resulting from large scale habitat loss from bushfires in 2019/2020 (DAWE 2022a).

Regional movement patterns are not fully understood, and can vary between years (Higgins 1999). The species is known to primarily spend the spring and summer in tall wet sclerophyll forests and woodlands at high altitudes, with the majority of birds moving to lower, drier habitat over autumn and winter (Higgins 1999). In central Victoria, records have shown that, occasionally, drops in numbers from highland regions over winter have not been met by a corresponding increase in numbers in nearby lowland regions, suggesting that some individuals may perform long-distance movements (Higgins 1999).

The Gang-gang Cockatoo inhabits a range of eucalypt and acacia dominated forest and woodland habitat within its distributional range, as well as urban parks, gardens and roadside reserves. The species feeds primarily in the tree canopy, on seeds of eucalypts and acacias, and berries of introduced Hawthorn *Crataegus monogyna*. The species occasionally feeds on the seeds of ornamental plants, berries, fruits and insects and their larvae (including extracting larvae from galls) (Higgins 1999, Farnes 2019). The species often forages in flocks of up to 50-60 birds outside of the breeding season. During the breeding season (usually October-January) the species feeds in pairs or small family groups. Gang-gang Cockatoos avoid pine plantations, which do not provide suitable nesting hollows or preferred food of eucalypt and acacia seeds, however, it has been recorded occasionally feeding on fallen pine cones (Higgins 1999).

Nests are constructed in hollows of tall mature trees, with tall living eucalypts favoured (Higgins 1999). Nest sites are usually located in tall mature sclerophyll forest with dense understory vegetation. Nests are enlarged as the birds chew at the hollow entrance and the inside cavity, leaving wood shavings as nesting material. Two eggs (rarely 1 or 3) are typically laid and incubated by both parents. Chicks fledge after 7-8 weeks. Breeding commences when birds are 3-4 years old (Higgins 1999). The species is monogamous and nests are often used by the same pair year after year. The species is adversely affected by clearing through removal of mature hollow-bearing trees. The species is found less often in regenerating eucalypt forest up to 15 years after logging (Higgins 1999).

12.1 Methods

Gang-gang Cockatoos were recorded during BUS surveys undertaken for the Project (Section 10). The species was not specifically targeted as it was not listed as threatened during the period of field assessments.

12.2 Existing Conditions

Biosis recorded a total of 25 flights by Gang-gang Cockatoos through the Investigation Area at three sites during BUS surveys (Figure 12a). Five birds (an individual and two pairs) were recorded flying at the edge of open farmland and native forest in August 2020 and February 2021 (BUS point C6, Figure 10a). Three were recorded flying together at the edge of pine plantation and Blue Gum plantation in February 2021 (BUS point T16, Figure 10a). Seventeen (one pair, and a flock of 15) were recorded flying at the edge of pine plantation and native forest in February 2021 (BUS point T14, Figure 10a). Flight heights ranged from 5 to 15 meters above the ground, with the flock of 15 flying at a height of 10 meters.

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

The pine plantations occupying the great majority of the wind farm component of the Project offer very limited resources for Gang-gang Cockatoos and, while they may travel through them on occasions, it is not considered to be suitable habitat that they would use routinely or frequently. Few flight-heights for the species were obtained due to the low incidence of the species during BUS surveys for the Project. Nonetheless, substantial experience with the species elsewhere suggests that the species infrequently flies in the height zone (above 60 metres) of the rotor-swept span of turbines proposed for the Project.

12.3 Impact assessment

Construction and operation of the KGPH has potential to impact upon Gang-gang Cockatoo via several mechanisms:

- Direct removal of habitat trees for construction of temporary and permanent infrastructure, such as turbines, hard stands and access roads.
- Impacts on habitat trees due to disturbance within tree protection zones while trenching for transmission lines and cables.
- Direct mortality due to collisions with turbines or transmission lines.
- Displacement of breeding or foraging activity due to disturbance caused by construction and operation of wind farm infrastructure.

Gang-gang Cockatoo was not considered to be a 'species of interest' (and hence not a 'species of concern') by DELWP (Moloney, Lumsden, & Smales 2019). As at 2018, the species had not been reported to have collided with wind turbines at any wind farm in Victoria (Moloney et al. 2019) and the Project is not aware of any subsequent records. The Project entails minor removal (0.52 hectares) of potential habitat for this species near the Heywood Terminal Station, and potential loss of habitat trees along Boiler Swamp Road due to trenching impacts upon tree roots.

12.3.1 Wind farm

The species is not expected to enter or pass through the Project area at heights that would place it at risk of turbine collisions other than very rarely. As a consequence, while a level of collision risk exists for the species with turbines and internal overhead transmission lines, it is considered to be low.

12.3.2 Transmission line

Gang-gang Cockatoos are quite slow in flight and their capacity to avoid collisions with overhead powerlines is considered to be high. The proposed undergrounding of the external transmission line effectively eliminates any collision risk. Potential impacts to trees along Boiler Swamp Road may have a minor impact upon this species, particularly if any trees with occupied hollows are impacted. However any tree impacts are occurring in a large forest block, adjacent to an existing road, and habitat loss due to potential tree death is considered insignificant in the context of the available habitat area.

12.3.3 Potential for direct impacts

Overall, it is considered that collisions with turbines or powerlines will occur extremely rarely if ever, and that the wind farm component of the Project is not likely to have direct significant impacts on the Gang-gang Cockatoo population.

12.3.4 Potential for indirect impacts

Effects of construction and operational noise, traffic and artificial light and hydrological impacts on natural vegetation outside the Project Area are not considered to impact on the Gang-gang Cockatoo, given its likely infrequent occurrence in the Project Area and in the habitats where construction is proposed.

12.3.5 Significance of impacts under EPBC Act

An assessment for Gang-gang Cockatoo against significant impact criteria for endangered and critically endangered species listed under the EPBC Act (DoE 2013a) is provided in Appendix 6 Table A6.2. The Project is considered unlikely to have a significant impact on Gang-gang Cockatoo as per the EPBC Act significant impact criteria.

12.3.6 Conclusion

When constructed and operated within the range of the sub-species, wind energy facilities have potential to impact upon Gang-gang Cockatoo by habitat loss and collision with turbines or power lines.

The KGPH Project is within the range of the sub-species, however it is proposed to be constructed in generally unpreferred habitat (pine plantation).

The species is not expected to enter or pass through the Project area at heights that would place it at risk of turbine collisions other than very rarely. As a consequence, while a level of collision risk exists for the species with turbines and internal overhead transmission lines, it is considered to be low.

The proposed undergrounding of the external transmission line effectively eliminates any collision risk. Potential impacts to trees along Boiler Swamp Road may have a minor impact upon this species, particularly if any trees with occupied hollows are impacted. However any tree impacts are occurring in a large forest block, adjacent to an existing road, and habitat loss due to potential tree death is considered insignificant in the context of the available habitat area.

Assessment of potential impacts against the relevant significant impact criteria for the sub-species suggests the construction and operation of the project is unlikely to constitute a significant impact.

13. Orange-bellied Parrot

Orange-bellied Parrot *Neophema chrysogaster* is listed as critically endangered under the EPBC Act and as critically endangered under the FFG Act.

Orange-bellied Parrots migrate from Tasmania to southern mainland Australia and overwinter for the period from March-April to October. The migration route includes the coast of western Tasmania and King Island (Holdsworth 2006). After crossing Bass Strait the birds disperse to favoured locations along the coast of Victoria and historically they were also recorded in small numbers as far as Adelaide and Sydney.

The majority of records of the species from the mainland are from within two kilometres of the coast, although some recent records are from up to 10 kilometres inland (DEWHA 2010). The species uses coastal saltmarsh and heathland vegetation communities on the mainland. The 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) (Figure 13b). The species may thus be present in the region of the project annually between March-April and October.

The overall paucity of previous records of the species more widely from the local area is likely to reflect both the low density at which the very small population occurs; a lack of survey effort in this part of the species' range; and, difficulty of access resulting in existing records being concentrated on few, more accessible locations.

Orange-bellied Parrots are known to integrate into Blue-winged Parrot *Neophema chrysostoma* flocks and coastal heath habitat is suitable for both species (DEWHA 2010). On the mainland, the species is thought to move in response to resource availability (Loyn et al. 1986). Non-breeding Orange-bellied Parrots fly between feeding and roosting areas (Loyn et al. 1986), which are generally within a few kilometres of each other. Roosting habitat includes dense shrubs, and the species forages on saltmarsh vegetation including Beaded Glasswort *Sarcocornia quinqueflora*, Austral Seablite *Suaeda australis*, Shrubby Glasswort *Tecticornia arbuscula*, within dune scrub and in pastures, and can also feed on some introduced plant species. Foraging areas are generally within 50 to 200 metres of water bodies.

Dense shrubby thickets have been recorded to be used as overnight roosting habitat. During the non-breeding season Orange-bellied Parrots may move in response to resource availability (Ehmke & Tzaros 2009) and, while resident in a given area they fly between feeding and roosting areas, which are generally within a few kilometres of each other.

It is possible that flight behaviours of Orange-bellied Parrots differ between those of long-distance migrations and routine local flights while the birds are periodically resident in an area. It is understood that during the annual autumn migration from Tasmania, the birds move in stages in which they may spend days or weeks at locations along the west coast of Tasmania and on King Island, before reaching the mainland. It is possible that after reaching the mainland, individuals may then gradually move along the Victorian coastline, or that they might fly more directly to particular locations. The spring migration is thought to be more direct, with individually marked birds recorded at mainland sites (particularly near Werribee) recorded in south-western Tasmania one or two days later. The precise route(s) and flight heights of migrations are not known. Efforts are currently underway to remotely track birds to obtain empirical data about those aspects, but results are not available at the time of writing (M. McGrath, Zoos Victoria, pers. comm.).

There is a long history of volunteer surveys for Orange-bellied Parrots that contribute to the recovery program for the species. Available information is that these have routinely taken place in areas of suitable habitat in the area between Portland and Peterborough in south-western Victoria and along the Coorong in South Australia. The area between Portland and the South Australian border, namely Discovery Bay Coastal Park and the Glenelg River estuary, adjacent to the Project Area, are also targeted for surveys in May, July and September each year, but DEECA (May 2022) advise that these are likely to have been limited to a single day of survey each year. Surveying for, and detecting, Orange-bellied Parrots is difficult as demonstrated by the number of known departed individuals from Melaleuca in Tasmania and lack of sightings of these individuals on the mainland. The main challenge in finding the birds during the wintering period is the wide range of their distribution and the overall low population numbers. For example, 192 Orange-bellied Parrots were presumed to have left Melaleuca in autumn 2021 and only 15 were detected during the 2021 wintering period, on the mainland. Approximately 70 were recorded returning to Melaleuca in the spring of the same year (DELWP pers. comm. 17/01/2022).

The species has been the subject of an intensive recovery program that has been in operation for more than 30 years. Among other measures, the program has entailed significant efforts to search for Orange-bellied Parrots throughout their mainland range, however, much of the apparently suitable mainland habitat is difficult to access and historically a large proportion of the known breeding population has not been able to be located during the non-breeding season. The wild population consisted of approximately 50 individuals in 2016 (DELWP 2016b).

Over the past four years the Orange-bellied Parrots Recovery Program has undertaken substantial releases of captive-bred birds (DELWP 2021c, SWIFFT 2022). These have significantly bolstered the wild population. As a consequence, the numbers of Orange-bellied Parrots in the wild has grown and sightings during the period of their annual sojourn on the mainland indicate that at least some individuals have travelled long distances to reach parts of the species former range where they have not been documented for many years. It is hoped that this recovery will continue. If it does, there is potential for greater use by the species of coastal habitats near the Project Area.

13.1 Methods

The survey guidelines for Australia's threatened birds (DEWHA 2010) outline the following considerations for Orange-bellied Parrot surveys:

- Winter habitat searches are conducted using area searches and point observations in suitable habitat by individual observers or small teams on foot. Area searches are employed during co-ordinated counts and incidental searches and rely mainly on flushing birds. Point observations are particularly useful at known or potential roost sites at dawn and dusk.
- Detection using only sight rarely confirms species identity in the first instance. It is therefore critical that observers are familiar with flight and alarm calls to distinguish from other *Neophema* species.
- In winter areas, the species is typically encountered in small flocks, sometimes singly and in pairs.
- Contact calls in flight and alarm calls are diagnostic. The species is sometimes found in association with other *Neophema* parrots.

- Survey effort guide:
  - For area searches (areas <50 hectares in suitable habitat at appropriate times of the year) 20 hours, 10 days.
  - Roost site point observations (1 hour before dusk to half an hour after. Half an hour before dawn to one hour after) 60 hours, 20 days.

Surveys have been undertaken at a time of the year, time of the day and at locations of suitable habitat where the species was likely to be present. The surveys considered aspects of the species behaviour and existing information as detailed below:

- Surveys were conducted in May, June, July and August 2020 when the species is known to be on the mainland.
- Surveys were located near Noble Rocks and Swan Lake, within coastal heath habitat near historical Orange-bellied Parrot records (Figure 13a, 13b).
- Given the extent of potentially suitable habitat, and lack of recent records and knowledge of roost and foraging sites, we applied a combined approach of DEWHA (2010) survey effort recommendations, surveying 2 hours from first and last light (Table 17).
- We recorded a single Orange-bellied Parrot near Swan Lake in May 2020, and the survey intensity was subsequently increased for the June, July and August 2020 surveys (Table 17).
- Surveys were undertaken by walking along the beach, parallel to dunes with suitable coastal heath habitat, and across the dunes through the habitat, scanning for the species and other *Neophema* parrots, and listening for calls.

Where Blue-winged Parrots were detected, careful observations were made to check for Orange-bellied Parrots. Other *Neophema* parrot species that can occur in the area include the Elegant Parrot *Neophema elegans* (listed as Vulnerable on the FFG Act), but no Elegant Parrots were recorded during the Project surveys.

Additionally, the bird utilisation survey (BUS) location T7 was 1.5 kilometres and BUS location C5 was 1.2 kilometres from known Orange-bellied Parrot records at Noble Rocks and Swan Lake respectively (Figure 10a, Figure 13b). A total of two hours was spent at these locations as part of the BUS (one hour in April, one hour in June), and each of the two BUS survey periods included a morning, middle of the day, and late afternoon 20-minute count. Section 10 provides more information about the BUS.

A summary of the survey effort and location for Orange-bellied Parrots is provided in Table 17. Further detail on survey times and weather conditions is provided in Appendix 5 Table A5.1. Total survey effort from May 2020 to August 2020 was 51 hours and 49 minutes over eight days at two sites (Appendix 5).

Table 17 Summary of Orange-bellied Parrot survey effort

Date	Location	Total survey effort
29/5/2020	Swan Lake; Nobles Rocks	2 hr 55 min
29/6/2020	Swan Lake; Nobles Rocks	5 hr 24 min
30/6/2020	Swan Lake; Nobles Rocks	7 hr 59 min
21/7/2020	Swan Lake; Nobles Rocks	8 hr 35 min
22/7/2020	Swan Lake; Nobles Rocks	10 hr 27 min
25/8/2020	Swan Lake; Nobles Rocks	8 hr 37 min
26/8/2020	Swan Lake; Nobles Rocks	3 hr 35 min
27/8/2020	Swan Lake; Nobles Rocks	3 hr 17 min

For impact assessment purposes, likely movements between areas surrounding the Project were inferred from the location of suitable habitat and based on the species' ecology and behaviour, particularly their tendency to associate with Blue-winged Parrot flocks.

13.2 Existing conditions

A single Orange-bellied Parrot was recorded during project field studies in the interdunal heathland vegetation adjacent to the beach south of Swan Lake on 29 May 2020 (Appendix 5 Table A5.2, Plate 17). This was the first record of the species in that area since 1993. The record has been reported to the Recovery Team Chair (DEECA) who passed it on to the local Regional Coordinator for Orange-bellied Parrot surveys in the area. The only other confirmed Orange-Bellied Parrot on the mainland within this region (west and south-west Victorian coast) was at Peterborough in 2020 (Galligan 2020). The results of the Orange-bellied Parrot surveys are provided in Figure 13a and Appendix 5 Table A5.2.

On 29 May 2020, the survey team walked along the beach south of Swan Lake and onto a dune after hearing what sounded like a *Neophema* call. The team stopped to listen and subsequently flushed a *Neophema* as they walked. The parrot flew silently westward, low above the heath and against the setting sun, landing approximately 200 metres away. The survey team walked to this location, where one of them saw the bright green parrot at 2-3 metres, moving under a heathy shrub. The team heard the distinctive Orange-bellied Parrot call shortly after, approximately 20 metres and 70 metres away. The individual then took off, flying high towards the west, calling while flying. A total of 25 minutes from the first detection of the call was spent searching, listening, watching and looking for the individual.

In June 2021 two wild-born juvenile Orange-bellied Parrots were reported from Hindmarsh Island near the Murray River mouth in South Australia. Indications are that the species continues to utilise much of its former mainland range, and it is hoped that as the population recovers the frequency of its occurrence throughout its range will increase. At present, the very low population and very large mainland range mean that the birds tend to be very sparsely distributed.

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

Discovery Bay Coastal Park. It is possible that Kentbruck Heath, north of the eastern extremity of the Project site, contains habitat that might be used by the species, but it was not part of the current surveys and turbines are not proposed for that area. The species has never been recorded from Kentbruck Heath but as noted previously, the area is difficult to access and despite the best efforts of largely volunteer observers, it is possible that the species could use that area and not have been detected.

If Orange-bellied Parrots are constrained to the narrow coastal zone from which they are generally known, they are not likely to pass over or through the Project Area on longer distance flights. If, however they are not constrained in that way, then some long-distance flights may occur over or through the Project Area.

13.3 Impact assessment

Construction and operation of the KGPH has potential to impact upon Orange-bellied Parrot via several mechanisms:

- Direct removal of foraging habitat construction of temporary and permanent infrastructure, such as turbines, hard stands and access roads.
- Direct mortality due to collisions with turbines or transmission lines.
- Displacement of foraging activity due to disturbance caused by construction and operation of wind farm infrastructure.

13.3.1 Wind farm

The Project does not entail removal of any vegetation that is suitable foraging or roosting habitat for the Orange-bellied Parrot. The seasonal migratory behaviour of the species means that the Project will not pose any risk to it during the annual 5-6 month period in which the population is in Tasmania.

The National Recovery Plan for the Orange-bellied Parrot (DELWP 2016b) notes that the species is highly mobile throughout the non-breeding range and that, although there is little more than anecdotal evidence for impacts on the species, it may be impacted by barriers to movement that may include wind turbines, powerlines and associated infrastructure.

There are three fundamental aspects of relevance in a consideration of potential for the Project to pose these risks to the species. They are:

- the extent to which Orange-bellied Parrots may use the Project Area;
- whether Project infrastructure may present a barrier to their movements; and,
- whether their flights are at risk of collision.

Potential use of the Project Area

The commercial pine and blue gum plantations occupying the great majority of the Project Area are not suitable habitats for Orange-bellied Parrots. Despite this, based on behavioural similarities between Orange-bellied and Blue-winged Parrots, it is plausible that individual Orange-bellied Parrots may occasionally fly over or through plantations, including areas that have been recently harvested and thus are relatively open. It is also possible that Orange-bellied Parrots may fly over or forage in weedy, low-lying agricultural portions of the Project Area that are used by Blue-winged Parrots. Much of the agricultural land with potential to be used by Orange-bellied Parrots in the eastern extremity of the Project Area will not contain turbines, and turbine-free buffer areas for Brolgas have also been applied to it (Biosis 2024b).

On the basis of habitat preferences and the small size of the Orange-bellied Parrot population, if any such movements away from their preferred coastal environment into the Project Area were to occur, they are likely to be very rare. However given the small size of the population, any mortality due to collision with turbines would be considered a high impact.

Potential barrier effect

The 'barrier effect' of wind energy facilities on birds is considered to have the potential to create a response in which birds prefer not to pass through an array of turbines and, if they detour around it, to cause them to expend additional energy to do so, and for that to have a level of negative effect. The effect has rarely been empirically demonstrated to occur in any species and a very large body of data from onshore wind farms in Australia has not detected such an effect (Biosis data).

A number of the longest running operational wind farms in Australia are within the migration pathways of the species. Bluff Point and Studland Bay Wind Farms in north-western Tasmania and Huxley Hill Wind Farm on King Island are considered likely to be in the direct migration route of the entire Orange-bellied Parrot population. Wind farms at Yambuk, Codrington and Portland in Victoria and at Lake Bonney in South Australia are also within the narrow coastal zone used by some of the population (Biosis Research 2005). Orange-bellied Parrots have continued to migrate twice annually between their breeding range in south-west Tasmania and Victoria since these wind farms have been in operation and it is apparent that they do not present impermeable barriers to long- or short-distance movements of the population. If the birds predominantly fly below rotor-swept height (see below) then turbines would not represent a significant barrier to their movements.

There is no empirical evidence for or against wind farms presenting barriers to the movements of Orange-bellied Parrots, and the possibility that the effect might have affected the species cannot be completely discounted. The wind farm component of the proposed Kentbruck Project, is planned to have turbines located primarily within existing pine plantation areas that are not habitat suitable for the species, while suitable habitat along the coastal zone of Discovery Bay Coastal Park will remain intact. It is expected that Orange-bellied Parrots will be able to move within and through this area unimpeded and that the Project wind farm will not present a barrier to movements by the species.

Turbine collision risk

There are four instances where Orange-bellied Parrots have been known to collide with man-made structures, as summarised in the recent TASCAT assessment of the Robbins Island Wind Farm in Tasmania. This includes a collision with a lighthouse more than 100 years ago and three incidents at the breeding site at Melaleuca in Tasmania. Two of these incidents were birds hitting buildings and one was a dead bird found at the base of a small (8 meter high) wind turbine used to provide power for buildings at the site.

During intensive monitoring of bird collisions over ten years at the operational Bluff Point Wind Farm and over six years at Studland Bay Wind Farm, no Orange-bellied Parrots were found to have collided with turbines (Woolnorth Wind Farm Holding 2014). Huxley Hill, Codrington and Lake Bonney facilities were approved prior to requirements for monitoring of bird collisions. For a number of years activities of Orange-bellied Parrots in the immediate vicinity of Yambuk Wind Farm were monitored, but no interactions with turbines were detected (Pacific Hydro 2009). Monitoring of bird collisions at operational wind farms is a sampling process so it is possible that undetected Orange-bellied Parrot collisions may have occurred at these wind farms. 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. They included five that are within the distributional range of the Orange-bellied Parrot (Cape Bridgewater, Cape Nelson North, Cape Sir William Grant, Cape Nelson South and Yambuk). No records of Orange-bellied Parrot collisions with turbines were reported from any wind farms.

No known flight height data is available for Orange-bellied Parrots, however the morphology and flight characteristics of Blue-winged Parrots are indistinguishable from those of the Orange-bellied Parrot. Data for flights by Blue-winged Parrots have been collected during point counts for the Project and by Biosis at Studland Bay and Musselroe wind farm sites in Tasmania. A total of 115 individual Blue-winged Parrot flights were documented during point counts for the Project. Of those, 111 were between the ground and 50 metres high, while four flights were between 60 and 90 metres high. The data for Blue-winged Parrots from Studland Bay and Musselroe wind farm sites include a combined total of 652 flights, all of which were less than 50 metres high, and the great majority were no higher than 20 metres. Turbines proposed to be used for the Project will have rotors with a minimum ground clearance of 60 metres. Available evidence but suggests that the great majority of flights by Orange-bellied Parrots will be below this rotor-swept height.

Data for Orange-bellied Parrots in the Project Area were not sufficient to support quantitative collision risk modelling.

The 'likelihood and consequence' matrix score provided by DELWP (Moloney, Lumsden, & Smales 2019) for the potential risk of turbine collisions for Orange-bellied Parrot is moderate – high. That is a generic assessment for the purpose of determining which species may be of concern relative to their potential to be impacted by wind energy developments in Victoria. It also was based on the expectation that wind turbines to be installed in Victoria would have rotors that reach down to approximately 25 metres above ground level, which is significantly lower than the 60 metres clearance proposed for turbines for the Kentbruck Project.

13.3.2 Transmission line

The external transmission line route is geographically far from any known habitat for the species and is to be entirely constructed underground. There is no mechanism by which the transmission line could have an impact on the species.

13.3.3 Potential for direct impacts

It is recognised that if the Project was to result in any level of mortality of the species that would represent a significant impact upon its critically low population. However, there is no likelihood that a barrier effect or the transmission line will impact on the species. It is considered that the overall lack of suitable habitat for the species combined with the very high proposed height of turbine rotor mean that collisions with turbines are extremely unlikely to occur and that the wind farm component of the Project is not likely to have a direct significant impact on the Orange-bellied Parrot population.

13.3.4 Potential for indirect impacts

Effects of construction and operational noise, traffic and artificial light and hydrological impacts on natural vegetation outside the Project Area have all been considered. However, the project design does not include mechanisms whereby effects on the species or its habitats are plausible. The Orange-bellied Parrot population is not considered likely to be impacted indirectly by the Project.

13.3.5 Significance of impacts under EPBC Act

An assessment for Orange-bellied Parrot against significant impact criteria for endangered and critically endangered species listed under the EPBC Act (DoE 2013a) is provided in Appendix 6 Table A6.3. Based on information set out above, the assessment considered the Project is unlikely to have a significant impact on the species as per the EPBC Act significant impact criteria.

13.3.6 Conclusion

Wind energy facilities have potential to impact upon Orange-bellied Parrot by habitat loss and collision with turbines or power lines.

The KGPH Project is proposed to be constructed in unpreferred habitat (pine plantation), and does not involve any removal of Orange-bellied Parrot habitat. The transmission line is to be constructed underground, which eliminates collision risk with overhead wires. The Project has also implemented buffer areas adjacent to potential habitat (including Discovery Bay Coastal Park), and the farmland area between Discovery Bay Coastal Park and the Kentbruck Heath is proposed to be free of turbines.

There is considerable uncertainty regarding the sub-species use of the project area, however, due to the low numbers of individuals in the population, and the inherent difficulty in detecting individuals and observing flight behaviour. With only one observation of the species during the project surveys, from outside the Project area, there is insufficient flight height data to undertake quantitative collision risk modelling. 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. Birds may fly through the project area during the life of the project, however, and may fly at rotor-swept height, putting them at risk of collision. However there is no evidence of any Orange-bellied Parrot collisions with a commercial wind turbine anywhere in Australia, and collisions of other *Neophema* species are also very infrequent.

Assessment of potential impacts against the relevant significant impact criteria for the sub-species suggests the construction and operation of the project is unlikely to constitute a significant impact.

14. Blue-winged Parrot

Blue-winged Parrot *Neophema chrysostoma* was listed as vulnerable under the EPBC Act in March 2023. It is not listed as threatened under the FFG Act. A Conservation Advice for the species has been published (DCCEEW 2023a).

The Blue-winged Parrot is a small olive-colored parrot with characteristic blue wings. The species is closely related to the Orange-bellied Parrot and the two species may occur as mixed flocks. The Blue-winged Parrot is found throughout south-eastern Australia, occupying coastal, subcoastal and inland regions. Blue-winged Parrots favour heathy woodland for breeding, especially in sites recently disturbed by fire or logging. The species is a partial migrant between the mainland and Tasmania, with most Tasmanian birds migrating to Victoria for the winter. A portion of the mainland population remains on the mainland to breed, and similarly some Tasmanian birds to not migrate to the mainland (Higgins 1999). Nesting occurs in tree hollows in coastal eucalypt forests and woodlands and appears to be largely constrained to parts of Tasmania and south of the Great Dividing Range on the south-eastern mainland. Outside of the breeding season Blue-winged Parrots may occur as far north as southern Queensland. The species forages on the ground in pairs or small flocks, feeding on the seeds of a range of native and introduced grasses and herbs. Flocks of several thousand are occasionally recorded in winter. Foraging habitat includes farmland, saltmarsh, grassland, grassy woodland and heathland. The species is rarely recorded in dense forest, although it has occasionally been observed in young pine plantations or clearings within mature plantations (Higgins 1999). Birds are likely to make seasonal movements between woodland habitats in spring and summer, and saltmarsh or dune habitats in autumn and winter, including both coastal locations and saltmarsh habitats far inland (e.g. around salt lakes).

14.1 Methods

Because the coastal habitat of Orange-bellied Parrot is also used by Blue-winged Parrot and the two species may occur together, targeted surveys for Orange-bellied Parrot also targeted and documented Blue-winged Parrots (see Section 13.1). Blue-winged Parrots occur in a broader geographic and habitat range than Orange-bellied Parrots and bird utilisation point counts across a wider spread of sites were also within habitats suitable for the species. Fixed-time bird utilisation point counts were undertaken for the Project to provide data about utilisation for all bird species (see section 10). A total of 418 point counts of 20 minutes duration were made at 27 sites across the proposed wind farm site and adjacent areas.

14.2 Existing conditions

Forty records of Blue-winged Parrots were made during the Orange-bellied Parrot surveys (Appendix 5 Table A5.2).

During bird utilisation point counts Blue-winged Parrots were recorded 56 times at seven control sites (locations that will not be affected by the Project) and six sites within the Project Area. In the 56 observations of the species a total of 115 flights were recorded. With the exception of one observation of 15 birds at site T17, all of the records were of between one and five parrots. All of 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 extremity of the wind farm Project

Area, where turbines are not proposed. Further, incidental observations of approximately 50 Blue-winged Parrots were also made in that property 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 metres above the ground from a track between more mature pines.

14.3 Impact assessment

Construction and operation of the KGPH has potential to impact upon Blue-winged Parrot via several mechanisms:

- Direct removal of foraging habitat construction of temporary and permanent infrastructure, such as turbines, hard stands and access roads.
- Direct mortality due to collisions with turbines or transmission lines.
- Displacement of foraging activity due to disturbance caused by construction and operation of wind farm infrastructure.

14.3.1 Wind farm

The Project does not entail removal of any vegetation that is suitable foraging, roosting or nesting habitat for the Blue-winged Parrot.

The primary Project risks for Blue-winged Parrot are considered to relate to the potential for wind energy infrastructure to present a barrier to movement by the species and/or for collisions with wind turbines.

There are thus three fundamental aspects of relevance in a consideration of potential for the Project to pose these risks to the species. They are, the extent to which Blue-winged Parrots may use the Project Area; whether Project infrastructure may present a barrier to their movements; and, whether their flights are at risk of collision.

Potential use of the Project Area

Areas of the commercial pine and blue gum plantations occupying the great majority of the Project Area that are relatively open (i.e. following timber harvest and during the early years of the production cycle) were found to be used by Blue-winged Parrots, as were areas of agricultural pasture. It is thus plausible that that the species will fly over or through areas of older plantations in passage between these open areas. Much of the agricultural land with potential to be used by Blue-winged Parrots in the eastern extremity of the Project Area will not contain turbines, and turbine-free buffer areas for Brolgas have also been applied to it (Biosis 2022).

Potential barrier effect

The 'barrier effect' of wind energy facilities on birds is considered to have the potential to create a response in which birds prefer not to pass through an array of turbines and, if they detour around it, to cause them to expend additional energy to do so, and for that to have a level of negative effect. The effect has rarely been empirically demonstrated to occur in any species and a very large body of data from onshore wind farms in Australia has not detected such an effect (Biosis data). Many of the longest running operational wind farms in Australia are within the range and known habitats of the species. It is understood that bird utilisation monitoring at a number of these has documented the presence of Blue-winged Parrots while these wind farms have been in operation and it is thus likely that they do not present impermeable barriers to movements of the population. For example, the species was documented at the operational Musselroe Wind Farm in north-eastern Tasmania during bird utilisation surveys in each of 2014, 2015 and 2016 (Woolnorth Wind Farm Holding 2016) and at Yambuk Wind Farm during a number of years of monitoring (Pacific Hydro 2009). If the birds predominantly fly below rotor-swept height (see below) then turbines are unlikely to represent a significant barrier to their movements.

It is expected that Blue-winged Parrots will be able to move within and through this area unimpeded and that the Project wind farm will not present a barrier to movements by the species.

Turbine collision risk

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. All of those wind farms are within the distributional range of 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.

Data for Blue-winged Parrots in the Project Area were sufficient to support quantitative collision risk modelling as follows:

During fixed-time point counts 111 flights recorded were of Blue-winged Parrots flying at heights between the ground and 50 metres high. Four flights were at heights between 60 and 90 metres.

A full description of the collision risk model is provided as Appendix 16. The following summarises input values, including assumptions used in modelling of turbines with 60 metre blade/ground clearance for Blue-winged Parrot. The species may fly during the hours of daylight and occasionally at night, although this is not known to have been quantified, the modelling allowed for birds to be in flight for 14 hours of every 24 hours at the same rate as they were detected during point counts.

The following summarises input values including assumptions used in modelling of turbines with 60 metre blade/ground clearance for turbines:

- Number of turbines: 105
- Hub height: 155 metres
- Lower rotor-tip height: 60 metres
- Upper rotor-tip height: 250 metres
- Mean rotational speed: 6.51 rpm

The following summarises input values used for Blue-winged Parrots

- Species is present on-site for 12 months per annum
- Flight period of 14 hours per 24 hours
- Population of 200 at the site
- Length of bird: 23 cm
- Mean flight-speed of 30 km/h
- Total period of point count surveys 8,360 minutes
- Flights recorded below rotor-swept height: 111

- Flights recorded within rotor-swept height: 4

Collision risk modelling for the project on the basis of as set out above, indicate the potential for the following numbers of Blue-winged Parrot collisions per annum for the entire Project turbine array:

- 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

With so few flights recorded within turbine rotor-swept height, the majority of risk in this modelling relates to the potential for Blue-winged Parrots to collide with static components of turbines, including the tower and nacelle (for which the model has assumed an avoidance rate of 0.9999). It is probable that the species has significantly higher capacity to avoid collisions with those elements of turbines.

Input values altered for comparative modelling of turbines with 45 metre blade/ground clearance for Blue-winged Parrot were:

- Flights recorded below rotor-swept height: 103
- Flights recorded within rotor-swept height: 12

Comparative collision risk modelling indicates the potential for the following numbers of Blue-winged Parrot collisions per annum:

- 2.56 collisions per annum at 0.95 rotor avoidance rate
- 1.03 collisions per annum at 0.98 rotor avoidance rate
- 0.52 collisions per annum at 0.99 rotor avoidance rate

The comparative modelling suggests that the project, as proposed with a 60 metre blade/ground clearance is likely to result in substantially fewer collisions by Blue-winged Parrots, than would the same array of turbines with a 45 metre blade/ground clearance. This is because flights by the species at the site were concentrated largely below 60 metres above the ground.

Overall, collision risk modelling for Blue-winged Parrot with turbines having a 60 metre blade/ground clearance as proposed by the Project, suggests that, at the lowest avoidance rate of 0.95, there might be an annual average of 1.5 collisions by the species. The Conservation Advice for *Neophema chrysostoma* (blue-winged parrot) under the EPBC Act (DCCEEW 2023a) cites estimates there are about 10,000 mature individuals of the species (Holdsworth et al. 2021) with minimum and maximum plausible population estimates of 7,500 and 15,000 and a mean generation time of 3.8 years. Despite this evident uncertainty, basic demographic principles (eg. Krebs 2013) mean that the loss of 1.5 birds p.a. would be well within the natural variability in the species population mortality rate and could not affect functioning or viability of the population.

14.3.2 Transmission line

The transmission line route is proposed to be underground. There is no mechanism by which the transmission line could have an impact on the species.

14.3.3 Potential for direct impacts

There is no likelihood that a barrier effect or the transmission line will impact on the species. Turbine collision risk modelling suggests that the wind farm component of the Project is not likely to have direct significant impact on the Blue-winged Parrot population.

14.3.4 Potential for indirect impacts

Effects of construction and operational noise, traffic and artificial light and hydrological impacts on natural vegetation outside the Project Area have all been considered. However, the project design does not include mechanisms whereby effects on the species or its habitats are plausible. The Blue-winged Parrot population is not considered likely to be impacted indirectly by the Project.

14.3.5 Significance of impacts under EPBC Act

An assessment for Blue-winged Parrot against significant impact criteria for vulnerable species listed under the EPBC Act (DoE 2013a) is provided in Appendix 6 Table A6.4. The Project is considered unlikely to have a significant impact on the species as per the EPBC Act significant impact criteria.

14.3.6 Conclusion

Wind energy facilities have potential to impact upon Blue-winged Parrot by habitat loss and collision with turbines or power lines.

Although Blue-winged Parrots are known to utilise the project area, including both areas of young pine plantation and farmland, the project will not involve significant disturbance to these habitats. Most of the farmland area in the east of the Project area is proposed to be free of turbines.

Construction and operation of the external transmission line is unlikely to impact upon the species as this will be constructed as an underground facility, and will not result in a collision risk.

Turbine collision risk modelling for Blue-winged Parrot with turbines having a 60 metre blade/ground clearance as proposed by the Project, suggests that, at the lowest avoidance rate of 0.95, there might be an annual average of 1.5 collisions by the species. Within the context of the natural dynamics of the population, that level of loss would not constitute an effect that could alter functioning or viability of the population and would not result in a significant impact upon it.

15. Elegant Parrot

Elegant Parrot *Neophema elegans* are not listed under the EPBC Act, but are listed vulnerable under the FFG Act.

Elegant Parrots occur in south-west and south-east Australia, where they occupy coastal and inland areas. In Victoria, they mainly occur in the west of the state, with records from coastal areas and further inland in the north-west.

The species is found in a range of open habitats, including grasslands, shrublands, mallee, woodlands, heathlands, saltmarshes, tree-lined watercourses and farmland (Higgins 1999). It may also inhabit coastal beaches and saltmarsh as well as inland and coastal sandhills with scrub cover (Higgins 1999).

The species forages mostly in on the ground. The Elegant Parrot diet includes seeds of grasses and herbaceous plants, grain crops and spilt grain on roadsides and they can occur together with Blue-winged Parrots while foraging (Higgins 1999). Elegant Parrot is often found in pairs or small groups, foraging together during the day and roosting together in dense tree canopies or tall shrubs. Flocks of up to 200 birds have been recorded outside of the breeding season (Higgins 1999). The Atlas of Living Australia includes one record of 200 individuals, recorded by the South Australian Ornithological Association, which is likely to be the same record. The VBA has no count information for most of the 71 Victorian records, however the maximum number recorded is 25 individuals.

Movement patterns are poorly known, although no migratory behaviour or large-scale movements have been recorded. The species appears to adopt a range of different strategies, from local to nomadic, driven potentially by food availability and seasonal conditions (Higgins 1999). Daily movement patterns include pairs and groups departing roost and foraging either nearby, or flying further to access food resources. Published observations indicate the species moves between breeding and non-breeding seasons in some parts of its range. Elegant Parrots use woodlands and depend on tree hollows for breeding. Treed habitat is also important for roosting during the non-breeding season (Higgins 1999).

Flight patterns are similar to those of the Blue-winged parrot. Normal flight is swift, directional, and at heights of up to 100 meters (Higgins 1999).

15.1 Methods

Desktop database searches were used to assess the occurrence of the Elegant Parrot within the Investigation Area, and the Project's potential impact on the species. Additionally, the other threatened bird surveys and bird utilisation surveys included extensive coverage of Elegant Parrot suitable habitat (surveys for Orange-bellied Parrot, shorebird and bird utilisation surveys).

15.2 Existing conditions

Six records occur within 10 kilometres of the Project Area. Elegant Parrots are considered rare in the region and were not recorded during surveys undertaken by Biosis in 2020. A DEECA staff member reported seeing a single bird at Nobles Rocks (Jack Krohn pers. comm. 2022). Two database records exist within the Investigation Area, one from VBA and one from eBird, recorded in 1991 from Lower Glenelg National Park, near the Glenelg River. They may potentially occasionally fly over the site given there are records and suitable habitat on the coast and inland, but are unlikely to inhabit the Investigation Area in large numbers.

15.3 Impact assessment

Construction and operation of the KGPH has potential to impact upon Elegant Parrot via several mechanisms:

- Direct removal of breeding habitat trees for construction of temporary and permanent infrastructure, such as turbines, hard stands and access roads.
- Direct removal of foraging habitat for construction of permanent and permanent infrastructure, such as turbines, hard stands and access roads.
- Impacts on breeding habitat trees due to disturbance within tree protection zones of while trenching for transmission lines and cables.
- Direct mortality due to collisions with turbines or transmission lines.
- Displacement of breeding or foraging activity due to disturbance caused by construction and operation of wind farm infrastructure.

15.3.1 Wind farm

The project does not entail removal of any vegetation that is suitable habitat for the Elegant Parrot. The majority of records and the main part of its distributional range occur further west, in South Australia and Western Australia. Similar to other *Neophema* parrot species, it is highly mobile and may fly at heights where turbines pose a collision risk. However, considering the low reporting rate and small numbers previously recorded in the Investigation Area, the wind farm is unlikely to pose a risk of impact to this species.

15.3.2 Transmission line

The transmission line route is geographically far from any habitat for the species and the entire transmission line is now proposed to be underground. There is no mechanism by which the transmission line could have an impact on the species.

15.3.3 Potential for direct impacts

Overall, it is considered that collisions with turbines or powerlines will occur extremely rarely if ever, and that the wind farm component of the Project is not likely to have direct significant impacts on the Elegant Parrot population.

15.3.4 Potential for indirect impacts

Effects of construction and operational noise, traffic and artificial light and hydrological impacts on natural vegetation outside the Project Area are not considered to impact on the Elegant Parrot, given its likely infrequent occurrence in the Project Area and in the habitats where construction is proposed.

15.3.5 Conclusion

Wind energy facilities have potential to impact upon Elegant Parrot by habitat loss and collision with turbines or power lines.

The species has been recorded within the investigation area, however reporting rates are very low and the area is not likely to support a significant population of the species. The project does not involve the removal of significant areas of habitat for this species, however the presence of turbines may result in a risk of collisions. Collision risk has not be quantified as part of the Project studies, as no flight observations of this species were recorded.

The Project is unlikely to pose a significant impact to this species.

16. Eastern Ground Parrot

The Eastern Ground Parrot *Pezoporus wallicus wallicus* is not listed under the EPBC Act and is listed as endangered under the FFG Act.

The Eastern Ground Parrot inhabits densely vegetated habitat, which includes heathlands and sedgelands in coastal areas, including dunes and estuarine floodplains. Near the Project Area such habitat occurs at Long Swamp and potentially the Kentbruck Heath. Kentbruck Heath was visited in October 2021 and found to contain suitable habitat for the Eastern Ground Parrot, and the species is considered likely to occur there.

16.1 Methods

The species can be detected from their call, particularly immediately after dusk, but can also be heard calling around dawn. Targeted surveys for this species were undertaken in spring and early summer (October to December) of 2020 (Table 18; Figure 16a).

Table 18 Eastern Ground Parrot survey details

Date	Location	Time start	Time end	Total survey time (min)
29/10/2020	Long swamp (Nobles Rocks Track, Nobles Rocks)	5:52	6:45	43
28/10/2020	Long Swamp (Spruce Track)	20:03	20:51	48
29/10/2020	Lake Mombeong	5:43	6:45	62
21/11/2020	Earls Road	20:28	21:27	59
25/11/2020	Black Swamp (near Nobles Rocks, 2 survey locations, north and south side of swamp)	5:24	6:13	49

Surveys undertaken for Australasian Bitterns (see Section 19) were undertaken within habitat that is largely also suitable for Eastern Ground Parrots and at an appropriate time of day to detect the Eastern Ground Parrot. Zoologists listened for the characteristic calls of Eastern Ground Parrots during all of those surveys.

16.2 Existing conditions

The database searches indicate that the Eastern Ground Parrot has previously been recorded at Long Swamp, Nobles Rocks and Lake Mombeong (Figure 16b). Eastern Ground Parrot was detected within the Investigation Area on three occasions during October 2020 in the Biosis surveys (Table 19; Figure 16a). More recently, BirdLife recorded the species at Long Swamp near Nobles Rocks, in December 2020 – DELWP notified Biosis of these records, and they are included in Figure 16b.

Eastern Ground Parrot was detected within the Investigation Area on three occasions during October 2020 Biosis surveys (Table 19; Figure 16a).

Table 19 Observations of Ground Parrot recorded during targeted surveys

Date	Time	Location*	Type of record	Number recorded	Behaviour
13/10/2020	20:15	Long Swamp	Heard during Australasian Bittern survey	1	Calling
13/10/2020	19:21	Long Swamp	Heard during Australasian Bittern survey	2	Calling
23/10/2020	21:10	Spruce Track	Heard during Ground Parrot survey	1	Calling

16.3 Impact assessment

Construction and operation of the KGPH has potential to impact upon Eastern Ground Parrot via several mechanisms:

- Direct removal of breeding and foraging habitat for construction of temporary and permanent infrastructure, such as turbines, hard stands and access roads.
- Direct mortality due to collisions with turbines or transmission lines.
- Displacement of breeding or foraging activity due to disturbance caused by construction and operation of wind farm infrastructure.

The Eastern Ground Parrot is a sedentary inhabitant of densely vegetated coastal and estuarine heathlands and sedgelands. They nest on the ground and inhabit sedgeland, temperate shrub and graminoid heathland including dunes and estuarine floodplains. Characteristic of their habitat is dense cover and high density of the species' preferred food plants, which include sedges and heaths Meredith 1984). The species is known from such habitats in the Long Swamp and is also likely to be present in the Kentbruck Heath.

State Wide Integrated Flora and Fauna Teams (SWIFFT 2021) notes that in Victoria, the Eastern Ground Parrot has suffered a significant decline since European settlement and the species has a fragmented population that occurs in eastern Australia and Tasmania (Meredith 1984, Higgins 1999). In 1990 the population was estimated to consist of the following number of individuals: Croajingolong National Park 200-250, Discovery Bay 50-60, Wilson's Promontory National Park 200-250, and Carlisle Heathlands (Otway Ranges) approximately three (Meredith & Jarernovic 1990). The species is now known in Victoria from Croajingolong National Park, Wilson's Promontory National Parks and Discovery Bay Coastal Park. Due to the lack of any recent records the sub-population in the Otway Ranges is now considered extirpated (Garnett & Baker 2021). Long Swamp in Discovery Bay now forms the western edge of the Victorian range for this species, which used to occur further west into South Australia (Nature Glenelg Trust 2019). Decline and population fragmentation are major threats to this species, with loss of habitat, fire regime changes and predation by introduced predators the main reasons for declines (Meredith 1984, Higgins 1999). Any water level alteration to the Long Swamp could impact the species and its habitat as this population is small and isolated (Meredith 1984).

The species is highly cryptic and is best detected from its characteristic calls. Calls were documented at Long Swamp in December 2019 by Nature Glenelg Trust (2019) and again during surveys Biosis conducted for the project in October 2020, also at Long Swamp.

Eastern Ground Parrots nest on the ground and utilise the dense cover of their habitat. Their flights tend to be low and just above the height of the heathy vegetation they inhabit (Forshaw & Cooper 1981). The species may move between suitable habitat separated by woodland and water. Pairs are sedentary and resident within their territories throughout the year (Meredith 1984, Higgins 1999). Juveniles may also be sedentary for up to 7 months of age and disperse post-breeding. Seasonal movements, including juvenile dispersal, in some parts of the range also occur (Higgins 1999) and can involve movements of 120–220 kilometres from breeding habitats (Meredith 1984, Higgins 1999). Juveniles in Victoria are known to disperse in January to March (Higgins 1999). Density of Eastern Ground Parrots in known habitats can change seasonally due to such dispersive movements, but also depends on years since fire and with the suitable amount of dense cover and seed availability in heathland habitats (Meredith 1984, Higgins 1999, Bluff 2016). This indicates the species moves in and out of suitable habitat as the habitat suitability changes over time after fire and post-breeding season.

There are no previous Eastern Ground Parrot records in the Kentbruck Heath to the north of the eastern portion of the Project wind farm site, but that area that is difficult to access and it is possible that Eastern Ground Parrots occur there given suitable habitat is present. Biosis did not survey Kentbruck Heath for presence of the species, though a habitat assessment of a small portion in the southern part of the heath confirmed extensive suitable habitat occurs within Kentbruck Heath.

The behaviour of Eastern Ground Parrots would suggest, that if they were to move occasionally between coastal heathlands and sedgelands in Discovery Bay Coastal Park and Kentbruck Heath, it is not likely that they would traverse pine plantations but if they were to do so the most direct route(s) are across very narrow portions of the Project wind farm site. Siting of the Project well outside suitable habitat will avoid collision risk impacts from turbines and other infrastructure. In addition, agricultural land in the eastern portion of the Project Area, between Discovery Bay and Kentbruck Heath, will be substantially covered by turbine-free buffers applied for Brolga breeding areas, and flights through this turbine free area will not be at risk of collision with turbines.

16.3.1 Wind farm

There is no habitat for the species within the wind farm component of the project and the project entails no loss of habitat for it. The species' movement behaviour suggests individuals will be mostly confined to suitable heathland and sedgeland habitats surrounding the Project Area. Whilst flights between these habitats may occur, they are most likely to move low and short distances between suitable habitats in the wider area.

16.3.2 Transmission line

The external transmission line route is geographically far from any habitat for the species and the entirety of its length is proposed to be underground. There is no mechanism by which the transmission line could have an impact on the species.

16.3.3 Potential for direct impacts

Eastern Ground Parrots are largely constrained to very specific habitat types, none of which will be removed or modified by the Project. The environment of the Project Area is not suitable habitat for the species. Whilst it is possible that Eastern Ground Parrots might exist within Kentbruck Heath and could fly over or through areas where project infrastructure is proposed (e.g. longer distance flights between Kentbruck Heath and Long Swamp), there is no available evidence that they do so. 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.

16.3.4 Potential for indirect impacts

Effects of construction and operational noise, traffic and artificial light and hydrological impacts on vegetation of the dune wetlands systems have all been considered. However, the Project design does not include mechanisms whereby effects on the species or its habitats are plausible. Eastern Ground Parrots are not considered likely to be impacted indirectly by the Project.

16.3.5 Conclusion

Wind energy facilities have potential to impact upon Eastern Ground Parrot by habitat loss, collision with turbines or powerlines and disturbance by construction and operation of the facility.

The Project does not involve removal or modification of habitat for this species. There is potential for some level of movement of birds between coastal environments and the potential habitat within the Kentbruck Heath, however this has not been documented, and the most likely area for movements is within turbine exclusion areas.

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.

17. King Quail

The King Quail, *Coturnix chinensis* is not listed under the EPBC Act and is listed as endangered under the FFG Act.

The King Quail is a small, diurnal ground-dwelling bird found throughout north and east Australia and its distribution also extends to India, South-East Asia and New Guinea. They are uncommonly reported in Victoria, considered rare and potentially in decline (O'Brien 2006). Historically, the species was often found in the Western Port surrounds in the mid-1800s (Wheelwright 1861). The Asian subspecies has also been introduced to Victoria (O'Brien 2006) and some records in Melbourne and Healesville-Warburton are attributed to aviary escapes (Emison et al. 1987). Current distribution in Victoria is mainly along the coast, with disjunct records mainly from East Gippsland, Wilsons Promontory, French Island and near Portland where it occurs in dense coastal heathlands (O'Brien 2006).

Local population densities and movement behaviour are difficult to determine as the species is small, cryptic and is usually only found when flushed from cover, which makes it difficult to survey for, and detect. 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 metres) covering a distance of 10-30 meters when the bird is disturbed (flushed from cover) (Marchant & Higgins 1993). Individuals are thought to be resident and undertake local movements (Marchant & Higgins 1993), and adult pairs are monogamous (Adkins-Regar 2016). Local population sizes can vary depending on seasonal conditions. Numbers can vary between years, with the species being absent when conditions are dry and occurring in higher numbers in wet conditions in some parts of its range (Marchant & Higgins 1993). This suggests individuals may undertake movements, potentially seasonally and over longer distances across the species range, when conditions and habitat becomes unsuitable. Further evidence of this is Chan's (2001) analysis of Australian partial migrants, which lists King Quail as having resident and partial migrant behaviours. However, nothing is known about these King Quail movements, their frequency, or flight heights.

King Quail are ground-feeding omnivores, taking grass seeds, grains, green grass shoots, fruit, nuts and small invertebrates (Marchant & Higgins 1993). The species is mostly diurnal, although it can be active on moonlit nights. The species inhabits a range of shrub and grass dominated habitat through coastal and subcoastal areas, including swamps, wet heathland, grassland and crops such as Lucerne (Marchant & Higgins 1993, O'Brien 2006). Habitat quality is determined largely by vegetation density, rather than height or species composition. Trees may or may not be present within habitat areas, although the canopy must be open enough to allow for development of dense undergrowth (Marchant & Higgins 1993). The species is vulnerable to fire, with burn intervals of less than 3 years being detrimental. However, the species is quick to use recently burnt areas as their dark plumage provides excellent camouflage (Marchant & Higgins 1993, O'Brien 2006).

17.1 Methods

Desktop database searches were used to assess the occurrence of the King Quail within the Investigation Area, and the Project's potential impact on the species. The species is very unlikely to have been detected in the surveys undertaken for other threatened species, as detection of quails is usually through flushing them from cover by walking through dense habitat.

17.2 Existing conditions

Four records occur within 10 kilometres of the Investigation Area, predominantly situated south of the proposed transmission line within Mount Richmond National Park and north of the proposed wind farm site in the Cobboboonee National Park with records from 1941, 1950s and 1990 (Figure 17a). However, this could be an under representation of numbers as King Quails could easily go unnoticed by birdwatchers using roads and other access tracks. The database records therefore probably reflect low survey effort – if the King Quail is present, it is likely to be under-represented in these databases. 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 proposed wind farm site and where it borders wetlands supporting suitable dense habitat within the Discovery Bay Coastal Park heathlands and shrublands, as well as the wet heathland areas within the Cobboboonee National Park, where it has previously recorded, as well as in the Kentbruck Heath. Given its flying and dispersal ability, individuals are considered unlikely to fly long distances and will most likely fly short distances between suitable habitat patches. Regular flights by numerous individuals through areas with turbines and powerlines are considered very unlikely.

17.3 Impact assessment

Construction and operation of the KGPH has potential to impact upon King Quail via several mechanisms:

- Direct removal of habitat for construction of temporary and permanent infrastructure, such as turbines, hard stands and access roads.
- Direct mortality due to collisions with turbines or transmission lines.
- Displacement of breeding or foraging activity due to disturbance caused by construction and operation of wind farm infrastructure.

17.3.1 Wind farm

The turbines are proposed to be located in the pine plantation and cleared agricultural farmland and thus the construction of this component of the wind farm will not involve removal of any King Quail habitat. No King Quail mortalities have been recorded from Victorian wind farms, though a single individual Little Button-quail and a possible Stubble Quail carcasses have been found in wind farm mortality monitoring programs (Moloney, Lumsden, & Smales 2019). Based on these findings, quail mortalities at wind farms appear to be rare. 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.

17.3.2 Transmission line

The transmission line route is geographically far from any habitat for the species. The portion, which traverses suitable habitat for this species is proposed to be underground. There is a low likelihood of loss of small area or possibly suitable habitat along the roadside through the Boiler Swamp Road, where the transmission line will be placed underground. The transmission line is considered not to have an impact on the species, particularly given the likely low numbers occurring in the area and the complete undergrounding of the line, which eliminates any collision risk with overhead powerlines.

17.3.3 Potential for direct impacts

Overall, it is considered that collisions with turbines or powerlines will occur extremely rarely if ever, and that all components of the wind farm are not likely to have direct significant impacts on the King Quail population.

17.3.4 Potential for indirect impacts

Effects of construction and operational noise, traffic and artificial light and hydrological impacts on natural vegetation within, or outside the Project Area are not considered to impact on the King Quail, given the species' likely infrequent occurrence in the Project Area, very low likelihood of flights at height that could put them at risk, as well as the lack of suitable habitat in areas where construction is proposed.

17.3.5 Conclusion

As discussed above (17.3.3 and 17.3.4), the Project is considered unlikely to impact upon King Quail for several reasons, including the flight behaviour of the species, likely infrequent occurrence within the Project area lack of suitable habitat in areas where construction is proposed.

18. Brolga

The Brolga *Grus rubincunda* is not listed under the EPBC Act and is listed as endangered under the FFG Act.

The Brolga assessment is presented in a separate report (Biosis 2024b).

19. Australasian Bittern

The Australasian Bittern is listed as endangered under the EPBC Act. It is listed as critically endangered under the FFG Act.

The species distribution includes Australia, New Zealand and New Caledonia (Marchant & Higgins 1990). In Australia, the species is found from south-east Queensland to south-east South Australia, Tasmania and south-west Western Australia (Department of the Environment and Energy 2019). In Victoria, Australasian Bittern occurs in wetlands of coastal, inland and Murray River regions (Department of the Environment and Energy 2019).

The Australasian Bittern inhabits freshwater wetlands and may also occur in estuarine and tidal wetlands and river mouths (Marchant & Higgins 1990). The species prefers permanent or seasonal wetlands with dense emergent vegetation, which can consist of a range of sedge, rush and reed species (e.g. *Juncus*, *Typha*, *Baumea*, *Gahnia*). The species is also known to breed in the Riverina rice fields and Tangled Lignum *Duma florulenta* swamps (Herring et al. 2019, Garnett & Baker 2021). Water depth of preferred wetlands is up to 0.3 metres, which include shallower areas for foraging along edges, and vegetation cover of 0.5 – 3.5 metres height (Department of the Environment and Energy 2019).

The Australian population consists of an estimated 1200 (650–1750) individuals (Garnett & Baker 2021) and is divided into south-eastern and south-western sub-populations (NESP TSRH 2019). The extent of the species' occurrence is 1,270,000 square kilometres and area of occupancy is 2,580 square kilometres (NESP TSRH 2019). Once widespread, the Australasian Bittern population has declined by 20–30% within 11 years prior to 2010 (Garnett, Szabo, & Dutson 2011) and has experienced a 70% decline in area of occupancy within 30 years, between 1997 and 2008 (CoA 2019). The population trend is declining based on assessment trends from 2005–2015 to 2015–2018 (NESP TSRH 2019). The latest assessment (NESP TSRH 2019) states that irrigated rice crops, which the species breeds in, may have contributed to stabilising the population in the decade up to 2015, but the 2005-2015 and 2015-2018 trends indicated that the Tasmanian and south-western Australian sub-populations were in decline over these time periods. In eastern Australia, from south-east South Australia to south-east Queensland, the species is known to use fewer than 30 natural wetlands for breeding (NESP TSRH 2019) and is thought to include 197–542 individuals, with 86–248 estimated in Victoria (Garnett, Szabo, & Dutson 2011).

The breeding season extends from October to February. Early in the breeding season the males establish territories and advertise them through distinctive and audible 'booming' calls, and defend their territories against other males. A male may have one or more females nesting within its territory (Department of the Environment and Energy 2019). Australasian Bittern prefers dense vegetation in wetlands for nesting and male booming platforms and density of individuals can be high in suitable wetlands during favourable conditions and water levels (Department of the Environment and Energy 2019, I. Veltheim pers. obs.). Recent work on the species has shown that 59% of the Australian population breeds in the Riverina rice fields, with other major large breeding concentrations in the Barmah-Millewa wetlands (up to 73 males) and the Bool Lagoon (up to 20 males) (Herring et al. 2019).

Satellite tracking and changes in local densities indicate Australasian Bitterns undertake seasonal and dispersive movements between breeding and non-breeding habitats, and as local habitat suitability conditions change (Bitterns in Rice Project 2024, Department of the Environment and Energy 2019).

Satellite tracking of the species recorded juveniles and adult males moving from the Riverina rice-growing areas inland, to coastal wetlands in South Australia, Victoria and New South Wales post-breeding season (Bitterns in Rice Project 2024). The species is also likely to be resident and sedentary in permanent wetlands and other waterbodies (Marchant & Higgins 1990, Department of the Environment and Energy 2019). Whether individuals fly between breeding and non-breeding areas as single birds, in pairs or groups, is unknown, however one juvenile male has been tracked moving at night from the Riverina rice fields to Long Swamp and Picaninny Swamp. The Eurasian Bittern, which is a similar species occurring in Europe, engages in display and circling flights in autumn and spring, as part of pre-migratory behaviour (White & Royal Society for the Protection of Birds 2006). Migrating Eurasian Bitterns depart at dusk, individually, in pairs or groups, and as it is a partial migrant some individuals remain resident throughout the year while others migrate as seasonal conditions change (White & Royal Society for the Protection of Birds 2006). The Australasian Bittern similarly appears to be a partial migrant with resident and seasonally migrating individuals within the Australian population.

Local and daily movement patterns of Australasian Bitterns are not well documented. Given the similarities with the Eurasian Bittern, movements of the latter species may be helpful in understanding those of the Australasian Bittern, though local habitat suitability and conditions are likely to be strong drivers of movement behaviour. Eurasian Bitterns chase each other in pursuit within a wetland, which can be part of breeding and social behaviours (White & Royal Society for the Protection of Birds 2006). Generally, males feed near their booming platforms and females near their nests. Females have been recorded feeding directly from the nest, up to 30–300 metres distance from it, foraging during the day but leaving the nest before dawn. During the non-breeding season individuals fly out to feed at dawn and return to the roost at dusk (White & Royal Society for the Protection of Birds 2006). Similarly to the Eurasian Bitterns, Australasian Bitterns have been observed engaging in aerial displays and chasing of each other, flying out of wetlands before dawn and flying from a nest to forage (Biosis 2021a). These observations have included flights of up to 400 metres within and between wetlands at heights of approximately 2–30 metres, including above tree canopy height (I. Veltheim pers. obs.).

The Draft National Recovery Plan for the Australasian Bittern (Department of the Environment and Energy 2019) defines habitat critical to the survival of the Australasian Bittern as:

- Any wetland habitat where the species is known or likely to occur (breeding or foraging habitat) within its known distribution.
- Any location with suitable habitat outside the mapped distribution in the Conservation Advice (Department of the Environment and Energy 2019) that may be periodically occupied by Australasian Bittern.

The recovery plan states the importance of protecting and conserving habitats where the species occurs regularly and recommends managing buffer areas around nesting and foraging habitats, which can be developed using expert opinion.

Identifying occupancy and important habitat for Australasian Bitterns requires survey effort during appropriate times of the year when detection of individuals can be maximised. The recommended methods include surveying during the breeding season to record territorially booming males (Birdlife Australia 2015, DEWHA 2010).

Australasian Bittern occurs at wetlands within the site and the adjacent Glenelg Estuary and Discovery Bay Ramsar site (Figure 19b). Of particular importance and relevance to the Project is 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 Kentbruck pine plantation near Lake Mombeong and Nobles Rocks.

Male Australasian Bitterns have a distinctive booming call, which can be easily detected throughout their breeding season (Birdlife Australia 2015, Herring et al. 2019, DEWHA 2010). Given the species is otherwise cryptic and secretive and therefore difficult to survey using visual observational methods, listening and call playback surveys during the breeding season are the best method to detect the species' presence.

19.1 Methods

Surveys for Australasian Bittern were undertaken together with Growling Grass Frog surveys in spring 2018 and late summer 2019, during the known Australasian Bittern breeding season (September to March). These surveys included call playback, active searching and call playback, focusing on permanent wetlands with dense aquatic and emergent vegetation within the Investigation Area.

In 2020, targeted surveys for Australasian Bittern were conducted in spring, at a time when the species is known to breed in the area and to be actively calling (B. Green pers. comm.; I. Veltheim pers. obs.). In 2020, call playback surveys were simultaneously done to detect the Little Bittern and Lewin's Rail at suitable habitats within and in close proximity to the Project Area.

No surveys were conducted during the non-breeding season as the aim of the investigations was to survey when the species is most likely to be detected, in spring during the breeding season when males are calling. No recommended methods exist for non-breeding season surveys. Given the species is cryptic, detection during non-breeding season would be difficult. Biosis consulted with species experts on methods prior to undertaking the surveys – at that time, others had not surveyed for the species during the non-breeding season.

The DEWHA (2010) survey guidelines for threatened Australian birds also include methods for 'observation of targeted foraging habitat within wetlands in the early morning or early evening' and 'area searches in suitable habitat for sightings, nests, indicative footprints and feathers' and BirdLife methodology includes transects through suitable habitat. The lack of knowledge on foraging habitat locations would require substantial survey effort to detect the species using these methods in the non-breeding season and would likely cause disturbance.

In addition to using an accepted and recommended methodology to detect the species during the breeding season, we also accessed information on satellite tracked Australasian Bitterns (www.bitternsinrice.com.au), used VBA database records and information in Farnes (2009) to understand the species' presence outside of the breeding season.

The peak of male bittern calling is 30 minutes before sunrise followed by two hours around sunset during the breeding season. We surveyed at these times and used the recommended BirdLife (2015) and DEWHA (2010) methodology to survey for Australasian Bittern, Little Bittern and Lewin's Rail.

BirdLife Australia (2015) survey method

- Surveys at wetlands to listen and record actively calling males.
- A survey should be conducted during:
  - Mid-September to the end of October
  - Early November to mid-December.

- Surveys could be carried out over a one-hour period, either from:
  - Half an hour before dawn to half an hour after; or
  - Half an hour before dusk to half an hour after dusk.
- Surveys need to be conducted in good weather conditions – of primary importance is little or no wind. The number of observers required depends on the wetland size – for small wetlands one observer or survey team, and for large wetlands observers should be stationed around the wetland for triangulating observations.

DEWHA (2010) survey method

- The DEWHA (2010) recommended survey methods for bitterns, rails and crakes, include:
  - Broadcast surveys in suitable habitat for solicited call responses and sightings. Broadcast stations may be established at wetland edges to avoid damage to wetland vegetation. Stations should usually be at least 250 metres apart.
  - Observation of targeted foraging habitat within wetlands in the early morning or early evening. Detection by sightings and unsolicited calls.
  - Area searches in suitable habitat for sightings, nests, indicative footprints and feathers.

Surveys within suitable foraging habitat, and call-broadcast surveys, were undertaken for Australasian Bittern, Little Bittern and Lewin's Rail at suitable habitat close to the proposed wind farm during December 2018, February 2019, October 2020 and November 2020. Results for the Australasian Bittern are discussed in this section and results for the Little Bittern and Lewin's Rail are discussed in Section 20. Given the extent of wetland habitat within the Investigation Area, Biosis surveys focused on wetlands within close proximity and at, or near, previous records. Survey methods included active listening and call broadcast only, which Biosis deemed as the most appropriate method to maximise detection of these species within the Investigation Area. Additionally, Biosis included a reference site where Australasian Bittern is known to occur and was active during the Project surveys (Biosis 2021a). The reference site was Walook Swamp, Portland, which was visited on the same days the surveys were conducted in the Investigation Area.

Bird utilisation point counts were located at representative sites within the wind farm; the land where the transmission line may be aligned; and in adjacent land. Sites where Australasian Bitterns have been previously documented near the Project Area at Mcfarlanes Swamp and Long Swamp / Black Swamp were specifically included as point count sites and included months during both breeding and non-breeding seasons for Australasian Bittern.

Surveys for the Australasian Bittern were also undertaken in 2018 and 2019 in conjunction with Growling Grass Frog surveys at a number of wetlands (Table 20, Figure 19a).

Table 20 Australasian Bittern surveys in 2018 and 2019

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

19.2 Existing conditions

Three Australasian Bitterns were recorded during the Biosis 2020 field study program – two within the Project Area (footprint) and an additional one outside the Project Area but within the Investigation Area. One was an incidental record, observed flying on 28 May 2020 across farmland on private property, Mt Kincaid Road Gorae West (Figure 19b).

Two male Australasian Bitterns were heard on 28 October 2020 – one at Lake Mombeong and the other at an adjacent wetland within the pine plantation (Figure 19b). On 15 October 2020 and 29 October 2020 Australasian Bitterns were recorded calling at a reference site in Portland (Walook Swamp). Australasian Bittern is known to occur in the Long Swamp, in the middle and east sections (near McFarlanes Swamp), in Lower Glenelg National Park and in wetlands near Portland (Figure 19a). Satellite tracking as part of the 'Bitterns in Rice' project has also recorded a juvenile Australasian Bittern moving from the NSW Riverina rice growing area into Long Swamp. This individual used the Long Swamp and Picaninny Ponds wetlands in South Australia (Herring, Veltheim, & Silcocks 2016) between April and September 2020, during the species' non-breeding season. Tracking showed other adult males also dispersing to coastal wetlands in autumn indicating that at least part of the Australasian Bittern population uses coastal wetlands after and during the non-breeding season. Refer to bitternsinrice.com.au/tracking-bunyip-birds/ for a map showing the tracking data for the individual bird (Robbie) that has made several movements to and from wetlands in the vicinity of the Project Area.

Satellite tracking and local observations indicate that Australasian Bitterns are present throughout the year, during the breeding and non-breeding season and some individuals are likely to remain resident, whilst others may regularly or occasionally fly inland between breeding and non-breeding seasons. Satellite tracking also demonstrates that individuals move between coastal and inland wetlands, including between Long Swamp and the New South Wales Riverina. The Biosis field surveys additionally confirmed Australasian Bitterns were present during the breeding season.

19.3 Impact assessment

Construction and operation of the KGPH has potential to impact upon Australasian Bittern via several mechanisms:

- Direct removal of habitat for construction of temporary and permanent infrastructure, such as turbines, hard stands and access roads.
- Direct mortality due to collisions with turbines or transmission lines.
- Displacement of breeding or foraging activity due to disturbance caused by construction and operation of wind farm infrastructure.
- Indirect disturbance to wetland habitat may also occur as a result of changes to hydrological regimes, sedimentation, erosion and pollution.
- Disturbance to riparian vegetation and other vegetation surrounding wetlands that provides a protective buffer.

A recent satellite tracking study revealed Australasian Bitterns move between coastal wetlands in Victoria, New South Wales and the New South Wales Riverina rice growing area (Herring et al. 2019). The findings indicate these populations are connected and individuals also use inland wetlands while dispersing from the Riverina breeding areas. One tracked individual dispersed from the Riverina to the recently restored Pick Swamp, near Mount Gambier in South Australia and subsequently moved to Long Swamp, in Discovery Bay Coastal Park, which was also recently restored. The tracking data shows this individual spent some time at the wetland near Nobles Rocks and appears to have moved there along the coast (Herring et al. 2019, Bitterns in Rice Project 2024). This young Australasian Bittern arrived in Long Swamp in May 2015 and stayed for about four months before flying approximately 600 kilometres back to the Riverina and then returning to Pick Swamp in December. From the tracking data at least some of these movements appear to be across (i.e. over) the southern part of the GTFP pine plantation, and the bird's September return to the Riverina indicates Australasian Bitterns may again fly across (i.e. over) the plantation when moving from coastal to inland habitats.

Whilst dispersal of juvenile Australasian Bitterns from the Riverina breeding areas to south-west Victorian coast occurs in autumn, the numbers of individuals dispersing is unknown as are the numbers present in these wetlands during the non-breeding season. The satellite-tracked individual showed they may make multiple such movements in a year and it is possible that juveniles hatched in the New South Wales rice fields return seasonally. It is not known if adults also make such seasonal movements between the south-west Victorian coast and the breeding areas in the Riverina rice fields. However, given that a number of adult males tracked from these breeding areas moved to other coastal areas in Victoria and New South Wales in autumn, it is conceivable that some adult males may also move between the wetlands of the south-west Victorian coast and breeding areas in the Riverina, and may spend all or some of the non-breeding season in these areas. Individuals also move between wetlands in winter and spring (Biosis 2021a, Farnes 2019).

Three Australasian Bitterns were recorded during Biosis surveys.

Two of these were within the Project Area, i.e. the footprint (Figure 19b):

- 28 May 2020: A single individual observed flying north-east within the Project Area, after dusk at private property at Mt Kincaid Road, Gorae West.
- 28 October 2020: One male calling at a wetland (wetland ID number 20505) within the Project Area, north of Lake Mombeong.

One additional individual was recorded outside of the Project Area, but within the Investigation Area:

- 28 October 2020: One male calling at Lake Mombeong, immediately adjacent to the southern edge of the proposed wind farm area. This male was heard calling on the same evening as the male recorded calling at wetland ID 20505.

Based on local observations (Farnes 2019) and VBA data (10 kilometre search area), Australasian Bittern is resident and present year-round in the Portland area and at Long Swamp. The species has been recorded at these locations from all months, except for March, but individuals have been recorded at Bridgewater Lakes and the Glenelg River estuary mouth. Australasian Bittern is thus likely to be present in suitable habitat throughout the search area though some nomadic movements may also occur (Farnes 2019). As noted above, long-distance movements are also made by some individuals. Australasian Bittern is known to breed in the wetlands between Portland and Nelson and breeding has been recorded in September to October (Farnes 2019) and December (Biosis 2021a).

Up to five individuals have been recorded from Walook Swamp in Portland, and the restored wetlands in south-western Victoria and south-eastern South Australia, such as Long Swamp (Victoria) and Pick Swamp (South Australia) support 15% of the Australian population (37–119 individuals, based on the total Australian population estimate) (NESP TSRH 2019). The total wetland area where the species has been recorded within the 10 kilometre VBA search area is 1140 hectares, for the following 10 wetlands (Figure 5a):

- Wetland number 20501 and 20614 – Long Swamp (east and west)
- Wetland number 20505
- Wetland number 20505 – Lake Mombeong
- Wetland number 23494 – Walook Swamp, Portland
- Wetland number 23497
- Wetland number 23496 – Fawthrop Marshland
- Wetland number 23479
- Wetland number 20562 and 20565 – Bridgewater Lakes.

A combined estimate exists for Long Swamp and Pick Swamp only (37–119), within the 10 kilometre search area subject to the current assessment (NESP TSRH 2019). Long Swamp is within the Investigation Area, Pick Swamp is located in South Australia and is outside of the Investigation Area. Australasian Bitterns have home ranges of 5–30 hectares, suggesting the number of individuals within the 10 kilometre search area could be approximately 38–228. The actual number could be higher, as a single booming male bittern may have more than one female within its territory.

Once widespread, the Australasian Bittern population declined 20–30% within 11 years prior to 2010 (Garnett, Szabo, & Dutson 2011). The population trend is declining based on an assessment trends from 2005–2015 to 2015–2018 (NESP TSRH 2019). The latest assessment (NESP TSRH 2019) states that irrigated rice crops, which the species breeds in, may have contributed to stabilising the population in the decade up to 2015, but the 2005-2015 and 2015-2018 trends indicated that the Tasmanian and South-western Australian sub-populations were in decline over these time periods.

The main threats to the species are loss and alteration of wetland habitat, climate variability and change, reduced water quality, invasive species and low genetic diversity (Department of the Environment and Energy 2019). Although powerline collisions are not a listed threat, a minimum of 10 individuals have been found dead under powerlines in the Portland district (Farnes 2019) and powerline strikes and wind farm mortalities of other bittern species have been noted overseas (der Vogelschutzwarten 2014), indicating the species is susceptible to collision risk from powerlines and wind turbines. Three Eurasian Bittern wind farm collisions have been recorded in Europe with two from Germany (LAG VSW 2014). Although based on a small sample size of three individuals, recent GPS movement tracking of Australasian Bitterns in New Zealand has shown the species flies at rotor swept area, with one individual spending 61% of its time at heights of 20–200 metres (E. Williams pers. comm.). Satellite tracking of the species in Australia has also shown the species flying at heights of 3–100 metres above ground (M. Herring pers. comm.).

The approach to impact assessment set out below for Australasian Bittern is possible because there are sound bases for estimating local population size and the quantum of suitable wetland habitat available in the region. There are also empirical data from satellite-tracked birds that provide some information about their movements. This is unlike most other taxa, for which such information is not available.

19.3.1 Wind farm

Wetland habitat, including breeding habitat is not likely to be impacted by the Project, as long as potential impacts on groundwater, surface water and sediment run-off from construction are managed to avoid hydrological impacts on wetlands. Given the distribution of potential and known habitat south, north and east of the Project Area and the likely local and seasonal movements across the wind farm, a portion of Australasian Bitterns using the local wetlands are expected to fly across the GTFP pine plantation, where turbines are proposed to be located. Based on what's known about the species' flight behaviour in Australia and New Zealand some flights could occur at rotor swept area and present a collision risk.

Given the known occurrence of mature and juvenile Australasian Bitterns in the wetlands surrounding the Project Area, and the movement path recorded south to north across the Project Area, some level of mortality and impact is likely. Satellite tracking has shown that Australasian Bittern long-distance movements can occur at night (Bitterns in Rice Project 2024). Timing of flights has similarly been shown to peak in the early hours of the morning and evening for an Australasian Bittern tracked for 18 month in New Zealand (Emma Williams pers. comm.). These data also show that the species can fly at any time throughout a 24-hour period. The species also moves locally, at dusk and dawn in low light conditions (as observed during the Biosis surveys) and may be less able to avoid barriers such as wind turbines and powerlines than diurnally flying species. They have been recorded to fly at heights of 3–200 metres and thus may be at risk of collision of turbines at these heights.

Uncertainty exists on the number of individuals that may fly across the wind farm, the frequency, as well as height of such flights. It is likely that such flights occur on an annual or seasonal basis, including multiple individuals occasionally moving across the wind farm (dispersing between coastal and inland wetlands), and could include individuals flying across the wind farm above tree canopy height. There is a lack of information on movement behaviour for all bittern species, and their interactions with turbines or actual wind farm collision risk. This increases uncertainty in assessing the potential impacts of the Project on the Australasian Bittern.

The EPBC Act Significant impact guidelines 1.1 state:

> *If there is scientific uncertainty about the impacts of your action and potential impacts are serious or irreversible, the precautionary principle is applicable. Accordingly, a lack of scientific certainty about the potential impacts of an action will not itself justify a decision that the action is not likely to have a significant impact on the environment.*

The potential impact of the wind turbines and overhead powerlines and transmission line on the Australasian Bittern has been assessed by applying the precautionary principle, based on the remaining uncertainty on the frequency and height of flights across the Project Area and on the best available information on the population numbers locally and Australia-wide.

The most robust population estimate is 37–119 in the Long Swamp and Pick Swamp, directly south and west of the Project Area, but could be as high as 228 based on the wetland area available within 10 kilometres. Not all of these individuals would be likely to move between the coast and inland wetlands, as the species is resident within the search area but multiple flights by multiple individuals annually are considered likely to occur.

Based on the available information, in the absence of a population viability analysis model, and the level of uncertainty on the number of movements across the wind farm, collisions from the Project could lead to a long-term decrease in the size of the population. The severity of existing threats in the Threatened Species Strategy Year 3 Scorecard (NESP TSRH 2019) is considered negligible with declines of <1% of the population. Using this criteria, 1% of the lower bound Australian population estimate of 247 individuals for the species equates to 2–3 individuals, and using the upper bound of 796 equates to 8 individuals. It is conceivable that this number of individuals could collide with wind turbines or overhead powerlines 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. For the reasons stated above it is difficult to ascertain if any such impact would affect the population in the long term, but using the precautionary principle we consider it is a possibility over the Project lifespan.

19.3.2 Transmission line

The entire external transmission line route is proposed to be constructed underground between Boiler Swamp Road and Heywood, which eliminates any collision risk due to this component of the project.

An overhead transmission line is proposed to be located parallel to Portland-Nelson Road from the western part of the Project to Gorae West. If this powerline is below or at the height of the pines, it is unlikely to pose a collision risk to the Australasian Bittern. A powerline that is taller than the pines presents a more serious collision risk than turbines, as the species is likely to fly above the pine trees, and the species is known to collide with transmission lines in the local area (Farnes 2019). Marking of overhead electricity wires has been shown to have a significant positive effect in reducing bird collisions (Bernardino et al. 2019). A substantial investigation by Gális and Ševčík (2019) that included egrets and storks, with similar morphology and ecology to bitterns, demonstrated a 93.5% reduction in collision fatalities. Bird diverters designed to maximise visibility in low light and nocturnal conditions are also available (eg. The Firefly Reflective Bird Diverter manufactured by the Australian company Summit Power), however this is relatively new technology and their effectiveness in reducing low light and nocturnal conditions has not been researched and published.

19.3.3 Potential for direct impacts

Direct impacts for the Australasian Bitterns are most likely to occur through wind turbine and powerline related fatal injury or mortality and is considered most likely to occur when individuals disperse between coastal and inland wetland habitats from Long Swamp and associated wetlands, in autumn and spring. Collision risk between Boiler Swamp Road and Heywood is eliminated through constructing this section underground. The Project will not remove wetland habitat, thus no direct impact on habitat is likely.

19.3.4 Potential for indirect impacts

Effects of noise and disturbance from wind turbines on Australasian Bittern, or other bittern species, is unknown. Deleterious effects of construction noise, traffic and artificial light are expected to be minimal due to the separation distances, topography and vegetation between the wind farm site and most wetlands used by Australasian Bitterns. The majority of Australasian Bittern known and suitable habitat (Figure 19b) is within the Brolga habitat buffers.

Construction noise may potentially impact on the ability of booming territorial males hearing each other when setting up territories during the breeding season and that effect could be minimised. Australasian Bitterns are known to inhabit some semi-urban wetlands with artificial light and noise (e.g. Walook Swamp, Portland and Braeside Park wetlands in suburban Melbourne). Noise and traffic during the operational life of the wind farm are not expected to affect Australasian Bitterns or their habitats.

For known and suitable wetlands that are not adequately buffered, excluding construction during the Australasian Bittern breeding season from October to February will avoid impacts in these areas. Construction outside of these seasons is unlikely to have a significant impact due to the existing buffer set backs from habitat and as the pine plantation is likely to shield habitats from construction noise and light.

Dewatering of turbine foundations has potential to impact upon downstream wetlands if surface flow, sedimentation and erosion is not appropriately managed. The Groundwater Assessment Report (AECOM 2024a) states that no turbines in the GTFP plantation are expected to intersect groundwater during excavation of their foundations. The proposed layout no longer includes turbines in the farmland in the east of the wind farm site, where there was potential for turbine bases to intersect with shallow ground water. As a result there is no expected intersection between turbines and groundwater, and therefore no requirement for dewatering of turbine foundations.

19.3.5 Significance of impacts under EPBC Act

An assessment for Australasian Bittern against significant impact criteria for endangered & critically endangered species listed under the EPBC Act (DoE 2013a) is provided in Appendix 6 Table A6.5. It indicates that there is potential for the Project to result in significant impacts under two criteria: “Lead to a long-term decrease in the size of a population” and “Interfere with the recovery of the species”. The project has potential to have an impact on the population. No population viability analysis exists for the Australasian Bittern and thus the magnitude of any impact on the population size cannot be quantified.

19.3.6 Conclusion

The Project has a potential to impact upon Australasian Bittern by collision with turbines or power lines and this impact is most likely to be from individuals moving seasonally between coastal and inland wetlands (autumn and spring). This assessment is based on no mitigation, but within context of the iteratively revised footprint as outlined in Section 1.2. Residual risk is managed through mitigation measures outlined in Section 37 and detailed in the Draft BBAMP.

Australasian Bittern is known to occur in wetlands in close proximity to the Project Area, within the Project Area close to the southern boundary near Lake Mombeong, and it has been recorded flying through the north-eastern part of the Project Area, including a local flight observed during field studies for this project in that area, and a regional movement between Long Swamp and the New South Wales Riverina, recorded during GPS tracking studies undertaken for the 'Bitterns in Rice' project.

Direct impacts to wetlands providing known or potential Australasian Bittern habitat have been avoided through the project design process. The transmission line is to be constructed underground, which eliminates collision risk with overhead wires for the underground section from Portland-Nelson Rd / Sandy Hill Road intersection or the collector substation near Wilsons Lower Road. Collision risk would still exist along the overhead section of the Portland-Nelson Road transmission line. It is recommended that line marker devices be applied to wires of the overhead powerline and that these should be devices that demonstrably function in low light levels. A number of tested devices are commercially available on the Australian market. Manufacturer's recommendations should be followed with regard to positioning of devices on lines.

The Project has also implemented buffer areas adjacent to potential habitat within Discovery Bay Coastal Park and other wetland habitats as part of the *Interim guidelines for the assessment, avoidance, mitigation and offsetting of potential wind farm impacts on the Victorian Brolga population* (DSE 2012), including in the north-eastern part of the Project Area where an Australasian Bittern flight was recorded. These buffers will avoid and minimise collision risk in areas the species could fly.

Some information is available regarding the flight patterns of this species from Australia and New Zealand, however, no flights during the day as part of the BUS were recorded during the study to enable site-specific collision risk modelling. It is known that the species may fly within rotor swept height, including when undertaking longer regional movements, based on GPS and satellite tracking data from Australia and New Zealand. There is insufficient information available to conduct population viability analysis (PVA) and no PVA exists for the species. Applying the precautionary principle, collisions with KGPH turbines or internal powerlines have potential to constitute a significant impact on the Australasian Bittern population.

Technology for mitigating wind energy collision impacts for birds is a rapidly developing field (Section 37.2), and while there are few 'off the shelf' systems currently available, or proven to be effective, it expected that systems involving integrated thermal camera technologies, triggering turbine shut-downs when the species is detected near turbines, may be appropriate for Australasian Bittern as an adaptive management measure.

Recent communications with Dr Henrik Skov indicate that a combination system that uses radar and video cameras can be used to train and recognise various species including bitterns, using artificial intelligence. This system works for cranes (Common Crane, *Grus grus*) and could be trained to detect bitterns and other nocturnal species using thermal video footage (H. Skov pers. comm. 2024). Radar system with camera-tracking and automated shut-down has been implemented recently for an offshore wind energy project in Poland to avoid Common Crane collisions during migration. This technology can operate curtailments for bitterns provided the AI is trained with thermal videos and the system operates with a thermal camera coupled to the radar (H.Skov (DHI) pers.comm. 2024).

20. Other threatened waterbirds

Magpie Goose

The Magpie Goose *Anseranas semipalmata* is a large conspicuous black and white 'pied' goose found throughout Australia and southern Papua New Guinea. The species is found predominantly in northern Australia, at wetlands within 300 kilometres of the coast. The species was abundant across south-eastern Australia prior to European settlement, however, loss of habitat through draining of wetlands and hunting has caused a significant decline in their numbers and range since the early 1900's (Emison et al. 1987). The global population is estimated to be 3.5 to 5 million individuals; however, numbers fluctuate significantly among years (average NT population estimated to be 1.7 million individuals, but has ranged from 750,000 to 3 million (Corriveau et al. 2022)).

The species forms small family groups with a dominant male and female, auxiliary males and females, and offspring of their last breeding episode. Pairs form lifelong bonds, although if either partner dies it is quickly replaced. Outside the breeding season family groups often congregate to form flocks of up to 50,000 birds.

Nests are constructed using tall emergent vegetation within deep water, with large areas of aquatic grasses as a food source for adults and chicks. Outside the breeding season family groups roost in tree canopies, or as large flocks on bare-earth plains (Marchant & Higgins 1990).

The species feeds primarily on a range of grass seeds during the wet season, and sedge rhizomes in the dry season, as well as grazing on tender leaves and shoots, and filter feeding on material suspended in the water (Marchant & Higgins 1990). Movements of the species are largely driven by the availability of food and water. Banding studies have shown that most movements are local, with individuals rarely moving further than 100 kilometres, and no movements over 500 kilometres recorded (Marchant & Higgins 1990).

Biosis recorded one Magpie Goose within the investigation area opportunistically in October 2020, within coastal habitat of the Discovery Bay Coastal Park (Figure 20a). Thirteen VBA records occur within the study area and include observations of between one and seven individuals. Mapped records indicate that three significant habitat areas are present within the region:

- Piccaninnie Ponds in South Australia, approx. 13 kilometres west of the Project Area (181 records, including individuals and small groups, and occasional flocks of up to 768 birds).
- Yambuk west, approx. 58 kilometres south-east of the Project Area (32 records, including individuals and small groups, and occasional flocks of up to 840 birds). No flock of over 200 birds has been recorded at this site since 2006.
- A complex of coastal wetlands surrounding Warrnambool, approx. 80 kilometres south-west of the Project Area, including Tower Hill Wildlife Reserve, Killarney Beach, and Levys Point Coastal Reserve (337 records, including individuals and small groups, and occasional flocks estimated to contain up to 1,000 birds).

Movements are likely to occur between these wetlands, with small family groups and flocks occasionally flying over the project area. Flocks of over 100 birds at these three habitat areas have been recorded throughout the year, although their frequency at the Yambuk and Warrnambool sites has dropped markedly since 2007.

Australian Painted Snipe

Australian Painted Snipe *Rostratula australis* is listed as endangered under the EPBC Act and as critically endangered under the FFG Act. The species is endemic to Australia where it is recorded in all mainland states, with most records from eastern Australia in the Murray-Darling Basin. It inhabits terrestrial shallow fresh or brackish water with muddy margins and low patch vegetation (Marchant & Higgins 1993, DSEWPC 2013). The Australian Painted Snipe is cryptic and rarely recorded as it is primarily active at night when it forages by probing soft mud in the cover of wetland vegetation. The species is often observed in small flocks, sometimes comprised of birds of a single sex. Diet consists of a range of vegetation, seed, insects, worms, molluscs and vegetation (Marchant & Higgins 1993, DSEWPC 2013).

Lewin's Rail

Lewin's Rail *Lewinia pectoralis* is listed as vulnerable under the FFG Act. It inhabits densely vegetated wetland habitats, including saline and freshwater wetlands, farm dams, saltmarshes, mangroves and tidal creeks with dense riparian vegetation. Additionally, the species occurs in coastal lagoons, saltmarsh and, permanent and seasonally inundated wetlands, and saline and freshwater habitats (Marchant & Higgins 1993, Schmidt, Quin, & Steele 2018), which are all present within the Investigation Area. The species is found throughout coastal areas of New Guinea and south and east Australia. Movements are largely unknown as the species is cryptic and wary of human interaction, with individuals usually seen singly or in pairs with chicks (Marchant & Higgins 1993). The species may be partially migratory, although some apparently resident as populations have been observed at some sites all year. Lewin's Rail likely moves between wetland habitats as their suitability changes and there appear to be a paucity of wetlands meeting the species' habitat requirements all the time (Schmidt, Quin, & Steele 2018). Their numbers fluctuate at some sites and at others they are only recorded in the summer, suggesting the species undertakes seasonal movements in and out of suitable habitats in some parts of the species' range (Marchant & Higgins 1993). The species is crepuscular, sometimes diurnal and primarily ground-dwelling and flights are rarely observed. Lewin's Rail forages solitarily in soft mud and shallow water (<5 cm) at the edge of wetlands, usually remaining close to, or in, dense vegetation (Marchant & Higgins 1993). The species is most likely to occur in wetlands with dense vegetation up to 20 centimetres in height with abundant shrub cover (Schmidt, Quin, & Steele 2018). Lewin's Rail diet consists of a variety of molluscs, earthworms, insects, crustaceans and occasionally frogs and bird eggs (Marchant & Higgins 1993).

Australian Little Bittern

Australian Little Bittern *Ixobrychus dubius* is listed as endangered under the FFG Act. It is Australia's smallest heron, occurring in south-eastern and south-western Australia. Although a small number of birds are regularly recorded in a number of coastal wetlands in northern Australia. The species occupies a broad distributional range and is typically observed in freshwater or saline habitats that contain its preferred habitat of dense emergent vegetation (e.g. rushes, reeds, sedges or shrub thickets >1.5m high) inundated by at least 30 cm of water. Australian Little Bittern mainly feeds upon aquatic invertebrates such as crustaceans and dragon fly larvae. However, small vertebrates such as fish and frogs are often hunted by methods of active stalking. Little is known about the species' flight behaviors or migration movements. However, the absence of records in southern Australia during autumn and winter suggest at least part of the population makes long-distance seasonal migrations, with records of the species having also been recorded in northern Australia, New Guinea and New Caledonia during over-wintering months.

20.1 Methods

Desktop database searches were used to assess the occurrence of the other threatened waterbirds within the Investigation Area, and the Project's potential impact on the species. These species are unlikely to have been detected in the surveys undertaken for other threatened species, due to their cryptic nature and low frequency of occurrence. Call playback was undertaken for Lewin's Rail during the Australasian Bittern surveys in suitable habitats.

20.2 Existing conditions

Records of Australian Painted Snipe in remote locations indicates this species is capable of traveling long distances. The species' distribution appears to change depending on seasonal rainfall and local flooding. There are two records of Australian Painted Snipe where it has been observed in wetland environments near Portland (Figure 20a). This species is widespread and cryptic and may occasionally fly over the site or occur in wetlands adjacent to the southern boundary of the Project Area. It is unlikely to be present frequently or in large numbers. Increased sightings post-flooding periods suggests dispersal from important breeding areas. Breeding records in Victoria are from northern Victoria dating pre1980s, and also include one record from the Western Treatment Plant from 1978. Historical and current knowledge on the species' occurrence in Victoria indicates it is rare and few in numbers when present. There are three recent records of Australian Painted Snipe in Victoria from 2023 – three individuals at Maldon, one at Horsham and one at Port Fairy.

Fifty records of Lewin's Rail occur within 10 kilometre of the Project Area (Figure 20a). The majority of these records are concentrated to wetland areas surrounding Nelson and Portland, which provide suitable cover and foraging habitat. The species was not recorded during surveys undertaken by Biosis in 2020. However, Lewin's Rail is considered a moderately common and widespread resident and cryptic bird (Farnes 2019), and may occasionally utilise suitable wetlands in the Investigation Area, particularly those surrounding the densely vegetated wetland habitats within the southern boundary of the proposed wind farm site, where the site borders suitable wetland habitats of the Discovery Bay Coastal Park. The species may move between heathlands near and around wetlands, and the Kentbruck Heath where likely suitable habitat also exists. It may also move between other suitable wetland habitats where it has been recorded in the Investigation Area, and the wider Portland–Nelson region.

Records of Lewin's Rail in the vicinity of the Project Area are from coastal swamps, reed beds and wet heaths at Glenelg River Estuary, Long Swamp, Lower Glenelg National Park, Fawthrop Lagoon, Surrey River. The species has also been recorded breeding in Fawthrop Lagoon in Portland. BirdData has four records that describe 'Non-specific breeding activity':

- 1 November 1999
- 31 December 2000
- 19 January 2001
- 15 November 1998

The VBA additionally has a breeding record dated 12 January 1978 from Long Swamp, between Johnsons Road and Nobles Rocks.

Three historical records (1949) of the Australian Little Bittern have been recorded within 10 kilometres of the Project Area, which include a wetland to the west and the Glenelg River to the north. Australian Little Bittern was not recorded during surveys undertaken by Biosis in 2020 and is very unlikely to occur regularly or in large numbers within the Project Area. However, it is noted that Australian Little Bittern is a cryptic species, and may potentially fly within the boundary of the proposed wind farm site, in order to reach suitable habitat surrounding the site and when undertaking seasonal migration movements.

20.3 Impact assessment

Construction and operation of the KGPH has potential to impact upon threatened waterbirds via several mechanisms:

- Direct removal of habitat for construction of temporary and permanent infrastructure, such as turbines, hard stands and access roads.
- Direct mortality due to collisions with turbines or transmission lines.
- Displacement of breeding or foraging activity due to disturbance caused by construction and operation of wind farm infrastructure.
- Indirect disturbance to wetland habitat may also occur as a result of changes to hydrological regimes, sedimentation, erosion and pollution.
- Disturbance to riparian vegetation and other vegetation surrounding wetlands that provides a protective buffer.

20.3.1 Wind farm

The Project will not involve removal of habitat for any of these threatened waterbirds. None of these species are likely to routinely fly at rotor swept height and they spend the majority of their time within densely vegetated habitats where they can safely forage and roost. Occasional dispersal or seasonal movements may occur for all four species and these may be at a height where there is a risk of turbine collisions but the location of the project largely within pine plantations that are not suitable habitat for them, and its configuration relative to appropriate habitat, suggests that any such flights are unlikely to pass through the proposed wind farm. Australian crake species have been recorded as transmission line collision mortalities in south-west Victoria (Goldstraw, P.W. & Du Guesclin, P.B. 1991) and 18 individual Corn Crakes *Crex crex* in Europe have been reported as wind farm collision mortalities (der Vogelschutzwarten 2014) suggesting some level of collision risk from wind farm infrastructure exists for crakes and rails more generally. Australian Painted Snipe may occasionally be present in wetlands surrounding the Project. Given current knowledge of the species, it is rare in the area and is likely to occur in small numbers or as single individuals when present. The risk of collision and impact to the species is considered to be very low due to these factors.

There is low potential for the species to collide with overhead sections of the transmission line within the wind farm site due to their cryptic life history and reliance on densely vegetated wetland habitats. Goldstraw and du Guesclin (1991) recorded crake mortalities under 73 metre 500 kV transmission lines in south-west Victoria (Spotless Crake *Porzana tabuensis* and Baillon's Crake *P. pusilla*), Lewin's Rail has been recorded to strike a window (Marchant & Higgins 1993) indicating collision risk from infrastructure exists for these species. Marking of overhead electricity wires has been shown to have a significant positive effect in reducing bird collisions (Bernardino et al. 2019). A substantial investigation by Gális and Ševčík (2019) that included egrets and storks, with similar morphology and ecology to bitterns, demonstrated a 93.5% reduction in collision fatalities.

20.3.2 Transmission line

The entire external length of the transmission line is proposed to be underground. There is no mechanism by which the underground transmission line could have an impact on these species.

20.3.3 Potential for direct impacts

It is possible that some collisions with project turbines and the internal overhead transmission line could occur for all four species considered in this section (Magpie Goose, Australian Painted Snipe, Lewin's Rail and Australian Little Bittern), but this is considered to be very infrequent and if it occurs, is likely to affect a very small number of individuals, with no significant population impacts on these species.

20.3.4 Potential for indirect impacts

The Project design does not include mechanisms or impact pathways whereby indirect effects on these species are plausible. Populations of these species are considered unlikely to be impacted indirectly by the Project.

20.3.5 Conclusion

These four threatened waterbird species (Magpie Goose, Australian Painted Snipe, Lewin's Rail and Australian Little Bittern) are either known to or have potential to occur within the Investigation Area, however if present, they are likely to be in very small numbers. Flight heights of these species are generally poorly known, although there is potential for occasional flights within rotor-swept area (above 60m), particularly when undertaking long distance movements. Quantitative modelling of collision risk was not possible for these species, due to the lack of flight observations, however it is assumed that there may be some level of collision risk.

It is recommended that line marker devices be applied to wires of the overhead powerline within the site and that these should be devices that demonstrably function in low light levels. A number of tested devices are commercially available on the Australian market. Manufacturer's recommendations should be followed with regard to positioning of devices on lines. Collisions with turbines or powerlines is assessed as unlikely to result in population level impacts, due to the rarity of these species near the Project Area.

21. Shorebirds, gulls and terns

All species of listed threatened and migratory waders, terns and gulls were included under this component of the targeted surveys (Appendix 3.2; Figure 21a-h). Species that are international migrants and that are year-round residents in Australia are included here. Red-capped Plover is not a threatened species, however it is included as it is a species that forms part of the ecological character description of the Glenelg Estuary and Discovery Bay Ramsar Site. A number of listed threatened and migratory waders, terns and gulls have been recorded within 10 kilometres of the Project Area (Appendix 3 Table A3.2).

21.1 Methods

The *EPBC Act Policy Statement 3.21 Industry guidelines for avoiding assessing and mitigating impacts on EPBC Act listed migratory shorebirds species* (DoEE 2017) (shorebird survey guidelines herein) provides the basis for surveys for these species. It is noted that the guideline requirements for surveys to determine whether sites constitute 'important habitat' for migratory species are generally not applicable because the sites in question are already considered important and that has led to designation of the Glenelg Estuary and Discovery Bay Ramsar site.

The main shorebird survey locations for the field surveys were selected based on the designation of this important habitat and Ramsar sites, database records and access — Glenelg River Estuary and accessible non-tidal areas within Discovery Bay Coastal Park. The latter have been identified to include the whole or portions of Swan Lake, Dead Horse Swamp, The Sheepwash, and Lake Mombeong and associated wetlands. In addition to the field surveys it is noted that 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.

The sites included (Figure 21a; numbers in brackets refer to the site number in figure):

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

Targeted surveys for migratory and threatened birds were undertaken at these locations in January, February, June, October, November and December 2020 and in January 2021. Surveys were used to determine the species occurring in proximity to the proposed wind farm site and the locations of key resources such as high productivity foraging areas and roost locations.

The recommendations in the shorebird survey guidelines (DoEE 2017) for survey effort to identify important habitat were followed (see also Table 21):

- Four surveys for roosting shorebirds at a time of the year when majority of shorebirds are present.
  - February 2020.
  - November 2020.
  - December 2020.
  - January 2021 (Nobles Rocks only).
- Replicate surveys, with one survey in December, two surveys in January, and one survey in February is considered adequate.
  - December 2020.
  - January 2020; January 2021.
  - February 2020.
- Four surveys for foraging shorebirds, including two surveys at spring low tide and two surveys at neap low tide.
  - January 2020 neap low tide; November 2020 neap low tide.
  - February 2020 spring low tide; December 2020 spring low tide.
- One survey during the northern hemisphere breeding season to record over-wintering shorebirds, and the Double-banded Plover *Charadrius bicinctus* (March to August).
  - July 2020.

The survey of mapped and accessible wetlands south of the Project Area boundary was undertaken to understand the habitat potential of lakes, swamps and interdunal wetland habitat to migratory shorebirds and their potential suitability particularly as high tide roosting and foraging habitat. These high tide and low tide surveys focused on recording presence and numbers to understand whether potential movement occurred between the shoreline, inland and interdunal wetlands. To further understand the potential high to low tide movements, shorebirds were counted on the same day in repeat surveys as detailed below (see also Table 21):

February 2020

- All sites except Nobles Rocks shoreline and shoreline near Swan Lake.

July 2020

- Nobles Rocks shoreline; Swan Lake shoreline.

November 2020

- All sites except Glenelg Estuary.

December 2020

- All sites.

January 2021

- Nobles Rocks shoreline.

Shoreline and estuary high tide and low tide surveys within the same survey period were conducted at:

- Glenelg Estuary
  - 28 February 2020 (spring tide).
  - 3 December 2020 (spring tide).
- Swan Lake shoreline
  - 22 July 2020 (spring tide).
  - 24 November 2020 (neap tide).
  - 3 December 2020 (spring tide).
- Nobles Rocks shoreline
  - 22 July 2020 (spring tide).
  - 24 November 2020 (neap tide).
  - 3 December 2020 (spring tide).

The January 2020 survey period allowed for only one low tide survey within a 24-hour period over two days, which were undertaken at two locations – Swan Lake shoreline and the Glenelg River estuary (including ocean-side shoreline). Nobles Rocks shoreline was added to the survey schedule in February 2020. The ocean-side shoreline at Glenelg Estuary was only surveyed in January and February 2020, due to tide and water levels preventing access at other times. During the January 2021 survey only Nobles Rocks was surveyed at both low and high tide, and Swan Lake shoreline and the Glenelg River estuary at low tide only. During the survey the Glenelg River estuary had numerous people using it over the public holiday weekend, which would have caused disturbance to birds using the estuary. Biosis conducted four low tide surveys for roosting shorebirds, three of these were at a time of the year when majority of shorebirds are present (with the exception of Nobles Rocks, see Table 21). All of these sites are already known to provide important shorebird habitat.

Regardless of the limitations, sufficient amount of information has been gathered to undertake an informed impact assessment based on the existing body of data and knowledge from:

- BirdLife and VBA and additional information gathered from BirdMark (Deakin University 2022).
- Biosis shorebird field surveys in 2020 and 2021.
- Discussions with relevant people from the Glenelg Hopkins Catchment Management Authority, Australasian Wader Studies Group and Victorian Wader Studies Group on the Sanderling project (within Discovery Bay Coastal Park and South Australia).
- Discussions with BirdLife Shorebird Migratory Shorebird Program Manager.
- Existing published knowledge more generally on shorebird migratory and pre-departure behaviour and flight heights.

Table 21 Summary of shorebird surveys undertaken for the Kentbruck Green Power Hub

Month (Spring/Neap tide)	Date	Location	High tide (roosting)	Low tide (foraging)
January (Spring)	**21/1/2020**	Swan Lake Shoreline near Swan Lake	No No	Yes Yes
	23/1/2020	Cain Hut Swamp The Sheepwash Lake Mombeong Unnamed small wetland east of Lake Mombeong Glenelg Estuary	No No No No No	Yes Yes Yes Yes Yes
February (Spring)	**26/2/2020**	Swan Lake Shoreline near Swan Lake	Yes Yes	Yes No
	27/2/2020	Nobles Rocks shoreline Lake Mombeong Unnamed small wetland east of Lake Mombeong Cain Hut Swamp The Sheepwash	Yes Yes Yes Yes Yes	No Yes Yes Yes Yes
	28/2/2020	Glenelg Estuary	Yes	Yes
July (Spring)	**22/7/2020**	Nobles Rocks shoreline Shoreline near Swan Lake Swan Lake Lake Mombeong Unnamed small wetland east of Lake Mombeong Unnamed wetland south of Lake Mombeong	Yes Yes Yes Yes Yes Yes	Yes Yes No No No No
	23/7/2020	Glenelg Estuary	Yes	No
November (Neap)	**24/11/2020**	Swan Lake Shoreline near Swan Lake	Yes Yes	Yes Yes
	25/11/2020	Nobles Rocks shoreline Cain Flat Swamp The Sheepwash Lake Mombeong Unnamed small wetland east of Lake Mombeong	Yes Yes Yes Yes Yes	Yes Yes Yes Yes Yes
	26/11/2020	Glenelg Estuary	Yes	No
December (Spring)	**2/12/2020**	Swan Lake Shoreline near Swan Lake Cain Flat Swamp The Sheepwash Lake Mombeong	Yes Yes Yes Yes Yes	Yes Yes Yes Yes Yes
	3/12/2020	Nobles Rocks shoreline	Yes	Yes
		Glenelg Estuary	Yes	Yes

Month (Spring/Neap tide)	Date	Location	High tide (roosting)	Low tide (foraging)
January (Neap)	**22/1/2021**	Nobles Rocks Cain Flat Swamp The Sheepwash Unnamed small wetland east of Lake Mombeong Lake Mombeong	Yes No No No No	Yes Yes Yes Yes Yes
	23/1/2021	Shoreline near Swan Lake	No	Yes
	24/1/2021	Swan Lake Glenelg Estuary	No No	Yes Yes

Biosis sought additional information on shorebird habitat use and movements was from BirdLife Australia (Dr Stefan Klose), Glenelg Hopkins Catchment Management Authority (Gavin Prentice), Victorian Wader Study Group and Australasian Wader Studies Group (Roz Jessop, Professor Marcel Klaassen), Dr Dan Lees (BirdLife Australia). The additional information particularly focuses on the Sanderling, as the Glenelg Estuary and Discovery Bay Ramsar Site is of international significance for this species. We also investigated flag re-sighting data in the BirdMark database to understand movement distances within coastal and between coastal and inland habitats, for:

- Sanderling with individually engraved colour leg flags (coastal only).
- Red-necked Stint plain colour leg flag (coastal and inland records).
- Sharp-tailed Sandpiper *Calidris acuminata* (coastal and inland records).
- Bar-tailed Godwit *Limosa lapponica* (coastal records).

21.2 Existing conditions

A number of 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 (Figure 21a-h). A great body of knowledge exists on the shorebird numbers, important and frequently used habitat, roosting, feeding and nesting locations (Birdlife Australia 2021b, Birdlife Australia 2022, Deakin University 2022, BirdLife Australia 2023). Surveys have included long stretches of the Discovery Bay Coastal Park shoreline. BirdLife has indicated there is no detailed information or analyses of shorebird movements within the Discovery Bay National Park and the Glenelg River Estuary and the best data source to understand movements in the area is the Australasian Wader Studies Group and Victorian Wader Study Group colour banding and flagging database in BirdMark (Dr Stefan Klose pers. comm.). We have incorporated information contained in these databases, reports, as well as from discussions with a number of people involved in the Sanderling tracking project coordinated by the Glenelg Hopkins Catchment Management Authority.

Limited suitable habitat for most migratory shorebirds, apart from the Long Swamp, Discovery Bay National Park coastline and Glenelg River estuary, exists within the dunes and elsewhere within the 10 kilometre search area. Shorebird habitat within the Investigation Area is confined to a few locations to the south of the southern boundary of the wind farm.

Many of these wetlands are inaccessible for on-ground surveying, due to extensive areas of dense inundated shrubby vegetation around the margins of the wetlands. Cain Hut Swamp, Lake Sheepwash, Lake Mombeong, Swan Lake and unnamed wetlands, accessible for surveying, have limited shorebird habitat, with short sections of unexposed sandy shores, which could be suitable for roosting and may occasionally be used for foraging by shorebirds. Swan Lake is considered to have the highest likelihood of supporting some species, most likely Red-necked Stint, Sharp-tailed Sandpiper and Curlew Sandpiper and possibly Common Greenshank *Tringa nebularia*, Marsh Sandpiper *Tringa stagnatilis* and Latham's Snipe.

Latham's Snipe may also occur in a number of the inland and interdunal wetlands. No shorebird species were recorded at any of these wetlands surveyed.

A small number of wetlands within the Kentbruck Heath, Lower Glenelg National Park, and Kentbruck H50 Bushland Reserve were visited to assess potential suitability of wetlands for shorebirds in these areas. The visited wetlands had steep edges, against dense heathy vegetation and are unlikely to provide regular habitat for shorebird species, though some species may occasionally occur when the water levels recede substantially (Appendix 4, Plate 25, Plate 26, Plate 27).

The maximum counts from the Project surveys was lower for most species compared with other sources. The impact assessment has used all data, including data from Biosis field surveys and Shorebird2020, BirdLife BirdData and the VBA.

21.2.1 Shorebirds – migratory and listed waders

The majority of the roosting and foraging shorebirds recorded during the targeted surveys were observed at the Glenelg River estuary (Table 22, Figure 21a; maximum count included below), near the river mouth, including:

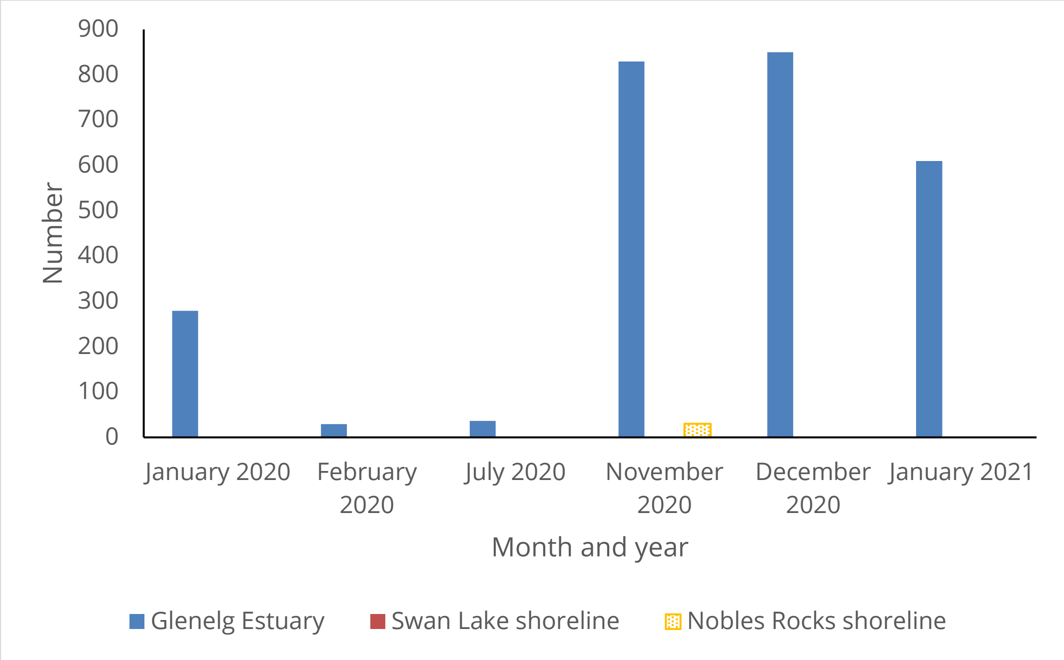
Migratory

- Red-necked Stint (850).
- Sanderling (630).
- Sharp-tailed Sandpiper (50).
- Double-banded Plover (30).
- Bar-tailed Godwit (4).
- Curlew Sandpiper (2).
- Common Greenshank (1).

Non-migratory

- Red-capped Plover (48).

Red-necked Stints were the most numerous migratory shorebird species at the Glenelg River estuary, with highest numbers recorded in November 2020 (829), December 2020 (850) and January 2021 (610) (Table 22, Graph 1).



Graph 1 Maximum counts of Red-necked Stint recorded during Biosis 2020/2021 shorebird surveys at the Glenelg River estuary, Swan Lake shoreline and Nobles Rocks shoreline. No Red-necked Stints were recorded at Swan Lake shoreline during the surveys.

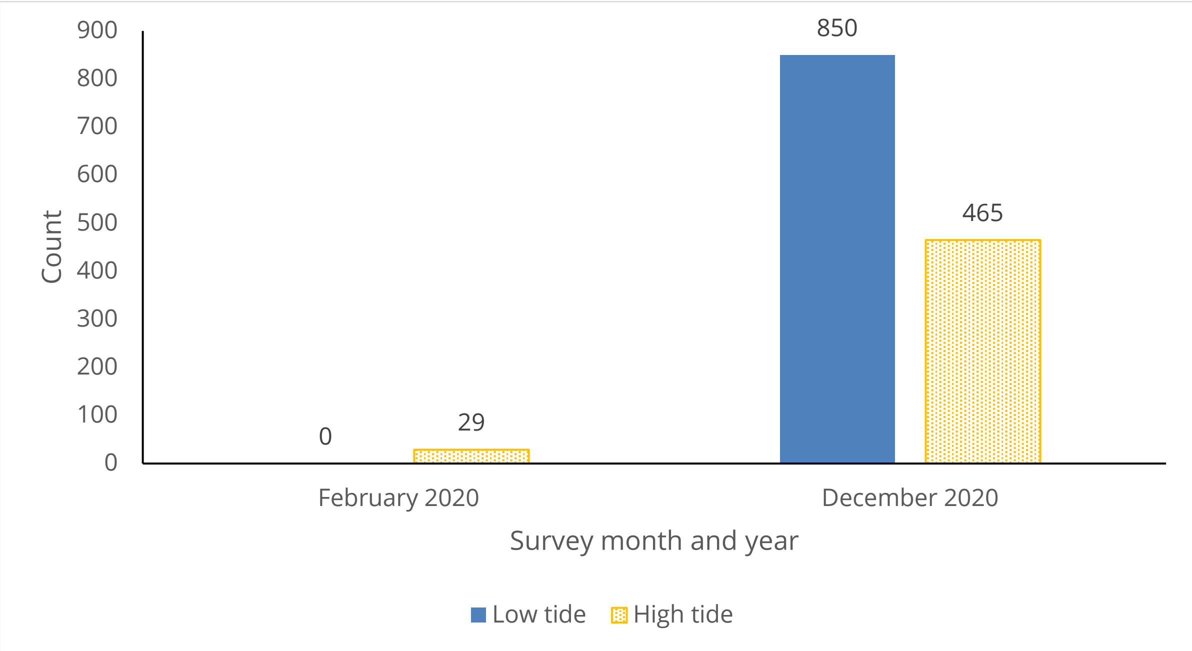
Shoreline and estuary high tide and low tide surveys within the same survey period were conducted at:

- Glenelg Estuary
  - 28 February 2020 (spring tide).
  - 3 December 2020 (spring tide).
- Swan Lake shoreline
  - 22 July 2020 (spring tide).
  - 24 November 2020 (neap tide).
  - 3 December 2020 (spring tide).
- Nobles Rocks shoreline
  - 22 July 2020 (spring tide).
  - 24 November 2020 (neap tide).
  - 3 December 2020 (spring tide).

In February 2020 no shorebirds were observed during the survey time at the Glenelg River estuary, at low or high tide. The survey team subsequently visited the Piccaninny Ponds Conservation Park in South Australia to determine whether any flocks may have moved there from the Glenelg River estuary. No shorebird species were recorded, however on return to the Glenelg River estuary, 29 Red-necked Stints were recorded (Table 22, Graph 1). In December 2020 almost less than half the number of Red-necked Stints were counted at high tide (465), compared with low tide (850) (Table 22, Graph 2). These observations indicate that movement in and out of the estuary occurs between high and low tides, and that some flocks move away from the estuary mouth on a rising to high tide. Surveys could not establish where the Red-necked Stints moved to, however there may be other suitable habitat further north within the estuary or inland lakes near the estuary, which the species could be using.

Based on discussions with Gavin Prentice (Glenelg Hopkins Catchment Management Authority) a high tide roost supporting Red-necked Stint and Sanderling is located on the western side of the Glenelg Estuary mouth, where a beach berm on the ocean side provides suitable roosting habitat. The river morphology along the Glenelg River inland of the estuary is steeper and not considered likely to support shorebirds or their habitat. Therefore, the changes in low tide and high tide numbers recorded in the Biosis surveys are most likely due to movements from within the estuary (e.g. the middle sandbank) and the high tide roost on the western side of the estuary.

The Victorian Wader Study Group (VWSG) has also observed Sanderling, Red-necked Stint and Red-capped Plover on a sandbar just inside the Glenelg estuary mouth and Sanderling on the western side of the river mouth (AWSG 2022). Their observations also indicate that shorebirds use multiple locations and are not routinely using just a single location (AWSG 2022). Sanderling and Red-necked Stint moved between high tide roosts on sandy islands at the Glenelg estuary mouth to the north-western shoreline for feeding within a small bay (AWSG 2022). A large feeding flock of Sanderling was also present between the Glenelg estuary mouth and Nobles Rocks in November 2021 indicating that Sanderling uses a wide area within the Ramsar site for foraging and roosting and will move throughout these coastal habitats.



Graph 2 Red-necked Stint high tide and low tide count

Numbers of other species recorded were too low to infer potential movements. A single Bar-tailed Godwit was recorded at high and low tide, and 11 Sharp-tailed Sandpipers were recorded at high tide and nine at low tide during the November 2020 surveys.

BirdMark plain colour flag sightings for Red-necked Stint and Sharp-tailed Sandpiper are from various locations between Port Fairy, Portland, Warrnambool, Discovery Bay Coastal Park, Glenelg estuary

(Victoria) and Port MacDonnell, Kingston, St Kilda, Lake Alexandrina, Coorong National Park and various other locations in South Australia, demonstrating these species can occur at a number of coastal and wetland habitats in the broader area and suggests they may move between suitable habitats. The closest records of Bar-tailed Godwits captured and marked in Victoria to the Project Area are from Geelong, the Werribee Western Treatment Plant (Victoria) and St Vincent Gulf (South Australia). It should be noted that most re-sightings are from coastal areas, where bird observers generally search for, and report sightings from. Farnes (2019) reports some shorebird species using coastal swamps in the broader Portland-Nelson region – these include the Sharp-tailed Sandpiper and Red-necked Stint, with Sharp-tailed Sandpiper often seen in inland swamps. There are only a few records of Red-necked Stint that exists from inland swamps and Curlew Sandpiper is rarely recorded in this habitat. These sightings indicate some movements of these species occurs between the coastal shores, swamps and inland wetlands. Geolocator studies on small shorebird species appear to show migratory paths in the vicinity of the Project Area (Lisovski et al. 2016, 2020).

Sanderlings were the next most numerous species recorded during the shorebird surveys and large flocks were observed in two survey periods. A flock of 115 overwintering Sanderlings was recorded foraging on the ocean shoreline near Swan Lake at high and low tide in July 2020, and 630 individuals were recorded at the Nobles Rocks shoreline at low tide in November 2020 (Table 22). Flocks of this species are likely to move along the shoreline to roost and forage, and also use the Glenelg River estuary, as evidenced by our observation of six individuals there in January 2020 and BirdLife Shorebird 2020 data.

At Nobles Rocks, species recorded were:

- Sanderling.
- Red-necked Stint.

The following species were recorded at the ocean-side shoreline near Swan Lake:

- Sanderling.
- Double-banded Plover.

The sections shoreline surveyed near Nobles Rocks and Swan Lake have limited suitable intertidal foraging habitat for the majority of migratory waders. The shoreline consists of a long sandy stretch of exposed ocean beach, which is suitable foraging habitat for species such as Sanderling, Red-necked Stints and plovers. During the Biosis surveys, a section of suitable high tide roosting habitat was found on the shoreline of Swan Lake, within one kilometre of the ocean beach. Other species may use this high tide roost occasionally, however this is considered to be a rare event involving small numbers of individuals.

No shorebirds were recorded in inland or interdunal wetlands, apart from a Latham's Snipe within a Blue Gum plantation in the north-east section of the Project Area as identified in (Figure 21e-f). We didn't record any regular migratory shorebird movements between the open ocean shoreline and inland or interdunal wetlands.

The VBA has a record of a Red-necked Stint, Red Knot, Sanderling, Broad-billed Sandpiper *Limicola falcinellus*, Oriental Plover *Charadrius veredus*, Latham's Snipe and Ruddy Turnstone *Arenaria interpres* from Malseeds Lake near Swan Lake. These records are from the late 1970s to 1980, with one record of Sanderling and Red-necked Stint from 2006. It is not clear if these are precise locations, and we consider it unlikely that the lake would now provide suitable habitat to regularly support migratory waders although they could occasionally use it when suitable habitat is present. The lake is surrounded by dense vegetation and aerial photography suggests it has deep sections and shallow sections with dense emergent and/or floating aquatic vegetation. The northern and eastern parts of the lake appear to at times have exposed shoreline that could provide some habitat to shorebirds when the water levels are low.

Table 22 Summary of migratory shorebirds recorded during Project shorebird surveys

Month	Species	Date	Time (start)	Tide	Location	Count
January 2020	Bar-tailed Godwit	23/01/2020	15:43	Low	Glenelg Estuary	9
	Common Greenshank	23/01/2020	15:43	Low	Glenelg Estuary	1
	Curlew Sandpiper	23/01/2020	15:43	Low	Glenelg Estuary	2
	Red-necked Stint	23/01/2020	15:43	Low	Glenelg Estuary	279
	Sanderling	23/01/2020	15:43	Low	Glenelg Estuary	6
	Sharp-tailed Sandpiper	23/01/2021	15:43	Low	Glenelg Estuary	50
February 2020	Red-necked Stint	28/02/2020	17:30	High	Glenelg Estuary	29
July 2020	Bar-tailed Godwit	22/07/2020	12:38	High	Glenelg Estuary	4
	Double-banded Plover	22/07/2020	12:38	High	Glenelg Estuary	53
	Red-necked Stint	22/07/2020	12:38	High	Glenelg Estuary	36
	Double-banded Plover	22/07/2020	13:50	High	Swan Lake shoreline	1
	Sanderling	22/07/2020	13:50	High	Swan Lake shoreline	115
November 2020	Red-necked Stint	25/11/2020	17:17	Low	Nobles Rocks shoreline	30
	Sanderling	25/11/2020	17:17	Low	Nobles Rocks shoreline	630
	Red-necked Stint	26/11/2020	10:00	High	Glenelg Estuary	829
	Sharp-tailed Sandpiper	26/11/2020	10:00	High	Glenelg Estuary	12
December 2020	Bar-tailed Godwit	3/12/2020	13:55	High	Glenelg Estuary	1
	Bar-tailed Godwit	3/12/2020	19:41	Low	Glenelg Estuary	1
	Red-necked Stint	3/12/2020	13:55	High	Glenelg Estuary	465
	Red-necked Stint	3/12/2020	19:41	Low	Glenelg Estuary	850
	Sharp-tailed Sandpiper	3/12/2020	13:55	High	Glenelg Estuary	11
	Sharp-tailed Sandpiper	3/12/2020	19:41	Low	Glenelg Estuary	9
	Sanderling	3/12/2020	17:20	Low	Nobles Rocks shoreline	1
January 2021	Red-necked Stint	24/01/2021	-	Low	Glenelg Estuary	610
	Sharp-tailed Sandpiper	24/01/2021	-	Low	Glenelg Estuary	11

The BirdLife Shorebird 2020 and VBA data show similar patterns and numbers of shorebird species at the Glenelg River estuary, Nobles Rocks and Swan Lake foreshores (Table 22). Both databases contain additional species to those recorded in the Biosis surveys, due to the databases containing long-term data from these locations. Uncommon species are less likely to be detected during short term surveys, however this is very unlikely to affect the overall impact assessment as these species are likely to be present less frequently and in smaller numbers, and as additional information on these species is available from the BirdLife Shorebird 2020 count data.

In summary, the greatest diversity and highest abundance of migratory shorebird species has been recorded within the Glenelg River estuary, with maximum counts listed below. The majority of these counts are from the Shorebird 2020 database, as most of the records in the VBA only record the species as present, without a count of individuals.

Most frequently and commonly recorded species at Glenelg River Estuary:

- Bar-tailed Godwit: 24 in October.
- Common Greenshank: 20 in January.
- Curlew Sandpiper: 3 in February (BirdLife), 24 in June (VBA).
- Double-banded Plover: 100 in August.
- Red-necked Stint: 1,000 in December.
- Sanderling: 1,200 in January.
- Sharp-tailed Sandpiper: 158 in January

Rarely recorded species at the Glenelg River estuary:

- Black-tailed Godwit *Limosa limosa*: 1 in October (the only record for this species).
- Common Sandpiper: 3 in February
- Great Knot *Calidris tenuirostris*: 12 in December.
- Grey Plover *Pluvialis squatarola*: 5 in December.
- Marsh Sandpiper: 1 in November.
- Pacific Golden Plover *Pluvialis fulva*: 1 in January.
- Pectoral Sandpiper *Calidris melanotos*: 1 in January.
- Red Knot: 10 in December.
- Terek Sandpiper *Xenus cinereus*: 1 in January.

Lower diversity of species and numbers of individuals has been previously recorded elsewhere within the 10 kilometre search area, with the exception of the Sanderling and Double-banded Plover, which have been recorded in similar numbers along the Discovery Bay Coastal Park shoreline and the Glenelg River Estuary.

Species and maximum numbers recorded near Nobles Rocks foreshore (and from Nobles Rocks to the Glenelg River Estuary), Discovery Bay Coastal Park:

- Double-banded Plover: 95 in July.
- Red-necked Stint: 200 in January and February.
- Ruddy Turnstone: 1 in September.
- Sanderling: 1,000 in January.
- Common Greenshank: present, no count.

- Common Sandpiper: present, no count.
- Curlew Sandpiper: present, no count.
- Eastern Curlew: present, no count.

Species and maximum numbers recorded near Swan Lake foreshore (and from Swan Lake to Nobles Rocks), Discovery Bay Coastal Park:

- Double-banded Plover: 58 in June.
- Red-necked Stint: 177 in June.
- Sanderling: 1,000 in January.
- Broad-billed Sandpiper: 1 in October.
- Common Greenshank: present, no count.
- Common Sandpiper: present, no count.
- Eastern Curlew: present, no count.

Sanderling

The Glenelg Estuary and Discovery Bay Ramsar Site is the fourth most important Australian non-breeding site for Sanderling (DEPI 2004, Watkins 1993). Sanderling is given some further consideration in this section due to the Ramsar Site's significance as non-breeding habitat for this species. Glenelg Hopkins Catchment Management Authority is coordinating a Sanderling Tracking Project, which began in 2020 and aims to characterise roosting and foraging habitat at Discovery Bay ((Glenelg Hopkins Catchment Management Authority 2023).

The Sanderling population of the East Asian-Australasian Flyway is estimated to be 30,000 (Hansen et al. 2022). The Glenelg Estuary and Discovery Bay Ramsar site supports 1.4% of this population and more recently in 2023 BirdLife recorded a flock of 5,000 (17% of the population) (Roz Jessop pers. comm.; Dan Lees pers. comm.). As part of identifying areas to capture Sanderling for the study, volunteers also recorded up to 1,500 at the Glenelg estuary mouth (November 2021) and 400 at Piccaninnie Ponds in South Australia (AWSG 2022). Flocks have also been recorded between Nobles Rocks and the Glenelg estuary mouth, beaches east of Port Fairy (Killarney Beach) and Yambuk (AWSG 2022). The largest flocks have been seen at the Swan Lake shoreline (>500), between Nobles Rocks and the Glenelg Estuary (>1000), at the Glenelg Estuary (>1200) and Piccaninnie Ponds (>1200) (Birdlife Australia 2021b). Sanderling numbers at different locations varies between years (Birdlife Australia 2022, Birdlife Australia 2021b).

In 2021, VWSG deployed 15 radio transmitters on Sanderlings at Nobles Rocks and Yambuk (AWSG 2022). Their habitat use and movements were studied along the coastal shoreline of the Discovery Bay area. Sanderlings tracked during this project have been recorded to move between Yambuk (Victoria) and Piccaninnie Ponds (some 120 kilometres) and up to the Coorong (about 400 kilometres). Three GPS transmitters fitted onto Sanderlings more recently have failed to provide data, and the project has plans to fit more GPS transmitters later in 2023 (AWSG committee meeting 17th February 2023).

The BirdMark database has some information on Sanderling movements based on engraved leg flag (ELF) sightings between capture and resighting locations. The species has been captured and fitted with ELFs at Brown Bay, Canunda National Park, Eumeralla River, Nora Creina Bay and Nene Valley and re-sightings have been recorded at Glenelg River Estuary, Livingstone Island Nature Walk Nelson, Discovery Bay Coastal Park and Yambuk Flora and Fauna Reserve, with distances between movements ranging from 14.5 kilometres to 162 kilometres.

21.2.2 Shorebirds – non-migratory and listed waders

Hooded plovers (listed as Vulnerable under the EPBC Act and FFG Act) were recorded at the Glenelg River Estuary, Nobles Rocks and Swan Lake shorelines (Figure 21b-f). The highest number recorded was eight individuals along the Swan Lake shoreline in July 2020. Hooded Plovers inhabit coastal beaches and are unlikely to fly over the Project Area.

21.2.3 Shorebirds – listed migratory terns and gulls

Listed migratory terns and gulls recorded during Project surveys included:

- Caspian Tern
- Common Tern *Sterna hirundo*
- Crested Tern *Thalasseus bergii*
- Fairy Tern (also listed as Vulnerable EPBC Act, Critically Endangered FFG Act)
- Little Tern (also listed as Critically Endangered FFG Act)
- Whiskered Tern *Chlidonias hybrida*
- Pacific Gull *Larus pacificus*.

The majority of these observations were from the Glenelg River estuary (Figure 21g). These species are mostly restricted to coastal and estuarine habitats and unlikely to fly over the Project Area, though some (e.g. Whiskered Tern) may also use inland or coastal wetlands.

21.2.4 Shorebirds – waders, gulls and terns not listed, non-migratory

Further to the listed and migratory species recorded during the Biosis surveys, the following species were observed (Figure 21h).

- Kelp Gull *Larus dominicanus*
- Pied Oystercatcher
- Silver Gull *Chroicocephalus novaehollandiae*
- Red-capped Plover
- Banded Lapwing *Vanellus tricolor*
- Masked Lapwing.

Kelp Gull and Pied Oystercatchers are restricted to coastal and estuarine habitats and unlikely to fly over the Project Area. Red-capped Plover may occasionally utilise suitable inland wetlands, and forage along exposed muddy banks. Masked Lapwing can utlise coastal, open grassy and cleared agricultural habitats and may occasionally fly over the Project Area.

Banded Lapwing is uncommon in south-western Victoria – it was recorded once during the Biosis surveys, south of Portland–Nelson Road. This species occurs in grasslands, agricultural areas and saline inland areas generally not associated with wetland or coastal areas, although may be found in proximity to water bodies (Marchant & Higgins 1993).

21.3 Impact assessment

Construction and operation of the KGPH has potential to impact upon shorebirds, gulls and terns via several mechanisms:

- Direct removal of habitat for construction of temporary and permanent infrastructure, such as turbines, hard stands and access roads.
- Direct mortality due to collisions with turbines or transmission lines.
- Displacement of breeding or foraging activity due to disturbance caused by construction and operation of wind farm infrastructure.

This section covers all species of waders, terns and gulls listed under provisions of the EPBC Act for international migratory species. A number of these species are also listed as threatened under the EPBC Act and the FFG Act. Some species included here are year-round residents in Australia that are listed as threatened.

A number of listed threatened and migratory waders, terns and gulls have been recorded within 10 kilometres of the Project Area and the *Ecological Character Description for Glenelg Estuary and Discovery Bay Ramsar Site* (DELWP 2017b) lists 43 taxa in the families Charadriidae, Haematopodidae, Laridae, Recurvirostridae and Scolopacidae that are known from the Ramsar site.

The shorebird survey guidelines (DoEE 2017) provides the basis for consideration of migratory wader species. It is noted that the guideline requirements for surveys to determine whether sites constitute 'important habitat' for migratory species are generally not applicable to most of the area adjacent to the wind farm site, because the sites in question are already considered important and that, in part, has led to their designation as the Glenelg Estuary and Discovery Bay Ramsar site.

An existing body of data demonstrates the use of Glenelg River estuary by a suite of shorebirds, terns and gulls and the beaches of Discovery Bay by Hooded Plover, Sanderling, occasional Eastern Curlew and species of terns and gulls. Vegetated interdune swamps ('slacks') and areas of damp pasture are known habitats for Latham's Snipe. It is feasible that the EPBC Act listed Australian resident, endangered Painted Snipe might utilise damp habitats like these. There are no records of the species despite considerable ornithological interest in these habitats, but it is cryptic, dispersive across the continent and is rarely observed.

Surveys undertaken for the project reinforced existing information but provided few new insights into distribution of habitats or behaviours of various species in the region. A possible exception was the recording of 115 Sanderling foraging in the morning and afternoon of 22 July 2020 on the ocean-beach near Swan Lake. The majority of the Sanderling population is normally in the northern hemisphere during the austral winter.

The greatest diversity and abundance of shorebirds were recorded at Glenelg River estuary. Apart from portions of Long Swamp, limited suitable habitat for most shorebirds exists within the dunes and elsewhere within the 10 kilometre search area. Wetland habitats adjacent to the Project Area are confined to a few locations along the southern boundary. Many of these wetlands are inaccessible for on-ground surveying, due to extensive areas of dense inundated shrubby vegetation around the margins of the wetlands, but that of itself makes them unsuitable for most shorebirds that forage on exposed areas of mud or sand. Cain Hut Swamp, Lake Sheepwash, Lake Mombeong, Swan Lake and unnamed wetlands, accessible for surveying, have limited shorebird habitat and, where present, it consists of short sections of sandy shores, which could be suitable for roosting and may occasionally be used for foraging by shorebirds. Swan Lake is considered to have the highest likelihood of supporting some species, most likely Red-necked Stint, Sharp-tailed Sandpiper and Curlew Sandpiper. Latham's Snipe may also occur in a number of the inland and interdunal wetlands.

21.3.1 Wind farm

The great majority of the wind farm site comprises commercial pine and Blue Gum plantations that provide no habitat for any shorebird species. The balance of the wind farm area is agricultural grazing land, most of which also offers no resources for shorebirds. A small portion of agricultural land in the eastern extremity of the wind farm site includes some ephemerally inundated areas that may occasionally be visited by some species. Latham's Snipe was recorded there in November 2021. The project entails no loss of habitat for shorebirds.

The primary concern for shorebirds relates to the potential for birds to fly over or through the wind farm and for turbines to present a collision risk. However, the potential to detect or quantify flights by shorebirds has significant practical limitations. Diurnal bird utilisation point counts were made at multiple sites within the Project Area and at nearby control sites. No flights by shorebirds over or within the Project Area were observed but, while there is no doubt that these areas are generally not suitable habitat for these species, of itself that does not discount the possibility that occasional flights passing over the site may occur and some may be nocturnal.

Flights by shorebirds can be categorised into two broad types. Migratory species make biannual long-distance journeys, with the majority of species that occur in Australia spending the non-breeding portion of the year (the austral spring-autumn) here and the breeding season in the northern hemisphere. In the case of the Double-banded Plover the migration is between New Zealand and Australia and they spend the winter here. The other category of movements are routine flights by year-round resident species and by migratory species during the time in which they are in Australia. These principally consist of local commuting flights between foraging areas (in response to food resources as they vary due to factors such as time of day, weather conditions and tidal state) and to favoured loafing and roost locations. The specific nature of such local movements may vary between species, but it is also the case that many shorebirds forage and roost in mixed flocks.

Migration flights and local flights differ in their potential for turbine collision risk. Studies of migratory shorebirds during their sojourns in Australia strongly indicate that various species return to the same coastal locations of south-eastern Australia to which they are faithful year after year and move very little between locations whilst here (e.g. Victorian Wader Study Group data reviewed at https://vwsg.org.au/waders/geolocator-studies/). It is not likely that after having arrived at selected coastal locations for the non-breeding season migratory shorebirds would often fly through the Project Area.

During daily activities most shorebirds generally remain within a single broad area of habitat (such as estuaries, other shallow wetlands, or ocean beaches) where foraging and roosting areas are in close proximity to each other, but may not be contiguous. Local flights are generally confined to the particular area of habitat, albeit that some movements between discrete habitat areas undoubtedly occur. Flights by year-round residents including Fairy Tern, Hooded Plover and Sooty Oystercatcher *Haematopus fuliginosus* are largely confined to areas of suitable habitat.

The principal consideration related to whether local flights by shorebirds may be at risk of collisions with turbines at the proposed wind farm is the geographic distribution of suitable habitats. Shorebirds can move between high tide roosts on the coast and foraging habitats inland from the coast and this may remain a possibility within the Investigation Area, albeit unlikely. The inter-dunal and inland wetland habitat was assessed as unlikely to provide such habitat, at least on a regular basis. Evidence of Red-necked Stint movements from foraging to high tide roost sites was observed at Glenelg Estuary, based on numbers between high tide and low tide counts. The high tide location was not identified during the Biosis surveys, but discussions with the Glenelg Hopkins Catchment Management Authority Sanderling tracking project officer indicate the most likely high tide roost is on the western, and ocean, side of the Glenelg Estuary mouth where Sanderling and up to 400 Red-necked Stints have been observed roosting.

For the very great majority of shorebird species, suitable habitats in the region are located along the relatively narrow coastal zone adjacent to the wind farm area and to its west and south-east. For these species there are no known local areas of suitable habitat inland of the wind farm area and there is little if any reason for these birds to fly across or through it in the course of routine activities. A turbine-free buffer extending 300 metres into the Project Area from the inland boundary of Discovery Bay Coastal Park has been applied in design of the Project and will serve to reduce the potential for turbine collision risk for this group of birds. Similarly, turbine-free buffers around Brolga breeding wetlands on agricultural land in the east of the wind farm site will limit the potential for collisions by birds that may use wetlands and surrounding land there. There is one old record of Sanderling from close to the centre of the GTFP pine plantation. The VBA also has records of Shy Albatross *Thalassarche cauta* and Southern Giant Petrel *Macronectes giganteus* at the same location and we consider the location of these records to be in error, as these species are highly unlikely to be recorded in non-marine environments.

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

Substantial turbine-free buffers in the north-east area of the Project will serve to limit the potential for collisions by Latham's Snipe that may use wetlands and surrounding land there (Figure 37a). The buffers were designed primarily to avoid impacts on Brolgas in accordance with the requirements of the *Interim guidelines for the assessment, avoidance, mitigation and offsetting of potential wind farm impacts on the Victorian Brolga population* (DSE 2012). These buffers will also reduce impact to numerous other bird species, particularly wetland-dependent species. These buffers extend 900 metres from suitable wetland habitat (Figure 37a). Latham's Snipe is also likely to occur throughout the Long Swamp and associated wetlands and may move to feed in other wetlands or agricultural areas in the Project area. Tracking has shown Latham's Snipe can move locally within a few kilometres, up to 20–30 kilometres from wetland roosts to feed (https://lathamssnipeproject.wordpress.com/news/). Nightly foraging flights and migratory flights from Long Swamp are likely to occur over the wind farm and turbine collision risk exists if individuals fly at rotor swept area height. Migratory departure flight heights are likely to be similar to those of other species, with individuals rapidly gaining height prior to heading on a northward migration. Currently no information exists on the species' flight heights but local roost to foraging habitat movements could occur at lower heights compared with migration departures. The 900 metre habitat buffer around Long Swamp is likely to ameliorate some of the collision risk to this species but some potential risk of collision remains for individuals moving locally between roosts and foraging habitats.

No population numbers exist for the Latham's Snipe in the area, as far as we know. The area is not counted as part of annual Latham's Snipe surveys. VBA, BirdData, Shorebird2020 and eBird database records indicate most observations are of 1-8 individuals, with one record of 22 from Cashmore north of Bats Ridge Wildlife Reserve near Portland, and one record of 100 at Dutton Way north-east of Portland. The Latham's Snipe population that occurs in Australia is estimated at 30,000, the maximum number of Latham's Snipe recorded near the Project is 100, which represents 0.3% of the estimated population that migrates and over-winters in Australia. No PVA for the species exists, nor is it possible to estimate potential numbers present, or how many may collide with the Project infrastructure. However, if the database records reflect the true numbers present in the area, fatal collisions are unlikely to have a population level impact on this species and it is unlikely that >1% of the estimated Australian population would be impacted.

Limitations on the capacity to document flights that may be at risk of turbine collisions mean that it is not feasible to quantify their likely occurrence. However, experience at various operational wind farms is available.

In an investigation by DELWP, Moloney et al. (2019) collated carcass data from 15 wind farms, 10 of which were in the south-west of Victoria. Carcass monitoring had been undertaken at all of the facilities for an average of two years during the overall period from 2003 to 2018. The data included 565 birds found during searches. Data was intentionally not ascribed to particular wind farms but the sites included Cape Bridgewater, Cape Nelson North, Cape Sir William Grant, Cape Nelson South and Yambuk. Those wind farms are close to the coast although they are not necessarily particularly close to habitats suitable for shorebirds. The data included no mortalities of shorebirds of any species.

Musselroe Wind Farm in north-eastern Tasmania is located immediately adjacent to the coast with prime habitat for waders including Hooded Plover, Sanderling and Ruddy Turnstone. Associated with the coast are also large ephemeral lagoons that are used by many other migratory shorebird species, including Pacific Golden Plover, Red-necked Stint, Double-banded Plover and sandpiper species. The wind farm has multiple turbines within 400 metres of these habitats and some less than 300 metres distant. Due to concerns about the potential for collisions by shorebirds a three-year regime of carcass monitoring entailed twice-weekly searches under relevant turbines during the seasonal presence of migratory waders. While various other bird and bat species were found, no migratory shorebird carcasses were detected (Woolnorth Wind Farm Holding 2016). Personal experience (I. Smales pers. obs.) indicates that while flights by wader species occur between wetlands there, the birds tend to concentrate their flight over low-lying ground between the lagoons which largely avoids locations of turbines and their flights are frequently below the lower rotor height of turbines, which are approximately 30 metres above the ground for this wind farm.

Flight behaviour of shorebirds during migration may differ markedly from that of local movements. In the present context, the nature of migratory departure and arrival are of most importance but there is little available information and, while departure flights have been observed for a variety of species at various locations, arrival flights are virtually unknown, with birds simply appearing at suitable locations, possibly due in some cases to the birds’ arrival at night.

On migration departure, wader species form into flocks and rapidly gain height (Broome Bird Observatory 2021) where they obtain the advantage of high prevailing winds. Migratory shorebirds inhabiting Australia typically fly at altitudes of 1,000-5,000 metres during migration (Geering, Agnew, & Harding 2007). Data about flight heights of such species is growing with the recent advent of tracking devices that are light-weight and have capacity to log altitude.

A number of studies have investigated the heights at which shorebirds fly while on migration and their departure and arrival locations and behaviours. Most studies on flight altitude selection in migratory shorebirds have been based on radar observations and suggest that migratory flights typically occur up to 1500 metres above ground/sea level, although much higher altitudes are also occasionally recorded (e.g. Chilson et al. 2017, Newton 2010, Shamoun-Baranes et al. 2017). Senner et al. (2018) recorded migrations of Black-tailed Godwits in the northern hemisphere in the absence of topographic features that might influence altitude. They found that the birds had a mean migration flight height of 1549 metres above the sea and that they flew at altitudes above 5,000 metres during 21% of all migratory flights, and reached maximum flight altitudes of nearly 6,000 metres. These high flights were associated with high air temperatures at lower altitudes and increasing wind support at higher altitudes. It is very likely that a range of closely related shorebirds that occur in Australia, where air temperatures at low altitudes are substantially higher than they are at greater height, use similar flight strategies on long migration flights. Some species do fly at lower elevations and Galtbalt et al. (2021) record that the larger-bodied, Eastern Curlew and Whimbrel *Numenius phaeopus* on migration flew over sea at mean heights of 155 metres and 133 metres above the surface, respectively.

Migration flights by most species of shorebirds are understood to arrive and depart directly from locations in south-eastern Australia. Thus, evidence indicates that flights to and from these habitats arrive and depart those locations directly by rapidly gaining height and then making a direct bearing toward their distant destinations. Project investigations of departures by some species from nearby Victorian coastal locations indicated such behaviours occurred there.

The Canadian agency, Alberta Environment and Sustainable Resource Development agency Wildlife Guidelines for Alberta Wind Energy Projects (AB ESRD 2011) states that, "High migration altitude and steep rate of climb of shorebirds is likely one important factor explaining the very low proportion of shorebirds found in mortality monitoring studies". It says further, "Shorebirds tend to fly at high altitudes and descend or ascend rapidly when approaching or leaving feeding areas. These observations may explain low collision rates recorded for both shorebirds and waterfowl", and that a further factor is the likely ability of shorebirds to detect obstacles, such as wind turbine generators, and use evasive flights to avoid them".

Johnson et al. (2000) used point-count observations of bird use and movement at 61 turbines. Over the four-year study, observers detected more than 1,607 shorebird passes with 7.7% to 17.5% at rotor-swept heights. At the same time, mortality monitoring studies at the same 61 turbines detected 55 fatalities, of which one was a shorebird but it was attributed to predation and not to collision with a turbine.

The available information is indicative that, at least on departure, shorebirds leaving areas of habitat south of the Project Area are likely to gather into flocks and then to fly steeply to gain height before taking a directional flight. For the species that migrate to the northern hemisphere, it is probable that they fly north across the continent. They are thus likely to fly at relatively high altitude across the wind farm site at the commencement of their northward migrations. If that is the case, shorebirds that are concentrated at the Glenelg River estuary would not cross the wind farm. The species that use the ocean beach of Discovery Bay and dune slacks are most likely to pass over the wind farm on departure and perhaps arrival. They are Sanderling, and to a lesser extent, Eastern Curlew, Red-necked Stint, Fairy Tern, Whiskered Tern (as indicated by database records) and Latham's Snipe.

It is not possible to discount the potential for occasional collisions with turbines at the proposed wind farm by some shorebirds. Shorebirds routinely fly in flocks. While it is plausible that a flock flying through the wind farm at rotor swept area could result in collisions of multiple individuals, it is the case that flocking is a behavioural mechanism that provides a greater level of competence and capacity to detect and avoid danger than can be achieved by a single bird. A review of the international literature has not found any reference to events in which multiple turbine collisions by flocking species have occurred. Multiple collisions by flocking shorebirds are not expected to occur at the proposed wind farm.

Migratory species are normally present in the local area for approximately half the year and absent for the remainder of the year. When present, most species largely confine their activities to areas of suitable habitat, all of which are outside the wind farm site. Available information suggests that the number of species that might pass over the site on migration flights will principally be limited to the few species that utilise ocean beaches. Migration departure flights that occur once per year for migratory species, are likely to pass high above the height of turbines.

21.3.2 Transmission line

The external transmission line route is geographically far from any habitat for shorebirds and the entire length is proposed to be underground. There is no mechanism by which the transmission line could have significant impact on these species.

21.3.3 Potential for direct impacts

While rare collisions by some shorebird species may occur, it is considered unlikely that the project will have direct significant impacts that would affect the viability of the population of any shorebird species.

21.3.4 Potential for indirect impacts

Habitats for shorebirds are substantially on the Discovery Bay beaches and at Glenelg River estuary. At its closest to the southern wind farm property boundary, shorebird habitat along the beach is greater than 1 kilometre distant and, due to application of a 300 metre wide turbine-free buffer on the landward side of the boundary, will be further from the closest wind turbines (between 2-2.5 km). In addition, the generally high and steep primary dune and extensive intervening dune system is expected to buffer the beach shorebird habitat visually and from construction and operational noise and vibration. Glenelg River estuary is approximately 5 kilometres from the closest proposed turbine and this separation will buffer the shorebird habitat there visually and from construction noise and vibration. Assessments of groundwater and surface water (AECOM 2024b, AECOM 2024a) indicate that altered ground- or surface-water regimes due to the Project are not likely to affect interdune slacks or the Glenelg River estuary. In turn, these are not likely to affect the values of those areas as shorebird habitat.

21.3.5 Significance of impacts under EPBC Act

An assessment for relevant species against significant impact criteria for migratory species listed under the EPBC Act (CoA 2009) is provided in Appendix 6 Table A6.7. It indicates that the Project is unlikely to result in a significant impact on any of these species.

21.3.6 Conclusion

The Project does not involve any direct or indirect disturbance to shorebird habitats. Turbine exclusion areas have resulted in all turbines being positioned more than 5 kilometres from the key shorebird area at the Glenelg River Estuary, and approximately 2 kilometres from shorebird habitat along the ocean beach. 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. As a result, some residual risk remains, and there is assumed to be potential for collisions to occur. Local flights may also be at risk or collision, and this particularly relates to Latham's Snipe, which is known to forage at a range of wetland types within the area.

The Project is unlikely to result in a significant impact to migratory shorebirds.

22. White-throated Needletail

White-throated Needletail *Hirundapus caudacutus caudacutus* is listed as vulnerable and as migratory under the EPBC Act. It is also listed as vulnerable under the FFG Act.

White-throated Needletails migrate from the northern hemisphere to Australia for their non-breeding season and routinely are annually present in south-eastern Australia between December and April. Observations over many decades by R. Loyn (pers. comm. May 2022) is that the birds are routinely present in south-western Victoria for no more than 2 months. There are two subspecies that both breed in Asia. Only the nominate subspecies is known to migrate and its entire population travels to Australia. It has been suggested that White-throated Needletail is often associated with the arrival of frontal weather changes or atmospheric disturbances, which would influence the appropriate timing of any surveys, although that correlation has been contested (Higgins 1999). Whilst in Australia, White-throated Needletails spend the great majority of their time high in the air and, while they may spend more time above woodlands than some other terrestrial environments, they are not strictly tied to any particular land-based habitat type. The species roosts in trees amongst dense foliage in the canopy or in hollows, but roost sites are generally poorly known and some may sleep on the wing (Tarburton & Garnett 2021). Roosting by the species has been detected extremely rarely in Australia. Vanderduys et al (2024) list seven records including their own of a single bird, since 1902. It is likely that pine trees that occupy the great majority of the site are do not provide roosting habitat for the species. The plantation pines are managed so that they do not form hollows and their upper foliage (needles) is generally upright and not likely to be suitable as roosting substrate. In addition, all of the exotic plantations across the site are clear felled on rotation. Whether or not the study site is used for roosting by White-throated Needletails, in the context of treed environments across the species range in eastern Australia, the study site would not represent a limiting resource and availability of roosting habitat is not noted in the literature as a cause of the species decline.

The Conservation Advice for White-throated Needletail (TSSC 2019) notes that it is difficult to systematically survey for the species in Australia. It also notes that some collisions with wind turbines have been documented in Australia. A recent review by Tarburton (2021) documents a decline in the species from 2011-2020, evidenced by reduced size of flocks, and considers that collisions with wind turbines within Australia may be a major contributing factor.

The species has been detected during surveys for this Project.

22.1 Methods

Bird utilisation point counts were located at representative sites within the wind farm site and in adjacent land. During all point counts between April 2020 and February 2021, observers scanned all airspace for the species and documented the locations and height of any birds detected. Details of the bird utilisation survey program are provided in Section 10.

22.2 Existing conditions

There a number of pre-existing database records of White-throated Needletail from the local area (Figure 21a). During surveys for the Project White-throated Needletail was recorded on 21 occasions mostly during bird utilisation surveys (BUS), as listed in Appendix 5, Table A5.5.

Two incidental observations were noted in late summer of 2020, both near Lake Mombeong. One of these observations (27 February 2020) was of 70 individuals.

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

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 noted above (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.

22.3 Impact assessment

Construction and operation of the KGPH has potential to impact upon White-throated Needletail via several mechanisms:

- Direct mortality due to collisions with turbines or transmission lines.
- Displacement of foraging activity due to disturbance caused by operation of wind farm infrastructure.

As a consequence of their annual migrations White-throated Needletails are not at risk of any effects from the Project in the annual period from mid-April until mid-October when they are routinely absent from Australia. They usually arrive in northern Australia during September and October, and sometimes in early November (Draffan, Garnett, & Malone 1983, Warham 1962). They usually spend much of the austral spring in the north of Australia before reaching Victoria and Tasmania in December. The northward migration, in which the species leaves Australia for breeding areas in eastern Siberia, north-eastern China and Japan, generally occurs in March-April. Specific details, including new and refined information about the routes and timing of the species' migration and of behaviours in Australia have been provided recently by Yamaguchi et al. (2021) and Tarburton and Garnett (2021).

Due to their transitory and wide geographic movements whilst present in Australia the Conservation Advice for White-throated Needletail (TSSC 2019) notes that it is difficult to systematically survey for the species in Australia. During the annual period in which they are present in the country, their presence in any region tends to be episodic, with sudden appearance and disappearance of aerial foraging flocks (DoE 2015). This is reflected in data for the species obtained during investigations for the Project. During 241 timed bird utilisation point counts undertaken for the Project in the months of October, December and February 2020, White-throated Needletails were recorded during 10 counts on three days only in February.

White-throated Needletails have been documented to fly from close to ground level up to more than 1,000 metres high (Coventry 1989, Tarburton 1993).

White-throated Needletails are generally observed only in the air and there has long been uncertainty about whether they roost at night or sleep on the wing. Tarburton and Garnett (2021) substantiates that birds frequently fly until after sunset and from before dawn. They also provide evidence that White-throated Needletails roost on vertical trunks and upper branches of trees at the edge of forest breaks or on ridgetops and, despite some anecdotes for their roosting on cliffs, that there is no empirical evidence that they ever do so.

22.3.1 Wind farm

The Project does not entail the removal of any treed environment that might provide roosting habitat for White-throated Needletails.

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

During a combined eleven years of carcass monitoring at two wind farms in north-western Tasmania, Hull et al. (2013) documented the detection of 11 White-throated Needletail collisions at each of the two wind farms. Smaller numbers of collision victims have been found at Victorian wind farms, despite the widespread use of trained dogs for carcass detection here, which were not used in the Tasmanian study. In a DELWP investigation of fauna collisions with wind turbines in Victoria, Moloney et al. (2019) collated carcass data obtained from 15 wind farms, 10 of which were in the south-west of the State. Carcass monitoring had been undertaken at all of the facilities for between two and three and a half years and is always a sampling process which can only account for a portion of the likely total number of collisions that may occur. A total of five White-throated Needletail mortalities had been detected as a result of collisions at the 15 facilities. Carcass monitoring is always a sampling process and a variety of factors including searcher efficiency, loss of carcasses to scavengers and decay, time interval between searches and the portion of turbines searched, must be taken into account in order to estimate a total number of collisions that may have occurred. Due to variable methods used at different sites, the study was not able to undertake statistical analyses to estimate total collision mortalities for the species. Thus neither Moloney et al. (2019) nor a similar study by Symbolix (2020), were able to provide an estimate of total collision mortality for the species. TSSC (2019) cite Hull et al. (2013) in their consideration that, *"Collision with wind turbines and overhead wires is of low severity and affects a small number of birds"*.

During investigations for the Project, White-throated Needletails were recorded at 10 locations, seven of which were within the wind farm site. In the 19 observations of the species during bird utilisation surveys, a total of 152 flights were recorded. Fourteen records were of between 1 and 3 individuals; two were of 6 individuals, while one each were of 8, 17 and 90 birds. Of those, 43 flights were between 12 and 45 metres above the ground and 109 were between 70 and 300 metres high.

The data from point counts were sufficient to undertake a quantitative evaluation of the potential for turbine collisions and the Biosis collision risk model was used for the purpose. Empirical data obtained during point counts were used for all relevant inputs to the model and the model extrapolated these values to per annum rates. Where input values entailed necessary assumptions due to uncertainties, an attempt was made to err, if at all, toward over-estimation of potential risk. The species may fly during the hours of daylight and at night, although this is not quantified for south-eastern Australia. The modelling allowed for birds to be in flight for 20 hours of every 24 hours at the same rate as they were detected during point counts. The following summarises input values including assumptions used in modelling of turbines with 60 metre blade/ground clearance for turbines:

- Number of turbines: 105
- Hub height: 155 metres
- Lower rotor-tip height: 60 metres
- Upper rotor-tip height: 250 metres
- Mean rotational speed: 6.51 rpm

The following summarises input values used for White-throated Needletails:

- 3 months per annum seasonal presence at site.
- Flight period of 20 hours per 24 hours.
- Population of 2000 at the site.
- Length of bird: 0.21 metres.
- Mean flight-speed of 77 km/h.
- Total period of point count surveys 8360 minutes.
- Flights recorded below rotor-swept height: 43.
- Flights recorded within rotor-swept height: 109.

The annual period in which White-throated Needletails are likely to be present in the south-west of Victoria has been informed by Yamaguchi et al. (2021). This indicates that the subspecies arrives annually in northern Australia in the austral spring and departs in the autumn, but that they do not generally reach southern Victoria until December and that they depart during April. Observations over many decades by R. Loyn (pers. comm. May 2022) is that the birds are routinely present in south-western Victoria for no more than 2 months. For the purposes of collision risk modelling, it has been assumed that the subspecies may be in the Project Area for 3 months of every year.

It has been assumed that up to 2000 individuals may be present for the entire annual period of 3 months. This is considered to be conservative and the maximum number observed during investigations for the Project was a flock of 90 birds. In the model, the size of the potential population that may interact with turbines simply provides a maximum of mortalities that can occur per annum.

White-throated Needletail is considered to be the world's fastest bird in flight, attaining speeds of up to 170 km/h (nzbirdsonline.org.nz) and the slower mean speed used for modelling is a conservative measure as it means the interaction of a bird with a turbine will be longer than it would at a higher flight speed and thereby functions to increase risk. The average speed of 77 has been sourced from recent GPS tracking data recorded within the species' breeding range (Yamaguchi et al. 2021)

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

Collision risk modelling using input values and assumptions as set out above, indicate the potential for the following numbers of White-throated Needletail collisions per annum for the entire Project turbine array:

- 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.

Input values altered for comparative modelling of turbines with 45 metre blade/ground clearance for White-throated Needletail were:

- Flights recorded below rotor-swept height: 37.
- Flights recorded within rotor-swept height: 115.

Comparative collision risk modelling indicates the potential for the following numbers of White-throated Needletail collisions per annum:

- 1.25 collisions per annum at 0.95 rotor avoidance rate.
- 0.50 collisions per annum at 0.98 rotor avoidance rate.
- 0.26 collisions per annum at 0.99 rotor avoidance rate.

The comparative modelling suggests that the Project, as proposed with a 60 metre blade/ground clearance is likely to results in somewhat fewer collisions by White-throated Needletails, than would the same array of turbines with a 45 metre blade/ground clearance. This is because the number of White-throated Needletail flights documented at the site did not differ greatly between 45 and 60 metres above the ground.

The *Referral guideline for 14 birds listed as migratory species under the EPBC Act* (DoE 2015) includes the White-throated Needletail. It says that an action is likely to have a significant impact:

> *When an action is likely to lead to serious disruption to an ecologically significant proportion of a population (having predicted annual mortality rates or affecting breeding cycles of a number of individuals) meeting or exceeding the upper of the thresholds (1%).*

It notes that, for species that aggregate in flocks, 1% of the population is considered internationally important and 0.1% of the population is nationally important. White-throated Needletails aggregate into flocks and the guidance document estimates that 1% of its population equates to approximately 100 individuals while 0.1% would equate to approximately 10 individuals. Thus the population estimate used there was for a total of 10,000 individuals. The more recent *Action Plan for Australian Birds 2020* (Tarburton & Garnett 2021) provides an updated population estimate of 41,000 (range from 20,000 to 61,000). So, currently 1% of the population would equate to approximately 410 individuals while 0.1% would equate to approximately 41 individuals. As the entire population is believed to migrate annually to Australia, the 'international' and the 'national' populations are the same. 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.

The *Action Plan for Australian Birds 2020* (Tarburton & Garnett 2021) evaluates the subspecies as meeting criteria for listing as Vulnerable. At a qualitative level, the collective experience from existing operational wind energy facilities; the variable and seasonal presence of the species in the Project

Area; and the recorded heights of the species flights at the Project site, suggest that some collisions with turbines are likely to occur. However, that experience is also indicative that the potential for collisions is unlikely to reach or exceed 1% or 0.1% of the estimated population. Contingent on assumptions used in collision risk modelling presented here, this quantitative approach also indicates that collisions are unlikely to reach or exceed 1% or 0.1% of the estimated population and in that respect they are not likely to constitute a significant impact on the species.

The 'likelihood and consequence' matrix score provided by DELWP (Moloney, Lumsden, & Smales 2019) for the potential risk of turbine collisions for White-throated Needletail is low–- moderate. Moloney, Lumsden and Smales (2019) document five known mortalities at wind farms within Victoria and the review by Tarburton (2021) documents 31 mortalities at windfarms outside of Victoria (Woodlawn and Capital windfarms in New South Wales, and Bluff Point and Studland Bay windfarms in Tasmania).

22.3.2 Transmission line

The majority of the length of the transmission line is proposed to be underground. There is no mechanism by which the underground transmission line could have an impact on the species. White-throated Needletails are known to occasionally collide with overhead transmission lines. In a total of 79,354 records of the species from between 1900 and 2020,Tarburton & Garnet (2021), documented 56 specimens found dead, of which four were found below power/phone lines. In the context of the existing network of overhead powerlines, the relatively short distance of overhead lines proposed by the Project represent a low potential for the species to collide that is unlikely to have any measurable effect on the population.

22.3.3 Potential for direct impacts

It is likely that some collisions by White-throated Needletails with Project turbines will occur. However, the number of collisions is unlikely to annually reach or exceed 1% or 0.1% of the estimated population and the White-throated Needletail population is not considered likely to be significantly impacted directly by the Project.

22.3.4 Potential for indirect impacts

The aerial behaviour of White-throated Needletails means they are not reliant on any particular terrestrial environment and the Project design does not include mechanisms whereby indirect effects on the species are plausible. The species forages on aerial invertebrates that may have part of their lifecycles dependent on terrestrial or aquatic systems, however any modifications to habitat resulting from the Project are unlikely to impact upon these invertebrate populations to an extent that the foraging resource for White-throated Needletail would be impacted. The White-throated Needletail population is not considered likely to be impacted indirectly by the Project.

22.3.5 Significance of impacts under EPBC Act

An assessment for White-throated Needletails against significant impact criteria for vulnerable species and for migratory species listed under the EPBC Act (DoE 2013a) is provided in Appendix 6 Table A6.6. Based on this assessment, the project is considered unlikely to lead to a significant impact to this species.

22.3.6 Conclusion

The key pathway by which Wind energy facilities have potential to impact upon White-throated Needletail is by collision with wind turbines.

White-throated Needletail are known to occur in the project area, may fly within the airspace above habitat types in which turbines are proposed, including plantations and farmland. Flights within rotor-swept height were observed during field studies for the Project.

As a result, it is likely that some collisions by White-throated Needletails with Project turbines will occur. Collision risk modelling undertaken for the Project predicts there may be 1.12 collisions per annum at the most conservative rotor avoidance rate (0.95). This number of collisions is unlikely to annually reach or exceed 1% or 0.1% of the estimated population and the White-throated Needletail population is not considered likely to be significantly impacted directly by the Project.

23. Fork-tailed Swift

Fork-tailed Swift *Apus pacificus* is listed as marine and migratory under the EPBC Act.

23.1 Methods

Desktop database searches were used to assess the occurrence of Fork-tailed Swifts within the Investigation Area, and the Project's potential impact on the species. The other threatened bird surveys and bird utilisation surveys included extensive coverage of the Project Area and its surrounds. If present in great numbers or frequently while in Australia, it is expected Fork-tailed Swift would have been recorded, similarly to the multiple observations of White-throated Needletails that were recorded during the various surveys.

23.2 Existing conditions

Numerous records occur within 10 kilometres of the Project Area between 1951 and 2019, with the majority situated at Oxbow Lake near Nelson, along the Glenelg River north of the Project Area, and at coastal wetlands south of the Project Area. The majority of the VBA records contain no count data. Six records with counts include groups of 3, 6, 40, 50, 100 and 200 within the 10 kilometre search area, indicating that large flocks of this species can occasionally be present.

No Fork-tailed Swifts were recorded during the Biosis surveys. No records fall within the proposed wind farm footprint, however it is unlikely that any substantial observations or survey effort would have been undertaken within the pine plantation or in the private agricultural farm lands where turbines are proposed. The Fork-tailed Swift, similarly to the White-throated Needletail is a highly aerial species and is likely to move in the airspace, between the coastal and inland areas and would be expected to fly through the Project Area where turbines and other infrastructure are proposed.

23.3 Impact assessment

Construction and operation of the KGPH has potential to impact upon Fork-tailed Swift via several mechanisms:

- Direct mortality due to collisions with turbines or transmission lines.
- Displacement of foraging activity due to disturbance caused by operation of wind farm infrastructure.

23.3.1 Wind farm

The Project will not involve removal of roosting habitat for the Fork-tailed Swift. The species is likely to fly at turbine height and be at similar risk of collision to that of White-throated Needletail. However, the species has been reported much less frequently than the White-throated Needletail within and surrounding the Project Area and it is thus considered to be less at risk of impact. However, when in the area, it could occur in large flocks, so if flying through the wind farm, a number of individuals could be at risk of collision. Fork-tailed Swifts may spend much of the 24-hour cycle on the wing and thus be at risk of collision throughout that period.

23.3.2 Transmission line

The entire length of the proposed external transmission line is proposed to be underground. There is no mechanism by which the underground transmission line could have an impact on the species.

23.3.3 Potential for direct impacts

It is likely that some collisions by Fork-tailed Swifts with project turbines at will occur, but this is considered to be very infrequent and if it occurs, is likely to affect a small number of individuals, with no significant population impacts on the species. The *Referral guideline for 14 birds listed as migratory species under the EPBC Act* (DoE 2015) gives 1% of the population as 1000 and thus the population estimate from that source is 100,000. This is evidently an approximation. The number of collisions is unlikely to annually reach or exceed 1% of the estimated population and therefore this will not exceed the impact threshold specified in DoE (2015).

23.3.4 Potential for indirect impacts

The aerial behaviour of Fork-tailed Swifts means they are not reliant on any particular terrestrial environment and the Project design does not include mechanisms or impact pathways whereby indirect effects on the species are plausible. The Fork-tailed Swift population is not considered likely to be impacted indirectly by the Project.

23.3.5 Conclusion

The key pathway by which Wind energy facilities have potential to impact upon Fork-tailed Swift is by collision with wind turbines.

Fork-tailed Swift was not recorded during surveys for the Project, but the species has been recorded in the area in the past. It may fly within the airspace above habitat types in which turbines are proposed, including plantations and farmland. Flights within rotor-swept are likely to occur.

Due to the lack of observations, quantitative CRM could not be undertaken for this species. The infrequent presence of the species in the area, however, indicates the number of collisions is unlikely to annually reach or exceed 1% of the estimated population and therefore this will not exceed the impact threshold specified in DoE (2015).

24. Owls

Three threatened owl species are known to occur within the Investigation Area, and are considered in this report:

- Powerful Owl *Ninox strenua* is listed as vulnerable under the FFG Act.
- Barking Owl *Ninox connivens* is listed as critically endangered under the FFG Act.
- Masked Owl *Tyto novaehollandiae* is listed as critically endangered under the FFG Act.

Two non-threatened species are also known to occur within the Investigation Area:

- Southern Boobook *Ninox boobook.*
- Barn Owl *Tyto alba*.

24.1.1 Powerful Owl

The Powerful Owl is the largest Australian owl, with a wingspan of up to 140 centimetres, and weighing between 1.2 and 1.45 kilograms (Higgins 1999). The species is endemic to east and south-east Australia, mainly on the seaward side of the Great Divide. They inhabit:

- Open sclerophyll forests and woodlands, usually dominated by tall eucalypt species such as Mountain Ash *Eucalyptus regnans*.
- Box-Ironbark woodlands.
- Riparian zones with large River Red-gum Gum *Eucalyptus camaldulensis* (Higgins 1999).

The species has been recorded as being displaced by habitat clearing for pine plantations, although it has been occasionally recorded roosting in plantations (Higgins 1999). The species appears to avoid dense rainforest, although it sometimes roosts in rainforest gullies, surrounded by sclerophyll forest. The Victorian population is estimated to be under 500 pairs (Higgins 1999) and the species is listed as Vulnerable under the FFG Act.

Powerful Owl forms monogamous pairs, with pairs defending territories of between 300-1500 hectares (Higgins 1999). Pairs often move within their home range seasonally, likely in response to the local availability of food, although pairs usually stay within 300 meters of nest sites during the breeding season when tending to dependant young (Higgins 1999).

Pairs roost on bare horizontal branches in the canopy of large trees within closed forest during the day. Birds are often recorded roosting with partially eaten prey held in talons. Nests are formed in the hollows of large old trees, usually living eucalypts, within or just below the canopy (Higgins 1999). Breeding occurs in winter, with the female laying two (rarely one) eggs and incubating them herself for 35-38 days. During this time the male hunts and feeds the female. Fledging occurs after 8-9 weeks, with juveniles hunting and roosting away from the nest after 12-14 weeks. Young are still dependant on adults to supplement their food intake for several months after leaving the nest (Higgins 1999).

The Powerful Owl is an active hunter, mostly taking arboreal mammals and birds, by swooping down and plucking them from trees at night. Their diet consists primarily of medium-sized possums, gliders and birds, and occasionally bats, insects and small mammals (Higgins 1999). Diet varies seasonally and regionally. In some coastal regions Ringtail Possums *Pseudocheirus peregrinus* comprised up to

95% of their diet. The species is occasionally recorded on the fringes of suburban areas, where it hunts for possums living in parks and gardens.

24.1.2 Barking Owl

The Barking Owl is a medium-sized owl found in dry forests and woodlands dominated by eucalypts in tropical, temperate and semi-arid zones throughout mainland Australia. The species has also been recorded roosting in pine plantations and remnant patches of eucalypt forest within pine plantations (Higgins 1999).

Barking Owls usually roosts in large densely foliaged trees, often near watercourses or wetlands. The species is largely sedentary and pairs maintain permanent territories around breeding sites, which are defended from other Barking Owls year-round. Size of territories is reportedly relatively small for an owl, often under 200 hectares, and as small as 30 hectares, with foraging occurring up to 5 kilometres from main roost (Higgins 1999). No evidence of long-distance movements has been documented (Higgins 1999).

Barking Owls nest in hollows of large trees, and rarely in rock crevices, although details of breeding and social habits are largely unknown. The species is likely monogamous, with pairs recorded nesting regularly together in the same hollow for up to 15 years (Higgins 1999). Breeding occurs over mid-winter to spring, where the female lays up to three eggs and incubates them for 36-37 days. During this time the male hunts to feed the female, and roosts outside the nest. After chicks hatch both parents hunt and feed the young. Fledging occurs after 6-7 weeks, although young remain dependant of parents for several months after fledging, dispersing from the nest in late summer (Higgins 1999).

The Barking Owl feeds on a range of species, taking mainly large insects outside of the breeding season and small to medium birds, terrestrial mammals, bats and possums during the breeding season. Foraging is opportunistic, and often begins in the hour before dark, or just after sunset, with individuals rarely returning to the nest until sunrise. Some foraging activity has been recorded in daylight hours, usually near roosts (Higgins 1999).

24.1.3 Masked Owl

The Masked Owl is a large, rarely observed but widespread owl found in a diverse range of wooded habitat throughout mainland Australia and Tasmania (Higgins 1999). The species is most often recorded within 300 kilometres of the coast, in open forest and woodland, where they roost and nest in large tree hollows. In treeless areas such as the Nullarbor Plains, they nest in caves inside limestone formations (Higgins 1999). The species has also been recorded in wet heath and heathy forest habitats, as well as treed farmland, although habitat modelling within Victoria shows aversion to farmland supporting sheep. Four subspecies are recognised within Australia, with the Tasmanian (*T. n. castanops*) and Northern (*T. n. kimerli*) subspecies listed as Vulnerable under the EPBC Act. Victorian Masked Owls are part of the southern mainland subspecies (*T. n. novaehollandiae*), which is not listed under the EPBC Act, but is listed as Critically Endangered within Victoria under the FFG Act.

Masked Owls form lifelong partner bonds and occupy home ranges, with size of territories varying regionally, likely based on available nesting habitat and food availability, although nests are rarely less than 1.5 kilometres apart. Estimates for home range size vary from between 400 to 1000 hectares (DSE 2003a).

Nests are usually constructed in hollows of large old eucalypts, usually in the trunk, but sometimes in vertical spouts. Breeding can occur year-round, and is likely influenced by availability of food. The female lays between one and four eggs (usually two or three) and incubates them for the duration of incubation (33–35 days), and broods the chicks for the first 2–3 weeks after hatching. The male hunts during this time to feed the female and chicks. Chicks fledge after 10–12 weeks, although they remain dependent on the adults for 1–3 months after fledging (Higgins 1999). Outside of the breeding season, males and females often roost separately (Higgins 1999).

Masked Owls are nocturnal and feed primarily on small to medium terrestrial mammals, including rodents, small dasyurids, possums, rabbits and occasionally bats, birds and reptiles (Higgins 1999). They forage throughout the night, starting after dusk, with individuals traveling long distances from roosting sites to find prey. Individuals usually hunt alone using a ‘perch and pounce’ ambush method and are thought to capture prey on the ground rather than trees. They are therefore expected to mostly fly below the canopy, though they can circle higher above during nocturnal display flights (Loyn 2022).

24.1.4 Likelihood of occurrence

Database records indicate the presence of Powerful Owl, Masked Owl and Barking Owl within 10 kilometres of the Project Area (VBA). Large hollow-bearing trees are an essential habitat feature for these species. National Parks immediately adjacent to the Project Area, such as Lower Glenelg National Park and Cobboboonee National Park, support vast areas of remnant forest with large hollow-bearing trees, and have numerous records of Powerful Owl, particularly within the conservation reserves surrounding the Project Area (Figure 24a). The Masked Owl and Barking Owl have also been previously recorded within these contiguous forested habitats (Figure 24a). It is therefore possible that these threatened owl species may occur near the site, or occasionally forage on site where the plantation abuts remnant forest. The Powerful Owl is also known to occasionally roost in pine trees.

24.2 Methods

Listening and broadcast surveys were undertaken for these owl species, as per the *Survey guidelines for Australia’s threatened birds* (DEWHA 2010) and the approved survey standards for Powerful Owl (DSE 2011a). A variety of habitats were surveyed to determine the presence of owls throughout the site, particularly within habitats where turbines are proposed, to assist with qualitative determination of collision risk (Figure 24a). The locations and number of surveys undertaken were informed by the preliminary design and vegetation and habitat mapping.

Call playback surveys for owls were conducted during calm, dry weather over a total survey time of 22 hours and 51 minutes from September to November 2020 (Table 23). Call playback sessions included periods of 2-5 minutes of continuous owl calls of the three species. Recorded calls were broadcast at approximately natural volume and were interspersed with periods (2-5 minutes) of silent listening and waiting/watching for any response from owls. Listening was continued after playback during a 15 minute spotlighting search for owls that may have responded by flying in quietly to the playback site. Call playback was not undertaken if nesting or roosting sites were located as call playback has the potential for detrimental effects on nesting owls.

Daytime investigations to detect roost or nest sites in potential habitat within the proposed disturbance footprint of the Project Area was also undertaken during spring-summer 2020. This included carefully looking for owls roosting among the foliage of dense trees and tall shrubs, and also in the eucalypt canopy. Searchers also looked for faeces and owl pellets.

Table 23 Summary of owl survey effort.

See also Figure 24a for survey locations; survey location reference in brackets in table below.

Date	Location
30/09/2020	NW pine plantation (1) Pine plantation west of Quarry Road (2) Pine plantation Browns Road (3) Blue Gum / pine plantation Spring Road (4) Blue Gum plantation Kentbruck Settlement Road (5) Boiler Swamp Road (6) Bridgewater Lakes Road/Peters Road/Great South West Walk (7) Blackwoods Road (8)
1/10/2020	NW pine plantation (1) Pine plantation west of Quarry Road (2) Pine plantation Browns Road (3) Blue Gum / pine plantation Spring Road (4) Blue Gum plantation Kentbruck Settlement Road (5) Boiler Swamp Road (6) Bridgewater Lakes Road/Peters Road/Great South West Walk (7) Blackwoods Road (8)
13/10/2020	NW pine plantation (1) Pine plantation west of Quarry Road (2)
14/10/2020	Boiler Swamp Road (6)
15/10/2020	Pine plantation Browns Road (3) Blue Gum / pine plantation Spring Road (4)
28/10/2020	NW pine plantation (1) Pine plantation west of Quarry Road (2) Blue Gum plantation Kentbruck Settlement Road (5) Boiler Swamp Road (6) Blackwoods Road (8)
29/10/2020	Pine plantation Browns Road (3) Blue Gum / pine plantation Spring Road (4) Blue Gum plantation Kentbruck Settlement Road (5) Bridgewater Lakes Road/Great South West Walk (7) Blackwoods Road (8)
24/11/2020	NW pine plantation (1) Pine plantation west of Quarry Road (2) Pine plantation Browns Road (3)
25/11/2020	Blackwoods Road (8) Blue Gum / pine plantation Spring Road (4) Blue Gum plantation Kentbruck Settlement Road (5) Boiler Swamp Road (6) Bridgewater Lakes Road/Great South West Walk (7) Blackwoods Road (8)

Date	Location
26/11/2020	Boiler Swamp Road (6) Bridgewater Lakes Road/Great South West Walk (7) Blackwoods Road (8)

24.3 Existing conditions

Powerful Owl, Masked Owl and Barking Owl have been recorded within the 10 kilometre search area. Surveys for owls undertaken from September to November 2020 recorded one Powerful Owl at the Blackwood Road call playback site near Portland (Figure 24a).

In addition, 29 Southern Boobook owls were recorded throughout the survey period, which was the only other owl species recorded during Biosis field surveys. The details of the owl survey effort and results are provided in Appendix 5 Table A5.7.

24.4 Impact assessment

Construction and operation of the KGPH has potential to impact upon threatened Owl species via several mechanisms:

- Direct removal of habitat trees for construction of temporary and permanent infrastructure, such as turbines, hard stands and access roads.
- Impacts on habitat trees due to disturbance within tree protection zones of while trenching for transmission lines and cables.
- Indirect impacts on prey due to habitat removal or disturbance.
- Direct mortality due to collisions with turbines or transmission lines.
- Displacement of breeding or foraging activity due to disturbance caused by construction and operation of wind farm infrastructure.

Powerful Owl, Masked Owl and Barking Owl have been previously recorded within ten kilometres of the Project Area (VBA, Figure 24a). Large hollow-bearing trees are an essential habitat feature for these threatened species, though they have differing prey preferences and hunting strategies. 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.

Database records demonstrate that, at times, individuals use suitable habitat in relatively close proximity to the site to the north and along the proposed underground section of the transmission line (VBA, particularly adjacent national parks). Of these threatened species the Powerful Owl was recorded at one site during the Project surveys, within an area of native forest near Portland at the Blackwoods Road site (site 8) (Figure 24a).

Southern Boobook, a common and widespread owl species, was recorded at multiple locations both within pine plantations and in adjacent areas such as along the proposed power line route. This species is known to use pine and other plantations (Loyn 2009) where it can likely still find the food sources it requires, in contrast to Powerful Owl, Masked Owl and Barking Owl that are less likely to be found in plantations, particularly pine plantations. Loyn et al. (2009) recorded Powerful Owl and Masked Owl only in native forests during surveys of the Green Triangle eucalypt and pine plantation in south-western Victoria and south-eastern South Australia, with some of their sites being within pine plantations north of the Portland–Nelson Road.

The Masked Owls' propensity to use native forest and woodland, and edge habitats, indicates that the species is most likely to occur in the conservation areas, treed road verges and some of the farmland/forest edges within and surrounding the Project Area. Individuals potentially move through and along roadsides and may hunt for mammals in those habitats and the most likely potential impact is considered to be from collisions with the overhead sections of the internal transmission line. The pine plantation does not contain hollow trees or nesting habitat for Powerful Owls or Barking Owls, species known to use this habitat. Both species may occasionally fly through the pine plantation, and may roost within it. The most likely roosting habitat is in the oldest age pine coupes, and the location of these changes within the age and harvesting cycle of the plantation.

24.4.1 Wind farm

The commercial pine plantations and cleared agricultural land within Project Area do not contain suitable nesting habitats for the Powerful Owl, Masked Owl or Barking Owl. These species may move through such areas when traversing these environments between areas of other, more suitable native forest and woodland habitat. Such movements are less likely north to south over the plantations, where turbines are proposed, as there is no suitable large forest owl habitat to the south of the plantations, apart from potential roosting habitat for Powerful and Barking Owl in the oldest pine plantation and the Blue Gum coupes.

With respect to local movements that may occur in the Kentbruck area, available information about the species' habitat preferences suggest that the birds may traverse the areas proposed for the wind farm, including the large portion occupied by pine plantations on occasion, but it would seem likely that this occurs rarely. All owl species in the area may hunt out from treed environments into open areas which could include portions of pine plantations following harvesting and cleared zones around turbines. This type of foraging is necessarily focussed on terrestrial prey species and would be unlikely to put the birds at risk of collision with turbines with lowest rotor height at 60 metres.

The 'likelihood and consequence' matrix scores provided by DELWP (Moloney, Lumsden, & Smales 2019) for the potential risk of turbine collisions for Barking Owl and Masked Owl is moderate. No Powerful Owl, Barking Owl or Masked Owl have been recorded as mortalities at Victorian wind farm sites where data is available (Moloney, Lumsden, & Smales 2019). The only reported owl mortality is a single Barn Owl, a common species in agricultural landscapes (Moloney, Lumsden, & Smales 2019). In post-construction owl utilisation monitoring at another Victorian wind farm, Powerful Owls were recorded present before construction and during operational phase of the wind farm on- and off-site, and no mortalities of the species were found (Biosis 2021b). However one record of Powerful Owl wind farm mortality is known from south-east New South Wales (NSW Office of Environment and Heritage Biodiversity Conservation Division unpublished data in Umwelt 2021).

24.4.2 Transmission line

There are numerous Powerful and Masked Owl database records adjacent to the proposed transmission line route through Cobboboonee National Park to Heywood. The external transmission line is now proposed to be entirely underground, which eliminates any collision risk.

24.4.3 Potential for direct impacts

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 transmission line collisions where new lines are proposed (e.g. 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 transmission line or turbine collisions is unlikely, as these will be higher than canopy height. Masked Owl is also known to make nocturnal display flights, which include circling and calling high above treetops, up to twice the height of tree canopy (Eco Insights 2022). Such behaviour could potentially and very occasionally place individuals at risk of collision with powerlines particularly as powerlines may be less visible to the species at night.

24.4.4 Potential for indirect impacts

Effects of construction and operational noise, traffic and artificial light and hydrological impacts on native vegetation outside the Project Area have all been considered. However, the Project design generally does not include mechanisms whereby effects on the species or its habitats are likely to affect the species. Overall, Powerful Owl, Masked Owl and Barking Owl populations are considered unlikely to be impacted indirectly by the Project.

24.4.5 Conclusion

Construction and operation of the KGPH has potential to impact upon threatened Owl species via habitat loss, disturbance, impacts upon prey species and mortality due to collisions with aerial infrastructure.

Powerful Owl and Masked Owl both have potential to occur within the Project area, although they are unlikely to frequently inhabit habitats where turbines are proposed. Powerful Owl has been known to roost in Pine Plantations, but both species are considered unlikely, other than very rarely, to fly within rotor swept height. The available knowledge summarised above suggests that collisions with turbines will be rare events.

Construction of the underground transmission line beneath an existing road through Cobboboonee National Park and Cobboboonee Forest Park may involve indirect loss of trees that may provide foraging or roosting habitat for forest Owls, however these tree impacts, if they occur, are insignificant from a habitat availability perspective, as they are occurring with an extensive area of native forest.

The Project is unlikely to pose a significant impact to forest owls.

25. Rufous Bristlebird (Coorong subspecies)

Rufous Bristlebird (Coorong subspecies) *Dasyornis broadbenti broadbenti* is not listed under the EPBC Act and is listed as endangered under the FFG Act.

The Rufous Bristlebird is a small primarily ground-dwelling bird found in coastal scrubland and forests in south-east Australia. Habitat includes a range of coastal and near-coastal tea-tree woodland, heathland, scrubland and wet forest, with high floristic diversity and a moderately dense shrub understorey.

Two subspecies are found in Victoria; the 'Otway' subspecies *Dasyornis broadbenti caryochrous*, occurring from Anglesea to Warrnambool, listed as vulnerable under the FFG Act; and the 'Coorong' subspecies *Dasyornis broadbenti broadbenti*, occurring from Port Fairy up to Coorong in South Australia, listed as endangered under the FFG Act.

The species is territorial and sedentary, with adult pairs maintaining territories of approximately 2 hectares year-round. The species is a weak flyer, spending most of the time on the ground, and is reluctant to break cover. No seasonal changes in movement patterns have been reported. Habitat clearing and residential development is a significant threat to the species as breaks of only a few hundred meters can fragment habitat.

Nests are built close to the ground, in tussocks, sedge or low shrubs. The female lays two eggs and incubates them for 21 days. The species forages on the ground and in low vegetation, feeding on a range of seeds, berries and ground-dwelling invertebrates. In areas where the species is abundant, it is occasionally observed foraging on open ground in parks, gardens and road reserves close to dense vegetation.

There is potential for this species to occur within pine plantations where suitable habitat is present within the understorey and potentially in younger regrowth plantation that may mimic suitable native habitat structure.

25.1 Methods

Monitoring for this species was undertaken as an adjunct to bird utilisation surveys in appropriate habitats, particularly in potential locations within the proposed disturbance footprint of the Project. The BUS locations are appropriate for characterising the presence and likely presence of the Rufous Bristlebird throughout the Project area, as demonstrated by the proximity of existing records to the BUS sites. Furthermore the Biosis surveys and database searches show records at or within close proximity to all the control sites and 13 of the 17 treatment sites.

These surveys took place between April 2020 and February 2021. Survey dates and locations are provided in Appendix 5 Table A5.8. The bird utilisation survey locations are shown in Figure 10a and methodology including survey effort described in Section 10.1. The species was also recorded as incidental when observed during other threatened species surveys.

25.2 Existing conditions

Rufous Bristlebird was recorded 19 times during Biosis surveys between June and December 2020 (Appendix 5 Table A5.8). It has been frequently recorded within 10 kilometres of the Project Area and was recorded several times in heathland vegetation surrounding the GTFP pine plantations during Biosis fauna surveys (Figure 25a). The species has also been recorded in young dense pine plantation in situations close to adjacent native habitat areas.

25.3 Impact assessment

Construction and operation of the KGPH has potential to impact upon Rufous Bristlebird via several mechanisms:

- Direct removal of habitat for construction of temporary and permanent infrastructure, such as turbines, hard stands, access roads and transmission lines.
- Direct mortality due to collisions with turbines or transmission lines.
- Displacement of breeding or foraging activity due to disturbance caused by construction and operation of wind farm infrastructure.

The Rufous Bristlebird has been frequently recorded within 10 kilometres of the Project Area. The species inhabits dense coastal heath and sedge communities including dense thickets of shrubs, such as coastal tea trees and woodland gullies. Nests are built close to the ground, in tussocks or low shrubs and the Rufous Bristlebird is usually observed within close proximity to cover.

The Rufous Bristlebird was recorded from calls at heathland and thickets on multiple occasions during Biosis fauna surveys for the Project. A small number of these records were from young stands of pines within areas of the commercial plantations, mostly in locations close to adjacent heathlands or heathy woodland. No records of the species were from older stands where no dense understorey remained. Growth of plantation pines and thinning of them are aspects of management of pine plantations that are not related to the Project.

The species is cryptic and the birds infrequently leave the dense cover of their habitat. Their flights tend to be constrained to the height of the vegetation they inhabit.

25.3.1 Wind farm

Rufous Bristlebirds are largely constrained to very specific habitat types the majority of which are outside the proposed wind farm site and none of which will be removed or modified by the Project. Rotation of plantation pine harvesting will continue to provide small areas of young, dense pine trees that may be inhabited by the species during the appropriate successional stages of their growth. Over the great 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 is proposed.

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.

Biosis recorded Rufous Bristlebird on the border of Kentbruck Heath in Cobboboonee National Park and agricultural land in the eastern portion of the Project Area. There are three widely scattered previous locations within Cobboboonee National Park where the species has been recorded historically. It is feasible that Rufous Bristlebirds inhabit Kentbruck Heath more widely than records suggest. If so, they may occasionally move between there and known suitable habitats within Discovery Bay Coastal Park. While that could entail movements across the intervening agricultural land proposed to form part of the Project wind farm, the behaviours of Rufous Bristlebirds strongly suggest that they would rarely, if ever traverse open land and their flights would be below rotor-swept height of turbines proposed for the Project.

The 'likelihood and consequence' matrix scores provided by DELWP (Moloney, Lumsden, & Smales 2019) for the potential risk of turbine collisions for the Rufous Bristlebird is low.

25.3.2 Transmission line

There are a number of existing database records of the species in the general area of the underground transmission alignment through Cobboboonee National Park to Heywood. The transmission line is proposed to be underground within an existing road alignment for the section through Cobboboonee National Park. Whilst some habitat alongside the road will be impacted through encroachment on TPZs as part of construction of the underground transmission line, this will not result in a significant impact on Rufous Bristlebirds or their habitat, which is extensive across the region.

25.3.3 Potential for direct impacts

Rufous Bristlebirds are not likely to be directly impacted by the Project.

25.3.4 Potential for indirect impacts

Effects of construction and operational noise, traffic and artificial light and hydrological impacts on vegetation of the dune wetlands systems have all been considered. However, the Project design does not include mechanisms whereby effects on the species or its habitats are plausible. Rufous Bristlebirds are not considered likely to be impacted indirectly by the Project.

25.3.5 Conclusion

Rufous Bristlebird is highly unlikely to fly more than a few metres above the ground, and are therefore unlikely to be at risk of collision with aerial infrastructure such as wind turbines or powerlines.

Construction of the underground powerline through Cobboboonee Forest Park and Cobboboonee National Park has potential to impact upon trees via disturbance to root protection zones, however the construction activities will not involve the removal of any understorey vegetation that provides habitat for Rufous Bristlebirds.

Construction of wind turbines and associated infrastructure in young pine plantations could displace individuals into adjacent habitat, but this is unlikely to result in mortality or impact upon the species.

The Project is unlikely to impact upon Rufous Bristlebird.

26. Little Eagle

Little Eagle *Hieraaetus morphnoides* is not listed under the EPBC Act and is listed as vulnerable under the FFG Act.

Little Eagle is a small, compact eagle found throughout mainland Australia and into New Guinea, in a wide range of dry, open wooded habitat; extending from the coast into semi-arid regions (Marchant & Higgins 1993). Little Eagle is often observed soaring and gliding at heights of up to 500 meters, over open wooded areas, especially mosaics of open farmland and woodland. The species generally avoids dense forest, although it has been recorded in mature pine plantations (Marchant & Higgins 1993). The species tolerates partial clearing and most land-uses aside from urbanization.

Little Eagles form monogamous bonds, with some pairs holding well-spaced territories throughout the year. Moderately-sized platform nests are constructed in large trees out of sticks, and lined with green leaves. The female typically lays two (rarely one or three) eggs, which are incubated for 33-41 days by both parents, although mostly by the female. The female often takes breaks to feed on prey brought by the male. Fledging occurs by around 60 days, with chicks dependant on parents for up to a month after fledging, becoming independent and leaving the nest area 2 months after fledging (Marchant & Higgins 1993). Single individuals are often recorded outside the breeding season, with some migrating to coastal regions over winter.

Little Eagles feed mostly on rabbits when available, which are located by soaring or from a perch, and caught by diving. Where rabbits are unavailable, Little Eagles feed primarily on birds, as well as small terrestrial and arboreal mammals, insects, fish and reptiles (Marchant & Higgins 1993).

26.1 Methods

Desktop database searches were used to assess the occurrence of Little Eagle within the Investigation Area, and the Project's potential impact on the species. The other threatened bird surveys and bird utilisation surveys included extensive coverage of the Project Area and its surrounds.

Bird utilisation point counts were located at representative sites within the wind farm site and in adjacent land. During all point counts between April 2020 and February 2021, observers scanned all airspace for the species and documented the locations and height of any birds detected. Details of the bird utilisation survey program are provided in Section 10. Other diurnal raptors of similar and smaller sizes were recorded during BUS and the surveys had appropriate capacity to detect Little Eagles if they had been present.

26.2 Existing conditions

The Little Eagle was not detected during field assessments for the Project. It has been documented occasionally in the local area (Figure 26a) in the past as evidenced by records on relevant biodiversity databases. It is known to utilise open woodlands, wooded farmlands and dry woodlands (Marchant & Higgins 1993).

It is considered unlikely to make regular use of the Project Area, particularly the portions located within pine plantation. The species is known to forage in open areas where it takes prey from the ground. In this regard suitable habitat within the Project Area exists in open farmland, although these areas are also devoid of woodland vegetation, which is usually associated with the species' presence.

26.3 Impact assessment

Construction and operation of the KGPH has potential to impact upon Little Eagle via several mechanisms:

- Direct removal of habitat for construction of temporary and permanent infrastructure, such as turbines, hard stands, access roads and transmission lines.
- Direct mortality due to collisions with turbines or transmission lines.
- Displacement of breeding or foraging activity due to disturbance caused by construction and operation of wind farm infrastructure.

There are occasional and historic records of the species in the local area and it is not considered to be a resident species. It was not recorded during site surveys, despite the recording of other raptor species. It is also known to be in decline, with very few records in Victoria over the past 10 years. There however remains some residual risk of impact from turbine and transmission line collision, although this is considered to be a very rare occurrence.

26.3.1 Wind farm

Due to a lack of suitable habitat throughout the majority of the Project Area and lack of contemporary records of the species and ongoing population declines, it is considered unlikely to regularly occur in the local area.

With respect to local movements that may occasionally occur in the Kentbruck area, available information about the species habitat preferences and foraging behaviour suggest that the species may traverse the areas proposed for the wind farm, including open farmland on occasion, but it would seem likely that this would occur rarely.

One Little Eagle has been recorded in mortalities at Victorian wind farm sites where data is available (Moloney, Lumsden, & Smales 2019). However, it was not noted as a species of concern for wind farm developments in Victoria (Moloney, Lumsden, & Smales 2019).

26.3.2 Transmission line

Collisions with powerlines are noted in the FFG Act nomination for the species as an additional threat. This acknowledges that like other raptors, static objects like powerlines can pose a collision risk to the species. As concluded above, it is considered unlikely to regularly occur in the local area and interactions with the transmission line is considered to be a very rare event.

26.3.3 Potential for direct impacts

Little Eagle is unlikely to be directly impacted by the Project for the reasons specified above.

26.3.4 Potential for indirect impacts

Effects of construction and operational noise, traffic and artificial light and hydrological impacts on native vegetation outside the Project Area have all been considered. However, the Project design does not include mechanisms whereby effects on the species or its habitats are plausible. Little Eagle is considered unlikely to be impacted indirectly by the Project.

26.3.5 Conclusion

Due to a lack of suitable habitat throughout the majority of the Project Area and lack of contemporary records of the species in the area, it is considered unlikely to regularly occur in the local area, or to be directly or indirectly impacted by the project.

27. White-bellied Sea Eagle

The White-bellied Sea Eagle *Haliaeetus leucogaster* is not listed as threatened under the EPBC Act is listed as Endangered under the FFG Act.

The species is a large eagle found throughout Australia in coastal regions and inland along rivers and large water bodies. They inhabit a range of inland wetlands, preferring deep open freshwater swamps and lakes (Marchant & Higgins 1993). It searches for prey and carrion by soaring above water bodies, up to 60 meters above the water, using thermals to gain elevation.

The species' social structure is not well studied. Individuals or pairs are often recorded, although large numbers occasionally congregate during periods of drought or at sites where food is abundant, especially immature individuals (Marchant & Higgins 1993).

The species forms lifelong monogamous bonds, and pairs have been recorded defending small breeding territories, especially from immature White-bellied Sea Eagles. Adults have favoured roosting sites, usually large dead trees, often near their nests. Large nests are constructed in tall trees or rocky crevices from large sticks, lined with green leaves or seaweed (Marchant & Higgins 1993). The female lays 1-2 eggs (rarely 3) and both parents take turns incubating the eggs for 35-40 days. Both parents' brood and feed chicks. Fledging occurs after 65-70 days. Adults feed chicks for up to 3 months after fledging, driving their young out of their territories after 4 months. Immature birds disperse widely, with one bird reportedly moving 3,000 kilometres (Marchant & Higgins 1993).

The species is a generalist opportunistic carnivore, actively hunting a wide range of prey, including fish, eels, sea-snakes, small mammals, waterbirds and turtles, and is occasionally recorded scavenging carrion (Marchant & Higgins 1993). When hunting, the eagle dives down on prey, snatching it in its powerful talons. The species is often seen taking fish from the surface of the water, sometimes diving and becoming completely submerged.

Biosis recorded one White-bellied Sea Eagle within the Project Area opportunistically in October 2021, flying at a height of 20 meters above the ground in cleared farmland in the eastern portion of the wind farm area, adjacent to Cobboboonee National Park.

27.1 Methods

Desktop database searches were used to assess the occurrence of White-bellied Sea Eagle within the Investigation Area, and the Project's potential impact on the species. The other threatened bird surveys and bird utilisation surveys included extensive coverage of the Project Area and its surrounds. Bird utilisation point counts were located at representative sites within the wind farm site and in adjacent land. During all point counts between April 2020 and February 2021, observers scanned all airspace for the species and documented the locations and height of any birds detected. Details of the bird utilisation survey program are provided in Section 10. Other diurnal raptors of similar and smaller sizes were recorded during BUS and the surveys had appropriate capacity to detect White-bellied Sea Eagle if they had been present.

27.2 Existing conditions

White-bellied Sea Eagle was recorded once opportunistically during field assessments for the Project. It was recorded within the Project Area, within farmland near Mount Richmond. It has been documented occasionally in the local area in the past as evidenced by records on relevant biodiversity databases. It is known to utilise open woodlands, wooded farmlands and dry woodlands (Marchant & Higgins 1993).

White-bellied Sea Eagle is considered unlikely to make regular use of the Project Area, particularly the portions located within pine plantation. The species is known to forage in open areas generally over water, but also at times over land where it takes prey from the water/ground. In this regard suitable habitat within the Project Area exists in open farmland, however other than adjacent coastal wetlands and the ocean, the Project Area lacks habitat which is more commonly associated with the species' presence.

27.3 Impact assessment

Construction and operation of the KGPH has potential to impact upon White-bellied Sea Eagle via several mechanisms:

- Direct removal of habitat for construction of temporary and permanent infrastructure, such as turbines, hard stands, access roads and transmission lines.
- Direct mortality due to collisions with turbines or transmission lines.
- Displacement of breeding or foraging activity due to disturbance caused by construction and operation of wind farm infrastructure.

White-bellied Sea Eagle was considered to be a 'species of interest' (and hence a 'species of concern') by DELWP (Moloney, Lumsden, & Smales 2019). The species had been reported to have collided once with wind turbines at a wind farm in Victoria (Moloney, Lumsden, & Smales 2019) and the Project is not aware of any subsequent mortality records. This existing mortality combined with the fact that the species is capable of flying at rotor swept height leads to a risk of collision.

The lack of White-bellied Sea Eagles recorded in the Kentbruck area during Project BUS prevented documentation of the birds' movements through the Project Area. The lack of flight data for the species in the Project Area precludes the possibility of undertaking a quantitative approach, such as turbine collision risk modelling.

The Project does not entail removal of any vegetation that is suitable habitat for White-bellied Sea Eagle.

Database records for this species in the local area are all from near coastal environments, with one 2021 VBA record in pine plantation adjacent to Lake Mombeong. This record combined with the one collected during Biosis field surveys for the Project, provide evidence that the species can be found further inland at times.

The lack of observations of this species during BUS for the Project and lack of suitable habitat within areas proposed for turbines result in some residual likelihood of collision risk.

The 'likelihood and consequence' matrix score provided by DELWP (Moloney, Lumsden, & Smales 2019) for the potential risk of turbine collisions for White-bellied Sea Eagle is moderate–- high.

27.3.1 Wind farm

The commercial pine plantations occupying the great majority of the Project Area are not suitable habitat for White-bellied Sea Eagle and 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.

The primary concern for White-bellied Sea Eagle from the wind farm is considered to relate to the potential for collisions with wind turbines and meteorology masts. The wind energy component of the project does not entail removal of any vegetation that is suitable habitat for the species. Therefore, turbine collision impacts are not expected to occur during construction of the wind farm and would be limited to the operational phase of the wind farm.

Potential use of the Project Area

The majority of records of the species in the local area are near-coastal (Figure 27a) which accords with what is considered to be typical habitat for the species. The great majority of the wind farm site is occupied by pine plantations that are not suitable habitat for White-bellied Sea Eagle. Some risk of collision exists for this species from flights that may occur both over the commercial pine plantations and over open farmland, particularly when the species forages inland away from the coast. There is no known information source for the risk of White-bellied Sea Eagle colliding with the guy wires of meteorology masts. Four masts have been in place on the site since late 2018. One of these in the far west of the site is planned to be relocated, but a total of four masts are planned to remain in operation at the wind farm. Some species of birds, particularly raptors, are known to collide with met mast guy wires and an element of risk may exist for any White-bellied Sea Eagle flights if they were to enter the site and encounter a mast.

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.

27.3.2 Transmission line

The entire length of the external transmission line is now proposed to be underground. There is no mechanism by which the underground transmission line could have an impact on the species.

27.3.3 Potential for direct impacts

Collision risk exists for White-bellied Sea Eagle, but this is considered to be a very infrequent event. If a collision does occur, local population impacts are likely as the total population is considered to be in decline, highly dispersed and reproduce slowly. Smales (2005) completed cumulative collision risk modelling for this species across the Australian distribution of the species at 35 wind energy facilities. The result predicted that an average of between slightly less than one and slightly more than two sea-eagles may be killed due to wind turbine collisions every year using a range of avoidance rates.

27.3.4 Potential for indirect impacts

Effects of construction and operational noise, traffic and artificial light and hydrological impacts on native vegetation outside the Project Area have all been considered. However, the Project design does not include mechanisms whereby effects on the species or its habitats are likely to affect the species. White-bellied Sea Eagle populations are considered unlikely to be impacted indirectly by the Project.

27.3.5 Significance of impacts under EPBC Act

An assessment for this species against significant impact criteria for migratory species listed under the EPBC Act (CoA 2013) is provided in Appendix 6. Based on this assessment, the project is considered unlikely to lead to a significant impact on this species.

27.3.6 Conclusion

White-bellied Sea Eagle is known to occur within the Project area, and can fly within rotor swept height (above 60m). Insufficient data were available to allow quantitative collision risk modelling to be undertaken for this species, however the rarity of sightings within pine plantation habitats away from the coast, where the majority of turbines are proposed, suggests that collisions are likely be infrequent events. There is unlikely to be a significantly impact on this species.

28. Terrestrial and arboreal mammals

28.1 Methods

Remote cameras were used to identify small terrestrial mammals at multiple locations across the Investigation Area. An initial camera survey was conducted between May 2020 and June 2020, with a second deployment running between October 2020 and November 2020 that covered new target areas. The focus of the surveys was to identify locations within the proposed disturbance footprint of the Project (including the wind farm and transmission line alignments) that may be potentially suitable habitat for threatened mammal species. Surveys for arboreal mammals were not undertaken because, at the time of the field investigations no arboreal mammal species occurring in the local area were listed as threatened. Since that time the Yellow-bellied Glider has been listed under both the EPBC Act and the FFG Act. It's habitat preferences are well known and there are substantial records of the species from appropriate habitat within the Investigation Area. Threatened mammal species previously recorded within, or in the vicinity of, the Project Area with a medium likelihood of occurrence include:

- Heath Mouse *Pseudomys shortridgei* (EPBC Act: endangered, FFG Act: endangered).
- Long-nosed Potoroo *Potorous tridactylus trisulcatus* (EPBC Act: vulnerable, FFG Act: vulnerable).
- Southern Brown Bandicoot *Isoodon obesulus obesulus* (EPBC Act: endangered, FFG Act: endangered).
- Swamp Antechinus *Antechinus minimus maritimus* (EPBC Act: vulnerable, FFG Act: vulnerable).
- Yellow-bellied Glider *Petaurus australis* (EPBC Act: vulnerable, FFG Act: vulnerable).

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

Camera traps were baited with a standard bait (rolled oats, peanut butter and honey) as described in the *Survey guidelines for Australia's threatened mammals* (DEWHA 2011a) with the inclusion of truffle oil for the Long-nosed Potoroo. The survey guidelines indicate that autumn is the preferred season for camera surveys for Southern Brown Bandicoots, however surveys can be conducted year round if validated with supporting evidence. Camera surveys in autumn were not feasible due to requirements for surveys of other taxa, and land access constraints. The long-term monitoring of Southern Brown Bandicoots for the Glenelg Ark program undertaken by DEECA (ARI) in areas directly adjacent to the study area, between 2005 and 2021 has deployed cameras in either spring or winter.

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

White-flash cameras can assist with identification of species, particularly for identifying the Heath Mouse in the Project Area. A mix of vertical and horizontal camera configurations was employed during both deployments (Table 24). During the May to June deployment a total of five white-flash cameras were deployed next to an infra-red camera within pine planation, Blue Gum plantation and farmland sites. These locations were selected based on identifying them as most likely to potentially detect threatened mammal species, based on nearby records, presence of potential habitat and being along edges adjacent to intact habitat.

The *Survey guidelines for Australia's threatened mammals* (DEWHA 2011a) recommend that camera trap surveys should be complemented with another survey technique. In addition, the specific survey guidelines for the Long-nosed Potoroo recommend using spotlighting, cage trapping or hair surveys in addition to using camera traps to survey for the species. Hair sampling funnel traps were deployed at the camera trap sites during the October to November surveys. Two hair traps were pegged to the ground at each camera site, 10 meters north and south of the camera trap. The hair samples were collected with the cameras and professionally analysed. The camera trap locations are shown in Figure 28a.

Table 24 Locations of mammal camera traps during May to June deployment.

Numbers refer to turbine ID, (D) refers to cameras in a vertical configuration (facing down).

Habitat type	Site Location	Site Type	Notes
Farmland	97 168 Substation 161	Edge Inside Edge Inside	Additional white flash camera deployed at 97 on 18 June 202 (15 days).
Blue-gum	136 170 84 37	Edge Inside Edge Inside	Additional white flash camera deployed at 136 on 18 June 2020 (15 days).
Pine 2010-- 2020	159 (D) 142 66 27	Edge Edge Inside Inside	Additional white flash camera deployed at 159 on 18 June 2020 (15 days).
Pine 2000-- 2010	93 143 (166) 7 (D) 80	Edge Edge Inside Inside	Camera at 143 moved to T166 on 18 June 2020 due to pine harvest operations.
Pine 1996 – 2000	180 17	Edge Inside	Additional white flash camera deployed at 180 on 18 June 2020 (15 days).
Pine 1991-- 1995	111 (D) 147 (D)	Edge Inside	
Pine 1981-- 1990	5 (D) 65 (D) 24 (D) 128 (D)	Edge Edge Inside Inside	Additional white flash camera deployed at 24 on 18 June 2020 (15 days).
Recently Cleared Native	129	Remnant	No replication available as this was the only recently cleared native vegetation.

Habitat type	Site Location	Site Type	Notes
Roadside	Johnsons Rd McLeans Rd Dry Blocks Rd Browns Rd	NA NA NA NA	

Table 25 Locations of mammal camera traps during October to November deployment.

Numbers refer to turbine ID, (D) refers to cameras in a vertical configuration (facing down).

Habitat type	Site Location	Site Type	Notes
Farmland	47 101	Edge Inside	Additional white flash camera deployed at 47.
Pine 2010-- 2020	85 (D) 103 51 (D) 52	Edge Edge Inside Inside	Additional white flash camera deployed at 103.
Pine 2000 – 2010	94 (D) 8 (D) 92	Edge Inside Inside	Additional white flash camera deployed at 8.
Pine 1996 – 2000	178 (D) 177	Edge Inside	
Pine 1991-- 1995	35 (D)	Inside	
Pine 1981-- 1990	149 (D) 116 67 (D) 152	Edge Edge Inside Inside	
Recently Cleared Native	129	Remnant	No replication available as this was the only recently cleared native vegetation.
Roadside	McLeans Rd Browns Rd		
Native	HW1 HW2 HW3 HW4		Haywood terminal station. Native, intact and edge habitat.
Native, linear remnant, Portland–Nelson Rd	P-N Rd 1 P-N Rd 2 P-N Rd 3 (D)		

28.2 Existing conditions

Eight threatened terrestrial or arboreal mammal species have previously been recorded within 10 kilometres of the Project Area:

- Swamp Antechinus *Antechinus minimus maritimus* (EPBC Act: vulnerable, FFG Act: vulnerable).
- Spot-tailed Quoll *Dasyurus maculatus maculatus* (EPBC Act: endangered, FFG Act: endangered).
- White-footed Dunnart *Sminthopsis leucopus* (FFG Act: vulnerable).
- Southern Brown Bandicoot *Isoodon obesulus obesulus* (EPBC Act: endangered, FFG Act: endangered).
- Yellow-bellied Glider *Petaurus australis* (EPBC Act: vulnerable, FFG Act: vulnerable).
- Long-nosed Potoroo *Potorous tridactylus trisulcatus* (EPBC Act: vulnerable, FFG Act: vulnerable).
- Heath Mouse *Pseudomys shortridgei* (EPBC Act: endangered, FFG Act: endangered).
- Smoky Mouse *Pseudomys fumeus* (EPBC Act: endangered, FFG Act: endangered).

The majority of these records are from intact, contiguous habitat outside of the Project Area.

Southern Brown Bandicoot was detected in Project surveys from a camera trap within Mount Clay State Forest as part of the assessment of a potential powerline route which has now been removed from the project (Figure 28a).

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. The site had a dense understorey of native vegetation contiguous with native vegetation of Kentbruck Heath in the adjacent Cobboboonee National Park. Possible Heath Mouse hair records were obtained from hair tubes and cameras within the pine plantation, but analysis was unable to provide confirmed species identity. It is thus possible that Heath Mouse may be more widely distributed within pine plantation habitat of the Project Area.

Yellow-bellied Glider is an inhabitant of eucalypt forests and woodlands and there are multiple records of it from these environments within Lower Glenelg and Cobboboonee National Parks. Amongst other food sources, the Yellow-bellied Glider feeds by incising eucalypts (including Messmate Stringybark and potentially Apple Jack) to obtain sap. It also requires large hollow-bearing eucalypts to provide den sites. It does not occur in pine plantations or in scattered trees in otherwise cleared land.

28.3 Impact assessment

Construction and operation of the KGPH has potential to impact upon threatened terrestrial mammals via several mechanisms:

- Direct mortality of individuals during vegetation clearing for construction of permanent or temporary infrastructure, such as turbines, hard stands, access roads and transmission lines.
- Direct removal of habitat for construction of temporary and permanent infrastructure, such as turbines, hard stands, access roads and transmission lines.

- Displacement of breeding or foraging activity due to disturbance caused by construction and operation of wind farm infrastructure.
- Indirect disturbance to habitat areas may also occur as a result of changes to hydrological regimes, sedimentation, erosion and pollution.

Six threatened terrestrial or arboreal mammal species are assessed has having medium or higher likelihood of occurrence within the within or near the Project Area:

- Swamp Antechinus *Antechinus minimus maritimus* (EPBC Act: vulnerable, FFG Act: vulnerable).
- Southern Brown Bandicoot *Isoodon obesulus obesulus* (EPBC Act: endangered, FFG Act: endangered).
- Yellow-bellied Glider *Petaurus australis* (EPBC Act: vulnerable, FFG Act: vulnerable).
- Long-nosed Potoroo *Potorous tridactylus trisulcatus* (EPBC Act: vulnerable, FFG Act: vulnerable).
- Heath Mouse *Pseudomys shortridgei* (EPBC Act: endangered, FFG Act: endangered).
- White-footed Dunnart *Sminthopsis leucopus* (FFG Act: vulnerable).

All six species have been previously recorded within 10 kilometres of the Project Area and the majority of these records are from intact, contiguous habitat outside of the wind farm footprint (Figure 28a). Southern Brown Bandicoot was recorded from a camera near the Heywood terminal station (Figure 28a). This site is contiguous with the Mount Clay State Forest and Narrawong Flora Reserve, which provides suitable habitat for this species and for the Heath Mouse, Long-nosed Potoroo and Swamp Antechinus. The proposed transmission line option along the western boundary of Mount Clay State Forest and Narrawong Flora Reserve is no longer included within the Project design. White-footed Dunnart was recorded in Blue-gum plantation near the eastern end of the Project Area.

Henry (in Menkhorst 1995) notes that in the region near Portland Yellow-bellied Glider prefers forest containing Manna Gum *Eucalyptus viminalis,* Scentbark *Eucalyptus aromaphloia* and Swamp Gum *Eucalyptus ovata* (taxonomic changes suggests that *Eucalyptus aromaphloia* may now refer to *Eucalyptus splendens*). There are multiple records of Yellow-bellied Glider from eucalypt dominated environments within Lower Glenelg and Cobboboonee National Parks.

Possible Heath Mouse was recorded from hair tubes and camera traps at several locations within the pine plantation.

28.3.1 Wind farm

The wind farm component of the Project site is unlikely to support significant habitat for any of these threatened mammals with the pine plantations replacing almost all native habitats that would have once provided suitable habitat. Although possible Heath Mouse was recorded in several locations within the GTFP plantation, areas of pine plantation are unlikely to provide high quality habitat for this species.

The plantation area would once have provided habitat contiguous with both the more wooded habitats to the north associated with the Glenelg River and Cobboboonee National Parks and the more coastal habitats to the south. The 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 they are also very narrow and disturbed, being adjacent to a high speed road and subject to regular slashing and pruning. None of these threatened species were recorded using these roadside patches.

28.3.2 Transmission line

The transmission line is proposed to be underground within an existing road alignment through Cobboboonee National Park for the greater portion of its length and to be also underground for a shorter section near Heywood. The broader area of Cobboboonee National Park provides habitat suitable for all of these threatened mammal species. While they may be present within the edges of the road alignment, disturbance will be confined to the short construction period, and potential impacts on tree protection zones of some adjacent trees is unlikely to impact on the broader populations within primary habitats throughout the National Park. Cleared agricultural land in the east of the transmission line route does not represent high quality habitat for any of these threatened mammal species.

Along the alignment of the proposed underground transmission line in Boiler Swamp Road a total of 276 Messmate Stringybark, 27 Swamp Gum and 10 Manna Gums are potentially impacted by encroachment into tree protection zones (Section 4.4.2). These represent the only preferred tree species for Yellow-bellied Glider that may be impacted by the Project. If some of these trees die as a result of tree protection zone disturbance for construction of the transmission line, this is unlikely to impact upon the local availability of habitat for Yellow-bellied Glider, given the context of the site, which is located within a very large patch of habitat, including Cobboboonee Forest Park, Cobboboonee National Park and portions of Lower Glenelg National Park.

28.3.3 Potential for direct impacts

Impacts on small mammal habitat for the proposed transmission route adjacent to Mount Clay State Forest have now been avoided by a change in alignment of the transmission line. The Project may involve minor clearing of roadside vegetation that may provide habitat for small terrestrial mammal species and for Yellow-bellied Glider, but these are unlikely to be significant impacts, due to the small amounts of clearance.

Clearance of a small area of native vegetation directly adjacent to the Heywood Terminal Station (0.52 hectares of Heathy Woodland) may result in a temporary loss of habitat for terrestrial mammal species. That area was not found to contain preferred tree species for Yellow-bellied Glider.

Increased road traffic, especially during construction may result in some increase in mortality. All four species are relatively abundant in the local area and it is not likely that impacts will significantly affect the viability of the populations of any of them.

28.3.4 Potential for indirect impacts

Effects of construction and operational noise, artificial light and hydrological impacts are not likely to affect threatened mammal species beyond a very short distance (measured in metres) and their populations that mostly occur well outside the Project Areas are unlikely to be influenced by such effects.

28.3.5 Significance of impacts under EPBC Act

Assessment for these species against relevant significant impact criteria for species listed under the EPBC Act (CoA 2013) is provided in Appendix 6. Based on this assessment, the project is considered unlikely to lead to a significant impact on these species.

28.3.6 Conclusion

Construction of the wind farm component of the Project does not involve direct removal of habitats identified as important for threatened terrestrial or arboreal mammal species, however increased traffic due to construction has potential to lead to a temporary and highly localised increase in road fatalities for species occurring in bushland adjacent to Portland-Nelson Road.

Construction of the transmission line involves removal of up to 0.52 hectares of Heathy Woodland near the Heywood Terminal Station. This area provides potential habitat for several terrestrial mammal species including Southern Brown Bandicoot, Swamp Antechinus, Heath Mouse and Long-nosed Potoroo. Construction of the transmission line beneath Boiler Swamp road will not impact upon understorey habitat, but may result in death of trees due to impacts to tree protection zones adjacent to the road. Some of these trees may be utilised by Yellow-Bellied Glider, however if any of these trees die, this is unlikely to significantly impact upon the species due to the context of the site and extent of continuous habitat.

The is a low risk of the Project impacting upon terrestrial or arboreal mammal species.

29. Microbats

The microbat and Southern Bent-wing Bat *Miniopterus orianae bassanii* assessment is presented in a separate report (Biosis 2024a).

Southern Bent-wing Bat is listed as critically endangered under the EPBC Act and as critically endangered under the FFG Act.

30. Grey-headed Flying-fox

Grey-headed Flying-fox *Pteropus poliocephalus* is listed as vulnerable under the EPBC Act and as vulnerable under the FFG Act.

The National Flying-fox Monitoring Program (NFFMP) has undertaken regular counts throughout the range of flying-fox species in Australia since 2012 (Westcott et al. 2011). An analysis of these data indicates that the Australian population of the Grey-headed Flying-fox is approximately 700,000 (CSIRO 2019). The February 2019 NFFMP counted 660,000 individuals across Queensland, New South Wales, Victoria, ACT and South Australia. Counts included 24 camps in Victoria, which held 9% of the Grey-headed Flying-fox population (CSIRO 2019). The most recent publicly available counts from February 2020 are available through the National Flying-fox monitoring viewer. Victoria has 26 camps, four of which are considered nationally important: Melbourne, Geelong, Bendigo and Bairnsdale (http://www.environment.gov.au/webgis-framework/apps/ffc-wide/ffc-wide.jsf). Other known camps are located at Colac, Warrnambool, and various locations in eastern, western and northern Victoria (http://www.environment.gov.au/webgis-framework/apps/ffc-wide/ffc-wide.jsf).

Grey-headed Flying-foxes have been expanding their distribution across Victoria in recent decades with roost-camps increasingly appearing from the east of the state to sites in the west. The species established a camp in Geelong in 2003 and has a year-round occupation. Further west, at Warrnambool Botanic Gardens Grey-headed Flying-foxes were first recorded in 2003 and at Colac Botanic Gardens the species was first seen in 2016. Grey-headed Flying-fox roosts have also been observed at Lower Gellibrand in 2016, and at Bacchus Marsh and Merrimu. In very recent years new roosts have been found near Hexham and Lismore and in Adelaide. A camp has been recently (2024) recorded in the Ballarat botanic gardens.

Grey-headed Flying-foxes feed on nectar, pollen and fruit (Eby & Law 2008). The species is known to feed on over 100 plant species, with eucalypts forming an important part of their diet (Commonwealth of Australia 2017, Eby & Law 2008). Individuals generally forage within 20 kilometres of their day roost, although they can fly up to 40-50 kilometres to feed and hundreds of kilometres in response to changing foraging resources (OEH 2020, Eby & Law 2008, Roberts et al. 2012, Commonwealth of Australia 2017). Eucalypt flowering and nectar production can be irregular and climate-driven. Grey-headed Flying-fox food resources are thus spatially and temporally variable from year-to-year, and related to climatic conditions across the species' distributional range (Eby & Law 2008). A camp including approximately 1500 Grey-headed Flying-foxes was also recorded in a pine plantation near Millicent (South Australia) in 2019. This is approximately 50 km north-west of the Project Area.

Movement behaviour of the species ranges from residency and nomadism to long-distance annual, north-south migration (Roberts et al. 2012). Individuals can move between camps, and large numbers of Grey-headed Flying-foxes abandon their southern summer camps and move north. Some camps in southern Australia support the species' year-round, whereas at other camps all individuals depart after summer. The variability and changing flowering resource availability drives the long-distance latitudinal migration behaviour (Eby and Law 2008, Roberts et al. 2012). Stop-over sites may occur in habitats suitable for long-distance migration (Eby & Law 2008).

No survey was undertaken for this species as at the time of carrying out targeted surveys as there were limited records in the region. Victorian Biodiversity Atlas records include observations of one or two individuals near Portland between 1998 and 2013. Recently records from a national satellite tracking study have been added to public databases and there are several records of Grey-headed Flying-fox to the north and west of the Project Area. One of the satellite tracked individuals appears to have followed the Glenelg River while moving between the Adelaide-based colony camp and areas in south-western Victoria. Department of Environment, Land, Water and Planning has also reported that a temporary Grey-headed Flying-fox camp was established recently in pine plantations to the north of the Glenelg River. Grey-headed Flying-fox have also recently established temporary camps in pine plantations elsewhere in south-west Victoria and have been recorded as wind farm collision mortalities at nearby wind farms. In the past several years Grey-headed Flying-fox has established temporary camps in many locations across western Victoria as the species expands its range into areas not previously known to have been occupied.

30.1 Methods

Desktop database searches were used to assess the occurrence of the Grey-headed Flying-fox within the Investigation Area, and the Project's potential impact on the species. Numerous diurnal and nocturnal surveys were undertaken by several experienced zoologists over many months during the course of the Project. If individuals or a camp were present it is expected that this would have been recorded. Consultation was also carried out with the plantation managers and this species was not raised as having camp(s) present onsite.

30.2 Existing conditions

The habitat within the Project Area is unlikely to be regularly used by Grey-headed Flying-fox, especially given that most camps are established near rivers or other waterbodies. Habitat to the south of the Project Area along the coast is unsuitable and therefore it is unlikely that the species would fly south over the Project Area to reach this location. The future use of the pine plantation cannot be completely ruled out given the use of similar habitats in the region, however the lack of a significant water source makes this less likely.

30.3 Impact assessment

Construction and operation of the KGPH has potential to impact upon Grey-headed Flying-fox via several mechanisms:

- Direct removal of foraging habitat for construction of temporary and permanent infrastructure, such as turbines, hard stands, access roads and transmission lines.
- Direct mortality due to collisions with turbines or transmission lines.
- Displacement of foraging activity due to disturbance caused by construction and operation of wind farm infrastructure.

Both the wind farm and transmission line, where it is constructed above ground, present a minor risk to Grey-headed Flying-fox given that currently there is very little habitat likely to attract the species to fly over the site. It is possible the species may fly across the site to access flowering eucalypts to the south of the site (for example Blue Gums) however this is only likely if a camp establishes in the area at some point in the future. For this reason the species has been given consideration in the draft BBAMP.

There remains some residual risk of the pine plantation being used as a temporary camp, or risks from movement through and above the tree canopy when transiting between camps in Victoria and South Australia, however this is also less likely due to a lack of more permanent water and current absence of camps in proximity to the Project. Seasonal and inter-camp long-distance movements of the species are more likely to occur along the Glenelg River, where some recent GPS tracking data shows movements between South Australian (Adelaide Botanic Gardens) and Victorian camps (Warrnambool, Hexham).

30.3.1 Wind farm

The wind farm presents a minor risk to Grey-headed Flying-fox given that currently there is no habitat likely to attract the species to fly over the site, although animals making long-distance dispersal movements certainly have capacity to fly over it and if they did so would be at some risk of collision with turbines. There remains some residual risk of the pine plantation being used as a temporary camp, however this is also less likely due to a general lack of permanent water there.

30.3.2 Transmission line

The entire external transmission line is now proposed to be constructed underground, which eliminates any collision risk to Grey-headed Flying-fox. There is no mechanism by which the underground transmission line could have an impact on the species.

30.3.3 Potential for direct impacts

It is likely that some collisions by Grey-headed Flying-fox with turbines could occur, but this is considered likely to be very infrequent and if it occurs, is likely to affect a small number of individuals, with no significant population impacts on the species. The number of collisions is unlikely to annually reach or exceed 1% of the estimated population.

30.3.4 Significance of impacts under EPBC Act

Assessment for this species against significant impact criteria for vulnerable species listed under the EPBC Act (CoA 2013) is provided in Appendix 6. Based on this assessment, the project is considered unlikely to lead to a significant impact on the species.

30.3.5 Conclusion

There are currently no known camps close to the Project Area, however this species appears to be expanding into new locations within western Victoria, and there is potential for a camp to establish in the future. This is most likely to occur within pine plantation or native forest close to fresh water, such as the Glenelg River. If a camp were to establish within the nightly foraging range of the species from the project area, it is possible that individuals may fly through the project area, potentially to access nectar resources (such as flowering plantation blue-gum trees) to the south or east of the wind farm, and may be at risk of collision. Given the size of the population, the project is considered highly unlikely to result in sufficient collisions for the impact to be considered a significant impact to the population.

31. Swamp Skink

Swamp Skink *Lissolepis coventryi* is listed as endangered under the EPBC Act and the FFG Act. It was listed under the EPBC Act in March 2023.

Swamp Skink occurs in densely vegetated swampy and wet habitats, within heathlands, sedgelands and saltmarsh vegetation and inhabits edges of dune lakes, damp areas and drainage lines. The species prefers dense reeds, sedges and Paperbark *Melaleuca* spp. or Tea-tree *Leptospermum* spp. thickets. Fallen logs and dense vegetation are used for basking (Robertson & Coventry 2019, Smales 1981) and the species shelters in burrows of crustaceans or those dug by themselves. While the Swamp Skink inhabits swamp-scrub thickets, it is not known from forested or otherwise densely treed environments, and it is strongly, although not entirely, associated with indigenous vegetation communities (DCCEEW 2023b).

The species has been previously recorded close to the Project Area in the Long Swamp complex of wetlands in Discovery Bay Coastal Park and within the Kentbruck Heath area of Cobboboonee National Park.

31.1 Methods

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

- Optimal timing for target species (time of year, and time of day).
- Optimal location of surveys (within the limitations outlined above on suitable habitat and impact areas).
- Spatial and temporal sampling.
- Selecting observers with knowledge and identification skills for surveying the target species.
- Documenting survey methods and results.
- Use of multiple survey techniques:
  - Diurnal active searching under rocks and logs.
  - Visual searches of sedges and rushes using binoculars, around swamps.
  - Roof tiles.

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

Twenty-three rows of 15 tiles (345 tiles) spaced 10 metres apart were deployed in July 2020 (Figure 31a) and each was checked on three separate occasions: once in October, November and December. A total of four hours was spent searching for Swamp Skink, at the location of a 1980 VBA record of a

Swamp Skink at the southern end of Johnsons Road, or at other swampy areas with potential habitat for the species throughout the Project Area. The time of year (late-spring to early-summer) was ideal for conducting these surveys because it coincides with the primary activity and breading season of the species.

31.2 Existing conditions

On 15 December 2020 two adult Swamp Skinks were recorded basking on a log in a densely vegetated Paper-bark *Melaleuca* spp. swamp at the southern end of Johnsons Road (Figure 31b). While this observation was not within the Project Area, it is approximately 200 metres outside of the boundary and is the exact location of a previous VBA record of a Swamp Skink from 1980. A photo of one Swamp Skink individual is shown in Plate 19 (Appendix 4).

Low-lying areas supporting appropriate vegetation in the immediate vicinity of the Project are likely to be inhabited by Swamp Skinks.

31.3 Impact assessment

Construction and operation of the KGPH has potential to impact upon Swamp Skinks via several mechanisms:

- Direct mortality of individuals during vegetation clearing for construction of permanent or temporary infrastructure, such as turbines, hard stands, access roads and transmission lines.
- Direct removal of habitat for construction of temporary and permanent infrastructure, such as turbines, hard stands, access roads and transmission lines.
- Displacement due to disturbance caused by construction and operation of wind farm infrastructure.
- Indirect disturbance to habitat areas may also occur as a result of changes to hydrological regimes, sedimentation, erosion and pollution.

31.3.1 Wind farm

The Swamp Skink is not likely to inhabit any portion of the wind farm component of the project site as it does not offer the required swamp habitats with dense indigenous vegetation.

31.3.2 Transmission line

The export transmission line is proposed to be underground within an existing road alignment through Cobboboonee National Park and then to Heywood. The broader area of Cobboboonee National Park provides areas of habitat suitable for the species. While it may be present within the edges of the road alignment where it intersects with low-lying and wetland environments, disturbance will be confined to the short construction period and will have little 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 habitat for the species.

31.3.3 Potential for direct impacts

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.

31.3.4 Potential for indirect impacts

Effects of construction and operational noise, artificial light and hydrological impacts are not likely to affect the species due to the separation distance between sources of these effects. Wetland habitat suitable for the species occurs within the Ramsar site outside the Project Area and no wind farm infrastructure is planned within 300 metres of the Ramsar site boundary, or 500 metres of wetlands within the Ramsar site. With regard to hydrology, the Project has been assessed (AECOM 2024a, AECOM 2024b) as having low to very low potential to alter hydrological regimes temporarily or permanently such that the of wetlands might be affected and there is no apparent hydrological pathway that might cause changes in the extent of freshwater vegetation communities.

The Conservation Advice for Swamp Skink (DCCEEW 2023b) notes that vegetation at many sites occupied by the species is subject to infestation by *Phytophthora cinnamomi* and that the pathogen can dramatically alter the prime characteristics of Swamp Skink habitat (Robertson & Clemann 2015). The Project Area is not significantly susceptible to the pathogen and appropriate measures to prevent its introduction or spread will be implemented in accordance with an environmental management plan, especially during construction.

31.3.5 Significance of impacts under EPBC Act

An assessment for this species against significant impact criteria for endangered species listed under the EPBC Act (CoA 2013) is provided in Appendix 6 Table A6.13. Based on this assessment, the project is considered unlikely to result in a significant impact on the Swamp Skink.

31.3.6 Conclusion

Swamp Skink has been recorded in suitable habitat outside the Project area, and has potential to occur in Tea-tree or Paperbark thickets along the transmission route within Cobboboonee National Park or Cobboboonee Forest Park.

These potential habitat areas are unlikely to be directly impacted by the Project, and indirect impacts are being avoided by avoiding hydrological impacts. As noted above, the Project is considered unlikely to result in a significant impact on the Swamp Skink.

32. Other threatened reptiles

Three reptile species listed as threatened under the FFG Act may occur within or near the Project Area. These species and their listed status under the FFG Act are shown below:

- Striped Worm-lizard *Aprasia striolata* (FFG Act: endangered).
- Glossy Grass Skink *Pseudemoia rawlinsoni* (FFG Act: endangered).
- Eastern Bearded Dragon *Pogona barbata* (FFG Act: vulnerable).

Striped Worm-lizard and Eastern Bearded Dragon have been previously recorded within 10 kilometres of the Project Area. Glossy Grass Skink has not been previously recorded, but it may occur based on its distribution and presence of potentially suitable habitat within 10 kilometres of the Project Area.

Striped Worm-lizards inhabit woodlands, heathlands with sandy soils and rocky outcrops in western Victoria (Robertson & Coventry 2019, Wilson & Swan 2017). The species was recorded during surveys for the Project and is considered likely to occur along roadsides and areas of low disturbance across the Project Area. The Glossy Grass Skink is patchily distributed along coastal regions of southern Victoria, and there are no records between Portland and the South Australian border, although it has been documented just inside South Australia. It inhabits swamps, wetlands and marshes. Eastern Bearded Dragon occurs in dry sclerophyll forests and heathland, particularly in areas with abundant woody debris (Robertson & Coventry 2019).

32.1 Methods

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

- Optimal timing for target species (time of year, and time of day).
- Optimal location of surveys (within the limitations outlined above on suitable habitat and impact areas).
- Spatial and temporal sampling.
- Selecting observers with knowledge and identification skills for surveying the target species.
- Documenting survey methods and results.
- Use of multiple survey techniques:
  - Diurnal active searching under rocks and logs.
  - Visual searches of sedges and rushes using binoculars, around swamps.
  - Roof tiles.

Aprasia species have been successfully surveyed and recorded using roof tiles (Nature Glenelg Trust [no date] I. Veltheim pers. obs.). *Aprasia* species are also often found beneath partially embedded surface rocks. Active visual searching using binoculars around swamp edges and sedges can be used to survey for Glossy Grass Skinks (J. Farquhar pers. obs.). Eastern Bearded Dragons can be located opportunistically; while they are basking on warm roads or active on the margins of tracks in treed areas (J. Farquhar pers. obs.).

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

Twenty-three rows of 15 tiles (345 tiles) spaced 10 metres apart were deployed in July 2020 (Figure 32a) and each were checked on three separate occasions: once in October, November and December. Two observers searched beneath a total of 127 rocks within or on the margins of the Project Area in search of Striped Worm-lizard. A total of four hours was spent searching for Glossy Grass Skink at the southern end of Johnsons Road, or at other swampy areas with potential habitat for the species throughout the Project Area. Eastern Bearded Dragons were found by opportunistic means, given that they are most likely encountered while driving along roads or walking to tile sites in treed areas. The time of year (late-spring to early-summer) was ideal for conducting these surveys because it coincides with the primary activity and breading season of these reptile species.

32.2 Existing conditions

A total of fifteen reptile species were recorded during the Project surveys (Appendix 3 Table A3.1). Four-toed Skink, McCoy's Skink, Southern Grass Skink and Eastern Three-lined Skink were regularly recorded during tile surveys, with the occasional Tiger Snake and White-lipped Snake. A Blotched Blue-tongued Lizard and an Eastern Bearded Dragon were recorded on camera traps in roadside remnant vegetation along Portland–Nelson Road. Several threatened reptiles were also recorded, either incidentally or during targeted searches, including Striped Worm-lizard and Eastern Bearded Dragon. Further details regarding records of threatened reptiles are provided below.

Striped Worm-lizard *Aprasia striolata* (FFG Act: endangered)

During surveys immediately adjacent to Johnsons Road, two juvenile Striped Worm-lizards were recorded under a single rock (Figure 32b). The freshly shed skin of a third individual was discovered beneath another rock along Johnsons Road on the same date (17 December 2020). This roadside habitat is ideal for Striped Worm-lizards, due to an abundance of limestone surface rocks which is greater in density than that of other sections of the Project Area. A single adult specimen was also found under a piece of iron sheet on a roadside verge at Swan Lake on 30 June 2020 (Plate 18).

Glossy Grass Skink *Pseudemoia rawlinsoni* (FFG Act: endangered)

Glossy Grass Skink was not detected during our reptile surveys, and there are no VBA records from the region. However, there is a single 2014 record of the species from remnant vegetation at a swamp margin within Discovery Bay Coastal Park, which has recently been uploaded to the iNaturalist database (by a community member) with a photo of the specimen. This is the only known record of the species from the region.

Eastern Bearded Dragon *Pogona barbata* (FFG Act: vulnerable)

On 6 October 2020 a single Eastern Bearded Dragon was found active in a patch of remnant vegetation immediately adjacent to Portland–Nelson Road (Figure 32b). A second individual was recorded along a track near the intersection of Carters Rd and South Road (i.e. at the southern border of the Project Area where the pine plantation meets coastal dune scrub) on 25 November 2020.

32.3 Impact assessment

Construction and operation of the KGPH has potential to impact upon threatened reptiles via several mechanisms:

- Direct mortality of individuals during vegetation clearing for construction of permanent or temporary infrastructure, such as turbines, hard stands, access roads and transmission lines.
- Direct removal of habitat for construction of temporary and permanent infrastructure, such as turbines, hard stands, access roads and transmission lines.
- Displacement of breeding or foraging activity due to disturbance caused by construction and operation of wind farm infrastructure.
- Indirect disturbance to habitat areas may also occur as a result of changes to hydrological regimes, sedimentation, erosion and pollution.

32.3.1 Wind farm

The wind farm site is inhabited by Striped Worm-lizard and the microhabitats in which they were detected reflect locations that offer shelter for them in the form of surface- or partially buried rocks (or the surrogate provided by roof tiles) and indigenous vegetation and its leaf litter that support the invertebrate species on which they prey. This species is cryptic and does not sun bask and they have very limited dispersal ability. It is likely that the local distribution, including populations along roadside verges, is a reflection of former populations that preceded the establishment of pine plantations and clearing for agriculture. Eastern Bearded Dragon was also recorded within 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 Glossy Grass Skink is not likely to inhabit any portion of the wind farm component of the project site as it does not offer their required swamp habitats with dense indigenous vegetation.

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. Requirements for these aspects of the project are not full detailed as yet, but 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.

32.3.2 Transmission line

The transmission line is proposed to be underground within an existing road alignment through Cobboboonee National Park and then to Heywood. The broader area of Cobboboonee National Park provides habitat suitable for the various threatened reptile species. While they may be present within the edges of the road alignment, disturbance will be confined to the short construction period and will have little 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 good habitat for any of the threatened reptile species and construction of the line will have no measurable effect on any of them.

32.3.3 Potential for direct impacts

The potential of the Project to have direct impacts on threatened reptiles relates, in the main, to some minor loss of habitat along some roadsides due to track widening within the wind farm site and access roads including Portland–Nelson Road. This is likely to affect Striped Worm-lizard and Eastern Bearded Dragon. Increased road traffic, especially during construction may result in some increase in mortality of Eastern Bearded Dragons. These two species are quite widespread and relatively abundant in the region and it is not likely that impacts will significantly affect the viability of the population of any of them.

32.3.4 Potential for indirect impacts

Effects of construction and operational noise, artificial light and hydrological impacts are not likely to affect reptile species beyond a very short distance (measured in metres) and their populations that are outside the Project Areas are unlikely to be influenced by such effects.

32.3.5 Conclusion

Striped Worm-lizard and Eastern Bearded Dragon were both recorded within road reserves supporting remnant native vegetation within the Project area. There is potential for these species to be impacted by road modifications and increased road traffic during construction, however these impacts are unlikely to significantly affect the viability of local populations.

33. Growling Grass Frog

Growling Grass Frog *Litoria raniformis major* is listed as vulnerable under the EPBC Act and as vulnerable under the FFG Act.

Growling Grass Frog inhabits wetlands and sometimes waterways which support suitable habitat in the form of fringing, emergent and floating vegetation. With the exception of there being one database record for the species (see Section 33.2), no habitat suitable for Growling Grass Frog has been identified anywhere within the Project Area, including along the underground section of the transmission line route. Surveys for Growling Grass Frog were undertaken at bodies of freshwater that exist close to the Project Area as the species can travel overland between suitable wetlands and there is some possibility that individuals might occasionally enter the Project Area. Due to the lack of suitable waterbodies within the Project Area this is considered to be a low probability.

33.1 Methods

Surveys for the species were conducted in accordance with methods set out in *Significant impact guidelines for the vulnerable Growling Grass Frog* (DEWHA 2009b). For this species call playback and listening (for male calls) surveys were supplemented by spotlighting. Surveys were carried out in November 2018 and February 2019, during a minimum of two nights by two zoologists at each wetland. In all frog surveys precautions were employed against spread of Chytrid fungus as per the 'Hygiene protocols for the control of diseases in Australian frogs' (Murray et al. 2011). Listening for the characteristic calls of Growling Grass Frog was also undertaken during all other nocturnal surveys near freshwater wetlands (i.e. during threatened freshwater wetland bird surveys), which provided an additional opportunity to detect this species outside of targeted Growling Grass Frog surveys during 2019 and 2020.

Surveys in conjunction with surveys for Australasian Bittern were undertaken at various wetlands as set out in Table 26.

Table 26 Locations of Growling Grass Frog surveys in 2018 and 2019

Date	Location
27/11/2018	Wetland south of Swan Lake
27/11/2018	Wetland 1 Mt. Richmond
27/11/2018	Wetland 2 Mt. Richmond
27/11/2018	Wetland Harolds Track, Mt. Richmond
28/11/2018	Lake Mombeong
28/11/2018	Little Creek, Quarry Road, Mt. Richmond
5/02/2019	Wetland 2 Mt. Richmond
5/02/2019	Wetland Harolds Track, Mt. Richmond
5/02/2019	Swan Lake

Date	Location
6/02/2019	Wetland Harolds Track, Mt. Richmond
6/02/2019	Swan Lake
7/02/2019	Small wetland east of Lake Mombeong

33.2 Existing conditions

Targeted surveys did not detect Growling Grass Frog, and we observed minimal habitat within the site that could be considered suitable habitat for the species. This is reflected in the fact that there are only two VBA database records of the species from within the wind farm site, with both records being over 40 years old. One of them is at a small wetland amongst a pine plantation just inside the boundary of the Project Area close to the south-eastern extremity of the wind farm area. A second record is from close to the centre of the GTFP pine plantation (1979, Figure 33). There is no wetland at the location of the record. The VBA also has records of Shy Albatross and Southern Giant Petrel at the same location, and we therefore consider the location of this record to be an error.

33.3 Impact assessment

Construction and operation of the KGPH has potential to impact upon Growling Grass Frog via several mechanisms:

- Direct removal of habitat for construction of temporary and permanent infrastructure, such as turbines, hard stands and access roads.
- Displacement of Growling Grass Frog from habitat areas due to disturbance caused by construction and operation of wind farm infrastructure.
- Indirect disturbance to wetland habitat may also occur as a result of changes to hydrological regimes, sedimentation, erosion and pollution.
- Disturbance to riparian vegetation and other vegetation surrounding wetlands that provides a protective buffer.

With the exception of one database record for the species, no habitat suitable for Growling Grass Frog has been identified anywhere within the Project Area, including along the transmission line alignment. Surveys for Growling Grass Frog were undertaken at bodies of freshwater that exist close to the Project Area because the species can travel overland between suitable wetlands, and to address the potential for the Project to adversely affect suitable wetlands outside the Project Area. Due to the lack of suitable waterbodies within the Project Area it is unlikely that Growling Grass Frogs might move into the site from wetlands outside of it.

33.3.1 Wind farm

Project surveys conducted in accordance with methods set out in *Significant impact guidelines for the vulnerable Growling Grass Frog* (DEWHA 2009b) did not detect Growling Grass Frog, and the wind farm site does not provide suitable habitat for the species.

The wind farm component of the Project entails no loss of habitat for the Growling Grass Frog.

33.3.2 Transmission line

The transmission line route crosses some streams but they are not considered to meet the requirements of suitable lotic habitat for the species (DEWHA 2009b). They may provide corridors for movement by Growling Grass Frogs between more suitable lotic habitats, however, the Project proposes horizontal directional drilling for cable laying under the Surrey River to avoid potential disturbance of their ecosystem values. Any potential for disturbance of Growling Grass Frogs or the capacity for them to move along streams will be short-term and confined to brief construction periods only.

33.3.3 Potential for direct impacts

Growling Grass Frog are constrained to very specific habitat types, none of which will be removed or modified by the Project. The environment of the Project Area is not suitable habitat for the species. Growling Grass Frogs are not likely to be directly impacted by the Project.

33.3.4 Potential for indirect impacts

Effects of construction and operational noise and traffic on vegetation of freshwater wetlands have been considered. However, the general lack of suitable habitat and the separation distances from locations of such effects on suitable wetlands means that Growling Grass Frogs and their habitats are not likely to be impacted indirectly by those aspects of the Project.

Dewatering of turbine foundations has potential to impact upon downstream wetlands if surface flow, sedimentation and erosion is not appropriately managed. The Groundwater Assessment Report (AECOM 2024a) states that no turbines in the GTFP plantation are expected to intersect groundwater during excavation of their foundations. The proposed layout no longer includes turbines in the farmland in the east of the wind farm site, where there was potential for turbine bases to intersect with shallow ground water. As a result there is no expected intersection between turbines and groundwater, and therefore no requirement for dewatering of turbine foundations.

33.3.5 Significance of impacts under EPBC Act

Assessments for Growling Grass Frog against significant impact criteria for vulnerable species listed under the EPBC Act (DoE 2013a) and against species-specific significant impact criteria for Growling Grass Frog (DEWHA 2009b) are provided in Appendix 6 Table A6.14. The assessment indicates that a significant impact on the species is unlikely.

33.3.6 Conclusion

The Project does not involve direct or indirect impacts to any wetlands that are known to or likely to support populations of Growling Grass Frog, and therefore the Project is unlikely to result in a significant impact to this species.

34. Aquatic fauna

Appendix A of the EES Scoping Requirements (Appendix 1 Scoping Requirements for KGPH Environment Effects Statement) includes several threatened fish species along with a number that are not threatened. The non-threatened species are included because they contribute to the ecological character of the Glenelg Estuary and Discovery Bay Ramsar site (DELWP 2017b).

The species noted in Appendix A of the EES Scoping Requirements are:

- Yarra Pygmy Perch *Nannoperca obscura* (EPBC Act: endangered; FFG Act: vulnerable).
- Little Galaxias *Galaxiella toourtkoourt* (FFG Act: vulnerable)
- Black Bream *Acanthopagrus butcheri*
- Southern Shortfin Eel *Anguilla australis*
- Common Galaxias *Galaxias maculatus*
- Mulloway *Argyrosomus japonicus*
- Estuary Perch *Percalates colonorum*
- Congolli (Tupong) *Pseudaphritis urvillei*.

Additionally, Appendix A of the EES scoping requirements mentions 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.

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)

34.1 Methods

A desktop aquatic assessment was undertaken with the aim to identify threatened and non-threatened fish considered to contribute to the ecological character of the Glenelg Estuary and Discovery Bay Ramsar site (DELWP 2017b). These species are referred to as 'species of interest' within this section of the report.

The desktop assessment is the culmination of a two-part process whereby waterways within (and intersecting) the search area were first assessed using a combination of aerial imagery, descriptions from the Biosis terrestrial ecology team and surrounding fauna records (sourced from the VBA) to determine the likelihood of occurrence of species of interest occurring within the Project Area.

Following the determination of likelihood of occurrence, a screening risk assessment was undertaken to identify major risks to species of interest that could arise from the Project.

No field assessment has been undertaken for species of interest as no areas of suitable habitat were identified within the Project Area, with the exception of:

- A visual assessment of Surrey River and Wild Dog Creek at the locations proposed to be crossed by the transmission route.
- Incidental recording of burrows of terrestrial Burrowing Crayfish where observed.

Potential impacts on groundwater dependent ecosystems (GDEs) was assessed in a report by CDM Smith (CDM Smith 2024).

34.2 Existing conditions

The search area contains a diversity of aquatic habitat consisting of numerous creeks, rivers, drainage lines, seasonal gullies, damp depressions, wetlands (Section 5) and riparian vegetation.

Within the search area, numerous VBA records for species of interest have been recorded. Potential occurrence of species of interest is summarised in Table 27 and is shown in Figure 34a.

Table 27 Potential occurrence of aquatic species within the Project Area

Species	Status EPBC Act	Status FFG Act	Potential occurrence within or near the Project Area
Yarra Pygmy Perch *Nannoperca obscura*	Endangered	Vulnerable	Known to occur in Long Swamp and Lake Mombeong
Little Galaxias *Galaxiella toourtkoourt*		Vulnerable	Known to occur in Long Swamp and Lake Mombeong
Variegated Pygmy Perch *Nannoperca variegata*	Vulnerable	Endangered	Known to occur in Long Swamp and Lake Mombeong
Glenelg Spiny Crayfish *Euastacus bispinosus*	Endangered	Endangered	Glenelg River and Moleside Creek. Likely present within the Surrey River

Species	Status EPBC Act	Status FFG Act	Potential occurrence within or near the Project Area
Ancient Greenling Damselfly *Hemiphlebia mirabilis*		Endangered	Known to occur in Long Swamp and Lake Mombeong
Southern Toadlet *Pseudophryne semimarmorata*		Endangered	VBA records within Cobboboonee National Park close to the proposed transmission line
Platypus *Ornithorhynchus anatinus*		Vulnerable	VBA records within the Surrey River
Black Bream *Acanthopagrus butcheri*			Occurs in estuaries including the Surrey River and the Glenelg River
Estuary Perch *Percalates colonorum*			
Southern Shortfin Eel *Anguilla australis*			Likely present in all estuaries and connected freshwater rivers
Common Galaxias *Galaxias maculatus*			Widespread within coastal freshwater systems
Mulloway *Argyrosomus japonicas*			Glenelg River
Congolli *Pseudaphritis urvillei*			Estuaries and connected freshwater rivers
Portland Burrowing Crayfish *Engaeus strictifrons*		Endangered	Damp areas within forested areas, and potentially wetlands within farmland
Hairy Burrowing Crayfish *Engaeus sericatus*		Vulnerable	
Western Bush Yabby *Geocharax falcata*		Endangered	

The majority of aquatic species of interest are considered unlikely to occur within the Project Area. This is primarily attributed to the absence of suitable habitat (e.g. substantial freshwater systems, freshwater wetlands, estuaries, brackish swamps, etc.) and is indicated by the paucity of recent local records.

Numerous wetlands occur within the wider local area, and are described in Section 5 of this report. Some of these wetlands (Long Swamp and Lake Mombeong) support populations of the threatened species Yarra Pygmy Perch, Variegated Pygmy Perch, Little Galaxias and Ancient Greenling Damselfly.

Both Long Swamp and Lake Mombeong are internationally important (Ramsar) wetlands, with the occurrence of these threatened species identified as a component of their ecological character (DELWP 2017b).

Fallen logs situated within riparian zones of waterways intersecting the search area are likely to provide roosting sites for a diversity of birds and basking sites for reptiles, whilst fallen leaf litter and bark within and adjacent to rivers, creeks, drainage lines, wetlands and damp areas are likely to provide habitat for FFG Act listed species Portland Burrowing Crayfish and Hairy Burrowing Crayfish (terrestrial invertebrate species that are reliant on subsurface riparian water). Burrows of Burrowing Crayfish (species unknown) were identified within suitable habitat in the east of the wind farm site. Historical records of Portland Burrowing Crayfish and Western Bush Yabby within the broader search area are shown in Figure 34a.

There is potential for some aquatic species of interest to occur within Surrey River and Wild Dog Creek; which are proposed to be crossed by the transmission line. Surrey River and Wild Dog Creek occur within the Portland Coastal Basin, which is predominantly a flat plain of volcanic rock with a coastal strip of dune complex. Freshwater sections of Surrey River (previously sampled between and downstream of the proposed transmission line crossing) found the river to be of moderate environmental condition (DEPI 2019).

The middle reaches of Surrey River, both intersecting and falling to the south of the proposed transmission line, were observed at various locations to contain a variety of slow-flow, semi-permanent or permanent instream pool/run environments and instream structural complexity (e.g. macrophytes, root cover, submerged rocks, woody debris, leaf packs and detritus).

These high quality habitats reflect the limited modification of terrestrial riparian habitat, which is contiguous with large tracts of native vegetation within the surrounding Cobboboonee National Park, and are likely to provide habitat for a diversity of locally common species of frogs (e.g. Southern Smooth Froglet *Geocrinia laevis*), fish (e.g. Common Galaxias, Short-finned Eel and Tupong), sensitive macroinvertebrates (Stoneflies and Caddisflies) as well as potential habitat for threatened species including the Little Galaxias (FFG Act: endangered), Yarra Pygmy Perch (EPBC Act: endangered), Western Bush Yabby (FFG Act: endangered) and Platypus (FFG Act: vulnerable). Historical records of Yarra Pygmy Perch and Platypus in the Surrey River are shown in Figure 34a.

Wild Dog Creek is characterised as an ephemeral tributary of the Surrey River and is surrounded by a dense bed of fallen leaf litter. These habitat features may continue to provide habitat for the FFG Act listed (endangered) Southern Toadlet, which has previously been recorded within the vicinity of the proposed transmission line in the creek at this location.

34.3 Impact assessment

Construction and operation of the KGPH has potential to impact upon Aquatic fauna via several mechanisms:

- Direct mortality of individuals during construction of permanent or temporary infrastructure, such as turbines, hard stands, access roads and underground transmission lines.
- Direct impact to aquatic habitat for construction of temporary and permanent infrastructure, such as turbines, hard stands and access roads.
- Indirect disturbance to aquatic habitat may also occur as a result of changes to hydrological regimes, sedimentation, erosion and pollution.

- Disturbance to riparian vegetation and other vegetation aquatic habitat areas that provides a protective buffer.

34.3.1 Wind farm

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). No turbines are proposed for this area, as much of the area is within turbine exclusion areas established to avoid impacts to a range of species including Brolga. Burrowing Crayfish can be locally abundant in patches of suitable habitat within their range, where they feed on rotting wood, detritus, root material and occasionally animal material. There is high potential for FFG Act listed terrestrial Burrowing Crayfish to occur in the riparian zone of ephemeral drainage lines, river and creeks and in damp depressions throughout the Project Area.

There is some potential for the FFG Act listed (endangered) species Southern Toadlet to occur within the riparian zones of ephemeral drainage lines and in damp depressions throughout the wind farm site. Historical records of this species within tributaries within the Project Area and broader search area are shown in Figure 34.

34.3.2 Transmission line

The middle instream and riparian reaches of Surrey River and Wild Dog Creek proposed to be crossed by the transmission line contain high quality habitat which may occasionally or permanently support the following species of interest:

- Yarra Pygmy Perch *Nannoperca obscura* (EPBC Act: endangered; FFG Act: vulnerable)
- Little Galaxias *Galaxiella toourtkoourt* (FFG Act: endangered)
- Southern Toadlet *Pseudophryne semimarmorata* (FFG Act: endangered)
- Platypus *Ornithorhynchus anatinus* (FFG Act: vulnerable)
- Southern Shortfin Eel *Anguilla australis*
- Common Galaxias *Galaxias maculatus*
- Congolli (Tupong) *Pseudaphritis urvillei*
- Western Bush Yabby *Geocharax falcata* (FFG Act: endangered)
- Glenelg Spiny Crayfish (EPBC Act: endangered; FFG Act: endangered)

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

34.3.3 Potential for direct impacts

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. No turbines or hardstands are proposed in areas intersecting potential Burrowing Crayfish habitat, however there are several locations, as shown on Figure 34b.1 and 34b.2, where access roads and the underground transmission line are in areas close to wetlands that may provide habitat for Burrowing Crayfish. Impacts to habitat for construction of access tracks can be avoided, following pre-construction surveys, by minor alignment changes. Potential habitat along the underground transmission line (Figure 34b.2) can be avoided by minor alignment changes, or use of directional drilling.

There is a negligible likelihood for permanent loss of habitat, death or injury during the construction phase only, of Glenelg Spiny Crayfish (EPBC Act: endangered; FFG Act: endangered), Yarra Pygmy Perch (EPBC Act: endangered; FFG Act: vulnerable), Little Galaxias (FFG Act: endangered), Variegated Pygmy Perch (EPBC Act: vulnerable; FFG Act: endangered), Platypus (FFG Act: vulnerable), Southern Shortfin Eel, Common Galaxias, Tupong or Western Bush Yabby (FFG Act: endangered) as the transmission line will be located beneath the Surrey River and Wild Dog Creek. No impacts on instream habitat are proposed.

34.3.4 Potential for indirect impacts

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:

- Removal of vegetation, which can increase local erosion and damage nearby burrows.
- 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 (e.g. increase in sediments, pollutants, etc. within Surrey River and Wild Dog Creek) during the construction of permanent and temporary infrastructure within the Project Area. Temporary impacts to water quality could impact upon aquatic species utilising these stream habitats including the Glenelg Spiny Crayfish. Appropriate setbacks (50 metres) will be applied to all aquatic areas, which includes drilling locations for waterway crossings. A detailed CEMP for the project to manage sediments and pollutants produced on site will also be adhered to.

It is noted that numerous wetlands occur within the search area and abut the wind farm site (Section 5 of this report). 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. It is considered a negligible likelihood that the construction of permanent and temporary infrastructure within the Project Area would result in a decline in water quality or reduction in their ecological character. A detailed CEMP for the project to manage sediments and pollutants produced on site will also be adhered to.

34.3.5 Significance of impacts under EPBC Act

Assessments for Yarra Pygmy Perch and Glenelg Spiny Crayfish against significant impact criteria for vulnerable species listed under the EPBC Act (DoE 2013a) are provided in Appendix 6 Table A6.16 and Table A6.17. The assessment indicate that significant impacts on these species are unlikely.

34.3.6 Conclusion

The Project is unlikely to impact upon fish, provided indirect impacts to hydrology and surface water are avoided through implementation of mitigation measures via the project CEMP.

The section of the proposed underground transmission line passing through farmland in the eastern section of the Project area has been micrhighlighted to avoid wetlands were Burrowing Crayfish burrows were observed, however there is potential that Burrowing Crayfish may occur outside these areas, depending on the seasonal conditions, and some individual crayfish may be impacted.

35. Protected (non-threatened) species

35.1 Potential for effects on non-threatened species

The Scoping Requirements for Kentbruck Green Power Hub (DELWP 2020) include provision for assessment of effects of the Project on 'protected species'. In Victoria species of flora and fauna that are indigenous are generally protected by provisions of the *Wildlife Act 1975* and the *Flora and Fauna Guarantee Act 1988* (FFG Act), whether or not they are listed under any category of threat. Species that are thus protected but are not threatened ('non-threatened species') are considered here. Many species occurring in the area, including both threatened and non-threatened species, are of cultural significance to local traditional owners, who have been engaged in the development of the project through the preparation of the Cultural Heritage Management Plan. Considering the rights and interests of traditional owners by acknowledging cultural and spiritual connections to land, biodiversity and resources through a relationship with country is a requirement of Section 4a of the FFG Act.

A number of species have been recently added to the FFG Act in the recent (2020) review of the Act, which involved assessing all species against IUCN criteria. That said, unforeseen circumstances, such as widespread fire or outbreaks of disease, can rapidly alter the conservation status of populations currently considered not to be under threat. Additionally, some species may be on a downward population trend, but have not been assessed for listing in detail, or do not yet satisfy the listing criteria, however in the absence of information from regulatory authorities to that effect it is not feasible to nominate any such taxa.

The proposed Project is contained within a geographic area that is small relative to the distributional ranges of the populations of all non-threatened species in the context of both Victoria and their ranges beyond the state. The Project is very largely confined to areas of commercial pine plantations, Blue-gum plantations and cleared pastoral land. As such it generally has low value as habitat for non-threatened species. The non-threatened species it does support are widespread and have adapted to such modified environments.

The principal potential effects on non-threatened species are likely to be collisions by birds and bats with wind turbines. The Project will entail very minor removal of habitat for any non-threatened species through mechanisms such as clearing of vegetation for the creation or widening of roads and hardstands for wind energy infrastructure.

Overall, the Project is not likely to have any measurable or substantive impacts on the population(s) of any non-threatened species.

The Koala *Phascolarctus cinereus* is a non-threatened species considered here due to its high public profile and interest.

35.2 Koala

The Victorian population of the Koala is considered to be secure and it not listed as threatened under the EPBC Act or the FFG Act. Koalas are widespread in southern Victoria and there is a significant concentration of records of the species in far south-western Victoria (Heard and Ramsey 2020), including the Kentbruck region.

Koalas feed almost entirely on the foliage of eucalypts. Hindell et al (1985) note that in Victoria, up to 24 species of *Eucalyptus* may be sources of food for Koalas, although a smaller number are eaten consistently. They found that Manna Gum *E. viminalis* is the most consistently preferred tree species. Of the known, and widely preferred food trees, *E. viminalis*, *E. ovata, E. obliqua* and *E. globulus* occur in the study area. The Project wind farm site substantially comprises commercial pine plantations and cleared pasture which are not habitats for Koalas. Small portions of the Project wind farm site are occupied by commercial Blue Gum *E. globulus* plantations, which are routinely utilised by Koalas. Management of Blue Gum plantations, including harvest operations, are covered by a regulatory guide, *"Minimising impacts to Koalas in blue gum plantations Regulatory Guide"* published by the Conservation Regulator Victoria (2023). Removal of Blue Gums for the purposes of the Project will comply with requirements of this regulatory guide.

The export transmission line for the project between the wind farm and the Heywood substation is planned to be underground within existing road alignments and through pastoral land. Within that alignment, investigations for the Project noted that most Rough-barked Manna Gums *E. viminalis* subsp. *cygnetensis*, which are limited to the eastern end of Boiler Swamp Road. showed signs of heavy browsing by Koalas (section 4.3). Section 4.4.2 of this report details the potential effects of this transmission line on eucalypts. Placing the transmission line underground, rather than overhead is a substantial measure to reduce impacts on these trees and may affect the tree protection zones or structural root zones of specified numbers of individual trees. In the context of the surrounding forested areas of Cobboboonee National Park and Cobboboonee Forest Park the proposed effects are minimal and their consequent effects on Koalas are not considered likely to have measurable impacts on the local population.

Onsite powerlines for the Project are described in section 1.2.2.2 of this report. They are proposed to run overhead along Portland–Nelson Road from the western collector substation to the eastern collector substation. From there the preferred line would transition to underground at the collector substation and run beneath existing roads in the GTFP pine plantation to the Sandy Hill Road intersection. From there it would pass beneath Portland–Nelson Road then continue underground to the main substation through agricultural land. None of these overhead or underground powerlines would affect habitat for Koalas.

Overall, the Project is not likely to have any impacts on the local, or wider Koala population.

35.3 Collision risk modelling for key non-threatened birds

Data obtained during bird utilisation investigations for the Project (see Section 10) represent a sample of flight activity for each species recorded. On the assumption that flight activity will not significantly alter in the presence of a wind farm, quantified collision risk modelling offers a structured approach to prediction of a potential rate at which birds might collide with turbines. However, this approach is reliant on a statistically meaningful and representative quantum of data for it to provide useful estimates of annual flight activity that is at risk. If data does not meet those requirements for a given species results of modelling using limited data may provide spurious estimates. Clearly, numerical modelling is not feasible for species that are not documented and for which there is thus no flight data. While there is no Australian regulatory guidance to collision risk modelling, the UK regulator Natural England, recommends that a minimum of 100 flight-height records of any species should be used to provide a representative proportion of birds at potential collision height for use in collision risk modelling (Natural England 2013).

A total of 417 bird utilisation surveys covering all seasons were undertaken but, with the exception of White-throated Needletail (see Section 22) records of flight activity by threatened bird species were not sufficient to support the application of collision risk modelling (see also Biosis (2024b) regarding scenario modelling for Brolga collision risk undertaken on the basis of a set of explicit assumptions and caveats).

The sum of time of all point counts represents a sample of the annual period in which relevant species may be in flight at the site. That total annual period accounts for whether birds are year-round residents or are present for a portion of the year only. It also accounts for the average number of hours within the diel cycle that each species may be active in flight (i.e. their daytime; crepuscular and/or nocturnal flight activity). So results from the total of all point counts (in this case 417 point counts x 20 minutes) is extrapolated up to the total available flight time per annum for relevant species.

Data obtained are sufficient to apply collision risk modelling for some non-threatened species. Yellow-tailed Black Cockatoo is, closely related to South-eastern Red-tailed Black Cockatoo. It is more numerous and evidently utilises the Project site to a greater degree than its threatened congener and collision risk modelling for it has been undertaken and is provided here. The Wedge-tailed Eagle is known to collide at various operational wind farms in south-eastern Australia. While fewer than 100 flights by Wedge-tailed Eagles were recorded at the site, collision risk modelling was undertaken in order to offer some indication of the potential for the Project to present a risk to the species.

The Biosis collision risk model was used for the modelling. Empirical data obtained during point counts were used for all relevant bird flight inputs to the model and the model extrapolates these values to per annum rates. The model uses approximately 20 specifications of turbine geometry and the following summarises basic input values including assumptions used in modelling of turbines with 60 metre blade/ground clearance for turbines:

- Total complement of turbines: 105
- Hub height: 155 metres
- Lower rotor-tip height: 60 metres
- Upper rotor-tip height: 250 metres
- Mean rotational speed: 6.51 rpm

The 60 metre lower blade tip height proposed for the project is substantially higher than that of turbines installed or proposed for other onshore wind energy facilities in south-eastern Australia. For this reason, collision risk modelling was undertaken to compare the risk of collisions for turbines proposed to be installed by the project (with a lower blade tip height of 60 metres above the ground) with turbines with a lower blade tip height of 45 metres above the ground which are similar to those operating or proposed for other contemporary onshore wind energy facilities. Modelling for this turbines with 45 metres blade/ground clearance is referred to as 'comparative collision risk modelling'.

The comparative modelling exercise altered the tower and hub heights but maintained all other specifications of turbines, including all dimensions of rotors, unchanged. The numbers of bird flights for use in the comparative modelling were drawn from flight height data collected during bird utilisation surveys undertaken for the project.

Birds have capacity to avoid collisions and, while this is not well defined for the great majority of species, it is an important aspect that is taken into account in all collision risk modelling. Where perfect avoidance capacity equates to 1.0, a 0.98 avoidance rate equates to one flight in 50 in which a bird does not avoid a turbine, and 0.99 avoidance rate equates to one flight in 100 in which a bird does not avoid a turbine.

In the Biosis model, the turbine is decomposed into its static and dynamic components. The entire turbine (including the tower, nacelle and the rotor when stationary) represents the static component. The dynamic component is the volume of airspace swept by the leading edge of the rotor blades in the time it takes a bird of a given length and flight speed to pass across the depth of the rotor-swept disk. Static components (i.e. the stationary turbine) are considered to pose minimal collision risk as they are very likely to be seen and avoided by birds in flight. The sweeping rotor blades are considered to represent higher risk due to their speed and the likely difficulty of a bird in flight avoiding them. The model takes these two elements into account by allocating different avoidance rates to them.

Based on experience with a wide range of bird species, it is assumed that virtually all species have high capacity to avoid collision with the static components of turbines. Avoidance rate for these components is thus consistently considered to be 0.9999 in all of the present modelling. In light of uncertainty about the capacity of various species to avoid moving rotor blades, modelling results are provided for rotor-avoidance rates of 0.95; 0.98 and 0.99.

35.3.1 Yellow-tailed Black Cockatoo

The Yellow-tailed Black-cockatoo *Calyptorhynchus funereus* is a large black cockatoo with a distinctive yellow tail and loud call. The species is found throughout south-eastern Australia and Tasmania, inhabiting sclerophyll forest and coastal and near-coastal woodlands dominated by *Banksia.* Pairs or small parties are often observed, with flocks of several hundred occasionally forming in autumn and winter (Higgins 1999). The species feeds on a range of seeds of native and introduced trees and shrubs, and wood-boring insect larvae, which are extracted using its powerful beak. Yellow-tailed Black-cockatoos are frequently observed feeding in pine plantations, where the birds break open pine cones to feed on the seeds (Higgins 1999).

During bird utilisation point counts for the project, Yellow-tailed Black Cockatoos were recorded at 20 locations, twelve of which were within the wind farm component of the Project site. In the 104 observations of the species a total of 459 flights were recorded. The maximum flock size recorded was of 150 birds, while 52 records were of 6 or fewer birds. 457 flights recorded were of birds flying at heights between the ground and 50 metres high. Two flights were at a height of 60 metres.

Yellow-tailed Black Cockatoos are considered to be substantially diurnal and the modelling allowed for them to be in flight for an average of 12 hours of every 24 hours.

The following summarises input values, including assumptions used in modelling of turbines with 60 metre blade/ground clearance for Yellow-tailed Black Cockatoo:

- Species is present on-site for 12 months per annum
- Flight period of 12 hours per 24 hours
- Population of 500 at the site
- Length of bird: 70 cm
- Mean flight-speed of 20 km/h
- Total period of point count surveys 8360 minutes
- Flights recorded below rotor-swept height: 455

- Flights recorded within rotor-swept height: 2

Collision risk modelling using input values and assumptions set out above, indicate the potential for the following numbers of Yellow-tailed Black Cockatoo collisions per annum for the entire Project turbine array:

- 0.15 collisions per annum at 0.95 rotor avoidance rate
- 0.07 collisions per annum at 0.98 rotor avoidance rate
- 0.04 collisions per annum at 0.99 rotor avoidance rate

With so few flights recorded within turbine rotor-swept height, the majority of risk in this modelling relates to the potential for Yellow-tailed Black Cockatoos to collide with static components of turbines, including the tower and nacelle (for which the model has assumed an avoidance rate of 0.9999). It is probable that the species has significantly higher capacity to avoid collisions with those elements of turbines.

Comparative modelling of lower blade-height

Input values altered for comparative modelling of turbines with 45 metre blade/ground clearance for Yellow-tailed Black Cockatoo were:

- Flights recorded below rotor-swept height: 410
- Flights recorded within rotor-swept height: 47

Comparative collision risk modelling indicates the potential for the following numbers of Yellow-tailed Black Cockatoo collisions per annum:

- 3.18 collisions per annum at 0.95 rotor avoidance rate
- 1.28 collisions per annum at 0.98 rotor avoidance rate
- 0.65 collisions per annum at 0.99 rotor avoidance rate

The comparative modelling suggests that the project, as proposed with a 60 metre blade/ground clearance is likely to results in very substantially fewer collisions by Yellow-tailed Black Cockatoos, than would the same array of turbines with a 45 metre blade/ground clearance. This is because very few flights Yellow-tailed Black Cockatoo above 60 metres (2 of 457) were documented at the site, whereas 47 of 457 flights were higher than 45 metres from the ground.

35.3.2 Wedge-tailed Eagle

The largest Australian eagle, with adult wingspan reaching over 2 meters, the Wedge-tailed Eagle *Aquila audax* is found throughout wooded and open areas of tropical, temperate and semi-arid regions, able to range far from water sources (Marchant & Higgins 1993). It is a highly aerial species, with monogamous pairs or small family groups often seen soaring together, using thermal air currents to reach heights of over 2,000 meters. The species is a generalist carnivore, taking live prey from the ground, and scavenging carrion. Prey varies regionally and includes a range of medium mammals, birds and large reptiles (Marchant & Higgins 1993). Often seen in groups feeding on roadkill kangaroos, or dead stock in farmland. Rabbits and Brown Hares can form a major part of the species diet in open country.

During bird utilisation point counts for the project, Wedge-tailed Eagles were recorded at 18 locations, twelve of which were within the wind farm component of the Project site. As detailed above (section 10), 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. In the 49 observations of the species a total of 55 flights were recorded. All records were of between 1 and 3 individuals with 37 flights between 8 and 50 metres above the ground and 18 were between 60 and 250 metres high.

The point count effort, entailing a total of 8360 mins of observation time, is of a similar level to what Biosis has undertaken for other large wind energy projects. The rate at which Wedge-tailed Eagle flights were recorded at the site was substantially lower than those documented from a variety of other Victorian wind farms. For example, at another wind farm site in western Victoria with 10,860 minutes of point count observations Wedge-tailed Eagles were recorded on average every 45 minutes. At Kentbruck, with 8,360 minutes of point count observations, Wedge-tailed Eagles were recorded on average every 152 minutes. This indicates that the species uses the site at a comparatively low level, probably due to much of it being pine plantation that is not suitable habitat for the species.

The quantum of Wedge-tailed Eagle flight data from point counts is low, but it is considered to be sufficient to offer an indication of collision risk for the species. This will permit Wedge-tailed Eagle collision risk for the project to be compared to other wind farms where the species occurs and collision risk modelling and/or empirical data for collisions has been collected.

Wedge-tailed Eagles are diurnal and the modelling allowed for them to be in flight for an average of 12 hours of every 24 hours.

The following summarises input values, were used in modelling of turbines with 60 metre blade/ground clearance for Wedge-tailed Eagles:

- Species is present on-site for 12 months per annum
- Flight period of 12 hours per 24 hours
- Population of 40 at the site
- Length of bird: 95 cm
- Mean flight-speed of 50 km/h (based on data for the closely related and very similar Golden Eagle *Aquila chrysaetos* from the UK)
- Total period of point count surveys 8360 minutes
- Flights recorded below rotor-swept height: 37
- Flights recorded within rotor-swept height: 18

Capacity for Wedge-tailed Eagles to avoid collisions with turbines is not known with certainty but post-construction monitoring of Tasmanian Wedge-tailed Eagle mortalities (ten years of data for Bluff Point Wind Farm and seven years of data for Studland Bay Wind Farm) suggests that they have an avoidance rate of 0.95 or slightly higher.

Collision risk modelling using input values and assumptions as set out above, indicate the potential for the following numbers of Wedge-tailed Eagle collisions per annum for the entire Project turbine array:

- 0.55 collisions per annum at 0.95 rotor avoidance rate
- 0.22 collisions per annum at 0.98 rotor avoidance rate
- 0.11 collisions per annum at 0.99 rotor avoidance rate

By comparison with some other wind energy projects in Victoria, the low estimates of collision risk for Wedge-tailed Eagle are a reflection of the low frequency of the species' flights at the site.

Input values altered for comparative modelling of turbines with 45 metre blade/ground clearance for Wedge-tailed Eagle were:

- Flights recorded below rotor-swept height: 30
- Flights recorded within rotor-swept height: 25

Comparative collision risk modelling indicates the potential for the following numbers of Wedge-tailed Eagle collisions per annum:

- 0.81 collisions per annum at 0.95 rotor avoidance rate
- 0.33 collisions per annum at 0.98 rotor avoidance rate
- 0.17 collisions per annum at 0.99 rotor avoidance rate

The comparative modelling suggests that the project, as proposed with a 60 metre blade/ground clearance is likely to results in slightly fewer collisions by Wedge-tailed Eagles, than would the same array of turbines with a 45 metre blade/ground clearance. This is because the number of Wedge-tailed Eagles flights documented at the site did not differ greatly between 45 and 60 metres above the ground.

35.4 Other species known to have mortalities at Victorian wind farms

A review commissioned by DELWP (Moloney, Lumsden, & Smales 2019) collated and analysed data about bird and bat collisions with turbines at multiple wind farms in Victoria. The study provides an indication of which species may be at risk of collision, and the numbers of detected mortalities, provide some indication of the relative level of risk, although it is acknowledged that the data presented in the report is limited by the intensity and duration of mortality monitoring, and the wind farms included are in a range of land types, mostly farmland.

The Moloney, Lumsden & Smales (2019) study also indicates which species are 'species of interest' due to being listed on threatened species lists. At the time of the study, this was based on the Victorian Advisory List of Threatened Fauna, which has since been replaced by more comprehensive listings through the FFG Act. Listed threatened species have been assessed individually in this report, including White-throated Needletail (Section 22), Fork-tailed Swift (Section 23) and White-bellied Sea Eagle (Section 27). Additionally, several species not considered 'Species of Interest' in Moloney, Lumsden and Smales (2019) have since been listed under the EPBC Act, the FFG Act or both (for example Little Eagle – Section 26).

Table 28 provides a list of native species known to have been killed by Victorian Wind Farms, that have been recorded, or assessed as likely to occur, within the Project Area. Species are listed in decreasing order of the number of detected mortalities.

Table 28 Potential occurrence of aquatic species within the Project Area

Species	Mortalities reported in Moloney, Lumsden and Smales (2019)	Number observed in bird utilisation studies
Australian Magpie *Gymnorhina tibicen*	115	665
Wedge-tailed Eagle *Aquila audax*	58	55
Nankeen Kestrel *Falco cenchroides*	54	2
Brown Falcon *Falco berigora*	48	9
Magpie-lark *Grallina cyanoleuca*	13	33
Short-tailed Shearwater *Ardenna tenuirostris*	9	0 (dead bird recorded within beach/dune habitat)
Swamp Harrier *Circus approximans*	6	19
Whistling Kite *Haliastur sphenurus*	5	1
Welcome Swallow *Hirundo neoxena*	4	573
Little Raven *Corvus mellori*	3	1194
Galah *Eolophus roseicapilla*	3	809
Straw-necked Ibis *Threskiornis spinicollis*	3	139
Pacific Black Duck *Anas superciliosa*	3	121
Red-rumped Parrot *Psephotus haematonotus*	3	82
Brown Goshawk *Accipiter fasciatus*	3	1
Sulphur-crested Cockatoo *Cacatua galerita*	2	102
Silver Gull *Chroicocephalus novaehollandiae*	2	100
Australian Pipit *Anthus australis*	2	17
Peregrine Falcon *Falco peregrinus*	2	2

Species	Mortalities reported in Moloney, Lumsden and Smales (2019)	Number observed in bird utilisation studies
Brown Songlark *Cincloramphus cruralis*	1	0 (recorded during other field studies)
Stubble Quail *Coturnix pectoralis*	1	0 (recorded during other field studies)
Silvereye *Zosterops lateralis*	1	437
Crimson Rosella *Platycercus elegans*	1	311
Australian Raven/Forest Raven *Corvus* spp.	1	186
New Holland Honeyeater *Phylidonyris novaehollandiae*	1	178
Australian White Ibis *Threskiornis molucca*	1	86
Black Swan *Cygnus atratus*	1	77
Grey Teal *Anas gracilis*	1	39
Australian Hobby *Falco longipennis*	1	9
Crested Pigeon *Ocyphaps lophotes*	1	3
Hoary-headed Grebe *Poliocephalus poliocephalus*	1	3
Black-shouldered Kite *Elanus axillaris*	1	2
Common Bronzewing *Phaps chalcoptera*	1	2
Collared Sparrowhawk *Accipiter cirrocephalus*	1	1
Horsfield's Bronze-Cuckoo *Chrysococcyx basalis*	1	1
Sacred Kingfisher *Todiramphus sanctus*	1	1

Additional non-threatened species known to have mortalities at wind farms, which were not recorded in project studies, but have potential to occur within the Project Area, include:

- Barn Owl *Tyto alba* (1 known mortality)
- Buff-banded Rail *Hypotaenidia philippensis* (1 known mortality)
- Dusky Woodswallow *Artamus cyanopterus* (42 known mortalities)
- Little Button-quail *Turnix velox* (1 known mortality)
- Australasian Swamphen *Porphyrio melanotus* (1 known mortality)
- Spotted Harrier *Circus assimilis* (1 known mortality)

The data summarised in Table 28 indicates that there are a number of non-threatened species that are relatively frequently found in mortality studies, that were regularly recorded in bird utilisation studies for the project. For some of these species, there would be sufficient data for collision risk modelling, but this has not been conducted (other than for those presented in Section 35.3), because as they are non-threatened species, there is no basis for assessment of population level impacts.

As with most Victorian wind farms, species most likely to be detected in mortality studies are likely to be those at the top of the table, including Australian Magpie, Wedge-tailed Eagle (Section 35.3.2), Nankeen Kestrel and Brown Falcon.

In the mortality monitoring for the KGPH Project, any repeated mortalities, or mortalities of multiple birds, should be given species consideration in the BBAMP as triggers for further investigation and adaptive management.

Potential impacts to non-threatened bat species are assessed in the Southern Bent Wing Bat Report.

35.5 Conclusion

The principal potential effects on non-threatened species are likely to be collisions by birds and bats with wind turbines. The Project will entail very minor removal of habitat for any non-threatened species through mechanisms such as clearing of vegetation for the creation or widening of roads and hardstands for wind energy infrastructure.

Overall, the Project is not likely to have any measurable or substantive impacts on the population(s) of any non-threatened species.

36. Cumulative impacts

36.1 Scoping Requirements and policy related to cumulative impact assessment

The *Scoping Requirements for Kentbruck Green Power Hub Environment Effects Statement* (DELWP 2018) call for a consideration of the potential for the Project to contribute to a greater cumulative effect on biodiversity in combination with other projects or actions taking place or proposed in the region.

Excerpts from the Scoping Requirements pertinent to consideration of cumulative impacts on biodiversity values are as follows:

- *Effects from a cumulative perspective, including threatened flora and fauna, social and amenity values, with particular consideration of the currently operating and already approved wind farm projects in the region.*
- *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.*
- *Assess the potential cumulative effects on listed species of fauna, in particular Brolga and Southern Bent-wing Bat, from the project in combination with other projects, in particular nearby proposed, approved or operating wind energy facilities.*

The *Ministerial Guidelines for Assessment of Environmental Effects under the Environment Effects Act 1978* (DTP 2023) provides information about how cumulative effects may be considered in light of practical ability for a proponent to know the types or extent of impacts that other projects may entail. The Ministerial Guidelines say that an EES assessment should consider:

> *Any other activities in the vicinity of the proposed project that a decision-maker or proponent might reasonably be aware of that may have the potential for cumulative effects.*

By way of further explanation, the Ministerial Guidelines say:

> *Projects may give rise to environmental effects through relatively direct cause-effect pathways, or through more complex, indirect pathways. In addition, the cumulative effect of a project in combination with other activities may need to be assessed if there is a risk of significant adverse effects.*
>
> *An EES should identify the potential for cumulative effects, i.e. where a project, in combination with one or more other proposed projects, or existing activities in an area, may have an overall significant effect on the same environmental asset. A regional perspective can be helpful in this regard, by putting the potential effects of a project in a wider context. While cumulative effects may be a relevant consideration for the assessment of a project, a proponent may not have a practical ability to provide such an assessment, for example because of their limited access to information on the effects of other existing activities or potential projects. Similarly, the ability of a proponent to provide a regional perspective in an EES will depend on the availability – usually from government agencies – of relevant regional policies, plans, strategies, as well as regional data. A proponent will at least need to provide an assessment of relevant effects (e.g. on landscape values, risks to fauna or emissions to air) in a form that can be integrated with information relating to other projects or activities, and thus enable the Minister to assess the potential cumulative effects. A specific need for a proponent to document potential cumulative effects may arise where a project is to be undertaken in a series of*

stages. Because of the factors constraining quantitative assessment of cumulative effects, often only a qualitative assessment will be practicable.

Additional policy guidance specific to wind energy is provided in *Development of Wind Energy Facilities in Victoria Policy and Planning Guidelines* (DELWP 2021b) . It notes that:

In evaluating wind energy facility impacts on birds and bats including cumulative impacts of a number of discrete wind energy developments within a broad area, it is important to place the collision risks inherent in wind energy facilities in context with other anthropogenic collision risks such as fences, windows and motor vehicles. However, potential impacts of specific developments should still be identified, quantified, minimised and where necessary offset to ensure that the net impact of wind energy facility developments on biodiversity values, especially with regard to threatened species, is at worst neutral.

36.2 Potential for the Project to contribute to cumulative impacts

The location and region of the Project have been subject to significant anthropogenic disturbance since European settlement. This includes loss of habitat of native flora and fauna species due to clearing of vegetation and replacement with agriculture, plantation forestry, roads and urban development of towns. These entail ongoing disturbance and mortality of fauna associated with human activities such as road traffic, collision with windows, entanglement in fences and numerous other causes. None of these impacts, past or ongoing, are quantified at any geographic scale in a manner that might be assessed in combination with the Project in order to consider their cumulative effects.

Ideally, an evaluation of current or proposed projects or actions that are within the same region as the Project and which may contribute to cumulative effects on biodiversity in combination with the Project, will be of projects whose effects on receptor species and/or ecological communities have been identified and measured. For the majority of potential receptor species, the 'region' for this assessment is the Glenelg Plain subregion of the Glenelg Hopkins Catchment Management Area (Glenelg-Hopkins Catchment Management Authority 2022). It encompasses the towns of Casterton, Dartmoor, Heywood and Portland. It is bounded by the coast and the Victoria/South Australia border and includes the Glenelg River, Darlot Creek, Surrey River, Crawford River, Stokes River, Fitzroy River and Eumeralla River. This region has been selected on the basis of its broadly supporting a suite of similar ecosystems and land uses.

A few species, principally coastal birds, use the marine environment and for those the region encompasses the coastal and pelagic environments out to a nominal distance in which early consideration is being given to offshore wind energy projects. Consideration of cumulative effects for birds and bats, some of whose populations range widely, encompasses their populations within Victoria (see below).

Impacts on native vegetation are measured and assessed according to the G*uidelines for the removal, destruction or lopping of native vegetation* (refer to Section 4) and, in effect, that process manages cumulative effects on native vegetation on a state-wide basis.

There are no known proposed or operational onshore projects within the region or within a wider geographic area, other than the Kentbruck Green Power Project that may contribute to cumulative effects on the Glenelg Estuary and Discovery Bay Ramsar Site.

At the time of preparing this report, there are two known offshore wind farm proposals that have been mooted for waters in the region between Portland and the South Australian border. Publicly available information about them is summarised here.

Vic Offshore Wind Farm Pty Ltd project includes an offshore wind farm in Discovery Bay near the coast of Portland.

The Vic Offshore Wind Farm project is subject to an EES process and reasons for the decision by the Minister for Planning include the potential for effects on biodiversity values.

Spinifex Offshore Wind Farm project includes an offshore wind farm in the vicinity of Portland Bay.

Both projects would require:

- Supporting electricity transmission assets required to transfer energy generated by the wind farm to the existing onshore electricity transmission network.
- Modifications to ports and harbours required to support the construction and operation of the wind farm.

No impact assessment information is known to yet be available for either project and it is therefore not feasible to offer any consideration of their possible contribution to cumulative effects in combination with the Kentbruck Green Power Project. However, it is likely that, with the possible exception of some coastal birds and shorebirds, the marine component of these two projects would affect a different suite of receptor species than may the Kentbruck Green Power Project which is situated entirely onshore.

The geographic distributions of many species of birds and bats that may be directly impacted by wind energy projects vary widely from local to continental, or even international, ranges. However, broadly speaking, the ranges of many species within Victoria intersect with multiple operational wind farms. Effects of wind energy on these species may include direct loss of habitat (including airspace); displacement due to behavioural preference to avoid the proximity of wind energy infrastructure; and mortality due to collisions with wind turbines and overhead powerlines.

There is no known available quantified or qualitative information about these potential effects other than limited information about turbine collisions, for some, but not all species of birds and bats as outlined below. As a consequence, consideration of possible cumulative effects of wind energy projects on this fauna is necessarily restricted to effects of turbine collisions.

36.3 Capacity for cumulative assessment of bird and bat collisions

Two investigations, one by DELWP (Moloney, Lumsden, & Smales 2019) and the other commissioned by DELWP (Symbolix 2020), have collated and analysed data about bird and bat collisions with turbines at multiple wind farms in Victoria. However, the primary objective of both studies was to evaluate the efficacy of methods used to survey for bird and bat collision carcasses and to estimate total fatalities, rather than to provide estimates of total fatalities *per se*.

Moloney *et al.* (2019) collated data from post-construction mortality surveys for 15 Victorian wind farms up to early 2018. The wind farms are named but mortality results were not identified for individual wind farms. Eight of the wind farms are in south-western Victoria. Most were monitored for a two-year period, with some monitored for up to 3.5 years. At a number of facilities purpose-trained dogs were used to detect carcasses.

Due to limitations in the quality and quantity of data from the 15 wind farms, detailed statistical analyses to estimate annual mortality rates for various species were only able to be undertaken for six, unidentified wind farms. Surveys comprised a total of 4,196 searches under turbines at the six facilities. Due to site-specific detection methods and results, the report cautions against extrapolation of results to different wind farms.

Symbolix (2020) undertook an independent assessment of bird and bat mortalities due to turbine collisions at wind farms in Victoria. The study included bird and bat carcass data from 10 wind farms in Victoria and the data in their study is believed to have been drawn from the same data available to Moloney *et al.* (2019).

Estimates of average turbine collision mortalities provided by both Moloney *et al.* (2019) and Symbolix (2020) are measured in terms of potential mortalities per turbine per year for the various species detected. As the results were not identified to individual wind farms in either study and some of the wind farms were not in south-western Victoria, total mortality estimates across multiple wind farms are not known for any species and any possible effects on the populations of relevant species in south-western Victoria are also unknown.

Moloney *et al*. (2019) provide the following discussion on the concepts and capacity to assess cumulative impacts of multiple wind farms on birds and bats:

> Population and cumulative impacts.
>
> Obtaining accurate estimates of annual mortality rates is just the first step in assessing whether wind farms are impacting the various species of birds and bats. The next step is determining whether the mortality rates are having a negative impact on the Victorian population of the relevant species. The third step is determining whether there is a cumulative impact on the relevant populations as a result of mortalities occurring at multiple wind farms. These latter two issues are very difficult to resolve. A range of modelling approaches (such as Population Viability Analysis, Integrated Population Modelling, and Potential Biological Removal Modelling), each with their advantages and disadvantages, can be informative; however, for many species the required basic demographic data is lacking, which would necessitate the use of more assumptions, and hence reduce confidence in the findings. For some key species, the collection of additional demographic data is likely to be required. Planning regulators have increasingly called for consideration of cumulative impacts from multiple wind farms; however, methods of assessing cumulative impacts are yet to be developed. There are a number of challenges that need to be overcome before a sound assessment of the cumulative impacts of wind farms in Victoria can be made. These include (i) the need for reduced uncertainties in the mortality estimates from individual wind farms, (ii) the need for all assessments to be undertaken using an agreed set of standards, (iii) the need for mortality estimates to be undertaken over the entire lifetime of a wind farm, (iv) the need for greater understanding of the impact of other anthropogenic causes of declines in populations, and (v) the need for the effects of all existing wind farms to be available before the likely effects of a new one can be predicted, which requires a centralised coordinated repository for all relevant information.

Current knowledge is not sufficient to permit any quantitative evaluation of possible cumulative effects of turbine collisions on populations of birds and bats. Nevertheless, Moloney *et al.* (2019) provide a list of all species and number of carcasses found dead at 15 wind farms between 2003 and 2018, while Symbolix provide a list of the 25 most frequently detected species and number of carcasses found dead at 10 wind farms over the same period. This information does provide a basis for consideration of which species are known to have been involved in collisions and offers a reference for consideration of the relative frequency of such collisions (see below).

36.4 Cumulative impact assessment for key flora and fauna species

The Scoping Requirements (Appendix 1) call for consideration of potential cumulative effects on key threatened and listed fauna species including but not limited to those listed in Appendix A of the Scoping Requirements. This section provides a qualitative evaluation of potential cumulative effects for all listed threatened mammals, reptiles, frogs, fish, invertebrates and plants followed by a similar consideration for birds and bats. The assessment includes all listed species that are considered to have some likelihood of occurrence in the Project Area or may be indirectly affected by the Project. Table 29 covers all flora and fauna other than birds and bats, which are covered in Table 30. Taxa listed in Appendix A of the Scoping Requirements are shown in bold type.

Table 29 Qualitative assessment of potential for cumulative impacts for flora and fauna, other than birds and bats, listed as threatened and/or listed in Appendix A of the Scoping Requirements (in bold and indicated with *).

Species	EPBC status	FFG status	Report section	Potential impact	Cumulative impact assessment
Mammals					
Platypus		VU	34	No impacts expected to suitable aquatic habitat.	No permanent or cumulative impact is considered likely.
Southern Brown Bandicoot (East)*	EN	EN	28	Possible minor impacts confined to areas already modified and with low value to the species.	Within context of pre-existing losses of habitat, cumulative effects of the Project considered to be negligible.
Heath Mouse*	EN	EN	28	Possible minor impacts confined to areas already modified and with low value to the species.	Within context of pre-existing losses of habitat, cumulative effects of the Project considered to be negligible.
Spot-tailed Quoll (SE mainland)*	EN	EN	28	Minor habitat loss	Within context of pre-existing losses of habitat, cumulative effects of the Project considered to be negligible.
Swamp Antechinus*	VU	VU	28	Minor habitat loss	Within context of pre-existing losses of habitat, cumulative effects of the Project considered to be negligible.

Species	EPBC status	FFG status	Report section	Potential impact	Cumulative impact assessment
White-footed Dunnart		VU	28	Minor habitat loss	Within context of pre-existing losses of habitat, cumulative effects of the Project considered to be negligible.
Long-nosed Potoroo (SE mainland)*	VU	VU	28	Minor habitat loss	Within context of pre-existing losses of habitat, cumulative effects of the Project considered to be negligible.
Yellow-bellied Glider*	VU	VU	28	Minor habitat loss	Within context of pre-existing losses of habitat, cumulative effects of the Project considered to be negligible.
Reptiles					
Striped Worm-Lizard		EN	31	Minor habitat loss	Within context of pre-existing losses of habitat, cumulative effects of the Project considered to be negligible.
Eastern Bearded Dragon		VU	31	Minor habitat loss	Within context of pre-existing losses of habitat, cumulative effects of the Project considered to be negligible.
Swamp Skink	EN	EN	31	Minor habitat loss	Within context of pre-existing losses of habitat, cumulative effects of the Project considered to be negligible.
Glossy Grass Skink		EN	31	Minor habitat loss	Within context of pre-existing losses of habitat, cumulative effects of the Project considered to be negligible.

Species	EPBC status	FFG status	Report section	Potential impact	Cumulative impact assessment
Frogs					
Growling Grass Frog*	VU	VU	33	No impacts expected to suitable aquatic habitat.	No permanent or cumulative impact is considered likely.
Fish					
Australian Grayling	VU	EN	34	No impacts expected to suitable aquatic habitat.	No permanent or cumulative impact is considered likely.
Yarra Pygmy Perch*	EN	VU	34	No impacts expected to suitable aquatic habitat.	No permanent or cumulative impact is considered likely.
Variegated Pygmy Perch	VU	EN	34	No impacts expected to suitable aquatic habitat.	No permanent or cumulative impact is considered likely.
Black Bream*			34	No impacts expected to suitable aquatic habitat.	Not a listed threatened species. No permanent or cumulative impact is considered likely.
Short-finned Eel*			34	No impacts expected to suitable aquatic habitat.	Not a listed threatened species. No permanent or cumulative impact is considered likely.
Common Galaxias*			34	No impacts expected to suitable aquatic habitat.	Not a listed threatened species. No permanent or cumulative impact is considered likely.
Little (formerly Dwarf) Galaxias*		EN	34	No impacts expected to suitable aquatic habitat.	No permanent or cumulative impact is considered likely.
Mulloway*			34	No impacts expected to suitable aquatic habitat.	Not a listed species. No permanent or cumulative impact is considered likely.

Species	EPBC status	FFG status	Report section	Potential impact	Cumulative impact assessment
Estuary Perch*			34	No impacts expected to suitable aquatic habitat.	Not a listed species. No permanent or cumulative impact is considered likely.
Tupong*			34	No impacts expected to suitable aquatic habitat.	Not a listed species. No permanent or cumulative impact is considered likely.
Invertebrates					
Glenelg Spiny Crayfish	EN	EN	34	No impacts expected to suitable aquatic habitat.	No permanent or cumulative impact is considered likely.
Ancient Greenling*		EN	34	No impacts expected to suitable aquatic habitat.	No permanent or cumulative impact is considered likely.
Plants					
Maroon Leek-orchid*	EN	EN	6	Minor habitat loss	Relative to pre-existing losses of habitat, cumulative Project effects will be negligible (if species is present).
Coloured Spider-orchid*	EN	CR	6	Minor habitat loss	Relative to pre-existing losses of habitat, cumulative Project effects will be negligible (if species is present).
Mellblom's Spider-orchid*	EN	CR	6	Minor habitat loss	Relative to pre-existing losses of habitat, cumulative Project effects will be negligible (if species is present).
Metallic Sun-orchid*	EN	EN	6	Minor habitat loss	Relative to pre-existing losses of habitat, cumulative Project effects will be negligible (if species is present).
Coast Dandelion*	VU	CR	6	Minor habitat loss	Relative to pre-existing losses of habitat, cumulative Project effects will be negligible (if species is present).

Species	EPBC status	FFG status	Report section	Potential impact	Cumulative impact assessment
Swamp Everlasting*	VU	CR	6	Minor habitat loss	Relative to pre-existing losses of habitat, cumulative Project effects will be negligible (if species is present).
Ornate Pink Fingers*	VU	EN	6	Minor habitat loss	Relative to pre-existing losses of habitat, cumulative Project effects will be negligible (if species is present).
Swamp Fireweed*	VU		6	Minor habitat loss	Relative to pre-existing losses of habitat, cumulative Project effects will be negligible (if species is present).
Clover Glycine*	VU	VU	6	Minor habitat loss	Relative to pre-existing losses of habitat, cumulative Project effects will be negligible (if species is present)
Green-striped Greenhood*	VU	EN	6	Minor habitat loss	Relative to pre-existing losses of habitat, cumulative Project effects will be negligible (if species is present).
Swamp Greenhood*	VU		6	Minor habitat loss	Relative to pre-existing losses of habitat, cumulative Project effects will be negligible (if species is present).
Coast (Sand) Ixodia ssp. *Arenicola**	VU		6	Minor habitat loss	Relative to pre-existing losses of habitat, cumulative Project effects will be negligible (if species is present).
Dense Leek-orchid*	VU	CR	6	Minor habitat loss	Relative to pre-existing losses of habitat, cumulative Project effects will be negligible (if species is present).
Square (Wingless) Raspwort ssp. *exalata**	VU		6	Minor habitat loss	Relative to pre-existing losses of habitat, cumulative Project effects will be negligible (if species is present).

Species	EPBC status	FFG status	Report section	Potential impact	Cumulative impact assessment
Limestone Spider-orchid*	VU	CR	6	Minor habitat loss	Relative to pre-existing losses of habitat, cumulative Project effects will be negligible (if species is present).
River Swamp Wallaby-grass*	VU		6	Minor habitat loss	Relative to pre-existing losses of habitat, cumulative Project effects will be negligible.

A list of the 25 bat and bird species most frequently found as collision carcasses at 10 Victorian wind farms provided by Symbolix (2020), includes no threatened species. Moloney *et al*. (2019) listed 69 species (13 bats species, 56 bird species) that had been detected at 15 Victorian wind farms with a combined total of 699 turbines. At each wind farm a regime of searching for the remains of collision victims was undertaken, most usually using purpose-trained dogs. This monitoring was usually undertaken monthly over at least 2 years and for as long as 3.5 years at some sites. The authors found that eight bird 'species of interest' (i.e. species listed as threatened or migratory under relevant legislation or government policy in 2019) had been recorded dead at Victorian wind farms. For six of those, only a single individual had been found. The remaining two species, Short-tailed Shearwater *Ardenna tenuirostris* and White-throated Needletail, were found dead nine and five times respectively.

Of the 13 species of bat, four had been recorded variously from between 16 and 296 carcasses. The widespread and common White-striped Free-tailed Bat was recorded by far the most frequently. All other bat species were recorded less than nine times, with three species recorded from single individuals only. Six species of birds had been recorded with between 13 and 115 carcasses. The Australian Magpie was recorded the most frequently. All 50 other bird species were recorded less than nine times, with 28 species recorded from single individuals only. It is important to note that these results are for carcasses detected during search regimes and they may represent a sample of fatalities only. As noted above, both Moloney *et al*. (2019) and Symbolix (2020) provide estimates of turbine collisions per turbine per annum for a number of species, but the total number of turbines and the duration and number of searches carried out across the range of wind farms are variables that do not permit overall total of mortalities to be determined for any species. There is thus no capacity to consider cumulative impacts of wind turbine collisions in a quantified manner. Nonetheless, the per turbine per annum estimated total collision rate was no more than 0.1 for these non-threatened species at two wind farms and with the exceptions of the common and widespread White-striped Free-tailed Bat, Eurasian Skylark, Australian Magpie and Nankeen Kestrel, it is thus reasonable to characterise turbine collisions as rare events.

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.

It is also worth noting that density dependence is an important ecological concept of relevance for consideration of effects on fauna populations. In essence, the size of any natural population is regulated by availability of resources to support it. This includes food, breeding sites, roost sites, mating opportunities, etc. all of which in combination represent 'habitat' for the species in question. Where an impact removes habitat the population will be reduced as a direct consequence. However, where the key resources for the species are not reduced the mortality of one individual makes resources available to another whose survival prospects are improved and the net result is that the size of the population is not altered. Unlike some other types of development, wind energy projects generally remove little in the way of habitat resources for fauna and the ecological principles of density dependence thus suggest that mortalities due to collisions may have little overall impact on the functioning of the populations of particular species.

Demographic principles also suggest that the mean generation time for a species of concern will represent the timeframe over which mortalities of animals can be expected to be replaced within a population. As the effects of wind farms, including turbine collisions are spread over time (potentially the life of the wind farm) the mean generation length of a particular species is the appropriate time-scale in which to evaluate any population-level effect.

These ecological principles are relevant and undoubtedly influence populations. However, with rare exceptions, vital information about population size, demographic functioning, density dependence, and other parameters are unknown for the majority of species of conservation concern and even where estimates are available, they usually have error margins such that potential wind energy effects cannot be quantified in a manner that is meaningful at the population-scale.

In view of the general inability to apply a quantitative assessment of possible cumulative impacts, Table 30 provides a qualitative evaluation of potential cumulative effects on all listed threatened birds and bats that are considered to have some likelihood of occurrence in the Project Area (as listed in Appendix 3 Table A2.2). The table also includes all of those taxa listed in Appendix A of the *Scoping Requirements* (shown in bold type) and some non-threatened species that have frequently been considered in previous wind energy approvals processes. The table provides available information from Moloney *et al*. (2019) for relevant species and an evaluation of the potential for the project to contribute to cumulative effects at the population level.

Table 30 Qualitative assessment of potential for cumulative impacts for key bat and bird species (species in bold, and indicated with *, are in Scoping Requirements)

Species (Species in Scoping Requirements in bold type)	EPBC status	FFG status	Mortalities detected at 15 Victorian wind farms (2003–2018) (Moloney et al. 2019)	Mortalities detected at 10 wind farms west of Melbourne 2014–2019 (Symbolix 2020)	Existing information	Cumulative impact assessment
Bats						
Southern Bent-wing Bat* (Biosis 2024a)	CR	CR	8	8 at <3 wind farms	Suitable habitat occurs at most SW Victorian wind farms. 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. Additional mortalities have since been recorded in south west Victoria, including 13 (in total) prior to 2023, and 8 during 2023.	Existing wind farms may be having a low, unquantified population-level effect. Project has potential to increase cumulative population-level impact. Refer to Southern Bent-wing Bat impact assessment report for the Project (Biosis 2024a).

Species (Species in Scoping Requirements in bold type)	EPBC status	FFG status	Mortalities detected at 15 Victorian wind farms (2003–2018) (Moloney et al. 2019)	Mortalities detected at 10 wind farms west of Melbourne 2014–2019 (Symbolix 2020)	Existing information	Cumulative impact assessment
Grey-headed Flying-fox Section 30	VU	VU	0	4 at <3 wind farms	Suitable habitat occurs close to many Victorian wind farms and widespread movements mean species may occasionally pass through many Victorian wind farms. Approx. 25 fatalities have been detected at wind farms in South-west Victoria subsequent to published studies. No fatality rate estimate is available. Australian population of several hundred thousand is a single highly mobile entity that has been growing in Victoria in recent decades.	Effects at existing wind farms are unlikely to be having a population-level impact. Project has low potential to increase cumulative population-level impact

Species (Species in Scoping Requirements in bold type)	EPBC status	FFG status	Mortalities detected at 15 Victorian wind farms (2003–2018) (Moloney et al. 2019)	Mortalities detected at 10 wind farms west of Melbourne 2014–2019 (Symbolix 2020)	Existing information	Cumulative impact assessment
Birds						
Little Egret		EN	0	0	Suitable habitat does not occur close to most Victorian wind farms, but widespread movements mean birds may occasionally pass through most Victorian wind farms.	No pre-existing wind energy impacts known. Project has little potential to increase cumulative population-level impact.
Plumed / Intermediate Egret		CR	0	0	Substantially confined to northern Victoria; unlikely to encounter a very few Victorian wind farms.	No pre-existing wind energy impacts known. Project has little potential to increase cumulative population-level impact.
Eastern Great Egret		VU	0	0	Suitable habitat does not occur close to most Victorian wind farms, but widespread movements mean birds may occasionally pass through many Victorian wind farms.	No pre-existing wind energy impacts known. Project has little potential to increase cumulative population-level impact.

Species (Species in Scoping Requirements in bold type)	EPBC status	FFG status	Mortalities detected at 15 Victorian wind farms (2003–2018) (Moloney et al. 2019)	Mortalities detected at 10 wind farms west of Melbourne 2014–2019 (Symbolix 2020)	Existing information	Cumulative impact assessment
Australian Little Bittern Section 20		EN	0	0	Suitable habitat does not occur close to most Victorian wind farms, but widespread movements mean birds may occasionally pass through some Victorian wind farms.	No pre-existing wind energy impacts known. Project has little potential to increase cumulative population-level impact.
Australasian Bittern* Section 19	EN	CR	0	0	Suitable habitat does not occur close to most Victorian wind farms, but widespread movements mean birds may occasionally pass through some Victorian wind farms.	No pre-existing wind energy impacts known. Project overall has the potential to result in population-level impact. Although no impacts have been documented or quantified there is potential for additional mortalities at other wind farms and transmission lines (associated or not associated with wind farms) within the species Victorian range.

Species (Species in Scoping Requirements in bold type)	EPBC status	FFG status	Mortalities detected at 15 Victorian wind farms (2003–2018) (Moloney et al. 2019)	Mortalities detected at 10 wind farms west of Melbourne 2014–2019 (Symbolix 2020)	Existing information	Cumulative impact assessment
Magpie Goose		VU	0	0	Suitable habitat does not occur close to most Victorian wind farms, but widespread movements mean birds may occasionally pass through some Victorian wind farms.	No pre-existing wind energy impacts known. Project has little potential to increase cumulative population-level impact.
Freckled Duck		EN	0	0	Suitable habitat does not occur close to most Victorian wind farms, but widespread movements mean birds may occasionally pass through most Victorian wind farms.	No pre-existing wind energy impacts known. Project has little potential to increase cumulative population-level impact.
Hardhead		VU	0	0	Suitable habitat does not occur close to most Victorian wind farms, but widespread movements mean birds may occasionally pass through most Victorian wind farms.	No pre-existing wind energy impacts known. Project has little potential to increase cumulative population-level impact.

Species (Species in Scoping Requirements in bold type)	EPBC status	FFG status	Mortalities detected at 15 Victorian wind farms (2003–2018) (Moloney et al. 2019)	Mortalities detected at 10 wind farms west of Melbourne 2014–2019 (Symbolix 2020)	Existing information	Cumulative impact assessment
Blue-billed Duck		VU	0	0	Suitable habitat does not occur close to most Victorian wind farms, but widespread movements mean birds may occasionally pass through most Victorian wind farms.	No pre-existing wind energy impacts known. Project has little potential to increase cumulative population-level impact.
Musk Duck		VU	0	0	Suitable habitat does not occur close to most Victorian wind farms, but widespread movements mean birds may occasionally pass through most Victorian wind farms.	No pre-existing wind energy impacts known. Project has little potential to increase cumulative population-level impact.
Square-tailed Kite		VU	0	0	Suitable habitat occurs at or near most Victorian wind farms, however the species is sparsely recorded over much of southern Victoria. Species can occur in both wooded habitats and nearby open areas.	No pre-existing wind energy impacts known. Project has little potential to increase cumulative population-level impact.

Species (Species in Scoping Requirements in bold type)	EPBC status	FFG status	Mortalities detected at 15 Victorian wind farms (2003–2018) (Moloney et al. 2019)	Mortalities detected at 10 wind farms west of Melbourne 2014–2019 (Symbolix 2020)	Existing information	Cumulative impact assessment
Grey Goshawk		EN	0	0	Sparsely distributed in western Victoria but suitable habitat occurs close to some Victorian wind farms.	No pre-existing wind energy impacts known. Project has little potential to increase cumulative population-level impact.
White-bellied Sea-Eagle Section 27		EN	1	0	Largely confined to proximity of coast and large waterbodies. Suitable habitat does not occur close to most Victorian wind farms, but widespread movements mean birds may occasionally pass through a limited number of Victorian wind farms.	Pre-existing wind energy impacts negligible at population level. Little potential for the Project to substantially alter impacts on the Victorian population.
Little Eagle Section 26		VU	1	0	Suitable habitat occurs close to most Victorian wind farms.	Pre-existing wind energy impacts negligible at population level. Little potential for the Project to substantially alter impacts on the Victorian population.

Species (Species in Scoping Requirements in bold type)	EPBC status	FFG status	Mortalities detected at 15 Victorian wind farms (2003–2018) (Moloney et al. 2019)	Mortalities detected at 10 wind farms west of Melbourne 2014–2019 (Symbolix 2020)	Existing information	Cumulative impact assessment
Wedge-tailed Eagle Section 35.3.2			58	33 at 7 windfarms	Species occurs at all Victorian wind farms. Moloney et al. (2019) estimated 0.1 fatalities per turbine per year (from 2 wind farms); Symbolix (2020) estimated 0.1-- 0.2 fatalities per turbine per year (from 7 wind farms)	Not a listed threatened species. Feasible that cumulative effects of collisions may be having an unquantified population-level impact. Project has potential to add to cumulative effect, however the rate at which Wedge-tailed Eagle flights were recorded at the site was very substantially lower than those documented from a variety of other Victorian wind farms (Biosis data). This strongly indicates that the species uses the site at a comparatively low level, probably due to it being pine plantation that is not suitable habitat for the species. This is reflected in the low estimates of collision risk as shown by modelling for the species (section 30.1.3).

Species (Species in Scoping Requirements in bold type)	EPBC status	FFG status	Mortalities detected at 15 Victorian wind farms (2003–2018) (Moloney et al. 2019)	Mortalities detected at 10 wind farms west of Melbourne 2014–2019 (Symbolix 2020)	Existing information	Cumulative impact assessment
Brolga* Section 18; Biosis 2022		EN	0	0	Species occurs at, or in proximity to, most wind farms in SW Victoria. At time of report preparation, one mortality is known to have been detected at one Victorian wind farm.	Pre-existing wind energy impacts negligible at population level. Project has little potential to increase cumulative population-level impact. Zero net impact mechanism set out in *Brolga Guidelines* is designed to ensure no cumulative impact occurs. Refer to Brolga impact assessment report for the Project (Biosis, 2022).
Lewin's Rail* Section 20		VU	0	0	Suitable habitat does not occur close to most Victorian wind farms, but widespread movements mean birds may occasionally pass through most Victorian wind farms.	No pre-existing wind energy impacts known. Project has little potential to increase cumulative population-level impact.

Species (Species in Scoping Requirements in bold type)	EPBC status	FFG status	Mortalities detected at 15 Victorian wind farms (2003–2018) (Moloney et al. 2019)	Mortalities detected at 10 wind farms west of Melbourne 2014–2019 (Symbolix 2020)	Existing information	Cumulative impact assessment
Bush Stone-curlew		CR	0	0	Species range substantially confined to far western and northern Victoria and habitat preference means species is not known to occur at any Victorian wind farms.	No pre-existing wind energy impacts known. Project has little potential to increase cumulative population-level impact.
Latham's Snipe Section 21	VU		0	0	Mainly present in southern Australia from August to April. Suitable habitat occurs at most Victorian wind farms.	Not a listed threatened species. Listed as migratory. No pre-existing wind energy impacts known. Project has little potential to increase cumulative population-level impact.
Ruddy Turnstone Section 21	VU	EN	0	0	Mainly present in southern Australia from August to April, but few birds may remain all year. Substantially confined to narrow coastal zone away from most wind farms. May occur or fly through wind farms within that zone only.	No pre-existing wind energy impacts known. Project has little potential to increase cumulative population-level impact.

Species (Species in Scoping Requirements in bold type)	EPBC status	FFG status	Mortalities detected at 15 Victorian wind farms (2003–2018) (Moloney et al. 2019)	Mortalities detected at 10 wind farms west of Melbourne 2014–2019 (Symbolix 2020)	Existing information	Cumulative impact assessment
Bar-tailed Godwit (*baueri*) Section 21	EN	VU	0	0	Mainly present in southern Australia from August to April, but few birds can remain all year and over-winter. Substantially confined to narrow coastal zone away from most wind farms. May occur or fly through wind farms within that zone only.	No pre-existing wind energy impacts known. Project has little potential to increase cumulative population-level impact.
Black-tailed Godwit	EN	CR	0	0	Substantially confined to narrow coastal zone and inland ephemeral wetlands away from most wind farms. Rarely observed in south-west Victoria, one record in BirdLife Shorebird2020 data. May occur or fly through wind farms within that zone only.	No pre-existing wind energy impacts known. Project has little potential to increase cumulative population-level impact.

Species (Species in Scoping Requirements in bold type)	EPBC status	FFG status	Mortalities detected at 15 Victorian wind farms (2003–2018) (Moloney et al. 2019)	Mortalities detected at 10 wind farms west of Melbourne 2014–2019 (Symbolix 2020)	Existing information	Cumulative impact assessment
Grey-tailed Tattler		CR	0	0	Mainly present in southern Australia from August to April, but few birds may remain all year. Substantially confined to narrow coastal zone away from most wind farms. May occur or fly through wind farms within that zone only.	No pre-existing wind energy impacts known. Project has little potential to increase cumulative population-level impact.
Common Sandpiper		VU	0	0	Mainly present in southern Australia from August to April, but few birds may remain all year. Substantially confined to narrow coastal zone away from most wind farms. May occur or fly through wind farms within that zone only.	No pre-existing wind energy impacts known. Project has little potential to increase cumulative population-level impact.

Species (Species in Scoping Requirements in bold type)	EPBC status	FFG status	Mortalities detected at 15 Victorian wind farms (2003–2018) (Moloney et al. 2019)	Mortalities detected at 10 wind farms west of Melbourne 2014–2019 (Symbolix 2020)	Existing information	Cumulative impact assessment
Common Greenshank Section 21	EN	EN	0	0	Mainly present in southern Australia from August to April, but few birds may remain all year. Substantially confined to narrow coastal zone and inland ephemeral wetlands away from most wind farms. May occur or fly through wind farms within that zone only.	No pre-existing wind energy impacts known. Project has little potential to increase cumulative population-level impact.
Marsh Sandpiper Section 21		EN	0	0	Mainly present in southern Australia from August to April, but few birds may remain all year. Substantially confined to coastal zone and inland ephemeral wetlands away from most wind farms. May occur or fly through wind farms within that zone only.	No pre-existing wind energy impacts known. Project has little potential to increase cumulative population-level impact.

Species (Species in Scoping Requirements in bold type)	EPBC status	FFG status	Mortalities detected at 15 Victorian wind farms (2003–2018) (Moloney et al. 2019)	Mortalities detected at 10 wind farms west of Melbourne 2014–2019 (Symbolix 2020)	Existing information	Cumulative impact assessment
Terek Sandpiper Section 21	VU	EN	0	0	Mainly present in southern Australia from August to April, but few birds may remain all year. Substantially confined to narrow coastal zone away from most wind farms. May occur or fly through wind farms within that zone only.	No pre-existing wind energy impacts known. Project has little potential to increase cumulative population-level impact.
Eastern Curlew*	CR	CR	0	0	Mainly present in southern Australia from August to April, but few birds may remain all year. Substantially confined to narrow coastal zone away from most wind farms. May occur or fly through wind farms within that zone only.	No pre-existing wind energy impacts known. Project has little potential to increase cumulative population-level impact.

Species (Species in Scoping Requirements in bold type)	EPBC status	FFG status	Mortalities detected at 15 Victorian wind farms (2003–2018) (Moloney et al. 2019)	Mortalities detected at 10 wind farms west of Melbourne 2014–2019 (Symbolix 2020)	Existing information	Cumulative impact assessment
Red Knot Section 21	VU	EN	0	0	Mainly present in southern Australia from August to April, but few birds may remain all year. Substantially confined to narrow coastal zone away from most wind farms. May occur or fly through wind farms within that zone only.	No pre-existing wind energy impacts known. Project has little potential to increase cumulative population-level impact.
Great Knot	VU	CR	0	0	Mainly present in southern Australia from August to April, but few birds may remain all year. Substantially confined to narrow coastal zone away from most wind farms. May occur or fly through wind farms within that zone only.	No pre-existing wind energy impacts known. Project has little potential to increase cumulative population-level impact.

Species (Species in Scoping Requirements in bold type)	EPBC status	FFG status	Mortalities detected at 15 Victorian wind farms (2003–2018) (Moloney et al. 2019)	Mortalities detected at 10 wind farms west of Melbourne 2014–2019 (Symbolix 2020)	Existing information	Cumulative impact assessment
Sanderling* Section 21			0	0	Mainly present in southern Australia from August to April, but few birds may remain all year and over-wintering flocks were recorded during the Project surveys. Substantially confined to narrow coastal zone away from most wind farms. May occur or fly through wind farms within that zone only.	Not a listed threatened species. Listed as migratory. No pre-existing wind energy impacts known. Project has little potential to increase cumulative population-level impact.
Curlew Sandpiper Section 21	CR	CR	0	0	Mainly present in southern Australia from August to April, but few birds may remain all year. Substantially confined to narrow coastal zone and inland ephemeral wetlands away from most wind farms. May occur or fly through wind farms within that zone only.	No pre-existing wind energy impacts known. Project has little potential to increase cumulative population-level impact.

Species (Species in Scoping Requirements in bold type)	EPBC status	FFG status	Mortalities detected at 15 Victorian wind farms (2003–2018) (Moloney et al. 2019)	Mortalities detected at 10 wind farms west of Melbourne 2014–2019 (Symbolix 2020)	Existing information	Cumulative impact assessment
Australian Painted-snipe Section 20	EN	CR	0	0	Suitable habitat does not occur close to most Victorian wind farms, but widespread movements mean birds may rarely pass through most Victorian wind farms.	No pre-existing wind energy impacts known. Project has little potential to increase cumulative population-level impact.
Red-capped Plover Section 21			0	0	Largely confined to proximity of coast and large waterbodies. Suitable habitat does not occur close to most Victorian wind farms, but widespread movements mean birds may occasionally pass through a limited number of Victorian wind farms.	Not a listed threatened species. Listed as migratory. No pre-existing wind energy impacts known. Project has little potential to increase cumulative population-level impact.

Species (Species in Scoping Requirements in bold type)	EPBC status	FFG status	Mortalities detected at 15 Victorian wind farms (2003–2018) (Moloney et al. 2019)	Mortalities detected at 10 wind farms west of Melbourne 2014–2019 (Symbolix 2020)	Existing information	Cumulative impact assessment
Double-banded Plover			0	0	Present in Australia from February to October but occasional records from throughout the year. Largely confined to proximity of coast and large waterbodies. Suitable habitat does not occur close to most Victorian wind farms, but widespread movements mean birds may occasionally pass through a limited number of Victorian wind farms.	Not a listed threatened species. Listed as migratory. No pre-existing wind energy impacts known. Project has little potential to increase cumulative population-level impact.
Greater Sand Plover	VU	VU	0	0	Mainly present in southern Australia from August to April, but young birds may remain all year. Substantially confined to narrow coastal zone away from most wind farms. May occur or fly through wind farms within that zone only.	No pre-existing wind energy impacts known. Project has little potential to increase cumulative population-level impact.

Species (Species in Scoping Requirements in bold type)	EPBC status	FFG status	Mortalities detected at 15 Victorian wind farms (2003–2018) (Moloney et al. 2019)	Mortalities detected at 10 wind farms west of Melbourne 2014–2019 (Symbolix 2020)	Existing information	Cumulative impact assessment
Grey Plover Section 21	VU	VU	0	0	Mainly present in southern Australia from August to April, but young birds may remain all year. Substantially confined to narrow coastal zone away from most wind farms. May occur or fly through wind farms within that zone only.	No pre-existing wind energy impacts known. Project has little potential to increase cumulative population-level impact.
Hooded Plover* Section 21	VU	VU	0	0	Substantially confined to narrow coastal zone away from most wind farms. May occur or fly through wind farms within that zone only.	No pre-existing wind energy impacts known. Project has little potential to increase cumulative population-level impact.
Australian Gull-billed Tern Section 21		EN	0	0	Largely confined to proximity of coast and large waterbodies. Suitable habitat does not occur close to most Victorian wind farms, but widespread movements mean birds may occasionally pass through a limited number of Victorian wind farms.	No pre-existing wind energy impacts known. Project has little potential to increase cumulative population-level impact.

Species (Species in Scoping Requirements in bold type)	EPBC status	FFG status	Mortalities detected at 15 Victorian wind farms (2003–2018) (Moloney et al. 2019)	Mortalities detected at 10 wind farms west of Melbourne 2014–2019 (Symbolix 2020)	Existing information	Cumulative impact assessment
Caspian Tern Section 21		VU	0	0	Largely confined to proximity of coast and large waterbodies. Suitable habitat does not occur close to most Victorian wind farms, but widespread movements mean birds may occasionally pass through a limited number of Victorian wind farms.	No pre-existing wind energy impacts known. Project has little potential to increase cumulative population-level impact.
Fairy Tern Section 21	VU	CR	0	0	Substantially confined to narrow coastal zone away from most wind farms. May occur or fly through wind farms within that zone only.	No pre-existing wind energy impacts known. Project has little potential to increase cumulative population-level impact.

Species (Species in Scoping Requirements in bold type)	EPBC status	FFG status	Mortalities detected at 15 Victorian wind farms (2003–2018) (Moloney et al. 2019)	Mortalities detected at 10 wind farms west of Melbourne 2014–2019 (Symbolix 2020)	Existing information	Cumulative impact assessment
Red-tailed Black-Cockatoo (SE)* Section 11	EN	EN	0	0	Range and habitat exclude the species from exposure to all existing Victorian wind farms. No mortalities known to have been detected at any Australian wind farm.	No pre-existing wind energy impacts known. Only one operational wind farm (Kiata) within the range of the species, however there may be future wind energy projects within the range of the sub-species. As the current project is assessed as unlikely to result in an impact, it is unlikely to contribute to a cumulative impact.
Orange-bellied Parrot* Section 13	CR	CR	0	0	Present in Victoria during autumn to winter months only. Substantially confined to narrow coastal zone away from most wind farms. May occur or fly through wind farms within that zone only. No mortalities known to have been detected at any Australian wind farm.	No pre-existing wind energy impacts known. Project has little potential to increase cumulative population-level impact.

Species (Species in Scoping Requirements in bold type)	EPBC status	FFG status	Mortalities detected at 15 Victorian wind farms (2003–2018) (Moloney et al. 2019)	Mortalities detected at 10 wind farms west of Melbourne 2014–2019 (Symbolix 2020)	Existing information	Cumulative impact assessment
Blue-winged Parrot Section 14	VU		0	<2	May occur or fly through many wind farms within Victoria. No mortalities known to have been detected at any Australian wind farm.	No pre-existing wind energy impacts known. Project has little potential to increase cumulative population-level impact.
Elegant Parrot Section 15		VU	0	0	Range and habitat exclude the species from exposure to all existing Victorian wind farms. No mortalities known to have been detected at any Australian wind farm.	No pre-existing wind energy impacts known. Project has little potential to increase cumulative population-level impact.
Eastern Ground Parrot* Section 16		EN	0	0	Species range confined to few near-coastal heathland communities in Victoria and habitat preference mean species is not known to occur at any Victorian wind farms.	No pre-existing wind energy impacts known. As species distribution does not encompass any other wind farms, project has little potential to increase cumulative population-level impact.
Masked Owl Section 24.1.3		CR	0	0	Sparsely distributed in western Victoria but suitable treed habitat occurs close to many Victorian wind farms.	No pre-existing wind energy impacts known. Project has little potential to increase cumulative population-level impact.

Species (Species in Scoping Requirements in bold type)	EPBC status	FFG status	Mortalities detected at 15 Victorian wind farms (2003–2018) (Moloney et al. 2019)	Mortalities detected at 10 wind farms west of Melbourne 2014–2019 (Symbolix 2020)	Existing information	Cumulative impact assessment
Powerful Owl* Section 24.1.1		VU	0	0	Suitable densely-treed habitat occurs close to some Victorian wind farms. Known to occur within at least one wind farm.	One pre-existing casualty known from a wind farm in NSW. Project has little potential to increase cumulative population-level impact.
White-throated Needletail* Section 22	VU	VU	5	0	Present in Australia during warmer months only. May occasionally fly over or through all Victorian wind farms. DELWP (Moloney et al. 2019) were unable to estimate total collision rate for any wind farm. A small number of fatalities have been reported from Tasmanian wind farms (Hull et al. 2013) and further fatalities at Victorian sites are believed to have been detected subsequent to published studies.	Existing wind farms may be having low, unquantified population-level effect. Project has some potential to increase cumulative population-level impact.

Species (Species in Scoping Requirements in bold type)	EPBC status	FFG status	Mortalities detected at 15 Victorian wind farms (2003–2018) (Moloney et al. 2019)	Mortalities detected at 10 wind farms west of Melbourne 2014–2019 (Symbolix 2020)	Existing information	Cumulative impact assessment
Fork-tailed Swift* Section 23			1	0	Present in Australia during warmer months only. May occasionally fly over or through all Victorian wind farms. DELWP (Moloney et al. 2019) were unable to estimate total collision rate for any wind farm.	Not a listed threatened species. Listed as migratory. Pre-existing wind energy impacts negligible at population level. Little potential for project to substantially alter impacts on Vic population.
Rufous Bristlebird (Coorong)* Section 25		EN	0	0	Species range confined to few near-coastal heathland communities in west Victoria and habitat preference mean species is not known to occur at any existing Victorian wind farms. Behaviour almost certainly excludes turbine collision risk.	No pre-existing wind energy impacts known. As species distribution does not encompass any other wind farms, project has little potential to increase cumulative population-level impact.
Chestnut-rumped Heathwren		VU	0	0	Sparsely distributed in western Victoria but suitable habitat occurs close to many Victorian wind farms. Behaviour almost certainly excludes turbine collision risk.	No pre-existing wind energy impacts known. Project has little potential to increase cumulative population-level impact.

Species (Species in Scoping Requirements in bold type)	EPBC status	FFG status	Mortalities detected at 15 Victorian wind farms (2003–2018) (Moloney et al. 2019)	Mortalities detected at 10 wind farms west of Melbourne 2014–2019 (Symbolix 2020)	Existing information	Cumulative impact assessment
Diamond Firetail	VU	VU	0	0	Sparsely distributed in western Victoria but suitable habitat occurs close to many Victorian wind farms. A woodland and open forest inhabitant and uses edges with grasslands.	No pre-existing wind energy impacts known. Project has little potential to increase cumulative population-level impact.

The cumulative impact assessment (Section 36) undertaken for the KGPH has identified potential for the project to contribute to cumulative impacts, in combination with other wind energy projects, upon:

- Southern Bent-wing Bat (assessment provided in Biosis 2024a)
- Australasian Bittern (refer to Section 19)
- Wedge-tailed Eagle (refer to Section 35.2.2)
- White-throated Needletail (refer to Section 22).

Recognising that there is residual uncertainty regarding abundance, movement patterns and flight heights of some species, unexpected collisions will be managed in accordance with an adaptive bird and bat management plan, submitted in draft form with the EES documentation and to be finalised in response to permit conditions if approval is granted to the project.

37. Mitigation

This section provides a summary of mitigation approaches relevant to the Project including project siting and design to avoid impacts, measures to deter birds and bats from colliding with turbines, and turbine curtailment.

The following information is provided:

- Section 37.1 provides a summary of the siting of the Project area and measures applied throughout the design of the project, including the initial site selection, turbine exclusion areas and selection of minimum blade sweep height. Some of this information is also presented in Section 1.2.4.
- Section 37.2 provides a review of approaches for minimising collision risk by deterring birds and bats from flying in close proximity to turbines and by curtailing turbine operation. The potential applicability of these approaches to reducing collision risk for species of concern is noted and if applicable recommendations provided in Section 35.3.
- Section 37.3 provides a table of mitigation recommendations, relating to all ecological values assessed, including terrestrial, aquatic and aerial values and species.

37.1 Project siting and design

37.1.1 Project siting

The Project area (site) for the KGPH was selected following consideration of a range of environmental and social factors, as well as technical and financial feasibility. A detailed description of the site selection process is provided in EES Section 4.1.

Avoidance of potential impacts through landscape-scale spatial planning and site design is considered the most effective primary means of achieving good ecological outcomes.

The wind farm component of the KGPH Project is intentionally sited largely within a commercial pine plantation that has low habitat values for the great majority of native birds and bats. The site is, however, located in a region with several large conservation reserves (Section 8), an internationally significant Ramsar site (Section 8) and populations of several significant species, which have potential to fly though the site. These risks and potential impacts are assessed throughout this report.

In addition, turbines that were originally planned to be sited in an area of agricultural grazing land at the eastern extremity of the Project area have been removed from the design to reduce the potential for impacts on Brolga and other species of birds and bats that may utilise the adjacent Kentbruck Heath and / or move between that area and Discovery Bay Coastal Park. The layout design for the Project has also removed proposed turbines from the north-western extremity so that the distance between turbines and known roost sites of Southern Bent-winged Bat near Glenelg River is a minimum of five kilometres.

The Project's site was selected to:

- Avoid large areas of native vegetation
- Avoid remnant patches of native vegetation with higher condition scores
- Avoid areas of medium and high value habitat for species with a high biodiversity risk rating
- Avoid listed threatened ecological communities

- Use land identified as suitable for wind energy facility use and development in the Glenelg Planning Scheme
- Avoid areas of identified important breeding, roosting or foraging habitat for listed threatened or migratory bird species.

37.1.2 Avoidance of potential for collisions and disturbance including turbine-free buffers

Turbine-free buffers have been recommended to avoid impacts on a range of species including Brolga and other birds, as well as microbats. These buffers have been adopted by the proponent during the development of the project design. All buffers are from the rotor swept area.

Buffers include:

- A number of buffers for the specific protection of Brolga breeding sites and movement corridors, as described in the Brolga report (Biosis 2023).
- Exclusion of turbines from within 300 metres of boundaries with surrounding conservation reserves, and other public land supporting native vegetation. As the project is located within plantation and farmland it is not possible to buffer these areas, despite these habitat types have been identified as being used for, to at least some extent, foraging and movement of SBWB.
- Exclusion of turbines from within 500 metres of wetlands within the Glenelg Estuary and Discovery Bay Ramsar site.
- Exclusion of turbines from within 5 kilometres of known Southern Bent-wing Bat roost sites.

Turbine-free buffers are shown in KGPH EES Project Development Chapter 4 (Figure 37a).

Undergrounding of a significant portion of the export transmission cable is a further measure that has been incorporated into the Project design for the purpose of eliminating the potential for birds and bats to collide with or to be electrocuted by an overhead transmission line.

Table 31 shows bird and bat species, including all listed threatened and / or migratory species that have some potential of collision with Project infrastructure. The table shows five key siting and design factors of the Project with a tick mark indicates the potential for each factor to limit potential for collisions by each species.

Table 31 KGPH Project siting and design factors likely to limit potential risk of collision by birds and bats

Common name	Siting on land managed for plantation forestry	Siting on land cleared for agriculture	Buffers from Ramsar boundary or other wetland	60 metre lower blade tip height	Underground transmission lines
Lewin's Rail	✓	✓	✓	✓	✓
Caspian Tern	✓	✓	✓	✓	✓
Crested Tern	✓	✓	✓	✓	✓
Grey Plover	✓	✓	✓	✓	✓
Hooded Plover	✓	✓	✓	✓	✓
Double-banded Plover	✓	✓	✓	✓	✓
Bar-tailed Godwit	✓	✓	✓	✓	✓
Black-tailed Godwit	✓	✓	✓	✓	✓

Common name	Siting on land managed for plantation forestry	Siting on land cleared for agriculture	Buffers from Ramsar boundary or other wetland	60 metre lower blade tip height	Underground transmission lines
Common Greenshank	✓	✓	✓	✓	✓
Red-necked Stint	✓	✓	✓	✓	✓
Sharp-tailed Sandpiper	✓	✓	✓	✓	✓
Sanderling	✓	✓	✓	✓	✓
Latham's Snipe	✓		✓	✓	✓
Australian Painted Snipe	✓	✓	✓	✓	✓
Brolga	✓		✓	✓	✓
Little Egret	✓		✓	✓	✓
Eastern Great Egret	✓		✓	✓	✓
Australian Little Bittern	✓	✓	✓	✓	✓
Australasian Bittern	✓	✓	✓	✓	✓
Magpie Goose	✓		✓	✓	✓
Freckled Duck	✓		✓	✓	✓
Hardhead	✓		✓	✓	✓
Blue-billed Duck	✓		✓	✓	✓
Musk Duck	✓		✓	✓	✓
Spotted Harrier	✓			✓	✓
Swamp Harrier	✓	✓	✓	✓	✓
Brown Goshawk	✓	✓		✓	✓
Collared Sparrowhawk	✓			✓	✓
Wedge-tailed Eagle	✓				✓
Little Eagle	✓				✓
White-bellied Sea-Eagle	✓		✓		✓
Whistling Kite	✓			✓	✓
Black-shouldered Kite	✓			✓	✓
Australian Hobby	✓				✓
Peregrine Falcon	✓				✓
Brown Falcon	✓				✓
Nankeen Kestrel	✓				✓
Powerful Owl	✓	✓	✓	✓	✓
Red-tailed Black-Cockatoo	✓	✓	✓	✓	✓
Yellow-tailed Black-Cockatoo		✓		✓	✓
Gang-gang Cockatoo	✓	✓	✓	✓	✓
Orange-bellied Parrot	✓		✓	✓	✓
Blue-winged Parrot	✓			✓	✓
Ground Parrot	✓	✓	✓	✓	✓

Common name	Siting on land managed for plantation forestry	Siting on land cleared for agriculture	Buffers from Ramsar boundary or other wetland	60 metre lower blade tip height	Underground transmission lines
White-throated Needletail					✓
Chestnut-rumped Heathwren	✓	✓	✓	✓	✓
Rufous Bristlebird (Coorong)	✓	✓	✓	✓	✓
Grey-headed Flying-fox		✓		✓	✓
Yellow-bellied Sheathtail Bat	✓	✓	✓	✓	✓
Southern Bent-winged Bat		✓	✓	✓	✓

37.1.3 Rotor height (ground clearance)

The project plans to use turbines with a lowest blade-tip height that will be 60 metres above the ground. As the maximum height of the pine plantation reach 30-40 metres this represents a clearance of at least 20 metres above the trees, but the clearance will typically be much greater than this as most coupes will be of younger trees. The majority of existing wind turbines in Australia have lowest blade-tip heights of between 20 and 35 metres above the ground.

Point count data collected at the project site and immediate environs includes 2371 flight-height records of 93 species of birds. Of these, 62 records (2.6%) were of flights greater than or equal to 60 metres above the ground. Twenty-one species were recorded flying at or above 60 metres, including three threatened species: White-throated Needletail (5 records totalling 103 individual bird movements), Brolga (1 record totalling 2 individual bird movements) and Blue-winged Parrot (2 records totalling 3 individual bird movements).

Of a total of 2739 Southern Bent-wing Bat calls detected, nine were at or above 54 metres above the ground. While limitations in these data are recognised (Biosis 2024a), the vast majority of the species calls were detected from below the project's proposed rotor height.

Potential for project application

Data for flight-heights of birds and bats suggest that, by comparison with currently operating turbines at onshore wind farms in Australia, turbines with a rotor ground clearance of 60 metres can be expected to very significantly reduce the potential for collisions for the great majority of species.

For this project, sufficient flight information was recorded to enable collision risk models to be calculated for one threatened species and three non-threatened species:

- White-throated Needletail (EPBC Act: Vulnerable and Migratory, FFG Act: Vulnerable)
- Yellow-tailed Black Cockatoo
- Blue-winged Parrot (EPBC Act: Vulnerable)
- Wedge-tailed Eagle

Details of the collision risk models and impact assessments for these species are presented in Sections 22.3 and 35.1. Collision risk models were calculated for two rotor configurations:

- Turbines with a minimum rotor blade ground clearance of 45 metres
- Turbines with a minimum rotor blade ground clearance of 60 metres.

For all of these species, the collision risk models predict few annual collisions with the 60 metre ground clearance scenario compared with the 45 metre ground clearance scenario (Table 32). This is due to a reduction in flights recorded in bird utilisation surveys as height increases. Approximate reductions in annual collision rates for these species are 4-5% for White-throated Needletail, 94–95% for Yellow-tailed Black Cockatoo, 32–47% for Blue-winged Parrot and 32-35% for Wedge-tailed Eagle.

Table 32 Comparative collision risk models for 45 and 60 metre rotor ground clearance scenarios

Species	Rotor avoidance rate	CRM annual collision prediction		% reduction in potential annual collisions due to adoption of 60 m ground clearance
		45 m ground clearance	60 m ground clearance	
White-throated Needletail	0.95	1.25	1.19	5%
	0.98	0.50	0.48	4%
	0.99	0.26	0.25	4%
Yellow-tailed Black Cockatoo	0.95	3.18	0.15	95%
	0.98	1.28	0.07	95%
	0.99	0.65	0.04	94%
Blue-winged Parrot	0.95	2.56	1.38	46%
	0.98	1.03	0.55	47%
	0.99	0.52	0.28	46%
Wedge-tailed Eagle	0.95	0.81	0.55	32%
	0.98	0.33	0.22	33%
	0.99	0.17	0.11	35%

37.2 Review of operational measures to minimise impacts on birds and bats

The review of measures to limit collisions presented here is intended as a summary only of currently available information. The Project is committed to implementation of measures that are demonstrably effective. This will include low wind speed curtailment of turbines to minimise potential for collisions by microbats including the Southern Bent-winged Bat.

The purpose of this section is to outline current methods and techniques while recognising that understanding of bird and bat interactions with wind energy facilities is in a stage of rapid improvement and methods and techniques to minimise negative effects of wind energy on fauna are also progressing rapidly. Specific applications will need to be fully informed by detailed information from manufacturers, experience at other wind farms and comprehensive consideration of suitability to specifics of the project and the project site prior to decisions about particular systems or applications to be used at the KGPH Project. Appropriate methods will be specified in a final Bird and

Bat Management Plan that will provide management measures with demonstrable effectiveness current at the time of Project commencing operation.

A summary of the references reviewed is provided in Appendix 13. Due to the rapid development underway in this field, the review was concentrated on literature published since 2017. Appendix 13 firstly lists reports of management measures and systems from operational commercial-scale wind farms as these are considered to represent the most robust indication of real-life experience. The table also lists a number of wider reviews and meta-analyses of techniques. There is a very extensive literature on experimental investigations, most of which have not been applied at commercial-scale facilities. A number of these are included in Appendix 13 for completeness and because some of those methods may ultimately be proven to work.

Most of the methods considered have been implemented only overseas and there is little information about their applicability or efficacy for Australian species. Many techniques have been experimental and have not been implemented with any measurable success at operating commercial wind energy facilities. Technological systems have been in rapid development and refinement, and it can be expected that this will continue. With these aspects in mind, the following review is intended to provide an overview of potential measures and techniques that have been implemented at commercial-scale onshore wind farms.

37.2.1 Turbine colouration

Studies have been made of painting a single blade black in contrast to the otherwise pale components of turbines. Painting a single blade black has proven to substantially reduce collisions by White-tailed Eagle in Norway (May et al. 2020). Also in Norway, the Willow Ptarmigan, a bird of the open tundra has been found to collide with the lower portions of turbine towers (Stokke et al. 2020). Colouring of towers so that they contrast with the snow-covered environment has reduced these collisions. Experiments have been made to investigate whether birds' capacity to see in the ultraviolet part of the light spectrum might have application, but these have been limited and to date are essentially unproven (Gorresen et al. 2015).

Potential for project application

Birds generally have good visual acuity but their primary focal range and the field of vision varies considerably between taxa. It is possible that single dark blades on otherwise pale turbines may reduce the incidence of collisions for some birds, potentially including raptors.

Microbats do not use vision as their primary sense for navigation and the method is not likely to be applicable to microbats. Flying-foxes have high visual acuity and night vision. It is possible that single dark blades on otherwise pale turbines may reduce the incidence of collisions for this species.

37.2.2 Deterrence using turbine lighting

Poorly designed lighting of tall structures can attract some species of birds and result in their 'entrapment' within a light pool which in turn may result in death or injury due to exhaustion or collision. Turbines in onshore situations generally only require aviation warning lighting at locations within a prescribed proximity to airfields. The red flashing lights required under such circumstances are not known to be attractive to birds or bats and there is no known international literature to suggest that this kind of lighting is of any concern at onshore wind farms.

Limited experiments have attempted to evaluate the responses of birds and bats to ultraviolet lighting of structures including wind turbines (Gorresen et al. 2015). The published studies indicate very limited and mixed results.

Potential for project application

The use of flashing red aviation warning lights mounted high on turbines is not likely to impact upon birds or bats.

The use of ultraviolet lighting of turbines is not known to have been implemented at any commercial-scale wind farms and information from experiments do not provide confidence that it is a technique likely to reduce effects on birds or bats.

37.2.3 Deterrence using audible noise

Limited experiments have been undertaken to broadcast audible noise in attempts to deter birds from close approach to turbines. Information from an experiment at an operational wind farm found no change in collisions by birds (Dorey, Dicky, & Walker 2019). No studies were found evaluating the effectiveness of this approach to deterrence of microbats.

Potential for project application

Information from experiments does not provide confidence that use of audible noise is a technique likely to reduce effects on birds or bats.

37.2.4 Deterrence using ultrasonic noise

A number of experiments have been carried out at operational wind farms to evaluate the effectiveness of broadcasting ultrasound noise with the intent of deterring microbats that rely on their own emission of ultrasound for navigation and foraging (Kinzie & Miller 2018, Schirmacher 2020, Cooper et al. 2020, Sievert et al. 2021, Romano et al. 2019, Weaver et al. 2020, Gilmour et al. 2020). The concept is that the broadcast noise will 'jam' the ultrasonic calls of bats as they approach a turbine. They have found a general, but variable reduction in fatalities of some, but not all, bat species at treatment turbines when compared with control turbines (Kinzie & Miller 2018, Romano et al. 2019, Weaver et al. 2020, Gilmour et al. 2020). They have also found that effectiveness of ultrasonic deterrence was limited by distance and area covered by broadcast ultrasound and that this was in part due to rapid attenuation (Kinzie & Miller 2018, Good et al. 2022). At least some studies have also indicated that turbine components themselves impede the broadcast of ultrasonic noise. The experiments have been conducted overseas and the potential applicability of the method to Australian species is unknown.

Potential for project application

Birds do not use ultrasonic noise to navigate and the technique has no known application for birds.

Microbats use ultrasonic calls as their primary sense for navigation and, if technical limitations can be overcome, the method may be applicable to microbats. The method is not applicable to flying-foxes.

37.2.5 Turbine curtailment

Rotating turbine blades clearly present a greater risk of collision for birds and bats than the static turbine components. Stopping rotors from turning, termed 'turbine curtailment', has been widely applied overseas to reduce the incidence of collisions. Turbine curtailment falls into two basic approaches:

- Turbine curtailment aimed at minimising collisions based on prediction of periods or conditions when particular species are most likely to be active near turbines (programmed curtailment).

- Methods to detect birds or bats and to curtail a turbine rotor when an animal approaches to within a prescribed distance of it (on-demand curtailment).

To date, turbine curtailment is understood to have been applied experimentally at just two wind farms in Australia (see *Low wind speed curtailment*, below). While a substantial reduction in overall bat mortality was demonstrated at one of them, no effect was found at the other. If turbine curtailment was to be applied as a purely precautionary measure from commencement of operation of a wind farm that would preclude an understanding of any level of collisions that might occur in the absence of curtailment. This is particularly important where other measures are implemented, such as the use of turbines with significantly higher than usual lower blade-tip height.

37.2.5.1 Seasonal or periodic programmed curtailment

Programmed curtailment generally refers to shutdown of turbines for short periods during which a species of concern is likely to be present or likely to be present in higher than usual numbers. Overseas It has mostly been used to coincide with short periods of seasonally concentrated migratory movements through a wind farm. It should be noted that in the northern hemisphere, where such programmed curtailment has been most applied, many species of birds and bats migrate along well-defined, often relatively narrow routes in short, highly predictable seasonal movements, often involving entire populations. The majority of birds and bats of south-eastern Australia do not undertake migrations of that kind. South-eastern Australia, including south-western Victoria, is the endpoint of annual migrations by many species of shorebirds and annual migration by various resident species between southern and northern Australia also occurs. In addition, many Australian species are nomadic and move throughout the continent in response to changeable environmental conditions and weather events. Migrations and nomadic movements by Australian species are generally diffuse across the broad landscape and are not confined to narrow geographic routes.

With sufficiently detailed knowledge it may be feasible for programmed curtailment to be applied to specific periods of the diurnal cycle or to the duration of particular activities of relevant species. In some cases, individual turbines may be curtailed for periods where they present greater risk than other turbines at a wind farm.

Programmed curtailment has occasionally been suggested as a response to high numbers of detected collisions by particular species, but it is not known to have been used for this purpose at any Australian wind farm to date.

Potential for project application

A variety of listed threatened and migratory birds may make seasonal and/or periodic movements through the project wind farm site. Others may occur episodically. While there is broad understanding of the seasonality of various species, programmed curtailment requires a high level of precision in order for it to function effectively without major reduction in generation of electricity. The current level of knowledge is not sufficient for any species to indicate with the necessary precision whether programmed curtailment might be applicable.

Data collected by the project indicates the seasonality and periods of the night when peak activity of Southern Bent-wing Bat calls were recorded in 2019 and 2020 (Biosis (2024a). Peaks of activity occurred in February and March, December, and at a lower level in September. For all months combined, nightly activity rose to a peak at 1900hrs and then gradually declined until 0500hrs. These results offer some level of information for the species, which is likely to be broadly relevant for other bats, but it should be noted that these results apply only to call data for the species that was almost entirely from ground-level detectors. Of a total of 2739 Southern Bent-wing Bat calls detected, just nine were at or above 54 metres above the ground. While limitations on these data are recognised

(Biosis 2022a), it is apparent that the vast majority of the species flights occur below the project's proposed rotor height and that programmed curtailment is not likely to be of value in limiting collision risk for this species or most other species of microbats.

Grey-headed Flying-foxes have not been recorded using the Project Area. The species tends to be present at southern Australian locations during the warmer months of the year, but that is not entirely predictable as it is apparent that it is also increasingly becoming established year-round at some locations. The spread of the species into southern Victoria is a dynamic process that is changing yearly. At present, it is not feasible to make reliable predictions that could be used to program any curtailment for the species at the project site.

37.2.5.2 Low wind speed programmed curtailment

The rotor on a wind turbine generator is passive, requiring the external force of the wind to induce rotation. By default, wind turbines adjust the pitch of the blades to present the full surface area to the oncoming wind direction so that when the minimum wind conditions are present, rotation will begin. As the wind speed increases, the rotational speed of the turbine will also increase until it reaches a point where it is effective to generate electricity, this is the electrical 'cut-in' wind speed. It is often the case that turbine rotors are allowed to turn while wind speed is below the cut-in wind speed and thus generating no electricity. This is done to reduce wear on turbine components by preventing overly frequent starting and stopping of the machinel.

A number of investigations overseas have demonstrated that flight activity of small species of bats is concentrated on periods when wind speeds are relatively low. A number of studies have demonstrated that preventing turbines from rotating during periods of low wind speed has reduced collisions by some bat species (Bennett et al. 2022, Good et al. 2022, Rabie et al. 2022, Mantoui et al. 2020, Anderson et al. 2022, Hayes et al. 2019). This is termed a 'low wind speed curtailment', and adjusts settings in the turbines operations, where the rotor blades are pitched to minimise surface area, effectively stopping rotation and reducing the risk of collision when electricity is not being generated. The turbine's blades will only adjust their pitch to begin rotation after a threshold wind speed has been exceeded (typically for a two minute average). These settings typically match or exceed the electrical cut in speed, resulting in increasing levels of electricity generation loss.

Low-wind speed curtailment is known to have been applied at two commercial-scale wind farms in Australia, Cape Nelson North Wind Farm near Portland in south-western Victoria and Mount Emerald Wind Farm in north Queensland. A peer-reviewed paper has been published about the Cape Nelson North Wind Farm (Bennett et al. 2022), which is close to the project site. Reports about the Mount Emerald Wind Farm study are provided on the wind farm's website (https://mtemeraldwindfarm.com.au/compliance/).

The species of principal concern at Cape Nelson North is Southern Bent-wing Bat. The wind farm incudes Senvion MM82 and MM92 turbines, with a maximum hub height of 80 metres, a maximum tip height of 126.5 metres and a ground clearance (below RSA) of approximately 33 metres. The study of curtailment there involved increase of cut-in wind speed from 3 metres/second to 4.5 metres/second. The study documented a 54% reduction in detected bat fatalities during curtailment relative to a preceding period without curtailment (Bennett et al. 2022). This result is for the pooled data encompassing eight identified species of microbats. Low numbers of detected fatalities for individual species, including Southern Bent-wing Bat (of which there was a total of three detected over the entire study), prevent conclusions from being drawn about any species.

At Mount Emerald, the species of principal concern are Spectacled Flying Fox *Pteropus conspicillatus* (EPBC Act: Endangered) and Bare-rumped Sheathtail Bat *Saccolaimus saccolaimus nudicluniatus* (EPBC

Act: Vulnerable). The wind farm consists of 53 turbines (37 Vestas V117 and 16 V112). Ground clearance is approximately 28–32 metres, depending on the turbine model. The study there has now completed two years of curtailment in which all turbines were curtailed in the first year, so that their rotors did not begin to turn until the cut-in wind speed of 3.0 meters/second was reached. During the second year of the study, half of the turbines had their cut in wind speed increased to 4.5 metres/second. Throughout the study to date, no Bare-rumped Sheathtail Bat fatalities have been detected. The number of Spectacled Flying Fox fatalities detected has also been so low that there has been no statistical power to demonstrate any change in mortality rate for that species. As a consequence, the curtailment experiment does not demonstrate any direct value of one level of wind speed curtailment over the other for these two threatened species.

In order to further explore the possible relative values of the curtailment for Mount Emerald results were analysed for all flying foxes (i.e. the pooled results for Spectacled Flying Foxes and Little Red Flying Foxes) and for the pooled results for all microbat species. Results of analyses were non-significant at the 0.05 level for both groups. This means that at Mount Emerald the mortality rate of both groups of bats at turbines operating with cut-in wind speed of 4.5 metres/second was not significantly different from the mortality rate experienced at turbines with a cut-in wind speed of 3.0 meters/second. The study at Mount Emerald is continuing in its third year, comparing curtailment on 50% of turbines (3 metres/second cut in), against no curtailment.

Potential for project application

Review of the extensive international literature has not found studies or application of low wind speed curtailment as a method to reduce bird collisions with turbines. Bird flight is functionally different from that of microbats and while bird flight is affected by wind speed, it is generally less likely to be influenced by wind changes to turbine cut-in at the speeds that have been demonstrated to reduce collision rates for some microbats. Low wind-speed curtailment is not considered likely to be applicable to reduction of collision risk for birds for the project.

Low wind speed curtailment is likely to be applicable to reduction of collisions by microbats, potentially including Southern Bent-wing Bat. The Project is committed to implementation of a low wind speed curtailment regime and that will be incorporated as an adaptive management measure, as part of the BBAMP.

As noted above (*Seasonal or periodic curtailment*), turbine curtailment can be expected to be of value only to bats flying within rotor-swept height. Data from the site suggests that the vast majority of flights by microbats, including those of the Southern Bent-wing Bat, occur below the project's proposed rotor height. If that remains the case during wind farm operation, it is not likely that low wind speed curtailment would contribute substantively to limiting collision risk for this species or most other species of microbats.

Grey-headed Flying-foxes are powerful fliers and low wind speed curtailment is not likely to affect their collision risk.

37.2.5.3 On-demand curtailment

The most promising methods to minimise bird and bat collisions with turbines are technologies that detect an animal that is approaching the turning turbine rotor in real time and integrate with the turbine control system (SCADA) to rapidly turn the turbine off. While messages can be transmitted quickly, turbines still require substantial time to come to a halt, which will require up to 30 seconds depending on the turbine model. As a result, these systems, as they are currently developed, are most suited to detecting birds or bats that are large enough to be detected well away from turbines.

A variety of such systems are now commercialised and in use at operating wind farms overseas and, at the time of writing this has been tested, with limited success, at one wind farm in Tasmania. In some cases, this approach has capacity to be species-specific and minimise loss of electricity generation by its operation on individual turbines and the ability to power-down only for the duration of the animal's presence. These methods are generally termed 'smart turbine curtailment'. The important advantage of these types of systems is that they are triggered by the detected presence of a target species and can thus be expected to be the most efficient means to both reduce collision risk and to minimise lost electricity generation.

As these technologies are progressing very rapidly and confirmation of their abilities is also improving at pace, it will be appropriate to recommend specific applications during the final design and construction stages of the Project.

Commercially available systems differ primarily in the technology for detection of relevant species and to some extent they have applications to different fauna. They employ radar, infrared and/or visible light imaging cameras or detection of bat calls to determine the presence of an animal and its proximity to a turbine. Some now use integration of more than one of these technologies into a single system.

This section provides a review of various automated systems designed to prevent potential collisions. The majority of systems reviewed here are designed to do that by using a monitoring system linked to an automated mechanism for shut-down and re-start of turbine(s). All turbines have existing SCADA (supervisory control and data acquisition) mechanisms for shut-down and re-start in response to wind conditions.

Automated systems designed simply to record and document collisions are not included here.

Automated turbine curtailment systems require a mechanism to detect a bird or bat that may be at risk (usually because it has entered a prescribed distance from the turbine) and use the detection as a trigger to shut down the turbine, or turbines, until the animal is no longer within the danger zone. SCADA is integral to functioning of the system by eliminating the need for monitoring or response intervention by human controllers and because of its rapid response capability.

On-demand systems may be both more efficient in reduction of collision risk than programmed or simple low wind speed curtailment because they respond to the actual detected presence of a bird or bat. They may also minimise loss of energy generation by their more targeted approach, however regular turbine shut-downs are technically challenging and can lead to mechanical issues including reduced turbine lifespan.

37.2.5.3.1 Bat call detection

Recording of ultrasonic bat calls is undertaken routinely in surveys for microbats and was used as the primary means of survey for small bats at the project site. The use of detected bat calls to trigger turbine shut-down to reduce collision risk requires a substantial additional system and a minimum number of detectors on every turbine. At least two commercially available systems using ultrasonic bat-call detection for this purpose have been developed in Europe and the USA (Hayes et al. 2019).

The capacity to curtail turbines on the basis of detecting ultrasonic calls for a particular species of concern is dependent on an automated positive and instantaneous identification of the species from its characteristic calls. In the case of Southern Bent-wing Bat, a degree of uncertainty in discriminating its calls from those of some other taxa that occur at the project site currently exists.

Bat-call detectors function by recording the calls of bats flying within proximity of the detector microphone. Detector technology has seen ongoing improvement over recent years and can be expected to continue to be refined and improved, nonetheless at present the capacity to detect a call and the quality of the recorded call are strongly influenced by the distance between the bat and the microphone and other causes of call-attenuation. Current model bat call detectors generally have a maximum detection distance of approximately 30 metres under optimal conditions and, in normal operation the turbines to be installed at the project are likely to take at least 30 seconds for rotors to come to a complete standstill. These factors present a problem particularly in light of the call detection distance relative to the proposed rotor span that is very much greater than 30 metres.

Potential for project application

Current limits on the distance over which ultrasonic bat calls can be reliably detected relative to the size of proposed turbines indicate that this technology is not likely to provide a consistent and reliable mechanism to curtail turbines if threatened species of bats fly in close proximity to turbines.

Grey-headed Flying-foxes do not make ultrasonic calls and this method is not applicable to them.

37.2.5.3.2 Radar

Radar uses radio waves to scan a given radius to detect objects within the airspace. Simultaneous use of horizontal and vertical surveillance radars allows scanning in three dimensions. Radar has a substantial history of use for detection of flying birds and bats and is widely used at airports to reduce aircraft bird and bat strikes. A number of commercially available radar systems have been developed and are in use at wind farms overseas (Nilsson et al. 2018, Moll et al. 2020). Radar has been used at wind farms overseas to obtain information about the overall use of the local airspace by birds and bats.

Where the surrounding terrestrial landscape has a complex topography or multiple obstacles such as trees or buildings, this ‘clutter’ renders radar ineffective for detecting targets that are close to the ground or amongst those obstacles. This clutter effect would be likely to place a severe constraint on the value of radar as a primary trigger mechanism at the project site due to its undulating topography and the presence of plantation trees over much of it.

Radar does not have intrinsic capacity to distinguish individual species and it does not readily discriminate large objects (like a single large animal) from a tight cluster of smaller objects (like a small flock of birds or insects), but with local experience it is possible to categorise flying animals into basic size classes. Radar has now been in use at various wind farms, primarily in the northern hemisphere, for the purpose of triggering curtailment to reduce collision risk. Available information about use of radar for this purpose suggests that its primary applications are where the species of concern are large birds or flocks of birds that are approaching a wind farm from outside its boundaries. It has been of value in detecting the approach of migrating flocks of birds or of individuals of large species like eagles, vultures or cranes. This type of application is of relevance where such events may occur seasonally or infrequently and a turbine shutdown can be used to reduce collision risk while the animals pass through the wind farm.

A radar system has recently been undergoing testing for the purpose of triggering shutdown of individual turbines to reduce fatalities of the EPBC Act listed Tasmanian Wedge-tailed Eagle at Musselroe Wind Farm in Tasmania (https://woolnorthrenewables.com.au/wp-content/uploads/2022/10/MRWF-Public-Environmental-Report-2019-2022.pdf). This has been an experimental study, involving tracking of eagles fitted with GPS, to evaluate detection probability achieved by the radar system. The system achieved a detection probability of approximately 60%, with a horizontal spatial accuracy of approximately 25 m. The range of the radar was approximately 6 km.

Radar functions by sweeping through the radius of airspace and there are intervals between sweeps. Anecdotal information suggests that the intervals allow for a bird to make a rapid change of direction in which it might collide with a turbine without its previous trajectory having triggered a turbine shutdown.

Potential for project application

Radar as a stand-alone mechanism to trigger turbine curtailment would be problematic at the project site due to ground clutter, which would limit detectability within plantation areas. Given the range of different threatened bird species that may occur at the project site and the apparent rarity with which most of them appear likely to visit the site, relative to the much larger range of non-threatened species, the inability of radar to discriminate between species (other than by simple size categories) would present a very significant limitation on its application as a usefully responsive trigger for turbine curtailment for birds.

The limitations outlined above for birds apply equally to microbats and flying-foxes. The small body sizes of microbats would make it unlikely that radar could reliably detect them. In addition, a range of microbat species occur at the site and are likely to be in flight for most nights of the year. It would not be feasible for radar to distinguish threatened microbat species as a trigger for turbine curtailment.

37.2.5.3.3 Camera tracking

A few automated camera-tracking systems have now been developed and used at operational wind farms. These are systems use high precision optical cameras (with the potential option for thermal imaging cameras also) located strategically to provide coverage of all turbines. The cameras track the movement of birds and calculate the trajectory of a detected bird relative to the rotor-swept area of turbines in real time. The system of cameras is interconnected to the SCADA system.

The system uses artificial intelligence to 'learn' to distinguish target species from other species and make curtailment 'decisions'. The learning process requires multiple different images of the target species which can be obtained during the early period of the system's operation.

Once functional the system tracks the movement of objects in the sky around the wind farm and determines whether an object is a target species. If it is, the system commences tracking and determining its trajectory in real time relative to turbines. Pre-defined distances from turbines are then used to trigger curtailment if the trajectory of the bird indicates it will enter a zone too close to a turbine. The system can track multiple eagles simultaneously and shut down any turbines required to avoid a collision.

A camera tracking system is in operation to minimise collisions by the Tasmanian Wedge-tailed Eagle and White-bellied Sea-eagle at Cattle Hill in Tasmania (https://cattlehillwindfarm.com/wp-content/uploads/2022/03/Assessment-of-IDF-Avian-Detection-System-FINAL_updated.pdf). The 2022 report on the system there suggests it has been highly effective in prevention of eagle collisions. The system in use at Cattle Hill has also been the subject of a peer-reviewed paper that assessed its effectiveness for eagles (McClure, Martinson & Allison 2018). That paper indicates that the system has the ability to detect species as large as, or larger than an American Kestrel (i.e. a body length of approximately 25 cm and a wingspan of approximately 56 cm).

Camera tracking systems appear to be the most effective currently available systems for triggering of on-demand turbine curtailment for medium to large target species of diurnal birds. It is possible that integration of thermal imaging capacity would allow them to also function for similar sized nocturnal birds and flying-foxes.

Potential for project application

It appears feasible that an optical (and potentially thermal imaging) camera tracking system would be applicable to minimise collisions by a number of medium to large threatened bird species that may occur at the project site. However, it may be difficult to obtain sufficient images of species that occur rarely or are cryptic to permit the system to 'learn' to recognise them.

Available information about camera tracking system suggest that, at present, they would not be suited to discriminatory detection of threatened microbats, due to their small body sizes and their similarity to non-threatened species. The nocturnal activity of microbats would necessitate the use of thermal imaging capacity.

If thermal imaging capacity is available a camera tracking system would appear likely to be suited to detection of flying-foxes.

37.2.5.3.4 Thermal imaging

Thermographic cameras detect radiation in the long-infrared range of the electromagnetic spectrum. Effectively this allows an image to be made from the variable temperatures of items in the absence of visible light. Thermal imaging cameras have now been used widely to detect and 'see' nocturnal wildlife. At least one system has been developed using thermal imaging to trigger monitoring of bat activity in proximity of turbines to trigger curtailment (Georgiev & Zehtindjiev 2022, Matzner, Warfel & Hull 2020). This system differs from camera-tracking systems described above and uses thermal imagers positioned on individual turbines.

While thermal imaging of this kind would have a primary application to bats and nocturnal birds, it would not be suited to discriminatory detection of threatened microbats, due to their similarity to non-threatened species.

To date little information has been obtained about the effectiveness of this type of system.

Potential for project application

Thermal signatures of birds during daylight are generally poor due to the limited difference between the body temperature of birds and their surrounds. In addition, the high insulating properties of plumage substantially limits the ability of thermal imaging to detect them. Thermal imaging may be applicable for nocturnal birds, but limitations on coverage of turbines would appear to significantly constrain the value of this technology as described.

While thermal imaging of this kind would appear to have a primary application to bats, it would not be suited to discriminatory detection of threatened microbats, due to their similarity to non-threatened species. In addition, limitations on coverage of turbines would appear to significantly constrain the value of this technology to reducing collisions by bats.

37.2.5.3.5 Integrated systems

A system that integrates radar with optical and thermal camera-tracking in the offshore environment has been reported recently from Scotland (https://group.vattenfall.com/uk/siteassets/wind-pdf-documents/eowdc/aowfl-aberdeen-seabird-study_annual-report-2020_v3_final-2.pdf). In effect, this system combines the capabilities of radar and camera-tracking as described above.

The radar is used to initially detect birds. High-speed processing software then allows birds discovered by the radar to be automatically targeted by the cameras and followed, using motion detection and video. Thermal imaging is incorporated and permits detection during darkness.

To date, this system is in use to obtain data about the flight activity and turbine-avoidance behaviours of birds. However, there would appear to be no reason why an integrated system of this kind could not also be employed to trigger curtailment. For example, such integrated systems have recently been included in permit conditions for a Polish offshore wind farm to avoid and minimise Common Crane collision during the species' migration.

Potential for project application

The integrated system outlined here has not been applied for triggering of turbine curtailment and the system has not been operated in the onshore environment. At present these technologies are not known to have not been developed to the point that they can be recommended for the project.

37.3 Mitigation recommendations

This report will inform the Environment Effects Statement and the planning permit applications to be made for the wind energy facility and the transmission line (utility installation).

Environmental impacts are expected to be managed during the construction and operation of the Kentbruck Green Energy Hub under an Environmental Management Plan (EMP), that is likely to comprise of a range of specific plans including:

- Construction Environmental Management Plan (CEMP)
- Native Vegetation Plan (NVP)
- Bird and Bat Adaptive Management Plan (BBAMP) (Smales, Gibson & Venosta 2022)

These plans will likely be required as a condition of any planning permits issued for the project, and will be informed by this impact assessment and the recommended mitigation measures (see Table 33). These plans will also be informed by the impact assessment and recommended mitigation measures included in other technical studies prepared for the EES and planning permit applications.

Table 33 provides recommendations for various project stages, including design, detailed design, pre-approval and construction. It should be noted that many of the recommendations related to exclusion of turbines from sensitive areas have already been incorporated into the project design, as outlined in Section 1.2.4.

Table 33 Mitigation measures relevant to biodiversity

Ecological value(s)	Mitigation measure #	Mitigation measure	Stage(s)
Native vegetation and habitat	MM-01	AVOID. Where possible, wind turbines and associated infrastructure including electricity poles associated with the reticulation and transmission network should be located away from native vegetation. This includes temporary stockpiles and storage of equipment during construction. Infrastructure should be located 15 metres away from any native trees if possible. Any works closer to native trees than 15 metres will require assessment by an arborist to determine if trees need to be included in loss calculations, due to impacts on tree protection zones. Note that for the section of the transmission line through Cobboboonee National Park and Cobboboonee Forest Park, it was not possible to always achieve a separation of 15 m and assumed tree losses have been included in impact calculations where tree protection zones are impacted by more than 10%.	Pre-construction. Detailed design, to be documented in native vegetation plan (Post EPBC Act approval).
Native vegetation and habitat	MM-02	MINIMISE. Existing gates and access tracks should be used where possible. Where there is a requirement to widen existing or create new access tracks, this should be undertaken outside areas of native vegetation	Pre-construction. Detailed design, to be documented in native vegetation plan (Post EPBC Act approval).
Native vegetation and habitat	MM-03	OFFSET. Source appropriate offsets for vegetation losses, in accordance with the *Guidelines for the removal, destruction or lopping of native vegetation* (DELWP 2017a) as described in Section 4.4.3 of this report.	Pre-construction. Detailed design, to be documented in native vegetation plan (Post EPBC Act approval).
Native vegetation and habitat	MM-04	Protect all areas of retained native vegetation including scattered trees during construction by means of temporary fencing if construction activities are to be conducted in proximity (within 15 metres) to native vegetation. Fencing must be installed before construction work commences.	Construction (Post EPBC Act approval).

Ecological value(s)	Mitigation measure #	Mitigation measure	Stage(s)
Native vegetation and habitat	MM-05	Trees not requiring direct removal to be protected in appropriately marked Tree Protection Zones (TPZs) in accordance with the *Australian Standard – Protection of trees on development sites (AS 4970-2009)*.	Construction (Post EPBC Act approval).
Native vegetation and habitat	MM-06	Any required tree pruning should be undertaken by an experienced arborist to ensure unnecessary damage does not occur. Understorey vegetation must be protected during tree pruning works.	Construction (Post EPBC Act approval).
Native vegetation and habitat	MM-07	For temporary disturbance required during construction only, sites should be rehabilitated by facilitating natural regeneration or planting appropriate locally indigenous species. Any rehabilitated sites will require ongoing monitoring and adaptive management to control weeds and ensure successful establishment.	Post construction (Post EPBC Act approval).
Native vegetation and habitat	MM-08	For the underground transmission route beneath Boiler Swamp Road, limit construction activities to the existing road formation.	Construction (Post EPBC Act approval).
Native vegetation and habitat	MM-09	Any sites used for storage of materials or equipment, or turning of vehicles, should be identified, prior to construction, with the advice of a qualified ecologist to ensure no additional native vegetation or habitat areas are impacted.	Pre-construction (Post EPBC Act approval).
Aquatic ecosystems	MM-10	Where possible, avoid impacts on waterways due to windfarm infrastructure such as turbines, access tracks, cables, power poles and transmission lines. Directional boring should be used to avoid impacts on perennial waterways including the Surrey River. Where project infrastructure such as transmission lines must cross minor waterways, this should be done either by overhead spanning, directional boring or trenching during dry conditions.	Pre-approval (Pre EPBC Act approval)

Ecological value(s)	Mitigation measure #	Mitigation measure	Stage(s)
Wetlands and drainage lines along the transmission line route	MM-11	Avoid placement of transmission poles and access tracks within wetlands and drainage lines. These features should be avoided entirely or spanned.	Detailed design (Pre EPBC Act approval).
Aquatic ecosystems, particularly within the RAMSAR site.	MM-12	Avoid any micrositing of turbines into locations that would result in foundations intersecting with groundwater, where de-watering would be required.	Pre-approval (Pre EPBC Act approval).
Wetlands within the project site supporting native vegetation and/or waterbird habitat	MM-13	Where possible avoid placement of wind farm infrastructure within wetlands supporting native vegetation or waterbird habitat. DELWP Mapped wetlands with little or no ecological value could be included in infrastructure areas, but any disturbed areas will need to be included in native vegetation offset calculations.	Pre-approval (Pre EPBC Act approval).

Ecological value(s)	Mitigation measure #	Mitigation measure	Stage(s)
Wetlands within the project site supporting native vegetation and/or waterbird habitat	MM-14	Where installation of turbine footings intersects with the water table in close proximity to wetlands: • Avoid infrastructure in these areas where possible • Minimise the duration of any excavation works beneath the water table • Conduct works during summer or autumn, outside the reproductive season of wetland dependent species. The GDE impact assessment (CDM Smith 2024) recommends that no turbines be located in areas with an inferred depth to groundwater of less than 6 metres, and that turbine foundations should be located more than 50 metres from locations where GDEs occur.	Pre-approval (Pre EPBC Act approval).
Native vegetation, aquatic systems	MM-15	Construction Environmental Management Plan to be prepared to guide all construction activities. This must be guided by current best practice, and include protocols for management of chemicals, erosion, sedimentation, surface water and groundwater. Associated plans will include pest plants and animals, pathogens, wildlife and native vegetation.	Pre-construction (Post EPBC Act approval).
Native vegetation	MM-16	Develop a native vegetation plan, clearly identifying areas permitted for removal or required for retention, and detailing procedures for protection of no-go areas. This plan is to be of suitable detail to be used during construction works by all contractors involved in the works.	Pre-Construction (Post EPBC Act approval).
Birds and bats	MM-17	Develop a BBAMP in consultation with DEECA and to the satisfaction of the responsible authority. The BBAMP must 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 is to ensure operation of the Kentbruck Green Power Hub does not result in net significant or lasting impacts on the viability or conservation status of birds and bats. The BBAMP will minimise, manage and mitigate bird and bat mortality arising from the operation of the wind farm. The BBAMP will also aim to determine whether the presence, abundance and flight behaviours of species of concern are altered, relative to pre-construction levels, in response to the presence and operation of the wind farm.	Operation (to be finalised post EPBC Act approval).

Ecological value(s)	Mitigation measure #	Mitigation measure	Stage(s)
		The Project should 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 should 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 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 should 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 should include: o Procedures for monitoring blade strikes and determine the effectiveness of mitigation and management measures, including carcass searches, carcass persistence trials and searcher efficiency trials. o Identification of impact triggers for threatened and non-threatened species requiring a management response to reduce impacts. o Procedures for conducting surveys at a time interval and sampling frequency agreed to with DEECA to ascertain: ▪ The species, number, age, sex (where possible) and date of any listed species mortality and any other bat and avifauna species mortality. ▪ Seasonal and yearly variation in the number of listed species mortality and any other bat and avifauna species mortality. ▪ Whether further detailed investigations of any potential impacts on listed species and any other bat and avifauna species mortality are warranted.	

Ecological value(s)	Mitigation measure #	Mitigation measure	Stage(s)
		○ Procedures for reporting strikes/mortalities of listed species to DEECA within 2 business days of becoming aware of any strike/mortality. ○ Procedures for reporting strikes/mortalities of bat and avifauna species other than listed species to DEECA Environment monthly. ○ Information on the efficacy of searches for carcasses of birds and bats, and, where practicable, information on the rate of removal of carcasses by scavengers so that correction factors can be determined to enable calculations of the likely total number of mortalities. ○ Measures to verify whether collision mortalities are within the range predicted during assessment of the Project and to identify ongoing improvement measures. ○ Procedures for determining whether further detailed investigations of any potential impacts on native birds and bats are warranted. Any further detailed investigations required are to be undertaken in consultation with DEECA Environment. ○ 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. ○ A data sharing agreement to provide georeferenced, time stamped, data that is collected as part of the BBAMP. All data will be entered into a database to be maintained by the wind farm operator. Raw data will be available to relevant regulatory authorities on request. ○ Procedures for the regular removal of carcasses likely to attract raptors to areas near turbines.	
Southern Bent-wing Bat	MM-18	Incorporate adaptive management in BBAMP. Specific mitigation recommendations regarding Southern Bent-wing Bat are provided in Biosis (DSE 2020).	Operation (to be finalised post EPBC Act approval).

Ecological value(s)	Mitigation measure #	Mitigation measure	Stage(s)
Native vegetation	MM-19	Audit native vegetation removal and undertake an offset balancing study. A key aspect of this will be arborist assessment of assumed tree losses for the underground transmission line. Any surplus (unused) offsets can be kept in reserve for future requirements of the project, subject to agreement with DEECA.	Post construction (Post EPBC Act approval).
Birds including Brolga and Australasian Bittern	MM-20	Mark all new overhead powerlines with standard commercially available bird diverters to increase visibility to birds and bats. Overhead powerlines along Portland-Nelson Road should 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.	Operation (Post EPBC Act approval).
Flora and fauna values. Adjacent conservation reserves.	MM-21	Implement best practice methods for weed and pest animal control, in collaboration with landholders and land management authorities. Methods to be documented in a pest plant and animal management plan, to ensure the project makes a positive contribution to pest plant and animal management within the area.	Pre-construction (Post EPBC Act approval).
Terrestrial fauna, including mammals and reptiles	MM-22	Pre-clearance surveys recommended to investigate potential occurrence of significant species within the plantation sub-area and road modifications for the transport route. Species to consider include Heath Mouse, Striped Worm-lizard and Eastern Bearded Dragon. If these species are detected, they should be avoided if possible by micrositing, or relocated to adjacent habitat (guided by an approved fauna salvage plan) if micrositing is not possible.	Pre-construction (Post EPBC Act approval).
Southern Toadlet	MM-23	Pre-clearance surveys recommended to investigate potential occurrence of Southern Toadlet near drainage lines along Boiler Swamp Road, including the crossings of the Surrey River, and other culverts.	Pre-construction (Post EPBC Act approval).

Ecological value(s)	Mitigation measure #	Mitigation measure	Stage(s)
Burrowing Crayfish	MM-24	Pre-clearance surveys recommended to investigate occurrence and clarify species of Burrowing Crayfish present within impacted wetlands in the North-eastern sub-area. Where possible, direct impacts to habitat areas should be avoided by minor micrositing of access tracks and micrositing of the underground transmission line, or use of directional drilling in areas where micrositing is impractical.	Pre-construction (Post EPBC Act approval).
Terrestrial and arboreal fauna	MM-25	Prepare a wildlife management plan for the project, detailing procedures for wildlife handling at locations requiring removal of native vegetation. The plan should consider pre-construction inspections, salvage and supervision during construction by an appropriately qualified and licensed wildlife handler.	Construction (Post EPBC Act approval).
Brolga and Australasian Bittern	MM-26	Any works, such as road construction, within Brolga breeding buffers should be conducted outside the Brolga breeding season (typically July to November) and Australasian Bittern breeding season (October to February). A pre-construction survey should be conducted in December, January, February, March, April to confirm breeding has finished before any works are commenced, noting that: • Unfledged Brolga chicks can still be present in December and that breeding season can extend to December–April when sufficient water is present in wetlands, particularly in years with high spring/summer rainfall. • Australasian Bittern breeding season extends to February. Develop contingency plan for stopping works at any time of the year if Brolgas or Australasian Bitterns are observed at breeding sites and engaging in breeding activity (courtship, nest building, incubating, with unfledged chicks). Shield any light spill toward Brolga and Australasian Bittern habitat during the breeding season, if current buffers are not sufficient to achieve this. Mark overhead powerlines with standard commercially available bird diverters to mitigate collisions from diurnal and nocturnal movements.	Construction (Post EPBC Act approval).

Ecological value(s)	Mitigation measure #	Mitigation measure	Stage(s)
Threatened flora species	MM-27	Pre-clearance surveys should be undertaken prior to removal of native vegetation in areas with known occurrences of significant species, such as Dune Fan-flower within the Plantation sub-area, and One-flower Early Nancy, Hairy Boronia, Wiry Bossiaea, Rough Daisy-bush and Apple Jack within the transmission line alignment.	Pre-construction (Post EPBC Act approval).
Threatened flora species	MM-28	Any known locations, or locations identified in pre-clearance surveys should be marked, and treated as no go-zones if within 30 metres of construction activities.	Construction (Post EPBC Act approval).
Threatened flora species – Apple Jack	MM-29	Impacts on Apple Jack trees along the proposed underground transmission line should be avoided by micrositing the alignment, and use of horizontal directional drilling to avoid trees where trenching would result in major encroachment on tree protection zones. Alternative impact avoidance techniques should also be investigated, including root investigations (pre-construction) to assess presence and depth of roots beneath the road formation.	Pre-construction and construction (Post EPBC Act approval).
Reptiles, amphibians and small terrestrial mammals	MM-30	Develop protocols for management of terrestrial fauna, including: • site inductions for construction staff • pre-construction surveys in areas of native vegetation • management of trenches to minimise chances of animals being accidentally trapped • handling of any captured or injured wildlife.	Pre-construction and construction (Post EPBC Act approval).

Ecological value(s)	Mitigation measure #	Mitigation measure	Stage(s)
Australasian Bittern	MM-31	Avoid impacts on known and suitable wetland habitat (mapped in Figure 19b) and exclude infrastructure and works in these habitats. The main known habitat, Long Swamp and associated wetlands bordering southern edge of the Project already incorporate a 900 m buffer in the design as a measure to avoid and minimise impacts on Brolgas. Suitable Australasian Bittern habitat is included within these buffers. This is comparable to the 1000 m distance from breeding sites to turbines suggested for the Eurasian Bittern (Busch et al. 2017). Avoid construction of overhead powerlines and place underground where possible.	Pre-approval Detailed design (Pre EPBC Act approval).
Australasian Bittern	MM-32	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. Investigate the feasibility of using on-site radar / camera systems technology to trigger responsive turbine shut-downs designed to minimise potential for turbine collisions by Australasian Bittern. As appropriate, incorporate as adaptive contingency measures in Bat and Avifauna Management Plan. Consider undertaking GPS/satellite tracking of movements, and other monitoring technologies (e.g. radar / camera systems) to further inform potential adaptive management strategies for inclusion in Bat and Avifauna Management Plan. Develop an offset strategy to compensate for mortalities to avoid significant impact to the population as detailed in the BBAMP.	Pre-construction (Post EPBC Act approval).

Ecological value(s)	Mitigation measure #	Mitigation measure	Stage(s)
Australasian Bittern	MM-33	Refine adaptive management measures as required and as outlined in the BBAMP through: • Information from on-going Australasian Bittern studies in Australia and New Zealand on flight and movement behaviour. • Undertaking further targeted investigations into Australasian Bittern movements using GPS tracking of individuals that use Long Swamp, Lake Mombeong and associated wetlands. • Inclusion of shut-down on-demand curtailment during the seasonal dispersal/migration season using integrated thermal camera technologies as detailed in the BBAMP if there are cases where the technology has been proven to reduce mortalities of species moving between dawn to dusk and it can contribute to reducing collision risk to the Australasian Bittern.	Operation (Post EPBC Act approval).
Red-tailed Black-cockatoo	MM-34	Avoid construction of overhead powerlines and place underground where possible.	Pre-approval (Pre EPBC Act approval)
Red-tailed Black-cockatoo	MM-35	Mark any new overhead powerlines to mitigate collisions from diurnal and nocturnal movements.	Construction (Post EPBC Act approval).
Red-tailed Black-cockatoo	MM-36	Incorporate adaptive management in Bat and Avifauna Management Plan. Investigate the feasibility of using on-site radar / camera systems) and turbine shut-down protocols, and implement if feasible, at times of the year when the species is most likely to be present.	Operation (Post EPBC Act approval).

38. Conclusion

The proposed Kentbruck Green Power Hub is located in highly modified environments, including commercial pine plantation and farmland. However the project is positioned in close proximity to 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. 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. Characterisation and quantification of potential impacts on these species has been a major focus of this biodiversity assessment.

Mortality due to collision with turbines is identified as the most significant potential impact of the project. Direct impacts from construction of the project, such as removal of native vegetation or disturbance of habitat, have been avoided and minimised in the site selection and design process. Conclusions regarding these two broad categories of impact are provided separately below, focusing on ecological features where impacts can be quantified, or are considered highly likely.

Impacts related to native vegetation and habitat removal

Construction of the project will require the removal of 8.696 hectares of native vegetation, and potential impact on 228 large trees due to disturbance within the tree protection zones (TPZs) of trees along the underground transmission route. A conservative approach has been taken to estimating extent of native vegetation impact, and it is possible that many impacted areas can be avoided by micrositing of elements of the project during the detailed design and construction phase.

Two FFG Act listed tree species – Apple Jack *Eucalyptus splendens* and Western Peppermint *Eucalyptus falciformis* – occur in abundance adjacent to Boiler Swamp Road where the underground transmission line is proposed to be constructed through Cobboboonee National Park and Cobboboonee Forest Park. Locations of these trees within close proximity of the road have been accurately identified, and the proponent has made a commitment to avoiding impacts to all Apple Jack tree protection zones by micrositing the route alignment and using directional drilling. Avoidance of Apple Jack has been prioritized, due to the higher level of threat (critically endangered) compared with Western Peppermint (vulnerable). Western Peppermint is abundant within the local area, being one of the dominant tree species in many vegetation types to the west of Portland.

Habitat removal may have minor impacts on terrestrial species such as small terrestrial mammals and reptiles, and some bird species that are reliant on terrestrial vegetation for roosting or foraging. However, none of these impacts have been determined to pose a threat to the ongoing survival of any populations of threatened species, as the extent of habitat removal is very minor in the context of habitat availability within the local area.

The Project Area supports a range of aquatic features, including wetlands, intermittent streams and perennial streams. Impacts on these aquatic features have been avoided by exclusion of turbines within 500 metres of wetlands in the Ramsar site, or where groundwater levels in the plantation were predicted to be within 6 metres of the ground surface where dewatering would be required for turbine foundations (AECOM 2023). The proposed underground transmission line crosses several waterways, including two crossings of the Surrey River. Impacts on these waterways are proposed to be avoided by directional drilling and appropriate sediment controls during construction.

The project intersects with DELWP (now DEECA) mapped wetlands where an access track and underground cabling is proposed in the eastern section of the Project Area. These impacts have been included in the native vegetation assessment, as specified in Victoria's *Guidelines for the removal, destruction or lopping of native vegetation*.

Burrowing Crayfish mounds (Chimneys) were observed in damp locations throughout the Project Area, particularly associated with low-lying ground in the farmland in the east, and damp locations along Boiler Swamp Road. It is unclear if these are Portland Burrowing Crayfish *Engaeus strictifrons* or Hairy Burrowing Crayfish *Engaeus sericatus*, both of which are listed as threatened under the FFG Act. Although impacts on these Crayfish are unlikely to be significant, due to the small extent of disturbance in relation to the habitat availability in the broader area, it is recommended that micrositing be applied during detailed design and construction to avoid these areas where possible.

Impacts on flying species due to collision with turbines and powerlines

Two nationally critically endangered species are known to occur in the Project Area:

- Southern Bent-wing Bat *Miniopterus orianae bassanii*
- Orange-bellied *Parrot Neophema chrysogaster*

Potential impacts on Southern Bent-wing Bat are assessed in a separate technical report (Biosis 2024a).

A single Orange-bellied Parrot was recorded during project field studies in the interdunal heathland vegetation on 29 May 2020. The species is very rarely recorded in coastal areas within south-west Victoria, where it forages within saltmarsh and shrublands close to the coast. Movements through the Project Area, and therefore at risk of collision, are possible but considered likely to be very infrequent. Although there is limited information on flight height and flights within rotor-swept area are possible, these are also considered unlikely or rare events. Although any level of mortality would be considered a significant impact due to the critically low population, collision with turbines is considered extremely unlikely to occur.

The impact assessment identified two threatened species, known to utilise the Project Area, where the risk of collision with turbines has potential to constitute a significant impact:

- Australasian Bittern *Botaurus poiciloptilus* (listed as endangered under the EPBC Act, critically endangered under the FFG Act)
- White-throated Needletail *Hirundapus caudacutus caudacutus* (listed as vulnerable under the EPBC Act and FFG Act).

Australasian Bittern was recorded in wetlands within the Project Area, and the species may fly through the wind farm as part of seasonal or local movements. Very little information is available regarding the flight patterns of this species and insufficient information was recorded during the study to enable collision risk modelling. There is also insufficient information available to conduct population viability analysis. Applying the precautionary principle, collisions with KGPH have potential to constitute a significant impact on the Australasian Bittern population.

White-throated Needletail is known to fly through the Project Area, sometimes at rotor swept height. Collision risk modelling predicts 0.91 collisions per annum at 0.95 avoidance rate, which is not expected to constitute a significant impact on the population over the life of the project.

Several areas in the vicinity of the Project Area are known to support breeding and foraging activity of Brolga *Grus rubicunda* (listed as endangered under the FFG Act), and field surveys for the project gathered substantial new information regarding Brolga activity in the area. Impacts on Brolga have been assessed in a separate report (Biosis 2024b), which follows the process specified in the Interim Guidelines for the *Assessment, Avoidance, Mitigation and Offsetting of Potential Wind Farm Impacts on the Victorian Brolga Population* (DSE 2012). This process has resulting in the establishment of several turbine free zones which are incorporated in the project design.

The Project is sited within the range the South-eastern Red-tailed Black Cockatoo, however it is proposed to be constructed in generally unpreferred habitat (pine plantation) and there are very few records of the sub-species to the south of the Project area, suggesting that flights through the area where turbines are proposed to be constructed are rare events. Observational studies on flight heights (from other parts of the sub-species' range) suggest that flights within rotor swept height (above 60m) are also likely to be rare events. The Project has been designed to avoid direct impacts to habitat, although there may be some loss of potential foraging trees due to indirect impacts on tree protection zones for construction of the underground transmission line.

The impact assessment also quantifies collision risk for several non-threatened species where sufficient information was available to construct a collision risk assessment (CRM) model, including Yellow-tailed Black Cockatoo, Blue-winged Parrot and Wedge-tailed Eagle. These models predict low levels of annual collision for these species, well below levels that could lead to population level effects.

Key mitigation measures adopted to reduce collision impacts on birds and bats are:

- Site selection of the wind farm, to be located in modified habitats which are non-preferred environments for most bird and bat species.
- Minimum blade sweep height of turbines to be greater than 60 metres above ground level.
- Turbine exclusion areas adjacent to conservation reserves and wetlands within the Ramsar site.
- Exclusions of turbines within farmland between conservation reserves and the Kentbruck Heath (within areas identified as Brolga breeding areas).
- Low wind speed curtailment, as detailed in the project BBAMP.

Recognising that there is residual uncertainty regarding abundance, movement patterns and flight heights of some species, unexpected collisions will be managed in accordance with an adaptive bird and bat management plan, submitted in draft form with the EES documentation and to be finalised in response to permit conditions if approval is granted to the project.

The Scoping Requirements for the KGPH Environment Effects Statement call for consideration of the potential for the Project to contribute to a greater cumulative effect on biodiversity in combination with other wind energy projects or actions taking place or proposed in the region.

The cumulative impact assessment (Section 36) undertaken for the KGPH has identified potential for the project to contribute to cumulative impacts, in combination with other wind energy projects, upon:

- Southern Bent-wing Bat (assessment provided in Biosis 2023a)
- Australasian Bittern
- Wedge-tailed Eagle
- White-throated Needletail

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Appendices

Appendix 1 Scoping Requirements for KGPH Environment Effects Statement

Scoping Requirements for Kentbruck Green Power Hub Environment Effects Statement

Environment Effects Act 1978

JANUARY 2020

Environment, Land, Water and Planning

Accessibility

If you would like to receive this publication in an alternative format, please telephone the DELWP Customer Service Centre on 136186 or customer.service@delwp.vic.gov.au. This document is also available on the internet at planning.vic.gov.au/environment-assessment/browse-projects.

List of abbreviations

DELWP	Department of Environment, Land, Water and Planning
EE Act	*Environment Effects Act 1978*
EES	Environment effects statement
EMF	Environmental management framework
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
FFG Act	*Flora and Fauna Guarantee Act 1988*
Ha	Hectares
km	Kilometres
kV	Kilovolts
MNES	Matters of national environmental significance
TRG	Technical reference group
MW	Megawatts
GWh	Gigawatt hours
EPA	Environment Protection Authority

Contents

1. Introduction

In light of the potential for significant environmental effects, on 25 August 2019 the Minister for Planning (the Minister) determined under the *Environment Effects Act 1978* (EE Act) that Neoen Australia Pty Ltd (the proponent) is to prepare an environment effects statement (EES) for the proposed Kentbruck Green Power Hub (the project). The purpose of the EES is to provide a detailed description of the project, assess its potential effects on the environment[1] and assess alternative project designs and approaches to avoid and mitigate effects. The EES will inform and seek feedback from the public and stakeholders and enable the Minister to issue an assessment of the project's environmental effects at the conclusion of the EES process. The Minister's assessment of the project's effects will inform statutory approval decision-makers.

The scoping requirements presented here, finalise the draft scoping requirements that were publically exhibited in December 2019. While the scoping requirements are intended to cover all relevant matters, the EES will need to address other issues that emerge during the EES investigations, especially those relevant to statutory decisions that will be informed by the assessment.

1.1 The project and setting

The project is located in southwest Victoria and comprises a windfarm, battery and powerlines. The proposed windfarm has a footprint of 7,500Ha, extending from approximately 3km east of Nelson to the north of Portland (Figure 1). The majority of the windfarm is located within an active commercial forestry operation, with the remaining footprint on agricultural land.

The proposed windfarm will consist of up to 157 wind turbines. The indicative rotor length is 190m with maximum blade tip height of 270m above ground level and the lowest blade tip height 45m (Figure 2). Depending on final turbine selection, each turbine will produce from 4MW to 8MW peak power output, to yield a forecast total capacity of approximately 900MW and annual production of approximately 3,300GWh. The project includes an on-site electrical substation and a battery storage facility with capacity of up to 1,000MW hours of storage. The operational life of the project is anticipated to be 25 years.

Aside from turbines, the project will include the upgrade and construction of onsite tracks and access to main roads, 16 lattice tower wind monitoring masts (anemometers) and up to eight power collection stations in addition to an operations building. Temporary infrastructure associated with construction of the project would include a construction compound (with office facilities, parking and toilet facilities), laydown areas, concrete batching plants and may also include an on-site quarry.

The project will require up to 45km of new transmission lines (underground and/or overhead) to connect to the existing Haywood-Portland 500kV powerline. The location of the connection has not been determined. Options being considered, by the proponent, include connection via the Heywood Terminal station approximately 35km east of the northern aspect of the project or connection via a new electrical terminal station adjacent to the existing 500kV line, north of Portland. If the new terminal station option is selected, the project will seek a transmission easement within the 'overhead line development envelope,' shown in Figure 1, that extends from Mount Richmond National Park in a south-easterly direction to Portland West.

Significant natural reserves lie immediately adjacent the project area, including Lower Glenelg National Park Cobboboonee National Park, Mount Richmond National Park and the Discovery Bay Coastal Park. The Discovery Bay Coastal Park and the western portion of Lower Glenelg National Park are elements of the recently listed Glenelg Estuary and Discovery Bay Ramsar site, immediately north and south of the project area, respectively (see Figure 1).

These reserves protect extensive tracts of native vegetation and other habitat types, and support populations of many significant species. The Glenelg Estuary and Discovery Bay Ramsar site includes wetland habitats attractive to wildlife such as mobile waterbird species, which are likely to traverse the project site. Species of designated conservation significance likely to occur on or close to the project and which could be affected by the project are listed in Appendix A.

[1] The meaning of 'environment' includes physical, biological, heritage, cultural, social, health, safety and economic aspects.

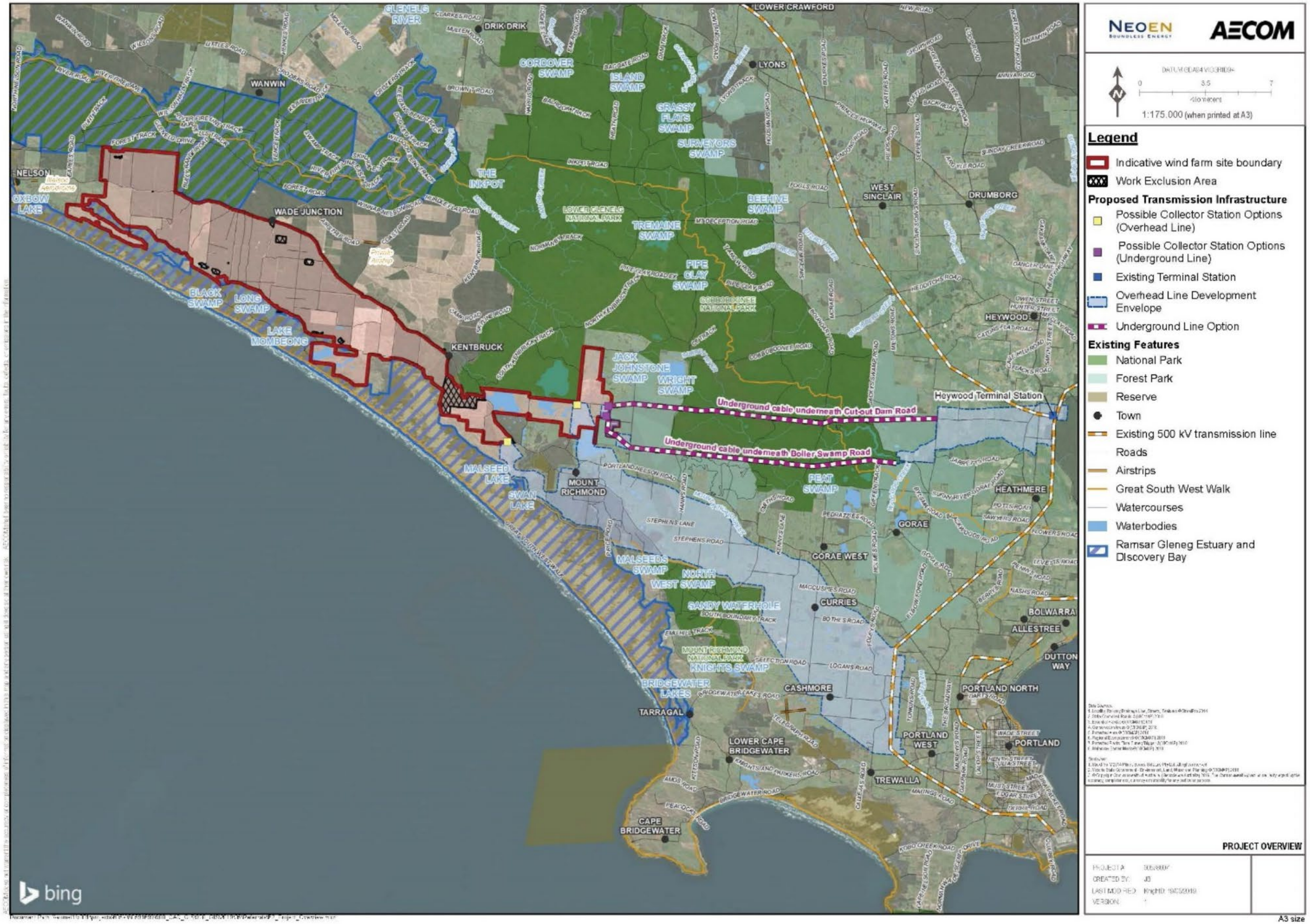

Figure 1: Location of the project (source: Neoen – AECOM).

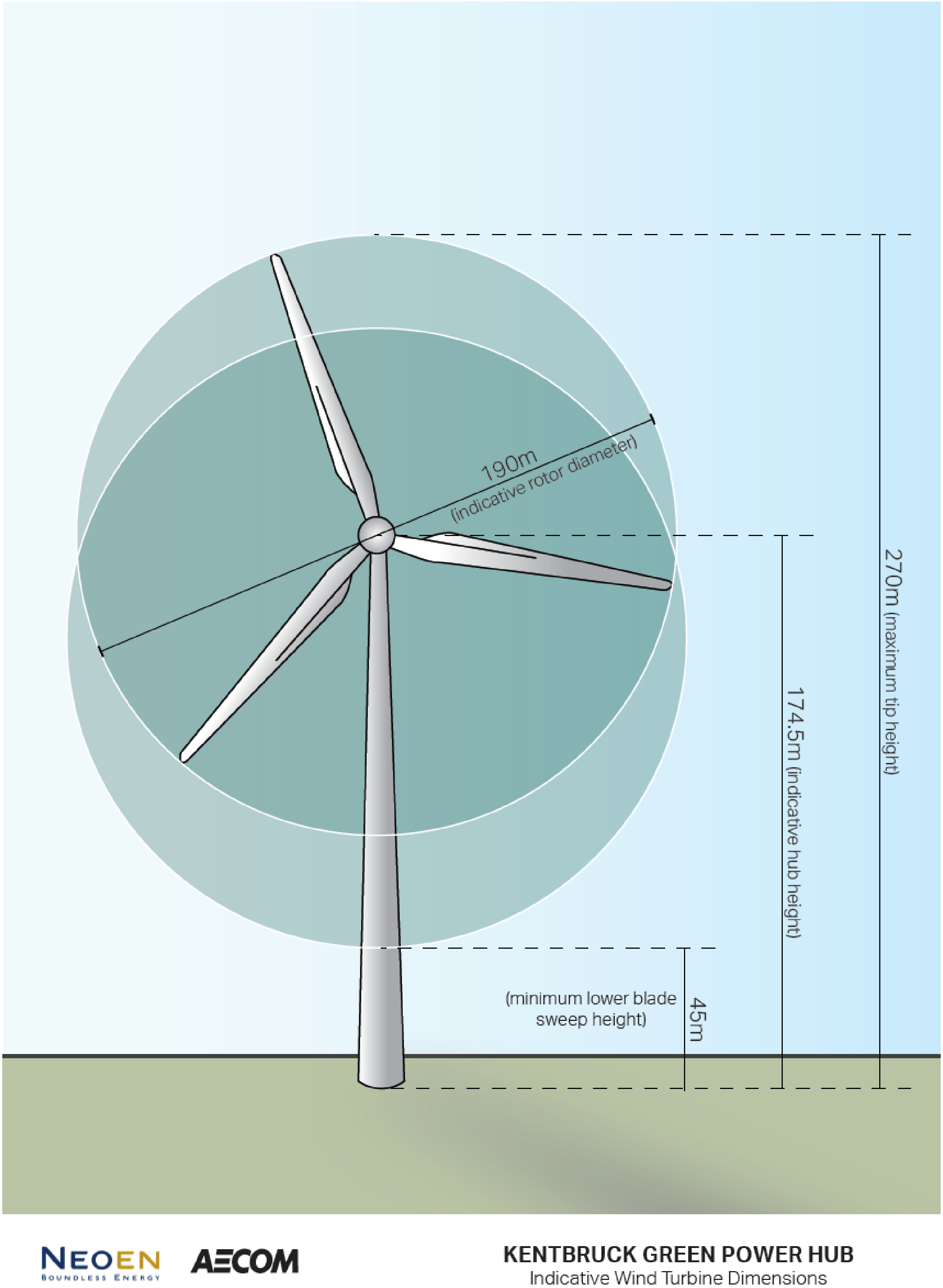

Figure 2: Indicative wind turbine dimensions (source: Neoen – AECOM).

1.2 Minister’s requirements for this EES

In light of the potential for significant environmental effects, the Minister’s decided that an EES was required to assess the project potential environmental effects. The Minister published procedures and requirements applicable to the preparation of the EES, in accordance with section 8B(5) of the EE Act (see Appendix B). In the procedures and requirements, the Minister identified key environmental risks that the project appeared to pose, *viz*.:

- effects on biodiversity and ecological values within, near and downstream of the project site including native vegetation, listed communities and species (flora and fauna) under the *Flora and Fauna Guarantee Act 1988* and *Environment Protection and Biodiversity Conservation Act 1999*;
- effects on surface water environments and related beneficial uses, including as a result of changes to stream flows, discharge of sediment and acid formation from disturbance of wetlands (including but not limited to Long Swamp and Glenelg Estuary and Discover Bay Ramsar site);
- effects on groundwater that may result in adverse changes to groundwater dependent ecosystems or affect the ecological character of the Glenelg Estuary and Discovery Bay Ramsar site;
- effects on Aboriginal and non-Aboriginal cultural heritage values;
- effects on state and regional landscape values and national parks;
- effects on local amenity values (e.g. visual, noise), including non-neighbouring landholders;
- effects on socio-economic environment, at local and regional scales, including increased traffic movement and indirect effects of construction on the capacity of local community infrastructure; and
- effects from a cumulative perspective, including threatened flora and fauna, social and amenity values, with particular consideration of the currently operating and already approved wind farm projects in the region.

These scoping requirements provide further detail on the specific matters to be investigated in the EES in the context of the *Ministerial Guidelines for Assessment of Environmental Effects under the EE Act* (Ministerial Guidelines).

2. Assessment process and required approvals

2.1 What is an EES?

An EES describes a project and its potential environmental effects. It should enable stakeholders and decision-makers to understand how the project is proposed to be implemented and the likely environmental effects of doing so. An EES has two main components.

1. The EES main report – an integrated, plain English document that assesses the potential impacts of the project and examines avoidance, mitigation or other measures to reduce the environmental effects. The main report draws on technical studies, data and statutory requirements such as specific limits for surface water and groundwater quality and waste discharge to the environment and should clearly identify which components of the scope are being addressed throughout.

2. The EES technical reports – specialist studies, investigations and analyses that provide the basis for the EES main report. These reports will be exhibited in full, as appendices to the main report.

2.2 The EES process

The proponent is responsible for preparing the EES, including conducting technical studies and undertaking stakeholder consultation. The Department of Environment, Land, Water and Planning (DELWP) is responsible for managing the EES process. The EES process has the following steps[2]:

- preparation of a draft study program and draft schedule by the proponent (completed);
- establishment of an inter-agency technical reference group (TRG) convened by DELWP (completed);
- preparation and exhibition of draft scoping requirements by DELWP on behalf of the Minister (completed);
- finalisation of the scoping requirements after considering public comments received during the advertised exhibition period, for issue by the Minister (this document);
- review of the proponent's EES studies and draft documentation by DELWP and the TRG[3];
- completion of the EES by the proponent;
- review of the complete EES by DELWP to establish its adequacy for public exhibition;
- exhibition of the proponent's EES and invitation for public comment by DELWP on behalf of the Minister;
- appointment of an inquiry panel by the Minister to review the EES and public submissions received, and provide a report to the Minister; and finally
- following receipt of the inquiry report, an assessment of the project's environmental effects by the Minister for the consideration of statutory decision-makers.

Technical reference group

DELWP has convened an agency-based TRG, comprising representatives of relevant state government agencies and departments as well as the Glenelg Shire Council. The TRG will advise DELWP and the proponent on:

- applicable policies, strategies and statutory provisions;
- the scoping requirements for the EES;
- the design and adequacy of technical studies for the EES;
- the proponent's public information and stakeholder consultation program for the EES;
- responses to issues arising from the EES investigations;
- the technical adequacy of draft EES documentation; and
- coordination of statutory processes.

Consultation plan

The proponent is responsible for informing and engaging the public and stakeholders to identify and respond to their issues in conjunction with the EES studies. Stakeholders include potentially affected parties, the local community and interested organisations and individuals, as well as government bodies. Under its EES

[2] See also planning.vic.gov.au/environment-assessment/what-is-the-ees-process-in-victoria.

[3] For critical components of the EES studies, peer review will be required.

consultation plan, the proponent will inform the public and stakeholders about the EES process and associated investigations and will provide opportunities for input and engagement during the EES investigations. The EES consultation plan is reviewed by DELWP and the TRG before it is finalised. The consultation plan will be published on the DELWP website[4]. The EES consultation plan will need to:

- identify stakeholders;
- characterise the stakeholder groups in terms of their interests, concerns and consultation needs and potential to provide local knowledge;
- describe the consultation methods to be used and outline a schedule of consultation activities during the EES investigations and development of the EES; and
- outline how inputs from stakeholders will be recorded, considered and/or addressed in the EES.

Statutory approvals and the EES process

The project will require a range of approvals under Victorian legislation. DELWP coordinates the EES process as closely as practicable with the approvals procedures, consultation and public notice requirements, in particular the planning approval process.

The key approvals known to be required under Victorian legislation are: an approved cultural heritage management plan (CHMP) under the *Aboriginal Heritage Act 2006,* approvals for a wind energy facility under the *Planning and Environment Act 1987* and an approved work plan and work authority under the *Mineral Resources (Sustainable Development) Act 1990* (for development of an on-site quarry).

Other approvals are likely to be required and will be determined throughout the course of the EES.

2.3 Accreditation of the EES process under the EPBC Act

The project was also referred to the Commonwealth under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). A delegate for the Commonwealth Minister for the Environment determined on 7 November 2019 that the project is a controlled action[5] and requires assessment and approval under the EPBC Act (see Appendix C). The provisions for the Commonwealth's controlled action decision under the EPBC Act are Ramsar wetlands (sections 16 and 17B), listed threatened species and ecological communities (sections 18 and 18A) and listed migratory species (sections 20 and 20A).

The EES process is accredited to assess impacts on matters of national environmental significance (MNES) under the EPBC Act through the Bilateral Assessment Agreement between the Commonwealth and the State of Victoria. Note that what are generally termed 'effects' in the EES process correspond to 'impacts' defined in section 82 of the EPBC Act.

The Commonwealth Minister or delegate will decide whether the project is approved, approved with conditions or refused under the EPBC Act, after having considered the Minister for Planning's assessment under the EE Act.

[4] planning.vic.gov.au/environment-assessment/browse-projects/projects/kentbruck-green-power-hub

[5] Under the EPBC Act, projects are considered as 'actions'. For the purposes of this document the term 'project' also means 'the action'.

3. Matters to be addressed in the EES

3.1 General approach

Preparation of the EES should be consistent with the principles of a systems approach and a risk-based approach[6], so that a greater level of effort is directed at investigating and addressing those matters that pose a relatively higher risk of adverse effects. The EES should put forward a sound rationale for the level of assessment and analysis undertaken for any environmental effect or combination of environmental effects[7] arising from construction and operational stages of the project.

In the case of potentially significant effects, analyses documented within the EES should be detailed enough to provide a good understanding of the nature of the effects including:

- the potential effects on individual environmental assets —magnitude, extent and duration of change in the values of each asset— having regard to intended avoidance and mitigation measures;
- the likelihood of adverse effects, including those caused indirectly as a result of proposed activities, and associated uncertainty of available predictions or estimates;
- further management measures that are proposed where avoidance and mitigation measures do not adequately address effects on environmental assets, including specific details of how the measures address relevant policies;
- likely residual effects, including significant residual impacts on MNES, that are likely to occur assuming the proposed measures to avoid and mitigate environmental effects are implemented; and
- proposed approach to managing and monitoring environmental performance and contingency planning.

3.2 Content and style

Together with the Minister's reasons for decision, the published procedures and requirements and the Ministerial Guidelines, the content of the EES and related investigations is to be guided by these scoping requirements. It is the proponent's responsibility to ensure that adequate studies are undertaken to support the assessment of environmental effects, focusing primarily on significant effects (including those that might emerge during the investigations). The EES should demonstrate how the project will achieve a balance of economic, social and environmental outcomes that contribute to ecologically sustainable development and provide a net community benefit. The EES should address statutory requirements associated with approvals that will be informed by the Minister's assessment as well as significant issues that emerge during the investigations.

The EES should provide a clear, objective and well-integrated analysis of the potential effects of the proposed project, including proposed avoidance, mitigation and management measures, as well as feasible alternatives. To facilitate decisions on required approvals, the EES should also address statutory requirements associated with approvals that will be informed by the Minister's assessment. Overall, the main report should include:

- an executive summary of the potential environmental effects of the project outlined in, including potential effects on identified MNES;
- a description of the entire project, including its objectives, rationale and key elements;
- a description of the relationship of the project to public policies and plans;
- an outline of the primary approvals required for the project to proceed;
- descriptions of the existing environment and future climate change scenarios, where these are relevant to the assessment of potential effects;
- appropriately detailed assessments of potential effects of the project on environmental values, relative to the 'no project' scenario, together with an estimate of the uncertainty associated with predictions;
- intended measures for avoiding, minimising, managing and monitoring effects;
- any proposed offset measures where avoidance and mitigation measures will not adequately address effects on environmental values, including the identified MNES, and discussion of how any offset package proposed meets the requirements of the Victorian Guidelines for the Removal,

[6] Ministerial Guidelines (p. 14).

[7] Effects include direct, indirect, combined, facilitated, short and long-term, beneficial, adverse and cumulative effects.

Destruction or Lopping of Native Vegetation and the EPBC Act Environmental Offsets Policy as it relates to MNES;
- predictions of residual effects, including residual significant impacts on MNES, of the project assuming implementation of proposed management measures;
- responses to issues raised through public and stakeholder consultation;
- evaluation of the implications for the project from the implementation of legislation and policy; and
- conclusions on the significance of impacts on regional, state and federal matters.

The proponent may choose to prepare a website with interactive functionality to provide an alternative form of access to EES information, which may compliment the conventional EES chapters and technical documents. Such an approach should be discussed with DELWP and should be integrated with the preparation of the EES package, including review by the TRG.

The EES should also include an outline of a program for community consultation, stakeholder engagement and communications proposed for implementation during the construction and operation of the project, including opportunities for local stakeholders to engage with the proponent to seek responses to issues that might arise during project implementation.

The proponent must also prepare a concise, graphical-based non-technical summary document (hard copy A4, no more than 25 pages) for free distribution to interested parties. The EES summary document should include details of the EES exhibition, public submission process and availability of the EES documentation.

3.3 Project description

The EES is to describe the project in sufficient detail to allow an understanding of all components, processes and development stages, and to enable assessment of their likely potential environmental effects. The project description should canvass the following:

- an overview of the proponent's environmental performance and track record, including experience in delivering similar projects, as well as organisation health, safety and environmental policies, and whether the proponent has been subject to any past or present proceedings under a Commonwealth, state or territory law for the protection of the environment or the conservation and sustainable use of natural resources;
- contextual information on the project, including its objectives and rationale, its relationship to statutory policies, plans and strategies, including the justification for need and selection of the project and implications of the project not proceeding;
- existing and planned land uses within, and in the vicinity of, the proposed project, supported by plans and maps.
- the proposed operational life of the project, and any decommissioning and rehabilitation arrangements; and
- other necessary works proposed for the project, such as road upgrades and/or connections, and infrastructure and services relocation.

The EES should detail the project's components:

- adopted specifications for turbines and other infrastructure;
- location, footprint, layout and access arrangements during construction and operation;
- design and expected construction staging and scheduling;
- proposed construction methods, and extent of areas to be disturbed during construction;
- solid waste, wastewater and hazardous material generation and management during construction and operation;
- lighting, safety, security, and noise requirements during construction and operation;
- hours of construction work and a description of the expected duration of project components, including which components are temporary and which are permanent; and
- operational requirements including maintenance activities and decommissioning.

3.4 Project alternatives

The EES should document the proponent's design development process leading to the project design presented in the EES. The EES should canvass the proponent’s consideration of feasible alternatives and include an explanation of how specific alternatives were shortlisted for evaluation within the EES. The EES should document the likely environmental effects of the alternatives, particularly where these offer a potential to minimise and/or avoid environmental effects whilst meeting the objectives of the project. The discussion of feasible alternatives and their effects should include:

- site selection process and extent of footprint;
- turbine models and configurations (including height, blade length and generator models);
- turbine and infrastructure layouts;
- internal collector powerline route selection process and investigations into the potentially suitable technologies, such as undergrounding;
- external powerline routes and configurations (e.g. underground);
- substation locations;
- access road site selection and alignment process;
- sourcing of raw construction materials (e.g. on-site quarry, including proposed locations); and
- site access and transport route selection process.

Where appropriate, the assessment of environmental effects of relevant layout, route and design alternatives is to address the matters set out in the subsequent sections of this document. The depth of investigation of alternatives should be proportionate to their potential to minimise potentially significant adverse effects as well as meet project objectives.

3.5 Applicable legislation, policies and strategies

In addition to the EE Act and the EPBC Act, the EES will need to identify relevant legislation, policies, guidelines and standards, and assess their specific requirements or implications for the project, particularly in relation to required approvals. Particular attention is drawn to the recent changes in the EP Act which are expected come into effect on 1 July 2020.

3.6 Draft evaluation objectives

Draft evaluation objectives are provided in Section 4 for each of the topics to be addressed in the EES. The draft evaluation objectives identify desired outcomes in the context of key legislative and statutory policies, as well as the principles and objectives of ecologically sustainable development and environment protection, including net community benefit. They provide a framework to guide an integrated assessment of environmental effects, in accordance with the Ministerial Guidelines, and for evaluating the overall implications of the project. These objectives may be refined by the proponent or DELWP as the EES is prepared.

3.7 Environmental management framework

Inadequate management of environmental effects during project design, construction, operation, decommissioning and rehabilitation could result in a failure to achieve necessary environmental outcomes and statutory requirements or sustain stakeholder confidence. Hence, the proposed environmental management framework (EMF) in the EES should describe a transparent framework with clear accountabilities for managing and monitoring the environmental effects and risks associated with the construction and operational phases[8]. The entity responsible for approval of environmental plans should be identified.

The EMF should describe the baseline environmental conditions to allow evaluation of the residual environmental effects of the project, as well as the efficacy of applied environmental management and contingency measures. The framework should include:

- the context of required approvals and consents;

[8] Ministerial Guidelines (p. 20).

- the proposed environmental management system to be adopted;
- organisational responsibilities and accountabilities for environmental management;
- an environmental risk register that is maintained during project implementation;
- the environmental management measures proposed in the EES to address specific issues, including commitments to mitigate adverse effects and enhance environmental outcomes;

An important aspect of the EMF is community consultation, stakeholder engagement and communications during the construction and operation of the project. As the project proceeds it will largely be the EMF that outlines opportunities for local stakeholders to engage with the proponent to seek responses to issues that might arise during construction or operation. To this end the EMF will set out procedures for:

- complaints recording and resolution;
- auditing and reporting of performance including compliance with relevant statutory conditions and standards; and
- review of the effectiveness of the EMF for continuous improvement.

Management measures proposed in the EES to address specific issues, including commitments to mitigate adverse effects and enhance environmental outcomes should be clearly described in the EMF. The EMF should describe proposed objectives, indicators and monitoring requirements, including for (but not limited to) managing or addressing:

- biodiversity values (including MNES) including bird and bat mortality and any mitigation or offsetting measures, if required;
- wetland values (including Ramsar listed wetlands)
- surface water and groundwater values;
- landscape and visual values, including blade glint and shadow flicker;
- noise and vibration, including during construction, decommissioning, and from operational turbines;
- air quality during construction;
- Aboriginal cultural heritage values;
- historic heritage values;
- aviation (including with respect to aerial firefighting) and electromagnetic interference;
- socioeconomic and land use values, such as for neighbouring residents and visitors to neighbouring National Parks and other Reserves; and
- traffic, particularly during construction, including managing temporary disruption and changed accessibility.

4. Assessment of specific environmental effects

Preparation of the EES document and the necessary investigation of effects should be proportional to the project risk, as outlined in the Ministerial Guidelines (p. 14). The risk-based approach should be adopted during the EES studies prior to the assessment of potential impacts, so that a greater level of effort is directed at investigating and managing those matters that pose relatively higher risk of adverse effects.

The following sections set out specific requirements for the assessment of effects. The sections are listed in order of apparent environmental risk (from most significant to least). The significance of risk may change as the assessment is progressed but it remains incumbent on the proponent, in consultation with the TRG, to assess risk and direct assessment effort accordingly. Each of the sections below use the following structure.

1. Identify **key issues** or risks that the project poses to achieve the draft evaluation objective.
2. Characterise the **existing environment** to underpin impact assessments having regard to the level of risk.
3. Assess the **likely effects** of the project on the existing environment and evaluate their significance.
4. Present design and **mitigation measures** that could substantially reduce and/or mitigate the risk of significant effects. An assessment of residual effects (post mitigation) and their significance will be required to illustrate the effectiveness of the proposed mitigation measures.
5. Propose **performance objectives** and management measures to evaluate whether the project's effects are maintained within permissible levels and propose contingency approaches if they are not.

The description and assessment of effects must not be confined to the immediate area of the project but must also consider the potential of the project to impact on nearby environmental values, including areas impacted through transport route upgrades.

4.1 Biodiversity and habitat

Draft evaluation objective

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.

Key issues

- Potential for significant effects and their acceptability on Southern Bent-wing Bat, 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.
- 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 Glenelg Estuary and Discovery Bay Ramsar site (including those listed in Appendix A).
- The availability of suitable offsets for the loss of native vegetation and habitat for listed threatened species under the FFG Act and EPBC Act.

Existing environment

- Characterise the type, distribution and condition of biodiversity values within a suitable study area, comprising the project site and its environs, including native vegetation, terrestrial and aquatic habitat and habitat corridors or linkages. This should include identifying and characterising any ephemeral wetlands/habitat for threatened species and communities listed under the FFG Act or EPBC Act.

- Identify and characterise any areas of native vegetation and groundwater dependant ecosystems that may be affected by groundwater drawdown or surface hydrological changes.
- Identify the presence and movements of Southern Bent-wing Bats within and near the project site, including locations of roosting or breeding sites within movement distances from the project site, in consultation with DELWP.
- Identify the presence of foraging and roosting habitat for South Eastern Red-tailed Black Cockatoo within the project site and broader locality in consultation with DELWP and the National Recovery Team for the species.
- Describe the biodiversity values that could be directly or indirectly affected by the project, including:
  - native vegetation and any ecological communities listed under the EPBC Act and FFG Act;
  - presence of, or suitable habitats for, protected flora and fauna species (including migratory species), in particular species listed under the EPBC Act, FFG Act, and DELWP advisory lists; and
  - potential use of the site and its environs for movement and/or foraging by protected fauna species including: Southern Bent-wing Bat, Red-tailed Black Cockatoo, Australasian Bittern, White-throated Needletail, Orange-bellied Parrot and Brolga.
- Describe any existing threats to biodiversity values, including:
  - direct removal of individuals or destruction of habitat;
  - historic or ongoing disturbance or alteration of habitat conditions (e.g. habitat fragmentation, severance of wildlife corridors or habitat linkages, changes to water quantity or quality, fire hazards, etc.);
  - background threats that lead to the mortality of listed threatened fauna; and
  - the presence of any declared weeds, pathogens and pest animals within and in the vicinity of the project area.
- Characterisation of the existing environment is to be informed by relevant databases, literature (and published data), community observations (including citizen science), appropriate targeted and/or seasonal surveys and modelling of the potential and actual presence of threatened species and communities consistent with Commonwealth and state survey guidelines, conservation advices and threatened species recovery plans. Where surveys do not identify a listed species or community, but past records and/or habitat analysis suggest that it may occur, a precautionary approach to the further investigation and assessment of its occurrence should be applied.

Likely effects

- Assess the direct and indirect effects of the project and feasible alternatives, including transport route upgrades and use, on native vegetation, listed ecological communities, and listed threatened and other protected flora species (especially those listed in Appendix A).
- Assess the direct and indirect effects of the project and feasible alternatives, on listed threatened, migratory and other protected fauna species under the EPBC Act, FFG Act and/or DELWP advisory lists (especially those listed in Appendix A).
- Assess the direct and indirect effects of the project and feasible alternatives, on the ecological character of the Glenelg Estuary and Discovery Bay declared Ramsar site.
- Assess the direct and indirect effects of the project, on biodiversity values, including:
  - disturbance or alteration of habitat conditions (e.g. habitat fragmentation, severance of wildlife corridors or habitat linkages, displacement due to avoidance of project infrastructure, changes to water quantity or quality, hydrological changes to wetland function, fire hazards, etc.);
  - the ability of wetlands, including Glenelg Estuary and Discovery Bay Ramsar site, to support listed species and communities;
  - the potential for birds and other fauna to be disturbed or disoriented by project effects such as noise, vibration or lighting;
  - direct removal of individuals or destruction of habitat;
  - threats of mortality of locally occurring listed threatened fauna (including site and species specific risk-factors); and

  - the presence and potential spread of any declared weeds, pathogens and pest animals within and in the vicinity of the project area.
- Assess the potential cumulative effects on listed species of fauna, in particular Brolga and Southern Bent-wing Bat, from the project in combination with other projects, in particular nearby proposed, approved or operating wind energy facilities.

Mitigation measures

- Identify and describe potential alternatives, proposed design options and mitigation measures (including operational mitigation measures) and their effectiveness in avoidance or reduction of significant effects on any flora, fauna and/or ecological communities listed on the EPBC Act, FFG Act or DELWP advisory lists, other protected species or ecological character of the Ramsar site. Provide clear statements noting which avoidance or mitigation measure will be committed to.
- Justify and describe the assumptions and level of uncertainty associated with the proposed measures achieving their desired outcomes.
- Develop hygiene controls for vehicle and machinery movement to minimise the spread of pathogens and weeds.
- Describe the application of the three-step approach to avoiding the removal of native vegetation, minimising impacts from removal of native vegetation that cannot be avoided and providing offsets to compensate for the biodiversity impact from the removal of native vegetation.

Performance objectives

- Describe and evaluate proposed commitments to manage residual effects of the project on biodiversity values, including an outline of an offset strategy and offset management plan to secure appropriate offsets to satisfy both Commonwealth and state offset requirements.
- Develop contingency measures to be implemented in the event of adverse residual effects (including ineffective mitigation) on flora and fauna values requiring further management.

4.2 Cultural heritage

Draft evaluation objective

To avoid or minimise adverse effects on Aboriginal and historic cultural heritage and associated values.

Key issues

- Destruction or disturbance of sites or places of Aboriginal or historical cultural heritage significance.

Existing environment

- Review land use history, previous studies and relevant registers to identify areas with Aboriginal cultural heritage value or potential Aboriginal cultural heritage value.
- Identify and characterise Aboriginal cultural heritage sites or areas of sensitivity potentially impacted by the project.
- Identify and document known, and previously unidentified places and sites of historic cultural heritage significance potentially impacted by the project, including any areas of significant archaeological interest, in accordance with the Guidelines for Conducting Archaeological Surveys (Heritage Victoria, 2013).

Likely effects

- Assess potential effects of the project on:
  - identified sites or places of Aboriginal cultural heritage significance; and
  - sites and places of historic cultural heritage significance, having regard to the *Guidelines for Investigating Historical Archaeological Artefacts and Sites*.

Mitigation measures

- Describe and evaluate proposed design, management or site protection measures that could avoid or mitigate potential adverse effects on known or potential Aboriginal or historical cultural heritage values.

- Develop management and contingency measures in accordance with the requirements for a Cultural Heritage Management Plan (CHMP) under the *Aboriginal Heritage Act 2006*.

Performance objectives

- Outline any proposed commitments to mitigate and manage residual effects on sites and places of Aboriginal cultural heritage significance (within the framework of a draft CHMP as appropriate).
- Outline any proposed commitments to mitigate and manage residual effects on sites and places of historical heritage significance, including site investigation and recording procedures.

4.3 Catchment values and hydrology

Draft evaluation objective

To maintain the functions and values of aquatic environments, surface water and groundwater quality and stream flows and prevent adverse effects on protected beneficial uses.

Key issues

- Potential for the project to have significant impact on wetland systems, including, but not limited to, Glenelg Estuary and Discovery Bay Ramsar site and its associated aquatic environments, and the ability for wetland systems to support habitat for protected flora and fauna species.
- The potential for adverse effects on nearby and downstream water environments (including Glenelg Estuary and Discovery Bay Ramsar site and listed Nationally Important Wetlands) due to changed water quality, flow regimes, impacts on groundwater or waterway conditions during construction.
- The potential for adverse effects on the functions, values and beneficial uses of groundwater due to the project's activities, including water extraction, interception or diversion of flows, discharges or seepage from quarrying areas, turbine foundations and other operational areas or saline water intrusion.
- Potential for the project to have a significant effect on hydrology and affect existing sedimentation and erosion processes leading to land and aquatic habitat degradation.
- Potential for disturbance of contaminated or acid sulphate soils.

Existing environment

- Characterise the groundwater (including depth, quality and availability to licence/ use) and surface water environments and drainage features in the project area and its environs.
- Characterise the wetland systems in the project area and its environs including the extent, types and condition of wetlands that could be impacted by the project, having regard to terrestrial and aquatic habitat, including as habitat corridors or linkages.
- Characterise hydrological requirements for wetlands in the project area and its environs and their acceptable limits for change.
- Characterise soil types and structures in the study area and identify the potential location and disturbance of acid sulphate soils.

Likely effects

- Assess the potential effects of the project on surface water and groundwater environments and beneficial uses, including on permanent and ephemeral wetland systems in the project area and its environs and downstream, considering appropriate climate change scenarios.
- Assess the potential effects on Glenelg Estuary and Discovery Bay Ramsar site, due for example to changed water quality, flow regimes, impacts on groundwater or waterway conditions during construction considering appropriate climate change scenarios.
- Identify and assess potential effects of the project on soil stability, erosion and the exposure and disposal of contaminants or hazardous soils (e.g. acid sulphate soils).

Mitigation measures

- Identify proposed measures to mitigate any potential effects, including any relevant design features or preventative techniques to be employed during construction and operation.

Performance objectives

- Describe proposed measures to manage and monitor effects on catchment values and identify likely residual effects.
- Describe contingency measures for responding to unexpected but foreseeable impacts such as disturbance of acid sulphate soils.

4.4 Landscape and visual

Draft evaluation objective

To minimise and manage potential adverse effects on landscape and visual amenity.

Key issues

- Potential effects on significant landscape values and landforms in the vicinity of the project, especially national parks, other reserves and areas identified for their landscape values.
- Potential for nearby residents / communities to be exposed to significant effects to the visual amenity, including blade glint and shadow flicker, from project infrastructure.
- Potential cumulative impacts of other operating and proposed/ approved wind farms on landscape values of the region.

Existing environment

- Characterise the landscape character, features and values of the project area and its environs.
- Identify public and private view sheds to and from the project and characterise visual values of the area, including dark skies.
- Identify the components of the project that may result in a significant visual amenity effect including turbines, powerlines and on-site quarry.
- Identify viewsheds in which the project site features, including from nearby residences (where permitted), public lookouts, tourist attractions, roads and key vantage points in the vicinity.
- Identify existing built features within the landscape (e.g. 500kV powerlines) and their impact on the existing landscape and visual setting.

Likely effects

- Assess the landscape and visual effects of the project, including on public and private views, and effects of blade glint and shadow flicker on neighbouring dwellings and communities. Use photomontages and other visual techniques to support the assessment.
- Assess the potential for cumulative impacts associated with the development of the project in the context of existing built infrastructures, as well as nearby operating and proposed/approved wind farm or other developments.

Mitigation measures

- Outline and evaluate any potential design and siting options that could avoid and minimise potential effects on landscape and visual amenity of neighbouring residences and communities and additional management strategies that may further minimise potential effects.

Performance objectives

- Describe proposed measures to manage residual effects on landscape and visual amenity values, including in the context of potential rehabilitation and restoration work following decommissioning.

4.5 Land use and socioeconomic

Draft evaluation objective – land use and infrastructure

To avoid and minimise adverse effects on land use, social fabric of the community, local infrastructure, aviation safety and to neighbouring landowners during construction, operation and decommissioning of the project.

Key issues

- Significant disruption to existing and/or proposed land uses, with associated economic and social effects.
- Potential adverse effects of wind turbines and associated infrastructure from an aviation perspective, including but not limited to impacts on aerial safety, air traffic control equipment, obstruction and turbulence.
- Potential interference with communication systems that use electromagnetic waves as the transmissions medium (e.g. television, radio, mobile reception).
- Potential disruption the management of public land.
- Potential adverse economic and social effects.

Existing environment

- Describe the project area and its environs in terms of land use (existing and proposed), residences, zoning and overlays and public infrastructure that support current and strategic patterns of economic and social activity.
- Describe the local community and social setting.
- Identify and describe the nearest aerodromes, air navigation and air traffic management services, transiting air routes, and designated airspaces.
- Characterise current use of aerial spraying and aerial firefighting that could be affected by the project (including any significant water resource that may be used for aerial firefighting in the region).
- Describe the source and predicted volumes of construction materials for wind turbines and associated infrastructure.
- Characterise tourism usage of the project area and its surroundings, including national parks and reserves.
- Characterise current local television and radiocommunication services within the project area and surrounding areas.
- Identify locations, values and prescribed management priorities for adjacent/nearby public land.

Likely effects

- Identify potential long and short-term effects of the project on existing and potential land uses, public infrastructure and fire and emergency management.
- Identify potential economic effects of the project, considering direct and indirect consequences on employment and local and regional economy.
- Identify potential impact on tourism and tourists attractions within the project area and surrounding natural reserves.
- Identify the potential effects and risks to aviation operations and safety from the project.
- Identify the potential for electromagnetic interference to radio-communications services from the project.
- Identify the potential effects of the project on land management practices and strategic direction for public land.

Mitigation measures

- Demonstrate whether the project is consistent with relevant planning scheme provisions and other relevant policies (including approved management plans for adjacent public land).
- Outline measures to minimise potential adverse effects of the project and enhance benefits to the community and local businesses.
- Describe proposed mitigation or management measures to reduce potential effects on aviation operations and safety with regard to advice from Civil Aviation Safety Authority and emergency services.
- Describe and evaluate potential design responses and/or other mitigation measures (e.g. installation of additional transmitter masts) to reduce potential electromagnetic interference to radio-communications services.

Performance objectives

- Describe proposed measures to mitigate, offset or manage social, land use and economic outcomes for communities living within the project area and its environs as well as proposed measures to enhance beneficial outcomes.
- Describe and evaluate proposed measures to manage and monitor residual electromagnetic interference and effects to aviation operations and safety and describe contingency measures for responding to unexpected impacts.

4.6 Community amenity, safety, roads and transport

Draft evaluation objective

To avoid and minimise adverse effects for community amenity and safety, with regard to construction noise, vibration, dust, traffic and transport, operational turbine noise and fire risk management.

Key issues

- Managing traffic disruptions for residents, businesses and travellers during the construction of the project.
- Potential damage to local and regional road surfaces along transport routes and increased risk to road safety on transport routes.
- Potential for adverse effects to air quality at sensitive receptors and on other sensitive land uses during construction of wind turbines, associated infrastructure and use of an on-site quarry.
- Potential for adverse effects on noise and vibration amenity at sensitive receptors during construction, operation and decommissioning (including on-site quarry).
- Implications of the project for fire risk management on surrounding land, including additional fire ignition risks arising from the project.
- Potential for adverse effects from waste generated during construction operation and decommissioning.

Existing environment

- Describe the existing road network surrounding the project area, including proposed construction transport route options, in terms of capacity, condition, accessibility and potentially sensitive users.
- Characterise current local conditions in relation to air quality using data collected from existing local monitoring stations, or project-installed monitoring equipment.
- Characterise the ambient noise environment and its values in adjacent established residential, farming zone, commercial and open space areas and at other sensitive land use and high amenity locations.
- Identify sensitive receptors within 3km of wind turbines, associated infrastructure and on-site quarry that may be subject to effects to amenity from the project including, but not limited to, residential dwellings and visitor accommodation (including camping grounds).
- Characterise the fire risk associated with the project area and its environs.

Likely effects

- Assess the potential effects of construction activities on existing traffic, preferred traffic routes and road conditions, including amenity and accessibility impacts.
- Identify any road works required to accommodate the project traffic during the construction stage (having regard to the type and dimensions of vehicles) and potential environment effects.
- Assess the potential effects to traffic and roads during operation and decommissioning of the project.
- Assess the potential effects of construction, operation and decommissioning activities on air quality.
- Assess the potential dust impacts from the proposed on-site quarry in accordance with the requirements of EPA Victoria's *Protocol for Environmental Management: Mining and Extractive Industries (2007)*.
- Assess the potential effects of the project on noise and vibration amenity at sensitive receptors, including information that addresses:
  - how the noise associated with construction of the wind farm will be managed in accordance with relevant guidelines, such as EPA Victoria's *Noise Control Guidelines Publication 1254* and *Noise from Industry in Regional Victoria Publication 1411*; and

  - how the operational wind farm noise will be managed in accordance with relevant guidelines, including *Policy and Planning Guidelines for Development of Wind Energy Facilities in Victoria*, *NZS 6808:2010 Acoustics – Wind Farm Noise* and EPA Victoria's *Noise from Industry in Regional Victoria Publication 1411*.
- Assess the potential noise and vibration (ground and airborne) effects from the proposed on-site quarry activities on sensitive receptors in accordance with guidelines, such as *The Guidelines for Ground Vibration and Airblast Limits for Blasting in Mines and Quarries.*
- Assess the risks that the project could cause a fire affecting land and assists within or outside the project footprint.
- Assess the implications of the project for ire risk management or bushfire suppression activities within the project footprint or in its vicinity.

Mitigation measures

- Identify the required road upgrades to accommodate construction traffic and additional road maintenance regime to address adverse impacts from project construction (including with reference to potentially limited construction windows due to project area's climate).
- Describe and evaluate the proposed traffic management and safety principles to address changed traffic conditions during construction of the project, covering (where appropriate) road safety, temporary or permanent road diversions, different traffic routes, hours of use, vehicle operating speeds, types of vehicles and emergency services provisions.
- Describe consultation undertaken with relevant authorities, to coordinate roadworks and upgrades required for project traffic.
- Describe and propose siting, design, mitigation and management measures to control emissions to air from construction activities.
- Describe and evaluate both potential and proposed design responses and/or other mitigation measures (e.g. staging/scheduling of works) which could minimise noise and vibration during construction, operation and decommissioning.
- Describe options for managing wastes generated through construction, operation and decommissioning of the project.

Performance objectives

- Outline and evaluate proposed measures designed to manage and monitor residual effects on road users and describe contingency measures for responding to unexpected impacts.
- Describe proposed measures to manage and monitor effects on amenity values and identify likely residual effects, including compliance with standards and proposed trigger levels for initiating contingency measures.
- Describe contingency measures for responding to unexpected impacts to amenity values resulting from the project during construction, operation and decommissioning.

Appendix A Local biodiversity values

Table A1 includes listed species that are known to occur locally and may be impacted by the project. Species that are critically endangered should attract particular attention/assessment. This table is not exhaustive and should be regarded as provisional and indicative. The onus remains with the proponent to ensure that the EES adequately addresses all relevant biodiversity values.

The EES must particularly address the project's potential impact on Southern Bent-wing Bat, Australasian Bittern, South-eastern Red-tailed Black Cockatoo, White-throated Needletail and Orange-bellied Parrot. They are particularly at risk of impact by the project due to their behaviour, ecology and distribution. These species are matters of national environmental significance (MNES) and are priorities of the accredited assessment under the EPBC Act.

Aside from individual species, the Subtropical and Temperate Coastal Saltmarsh is listed a vulnerable under the EPBC Act and contributes to the protected values of the Glenelg Estuary and Discovery Bay Ramsar site.

Table A1: Listed species known to occur locally.

Species	EPBC Act (threatened)	EPBC Act[2] (migratory)	Ramsar[3] listing	FFG Act[4]	Advisory[5] List
Mammals					
Southern Bent-wing Bat	CE		✓	L	ce
Southern Brown Bandicoot (East)	E			L	nt
Heath Mouse (Rat)	E			L	nt
Spot-tailed Quoll (SE mainland)	E			L	e
Swamp Antechinus	V			L	nt
Long-nosed Potoroo (SE mainland)	V			L	nt
Birds					
Curlew Sandpiper	CE	B,C,J,K	✓	L	e
Eastern Curlew	CE	B,C,J,K	✓	L	v
Orange-bellied Parrot	CE			L	ce
Australasian Bittern	E		✓	L	e
Red-tailed Black-Cockatoo (SE)	E			L	e
Red Knot	E	B,C,J,K			e
White-throated Needletail	V	C,J,K		L	v
Hooded Plover	V		✓	L	v
Fairy Tern	V		✓	L	e
Caspian Tern		J		L	nt
Sanderling		B,C,J,K	✓		Nt
Fork-tailed Swift		J			
Masked Owl				L	e
Eastern Ground Parrot				L	e
Rufous Bristlebird (Coorong)				L	nt
Brolga				L	v
Baillon's Crake				L	v
Powerful Owl				L	v
Lewin's Rail				L	v
Red-capped Plover			✓		
Frogs					
Growling Grass Frog	V		✓	L	e
Fishes					
Yarra Pygmy Perch	V		✓	L	v
Black Bream			✓		
Short-finned Eel			✓		
Common Galaxias			✓		
Little (formerly Dwarf) Galaxias			✓	L	
Mulloway			✓		
Estuary Perch			✓		
Tupong			✓		

/cont.

Table A1 (cont.): Listed species known to occur locally.

Species	EPBC Act (threatened)	EPBC Act[2] (migratory)	Ramsar[3] listing	FFG Act[4]	Advisory[5] List
Insects					
Ancient Greenling			✓	L	e
Plants					
Maroon Leek-orchid	E		✓	L	e
Coloured Spider-orchid	E				
Mellblom's Spider-orchid	E			L	e
Metallic Sun-orchid	E			L	e
Coast Dandelion	V			L	e
Swamp Everlasting	V			L	v
Ornate Pink Fingers	V			L	v
Swamp Fireweed	V				v
Clover Glycine	V			L	v
Green-striped Greenhood	V			L	v
Swamp Greenhood	V		✓		v
Sand Ixodia ssp *arenicola*	V				v
Dense Leek-orchid	V				e
Wingless Raspwort ssp *exalata*	V				v
Limestone Spider-orchid	V			L	e
River Swamp Wallaby-grass	V				

[1]EPBC Act (threatened): CE – critically endangered; E – endangered; V – vulnerable
[2]EPBC Act (migratory): B - listed as migratory under the Bonn Convention; C: listed under the China Australia Migratory Birds Agreement; J – listed under the Japan Australia Migratory Birds Agreement; K – listed under the Republic of Korea Australia Migratory Birds Agreement
[3]Ramsar's ecological character description: the species and communities listed in this column contribute to the protected values of the Glenelg Estuary and Discovery Bay Ramsar site as mentioned in the site's ecological character description.
[4]FFG Act: L – listed (as threatened in Victoria)
[5]DELWP Advisory List ce – critically endangered in Victoria; v – vulnerable in Victoria; nt – near threatened in Victoria

Appendix B Procedures and requirements

DECISION ON PROJECT: The Kentbruck Green Power Hub Project

Decision under section 8B(3)(a) of the *Environment Effects Act 1978*

Assessment through an environment effects statement (EES) under the *Environment Effects Act 1978* **is required** for the reasons set out in the attached Reasons for Decision.

Procedures and requirements under section 8B(5) of the *Environment Effects Act 1978*

The procedures and requirements applying to the EES process, in accordance with both section 8B(5) and the *Ministerial guidelines for assessment of environmental effects under the Environment Effects Act 1978* (Ministerial Guidelines), are as follows.

(i) The EES is to document the investigation and avoidance of potential environmental effects of the proposed project, including for any relevant alternatives, as well as associated environmental mitigation and management measures. In particular, the EES needs to address:

   a. effects on biodiversity and ecological values within, near and downstream of the project site including native vegetation, listed communities and species (flora and fauna) under the *Flora and Fauna Guarantee Act 1988* and *Environment Protection and Biodiversity Conservation Act 1999*;

   b. effects on surface water environments and related beneficial uses, including as a result of changes to stream flows, discharge of sediment and acid formation from disturbance of wetlands (including but not limited to Long Swamp and Glenelg and Discover Bay Ramsar Site);

   c. effects on groundwater that may result in adverse changes to groundwater dependent ecosystems or effect the ecological character of the Glenelg and Discovery Bay Ramsar site.

   d. effects on Aboriginal and non-Aboriginal cultural heritage values;

   e. effects on state and regional landscape values and national parks;

   f. effects on local amenity values (e.g. visual, noise) , including non-neighbouring landholders;

   g. effects on socio-economic environment, at local and regional scales, including increased traffic movement and indirect effects of construction on the capacity of local community infrastructure; and

   h. effects from a cumulative perspective, including threatened flora and fauna, social and amenity values, with particular consideration of the currently operating and already approved wind farm projects in the region.

(ii) The matters to be investigated and documented in the EES will be set out in detail in scoping requirements prepared by the Department of Environment, Land, Water and Planning (the department). Draft scoping requirements will be exhibited for 15 business days for public comment, before being finalised and then issued by the Minister for Planning.

(iii) The level of detail of investigation for the EES studies should be consistent with the scoping requirements issued for this project and be adequate to inform an assessment of the potential environmental effects (and their acceptability) of the project and any relevant alternatives, in the context of the Ministerial Guidelines.

(iv) The proponent is to prepare and submit to the department a draft EES study program to inform the preparation of scoping requirements.

(v) The department is to convene an inter-agency technical reference group (TRG) to advise the proponent and the department, as appropriate, on scoping and adequacy of the EES investigations and documentation during the preparation of the EES, as well as coordination with statutory approval processes.

(vi) The proponent is to prepare and submit to the department its proposed EES consultation plan for consulting the public and engaging with stakeholders during the preparation of the EES.

Once completed to the satisfaction of the department, the EES consultation plan is to be implemented by the proponent, having regard to advice from the department and the TRG.

(vii) The proponent is also to prepare and submit to the department its proposed schedule for the studies, preparation and exhibition of the EES, following confirmation of draft scoping requirements. This is to enable effective management of the EES process on the basis of an agreed alignment of the proponent's and department's schedules, including for TRG review of technical investigations and the EES documentation.

(viii) The proponent is to apply appropriate peer review and quality management procedures to enable the completion of EES studies and documentation to an acceptable standard.

(ix) The EES is to be exhibited for a period of no less than 30 business days for public comment, unless the exhibition period spans the Christmas–New Year period, in which case 40 business days will apply.

(x) An inquiry will be appointed under the *Environment Effects Act 1978* to consider and report on the environmental effects of the proposal.

Notification

The following parties (proponent and relevant decision-makers) are to be notified of this decision in accordance with sections 8A and 8B(4)(a)(i) of the *Environment Effects Act 1978*:

- Neoen Australia Pty Ltd (proponent)
- Minister for Energy, Environment and Climate Change
- Secretary of Department of Environment, Land, Water and Planning
- Secretary of Department of Health and Human Services
- Secretary of Department of Jobs, Precincts and Regions
- Minister for Planning
- Minister for Regional Development
- Minister for Water
- Chairperson of Gunditj Mirring Traditional Owners Aboriginal Corporation
- Executive Director of Aboriginal Victoria
- Executive Director of Heritage Victoria
- Glenelg Shire Council
- Environment Protection Authority
- Glenelg Hopkins Catchment Management Authority
- Parks Victoria

Richard Wynne

RICHARD WYNNE MP
Minister for Planning

Date: 25/8/19

Appendix C Controlled action decision

Australian Government
Department of the Environment and Energy

Notification of
REFERRAL DECISION AND DESIGNATED PROPONENT – controlled action

Kentbruck Green Power Hub, between Portland and Nelson, Victoria (EPBC 2019/8510)

This decision is made under section 75 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

proposed action	To construct and operate a wind farm consisting of up to 157 wind turbines, a battery storage facility, transmission line and associated infrastructure, between Portland and Nelson, Victoria [See EPBC Act referral 2019/8510].

decision on proposed action	The proposed action is a controlled action. The project will require assessment and approval under the EPBC Act before it can proceed.
relevant controlling provisions	Ramsar wetlands (sections 16 & 17B) Listed migratory species (sections 20 & 20A) Listed threatened species and communities (sections 18 & 18A)
designated proponent	NEOEN AUSTRALIA PTY LTD ABN: 57 160 905 706

assessment approach	The project will be assessed under the assessment bilateral agreement with Victoria.

Decision-maker

Name and position	Andrew McNee Assistant Secretary Assessments and Governance Branch
Signature	
date of decision	7 November 2019

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Appendix 2 Flora

The following abbreviations and symbols are relevant to this Appendix:

Code	Meaning	Reference
National listings (EPBC Act)		
CR	Critically endangered	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)
EN	Endangered	
VU	Vulnerable	
PMST	Protected Matters Search Tool (Provided in Appendix 14)	
State listings (FFG Act)		
VU	Vulnerable	Victorian *Flora and Fauna Guarantee Act 1988* (FFG Act)
EN	Endangered	
CR	Critically endangered	
P	Protected species (public land only)	
N	Nominated for listing as threatened	
I	Determined ineligible for listing	
D	Delisted	
Noxious weed status (CaLP Act)		
SP	State prohibited species	Victorian *Catchment and Land Protection Act 1994* (CaLP Act)
RP	Regionally prohibited species	
RC	Regionally controlled species	
R	Restricted species	
Other		
#	Native species outside its natural range	Victorian Biodiversity Atlas (VBA)

A2.1 Flora species recorded from the Investigation Area

Table A2.1 Flora species recorded from the Investigation Area

Status			Scientific name	Common name
EPBC	FFG	CALP		
Indigenous species				
	P		*Acacia longifolia* subsp. *longifolia*	Sallow Wattle
	P		*Acacia longifolia* subsp. *sophorae*	Coast Wattle
	P		*Acacia mearnsii*	Black Wattle
			Acacia melanoxylon	Blackwood
	P		*Acacia mitchellii*	Mitchel's Wattle
	P		*Acacia myrtifolia*	Myrtle Wattle
	P		*Acacia oxycedrus*	Spike Wattle
	P		*Acacia pycnantha*	Golden Wattle
	P		*Acacia stricta*	Hop Wattle
	P		*Acacia verticillata* subsp. *verticillata*	Prickly Moses
			Acaena echinata	Sheep's Burr
			Acaena novae-zelandiae	Bidgee-widgee
	P		*Acianthus* spp.	Mosquito Orchid
	P		*Acrotriche prostrata*	Trailing Ground-berry
	P		*Acrotriche serrulata*	Honey-pots
	P		*Adiantum aethiopicum*	Common Maidenhair
			Ajuga australis	Austral Bugle
			Allocasuarina littoralis	Black Sheoak
			Allocasuarina paludosa	Scrub Sheoak
			Allocasuarina verticillata	Drooping Sheoak
			Alyxia buxifolia	Sea Box
			Amperea xiphoclada var. *xiphoclada*	Broom Spurge
			Amphibromus spp.	Swamp Wallaby-grass
			Amyema pendula	Drooping Mistletoe
	P EN		*Argentipallium dealbatum*	Silver Everlasting
	P		*Asperula oblanceolata*	Otway Woodruff
	P		*Asperula* spp.	Woodruff
	P		*Asplenium flabellifolium*	Necklace Fern
			Austrostipa mollis	Supple Spear-grass
			Austrostipa muelleri	Wiry Spear-grass
			Austrostipa pubinodis	Tall Spear-grass
			Austrostipa spp.	Spear Grass
			Austrostipa stuposa	Quizzical Spear-grass
			Baloskion tetraphyllum subsp. *tetraphyllum*	Tassel Cord-rush
			Banksia marginata	Silver Banksia
			Bauera rubioides	Wiry Bauera
			Beyeria lechenaultii	Pale Turpentine-bush

Status			Scientific name	Common name
EPBC	FFG	CALP		
			Billardiera mutabilis	Common Apple-berry
	P		*Blechnum nudum*	Fishbone Water-fern
	P		*Boronia nana*	Dwarf Boronia
	P EN		*Boronia pilosa* subsp. *torquata*	Hairy Boronia
	P		*Boronia* spp.	Boronia
			Bossiaea cinerea	Showy Bossiaea
	P EN		*Bossiaea cordigera*	Wiry Bossiaea
			Bossiaea prostrata	Creeping Bossiaea
	P		*Brachyloma ciliatum*	Fringed Brachyloma
	P		*Brunonia australis*	Blue Pincushion
			Burchardia umbellata	Milkmaids
			Bursaria spinosa	Sweet Bursaria
	P CR		*Caladenia fragrantissima*	Scented Spider-orchid
EN	P CR		*Caladenia hastata*	Mellblom's Spider-orchid
	P		*Caladenia latifolia*	Pink Fairies
	P		*Caladenia mentiens*	Cryptic Pink-fingers
VU	P EN		*Caladenia ornata*	Ornate Pink-fingers
			Cardamine spp.	Bitter Cress
			Carex appressa	Tall Sedge
			Carex breviculmis	Common Grass-sedge
			Carex fascicularis	Tassel Sedge
			Carex inversa	Knob Sedge
			Carpobrotus rossii	Karkalla
	P		*Cassinia aculeata* subsp. *aculeata*	Common Cassinia
VU	P CR		*Cassinia rugata*	Wrinkled Cassinia
			Cassinia spp.	Cassinia
			Chamaescilla corymbosa var. *corymbosa*	Blue Stars
	P		*Chiloglottis* spp.	Bird Orchid
	P		*Chiloglottis valida*	Common Bird-orchid
			Clematis aristata	Mountain Clematis
			Comesperma volubile	Love Creeper
			Conospermum mitchellii x *patens*	
			Coprosma quadrifida	Prickly Currant-bush
	P		*Corybas* spp.	Helmet Orchid
	P		*Craspedia variabilis*	Variable Billy-buttons
			Crassula decumbens var. *decumbens*	Spreading Crassula
			Crassula helmsii	Swamp Crassula
			Cycnogeton procerum (narrow floating leaf variant)	Common Water-ribbons
			Cynoglossum australe	Australian Hound's-tongue
			Daucus glochidiatus	Australian Carrot
			Dianella brevicaulis	Small-flower Flax-lily

Status			Scientific name	Common name
EPBC	FFG	CALP		
			Dianella revoluta var. *revoluta s.l.*	Black-anther Flax-lily
			Dichondra repens	Kidney-weed
			Dillwynia glaberrima	Smooth Parrot-pea
			Dillwynia sericea	Showy Parrot-pea
			Dillwynia spp.	Parrot Pea
			Drosera aberrans	Scented Sundew
			Drosera auriculata	Tall Sundew
			Drosera hookeri	Branched Sundew
			Drosera macrantha subsp. *planchonii*	Climbing Sundew
			Drosera pygmaea	Tiny Sundew
	P		*Epacris impressa*	Common Heath
			Epilobium pallidiflorum	Showy Willow-herb
			Epilobium spp.	Willow Herb
			Erodium spp.	Heron’s Bill
			Eryngium vesiculosum	Prickfoot
			Eucalyptus botryoides	Southern Mahogany
	P VU		*Eucalyptus falciformis*	Western Peppermint
			Eucalyptus globulus	Southern Blue-gum
			Eucalyptus obliqua	Messmate Stringybark
			Eucalyptus ovata	Swamp Gum
	P CR		*Eucalyptus splendens*	Apple Jack
			Eucalyptus spp.	Eucalypt
			Eucalyptus viminalis	Manna Gum
			Eucalyptus viminalis subsp. *cygnetensis*	Rough-barked Manna-gum
	P		*Euchiton sphaericus*	Annual Cudweed
	P		*Euchiton* spp.	Cudweed
			Exocarpos cupressiformis	Cherry Ballart
	P EN		*Exocarpos syrticola*	Coast Ballart
			Ficinia nodosa	Knobby Club-sedge
			Gahnia clarkei	Tall Saw-sedge
			Gahnia radula	Thatch Saw-sedge
			Gahnia sieberiana	Red-fruit Saw-sedge
			Galium spp.	Bedstraw
	P		*Gastrodia vescula*	Small Potato-orchid
			Geranium spp.	Crane’s Bill
	P		*Glossodia major*	Wax-lip Orchid
			Gonocarpus humilis	Shade Raspwort
			Gonocarpus micranthus	Creeping Raspwort
			Gonocarpus spp.	Raspwort
			Gonocarpus tetragynus	Common Raspwort
			Goodenia lanata	Trailing Goodenia
			Goodenia ovata	Hop Goodenia

Status			Scientific name	Common name
EPBC	FFG	CALP		
	P EN		*Goodia medicaginea*	Western Golden-tip
			Hakea rostrata	Beaked Hakea
VU			*Haloragis exalata* var. *exalata*	Square Raspwort
	P		*Helichrysum leucopsideum*	Satin Everlasting
			Hibbertia fasciculata var. *prostrata*	Bundled Guinea-flower
			Hibbertia spp.	Guinea Flower
			Hydrocotyle hirta	Hairy Pennywort
			Hydrocotyle laxiflora	Stinking Pennywort
			Hydrocotyle spp.	Pennywort
			Hypericum gramineum	Small St John's Wort
			Hypolaena fastigiata	Tassel Rope-rush
			Imperata cylindrica	Blady Grass
			Indigofera australis subsp. *australis*	Austral Indigo
			Isolepis spp.	Club Sedge
			Isopogon ceratophyllus	Horny Cone-bush
			Isotoma fluviatilis subsp. *australis*	Swamp Isotome
VU	P		*Ixodia achillaeoides* subsp. *arenicola*	Coast Ixodia
			Juncus spp.	Rush
			Kennedia prostrata	Running Postman
			Kunzea pomifera	Muntries
	P		*Laphangium luteoalbum*	Jersey Cudweed
			Laxmannia orientalis	Dwarf Wire-lily
			Lepidobolus drapetocoleus	Scale Shedder
			Lepidosperma filiforme	Common Rapier-sedge
			Lepidosperma gladiatum	Coast Sword-sedge
			Lepidosperma spp.	Sword Sedge
			Leptospermum continentale	Prickly Tea-tree
			Leptospermum laevigatum	Coast Tea-tree
			Leptospermum lanigerum	Woolly Tea-tree
			Leptospermum myrsinoides	Heath Tea-tree
			Leptostigma reptans	Dwarf Nertera
	P		*Leucopogon parviflorus*	Coast Beard-heath
	P		*Leucopogon* spp.	Beard Heath
	P		*Lindsaea linearis*	Screw Fern
			Linum marginale	Native Flax
			Lobelia anceps	Angled Lobelia
			Lobelia spp.	Lobelia
			Lomandra filiformis	Wattle Mat-rush
			Lomandra longifolia	Spiny-headed Mat-rush
			Lomandra multiflora subsp. *multiflora*	Many-flowered Mat-rush
			Lomandra nana	Dwarf Mat-rush
			Lomandra sororia	Small Mat-rush

Status			Scientific name	Common name
EPBC	FFG	CALP		
			Luzula meridionalis	Common Woodrush
			Luzula meridionalis var. *meridionalis*	Common Woodrush
			Lythrum hyssopifolia	Small Loosestrife
			Melaleuca lanceolata	Moonah
			Melaleuca spp.	Honey-myrtle
	P		*Melaleuca squarrosa*	Scented Paperbark
			Mentha australis	River Mint
			Microlaena stipoides var. *stipoides*	Weeping Grass
	P		*Microseris walteri*	Yam Daisy
	P		*Microtis arenaria*	Notched Onion-orchid
	P		*Microtis parviflora*	Slender Onion-orchid
	P		*Microtis* spp.	Onion Orchid
	P		*Microtis unifolia*	Common Onion-orchid
			Muehlenbeckia adpressa	Climbing Lignum
			Muellerina eucalyptoides	Creeping Mistletoe
			Myoporum insulare	Common Boobialla
			Myosotis spp.	Forget-me-not
	P EN		*Olearia asterotricha*	Rough Daisy-bush
	P		*Olearia axillaris*	Coast Daisy-Bush
	P		*Olearia glutinosa*	Sticky Daisy-bush
	P		*Olearia* spp.	Daisy Bush
			Opercularia ovata	Broad-leaf Stinkweed
			Opercularia varia	Variable Stinkweed
	P		*Orchidaceae* spp.	Orchid
			Ornduffia reniformis	Running Marsh-flower
			Oxalis exilis	Shade Wood-sorrel
			Oxalis perennans	Grassland Wood-sorrel
			Oxalis spp.	Wood Sorrel
			Patersonia fragilis	Short Purple-flag
			Patersonia occidentalis var. *occidentalis*	Long Purple-flag
			Pauridia vaginata	Yellow Star
			Pelargonium australe	Austral Stork's-bill
			Pelargonium littorale	Coast Stork's-bill
			Pelargonium rodneyanum	Magenta Stork's-bill
			Persicaria spp.	Knotweed
			Persoonia juniperina	Prickly Geebung
			Phragmites australis	Common Reed
			Pimelea humilis	Common Rice-flower
			Pimelea linifolia	Slender Rice-flower
			Pimelea octophylla	Woolly Rice-flower
			Pimelea serpyllifolia subsp. *serpyllifolia*	Thyme Rice-flower
			Plantago varia	Variable Plantain

Status			Scientific name	Common name
EPBC	FFG	CALP		
			Platylobium obtusangulum	Common Flat-pea
	P EN		*Pneumatopteris pennigera*	Lime Fern
			Poa labillardierei	Common Tussock-grass
			Poa sieberiana	Grey Tussock-grass
			Poa spp.	Tussock Grass
			Poa tenera	Slender Tussock-grass
			Pomaderris aspera	Hazel Pomaderris
	P CR		*Prasophyllum litorale*	Coastal Leek-orchid
			Pteridium esculentum subsp. *esculentum*	Austral Bracken
VU	P EN		*Pterostylis cucullata*	Leafy Greenhood
	P EN		*Pterostylis lustra*	Small Sickle Greenhood
	P		*Pterostylis pedunculata*	Maroonhood
	P		*Pterostylis* spp.	Greenhood
VU	P		*Pterostylis tenuissima*	Swamp Greenhood
			Ptilotus macrocephalus	Feather Heads
			Ranunculus spp.	Buttercup
			Rhagodia candolleana subsp. *candolleana*	Seaberry Saltbush
			Rubus parvifolius	Small-leaf Bramble
			Rumex brownii	Slender Dock
			Rytidosperma geniculatum	Kneed Wallaby-grass
			Rytidosperma spp.	Wallaby Grass
			Scaevola aemula	Fairy Fan-flower
			Scaevola albida	Small-fruit Fan-flower
	P EN		*Scaevola calendulacea*	Dune Fan-flower
			Schoenus apogon	Common Bog-sedge
	P		*Senecio biserratus*	Jagged Fireweed
	P		*Senecio glomeratus*	Annual Fireweed
	P		*Senecio linearifolius*	Fireweed Groundsel
	P		*Senecio minimus*	Shrubby Fireweed
	P		*Senecio odoratus*	Scented Groundsel
	P		*Senecio pinnatifolius*	Variable Groundsel
	P		*Senecio* spp.	Groundsel
	P		*Sigesbeckia orientalis* subsp. *orientalis*	Indian Weed
			Solanum aviculare	Kangaroo Apple
			Solanum prinophyllum	Forest Nightshade
	P		*Solenogyne gunnii*	Hairy Solenogyne
			Spergularia spp.	Sand Spurrey
			Spyridium parvifolium	Dusty Miller
			Stackhousia spathulata	Coast Stackhousia
	P		*Stenanthera conostephioides*	Flame Heath
	P		*Stylidium armeria*	Common Triggerplant

Status			Scientific name	Common name
EPBC	FFG	CALP		
			Swainsona lessertiifolia	Coast Swainson-pea
VU	P CR		*Taraxacum cygnorum*	Coast Dandelion
			Tetragonia implexicoma	Bower Spinach
			Tetrarrhena distichophylla	Hairy Rice-grass
			Tetratheca ciliata	Pink-bells
	P		*Thelymitra aristata*	Great Sun-orchid
	P		*Thelymitra juncifolia*	Rush-leaf Sun-orchid
	P		*Thelymitra rubra*	Salmon Sun-orchid
	P		*Thelymitra* spp.	Sun Orchid
			Themeda triandra	Kangaroo Grass
	P		*Thysanotus patersonii*	Twining Fringe-lily
	P		*Thysanotus racemoides*	Branching Fringe-lily
			Veronica calycina	Hairy Speedwell
	P EN		*Veronica hillebrandii*	Coast Speedwell
			Viola hederacea sensu Entwisle (1996)	Ivy-leaf Violet
			Viola hederacea sensu Willis (1972)	Ivy-leaf Violet
	P		*Vittadinia cuneata*	Fuzzy New Holland Daisy
			Wahlenbergia gymnoclada	Naked Bluebell
			Wahlenbergia multicaulis	Branching Bluebell
			Wahlenbergia spp.	Bluebell
	P VU		*Wurmbea uniflora*	One-flower Early Nancy
	P		*Xanthorrhoea australis*	Austral Grass-tree
	P		*Xanthorrhoea minor* subsp. *lutea*	Small Grass-tree
			Xanthosia huegelii	Heath Xanthosia
			Xanthosia pilosa	Woolly Xanthosia
Introduced species				
			Acetosella vulgaris	Sheep Sorrel
			Agrostis capillaris	Brown-top Bent
		R	*Allium triquetrum*	Angled Onion
			Alopecurus geniculatus	Marsh Fox-tail
			Ammophila arenaria	Marram Grass
			Anthoxanthum odoratum	Sweet Vernal-grass
			Arctotheca calendula	Cape Weed
			Arctotheca populifolia	Beach Daisy
			Arum spp.	Arum
		R	*Asparagus asparagoides*	Bridal Creeper
		R	*Asparagus scandens*	Asparagus Fern
			Asphodelus fistulosus	Onion Weed
			Avena fatua	Wild Oat
			Bellis perennis	English Daisy
			Berkheya rigida	African Thistle
			Brassica spp.	Turnip

Status			Scientific name	Common name
EPBC	FFG	CALP		
			Briza maxima	Large Quaking-grass
			Briza minor	Lesser Quaking-grass
			Bromus diandrus	Great Brome
			Catapodium spp.	Fern Grass
			Cenchrus clandestinus	Kikuyu
			Centaurium erythraea	Common Centaury
			Centaurium spp.	Centaury
			Cerastium glomeratum s.l.	Common Mouse-ear Chickweed
			Cerastium glomeratum s.s.	Sticky Mouse-ear Chickweed
		RC	*Chrysanthemoides monilifera*	Boneseed
		RC	*Cirsium vulgare*	Spear Thistle
			Coprosma repens	Mirror Bush
			Cordyline spp.	Palm Lily
			Cotula coronopifolia	Water Buttons
			Dactylis glomerata	Cocksfoot
			Daucus carota	Carrot
		RC	*Diplotaxis tenuifolia*	Sand Rocket
		RC	*Dittrichia graveolens*	Stinkwort
		RC	*Echium plantagineum*	Paterson's Curse
			Ehrharta erecta	Panic Veldt-grass
			Ehrharta longiflora	Annual Veldt-grass
			Erigeron bonariensis	Flaxleaf Fleabane
			Erigeron spp.	Fleabane
			Erodium cicutarium	Common Heron's-bill
			Euphorbia peplus	Petty Spurge
			Festuca arundinacea	Tall Fescue
		R	*Foeniculum vulgare*	Fennel
			Fumaria spp.	Fumitory
			Galium aparine	Cleavers
		RC	*Genista monspessulana*	Montpellier Broom
			Geranium dissectum	Cut-leaf Crane's-bill
			Helminthotheca echioides	Ox-tongue
			Holcus lanatus	Yorkshire Fog
		RC	*Hypericum perforatum* subsp. *veronense*	St John's Wort
			Hypochaeris radicata	Flatweed
			Lagurus ovatus	Hare's-tail Grass
			Leontodon saxatilis subsp. *saxatilis*	Hairy Hawkbit
			Lolium perenne	Perennial Rye-grass
		RC	*Lycium ferocissimum*	African Box-thorn
			Malus spp.	Apple
		RC	*Marrubium vulgare*	Horehound

Status			Scientific name	Common name
EPBC	FFG	CALP		
			Medicago arabica	Spotted Medic
			Medicago spp.	Medic
			Modiola caroliniana	Red-flower Mallow
			Myosotis arvensis	Field Forget-me-not
			Nasturtium officinale	Watercress
			Paraserianthes lophantha subsp. *lophantha*	Cape Wattle
			Petrorhagia dubia	Velvety Pink
			Phalaris aquatica	Toowoomba Canary-grass
			Pinus radiata	Radiata Pine
			Pittosporum undulatum	Sweet Pittosporum
			Plantago coronopus	Buck's-horn Plantain
			Plantago lanceolata	Ribwort
			Polygala myrtifolia	Myrtle-leaf Milkwort
			Prunella vulgaris	Self-heal
			Prunus spp.	Prunus
			Rhamnus alaternus	Italian Buckthorn
			Romulea rosea	Onion Grass
		RC	*Rubus anglocandicans*	Common Blackberry
			Rumex crispus	Curled Dock
			Salvia verbenaca	Wild Sage
			Senecio elegans	Purple Groundsel
			Sherardia arvensis	Field Madder
			Sonchus oleraceus	Common Sow-thistle
			Sparaxis bulbifera	Harlequin Flower
			Sporobolus africanus	Rat-tail Grass
			Stellaria media	Chickweed
			Tradescantia fluminensis	Wandering Jew
			Trifolium spp.	Clover
		RC	*Ulex europaeus*	Gorse
			Vicia spp.	Vetch
			Vulpia bromoides	Squirrel-tail Fescue
			Vulpia spp.	Fescue

A2.2 Listed flora species

The following table includes the listed flora species that have potential to occur within the Project Area. The list of species is sourced from the VBA and PMST (accessed on 8 July 2022 – full report provided in Appendix 14). Where years are specified for the most recent database records, these refer to records from the VBA unless otherwise specified. Where no year is specified, the PMST has predicted that the species has potential to occur. A proportion of the flora habitat descriptions have been reproduced with permission from the Royal Botanic Gardens Victoria (Stajsic 2019).

Table A2.2 Listed flora species recorded or predicted to occur within 10 kilometres of the Project Area

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in Project Area	Rationale for likelihood ranking
		EPBC	FFG					
National significance								
Amphibromus fluitans	River Swamp Wallaby-grass	VU		1989	PMST	Swampy areas, mainly along the Murray River between Wodonga and Echuca with scattered records from southern Victoria.	**Medium**	Potential to occur in swamps in forest and farmland areas.
Caladenia calcicola	Limestone Spider-orchid	VU	CR	2005	PMST	Heathy woodland on sandy soils over limestone.	**Medium**	May occur along roadsides and other less-disturbed portions of site, on sandy soils over limestone.
Caladenia colorata	Colourful Spider-orchid	EN	CR	2007	PMST	Open areas in low, mixed eucalypt woodland with heathy understorey on calcareous sands and sandy loams.	**Medium**	Known to occur in several locations within Discovery Bay Coastal Park.

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in Project Area	Rationale for likelihood ranking
		EPBC	FFG					
Caladenia hastata	Mellblom's Spider-orchid	EN	CR	2017	PMST	Dense coastal heath and heathy woodlands, commonly on the margins of swampy depressions.	**Low**	Known to occur in several locations within Discovery Bay Coastal Park. Recorded in the recent surveys near Portland.
Caladenia ornata	Ornate Pink-fingers	VU	EN	2003	PMST	Heathy and grassy woodlands.	**Low**	Known to occur within Lower Glenelg National Park. Recorded in the recent surveys near Portland.
Cassinia rugata	Wrinkled Cassinia	VU	CR	2012	PMST	Damp, low open forest or dense heathy scrub.	**Recorded**	Recorded within Cobboboonee National Park close to the Surrey River and its tributaries.
Dianella amoena	Matted Flax-lily	EN	CR		PMST	Lowland grassland and grassy woodland, on well-drained to seasonally waterlogged fertile sandy loam soils to heavy cracking clays.	**Low**	Limited suitable habitat within the Project Area. Closest recent record more than 30 kilometres away.

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in Project Area	Rationale for likelihood ranking
		EPBC	FFG					
Glycine latrobeana	Clover Glycine	VU	VU	2015	PMST	Grasslands and grassy woodlands, particularly those dominated by Kangaroo Grass.	**Medium**	May occur along roadsides and other less-disturbed portions of site, in remnant patches of grassland or grassy woodland.
Haloragis exalata var. *exalata*	Square Raspwort	VU		2010	PMST	Damp riparian habitats.	**Recorded**	Recorded within Lower Glenelg National Park.
Ixodia achillaeoides subsp. *arenicola*	Coast Ixodia	VU		2021	PMST	Low coastal Shrublands on exposed limestone headlands, often on steeply sloped sites.	**Low**	Limited suitable habitat within the Project Area.
Lepidium aschersonii	Spiny Peppercress	VU	EN		PMST	Heavy clay soils near salt lakes on the volcanic plains; disjunct records near Lake Omeo.	**Low**	Limited suitable habitat within the Investigation Area. No known records of the species within 10 kilometres of the Project Area.
Lepidium hyssopifolium s.s.	Basalt Peppercress	EN	EN		PMST	Basalt plains grassland and woodland communities.	**Low**	Limited suitable habitat within the Project Area.

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in Project Area	Rationale for likelihood ranking
		EPBC	FFG					
Pomaderris halmaturina subsp. *halmaturina*	Kangaroo Island Pomaderris	VU			PMST		**Negligible**	Does not occur within Victoria. Only *P. halmaturina* subsp. *continentis* is recorded within Victoria.
Prasophyllum diversiflorum	Gorae Leek-orchid	EN	CR	1949		Along watercourses and around swamps in open forests, and in Western Basalt Plains Grasslands. Habitat characteristics vary, however, all known locations are subject to seasonal inundation.	**Medium**	Generally limited to basalt soils subject to seasonal inundation. Known to occur in the eastern sections of Cobboboonee Forest Park.
Prasophyllum frenchii	Maroon Leek-orchid	EN	EN	2018	PMST	Grassland and grassy woodland environments on sandy or black clay loam soils that are generally damp but well drained.	**Medium**	May occur along roadsides and other less-disturbed portions of site, in grassland and grassy woodland environments on sandy or black clay loam soils.

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in Project Area	Rationale for likelihood ranking
		EPBC	FFG					
Prasophyllum pallidum s.l.	Pale Leek-orchid	VU		1980		In Victoria, confined to the west between Edenhope, Nhill and Stawell where occurring in heathy woodland and box-ironbark forest on clayey and/or gravelly (often lateritic) soils.	**Low**	Not a recognised taxon within Victoria.
Prasophyllum spicatum	Dense Leek-orchid	VU	CR	2009	PMST	Heath and heathy woodlands.	**Medium**	Known to occur within conservation reserves near the Project Area.
Pterostylis cheraphila	Floodplain Rustyhood	VU	EN	2009		Bare, open ground in floodplain Black Box Black Box woodlands.	**Low**	No suitable habitat.
Pterostylis chlorogramma	Green-striped Greenhood	VU	EN	2007	PMST	Heathy woodland; more specific habitat requirements are poorly known.	**Medium**	May occur along roadsides and other less-disturbed portions of sit
Pterostylis cucullata subsp. *cucullata*	Leafy Greenhood	VU	EN		PMST	Sand dune scrubs in coastal areas, and inland on slopes and river flats in moist foothill and montane forests.	**Low**	May occur along roadsides and other less-disturbed portions of site, in remnant and sheltered patches of coastal scrub and heath.

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in Project Area	Rationale for likelihood ranking
		EPBC	FFG					
Pterostylis tenuissima	Swamp Greenhood	VU		2018	PMST	Swamp scrub with a dense canopy and open understorey, often on or beside animal tracks.	**Recorded**	Known to occur within Discovery Bay Coastal Park.
Senecio macrocarpus	Large-headed Fireweed	VU	CR		PMST	Grassland, shrubland and woodland habitats on heavy soils subject to waterlogging and/or drought conditions in summer.	**Low**	No suitable habitat.
Senecio psilocarpus	Swamp Fireweed	VU		2021	PMST	Seasonally inundated herb-rich swamps, growing on peaty soils or volcanic clays.	**Medium**	Recorded within Cobboboonee State Forest.
Stackhousia aspericocca subsp. 1	Rough-nut Stackhousia	VU		2009		Known in Victoria from only a few collections in the Sunset Country, where growing on sandy rises.	**Low**	No suitable habitat.
Taraxacum cygnorum	Coast Dandelion	VU	CR	2018	PMST	Confined to woodlands and scrub on calcareous soils.	**Recorded**	May occur on the margins of swamps and wetlands, on black cracking clay soils. Recorded in a recent reference site check north of Nelson.

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in Project Area	Rationale for likelihood ranking
		EPBC	FFG					
Thelymitra epipactoides	Metallic Sun-orchid	EN	EN	2000	PMST	Moist or dry sandy loams or loamy sands, primarily in coastal heaths, grasslands and woodlands, but also in similar communities at drier inland sites.	**Medium**	May occur along roadsides and other less-disturbed portions of site, on sandy loams or loamy sands, primarily in coastal heaths, grasslands and woodlands.
Thelymitra matthewsii	Spiral Sun-orchid	VU	EN		PMST	Typically on well-drained soils on slightly elevated sites, but also on coastal sandy flats. Often in open situations following disturbance.	**Low**	Little suitable habitat where there is a combination of well drained soils and open canopies. No records of the species within 10 kilometres of the Project Area.
Xerochrysum palustre	Swamp Everlasting	VU	CR	1947	PMST	Sedge-swamps and shallow freshwater marshes and swamps in lowlands, on black cracking clay soils.	**Medium**	May occur on the margins of swamps and wetlands, on black cracking clay soils.

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in Project Area	Rationale for likelihood ranking
		EPBC	FFG					
Acacia verticillata subsp. *ruscifolia*	Broad-leaf Prickly Moses		EN	2002		Mostly recorded in the Wilsons Promontory area with isolated records around Apollo Bay. Specific habitat requirements are poorly known.	**Low**	2002 record from Mount Richmond National Park. Damp sands herb-rich woodland also modelled to occur in the Lower Glenelg National Park, on the border of the Project Area.
Acrotriche cordata	Coast Ground-berry		EN	2015		Limestone-derived soils, often near coastal or riparian cliffs in coastal scrub, Mallee or woodland.	**Low**	No recent records of the species. Also, no suitable habitat within the Project Area.
Adriana quadripartita	Coast Bitter-bush		EN	2021		Coastal dunes and sand plains.	**Medium**	Suitable habitat to the south of the Wind Farm.
Amphibromus sinuatus	Wavy Swamp Wallaby-grass		EN	2014		Confined to permanent swamps in cool sites.	**Low**	No suitable habitat.
Argentipallium dealbatum	Silver Everlasting		EN	1991		Disjunct distribution in near-coastal heathlands of the south-west (Portland-Digby areas) and in South Gippsland (Cape Liptrap to Yarram).	**Medium**	One historic record No suitable habitat within the Project Area

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in Project Area	Rationale for likelihood ranking
		EPBC	FFG					
Asplenium trichomanes subsp. *quadrivalens*	Common Spleenwort		EN	2018		Recorded along limestone creeks, including the Glenelg River and Moleside Creek.	**Low**	No suitable habitat.
Austrostipa mundula	Neat Spear-grass		EN	2011		Uncommon to rare, occurring on sandy soils in Mallee-scrub and in low woodland, e.g. Big and Little Deserts, Mt Arapiles, with an isolated occurrence on limestone in the lower Glenelg area of the south-west.	**Low**	Limited limestone soil derived habitat in the Project Area. Although several historic record within 10 kilometres also found in heathland / heathy woodland vegetation.
Boronia pilosa subsp. *torquata*	Hairy Boronia		EN	2018		Occurs in heathlands and heathy woodlands of the far south-west (e.g. Casterton and Portland areas), usually on sandy soils.	**Recorded**	Several suitable heathland habitats within the Project Area.
Bossiaea cordigera	Wiry Bossiaea		EN	2018		Moist habitats in heathland, heathy woodland and open-forest.	**Recorded near Portland, outside the Project Area and along the transmission line,**	Several recent and historic records near the Project Area. Extensive areas of suitable habitat remain.

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in Project Area	Rationale for likelihood ranking
		EPBC	FFG					
Burnettia cuneata	Lizard Orchid		EN	2013		Usually on acidic, low-nutrient soils which are frequently waterlogged and dominated by Scented Paperbark Melaleuca squarrosa.	**Medium**	One historic record within Damp Sands Herb-rich Woodland in the Project Area. Several others in Cobboboonee National Park. Suitable habitat within the Project Area.
Caladenia bicalliata subsp. *bicalliata*	Limestone Ridge Spider-orchid		EN	2015		From a single locality in the Discovery Bay Coastal Park in coastal scrub on sand over limestone.	**Medium**	Limited or poorly known distribution.
Caladenia flavovirens	Christmas Spider-orchid		CR	1952		Heathy woodland and moist foothill forest.	**Low**	No recent records within 10 kilometres of the Project Area. Some suitable habitat, but records very old.

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in Project Area	Rationale for likelihood ranking
		EPBC	FFG					
Caladenia fragrantissima	Scented Spider-orchid		CR	2018		Known only from far south-west Victoria, between Nelson and Portland, where it grows in coastal and near-coastal heath or heathy woodland in sandy loam.	**Recorded**	May occur along roadsides and other less-disturbed portions of site, on sandy loams. Recorded within several conservation reserves near the Project Area, including Discovery Bay Coastal Park. Recorded in the recent surveys within Discovery Bay Coastal Park.
Caladenia reticulata s.s.	Veined Spider-orchid		EN	1925		Open *Eucalyptus leucoxylon* woodland on poorly structured clay loams.	**Low**	No suitable habitat.

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in Project Area	Rationale for likelihood ranking
		EPBC	FFG					
Caladenia valida	Robust Spider-orchid		CR	2012		Coastal or near coastal heaths and heathy woodland.	**Medium**	May occur along roadsides and other less-disturbed portions of site, in remnant patches of coastal heath and heathy woodland. Known to occur within Mount Richmond National Park.
Caladenia venusta	Large White Spider-orchid		EN	2006		Heath and heathy woodlands primarily in coastal areas, extending inland in Western Victoria.	**Medium**	Sub-coastal woodlands within the Investigation Area could support the species. Recent records in wet heathland.
Caladenia vulgaris	Slender Pink-fingers		VU	2001		Scattered across southern Victoria where sometimes locally common in heathland and coastal scrub on moisture-retentive sandy soils.	**Medium**	Recent record found in Lowland Forest of Cobboboonee National Park.
Cardamine papillata	Forest Bitter-cress		EN	1983		Hilly or mountainous forest areas.	**Low**	Limited suitable habitat.

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in Project Area	Rationale for likelihood ranking
		EPBC	FFG					
Carex tasmanica	Curly Sedge		EN	2015		Seasonally wet areas, such as around drainage lines and freshwater swamps, on fertile, clay soils derived from basalt.	**Low**	Limited suitable habitat within the Project Area.
Chiloglottis seminuda	Bare-tip Wasp-orchid		VU	2011		In Victoria known with certainty only from near Ballarat, but also with unvouchered records for far East Gippsland near Genoa. Grows in sandy soils under open forest.	**Low**	Poorly known distribution. One recent record near the Glenelg River north of Nelson.
Cladium procerum	Leafy Twig-sedge		EN	2019		Waterlogged soils, often along slow-flowing streams and lake margins.	**Low**	Most records restricted to coastal scrub. Some historic records in heathland along the Glenelg River. Possibly little suitable habitat within the Investigation Area.

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in Project Area	Rationale for likelihood ranking
		EPBC	FFG					
Colobanthus apetalus var. *apetalus*	Coast Colobanth		EN	2015		Coastal areas, typically on sheltered dune slopes or in swales.	**Low**	Primarily found in coastal dune habitat. Two historic outlying records in Glenelg National Park. Unlikely to be suitable habitat in the Project Area.
Comesperma polygaloides	Small Milkwort		CR	1991		Grasslands on the western basalt plains; less commonly in grassy woodlands between Bendigo and the Wimmera.	**Low**	Limited suitable habitat.
Coronidium gunnianum	Pale Swamp Everlasting		CR	2011		Widespread and sometimes locally common, particularly in high-rainfall areas of Victoria; often in moist sites in open forests and woodlands.	**Medium**	Recorded within Cobboboonee State Forest.
Correa alba var. *pannosa*	Velvet White Correa		EN	2017		Calcareous sands and coastal cliffs; likely to be extinct from the Port Phillip region.	**Low**	No suitable habitat within the Project Area

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in Project Area	Rationale for likelihood ranking
		EPBC	FFG					
Corunastylis nuda	Tiny Midge-orchid		VU	1980		Mainly found in eastern Victoria with a disjunct occurrence near Portland. Usually growing in moist grassy areas in open forest, from low to moderate elevations.	**Medium**	No recent records within 10 kilometres of the Project Area. Suitable habitat within Cobboboonee National Park
Corybas despectans	Coast Helmet-orchid		EN	2016		Sandy soils in moist, shady situations within coastal scrubs of Coast Tea-tree *Leptospermum laevigatum* and Moonah *Melaleuca lanceolata*.	**Medium**	May occur along roadsides and other less-disturbed portions of site, on sandy soils associated with Coast Tea-tree and/or Moonah. Recorded within Discovery Bay Coastal Park to the south of the Wind Farm.

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in Project Area	Rationale for likelihood ranking
		EPBC	FFG					
Corybas sp. aff. *diemenicus* (Coastal)	Late Helmet-orchid		CR	2008		Raised clumps of ground in wet areas of Swamp Scrub, which have a dense overstorey of Woolly Tea Tree or Scented Paperbark.	**Medium**	May occur along roadsides and other less-disturbed portions of site, on raised ground in areas of swamp scrub. Known to occur within Discovery Bay Coastal Park.
Cyanothamnus nanus var. *pubescens*	Dwarf Boronia		EN	2011		On rocky substrates in open forests, woodland and heath.	**Medium**	Some disjunct wet heathland that might provide some suitable habitat. One recent records within 10 kilometres of the Project Area, in Cobboboonee National Park.
Dianella callicarpa	Swamp Flax-lily		EN	2005		Dense heathland and woodlands often in waterlogged sites.	**Low**	Little suitable habitat, no local records.

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in Project Area	Rationale for likelihood ranking
		EPBC	FFG					
Dipodium pardalinum	Spotted Hyacinth-orchid		EN	1994		Scattered in higher rainfall parts of western Victoria.	**Medium**	Several historic records intersect the Project Area in the east of Cobboboonee National Park. Suitable habitat remains within the Project Area.
Diuris behrii	Golden Cowslips		EN	1991		Grasslands, open grassy woodlands and Box Ironbark Forests.	**Low**	No suitable habitat.
Diuris palustris	Swamp Diuris		EN	2006		Grasslands and open woodlands, often in swampy depressions; confined to the west of the State.	**Medium**	Relatively recent records in the Cashmore (Bats Ridge Wildlife Reserve) area.
Eucalyptus diversifolia subsp. *megacarpa*	Coast Gum		VU	2020		Restricted to the Cape Nelson area in Victoria.	**Low**	Closest known locations are at Cape Nelson.
Eucalyptus falciformis	Western Peppermint		VU	2017		Sandy soils in forest, woodland or heath communities on hillslopes and plains.	**Recorded**	Suitable habitat present throughout the Project Area.
Eucalyptus kitsoniana	Bog Gum		CR	2018		Damp alluvial soils or boggy flats.	**Medium**	Some recent records close to the Project Area boundary. Suitable habitat within the Investigation Area.

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in Project Area	Rationale for likelihood ranking
		EPBC	FFG					
Eucalyptus leucoxylon subsp. *megalocarpa*	Large-fruit Yellow-gum		CR	2012		Coastal, near Nelson.	**Low**	Known to occur near the western end of the Project Area.
Eucalyptus ovata subsp. *grandiflora*	West-coast Swamp-gum		EN	2021		Swampy flats and poorly drained soils, less commonly on slightly higher, undulating sites with gravelly clay soils.	**Low**	Little suitable habitat within Project Area.
Eucalyptus sabulosa	Wimmera Scentbark		VU	1980		Sandy soils west of the Grampians to the Little Desert and south west to Cavendish.	**Low**	Little suitable habitat within Project Area.
Eucalyptus splendens	Apple Jack		CR	2014		Known only from near Mt Richmond.	**High / Recorded**	Recorded habitat near the eastern portion of the wind farm and transmission line.
Euphrasia collina subsp. *tetragona*	Purple Eyebright		VU	1770		In Victoria largely confined to sandy mallee-heaths of the Big and Little Deserts, isolated records from the lower Glenelg River area and Wilsons Promontory requiring confirmation.	**Low**	No local records. Little suitable habitat. Closest records require confirmation.

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in Project Area	Rationale for likelihood ranking
		EPBC	FFG					
Euphrasia scabra	Rough Eyebright		EN	1936		Grassy woodlands and clearings in subalpine woodlands or sclerophyll forests.	**Low**	Limited suitable habitat. No recent records.
Exocarpos syrticola	Coast Ballart		EN	2018		Calcareous sands of coastal dunes and cliffs. Semi-parasitic on the roots of nearby plants.	**Low**	Limited suitable habitat within the project area. Recent records restricted to coastal heathlands.
Galium curvihirtum	Tight Bedstraw		VU	2018		Moist, shaded sites in open-forest and woodland.	**Medium**	One recent record very close to the Project Area. Suitable habitat within the Project Area, particularly in Cobboboonee National Park.
Geranium solanderi var. *solanderi s.s.*	Austral Crane's-bill		EN	1946		Grasslands or grassy woodlands where hydrology is not a limiting factor.	**Low**	Limited suitable habitat. No recent records.
Goodenia lineata	Grampians Goodenia		VU	1983		Heathland on sandy soils.	**Medium**	Historic record within the Investigation Area. Suitable habitat remains.

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in Project Area	Rationale for likelihood ranking
		EPBC	FFG					
Goodia medicaginea	Western Golden-tip		EN	2021		Drier sites within wet or dry sclerophyll forests.	**Recorded**	Some suitable habitat in Project Area, particularly within Cobboboonee National Park.
Goodia pubescens	Silky Golden-tip		EN	1980		Wet and dry sclerophyll forests.	**Medium**	Some historic records within 10 kilometres of the Project Area. Some suitable habitat within the Project Area.
Gratiola pumilo	Dwarf Brooklime		EN	2016		Seasonally inundated depressions, typically river flats and lake margins, on alluvial soils.	**Medium**	Suitable habitat limited, but possibly within the Project Area along the Surrey river.
Grevillea micrantha	Small-flower Grevillea		CR	2010		Poor stony soils in mallee or Ironbark woodlands.	**Low**	Recent record in Lowland forest habitat near Mount clay. No records in similar habitat in Cobboboonee National Park, however.

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in Project Area	Rationale for likelihood ranking
		EPBC	FFG					
Haloragis eichleri	Eichler's Raspwort		VU	1980		Confined to Portland area where it is known from a single collection.	**Low**	No recent or historic records in Project Area, and suitable habitat not present.
Haloragis myriocarpa	Prickly Raspwort		EN	1985		Confined to the west between Little Desert and Portland where it grows in wet habitats.	**Medium**	Recorded within Lower Glenelg National Park and Cobboboonee National Park.
Hibbertia pallidiflora	Pale Guinea-flower		EN	2021		Coastal heath and mallee vegetation in SW Victoria.	**Low**	Limited suitable habitat in Project Area. Nearby records within Discovery Bay Coastal Park.
Isolepis wakefieldiana	Tufted Club-sedge		EN	1999		Scattered in cooler areas.	**Low**	No local or recent records within or near the Project Area.
Lachnagrostis rudis subsp. *rudis*	Rough Blown-grass		EN	2016		Uncommon, occurs in moist, shaded forests and swamp margins near the coast.	**Medium**	Recent record along the Surrey River as well as several historic records within Cobboboonee National Park,

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in Project Area	Rationale for likelihood ranking
		EPBC	FFG					
Lachnagrostis semibarbata var. *filifolia*	Purple Blown-grass		EN	1991		Wet marshes and slightly saline swamps and depressions, on heavy soils away from the coast.	**Low**	No suitable habitat.
Lasiopetalum schulzenii	Drooping Velvet-bush		CR	2016		Confined to clifftop and dune woodland and heathland, favouring sandy soils derived from limestone.	**Low**	No suitable habitat.
Lepidium desvauxii	Bushy Peppercress		EN	1946		On coastal dunes in far south-west of the state and south Gippsland.	**Low**	No suitable habitat.
Lepidium foliosum	Leafy Peppercress		EN	1960		Found on coastal islands and less commonly on the mainland coast.	**Low**	No suitable habitat.
Lepidosperma canescens	Hoary Rapier-sedge		EN	2018		Sandy heaths and woodland.	**Low**	Limited suitable habitat.
Leptospermum turbinatum	Shiny Tea-tree		EN	2011		Rocky terrain, particularly sandstone and granitic outcrops, over sandy or gravelly soils.	**Low**	Limited suitable habitat.
Levenhookia sonderi	Slender Stylewort		EN	1980		Lowland areas in seasonally damp grounds and drying swamps.	**Low**	Limited suitable habitat and no records.

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in Project Area	Rationale for likelihood ranking
		EPBC	FFG					
Lobelia beaugleholei	Showy Lobelia		VU	2018		Black loamy soils (rarely red clays) on waterlogged sites near swamps and other wetlands.	**High**	Suitable habitat and recent records along Surrey river, close to the Project Area.
Logania ovata	Oval-leaf Logania		EN	2018		Woodlands on rocky, calcareous soils, often near coast but not on beach sands.	**Medium**	Some suitable habitat within and recent records near the Project Area.
Lomandra micrantha subsp. *tuberculata*	Small-flower Mat-rush		VU	1984		Dry sclerophyll forest chiefly in the Grampians and Highlands.	**Low**	Limited suitable habitat and no records
Machaerina laxa	Lax Twig-sedge		EN	2009		Wet sandy areas in heathlands and heathy swamps.	**High**	Three recent records within the study area.
Melaleuca armillaris subsp. *armillaris*	Giant Honey-myrtle		EN	2021		Near coastal heath/scrub, rocky coast and foothill outcrops.	**Negligible**	Any local records ore of planted specimens.
Melaleuca halmaturorum	Salt Paperbark		EN	2012		In Victoria mostly fringing salt lakes in the north-west (where becoming rare), with an isolated near-coastal occurrence on saline ground at Tyrendarra, near Portland.	**Low**	No suitable habitat.

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in Project Area	Rationale for likelihood ranking
		EPBC	FFG					
Microlepidium pilosulum	Hairy Shepherd's Purse		CR	1980		Primarily near-coastal sites west of Cape Otway, usually associated with saltmarsh vegetation.	**Low**	No suitable habitat.
Microtis (Hydrorchis) orbicularis	Swamp Onion-orchid		EN	1990		This semi-aquatic species often flowers in shallow water around the margins of swamps. It occurs in south-west Victoria (e.g. Portland, Grampians, Little Desert) and east of Melbourne on French Island, Wonthaggi area (where possibly now extinct) and Wilsons Promontory.	**Low**	No suitable habitat.
Muehlenbeckia gunnii	Coastal Lignum		EN	2018		In Victoria known only from coastal shrubland on dune limestone in the south-west near Cape Bridgewater and Port Campbell and a recent (2016) collection from scrub along the sandy shores of Dock Inlet near Bemm River.	**Low**	No suitable habitat

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in Project Area	Rationale for likelihood ranking
		EPBC	FFG					
Olearia asterotricha	Rough Daisy-bush		EN	2011		Moist forests and swampy heathlands.	**Medium**	Suitable habitat within the Project Area. Historic and recent records close to the Project Area.
Olearia passerinoides subsp. *glutescens*	Shiny Daisy-bush		CR	1891		Rare, restricted in Victoria to a single population near Inglewood, growing at the edges of Box-Ironbark forest dominated by Eucalyptus 413anksia413e413 and E. microcarpa.	**Low**	No recent records.
Ornduffia umbricola var. *umbricola*	Lax Marsh-flower		EN	2019		Known in Victoria only from swampland at Bridgewater Lakes, near Casterton and at Lake Fyans.	**Low**	No suitable habitat within the Project Area.
Orthrosanthus multiflorus	Morning Flag		EN	2014		Heathland communities.	**Low**	No suitable habitat
Picris squarrosa	Squat Picris		EN	1770		Usually found on coastal sand-dunes or in alluvial soils on river banks and floodplains, mainly at low altitudes.	**Low**	No records nearby, limited suitable habitat

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in Project Area	Rationale for likelihood ranking
		EPBC	FFG					
Pimelea hewardiana	Forked Rice-flower		EN	2018		Rocky ground in gullies and mallee shrubland; only recorded in the western half of the State.	**Medium**	Limited suitable habitat, but possibly some can be found within the Project Area.
Pneumatopteris pennigera	Lime Fern		EN	2018		Rare in Victoria, confined to the lower tract of the Glenelg River and its tributaries, and stream banks near Port Campbell. It grows on damp limestone or calcareous soils.	**Medium**	Known to occur on stream banks through limestone, including within Lower Glenelg National Park.
Poa billardierei	Coast Fescue		EN	2007		Coastal dunes.	**Low**	No suitable habitat
Poa fax	Scaly Poa		EN	1980		Mostly confined to dune mallee and gypsum plains in the northwest, with a few occurrences from near-coastal sands around Nelson and Port Fairy in the far south-west.	**Low**	No suitable habitat

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in Project Area	Rationale for likelihood ranking
		EPBC	FFG					
Poa halmaturina	Dwarf Coast Poa		EN	2016		Known in Victoria from near Cape Bridgewater and Port Fairy in the far south-west and occurring on coastal calcareous sands, usually overlying dune limestone or sometimes basalt.	**Medium**	Potential habitat within the wind farm close to dune systems.
Poa poiformis var. *ramifer*	Dune Poa		EN	2007		Scattered areas along the coast.	**Low**	No suitable habitat.
Pomaderris halmaturina subsp. *continentis*	Glenelg Pomaderris		EN	2021		Occasional along the lower Glenelg river in the far south-west of Victoria where occurring on limestone-derived and alluvial soils, with a disjunct easterly occurrence near Torquay. Usually growing in shrubland or shrubby open-forest.	**Low**	Mostly restricted to the Glenelg River.
Prasophyllum aff. *parviflorum* (SW Victoria)	Dainty Leek-orchid			1968		Largely, if not entirely confined to far south-western Victoria on calcareous sandy soils in near-coastal heath and heathy woodland.	**Low**	No recent records. Poorly documented distribution.
Prasophyllum lindleyanum	Green Leek-orchid		EN	1958		Fertile soils in woodland or scrubby heath.	**Low**	Old record near Mt Clay, east of the Project Area.

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in Project Area	Rationale for likelihood ranking
		EPBC	FFG					
Prasophyllum litorale	Coastal Leek-orchid		CR	2016		Coastal scrub and heath on sand hills or headlands, in sand over moisture-retentive clays.	**Recorded**	Scattered occurrences within Discovery Bay Coastal Park.
Prasophyllum niphopedium	Marsh Leek-orchid		EN	1983		Snow plains in grassy alpine heath, usually near watercourses.	**Low**	Several outlier records near Cape Nelson and Narrawong.
Prasophyllum parviflorum	Slender Leek-orchid		EN	1980		Coastal heaths.	**Medium**	Known to occur in Discovery Bay Coastal Park and Cobboboonee Forest Park.
Prasophyllum pyriforme s.s.	Silurian Leek-orchid			1958		Dry foothill forest with shrubby understorey.	**Low**	No recent records.
Pterostylis cucullata subsp. *cucullata*	Leafy Greenhood		EN	2001		Protected areas of stabilised coastal sand dunes within scrub communities with an open ground layer; occasionally in Coastal Manna Gum woodland.	**Recorded**	May occur along roadsides and other less-disturbed portions of site, in remnant and sheltered patches of coastal scrub and heath. Recorded in the recent surveys at Bridgewater Lakes, Discovery Bay Coastal Park.

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in Project Area	Rationale for likelihood ranking
		EPBC	FFG					
Pterostylis dolichochila	Long-tongue Shell-orchid		CR	2006		Often growing under Mallee-scrub or *Callitris gracilis*-- *Eucalyptus leucoxylon* woodland on well-drained sandy soil.	**Low**	Limited suitable habitat
Pterostylis lustra	Small Sickle Greenhood		EN	2014		In shaded, damp to wet areas along stream banks, in wet soaks and swamps.	**Recorded**	Nearby records are limited to wet areas within Cobboboonee Forest Park.
Pterostylis X ingens	Sharp Greenhood		VU	1991		Moist areas in open forest.	**Low**	No recent or historic records within the Project Area, some suitable habitat
Pultenaea canaliculata	Coast Bush-pea		EN	1999		Coastal dunes and limestone cliffs.	**Low**	No suitable habitat
Pultenaea prolifera	Otway Bush-pea		EN	2018		Confined to a few scattered, near coastal localities in the west in heathy understorey of *Eucalyptus baxteri* or *E. Obliqua* open forest.	**Low**	Suitable habitat within the Investigation Area, but only historic records present.
Ranunculus amplus	Lacey River Buttercup		CR	2011		Shallow margins of freshwater swamps, billabongs and dams.	**High**	One recent record along the Surrey River (within or very close to the Project Area).

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in Project Area	Rationale for likelihood ranking
		EPBC	FFG					
Roepera billardierei	Coast Twin-leaf		EN	2018		Dunes and limestone cliffs in scrubby vegetation.	**Low**	No suitable habitat
Salsola tragus subsp. *pontica*	Coast Saltwort		EN	1980		Saline, coastal environments.	**Low**	No suitable habitat
Scaevola calendulacea	Dune Fan-flower		EN	2021		Scattered and uncommon in Victoria. Mainly found on coastal dunes between the mouth of the Glenelg River and Gabo Island, often forming low hummocks through accretion of windblown sand.	**Recorded**	Known to occur within Discovery Bay Coastal Park.
Schoenus carsei	Wiry Bog-sedge		EN	1991		Scattered but uncommon in Victoria, where known from damp heaths in the far south-west near Portland, the Victoria Valley in the Grampians and disjunct occurrences in the Gembrook-Tonimbuk area and Wilsons Promontory.	**Low**	Limited suitable habitat in the Project Area. Some habitat may persist in small disjunct patches. No recent records
Schoenus deformis	Small Bog-sedge		VU	1980		Coastal mallee on sandy soils near Cape Nelson.	**Low**	Known to occur only at Cape Nelson.

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in Project Area	Rationale for likelihood ranking
		EPBC	FFG					
Senecio hispidissimus	Sand Fireweed		EN	2006		Grows in sandy soil in heathlands, woodlands and shrublands in lowland areas of Western Victoria south from Little Desert and east to the Grampians with a disjunct occurrence at Wilson's Promontory.	**Medium**	Single recent record in heathland close to the Project Area.
Sporadanthus tasmanicus	Branching Scale-rush		EN	1992		Restricted to the Grampians and the south-west, occurs mainly in swampy heathland, at swamp margins and along rocky margins of watercourses.	**Low**	No recent or historic records within the Project Area. Only limited habitat.
Thelionema umbellatum	Clustered Lily		VU	1950		Sandy, often poorly drained soils of heathy woodlands and heathlands.	**Low**	Some suitable habitat. Possibly overlooked, could be more widespread than records suggest. Historic record, however, quite old.

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in Project Area	Rationale for likelihood ranking
		EPBC	FFG					
Thelymitra azurea	Azure Sun-orchid		EN	2012		Widespread but uncommon in mallee scrublands, heathy woodlands and heathland on deep sand, sandy loam or peaty soils around swamp margins.	**Medium**	Previous records near the eastern end of the wind farm.
Thelymitra benthamiana	Blotched Sun-orchid		EN	2006		Found mostly in heathland, heathy woodlands and open forests on well-drained sand and clay loams.	**Medium**	Previous records within Lower Glenelg National Park and Cobboboonee National Park and Bats Ridge Wildlife Reserve.
Thelymitra hiemalis	Winter Sun-orchid		CR	2010		Brown Stringybark *Eucalyptus baxteri* or Promontory Peppermint *E. willisii* woodland, typically with a heathy understorey.	**Medium**	Previous records within Mount Richmond National Park and Bats Ridge Wildlife Reserve.
Thelymitra inflata	Inflated Sun-orchid		EN	1981		Seasonally wet sites in woodlands and forest, often in disturbed areas.	**Medium**	Poorly known. One previous record to the east of the wind farm.
Thelymitra X *macmillanii*	Crimson Sun-orchid		VU	1938		The habitat requirements of this species are poorly known.	**Low**	No recent records.

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in Project Area	Rationale for likelihood ranking
		EPBC	FFG					
Triglochin mucronata	Prickly Arrowgrass		EN	1980		Herbfields on damp saline soils of salt flats and coastal saltmarshes.	**Low**	No recent records, no suitable habitat
Utricularia violacea	Violet Bladderwort		EN	2018		Confined to wet heaths and swamps in the south-west between the Little desert and Portland	**Low**	Limited suitable habitat, no records.
Veronica hillebrandii	Coast Speedwell		EN	2009		Rare in Victoria, confined to coastal shrubland, in sand over dune limestone.	**Low**	Within the region known only from the Cape Bridgewater area.
Viola sieberiana s.s.	Tiny Violet		EN	2018		Lowland heaths, and alpine heathlands and grassland.	**Medium**	Several areas of suitable habitat, recent record close to the Project Area.
Wurmbea uniflora	One-flower Early Nancy		VU	2006		Moist, heathy lowland environments.	**Recorded**	Suitable habitat, particularly in Cobboboonee National Park near the Surrey river. Also in some damp sands herb rich woodland.

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in Project Area	Rationale for likelihood ranking
		EPBC	FFG					
Xanthorrhoea caespitosa	Tufted Grass-tree		VU	2012		Sandy and sometimes rocky soils in mallee and heathland communities.	**Medium**	Two recent records near the Project Area. Heathland habitat present within the Project Area.
Xanthosia leiophylla	Parsley Xanthosia		EN	2011		Sandy heathland and heathy woodland.	**Low**	No recent records within or near the Project Area, limited suitable habitat.
Xanthosia tasmanica	Southern Xanthosia		EN	2011		Occurring mainly in coastal areas in heath on sand. .	**Medium**	Herb rich foothill forest habitat occur within the Project Area. Two recent records of the species in this habitat near the Project Area.

A2.3 Threatened ecological communities

Table A2.3 Threatened ecological communities predicted to occur within 10 kilometres of the Project Area.

Ecological community	Conservation status	Comments	Likelihood of occurrence
National significance			
Assemblages of species associated with open-coast salt-wedge estuaries of western and central Victoria	EN	The ecological community is characterised by obligate estuarine taxa, with associated coastal, estuarine, brackish and freshwater taxa that may reside in the estuary for periods of time or visit the estuary for specific purposes such as reproduction, feeding, refuge or migration (DoEE 2018). The community is limited to Victoria, and the lower 67.9 kilometres of the Glenelg River the western-most occurrence. The conservation advice (DoEE 2018) defines the extent of the community, and also specifies buffer zones which should be considered when determining likely significant impacts on the community. This community is not expected to be directly or indirectly impacted by the project.	Present within Investigation Area. Not present within Project Area.
Giant Kelp Marine Forests of South East Australia	EN	Occurs on rocky substrates at depths of greater than 8 metres, along the southern Australian coastline, including Tasmania (Threatened Species Scientific Committee 2012). This community is expected to be present in off shore marine habitats along the coastline of Discovery Bay Coastal Park. Detailed assessment of this community is not included in the current studies for the project, due to the low likelihood of impacts resulting from the development and operation of the facility.	Present within marine habitats outside of the Investigation Area.

Ecological community	Conservation status	Comments	Likelihood of occurrence
Grassy Eucalypt Woodland of the Victorian Volcanic Plain	CR	This community is limited to the Victorian Volcanic Plain, as defined in the Interim Biogeographical Regionalisation of Australia version 6 (DSEWPC 2011b), which is consistent with the current Victorian Bioregion map in the Portland region. There is a small section of the VVP to the west of Heathmere, which the northern grid route passes through. This community is typically dominated by River Red-gum, but can have an overstorey of Manna Gum or Swamp Gum in areas that receive more than 700 millimetres of rainfall per year. Manna Gum and Swamp Gum are both present in the area, but are generally associated with EVCs that are not considered to represent this community. This community was not recorded within the Project Area.	Low.
Karst springs and associated alkaline fens of the Naracoorte Coastal Plain Bioregion	EN	This community was listed under the EPBC Act on 15/12/2020. Known occurrences within the Investigation Area include Lake Mombeong within Discovery Bay Coastal Park (DAWE 2020). This Groundwater Dependent Ecosystems (GDE) will be also be considered in the GDE impact assessment (CDM Smith 2024).	Present within Investigation Area in close proximity to the Project Area at Lake Mombeong.
Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains	CR	This community can occur within the VVP bioregion and adjacent bioregions. No examples of this community were recorded. Most wetlands within the Project Area are of types that are excluded from this community definition, including Karst wetlands on limestone derived substrates, or shallow wetlands resulting from springs.	Not present.
Natural Temperate Grassland of the Victorian Volcanic Plain	CR	This community can occur within the VVP bioregion and adjacent bioregions. There is some potential for this community to be present within farmland areas along the grid routes, but likelihood is expected to be low due to the high rainfall and dominance of introduced species in most pastures. This community was not recorded within the Project Area during field assessments.	Low.

Ecological community	Conservation status	Comments	Likelihood of occurrence
Subtropical and Temperate Coastal Saltmarsh	VU	This community is present near the Glenelg River estuary mouth, associated with Oxbow Lake. Approximately 13 hectares of the Coastal Saltmarsh EVC is present. This community is protected via the EPBC Act threatened community listing, and preservation of this 13 hectares area as Coastal Saltmarsh is specified as a "Limits of Acceptable Change" within the Glenelg Estuary and Discovery Bay Ramsar Site Ecological Character Definition (DELWP 2017b).	Present within Investigation Area. Not present within Project Area.
State significance			
Coastal Moonah (*Melaleuca lanceolata* subsp. *lanceolata*) Woodland Community	L	Known to occur around the Bridgewater Lakes and throughout Discovery Bay Coastal Park (DSE 2003b), with some degraded examples on cleared farmland close to the coast.	Present within Investigation Area. Not present within Project Area.
Red Gum Swamp Community No. 1	L	Known to occur further north, within drier portions of the Glenelg catchment.	Not present.
Victorian Temperate Woodland Bird Community (including Red-tailed Black Cockatoo)	L	Typically occurs in drier situation on the slopes and plains north of the Great Dividing Range.	Not present.
Western (Basalt) Plains Grassland Community	L	There is some potential for this community to be present within farmland areas along the grid routes, but likelihood is expected to be low due to the high rainfall and dominance of introduced species in most pastures. This community was not recorded within the Project Area during field assessments.	Not present.
Western Basalt Plains (River Red Gum) Grassy Woodland.	L	There is some potential for this community to be present within farmland areas along the grid routes, but likelihood is expected to be low due to the high rainfall and dominance of introduced species in most pastures. This community was not recorded within the Project Area during field assessments.	Not present.

Appendix 3 Fauna

Abbreviations and symbols:

Code	Meaning	Reference
National listings (EPBC Act)		
EX	Extinct	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)
CR	Critically endangered	
EN	Endangered	
VU	Vulnerable	
NT	Near threatened	
CD	Conservation dependent	
PMST	Protected Matters Search Tool	
MI	Listed migratory species	
State listings (FFG Act)		
VU	Vulnerable	Victorian *Flora and Fauna Guarantee Act 1988* (FFG Act)
EN	Endangered	
CR	Critically endangered	
N	Nominated for listing as threatened	
I	Determined ineligible for listing	
D	Delisted	
Pest animal status (CaLP Act)		
PS	Declared pest animal	Victorian *Catchment and Land Protection Act 1994* (CaLP Act)
Other		
*	Introduced species	Victorian Biodiversity Atlas (VBA)

A3.1 Fauna species recorded from the Investigation Area

Table A3.1 Fauna species recorded from the Investigation Area during Biosis surveys (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).

EPBC Act	FFG Act/ CALP Act	Scientific name	Common name
Native birds			
		Dromaius novaehollandiae	Emu
		Coturnix pectoralis	Stubble Quail
		Phaps chalcoptera	Common Bronzewing
		Phaps elegans	Brush Bronzewing
		Ocyphaps lophotes	Crested Pigeon
		Gallinula tenebrosa	Dusky Moorhen
		Porphyrio melanotus	Australasian Swamphen
		Fulica atra	Eurasian Coot
		Podiceps cristatus	Great Crested Grebe
		Tachybaptus novaehollandiae	Australasian Grebe
		Poliocephalus poliocephalus	Hoary-headed Grebe
		Phalacrocorax carbo	Great Cormorant
		Phalacrocorax sulcirostris	Little Black Cormorant
		Phalacrocorax fuscescens	Black-faced Cormorant
		Phalacrocorax varius	Pied Cormorant
		Microcarbo melanoleucos	Little Pied Cormorant
		Pelecanus conspicillatus	Australian Pelican
MI	VU	*Hydroprogne caspia*	Caspian Tern
MI		*Thalasseus bergii*	Crested Tern
		Chroicocephalus novaehollandiae	Silver Gull
		Larus dominicanus	Kelp Gull
		Larus pacificus	Pacific Gull
		Haematopus longirostris	Pied Oystercatcher
		Erythrogonys cinctus	Red-kneed Dotterel
		Vanellus miles	Masked Lapwing

EPBC Act	FFG Act/ CALP Act	Scientific name	Common name
		Vanellus tricolor	Banded Lapwing
		Himantopus leucocephalus	Pied Stilt
VU, MI	VU	*Pluvialis squatarola*	Grey Plover
	VU	*Thinornis cucullatus*	Hooded Plover
MI		*Charadrius bicinctus*	Double-banded Plover
		Charadrius ruficapillus	Red-capped Plover
EN, MI	VU	*Limosa lapponica*	Bar-tailed Godwit
EN , MI	EN	*Tringa nebularia*	Common Greenshank
MI		*Calidris ruficollis*	Red-necked Stint
VU, MI		*Calidris acuminata*	Sharp-tailed Sandpiper
MI		*Calidris alba*	Sanderling
VU, MI		*Gallinago hardwickii*	Latham's Snipe
	EN	*Grus rubicunda*	Brolga
		Threskiornis molucca	Australian White Ibis
		Threskiornis spinicollis	Straw-necked Ibis
		Platalea regia	Royal Spoonbill
	EN	*Egretta garzetta*	Little Egret
	VU	*Ardea alba modesta*	Eastern Great Egret
		Egretta novaehollandiae	White-faced Heron
		Ardea pacifica	White-necked Heron
EN	CR	*Botaurus poiciloptilus*	Australasian Bittern
	VU	*Anseranas semipalmata*	Magpie Goose
		Chenonetta jubata	Australian Wood Duck
		Cygnus atratus	Black Swan
		Tadorna tadornoides	Australian Shelduck
		Anas superciliosa	Pacific Black Duck
		Anas castanea	Chestnut Teal
		Anas gracilis	Grey Teal
	VU	*Aythya australis*	Hardhead
	VU	*Biziura lobata*	Musk Duck
		Circus assimilis	Spotted Harrier
		Circus approximans	Swamp Harrier

EPBC Act	FFG Act/ CALP Act	Scientific name	Common name
		Accipiter fasciatus	Brown Goshawk
		Accipiter cirrocephalus	Collared Sparrowhawk
		Aquila audax	Wedge-tailed Eagle
	EN	*Haliaeetus leucogaster*	White-bellied Sea-Eagle
		Haliastur sphenurus	Whistling Kite
		Elanus axillaris	Black-shouldered Kite
		Falco longipennis	Australian Hobby
		Falco peregrinus	Peregrine Falcon
		Falco berigora	Brown Falcon
		Falco cenchroides	Nankeen Kestrel
		Ninox boobook	Southern Boobook
	VU	*Ninox strenua*	Powerful Owl
		Trichoglossus molucannus	Rainbow Lorikeet
		Parvipsitta porphyrocephala	Purple-crowned Lorikeet
		Calyptorhynchus funereus	Yellow-tailed Black-Cockatoo
		Callocephalon fimbriatum	Gang-gang Cockatoo
		Cacatua galerita	Sulphur-crested Cockatoo
		Cacatua sanguinea	Little Corella
		Cacatua tenuirostris	Long-billed Corella
		Eolophus roseicapilla	Galah
		Platycercus elegans	Crimson Rosella
		Platycercus eximius	Eastern Rosella
		Psephotus haematonotus	Red-rumped Parrot
	CR	*Neophema chrysogaster*	Orange-bellied Parrot
VU		*Neophema chrysostoma*	Blue-winged Parrot
	VU	*Neophema elegans*	Elegant Parrot
	EN	*Pezoporus wallicus*	Ground Parrot
		Podargus strigoides	Tawny Frogmouth
		Dacelo novaeguineae	Laughing Kookaburra
		Todiramphus sanctus	Sacred Kingfisher
VU, MI	VU	*Hirundapus caudacutus*	White-throated Needletail

EPBC Act	FFG Act/ CALP Act	Scientific name	Common name
		Cacomantis flabelliformis	Fan-tailed Cuckoo
		Chrysococcyx'basalis	Horsfield's Bronze-Cuckoo
		Chrysococcyx lucidus	Shining Bronze-Cuckoo
		Hirundo neoxena	Welcome Swallow
		Petrochelidon nigricans	Tree Martin
		Petrochelidon ariel	Fairy Martin
		Rhipidura albiscapa	Grey Fantail
		Rhipidura leucophrys	Willie Wagtail
		Microeca fascinans	Jacky Winter
		Petroica boodang	Scarlet Robin
		Petroica phoenicea	Flame Robin
		Petroica rosea	Rose Robin
		Eopsaltria australis	Eastern Yellow Robin
		Pachycephala pectoralis	Golden Whistler
		Pachycephala rufiventris	Rufous Whistler
		Pachycephala olivacea	Olive Whistler
		Colluricincla harmonica	Grey Shrike-thrush
		Grallina cyanoleuca	Magpie-lark
		Falcunculus frontatus	Eastern Shrike-tit
		Coracina novaehollandiae	Black-faced Cuckoo-shrike
		Cinclosoma punctatum	Spotted Quail-thrush
		Epthianura albifrons	White-fronted Chat
		Smicrornis brevirostris	Weebill
		Acanthiza lineata	Striated Thornbill
		Acanthiza nana	Yellow Thornbill
		Acanthiza pusilla	Brown Thornbill
		Acanthiza reguloides	Buff-rumped Thornbill
		Acanthiza chrysorrhoa	Yellow-rumped Thornbill
		Sericornis frontalis	White-browed Scrubwren
		Calamanthus fuliginosus	Striated Fieldwren

EPBC Act	FFG Act/ CALP Act	Scientific name	Common name
	EN	*Dasyornis broadbenti broadbenti*	Rufous Bristlebird (Coorong)
		Cincloramphus cruralis	Brown Songlark
		Cincloramphus mathewsi	Rufous Songlark
		Poodytes gramineus	Little Grassbird
		Acrocephalus australis	Australian Reed Warbler
		Cisticola exilis	Golden-headed Cisticola
		Stipiturus malachurus	Southern Emu-wren
		Malurus cyaneus	Superb Fairy-wren
		Artamus cyanopterus	Dusky Woodswallow
		Daphoenositta chrysoptera	Varied Sittella
		Cormobates leucophaea	White-throated Treecreeper
		Pardalotus punctatus	Spotted Pardalote
		Zosterops lateralis	Silvereye
		Melithreptus lunatus	White-naped Honeyeater
		Melithreptus brevirostris	Brown-headed Honeyeater
		Acanthorhynchus tenuirostris	Eastern Spinebill
		Gavicalis virescens	Singing Honeyeater
		Caligavis chrysops	Yellow-faced Honeyeater
		Nesoptilotis leucotis	White-eared Honeyeater
		Ptilotula penicillata	White-plumed Honeyeater
		Phylidonyris pyrrhopterus	Crescent Honeyeater
		Phylidonyris novaehollandiae	New Holland Honeyeater
		Anthochaera chrysoptera	Little Wattlebird
		Anthochaera carunculata	Red Wattlebird
		Acanthagenys rufogularis	Spiny-cheeked Honeyeater
		Anthus australis	Australasian Pipit
		Mirafra 'avanica	Horsfield's Bushlark
		Stagonopleura bella	Beautiful Firetail
		Neochmia temporalis	Red-browed Finch
		Corcorax melanorhamphos	White-winged Chough

EPBC Act	FFG Act/ CALP Act	Scientific name	Common name
		Strepera graculina	Pied Currawong
		Strepera versicolor	Grey Currawong
		Gymnorhina tibicen	Australian Magpie
		Zoothera lunulata	Bassian Thrush
		Corvus tasmanicus	Forest Raven
		Corvus coronoides	Australian Raven
		Corvus mellori	Little Raven
		Pardalotus striatus	Striated Pardalote
Native mammals			
		Tachyglossus aculeatus	Short-beaked Echidna
		Antechinus agilis	Agile Antechinus
	VU	*Sminthopsis leucopus*	White-footed Dunnart
		Trichosurus vulpecula	Common Brush-tailed Possum
		Pseudocheirus peregrinus	Eastern Ring-tailed Possum
		Petaurus breviceps	Sugar Glider
		Phascolarctos cinereus	Koala
		Isoodon obesulus	Southern Brown Bandicoot
		Wallabia bicolor	Black-tailed Wallaby
		Notamacropus rufogriseus banksianus	Red-necked Wallaby
		Macropus giganteus	Eastern Grey Kangaroo
		Rattus fuscipes	Bush Rat
		Rattus lutreolus	Swamp Rat
		Chalinolobus gouldii	Gould's Wattled Bat
		Chalinolobus morio	Chocolate Wattled Bat
		Falsistrellus tasmaniensis	Eastern False Pipistrelle
		Ozimops spp.	Free-tailed Bats
CR	CR	*Miniopterus orianae bassanii*	Southern Bent-wing Bat
		Myotis macropus	Southern Myotis
		Nyctophilus spp.	Long-eared bats
		Austronomus australis	White-striped Free-tailed Bat

EPBC Act	FFG Act/ CALP Act	Scientific name	Common name
		Vespadelus darlingtoni	Large Forest Bat
		Vespadelus regulus	Southern Forest Bat
		Vespadelus vulturnus	Little Forest Bat
		Scotorepens balstoni	Inland Broad-nosed Bat
Native frogs			
		Limnodynastes dumerilii	Pobblebonk Frog
		Limnodynastes peronii	Striped Marsh Frog
		Crinia signifera	Common Froglet
		Limnodynastes tasmaniensis SCR	Spotted Marsh Frog SCR
		Litoria ewingii	Southern Brown Tree Frog
Native reptiles			
		Chelodina longicollis	Eastern Snake-necked Turtle
	EN	*Aprasia striolata*	Striped Worm-Lizard
	VU	*Pogona barbata*	Eastern Bearded Dragon
		Acritoscincus duperreyi	Eastern Three-lined Skink
		Anepischet'sia maccoyi	McCoy's Skink
		Hemiergis peronii	Four-toed Skink
		Lampropholis guichenoti	Garden Skink
		Lerista bougainv'llii	Bougainville's Skink
EN	EN	*Lissolepis coventryi*	Swamp Skink
		Pseudemoia entrecasteauxii	Southern Grass Skink
		Tiliqua nigrolutea	Blotched Blue-tongued Lizard
		Austrelaps superbus	Lowland Copperhead
		Drysdalia coronoides	White-lipped Snake
		Notechis scutatus	Tiger Snake
		Pseudonaja textilis	Eastern Brown Snake
Native fish			
		Galaxias spp.	Galaxias
Introduced birds			
		Turdus merula	Common Blackbird
		Alauda arvensis	Eurasian Skylark
		Sturnus vulgaris	Common Starling

EPBC Act	FFG Act/ CALP Act	Scientific name	Common name
		Carduelis carduelis	European Goldfinch
Introduced mammals			
		Rattus rattus	Black Rat
	PS	*Mus musculus*	House Mouse
	PS	*Oryctolagus cuniculus*	European Rabbit
	PS	*Sus scrofa*	Pig
		Ovis aries	Sheep
		Dama dama	Fallow Deer
		Cervus unicolor	Sambar Deer
	PS	*Felis catus*	Domestic Cat
		Vulpes vulpes	Red Fox

A3.2 Listed fauna species

The following table includes a list of the listed fauna species that have potential to occur within the Project Area. The list of species is sourced from the VBA and PMST (accessed on 8 July 2022). Where years are specified for the most recent database records, these refer to records from the VBA unless otherwise specified. Where no year is specified, the PMST has predicted that the species has potential to occur.

Table A3.2 Listed fauna species recorded or predicted to occur within 10 kilometres of the Project Area

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in Project Area	Rationale for likelihood ranking
		EPBC	FFG					
National significance								
Myiagra cyanoleuca	Satin Flycatcher	MI		2012		Densely vegetated areas of forest gullies and tall woodlands. During migration, the species may occur in more open environments and coastal areas.	**High**	Suitable habitat with forested areas, including the transmission route.
Rhipidura rufifrons	Rufous Fantail	MI		2012		Summer migrants to Victoria, inhabiting wet forests and rainforests.	**High**	Suitable habitat with forested areas, including the transmission route.
Callocephalon fimbriatum	Gang-gang Cockatoo	EN		2019	PMST	S Vic to E NSW. Forests and woodlands from coast to alpine areas. Autumn-winter dispersal from highlands to lower elevations. Forages in eucalypts, acacias and some exotic garden trees and shrubs.	**High-- Recorded**	Recorded within the Project Area. Suitable habitat nearby; may fly over the site and feed within suitable native trees within the site and adjacent forest.
Leipoa ocellata	Malleefowl	VU	VU	1991		Low woodlands dominated by Mallee eucalypts, Callitris spp. woodlands and heathlands.	**Negligible**	Outside known range; no suitable habitat.
Pedionomus torquatus	Plains-wanderer	CR	CR	1972	PMST	Native grassland with a sparse, open structure.	**Negligible**	Outside known range; no suitable habitat.

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in Project Area	Rationale for likelihood ranking
		EPBC	FFG					
Rostratula australis	Australian Painted-snipe	EN	CR	2005	PMST	Shallows of well-vegetated freshwater wetlands.	**Low**	Suitable habitat nearby; likely to fly over site occasionally
Gallinago hardwickii	Latham's Snipe	VU, MI		2018		A migrant to Australia from July to April occurring in a wide variety of permanent and ephemeral wetlands. Prefers open freshwater wetlands with nearby cover, but also recorded on the edges of creeks and rivers, river-pools and floodplains. Forages in soft mud at edge of wetlands and roosts in a variety of vegetation around wetlands including tussock grasslands, reeds and rushes, tea-tree scrub, woodlands and forests.	**High - Recorded**	Recorded within the Project Area. Suitable habitat within and adjacent to the Project Area; likely to fly over site when individuals undertake seasonal and dispersive movements between the coast and inland.
Botaurus poiciloptilus	Australasian Bittern	EN	CR	2020	PMST	Shallow freshwater and brackish wetlands with abundant emergent aquatic vegetation.	**High-- Recorded**	Recorded within the Project Area. Suitable habitat within and adjacent to the Project Area; likely to fly over site when individuals undertake seasonal and dispersive movements between the coast and inland.
Calyptorhynchus banksii graptogyne	Red-tailed Black-Cockatoo (south-eastern)	EN	CR	2020	PMST	Desert Stringybark, Brown Stringybark and Buloke woodlands.	**Low**	Suitable habitat nearby; may fly over site occasionally

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in Project Area	Rationale for likelihood ranking
		EPBC	FFG					
Neophema chrysogaster	Orange-bellied Parrot	CR	CR	2000	PMST	Coastal vegetation including saltmarshes, dunes, pastures, shrublands, sewage plants, saltworks, islands, and beaches.	**Low**	Recorded within the Investigation Area, unlikely to inhabit the Project Area due to lack of suitable habitat. Suitable habitat nearby; may fly over site occasionally.
Neophema chrysostoma	Blue-winged Parrot	VU				Coastal vegetation including saltmarshes, dunes, pastures, shrublands, sewage plants, saltworks, islands, and beaches. Also inland in pasture and grasslands.	**High-- Recorded**	Recorded within the Project Area. Suitable habitat within and adjacent to the Project Area; likely to fly over site when individuals undertake seasonal and dispersive movements between the coast and inland.
Lathamus discolor	Swift Parrot	CR	CR	2011	PMST	A range of forests and woodlands, especially those supporting nectar-producing tree species. Also well-treed urban areas.	**Negligible**	No suitable habitat.
Pezoporus occidentalis	Night Parrot	EN			PMST	Low vegetation in arid and semi-arid areas dominated by *Triodia* spp., chenopod, and samphire shrublands.	**Negligible**	Outside known range; no suitable habitat.
Hirundapus caudacutus	White-throated Needletail	VU, MI	VU	2019	PMST	An almost exclusively aerial species within Australia, occurring over most types of habitat, particularly wooded areas.	**High-- Recorded**	Likely to fly over site during annual migration period in Australia. Recorded within the Project Area.
Apus pacificus	Fork-tailed Swift	MI		2007		An aerial species, occurring over a wide range of environments, predominately over open countryside but sometimes over forests and urban landscapes.	**High**	Numerous records within 10 km of the Project Area.

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in Project Area	Rationale for likelihood ranking
		EPBC	FFG					
Pachyptila turtur subantarctica	Fairy Prion (southern)	VU			PMST	Open ocean over continental shelves and slopes, and rarely coming close to shore except at breeding islands and during rough weather.	**Negligible**	Species is entirely marine.
Thalassarche bulleri platei	Northern Buller's Albatross	VU, MI	EN		PMST	Buller's Albatross breeds in New Zealand and is a seasonal visitor to Victorian coastal waters where it occurs in pelagic and inshore waters.	**Negligible**	Species is entirely marine.
Pterodroma leucoptera leucoptera or *Pterodroma leucoptera*	Gould's Petrel	EN			PMST	The Gould's Petrel is a marine pelagic spending the majority of its time at sea. It has breeding colonies on Cabbage Tree Island and Boondelbah Island.	**Negligible**	Species is entirely marine.
Pterodroma mollis	Soft-plumaged Petrel	VU		1959	PMST	A marine, oceanic species that breeds on islands including islands off Tasmania. Burrows among tussock grass and ferns on slopes and valleys.	**Negligible**	Species is entirely marine.
Halobaena caerulea	Blue Petrel	VU		2012	PMST	A marine species, usually pelagic but sometimes observed over shallow waters. A regular visitor to southern Australian waters.	**Negligible**	Species is entirely marine.
Diomedea exulans	Wandering Albatross	VU, MI	CR	1997	PMST	Occurs from Antarctic to subtropical areas in the southern hemisphere. In Australia, observed over continental shelves often in areas of continental upwellings. Regularly recorded feeding in sheltered harbours, often gathering at sewerage outfalls.	**Negligible**	Species is entirely marine.

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in Project Area	Rationale for likelihood ranking
		EPBC	FFG					
Thalassarche melanophris	Black-browed Albatross	VU, MI		2019	PMST	Breeds in Antarctic and sub-Antarctic islands, but commonly occurs in pelagic waters off the coast of Victoria.	**Negligible**	Species is entirely marine.
Thalassarche carteri	Indian Yellow-nosed Albatross	VU, MI	EN	2017	PMST	The Indian Yellow-nosed Albatross is a marine bird, located in subtropical and warmer subantarctic waters.	**Negligible**	Species is entirely marine.
Thalassarche chrysostoma	Grey-headed Albatross	EN, MI	EN	2011	PMST	Occurs in warmer areas over winter, its breeding grounds are found in the Antarctic and subantarctic islands. Generally, forages over the open oceans.	**Negligible**	Species is entirely marine.
Thalassarche cauta	Shy Albatross	EN, MI	EN	2013	PMST	The Shy Albatross is a marine pelagic species inhabiting sub-Antarctic and subtropical waters, spending the majority of their time at sea. Occasionally it is observed in continental shelf waters in bays and harbours.	**Negligible**	Species is entirely marine.
Phoebetria fusca	Sooty Albatross	VU, MI	CR	2013	PMST	Subantarctic and subtropical marine waters.	**Negligible**	Species is entirely marine.
Macronectes giganteus	Southern Giant-Petrel	EN, MI	EN	2017	PMST	Adults of this species are present all year round at Antarctic breeding colonies, from where immature birds disperse, some as far north as subtropical areas.	**Negligible**	Species is entirely marine.
Thalassarche bulleri	Buller's Albatross	VU, MI	E'	1990	PMST	Buller's Albatross breeds in New Zealand and is a seasonal visitor to Victorian coastal waters where it occurs in pelagic and inshore waters.	**Negligible**	Species is entirely marine.

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in Project Area	Rationale for likelihood ranking
		EPBC	FFG					
Macronectes halli	Northern Giant-Petrel	VU, MI	EN	1997	PMST	Breeds in coastal habitats on subantarctic islands. Dispersal movements of juveniles are poorly known but have been observed along temperate coastal areas of Australia. Often seen around sewer outfalls or seal and penguin colonies.	**Negligible**	Species is entirely marine.
Diomedea epomophora	Southern Royal Albatross	VU, MI	CR	1997	PMST	The range of the Southern Royal Albatross extends throughout the oceans of the Southern Hemisphere. The Southern Royal Albatross nests almost exclusively on the Chatham Islands, located hundreds of miles east of New Zealand.	**Negligible**	Species is entirely marine.
Diomedea sanfordi	Northern Royal Albatross	EN, MI			PMST	A marine, pelagic species and its habitat includes subantarctic, subtropical, and occasionally Antarctic waters (Marchant & Higgins 1990). Commonly nest on Campbell Island and the Auckland Islands.	**Negligible**	Species is entirely marine.
Diomedea antipodensis	New Zealand Wandering Albatross	VU, MI			PMST	Marine, pelagic species that ranges widely throughout the Pacific region of the Southern Ocean. It visits off-shore waters of southern Australia.	**Negligible**	Species is entirely marine.
Thalassarche salvini	Salvin's Albatross	VU, MI			PMST	Marine species occurring in subantarctic and subtropical waters (Marchant & Higgins 1990).	**Negligible**	Species is entirely marine.

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in Project Area	Rationale for likelihood ranking
		EPBC	FFG					
Thalassarche steadi	White-capped Albatross	VU, MI		2019	PMST	Marine species occurring in subantarctic and subtropical waters. Birds nest on slopes vegetated with tussock and succulents on Auckland Island (Marchant & Higgins 1990).	**Negligible**	Species is entirely marine.
Thalassarche impavida	Campbell Albatross	VU, MI			PMST	Marine species occurring in sub-Antarctic and subtropical waters from pelagic to shelf-break water habitats. They breed on Campbell Island (Marchant & Higgins 1990).	**Negligible**	Species is entirely marine.
Limosa lapponica baueri	Bar-tailed Godwit (baueri)	EN, MI	VU	2018	PMST	Common in coastal areas around Australia, including estuarine mudflats and beaches and mangroves.	**Low**	Recorded within the Investigation Area, may fly over the site occasionally but is unlikely to inhabit the Project Area due to lack of suitable habitat.
Sternula nereis	Fairy Tern	VU	CR	2019	PMST	Inhabit coastal environments including intertidal mudflats, sand flats and beaches. Nests above high-water mark on sandy shell-grit beaches.	**Low**	Suitable habitat nearby; may fly over site rarely.
Thinornis cucullatus	Hooded Plover	VU	VU	2019	PMST	Sandy ocean beaches, estuaries and coastal lakes.	**Low**	Suitable habitat nearby; but unlikely to fly over site. Recorded within the Investigation Area, unlikely to inhabit the Project Area due to lack of suitable habitat.
Charadrius leschenaultii	Greater Sand Plover	VU, MI	VU	1979	PMST	Intertidal mudflats and sandbanks of sheltered bays and estuaries.	**Low**	Suitable habitat nearby; may fly over site rarely.

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in Project Area	Rationale for likelihood ranking
		EPBC	FFG					
Charadrius bicinctus	Double-banded Plover	MI		2015		Winter migrants from New Zealand, inhabiting intertidal mudflats and muddy or grassy edges of saline or freshwater lakes.	**Low**	Suitable habitat nearby, and regularly recorded at the Glenelg River Estuary (including during this study).
Numenius madagascariensis	Eastern Curlew	CR, MI	CR	2005	PMST	Large intertidal sandflats, banks, mudflats, estuaries, inlets, coastal lagoons and bays.	**Low**	Suitable habitat nearby; may fly over site rarely.
Numenius minutus	Little Curlew	MI			PMST	Large intertidal sandflats, banks, mudflats, estuaries, inlets, coastal lagoons and bays.	**Negligible**	Rarely recorded in south-western Victoria.
Calidris ferruginea	Curlew Sandpiper	CR, MI	CR	2019	PMST	Large intertidal sandflats, banks, mudflats, estuaries, inlets, sewage farms, saltworks, harbours, coastal lagoons and bays, and shallow inland lakes with extensive mudflats (often saline).	**Low**	Suitable habitat nearby; may fly over site rarely.
Calidris canutus	Red Knot	VU, MI	EN	2017	PMST	Large intertidal sandflats, banks, mudflats, estuaries, inlets, sewage farms, saltworks, harbours, coastal lagoons and bays.	**Low**	Suitable habitat nearby; may fly over site rarely.
Calidris tenuirostris	Great Knot	VU, MI	CR	2012		Large intertidal sandflats, banks, mudflats, estuaries, inlets, sewage farms, saltworks, harbours, coastal lagoons and bays.	**Low**	Suitable habitat nearby; may fly over site rarely.
Calidris acuminata	Sharp-tailed Sandpiper	VU, MI		2014		Prefers muddy edges of shallow fresh or brackish wetlands with inundated or emergent low vegetation. Occasionally use flooded paddocks and other ephemeral wetlands.	**Low**	Recorded within the investigation area. Suitable habitat near the Project Area; may fly over site rarely.

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in Project Area	Rationale for likelihood ranking
		EPBC	FFG					
Calidris alba	Sanderling	MI		2019		Summer migrants to Victoria, with some non-breeding individuals remaining over winter. The species is typically found on sandy beaches and foraging among piles of seaweed.	**Low**	Recorded within the investigation area on ocean beaches. Suitable habitat near the Project Area; may fly over site rarely.
Calidris melanotos	Pectoral Sandpiper	MI		2006		A variety of wetland habitats with fringing mudflats including bays, coastal lagoons, lakes, swamps, creeks, inundated grasslands, saltmarshes and artificial wetlands. Mostly recorded from Port Phillip Bay and Murray River Valley region.	**Low**	Has been recorded within the investigation area at the Glenelg estuary.
Calidris ruficollis	Red-necked Stint	MI		2015		Intertidal mudflats and bare mudflats around a variety of wetland types.	**Low**	Has been regularly recorded within the investigation area at the Glenelg estuary.
Grantiella picta	Painted Honeyeater	VU	VU		PMST	Dry open woodlands and forests. Typically forages for fruit and nectar in mistletoes and in tree canopies.	**Negligible**	No suitable habitat.
Anthochaera phrygia	Regent Honeyeater	CR	CR	1958		A range of dry woodlands and forests dominated by nectar-producing tree species.	**Negligible**	Outside recognised distribution
Dasyurus maculatus maculatus	Spot-tailed Quoll	EN	EN	2008	PMST	Rainforest and wet and dry sclerophyll forests and woodlands.	**Low**	Suitable habitat nearby; may occasionally visit limited portions of site.
Antechinus minimus maritimus	Swamp Antechinus	VU	VU	2007	PMST	Dense wet heath and heathy woodland, sedgeland and dense tussock grassland.	**Medium**	Suitable habitat nearby; may utilise limited portions of site with native vegetation.

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in Project Area	Rationale for likelihood ranking
		EPBC	FFG					
Isoodon obesulus obesulus	Southern Brown Bandicoot	EN	EN	2019	PMST	Heathland, shrubland, sedgeland, heathy open forest and woodland; also exotic vegetation, such as blackberry thickets and rank grasses where native vegetation has been removed.	**Medium**	Recorded within native forest habitat within the Investigation Area. Suitable habitat nearby; may utilise limited portions of site.
Petaurus australis	Yellow-bellied Glider	VU	VU		PMST	Forest and woodlands. In the region it is recorded to prefer areas with Manna Gum, Scentbark and Swamp Gum (Menkhorst 1995)	**Medium**	Recorded within native forest habitat within the Investigation Area. . May utilise limited portions of site with native vegetation
Potorous tridactylus trisulcatus	Long-nosed Potoroo	VU	VU	2019	PMST	Forest, heathy woodlands and heathlands.	**Medium**	Suitable habitat nearby; may utilise limited portions of site with native vegetation.
Pseudomys fumeus	Smoky Mouse	EN	EN	2005	PMST	Coastal heath and heathy woodland, wet forest, sub-alpine heath and dry sclerophyll forest.	**Negligible**	Outside known range; no suitable habitat.
Pseudomys shortridgei	Heath Mouse	EN	EN	2019	PMST	Lowland heathland and heathy sclerophyll forest.	**Recorded**	Likely to occur in low-lying roadsides and other less disturbed portions of site. Possible records from hair tubes and cameras within the GTFP.
Arctophoca tropicalis	Subantarctic Fur Seal	EN		2019		Near coastal and offshore waters.	**Negligible**	Species is entirely marine.
Neophoca cinerea	Sea-lion	VU	EN	2018	PMST	Near coastal and offshore waters.	**Negligible**	No suitable habitat.
Mirounga leonina	Southern Elephant Seal	VU		1997		Occurs in Antarctic and sub-Antarctic areas. Victorian records likely to be of vagrants, which have been found on rare occasions along the entire Victorian coast.	**Negligible**	No suitable habitat.

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in Project Area	Rationale for likelihood ranking
		EPBC	FFG					
Eubalaena glacialis australis	Southern Right Whale	EN, MI	EN	2019	PMST	Migrates between summer feeding grounds in the Southern Ocean to warmer northern waters over winter, where it can be found along the Victorian coastline. The coast 8 kilometres east of Warrnambool is a locally important calving and nursing site until late October or early November.	**Negligible**	Species is entirely marine.
Balaenoptera musculus	Blue Whale	EN, MI	EN	2018	PMST	Found throughout the Southern Ocean, though migration paths appear to be diffuse and widespread. Often enters coastal waters, including Victoria (particularly the smaller subspecies *Balaenoptera physalus*).	**Negligible**	Species is entirely marine.
Balaenoptera borealis schlegelii	Southern Sei Whale	VU, MI			PMST	An oceanic species recorded in Australian waters.	**Negligible**	Species is entirely marine.
Balaenoptera physalus	Fin Whale	VU, MI			PMST	Occurs worldwide with populations in the southern hemisphere undergoing extensive north-south migrations. Only one record in Victoria.	**Negligible**	Species is entirely marine.
Megaptera novaeangliae australis	Southern Humpback Whale	VU, MI	CR	2019	PMST	Migrate between summer feeding grounds in the Southern Ocean to Northern waters where birthing and mating occurs. Increasingly recorded along the Victorian coast, occasionally entering Port Phillip and Western Port.	**Negligible**	Species is entirely marine.

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in Project Area	Rationale for likelihood ranking
		EPBC	FFG					
Pteropus poliocephalus	Grey-headed Flying-fox	VU	VU	2013	PMST	Rainforest, wet and dry sclerophyll forest, woodland and urban areas.	**Medium**	Distribution and abundance in western Victoria is increasing; may fly over site occasionally.
Miniopterus orianae bassanii	Southern Bent-winged Bat	CR	CR		PMST	Woodlands, grasslands, pasture especially near wetlands. Roosts in caves, crevices in cliff faces and in mines.	**High-- Recorded**	Recorded flying throughout project wind farm site.
Chelonia mydas	Green Turtle	VU, MI			PMST	Marine species with a pan-tropical distribution throughout the world. More abundant along the tropical coasts of Australia and the Great Barrier Reef. Green Turtles spend their first five to ten years drifting on ocean currents.	**Negligible**	Species is entirely marine.
Dermochelys coriacea	Leathery Turtle	EN, MI	CR	2013	PMST	Marine species usually sighted along the eastern seaboard often in bays, estuaries and rivers. No major nesting events have been recorded in Australia.	**Negligible**	Species is entirely marine.
Caretta caretta	Loggerhead Turtle	EN, MI		1991	PMST	Loggerhead Turtles forage widely in the waters of coral and rocky reefs, seagrass beds and muddy bays throughout eastern, northern and western Australia. Nesting occurs in coastal environments of northern WA, NT and QLD.	**Negligible**	Species is entirely marine.
Delma impar	Striped Legless Lizard	VU	e		PMST	Natural temperate grassland, grassy woodland and exotic grassland.	**Negligible**	Outside species known range. No local records or suitable natural temperate grassland habitat.

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in Project Area	Rationale for likelihood ranking
		EPBC	FFG					
Lissolepis coventryi	Swamp Skink	EN	EN	2009		Densely vegetated swamps and associated watercourses, and adjacent wet heaths, sedgelands and saltmarshes.	**Medium**	Recorded in the Investigation Area within adjacent wet areas; may occur in small patches of remnant habitat within site.
Litoria raniformis	Growling Grass Frog	VU	VU	2002	PMST	Still or slow-flowing waterbodies and surrounding terrestrial vegetation.	**Medium**	Suitable habitat nearby; may utilise limited portions of site.
Carcharodon carcharias	Great White Shark	VU, MI	EN		PMST	Near coastal and offshore waters.	**Negligible**	Species is entirely marine.
Prototroctes maraena	Australian Grayling	VU	EN		PMST	Adults inhabit cool, clear, freshwater streams.	**Negligible / Medium**	No suitable habitat at wind farm site. Transmission route crosses some suitable streams.
Galaxiella pusilla	Dwarf Galaxias	VU	EN		PMST	Slow-flowing or still freshwater wetlands such as swamps, drains and backwaters of streams.	**Negligible / Medium**	No suitable habitat at wind farm site. Transmission route crosses some suitable streams.
Nannoperca obscura	Yarra Pygmy Perch	EN	VU	2020	PMST	Lakes, pools and slow-flowing streams with abundant aquatic vegetation.	**Negligible / Medium**	No suitable habitat at wind farm site. Transmission route crosses some suitable streams.
Nannoperca variegata	Variegated Pygmy Perch	VU	EN	2001	PMST	Shallow freshwater streams with moderate to high water flow and a high cover of aquatic vegetation.	**Negligible / Medium**	Recorded in Lake Mombeong in 2001. No suitable habitat at wind farm site. Transmission route crosses some suitable streams.
Euastacus bispinosus	Glenelg Spiny Crayfish	EN	EN	2016	PMST	Cool, shaded, flowing areas of rivers and streams, which have intact riparian vegetation and high water quality.	**Negligible / Medium**	No suitable habitat at wind farm site. Transmission route crosses some suitable streams.

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in Project Area	Rationale for likelihood ranking
		EPBC	FFG					
State significance								
Synoicus chinensis	King Quail		EN	1990		Swampy grassland, sedgeland and heathland.	**Low**	Outside regular distributional range of the species.
Geopelia cuneata	Diamond Dove		VU	1938		Drier woodlands and scrub, spinifex and mulga.	**Negligible**	Rare in the region.
Lewinia pectoralis	Lewin's Rail		VU	2019		Swamps, dense riparian vegetation and saltmarsh.	**Medium**	Likely to inhabit adjacent wetlands; may occasionally fly over site.
Burhinus grallarius	Bush Stone-curlew		CR	1978		Open woodland, treed farmland.	**Low**	May occur in adjacent land; may fly over site occasionally
Grus rubicunda	Brolga		EN	2021		Shallow freshwater and brackish wetlands, crops, grassland and pasture.	**High-- Recorded**	Recorded at several locations within the Project Area.
Egretta garzetta	Little Egret		EN	2019		Swamps, billabongs, floodplain pools, mudflats, mangroves and channels; breeds in trees standing in water.	**Low**	Recorded within the Investigation Area. May fly over the site occasionally, unlikely to inhabit the Project Area due to a lack of suitable habitat.
Ardea intermedia plumifera	Plumed Egret		CR	2007		Densely-vegetated freshwater wetlands including lakes, swamps and billabongs. Breeds in trees standing in water.	**Low**	Species rarely visits southern Victoria.
Ardea alba modesta	Eastern Great Egret		VU	2019		Flooded crops, pasture, swamps, lagoons, saltmarsh, sewage ponds, estuaries, dams, roadside ditches. Breeds in trees standing in water.	**Recorded within the Investigation Area**	Known from adjacent wetlands; likely to fly over site occasionally.

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in Project Area	Rationale for likelihood ranking
		EPBC	FFG					
Ixobrychus dubius	Australian Little Bittern		EN	1991		Freshwater swamps, lakes and rivers with dense reedbeds	**Low**	Suitable habitat nearby; likely to fly over site occasionally; few records in the region.
Anseranas semipalmata	Magpie Goose		VU	2019		Swamps, lakes, flooded pasture, and dams.	**Low**	Recorded in coastal habitat within the Investigation Area. May fly over the site and use adjacent wetlands occasionally, unlikely to inhabit the Project Area due to lack of suitable habitat.
Spatula rhynchotis	Australasian Shoveler		VU	2019		Prefers large, permanent lakes and swamps with deep water, stable conditions and abundant aquatic vegetation. Less commonly recorded in small or shallow waters, such as sewage ponds, freshwater rivers and densely vegetated farm dams. Forages in open water but nests in densely vegetated freshwater wetlands.	**Low**	Likely in adjacent wetlands; likely to fly over site occasionally.
Stictonetta naevosa	Freckled Duck		EN	2017		Large freshwater wetlands, generally with dense vegetation.	**Medium**	Likely in adjacent wetlands; likely to fly over site occasionally.
Aythya australis	Hardhead		VU	2019		A mainly aquatic species preferring large, deep freshwater environments with abundant aquatic vegetation, including slow moving areas of rivers.	**Medium**	Recorded at wetlands within the Investigation Area, Likely to fly over the site occasionally, unlikely to inhabit the Project Area due to lack of suitable habitat.
Oxyura australis	Blue-billed Duck		VU	2017		Open or densely vegetated wetlands.	**High**	Likely in adjacent wetlands; likely to fly over site occasionally.

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in Project Area	Rationale for likelihood ranking
		EPBC	FFG					
Biziura lobata	Musk Duck		VU	2019		A largely aquatic species preferring deep water on large, permanent swamps, lakes and estuaries with abundant aquatic vegetation. Often occurs in areas of dense vegetated cover within a wetland.	**Medium**	Recorded at wetlands within the Investigation Area, Likely to fly over the site occasionally, unlikely to inhabit the Project Area due to lack of suitable habitat.
Plegadis falcinellus	Glossy Ibis	MI		2008		Freshwater wetlands especially permanent or ephemeral water bodies on floodplains, including wet pasture environments. Also sheltered coastal environments.	**Low**	Infrequent occurrence in region.
Accipiter novaehollandiae	Grey Goshawk		EN	2019		Rainforest, gallery forest, tall wet forest and woodland. Also partially cleared agricultural land.	**Low**	Infrequent occurrence in region.
Hieraaetus morphnoides	Little Eagle		VU	2010		Woodland and open areas. Rabbits are a key component of their diet. Nesting occurs in mature trees in open woodland or riparian vegetation.	**Medium**	Likely to fly over site occasionally.
Haliaeetus leucogaster	White-bellied Sea-Eagle		EN	2019		Coastal areas such as beaches and estuaries, inland wetlands and major inland streams.	**High-- Recorded**	Recorded within the Project Area. Likely in adjacent wetlands; likely to fly over site occasionally.
Lophoictinia isura	Square-tailed Kite		VU	2018		Eucalypt woodlands, open forest and partially cleared farmland.	**Low**	Infrequent occurrence in region.
Falco subniger	Black Falcon		CR	2010		Woodlands, open country and around terrestrial wetlands areas, including rivers and creeks. Mostly hunts over open plains and undulating land with large tracts of low vegetation.	**Negligible**	Infrequent occurrence in region.

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in Project Area	Rationale for likelihood ranking
		EPBC	FFG					
Pandion cristatus	Eastern Osprey	MI			PMST	Coastal environments and some large inland rivers. Rare vagrants to Victoria.	**Negligible**	Outside regular distributional range of the species.
Ninox connivens	Barking Owl		CR	2003		Eucalypt forests and woodlands.	**Negligible**	Little suitable habitat.
Ninox strenua	Powerful Owl		VU	2019		Eucalypt forests and woodlands, well-treed urban areas.	**High**	Recorded within the Investigation Area, unlikely to regularly inhabit the Project Area due to lack of suitable habitat, but may roost occasionally in pine plantation areas.
Tyto novaehollandiae	Masked Owl		CR	2019		A variety of lowland forests and woodlands.	**Low**	Little suitable habitat.
Lophochroa leadbeateri	Major Mitchell's Cockatoo		CR	1957		Mallee, mulga, treed farmland, cereal crops and Callitris woodland.	**Negligible**	Outside regular distributional range of the species.
Neophema elegans	Elegant Parrot		VU	2019		Woodlands, open woody grasslands, partially cleared farmlands and the fringes of clearings in forests, tree-lined watercourses and Mallee environments.	**Low**	Infrequent in region, but recorded in adjacent habitat; may fly over site occasionally.
Pezoporus wallicus	Ground Parrot		EN	2018		Coastal heathland and swamps.	**Low**	Recorded within coastal heath within the Investigation Area, unlikely to inhabit the Project Area due to lack of suitable habitat.

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in Project Area	Rationale for likelihood ranking
		EPBC	FFG					
Pelagodroma marina	White-faced Storm-Petrel		e	1997		Coastal in pelagic and inshore waters; breeding colonies on Mud and South Channel Islands in Port Phillip Bay.	**Low**	Primarily pelagic species outside of breeding season. Nests in known island colonies at Port Phillip Bay. May occasionally fly over site.
Phoebetria palpebrata	Light-mantled Sooty Albatross	MI	CR	1980		Pelagic marine species.	**Negligible**	Species is entirely marine.
Gelochelidon macrotarsa	Australian Gull-billed Tern		EN	1999		Floodplains, saltmarsh, claypans and flooded pasture.	**Low**	Suitable habitat nearby; may fly over site rarely.
Hydroprogne caspia	Caspian Tern	MI	VU	2019		Estuaries, inlets, bays, lagoons, inland lakes, flooded pasture, sewage ponds.	**Low**	Recorded within the Investigation Area. May fly over the site rarely, unlikely to inhabit the Project Area due to lack of suitable habitat.
Sternula albifrons	Little Tern	MI	CR	2015	PMST	Mostly recorded in sheltered coastal environments, including bays, lagoons and estuaries. Nests on sandy substrates containing much shell-grit, which provides good camouflage for their eggs.	**Low**	Suitable habitat nearby; may fly over site rarely.
Sterna hirundo	Common Tern	MI		2011		Summer migrants to Australia, occurring along sandy beaches.	**Low**	Suitable habitat nearby; may fly over site rarely.
Thalasseus bergii	Crested Tern	MI		2015		Coastal environments in sheltered embayments such as bays, inlets, estuaries and lagoons. Breeds on offshore islands.	**Low – Recorded within investigation area**	Suitable habitat nearby; may fly over site rarely.
Arenaria interpres	Ruddy Turnstone	VU, MI	EN	2002	PMST	Mainly found on coastal beaches, exposed reefs, and rock platforms.	**Low**	Suitable habitat nearby; may fly over site rarely.

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in Project Area	Rationale for likelihood ranking
		EPBC	FFG					
Pluvialis squatarola	Grey Plover	VU, MI	VU	2015		Mudflats, saltmarsh, tidal reefs and estuaries.	**Low**	Recorded within the Investigation Area. May fly over the site rarely, unlikely to inhabit the Project Area due to lack of suitable habitat.
Pluvialis fulva	Pacific Golden Plover	MI	VU	2005	PMST	A range of coastal habitats including mudflats, sandflats rocky shores and saltmarsh.	**Low**	Suitable coastal habitat nearby. Several records at nearby Yambuk Lake and in the Glenelg Estuary. May occasionally fly over site.
Numenius phaeopus	Whimbrel	MI	EN	2005		Coastal environments on mudflats, sandy shores and the crevices of rock platforms. The species is rarely recorded inland.	**Low**	Suitable habitat nearby; may fly over site rarely.
Tringa glareola	Wood Sandpiper	MI	EN	2006	PMST	Well-vegetated shallow freshwater wetlands with emergent aquatic plants and dense fringing vegetation.	**Low**	Suitable habitat nearby; may fly over site rarely.
Tringa brevipes	Grey-tailed Tattler	MI	CR	2005		Large intertidal sandflats, banks, mudflats, estuaries, inlets, sewage farms, saltworks, harbours, coastal lagoons and bays.	**Low**	Suitable habitat nearby; may fly over site rarely.
Actitis hypoleucos	Common Sandpiper	MI	VU	2017	PMST	Migrates to Australia from Eurasia in August where it inhabits a wide variety of coastal and inland wetlands with muddy margins before departing north in March.	**Low**	Suitable habitat nearby; may fly over site rarely.

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in Project Area	Rationale for likelihood ranking
		EPBC	FFG					
Tringa nebularia	Common Greenshank	EN, MI	EN	2019	PMST	A variety of ephemeral and permanent inland wetlands and sheltered coastal wetlands.	**Low**	Recorded within the Investigation Area. May fly over the site rarely, unlikely to inhabit the Project Area due to lack of suitable habitat.
Tringa stagnatilis	Marsh Sandpiper	MI	EN	2003	PMST	Permanent or ephemeral wetlands, mudflats and saltmarshes in coastal and inland environments.	**Low**	Suitable habitat nearby; may fly over site rarely.
Xenus cinereus	Terek Sandpiper	VU, MI	EN	2000		Large intertidal sandflats, banks, mudflats, estuaries, inlets, sewage farms, saltworks, harbours, coastal lagoons and bays.	**Low**	Suitable habitat nearby; may fly over site rarely.
Limosa limosa	Black-tailed Godwit	EN, MI	CR	2014		Primarily coastal environments such as bays, estuaries and lagoons with large intertidal mudflats or sandflats; occasionally found on rocky coasts or coral islets.	**Low**	Suitable habitat nearby; may fly over site rarely. Outside typical range.
Melanodryas cucullata cucullata	Hooded Robin	EN	VU	1998		Woodlands of eucalypt, Mallee, semi-cleared farmland.	**Low**	Infrequent in region; little suitable habitat.
Coracina maxima	Ground Cuckoo-shrike		EN	1957		Open woodland, farmland, mulga, spinifex with scattered trees.	**Negligible**	Outside recognised distribution.
Pomatostomus temporalis	Grey-crowned Babbler		VU	1938		Open forests and woodlands.	**Negligible**	Outside recognised distribution.
Calamanthus pyrrhopygius	Chestnut-rumped Heathwren		VU	1980		Woodland habitat with a dense, shrubby understorey.	**Low**	Likely in nearby woodlands, but little suitable habitat on site.
Pyrrholaemus sagittatus	Speckled Warbler		EN	1940		Eucalypt woodland with rocky gullies, ridges, tussock grasses and a sparse shrub understorey.	**Negligible**	Outside recognised distribution.

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in Project Area	Rationale for likelihood ranking
		EPBC	FFG					
Stagonopleura guttata	Diamond Firetail	VU	VU	1998		Open forests and woodlands with a grassy ground layer.	**Low**	Likely in nearby woodlands, but little suitable habitat on site.
Dasyornis broadbenti broadbenti	Rufous Bristlebird (Coorong)		EN	2007		Dense coastal heathlands and undergrowth of wet forests.	**High-- Recorded**	Recorded in young dense pine plantation within the Project Area, known from adjacent coastal heaths.
Dasyornis broadbenti caryochrous	Rufous Bristlebird (Otway)		VU	2007		Dense coastal heathlands and undergrowth of wet forests.	**Negligible**	Otway region subspecies. Single record from near Portland likely to be a misidentified Coorong individual (*Dasyornis broadbenti broadbenti).*
Sminthopsis murina murina	Common Dunnart		VU	1962		Found in heathland areas, open forests and woodlands that have structurally complex microhabitats. Common Dunnart prefer dry sclerophyll forest and Mallee heath with high rock and crevice density.	**Low**	No recent local records.
Sminthopsis leucopus	White-footed Dunnart		VU	2019		Lowland heathy woodland and forest, coastal scrub and coastal grasslands.	**High-- Recorded**	Species was recorded in small Blue Gum plantation portion of the Project Area. Pine plantations are considered to be unsuitable habitat.
Thylogale billardierii	Rufous-bellied Pademelon			1980		Extinct on the mainland, occurs in Tasmania. Rainforest and wet forest is the preferred habitat, although wet gullies in dry open eucalypt forest are also used.	**Negligible**	Species is extinct on the mainland.

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in Project Area	Rationale for likelihood ranking
		EPBC	FFG					
Arctophoca forsteri	Long-nosed Fur Seal		VU	2019		Breeds on islands off the southern Australian coast.	**Negligible**	Primarily marine species. No suitable habitat at wind farm site.
Tursiops australis	Burrunan Dolphin		CR	1986		Marine waters in Port Phillip and the Gippsland Lakes.	**Negligible**	Species is entirely marine.
Ornithorhynchus anatinus	Platypus		VU	1979		A variety of freshwater waterbodies, particularly those with stable banks suitable for burrows, and shallow waters for foraging.	**Negligible / Medium**	No suitable habitat at wind farm site. Transmission route crosses some suitable streams.
Aprasia striolata	Striped Worm-Lizard		EN	2020		Open woodlands and heathlands with abundant leaf litter on loamy soils.	**High-- Recorded**	Recorded within the Project Area in suitable rocky microhabitats along roadsides and other less disturbed portions of site.
Pogona barbata	Eastern Bearded Dragon		VU	2019		Woodlands, forests and heathlands with abundant cover of course woody debris.	**High-- Recorded**	Recorded within the Project Area along roadsides and other less disturbed portions of site.
Ogyris halmaturia	Large Bronze Azure Butterfly		CR	1905		Requires relatively open habitats within heathland and mallee-heath communities on light or sandy soils. These areas must also contain abundant nests of the Camponotus ants. *Camponotus terebrans* nests are always found in sandy areas, particularly at the base of mallee eucalypts.	**Negligible**	Species has been very rarely recorded in Victoria. It is unlikely that the Project Area supports suitable habitat.

Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in Project Area	Rationale for likelihood ranking
		EPBC	FFG					
Hygrobia australasiae	Squeak Beetle		EN	1973		Still and ephemeral freshwater habitats, with coarse and sandy substrates.	**Negligible**	No streams offering habitat on-site.
Engaeus strictifrons	Portland Burrowing Crayfish		EN	2014		Burrows on flood-plains, in creeks, swamps, and in drainage channels. Most often in hard soils with a heavy clay component (clays brown or grey). Burrows have been recorded in cleared, partially drained swamps with silty or sandy black organic soils.	**Negligible / Low**	No suitable habitat at wind farm site. Soils within Project Area are primarily white sand. Transmission route crosses some potentially suitable streamside habitat.
Engaeus sericatus	Hairy Burrowing Crayfish		VU	2008		Burrows are connected to the water table, typically adjacent to creeks or on floodplains. Although it is widespread in Victoria, most records are found in an area extending from the Otway Ranges, west to Port Fairy and north to Ballarat.	**Negligible**	Project Area is outside the species usual range. No suitable habitat at wind farm site. Transmission route crosses some potentially suitable streamside habitat.
Hemiphlebia mirabilis	Ancient Greenling		EN		2009	Seasonally ephemeral floodplain and coastal wetlands. Has very limited dispersal capacity and believed to be constrained to suitable habitat. Known from Long Swamp.	**Negligible**	Occurs in adjacent wetlands but no suitable habitat in Project Area.

A3.3 Migratory species (EPBC Act listed)

Table A3.3 Migratory fauna species recorded or predicted to occur within 10 kilometres of the Project Area

Note: Threatened and non-threatened migratory taxa that are recognised to occur within Victoria are also listed in Table 3.2, which provides an assessment of likelihood of occurrence. Non-threatened migratory species that are limited to marine habitats are not included in Table 3.2.

Scientific name	Common name	Most recent record
Migratory species		
Gallinago megala	Swinhoe's Snipe	PMST
Gallinago stenura	Pin-tailed Snipe	PMST
Gallinago hardwickii	Latham's Snipe	2018
Plegadis falcinellus	Glossy Ibis	2008
Hirundapus caudacutus	White-throated Needletail	2019
Apus pacificus	Fork-tailed Swift	2007
Pandion cristatus	Eastern Osprey	PMST
Ardenna grisea	Sooty Shearwater	PMST
Ardenna tenuirostris	Short-tailed Shearwater	2014
Ardenna carneipes	Flesh-footed Shearwater	PMST
Diomedea exulans	Wandering Albatross	1985
Thalassarche melanophris	Black-browed Albatross	2009
Thalassarche carteri	Indian Yellow-nosed Albatross	1981
Thalassarche chrysostoma	Grey-headed Albatross	PMST
Thalassarche chrysostoma	Grey-headed Albatross	2011
Thalassarche cauta	Shy Albatross	2013
Phoebetria fusca	Sooty Albatross	2013
Phoebetria palpebrata	Light-mantled Sooty Albatross	1980
Stercorarius parasiticus	Arctic Jaeger	2006
Macronectes giganteus	Southern Giant-Petrel	2011
Thalassarche bulleri	Buller's Albatross	PMST
Macronectes halli	Northern Giant-Petrel	1981
Sterna hirundo	Common Tern	2011
Diomedea epomophora	Southern Royal Albatross	1986
Diomedea sanfordi	Northern Royal Albatross	PMST
Diomedea antipodensis	New Zealand Wandering Albatross	PMST
Thalassarche salvini	Salvin's Albatross	PMST
Thalassarche steadi	White-capped Albatross	2019
Thalassarche impavida	Campbell Albatross	PMST
Hydroprogne caspia	Caspian Tern	2019
Thalasseus bergii	Crested Tern	2015
Sternula albifrons	Little Tern	2015
Arenaria interpres	Ruddy Turnstone	2002

Scientific name	Common name	Most recent record
Pluvialis squatarola	Grey Plover	2010
Charadrius bicinctus	Double-banded Plover	2015
Charadrius leschenaultii	Greater Sand Plover	1979
Numenius madagascariensis	Eastern Curlew	2005
Numenius minutus	Little Curlew	PMST
Limosa lapponica	Bar-tailed Godwit	2018
Tringa brevipes	Grey-tailed Tattler	2005
Actitis hypoleucos	Common Sandpiper	2015
Tringa nebularia	Common Greenshank	2015
Tringa stagnatilis	Marsh Sandpiper	2003
Xenus cinereus	Terek Sandpiper	2000
Calidris ferruginea	Curlew Sandpiper	2019
Calidris ruficollis	Red-necked Stint	2015
Calidris acuminata	Sharp-tailed Sandpiper	2014
Calidris canutus	Red Knot	2017
Calidris tenuirostris	Great Knot	2012
Calidris alba	Sanderling	2019
Calidris melanotos	Pectoral Sandpiper	2006
Limosa limosa	Black-tailed Godwit	2006
Motacilla flava	Yellow Wagtail	PMST
Rhipidura rufifrons	Rufous Fantail	2012
Myiagra cyanoleuca	Satin Flycatcher	2012
Balaenoptera borealis	Sei Whale	PMST
Megaptera novaeangliae australis	Southern Humpback Whale	PMST
Balaena glacialis australis	Southern Right Whale	PMST
Lagenorhynchus obscurus	Dusky Dolphin	PMST
Eubalaena australis	Southern Right Whale	2018
Caperea marginata	Pygmy Right Whale	PMST
Balaenoptera musculus	Blue Whale	1979
Balaenoptera physalus	Fin Whale	PMST
Orcinus orca	Killer Whale	PMST
Chelonia mydas	Green Turtle	PMST
Dermochelys coriacea	Leathery Turtle	2013
Caretta caretta	Loggerhead Turtle	1991
Lamna nasus	Porbeagle	PMST
Carcharodon carcharias	Great White Shark	PMST

A3.4 Bird utilisation survey results

Table A3.4 List of bird species recorded at each BUS point

Survey point	Habitat type	Other species
C1	Wetland	Australasian Grebe, Australian Magpie, Australian Pelican, Australian Raven, Australian Shelduck, Australian White Ibis, Black-faced Cormorant, Black Swan, Blue-winged Parrot, Chestnut Teal, Common Starling, Crested Tern, Eurasian Coot, European Goldfinch, Great Cormorant, Eastern Great Egret, Grey Fantail, Grey Shrike-thrush, Grey Teal, Hoary-headed Grebe, Little Black Cormorant, Little Pied Cormorant, Little Raven, Magpie-lark, Masked Lapwing, Musk Duck, Pacific Black Duck, Pied Cormorant, Pied Oystercatcher, Plumed Egret, Purple-crowned Lorikeet, Red-browed Finch, Red-necked Stint, Red-rumped Parrot, Red-tailed Black-Cockatoo, Royal Spoonbill, Sanderling, Silvereye, Silver Gull, Spiny-cheeked Honeyeater, Superb Fairy-wren, Swamp Harrier, Wedge-tailed Eagle, Welcome Swallow, White-browed Scrubwren, White-faced Heron, Willie Wagtail, Yellow-faced Honeyeater, Bar-tailed Godwit, Brown Falcon, Common Blackbird, Crimson Rosella, Eastern Yellow Robin, Forest Raven, Galah, Golden Whistler, Grey Plover, Hardhead, Hooded Plover, Plumed Egret, Little Corella, Little Egret, Pied Currawong
C2	Native woodland	Australian Raven, Blue-winged Parrot, Brown Thornbill, Crimson Rosella, Eastern Yellow Robin, European Goldfinch, Grey Fantail, Grey Shrike-thrush, Little Raven, Peregrine Falcon, Red-browed Finch, Red Wattlebird, Sacred Kingfisher, Silvereye, Striated Thornbill, Superb Fairy-wren, Wedge-tailed Eagle, White-browed Scrubwren, White-throated Needletail, White-throated Treecreeper, Yellow-faced Honeyeater, Brolga, Brown-headed Honeyeater, Common Blackbird, Common Bronzewing, Eastern Spinebill, Eurasian Skylark, Fan-tailed Cuckoo, Galah, Golden Whistler, Grey Currawong, Laughing Kookaburra, Little Wattlebird, Long-billed Corella, Pied Currawong, Rufous Bristlebird, Spotted Quail-thrush, White-browed Treecreeper, White-cheeked Honeyeater, White-naped Honeyeater
C3	Pine	Australian Magpie, Australian Raven, Brown Thornbill, Crimson Rosella, Emu, Flame Robin, Grey Shrike-thrush, Pied Currawong, Scarlet Robin, Striated Thornbill, Superb Fairy-wren, Weebill, White-browed Scrubwren, White-winged Chough, Yellow-tailed Black-Cockatoo, Fan-tailed Cuckoo, Grey Currawong, Grey Fantail, Laughing Kookaburra, Short-tailed Shearwater
C4	Pine	Australian Magpie, Australian Raven, Blue-winged Parrot, Brown Thornbill, Crimson Rosella, Flame Robin, Forest Raven, Grey Currawong, Little Raven, Pied Currawong, Scarlet Robin, Silvereye, Superb Fairy-wren, White-browed Scrubwren, White-plumed Honeyeater, Yellow-tailed Black-Cockatoo, Brush Bronzewing, Fan-tailed Cuckoo, Golden Whistler, Grey Fantail, Grey Shrike-thrush, Red Wattlebird, Striated Thornbill

Survey point	Habitat type	Other species
C5	Farmland	Australian Magpie, Australian Raven, Black-faced Cuckoo-shrike, Brown Thornbill, Common Starling, Eurasian Skylark, Galah, Grey Currawong, Little Raven, Little Wattlebird, Magpie-lark, New Holland Honeyeater, Pied Currawong, Red Wattlebird, Silvereye, Singing Honeyeater, Straw-necked Ibis, Striated Thornbill, Sulphur-crested Cockatoo, Superb Fairy-wren, Welcome Swallow, White-browed Scrubwren, White-eared Honeyeater, Yellow-faced Honeyeater, Yellow-tailed Black-Cockatoo, Common Blackbird, Crimson Rosella, Eastern Spinebill, Fan-tailed Cuckoo, Forest Raven, Grey Shrike-thrush, Rufous Bristlebird
C6	Farmland, Native woodland	Australian Magpie, Australian Raven, Brolga, Brown Falcon, Brown-headed Honeyeater, Brown Thornbill, Collared Sparrowhawk, Crested Tern, Crimson Rosella, Eastern Spinebill, Galah, Gang-gang Cockatoo, Golden Whistler, Grey Currawong, Grey Fantail, Grey Shrike-thrush, Jacky Winter, Little Raven, Masked Lapwing, New Holland Honeyeater, Peregrine Falcon, Red-browed Finch, Straw-necked Ibis, Striated Thornbill, Sulphur-crested Cockatoo, Superb Fairy-wren, Swamp Harrier, Wedge-tailed Eagle, Welcome Swallow, White-browed Scrubwren, White-faced Heron, White-throated Needletail, White-throated Treecreeper, Willie Wagtail, Yellow-faced Honeyeater, Yellow-tailed Black-Cockatoo, Blue-winged Parrot, Eastern Yellow Robin, Forest Raven, Laughing Kookaburra, Magpie-lark, Olive Whistler, Pied Currawong, Red Wattlebird
C7	Farmland	Australian Magpie, Australian Pelican, Australian Raven, Australian Shelduck, Australian White Ibis, Black-faced Cuckoo-shrike, Black-shouldered Kite, Black Swan, Blue-winged Parrot, Brolga, Chestnut Teal, Common Blackbird, Common Starling, Crested Tern, Crimson Rosella, European Goldfinch, Fairy Martin, Galah, Great Cormorant, Grey Fantail, Grey Shrike-thrush, Grey Teal, Little Egret, Little Pied Cormorant, Little Raven, Long-billed Corella, Magpie-lark, Masked Lapwing, Musk Duck, New Holland Honeyeater, Pacific Black Duck, Red-browed Finch, Royal Spoonbill, Silvereye, Silver Gull, Straw-necked Ibis, Striated Thornbill, Sulphur-crested Cockatoo, Superb Fairy-wren, Swamp Harrier, Wedge-tailed Eagle, Welcome Swallow, White-browed Scrubwren, White-eared Honeyeater, White-faced Heron, White-necked Heron, White-naped Honeyeater, Willie Wagtail, Eurasian Skylark, Laughing Kookaburra, Little Wattlebird, Red Wattlebird, Rufous Bristlebird, Yellow-faced Honeyeater

Survey point	Habitat type	Other species
C8	Farmland, Native woodland	Australian Hobby, Australian Magpie, Australian Raven, Australian Shelduck, Blue-winged Parrot, Brown Thornbill, Brush Bronzewing, Buff-rumped Thornbill, Common Starling, Crimson Rosella, Eastern Spinebill, Eastern Yellow Robin, Galah, Grey Currawong, Grey Fantail, Grey Shrike-thrush, Little Raven, Magpie-lark, New Holland Honeyeater, Pacific Black Duck, Pied Currawong, Red Wattlebird, Rufous Bristlebird, Scarlet Robin, Silvereye, Striated Thornbill, Sulphur-crested Cockatoo, Superb Fairy-wren, Wedge-tailed Eagle, Welcome Swallow, White-browed Scrubwren, White-cheeked Honeyeater, White-faced Heron, White-naped Honeyeater, White-throated Treecreeper, Willie Wagtail, Yellow-faced Honeyeater, Yellow-rumped Thornbill, Yellow-tailed Black-Cockatoo, Yellow Thornbill, Brown-headed Honeyeater, Common Blackbird, Eurasian Skylark, Olive Whistler, Spotted Pardalote, White-fronted Honeyeater
C9	Native woodland	Australian Shelduck, Blue-winged Parrot, Brown-headed Honeyeater, Brown Thornbill, Crescent Honeyeater, Crimson Rosella, Eastern Spinebill, Eastern Yellow Robin, Forest Raven, Grey Fantail, Grey Shrike-thrush, Little Raven, Pied Currawong, Striated Thornbill, Sulphur-crested Cockatoo, Superb Fairy-wren, White-browed Scrubwren, White-necked Heron, Yellow-faced Honeyeater, Yellow-tailed Black-Cockatoo, Black-faced Cuckoo-shrike, Common Blackbird, Fan-tailed Cuckoo, Golden Whistler, Grey Currawong, Laughing Kookaburra, Olive Whistler, Red-tailed Black-Cockatoo, Red Wattlebird, Rose Robin, Rufous Whistler, Shining Bronze-Cuckoo, Spotted Pardalote, Striated Pardalote
C10	Farmland	Australian Hobby, Australian Magpie, Australian Raven, Australian Shelduck, Australian White Ibis, Blue-winged Parrot, Brown Falcon, Brown Thornbill, Chestnut Teal, Common Starling, Crimson Rosella, Eastern Yellow Robin, European Goldfinch, Galah, Golden Whistler, Grey Fantail, Grey Shrike-thrush, Little Raven, Little Wattlebird, Masked Lapwing, New Holland Honeyeater, Pied Currawong, Red-browed Finch, Red Wattlebird, Silvereye, Silver Gull, Straw-necked Ibis, Striated Thornbill, Sulphur-crested Cockatoo, Superb Fairy-wren, Swamp Harrier, Wedge-tailed Eagle, Welcome Swallow, White-browed Scrubwren, White-faced Heron, Whistling Kite, Willie Wagtail, Yellow-faced Honeyeater, Yellow-tailed Black-Cockatoo, Brown-headed Honeyeater, Eurasian Skylark, Magpie-lark, Rufous Bristlebird, White-fronted Honeyeater, White-throated Treecreeper, White-plumed Honeyeater
T1	Pine, Farmland	Australian Magpie, Australian Raven, Brown Thornbill, Crimson Rosella, Eastern Yellow Robin, European Goldfinch, Forest Raven, Galah, Grey Currawong, Grey Shrike-thrush, Little Raven, Nankeen Kestrel, Pied Currawong, Red-browed Finch, Silvereye, Superb Fairy-wren, Wedge-tailed Eagle, Welcome Swallow, White-browed Scrubwren, Yellow-tailed Black-Cockatoo, Brown Songlark, Eurasian Skylark, Grey Fantail, Little Wattlebird, Red Wattlebird, Striated Thornbill, Stubble Quail, Sulphur-crested Cockatoo

Survey point	Habitat type	Other species
T2	Farmland	Australian Magpie, Australian Raven, Australian Shelduck, Brolga, Brown Falcon, Chestnut Teal, Common Starling, Crimson Rosella, Eastern Rosella, European Goldfinch, Eurasian Skylark, Forest Raven, Galah, Grey Currawong, Grey Shrike-thrush, Horsfield's Bushlark, Little Raven, Little Wattlebird, Magpie-lark, Nankeen Kestrel, New Holland Honeyeater, Pacific Black Duck, Pied Currawong, Red-rumped Parrot, Red Wattlebird, Silvereye, Straw-necked Ibis, Superb Fairy-wren, Swamp Harrier, Welcome Swallow, White-faced Heron, Willie Wagtail, Yellow-rumped Thornbill, Blue-winged Parrot, Common Blackbird, Eastern Yellow Robin, Golden Whistler, Grey Teal, Stubble Quail
T3	Farmland	Australian Hobby, Australian Magpie, Australian Pipit, Australian Raven, Australian White Ibis, Blue-winged Parrot, Common Starling, Crested Pigeon, Crimson Rosella, Eastern Yellow Robin, European Goldfinch, Eurasian Skylark, Galah, Grey Fantail, Grey Shrike-thrush, Little Raven, Magpie-lark, New Holland Honeyeater, Pied Currawong, Plumed Egret, Purple-crowned Lorikeet, Red Wattlebird, Rufous Bristlebird, Silvereye, Striated Fieldwren, Straw-necked Ibis, Superb Fairy-wren, Swamp Harrier, Wedge-tailed Eagle, Welcome Swallow, White-fronted Chat, White-faced Heron, White-throated Needletail, Willie Wagtail, Yellow-tailed Black-Cockatoo, Brush Bronzewing, Common Blackbird, Forest Raven, Grey Currawong, Horsfield's Bushlark, Masked Lapwing, Red-rumped Parrot, Yellow-faced Honeyeater
T4	Pine	Australian Magpie, Australian Raven, Brown Thornbill, Brush Bronzewing, Common Blackbird, Crimson Rosella, European Goldfinch, Galah, Grey Currawong, Grey Shrike-thrush, Little Raven, Pied Currawong, Plumed Egret, Purple-crowned Lorikeet, Rufous Bristlebird, Silvereye, Superb Fairy-wren, Wedge-tailed Eagle, Willie Wagtail, Yellow-tailed Black-Cockatoo, Rufous Bristlebird, Eastern Spinebill, Eastern Yellow Robin, Golden Whistler, Grey Fantail, Laughing Kookaburra, Olive Whistler, Red Wattlebird, Striated Thornbill, Sulphur-crested Cockatoo, White-browed Scrubwren, White-browed Treecreeper, White-throated Treecreeper, Yellow-faced Honeyeater
T5	Pine	Australian Magpie, Australian Raven, Black-faced Cuckoo-shrike, Brown Falcon, Brown Thornbill, Buff-rumped Thornbill, Crimson Rosella, European Goldfinch, Galah, Grey Currawong, Grey Fantail, Grey Shrike-thrush, Laughing Kookaburra, Little Raven, Pied Currawong, Red Wattlebird, Scarlet Robin, Silvereye, Striated Thornbill, Superb Fairy-wren, White-browed Scrubwren, White-eared Honeyeater, White-throated Needletail, Yellow-faced Honeyeater, Yellow-tailed Black-Cockatoo, Blue-winged Parrot, Common Blackbird, Eastern Spinebill, Eastern Yellow Robin, Fan-tailed Cuckoo, Flame Robin, Forest Raven, Golden Whistler, Little Wattlebird, Magpie-lark, New Holland Honeyeater, White-throated Treecreeper

Survey point	Habitat type	Other species
T6	Pine	Australian Magpie, Australian Raven, Brown Falcon, Brown Thornbill, European Goldfinch, Galah, Little Raven, Pied Currawong, Striated Thornbill, Superb Fairy-wren, Wedge-tailed Eagle, White-browed Scrubwren, White-throated Needletail, Yellow-tailed Black-Cockatoo, Brush Bronzewing, Common Blackbird, Crimson Rosella, Eastern Yellow Robin, Fan-tailed Cuckoo, Golden Whistler, Grey Currawong, Grey Shrike-thrush, Red Wattlebird, Rufous Bristlebird, Silvereye, Singing Honeyeater, Yellow-faced Honeyeater
T7	Wetland, Native woodland	Australian Raven, Brown Falcon, Brown Thornbill, Common Bronzewing, Crimson Rosella, European Goldfinch, Grey Shrike-thrush, Little Raven, Little Wattlebird, New Holland Honeyeater, Pied Currawong, Red Wattlebird, Silvereye, Superb Fairy-wren, Wedge-tailed Eagle, Welcome Swallow, White-throated Needletail, Eastern Yellow Robin, Galah, Singing Honeyeater, Swamp Harrier, White-browed Scrubwren, Brush Bronzewing, Fan-tailed Cuckoo, Golden Whistler, Grey Currawong, Grey Fantail, Olive Whistler, Rufous Bristlebird, Horsfield's Bronze-Cuckoo, Yellow-faced Honeyeater
T8	Pine	Australian Raven, Brown Thornbill, Crimson Rosella, Grey Currawong, Grey Fantail, Grey Shrike-thrush, Little Raven, Pied Currawong, Red Wattlebird, Silvereye, Superb Fairy-wren, Wedge-tailed Eagle, White-browed Scrubwren, White-throated Needletail, Yellow-tailed Black-Cockatoo, Australian Magpie, Black-faced Cuckoo-shrike, Common Blackbird, Eastern Yellow Robin, Eurasian Skylark, Fan-tailed Cuckoo, Olive Whistler, Striated Thornbill, Yellow-faced Honeyeater
T9	Pine	Australian Magpie, Australian Pipit, Australian Raven, Black Swan, Blue-winged Parrot, Brush Bronzewing, Eurasian Skylark, Grey Currawong, Little Raven, Masked Lapwing, Silvereye, Superb Fairy-wren, Wedge-tailed Eagle, Welcome Swallow, White-fronted Chat, European Goldfinch, Fan-tailed Cuckoo, Pied Currawong
T10	Pine	Australian Magpie, Blue-winged Parrot, Crimson Rosella, Forest Raven, Galah, Grey Shrike-thrush, Little Raven, Pied Currawong, Wedge-tailed Eagle, White-browed Scrubwren, White-faced Heron, White-throated Needletail, Australian Raven, Brown Thornbill, Common Blackbird, Common Bronzewing, Eastern Yellow Robin, Fan-tailed Cuckoo, Golden Whistler, Grey Currawong, Grey Fantail, Olive Whistler, Rufous Whistler, Striated Thornbill, Superb Fairy-wren, Yellow-tailed Black-Cockatoo

Survey point	Habitat type	Other species
T11	Wetland	Australasian Grebe, Australian Raven, Australian Shelduck, Black Swan, Blue-winged Parrot, Brown Falcon, Brown Thornbill, Chestnut Teal, Crimson Rosella, Eurasian Coot, Galah, Grey Fantail, Grey Shrike-thrush, Hoary-headed Grebe, Horsfield's Bronze-Cuckoo, Plumed Egret, Little Egret, Little Pied Cormorant, Little Raven, Magpie-lark, Musk Duck, New Holland Honeyeater, Pacific Black Duck, Pied Currawong, Plumed Egret, Purple-crowned Lorikeet, Red Wattlebird, Silvereye, Superb Fairy-wren, Swamp Harrier, Tree Martin, Welcome Swallow, White-browed Scrubwren, White-faced Heron, Yellow-tailed Black-Cockatoo, Australian Magpie, Australian Pipit, Common Blackbird, Crested Pigeon, European Goldfinch, Fan-tailed Cuckoo, Great Crested Grebe, Grey Currawong, Olive Whistler, Rufous Bristlebird, Singing Honeyeater
T12	Wetland, pine	Black Swan, Brown Falcon, Brown Goshawk, Brown Thornbill, Crimson Rosella, Eastern Rosella, Fairy Martin, Forest Raven, White-throated Needletail, Galah, Grey Fantail, Little Raven, New Holland Honeyeater, Pied Currawong, Red Wattlebird, Silvereye, Superb Fairy-wren, Swamp Harrier, Tree Martin, Wedge-tailed Eagle, Welcome Swallow, White-browed Scrubwren, Australian Magpie, Bassian Thrush, Common Blackbird, Common Bronzewing, Eastern Yellow Robin, Fan-tailed Cuckoo, Golden Whistler, Grey Currawong, Grey Shrike-thrush, Horsfield's Bronze-Cuckoo, Little Wattlebird, Masked Lapwing, Olive Whistler, Rufous Bristlebird, Rufous Whistler, Yellow-tailed Black-Cockatoo
T13	Pine	Australian Magpie, Australian Raven, Brown Thornbill, Crimson Rosella, Emu, Forest Raven, Galah, Little Raven, Pied Currawong, Red Wattlebird, Scarlet Robin, Silvereye, Superb Fairy-wren, White-browed Scrubwren, Yellow-tailed Black-Cockatoo, Common Blackbird, Eastern Shrike-tit, Eastern Yellow Robin, Fan-tailed Cuckoo, Grey Currawong, Grey Fantail, Grey Shrike-thrush, White-throated Treecreeper
T14	Pine	Australian Magpie, Australian Raven, Brown Thornbill, Crimson Rosella, European Goldfinch, Forest Raven, Gang-gang Cockatoo, Grey Fantail, Grey Shrike-thrush, Little Raven, Pied Currawong, Red Wattlebird, Rufous Bristlebird, Silvereye, Superb Fairy-wren, Wedge-tailed Eagle, Yellow-faced Honeyeater, Yellow-tailed Black-Cockatoo, Yellow Thornbill, Black-faced Cuckoo-shrike, Blue-winged Parrot, Common Blackbird, Eastern Yellow Robin, Golden Whistler, Grey Currawong, New Holland Honeyeater, Striated Thornbill, White-browed Scrubwren, White-throated Treecreeper

Survey point	Habitat type	Other species
T15	Wetland, Farmland	Australian Magpie, Australian Raven, Australian Shelduck, Australian White Ibis, Black Swan, Blue-winged Parrot, Brolga, Brown Falcon, Common Starling, Emu, European Goldfinch, Eurasian Skylark, Forest Raven, Galah, Little Raven, Magpie-lark, Masked Lapwing, Pied Currawong, Red-browed Finch, Red Wattlebird, Royal Spoonbill, Straw-necked Ibis, Sulphur-crested Cockatoo, Swamp Harrier, Wedge-tailed Eagle, Welcome Swallow, White-fronted Chat, White-faced Heron, Willie Wagtail, Yellow-tailed Black-Cockatoo, Australian Pipit, Common Bronzewing, Grey Currawong, Grey Shrike-thrush, Stubble Quail, Superb Fairy-wren
T16	Pine, Blue gum	Australian Magpie, Australian Raven, Black-faced Cuckoo-shrike, Brown-headed Honeyeater, Brown Thornbill, Crimson Rosella, Emu, Forest Raven, Gang-gang Cockatoo, Grey Fantail, Grey Shrike-thrush, Little Raven, New Holland Honeyeater, Pied Currawong, Red Wattlebird, Scarlet Robin, Silvereye, Striated Thornbill, Superb Fairy-wren, White-browed Scrubwren, White-naped Honeyeater, Yellow-faced Honeyeater, Yellow-rumped Thornbill, Yellow-tailed Black-Cockatoo, Eastern Spinebill, Eastern Shrike-tit, Eastern Yellow Robin, Grey Currawong, Spotted Pardalote, White-eared Honeyeater
T17	Pine	Australian Magpie, Australian Pipit, Australian Raven, Australian Shelduck, Black-faced Cuckoo-shrike, Blue-winged Parrot, Common Starling, Crimson Rosella, Emu, European Goldfinch, Eurasian Skylark, Galah, Grey Currawong, Little Raven, Pied Currawong, Red Wattlebird, Straw-necked Ibis, Sulphur-crested Cockatoo, Swamp Harrier, Tree Martin, Wedge-tailed Eagle, Welcome Swallow, White-fronted Chat, Yellow-tailed Black-Cockatoo, Australian Wood Duck, Brolga, Eastern Spinebill, Grey Shrike-thrush, Laughing Kookaburra, Magpie-lark, Superb Fairy-wren, White-eared Honeyeater, Willie Wagtail, Yellow-faced Honeyeater

Appendix 4 Photographs

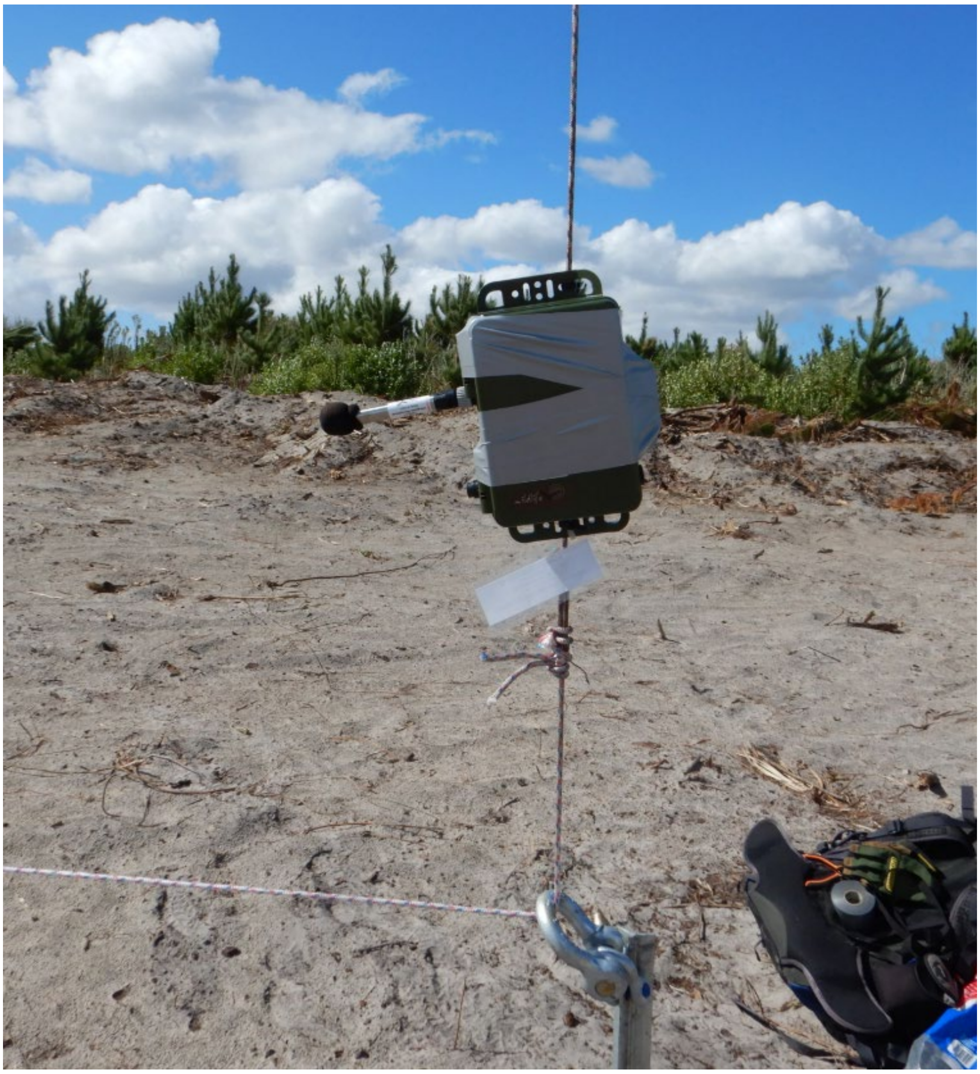

Plate 1 Songmeter acoustic detector at mast showing pulley system

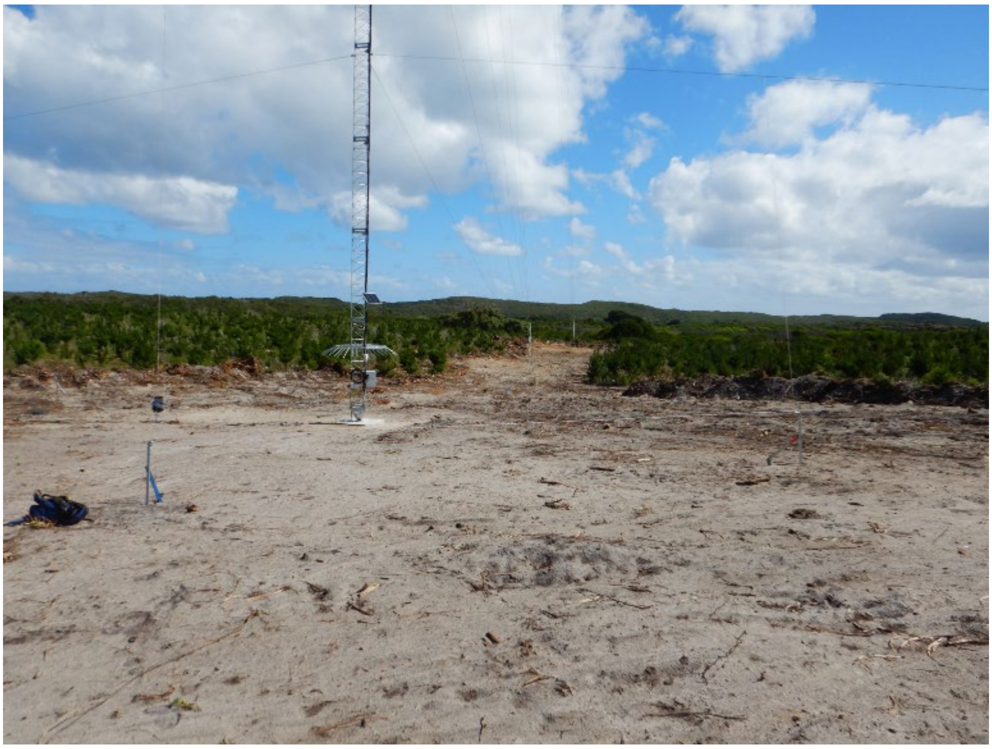

Plate 2 Base of met mast 3

Plate 3 Mature Pine plantation

Plate 4 Young Pine plantation

Plate 5 Recently cleared and re-established Pine plantation

Plate 6 Pine plantation showing understorey colonised by sedges *Lepidosperma* spp.

Plate 7 Internal access track through Pine plantation

Plate 8 Native vegetation along Johnsons Road, looking south

Plate 9 Small patch of remnant vegetation within the Pine plantation

Plate 10 **Remnant tree (Drooping Sheoak *Allocasuarina verticillata*) within the Pine Plantation area**

Plate 11 **Blue gum plantation in the eastern portion of the Project Area**

Plate 12 Farmland dominated by introduced pasture species

Plate 13 Farmland area with vegetated dunes (Coastal Alkaline Scrub) in the background

Plate 14 Farmland in the eastern section of the wind farm area

Plate 15 Potential underground grid route beneath Boiler Swamp Road. Lowland Forest EVC

Plate 16 Potential underground grid route beneath Boiler Swamp Road. Sedgy Riparian Woodland EVC

Plate 17 Interdunal heathland vegetation, where an Orange-bellied Parrot was observed and heard on 2^{9t}h May 2020

Plate 18 One of three Striped Worm-lizards *Aprasia striolata* found on Johnsons Road beneath surface limestone rocks on 17 December 2020.

Plate 19 One of two Swamp Skinks *Lissolepis coventryi* found basking on a log in a densely vegetated *Melaleuca* swamp at the southern end of Johnsons Road on 15 December 2020.

Plate 20 Four-toed Skink *Hemiergis peronii*. This individual was recorded frequently beneath tiles in the Project Area, both in the core and edge of pine and blue gum plantations

Plate 21 DELWP Mapped wetland #20636, showing areas of Red-fruit Saw-sedge *Gahnia sieberiana* and scrambling Bower Spinach *Tetragonia implexicoma*.

Plate 22 Section of mapped wetland #20522, showing wetlands associated with drainage lines.

Plate 23 Wetland associated with a drainage line just outside mapped wetland #20522, where a Brolga breeding attempt was recorded.

Plate 24 Wetland in depression approximately 100 metres west of mapped wetland #20532.

Plate 25 Open water wetland located 100 m east of mapped wetland #20532, and 50 metres south of the Lower Glenelg National Park boundary.

**Plate 26	Wetland surrounded by Wet Heathland and Heathy Woodland, within Kentbruck H50 Bushland Reserve and mapped wetland #20522.**

**Plate 27	Wetland surrounded by Wet Heathland within Lower Glenelg National Park, approximately 100 metres north of the park boundary, within mapped wetland #20532.**

Plate 28 Large seasonal wetland in grazing paddock approximately 500 metres north-west of the Heywood Terminal Station.

Plate 29 Aquatic plants in seasonal wetland in drainage line in grazing paddock approximately 500 metres west of the Heywood Terminal Station.

Plate 30 Wetland within drainage line, with scattered River Red Gum, in grazing paddock approximately 500 metres west of the Heywood Terminal Station.

Plate 31 Surrey River at Jennings Road, showing marginal Tall Marsh dominated by Common Reed *Phragmites australis*.

Plate 32 Wetland #20508, near "The Sheepwash" showing dense cover of Coast Wattle *Acacia longifolia* subsp. *sophorae*.

Plate 33 Wetland #20505, near "The Sheepwash" showing dense cover of Coast Wattle Acacia sophorae *Acacia longifolia* subsp. *sophorae* and Bower Spinach *Tetragonia implexicoma*.

Plate 34 Overlooking wetland #20512, near "The Sheepwash" showing dense cover of Coast Wattle Acacia sophorae *Acacia longifolia* subsp. *sophorae* with some Woolly Tea-tree *Leptospermum lanigerum* near the centre of the wetland.

Appendix 5 Survey effort and results

Table A5.1 Details of Orange-bellied Parrot surveys, May 2020 to August 2020 (sunrise/sunset times from Portland)

Date	Location	First light Sunrise	Sunset Last light	Time start	Time end	Temp. (°C)	Wind direction and speed km/h	Precipitation	Cloud	Observers
29/5/2020	Nobles Rocks	7:10 7:39	17:22 17:51	07:49	09:45	7.5	N light	Nil	<1/8	IV, CEP
29/5/2020	Swan Lake	7:10 7:39	17:22 17:51	15:30	17:30	15.8	NNW moderate	Nil	2/8	IV, CEP
29/6/2020	Swan Lake	7:21 7:51	17:22 17:52	7:58	9:50	3.7	N 9	Nil	0	CEP, MJJ
29/6/2020	Swan Lake	7:21 7:51	17:22 17:52	15:38	17:23	14.8	N 2	Nil	0	MJJ, IS
29/6/2020	Nobles Rocks	7:21 7:51	17:22 17:52	15:53	17:41	13.7	N 3.4	Nil	0	CEP, DCG
30/6/2020	Swan Lake	7:21 7:51	17:23 17:52	7:47	10:10	11.7	N 5	Nil	2/8	MJJ, DCG
30/6/2020	Nobles Rocks	7:21 7:51	17:23 17:52	7:27	9:49	8.4	NNE 12	Nil	7/8	CEP, IS
30/6/2020	Swan Lake	7:21 7:51	17:23 17:52	15:30	17:00	14.4	NW 9	Nil	2/8	MJJ, DCG
30/6/2020	Nobles Rocks	7:21 7:51	17:23 17:52	15:53	17:42	13.4	N 1	Nil	2/8	CEP, IS
21/7/2020	Swan Lake	7:14 7:43	17:36 18:05	7:46	10:18	9.0	SW 4	Nil	8/8	IV, MJJ
21/7/2020	Nobles Rocks	7:14 7:43	17:36 18:05	7:53	9:46	7.5	NW 2	Nil	8/8	CEP, JF
21/7/2020	Swan Lake	7:14 7:43	17:36 18:05	15:36	17:47	11.8	SSW 17	Nil	4/8	IV, MJJ
21/7/2020	Nobles Rocks	7:14 7:43	17:36 18:05	15:52	17:51	13.6	N 10.3	Nil	5/8	CEP, JF
22/7/2020	Swan Lake	7:13 7:42	17:37 18:06	7:47	9:34	11.00	SW 8.6	Fog/periodic drizzle	8/8	CEP, JF
22/7/2020	Nobles Rocks	7:13 7:42	17:37 18:06	7:45	10:25	9.0	W 13.0	Fog/periodic drizzle	8/8	IV, MJJ

Date	Location	First light Sunrise	Sunset Last light	Time start	Time end	Temp. (°C)	Wind direction and speed km/h	Precipitation	Cloud	Observers
22/7/2020	Swan Lake	7:13 7:42	17:37 18:06	13:50	17:19	12.0	SW 16.0	Nil	3/8	CEP, JF
22/7/2020	Nobles Rocks	7:13 7:42	17:37 18:06	15:46	18:17	11.0	W 10.0	Nil	7/8	IV, MJJ
25/8/2020	Swan Lake	6:37 7:04	18:06 18:33	7:06	10:15	7.5	0	Fog/periodic drizzle	6/8	IV, MSG
25/8/2020	Nobles Rocks	6:37 7:04	18:06 18:33	6:25	8:10	7.6	WNW 13	Fog/periodic drizzle	7/8	GZ, IS
25/8/2020	Swan Lake	6:37 7:04	18:06 18:33	16:55	18:53	12	WSW 13	Nil	6/8	IV, MSG
25/8/2020	Nobles Rocks	6:37 7:04	18:06 18:33	16:25	18:10	9.5	WNW 15	Nil	7/8	GZ, IS
26/8/2020	Swan Lake	6:36 7:03	18:07 18:33	16:39	18:36	9.1	NNW 13	Nil	4/8	GZ, IS
26/8/2020	Nobles Rocks	6:36 7:03	18:07 18:33	16:51	18:29	15	N 13	Nil	5/8	IV, MSG
27/8/2020	Swan Lake	6:35 7:01	18:08 18:34	6:56	9:23	10.8	NW 17	Nil	7/8	GZ, IS
27/8/2020	Nobles Rocks	6:35 7:01	18:08 18:34	7:20	9:10	8	NNW 9	Nil	5/8	IV, MSG

Table A5.2 Orange-bellied parrot survey effort and results

Date	Location	Time start	Time end	Total survey hours	Number of Orange-bellied parrot recorded	Other *Neophema* parrots recorded (species, number for each observation)
29/5/2020	Nobles Rocks	07:49	09:45	1 hr 55 min	1	0
29/5/2020	Swan Lake	15:30	17:30	2 hr	0	0
29/6/2020	Swan Lake	7:58	9:50	1 hr 52 min	0	0
29/6/2020	Swan Lake	15:38	17:23	1 hr 45 min	0	0
29/6/2020	Nobles Rocks	15:53	17:41	1 hr 47 min	0	Blue-winged Parrot 6
30/6/2020	Swan Lake	7:47	10:10	2 hr 18 min	0	Blue-winged Parrot 7, 3, 1
30/6/2020	Nobles Rocks	7:27	9:49	2 hr 22 min	0	Blue-winged Parrot 5, 11

Date	Location	Time start	Time end	Total survey hours	Number of Orange-bellied parrot recorded	Other *Neophema* parrots recorded (species, number for each observation)
30/6/2020	Swan Lake	15:30	17:00	1 hr 30 min	0	0
30/6/2020	Nobles Rocks	15:53	17:42	1 hr 49 min	0	0
21/7/2020	Swan Lake	7:46	10:18	2 hr 32 min	0	Blue-winged Parrot 1
21/7/2020	Nobles Rocks	7:53	9:46	1 hr 53 min	0	0
21/7/2020	Swan Lake	15:36	17:47	2 hr 11 min	0	0
21/7/2020	Nobles Rocks	15:52	17:51	1 hr 59 min	0	0
22/7/2020	Swan Lake	7:47	9;34	1 hr 47 min	0	Blue-winged Parrot 2
22/7/2020	Nobles Rocks	7:45	10:25	2 hr 40 min	0	0
22/7/2020	Swan Lake	13:50	17:19	3 hr 29 min	0	0
22/7/2020	Nobles Rocks	15:46	18:17	2 hr 31 min	0	0
25/8/2020	Swan Lake	7:06	10:15	3 hr 9 min	0	Blue-winged Parrot 3
25/8/2020	Nobles Rocks	6:25	8:10	1 hr 45 min	0	0
25/8/2020	Swan Lake	16:55	18:53	1 hr 58 min	0	0
25/8/2020	Nobles Rocks	16:25	18:10	1 hr 45 min	0	0
26/8/2020	Swan Lake	16:39	18:36	1 hr 57 min	0	0
26/8/2020	Nobles Rocks	16:51	18:29	1 hr 38 min	0	0
27/8/2020	Swan Lake	6:56	9:23	1 hr 27 min	0	0
27/8/2020	Nobles Rocks	7:20	9:10	1 hr 50 min	0	Blue-winged Parrot 1
Total				**51 hr 49 min**	**1**	**40**

Table A5.3 Details of Brolga breeding flocking season surveys conducted monthly from December 2020 to June 2021 (sunrise/sunset times from Portland; NR = not recorded)

Date	First light Sunrise	Sunset Last light	Time	Temp (°C)	Wind direction and speed km/h	Precipitation	Cloud	Observers
DECEMBER								
16/12/21	5:32 6:04	20:54 21:25	5:00 12:00	14 13	S 27 ESE 17	Nil Medium rain	7/8 8/8	JF, WR
17/12/21	5:33 6:04	20:54 21:26	20:10	14	SW 9	Light rain	8/8	JF, WR
JANUARY								
23/01/21	6:06 6:36	20:54 21:24	6:04	10	N 1	Nil	7/8	ERB, IV
24/1/21	6:07 6:37	20:53 21:23	11:40	28	ENE 17	Nil	8/8	ERB
FEBRUARY								
24/2/21	6:45 7:12	20:20 20:47	11:45 20:07	17 15	SSW 6 SW 4	Light rain Nil	8/8 0	ERB ERB
25/2/21	6:46 7:13	20:19 20:46	7:02	10	N 15	Nil	6/8	ERB
MARCH								
29/3/21	7:19 7:45	19:31 19:57	11:30 18:31	18 15	NE 9 NE 7	Nil Nil	6/8 6/8	JF JF
30/3/21	7:19 7:46	19:29 19:55	6:49	15	NE 7	Nil	6/8	JF
APRIL								
27/4/21	6:44 7:12	17:50 18:17	11:30 16:51	15 13	NE 7 E 5	Nil Nil	6/8 8/8	JF
28/4/21	6:45 7:13	17:48 18:16	6:15	10	E 2	Nil	8/8	JF
MAY								
24/5/21	7:07 7:35	17:24 17:53	11:30 16:55	16 16	NE 11 NE 8	Nil Nil	3/8 8/8	JF
25/5/21	7:07 7:36	17:24 17:53	7:55	12	NE 6	Nil	8/8	JF

Table A5.4 Details of Brolga breeding season surveys, July 2020, September 2020 and November 2020 (sunrise/sunset times from Portland; NR = not recorded)

Date	Location	First light Sunrise	Sunset Last light	Time	Temp (°C)	Wind direction and speed km/h	Precipitation	Cloud	Observers
JULY									
21/7/2020	**Dawn**	7:14	17:36	7:29	9	SW 4	Nil	8/8	IV, CEP
	• Swan Lake	7:43	18:05						
	Roaming								
	• Swan Lake			11:27	11	W 7	Fog/periodic drizzle	8/8	
	• Telegraph/Post Office Rd			13:15	11	W 11		8/8	
	• Portland–Nelson/Post Office Rd			13:33	11	W 11	Fog/periodic drizzle	8/8	
	• Blacks Road 1, near Cobboboonee National Park			13:46	11	W 11	Fog/periodic drizzle	8/8	
	• Blacks Road 2, near Cobboboonee National Park			13:55	11	W 11		8/8	
	• Lower Glenelg National Park			14:23	11	W11	Fog/periodic drizzle	8/8	
	Dusk								
	• Swan Lake			18:02	X	X	X	X	
22/7/2020	**Roaming**								IV, MJJ
	Long Swamp, near	7:13	17:37	9:30	8.6	W 4	Nil		
	Nobles Rocks	7:42	18:06	9:30	12	SW 10	Nil		
				9:30	12	SW 10	Nil		
				17:01	9	W 11	Nil		
				17:25	10	W 4	Nil		

Date	Location	First light Sunrise	Sunset Last light	Time	Temp (°C)	Wind direction and speed km/h	Precipitation	Cloud	Observers
23/7/2020	**Dawn**								IV, CEP, JF
	• Private property Mt Kincaid Road, Gorae West	7:13 7:41	17:38 18:06	7:37 9:12	2 8	NNE 13 0	Nil Nil	3/8 8/8	
	• Private property Mt Kincaid Road, Gorae West			11:01	9.5	NW 7	Nil	8/8	
	• Private property, Johnsons Road, near McFarlanes Swamp			14:00	10.9	WNW 7	Nil	8/8	
	• Wetlands south of Portland–Nelson Road (scan from road)			14:15 15:02 15:28 15:40	10.5 10.4 10.4 10.2	WNW 13 WNW 13 WNW 13 WNW 11	Nil Nil Nil Nil	8/8 8/8 8/8 8/8	
	• Martin's Road			16:29	10	N11	Nil	8/8	
	• Hanns Rd/Mt Richmond Rd								
	• Hanns Rd/Mt Richmond Rd			18:29	9	0	Nil	8/8	
	• Wetland adjacent to road (need location/name of rd)								
	• Private property Mt Kincaid Road, Gorae West								
	Dusk								
	• Near Black's Road, Gorae West								
SEPTEMBER									
29/9/2020	**Dawn**	5:44	18:36						DG, JF, CEP, JBF
	• Kentbruck Settlement Road	6:10	19:03	6:09 6:20	11 9.1	NR NW 7.1	Nil Nil	1/8 1/8	
	• Swan Lake			7:19					
	Roaming								

Date	Location	First light Sunrise	Sunset Last light	Time	Temp (°C)	Wind direction and speed km/h	Precipitation	Cloud	Observers
	• PFOlsen blue gum plantation • PFOlsen blue gum plantation • PFOlsen blue gum plantation • PFOlsen blue gum plantation • PFOlsen blue gum plantation • PFOlsen blue gum plantation • PFOlsen blue gum plantation • PFOlsen blue gum plantation • Private property Mt Kincaid Road, Gorae West • South of Kentbruck Settlement road • PFOlsen blue gum plantation • Martin's Lane • Hanns Road • Stephens Road • Knights Swamp • Wetland not accessible • Mt Richmond National Park, south of Malseed Road • South of Bridgewater Lakes Road • Wetland not accessible • Wetland east of newtons Road • Wetland north of Bridgewater Road			7:35 7:50 8:13 8:57 9:08 9:13 9:41 9:49 10:45 10:59 11:53 12:25 12:36 13:04 13:09 13:16 13:28 13:36 14:02 14:17	12.3 13.2 20	NW 6.4 NW 8.7 N 5	Nil Nil Nil	2/8 3/8 8/8	

Date	Location	First light Sunrise	Sunset Last light	Time	Temp (°C)	Wind direction and speed km/h	Precipitation	Cloud	Observers
30/9/2020	**Dawn**	5:42	18:37						
	• Stephens Road	6:09	19:04	5:41	8	NW 5	Nil	2/8	
	Roaming								
	• Private property Mt Kincaid Road, Gorae West			7:11 8:45	15 11	NW15 N 25	Fog/periodic drizzle Nil	8/8 8/8	
	• Private property Mt Kincaid Road, Gorae West			10:05 10:25 11:01	12 15 15	N 15 N 10 NW 20	Nil Nil Fog/periodic drizzle	NR 8/8 8/8	
	• Blacks Road, Mt Richmond			11:10					
	• Kentbruck Settlement Road			11:19	11	N 20	Medium rain	8/8	
	• Wetland east of Beaugleholes Road			11:29 11:42					
	• Wetland north of Gorae Road			11:58	14	N 10	Light rain	8/8	
	• Wetland south of Gorae Road			12:05 12:06					
	• South of Gorae Road			12:28					
	• Wetland north of Pedrazzies Road			12:44					
	• Large wetland north of Pedrazzies Road			12:56 13:30	17	N 10	Nil	8/8	
	• South of Pedrazzies Road			17:41 18:00	12	N 8	Nil	7/8	
	• Gorae								
	• Wetland west of Holmes Road			18:34 18:35	11	W 13	Nil	2/8	
	• Large wetland north of Gorae Road								
	• Wetland in corner of paddock south of Gorae Road			18:38	13	W 15	Nil	2/8	

Date	Location	First light Sunrise	Sunset Last light	Time	Temp (°C)	Wind direction and speed km/h	Precipitation	Cloud	Observers
	• Bridgewater Lakes, Discovery Bay Coastal Park • Kentbruck Settlement Road • Kentbruck Settlement Road **Dusk** • Johnsons Road • Private property, Johnsons Road, near McFarlanes Swamp (BUS location T2) • Swan Lake								
1/10/2020	**Dusk** • Kentbruck Settlement Road • Private property Mt Kincaid Road, Gorae West	5:40 6:07	18:38 19:04	18:02 18:02	17.9 15	SW 2.1	Nil Nil	0 0	JF, CEP
NOVEMBER									
10/11/20	**Roaming** • Private property Mt Kincaid Road, Gorae West • Kentbruck Settlement Road	5:46 6:15	20:19 20:48	14:15 14:45	27.5 27.5	NNE 36 NNE 36	Nil Nil	0 0	MSG, JMU
12/11/20	**Roaming** • Martin Road, Gorae West	5:44 6:13	20:21 20:51	16:35	15	W 15	Nil	6/8	MSG, JMU
24/11/20	**Dawn** • Swan Lake **Roaming**	5:35 6:05	20:34 21:06	5:25	13	N 3	Nil	NR	

Date	Location	First light Sunrise	Sunset Last light	Time	Temp (°C)	Wind direction and speed km/h	Precipitation	Cloud	Observers
	• Swan Lake			18:13	18	W16	Nil	8/8	
25/11/20	**Dawn** • Long Swamp near Nobles Rocks	5:35 6:05	20:35 21:06	5:26	9.9	NE 4	Nil	8/8	
	Dusk • Private property Mt Kincaid Road, Gorae West			20:28	14	W 17	Nil	0	

Table A5.5 Incidental and bird utilisation survey records of White-throated Needletail.

Date	Time	Location	Number of individuals recorded
23/01/2020	Afternoon	Lake Mombeong	2
25/02/2021	Morning	C6	17
25/02/2021	Morning	C6	3
25/02/2021	Morning	C6	6
24/02/2021	Afternoon	T10	1
24/02/2021	Afternoon	T10	2
24/02/2021	Afternoon	T10	3
24/02/2021	Afternoon	T10	1
25/02/2021	Midday	T10	1
25/02/2021	Afternoon	T3	1
25/02/2021	Morning	T8	6
25/02/2021	Morning	T8	1
25/02/2021	Midday	T5	3
25/02/2021	Midday	T5	3
25/02/2021	Midday	T7	1
25/02/2021	Midday	T6	2
25/02/2021	Afternoon	C2	1
27/02/2020	Afternoon	600 metres north of Lake Mombeong at met mast 3	70
24/02/2021	Not recorded	T7	2
24/02/2021	Morning	T3	90
24/02/2021	Morning	T3	8

Table A5.6 Shorebird survey timing and survey effort (tide times from Portland and Glenelg River Estuary, HT = high tide, LT = low tide; - means not recorded).

Date	Spring or neap Tide, time, height (in meters)	Location (tide)	Time start	Time end	Temperature (°C)	Wind direction and speed km/h	Precipitation	Cloud	Observers
21/1/2020	Spring Portland HT 01:35 0.88 LT 13:21 0.31 Glenelg River Entrance HT 02:36, 0.87 LT 13:28 0.32	Swan Lake LT Shoreline near Swan Lake LT	11:33 13:20	11:46 14:40	18.8 18.8	E 5.0 SE 9.0	Nil Nil	2/8 <1/8	IV, CEP IV, CEP
23/1/2020	Spring Portland HT 01:28 1.04 LT 17:13 0.29 Glenelg River Entrance HT 02:38, 1.03 LT 18:00, 0.30	Cain Hut Swamp LT The Sheepwash LT Lake Mombeong LT Unnamed small wetland east of Lake Mombeong LT Glenelg Estuary LT	10:59 12:19 12:38 12:38 15:32	11:09 12:26 13:00 13:00 18:40	14.5 16.0 16.0 16.0 16.8	SW 12 SW 17 SW 20 SW 20 W 10.5	Drizzle/light rain/heavy rain Drizzle/light rain Drizzle/light rain Nil	7/8 5/8 2/8 2/8 7/8	IV, CEP IV, CEP IV, CEP IV, CEP IV, CEP
26/2/2020	Spring Portland LT 09:17 0.38 HT 14:50 0.84 Glenelg River Entrance LT 10:15 0.39 HT 15:42 0.79	Swan Lake LT Swan Lake HT Shoreline near Swan Lake HT	10:18 15:30 12:55	10:51 16:06 14:50	16.0 23.0 16.0	SW 22 WSW 10 SW 30	Nil Nil Nil	5/8 2/8 2/8	IV, CEP IV, CEP IV, CEP

Date	Spring or neap Tide, time, height (in meters)	Location (tide)	Time start	Time end	Temperature (°C)	Wind direction and speed km/h	Precipitation	Cloud	Observers
27/2/2020	Spring Portland LT 09:32 0.35 HT 15:18 0.88 Glenelg River Entrance LT 10:21 0.35 HT 16:03 0.84	Nobles Rocks shoreline HT	13:39	14:39	15.0	W 25	Nil	5/8	IV, CEP
		Lake Mombeong LT	11:20	11:34	15.0	NW 14	Nil	4/8	IV, CEP
		Unnamed small wetland east of Lake Mombeong LT	11:06	11:10	15.0	NW10	Nil	4/8	IV, CEP
		Lake Mombeong HT	16:02	16:08	18.2	W 12	Nil	4/8	IV, CEP
		Cain Hut Swamp LT	10:18	10:23	14.9	NWN 15	Nil	4/8	IV, CEP
		Cain Hut Swamp HT	16:44	16:48	18	W 18	Nil	7/8	IV, CEP
		The Sheepwash LT	10:37	10:43	14.9	WNW 13	Nil	8/8	IV, CEP
		The Sheepwash HT	16:27	16:37	18	W 15	Nil	8/8	IV, CEP
28/2/2020	Spring Portland LT 09:46 0.32 HT 15:46 0.90 Glenelg River Entrance LT 10:33 0.31 HT 16:29 0.87	Glenelg Estuary LT	8:54	10:18	13.9	WNW 9	Nil	4/8	IV, CEP
		Glenelg Estuary HT	13:55	15:29	18.8	WSW 7	Nil	4/8	IV, CEP

Date	Spring or neap Tide, time, height (in meters)	Location (tide)	Time start	Time end	Temperature (°C)	Wind direction and speed km/h	Precipitation	Cloud	Observers
22/7/2020	Spring Portland LT 06:15 0.35 HT 14:01 1.30 Glenelg River Entrance LT 6:49 0.29 HT 14:38 1.25	Nobles Rocks shoreline LT	7:50	8:15	9.3	W 13	Nil	8/8	IV, MJ
		Nobles Rocks shoreline HT	15:46	16:10	10.8	SW 7	Nil	7/8	IV, MJ
		Shoreline near Swan Lake LT	7:47	8:20	11.0	SW 8.6	Fog/periodic drizzle	8/8	CEP, JF
		Shoreline near Swan Lake HT	13:50	15:32	12.0	SW 16	Nil	3/8	CEP, JF
		Swan Lake HT	12:50	13:01	12.9	SW 6	Nil	7/8	CEP, JF
		Glenelg Estuary HT	12:38	-	11.1	WNW 7	Nil	8/8	IV, MJ
		Lake Mombeong HT	14:42	14:47	11.0	WSW 12	Nil	7/8	IV, MJ
		Unnamed small wetland east of Lake Mombeong HT	14:59	15:02	11.0	WSW 12	Nil	7/8	IV, MJ
		Unnamed wetland south of Lake Mombeong HT	14:59	15:02	11.0	WSW 12	Nil	7/8	IV, MJ
23/7/2020	Spring Portland LT 06:50 0.34 HT 14:27 1.26 Glenelg River Entrance LT 7:22 0.29 HT 15:06 1.21	Glenelg Estuary HT	8:37	10:01	7.7	WNW 5.5	Nil	8/8	IV
24/11/2020	Neap Portland HT 06:06 0.81 LT 18:35 0.56 Glenelg River Entrance HT 6:25 0.85 LT 17:30 0.60	Shoreline near Swan Lake HT	7:11	7:55	14	W 10.9	Nil	8/8	DG, ERB
		Shoreline near Swan Lake LT	17:12	-	17	W 3.2	Nil	8/8	DG, ERB

Date	Spring or neap Tide, time, height (in meters)	Location (tide)	Time start	Time end	Temperature (°C)	Wind direction and speed km/h	Precipitation	Cloud	Observers
25/11/2020	Neap Portland HT 7:57 0.74 LT 17:21 0.50 Glenelg River Entrance HT 8:35 0.81 LT 17:40 0.55	Nobles Rocks shoreline HT Cain Flat Swamp HT The Sheepwash HT Unnamed small wetland east of Lake Mombeong HT Lake Mombeong HT Cain Flat Swamp LT The Sheepwash LT Unnamed small wetland east of Lake Mombeong LT Lake Mombeong LT Nobles Rocks shoreline LT	6:33 9:04 9:42 9:53 10:06 15:20 15:35 15:49 15:56 17:17	7:30 - 9:44 - - 15:22 15:40 15:50 16:16 18:56	9.8 17.4 - 24.7 20 24 25 22.6 25 23.6	ENE 4 N 1.8 N 1 N 2.7 N 11 NW 4.9 NW 14 NE 13 NW 11 NNE 12.3	Nil Nil Nil Nil Nil Nil Nil Nil Nil Nil	- - - - - - - - - -	DG, ERB DG, ERB DG, ERB DG, ERB DG, ERB DG, ERB DG, ERB DG, ERB DG, ERB DG, ERB
26/11/2020	Neap Portland HT 1:03 0.76 LT 17:29 0.44 Glenelg River Entrance HT 10:02 0.80 LT 17:36 0.49	Glenelg estuary HT	9:00	11:15	17.4	E 6.7	Nil	5/8	ERB, DG

Date	Spring or neap Tide, time, height (in meters)	Location (tide)	Time start	Time end	Temperature (°C)	Wind direction and speed km/h	Precipitation	Cloud	Observers
02/12/2020	Spring	Swan Lake HT	11:35	11:36	19	S 6	Nil	7/8	CEP, MV
	Portland	Shoreline near Swan Lake HT	12:21	13:54	15.8	S 14.5	Nil	6/8	CEP, MV
	HT 13:16 0.67	Cain Flat Swamp HT	14:50	14:51	15.2	S 8	Nil	7/8	CEP, MV
	LT 19:16 0.22	The Sheepwash HT	15:00	15:02	15.2	S 8	Nil	7/8	CEP, MV
		Lake Mombeong HT	15:12	15:12	15.2	S 8	Nil	7/8	CEP, MV
		Lake Mombeong LT	16:53	16:53	17	S 8	Nil	7/8	CEP, MV
	Glenelg River Entrance	The Sheepwash LT	17:12	17:12	17	S 8	Nil	7/8	CEP, MV
	HT 13:43 0.69	Cain Flat Swamp LT	17:19	17:20	17	S 8	Nil	7/8	CEP, MV
	LT 19:43 0.24	Shoreline near Swan Lake LT	19:44	18:30	14.8	S 12	Nil	2/8	CEP, MV
		Swan Lake LT	20:18	20:19	16	0	Nil	0/8	CEP, MV
03/12/2020	Spring	Nobles Rocks shoreline HT	11:36	13:14	17	S 7	Nil	0/8	CEP, MV
	Portland	Nobles Rocks shoreline LT	17:20	-	15.5	S 8	Nil	2/8	CEP, MV
	HT 13:32 0.67	Glenelg Estuary HT	13:55	15:13	21	S 14	Nil	1/8	CEP
	LT 19:38 0.21	Glenelg Estuary LT	19:41	20:20	16	0	Nil	1/8	CEP
	Glenelg River Entrance								
	HT 13:43 0.68								
	LT 20:09 0.25								
22/01/2021	Neap	Nobles Rocks LT	11:25	12:58	21.7	W 11	Nil	2/8	IV, ERB
	Portland	Cain Flat Swamp LT	13:30	13:33	22.9	WSW 15	Nil	1/8	IV, ERB
	LT 11:57 0.37	The Sheepwash LT	13:40	-	-	-	Nil	1/8	IV, ERB
	HT 20:23 0.73	Unnamed small wetland east of Lake Mombeong LT	13:52	13:52	23.6	W 5	Nil	1/8	IV, ERB
	Glenelg River Entrance	Lake Mombeong LT	13:55	-	23.6	S 13	Nil	2/8	IV, ERB
	LT 12:49 0.37	Nobles Rocks HT	18:44	20:37	17.4	S 10	Nil	1/8	IV, ERB
	HT 20:25 0/74								

Date	Spring or neap Tide, time, height (in meters)	Location (tide)	Time start	Time end	Temperature (°C)	Wind direction and speed km/h	Precipitation	Cloud	Observers
23/01/2021	Neap Portland HT 3:44 0.81 LT 12:21 0.37 Glenelg River Estuary HT 4:55 0.85 LT 13:01 0.37	Shoreline near Swan Lake LT	13:40	14:20	27.2	SEE 11	Nil	-	IV, ERB
24/01/2021	Neap Portland HT 1:30 0.85 LT 12:52 0.39 Glenelg River Entrance HT 3:23 0.85 LT 13:18 0.38	Swan Lake LT Glenelg Estuary LT	11:10 -	11:19 -	12.6 38.9	NNW 17 N 15	Nil Nil	8/8 6/8	IV, ERB IV, ERB

Table A5.7 Targeted owls survey locations, effort and results.

Date	Location	Time start	Time end	Survey time	Owls recorded (species and number)
30/09/2020	Great Southwest walk	0:53	1:11	18 min	
30/09/2020	NW pine plantation	22:00	22:42	42 min	
30/09/2020	Boiler Swamp Road	23:15	23:50	35 min	1 Southern Boobook
30/09/2020	Pine plantation Browns Road	22:47	23:26	39 min	
30/09/2020	NW pine plantation	22:30	23:18	48 min	2 Southern Boobook
30/09/2020	Blackwood Road	1:30	2:05	35 min	2 Southern Boobook
30/09/2020	PF Olsen plantation	21:45	22:44	59 min	1 Southern Boobook
1/10/2020	NW pine plantation	23:55	0:18	23 min	2 Southern Boobook
1/10/2020	Pine plantation Browns Road	0:44	1:10	26 min	
1/10/2020	T2 Private property	23:46	0:16	30 min	
1/10/2020	Blue gum plantation spring road, south of Portland–Nelson Rd	1:29	1:55	26 min	
1/10/2020	Blackwood Road	23:55	0:31	36 min	1 Southern Boobook
1/10/2020	PF Olsen plantation	1:09	1:52	43 min	1 Southern Boobook
1/10/2020	Boiler Swamp Road	21:49	22:25	36 min	1 Southern Boobook
13/10/2020	Peters Road	0:33	1:05	32 min	
13/10/2020	NW pine plantation	0:54	1:34	40 min	2 Southern Boobook
14/10/2020	Boiler Swamp Road	23:15	23:50	35 min	1 Southern Boobook
28/10/2020	Quarry Road	23:24	0:02	38 min	
28/10/2020	Boiler Swamp Road	0:00	0:53	53 min	
28/10/2020	Pine plantation old & blue gum plantation	23:36	0:20	44 min	
28/10/2020	Blackwood Road	2:09	2:48	39 min	1 Southern Boobook; 1 Powerful Owl
28/10/2020	PF Olsen plantation	0:46	2:20	1 hr 34 min	1 Southern Boobook
28/10/2020	NW pine plantation	22:11	23:00	49 min	1 Southern Boobook
29/10/2020	Pine plantation Browns Road	22:38	23:18	40 min	
29/10/2020	Old blue gum and pine plantation	23:57	0:17	20 min	

Date	Location	Time start	Time end	Survey time	Owls recorded (species and number)
29/10/2020	Peters Road	2:29	3:01	32 min	1 Southern Boobook
29/10/2020	PF Olsen plantation	22:04	22:42	38 min	2 Southern Boobook
24/11/2020	NW pine plantation	22:45	23:21	36 min	1 Southern Boobook
24/11/2020	Peters Road	22:47	23:26	39 min	
24/11/2020	Quarry Road	23:24	0:02	38 min	
25/11/2020	Blackwood Road	1:52	2:32	40 min	2 Southern Boobook
25/11/2020	PF Olsen plantation	22:59	23:34	35 min	1 Southern Boobook
26/11/2020	Boiler Swamp Road	23:17	23:51	34 min	2 Southern Boobook
26/11/2020	Bridgewater road	22:30	23:00	30 min	1 Southern Boobook
26/11/2020	Blackwood Road	0:13	0:41	28 min	2 Southern Boobook
26/11/2020	Old pine plantation and blue gum plantation	23:14	23:56	42 min	
Total				**22 hr 51 min**	

Table A5.8 Incidental and bird utilisation survey records of Rufous Bristlebird

Date	Time	Location	Number of individuals
16/06/2020	Afternoon	T4	1
17/06/2020	Morning	T3	1
29/06/2020	Morning	Nobles Rocks	1
27/08/2020	Afternoon	T12	1
27/08/2020	Afternoon	T6	1
27/08/2020	Afternoon	T4	1
27/08/2020	Afternoon	T4	1
27/08/2020	Afternoon	T4	1
27/08/2020	Afternoon	T4	1
28/08/2020	Afternoon	C8	1
28/08/2020	Afternoon	C8	1
28/08/2020	Morning	T3	1
28/08/2020	Morning	T7	1
28/08/2020	Morning	T12	1
28/08/2020	Morning	T6	1
28/10/2020	Morning	T4	1

Date	Time	Location	Number of individuals
23/11/2020	Afternoon	Swan Lake	1
24/11/2020	Afternoon	Nobles Rocks	1
24/11/2020	Afternoon	Black Swamp	1
24/11/2020	Afternoon	Nobles Rocks	1
15/12/2020	Morning	T14	1
28/06/2020	Afternoon	Swan Lake dunes	1
29/06/2020	Afternoon	Swan Lake	1
30/06/2020	Morning	Nobles Rocks	1
30/06/2020	Morning	Swan Lake	4
20/07/2020	Afternoon	Nobles Rocks	1
20/07/2020	Afternoon	Nobles Rocks	1
21/07/2020	Morning	GTFP Plantation	1
21/07/2020	Afternoon	Swan Lake beach	1
21/07/2020	Afternoon	Nobles Rocks	1
22/07/2020	Morning	Swan Lake beach	1
27/08/2020	Morning	T12	1
27/08/2020	Morning	T6	1
27/08/2020	Afternoon	T4	1
27/08/2020	Afternoon	T4	1
27/08/2020	Afternoon	T4	1
28/08/2020	Morning	T3	1
28/08/2020	Morning	T7	1
28/08/2020	Morning	T12	1
28/08/2020	Morning	T6	1
7/10/2020	Morning	Sharrocks Road	1
13/10/2020	Morning	North Block Road Tile Grid	1
27/10/2020	Morning	Pine Plantation North of Portland–Nelson Road	1
27/10/2020	Afternoon	GTFP Plantation North	2
27/10/2020	Afternoon	Track 44 GTFP Plantation North	1
27/10/2020	Afternoon	Nobles Rocks	1
27/10/2020	Afternoon	Nobles Rocks	1
28/10/2020	Morning	Spruce Track	1

Date	Time	Location	Number of individuals
28/10/2020	Afternoon	C10	1
28/10/2020	Afternoon	C10	1
29/10/2020	Morning	Swan Lake	1
29/10/2020	Morning	GTFP Plantation North	2
23/11/2020	Afternoon	Swan Lake	1
24/11/2020	Morning	Earls Road Nelson	1
24/11/2020	Afternoon	Nobles Rocks	1
24/11/2020	Afternoon	Black Swamp	1
24/11/2020	Afternoon	Nobles Rocks	1
25/11/2020	Morning	David Goldby paddock west	1
25/11/2020	Morning	Lake Sheepwash	1
25/11/2020	Morning	Cain Flat Swamp	1
26/11/2020	Morning	Spruce Track	3
15/12/2020	Morning	Kentbruck incidentals	1
16/12/2020	Afternoon	GTFP plantation Portland–Nelson Road	1

Table A5.9 Terrestrial mammals recorded on remote cameras (species confirmed included only). (D) refers to cameras in a vertical configuration (facing down).

Habitat type	Site Location	Site Type	Species recorded
Farmland	T47	Edge	Australian Magpie *Gymnorhina tibicen* Black Wallaby *Wallabia bicolor* Bush Rat *Rattus fuscipes* Eastern Grey Kangaroo *Macropus giganteus* Emu *Dromaius novaehollandiae* House Mouse *Mus musculus* Koala *Phascolarctos cinereus* Pied Currawong *Strepera graculina* Red Fox *Vulpes vulpes* Sheep *Ovis aries*
Farmland	T47 WF	Edge	Camera failed
Farmland	T101	Inside	Australian Magpie *Gymnorhina tibicen* Eastern Grey Kangaroo *Macropus giganteus* Raven *Corvus* sp. Sheep *Ovis aries*

Habitat type	Site Location	Site Type	Species recorded
Farmland	T97	Edge	Black Wallaby *Wallabia bicolor* Bush Rat *Rattus fuscipes* Eastern Yellow Robin *Eopsaltria australis* White-browed Scrubwren *Sericornis frontalis* Cattle *Bos taurus*
Farmland	T168	Inside	Red Fox *Vulpes vulpes*
Farmland	Substation	Edge	Sheep *Ovis aries* House Mouse *Mus musculus*
Farmland	T161	Inside	Australian Magpie *Gymnorhina tibicen*
Blue gum	136	Edge	Black Wallaby *Wallabia bicolor* House Mouse *Mus musculus* Short-beaked Echidna *Tachyglossus aculeatus* Fallow Deer *Dama dama* Raven *Corvus* sp. Bush Rat *Rattus fuscipes* Koala *Phascolarctos cinereus* Crimson Rosella *Platycercus elegans* Eastern Grey Kangaroo *Macropus giganteus* Red Fox *Vulpes vulpes* Deer sp.
Blue gum	170	Inside	Eastern Grey Kangaroo *Macropus giganteus* Black Wallaby *Wallabia bicolor* Koala *Phascolarctos cinereus* Raven *Corvus* sp. House Mouse *Mus musculus*
Blue gum	37 (D)	Inside	European Rabbit *Oryctolagus cuniculus* House Mouse *Mus musculus* Macropod sp.
Blue gum	84 (D)	Edge	Black Rat *Rattus rattus* Black Wallaby *Wallabia bicolor* Bush Rat *Rattus fuscipes* Domestic Cat *Felis catus* Koala *Phascolarctos cinereus* Pied Currawong *Strepera graculina* Macropod sp.
Blue gum	T126 (D)	?	Grey Currawong *Strepera versicolor* Pied Currawong *Strepera graculina* Red-necked Wallaby *Notamacropus rufogriseus banksianus* Eastern Grey Kangaroo *Macropus giganteus*

Habitat type	Site Location	Site Type	Species recorded
Blue gum	T126 WF	Inside	Black Wallaby *Wallabia bicolor* Eastern Grey Kangaroo *Macropus giganteus* Emu *Dromaius novaehollandiae* European Brown Hare *Lepus europaeus* Grey Currawong *Strepera versicolor* Pied Currawong *Strepera graculina* Red Fox *Vulpes vulpes* Red-necked Wallaby *Notamacropus rufogriseus banksianus* Short-beaked Echidna *Tachyglossus aculeatus*
Pine	T36	Edge	Australian Magpie *Gymnorhina tibicen* Eastern Grey Kangaroo *Macropus giganteus* Raven *Corvus* sp. Koala *Phascolarctos cinereus* Red Fox *Vulpes vulpes* Red-necked Wallaby *Notamacropus rufogriseus banksianus*
Pine 2010 - 2020	159 (D)	Edge	Bush Rat *Rattus fuscipes* Superb Fairy-wren *Malurus cyaneus* Black Wallaby *Wallabia bicolor* Eastern Grey Kangaroo *Macropus giganteus* Short-beaked Echidna *Tachyglossus aculeatus* Pied Currawong *Strepera graculina*
Pine 2010 - 2020	66	Inside	House Mouse *Mus musculus* Black Wallaby *Wallabia bicolor* Australian Magpie *Gymnorhina tibicen* Brush Bronzewing *Phaps elegans* Pig (feral) *Sus scrofa*
Pine 2010 - 2020	142	Edge	House Mouse *Mus musculus* Eastern Grey Kangaroo *Macropus giganteus*
Pine 2010 - 2020	27	Inside	Bush Rat *Rattus fuscipes*
Pine 2010 - 2020	85 (D)	?	Antechinus spp. Bassian Thrush *Zoothera lunulata* Black Wallaby *Wallabia bicolor* Bush Rat *Rattus fuscipes* Domestic Cat *Felis catus* House Mouse *Mus musculus* Short-beaked Echidna *Tachyglossus aculeatus* White-browed Scrubwren *Sericornis frontalis*
Pine 2010 - 2020	94 (D)	Edge	Bush Rat *Rattus fuscipes*

Habitat type	Site Location	Site Type	Species recorded
Pine 2010 - 2020	103	Inside	Black Wallaby *Wallabia bicolor* Brush Bronzewing *Phaps elegans* Bush Rat *Rattus fuscipes* Eastern Grey Kangaroo *Macropus giganteus* House Mouse *Mus musculus* Red Fox *Vulpes vulpes* Short-beaked Echidna *Tachyglossus aculeatus* Macropod sp.
Pine 2000 - 2010	93	Edge	House Mouse *Mus musculus* Agile Antechinus *Antechinus agilis* Deer sp.
Pine 2000 - 2010	7 (D)	Inside	Bush Rat *Rattus fuscipes*
Pine 2000 - 2010	143	Edge	Black Wallaby *Wallabia bicolor* Red Fox *Vulpes vulpes* Eastern Grey Kangaroo *Macropus giganteus* Deer sp.
Pine 2000 - 2010	166	Edge	House Mouse *Mus musculus* Bush Rat *Rattus fuscipes* European Rabbit *Oryctolagus cuniculus*
Pine 2000 - 2010	80	Inside	Grey Shrike-thrush *Colluricincla harmonica* Red Fox *Vulpes vulpes*
Pine 2000 - 2010	92	Inside	Black Wallaby *Wallabia bicolor*
Pine 1996 – 2000	180	Edge	Bush Rat *Rattus fuscipes* Red-necked Wallaby *Notamacropus rufogriseus banksianus* Antechinus *Antechinus* sp. House Mouse *Mus musculus* Deer sp. Superb Fairy-wren *Malurus cyaneus* Black Wallaby *Wallabia bicolor*
Pine 1996 – 2000	17	Inside	Bush Rat *Rattus fuscipes* Superb Fairy-wren *Malurus cyaneus* Black Wallaby *Wallabia bicolor* Eastern Grey Kangaroo *Macropus giganteus*
Pine 1996 – 2000	51 (D)	Edge	Red-necked Wallaby *Notamacropus rufogriseus banksianus*
Pine 1996 – 2000	178 (D)	Edge	Bush Rat *Rattus fuscipes* Short-beaked Echidna *Tachyglossus aculeatus*
Pine 1996 – 2000	52	Inside	Red-necked Wallaby *Notamacropus rufogriseus banksianus*
Pine 1996 – 2000	177	Inside	Common Blackbird *Turdus merula* Red Fox *Vulpes vulpes* Red-necked Wallaby *Notamacropus rufogriseus banksianus* White-winged Chough

Habitat type	Site Location	Site Type	Species recorded
Pine 1991 - 1995	111 (D)	Edge	House Mouse *Mus musculus* Black Wallaby *Wallabia bicolor*
Pine 1991 - 1995	147 (D)	Inside	House Mouse *Mus musculus*
Pine 1991 - 1995	35 (D)	Inside	Bush Rat *Rattus fuscipes*
Pine 1981 - 1990	5 (D)	Edge	Raven *Corvus* sp. House Mouse *Mus musculus* Bush Rat *Rattus fuscipes*
Pine 1981 - 1990	24 (D)	Inside	Bush Rat *Rattus fuscipes* Australian Magpie *Gymnorhina tibicen* Red Fox *Vulpes vulpes*
Pine 1981 - 1990	65 (D)	Edge	Bush Rat *Rattus fuscipes* Pied Currawong *Strepera graculina* House Mouse *Mus musculus*
Pine 1981 - 1990	128 (D)	Inside	Camera failed
Pine 1981 - 1990	116	Edge	Pied Currawong *Strepera graculina* Red Fox *Vulpes vulpes* Short-beaked Echidna *Tachyglossus aculeatus*
Pine 1981 - 1990	149 (D)	Edge	Bush Rat *Rattus fuscipes*
Pine 1981 - 1990	67 (D)	Inside	Australian Magpie *Gymnorhina tibicen* Bush Rat *Rattus fuscipes* Eastern Grey Kangaroo *Macropus giganteus* Grey Currawong *Strepera versicolor* Short-beaked Echidna *Tachyglossus aculeatus* White-browed Scrubwren *Sericornis frontalis*
Pine 1981 - 1990	129	Inside	Eastern Grey Kangaroo *Macropus giganteus*
Pine 1981 - 1990	152	?	Black Wallaby *Wallabia bicolor* Red Fox *Vulpes vulpes* Red-necked Wallaby *Notamacropus rufogriseus banksianus* Short-beaked Echidna *Tachyglossus aculeatus* White-winged Chough *Corcorax melanorhamphos*
Recently cleared pine plantation	?	?	House Mouse *Mus musculus* Bush Rat *Rattus fuscipes* White-browed Scrubwren *Sericornis frontalis* Red-necked Wallaby *Notamacropus rufogriseus banksianus*
Roadside	Johnsons Rd		Bush Rat *Rattus fuscipes* House Mouse *Mus musculus* White-browed Scrubwren *Sericornis frontalis* Superb Fairy-wren *Malurus cyaneus* Black Wallaby *Wallabia bicolor*

Habitat type	Site Location	Site Type	Species recorded
Roadside	McLeans Rd		House Mouse *Mus musculus* Superb Fairy-wren *Malurus cyaneus* White-browed Scrubwren *Sericornis frontalis* Black Wallaby *Wallabia bicolor* Black Rat *Rattus rattus* Red-necked Wallaby *Notamacropus rufogriseus banksianus* Red Fox *Vulpes vulpes*
Roadside	Dry Blocks Rd		House Mouse *Mus musculus* Bush Rat *Rattus fuscipes* Red Fox *Vulpes vulpes* Brush Bronzewing *Phaps elegans*
Roadside	Browns Rd		House Mouse *Mus musculus* White-browed Scrubwren *Sericornis frontalis* Bush Rat *Rattus fuscipes* White-throated Treecreeper *Cormobates leucophaea* Superb Fairy-wren *Malurus cyaneus*
Roadside	RC3		Bush Rat *Rattus fuscipes* Koala *Phascolarctos cinereus* White-browed Scrubwren *Sericornis frontalis*
Roadside	RC23		Black Wallaby *Wallabia bicolor* Bush Rat *Rattus fuscipes* Domestic Cat *Felis catus* White-browed Scrubwren *Sericornis frontalis*
Roadside	RC48		Bassian Thrush *Zoothera lunulata* Eastern Bearded Dragon *Pogona barbata* Black Wallaby *Wallabia bicolor* Blotched Blue-tongued Lizard *Tiliqua nigrolutea* Brush Bronzewing *Phaps elegans* Bush Rat *Rattus fuscipes* Domestic Cat *Felis catus* House Mouse *Mus musculus* Short-beaked Echidna *Tachyglossus aculeatus* White-browed Scrubwren *Sericornis frontalis*
Native	HW1		Black Wallaby *Wallabia bicolor*
Native	HW2		Black Wallaby *Wallabia bicolor* Bush Rat *Rattus fuscipes* Southern Brown Bandicoot *Isoodon obesulus* Macropod sp.
Native	HW3		Black Wallaby *Wallabia bicolor* Bush Rat *Rattus fuscipes*

Habitat type	Site Location	Site Type	Species recorded
Native	HW4		Black Wallaby *Wallabia bicolor* Bush Rat *Rattus fuscipes* Red-necked Wallaby *Notamacropus rufogriseus banksianus* Short-beaked Echidna *Tachyglossus aculeatus* Antechinus spp.
Native, Portland–Nelson Rd	P-N Rd 1		Australian Raven *Corvus coronoides* Bush Rat *Rattus fuscipes* Koala *Phascolarctos cinereus*
Native, Portland–Nelson Rd	P-N Rd 2		Antechinus spp. Bassian Thrush *Zoothera lunulata* Black Wallaby *Wallabia bicolor* Bush Rat *Rattus fuscipes* Eastern Ring-tailed Possum *Pseudocheirus peregrinus* Short-beaked Echidna *Tachyglossus aculeatus* Superb Fairy-wren *Malurus cyaneus* White-browed Scrubwren *Sericornis frontalis* White-throated Treecreeper *Cormobates leucophaea*
Native, Portland–Nelson Rd	P-N Rd 3 (D)		Bush Rat *Rattus fuscipes* Koala *Phascolarctos cinereus* Red Fox *Vulpes vulpes* White-browed Scrubwren *Sericornis frontalis* White-throated Treecreeper *Cormobates leucophaea*

Table A5.10 Species identified from hair trap samples

Habitat type	Site Location	Site Type	Species recorded
Pine 1991 - 1995	35		Rat sp. *Rattus sp.*
Native	HW4		Rat sp. *Rattus sp.*
Pine 2010 - 2020	94		Rat sp. *Rattus sp.*
Pine 1996 – 2000	178		Goat *Capra hircus*
Pine 1996 - 2000	177		Goat *Capra hircus*
Native	HW1		Koala *Phascolarctos cinereus*
Pine	T92		Bush Rat *Rattus fuscipes* or Swamp Rat *Rattus lutreolus* Black Wallaby *Wallabia bicolor*

Appendix 6 EPBC Act assessment criteria

A6.1 South-eastern Red-tailed Black Cockatoo

Table A6.1 South-eastern Red-tailed Black Cockatoo. Assessment against significant impact criteria for endangered & critically endangered species (DoE 2013a)

Significant impact criteria	Likelihood of significant impact	Rationale
Lead to a long-term decrease in the size of a population	Unlikely	The principal potential risk to the species is collision with turbines. Habitat within the Project Area is not considered to be suitable for the species, although South-eastern Red-tailed Black Cockatoos might rarely fly through the site. They were not recorded during bird utilisation surveys onsite. The species flights are generally expected to be below turbine rotor heights. Due to lack of habitat and flight behaviour, it is considered that such collisions are unlikely to occur. The potential for the project to lead to a long-term decrease in the size of the population is unlikely.
Reduce the area of occupancy of the species	Unlikely	The site contains no habitat for Red-tailed Black Cockatoos. Existing land use and vegetation of the site will remain substantially unchanged. The project is not likely to lead to a reduction in the area occupied by the species.
Fragment an existing population into two or more populations	Unlikely	As the project will not entail substantive alterations to existing habitats, there are no effects or mechanisms that might fragment existing population of South-eastern Red-tailed Black Cockatoos.
Adversely affect habitat critical to the survival of a species	Unlikely	The site substantially does not contain habitat for South-eastern Red-tailed Black Cockatoos. The project may entail minor loss of habitat critical to the survival of the subspecies (as defined in CoA 2006a) where the underground export powerline is proposed to be constructed in an alignment of approximately 200 x 3 metres where some Brown Strinybark trees occur near the Heywood substation.
Disrupt the breeding cycle of a population	Unlikely	South-eastern Red-tailed Black Cockatoos breed in hollow eucalypts outside the Project Area. The project is not likely to affect the breeding cycle of the species.
Modify destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	Unlikely	The project site contains no habitat suitable for South-eastern Red-tailed Black Cockatoos. The project has no potential to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

Significant impact criteria	Likelihood of significant impact	Rationale
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat	Unlikely	The project does not include any known mechanism that would result in establishment of invasive species that are not already present in the relevant environment.
Introduce disease that may cause the species to decline	Unlikely	The project does not include any known mechanism that would result in introduction of any disease that is not already present in the relevant environment.
Interfere with the recovery of the species	Unlikely	The project is not likely to interfere with the recovery of the species. There are no threat mechanisms or recovery actions noted in the recovery plan that are relevant to the species at the project site.

A6.2 Gang-gang Cockatoo

Table A6.2 Gang-gang Cockatoo. Assessment against significant impact criteria for endangered & critically endangered species (DoE 2013a)

Significant impact criteria	Likelihood of significant impact	Rationale
Lead to a long-term decrease in the size of a population	Unlikely	The principal potential risk to the species is collision with turbines. Habitat within the Project Area is not considered to be suitable for the species, although Gang-gang Cockatoos might rarely fly through the site. The species flights are generally expected to be below turbine rotor heights. Due to lack of habitat and flight behaviour, it is considered that such collisions are unlikely to occur. The potential for the project to lead to a long-term decrease in the size of the population is unlikely.
Reduce the area of occupancy of the species	Unlikely	Existing land use and vegetation of the site will remain substantially unchanged and removal of vegetation will entail no habitat for Gang-gang Cockatoos, other than some tree impacts for the construction of the underground section of the transmission line. The project is not likely to lead to a reduction in the area occupied by the species.
Fragment an existing population into two or more populations	Unlikely	As the project will not entail substantive alterations to existing habitats, there are no effects or mechanisms that might fragment existing population of Gang-gang Cockatoos.
Adversely affect habitat critical to the survival of a species	Unlikely	The site contains no habitat critical to survival of Gang-gang Cockatoos. The project will not adversely affect habitat critical to the survival of a species.
Disrupt the breeding cycle of a population	Unlikely	Gang-gang Cockatoos breed in hollow eucalypts outside the Project Area. The project is not likely to affect the breeding cycle of the species.
Modify destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	Unlikely	The very limited values of habitat for Gang-gang Cockatoos on the project site is such that the project has no potential to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

Significant impact criteria	Likelihood of significant impact	Rationale
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat	Unlikely	The project does not include any known mechanism that would result in establishment of invasive species that are not already present in the relevant environment.
Introduce disease that may cause the species to decline	Unlikely	The project does not include any known mechanism that would result in introduction of any disease that is not already present in the relevant environment.
Interfere with the recovery of the species	Unlikely	The project is not likely to interfere with the recovery of the species. There are no threat mechanisms or recovery actions noted in the recovery plan that are relevant to the species at the project site.

A6.3 Orange-bellied Parrot

Table A6.3 Orange-bellied Parrot. Assessment against significant impact criteria for endangered & critically endangered species (CoA 2013)

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

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

A6.4 Blue-winged Parrot

Table A6.4 Blue-winged Parrot. Assessment against significant impact criteria for vulnerable species (CoA 2013)

NB The Conservation Advice for *Neophema chrysostoma* (Blue-winged Parrot) (DCCEEW 2023a) does not define an 'important population' for the species. While a portion of the population migrates between Tasmania and the mainland, there is known evidence that it does not comprise a single overall population and that is considered to be the case for the assessment below.

Significant impact criteria	Likelihood of significant impact	Rationale
Lead to a long-term decrease in the size of an important population of a species	Unlikely	The potential for impacts on Blue-winged Parrot is considered to relate to collisions with wind turbines. While some collisions may occur their number and frequency are expected to be lower than thresholds for a significant impacts defined by the EPBC Significant Impact Guideline 1.1. The potential for the project to lead to a long-term decrease in the size of the population is unlikely.
Reduce the area of occupancy of an important population	Unlikely	The project entails no mechanism by which the area of occupancy by the species might be affected. The project is not likely to lead to a reduction in the area occupied by the species.
Fragment an existing population into two or more populations	Unlikely	The species is partially migratory and highly mobile. The project entails no effects or mechanisms that might fragment the populations of Blue-winged Parrot.

Significant impact criteria	Likelihood of significant impact	Rationale
Adversely affect habitat critical to the survival of a species	Unlikely	The Conservation Advice for *Neophema chrysostoma* (blue-winged parrot) (DCCEEW 2023a) defines habitat critical to the survival of a species. It includes: *"Foraging and staging habitats found from coastal, sub-coastal and inland areas, right through to semi-arid zones including: grasslands, grassy woodlands and semi-arid chenopod shrubland with native and introduced grasses, herbs and shrubs."* The site contains some portions that meet these criteria, primarily confined to areas of grazing pasture. The removal of minor areas of grazing pasture for access tracks and turbine hardstands are not considered sufficient to adversely affect habitat critical to the survival of the species.
Disrupt the breeding cycle of an important population	Unlikely	The great majority of the site supports no habitat suitable for breeding by Blue-winged Parrots. Without any defined 'important population' the project is considered not to have capacity to disrupt the breeding cycle of the population.
Modify destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	Unlikely	The project does not entail activities that have potential to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	Unlikely	The project will not entail mechanisms for the potential introduction or establishment of invasive species harmful to Blue-winged Parrots.
Introduce disease that may cause the species to decline	Unlikely	The project will not entail mechanisms with potential for introduction or establishment of disease that might affect Blue-winged Parrots.
Interfere with the recovery of the species	Unlikely	The scale of possible effects of the project on the species is not likely to interfere with the recovery of the species.

A6.5 Australasian Bittern

Table A6.5 Australasian Bittern. Assessment against significant impact criteria for endangered & critically endangered species (CoA 2013)

Significant impact criteria	Likelihood of significant impact	Rationale
Lead to a long-term decrease in the size of a population	Likely	The main risk to the Australasian Bittern is collision with turbines and overhead power lines. Suitable wetland habitat for the species occurs to the south, east and north of the Project Area and the species is known to move locally between wetlands and seasonally between the coastal wetlands and inland wetlands in Victoria and New South Wales. Individuals would be expected to occasionally fly across the Project Area and may collide with wind turbines and overhead power lines. Uncertainty exists on the number of individuals that may fly across the wind farm, the number, frequency as well as height of such flights. Satellite tracking has shown that long-distance movements can occur at night. The species also moves locally, at dusk (as observed during the Biosis surveys) and may be less able to avoid barriers such as wind turbines and power lines than diurnally moving species. The most robust population estimate is 37–119 in the Long Swamp and Pick Swamp, directly south and west of the Project Area, but could be as high as 228 based on the wetland area available within 10 kilometres. Not all of these individuals would be likely to move between the coast and inland wetlands, as the species is resident within the search area. Based on the available information, and the level of uncertainty on the number of movements across the wind farm, the project may have a moderate likelihood that it will lead to a long-term decrease in the size of the population. The severity of existing threats in NESP (2019) is considered negligible with declines of <1% of the population. Using the same criteria, 1% of the lower bound Australian population estimate (Garnett & Baker 2021) of 650 individual for the species this is 6–7 individuals, using the mean of 1200 is 12 and using the upper bound of 1750 is 17–18 individuals. It is conceivable this number of individuals may collide with turbines or overhead powerlines within the lifetime of the project, indicating the project has potential to have an impact on

Significant impact criteria	Likelihood of significant impact	Rationale
		the population, but the magnitude of this impact cannot be quantified due to the lack of a population viability analysis. It is difficult to ascertain if any such impact would affect the population in the long term, but using the precautionary principle we consider it is a possibility.
Reduce the area of occupancy of the species	Unlikely	The project is unlikely to impact directly on the Australasian Bittern wetland habitat. No information exists on potential disturbance effects of turbines on Australasian Bittern, or other bittern species', habitat use or breeding. Indirect disturbance may potentially reduce occupancy at wetlands but likelihood of this is considered remote to low, particularly if turbines are not adjacent to wetland habitat, where the species' breeding activity has been recorded.
Fragment an existing population into two or more populations	Unlikely	The project will not remove wetland habitat and is unlikely to fragment an existing population into two or more populations.
Adversely affect habitat critical to the survival of a species	Unlikely	Any wetland habitat where the species is known or likely to occur and any location with suitable habitat outside the above area that may be periodically occupied by the species is defined as critical habitat (CoA 2019). No direct impacts on wetland habitats are predicted, as long as no impact is predicted for groundwater levels, surface water run-off, or sedimentation, which might affect wetland quality.
Disrupt the breeding cycle of a population	Unlikely	The wetlands with known Australasian Bittern breeding activity are outside of the Project Area, except for a wetland north of Lake Mombeong (wetland ID 20505) where Biosis recorded breeding activity. Therefore the project is unlikely to disrupt the breeding cycle of a population.
Modify destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	Unlikely	No direct impacts on wetlands are predicted, as long as no impact is predicted for groundwater levels, surface water run-off, or sedimentation, which might affect wetland quality.

Significant impact criteria	Likelihood of significant impact	Rationale
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat	Unlikely	The invasive species listed as a threat to the Australasian Bittern include pigs, horses, goats, deer, foxes, cats, rats and pigs (CoA 2019). The project will not involve actions that would increase or introduce risk from invasive species that is already not present.
Introduce disease that may cause the species to decline	Unlikely	No diseases are listed as a threat to the Australasian Bittern (CoA 2019). The project does not include any known mechanism that would result in introduction of any disease that is not already present in the relevant environment.
Interfere with the recovery of the species	Likely	A number of recovery actions are currently under way for the Australasian Bittern, although the formal recovery plan remains in draft. These include wetland habitat restoration by Nature Glenelg Trust (Long Swamp and Pick Swamp), the Glenelg Hopkins Catchment Management Authority Coastal Connections Project, the North Central Catchment Management Authority, habitat creation and enhancement in the Riverina rice fields, and environmental water allocations within the Murray-Darling Basin. The project will not impact on the species' habitat, or wetland habitats subject to these recovery actions. Some individuals benefiting from these recovery actions may potentially collide with wind turbines and power lines, resulting in at least some impact on the recovery efforts at these locations.

A6.6 White-throated Needletail

Table A6.6 White-throated Needletail. Assessment against significant impact criteria for vulnerable species (CoA 2013)

Significant impact criteria	Likelihood of significant impact	Rationale
Lead to a long-term decrease in the size of an important population of a species	Unlikely	The potential for impacts on White-throated Needletail is considered to relate to the potential for collisions with wind turbines. While some collisions may occur their number and frequency is expected to be lower than thresholds for significant impacts defined by the species-specific EPBC Referral Guideline. The potential for the project to lead to a long-term decrease in the size of the population is unlikely. It is likely that some collisions by White-throated Needletails with turbines at the Kentbruck wind farm will occur. However, the number of collisions are unlikely to annually reach or exceed 1% of the estimated population and in that respect the White-throated Needletail population is not considered likely to be significantly impacted directly by the project.
Reduce the area of occupancy of an important population	Unlikely	The aerial behaviour of White-throated Needletails means they are not reliant on any particular terrestrial environment other than roost sites. The project entails no mechanism by which the area of occupancy by the species might be affected. The project is not likely to lead to a reduction in the area occupied by the species.
Fragment an existing population into two or more populations	Unlikely	The project entails no effects or mechanisms that might fragment the populations of White-throated Needletail.
Adversely affect habitat critical to the survival of a species	Unlikely	The site contains no habitat critical to the survival of White-throated Needletails. The project is not likely to adversely affect habitat critical to the survival of the species.
Disrupt the breeding cycle of an important population	Unlikely	White-throated Needletails breed exclusively in the northern hemisphere. The project has no capacity to disrupt the breeding cycle of the population.

Significant impact criteria	Likelihood of significant impact	Rationale
Modify destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	Unlikely	The aerial behaviour of White-throated Needletails means they are not reliant on any particular terrestrial environment other than roost sites. The project has no potential to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	Unlikely	There are no known invasive species that are harmful to White-throated Needletails and the project will not entail mechanisms for the potential introduction or establishment of invasive species.
Introduce disease that may cause the species to decline	Unlikely	The project will not entail mechanisms with potential for introduction or establishment of disease that might affect White-throated Needletails.
Interfere with the recovery of the species	Unlikely	The project is not likely to interfere with the recovery of the species. There is no recovery plan for this species, however DAWE note that the conservation advice (DCCEEW 2023b) provides sufficient direction to implement priority actions, mitigate against key threats and enable recovery. TSSC (2019) notes Australian evidence of collisions with wind turbines, but further classes this as low in severity and as affecting a small number of birds.

A6.7 Migratory Shorebirds

Table A6.7 Migratory shorebirds and other listed Migratory species. Assessment against significant impact criteria for migratory species (CoA 2013)

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

A6.8 Southern Brown Bandicoot

Table A6.8 Southern Brown Bandicoot. Assessment against significant impact criteria for endangered & critically endangered species (CoA 2013)

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

Significant impact criteria	Likelihood of significant impact	Rationale
Introduce disease that may cause the species to decline	Unlikely	The project does not include any known mechanism that would result in introduction of any disease that is not already present in the relevant environment.
Interfere with the recovery of the species	Unlikely	As outlined in responses above, the project is not likely to interfere with the recovery of the species. There is no recovery plan.

A6.9 Swamp Antechinus

Table A6.9 Swamp Antechinus. Assessment against significant impact criteria for vulnerable species (CoA 2013)

Significant impact criteria	Likelihood of significant impact	Rationale
Lead to a long-term decrease in the size of an important population of a species	Unlikely	The project is not likely to have any effect on the population of Swamp Antechinus. There is no likelihood of a long-term decrease in the size of the population. It was not recorded in targeted survey, however suitable habitat exists in Mount Clay State Forest and Narrawong Flora Reserve, however the transmission line is no longer planned to pass through this area.
Reduce the area of occupancy of an important population	Unlikely	Existing land use and vegetation of the site will remain substantially unchanged. The project is not likely to lead to a reduction in the area occupied by the species.
Fragment an existing population into two or more populations	Unlikely	As the project will not entail substantive alterations to existing habitats, there are no effects or mechanisms that might fragment the existing population of Swamp Antechinus.
Adversely affect habitat critical to the survival of a species	Unlikely	The project will not affect existing land use and vegetation of the site will remain substantially unchanged. The very great majority of the project site is occupied by introduced pine plantations and is not preferred habitat for the species.
Disrupt the breeding cycle of an important population	Unlikely	The project is not likely to result in an impact on the breeding of Swamp Antechinus.
Modify destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	Unlikely	The project will not entail substantive alterations to any existing habitats for Swamp Antechinus. The project has no potential to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline. Further design of the transmission route will determine the scale of potential impacts.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	Unlikely	The project does not include any known mechanism that would result in establishment of invasive species that are not already present in the relevant environment.
Introduce disease that may cause the species to decline	Unlikely	The project does not include any known mechanism that would result in introduction of any disease that is not already present in the relevant environment.

Significant impact criteria	Likelihood of significant impact	Rationale
Interfere with the recovery of the species	Unlikely	As outlined in responses above, the project is not likely to interfere with the recovery of the species. There is no recovery plan, however the species conservation advice (Threatened Species Scientific Committee 2016a) notes habitat loss and fragmentation as severe across the species' distribution and that protection of habitat is a primary conservation action. Further design of the transmission route will determine the scale of potential impacts.

A6.10 Yellow-bellied Glider

Table A6.10 Yellow-bellied Glider (south-eastern). Assessment against significant impact criteria for vulnerable species (CoA 2013)

Significant impact criteria	Likelihood of significant impact	Rationale
Lead to a long-term decrease in the size of an important population of a species	Unlikely	The western Victoria populations including the one local to the Project, are considered to be populations important to the survival of the taxon. The potential for loss of a small number of preferred tree species (which may occur for construction of the underground transmission line only) is not likely to result in a long-term decrease in the size of the population.
Reduce the area of occupancy of an important population	Unlikely	The potential for loss of a small number of preferred tree species (which may occur for construction of the underground transmission line only) is not likely to lead to a reduction in the area occupied by the species.
Fragment an existing population into two or more populations	Unlikely	The project entails no effects or mechanisms that might fragment populations of Yellow-bellied Glider.
Adversely affect habitat critical to the survival of a species	Unlikely	The potential for loss of a small number of preferred tree species (which may occur for construction of the underground transmission line only) does not entail impacts upon habitat critical to survival of the taxon, as defined in Conservation Advice for *Petaurus australis* Yellow-bellied Glider (south-eastern) (DAWE 2022b).
Disrupt the breeding cycle of an important population	Unlikely	The great majority of the site supports no habitat suitable for breeding by Yellow-bellied Glider and the potential for loss of a small number of preferred tree species (which may occur for construction of the underground transmission line only) is not likely to include large hollow-bearing nest trees. The project is considered not to have capacity to disrupt the breeding cycle of the population.
Modify destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	Unlikely	The project does not entail activities that have potential to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

Significant impact criteria	Likelihood of significant impact	Rationale
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	Unlikely	The project will not entail mechanisms for the potential introduction or establishment of invasive species harmful to Yellow-bellied Gliders.
Introduce disease that may cause the species to decline	Unlikely	The project will not entail mechanisms with potential for introduction or establishment of disease that might affect Yellow-bellied Gliders.
Interfere with the recovery of the species	Unlikely	The scale of possible effects of the project on the species is not likely to interfere with the recovery of the species.

A6.11 Long-nosed Potoroo

Table A6.11 Long-nosed Potoroo. Assessment against significant impact criteria for vulnerable species (CoA 2013)

Significant impact criteria	Likelihood of significant impact	Rationale
Lead to a long-term decrease in the size of an important population of a species	Unlikely	The project is not likely to have any effect on the population of Long-nosed Potoroo. There is no likelihood of a long-term decrease in the size of the population. It was not recorded in targeted survey, however suitable habitat exists in Mount Clay State Forest and Narrawong Flora Reserve. The site and Project Area supports little to no habitat for the species, except for adjacent to/within Narrawong Flora Reserve where the species is known from previous records. The transmission line alignment has been modified, and this section (adjacent to Narrawong Flora Reserve) is no longer planned.
Reduce the area of occupancy of an important population	Unlikely	Existing land use and vegetation of the site will remain substantially unchanged. The project is not likely to lead to a reduction in the area occupied by the species.
Fragment an existing population into two or more populations	Unlikely	As the project will not entail substantive alterations to existing habitats, there are no effects or mechanisms that might fragment the existing population of Long-nosed Potoroo.
Adversely affect habitat critical to the survival of a species	Unlikely	The project will not affect existing land use and vegetation of the site will remain substantially unchanged. The very great majority of the project site is occupied by introduced pine plantations and is not preferred habitat for the species..
Disrupt the breeding cycle of an important population	Unlikely	The project is not likely to result in an impact on the breeding of Long-nosed Potoroo.
Modify destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	Unlikely	The project will not entail substantive alterations to any existing habitats for Long-nosed Potoroo. The project has no potential to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline. Further design of the transmission route will determine the scale of potential impacts.

Significant impact criteria	Likelihood of significant impact	Rationale
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	Unlikely	The project does not include any known mechanism that would result in establishment of invasive species that are not already present in the relevant environment.
Introduce disease that may cause the species to decline	Unlikely	The project does not include any known mechanism that would result in introduction of any disease that is not already present in the relevant environment.
Interfere with the recovery of the species	Unlikely	As outlined in responses above, the project is not likely to interfere with the recovery of the species. The conservation advice for the species (Threatened Species Scientific Committee 2019) notes habitat loss, fragmentation and degradation as current threats. Further design of the transmission route will determine the scale of potential impacts.

A6.12 Heath Mouse

Table A6.12 Heath Mouse. Assessment against significant impact criteria for endangered & critically endangered species (CoA 2013)

Significant impact criteria	Likelihood of significant impact	Rationale
Lead to a long-term decrease in the size of a population	Unlikely	The project is not likely to have any effect on the population of Heath Mouse. There is no likelihood of a long-term decrease in the size of the population. Probable Heath Mouse detections were noted from camera trapping and hair tube samples in several locations within the pine plantation. Presence within pine plantation habitat suggests that this species is likely to be locally common within the Investigation Area.
Reduce the area of occupancy of the species	Unlikely	Existing land use and vegetation of the site will remain substantially unchanged. The project is not likely to lead to a reduction in the area occupied by the species.
Fragment an existing population into two or more populations	Unlikely	As the project will not entail substantive alterations to existing habitats, there are no effects or mechanisms that might fragment the existing population of Heath Mouse.
Adversely affect habitat critical to the survival of a species	Unlikely	The project will not affect existing land use and vegetation of the site will remain substantially unchanged. The very great majority of the project site is occupied by introduced pine plantations and is not preferred habitat for the species. The project will not adversely affect habitat critical to the survival of the species.
Disrupt the breeding cycle of a population	Unlikely	The project is not likely to result in an impact on the breeding of Heath Mouse.
Modify destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	Unlikely	The project will not entail substantive alterations to any existing habitats for Heath Mouse. The project has no potential to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline. Further design of the transmission route will determine the scale of potential impacts.

Significant impact criteria	Likelihood of significant impact	Rationale
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat	Unlikely	The project does not include any known mechanism that would result in establishment of invasive species that are not already present in the relevant environment.
Introduce disease that may cause the species to decline	Unlikely	The project does not include any known mechanism that would result in introduction of any disease that is not already present in the relevant environment.
Interfere with the recovery of the species	Unlikely	As outlined in responses above, the project is not likely to interfere with the recovery of the species. The conservation advice for the species (Threatened Species Scientific Committee 2016b) notes habitat loss, fragmentation and modification as current threats. Further design of the transmission route will determine the scale of potential impacts.

A6.13 Swamp Skink

Table A6.13 Swamp Skink. Assessment against significant impact criteria for endangered & critically endangered species (CoA 2013)

Significant impact criteria	Likelihood of significant impact	Rationale
Lead to a long-term decrease in the size of a population	Unlikely	Suitable wetland habitat for the species occurs adjacent to, but outside of the Project Area. The project does not entail loss of habitat and set-back distances mean that the size(s) of local population(s) are not likely to be affected.
Reduce the area of occupancy of the species	Unlikely	Suitable wetland habitat for the species occurs adjacent to, but outside of the Project Area. The project does not entail loss of habitat and the area(s) occupied by local population(s) are not likely to be affected.
Fragment an existing population into two or more populations	Unlikely	The project will not remove suitable wetland habitat and it does not have potential to fragment an existing population into two or more populations.
Adversely affect habitat critical to the survival of a species	Unlikely	Habitat critical to survival of the species is defined in the species Conservation Advice (DCCEEW 2023b). No habitat critical to survival of the species will be affected by the Project.
Disrupt the breeding cycle of a population	Unlikely	The project will not remove suitable wetland habitat and it does not have potential to disrupt the breeding cycle of a population of the species.
Modify destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	Unlikely	The project will not destroy or remove suitable wetland habitat. Design of the Project, including set-back distances, and management measures during construction are planned to prevent modification, isolation or decrease in availability or quality of any habitat for the species.

Significant impact criteria	Likelihood of significant impact	Rationale
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat	Unlikely	A number of invasive species that threaten the Swamp Skink are listed in the species Conservation Advice (DCCEEW 2023b). The project will not involve actions that would increase or introduce risk from invasive species that are not already present.
Introduce disease that may cause the species to decline	Unlikely	The vegetation at many sites occupied by swamp skinks is subject to infestation by *Phytophthera cinnamomi*. This pathogen has capacity to degrade Swamp Skink habitat. The Project Area is not significantly susceptible to the pathogen and appropriate measures to prevent its introduction or spread will be used in accordance with an environmental management plan, especially during construction. The project does not include any other known mechanism that would result in introduction of any disease that is not already present in the relevant environment.
Interfere with the recovery of the species	Unlikely	The Project does not include any actions that have potential to interfere with the recovery of the species.

A6.14 Growling Grass Frog

Table A6.14 Growling Grass Frog. Assessment against significant impact criteria for vulnerable species (CoA 2013)

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

Significant impact criteria	Likelihood of significant impact	Rationale
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	Unlikely	In the absence of habitat within the project site, the project is not likely to result in invasive species that are harmful to Growling Grass Frogs becoming established in the species' habitat. The project will not entail mechanisms that do not already exist for the potential introduction or establishment of invasive species into any nearby habitats for Growling Grass Frog.
Introduce disease that may cause the species to decline	Unlikely	In the absence of habitat within the project site, the project is not likely to result in introduction of disease to Growling Grass Frog. The project will not entail mechanisms that do not already exist for the potential introduction or establishment of disease to any nearby habitats for Growling Grass Frog.
Interfere with the recovery of the species	Unlikely	The project is not likely to interfere with the recovery of the species.

A6.15 Growling Grass Frog –species specific criteria

Table A6.15 Growling Grass Frog assessment against species-specific significant impact criteria (CoA 2009)

Ecological element affected	Impact threshold	Comment
Habitat degradation in an area supporting an important population	Permanent removal or degradation of terrestrial habitat (for example between ponds, drainage lines or other temporary/permanent habitat) within 200 metres of a water body in temperate regions, or 350 metres of a water body in semi-arid regions, that results in the loss of dispersal or overwintering opportunities for an important population. EPBC Act Policy Statement 3.14 says any viable population is considered to be an important population for the persistence and recovery of the Growling Grass Frog. For this species, a viable population is one which is not isolated from other populations or water bodies, such that it has the opportunity to interact with other nearby populations or has the ability to establish new populations when water bodies fill and become available. Interaction with nearby populations and colonisation of newly available water bodies occurs via the dispersal of individual frogs across suitable movement habitat.	Available information does not appear to be sufficient to determine whether the local area supports an important population, however the project entails no removal or modification of habitat for Growling Grass Frog.
Isolation and fragmentation of populations	Alteration of aquatic vegetation diversity or structure that leads to a decrease in habitat quality. Alteration to wetland hydrology, diversity and structure (for example any changes to timing, duration or frequency of flood events) that leads to a decrease in habitat quality. Introduction of predatory fish and/or disease agents. Net reduction in the number and/or diversity of water bodies available to	The project entails no removal or modification of habitat for Growling Grass Frog and has no capacity to isolate or fragment populations of the species.

Ecological element affected	Impact threshold	Comment
	an important population. Removal or alteration of available terrestrial or aquatic habitat corridors (including alteration of connectivity during flood events). Construction of physical barriers to movement between water bodies, such as roads or buildings. Alteration to wetland hydrology, diversity and structure (for example any changes to timing, duration or frequency of flood events) that leads to a decrease in habitat quality. Introduction of predatory fish and/or disease agents. Net reduction in the number and/or diversity of water bodies available to an important population. Removal or alteration of available terrestrial or aquatic habitat corridors (including alteration of connectivity during flood events). Construction of physical barriers to movement between water bodies, such as roads or buildings.	

A6.16 Yarra Pygmy Perch

Table A6.16 Yarra Pygmy Perch. Assessment against significant impact criteria for endangered species (CoA 2013).

Significant impact criteria	Likelihood of significant impact	Rationale
Lead to a long-term decrease in the size of an important population of a species	Unlikely	The wind farm Project Site does not contain habitat suitable for this species. Underground crossings of the transmission line at Surrey River and Wild Dog Creek are proposed. The principal potential for an effect on this species will be confined to the construction period and locations of effect will be rehabilitated thereafter. These effects are not likely to result in a long-term decrease in the size of the population. Suitable wetland habitat for this species occurs adjacent to, but outside of the Project Area. The project does not entail loss of habitat and set-back distances mean that the size(s) of local population(s) are not likely to be affected. There is no likelihood of a long-term decrease in the size of an important population of this species.
Reduce the area of occupancy of an important population	Unlikely	The site contains no known or potential habitat for this species. Suitable habitats in the wider vicinity are not likely to be affected. The project is not likely to lead to a reduction in the area occupied by the species.
Fragment an existing population into two or more populations	Unlikely	The project entails no effects or mechanisms that might fragment existing populations of this species.
Adversely affect habitat critical to the survival of a species	Unlikely	The site contains no known potential habitat for this species. Suitable habitats in the wider vicinity are not likely to be affected. The project is not likely to adversely affect habitat critical to the survival of the species.
Disrupt the breeding cycle of an important population	Unlikely	The Project Area contains no known potential breeding habitat for this species. The project is not likely to disrupt the breeding cycle of the population.

Significant impact criteria	Likelihood of significant impact	Rationale
Modify destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	Unlikely	The site contains no known or potential habitat for this species. Suitable habitats in the wider vicinity are not likely to be affected. The Project has no potential to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	Unlikely	In the absence of habitat within the Project Area, the project is not likely to result in invasive species that are harmful to this species becoming established in its habitat. The project will not entail mechanisms that do not already exist for the potential introduction or establishment of invasive species into any nearby habitats for this species.
Introduce disease that may cause the species to decline	Unlikely	In the absence of habitat within the project site, the project is not likely to result in introduction of disease to this species. The project will not entail mechanisms that do not already exist for the potential introduction or establishment of disease to any nearby habitats for the species.
Interfere with the recovery of the species	Unlikely	The project is not likely to interfere with the recovery of the species.

A6.17 Glenelg Spiny Cray

Table A6.17 Glenelg Spiny Cray. Assessment against significant impact criteria for endangered & critically endangered species (CoA 2013)

Significant impact criteria	Likelihood of significant impact	Rationale
Lead to a long-term decrease in the size of a population	Unlikely	The wind farm Project Site does not contain habitat suitable for this species. Underground crossings of the transmission line at Surrey River and Wild Dog Creek are proposed. The principal potential for an effect on this species will be confined to the construction period and locations of effect will be rehabilitated thereafter. These effects are not likely to result in a long-term decrease in the size of the population. Suitable wetland habitat for this species occurs adjacent to, but outside of the Project Area. The project does not entail loss of habitat and set-back distances mean that the size(s) of local population(s) are not likely to be affected. There is no likelihood of a long-term decrease in the size of an important population of this species.
Reduce the area of occupancy of the species	Unlikely	The site contains no known or potential habitat for this species. Suitable habitats in the wider vicinity are not likely to be affected. The project is not likely to lead to a reduction in the area occupied by the species.
Fragment an existing population into two or more populations	Unlikely	The project entails no effects or mechanisms that might fragment existing populations of this species.
Adversely affect habitat critical to the survival of a species	Unlikely	The site contains no known potential habitat for this species. Suitable habitats in the wider vicinity are not likely to be affected. The project is not likely to adversely affect habitat critical to the survival of the species.
Disrupt the breeding cycle of a population	Unlikely	The Project Area contains no known potential breeding habitat for this species. The project is not likely to disrupt the breeding cycle of the population.

Significant impact criteria	Likelihood of significant impact	Rationale
Modify destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	Unlikely	The site contains no known or potential habitat for this species. Suitable habitats in the wider vicinity are not likely to be affected. The Project has no potential to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat	Unlikely	In the absence of habitat within the Project Area, the project is not likely to result in invasive species that are harmful to this species becoming established in its habitat. The project will not entail mechanisms that do not already exist for the potential introduction or establishment of invasive species into any nearby habitats for this species.
Introduce disease that may cause the species to decline	Unlikely	In the absence of habitat within the project site, the project is not likely to result in introduction of disease to this species. The project will not entail mechanisms that do not already exist for the potential introduction or establishment of disease to any nearby habitats for the species.
Interfere with the recovery of the species	Unlikely	The project is not likely to interfere with the recovery of the species.

A6.18 Glenelg Estuary and Discovery Bay Ramsar site

Table A6.18 Assessment of the project against significant impact criteria for Wetlands of International Importance (CoA 2013)

Significant impact criteria	Likelihood of significant impact	Rationale
Result in areas of the wetland being destroyed or substantially modified	Unlikely	The project is situated entirely outside of the Ramsar Site and there are no identifiable mechanisms by which it will result directly or indirectly, in areas of the wetland being destroyed or substantially modified.
Result in a substantial and measurable change in the hydrological regime of the wetland, for example, a substantial change to the volume, timing, duration and frequency of ground and surface water flows to and within the wetland	Unlikely	The project is not expected to have any measurable effect on volume, timing, duration or frequency of surface or groundwater flows to or within the Ramsar wetland. The GDE Impact Assessment (CDM Smith 2024) concluded that the aquatic GDEs associated with the Ramsar site are outside the predicted extent of any groundwater drawdowns likely to result from the project.
Result in the habitat or lifecycle of native species, including invertebrate fauna and fish species, dependent upon the wetland being seriously affected	Unlikely	The project includes no identifiable mechanisms that will result directly or indirectly, in the habitat or lifecycle of any native species, including invertebrate fauna and fish species that are dependent upon the wetland being seriously affected.
Result in a substantial and measurable change in the water quality of the wetland – for example, a substantial change in the level of salinity, pollutants, or nutrients in the wetland, or water temperature which may adversely impact on biodiversity, ecological integrity, social amenity or human health	Unlikely	The project includes no identifiable mechanisms that will result directly or indirectly, in substantial and measurable change in any aspect of the water quality of the wetland and no consequent effects on biodiversity, ecological integrity, social amenity or human health are anticipated.
Result in an invasive species that is harmful to the ecological character of the wetland being established (or an existing invasive species being spread) in the wetland	Unlikely	The project includes no identifiable mechanisms by which an invasive species that is harmful to the ecological character of the wetland may become established (nor an existing invasive species being spread) in the wetland.

A6.19 Karst springs and associated alkaline fens of the Naracoorte Coastal Plain Bioregion

Table A6.19 Assessment of the project against significant impact criteria for the Karst springs and associated alkaline fens of the Naracoorte Coastal Plain Bioregion endangered ecological community (CoA 2013)

Significant impact criteria	Likelihood of significant impact	Rationale
Reduce the extent of an ecological community	Unlikely	Within the Investigation Area, the TEC is only known from Lake Mombeong, outside the Project Area and more than 1.5 kilometres any proposed turbine locations. All turbine foundations in the Plantation sub-area will avoid intersecting groundwater. As a result, no impact pathway between the Project and the occurrence of the TEC has been identified and a reduction in extent of the TEC as a result of the project is unlikely. The GDE impact assessment (CDM Smith 2024) concluded that aquatic GDEs associated with the Glenelg Estuary Ramsar Site (including examples of this TEC) are outside the predicted drawdown extent.
Fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines	Unlikely	Within the Investigation Area, the TEC is only known from Lake Mombeong, outside the Project Area. All occurrences are more than 1.5 kilometres from any proposed turbine locations. All turbine foundations in the Plantation sub-area will avoid intersecting groundwater. As a result, no impact pathway between the Project and the occurrence of the TEC has been identified and fragmentation of the TEC as a result of the project is unlikely.
Adversely affect habitat critical to the survival of an ecological community	Unlikely	There is no definition for habitat critical to the survival of the TEC. All occurrences of the TEC are more than 1.5 kilometres from any proposed turbine locations. All turbine foundations in the Plantation sub-area will avoid intersecting groundwater. No impact pathway between the Project and the occurrence of the TEC has been identified, therefore the project is unlikely to adversely affect habitat critical to the survival of the TEC.

Significant impact criteria	Likelihood of significant impact	Rationale
Modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns	Unlikely	Based on current turbine locations, which are at least 1.5 kilometres from the documented occurrence of the TEC at Lake Mombeong, and that turbine foundation excavations in the Plantation sub-area will avoid intersecting groundwater, no impact pathway between the Project and the occurrence of the TEC has been identified and the Project is unlikely to modify or destroy abiotic factors necessary for the survival of the TEC.
Cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting	Unlikely	The project is unlikely to result in any changes to flora or aquatic fauna species composition, as the nearest wind farm infrastructure is more than 1.5 kilometres from any occurrences of the community no changes are expected to surface or groundwater hydrological regimes. There is some potential for mobile fauna, such as wetland birds and bats, that may occupy areas of the TEC to be impacted by turbine collisions, however the magnitude of these collisions is unlikely to be sufficient to cause a substantial change in the fauna species composition of the TEC.
Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to: • **assisting invasive species, that are harmful to the listed ecological community, to become established, or** • **causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community**	Unlikely	The project will adopt best practice controls regarding handling of weeds, pathogens, chemicals and pollutants, and all construction and operation activities are limited to areas more than 1.5 kilometres from Lake Mombeong, The construction and operation of the Project is unlikely to result in any increase to invasive animal populations.

Significant impact criteria	Likelihood of significant impact	Rationale
Interfere with the recovery of an ecological community	Unlikely	There is no recovery plan in place for the TEC. Identified key threats to the TEC include hydrological changes, vegetation clearance and invasive species. As described above the Project is unlikely to result in surface or groundwater hydrological changes that would impact on the TEC and no direct vegetation clearance is required. The Project is also unlikely to result in increases to any invasive species, provided best practice construction methodologies and environmental controls are in place.

Appendix 7 South-eastern Red-tailed Black Cockatoo study

South-eastern Red-tailed Black-Cockatoo flight behaviour investigation for Kentbruck Green Energy Hub

This appendix provides details and findings of an investigation undertaken in July 2020 to document flight behaviours of South-eastern Red-tailed Black-Cockatoo near Edenhope, Victoria. The study was collaboratively supported by Neoen Australia Pty Ltd and Wind Projects Australia Pty Ltd. In the absence of any pre-existing quantitative data about flight behaviour of the species, the aim of the study was to provide some empirical information about this aspect that may assist understanding of wind turbine collision risk for the species. It is recognised that there are significant uncertainties associated with assessment of potential effects of wind energy on the population of South-eastern Red-tailed Black-Cockatoo.

Background information about the South-eastern Red-tailed Black-Cockatoo population and assessment of potential impacts on the species are provided under the relevant species accounts in the main body of the report.

The flight heights of birds are of particular relevance to turbine collision risk. This is becoming an important aspect as increasingly larger turbines are available and the height of rotor blades above the ground has considerable capacity to increase. Turbines at Kentbruck may have a lower tip height of 60 metres above ground-level, which is substantially higher than the majority of wind turbines currently installed in Australia that generally have lower tip heights in the range of 20 – 35 metres. Over the past 20 years Biosis has collected flight height data for many bird species at multiple wind farm sites in south-eastern Australia and elsewhere. The data demonstrates that, while many birds occasionally fly particularly high or low, the great majority of flights by most species are within fairly tight height bands that respond to their ecologies and key behavioural traits. Where the blades of turbines are above the routine flight heights of a given species, the risk of collisions is reduced accordingly.

The present study was designed to provide some data about heights at which Red-tailed Black-Cockatoos naturally fly. Prior to this investigation there was no known quantitative data about flight behaviour of the subspecies, and the aim of the study was to provide some empirical information about this aspect that may assist understanding of wind turbine collision risk for the subspecies. It is recognised that there are limitations to the results (see Methods: Limitations, below), however consideration of turbine collision risk for Red-tailed Black-Cockatoos for the wind farm component of the Kentbruck project can be informed, at least to some extent, by flight-height information for the subspecies.

Methods

Information about the localities where Red-tailed Black-Cockatoos were recorded in May 2020 was obtained from the South-eastern Red-tailed Black-Cockatoo Recovery Program website [http://www.redtail.com.au/news/138/72/Locals-Look-to-the-Skies-for-Red-tailed-Black-Cockatoos.html]. The study was necessarily constrained to locations occupied by Red-tailed Black-Cockatoos and information from the South-eastern Red-tailed Black-Cockatoo Recovery Program and DELWP is that the entire known population was in the Wimmera during the period of the investigation.

Flight data for Red-tailed Black-Cockatoos was recorded during fieldwork on 13-16 July 2020 and on 24-27 July 2020 (dates inclusive) in the Edenhope area, Victoria.

Groups of birds were detected on the basis of the most current location records from Birdlife Australia online data and personal communication with DELWP personnel in the Wimmera region. DELWP habitat modelling and information about locations where the species had been frequently noted by DELWP Forest Fire Management, Edenhope were used to explore similar suitable habitat in the region when looking for additional groups of birds. The fieldwork was undertaken by Daniel Gilmore and Kristen Campbell, of Biosis. Vehicle tracks within suitable habitats were driven slowly while looking for fresh signs of the birds in the area. These include freshly broken off leaf clusters and chewed fruits of Desert Stringybark. The vehicle was stopped every 50 - 100 meters and turned off while staff listened for calls of the species.

On any given day, observations commenced when Red-tailed Black-Cockatoos were first found and continued until birds were observed to have moved from areas of active foraging to overnight roost locations. First observations were between 0930 hrs and 1045 hrs on five days and were between 1430 and 1530 on four days. Last observations were between 1600 and 1750 hrs on all days. Once a group was detected, observers sat quietly approximately 50 meters away from the group and recorded flight movements of the group for the day. It was not possible to observe movements of all members of feeding groups, since the flock was typically dispersed across many hectares of woodland habitat. Hence, observers recorded flight behaviours of those birds closest to them (generally as close as 50 metres). However, when observations were made of groups of birds flying to roost and drinking sites, these observations generally recorded flights of the entire group.

Locations where Red-tailed Black-Cockatoos were found were recorded, as were locations where they were observed to roost. Locations were also recorded where evidence of their recent past presence in the form of feeding debris was found.

Dusk counts and flight movements were undertaken at sites that had been observed as roost sits or were suspected to be roost sites by the observers. Dusk counts involved the two observers standing or sitting under the cover of a tree and recording flights of the birds along with keeping a tally of individual birds as they flew into the roost or drinking site.

Flight data recorded for the subspecies included: number of movements, number of birds, distance from observer and height of flight. Flights out of woodland patches over open country such as adjacent paddocks and roads were noted. Distance from observer and flight height was calibrated between observers by initially using a rangefinder and clinometer to determine dome reference distances and heights for each site against which flights could be compared during the observation period. The heights of flights amongst and immediately above tree canopy height are considered to be precise as tree heights were able to be accurately measured. Flight heights greater than 5 metres above tree canopy height are considered to have a range of +/- 2m of the cited value. Heights recorded for groups of birds were of the highest individual.

To minimise disturbance to the birds, observers never approached to closer than 50 meters of a feeding group of birds. However, the birds frequently moved closer to the observers of their own accord.

Limitations

During the present study, a large portion of the known population was concentrated in the Edenhope area and it was confirmed by DELWP staff and BirdLife Australia (http://www.redtail.com.au/results.html) that the great majority of the known population were present in the northern portion of the subspecies' range in 2020.

Results

The South-eastern Red-tailed Black-Cockatoo Recovery Program noted that in May 2020, the greatest numbers of birds (approximately 450) were found near Ullswater, Victoria. Birds were also found in Victoria near Benayeo and Meereek, close to the South Australian border.

In the present investigation, Red-tailed Black-Cockatoos were found and observed in Arnolds State Forest; at Yalakar State Forest; and on private property on Allnuts Road. Roost sites were documented at the first two of these woodlands. The Arnolds State Forest location is near Ullswater and is likely to represent at least a portion of the area where birds were reported during the annual co-ordinated count by BirdLife Australia in May 2020.

Red-tailed Black-Cockatoos were counted as they moved to roost locations. At each of Arnolds and Yalakar State Forests there were approximately 180 individuals, while there were approximately 20 recorded at Allnuts Road. Hence observations were of a total of approximately 380 birds.

Red-tailed Black-Cockatoos spent the majority of each day feeding amongst the canopy of stringybarks in woodlands. Occasional movements out of foraging areas in woodlands were observed for birds moving between feeding patches or large groups flushed out of the woodland by a bird of prey. When flushed, Red-tailed Black-Cockatoo would form a tight group and circle above the woodland for several minutes emitting alarm calls.

Flights during feeding were typically small distance movements between trees or branches. Typically the birds spent the majority of the day in small feeding groups in a single area. At around 1500 hours the birds became restless and begun to become what can be described as playful. Hanging upside down off branches, performing complicated aerials amongst the branches and courtship behaviour (males head bopping and making a raspy call). The birds started moving towards the edge of the woodland at around 1500 hours. When observing roost sites, it was noted that birds started to gather on the edges of stringybark woodland at around 1630 hours. Most direct flights from woodlands over paddocks to roost sites occurred between 1720 and 1750 hours, it was noted that these flights occurred slightly later each day with longer daylight.

A total of 1001 observations of Red-tailed Black-Cockatoo were documented and included a total of 3639 flights (i.e. individual records included multiple instances of flights by more than one individual).

During the course of their observed activities, Red-tailed Black-Cockatoos flew infrequently and they spent the great majority of their daily activity foraging while perched and climbing amongst tree canopies. Of the 3639 recorded Red-tailed Black-Cockatoo flights, 2006 (55%) were over paddocks and 1633 (45%) were within or over woodlands. While the relative proportion of flights over open ground is high, they consisted of one or two flights per day by individual birds as they moved to roost or drinking locations in the late afternoon. Other flights within woodlands were almost all very short fights made between trees. Three instances, involving 88 flights by Red-tailed Black-Cockatoos, were recorded in which the birds were disturbed by the presence of a Wedge-tailed Eagle. In these cases, the cockatoos flew above the woodland tree canopy to maximum heights respectively, of 15, 20 and 30 metres above the ground.

The heights of Red-tailed Black-Cockatoo flights recorded during the study are summarised in Table 30 for each of open country (i.e. over paddocks) and within woodlands.

Table 34 Heights of 3639 Red-tailed Black-Cockatoo flights recorded near Edenhope in 2020

Height of flights above ground (metres)	Number of flights over open country (% within this environment)	Number of flights within / over woodland (% within this environment)
0 - 19	1,110 (55%)	1,341 (82%)
20 - 29	530 (26%)	278 (17%)
30 - 39	354 (18%)	6 (0.4%)
40 - 49	3 (0.2%)	0 (0.0%)
50 - 54	9 (0.4%)	8 (0.5%)

Table 1 also shows the percentage of flights within various height-bands for each of the two environments. Over open paddocks, 99% of all flights were between the ground and 39 metres high. Within woodlands, 99% of all flights were between the ground and 29 metres high and this appeared to be in response to the nature of flights that were primarily simply between trees in that environment. There were no evident reasons for the highest flights. Flights at or above 50 metres from the ground include a flight of three birds at 50 metres; a flight of nine birds at 51 metres and a flight of five birds at 54 metres.

Implications to assessment of wind energy projects

With regard to natural flight heights of South-eastern Red-tailed Black-Cockatoos, it is noted that prior to the present investigation, there was no known or available data for this or any other of the subspecies. Hence, results of this short investigation offer the only empirical data that may assist in a qualitative consideration of turbine collision risk.

The investigation was concentrated on natural woodlands and whilst the vegetation species composition at the study locations differs from that of woodlands in the southern portion of the subspecies' range near Kentbruck, it is structurally analogous with trees of similar height. As noted above, the entire population is believed to have been within the northern portion of its range, far from Kentbruck, at the time the study was undertaken and during the assessment to date it has not been possible to study the birds near Kentbruck. The flight-height data collected by the study cannot be taken as a definitive indication of the heights at which the subspecies might fly through the Kentbruck wind farm site. However, the dataset is the only known quantification of flight-heights for the subspecies and results for the period of the study were that the very great majority of flights were below the rotor-swept height of turbines proposed for the wind farm.

Biosis has recorded flights of the congeneric Yellow-tailed Black Cockatoo *Calyptorhynchus funereus* at the Kentbruck site and at some operational wind farms elsewhere in Victoria and Tasmania. Its habitat preferences are broader than those of the Red-tailed Black-Cockatoo, but its general flight characteristics and morphology are similar. We are not aware of any records of Yellow-tailed Black Cockatoo collisions with wind turbines. During bird utilisation point counts undertaken for the Kentbruck project a total of 415 flights by Yellow-tailed Black Cockatoos were recorded at 12 sites within pine plantations. The records include 2 flights at 60 metres height with all other flights at lower heights.

If the flight heights of Red-tailed Black-Cockatoo documented here are indicative of the routine behaviours of the species as they fly within treed areas or open country in the area of the Kentbruck project, the probability of them colliding with turbines proposed for the wind farm would be very low.

References

Commonwealth of Australia 2006. *Background and Implementation Information for the South-eastern Red-tailed Black-cockatoo* Calyptorhynchus banksii graptogyne Recovery Plan. Australian Government Department of the Environment and Water Resources.

Commonwealth of Australia 2007. *National recovery plan for the South-eastern Red-tailed Black-*Cockatoo Calyptorhynchus banksii graptogyne. Australian Government Department of the Environment and Water Resources.

Appendix 8 Habitat Importance Models

This appendix lists species that have habitat importance models intersecting the Project Area.

Code	Meaning	Reference
National listings (EPBC Act)		
CR	Critically endangered	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)
EN	Endangered	
VU	Vulnerable	
State listings (FFG Act)		
VU	Vulnerable	Victorian *Flora and Fauna Guarantee Act 1988* (FFG Act)
EN	Endangered	
CR	Critically endangered	

Table A8.1 Flora species with habitat importance models intersecting the Project Area

Status		Scientific name	Common name
EPBC	FFG		
	EN	*Acrotriche cordata*	Coast Ground-berry
	EN	*Adriana quadripartita*	Coast Bitter-bush
	EN	*Amphibromus sinuatus*	Wavy Swamp Wallaby-grass
	EN	*Austrostipa mundula*	Neat Spear-grass
	EN	*Boronia nana* var. *pubescens*	Dwarf Boronia
	EN	*Boronia pilosa* subsp. *torquata*	Hairy Boronia
	EN	*Bossiaea cordigera*	Wiry Bossiaea
	CR	*Caladenia fragrantissima*	Scented Spider-orchid
EN	CR	*Caladenia hastate*	Mellblom's Spider-orchid
	CR	*Caladenia valida*	Robust Spider-orchid
	EN	*Caladenia venusta*	Large White Spider-orchid
	V	*Caladenia vulgaris*	Slender Pink-fingers
	EN	*Cardamine papillata*	Forest Bitter-cress
		Cardamine paucijuga s.s. (forest form)	Annual Bitter-cress
	EN	*Cladium procerum*	Leafy Twig-sedge
	EN	*Colobanthus apetalus* var. *apetalus*	Coast Colobanth
	CR	*Coronidium gunnianum*	Pale Swamp Everlasting
	EN	*Corybas despectans*	Coast Helmet-orchid
	EN	*Dianella callicarpa*	Swamp Flax-lily
	EN	*Dichondra sp.* 1	Silky Kidney-weed

Status		Scientific name	Common name
EPBC	FFG		
	EN	*Dipodium pardalinum*	Spotted Hyacinth-orchid
	EN	*Diuris palustris*	Swamp Diuris
	V	*Eucalyptus falciformis*	Western Peppermint
	CR	*Eucalyptus kitsoniana*	Bog Gum
	CR	*Eucalyptus leucoxylon* subsp. *megalocarpa*	Large-fruit Yellow-gum
	CR	*Eucalyptus splendens*	Apple Jack
	EN	*Exocarpos syrticola*	Coast Ballart
	V	*Galium curvihirtum*	Tight Bedstraw
	EN	*Geranium solanderi* var. *solanderi s.s.*	Austral Crane's-bill
	EN	*Geranium* sp. 6	Delicate Crane's-bill
VU	V	*Glycine latrobeana*	Clover Glycine
	EN	*Gratiola pumilo*	Dwarf Brooklime
VU		*Haloragis exalata* var. *exalata*	Square Raspwort
	EN	*Hibbertia pallidiflora*	Pale Guinea-flower
		Hibbertia sericea var. *scabrifolia*	Silky Guinea-flower
	EN	*Lachnagrostis rudis* subsp. *rudis*	Rough Blown-grass
	EN	*Lachnagrostis semibarbata* var. *filifolia*	Purple Blown-grass
	EN	*Lachnagrostis semibarbata* var. *semibarbata*	Purple Blown-grass
	EN	*Lepidosperma canescens*	Hoary Rapier-sedge
	EN	*Levenhookia sonderi*	Slender Stylewort
	VU	*Lobelia beaugleholei*	Showy Lobelia
	EN	*Logania ovata*	Oval-leaf Logania
	VU	*Lomandra micrantha* subsp. *tuberculata*	Small-flower Mat-rush
	EN	*Machaerina laxa*	Lax Twig-sedge
	EN	*Melaleuca halmaturorum*	Salt Paperbark
	CR	*Microseris scapigera s.s.*	Plains Yam-daisy
	EN	*Microtis orbicularis*	Swamp Onion-orchid
	EN	*Muehlenbeckia gunnii*	Coastal Lignum
	EN	*Olearia asterotricha*	Rough Daisy-bush
	EN	*Picris squarrosa*	Squat Picris
	EN	*Pimelea hewardiana*	Forked Rice-flower
	EN	*Pneumatopteris pennigera*	Lime Fern
	EN	*Poa poiformis* var. *ramifer*	Dune Poa

Status		Scientific name	Common name
EPBC	FFG		
	EN	*Pomaderris halmaturina* subsp. *continentis*	Glenelg Pomaderris
EN	EN	*Prasophyllum frenchii*	Maroon Leek-orchid
	CR	*Prasophyllum litorale*	Coastal Leek-orchid
VU	CR	*Prasophyllum spicatum*	Dense Leek-orchid
VU	EN	*Pterostylis chlorogramma*	Green-striped Greenhood
	EN	*Pterostylis cucullata* subsp. *cucullata*	Leafy Greenhood
	EN	*Pterostylis lustra*	Small Sickle Greenhood
VU		*Pterostylis tenuissima*	Swamp Greenhood
	EN	*Pultenaea canaliculata*	Coast Bush-pea
	EN	*Pultenaea prolifera*	Otway Bush-pea
	EN	*Quinetia urvillei*	Grey Zig-zag
	CR	*Ranunculus amplus*	Lacey River Buttercup
	EN	*Roepera billardierei*	Coast Twin-leaf
	EN	*Scaevola calendulacea*	Dune Fan-flower
	EN	*Schoenus carsei*	Wiry Bog-sedge
	EN	*Senecio cunninghamii* var. *cunninghamii*	Branching Groundsel
VU		*Senecio psilocarpus*	Swamp Fireweed
	EN	*Sporadanthus tasmanicus*	Branching Scale-rush
	EN	*Thelymitra benthamiana*	Blotched Sun-orchid
EN	EN	*Thelymitra epipactoides*	Metallic Sun-orchid
	CR	*Thelymitra hiemalis*	Winter Sun-orchid
	EN	*Thelymitra malvina*	Mauve-tuft Sun-orchid
	EN	*Thomasia petalocalyx*	Paper Flower
	VU	*Wurmbea uniflora*	One-flower Early Nancy
	VU	*Xanthorrhoea caespitosa*	Tufted Grass-tree
	EN	*Xanthosia leiophylla*	Parsley Xanthosia
	EN	*Xanthosia tasmanica*	Southern Xanthosia
VU	CR	*Xerochrysum palustre*	Swamp Everlasting

Table A8.2 Fauna species with habitat importance models intersecting the Project Area

Status		Scientific name	Common name
EPBC	FFG		
	EN	*Accipiter novaehollandiae*	Grey Goshawk
	VU	*Actitis hypoleucos*	Common Sandpiper
	EN	*Antigone rubicunda*	Brolga
	VU	*Ardea alba modesta*	Eastern Great Egret
	CR	*Ardea intermedia plumifera*	Plumed Egret
	VU	*Aythya australis*	Hardhead
	VU	*Biziura lobata*	Musk Duck
EN	CR	*Botaurus poiciloptilus*	Australasian Bittern
	VU	*Calamanthus pyrrhopygius*	Chestnut-rumped Heathwren
EN	EN	*Calyptorhynchus banksii graptogyne*	Red-tailed Black-Cockatoo (south-eastern)
EN	EN	*Dasyurus maculatus maculatus*	Spot-tailed Quoll
	EN	*Egretta garzetta*	Little Egret
	EN	*Engaeus strictifrons*	Portland Burrowing Crayfish
	CR	*Falco subniger*	Black Falcon
	EN	*Galaxiella toourtkoourt*	Little Galaxias
	EN	*Gelochelidon macrotarsa*	Australian Gull-billed Tern
	EN	*Haliaeetus leucogaster*	White-bellied Sea-Eagle
VU	VU	*Hirundapus caudacutus*	White-throated Needletail
	VU	*Lewinia pectoralis*	Lewin's Rail
EN	EN	*Lissolepis coventryi*	Swamp Skink
VU	VU	*Litoria raniformis*	Growling Grass Frog
	VU	*Lophoictinia isura*	Square-tailed Kite
	CR	*Miniopterus orianae oceanensis*	Eastern Bent-winged Bat
EN	VU	*Nannoperca obscura*	Yarra Pygmy Perch
CR	CR	*Neophema chrysogaster*	Orange-bellied Parrot
	VU	*Neophema elegans*	Elegant Parrot
	CR	*Ninox connivens*	Barking Owl
	VU	*Ninox strenua*	Powerful Owl
	VU	*Oxyura australis*	Blue-billed Duck
	EN	*Pezoporus wallicus*	Ground Parrot
VU	VU	*Pluvialis squatarola*	Grey Plover

Status		Scientific name	Common name
EPBC	FFG		
	EN	*Pseudemoia rawlinsoni*	Glossy Grass Skink
	EN	*Pseudophryne semimarmorata*	Southern Toadlet
VU	VU	*Pteropus poliocephalus*	Grey-headed Flying-fox
	VU	*Spatula rhynchotis*	Australasian Shoveler
MI	CR	*Sternula albifrons*	Little Tern
VU	CR	*Sternula nereis*	Fairy Tern
	EN	*Stictonetta naevosa*	Freckled Duck
	EN	*Synoicus chinensis*	King Quail
EN	EN	*Tringa nebularia*	Common Greenshank
	EN	*Tringa stagnatilis*	Marsh Sandpiper
	CR	*Tyto novaehollandiae*	Masked Owl
VU	EN	*Xenus cinereus*	Terek Sandpiper

Appendix 9 Native vegetation removal report

This appendix presents the native vegetation removal report for the project (81 pages).

Native Vegetation Removal Report

NVRR ID: 323_20241122_05G

This report provides information to support an application to remove, destroy or lop native vegetation in accordance with the *Guidelines for the removal, destruction or lopping of native vegetation* (the Guidelines). This report is **not an assessment by DEECA** of the proposed native vegetation removal. Native vegetation information and offset requirements have been determined using spatial data provided by the applicant or their consultant.

Report details

Date created: 22/11/2024

Local Government Area: GLENELG SHIRE

Shapefile name:
35014_VegClearing_Patches_20241122_2.shp

Site assessor name: Matthew Gibson

Registered Aboriginal Party: Gunditj Mirring

Coordinates: 141.30129, -38.16068

Address:
98 JOHNSONS ROAD NELSON 3292
17 STANLEYS ROAD MOUNT RICHMOND 3305
PORTLAND-NELSON ROAD MOUNT RICHMOND 3305
79 RIFLE RANGE ROAD HEYWOOD 3304
JENNINGS ROAD GORAE 3305
350 GOLF COURSE ROAD HEYWOOD 3304
211 PORTLAND-NELSON ROAD PORTLAND 3305
7 LIGHTBODYS ROAD PORTLAND 3305
PORTLAND-NELSON ROAD NELSON 3292
200 CUT OUT DAM ROAD GORAE 3305
(8 additional addresses not listed)

Regulator Notes

Removal polygons are located:

- Within a DEECA Mapped Wetland area
- On Crown Land

Summary of native vegetation to be removed

Assessment pathway	**Detailed Assessment Pathway**		
Location category	Location 3 Within this area, the removal of less than 0.5 hectares of native vegetation could have a significant impact on the habitat of one or more rare or threatened species. In such cases, a Species Offset will be required.		
Total extent including past and proposed removal (ha) *Includes endangered EVCs (ha): 0.306*	**8.696**	*Extent of past removal (ha)*	*0*
		Extent of proposed removal - Patches (ha)	*8.696*
		Extent of proposed removal - Scattered Trees (ha)	*0.000*
No. Large Trees proposed to be removed	**228**	*No. Large Patch Trees*	*228*
		No. Large Scattered Trees	*0*
No. Small Scattered Trees	0		

Offset requirements if approval is granted

Any approval granted will include a condition to obtain an offset, before the removal of native vegetation, that meets the following requirements:

General Offset amount [1]	**0.5360 General Habitat Units**
Vicinity	Glenelg Hopkins CMA or GLENELG SHIRE LGA
Minimum strategic biodiversity value score [2]	0.3280
Large Trees*	23
Species Offset amount	**6.755** Species Habitat Units for Lax Twig-sedge, Baumea laxa (500378)
	2.824 Species Habitat Units for Oval-leaf Logania, Logania ovata (502032)
	6.009 Species Habitat Units for Scented Spider-orchid, Caladenia fragrantissima (504351)
	2.542 Species Habitat Units for Hairy Boronia, Boronia pilosa subsp. torquata (505645)
	5.725 Species Habitat Units for Leafy Greenhood, Pterostylis cucullata subsp. cucullata (505911)
Large Trees*	205
***The total number of Large Trees that the offset must protect**	**228** Large Trees to be protected in either the General, Species or combination across all habitat units protected

1. The General Offset amount required is the sum of all General Habitat Units in Appendix 1.
2. Minimum strategic biodiversity value score is 80 per cent of the weighted average score across habitat zones where a General Offset is required.
3. The Species Offset amount(s) required is the sum of all Species Habitat Units in Appendix 1.

NB: values within tables in this document may not add to the totals shown above due to rounding

Appendix 1 includes information about the native vegetation to be removed

Appendix 2 includes information about the rare or threatened species with mapped habitat at the site

Appendix 3 includes the following figures

- Location map
- Strategic Biodiversity Value map
- Condition map
- Endangered EVCs map
- Aerial photograph showing mapped native vegetation
- Property in context
- Habitat Importance maps

Next steps

Any proposal to remove native vegetation must meet the application requirements of the Detailed Assessment Pathway and it will be assessed under the Detailed Assessment Pathway.

If you wish to remove the mapped native vegetation you are required to apply for approval from the responsible authority. The responsible authority will refer your application to DEECA for assessment, as required. **This report is not a referral assessment by DEECA.**

This *Native vegetation removal report* must be submitted with your application for approval to remove, destroy or lop native vegetation.

Refer to the Guidelines for a full list of application requirements This report provides information that meets the following application requirements:

- The assessment pathway and reason for the assessment pathway.
- A description of the native vegetation to be removed (partly met).
- Maps showing the native vegetation and property (partly met).
- Information about the impacts on rare or threatened species.
- The offset requirements determined in accordance with Section 5 of the Guidelines that apply if approval is granted to remove native vegetation.

Additional application requirements must be met including:

- Topographical and land information
- Recent dated photographs.
- Details of past native vegetation removal.
- An avoid and minimise statement.
- A copy of any Property Vegetation Plan as applicable.
- A defendable space statement as applicable.
- A statement about the Native Vegetation Precinct Plan (NVPP) as applicable.
- A site assessment report including a habitat hectare assessment of any patches of native vegetation and details of trees.
- An offset statement that explains that an offset has been identified and how it will be secured.

Appendix 1: Description of native vegetation to be removed

The Species-General Offset Test was applied to your proposal. This test determines if the proposed removal of native vegetation has a proportional impact on any rare or threatened species habitats above the Species Offset threshold. The threshold is set at 0.005 per cent of the mapped habitat value for a species. When the proportional impact meets or exceeds the Species Offset threshold, a Species Offset is required. This test is completed for all species with mapped habitat at the site. Multiple Species Offsets will be required if the Species Offset threshold is exceeded for multiple species.

Where a zone requires Species Offset(s), the Species Habitat Units for each species in that zone are calculated by the following equation in accordance with the Guidelines: ***Species Habitat Units = extent without overlap x condition score x species landscape factor x 2, where the species landscape factor = 0.5 + (habitat importance score/2)***

The Species Offset amount(s) required is the sum of all Species Habitat Units per zone.

Where a zone does not require a Species Offset, the General Habitat Units in that zone are calculated by the following equation in accordance with the Guidelines: ***General Habitat Units = extent without overlap x condition score x general landscape factor x 1.5, where the general landscape factor = 0.5 + (strategic biodiversity value score/2)***

The General Offset amount required is the sum of all General Habitat Units per zone.

Native vegetation to be removed

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	**Type**	**DBH (cm)**	**EVC code**	**Bioregional conservation status**	**Partial Removal**	**Condition score**	**Large Tree(s)**	**Polygon extent (ha)**	**Extent without overlap (ha)**	**SBV score**	**HI Score**	**Habitat Units**	**Offset Type**
0-AA	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.005	0.005	0.990	0.860	0.008	Lax Twig-sedge Baumea laxa (500378)
0-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.008	0.008	0.960	0.820	0.012	Lax Twig-sedge Baumea laxa (500378)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	**Type**	**DBH (cm)**	**EVC code**	**Bioregional conservation status**	**Partial Removal**	**Condition score**	**Large Tree(s)**	**Polygon extent (ha)**	**Extent without overlap (ha)**	**SBV score**	**HI Score**	**Habitat Units**	**Offset Type**
0-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.008	0.008	0.960	0.820	0.012	Oval-leaf Logania Logania ovata (502032)
0-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.006	0.006	0.820	0.830	0.010	Lax Twig-sedge Baumea laxa (500378)
0-AD	Patch	-	VVP_0023	Vulnerable	no	0.710	-	0.001	0.001	0.640	0.840	0.002	Lax Twig-sedge Baumea laxa (500378)
1-AA	Patch	-	GleP0003	Vulnerable	no	0.190	-	0.014	0.014	0.150	-	0.002	General
1-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.008	0.008	0.940	0.850	0.012	Lax Twig-sedge Baumea laxa (500378)
1-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.008	0.008	0.940	0.850	0.012	Scented Spider-orchid Caladenia fragrantissima (504351)
1-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.002	0.002	0.880	0.850	0.003	Lax Twig-sedge Baumea laxa (500378)
1-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.002	0.002	0.880	0.850	0.003	Oval-leaf Logania Logania ovata (502032)
1-AD	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.020	0.020	0.820	0.830	0.030	Lax Twig-sedge Baumea laxa (500378)
1-AE	Patch	-	VVP_0023	Vulnerable	no	0.710	-	0.002	0.002	0.640	0.840	0.003	Lax Twig-sedge Baumea laxa (500378)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	**Type**	**DBH (cm)**	**EVC code**	**Bioregional conservation status**	**Partial Removal**	**Condition score**	**Large Tree(s)**	**Polygon extent (ha)**	**Extent without overlap (ha)**	**SBV score**	**HI Score**	**Habitat Units**	**Offset Type**
10-AA	Patch	-	GleP0858	Endangered	no	0.480	-	0.001	0.001	0.270	0.270	0.000	Lax Twig-sedge Baumea laxa (500378)
10-AA	Patch	-	GleP0858	Endangered	no	0.480	-	0.001	0.001	0.270	0.270	0.000	Oval-leaf Logania Logania ovata (502032)
10-AA	Patch	-	GleP0858	Endangered	no	0.480	-	0.001	0.001	0.270	0.270	0.000	Scented Spider-orchid Caladenia fragrantissima (504351)
10-AA	Patch	-	GleP0858	Endangered	no	0.480	-	0.001	0.001	0.270	0.270	0.000	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
10-AB	Patch	-	VVP_0198	Vulnerable	no	0.830	-	0.004	0.004	0.970	0.820	0.006	Lax Twig-sedge Baumea laxa (500378)
10-AB	Patch	-	VVP_0198	Vulnerable	no	0.830	-	0.004	0.004	0.970	0.820	0.006	Oval-leaf Logania Logania ovata (502032)
10-AB	Patch	-	VVP_0198	Vulnerable	no	0.830	-	0.004	0.004	0.970	0.820	0.006	Scented Spider-orchid Caladenia fragrantissima (504351)
10-AB	Patch	-	VVP_0198	Vulnerable	no	0.830	-	0.004	0.004	0.970	0.820	0.006	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
10-AC	Patch	-	VVP_0198	Vulnerable	no	0.830	1	0.011	0.011	0.860	0.840	0.017	Lax Twig-sedge Baumea laxa (500378)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	Type	DBH (cm)	EVC code	Bioregional conservation status	Partial Removal	Condition score	Large Tree(s)	Polygon extent (ha)	Extent without overlap (ha)	SBV score	HI Score	Habitat Units	Offset Type
10-AC	Patch	-	VVP_0198	Vulnerable	no	0.830	1	0.011	0.011	0.860	0.840	0.017	Scented Spider-orchid Caladenia fragrantissima (504351)
10-AC	Patch	-	VVP_0198	Vulnerable	no	0.830	1	0.011	0.011	0.860	0.840	0.017	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
10-AD	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.004	0.004	0.680	0.840	0.006	Lax Twig-sedge Baumea laxa (500378)
10-AD	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.004	0.004	0.680	0.840	0.006	Scented Spider-orchid Caladenia fragrantissima (504351)
10-AE	Patch	-	GleP0008	Least Concern	no	0.650	-	0.778	0.778	0.916	0.600	0.809	Scented Spider-orchid Caladenia fragrantissima (504351)
10-AE	Patch	-	GleP0008	Least Concern	no	0.650	-	0.778	0.778	0.916	1.000	1.012	Hairy Boronia Boronia pilosa subsp. torquata (505645)
10-AE	Patch	-	GleP0008	Least Concern	no	0.650	-	0.778	0.778	0.916	0.600	0.809	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
11-AA	Patch	-	GleP0858	Endangered	no	0.480	-	0.007	0.007	0.270	0.270	0.004	Lax Twig-sedge Baumea laxa (500378)
11-AA	Patch	-	GleP0858	Endangered	no	0.480	-	0.007	0.007	0.270	0.270	0.004	Oval-leaf Logania Logania ovata (502032)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	**Type**	**DBH (cm)**	**EVC code**	**Bioregional conservation status**	**Partial Removal**	**Condition score**	**Large Tree(s)**	**Polygon extent (ha)**	**Extent without overlap (ha)**	**SBV score**	**HI Score**	**Habitat Units**	**Offset Type**
11-AA	Patch	-	GleP0858	Endangered	no	0.480	-	0.007	0.007	0.270	0.270	0.004	Scented Spider-orchid Caladenia fragrantissima (504351)
11-AA	Patch	-	GleP0858	Endangered	no	0.480	-	0.007	0.007	0.270	0.270	0.004	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
11-AB	Patch	-	VVP_0198	Vulnerable	no	0.830	-	0.003	0.003	0.970	0.820	0.004	Lax Twig-sedge Baumea laxa (500378)
11-AB	Patch	-	VVP_0198	Vulnerable	no	0.830	-	0.003	0.003	0.970	0.820	0.004	Oval-leaf Logania Logania ovata (502032)
11-AB	Patch	-	VVP_0198	Vulnerable	no	0.830	-	0.003	0.003	0.970	0.820	0.004	Scented Spider-orchid Caladenia fragrantissima (504351)
11-AB	Patch	-	VVP_0198	Vulnerable	no	0.830	-	0.003	0.003	0.970	0.820	0.004	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
11-AC	Patch	-	VVP_0023	Vulnerable	no	0.770	-	0.004	0.004	0.960	0.790	0.005	Lax Twig-sedge Baumea laxa (500378)
11-AC	Patch	-	VVP_0023	Vulnerable	no	0.770	-	0.004	0.004	0.960	0.790	0.005	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
11-AD	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.005	0.005	0.680	0.840	0.008	Lax Twig-sedge Baumea laxa (500378)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	Type	DBH (cm)	EVC code	Bioregional conservation status	Partial Removal	Condition score	Large Tree(s)	Polygon extent (ha)	Extent without overlap (ha)	SBV score	HI Score	Habitat Units	Offset Type
11-AD	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.005	0.005	0.680	0.840	0.008	Scented Spider-orchid Caladenia fragrantissima (504351)
11-AE	Patch	-	GleP0008	Least Concern	no	0.650	-	1.177	1.177	0.942	0.566	1.198	Lax Twig-sedge Baumea laxa (500378)
11-AE	Patch	-	GleP0008	Least Concern	no	0.650	-	1.177	1.177	0.942	0.633	1.250	Scented Spider-orchid Caladenia fragrantissima (504351)
11-AE	Patch	-	GleP0008	Least Concern	no	0.650	-	1.177	1.177	0.942	1.000	1.530	Hairy Boronia Boronia pilosa subsp. torquata (505645)
11-AE	Patch	-	GleP0008	Least Concern	no	0.650	-	1.177	1.177	0.942	0.633	1.250	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
12-AA	Patch	-	GleP0003	Vulnerable	no	0.480	-	0.162	0.162	0.166	0.167	0.091	Lax Twig-sedge Baumea laxa (500378)
12-AA	Patch	-	GleP0003	Vulnerable	no	0.480	-	0.162	0.162	0.166	0.167	0.091	Oval-leaf Logania Logania ovata (502032)
12-AA	Patch	-	GleP0003	Vulnerable	no	0.480	-	0.162	0.162	0.166	0.167	0.091	Scented Spider-orchid Caladenia fragrantissima (504351)
12-AA	Patch	-	GleP0003	Vulnerable	no	0.480	-	0.162	0.162	0.166	0.167	0.091	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	**Type**	**DBH (cm)**	**EVC code**	**Bioregional conservation status**	**Partial Removal**	**Condition score**	**Large Tree(s)**	**Polygon extent (ha)**	**Extent without overlap (ha)**	**SBV score**	**HI Score**	**Habitat Units**	**Offset Type**
12-AB	Patch	-	VVP_0198	Vulnerable	no	0.830	1	0.008	0.008	0.970	0.820	0.012	Lax Twig-sedge Baumea laxa (500378)
12-AB	Patch	-	VVP_0198	Vulnerable	no	0.830	1	0.008	0.008	0.970	0.820	0.012	Oval-leaf Logania Logania ovata (502032)
12-AB	Patch	-	VVP_0198	Vulnerable	no	0.830	1	0.008	0.008	0.970	0.820	0.012	Scented Spider-orchid Caladenia fragrantissima (504351)
12-AB	Patch	-	VVP_0198	Vulnerable	no	0.830	1	0.008	0.008	0.970	0.820	0.012	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
12-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.016	0.016	0.880	0.850	0.024	Lax Twig-sedge Baumea laxa (500378)
12-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.016	0.016	0.880	0.850	0.024	Oval-leaf Logania Logania ovata (502032)
12-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.016	0.016	0.880	0.850	0.024	Scented Spider-orchid Caladenia fragrantissima (504351)
12-AD	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.005	0.005	0.680	0.820	0.007	Lax Twig-sedge Baumea laxa (500378)
12-AD	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.005	0.005	0.680	0.820	0.007	Scented Spider-orchid Caladenia fragrantissima (504351)
12-AE	Patch	-	GleP0008	Least Concern	no	0.350	-	0.160	0.160	0.830	0.348	0.075	Scented Spider-orchid Caladenia fragrantissima (504351)

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Zone	**Type**	**DBH (cm)**	**EVC code**	**Bioregional conservation status**	**Partial Removal**	**Condition score**	**Large Tree(s)**	**Polygon extent (ha)**	**Extent without overlap (ha)**	**SBV score**	**HI Score**	**Habitat Units**	**Offset Type**
12-AE	Patch	-	GleP0008	Least Concern	no	0.350	-	0.160	0.160	0.830	0.348	0.075	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
13-AA	Patch	-	GleP0048	Least Concern	no	0.320	-	0.120	0.120	0.820	0.552	0.059	Scented Spider-orchid Caladenia fragrantissima (504351)
13-AA	Patch	-	GleP0048	Least Concern	no	0.320	-	0.120	0.120	0.820	0.552	0.059	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
13-AB	Patch	-	VVP_0198	Vulnerable	no	0.830	-	0.006	0.006	0.970	0.820	0.009	Lax Twig-sedge Baumea laxa (500378)
13-AB	Patch	-	VVP_0198	Vulnerable	no	0.830	-	0.006	0.006	0.970	0.820	0.009	Oval-leaf Logania Logania ovata (502032)
13-AB	Patch	-	VVP_0198	Vulnerable	no	0.830	-	0.006	0.006	0.970	0.820	0.009	Scented Spider-orchid Caladenia fragrantissima (504351)
13-AB	Patch	-	VVP_0198	Vulnerable	no	0.830	-	0.006	0.006	0.970	0.820	0.009	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
13-AC	Patch	-	VVP_0198	Vulnerable	no	0.830	1	0.005	0.005	0.860	0.840	0.008	Lax Twig-sedge Baumea laxa (500378)
13-AC	Patch	-	VVP_0198	Vulnerable	no	0.830	1	0.005	0.005	0.860	0.840	0.008	Oval-leaf Logania Logania ovata (502032)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	**Type**	**DBH (cm)**	**EVC code**	**Bioregional conservation status**	**Partial Removal**	**Condition score**	**Large Tree(s)**	**Polygon extent (ha)**	**Extent without overlap (ha)**	**SBV score**	**HI Score**	**Habitat Units**	**Offset Type**
13-AC	Patch	-	VVP_0198	Vulnerable	no	0.830	1	0.005	0.005	0.860	0.840	0.008	Scented Spider-orchid Caladenia fragrantissima (504351)
13-AC	Patch	-	VVP_0198	Vulnerable	no	0.830	1	0.005	0.005	0.860	0.840	0.008	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
13-AD	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.003	0.003	0.740	0.840	0.004	Lax Twig-sedge Baumea laxa (500378)
13-AE	Patch	-	GleP0003	Vulnerable	no	0.250	-	0.038	0.038	0.800	0.222	0.012	Lax Twig-sedge Baumea laxa (500378)
13-AE	Patch	-	GleP0003	Vulnerable	no	0.250	-	0.038	0.038	0.800	0.222	0.012	Oval-leaf Logania Logania ovata (502032)
13-AE	Patch	-	GleP0003	Vulnerable	no	0.250	-	0.038	0.038	0.800	0.222	0.012	Scented Spider-orchid Caladenia fragrantissima (504351)
13-AE	Patch	-	GleP0003	Vulnerable	no	0.250	-	0.038	0.038	0.800	0.222	0.012	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
14-AA	Patch	-	GleP0048	Least Concern	no	0.230	-	0.062	0.062	0.470	0.560	0.022	Scented Spider-orchid Caladenia fragrantissima (504351)
14-AA	Patch	-	GleP0048	Least Concern	no	0.230	-	0.062	0.062	0.470	0.560	0.022	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	**Type**	**DBH (cm)**	**EVC code**	**Bioregional conservation status**	**Partial Removal**	**Condition score**	**Large Tree(s)**	**Polygon extent (ha)**	**Extent without overlap (ha)**	**SBV score**	**HI Score**	**Habitat Units**	**Offset Type**
14-AB	Patch	-	VVP_0198	Vulnerable	no	0.830	-	0.001	0.001	0.970	0.820	0.002	Lax Twig-sedge Baumea laxa (500378)
14-AB	Patch	-	VVP_0198	Vulnerable	no	0.830	-	0.001	0.001	0.970	0.820	0.002	Oval-leaf Logania Logania ovata (502032)
14-AB	Patch	-	VVP_0198	Vulnerable	no	0.830	-	0.001	0.001	0.970	0.820	0.002	Scented Spider-orchid Caladenia fragrantissima (504351)
14-AB	Patch	-	VVP_0198	Vulnerable	no	0.830	-	0.001	0.001	0.970	0.820	0.002	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
14-AC	Patch	-	VVP_0198	Vulnerable	no	0.830	-	0.004	0.004	0.860	0.840	0.006	Lax Twig-sedge Baumea laxa (500378)
14-AC	Patch	-	VVP_0198	Vulnerable	no	0.830	-	0.004	0.004	0.860	0.840	0.006	Oval-leaf Logania Logania ovata (502032)
14-AC	Patch	-	VVP_0198	Vulnerable	no	0.830	-	0.004	0.004	0.860	0.840	0.006	Scented Spider-orchid Caladenia fragrantissima (504351)
14-AC	Patch	-	VVP_0198	Vulnerable	no	0.830	-	0.004	0.004	0.860	0.840	0.006	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
14-AD	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.002	0.002	0.680	0.840	0.003	Lax Twig-sedge Baumea laxa (500378)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	Type	DBH (cm)	EVC code	Bioregional conservation status	Partial Removal	Condition score	Large Tree(s)	Polygon extent (ha)	Extent without overlap (ha)	SBV score	HI Score	Habitat Units	Offset Type
14-AD	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.002	0.002	0.680	0.840	0.003	Scented Spider-orchid Caladenia fragrantissima (504351)
14-AE	Patch	-	GleP0858	Endangered	no	0.410	-	0.000	0.000	0.200	-	0.000	General
15-AA	Patch	-	VVP_0008	Least Concern	no	0.230	-	0.028	0.028	0.450	-	0.007	General
15-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.004	0.004	0.750	0.860	0.006	Lax Twig-sedge Baumea laxa (500378)
15-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.004	0.004	0.750	0.860	0.006	Oval-leaf Logania Logania ovata (502032)
15-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.004	0.004	0.870	0.830	0.006	Lax Twig-sedge Baumea laxa (500378)
15-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.004	0.004	0.870	0.830	0.006	Oval-leaf Logania Logania ovata (502032)
15-AD	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.005	0.005	0.740	0.840	0.008	Lax Twig-sedge Baumea laxa (500378)
15-AE	Patch	-	GleP0003	Vulnerable	no	0.410	-	0.057	0.057	0.170	-	0.021	General
16-AA	Patch	-	VVP_0023	Vulnerable	no	0.180	-	0.009	0.009	0.758	0.560	0.003	Lax Twig-sedge Baumea laxa (500378)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	**Type**	**DBH (cm)**	**EVC code**	**Bioregional conservation status**	**Partial Removal**	**Condition score**	**Large Tree(s)**	**Polygon extent (ha)**	**Extent without overlap (ha)**	**SBV score**	**HI Score**	**Habitat Units**	**Offset Type**
16-AA	Patch	-	VVP_0023	Vulnerable	no	0.180	-	0.009	0.009	0.758	0.560	0.003	Oval-leaf Logania Logania ovata (502032)
16-AA	Patch	-	VVP_0023	Vulnerable	no	0.180	-	0.009	0.009	0.758	0.560	0.003	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
16-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.002	0.002	0.750	0.860	0.003	Lax Twig-sedge Baumea laxa (500378)
16-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.002	0.002	0.750	0.860	0.003	Oval-leaf Logania Logania ovata (502032)
16-AC	Patch	-	VVP_0198	Vulnerable	no	0.830	1	0.007	0.007	0.860	0.840	0.011	Lax Twig-sedge Baumea laxa (500378)
16-AC	Patch	-	VVP_0198	Vulnerable	no	0.830	1	0.007	0.007	0.860	0.840	0.011	Oval-leaf Logania Logania ovata (502032)
16-AC	Patch	-	VVP_0198	Vulnerable	no	0.830	1	0.007	0.007	0.860	0.840	0.011	Scented Spider-orchid Caladenia fragrantissima (504351)
16-AC	Patch	-	VVP_0198	Vulnerable	no	0.830	1	0.007	0.007	0.860	0.840	0.011	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
16-AD	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.001	0.001	0.740	0.840	0.002	Lax Twig-sedge Baumea laxa (500378)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	**Type**	**DBH (cm)**	**EVC code**	**Bioregional conservation status**	**Partial Removal**	**Condition score**	**Large Tree(s)**	**Polygon extent (ha)**	**Extent without overlap (ha)**	**SBV score**	**HI Score**	**Habitat Units**	**Offset Type**
16-AE	Patch	-	GleP0003	Vulnerable	no	0.410	-	0.039	0.039	0.210	-	0.015	General
17-AA	Patch	-	GleP0179	Depleted	no	0.400	1	0.225	0.225	0.558	0.337	0.120	Scented Spider-orchid Caladenia fragrantissima (504351)
17-AA	Patch	-	GleP0179	Depleted	no	0.400	1	0.225	0.225	0.558	0.337	0.120	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
17-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.006	0.006	0.927	0.826	0.009	Lax Twig-sedge Baumea laxa (500378)
17-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.006	0.006	0.927	0.826	0.009	Oval-leaf Logania Logania ovata (502032)
17-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.006	0.006	0.927	0.826	0.009	Scented Spider-orchid Caladenia fragrantissima (504351)
17-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.006	0.006	0.927	0.820	0.009	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
17-AC	Patch	-	VVP_0198	Vulnerable	no	0.830	1	0.004	0.004	0.860	0.840	0.006	Lax Twig-sedge Baumea laxa (500378)
17-AC	Patch	-	VVP_0198	Vulnerable	no	0.830	1	0.004	0.004	0.860	0.840	0.006	Oval-leaf Logania Logania ovata (502032)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	**Type**	**DBH (cm)**	**EVC code**	**Bioregional conservation status**	**Partial Removal**	**Condition score**	**Large Tree(s)**	**Polygon extent (ha)**	**Extent without overlap (ha)**	**SBV score**	**HI Score**	**Habitat Units**	**Offset Type**
17-AC	Patch	-	VVP_0198	Vulnerable	no	0.830	1	0.004	0.004	0.860	0.840	0.006	Scented Spider-orchid Caladenia fragrantissima (504351)
17-AC	Patch	-	VVP_0198	Vulnerable	no	0.830	1	0.004	0.004	0.860	0.840	0.006	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
17-AD	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.004	0.004	0.730	0.840	0.006	Lax Twig-sedge Baumea laxa (500378)
17-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.033	0.033	0.230	0.490	0.019	Lax Twig-sedge Baumea laxa (500378)
17-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.033	0.033	0.230	0.490	0.019	Oval-leaf Logania Logania ovata (502032)
17-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.033	0.033	0.230	0.490	0.019	Scented Spider-orchid Caladenia fragrantissima (504351)
17-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.033	0.033	0.230	0.490	0.019	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
18-AA	Patch	-	GleP0003	Vulnerable	no	0.210	-	0.021	0.021	0.170	0.350	0.006	Lax Twig-sedge Baumea laxa (500378)
18-AA	Patch	-	GleP0003	Vulnerable	no	0.210	-	0.021	0.021	0.170	0.350	0.006	Scented Spider-orchid Caladenia fragrantissima (504351)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	**Type**	**DBH (cm)**	**EVC code**	**Bioregional conservation status**	**Partial Removal**	**Condition score**	**Large Tree(s)**	**Polygon extent (ha)**	**Extent without overlap (ha)**	**SBV score**	**HI Score**	**Habitat Units**	**Offset Type**
18-AA	Patch	-	GleP0003	Vulnerable	no	0.210	-	0.021	0.021	0.170	0.350	0.006	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
18-AB	Patch	-	VVP_0198	Vulnerable	no	0.830	-	0.003	0.003	0.970	0.820	0.004	Lax Twig-sedge Baumea laxa (500378)
18-AB	Patch	-	VVP_0198	Vulnerable	no	0.830	-	0.003	0.003	0.970	0.820	0.004	Oval-leaf Logania Logania ovata (502032)
18-AB	Patch	-	VVP_0198	Vulnerable	no	0.830	-	0.003	0.003	0.970	0.820	0.004	Scented Spider-orchid Caladenia fragrantissima (504351)
18-AB	Patch	-	VVP_0198	Vulnerable	no	0.830	-	0.003	0.003	0.970	0.820	0.004	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
18-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.011	0.011	0.880	0.850	0.017	Lax Twig-sedge Baumea laxa (500378)
18-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.011	0.011	0.880	0.850	0.017	Oval-leaf Logania Logania ovata (502032)
18-AD	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.002	0.002	0.696	0.840	0.003	Lax Twig-sedge Baumea laxa (500378)
18-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.047	0.047	0.230	0.530	0.027	Lax Twig-sedge Baumea laxa (500378)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	Type	DBH (cm)	EVC code	Bioregional conservation status	Partial Removal	Condition score	Large Tree(s)	Polygon extent (ha)	Extent without overlap (ha)	SBV score	HI Score	Habitat Units	Offset Type
18-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.047	0.047	0.230	0.530	0.027	Oval-leaf Logania Logania ovata (502032)
18-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.047	0.047	0.230	0.530	0.027	Scented Spider-orchid Caladenia fragrantissima (504351)
18-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.047	0.047	0.230	0.530	0.027	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
19-AA	Patch	-	GleP0003	Vulnerable	no	0.310	-	0.008	0.008	0.820	0.240	0.003	Lax Twig-sedge Baumea laxa (500378)
19-AA	Patch	-	GleP0003	Vulnerable	no	0.310	-	0.008	0.008	0.820	0.240	0.003	Oval-leaf Logania Logania ovata (502032)
19-AA	Patch	-	GleP0003	Vulnerable	no	0.310	-	0.008	0.008	0.820	0.240	0.003	Scented Spider-orchid Caladenia fragrantissima (504351)
19-AA	Patch	-	GleP0003	Vulnerable	no	0.310	-	0.008	0.008	0.820	0.240	0.003	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
19-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.000	0.000	0.970	0.820	0.000	Lax Twig-sedge Baumea laxa (500378)
19-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.000	0.000	0.970	0.820	0.000	Oval-leaf Logania Logania ovata (502032)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	**Type**	**DBH (cm)**	**EVC code**	**Bioregional conservation status**	**Partial Removal**	**Condition score**	**Large Tree(s)**	**Polygon extent (ha)**	**Extent without overlap (ha)**	**SBV score**	**HI Score**	**Habitat Units**	**Offset Type**
19-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.000	0.000	0.970	0.820	0.000	Scented Spider-orchid Caladenia fragrantissima (504351)
19-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.000	0.000	0.970	0.820	0.000	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
19-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.018	0.018	0.860	0.849	0.027	Lax Twig-sedge Baumea laxa (500378)
19-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.018	0.018	0.860	0.840	0.027	Oval-leaf Logania Logania ovata (502032)
19-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.018	0.018	0.860	0.849	0.027	Scented Spider-orchid Caladenia fragrantissima (504351)
19-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.018	0.018	0.860	0.849	0.027	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
19-AD	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.011	0.011	0.718	0.840	0.017	Lax Twig-sedge Baumea laxa (500378)
19-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.040	0.040	0.160	0.239	0.019	Lax Twig-sedge Baumea laxa (500378)
19-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.040	0.040	0.160	0.239	0.019	Oval-leaf Logania Logania ovata (502032)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	**Type**	**DBH (cm)**	**EVC code**	**Bioregional conservation status**	**Partial Removal**	**Condition score**	**Large Tree(s)**	**Polygon extent (ha)**	**Extent without overlap (ha)**	**SBV score**	**HI Score**	**Habitat Units**	**Offset Type**
19-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.040	0.040	0.160	0.239	0.019	Scented Spider-orchid Caladenia fragrantissima (504351)
19-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.040	0.040	0.160	0.239	0.019	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
2-AA	Patch	-	GleP0003	Vulnerable	no	0.250	-	0.002	0.002	0.210	0.590	0.001	Lax Twig-sedge Baumea laxa (500378)
2-AA	Patch	-	GleP0003	Vulnerable	no	0.250	-	0.002	0.002	0.210	0.590	0.001	Oval-leaf Logania Logania ovata (502032)
2-AA	Patch	-	GleP0003	Vulnerable	no	0.250	-	0.002	0.002	0.210	0.590	0.001	Scented Spider-orchid Caladenia fragrantissima (504351)
2-AA	Patch	-	GleP0003	Vulnerable	no	0.250	-	0.002	0.002	0.210	0.590	0.001	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
2-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.001	0.001	0.930	0.840	0.001	Lax Twig-sedge Baumea laxa (500378)
2-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.001	0.001	0.930	0.840	0.001	Oval-leaf Logania Logania ovata (502032)
2-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.001	0.001	0.930	0.840	0.001	Scented Spider-orchid Caladenia fragrantissima (504351)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	**Type**	**DBH (cm)**	**EVC code**	**Bioregional conservation status**	**Partial Removal**	**Condition score**	**Large Tree(s)**	**Polygon extent (ha)**	**Extent without overlap (ha)**	**SBV score**	**HI Score**	**Habitat Units**	**Offset Type**
2-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.001	0.001	0.930	0.840	0.001	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
2-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.020	0.020	0.960	0.820	0.030	Lax Twig-sedge Baumea laxa (500378)
2-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.020	0.020	0.960	0.820	0.030	Oval-leaf Logania Logania ovata (502032)
2-AD	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.025	0.025	0.810	0.830	0.038	Lax Twig-sedge Baumea laxa (500378)
2-AE	Patch	-	VVP_0023	Vulnerable	no	0.710	1	0.002	0.002	0.640	0.840	0.003	Lax Twig-sedge Baumea laxa (500378)
20-AA	Patch	-	GleP0179	Depleted	no	0.300	-	0.369	0.369	0.807	0.416	0.157	Scented Spider-orchid Caladenia fragrantissima (504351)
20-AA	Patch	-	GleP0179	Depleted	no	0.300	-	0.369	0.369	0.807	0.416	0.157	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
20-AB	Patch	-	VVP_0198	Vulnerable	no	0.830	1	0.011	0.011	0.970	0.820	0.017	Lax Twig-sedge Baumea laxa (500378)
20-AB	Patch	-	VVP_0198	Vulnerable	no	0.830	1	0.011	0.011	0.970	0.820	0.017	Oval-leaf Logania Logania ovata (502032)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	**Type**	**DBH (cm)**	**EVC code**	**Bioregional conservation status**	**Partial Removal**	**Condition score**	**Large Tree(s)**	**Polygon extent (ha)**	**Extent without overlap (ha)**	**SBV score**	**HI Score**	**Habitat Units**	**Offset Type**
20-AB	Patch	-	VVP_0198	Vulnerable	no	0.830	1	0.011	0.011	0.970	0.820	0.017	Scented Spider-orchid Caladenia fragrantissima (504351)
20-AB	Patch	-	VVP_0198	Vulnerable	no	0.830	1	0.011	0.011	0.970	0.820	0.017	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
20-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.002	0.002	0.930	0.840	0.003	Lax Twig-sedge Baumea laxa (500378)
20-AD	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.002	0.002	0.680	0.840	0.003	Lax Twig-sedge Baumea laxa (500378)
20-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.057	0.057	0.196	0.436	0.031	Lax Twig-sedge Baumea laxa (500378)
20-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.057	0.057	0.196	0.436	0.031	Oval-leaf Logania Logania ovata (502032)
20-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.057	0.057	0.196	0.436	0.031	Scented Spider-orchid Caladenia fragrantissima (504351)
20-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.057	0.057	0.196	0.436	0.031	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
21-AA	Patch	-	GleP0858	Endangered	no	0.300	-	0.008	0.008	0.410	0.310	0.003	Lax Twig-sedge Baumea laxa (500378)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	**Type**	**DBH (cm)**	**EVC code**	**Bioregional conservation status**	**Partial Removal**	**Condition score**	**Large Tree(s)**	**Polygon extent (ha)**	**Extent without overlap (ha)**	**SBV score**	**HI Score**	**Habitat Units**	**Offset Type**
21-AA	Patch	-	GleP0858	Endangered	no	0.300	-	0.008	0.008	0.410	0.310	0.003	Oval-leaf Logania Logania ovata (502032)
21-AA	Patch	-	GleP0858	Endangered	no	0.300	-	0.008	0.008	0.410	0.310	0.003	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
21-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.004	0.004	0.750	0.860	0.006	Lax Twig-sedge Baumea laxa (500378)
21-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.002	0.002	0.930	0.840	0.003	Lax Twig-sedge Baumea laxa (500378)
21-AD	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.018	0.018	0.681	0.840	0.027	Lax Twig-sedge Baumea laxa (500378)
21-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.056	0.056	0.170	0.474	0.032	Lax Twig-sedge Baumea laxa (500378)
21-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.056	0.056	0.170	0.474	0.032	Oval-leaf Logania Logania ovata (502032)
21-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.056	0.056	0.170	0.474	0.032	Scented Spider-orchid Caladenia fragrantissima (504351)
21-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.056	0.056	0.170	0.474	0.032	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	Type	DBH (cm)	EVC code	Bioregional conservation status	Partial Removal	Condition score	Large Tree(s)	Polygon extent (ha)	Extent without overlap (ha)	SBV score	HI Score	Habitat Units	Offset Type
22-AA	Patch	-	GleP0858	Endangered	no	0.300	-	0.002	0.002	0.410	0.310	0.001	Lax Twig-sedge Baumea laxa (500378)
22-AA	Patch	-	GleP0858	Endangered	no	0.300	-	0.002	0.002	0.410	0.310	0.001	Oval-leaf Logania Logania ovata (502032)
22-AA	Patch	-	GleP0858	Endangered	no	0.300	-	0.002	0.002	0.410	0.310	0.001	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
22-AB	Patch	-	VVP_0198	Vulnerable	no	0.830	-	0.005	0.005	0.970	0.820	0.008	Lax Twig-sedge Baumea laxa (500378)
22-AB	Patch	-	VVP_0198	Vulnerable	no	0.830	-	0.005	0.005	0.970	0.820	0.008	Oval-leaf Logania Logania ovata (502032)
22-AB	Patch	-	VVP_0198	Vulnerable	no	0.830	-	0.005	0.005	0.970	0.820	0.008	Scented Spider-orchid Caladenia fragrantissima (504351)
22-AB	Patch	-	VVP_0198	Vulnerable	no	0.830	-	0.005	0.005	0.970	0.820	0.008	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
22-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.025	0.025	0.870	0.830	0.038	Lax Twig-sedge Baumea laxa (500378)
22-AD	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.005	0.005	0.680	-	0.005	General

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	Type	DBH (cm)	EVC code	Bioregional conservation status	Partial Removal	Condition score	Large Tree(s)	Polygon extent (ha)	Extent without overlap (ha)	SBV score	HI Score	Habitat Units	Offset Type
22-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.037	0.037	0.170	0.222	0.017	Lax Twig-sedge Baumea laxa (500378)
22-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.037	0.037	0.170	0.222	0.017	Oval-leaf Logania Logania ovata (502032)
22-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.037	0.037	0.170	0.222	0.017	Scented Spider-orchid Caladenia fragrantissima (504351)
22-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.037	0.037	0.170	0.222	0.017	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
23-AA	Patch	-	GleP0003	Vulnerable	no	0.410	-	0.002	0.002	0.380	0.130	0.001	Lax Twig-sedge Baumea laxa (500378)
23-AA	Patch	-	GleP0003	Vulnerable	no	0.410	-	0.002	0.002	0.380	0.130	0.001	Oval-leaf Logania Logania ovata (502032)
23-AA	Patch	-	GleP0003	Vulnerable	no	0.410	-	0.002	0.002	0.380	0.130	0.001	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
23-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.006	0.006	0.750	0.860	0.010	Lax Twig-sedge Baumea laxa (500378)
23-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.005	0.005	0.860	0.840	0.008	Lax Twig-sedge Baumea laxa (500378)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	**Type**	**DBH (cm)**	**EVC code**	**Bioregional conservation status**	**Partial Removal**	**Condition score**	**Large Tree(s)**	**Polygon extent (ha)**	**Extent without overlap (ha)**	**SBV score**	**HI Score**	**Habitat Units**	**Offset Type**
23-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.005	0.005	0.860	0.840	0.008	Oval-leaf Logania Logania ovata (502032)
23-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.005	0.005	0.860	0.840	0.008	Scented Spider-orchid Caladenia fragrantissima (504351)
23-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.005	0.005	0.860	0.840	0.008	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
23-AD	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.002	0.002	0.680	-	0.002	General
23-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.006	0.006	0.240	-	0.002	General
24-AA	Patch	-	GleP0003	Vulnerable	no	0.410	-	0.015	0.015	0.380	0.130	0.007	Lax Twig-sedge Baumea laxa (500378)
24-AA	Patch	-	GleP0003	Vulnerable	no	0.410	-	0.015	0.015	0.380	0.130	0.007	Oval-leaf Logania Logania ovata (502032)
24-AA	Patch	-	GleP0003	Vulnerable	no	0.410	-	0.015	0.015	0.380	0.130	0.007	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
24-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.000	0.000	0.970	0.820	0.000	Lax Twig-sedge Baumea laxa (500378)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	**Type**	**DBH (cm)**	**EVC code**	**Bioregional conservation status**	**Partial Removal**	**Condition score**	**Large Tree(s)**	**Polygon extent (ha)**	**Extent without overlap (ha)**	**SBV score**	**HI Score**	**Habitat Units**	**Offset Type**
24-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.000	0.000	0.970	0.820	0.000	Oval-leaf Logania Logania ovata (502032)
24-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.000	0.000	0.970	0.820	0.000	Scented Spider-orchid Caladenia fragrantissima (504351)
24-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.000	0.000	0.970	0.820	0.000	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
24-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.005	0.005	0.930	-	0.006	General
24-AD	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.002	0.002	0.680	-	0.002	General
24-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.006	0.006	0.240	-	0.002	General
25-AA	Patch	-	GleP0858	Endangered	no	0.410	-	0.000	0.000	0.200	-	0.000	General
25-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.007	0.007	1.000	0.850	0.011	Lax Twig-sedge Baumea laxa (500378)
25-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.007	0.007	1.000	0.850	0.011	Scented Spider-orchid Caladenia fragrantissima (504351)
25-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.008	0.008	0.860	0.830	0.012	Lax Twig-sedge Baumea laxa (500378)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	**Type**	**DBH (cm)**	**EVC code**	**Bioregional conservation status**	**Partial Removal**	**Condition score**	**Large Tree(s)**	**Polygon extent (ha)**	**Extent without overlap (ha)**	**SBV score**	**HI Score**	**Habitat Units**	**Offset Type**
25-AD	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.006	0.006	0.660	-	0.006	General
25-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.032	0.032	0.240	0.255	0.015	Lax Twig-sedge Baumea laxa (500378)
25-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.032	0.032	0.240	0.470	0.018	Oval-leaf Logania Logania ovata (502032)
25-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.032	0.032	0.240	0.255	0.015	Scented Spider-orchid Caladenia fragrantissima (504351)
25-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.032	0.032	0.240	0.255	0.015	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
26-AA	Patch	-	GleP0858	Endangered	no	0.410	-	0.007	0.007	0.204	-	0.003	General
26-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.001	0.001	0.750	0.850	0.002	Lax Twig-sedge Baumea laxa (500378)
26-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.001	0.001	0.750	0.850	0.002	Scented Spider-orchid Caladenia fragrantissima (504351)
26-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.006	0.006	0.930	-	0.008	General
26-AD	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.018	0.018	0.680	0.840	0.027	Lax Twig-sedge Baumea laxa (500378)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	**Type**	**DBH (cm)**	**EVC code**	**Bioregional conservation status**	**Partial Removal**	**Condition score**	**Large Tree(s)**	**Polygon extent (ha)**	**Extent without overlap (ha)**	**SBV score**	**HI Score**	**Habitat Units**	**Offset Type**
26-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.010	0.010	0.240	0.470	0.005	Lax Twig-sedge Baumea laxa (500378)
26-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.010	0.010	0.240	0.470	0.005	Oval-leaf Logania Logania ovata (502032)
26-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.010	0.010	0.240	0.470	0.005	Scented Spider-orchid Caladenia fragrantissima (504351)
26-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.010	0.010	0.240	0.470	0.005	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
27-AA	Patch	-	GleP0858	Endangered	no	0.410	-	0.010	0.010	0.190	-	0.004	General
27-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.005	0.005	1.000	0.850	0.008	Lax Twig-sedge Baumea laxa (500378)
27-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.005	0.005	1.000	0.850	0.008	Scented Spider-orchid Caladenia fragrantissima (504351)
27-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.005	0.005	0.930	-	0.006	General
27-AD	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.015	0.015	0.680	-	0.016	General
27-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.002	0.002	0.240	0.200	0.001	Lax Twig-sedge Baumea laxa (500378)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	**Type**	**DBH (cm)**	**EVC code**	**Bioregional conservation status**	**Partial Removal**	**Condition score**	**Large Tree(s)**	**Polygon extent (ha)**	**Extent without overlap (ha)**	**SBV score**	**HI Score**	**Habitat Units**	**Offset Type**
27-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.002	0.002	0.240	0.200	0.001	Oval-leaf Logania Logania ovata (502032)
27-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.002	0.002	0.240	0.200	0.001	Scented Spider-orchid Caladenia fragrantissima (504351)
27-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.002	0.002	0.240	0.200	0.001	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
28-AA	Patch	-	GleP0858	Endangered	no	0.410	-	0.007	0.007	0.190	-	0.003	General
28-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.002	0.002	0.969	0.820	0.003	Lax Twig-sedge Baumea laxa (500378)
28-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.002	0.002	0.969	0.820	0.003	Oval-leaf Logania Logania ovata (502032)
28-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.002	0.002	0.969	0.820	0.003	Scented Spider-orchid Caladenia fragrantissima (504351)
28-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.002	0.002	0.969	0.820	0.003	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
28-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.003	0.003	0.930	0.840	0.004	Lax Twig-sedge Baumea laxa (500378)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	Type	DBH (cm)	EVC code	Bioregional conservation status	Partial Removal	Condition score	Large Tree(s)	Polygon extent (ha)	Extent without overlap (ha)	SBV score	HI Score	Habitat Units	Offset Type
28-AD	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.025	0.025	0.680	-	0.026	General
28-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.019	0.019	0.240	0.530	0.011	Lax Twig-sedge Baumea laxa (500378)
28-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.019	0.019	0.240	0.530	0.011	Oval-leaf Logania Logania ovata (502032)
28-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.019	0.019	0.240	0.530	0.011	Scented Spider-orchid Caladenia fragrantissima (504351)
28-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.019	0.019	0.240	0.530	0.011	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
29-AA	Patch	-	GleP0858	Endangered	no	0.410	-	0.011	0.011	0.150	-	0.004	General
29-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.006	0.006	0.965	0.821	0.010	Lax Twig-sedge Baumea laxa (500378)
29-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.006	0.006	0.965	0.821	0.010	Oval-leaf Logania Logania ovata (502032)
29-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.006	0.006	0.965	0.820	0.010	Scented Spider-orchid Caladenia fragrantissima (504351)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	Type	DBH (cm)	EVC code	Bioregional conservation status	Partial Removal	Condition score	Large Tree(s)	Polygon extent (ha)	Extent without overlap (ha)	SBV score	HI Score	Habitat Units	Offset Type
29-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.006	0.006	0.965	0.821	0.010	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
29-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.001	0.001	0.930	0.840	0.002	Lax Twig-sedge Baumea laxa (500378)
29-AD	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.011	0.011	0.660	-	0.011	General
29-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.015	0.015	0.250	0.578	0.009	Lax Twig-sedge Baumea laxa (500378)
29-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.015	0.015	0.250	0.578	0.009	Oval-leaf Logania Logania ovata (502032)
29-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.015	0.015	0.250	0.578	0.009	Scented Spider-orchid Caladenia fragrantissima (504351)
29-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.015	0.015	0.250	0.578	0.009	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
3-AA	Patch	-	GleP0003	Vulnerable	no	0.310	-	0.095	0.095	0.892	0.258	0.037	Lax Twig-sedge Baumea laxa (500378)
3-AA	Patch	-	GleP0003	Vulnerable	no	0.310	-	0.095	0.095	0.892	0.258	0.037	Oval-leaf Logania Logania ovata (502032)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	Type	DBH (cm)	EVC code	Bioregional conservation status	Partial Removal	Condition score	Large Tree(s)	Polygon extent (ha)	Extent without overlap (ha)	SBV score	HI Score	Habitat Units	Offset Type
3-AA	Patch	-	GleP0003	Vulnerable	no	0.310	-	0.095	0.095	0.892	0.258	0.037	Scented Spider-orchid Caladenia fragrantissima (504351)
3-AA	Patch	-	GleP0003	Vulnerable	no	0.310	-	0.095	0.095	0.892	0.258	0.037	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
3-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.003	0.003	0.930	0.840	0.004	Lax Twig-sedge Baumea laxa (500378)
3-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.003	0.003	0.930	0.840	0.004	Oval-leaf Logania Logania ovata (502032)
3-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.003	0.003	0.930	0.840	0.004	Scented Spider-orchid Caladenia fragrantissima (504351)
3-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.003	0.003	0.930	0.840	0.004	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
3-AC	Patch	-	VVP_0198	Vulnerable	no	0.830	-	0.001	0.001	0.860	0.840	0.001	Lax Twig-sedge Baumea laxa (500378)
3-AC	Patch	-	VVP_0198	Vulnerable	no	0.830	-	0.001	0.001	0.860	0.840	0.001	Oval-leaf Logania Logania ovata (502032)
3-AC	Patch	-	VVP_0198	Vulnerable	no	0.830	-	0.001	0.001	0.860	0.840	0.001	Scented Spider-orchid Caladenia fragrantissima (504351)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	**Type**	**DBH (cm)**	**EVC code**	**Bioregional conservation status**	**Partial Removal**	**Condition score**	**Large Tree(s)**	**Polygon extent (ha)**	**Extent without overlap (ha)**	**SBV score**	**HI Score**	**Habitat Units**	**Offset Type**
3-AC	Patch	-	VVP_0198	Vulnerable	no	0.830	-	0.001	0.001	0.860	0.840	0.001	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
3-AD	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.002	0.002	0.710	0.820	0.003	Lax Twig-sedge Baumea laxa (500378)
3-AD	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.002	0.002	0.710	0.820	0.003	Scented Spider-orchid Caladenia fragrantissima (504351)
3-AE	Patch	-	VVP_0023	Vulnerable	no	0.710	1	0.011	0.011	0.680	0.850	0.015	Lax Twig-sedge Baumea laxa (500378)
3-AE	Patch	-	VVP_0023	Vulnerable	no	0.710	1	0.011	0.011	0.680	0.850	0.015	Scented Spider-orchid Caladenia fragrantissima (504351)
30-AA	Patch	-	GleP0858	Endangered	no	0.410	-	0.000	0.000	0.150	-	0.000	General
30-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.008	0.008	0.966	0.850	0.012	Lax Twig-sedge Baumea laxa (500378)
30-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.008	0.008	0.966	0.850	0.012	Scented Spider-orchid Caladenia fragrantissima (504351)
30-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.008	0.008	0.966	0.850	0.012	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	Type	DBH (cm)	EVC code	Bioregional conservation status	Partial Removal	Condition score	Large Tree(s)	Polygon extent (ha)	Extent without overlap (ha)	SBV score	HI Score	Habitat Units	Offset Type
30-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.004	0.004	0.950	0.850	0.006	Lax Twig-sedge Baumea laxa (500378)
30-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.004	0.004	0.950	0.850	0.006	Scented Spider-orchid Caladenia fragrantissima (504351)
30-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.004	0.004	0.950	0.850	0.006	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
30-AD	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.015	0.015	0.660	-	0.016	General
30-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.012	0.012	0.250	0.560	0.007	Lax Twig-sedge Baumea laxa (500378)
30-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.012	0.012	0.250	0.560	0.007	Oval-leaf Logania Logania ovata (502032)
30-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.012	0.012	0.250	0.560	0.007	Scented Spider-orchid Caladenia fragrantissima (504351)
30-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.012	0.012	0.250	0.560	0.007	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
31-AA	Patch	-	GleP0858	Endangered	no	0.480	-	0.007	0.007	0.270	-	0.003	General

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	**Type**	**DBH (cm)**	**EVC code**	**Bioregional conservation status**	**Partial Removal**	**Condition score**	**Large Tree(s)**	**Polygon extent (ha)**	**Extent without overlap (ha)**	**SBV score**	**HI Score**	**Habitat Units**	**Offset Type**
31-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.002	0.002	0.927	0.827	0.003	Lax Twig-sedge Baumea laxa (500378)
31-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.002	0.002	0.927	0.827	0.003	Oval-leaf Logania Logania ovata (502032)
31-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.002	0.002	0.927	0.820	0.003	Scented Spider-orchid Caladenia fragrantissima (504351)
31-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.002	0.002	0.927	0.827	0.003	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
31-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.002	0.002	0.930	0.840	0.003	Lax Twig-sedge Baumea laxa (500378)
31-AD	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.015	0.015	0.660	-	0.016	General
31-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.027	0.027	0.244	0.560	0.016	Lax Twig-sedge Baumea laxa (500378)
31-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.027	0.027	0.244	0.560	0.016	Oval-leaf Logania Logania ovata (502032)
31-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.027	0.027	0.244	0.560	0.016	Scented Spider-orchid Caladenia fragrantissima (504351)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	**Type**	**DBH (cm)**	**EVC code**	**Bioregional conservation status**	**Partial Removal**	**Condition score**	**Large Tree(s)**	**Polygon extent (ha)**	**Extent without overlap (ha)**	**SBV score**	**HI Score**	**Habitat Units**	**Offset Type**
31-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.027	0.027	0.244	0.560	0.016	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
32-AA	Patch	-	GleP0858	Endangered	no	0.480	-	0.007	0.007	0.270	-	0.003	General
32-AB	Patch	-	VVP_0016	Least Concern	no	0.820	2	0.026	0.026	0.953	0.823	0.039	Lax Twig-sedge Baumea laxa (500378)
32-AB	Patch	-	VVP_0016	Least Concern	no	0.820	2	0.026	0.026	0.953	0.823	0.039	Oval-leaf Logania Logania ovata (502032)
32-AB	Patch	-	VVP_0016	Least Concern	no	0.820	2	0.026	0.026	0.953	0.820	0.039	Scented Spider-orchid Caladenia fragrantissima (504351)
32-AB	Patch	-	VVP_0016	Least Concern	no	0.820	2	0.026	0.026	0.953	0.823	0.039	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
32-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.005	0.005	0.860	-	0.006	General
32-AD	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.004	0.004	0.740	0.840	0.006	Lax Twig-sedge Baumea laxa (500378)
32-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.007	0.007	0.240	-	0.002	General

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	Type	DBH (cm)	EVC code	Bioregional conservation status	Partial Removal	Condition score	Large Tree(s)	Polygon extent (ha)	Extent without overlap (ha)	SBV score	HI Score	Habitat Units	Offset Type
33-AA	Patch	-	GleP0858	Endangered	no	0.480	-	0.011	0.011	0.270	-	0.005	General
33-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.011	0.011	0.845	0.841	0.017	Lax Twig-sedge Baumea laxa (500378)
33-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.011	0.011	0.845	0.850	0.017	Scented Spider-orchid Caladenia fragrantissima (504351)
33-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.011	0.011	0.845	0.850	0.017	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
33-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.003	0.003	0.890	-	0.003	General
33-AD	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.061	0.061	0.740	0.830	0.092	Lax Twig-sedge Baumea laxa (500378)
33-AD	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.061	0.061	0.740	0.830	0.092	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
33-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.008	0.008	0.240	0.390	0.004	Lax Twig-sedge Baumea laxa (500378)
33-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.008	0.008	0.240	0.390	0.004	Oval-leaf Logania Logania ovata (502032)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	Type	DBH (cm)	EVC code	Bioregional conservation status	Partial Removal	Condition score	Large Tree(s)	Polygon extent (ha)	Extent without overlap (ha)	SBV score	HI Score	Habitat Units	Offset Type
33-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.008	0.008	0.240	0.390	0.004	Scented Spider-orchid Caladenia fragrantissima (504351)
33-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.008	0.008	0.240	0.390	0.004	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
34-AA	Patch	-	GleP0858	Endangered	no	0.480	-	0.001	0.001	0.270	0.270	0.001	Lax Twig-sedge Baumea laxa (500378)
34-AA	Patch	-	GleP0858	Endangered	no	0.480	-	0.001	0.001	0.270	0.270	0.001	Oval-leaf Logania Logania ovata (502032)
34-AA	Patch	-	GleP0858	Endangered	no	0.480	-	0.001	0.001	0.270	0.270	0.001	Scented Spider-orchid Caladenia fragrantissima (504351)
34-AA	Patch	-	GleP0858	Endangered	no	0.480	-	0.001	0.001	0.270	0.270	0.001	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
34-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.011	0.011	0.911	0.835	0.017	Lax Twig-sedge Baumea laxa (500378)
34-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.011	0.011	0.911	0.850	0.017	Scented Spider-orchid Caladenia fragrantissima (504351)
34-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.004	0.004	0.860	0.830	0.006	Lax Twig-sedge Baumea laxa (500378)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	Type	DBH (cm)	EVC code	Bioregional conservation status	Partial Removal	Condition score	Large Tree(s)	Polygon extent (ha)	Extent without overlap (ha)	SBV score	HI Score	Habitat Units	Offset Type
34-AD	Patch	-	VVP_0016	Least Concern	no	0.820	2	0.014	0.014	0.740	0.821	0.022	Lax Twig-sedge Baumea laxa (500378)
34-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.019	0.019	0.240	0.600	0.012	Lax Twig-sedge Baumea laxa (500378)
34-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.019	0.019	0.240	0.600	0.012	Oval-leaf Logania Logania ovata (502032)
34-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.019	0.019	0.240	0.600	0.012	Scented Spider-orchid Caladenia fragrantissima (504351)
34-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.019	0.019	0.240	0.600	0.012	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
35-AA	Patch	-	GleP0858	Endangered	no	0.480	-	0.002	0.002	0.270	0.270	0.001	Lax Twig-sedge Baumea laxa (500378)
35-AA	Patch	-	GleP0858	Endangered	no	0.480	-	0.002	0.002	0.270	0.270	0.001	Oval-leaf Logania Logania ovata (502032)
35-AA	Patch	-	GleP0858	Endangered	no	0.480	-	0.002	0.002	0.270	0.270	0.001	Scented Spider-orchid Caladenia fragrantissima (504351)
35-AA	Patch	-	GleP0858	Endangered	no	0.480	-	0.002	0.002	0.270	0.270	0.001	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	Type	DBH (cm)	EVC code	Bioregional conservation status	Partial Removal	Condition score	Large Tree(s)	Polygon extent (ha)	Extent without overlap (ha)	SBV score	HI Score	Habitat Units	Offset Type
35-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.002	0.002	1.000	0.850	0.003	Lax Twig-sedge Baumea laxa (500378)
35-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.002	0.002	1.000	0.850	0.003	Oval-leaf Logania Logania ovata (502032)
35-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.004	0.004	0.890	-	0.004	General
35-AD	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.001	0.001	0.740	0.830	0.001	Lax Twig-sedge Baumea laxa (500378)
35-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.016	0.016	0.240	0.600	0.010	Lax Twig-sedge Baumea laxa (500378)
35-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.016	0.016	0.240	0.600	0.010	Oval-leaf Logania Logania ovata (502032)
35-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.016	0.016	0.240	0.600	0.010	Scented Spider-orchid Caladenia fragrantissima (504351)
35-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.016	0.016	0.240	0.600	0.010	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
36-AA	Patch	-	Brid0858	Least Concern	no	0.480	-	0.008	0.008	0.267	-	0.004	General
36-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.018	0.018	0.843	0.850	0.027	Lax Twig-sedge Baumea laxa (500378)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	Type	DBH (cm)	EVC code	Bioregional conservation status	Partial Removal	Condition score	Large Tree(s)	Polygon extent (ha)	Extent without overlap (ha)	SBV score	HI Score	Habitat Units	Offset Type
36-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.018	0.018	0.843	0.850	0.027	Scented Spider-orchid Caladenia fragrantissima (504351)
36-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.018	0.018	0.843	0.850	0.027	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
36-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.015	0.015	0.860	0.850	0.023	Lax Twig-sedge Baumea laxa (500378)
36-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.015	0.015	0.860	0.850	0.023	Oval-leaf Logania Logania ovata (502032)
36-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.015	0.015	0.860	0.850	0.023	Scented Spider-orchid Caladenia fragrantissima (504351)
36-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.015	0.015	0.860	0.850	0.023	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
36-AD	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.001	0.001	0.740	0.830	0.002	Lax Twig-sedge Baumea laxa (500378)
36-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.009	0.009	0.250	0.660	0.005	Lax Twig-sedge Baumea laxa (500378)
36-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.009	0.009	0.250	0.660	0.005	Oval-leaf Logania Logania ovata (502032)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	Type	DBH (cm)	EVC code	Bioregional conservation status	Partial Removal	Condition score	Large Tree(s)	Polygon extent (ha)	Extent without overlap (ha)	SBV score	HI Score	Habitat Units	Offset Type
36-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.009	0.009	0.250	0.660	0.005	Scented Spider-orchid Caladenia fragrantissima (504351)
36-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.009	0.009	0.250	0.660	0.005	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
37-AA	Patch	-	GleP0858	Endangered	no	0.480	-	0.080	0.080	0.237	0.140	0.044	Scented Spider-orchid Caladenia fragrantissima (504351)
37-AA	Patch	-	GleP0858	Endangered	no	0.480	-	0.080	0.080	0.237	0.140	0.044	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
37-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.004	0.004	1.000	0.830	0.006	Lax Twig-sedge Baumea laxa (500378)
37-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.001	0.001	0.950	0.845	0.001	Lax Twig-sedge Baumea laxa (500378)
37-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.001	0.001	0.950	0.845	0.001	Oval-leaf Logania Logania ovata (502032)
37-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.001	0.001	0.950	0.845	0.001	Scented Spider-orchid Caladenia fragrantissima (504351)
37-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.001	0.001	0.950	0.845	0.001	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	Type	DBH (cm)	EVC code	Bioregional conservation status	Partial Removal	Condition score	Large Tree(s)	Polygon extent (ha)	Extent without overlap (ha)	SBV score	HI Score	Habitat Units	Offset Type
37-AD	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.001	0.001	0.740	0.820	0.002	Lax Twig-sedge Baumea laxa (500378)
37-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.011	0.011	0.250	0.660	0.007	Lax Twig-sedge Baumea laxa (500378)
37-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.011	0.011	0.250	0.660	0.007	Oval-leaf Logania Logania ovata (502032)
37-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.011	0.011	0.250	0.660	0.007	Scented Spider-orchid Caladenia fragrantissima (504351)
37-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.011	0.011	0.250	0.660	0.007	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
38-AA	Patch	-	GleP0858	Endangered	no	0.480	-	0.006	0.006	0.248	0.140	0.003	Scented Spider-orchid Caladenia fragrantissima (504351)
38-AA	Patch	-	GleP0858	Endangered	no	0.480	-	0.006	0.006	0.248	0.140	0.003	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
38-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.018	0.018	0.830	0.850	0.027	Lax Twig-sedge Baumea laxa (500378)
38-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.018	0.018	0.830	0.850	0.027	Scented Spider-orchid Caladenia fragrantissima (504351)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	**Type**	**DBH (cm)**	**EVC code**	**Bioregional conservation status**	**Partial Removal**	**Condition score**	**Large Tree(s)**	**Polygon extent (ha)**	**Extent without overlap (ha)**	**SBV score**	**HI Score**	**Habitat Units**	**Offset Type**
38-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.008	0.008	0.930	0.840	0.012	Lax Twig-sedge Baumea laxa (500378)
38-AD	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.049	0.049	0.740	0.841	0.074	Lax Twig-sedge Baumea laxa (500378)
38-AD	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.049	0.049	0.740	0.850	0.074	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
38-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.024	0.024	0.250	0.600	0.015	Lax Twig-sedge Baumea laxa (500378)
38-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.024	0.024	0.250	0.600	0.015	Oval-leaf Logania Logania ovata (502032)
38-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.024	0.024	0.250	0.600	0.015	Scented Spider-orchid Caladenia fragrantissima (504351)
38-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.024	0.024	0.250	0.600	0.015	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
39-AA	Patch	-	GleP0858	Endangered	no	0.480	-	0.000	0.000	0.200	-	0.000	General
39-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.002	0.002	0.810	0.840	0.003	Lax Twig-sedge Baumea laxa (500378)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	**Type**	**DBH (cm)**	**EVC code**	**Bioregional conservation status**	**Partial Removal**	**Condition score**	**Large Tree(s)**	**Polygon extent (ha)**	**Extent without overlap (ha)**	**SBV score**	**HI Score**	**Habitat Units**	**Offset Type**
39-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.002	0.002	0.810	0.840	0.003	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
39-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.001	0.001	0.950	0.840	0.002	Lax Twig-sedge Baumea laxa (500378)
39-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.001	0.001	0.950	0.840	0.002	Oval-leaf Logania Logania ovata (502032)
39-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.001	0.001	0.950	0.840	0.002	Scented Spider-orchid Caladenia fragrantissima (504351)
39-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.001	0.001	0.950	0.840	0.002	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
39-AD	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.006	0.006	0.740	0.820	0.009	Lax Twig-sedge Baumea laxa (500378)
39-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.076	0.076	0.700	0.490	0.043	Lax Twig-sedge Baumea laxa (500378)
39-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.076	0.076	0.700	0.490	0.043	Scented Spider-orchid Caladenia fragrantissima (504351)
39-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.076	0.076	0.700	0.490	0.043	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	**Type**	**DBH (cm)**	**EVC code**	**Bioregional conservation status**	**Partial Removal**	**Condition score**	**Large Tree(s)**	**Polygon extent (ha)**	**Extent without overlap (ha)**	**SBV score**	**HI Score**	**Habitat Units**	**Offset Type**
4-AA	Patch	-	GleP0003	Vulnerable	no	0.190	-	0.010	0.010	0.210	-	0.002	General
4-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.006	0.006	0.930	0.840	0.010	Lax Twig-sedge Baumea laxa (500378)
4-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.006	0.006	0.930	0.840	0.010	Oval-leaf Logania Logania ovata (502032)
4-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.006	0.006	0.930	0.840	0.010	Scented Spider-orchid Caladenia fragrantissima (504351)
4-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.006	0.006	0.930	0.840	0.010	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
4-AC	Patch	-	VVP_0023	Vulnerable	no	0.770	1	0.006	0.006	0.960	0.790	0.009	Lax Twig-sedge Baumea laxa (500378)
4-AD	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.003	0.003	0.680	0.820	0.004	Lax Twig-sedge Baumea laxa (500378)
4-AD	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.003	0.003	0.680	0.820	0.004	Scented Spider-orchid Caladenia fragrantissima (504351)
4-AE	Patch	-	VVP_0023	Vulnerable	no	0.710	1	0.006	0.006	0.670	0.848	0.008	Lax Twig-sedge Baumea laxa (500378)
4-AE	Patch	-	VVP_0023	Vulnerable	no	0.710	1	0.006	0.006	0.670	0.850	0.008	Scented Spider-orchid Caladenia fragrantissima (504351)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	Type	DBH (cm)	EVC code	Bioregional conservation status	Partial Removal	Condition score	Large Tree(s)	Polygon extent (ha)	Extent without overlap (ha)	SBV score	HI Score	Habitat Units	Offset Type
40-AA	Patch	-	GleP0858	Endangered	no	0.480	-	0.001	0.001	0.190	0.100	0.000	Lax Twig-sedge Baumea laxa (500378)
40-AA	Patch	-	GleP0858	Endangered	no	0.480	-	0.001	0.001	0.190	0.100	0.000	Oval-leaf Logania Logania ovata (502032)
40-AA	Patch	-	GleP0858	Endangered	no	0.480	-	0.001	0.001	0.190	0.100	0.000	Scented Spider-orchid Caladenia fragrantissima (504351)
40-AA	Patch	-	GleP0858	Endangered	no	0.480	-	0.001	0.001	0.190	0.100	0.000	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
40-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.008	0.008	0.961	0.792	0.011	Lax Twig-sedge Baumea laxa (500378)
40-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.008	0.008	0.961	0.792	0.011	Oval-leaf Logania Logania ovata (502032)
40-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.025	0.025	0.860	0.832	0.038	Lax Twig-sedge Baumea laxa (500378)
40-AD	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.001	0.001	0.680	0.820	0.001	Lax Twig-sedge Baumea laxa (500378)
40-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.018	0.018	0.700	0.540	0.010	Lax Twig-sedge Baumea laxa (500378)
40-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.018	0.018	0.700	0.540	0.010	Scented Spider-orchid Caladenia fragrantissima (504351)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	**Type**	**DBH (cm)**	**EVC code**	**Bioregional conservation status**	**Partial Removal**	**Condition score**	**Large Tree(s)**	**Polygon extent (ha)**	**Extent without overlap (ha)**	**SBV score**	**HI Score**	**Habitat Units**	**Offset Type**
40-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.018	0.018	0.700	0.540	0.010	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
41-AA	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.154	0.154	0.174	0.152	0.068	Lax Twig-sedge Baumea laxa (500378)
41-AA	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.154	0.154	0.174	0.170	0.069	Oval-leaf Logania Logania ovata (502032)
41-AA	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.154	0.154	0.174	0.152	0.068	Scented Spider-orchid Caladenia fragrantissima (504351)
41-AA	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.154	0.154	0.174	0.152	0.068	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
41-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.005	0.005	0.970	0.810	0.007	Lax Twig-sedge Baumea laxa (500378)
41-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.005	0.005	0.970	0.810	0.007	Oval-leaf Logania Logania ovata (502032)
41-AC	Patch	-	VVP_0016	Least Concern	no	0.820	2	0.030	0.030	0.860	0.830	0.044	Lax Twig-sedge Baumea laxa (500378)
41-AD	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.002	0.002	0.680	0.820	0.003	Lax Twig-sedge Baumea laxa (500378)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	Type	DBH (cm)	EVC code	Bioregional conservation status	Partial Removal	Condition score	Large Tree(s)	Polygon extent (ha)	Extent without overlap (ha)	SBV score	HI Score	Habitat Units	Offset Type
41-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.029	0.029	0.200	0.610	0.017	Lax Twig-sedge Baumea laxa (500378)
41-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.029	0.029	0.200	0.610	0.017	Scented Spider-orchid Caladenia fragrantissima (504351)
41-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.029	0.029	0.200	0.610	0.017	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
42-AA	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.068	0.068	0.120	0.170	0.030	Lax Twig-sedge Baumea laxa (500378)
42-AA	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.068	0.068	0.120	0.170	0.030	Oval-leaf Logania Logania ovata (502032)
42-AA	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.068	0.068	0.120	0.170	0.030	Scented Spider-orchid Caladenia fragrantissima (504351)
42-AA	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.068	0.068	0.120	0.170	0.030	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
42-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.001	0.001	0.810	0.840	0.001	Lax Twig-sedge Baumea laxa (500378)
42-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.000	0.000	0.950	0.840	0.000	Lax Twig-sedge Baumea laxa (500378)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	**Type**	**DBH (cm)**	**EVC code**	**Bioregional conservation status**	**Partial Removal**	**Condition score**	**Large Tree(s)**	**Polygon extent (ha)**	**Extent without overlap (ha)**	**SBV score**	**HI Score**	**Habitat Units**	**Offset Type**
42-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.000	0.000	0.950	0.840	0.000	Oval-leaf Logania Logania ovata (502032)
42-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.000	0.000	0.950	0.840	0.000	Scented Spider-orchid Caladenia fragrantissima (504351)
42-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.000	0.000	0.950	0.840	0.000	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
42-AD	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.005	0.005	0.680	0.830	0.008	Lax Twig-sedge Baumea laxa (500378)
42-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.008	0.008	0.204	0.614	0.005	Lax Twig-sedge Baumea laxa (500378)
42-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.008	0.008	0.204	0.614	0.005	Scented Spider-orchid Caladenia fragrantissima (504351)
42-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.008	0.008	0.204	0.614	0.005	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
43-AA	Patch	-	GleP0003	Vulnerable	no	0.410	-	0.003	0.003	0.380	0.130	0.001	Lax Twig-sedge Baumea laxa (500378)
43-AA	Patch	-	GleP0003	Vulnerable	no	0.410	-	0.003	0.003	0.380	0.130	0.001	Oval-leaf Logania Logania ovata (502032)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	Type	DBH (cm)	EVC code	Bioregional conservation status	Partial Removal	Condition score	Large Tree(s)	Polygon extent (ha)	Extent without overlap (ha)	SBV score	HI Score	Habitat Units	Offset Type
43-AA	Patch	-	GleP0003	Vulnerable	no	0.410	-	0.003	0.003	0.380	0.130	0.001	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
43-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.002	0.002	0.810	0.830	0.003	Lax Twig-sedge Baumea laxa (500378)
43-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.000	0.000	0.950	0.840	0.000	Lax Twig-sedge Baumea laxa (500378)
43-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.000	0.000	0.950	0.840	0.000	Oval-leaf Logania Logania ovata (502032)
43-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.000	0.000	0.950	0.840	0.000	Scented Spider-orchid Caladenia fragrantissima (504351)
43-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.000	0.000	0.950	0.840	0.000	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
43-AD	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.002	0.002	0.680	0.830	0.003	Lax Twig-sedge Baumea laxa (500378)
43-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.011	0.011	0.210	0.620	0.007	Lax Twig-sedge Baumea laxa (500378)
43-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.011	0.011	0.210	0.620	0.007	Scented Spider-orchid Caladenia fragrantissima (504351)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	Type	DBH (cm)	EVC code	Bioregional conservation status	Partial Removal	Condition score	Large Tree(s)	Polygon extent (ha)	Extent without overlap (ha)	SBV score	HI Score	Habitat Units	Offset Type
43-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.011	0.011	0.210	0.620	0.007	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
44-AA	Patch	-	GleP0003	Vulnerable	no	0.410	-	0.019	0.019	0.380	0.130	0.009	Lax Twig-sedge Baumea laxa (500378)
44-AA	Patch	-	GleP0003	Vulnerable	no	0.410	-	0.019	0.019	0.380	0.130	0.009	Oval-leaf Logania Logania ovata (502032)
44-AA	Patch	-	GleP0003	Vulnerable	no	0.410	-	0.019	0.019	0.380	0.130	0.009	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
44-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.011	0.011	0.810	0.835	0.017	Lax Twig-sedge Baumea laxa (500378)
44-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.011	0.011	0.810	0.840	0.017	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
44-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.006	0.006	0.890	-	0.007	General
44-AD	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.002	0.002	0.740	0.830	0.003	Lax Twig-sedge Baumea laxa (500378)
44-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.022	0.022	0.210	0.620	0.013	Lax Twig-sedge Baumea laxa (500378)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	**Type**	**DBH (cm)**	**EVC code**	**Bioregional conservation status**	**Partial Removal**	**Condition score**	**Large Tree(s)**	**Polygon extent (ha)**	**Extent without overlap (ha)**	**SBV score**	**HI Score**	**Habitat Units**	**Offset Type**
44-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.022	0.022	0.210	0.620	0.013	Scented Spider-orchid Caladenia fragrantissima (504351)
44-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.022	0.022	0.210	0.620	0.013	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
45-AA	Patch	-	GleP0858	Endangered	no	0.810	-	0.001	0.001	0.200	-	0.001	General
45-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.006	0.006	0.830	0.850	0.010	Lax Twig-sedge Baumea laxa (500378)
45-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.018	0.018	0.910	0.850	0.027	Lax Twig-sedge Baumea laxa (500378)
45-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.018	0.018	0.910	0.850	0.027	Oval-leaf Logania Logania ovata (502032)
45-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.018	0.018	0.910	0.850	0.027	Scented Spider-orchid Caladenia fragrantissima (504351)
45-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.018	0.018	0.910	0.850	0.027	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
45-AD	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.002	0.002	0.704	0.830	0.003	Lax Twig-sedge Baumea laxa (500378)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	Type	DBH (cm)	EVC code	Bioregional conservation status	Partial Removal	Condition score	Large Tree(s)	Polygon extent (ha)	Extent without overlap (ha)	SBV score	HI Score	Habitat Units	Offset Type
45-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.034	0.034	0.210	0.570	0.020	Lax Twig-sedge Baumea laxa (500378)
45-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.034	0.034	0.210	0.570	0.020	Oval-leaf Logania Logania ovata (502032)
45-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.034	0.034	0.210	0.570	0.020	Scented Spider-orchid Caladenia fragrantissima (504351)
45-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.034	0.034	0.210	0.570	0.020	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
46-AA	Patch	-	GleP0858	Endangered	no	0.810	-	0.005	0.005	0.201	-	0.004	General
46-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.005	0.005	0.810	0.840	0.008	Lax Twig-sedge Baumea laxa (500378)
46-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.005	0.005	0.810	0.840	0.008	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
46-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.011	0.011	0.850	-	0.013	General
46-AD	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.003	0.003	0.740	0.830	0.004	Lax Twig-sedge Baumea laxa (500378)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	Type	DBH (cm)	EVC code	Bioregional conservation status	Partial Removal	Condition score	Large Tree(s)	Polygon extent (ha)	Extent without overlap (ha)	SBV score	HI Score	Habitat Units	Offset Type
46-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.012	0.012	0.210	0.570	0.007	Lax Twig-sedge Baumea laxa (500378)
46-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.012	0.012	0.210	0.570	0.007	Oval-leaf Logania Logania ovata (502032)
46-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.012	0.012	0.210	0.570	0.007	Scented Spider-orchid Caladenia fragrantissima (504351)
46-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.012	0.012	0.210	0.570	0.007	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
47-AA	Patch	-	GleP0003	Vulnerable	no	0.410	-	0.001	0.001	0.210	-	0.000	General
47-AB	Patch	-	VVP_0016	Least Concern	no	0.820	2	0.032	0.032	0.810	0.830	0.047	Lax Twig-sedge Baumea laxa (500378)
47-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.004	0.004	0.850	-	0.004	General
47-AD	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.001	0.001	0.740	0.830	0.002	Lax Twig-sedge Baumea laxa (500378)
47-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.011	0.011	0.210	0.372	0.006	Lax Twig-sedge Baumea laxa (500378)
47-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.011	0.011	0.210	0.372	0.006	Oval-leaf Logania Logania ovata (502032)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	**Type**	**DBH (cm)**	**EVC code**	**Bioregional conservation status**	**Partial Removal**	**Condition score**	**Large Tree(s)**	**Polygon extent (ha)**	**Extent without overlap (ha)**	**SBV score**	**HI Score**	**Habitat Units**	**Offset Type**
47-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.011	0.011	0.210	0.372	0.006	Scented Spider-orchid Caladenia fragrantissima (504351)
47-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.011	0.011	0.210	0.372	0.006	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
48-AA	Patch	-	GleP0003	Vulnerable	no	0.410	-	0.113	0.113	0.177	-	0.041	General
48-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.007	0.007	0.798	0.842	0.011	Lax Twig-sedge Baumea laxa (500378)
48-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.004	0.004	0.910	0.840	0.006	Lax Twig-sedge Baumea laxa (500378)
48-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.004	0.004	0.910	0.840	0.006	Scented Spider-orchid Caladenia fragrantissima (504351)
48-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.004	0.004	0.910	0.840	0.006	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
48-AD	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.004	0.004	0.741	0.830	0.006	Lax Twig-sedge Baumea laxa (500378)
48-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.015	0.015	0.210	0.510	0.009	Lax Twig-sedge Baumea laxa (500378)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	**Type**	**DBH (cm)**	**EVC code**	**Bioregional conservation status**	**Partial Removal**	**Condition score**	**Large Tree(s)**	**Polygon extent (ha)**	**Extent without overlap (ha)**	**SBV score**	**HI Score**	**Habitat Units**	**Offset Type**
48-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.015	0.015	0.210	0.510	0.009	Oval-leaf Logania Logania ovata (502032)
48-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.015	0.015	0.210	0.510	0.009	Scented Spider-orchid Caladenia fragrantissima (504351)
48-AE	Patch	-	GleP0003	Vulnerable	no	0.380	-	0.015	0.015	0.210	0.510	0.009	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
49-AA	Patch	-	GleP0003	Vulnerable	no	0.410	-	0.042	0.042	0.182	-	0.015	General
49-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.008	0.008	0.980	0.850	0.012	Lax Twig-sedge Baumea laxa (500378)
49-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.008	0.008	0.980	0.850	0.012	Oval-leaf Logania Logania ovata (502032)
49-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.008	0.008	0.980	0.850	0.012	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
49-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.003	0.003	0.890	-	0.003	General
49-AD	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.001	0.001	0.740	0.830	0.002	Lax Twig-sedge Baumea laxa (500378)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	**Type**	**DBH (cm)**	**EVC code**	**Bioregional conservation status**	**Partial Removal**	**Condition score**	**Large Tree(s)**	**Polygon extent (ha)**	**Extent without overlap (ha)**	**SBV score**	**HI Score**	**Habitat Units**	**Offset Type**
49-AE	Patch	-	VVP_0048	Vulnerable	no	0.280	3	0.110	0.110	0.620	0.390	0.043	Lax Twig-sedge Baumea laxa (500378)
49-AE	Patch	-	VVP_0048	Vulnerable	no	0.280	3	0.110	0.110	0.620	0.450	0.045	Oval-leaf Logania Logania ovata (502032)
49-AE	Patch	-	VVP_0048	Vulnerable	no	0.280	3	0.110	0.110	0.620	0.450	0.045	Scented Spider-orchid Caladenia fragrantissima (504351)
5-AA	Patch	-	GleP0858	Endangered	no	0.410	-	0.045	0.045	0.145	-	0.016	General
5-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.011	0.011	0.930	0.840	0.017	Lax Twig-sedge Baumea laxa (500378)
5-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.011	0.011	0.930	0.840	0.017	Oval-leaf Logania Logania ovata (502032)
5-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.011	0.011	0.930	0.840	0.017	Scented Spider-orchid Caladenia fragrantissima (504351)
5-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.011	0.011	0.930	0.840	0.017	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
5-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.002	0.002	0.880	0.850	0.003	Lax Twig-sedge Baumea laxa (500378)
5-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.002	0.002	0.880	0.850	0.003	Oval-leaf Logania Logania ovata (502032)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	**Type**	**DBH (cm)**	**EVC code**	**Bioregional conservation status**	**Partial Removal**	**Condition score**	**Large Tree(s)**	**Polygon extent (ha)**	**Extent without overlap (ha)**	**SBV score**	**HI Score**	**Habitat Units**	**Offset Type**
5-AD	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.003	0.003	0.680	0.820	0.004	Lax Twig-sedge Baumea laxa (500378)
5-AD	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.003	0.003	0.680	0.820	0.004	Scented Spider-orchid Caladenia fragrantissima (504351)
5-AE	Patch	-	VVP_0023	Vulnerable	no	0.710	1	0.005	0.005	0.640	0.775	0.006	Lax Twig-sedge Baumea laxa (500378)
50-AA	Patch	-	GleP0003	Vulnerable	no	0.410	-	0.029	0.029	0.170	-	0.010	General
50-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.004	0.004	0.980	0.850	0.006	Lax Twig-sedge Baumea laxa (500378)
50-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.004	0.004	0.980	0.850	0.006	Oval-leaf Logania Logania ovata (502032)
50-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.004	0.004	0.980	0.850	0.006	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
50-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.003	0.003	0.910	0.850	0.004	Lax Twig-sedge Baumea laxa (500378)
50-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.003	0.003	0.910	0.850	0.004	Oval-leaf Logania Logania ovata (502032)
50-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.003	0.003	0.910	0.850	0.004	Scented Spider-orchid Caladenia fragrantissima (504351)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	**Type**	**DBH (cm)**	**EVC code**	**Bioregional conservation status**	**Partial Removal**	**Condition score**	**Large Tree(s)**	**Polygon extent (ha)**	**Extent without overlap (ha)**	**SBV score**	**HI Score**	**Habitat Units**	**Offset Type**
50-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.003	0.003	0.910	0.850	0.004	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
50-AD	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.020	0.020	0.740	0.830	0.030	Lax Twig-sedge Baumea laxa (500378)
50-AE	Patch	-	VVP_0048	Vulnerable	no	0.280	3	0.063	0.063	0.620	0.370	0.024	Lax Twig-sedge Baumea laxa (500378)
50-AE	Patch	-	VVP_0048	Vulnerable	no	0.280	3	0.063	0.063	0.620	0.370	0.024	Oval-leaf Logania Logania ovata (502032)
50-AE	Patch	-	VVP_0048	Vulnerable	no	0.280	3	0.063	0.063	0.620	0.370	0.024	Scented Spider-orchid Caladenia fragrantissima (504351)
51-AA	Patch	-	VVP_0023	Vulnerable	no	0.240	-	0.001	0.001	0.630	-	0.000	General
51-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.015	0.015	0.970	0.820	0.023	Lax Twig-sedge Baumea laxa (500378)
51-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.015	0.015	0.970	0.820	0.023	Oval-leaf Logania Logania ovata (502032)
51-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.011	0.011	0.850	-	0.013	General
51-AD	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.002	0.002	0.760	0.830	0.003	Lax Twig-sedge Baumea laxa (500378)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	Type	DBH (cm)	EVC code	Bioregional conservation status	Partial Removal	Condition score	Large Tree(s)	Polygon extent (ha)	Extent without overlap (ha)	SBV score	HI Score	Habitat Units	Offset Type
51-AD	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.002	0.002	0.760	0.830	0.003	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
51-AE	Patch	-	VVP_0023	Vulnerable	no	0.770	-	0.002	0.002	0.990	0.790	0.003	Lax Twig-sedge Baumea laxa (500378)
52-AA	Patch	-	VVP_0023	Vulnerable	no	0.240	-	0.011	0.011	0.810	0.596	0.004	Lax Twig-sedge Baumea laxa (500378)
52-AA	Patch	-	VVP_0023	Vulnerable	no	0.240	-	0.011	0.011	0.810	0.596	0.004	Oval-leaf Logania Logania ovata (502032)
52-AA	Patch	-	VVP_0023	Vulnerable	no	0.240	-	0.011	0.011	0.810	0.600	0.004	Scented Spider-orchid Caladenia fragrantissima (504351)
52-AA	Patch	-	VVP_0023	Vulnerable	no	0.240	-	0.011	0.011	0.810	0.596	0.004	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
52-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.011	0.011	0.970	0.820	0.017	Lax Twig-sedge Baumea laxa (500378)
52-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.011	0.011	0.970	0.820	0.017	Oval-leaf Logania Logania ovata (502032)
52-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.009	0.009	0.850	-	0.010	General

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	Type	DBH (cm)	EVC code	Bioregional conservation status	Partial Removal	Condition score	Large Tree(s)	Polygon extent (ha)	Extent without overlap (ha)	SBV score	HI Score	Habitat Units	Offset Type
52-AD	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.000	0.000	0.760	0.830	0.000	Lax Twig-sedge Baumea laxa (500378)
52-AE	Patch	-	VVP_0023	Vulnerable	no	0.770	-	0.004	0.004	0.990	0.790	0.005	Lax Twig-sedge Baumea laxa (500378)
53-AA	Patch	-	Brid0858	Least Concern	no	0.300	-	0.066	0.066	0.410	0.310	0.026	Lax Twig-sedge Baumea laxa (500378)
53-AA	Patch	-	Brid0858	Least Concern	no	0.300	-	0.066	0.066	0.410	0.310	0.026	Oval-leaf Logania Logania ovata (502032)
53-AA	Patch	-	Brid0858	Least Concern	no	0.300	-	0.066	0.066	0.410	0.310	0.026	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
53-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.003	0.003	0.980	0.850	0.004	Lax Twig-sedge Baumea laxa (500378)
53-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.003	0.003	0.980	0.850	0.004	Oval-leaf Logania Logania ovata (502032)
53-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.003	0.003	0.980	0.850	0.004	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
53-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.008	0.008	0.910	0.850	0.012	Lax Twig-sedge Baumea laxa (500378)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	**Type**	**DBH (cm)**	**EVC code**	**Bioregional conservation status**	**Partial Removal**	**Condition score**	**Large Tree(s)**	**Polygon extent (ha)**	**Extent without overlap (ha)**	**SBV score**	**HI Score**	**Habitat Units**	**Offset Type**
53-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.008	0.008	0.910	0.850	0.012	Oval-leaf Logania Logania ovata (502032)
53-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.008	0.008	0.910	0.850	0.012	Scented Spider-orchid Caladenia fragrantissima (504351)
53-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.008	0.008	0.910	0.850	0.012	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
53-AD	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.008	0.008	0.740	0.830	0.012	Lax Twig-sedge Baumea laxa (500378)
54-AA	Patch	-	Brid0858	Least Concern	no	0.300	-	0.000	0.000	0.410	0.310	0.000	Lax Twig-sedge Baumea laxa (500378)
54-AA	Patch	-	Brid0858	Least Concern	no	0.300	-	0.000	0.000	0.410	0.310	0.000	Oval-leaf Logania Logania ovata (502032)
54-AA	Patch	-	Brid0858	Least Concern	no	0.300	-	0.000	0.000	0.410	0.310	0.000	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
54-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.005	0.005	0.980	0.850	0.007	Lax Twig-sedge Baumea laxa (500378)
54-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.005	0.005	0.980	0.850	0.007	Oval-leaf Logania Logania ovata (502032)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	Type	DBH (cm)	EVC code	Bioregional conservation status	Partial Removal	Condition score	Large Tree(s)	Polygon extent (ha)	Extent without overlap (ha)	SBV score	HI Score	Habitat Units	Offset Type
54-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.005	0.005	0.980	0.850	0.007	Scented Spider-orchid Caladenia fragrantissima (504351)
54-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.006	0.006	0.910	0.850	0.010	Lax Twig-sedge Baumea laxa (500378)
54-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.006	0.006	0.910	0.850	0.010	Scented Spider-orchid Caladenia fragrantissima (504351)
54-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.006	0.006	0.910	0.850	0.010	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
54-AD	Patch	-	VVP_0016	Least Concern	no	0.820	2	0.014	0.014	0.760	0.830	0.021	Lax Twig-sedge Baumea laxa (500378)
54-AD	Patch	-	VVP_0016	Least Concern	no	0.820	2	0.014	0.014	0.760	0.830	0.021	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
55-AA	Patch	-	VVP_0023	Vulnerable	no	0.770	2	0.157	0.157	0.910	0.518	0.184	Lax Twig-sedge Baumea laxa (500378)
55-AA	Patch	-	VVP_0023	Vulnerable	no	0.770	2	0.157	0.157	0.910	0.457	0.176	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
55-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.018	0.018	0.980	0.850	0.027	Lax Twig-sedge Baumea laxa (500378)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	**Type**	**DBH (cm)**	**EVC code**	**Bioregional conservation status**	**Partial Removal**	**Condition score**	**Large Tree(s)**	**Polygon extent (ha)**	**Extent without overlap (ha)**	**SBV score**	**HI Score**	**Habitat Units**	**Offset Type**
55-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.018	0.018	0.980	0.850	0.027	Oval-leaf Logania Logania ovata (502032)
55-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.018	0.018	0.980	0.850	0.027	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
55-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.005	0.005	0.850	-	0.006	General
55-AD	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.002	0.002	0.770	0.830	0.003	Lax Twig-sedge Baumea laxa (500378)
55-AE	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.005	0.005	0.990	0.751	0.007	Lax Twig-sedge Baumea laxa (500378)
56-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.015	0.015	0.960	0.810	0.023	Lax Twig-sedge Baumea laxa (500378)
56-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.015	0.015	0.960	0.810	0.023	Oval-leaf Logania Logania ovata (502032)
56-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.023	0.023	0.910	0.850	0.035	Lax Twig-sedge Baumea laxa (500378)
56-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.023	0.023	0.910	0.850	0.035	Scented Spider-orchid Caladenia fragrantissima (504351)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	**Type**	**DBH (cm)**	**EVC code**	**Bioregional conservation status**	**Partial Removal**	**Condition score**	**Large Tree(s)**	**Polygon extent (ha)**	**Extent without overlap (ha)**	**SBV score**	**HI Score**	**Habitat Units**	**Offset Type**
56-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.023	0.023	0.910	0.850	0.035	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
56-AD	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.004	0.004	0.770	0.830	0.006	Lax Twig-sedge Baumea laxa (500378)
56-AE	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.004	0.004	0.931	0.750	0.005	Lax Twig-sedge Baumea laxa (500378)
57-AA	Patch	-	GleP0048	Least Concern	no	0.800	3	0.520	0.520	0.862	0.750	0.728	Lax Twig-sedge Baumea laxa (500378)
57-AA	Patch	-	GleP0048	Least Concern	no	0.800	3	0.520	0.520	0.862	0.750	0.728	Oval-leaf Logania Logania ovata (502032)
57-AA	Patch	-	GleP0048	Least Concern	no	0.800	3	0.520	0.520	0.862	0.768	0.736	Scented Spider-orchid Caladenia fragrantissima (504351)
57-AA	Patch	-	GleP0048	Least Concern	no	0.800	3	0.520	0.520	0.862	0.750	0.728	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
57-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.008	0.008	0.980	0.850	0.012	Lax Twig-sedge Baumea laxa (500378)
57-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.008	0.008	0.980	0.850	0.012	Oval-leaf Logania Logania ovata (502032)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	**Type**	**DBH (cm)**	**EVC code**	**Bioregional conservation status**	**Partial Removal**	**Condition score**	**Large Tree(s)**	**Polygon extent (ha)**	**Extent without overlap (ha)**	**SBV score**	**HI Score**	**Habitat Units**	**Offset Type**
57-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.008	0.008	0.980	0.850	0.012	Scented Spider-orchid Caladenia fragrantissima (504351)
57-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.025	0.025	0.850	-	0.029	General
57-AD	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.004	0.004	0.760	0.820	0.006	Lax Twig-sedge Baumea laxa (500378)
57-AE	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.008	0.008	0.990	0.750	0.011	Lax Twig-sedge Baumea laxa (500378)
58-AA	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.016	0.016	0.910	0.756	0.023	Lax Twig-sedge Baumea laxa (500378)
58-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.004	0.004	0.960	0.820	0.006	Lax Twig-sedge Baumea laxa (500378)
58-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.004	0.004	0.960	0.820	0.006	Oval-leaf Logania Logania ovata (502032)
58-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.004	0.004	0.960	0.820	0.006	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
58-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.008	0.008	0.910	0.840	0.012	Lax Twig-sedge Baumea laxa (500378)
58-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.008	0.008	0.910	0.840	0.012	Scented Spider-orchid Caladenia fragrantissima (504351)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	**Type**	**DBH (cm)**	**EVC code**	**Bioregional conservation status**	**Partial Removal**	**Condition score**	**Large Tree(s)**	**Polygon extent (ha)**	**Extent without overlap (ha)**	**SBV score**	**HI Score**	**Habitat Units**	**Offset Type**
58-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.008	0.008	0.910	0.840	0.012	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
58-AD	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.001	0.001	0.770	0.830	0.002	Lax Twig-sedge Baumea laxa (500378)
59-AA	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.015	0.015	0.780	0.847	0.023	Lax Twig-sedge Baumea laxa (500378)
59-AA	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.015	0.015	0.780	0.850	0.023	Oval-leaf Logania Logania ovata (502032)
59-AA	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.015	0.015	0.780	0.847	0.023	Scented Spider-orchid Caladenia fragrantissima (504351)
59-AA	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.015	0.015	0.780	0.847	0.023	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
59-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.011	0.011	0.960	0.820	0.017	Lax Twig-sedge Baumea laxa (500378)
59-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.011	0.011	0.960	0.820	0.017	Oval-leaf Logania Logania ovata (502032)
59-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.011	0.011	0.960	0.820	0.017	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	**Type**	**DBH (cm)**	**EVC code**	**Bioregional conservation status**	**Partial Removal**	**Condition score**	**Large Tree(s)**	**Polygon extent (ha)**	**Extent without overlap (ha)**	**SBV score**	**HI Score**	**Habitat Units**	**Offset Type**
59-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.002	0.002	0.910	0.840	0.003	Lax Twig-sedge Baumea laxa (500378)
59-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.002	0.002	0.910	0.840	0.003	Scented Spider-orchid Caladenia fragrantissima (504351)
59-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.002	0.002	0.910	0.840	0.003	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
59-AD	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.004	0.004	0.770	0.830	0.006	Lax Twig-sedge Baumea laxa (500378)
6-AA	Patch	-	GleP0858	Endangered	no	0.410	-	0.004	0.004	0.150	-	0.001	General
6-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.020	0.020	0.990	0.850	0.030	Lax Twig-sedge Baumea laxa (500378)
6-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.020	0.020	0.990	0.850	0.030	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
6-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.015	0.015	0.870	0.840	0.023	Lax Twig-sedge Baumea laxa (500378)
6-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.015	0.015	0.870	0.840	0.023	Oval-leaf Logania Logania ovata (502032)
6-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.015	0.015	0.870	0.840	0.023	Scented Spider-orchid Caladenia fragrantissima (504351)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	**Type**	**DBH (cm)**	**EVC code**	**Bioregional conservation status**	**Partial Removal**	**Condition score**	**Large Tree(s)**	**Polygon extent (ha)**	**Extent without overlap (ha)**	**SBV score**	**HI Score**	**Habitat Units**	**Offset Type**
6-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.015	0.015	0.870	0.840	0.023	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
6-AD	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.005	0.005	0.680	0.820	0.007	Lax Twig-sedge Baumea laxa (500378)
6-AD	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.005	0.005	0.680	0.820	0.007	Scented Spider-orchid Caladenia fragrantissima (504351)
6-AE	Patch	-	VVP_0198	Vulnerable	no	0.830	1	0.005	0.005	0.860	0.840	0.008	Lax Twig-sedge Baumea laxa (500378)
6-AE	Patch	-	VVP_0198	Vulnerable	no	0.830	1	0.005	0.005	0.860	0.840	0.008	Oval-leaf Logania Logania ovata (502032)
6-AE	Patch	-	VVP_0198	Vulnerable	no	0.830	1	0.005	0.005	0.860	0.840	0.008	Scented Spider-orchid Caladenia fragrantissima (504351)
6-AE	Patch	-	VVP_0198	Vulnerable	no	0.830	1	0.005	0.005	0.860	0.840	0.008	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
60-AA	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.005	0.005	0.780	0.840	0.008	Lax Twig-sedge Baumea laxa (500378)
60-AA	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.005	0.005	0.780	0.840	0.008	Scented Spider-orchid Caladenia fragrantissima (504351)

Information provided by or on behalf of the applicant							Information calculated by NVR Map							
Zone	Type	DBH (cm)	EVC code	Bioregional conservation status	Partial Removal	Condition score	Large Tree(s)	Polygon extent (ha)	Extent without overlap (ha)	SBV score	HI Score	Habitat Units	Offset Type
60-AA	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.005	0.005	0.780	0.840	0.008	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
60-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.004	0.004	0.960	0.810	0.006	Lax Twig-sedge Baumea laxa (500378)
60-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.004	0.004	0.960	0.810	0.006	Oval-leaf Logania Logania ovata (502032)
60-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.004	0.004	0.960	0.810	0.006	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
60-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.008	0.008	0.820	-	0.009	General
60-AD	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.006	0.006	0.770	0.830	0.010	Lax Twig-sedge Baumea laxa (500378)
60-AE	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.000	0.000	0.910	0.750	0.000	Lax Twig-sedge Baumea laxa (500378)
61-AA	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.004	0.004	0.780	0.850	0.006	Lax Twig-sedge Baumea laxa (500378)
61-AA	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.004	0.004	0.780	0.850	0.006	Oval-leaf Logania Logania ovata (502032)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	**Type**	**DBH (cm)**	**EVC code**	**Bioregional conservation status**	**Partial Removal**	**Condition score**	**Large Tree(s)**	**Polygon extent (ha)**	**Extent without overlap (ha)**	**SBV score**	**HI Score**	**Habitat Units**	**Offset Type**
61-AA	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.004	0.004	0.780	0.850	0.006	Scented Spider-orchid Caladenia fragrantissima (504351)
61-AA	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.004	0.004	0.780	0.850	0.006	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
61-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.004	0.004	0.960	0.820	0.006	Lax Twig-sedge Baumea laxa (500378)
61-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.004	0.004	0.960	0.820	0.006	Oval-leaf Logania Logania ovata (502032)
61-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.004	0.004	0.960	0.820	0.006	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
61-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.011	0.011	0.836	0.850	0.017	Lax Twig-sedge Baumea laxa (500378)
61-AD	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.011	0.011	0.770	0.830	0.017	Lax Twig-sedge Baumea laxa (500378)
62-AA	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.005	0.005	0.920	0.850	0.008	Lax Twig-sedge Baumea laxa (500378)
62-AA	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.005	0.005	0.920	0.850	0.008	Oval-leaf Logania Logania ovata (502032)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	Type	DBH (cm)	EVC code	Bioregional conservation status	Partial Removal	Condition score	Large Tree(s)	Polygon extent (ha)	Extent without overlap (ha)	SBV score	HI Score	Habitat Units	Offset Type
62-AA	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.005	0.005	0.920	0.850	0.008	Scented Spider-orchid Caladenia fragrantissima (504351)
62-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.005	0.005	0.740	0.840	0.008	Lax Twig-sedge Baumea laxa (500378)
62-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.005	0.005	0.740	0.840	0.008	Scented Spider-orchid Caladenia fragrantissima (504351)
62-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.005	0.005	0.910	0.840	0.008	Lax Twig-sedge Baumea laxa (500378)
62-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.005	0.005	0.910	0.840	0.008	Scented Spider-orchid Caladenia fragrantissima (504351)
62-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.005	0.005	0.910	0.840	0.008	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
62-AD	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.006	0.006	0.790	0.830	0.010	Lax Twig-sedge Baumea laxa (500378)
62-AD	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.006	0.006	0.790	0.830	0.010	Scented Spider-orchid Caladenia fragrantissima (504351)
62-AE	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.002	0.002	0.910	0.750	0.003	Lax Twig-sedge Baumea laxa (500378)
63-AA	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.004	0.004	0.780	0.850	0.006	Lax Twig-sedge Baumea laxa (500378)

Information provided by or on behalf of the applicant							Information calculated by NVR Map							
Zone	**Type**	**DBH (cm)**	**EVC code**	**Bioregional conservation status**	**Partial Removal**	**Condition score**	**Large Tree(s)**	**Polygon extent (ha)**	**Extent without overlap (ha)**	**SBV score**	**HI Score**	**Habitat Units**	**Offset Type**
63-AA	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.004	0.004	0.780	0.850	0.006	Oval-leaf Logania Logania ovata (502032)
63-AA	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.004	0.004	0.780	0.850	0.006	Scented Spider-orchid Caladenia fragrantissima (504351)
63-AA	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.004	0.004	0.780	0.850	0.006	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
63-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.004	0.004	0.963	0.848	0.006	Lax Twig-sedge Baumea laxa (500378)
63-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.004	0.004	0.963	0.848	0.006	Oval-leaf Logania Logania ovata (502032)
63-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.004	0.004	0.963	0.848	0.006	Scented Spider-orchid Caladenia fragrantissima (504351)
63-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.004	0.004	0.963	0.840	0.006	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
63-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.011	0.011	0.890	-	0.013	General
63-AD	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.018	0.018	0.770	0.830	0.026	Lax Twig-sedge Baumea laxa (500378)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	Type	DBH (cm)	EVC code	Bioregional conservation status	Partial Removal	Condition score	Large Tree(s)	Polygon extent (ha)	Extent without overlap (ha)	SBV score	HI Score	Habitat Units	Offset Type
63-AE	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.004	0.004	0.990	0.804	0.006	Lax Twig-sedge Baumea laxa (500378)
64-AA	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.004	0.004	0.814	0.850	0.006	Lax Twig-sedge Baumea laxa (500378)
64-AA	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.004	0.004	0.814	0.850	0.006	Oval-leaf Logania Logania ovata (502032)
64-AA	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.004	0.004	0.814	0.850	0.006	Scented Spider-orchid Caladenia fragrantissima (504351)
64-AA	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.004	0.004	0.814	0.850	0.006	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
64-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.006	0.006	0.980	0.850	0.010	Lax Twig-sedge Baumea laxa (500378)
64-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.006	0.006	0.980	0.850	0.010	Oval-leaf Logania Logania ovata (502032)
64-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.006	0.006	0.980	0.850	0.010	Scented Spider-orchid Caladenia fragrantissima (504351)
64-AC	Patch	-	VVP_0016	Least Concern	no	0.820	2	0.022	0.022	0.810	0.830	0.033	Lax Twig-sedge Baumea laxa (500378)
64-AC	Patch	-	VVP_0016	Least Concern	no	0.820	2	0.022	0.022	0.810	0.830	0.033	Scented Spider-orchid Caladenia fragrantissima (504351)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	Type	DBH (cm)	EVC code	Bioregional conservation status	Partial Removal	Condition score	Large Tree(s)	Polygon extent (ha)	Extent without overlap (ha)	SBV score	HI Score	Habitat Units	Offset Type
64-AC	Patch	-	VVP_0016	Least Concern	no	0.820	2	0.022	0.022	0.810	0.830	0.033	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
64-AD	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.006	0.006	0.790	0.840	0.010	Lax Twig-sedge Baumea laxa (500378)
64-AD	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.006	0.006	0.790	0.840	0.010	Scented Spider-orchid Caladenia fragrantissima (504351)
65-AA	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.004	0.004	0.920	0.850	0.006	Lax Twig-sedge Baumea laxa (500378)
65-AA	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.004	0.004	0.920	0.850	0.006	Oval-leaf Logania Logania ovata (502032)
65-AA	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.004	0.004	0.920	0.850	0.006	Scented Spider-orchid Caladenia fragrantissima (504351)
65-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.006	0.006	0.740	0.840	0.010	Lax Twig-sedge Baumea laxa (500378)
65-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.006	0.006	0.740	0.840	0.010	Scented Spider-orchid Caladenia fragrantissima (504351)
65-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.011	0.011	0.910	0.840	0.017	Lax Twig-sedge Baumea laxa (500378)
65-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.011	0.011	0.910	0.840	0.017	Scented Spider-orchid Caladenia fragrantissima (504351)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	**Type**	**DBH (cm)**	**EVC code**	**Bioregional conservation status**	**Partial Removal**	**Condition score**	**Large Tree(s)**	**Polygon extent (ha)**	**Extent without overlap (ha)**	**SBV score**	**HI Score**	**Habitat Units**	**Offset Type**
65-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.011	0.011	0.910	0.840	0.017	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
65-AD	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.004	0.004	0.790	0.840	0.006	Lax Twig-sedge Baumea laxa (500378)
66-AA	Patch	-	VVP_0016	Least Concern	no	0.820	2	0.025	0.025	0.736	0.846	0.038	Lax Twig-sedge Baumea laxa (500378)
66-AA	Patch	-	VVP_0016	Least Concern	no	0.820	2	0.025	0.025	0.736	0.850	0.038	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
66-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.015	0.015	0.870	0.840	0.023	Lax Twig-sedge Baumea laxa (500378)
66-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.015	0.015	0.870	0.840	0.023	Oval-leaf Logania Logania ovata (502032)
66-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.015	0.015	0.870	0.840	0.023	Scented Spider-orchid Caladenia fragrantissima (504351)
66-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.015	0.015	0.870	0.840	0.023	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
66-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.006	0.006	0.820	-	0.007	General

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	Type	DBH (cm)	EVC code	Bioregional conservation status	Partial Removal	Condition score	Large Tree(s)	Polygon extent (ha)	Extent without overlap (ha)	SBV score	HI Score	Habitat Units	Offset Type
66-AD	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.001	0.001	0.790	0.840	0.002	Lax Twig-sedge Baumea laxa (500378)
66-AD	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.001	0.001	0.790	0.840	0.002	Scented Spider-orchid Caladenia fragrantissima (504351)
66-AE	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.005	0.005	0.990	0.770	0.007	Lax Twig-sedge Baumea laxa (500378)
67-AA	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.004	0.004	0.920	0.850	0.006	Lax Twig-sedge Baumea laxa (500378)
67-AA	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.004	0.004	0.920	0.850	0.006	Oval-leaf Logania Logania ovata (502032)
67-AA	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.004	0.004	0.920	0.850	0.006	Scented Spider-orchid Caladenia fragrantissima (504351)
67-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.011	0.011	0.980	0.850	0.017	Lax Twig-sedge Baumea laxa (500378)
67-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.011	0.011	0.980	0.850	0.017	Oval-leaf Logania Logania ovata (502032)
67-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.011	0.011	0.980	0.850	0.017	Scented Spider-orchid Caladenia fragrantissima (504351)
67-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.011	0.011	0.910	0.850	0.017	Lax Twig-sedge Baumea laxa (500378)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	**Type**	**DBH (cm)**	**EVC code**	**Bioregional conservation status**	**Partial Removal**	**Condition score**	**Large Tree(s)**	**Polygon extent (ha)**	**Extent without overlap (ha)**	**SBV score**	**HI Score**	**Habitat Units**	**Offset Type**
67-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.011	0.011	0.910	0.850	0.017	Scented Spider-orchid Caladenia fragrantissima (504351)
67-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.011	0.011	0.910	0.850	0.017	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
67-AD	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.008	0.008	0.790	0.830	0.012	Lax Twig-sedge Baumea laxa (500378)
67-AD	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.008	0.008	0.790	0.830	0.012	Scented Spider-orchid Caladenia fragrantissima (504351)
67-AE	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.004	0.004	0.990	0.790	0.006	Lax Twig-sedge Baumea laxa (500378)
68-AA	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.011	0.011	0.780	0.850	0.017	Lax Twig-sedge Baumea laxa (500378)
68-AA	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.011	0.011	0.780	0.850	0.017	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
68-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.004	0.004	0.740	0.820	0.006	Lax Twig-sedge Baumea laxa (500378)
68-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.004	0.004	0.740	0.820	0.006	Oval-leaf Logania Logania ovata (502032)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	**Type**	**DBH (cm)**	**EVC code**	**Bioregional conservation status**	**Partial Removal**	**Condition score**	**Large Tree(s)**	**Polygon extent (ha)**	**Extent without overlap (ha)**	**SBV score**	**HI Score**	**Habitat Units**	**Offset Type**
68-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.004	0.004	0.740	0.820	0.006	Scented Spider-orchid Caladenia fragrantissima (504351)
68-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.004	0.004	0.740	0.820	0.006	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
68-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.004	0.004	0.910	0.850	0.006	Lax Twig-sedge Baumea laxa (500378)
68-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.004	0.004	0.910	0.850	0.006	Scented Spider-orchid Caladenia fragrantissima (504351)
68-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.004	0.004	0.910	0.850	0.006	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
68-AD	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.002	0.002	0.800	0.830	0.003	Lax Twig-sedge Baumea laxa (500378)
68-AE	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.002	0.002	0.990	0.750	0.003	Lax Twig-sedge Baumea laxa (500378)
69-AA	Patch	-	VVP_0016	Least Concern	no	0.820	2	0.010	0.010	0.920	0.850	0.015	Lax Twig-sedge Baumea laxa (500378)
69-AA	Patch	-	VVP_0016	Least Concern	no	0.820	2	0.010	0.010	0.920	0.850	0.015	Oval-leaf Logania Logania ovata (502032)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	Type	DBH (cm)	EVC code	Bioregional conservation status	Partial Removal	Condition score	Large Tree(s)	Polygon extent (ha)	Extent without overlap (ha)	SBV score	HI Score	Habitat Units	Offset Type
69-AA	Patch	-	VVP_0016	Least Concern	no	0.820	2	0.010	0.010	0.920	0.850	0.015	Scented Spider-orchid Caladenia fragrantissima (504351)
69-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.005	0.005	0.980	0.850	0.008	Lax Twig-sedge Baumea laxa (500378)
69-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.005	0.005	0.980	0.850	0.008	Oval-leaf Logania Logania ovata (502032)
69-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.005	0.005	0.980	0.850	0.008	Scented Spider-orchid Caladenia fragrantissima (504351)
69-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.005	0.005	0.810	0.830	0.008	Lax Twig-sedge Baumea laxa (500378)
69-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.005	0.005	0.810	0.830	0.008	Oval-leaf Logania Logania ovata (502032)
69-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.005	0.005	0.810	0.830	0.008	Scented Spider-orchid Caladenia fragrantissima (504351)
69-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.005	0.005	0.810	0.830	0.008	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
69-AD	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.011	0.011	0.790	0.840	0.017	Lax Twig-sedge Baumea laxa (500378)
69-AE	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.005	0.005	0.990	0.810	0.007	Lax Twig-sedge Baumea laxa (500378)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	Type	DBH (cm)	EVC code	Bioregional conservation status	Partial Removal	Condition score	Large Tree(s)	Polygon extent (ha)	Extent without overlap (ha)	SBV score	HI Score	Habitat Units	Offset Type
7-AA	Patch	-	GleP0858	Endangered	no	0.410	-	0.074	0.074	0.230	-	0.028	General
7-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.004	0.004	0.990	0.860	0.006	Lax Twig-sedge Baumea laxa (500378)
7-AC	Patch	-	VVP_0198	Vulnerable	no	0.830	2	0.011	0.011	0.920	0.840	0.017	Lax Twig-sedge Baumea laxa (500378)
7-AC	Patch	-	VVP_0198	Vulnerable	no	0.830	2	0.011	0.011	0.920	0.840	0.017	Scented Spider-orchid Caladenia fragrantissima (504351)
7-AD	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.018	0.018	0.680	0.820	0.026	Lax Twig-sedge Baumea laxa (500378)
7-AD	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.018	0.018	0.680	0.820	0.026	Scented Spider-orchid Caladenia fragrantissima (504351)
7-AE	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.031	0.031	0.873	0.843	0.047	Lax Twig-sedge Baumea laxa (500378)
7-AE	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.031	0.031	0.873	0.843	0.047	Oval-leaf Logania Logania ovata (502032)
7-AE	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.031	0.031	0.873	0.843	0.047	Scented Spider-orchid Caladenia fragrantissima (504351)
7-AE	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.031	0.031	0.873	0.840	0.047	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	**Type**	**DBH (cm)**	**EVC code**	**Bioregional conservation status**	**Partial Removal**	**Condition score**	**Large Tree(s)**	**Polygon extent (ha)**	**Extent without overlap (ha)**	**SBV score**	**HI Score**	**Habitat Units**	**Offset Type**
70-AA	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.010	0.010	0.920	0.850	0.015	Lax Twig-sedge Baumea laxa (500378)
70-AA	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.010	0.010	0.920	0.850	0.015	Oval-leaf Logania Logania ovata (502032)
70-AA	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.010	0.010	0.920	0.850	0.015	Scented Spider-orchid Caladenia fragrantissima (504351)
70-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.025	0.025	0.870	0.840	0.038	Lax Twig-sedge Baumea laxa (500378)
70-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.025	0.025	0.870	0.840	0.038	Oval-leaf Logania Logania ovata (502032)
70-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.025	0.025	0.870	0.840	0.038	Scented Spider-orchid Caladenia fragrantissima (504351)
70-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.025	0.025	0.870	0.840	0.038	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
70-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.045	0.045	0.810	0.830	0.068	Lax Twig-sedge Baumea laxa (500378)
70-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.045	0.045	0.810	0.830	0.068	Scented Spider-orchid Caladenia fragrantissima (504351)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	**Type**	**DBH (cm)**	**EVC code**	**Bioregional conservation status**	**Partial Removal**	**Condition score**	**Large Tree(s)**	**Polygon extent (ha)**	**Extent without overlap (ha)**	**SBV score**	**HI Score**	**Habitat Units**	**Offset Type**
70-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.045	0.045	0.810	0.830	0.068	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
70-AD	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.011	0.011	0.680	0.830	0.017	Lax Twig-sedge Baumea laxa (500378)
70-AD	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.011	0.011	0.680	0.830	0.017	Scented Spider-orchid Caladenia fragrantissima (504351)
70-AE	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.002	0.002	0.910	0.750	0.002	Lax Twig-sedge Baumea laxa (500378)
71-AA	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.008	0.008	0.680	0.840	0.012	Lax Twig-sedge Baumea laxa (500378)
71-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.006	0.006	0.870	0.840	0.010	Lax Twig-sedge Baumea laxa (500378)
71-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.006	0.006	0.870	0.840	0.010	Oval-leaf Logania Logania ovata (502032)
71-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.006	0.006	0.870	0.840	0.010	Scented Spider-orchid Caladenia fragrantissima (504351)
71-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.006	0.006	0.870	0.840	0.010	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	**Type**	**DBH (cm)**	**EVC code**	**Bioregional conservation status**	**Partial Removal**	**Condition score**	**Large Tree(s)**	**Polygon extent (ha)**	**Extent without overlap (ha)**	**SBV score**	**HI Score**	**Habitat Units**	**Offset Type**
71-AC	Patch	-	VVP_0016	Least Concern	no	0.820	2	0.013	0.013	0.820	-	0.015	General
71-AD	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.018	0.018	0.680	0.830	0.026	Lax Twig-sedge Baumea laxa (500378)
71-AD	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.018	0.018	0.680	0.830	0.026	Scented Spider-orchid Caladenia fragrantissima (504351)
71-AE	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.006	0.006	0.910	0.750	0.009	Lax Twig-sedge Baumea laxa (500378)
72-AA	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.004	0.004	0.920	0.850	0.006	Lax Twig-sedge Baumea laxa (500378)
72-AA	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.004	0.004	0.920	0.850	0.006	Oval-leaf Logania Logania ovata (502032)
72-AA	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.004	0.004	0.920	0.850	0.006	Scented Spider-orchid Caladenia fragrantissima (504351)
72-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.049	0.049	0.960	0.813	0.073	Lax Twig-sedge Baumea laxa (500378)
72-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.049	0.049	0.960	0.813	0.073	Oval-leaf Logania Logania ovata (502032)
72-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.001	0.001	0.810	0.830	0.002	Lax Twig-sedge Baumea laxa (500378)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	**Type**	**DBH (cm)**	**EVC code**	**Bioregional conservation status**	**Partial Removal**	**Condition score**	**Large Tree(s)**	**Polygon extent (ha)**	**Extent without overlap (ha)**	**SBV score**	**HI Score**	**Habitat Units**	**Offset Type**
72-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.001	0.001	0.810	0.830	0.002	Scented Spider-orchid Caladenia fragrantissima (504351)
72-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.001	0.001	0.810	0.830	0.002	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
72-AD	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.015	0.015	0.680	0.820	0.023	Lax Twig-sedge Baumea laxa (500378)
72-AD	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.015	0.015	0.680	0.820	0.023	Scented Spider-orchid Caladenia fragrantissima (504351)
72-AE	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.004	0.004	0.990	0.800	0.006	Lax Twig-sedge Baumea laxa (500378)
73-AA	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.006	0.006	0.890	0.850	0.008	Lax Twig-sedge Baumea laxa (500378)
73-AA	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.006	0.006	0.890	0.850	0.008	Oval-leaf Logania Logania ovata (502032)
73-AA	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.006	0.006	0.890	0.850	0.008	Scented Spider-orchid Caladenia fragrantissima (504351)
73-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.005	0.005	0.980	0.850	0.008	Lax Twig-sedge Baumea laxa (500378)
73-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.005	0.005	0.980	0.850	0.008	Oval-leaf Logania Logania ovata (502032)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	**Type**	**DBH (cm)**	**EVC code**	**Bioregional conservation status**	**Partial Removal**	**Condition score**	**Large Tree(s)**	**Polygon extent (ha)**	**Extent without overlap (ha)**	**SBV score**	**HI Score**	**Habitat Units**	**Offset Type**
73-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.005	0.005	0.980	0.850	0.008	Scented Spider-orchid Caladenia fragrantissima (504351)
73-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.008	0.008	0.868	0.842	0.012	Lax Twig-sedge Baumea laxa (500378)
73-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.008	0.008	0.868	0.842	0.012	Scented Spider-orchid Caladenia fragrantissima (504351)
73-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.008	0.008	0.868	0.842	0.012	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
73-AD	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.008	0.008	0.870	0.800	0.012	Lax Twig-sedge Baumea laxa (500378)
73-AE	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.005	0.005	0.990	0.801	0.007	Lax Twig-sedge Baumea laxa (500378)
74-AA	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.002	0.002	0.840	0.850	0.003	Lax Twig-sedge Baumea laxa (500378)
74-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.005	0.005	0.740	0.842	0.008	Lax Twig-sedge Baumea laxa (500378)
74-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.005	0.005	0.740	0.842	0.008	Scented Spider-orchid Caladenia fragrantissima (504351)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	**Type**	**DBH (cm)**	**EVC code**	**Bioregional conservation status**	**Partial Removal**	**Condition score**	**Large Tree(s)**	**Polygon extent (ha)**	**Extent without overlap (ha)**	**SBV score**	**HI Score**	**Habitat Units**	**Offset Type**
74-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.005	0.005	0.740	0.850	0.008	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
74-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.001	0.001	0.810	0.840	0.001	Lax Twig-sedge Baumea laxa (500378)
74-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.001	0.001	0.810	0.840	0.001	Scented Spider-orchid Caladenia fragrantissima (504351)
74-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.001	0.001	0.810	0.840	0.001	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
74-AD	Patch	-	VVP_0023	Vulnerable	no	0.710	-	0.006	0.006	0.810	0.836	0.008	Lax Twig-sedge Baumea laxa (500378)
74-AE	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.004	0.004	0.990	0.770	0.006	Lax Twig-sedge Baumea laxa (500378)
75-AA	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.002	0.002	0.680	0.830	0.003	Lax Twig-sedge Baumea laxa (500378)
75-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.003	0.003	0.740	0.840	0.004	Lax Twig-sedge Baumea laxa (500378)
75-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.003	0.003	0.740	0.840	0.004	Scented Spider-orchid Caladenia fragrantissima (504351)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	Type	DBH (cm)	EVC code	Bioregional conservation status	Partial Removal	Condition score	Large Tree(s)	Polygon extent (ha)	Extent without overlap (ha)	SBV score	HI Score	Habitat Units	Offset Type
75-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.003	0.003	0.740	0.840	0.004	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
75-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.002	0.002	0.810	0.830	0.003	Lax Twig-sedge Baumea laxa (500378)
75-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.002	0.002	0.810	0.830	0.003	Scented Spider-orchid Caladenia fragrantissima (504351)
75-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.002	0.002	0.810	0.830	0.003	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
75-AD	Patch	-	VVP_0023	Vulnerable	no	0.710	1	0.003	0.003	0.810	0.840	0.004	Lax Twig-sedge Baumea laxa (500378)
76-AA	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.001	0.001	0.680	0.830	0.001	Lax Twig-sedge Baumea laxa (500378)
76-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.007	0.007	0.740	0.830	0.010	Lax Twig-sedge Baumea laxa (500378)
76-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.007	0.007	0.740	0.820	0.010	Oval-leaf Logania Logania ovata (502032)
76-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.007	0.007	0.740	0.830	0.010	Scented Spider-orchid Caladenia fragrantissima (504351)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	**Type**	**DBH (cm)**	**EVC code**	**Bioregional conservation status**	**Partial Removal**	**Condition score**	**Large Tree(s)**	**Polygon extent (ha)**	**Extent without overlap (ha)**	**SBV score**	**HI Score**	**Habitat Units**	**Offset Type**
76-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.007	0.007	0.740	0.830	0.010	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
76-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.008	0.008	0.810	0.830	0.012	Lax Twig-sedge Baumea laxa (500378)
76-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.008	0.008	0.810	0.830	0.012	Scented Spider-orchid Caladenia fragrantissima (504351)
76-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.008	0.008	0.810	0.830	0.012	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
76-AD	Patch	-	VVP_0023	Vulnerable	no	0.710	1	0.011	0.011	0.810	0.840	0.015	Lax Twig-sedge Baumea laxa (500378)
77-AA	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.001	0.001	0.890	0.860	0.001	Lax Twig-sedge Baumea laxa (500378)
77-AA	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.001	0.001	0.890	0.860	0.001	Oval-leaf Logania Logania ovata (502032)
77-AA	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.001	0.001	0.890	0.860	0.001	Scented Spider-orchid Caladenia fragrantissima (504351)
77-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.018	0.018	0.870	0.844	0.027	Lax Twig-sedge Baumea laxa (500378)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	Type	DBH (cm)	EVC code	Bioregional conservation status	Partial Removal	Condition score	Large Tree(s)	Polygon extent (ha)	Extent without overlap (ha)	SBV score	HI Score	Habitat Units	Offset Type
77-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.018	0.018	0.870	0.844	0.027	Oval-leaf Logania Logania ovata (502032)
77-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.018	0.018	0.870	0.844	0.027	Scented Spider-orchid Caladenia fragrantissima (504351)
77-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.018	0.018	0.870	0.840	0.027	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
77-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.013	0.013	0.810	0.830	0.019	Lax Twig-sedge Baumea laxa (500378)
77-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.013	0.013	0.810	0.830	0.019	Scented Spider-orchid Caladenia fragrantissima (504351)
77-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.013	0.013	0.810	0.830	0.019	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
77-AD	Patch	-	VVP_0023	Vulnerable	no	0.710	-	0.001	0.001	0.640	0.840	0.001	Lax Twig-sedge Baumea laxa (500378)
78-AA	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.004	0.004	0.890	0.843	0.006	Lax Twig-sedge Baumea laxa (500378)
78-AA	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.004	0.004	0.890	0.843	0.006	Oval-leaf Logania Logania ovata (502032)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	**Type**	**DBH (cm)**	**EVC code**	**Bioregional conservation status**	**Partial Removal**	**Condition score**	**Large Tree(s)**	**Polygon extent (ha)**	**Extent without overlap (ha)**	**SBV score**	**HI Score**	**Habitat Units**	**Offset Type**
78-AA	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.004	0.004	0.890	0.843	0.006	Scented Spider-orchid Caladenia fragrantissima (504351)
78-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.006	0.006	0.960	0.820	0.009	Lax Twig-sedge Baumea laxa (500378)
78-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.006	0.006	0.960	0.820	0.009	Oval-leaf Logania Logania ovata (502032)
78-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.006	0.006	0.960	0.820	0.009	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
78-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.015	0.015	0.820	-	0.017	General
78-AD	Patch	-	VVP_0023	Vulnerable	no	0.710	1	0.002	0.002	0.640	-	0.002	General
79-AA	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.004	0.004	0.680	0.830	0.006	Lax Twig-sedge Baumea laxa (500378)
79-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.003	0.003	0.920	0.840	0.004	Lax Twig-sedge Baumea laxa (500378)
79-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.003	0.003	0.920	0.840	0.004	Scented Spider-orchid Caladenia fragrantissima (504351)
79-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.008	0.008	0.820	0.850	0.012	Lax Twig-sedge Baumea laxa (500378)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	**Type**	**DBH (cm)**	**EVC code**	**Bioregional conservation status**	**Partial Removal**	**Condition score**	**Large Tree(s)**	**Polygon extent (ha)**	**Extent without overlap (ha)**	**SBV score**	**HI Score**	**Habitat Units**	**Offset Type**
79-AD	Patch	-	VVP_0023	Vulnerable	no	0.710	1	0.020	0.020	0.640	-	0.017	General
8-AA	Patch	-	GleP0858	Endangered	no	0.480	-	0.003	0.003	0.200	0.360	0.002	Lax Twig-sedge Baumea laxa (500378)
8-AA	Patch	-	GleP0858	Endangered	no	0.480	-	0.003	0.003	0.200	0.360	0.002	Oval-leaf Logania Logania ovata (502032)
8-AA	Patch	-	GleP0858	Endangered	no	0.480	-	0.003	0.003	0.200	0.360	0.002	Scented Spider-orchid Caladenia fragrantissima (504351)
8-AA	Patch	-	GleP0858	Endangered	no	0.480	-	0.003	0.003	0.200	0.360	0.002	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
8-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.006	0.006	0.930	0.860	0.010	Lax Twig-sedge Baumea laxa (500378)
8-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.006	0.006	0.930	0.860	0.010	Oval-leaf Logania Logania ovata (502032)
8-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.006	0.006	0.930	0.860	0.010	Scented Spider-orchid Caladenia fragrantissima (504351)
8-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.006	0.006	0.930	0.860	0.010	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	**Type**	**DBH (cm)**	**EVC code**	**Bioregional conservation status**	**Partial Removal**	**Condition score**	**Large Tree(s)**	**Polygon extent (ha)**	**Extent without overlap (ha)**	**SBV score**	**HI Score**	**Habitat Units**	**Offset Type**
8-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.015	0.015	0.880	0.850	0.023	Lax Twig-sedge Baumea laxa (500378)
8-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.015	0.015	0.880	0.850	0.023	Oval-leaf Logania Logania ovata (502032)
8-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.015	0.015	0.880	0.850	0.023	Scented Spider-orchid Caladenia fragrantissima (504351)
8-AD	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.004	0.004	0.710	0.820	0.006	Lax Twig-sedge Baumea laxa (500378)
8-AD	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.004	0.004	0.710	0.820	0.006	Scented Spider-orchid Caladenia fragrantissima (504351)
8-AE	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.031	0.031	0.820	-	0.035	General
80-AA	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.001	0.001	0.840	0.840	0.001	Lax Twig-sedge Baumea laxa (500378)
80-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.003	0.003	0.740	0.840	0.004	Lax Twig-sedge Baumea laxa (500378)
80-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.003	0.003	0.740	0.840	0.004	Scented Spider-orchid Caladenia fragrantissima (504351)
80-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.003	0.003	0.740	0.840	0.004	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	**Type**	**DBH (cm)**	**EVC code**	**Bioregional conservation status**	**Partial Removal**	**Condition score**	**Large Tree(s)**	**Polygon extent (ha)**	**Extent without overlap (ha)**	**SBV score**	**HI Score**	**Habitat Units**	**Offset Type**
80-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.004	0.004	0.816	0.840	0.006	Lax Twig-sedge Baumea laxa (500378)
80-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.004	0.004	0.816	0.840	0.006	Scented Spider-orchid Caladenia fragrantissima (504351)
80-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.004	0.004	0.816	0.840	0.006	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
80-AD	Patch	-	VVP_0023	Vulnerable	no	0.710	1	0.004	0.004	0.640	0.840	0.005	Lax Twig-sedge Baumea laxa (500378)
81-AA	Patch	-	VVP_0016	Least Concern	no	0.820	3	0.083	0.083	0.890	0.859	0.126	Lax Twig-sedge Baumea laxa (500378)
81-AA	Patch	-	VVP_0016	Least Concern	no	0.820	3	0.083	0.083	0.890	0.859	0.126	Oval-leaf Logania Logania ovata (502032)
81-AA	Patch	-	VVP_0016	Least Concern	no	0.820	3	0.083	0.083	0.890	0.859	0.126	Scented Spider-orchid Caladenia fragrantissima (504351)
81-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.011	0.011	0.920	0.848	0.017	Lax Twig-sedge Baumea laxa (500378)
81-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.011	0.011	0.920	0.848	0.017	Scented Spider-orchid Caladenia fragrantissima (504351)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	**Type**	**DBH (cm)**	**EVC code**	**Bioregional conservation status**	**Partial Removal**	**Condition score**	**Large Tree(s)**	**Polygon extent (ha)**	**Extent without overlap (ha)**	**SBV score**	**HI Score**	**Habitat Units**	**Offset Type**
81-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.011	0.011	0.920	0.840	0.017	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
81-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.002	0.002	0.810	0.840	0.003	Lax Twig-sedge Baumea laxa (500378)
81-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.002	0.002	0.810	0.840	0.003	Scented Spider-orchid Caladenia fragrantissima (504351)
81-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.002	0.002	0.810	0.840	0.003	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
81-AD	Patch	-	VVP_0023	Vulnerable	no	0.710	1	0.005	0.005	0.620	0.840	0.007	Lax Twig-sedge Baumea laxa (500378)
82-AA	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.011	0.011	0.840	0.840	0.017	Lax Twig-sedge Baumea laxa (500378)
82-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.011	0.011	0.870	0.840	0.017	Lax Twig-sedge Baumea laxa (500378)
82-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.011	0.011	0.870	0.840	0.017	Oval-leaf Logania Logania ovata (502032)
82-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.011	0.011	0.870	0.840	0.017	Scented Spider-orchid Caladenia fragrantissima (504351)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	**Type**	**DBH (cm)**	**EVC code**	**Bioregional conservation status**	**Partial Removal**	**Condition score**	**Large Tree(s)**	**Polygon extent (ha)**	**Extent without overlap (ha)**	**SBV score**	**HI Score**	**Habitat Units**	**Offset Type**
82-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.011	0.011	0.870	0.840	0.017	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
82-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.001	0.001	0.810	0.840	0.002	Lax Twig-sedge Baumea laxa (500378)
82-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.001	0.001	0.810	0.840	0.002	Scented Spider-orchid Caladenia fragrantissima (504351)
82-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.001	0.001	0.810	0.840	0.002	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
82-AD	Patch	-	VVP_0023	Vulnerable	no	0.710	-	0.002	0.002	0.629	0.840	0.003	Lax Twig-sedge Baumea laxa (500378)
83-AA	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.005	0.005	0.840	0.850	0.008	Lax Twig-sedge Baumea laxa (500378)
83-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.002	0.002	0.750	0.830	0.003	Lax Twig-sedge Baumea laxa (500378)
83-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.004	0.004	0.860	0.840	0.006	Lax Twig-sedge Baumea laxa (500378)
83-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.004	0.004	0.860	0.840	0.006	Scented Spider-orchid Caladenia fragrantissima (504351)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	Type	DBH (cm)	EVC code	Bioregional conservation status	Partial Removal	Condition score	Large Tree(s)	Polygon extent (ha)	Extent without overlap (ha)	SBV score	HI Score	Habitat Units	Offset Type
83-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.004	0.004	0.860	0.840	0.006	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
83-AD	Patch	-	VVP_0023	Vulnerable	no	0.710	1	0.004	0.004	0.640	-	0.003	General
84-AA	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.011	0.011	0.890	0.850	0.017	Lax Twig-sedge Baumea laxa (500378)
84-AA	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.011	0.011	0.890	0.850	0.017	Oval-leaf Logania Logania ovata (502032)
84-AA	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.011	0.011	0.890	0.850	0.017	Scented Spider-orchid Caladenia fragrantissima (504351)
84-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.004	0.004	0.960	0.820	0.006	Lax Twig-sedge Baumea laxa (500378)
84-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.004	0.004	0.960	0.820	0.006	Oval-leaf Logania Logania ovata (502032)
84-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.004	0.004	0.960	0.820	0.006	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
84-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.001	0.001	0.810	0.840	0.001	Lax Twig-sedge Baumea laxa (500378)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	**Type**	**DBH (cm)**	**EVC code**	**Bioregional conservation status**	**Partial Removal**	**Condition score**	**Large Tree(s)**	**Polygon extent (ha)**	**Extent without overlap (ha)**	**SBV score**	**HI Score**	**Habitat Units**	**Offset Type**
84-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.001	0.001	0.810	0.840	0.001	Scented Spider-orchid Caladenia fragrantissima (504351)
84-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.001	0.001	0.810	0.840	0.001	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
84-AD	Patch	-	VVP_0023	Vulnerable	no	0.710	1	0.015	0.015	0.620	0.850	0.020	Lax Twig-sedge Baumea laxa (500378)
85-AA	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.025	0.025	0.890	0.850	0.038	Lax Twig-sedge Baumea laxa (500378)
85-AA	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.025	0.025	0.890	0.850	0.038	Oval-leaf Logania Logania ovata (502032)
85-AA	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.025	0.025	0.890	0.850	0.038	Scented Spider-orchid Caladenia fragrantissima (504351)
85-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.011	0.011	0.960	0.782	0.016	Lax Twig-sedge Baumea laxa (500378)
85-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.011	0.011	0.960	0.782	0.016	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
85-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.004	0.004	0.810	0.840	0.006	Lax Twig-sedge Baumea laxa (500378)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	**Type**	**DBH (cm)**	**EVC code**	**Bioregional conservation status**	**Partial Removal**	**Condition score**	**Large Tree(s)**	**Polygon extent (ha)**	**Extent without overlap (ha)**	**SBV score**	**HI Score**	**Habitat Units**	**Offset Type**
85-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.004	0.004	0.810	0.840	0.006	Scented Spider-orchid Caladenia fragrantissima (504351)
85-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.004	0.004	0.810	0.840	0.006	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
85-AD	Patch	-	VVP_0023	Vulnerable	no	0.710	1	0.008	0.008	0.620	0.840	0.010	Lax Twig-sedge Baumea laxa (500378)
86-AA	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.004	0.004	0.940	0.850	0.006	Lax Twig-sedge Baumea laxa (500378)
86-AA	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.004	0.004	0.940	0.850	0.006	Scented Spider-orchid Caladenia fragrantissima (504351)
86-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.015	0.015	0.870	0.840	0.023	Lax Twig-sedge Baumea laxa (500378)
86-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.015	0.015	0.870	0.840	0.023	Oval-leaf Logania Logania ovata (502032)
86-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.015	0.015	0.870	0.840	0.023	Scented Spider-orchid Caladenia fragrantissima (504351)
86-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.015	0.015	0.870	0.840	0.023	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	Type	DBH (cm)	EVC code	Bioregional conservation status	Partial Removal	Condition score	Large Tree(s)	Polygon extent (ha)	Extent without overlap (ha)	SBV score	HI Score	Habitat Units	Offset Type
86-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.004	0.004	0.865	0.840	0.006	Lax Twig-sedge Baumea laxa (500378)
86-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.004	0.004	0.865	0.840	0.006	Scented Spider-orchid Caladenia fragrantissima (504351)
86-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.004	0.004	0.865	0.840	0.006	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
86-AD	Patch	-	VVP_0023	Vulnerable	no	0.710	-	0.004	0.004	0.620	0.840	0.005	Lax Twig-sedge Baumea laxa (500378)
87-AA	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.003	0.003	0.910	0.840	0.004	Lax Twig-sedge Baumea laxa (500378)
87-AA	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.003	0.003	0.910	0.840	0.004	Oval-leaf Logania Logania ovata (502032)
87-AA	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.003	0.003	0.910	0.840	0.004	Scented Spider-orchid Caladenia fragrantissima (504351)
87-AA	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.003	0.003	0.910	0.840	0.004	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
87-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.006	0.006	0.870	0.850	0.010	Lax Twig-sedge Baumea laxa (500378)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	Type	DBH (cm)	EVC code	Bioregional conservation status	Partial Removal	Condition score	Large Tree(s)	Polygon extent (ha)	Extent without overlap (ha)	SBV score	HI Score	Habitat Units	Offset Type
87-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.006	0.006	0.870	0.850	0.010	Oval-leaf Logania Logania ovata (502032)
87-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.006	0.006	0.870	0.850	0.010	Scented Spider-orchid Caladenia fragrantissima (504351)
87-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.001	0.001	0.790	0.830	0.001	Lax Twig-sedge Baumea laxa (500378)
87-AD	Patch	-	VVP_0023	Vulnerable	no	0.710	1	0.011	0.011	0.620	0.850	0.015	Lax Twig-sedge Baumea laxa (500378)
88-AA	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.011	0.011	0.940	0.850	0.017	Lax Twig-sedge Baumea laxa (500378)
88-AA	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.011	0.011	0.940	0.850	0.017	Scented Spider-orchid Caladenia fragrantissima (504351)
88-AA	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.011	0.011	0.940	0.850	0.017	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
88-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.003	0.003	0.870	0.850	0.004	Lax Twig-sedge Baumea laxa (500378)
88-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.003	0.003	0.870	0.850	0.004	Oval-leaf Logania Logania ovata (502032)
88-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.003	0.003	0.870	0.850	0.004	Scented Spider-orchid Caladenia fragrantissima (504351)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	**Type**	**DBH (cm)**	**EVC code**	**Bioregional conservation status**	**Partial Removal**	**Condition score**	**Large Tree(s)**	**Polygon extent (ha)**	**Extent without overlap (ha)**	**SBV score**	**HI Score**	**Habitat Units**	**Offset Type**
88-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.005	0.005	0.790	0.830	0.008	Lax Twig-sedge Baumea laxa (500378)
88-AD	Patch	-	VVP_0023	Vulnerable	no	0.710	-	0.004	0.004	0.640	0.850	0.005	Lax Twig-sedge Baumea laxa (500378)
88-AD	Patch	-	VVP_0023	Vulnerable	no	0.710	-	0.004	0.004	0.640	0.850	0.005	Scented Spider-orchid Caladenia fragrantissima (504351)
89-AA	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.002	0.002	0.940	0.850	0.003	Lax Twig-sedge Baumea laxa (500378)
89-AA	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.002	0.002	0.940	0.850	0.003	Scented Spider-orchid Caladenia fragrantissima (504351)
89-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.008	0.008	0.740	0.840	0.012	Lax Twig-sedge Baumea laxa (500378)
89-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.008	0.008	0.740	0.840	0.012	Scented Spider-orchid Caladenia fragrantissima (504351)
89-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.008	0.008	0.740	0.840	0.012	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
89-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.006	0.006	0.790	0.830	0.009	Lax Twig-sedge Baumea laxa (500378)
89-AD	Patch	-	VVP_0023	Vulnerable	no	0.710	-	0.004	0.004	0.640	0.850	0.005	Lax Twig-sedge Baumea laxa (500378)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	**Type**	**DBH (cm)**	**EVC code**	**Bioregional conservation status**	**Partial Removal**	**Condition score**	**Large Tree(s)**	**Polygon extent (ha)**	**Extent without overlap (ha)**	**SBV score**	**HI Score**	**Habitat Units**	**Offset Type**
89-AD	Patch	-	VVP_0023	Vulnerable	no	0.710	-	0.004	0.004	0.640	0.850	0.005	Scented Spider-orchid Caladenia fragrantissima (504351)
9-AA	Patch	-	GleP0858	Endangered	no	0.480	-	0.005	0.005	0.270	-	0.002	General
9-AB	Patch	-	VVP_0198	Vulnerable	no	0.830	-	0.002	0.002	0.970	0.820	0.003	Lax Twig-sedge Baumea laxa (500378)
9-AB	Patch	-	VVP_0198	Vulnerable	no	0.830	-	0.002	0.002	0.970	0.820	0.003	Oval-leaf Logania Logania ovata (502032)
9-AB	Patch	-	VVP_0198	Vulnerable	no	0.830	-	0.002	0.002	0.970	0.820	0.003	Scented Spider-orchid Caladenia fragrantissima (504351)
9-AB	Patch	-	VVP_0198	Vulnerable	no	0.830	-	0.002	0.002	0.970	0.820	0.003	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
9-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.003	0.003	0.880	0.840	0.004	Lax Twig-sedge Baumea laxa (500378)
9-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.003	0.003	0.880	0.840	0.004	Oval-leaf Logania Logania ovata (502032)
9-AD	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.015	0.015	0.680	0.833	0.023	Lax Twig-sedge Baumea laxa (500378)
9-AD	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.015	0.015	0.680	0.833	0.023	Scented Spider-orchid Caladenia fragrantissima (504351)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	Type	DBH (cm)	EVC code	Bioregional conservation status	Partial Removal	Condition score	Large Tree(s)	Polygon extent (ha)	Extent without overlap (ha)	SBV score	HI Score	Habitat Units	Offset Type
9-AE	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.031	0.031	0.740	0.840	0.047	Lax Twig-sedge Baumea laxa (500378)
90-AA	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.002	0.002	0.940	0.850	0.003	Lax Twig-sedge Baumea laxa (500378)
90-AA	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.002	0.002	0.940	0.850	0.003	Scented Spider-orchid Caladenia fragrantissima (504351)
90-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.005	0.005	0.920	0.840	0.008	Lax Twig-sedge Baumea laxa (500378)
90-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.005	0.005	0.920	0.840	0.008	Scented Spider-orchid Caladenia fragrantissima (504351)
90-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.006	0.006	0.790	0.830	0.010	Lax Twig-sedge Baumea laxa (500378)
90-AD	Patch	-	VVP_0023	Vulnerable	no	0.710	1	0.005	0.005	0.620	0.850	0.007	Lax Twig-sedge Baumea laxa (500378)
90-AD	Patch	-	VVP_0023	Vulnerable	no	0.710	1	0.005	0.005	0.620	0.850	0.007	Scented Spider-orchid Caladenia fragrantissima (504351)
91-AA	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.008	0.008	0.940	0.850	0.012	Lax Twig-sedge Baumea laxa (500378)
91-AA	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.008	0.008	0.940	0.850	0.012	Scented Spider-orchid Caladenia fragrantissima (504351)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	Type	DBH (cm)	EVC code	Bioregional conservation status	Partial Removal	Condition score	Large Tree(s)	Polygon extent (ha)	Extent without overlap (ha)	SBV score	HI Score	Habitat Units	Offset Type
91-AA	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.008	0.008	0.940	0.850	0.012	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
91-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.011	0.011	0.750	0.830	0.017	Lax Twig-sedge Baumea laxa (500378)
91-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.006	0.006	0.790	0.840	0.010	Lax Twig-sedge Baumea laxa (500378)
91-AD	Patch	-	VVP_0023	Vulnerable	no	0.710	2	0.006	0.006	0.640	0.860	0.008	Lax Twig-sedge Baumea laxa (500378)
91-AD	Patch	-	VVP_0023	Vulnerable	no	0.710	2	0.006	0.006	0.640	0.860	0.008	Scented Spider-orchid Caladenia fragrantissima (504351)
92-AA	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.003	0.003	0.910	0.840	0.004	Lax Twig-sedge Baumea laxa (500378)
92-AA	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.003	0.003	0.910	0.840	0.004	Oval-leaf Logania Logania ovata (502032)
92-AA	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.003	0.003	0.910	0.840	0.004	Scented Spider-orchid Caladenia fragrantissima (504351)
92-AA	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.003	0.003	0.910	0.840	0.004	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	**Type**	**DBH (cm)**	**EVC code**	**Bioregional conservation status**	**Partial Removal**	**Condition score**	**Large Tree(s)**	**Polygon extent (ha)**	**Extent without overlap (ha)**	**SBV score**	**HI Score**	**Habitat Units**	**Offset Type**
92-AB	Patch	-	VVP_0198	Vulnerable	no	0.830	-	0.003	0.003	0.860	0.840	0.004	Lax Twig-sedge Baumea laxa (500378)
92-AB	Patch	-	VVP_0198	Vulnerable	no	0.830	-	0.003	0.003	0.860	0.840	0.004	Scented Spider-orchid Caladenia fragrantissima (504351)
92-AB	Patch	-	VVP_0198	Vulnerable	no	0.830	-	0.003	0.003	0.860	0.840	0.004	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
92-AC	Patch	-	VVP_0016	Least Concern	no	0.820	2	0.006	0.006	0.790	0.840	0.009	Lax Twig-sedge Baumea laxa (500378)
92-AD	Patch	-	VVP_0023	Vulnerable	no	0.710	1	0.015	0.015	0.640	0.859	0.020	Lax Twig-sedge Baumea laxa (500378)
92-AD	Patch	-	VVP_0023	Vulnerable	no	0.710	1	0.015	0.015	0.640	0.859	0.020	Scented Spider-orchid Caladenia fragrantissima (504351)
93-AA	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.004	0.004	0.930	0.840	0.006	Lax Twig-sedge Baumea laxa (500378)
93-AA	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.004	0.004	0.930	0.840	0.006	Oval-leaf Logania Logania ovata (502032)
93-AA	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.004	0.004	0.930	0.840	0.006	Scented Spider-orchid Caladenia fragrantissima (504351)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	**Type**	**DBH (cm)**	**EVC code**	**Bioregional conservation status**	**Partial Removal**	**Condition score**	**Large Tree(s)**	**Polygon extent (ha)**	**Extent without overlap (ha)**	**SBV score**	**HI Score**	**Habitat Units**	**Offset Type**
93-AA	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.004	0.004	0.930	0.840	0.006	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
93-AB	Patch	-	VVP_0023	Vulnerable	no	0.770	1	0.008	0.008	0.960	0.770	0.011	Lax Twig-sedge Baumea laxa (500378)
93-AB	Patch	-	VVP_0023	Vulnerable	no	0.770	1	0.008	0.008	0.960	0.770	0.011	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
93-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.001	0.001	0.790	0.840	0.001	Lax Twig-sedge Baumea laxa (500378)
93-AD	Patch	-	VVP_0023	Vulnerable	no	0.710	-	0.002	0.002	0.640	0.850	0.003	Lax Twig-sedge Baumea laxa (500378)
93-AD	Patch	-	VVP_0023	Vulnerable	no	0.710	-	0.002	0.002	0.640	0.850	0.003	Scented Spider-orchid Caladenia fragrantissima (504351)
94-AA	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.002	0.002	0.930	0.840	0.003	Lax Twig-sedge Baumea laxa (500378)
94-AA	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.002	0.002	0.930	0.840	0.003	Oval-leaf Logania Logania ovata (502032)
94-AA	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.002	0.002	0.930	0.840	0.003	Scented Spider-orchid Caladenia fragrantissima (504351)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	**Type**	**DBH (cm)**	**EVC code**	**Bioregional conservation status**	**Partial Removal**	**Condition score**	**Large Tree(s)**	**Polygon extent (ha)**	**Extent without overlap (ha)**	**SBV score**	**HI Score**	**Habitat Units**	**Offset Type**
94-AA	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.002	0.002	0.930	0.840	0.003	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
94-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.008	0.008	0.960	0.820	0.012	Lax Twig-sedge Baumea laxa (500378)
94-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.008	0.008	0.960	0.820	0.012	Oval-leaf Logania Logania ovata (502032)
94-AC	Patch	-	VVP_0016	Least Concern	no	0.820	2	0.014	0.014	0.830	0.840	0.021	Lax Twig-sedge Baumea laxa (500378)
94-AD	Patch	-	VVP_0023	Vulnerable	no	0.710	1	0.011	0.011	0.640	0.850	0.015	Lax Twig-sedge Baumea laxa (500378)
94-AD	Patch	-	VVP_0023	Vulnerable	no	0.710	1	0.011	0.011	0.640	0.850	0.015	Scented Spider-orchid Caladenia fragrantissima (504351)
95-AA	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.018	0.018	0.940	0.850	0.027	Lax Twig-sedge Baumea laxa (500378)
95-AA	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.018	0.018	0.940	0.850	0.027	Scented Spider-orchid Caladenia fragrantissima (504351)
95-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.004	0.004	0.920	0.850	0.006	Lax Twig-sedge Baumea laxa (500378)
95-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.004	0.004	0.920	0.850	0.006	Scented Spider-orchid Caladenia fragrantissima (504351)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	**Type**	**DBH (cm)**	**EVC code**	**Bioregional conservation status**	**Partial Removal**	**Condition score**	**Large Tree(s)**	**Polygon extent (ha)**	**Extent without overlap (ha)**	**SBV score**	**HI Score**	**Habitat Units**	**Offset Type**
95-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.008	0.008	0.830	0.850	0.012	Lax Twig-sedge Baumea laxa (500378)
95-AD	Patch	-	VVP_0023	Vulnerable	no	0.710	-	0.002	0.002	0.640	0.850	0.003	Lax Twig-sedge Baumea laxa (500378)
95-AD	Patch	-	VVP_0023	Vulnerable	no	0.710	-	0.002	0.002	0.640	0.850	0.003	Scented Spider-orchid Caladenia fragrantissima (504351)
96-AA	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.008	0.008	0.930	0.840	0.012	Lax Twig-sedge Baumea laxa (500378)
96-AA	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.008	0.008	0.930	0.840	0.012	Oval-leaf Logania Logania ovata (502032)
96-AA	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.008	0.008	0.930	0.840	0.012	Scented Spider-orchid Caladenia fragrantissima (504351)
96-AA	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.008	0.008	0.930	0.840	0.012	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
96-AB	Patch	-	VVP_0016	Least Concern	no	0.820	2	0.009	0.009	0.870	0.844	0.013	Lax Twig-sedge Baumea laxa (500378)
96-AB	Patch	-	VVP_0016	Least Concern	no	0.820	2	0.009	0.009	0.870	0.844	0.013	Oval-leaf Logania Logania ovata (502032)
96-AB	Patch	-	VVP_0016	Least Concern	no	0.820	2	0.009	0.009	0.870	0.844	0.013	Scented Spider-orchid Caladenia fragrantissima (504351)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	**Type**	**DBH (cm)**	**EVC code**	**Bioregional conservation status**	**Partial Removal**	**Condition score**	**Large Tree(s)**	**Polygon extent (ha)**	**Extent without overlap (ha)**	**SBV score**	**HI Score**	**Habitat Units**	**Offset Type**
96-AB	Patch	-	VVP_0016	Least Concern	no	0.820	2	0.009	0.009	0.870	0.840	0.013	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
96-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.005	0.005	0.830	0.840	0.008	Lax Twig-sedge Baumea laxa (500378)
96-AD	Patch	-	VVP_0023	Vulnerable	no	0.710	1	0.003	0.003	0.640	0.860	0.004	Lax Twig-sedge Baumea laxa (500378)
96-AD	Patch	-	VVP_0023	Vulnerable	no	0.710	1	0.003	0.003	0.640	0.860	0.004	Scented Spider-orchid Caladenia fragrantissima (504351)
97-AA	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.011	0.011	0.910	0.840	0.017	Lax Twig-sedge Baumea laxa (500378)
97-AA	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.011	0.011	0.910	0.840	0.017	Oval-leaf Logania Logania ovata (502032)
97-AA	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.011	0.011	0.910	0.840	0.017	Scented Spider-orchid Caladenia fragrantissima (504351)
97-AA	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.011	0.011	0.910	0.840	0.017	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
97-AB	Patch	-	VVP_0198	Vulnerable	no	0.830	-	0.003	0.003	0.860	0.840	0.004	Lax Twig-sedge Baumea laxa (500378)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	Type	DBH (cm)	EVC code	Bioregional conservation status	Partial Removal	Condition score	Large Tree(s)	Polygon extent (ha)	Extent without overlap (ha)	SBV score	HI Score	Habitat Units	Offset Type
97-AB	Patch	-	VVP_0198	Vulnerable	no	0.830	-	0.003	0.003	0.860	0.840	0.004	Scented Spider-orchid Caladenia fragrantissima (504351)
97-AB	Patch	-	VVP_0198	Vulnerable	no	0.830	-	0.003	0.003	0.860	0.840	0.004	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
97-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.003	0.003	0.830	0.830	0.004	Lax Twig-sedge Baumea laxa (500378)
97-AD	Patch	-	VVP_0023	Vulnerable	no	0.710	1	0.018	0.018	0.679	0.850	0.023	Lax Twig-sedge Baumea laxa (500378)
97-AD	Patch	-	VVP_0023	Vulnerable	no	0.710	1	0.018	0.018	0.679	0.850	0.023	Scented Spider-orchid Caladenia fragrantissima (504351)
98-AA	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.008	0.008	0.930	0.845	0.012	Lax Twig-sedge Baumea laxa (500378)
98-AA	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.008	0.008	0.930	0.845	0.012	Oval-leaf Logania Logania ovata (502032)
98-AA	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.008	0.008	0.930	0.845	0.012	Scented Spider-orchid Caladenia fragrantissima (504351)
98-AA	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.008	0.008	0.930	0.845	0.012	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	Type	DBH (cm)	EVC code	Bioregional conservation status	Partial Removal	Condition score	Large Tree(s)	Polygon extent (ha)	Extent without overlap (ha)	SBV score	HI Score	Habitat Units	Offset Type
98-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.012	0.012	0.870	0.840	0.017	Lax Twig-sedge Baumea laxa (500378)
98-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.012	0.012	0.870	0.840	0.017	Oval-leaf Logania Logania ovata (502032)
98-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.012	0.012	0.870	0.840	0.017	Scented Spider-orchid Caladenia fragrantissima (504351)
98-AB	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.012	0.012	0.870	0.840	0.017	Leafy Greenhood Pterostylis cucullata subsp. cucullata (505911)
98-AC	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.003	0.003	0.830	0.840	0.004	Lax Twig-sedge Baumea laxa (500378)
98-AD	Patch	-	VVP_0023	Vulnerable	no	0.710	-	0.006	0.006	0.640	0.850	0.008	Lax Twig-sedge Baumea laxa (500378)
98-AD	Patch	-	VVP_0023	Vulnerable	no	0.710	-	0.006	0.006	0.640	0.850	0.008	Scented Spider-orchid Caladenia fragrantissima (504351)
99-AA	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.002	0.002	0.940	0.850	0.003	Lax Twig-sedge Baumea laxa (500378)
99-AA	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.002	0.002	0.940	0.850	0.003	Scented Spider-orchid Caladenia fragrantissima (504351)
99-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.006	0.006	0.880	0.850	0.010	Lax Twig-sedge Baumea laxa (500378)

Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	**Type**	**DBH (cm)**	**EVC code**	**Bioregional conservation status**	**Partial Removal**	**Condition score**	**Large Tree(s)**	**Polygon extent (ha)**	**Extent without overlap (ha)**	**SBV score**	**HI Score**	**Habitat Units**	**Offset Type**
99-AB	Patch	-	VVP_0016	Least Concern	no	0.820	1	0.006	0.006	0.880	0.850	0.010	Oval-leaf Logania Logania ovata (502032)
99-AC	Patch	-	VVP_0016	Least Concern	no	0.820	-	0.015	0.015	0.830	0.830	0.023	Lax Twig-sedge Baumea laxa (500378)
99-AD	Patch	-	VVP_0023	Vulnerable	no	0.710	1	0.002	0.002	0.680	0.850	0.003	Lax Twig-sedge Baumea laxa (500378)
99-AD	Patch	-	VVP_0023	Vulnerable	no	0.710	1	0.002	0.002	0.680	0.850	0.003	Scented Spider-orchid Caladenia fragrantissima (504351)

Appendix 2: Information about impacts to rare or threatened species' habitats on site

This table identifies all rare or threatened species with mapped habitat at the site and the proportional impact associated with the proposed native vegetation removal.

Species common name	Species scientific name	Taxon ID	Conservation status	Group	Habitat impacted	Proportional impact (%)
Hairy Boronia	Boronia pilosa subsp. torquata	505645	Rare	Highly Localised Habitat	Habitat importance map	**0.0329**
Lax Twig-sedge	Baumea laxa	500378	Rare	Dispersed	Top ranking map	**0.0216**
Leafy Greenhood	Pterostylis cucullata subsp. cucullata	505911	Endangered	Dispersed	Top ranking map	**0.0074**
Oval-leaf Logania	Logania ovata	502032	Rare	Dispersed	Habitat importance map	**0.0058**
Scented Spider-orchid	Caladenia fragrantissima	504351	Endangered	Dispersed	Habitat importance map	**0.0054**
Wiry Bog-sedge	Schoenus carsei	503043	Rare	Dispersed	Top ranking map	0.0045
Southern Bent-wing Bat	Miniopterus schreibersii bassanii	61343	Critically endangered	Dispersed	Habitat importance map	0.0039
Coast Ground-berry	Acrotriche cordata	500119	Rare	Dispersed	Top ranking map	0.0036
Lax Twig-sedge	Baumea laxa	500378	Rare	Dispersed	Habitat importance map	0.0036
Lime Fern	Pneumatopteris pennigera	502578	Endangered	Dispersed	Habitat importance map	0.0036
Wiry Bog-sedge	Schoenus carsei	503043	Rare	Dispersed	Habitat importance map	0.0034

Species common name	Species scientific name	Taxon ID	Conservation status	Group	Habitat impacted	Proportional impact (%)
Otway Bush-pea	Pultenaea prolifera	502868	Rare	Dispersed	Top ranking map	0.0032
Dense Leek-orchid	Prasophyllum spicatum	504506	Endangered	Dispersed	Top ranking map	0.0032
Swamp Diuris	Diuris palustris	501082	Vulnerable	Dispersed	Habitat importance map	0.0031
Coast Helmet-orchid	Corybas despectans	500836	Vulnerable	Dispersed	Habitat importance map	0.0030
Plains Yam-daisy	Microseris scapigera s.s.	504657	Vulnerable	Dispersed	Top ranking map	0.0028
Swamp Diuris	Diuris palustris	501082	Vulnerable	Dispersed	Top ranking map	0.0025
Dense Leek-orchid	Prasophyllum spicatum	504506	Endangered	Dispersed	Habitat importance map	0.0025
Winter Sun-orchid	Thelymitra hiemalis	505006	Endangered	Dispersed	Habitat importance map	0.0025
Coast Ground-berry	Acrotriche cordata	500119	Rare	Dispersed	Habitat importance map	0.0023
Southern Xanthosia	Xanthosia tasmanica	504088	Rare	Dispersed	Habitat importance map	0.0023
Showy Lobelia	Lobelia beaugleholei	502733	Rare	Dispersed	Top ranking map	0.0022
Leafy Greenhood	Pterostylis cucullata subsp. cucullata	505911	Endangered	Dispersed	Habitat importance map	0.0022
Robust Spider-orchid	Caladenia valida	501022	Endangered	Dispersed	Habitat importance map	0.0021

Species common name	Species scientific name	Taxon ID	Conservation status	Group	Habitat impacted	Proportional impact (%)
Forked Rice-flower	Pimelea hewardiana	502522	Rare	Dispersed	Habitat importance map	0.0021
Small Sickle Greenhood	Pterostylis lustra	504876	Endangered	Dispersed	Top ranking map	0.0021
Slender Stylewort	Levenhookia sonderi	501998	Rare	Dispersed	Habitat importance map	0.0018
Lime Fern	Pneumatopteris pennigera	502578	Endangered	Dispersed	Top ranking map	0.0018
Wiry Bossiaea	Bossiaea cordigera	500435	Rare	Dispersed	Habitat importance map	0.0016
Hoary Rapier-sedge	Lepidosperma canescens	501915	Rare	Dispersed	Habitat importance map	0.0016
Showy Lobelia	Lobelia beaugleholei	502733	Rare	Dispersed	Habitat importance map	0.0016
Small Sickle Greenhood	Pterostylis lustra	504876	Endangered	Dispersed	Habitat importance map	0.0016
Swamp Skink	Lissolepis coventryi	12407	Vulnerable	Dispersed	Habitat importance map	0.0014
Rough Daisy-bush	Olearia asterotricha	502300	Rare	Dispersed	Habitat importance map	0.0014
Mauve-tuft Sun-orchid	Thelymitra malvina	503374	Vulnerable	Dispersed	Habitat importance map	0.0014
Slender Pink-fingers	Caladenia vulgaris	504449	Rare	Dispersed	Habitat importance map	0.0014

Species common name	Species scientific name	Taxon ID	Conservation status	Group	Habitat impacted	Proportional impact (%)
Coast Bush-pea	Pultenaea canaliculata	502839	Rare	Dispersed	Top ranking map	0.0013
Mellblom's Spider-orchid	Caladenia hastata	504348	Endangered	Dispersed	Habitat importance map	0.0011
Southern Toadlet	Pseudophryne semimarmorata	13125	Vulnerable	Dispersed	Habitat importance map	0.0010
Bog Gum	Eucalyptus kitsoniana	501290	Rare	Dispersed	Habitat importance map	0.0010
Otway Bush-pea	Pultenaea prolifera	502868	Rare	Dispersed	Habitat importance map	0.0010
Blotched Sun-orchid	Thelymitra benthamiana	503369	Vulnerable	Dispersed	Habitat importance map	0.0010
Spotted Hyacinth-orchid	Dipodium pardalinum	500324	Rare	Dispersed	Top ranking map	0.0009
Leafy Twig-sedge	Cladium procerum	500786	Rare	Dispersed	Habitat importance map	0.0009
Wavy Swamp Wallaby-grass	Amphibromus sinuatus	503625	Vulnerable	Dispersed	Habitat importance map	0.0009
Swamp Flax-lily	Dianella callicarpa	505086	Rare	Dispersed	Habitat importance map	0.0009
Spotted Hyacinth-orchid	Dipodium pardalinum	500324	Rare	Dispersed	Habitat importance map	0.0008
Parsley Xanthosia	Xanthosia leiophylla	504562	Rare	Dispersed	Habitat importance map	0.0008

Species common name	Species scientific name	Taxon ID	Conservation status	Group	Habitat impacted	Proportional impact (%)
Plains Yam-daisy	Microseris scapigera s.s.	504657	Vulnerable	Dispersed	Habitat importance map	0.0008
Green-striped Greenhood	Pterostylis chlorogramma	504728	Vulnerable	Dispersed	Habitat importance map	0.0008
Lacey River Buttercup	Ranunculus amplus	505019	Rare	Dispersed	Top ranking map	0.0008
Western Peppermint	Eucalyptus falciformis	505358	Rare	Dispersed	Habitat importance map	0.0007
Southern Bent-wing Bat	Miniopterus schreibersii bassanii	61343	Critically endangered	Dispersed	Top ranking map	0.0007
Large White Spider-orchid	Caladenia venusta	500533	Rare	Dispersed	Habitat importance map	0.0006
Neat Spear-grass	Austrostipa mundula	503281	Rare	Dispersed	Habitat importance map	0.0006
Purple Blown-grass	Lachnagrostis punicea subsp. filifolia	504222	Rare	Dispersed	Habitat importance map	0.0006
Red-tailed Black-Cockatoo	Calyptorhynchus banksii graptogyne	10264	Endangered	Dispersed	Habitat importance map	0.0005
Rough Blown-grass	Lachnagrostis rudis subsp. rudis	500159	Endangered	Dispersed	Habitat importance map	0.0005
One-flower Early Nancy	Wurmbea uniflora	503583	Rare	Dispersed	Habitat importance map	0.0005
Pale Swamp Everlasting	Coronidium gunnianum	504655	Vulnerable	Dispersed	Habitat importance map	0.0005

Species common name	Species scientific name	Taxon ID	Conservation status	Group	Habitat impacted	Proportional impact (%)
Tufted Grass-tree	Xanthorrhoea caespitosa	505088	Rare	Dispersed	Habitat importance map	0.0005
Branching Scale-rush	Sporadanthus tasmanicus	501969	Rare	Dispersed	Habitat importance map	0.0004
Swamp Onion-orchid	Hydrorchis orbicularis	502186	Vulnerable	Dispersed	Top ranking map	0.0004
Swamp Everlasting	Xerochrysum palustre	503763	Vulnerable	Dispersed	Habitat importance map	0.0004
Dwarf Boronia	Boronia nana var. pubescens	504278	Rare	Dispersed	Habitat importance map	0.0004
Australasian Bittern	Botaurus poiciloptilus	10197	Endangered	Dispersed	Habitat importance map	0.0003
Grey Goshawk	Accipiter novaehollandiae novaehollandiae	10220	Vulnerable	Dispersed	Habitat importance map	0.0003
Masked Owl	Tyto novaehollandiae novaehollandiae	10250	Endangered	Dispersed	Habitat importance map	0.0003
Coast Helmet-orchid	Corybas despectans	500836	Vulnerable	Dispersed	Top ranking map	0.0003
Tight Bedstraw	Galium curvihirtum	501407	Rare	Dispersed	Habitat importance map	0.0003
Coast Bush-pea	Pultenaea canaliculata	502839	Rare	Dispersed	Habitat importance map	0.0003
Dwarf Brooklime	Gratiola pumilo	503753	Rare	Dispersed	Habitat importance map	0.0003

Species common name	Species scientific name	Taxon ID	Conservation status	Group	Habitat impacted	Proportional impact (%)
Southern Toadlet	Pseudophryne semimarmorata	13125	Vulnerable	Dispersed	Top ranking map	0.0002
Small-flower Mat-rush	Lomandra micrantha subsp. tuberculata	504711	Rare	Dispersed	Habitat importance map	0.0002
Delicate Crane's-bill	Geranium sp. 6	505347	Vulnerable	Dispersed	Habitat importance map	0.0002
Little Galaxias	Galaxiella toourtkoourt	903034	Vulnerable	Dispersed	Habitat importance map	0.0002
Lewin's Rail	Lewinia pectoralis pectoralis	10045	Vulnerable	Dispersed	Habitat importance map	0.0001
Barking Owl	Ninox connivens connivens	10246	Endangered	Dispersed	Habitat importance map	0.0001
Powerful Owl	Ninox strenua	10248	Vulnerable	Dispersed	Habitat importance map	0.0001
White-throated Needletail	Hirundapus caudacutus	10334	Vulnerable	Dispersed	Habitat importance map	0.0001
Chestnut-rumped Heathwren	Calamanthus pyrrhopygius	10498	vulnerable	Dispersed	Habitat importance map	0.0001
Clover Glycine	Glycine latrobeana	501456	Vulnerable	Dispersed	Habitat importance map	0.0001
Glenelg Pomaderris	Pomaderris halmaturina subsp. continentis	503944	Rare	Dispersed	Habitat importance map	0.0001
Forest Bitter-cress	Cardamine papillata	505034	Vulnerable	Dispersed	Habitat importance map	0.0001

Species common name	Species scientific name	Taxon ID	Conservation status	Group	Habitat impacted	Proportional impact (%)
Austral Crane's-bill	Geranium solanderi var. solanderi s.s.	505337	Vulnerable	Dispersed	Habitat importance map	0.0001
Silky Kidney-weed	Dichondra sp. 1	505786	Rare	Dispersed	Habitat importance map	0.0001
Australasian Shoveler	Anas rhynchotis	10212	Vulnerable	Dispersed	Habitat importance map	0.0000
Hardhead	Aythya australis	10215	Vulnerable	Dispersed	Habitat importance map	0.0000
Musk Duck	Biziura lobata	10217	Vulnerable	Dispersed	Habitat importance map	0.0000
Square-tailed Kite	Lophoictinia isura	10230	Vulnerable	Dispersed	Habitat importance map	0.0000
Black Falcon	Falco subniger	10238	Vulnerable	Dispersed	Habitat importance map	0.0000
Ground Parrot	Pezoporus wallicus wallicus	10311	Endangered	Dispersed	Habitat importance map	0.0000
Coast Ballart	Exocarpos syrticola	501354	Rare	Dispersed	Habitat importance map	0.0000
Swamp Onion-orchid	Hydrorchis orbicularis	502186	Vulnerable	Dispersed	Habitat importance map	0.0000
Maroon Leek-orchid	Prasophyllum frenchii	502709	Endangered	Dispersed	Habitat importance map	0.0000

Species common name	Species scientific name	Taxon ID	Conservation status	Group	Habitat impacted	Proportional impact (%)
Quinetia	Quinetia urvillei	502885	Rare	Dispersed	Habitat importance map	0.0000
Paper Flower	Thomasia petalocalyx	503392	Rare	Dispersed	Habitat importance map	0.0000
Coast Twin-leaf	Zygophyllum billardierei	503615	Rare	Dispersed	Habitat importance map	0.0000
Coast Bitter-bush	Adriana quadripartita	504755	Vulnerable	Dispersed	Habitat importance map	0.0000
Lacey River Buttercup	Ranunculus amplus	505019	Rare	Dispersed	Habitat importance map	0.0000

Habitat Group

- Highly localised habitat means there is 2,000 hectares or less mapped habitat for the species.
- Dispersed habitat means there is more than 2,000 hectares of mapped habitat for the species.

Habitat Impacted

The Species General Offset test, as described in Section 5.3.1 of the Guidelines, is used to determine if proposed native vegetation removal will result in a proportionally significant impact on the habitat value of rare or threatened species. The test is applied where the native vegetation proposed for removal:

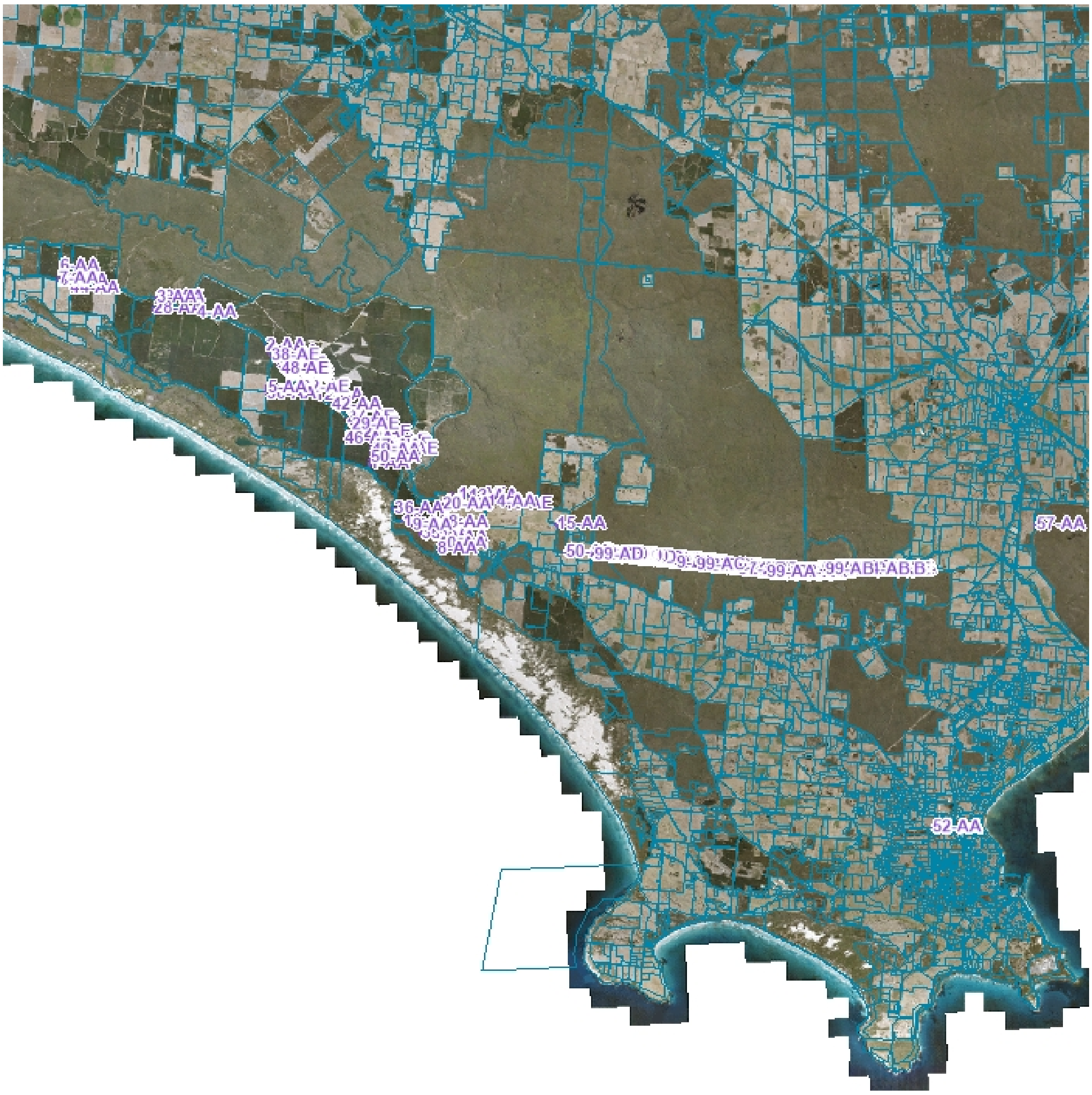
- Intersects the Habitat Importance Map for a rare or threatened species; or
- Intersects the 'top ranking' modelled habitat for a rare or threatened species with dispersed habitat, as identified in its Top Ranking Habitat Importance Map.

Top Ranking Maps consist of the 2,000 hectares of habitat with the highest Habitat Importance Scores for each dispersed species.

The 'Habitat impacted' column identifies whether the Habitat Importance Map or its Top Ranking Map was used to determine the proportional impact for a species with dispersed habitat.

Appendix 3: Images of mapped native vegetation

1. Property in context



Proposed Removal
Past Removal
Partial Removal
Property Boundaries

N

8000 m

2. Aerial photograph showing mapped native vegetation

Proposed Removal

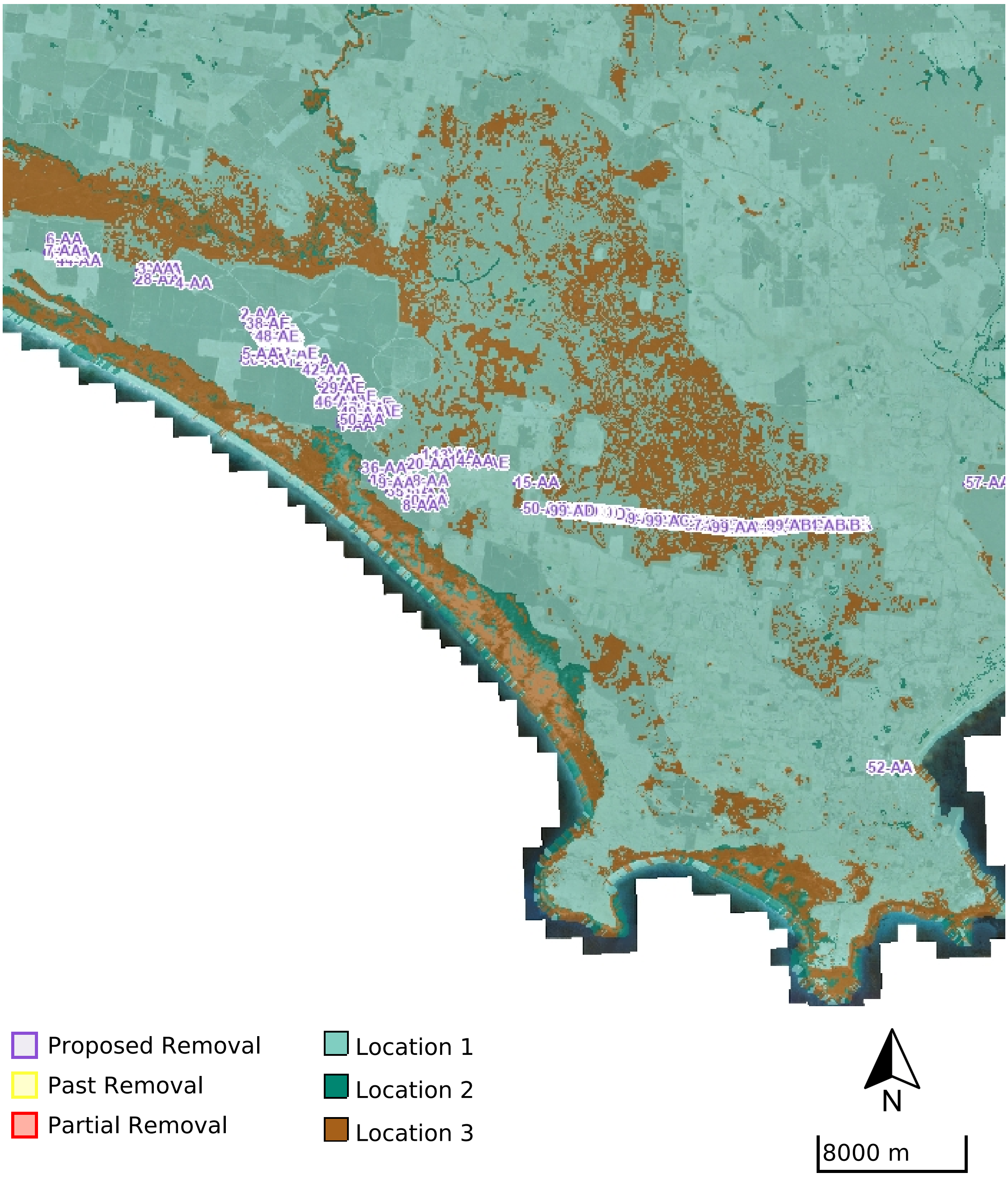
Past Removal

Partial Removal

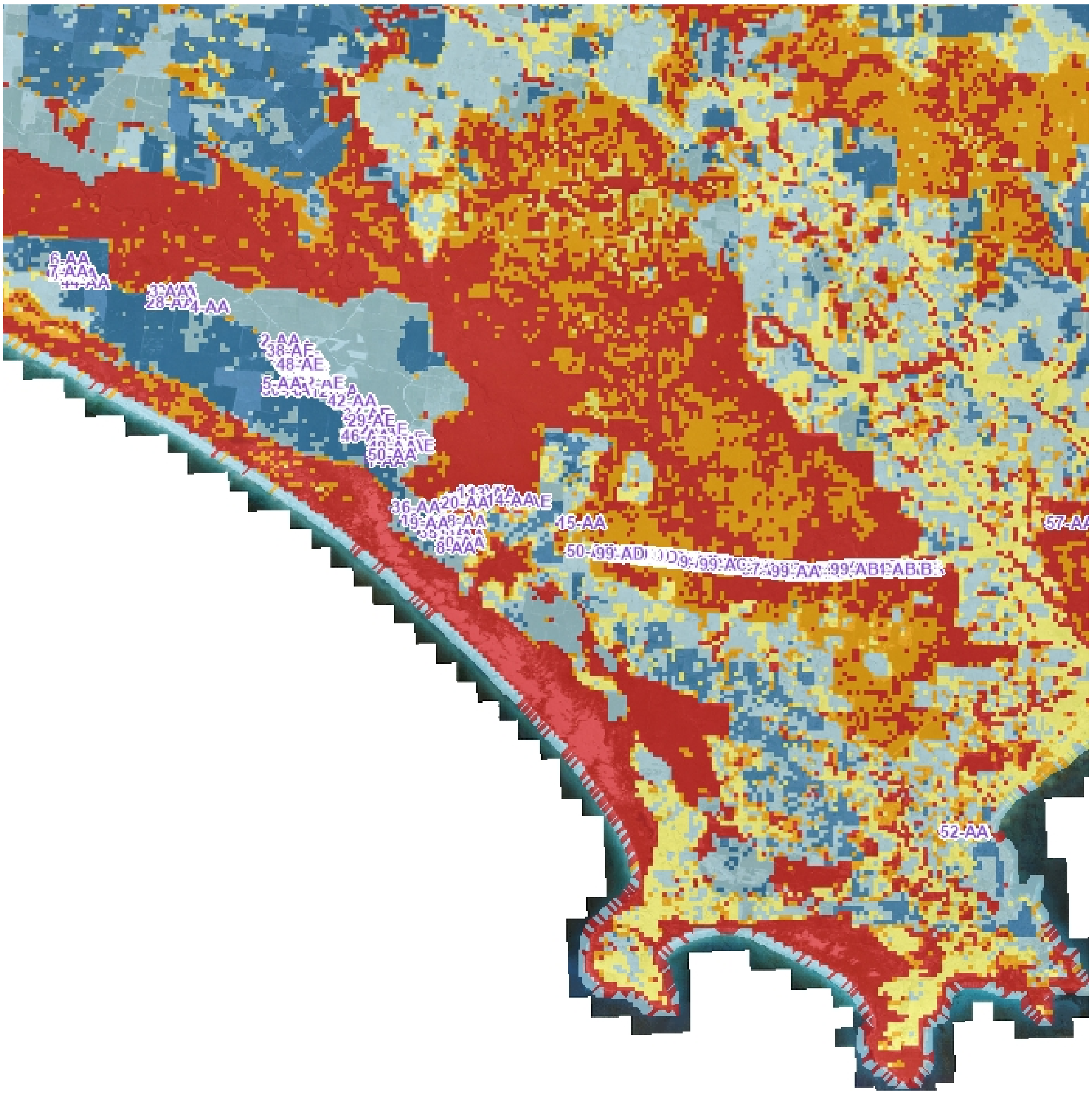
N

8000 m

3. Location Risk Map



4. Strategic Biodiversity Value Score Map

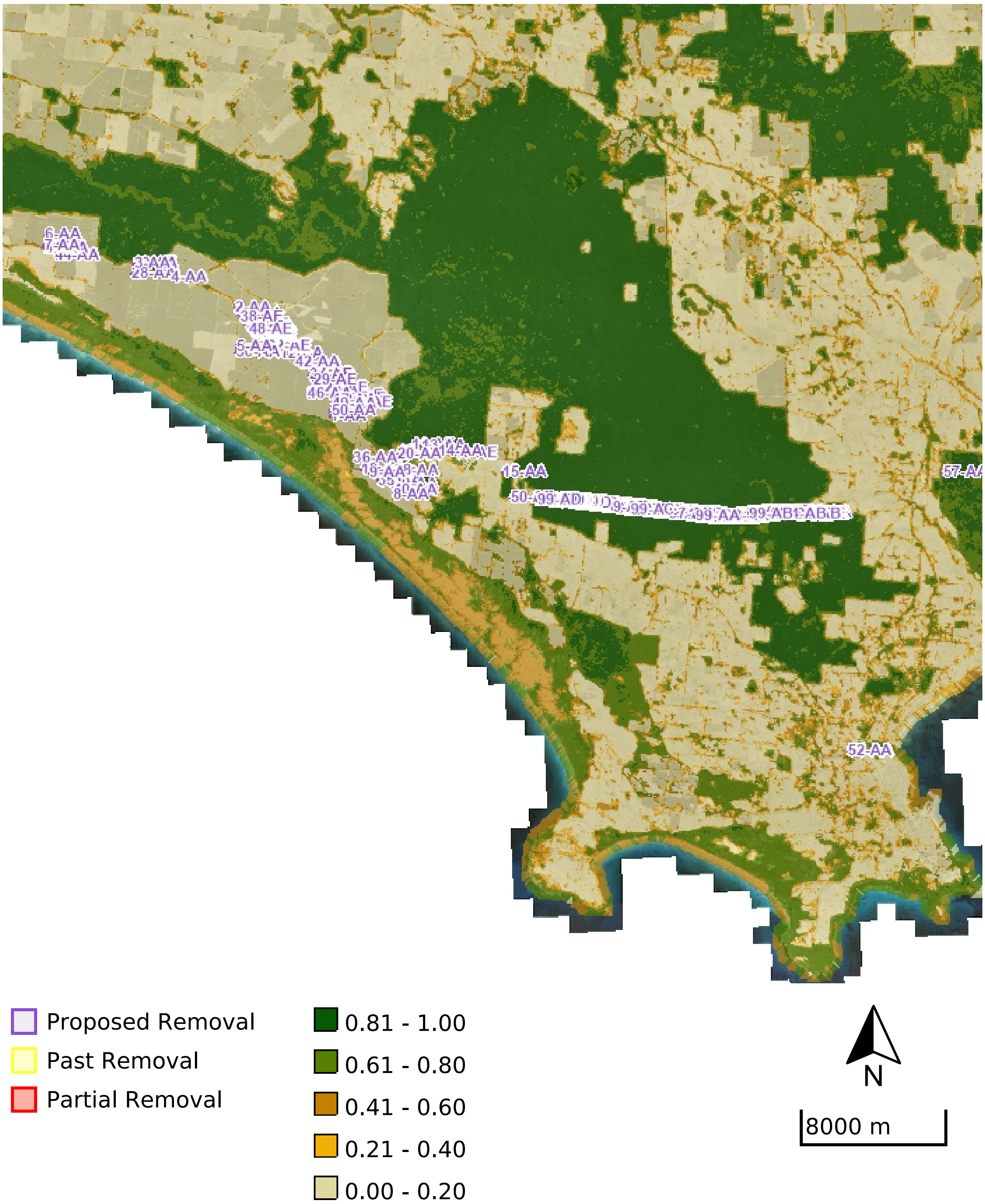


Proposed Removal
Past Removal
Partial Removal

0.81 - 1.00
0.61 - 0.80
0.41 - 0.60
0.21 - 0.40
0.00 - 0.20

N
8000 m

5. Modelled Condition Score Map



6. Modelled Endangered EVCs

Proposed Removal

Past Removal

Partial Removal

Endangered 1750 Ecological Vegetation Classes

N

8000 m

7. Habitat Importance maps

Hairy Boronia

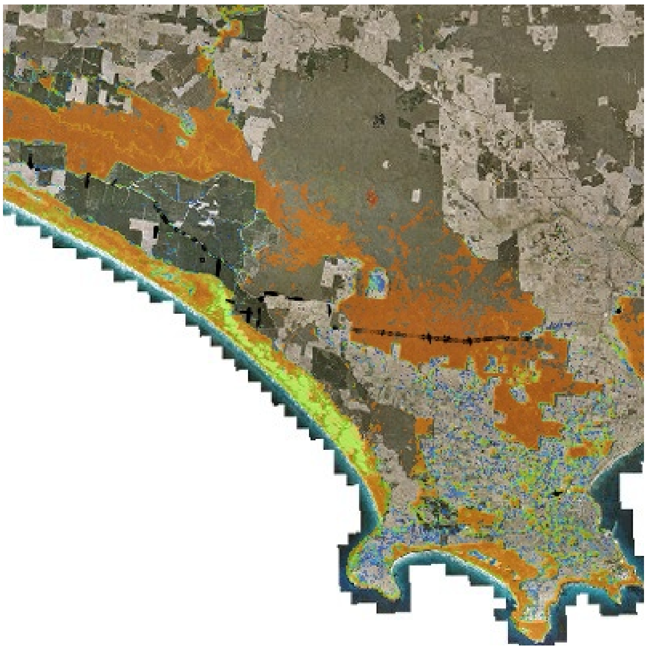
Boronia pilosa subsp. torquata

505645

Lax Twig-sedge

Baumea laxa

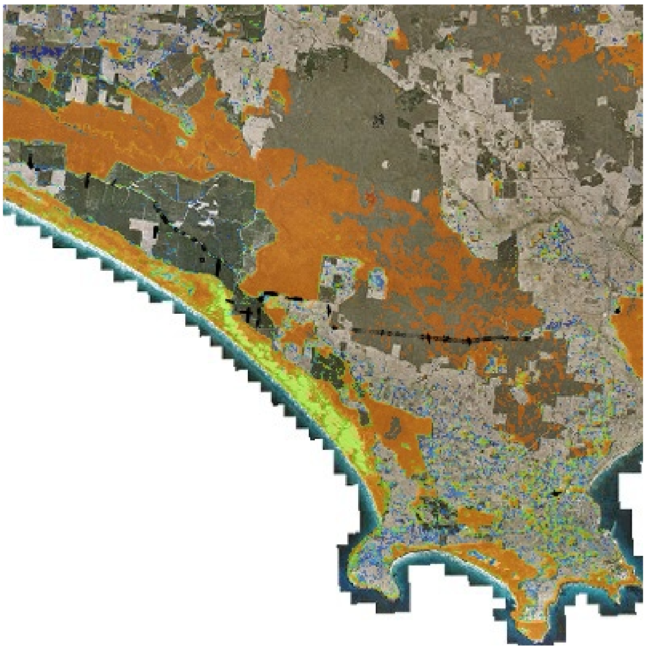
500378



Leafy Greenhood

Pterostylis cucullata subsp. cucullata

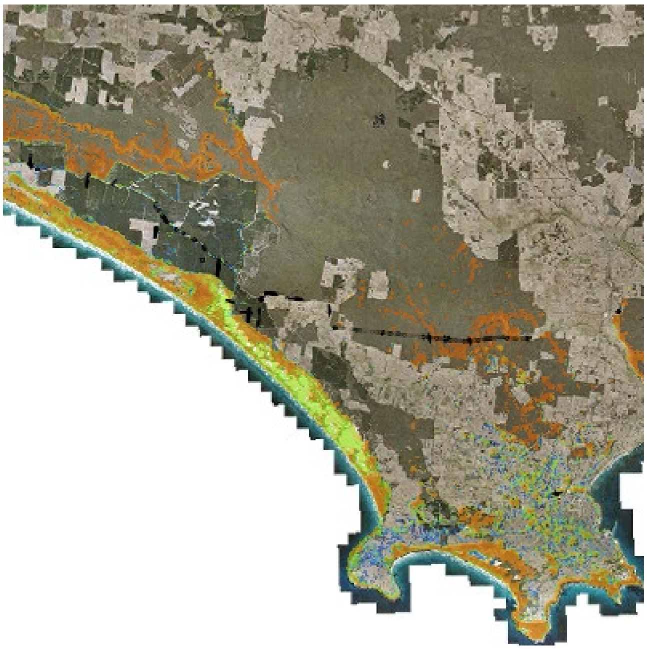
505911



Oval-leaf Logania

Logania ovata

502032



Removal Features

Habitat Importance

0 100

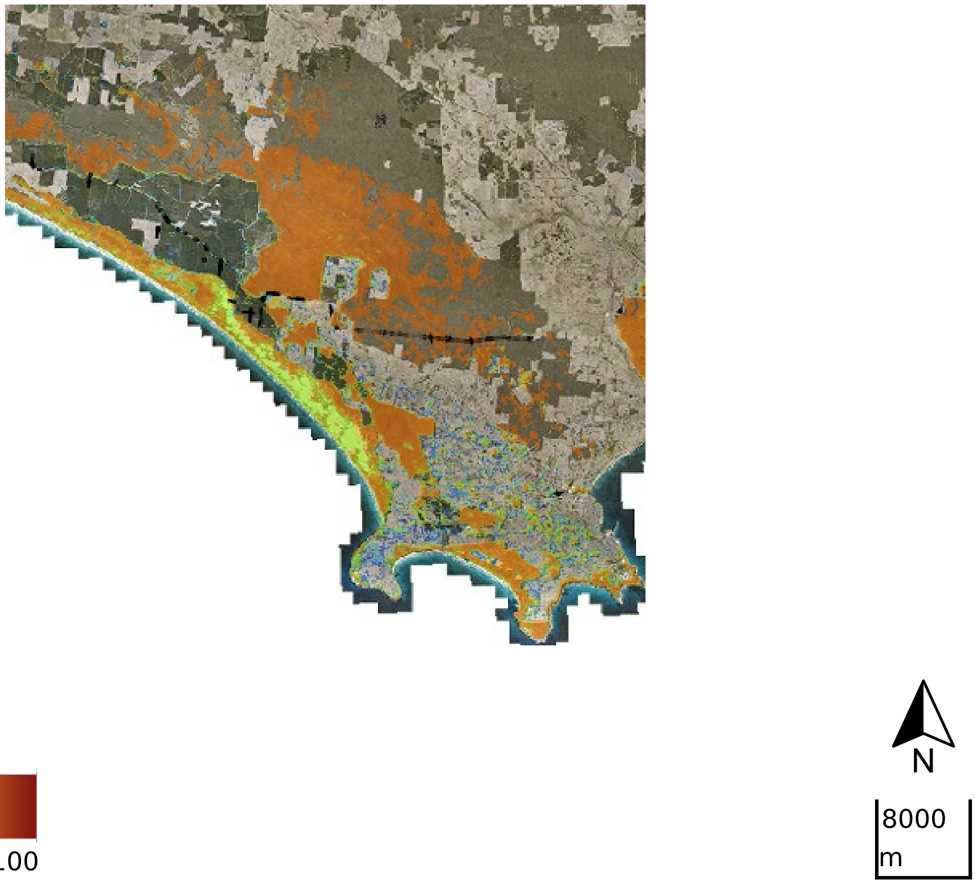
N

8000 m

Scented Spider-orchid

Caladenia fragrantissima

504351



Appendix 10 Bat and Avifauna Management Plan Framework

The BAMP has been provided separately and has not been inserted into this document at this stage.

Appendix 11 Summary of Independent Peer Reviews

Two independent peer reviews (IPRs) were commissioned by DELWP, involving review by an independent expert on the following species/species groups:

- Selected threatened birds
- Southern Bent-wing Bat *Miniopterus orianae bassanii*

Both IPRs were conducted in two stages. Stage A was primarily concerned with proposed approaches and methodology, and stage B was to review the impact assessment findings.

A Summary of the scope, findings and responses to the threatened bird peer reviews is provided below. The Southern Bent-wing Bat peer review and response is summarised in the SBWB report (Biosis 2024a).

Selected threatened birds

Independent reviewer: Richard Loyn, Eco Insights

Species to be considered in the bird IPR were:

- South-eastern Red-tailed Black Cockatoo *Calyptorhynchus banksii graptogyne*
- Migratory shorebirds listed under the *Environment Protection Biodiversity and Conservation Act 1999*
- Australasian Bittern *Botaurus poiciloptilus*
- Orange-bellied Parrot *Neophema chrysogaster*

The scope of the avifauna peer review evolved during the course of the project, and a range of other threatened species were considered, including Brolga *Grus rubicunda*, Lewin's Rail *Lewinia pectoralis*, White-throated Needletail *Hirundapus caudacutus*, Eastern Ground Parrot *Pezoporus wallicus wallicus*, Powerful Owl *Ninox strenua*, Barking Owl *Ninox connivens*, Masked Owl *Tyto novaehollandiae*, Australian Painted-Snipe *Rostratula australis*, Rufous Bristlebird *Dasyornis broadbenti broadbenti* and King Quail *Synoicus chinensis*.

The scope provided to the reviewer by DELWP is repeated below:

Scope – Task A

The proponent will provide the IPR their documentation covering all work completed to date, including clear articulation of intended approach and specific methods applied to assess the potential impacts of the project on the species listed above.

The output from the independent peer review will be a concise report (initially in draft form for DELWP to review) advising whether the proponent's proposed methods:

a) *provide a scientifically robust technical response to the matters related to the Red-tailed Black-Cockatoo, migratory shorebirds, Australasian Bittern and Orange-bellied Parrot, as specified in the Scoping Requirements, in the context of best practice ecological investigations;*
b) *identify and makes appropriate use (comparison and extrapolations) of the best available data sources and scientific literature;*

c) is able to generate empirical data and/or modelled scenarios that enable valid interpretations, predictions and conclusions to be drawn in assessing potential project impacts on the above listed species; and
d) provide a reasonable response to relevant uncertainties related to the population ecology and behaviour of these species, including movement (both short and long distance) of species across the landscape.

Where the proposed method does not offer the veracity sought in a-d, the IPR should recommend alternative methods.

The report will be provided to the proponent and TRG by the department. The proponent will have 5 five business days to communicate how they intend to respond to the advice contained within the IPR report. The IPR will review the response and provide comment on the updated approach to DELWP. This engagement approach is demonstrated by Figure 1 on the proceeding page.

It is estimated that Task A will take no more than ten working days to complete, including four hours for up to two meetings to discuss the IPR report with Neoen's selected specialist consultant(s).

The reviewer's report must be submitted within 15 working days of receiving the appropriate documentation. Note that if more than 10 days of work is needed to complete Task A, the prior agreement of DELWP impact assessment unit must be obtained.

Scope – Task B

The second task is to review the final impact assessment report(s) prepared by Neoen's specialist consultants. It is anticipated that the impact assessment work will be finalised by Neon's consultants between June 2021 and July 2021 (depending on seasonal survey requirements, to be confirmed following receipt and review of study methods).

The output will be a report to advise whether:

a) the study methods adopted were indeed appropriate and applied/ implemented effectively;
b) the analysis and interpretation of relevant results, conclusions and information relating to the environmental characteristics of the species are scientifically sound; mitigation measures recommended (and assumed for the purposes of impact assessment) are reasonable and could be effective in addressing likely impacts;
c) the results and conclusions provide an adequate level of certainty and confidence to enable an informed impact assessment;
d) the conclusions adequately address and/or take account of current uncertainties relating to local population ecology and species behaviour, including movement (both short and long distance) of the species across the landscape;
e) overall, the range of matters related to the key birds species specified in this scoping document and the EES Scoping Requirements have been addressed as far as practicable.

The IPR report will be provided to the proponent and TRG by the department. The proponent will have five business days to communicate how they intend to respond to the advice contained within the IPR report. The IPR will review the response and provide comment on the updated approach to DELWP. This engagement approach is demonstrated by Figure 1 on the proceeding page. It is estimated that Task B will take no more than five working days to complete.

Response to Richard Loyn's Kentbruck Green Energy Hub EES Independent expert peer review of matters relating to birds: Stage B

Richard Loyn undertook a peer review of avifauna sections of the Biosis Kentbruck Green Power Hub (KGPH) Environment Effect Statement Technical Report: Flora and Fauna Existing Conditions and Impact Assessment. The review suggests a range of possible changes to the report. Biosis updated the report based on this review.

This letter memo outlines a broad response to the issues that Richard Loyn highlighted as most important in the peer review.

A number of other general and species-specific comments were raised, and Biosis has compiled a detailed response to these. Majority of the suggestions have been accepted, with additional information and clarification included into the revised report. Where Biosis has not agreed with suggested changes or comments, details and rationale have been provided. This full response to all comments raised in the peer review has been provided to NeoEn.

Migratory swifts (especially White-throated Needletails)

Issues raised included:

- Protection of migratory swifts (especially White-throated Needletails) from potential collision with turbines, including cumulative impacts from multiple windfarms in eastern Australia and eastern Asia.
- Modelling of collision risks to account for shorter annual period of seasonal presence and potentially greater number of birds.
- Due regard to cumulative effects in Australia and Asia.
- Using modern technology to protect White-throated Needletail from potential collision risk.

Biosis response:

We fully agree with the concepts here related to cumulative impacts on the species. However, it requires a broader policy approach. As discussed by Moloney et al. (2019) there is no capacity to quantitatively model collision risk for multiple wind farms within the species' range due to lack of a co-ordinated strategic, industry-wide or government framework to achieve this. A single proponent is not privy to the relevant data from other facilities to enable them to do this. The report states that existing wind farms may be having low, unquantified population-level effect and that the project has some potential to increase cumulative population-level impact. A more nuanced cumulative impact assessment or discussion is not possible due to the lack of data.

The collision model for White-throated Needletail has been re-run with adjustments to parameter values indicated here.

Biosis has undertaken a review of current technologies used for mitigating avifauna and bat collision risk, including considerations for White-throated Needletail and other species of most concern for the KGPH project. The review evaluated the feasibility of implementing various methods and for achieving reduced collision risk at KGPH. The review is provided in Section 37.2.

Clarifying movements of shorebirds

Issues raised included:

- Movements and destination of shorebirds between high tide and low tide.
- Contact relevant experts to obtain information on movements in the Glenelg Estuary area.

We agree that understanding shorebird movements within the project assessment area is important, particularly to understand potential collisions. Shorebirds are known to move between suitable foraging (low tide) and roosting (high tide) habitats. The most suitable, known and likely habitat for shorebirds within the assessment area is within the Glenelg Estuary, Discovery Bay Coastal Park (DBCP) ocean beach and potentially some of the lakes inland (e.g. Swan Lake) with shallow edges (for foraging) and flats or bare banks (for roosting). Knowledge of local high tide to low tide movements and current evidence on the location of suitable habitat in the area suggests local shorebird movements are confined to these areas. Such movements are considered likely and are acknowledged and discussed in the Biosis report.

The pine plantation has no suitable shorebird habitat and no known or mapped wetlands exist between the plantation's northern boundary and Glenelg River. Wetland habitat at the eastern part of the Project Area, at Gorae West is not considered to support shorebirds, though the habitat is suitable for Latham's Snipe and the occasional occurrence of small shorebird species that can use inland lakes and wetlands (i.e. Sharp-tailed Sandpiper and Red-necked Stint) cannot be completely ruled out. Regular east-west tidal cycle movements between Glenelg Estuary and this area is extremely unlikely, given suitable roosting and foraging habitat is concentrated within the Glenelg Estuary and DBCP ocean beaches. Therefore, understanding movements within the Glenelg Estuary is of no relevance or consequence to the project, as the estuary is well outside of the wind farm footprint and local movements across the proposed wind farm are very unlikely. Annual northward and southward migratory movements across the KGPH may occur, particularly if flocks depart and arrive at the DBCP coast (as opposed to potentially departing and arriving in the estuary). We consider that the local movements between suitable habitats and migratory movements have been adequately assessed in the Biosis report. Biosis has updated the report to reflect information gathered from additional consultations from relevant people with shorebird knowledge of the area and from tracking studies. Results of these discussions are also outlined here.

Biosis sought additional information on shorebird habitat use and movements from BirdLife Australia (Dr Stefan Klose), Glenelg Hopkins Catchment Management Authority (Gavin Prentice), Victorian Wader Study Group and Australasian Wader Studies Group (Roz Jessop, Professor Marcel Klaassen), Dr Dan Lees (BirdLife Australia). The additional information particularly focuses on the Sanderling, as the Glenelg Estuary and Discovery Bay Ramsar Site is of international significance for this species.

Biosis recorded changes in Red-necked Stint numbers within the estuary, but the roost site was not identified. We have sought additional information to understand the likely movements and high and low tide habitats these shorebirds use. Gavin Prentice (Glenelg Hopkins Catchment Management Authority) described a roost site on the western side of the Glenelg Estuary – a beach berm on the ocean side where Sanderling and up to 400 Red-necked Stints have been observed roosting at high tide. This roost is difficult to observe unless approached from the South Australian side of the estuary. This is the most likely high tide roost location that the shorebirds using the inner Glenelg Estuary move to as the rising tide inundates foraging habitat in the inner estuary. Based on these conversations, it is also unlikely that shorebirds would move up the river further north from the estuary, as it gets steeper and lacks suitable habitat. Therefore, the changes in low tide and high tide numbers recorded in the Biosis surveys are most likely due to movements from within the estuary (e.g. the middle sandbank) and the high tide roost on the western side of the estuary.

The Victorian Wader Study Group (VWSG) has also observed Sanderling, Red-necked Stint and Red-capped Plover on a sandbar just inside the Glenelg estuary mouth and Sanderling on the western side of the river mouth (AWSG 2022). Their observations also indicate that shorebirds use multiple locations and are not routinely using just a single location (AWSG 2022). Sanderling and Red-necked Stint moved between high tide roosts on sandy islands at the Glenelg estuary mouth to the north-western shoreline for feeding within a small bay (AWSG 2022). Biosis observed a large feeding flock of Sanderling between the Glenelg estuary mouth and Nobles Rocks in November 2021 indicating that Sanderling use a wide area within the Ramsar site for foraging and roosting and will move throughout these coastal habitats.

Discussions with Steve Klose indicate that movement data has not been collected in the Shorebird2020 counts at the Glenelg Estuary. However, assuming that birds move between suitable habitats and along coastal/suitable habitat contours are reasonable ways of attempting to understand movements. A useful outcome from this discussion was also to follow up on any flag sightings in the area, which Biosis has now done. Majority of flag re-sightings are from coastal areas, where birdwatchers and shorebird enthusiasts focus their search efforts. However, the information is useful in understanding the long distances shorebirds can move while in Australia in the non-breeding season.

We investigated flag re-sighting data in the BirdMark database to understand movement distances within coastal and between coastal and inland habitats, for the most numerous and commonly occurring shorebirds to represent the different habitats in the investigations area that shorebirds may use (estuary, shoreline, coastal wetlands, inland wetlands):

- Sanderling with individually engraved colour leg flags (coastal only)
- Red-necked Stint plain colour leg flag (coastal and inland records)
- Sharp-tailed Sandpiper (coastal and inland records
- Bar-tailed Godwit (coastal records)

BirdMark plain colour flag sightings for Red-necked Stint and Sharp-tailed Sandpiper are from various locations between Port Fairy, Portland, Warrnambool, Discovery Bay Coastal Park, Glenelg estuary (Victoria) and Port MacDonnell, Kingston, St Kilda, Lake Alexandrina, Coorong National Park and various other locations in South Australia, demonstrating these species can occur at a number of coastal and wetland habitats in the broader area and suggests they may move between suitable habitats. The closest records of Bar-tailed Godwits captured and marked in Victoria to the Project Area are from Geelong, the Werribee Western Treatment Plant (Victoria) and St Vincent Gulf (South Australia). It should be noted that most re-sightings are from coastal areas, where bird observers generally search for, and report sightings from. Farnes (2019) reports some shorebird species using coastal swamps in the broader Portland-Nelson region – these include the Sharp-tailed Sandpiper and Red-necked Stint, with Sharp-tailed Sandpiper often seen in inland swamps. There are only a few records of Red-necked Stints exists from inland swamps and Curlew Sandpiper is rarely recorded in this habitat. These sightings indicate some movements of these species occurs between the coastal shores, swamps and inland wetlands. Geolocator studies on small shorebirds appear to show migratory paths in the vicinity of the project area (Lisovski et al. 2016, 2020).

Biosis included additional information on Sanderling in the updated report, as a response to the Loyn (2022) peer review. This is also provided below.

Sanderling

The Glenelg Estuary and Discovery Bay Ramsar Site is an internationally important non-breeding site for Sanderling (*Calidris alba*) (DEPI 2004, Watkins 1993), and is considered the fourth most important non-breeding site within Australia. Glenelg Hopkins Catchment Management Authority is coordinating a Sanderling Tracking Project, which began in 2020 and aims to characterise roosting and foraging habitat at Discovery Bay (Glenelg Hopkins Catchment Management Authority 2023).

The Sanderling population of the East Asian-Australasian Flyway is estimated to be 30,000 (Hansen et al. 2022). The Glenelg Estuary and Discovery Bay Ramsar site supports 1.4% of the flyway Sanderling population and more recently in 2023 BirdLife recorded a flock of 5000 Sanderling (17% of the population) (Roz Jessop pers. comm.; Dan Lees pers. comm.). As part of identifying areas to capture Sanderling for the study, volunteers also recorded up to 1,500 birds at the Glenelg estuary mouth (November 2021) and 400 birds at Piccaninnie Ponds (South Australia) (AWSG 2022). Flocks have also been recorded between Nobles Rocks and the Glenelg estuary mouth, beaches east of Port Fairy (Killarney Beach) and Yambuk (AWSG 2022). Large flocks have also been recorded at the Swan Lake shoreline (>500 birds), between Nobles Rocks and Glenelg Estuary (>1000 birds), the Glenelg Estuary (>1200 birds) and at Piccaninnie Ponds (>1200 birds) (Birdlife Australia 2021b). Sanderling numbers at specific sites are known to vary between years (Birdlife Australia 2021b, Birdlife Australia 2022).

In 2021, VWSG deployed 15 radio transmitters on Sanderling at Nobles Rocks and Yambuk (AWSG 2022). Their habitat use and movements were studied along the coastal shoreline of the Discovery Bay area. Sanderling monitored during this project have been recorded to move between Yambuk (Victoria) and Piccaninnie Ponds (South Australia) (some 120 kilometres) and further east to the Coorong (about 400 kilometres). Three GPS transmitters fitted onto Sanderling more recently have failed to provide data, and the project has plans to fit more GPS transmitters later in 2023 (AWSG committee meeting 17th February 2023). The BirdMark database has some information Sanderling movements based on engraved leg flag (ELF) sightings between capture and resighting locations. The species has been captured and fitted with ELFs at Brown Bay, Canunda National Park, Eumeralla River, Nora Creina Bay and Nene Valley and re-sightings at Glenelg River Estuary, Livingstone Island Nature Walk Nelson, Discovery Bay Coastal Park and Yambuk Flora and Fauna Reserve, with distances between fixes ranging from 14.5 kilometres to 162 kilometres. No shorter distance or local movements have been recorded to date, and all tracking and re-sightings of flagged individuals have focused on the ocean beaches.

Preparing for intermittent movements of various species across the proposed wind farm site

Issues raised included:

- Threatened species potential flights across the KGPH on an intermittent or seasonal basis, where suitable habitat occurs on both sides of the development.
- Ideally the report would identify likely flight-paths for such movements so that turbines could be located with minimum risk.
- Protocols for detecting such movements during operation and responding appropriately, especially if mortalities are recorded.

Biosis response:

The most likely movements are considered to occur between heathland habitats in the north-east and south of the Project Area. Requirements for turbine-free Brolga breeding habitat buffers will avoid and mitigate potential risk to a number of other threatened bird species that may fly between Kentbruck Heath and the Discovery Bay Coastal Park heathland and wetland habitats. South of the KGPH, Long Swamp stretches for approximately two-thirds of the Project Area length with smaller associated wetlands located nearby to Long Swamp, including three within the Project Area footprint. Local movements between these wetlands are expected. Furthermore, migratory and seasonal movements across the KGPH are likely, particularly waterbirds moving in and out of Long Swamp.

These potential movements are discussed for each species in the report sections. Mapping flight-paths in the absence of such data is not advisable as it may provide an erroneous or incorrect perception of bird movements in the area and uninformative for guiding layout design and turbine locations. We have therefore opted not to map flight-paths (with the exception of the Brolga), as there is no data or evidence to support such mapping or analysis, and as it would be easily misinterpreted.

Biosis has undertaken a review of current technologies used for mitigating collision risk for White-throated Needletail and other species of most concern for the KGPH project. This review evaluated the feasibility of implementing various methods and for achieving reduced collision risk at KGPH. A draft bird and bat avifauna monitoring plan has also been prepared and has been included in the report.

Fatality estimates

Issues raised included:

- Discrepancy in the Wedge-tailed Eagle fatality estimates, to be fixed or explained.
- Acceptable levels of fatality not considered in the report, which may need further public policy input.

This is not a discrepancy. Further explanation has been provided at 35.2.2 and Table 24. The rate at which Wedge-tailed Eagle flights were recorded at the site was very substantially lower than those documented from a variety of other Victorian wind farms. This strongly indicates that the species uses the site at a comparatively low level. This is reflected in the low estimates of collision risk as shown by modelling for the species (section 35.2.2). We do not know which two wind farms were used for the Moloney et al. (2019) mortality estimates for the species. By way of example, at one site with high topographic relief, in 10864 minutes of observations we documented a mean of 1 WTE flight per 5.25 minutes. At Kentbruck, with 8360 minutes of observation, the mean was 1 WTE flight per 152 minutes. We agree with the importance of a public policy approach to determining a level of effect on a population that does not affect its viability. Such a policy is not currently available.

Appendix 12 Arborists Report

Detailed tree mapping along was undertaken along Boiler Swamp Road, by Axiom Tree Management in May and June of 2021.

The purpose of the assessment was to accurately record locations, size and species of tree on either side of the road that may have tree protection zones (TPZs) impacted by the proposed trenching of the transmission line. Tree data was collected to a high spatial accuracy using differential GPS (sub metre accuracy). Trees were assessed in detail if located within 15 m of the road edge, with potential for TPZs to extend to the road edge.

The information was used during the design of the project, to understand potential impacts and develop mitigation measures to avoid and minimise impacts. Spatial data was used to microsite the location of the trench, and the location of directional drilling, with a focus on avoiding major encroachment (>10% impact to TPZ) to Apple Jack *Eucalyptus splendens*.

Throughout the development of the project, the tree data from the arborists assessment was used by Biosis and Neoen to advance the design, but the arborist report has not been updated to reflect the current design. Predicted tree impacts contained within the report can therefore be considered as 'pre-mitigation' impacts.

Development Impact Report

Boiler Swamp Road, Cobboboonee National Park

Report Details

Client:	Biosis 1/22 Skipton St Ballarat 3350
Intended Audience:	Parks Victoria Contractor/developer
Subject site details:	Boiler Swamp Road, Cobboboonee National Park (Kentbruck Wind Farm Project)
Date of assessment	Monday 24 to Wednesday 26 May and Thursday 10-Frdiay 11 June 2021
Date of report:	Thursday, 18 April 2024
Planning permit details:	
Zone and relevant overlays:	
Relevant Standards:	AS 4970:2009- Protection of Trees on Development Sites AS 4373:2007 - Pruning of Amenity Trees AS 4687:2007 - Temporary Fencing and Hoardings
Plans, maps or other construction information:	
Other relevant Arborist, Ecology or Development Impact Reports:	
Axiom Tree Management Job Number:	10693
Prepared By:	*Tim Cameron - Consulting Arborist/Director* Email: timcameron@axiomtrees.com Qualifications: -Graduate Certificate Arboriculture -Diploma Horticulture (Arboriculture) – AQF Level 5
Reviewed By:	*Robyn Cameron – Axiom Tree Management Administration Co-ordinator*
Axiom Tree Management Business Information	Axiom Tree Management Pty Ltd (Office Address) Office 2/ 8 Sauer Rd, New Gisborne VIC 3438 (Postal Address) 48 Montgomerys Lane, Woodend 3442 Ph: 0428 896 951 ABN: 11 612 205 099

Summary

Axiom Tree Management Pty Ltd has been engaged by Biosis to provide a Development Impact report on trees as part of the Kentbruck Wind Farm Project. An Arborist report has been requested as part of an investigation into service installation along an access road through the Cobboboonee National Park.

The subject site is Boiler Swamp Road which is a maintained gravel road that intersects the Cobboboonee National Park and extends for approximately 14kms. The Boiler Swamp Road is a maintained gravel road that extends from Blacks Road to the west to Cut Out Dam Road to the east. The formed road is approximately 5-6m wide with 1-1.5m wide shoulders that is maintained clear of vegetation. The site ranges from flat to undulating with a number of water course and swamps along the road alignment.

- Two thousand and thirty-seven trees (2037) were assessed along Boiler Swamp Road within the Cobboboonee National Park.
    - The trees are all indigenous the local area and have grown through natural regeneration.
    - The trees consist of *Eucalyptus obliqua, Eucalyptus falciformis, Eucalyptus splendens, Eucalyptus ovata, Eucalyptus viminalis subsp. Cygnetensis, Acacia melanoxylon* and *Exocarpos cupressiformis.*
    - The assessed trees are primarily large mature canopy trees growing close to the roadside.
- The health of most of the trees is 'Good'.
    - The trees are indigenous specimens growing within their natural range and tolerant to their local conditions and climate.
    - Impacts are likely to have occurred from road construction and maintenance over many decades, however many of the trees will have adapted or grown to tolerate these impacts.
- The structure of most of the trees is 'Fair'.
    - The trees are typical of native roadside vegetation which often contain decay and cavities from past clearance pruning.
    - Many of the trees are leaning towards the road envelope for available light and space.
- ULE is an estimation of how long a tree can provide amenity in the landscape at an acceptable level of risk.
    - The trees are long lived species and have the potential to live for many decades and centuries.

The proposal includes excavation of a 1.5m trench within the middle of the formed road and install High voltage power cables, wider trenches for junction points, pruning for an 8m x 8m wide envelope. The location of the proposed trench for HV cable installation is based mapping of the centre of the existing road at the time of assessment (accuracy +/- 1m). Where greater accuracy is required, trees and the location of the trench should be verified onsite by qualified surveyors. Based upon excavation of a 1.5m wide trench along the centre alignment of Boiler Swamp Road:

- There will be no encroachment into the TPZ of 1022 trees.
- There will be encroachment of between 1% and 10% encroachment into the TPZ of 588 trees.
    - Provided TPZ specifications are adhered to the long-term health and viability of the trees will not be significantly impacted.
    - Construction equipment and will be required to work within the road footprint.
    - Large intersections and periodic water points can be used for access and laydown areas.
- There will be encroachment greater 10% into the TPZ of 408 trees.
    - There is likely to be a major impact on the trees long term health and viability.
    - Complete removal, redesign, or alternative construction methods will be required.
- 19 trees have completely failed since the original assessment.

Contents

1 Introduction

Axiom Tree Management Pty Ltd has been engaged by Biosis to provide a Development Impact report on trees as part of the Kentbruck Wind Farm Project. An Arborist report has been requested as part of an investigation into service installation along an access road through the Cobboboonee National Park.

As part of the report the key objectives include:

- Identify and record the dimensions of trees directly adjoining the access road that have the potential to be impacted by future service installation.
- Provide an assessment of the health, structure, and life expectancy of the trees. and
- Provide tree protection and mitigation measures to reduce the impact on adjoining trees.

1.1 Documents

Documents viewed as part of the preparation of the report include:

- AS 4970 – 2009 – Protection of trees on development sites.
- AS 4373-2007 – Pruning of amenity trees.
- Assessors handbook Applications to remove, lop or destroy native vegetation V1.1 October 2018; and
- Guidelines for the removal, destruction or lopping of native vegetation December 2017.

1.2 Site Methodology

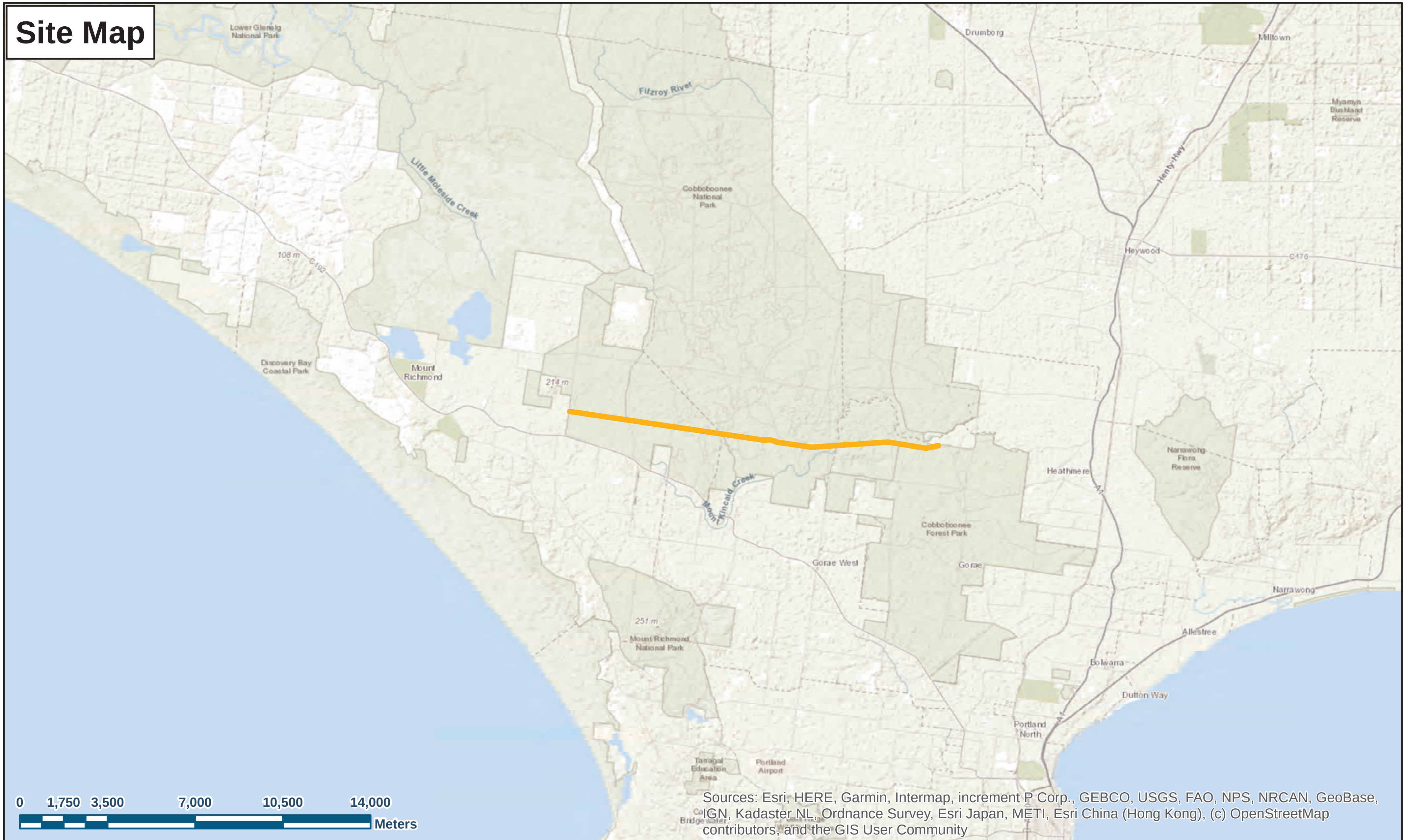
From Monday 24 May to Friday, 11 June 2021, Tim Cameron and Michael McCallum conducted a site inspection. Data collected for the trees included but was not limited to:

- Botanical Name;
- Diameter at Breast Height (DBH measured at 1.3m above ground level);
- Canopy Dimensions (estimated);
- Health and Structure ratings;

Additional methodology includes:

- Assessments were conducted from ground level, with no instruments other than a diameter tape to measure DBH.
- A detailed visual inspection of the tree/s and the surrounding site was conducted, including a complete walk around the tree, looking at the buttress roots, trunk, branches, and leaves.
- Trees were assessed and located using differentially corrected GPS (generally +/- 1.0m accuracy) and aligned to a surveyor feature survey where available.
- DBH has been measured at 1.3m above ground level in accordance with Native vegetation regulation.
- Given the large area and number of trees, Tree Protection Zones (TPZ) and Structural Root Zones (SRZ) have been calculated using DBH measured at 1.3m above ground level.
- All trees within 15m of the proposed excavation were visually assessed with only trees that have potential for excavation to occur within their TPZ, formally assessed, located, and recorded.

Site Map



AXIOM
Tree Management Pty Ltd

Drawn and Plotted by: TDC
Date: 6/09/2021 Scale: 1:198,515
Geographic Projection:
GDA 1994 MGA Zone 55

Assessment of Trees Along Boiler Swamp Road

Legend

Formed_Road

Road_Verge

N W E S

2 Observations/Discussions

2.1 Subject Site

The subject site is Boiler Swamp Road which is a maintained gravel road that intersects the Cobboboonee National Park and extends for approximately 14kms. The Boiler Swamp Road is a maintained gravel road that extends from Blacks Road to the west to Cut Out Dam Road to the east. The formed road is approximately 5-6m wide with 1-1.5m wide shoulders that is maintained clear of vegetation. The site ranges from flat to undulating with a number of water course and swamps along the road alignment.

Figure 1. Boiler swamp road showing road surface and adjoining vegetation.

Figure 2. Boiler Swamp Road showing road surface and adjoining vegetation.

2.2 Trees Details

2.2.1 Species Composition

Two thousand and thirty-seven trees (2037) were assessed along Boiler Swamp Road within the Cobboboonee National Park. The trees are all indigenous the local area and have grown through natural regeneration. The trees consist of *Eucalyptus obliqua, Eucalyptus falciformis, Eucalyptus splendens, Eucalyptus ovata, Eucalyptus viminalis subsp. Cygnetensis, Acacia melanoxylon* and *Exocarpos cupressiformis.* The assessed trees are primarily large mature canopy trees growing close to the roadside.

Table 1. Species composition

Botanical Name	Common Name	Origin	Count
Eucalyptus obliqua	Messmate Stringybark	Indigenous	**895**
Eucalyptus falciformis	Western Peppermint	Indigenous	**526**
Eucalyptus splendens	Apple Jack	Indigenous	**417**
Eucalyptus ovata	Swamp Gum	Indigenous	**109**
Eucalyptus viminalis subsp. Cygnetensis	Rough-barked Manna Gum	Indigenous	**65**
Failed			**19**
Acacia melanoxylon	Blackwood	Indigenous	**5**
Exocarpos cupressiformis	Cherry Ballart	Indigenous	**1**
Total			**2037**

2.2.2 Health

The health of most of the trees is 'Good'. The assessment of health has been assigned based on several factors including canopy growth and density, presence of pest or disease, presence of dead branches considering the time of year and typical form of the species. The trees are indigenous specimens growing within their natural range and tolerant to their local conditions and climate. Impacts are likely to have occurred from road construction and maintenance over many decades, however many of the trees will have adapted or grown to tolerate these impacts.

2.2.3 Structure

The structure of most of the trees is 'Fair'. The trees are typical of native roadside vegetation which often contain decay and cavities from past clearance pruning. Many of the trees are leaning towards the road envelope to take advantage of the available light and space.

2.2.4 Useful Life Expectancy (ULE)

The ULE of a tree is assigned by the assessor based on many factors including species longevity, suitability to the site and current age and condition both regarding health and structure. It is an estimation of how long a tree can provide amenity in the landscape at an acceptable level of risk. The trees are long lived species and have the potential to live for many decades and centuries.

Table 2. Health, structure, and ULE ratings

Health/Structure Range	Health Count	Structure Count	ULE ratings	ULE
Good	1321	314	**0-5 years**	46
Fair	547	1538	**5-10 years**	69
Poor	105	159	**10-20 years**	206
Very poor/Dead	45	7	**20+ years**	1697
	19	19		19
Total	**2037**	**2037**	**Total**	**2037**

2.3 TPZ Specifications

Regardless of tree condition or retention value, any tree selected to be retained requires protection during construction. The best way to protect retained trees as part of any development is by establishing a tree protection zone (TPZ). TPZs have been calculated according to *Protection of Trees on Development Sites* (AS 4970-2009) for all trees to be retained calculating the TPZ as 12 times the trunk diameter at 1.4m above ground level (DBH).

The TPZ fenced area is where construction activities are prohibited or restricted and is specified to protect the above and below ground parts of the tree/s. The TPZ fenced area considers the TPZ/SRZ dimensions and the type of activities proposed. Given the type and extent of works, parra webbing/double flagging is appropriate to be used as TPZ fencing. Double flagging is to be fixed to star pickets no greater than 10m apart. TPZ signage is to be fixed to every 2-3-star picket/wooden stakes. TPZ fencing is to be maintained throughout the duration of construction works. Activities excluded from the TPZ include but are not limited to-

- machine excavation (unless on approved plans);
- cultivation;
- preparation of chemicals, including cement products;
- refuelling;
- wash down and cleaning of equipment;
- lighting of fires;
- temporary or permanent installation of utilities and signs;
- excavation for silt fencing;
- storage;
- parking of vehicles and plant;
- dumping of waste;
- placement of fill;
- soil level changes;
- physical damage to the tree/s.

2.3.1 Encroachment

Encroachment into the TPZ of trees is allowed under certain circumstances depending on a number of factors including site and tree conditions.

2.3.1.1 Encroachment Less Than 10%

Encroachment of less than 10% of the TPZ and outside the SRZ is deemed to be minor encroachment according to AS 4970-2009. Detailed root investigations should not be required but must be compensated with an extension to the TPZ elsewhere (Figure 6 & Figure 7). Variations must be made by the project arborist considering other relevant factors including tree health, vigour, stability, species sensitivity and soil characteristics.

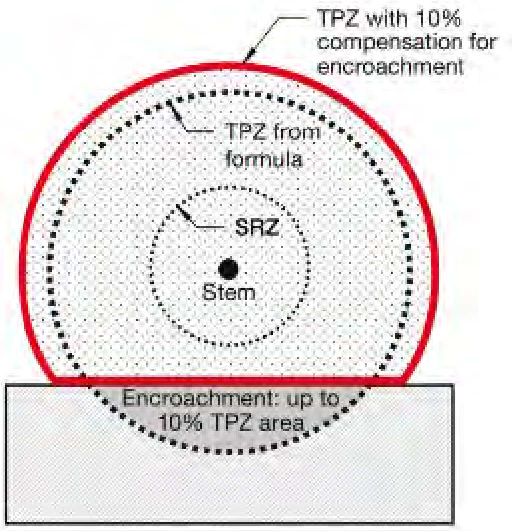


Figure 3. Example of TPZ encroachment and compensatory offset (image from AS 4970-2009).

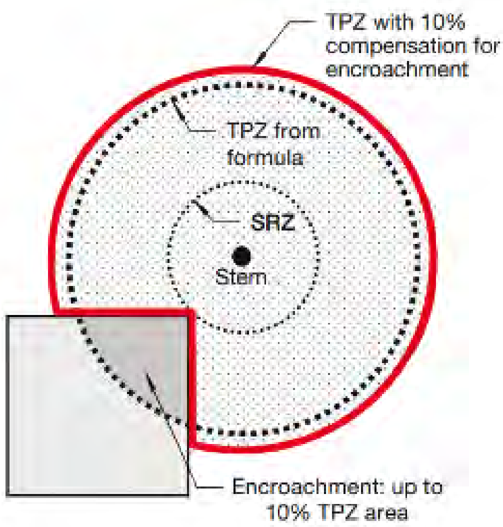


Figure 4. Example of TPZ encroachment and compensatory offset (image from AS 4970-2009).

2.3.1.2 Encroachment Greater Than 10%
Encroachment of more than 10% of the TPZ or into the SRZ will require the project arborist to demonstrate that the tree(s) will remain viable. The area lost to this encroachment should be compensated for elsewhere and contiguous with the TPZ. This may require root investigation by non-destructive methods and consideration of relevant factors tree health, vigour, stability, species sensitivity and soil characteristics.

2.3.2 SRZ
The SRZ is the minimum volume of roots required by the tree to remain stable in the ground. If the SRZ is breached the chances of windthrow are significantly increased, especially if roots are cut on the same side as prevailing winds. Windthrow is an event where the entire tree fails/falls over. Often, the tree is completely uprooted with devastating results. It is important to note that the SRZ is not related to tree health. It refers to the physical volume of roots required for the tree to remain stable in the ground. It is in no way related to the physiological requirements of the tree but is the minimum volume of roots required for the tree to remain standing.

2.4 Design Proposal and Construction Impact
The proposal includes excavation of a 1.5m trench within the middle of the formed road and install High voltage power cables, wider trenches for junction points, pruning for an 8m x 8m wide envelope.

Construction into the TPZs of trees is allowed (AS 4970 2009). The level of encroachment is based upon the percentage of TPZ area intruded upon with less than 10% encroachment considered minor and greater than 10% encroachment considered major. Minor encroachment is considered acceptable with some modification of the TPZ, whereas mitigation measures/alternative designs are required for trees with major encroachment.

The location of the proposed trench for HV cable installation is based mapping of the centre of the existing road at the time of assessment (accuracy +/- 1m). Where greater accuracy is required, trees and the location of the trench should be verified onsite by qualified surveyors.

Based upon excavation of a 1.5m wide trench along the centre alignment of Boiler Swamp Road:

- There will be no encroachment into the TPZ of 1022 trees.
- There will be encroachment of between 1% and 10% encroachment into the TPZ of 588 trees.
  - Provided TPZ specifications are adhered to the long-term health and viability of the trees will not be significantly impacted.
  - Construction equipment and will be required to work within the road footprint.
  - Large intersections and periodic water points can be used for access and laydown areas.
- There will be encroachment greater 10% into the TPZ of 408 trees.
  - There is likely to be a major impact on the trees long term health and viability.
  - Complete removal, redesign, or alternative construction methods will be required.
- 19 trees have completely failed since the original assessment.

Table 3. Construction Impact

Encroachment	Action/construction method	Count
0% Encroachment	Open trench excavation/protection measures	1022
1-10% Encroachment	Open trench excavation/protection measures	588
> 10% Encroachment	Removal/redesign/Root investigation	408
Failed	Failed	19
Total		2037

2.4.1 Detailed Investigation, Redesign, or Alternative Construction Methods

The location of the 1.5m wide open trench has been aligned with the road centreline to reduce the impact on trees. Regardless of the future design, a detailed Tree Management Plan will be required. Options exist to undertake detailed root investigations, realign the location of the trench, and use alternative construction methods including:

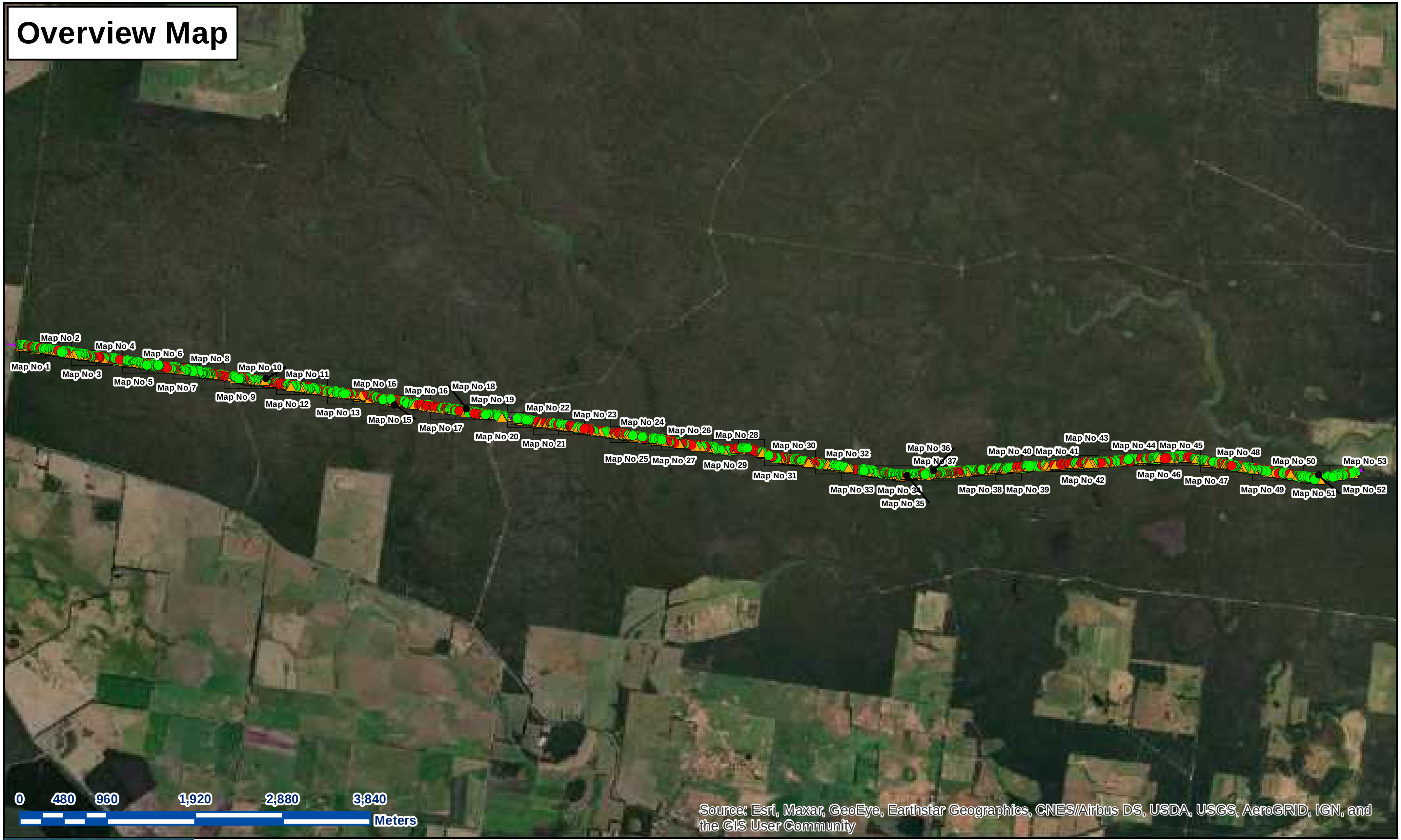
- Detailed root investigation using non-destructive methods within TPZ areas greater than 10%:
  - Location and distribution of the roots to be determined through non-destructive investigation methods (AS4970-2009).
  - Given the presence of the road and its compacted nature, root growth may be reduced or not present within parts of the road. Tree roots need oxygen, water, nutrients, and gases obtained from the atmosphere to survive and function. When soils are compacted, or soil fill is placed over the roots their ability to obtain these things is greatly impaired. Roads are generally constructed over a compacted base and do not provide conditions that are favourable for root growth.
  - Hydro excavation is the most appropriate method of non-destruction excavation in this situation.
- Redesigning or realigning the location of the trench depending on the location of TPZ areas:
  - Realign the location of the trench will reduce impact on trees with encroachment greater than 10%.
  - Realignment may not be possible where large trees are located on both sides of the road.
  - Verification of locations by qualified surveyors will be required prior to redesigning the location of the trench.
  - Wider trenches for junction points can be located outside TPZ areas.
  - Realigning the trench location may result above ground constraints requiring additional pruning to allow for construction works with large machinery.
- Alternative construction methods:
  - Alternative construction methods may include horizontal boring to a depth greater than 1m below ground level.
  - Given the large size of the cables, horizontal boring options are limited.

2.4.2 Above Ground Constraints

Excavation of a 1.5m wide trench will require large construction machinery potentially impacting above ground parts of trees and affect the normal function of the road. The following factors should be taken into consideration.

- Pruning to a width of 6-7m has been carried out recently as part of pruning works. Further pruning is likely to result in pruning or lopping of the trunk which will result in the being lost in accordance with Clause 52.17.
- Normal traffic along Boiler Swamp Road will be interrupted for the duration of construction. Traffic diversions will be required for large vehicles, with small cars and utilities able to utilise the road shoulder. Given the small traffic volumes traffic interruptions should not be a major issue.
- Construction should be undertaken in drier summer months to ensure excess runoff or soil compaction on road shoulders does not occur.

Overview Map



AXIOM Tree Management Pty Ltd

Drawn and Plotted by: TDC
Date: 22/08/2021 Scale: 1:54,267
Geographic Projection:
GDA 1994 MGA Zone 55

Assessment of Trees within Cobboboonee National Park

Legend

Trees-Encroachment %
- 0%
- 1-10%
- > 10%

TPZ
SRZ
Maps
Trench
Formed road
Road verge

N W E S

3 Conclusion and Recommendations

Axiom Tree Management Pty Ltd has been engaged by Biosis to provide a Development Impact report on trees as part of the Kentbruck Wind Farm Project. An Arborist report has been requested as part of an investigation into service installation along an access road through the Cobboboonee National Park.

The subject site is Boiler Swamp Road which is a maintained gravel road that intersects the Cobboboonee National Park and extends for approximately 14kms. The Boiler Swamp Road is a maintained gravel road that extends from Blacks Road to the west to Cut Out Dam Road to the east. The formed road is approximately 5-6m wide with 1-1.5m wide shoulders that is maintained clear of vegetation. The site ranges from flat to undulating with a number of water course and swamps along the road alignment.

- Two thousand and thirty-seven trees (2037) were assessed along Boiler Swamp Road within the Cobboboonee National Park.
  - The trees are all indigenous the local area and have grown through natural regeneration.
  - The trees consist of *Eucalyptus obliqua, Eucalyptus falciformis, Eucalyptus splendens, Eucalyptus ovata, Eucalyptus viminalis subsp. Cygnetensis, Acacia melanoxylon* and *Exocarpos cupressiformis.*
  - The assessed trees are primarily large mature canopy trees growing close to the roadside.
- The health of most of the trees is 'Good'.
  - The trees are indigenous specimens growing within their natural range and tolerant to their local conditions and climate.
  - Impacts are likely to have occurred from road construction and maintenance over many decades, however many of the trees will have adapted or grown to tolerate these impacts.
- The structure of most of the trees is 'Fair'.
  - The trees are typical of native roadside vegetation which often contain decay and cavities from past clearance pruning.
  - Many of the trees are leaning towards the road envelope for available light and space.
- ULE is an estimation of how long a tree can provide amenity in the landscape at an acceptable level of risk.
  - The trees are long lived species and have the potential to live for many decades and centuries.

The proposal includes excavation of a 1.5m trench within the middle of the formed road and install High voltage power cables, wider trenches for junction points, pruning for an 8m x 8m wide envelope. The location of the proposed trench for HV cable installation is based mapping of the centre of the existing road at the time of assessment (accuracy +/- 1m). Where greater accuracy is required, trees and the location of the trench should be verified onsite by qualified surveyors. Based upon excavation of a 1.5m wide trench along the centre alignment of Boiler Swamp Road:

- There will be no encroachment into the TPZ of 1022 trees.
- There will be encroachment of between 1% and 10% encroachment into the TPZ of 588 trees.
  - Provided TPZ specifications are adhered to the long-term health and viability of the trees will not be significantly impacted.
  - Construction equipment and will be required to work within the road footprint.
  - Large intersections and periodic water points can be used for access and laydown areas.
- There will be encroachment greater 10% into the TPZ of 408 trees.
  - There is likely to be a major impact on the trees long term health and viability.
  - Complete removal, redesign, or alternative construction methods will be required.
- 19 trees have completely failed since the original assessment.

4 References

AS 4373, 2007, *Australian Standard, Pruning Amenity Trees*, 2nd Edition Standards Australia

AS 4970, 2009, *Australian Standard, Protection of Trees on Development Sites*, Standards Australia.

5 Appendices

5.1 Definitions

Botanical name:

The genus, species and common name.

Canopy dimensions

Height (approximate) and width (measured) of the canopy in metres.

DBH

Diameter at breast height (measured at 1.3pm above ground level).

Tree Origin

Term	Definition
Exotic	The species originates in a country other than Australia.
Native	The species originates within Australia.
Indigenous	The species originates within the local environs.

Health

Term	Definition
Excellent	The tree is demonstrating excellent or exceptional growth. The tree should exhibit a full canopy of foliage and be free of pest and disease problems.
Good	The tree is demonstrating good or exceptional growth. The tree should exhibit a full canopy of foliage, and have only minor pest or diseases problems.
Fair	The tree is in reasonable condition and growing well. The tree should exhibit an adequate canopy of foliage. There may be some deadwood present in the crown. Some grazing by insects or possums may be evident.
Poor	The tree is not growing to its full capacity; extension growth of the laterals is minimal. The canopy may be thinning or sparse. Large amounts of deadwood may be evident throughout the crown. Significant pest and disease problems may be evident or symptoms of stress indicating tree decline.
Very Poor	The tree appears to be in a state of decline. The tree is not growing to its full capacity. The canopy may be very thin and sparse. A significant volume of deadwood may be present in the canopy or pest and disease problems may be causing a severe decline in tree health.
Dead	The tree is dead.

Structure

Term	Definition
Good	The tree has a well-defined and balanced crown. Branch unions appear to be strong, with no defects evident in the trunk or the branches. Major limbs are well defined. The tree is considered a good example of the species.
Fair	The tree has some minor problems in the structure of the crown. The crown may be slightly out of balance, and some branch unions may be exhibiting minor structural faults. If the tree has a single trunk, it may be on a slight lean or exhibiting minor defects.
Poor	The tree may have a poorly structured crown. The crown may be unbalanced or exhibit large gaps. Major limbs may not be well defined. Branches may be rubbing or crossing over. Branch unions may be poor or faulty at the point of attachment. The tree may have suffered root damage.
Very Poor	The tree has a poorly structured crown. The crown is unbalanced or exhibit large gaps with possibly large sections of deadwood. Major limbs may not be well defined. Branches may be rubbing or crossing over. Branch unions may be poor or faulty at the point of attachment. Branches may exhibit large cracks that are likely to fail in the future. The tree may have suffered major root damage.
Failed	The tree has a very poorly structured crown. A section of the tree has failed or is in imminent danger of failure.

Useful Life Expectancy (ULE) Rating

Useful Life Expectancy is approximately how long a tree can be retained safely and usefully in the landscape.

Term	Definition
0 years	The tree is considered dangerous in the location.
Less than 5 years	The tree, under normal circumstances and without extra stresses being imposed on it, should be safe and have value for up to five years, but will need to be replaced. During this period, normal inspections and maintenance will be required. If possible, replacement trees should be planted.
5 – 10 years	The tree, under normal circumstances and without extra stresses being imposed on it, should be safe and of value for up to ten years. During this period, normal inspections and maintenance will be required.
10– 20 years	The tree, under normal circumstances and without extra stresses being imposed on it, should be safe and of value for up to twenty years. During this period, normal inspections and maintenance will be required.
Greater than 20 years	The tree, under normal circumstances and without extra stresses being imposed on it, should be safe and of value for greater than 20 years. During this period, normal inspections and maintenance will be required.

5.2 Individual Tree Details Spreadsheet

ID	Botanical Name	Common Name	Origin	Age	H x W	DBH (cm)	Health	Structure	ULE	Retention Value	TPZ (m radius)	SRZ (m radius)	Comments	Retain/ remove	Encroach. %
1	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	22m x 14m	111	Fair	Fair	20+ years	High	13.32	3.46		> 10%	20
2	Eucalyptus viminalis subsp. Cygnetensis	Rough-barked Manna Gum	Indigenous	Mature	18m x 6m	74	Poor	Fair	10-20 years	Medium	8.88	2.92		1-10%	8
3	Eucalyptus viminalis subsp. Cygnetensis	Rough-barked Manna Gum	Indigenous	Mature	19m x 7m	90	Fair	Poor	10-20 years	Medium	10.8	3.17		1-10%	7
4	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	17m x 4m	39	Good	Fair	20+ years	Medium	4.68	2.23		0%	0
5	Eucalyptus viminalis subsp. Cygnetensis	Rough-barked Manna Gum	Indigenous	Young	8m x 2m	13	Good	Good	20+ years	Low	2	1.50		0%	0
6	Eucalyptus viminalis subsp. Cygnetensis	Rough-barked Manna Gum	Indigenous	Semi mature	18m x 7m	57	Good	Good	20+ years	Medium	6.84	2.61		0%	0
7	Eucalyptus viminalis subsp. Cygnetensis	Rough-barked Manna Gum	Indigenous	Mature	16m x 5m	62	Poor	Poor	10-20 years	Medium	7.44	2.71		1-10%	4
8	Eucalyptus splendens	Apple Jack	Native	Mature	18m x 5m	52	Poor	Poor	10-20 years	Medium	6.24	2.51		0%	0
9	Eucalyptus splendens	Apple Jack	Native	Semi mature	9m x 3m	26	Fair	Fair	20+ years	Medium	3.12	1.88		0%	0
10	Eucalyptus splendens	Apple Jack	Native	Semi mature	18m x 5m	46	Good	Good	20+ years	High	5.52	2.39		0%	0
11	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	19m x 5m	49	Good	Fair	20+ years	Medium	5.88	2.45		1-10%	10
12	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	19m x 5m	45	Good	Fair	20+ years	Very high	5.4	2.37		1-10%	4
13	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	18m x 3m	28	Good	Fair	20+ years	Medium	3.36	1.94		0%	0
14	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	20m x 4m	43	Good	Fair	20+ years	Medium	5.16	2.32		0%	0
15	Eucalyptus viminalis subsp. Cygnetensis	Rough-barked Manna Gum	Indigenous	Semi mature	15m x 2m	32	Good	Fair	20+ years	Low	3.84	2.05		0%	0
16	Eucalyptus viminalis subsp. Cygnetensis	Rough-barked Manna Gum	Indigenous	Semi mature	19m x 15m	74	Good	Fair	20+ years	High	8.88	2.92		> 10%	12
17	Eucalyptus splendens	Apple Jack	Native	Semi mature	18m x 5m	61	Good	Fair	20+ years	Medium	7.32	2.69		1-10%	8
18	Eucalyptus viminalis subsp. Cygnetensis	Rough-barked Manna Gum	Indigenous	Semi mature	19m x 6m	60	Good	Fair	20+ years	Medium	7.2	2.67		1-10%	6
19	Eucalyptus viminalis subsp. Cygnetensis	Rough-barked Manna Gum	Indigenous	Mature	20m x 7m	76	Good	Fair	20+ years	High	9.12	2.95		1-10%	2
20	Eucalyptus viminalis subsp. Cygnetensis	Rough-barked Manna Gum	Indigenous	Semi mature	18m x 4m	49	Fair	Fair	20+ years	Medium	5.88	2.45		0%	0
21	Eucalyptus viminalis subsp. Cygnetensis	Rough-barked Manna Gum	Indigenous	Semi mature	21m x 4m	52	Good	Good	20+ years	Medium	6.24	2.51		0%	0
22	Eucalyptus viminalis subsp. Cygnetensis	Rough-barked Manna Gum	Indigenous	Semi mature	15m x 2m	26	Good	Good	20+ years	Low	3.12	1.88		0%	0
23	Eucalyptus viminalis subsp. Cygnetensis	Rough-barked Manna Gum	Indigenous	Semi mature	17m x 3m	37	Good	Good	20+ years	Medium	4.44	2.18		0%	0
24	Eucalyptus viminalis subsp. Cygnetensis	Rough-barked Manna Gum	Indigenous	Semi mature	18m x 3m	39	Good	Good	20+ years	Medium	4.68	2.23		0%	0
25	Eucalyptus viminalis subsp. Cygnetensis	Rough-barked Manna Gum	Indigenous	Mature	20m x 5m	86	Poor	Fair	20+ years	High	10.32	3.11		> 10%	11
26	Eucalyptus splendens	Apple Jack	Native	Mature	18m x 5m	55	Fair	Fair	10-20 years	Medium	6.6	2.57		1-10%	7
27	Eucalyptus viminalis subsp. Cygnetensis	Rough-barked Manna Gum	Indigenous	Mature	20m x 18m	76	Good	Fair	10-20 years	Very high	9.12	2.95		1-10%	2
28	Eucalyptus viminalis subsp. Cygnetensis	Rough-barked Manna Gum	Indigenous	Mature	22m x 8m	113	Fair	Fair	20+ years	Very high	13.56	3.48		1-10%	9
29	Eucalyptus viminalis subsp. Cygnetensis	Rough-barked Manna Gum	Indigenous	Mature	18m x 9m	147	Fair	Very poor	20+ years	High	15	3.89		1-10%	1
30	Eucalyptus viminalis subsp. Cygnetensis	Rough-barked Manna Gum	Indigenous	Semi mature	20m x 3m	45	Good	Fair	20+ years	Medium	5.4	2.37		0%	0
31	Eucalyptus viminalis subsp. Cygnetensis	Rough-barked Manna Gum	Indigenous	Semi mature	20m x 5m	55	Good	Fair	20+ years	Medium	6.6	2.57		0%	0
32	Eucalyptus viminalis subsp. Cygnetensis	Rough-barked Manna Gum	Indigenous	Semi mature	18m x 5m	45	Good	Fair	20+ years	Medium	5.4	2.37		0%	0
33	Eucalyptus viminalis subsp. Cygnetensis	Rough-barked Manna Gum	Indigenous	Semi mature	18m x 4m	47	Good	Fair	20+ years	Medium	5.64	2.41		0%	0
34	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	23m x 5m	87	Fair	Poor	10-20 years	High	10.44	3.12		> 10%	15
35	Eucalyptus falciformis	Western Peppermint	Indigenous	Young	8m x 1m	13	Good	Good	20+ years	Low	2	1.50		0%	0
36	Eucalyptus viminalis subsp. Cygnetensis	Rough-barked Manna Gum	Indigenous	Mature	18m x 6m	68	Fair	Fair	20+ years	Medium	8.16	2.81		0%	0

ID	Botanical Name	Common Name	Origin	Age	H x W	DBH (cm)	Health	Structure	ULE	Retention Value	TPZ (m radius)	SRZ (m radius)	Comments	Retain/ remove	Encroach. %
37	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	20m x 6m	49	Fair	Fair	20+ years	Medium	5.88	2.45		0%	0
38	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	20m x 5m	48	Fair	Fair	20+ years	Medium	5.76	2.43		0%	0
39	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	18m x 7m	40	Good	Good	20+ years	Medium	4.8	2.25		0%	0
40	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	16m x 3m	24	Good	Good	20+ years	Low	2.88	1.82		0%	0
41	Eucalyptus viminalis subsp. Cygnetensis	Rough-barked Manna Gum	Indigenous	Mature	20m x 4m	48	Good	Good	20+ years	Medium	5.76	2.43		0%	0
42	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	18m x 4m	40	Good	Fair	20+ years	Medium	4.8	2.25		1-10%	1
43	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	18m x 5m	55	Good	Fair	20+ years	Medium	6.6	2.57		1-10%	9
44	Eucalyptus viminalis subsp. Cygnetensis	Rough-barked Manna Gum	Indigenous	Mature	14m x 5m	79	Fair	Poor	10-20 years	Medium	9.48	3.00		1-10%	8
45	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	18m x 8m	70	Good	Fair	20+ years	Low	8.4	2.85		> 10%	11
46	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	15m x 5m	50	Good	Good	20+ years	Medium	6	2.47		1-10%	1
47	Eucalyptus falciformis	Western Peppermint	Indigenous	Young	6m x 2m	16	Good	Good	20+ years	Low	2	1.53		0%	0
48	Eucalyptus viminalis subsp. Cygnetensis	Rough-barked Manna Gum	Indigenous	Semi mature	15m x 3m	40	Fair	Fair	10-20 years	Medium	4.8	2.25		0%	0
49	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	20m x 5m	55	Good	Good	20+ years	Medium	6.6	2.57		0%	0
50	Eucalyptus falciformis	Western Peppermint	Indigenous	Young	15m x 2m	27	Good	Good	20+ years	Low	3.24	1.91		0%	0
51	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	18m x 4m	35	Fair	Good	20+ years	Medium	4.2	2.13		0%	0
52	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	18m x 7m	48	Fair	Fair	20+ years	Medium	5.76	2.43		0%	0
53	Eucalyptus viminalis subsp. Cygnetensis	Rough-barked Manna Gum	Indigenous	Mature	17m x 6m	47	Good	Fair	20+ years	Medium	5.64	2.41		1-10%	2
54	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	20m x 4m	49	Poor	Fair	10-20 years	Medium	5.88	2.45		1-10%	6
55	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	18m x 9m	99	Poor	Poor	5-10 years	Medium	11.88	3.30		> 10%	17
56	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	18m x 5m	71	Fair	Fair	10-20 years	Medium	8.52	2.87		1-10%	9
57	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	18m x 3m	35	Fair	Fair	10-20 years	Medium	4.2	2.13		0%	0
58	Eucalyptus viminalis subsp. Cygnetensis	Rough-barked Manna Gum	Indigenous	Semi mature	18m x 5m	39	Good	Fair	20+ years	Medium	4.68	2.23		0%	0
59	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	20m x 3m	38	Fair	Fair	10-20 years	Medium	4.56	2.20		0%	0
60	Eucalyptus splendens	Apple Jack	Native	Semi mature	18m x 5m	61	Fair	Fair	20+ years	High	7.32	2.69		> 10%	12
61	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	18m x 12m	125	Poor	Poor	10-20 years	Very high	15	3.63		> 10%	14
62	Eucalyptus viminalis subsp. Cygnetensis	Rough-barked Manna Gum	Indigenous	Mature	14m x 2m	35	Dead	Poor	0 years	Low	4.2	2.13		0%	0
63	Eucalyptus viminalis subsp. Cygnetensis	Rough-barked Manna Gum	Indigenous	Young	12m x 2m	24	Good	Good	20+ years	Low	2.88	1.82		0%	0
64	Eucalyptus viminalis subsp. Cygnetensis	Rough-barked Manna Gum	Indigenous	Semi mature	16m x 5m	40	Good	Good	20+ years	Medium	4.8	2.25		0%	0
65	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	15m x 3m	28	Good	Good	20+ years	Very high	3.36	1.94		0%	0
66	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	18m x 3m	49	Dead	Poor	0 years	Low	5.88	2.45		0%	0
67	Eucalyptus viminalis subsp. Cygnetensis	Rough-barked Manna Gum	Indigenous	Young	7m x 3m	20	Good	Good	20+ years	High	2.4	1.68		0%	0
68	Eucalyptus splendens	Apple Jack	Native	Mature	23m x 20m	90	Good	Fair	20+ years	Very high	10.8	3.17		> 10%	19
69	Eucalyptus splendens	Apple Jack	Native	Semi mature	20m x 3m	52	Good	Good	20+ years	Medium	6.24	2.51		1-10%	2
70	Eucalyptus splendens	Apple Jack	Native	Semi mature	19m x 3m	41	Good	Good	20+ years	Medium	4.92	2.28		0%	0
71	Eucalyptus viminalis subsp. Cygnetensis	Rough-barked Manna Gum	Indigenous	Semi mature	17m x 7m	48	Good	Good	20+ years	Medium	5.76	2.43		0%	0
72	Eucalyptus viminalis subsp. Cygnetensis	Rough-barked Manna Gum	Indigenous	Semi mature	16m x 3m	36	Good	Good	20+ years	Medium	4.32	2.15		0%	0

ID	Botanical Name	Common Name	Origin	Age	H x W	DBH (cm)	Health	Structure	ULE	Retention Value	TPZ (m radius)	SRZ (m radius)	Comments	Retain/ remove	Encroach. %
73	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Young	7m x 1m	28	Fair	Poor	5-10 years	Low	3.36	1.94		0%	0
74	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	18m x 9m	49	Good	Fair	20+ years	Medium	5.88	2.45		1-10%	7
75	Eucalyptus viminalis subsp. Cygnetensis	Rough-barked Manna Gum	Indigenous	Mature	18m x 5m	58	Good	Fair	20+ years	Medium	6.96	2.63		1-10%	1
76	Eucalyptus viminalis subsp. Cygnetensis	Rough-barked Manna Gum	Indigenous	Mature	18m x 6m	55	Good	Fair	20+ years	Medium	6.6	2.57		0%	0
77	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	15m x 2m	31	Fair	Fair	10-20 years	Medium	3.72	2.02		0%	0
78	Eucalyptus viminalis subsp. Cygnetensis	Rough-barked Manna Gum	Indigenous	Semi mature	17m x 3m	39	Dead	Poor	0 years	Low	4.68	2.23		0%	0
79	Eucalyptus viminalis subsp. Cygnetensis	Rough-barked Manna Gum	Indigenous	Semi mature	18m x 5m	42	Good	Fair	20+ years	Medium	5.04	2.30		1-10%	1
80	Eucalyptus viminalis subsp. Cygnetensis	Rough-barked Manna Gum	Indigenous	Semi mature	14m x 3m	37	Fair	Poor	10-20 years	Medium	4.44	2.18		0%	0
81	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	18m x 5m	51	Fair	Fair	20+ years	Medium	6.12	2.49		1-10%	3
82	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	21m x 5m	41	Good	Fair	20+ years	Medium	4.92	2.28		0%	0
83	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	19m x 4m	48	Good	Fair	20+ years	Medium	5.76	2.43		1-10%	5
84	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	16m x 6m	72	Poor	Poor	5-10 years	Medium	8.64	2.88		> 10%	24
85	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	18m x 12m	100	Very Poor	Poor	5-10 years	Medium	12	3.31		> 10%	24
86	Eucalyptus splendens	Apple Jack	Native	Young	15m x 2m	24	Good	Good	20+ years	Medium	2.88	1.82		0%	0
87	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	18m x 3m	42	Good	Fair	20+ years	Medium	5.04	2.30		0%	0
88	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Young	7m x 1m	16	Good	Fair	20+ years	Low	2	1.53		0%	0
89	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	20m x 5m	48	Good	Good	20+ years	Medium	5.76	2.43		1-10%	1
90	Eucalyptus splendens	Apple Jack	Native	Mature	23m x 6m	59	Good	Good	20+ years	Medium	7.08	2.65		0%	0
91	Eucalyptus falciformis	Western Peppermint	Indigenous	Young	16m x 1m	13	Poor	Poor	5-10 years	Low	2	1.50		0%	0
92	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	18m x 3m	33	Fair	Fair	20+ years	Medium	3.96	2.08		0%	0
93	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	18m x 2m	26	Poor	Poor	5-10 years	Low	3.12	1.88		0%	0
94	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	16m x 4m	36	Poor	Fair	5-10 years	Low	4.32	2.15		0%	0
95	Eucalyptus splendens	Apple Jack	Native	Young	15m x 2m	25	Good	Good	20+ years	Low	3	1.85		0%	0
96	Eucalyptus splendens	Apple Jack	Native	Semi mature	20m x 5m	56	Good	Fair	20+ years	Medium	6.72	2.59		1-10%	3
97	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Young	12m x 2m	20	Good	Good	20+ years	Low	2.4	1.68		0%	0
98	Failed	Failed	Native	Failed	16m x 2m	21	Failed	Failed	Failed	Low	2.52	1.72		Failed	0
99	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	20m x 8m	70	Fair	Fair	20+ years	Medium	8.4	2.85		1-10%	8
100	Eucalyptus splendens	Apple Jack	Native	Semi mature	12m x 3m	21	Fair	Fair	10-20 years	Low	2.52	1.72		0%	0
101	Eucalyptus splendens	Apple Jack	Native	Semi mature	16m x 6m	40	Fair	Fair	20+ years	Medium	4.8	2.25		0%	0
102	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	15m x 3m	30	Good	Fair	20+ years	Medium	3.6	2.00		0%	0
103	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Young	15m x 2m	20	Good	Good	20+ years	Low	2.4	1.68		0%	0
104	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Young	15m x 2m	16	Good	Good	20+ years	Low	2	1.53		0%	0
105	Eucalyptus falciformis	Western Peppermint	Indigenous	Young	16m x 3m	25	Good	Good	20+ years	Low	3	1.85		0%	0
106	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	22m x 7m	65	Good	Good	20+ years	High	7.8	2.76		1-10%	4
107	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	18m x 3m	20	Good	Fair	20+ years	Medium	2.4	1.68		0%	0
108	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	8m x 1m	21	Good	Fair	20+ years	Medium	2.52	1.72		0%	0

ID	Botanical Name	Common Name	Origin	Age	H x W	DBH (cm)	Health	Structure	ULE	Retention Value	TPZ (m radius)	SRZ (m radius)	Comments	Retain/ remove	Encroach. %
109	Eucalyptus viminalis subsp. Cygnetensis	Rough-barked Manna Gum	Indigenous	Mature	22m x 5m	47	Good	Fair	20+ years	Medium	5.64	2.41		0%	0
110	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	23m x 10m	78	Good	Fair	20+ years	High	9.36	2.98		1-10%	8
111	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	18m x 3m	32	Fair	Fair	20+ years	Medium	3.84	2.05		0%	0
112	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	18m x 5m	52	Fair	Fair	20+ years	Medium	6.24	2.51		0%	0
113	Eucalyptus splendens	Apple Jack	Native	Semi mature	17m x 3m	31	Good	Fair	20+ years	Medium	3.72	2.02		0%	0
114	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	19m x 2m	19	Good	Fair	20+ years	Medium	2.28	1.65		0%	0
115	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	24m x 5m	64	Good	Fair	20+ years	High	7.68	2.74		> 10%	21
116	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	24m x 7m	80	Good	Fair	20+ years	Medium	9.6	3.01		1-10%	8
117	Eucalyptus falciformis	Western Peppermint	Indigenous	Young	12m x 2m	22	Good	Poor	10-20 years	Low	2.64	1.75		0%	0
118	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	16m x 4m	37	Good	Good	20+ years	Medium	4.44	2.18		0%	0
119	Failed	Failed	Native	Failed	16m x 4m	37	Failed	Failed	Failed	Very high	4.44	2.18		Failed	0
120	Eucalyptus splendens	Apple Jack	Native	Semi mature	12m x 2m	37	Good	Fair	20+ years	Low	4.44	2.18		0%	0
121	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	17m x 6m	39	Good	Fair	20+ years	Medium	4.68	2.23		0%	0
122	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	22m x 5m	45	Good	Fair	20+ years	High	5.4	2.37		0%	0
123	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	14m x 3m	30	Good	Fair	20+ years	Medium	3.6	2.00		0%	0
124	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	23m x 7m	80	Fair	Fair	20+ years	Very high	9.6	3.01		> 10%	12
125	Eucalyptus splendens	Apple Jack	Native	Mature	23m x 15m	80	Fair	Fair	20+ years	High	9.6	3.01		1-10%	6
126	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	18m x 5m	47	Good	Fair	20+ years	Medium	5.64	2.41		0%	0
127	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	18m x 4m	32	Good	Fair	20+ years	Medium	3.84	2.05		0%	0
128	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	18m x 3m	37	Fair	Fair	20+ years	Medium	4.44	2.18		0%	0
129	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	18m x 3m	36	Good	Fair	20+ years	Medium	4.32	2.15		0%	0
130	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	18m x 3m	39	Good	Fair	20+ years	Medium	4.68	2.23		0%	0
131	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	20m x 3m	39	Good	Fair	20+ years	Low	4.68	2.23		0%	0
132	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	18m x 5m	63	Poor	Poor	20+ years	Medium	7.56	2.73		0%	0
133	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	18m x 4m	46	Good	Fair	20+ years	Medium	5.52	2.39		0%	0
134	Eucalyptus splendens	Apple Jack	Native	Mature	20m x 4m	46	Good	Fair	20+ years	Medium	5.52	2.39		0%	0
135	Eucalyptus splendens	Apple Jack	Native	Mature	24m x 16m	79	Good	Fair	20+ years	Very high	9.48	3.00		> 10%	16
136	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	13m x 2m	25	Good	Fair	20+ years	Low	3	1.85		0%	0
137	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	15m x 3m	37	Good	Fair	20+ years	Medium	4.44	2.18		0%	0
138	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	25m x 10m	82	Good	Fair	20+ years	Very high	9.84	3.04		1-10%	3
139	Eucalyptus splendens	Apple Jack	Native	Mature	26m x 14m	87	Good	Fair	20+ years	Very high	10.44	3.12		> 10%	13
140	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	20m x 3m	58	Good	Fair	10-20 years	Medium	6.96	2.63		> 10%	27
141	Eucalyptus splendens	Apple Jack	Native	Mature	25m x 5m	76	Good	Fair	20+ years	Very high	9.12	2.95		> 10%	11
142	Eucalyptus viminalis subsp. Cygnetensis	Rough-barked Manna Gum	Indigenous	Mature	20m x 10m	75	Dead	Poor	0 years	Low	9	2.93		1-10%	10
143	Eucalyptus viminalis subsp. Cygnetensis	Rough-barked Manna Gum	Indigenous	Mature	25m x 5m	84	Dead	Poor	0 years	Low	10.08	3.08		1-10%	2
144	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	24m x 5m	76	Fair	Fair	20+ years	Medium	9.12	2.95		> 10%	21

ID	Botanical Name	Common Name	Origin	Age	H x W	DBH (cm)	Health	Structure	ULE	Retention Value	TPZ (m radius)	SRZ (m radius)	Comments	Retain/ remove	Encroach. %
145	Eucalyptus viminalis subsp. Cygnetensis	Rough-barked Manna Gum	Indigenous	Mature	23m x 16m	125	Fair	Very poor	20+ years	High	15	3.63		> 10%	13
146	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	14m x 3m	27	Fair	Fair	20+ years	Medium	3.24	1.91		0%	0
147	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	24m x 10m	60	Good	Fair	20+ years	High	7.2	2.67		0%	0
148	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	8m x 2m	22	Good	Fair	20+ years	Medium	2.64	1.75		0%	0
149	Eucalyptus splendens	Apple Jack	Native	Semi mature	18m x 3m	36	Good	Fair	20+ years	Medium	4.32	2.15		0%	0
150	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	22m x 8m	90	Fair	Fair	20+ years	High	10.8	3.17		> 10%	16
151	Eucalyptus splendens	Apple Jack	Native	Mature	18m x 7m	52	Good	Good	20+ years	High	6.24	2.51		0%	0
152	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	14m x 3m	27	Good	Fair	20+ years	Medium	3.24	1.91		0%	0
153	Eucalyptus splendens	Apple Jack	Native	Semi mature	18m x 4m	48	Dead	Very poor	20+ years	Medium	5.76	2.43		1-10%	3
154	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	16m x 3m	30	Good	Fair	20+ years	Medium	3.6	2.00		0%	0
155	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	20m x 5m	47	Good	Fair	20+ years	Medium	5.64	2.41		1-10%	1
156	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	18m x 5m	45	Good	Fair	20+ years	Medium	5.4	2.37		0%	0
157	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	18m x 3m	30	Good	Fair	20+ years	Medium	3.6	2.00		0%	0
158	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	18m x 3m	28	Good	Fair	20+ years	Medium	3.36	1.94		0%	0
159	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	14m x 2m	24	Fair	Fair	20+ years	Low	2.88	1.82		0%	0
160	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	20m x 14m	72	Good	Fair	20+ years	High	8.64	2.88		1-10%	9
161	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Young	20m x 3m	33	Good	Good	20+ years	Low	3.96	2.08		0%	0
162	Eucalyptus splendens	Apple Jack	Native	Mature	20m x 14m	98	Good	Fair	20+ years	Very high	11.76	3.28		1-10%	6
163	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	24m x 12m	111	Good	Poor	20+ years	Very high	13.32	3.46		1-10%	10
164	Eucalyptus splendens	Apple Jack	Native	Mature	23m x 10m	74	Good	Fair	20+ years	High	8.88	2.92		1-10%	3
165	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	20m x 7m	65	Fair	Fair	20+ years	High	7.8	2.76		> 10%	12
166	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	23m x 7m	60	Good	Fair	20+ years	High	7.2	2.67		1-10%	8
167	Eucalyptus splendens	Apple Jack	Native	Semi mature	18m x 5m	42	Good	Fair	20+ years	Medium	5.04	2.30		0%	0
168	Eucalyptus splendens	Apple Jack	Native	Young	9m x 1m	13	Good	Fair	20+ years	Low	2	1.50		0%	0
169	Eucalyptus viminalis subsp. Cygnetensis	Rough-barked Manna Gum	Indigenous	Mature	25m x 8m	87	Good	Fair	20+ years	High	10.44	3.12		0%	0
170	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	18m x 10m	53	Good	Fair	20+ years	Medium	6.36	2.53		1-10%	1
171	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Young	9m x 1m	13	Good	Good	20+ years	Low	2	1.50		0%	0
172	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	13m x 3m	28	Good	Fair	20+ years	Medium	3.36	1.94		0%	0
173	Eucalyptus splendens	Apple Jack	Native	Semi mature	16m x 7m	48	Good	Fair	20+ years	Medium	5.76	2.43		0%	0
174	Eucalyptus viminalis subsp. Cygnetensis	Rough-barked Manna Gum	Indigenous	Semi mature	12m x 2m	17	Good	Fair	20+ years	Low	2.04	1.57		0%	0
175	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	20m x 6m	48	Good	Fair	20+ years	High	5.76	2.43		0%	0
176	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	20m x 3m	29	Good	Good	20+ years	Medium	3.48	1.97		0%	0
177	Eucalyptus splendens	Apple Jack	Native	Mature	20m x 7m	50	Good	Good	20+ years	High	6	2.47		0%	0
178	Eucalyptus ovata	Swamp Gum	Indigenous	Semi mature	16m x 5m	28	Fair	Fair	10-20 years	Medium	3.36	1.94		0%	0
179	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	18m x 5m	38	Good	Good	20+ years	Medium	4.56	2.20		0%	0
180	Eucalyptus ovata	Swamp Gum	Indigenous	Mature	20m x 9m	61	Fair	Fair	20+ years	Medium	7.32	2.69		1-10%	5

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181	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	17m x 6m	37	Good	Fair	20+ years	Medium	4.44	2.18		0%	0
182	Eucalyptus ovata	Swamp Gum	Indigenous	Semi mature	16m x 7m	44	Good	Fair	20+ years	Medium	5.28	2.34		0%	0
183	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	15m x 3m	31	Good	Fair	20+ years	Medium	3.72	2.02		0%	0
184	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	19m x 4m	34	Good	Fair	20+ years	Medium	4.08	2.10		0%	0
185	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	19m x 4m	37	Good	Fair	20+ years	Medium	4.44	2.18		0%	0
186	Eucalyptus splendens	Apple Jack	Native	Mature	24m x 4m	49	Good	Good	20+ years	High	5.88	2.45		0%	0
187	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	18m x 2m	29	Good	Fair	20+ years	Medium	3.48	1.97		0%	0
188	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	20m x 6m	49	Good	Fair	20+ years	Medium	5.88	2.45		0%	0
189	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	20m x 3m	29	Good	Fair	20+ years	Medium	3.48	1.97		0%	0
190	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	20m x 3m	32	Good	Fair	20+ years	Medium	3.84	2.05		0%	0
191	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	18m x 4m	34	Good	Fair	20+ years	Medium	4.08	2.10		0%	0
192	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	20m x 6m	40	Good	Fair	20+ years	Medium	4.8	2.25		0%	0
193	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	16m x 3m	30	Poor	Poor	5-10 years	Low	3.6	2.00		0%	0
194	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	15m x 3m	30	Poor	Poor	5-10 years	Very high	3.6	2.00		0%	0
195	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	18m x 4m	32	Fair	Fair	10-20 years	Medium	3.84	2.05		0%	0
196	Failed	Failed	Native	Failed	16m x 10m	115	Failed	Failed	Failed	Medium	13.8	3.51		Failed	0
197	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	20m x 4m	33	Good	Fair	20+ years	Medium	3.96	2.08		0%	0
198	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	22m x 5m	52	Good	Fair	20+ years	Medium	6.24	2.51		0%	0
199	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	18m x 5m	43	Good	Fair	20+ years	Low	5.16	2.32		0%	0
200	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	20m x 6m	85	Dead	Poor	0 years	Low	10.2	3.09		> 10%	13
201	Eucalyptus splendens	Apple Jack	Native	Semi mature	18m x 7m	52	Good	Fair	20+ years	Medium	6.24	2.51		0%	0
202	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	18m x 3m	40	Good	Fair	20+ years	Medium	4.8	2.25		0%	0
203	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	18m x 3m	43	Good	Fair	20+ years	Medium	5.16	2.32		0%	0
204	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	20m x 7m	53	Good	Fair	20+ years	Medium	6.36	2.53		0%	0
205	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	26m x 12m	88	Good	Fair	20+ years	Very high	10.56	3.14		> 10%	16
206	Eucalyptus splendens	Apple Jack	Native	Mature	18m x 14m	56	Good	Good	20+ years	Medium	6.72	2.59		0%	0
207	Eucalyptus ovata	Swamp Gum	Indigenous	Mature	19m x 5m	46	Poor	Poor	5-10 years	Medium	5.52	2.39		0%	0
208	Eucalyptus splendens	Apple Jack	Native	Mature	18m x 5m	43	Good	Fair	20+ years	Medium	5.16	2.32		0%	0
209	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	18m x 3m	39	Fair	Fair	10-20 years	Medium	4.68	2.23		0%	0
210	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	10m x 2m	36	Fair	Poor	10-20 years	Medium	4.32	2.15		0%	0
211	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	14m x 4m	34	Good	Fair	20+ years	Medium	4.08	2.10		0%	0
212	Eucalyptus splendens	Apple Jack	Native	Mature	16m x 5m	50	Fair	Poor	10-20 years	Low	6	2.47		1-10%	2
213	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	20m x 6m	40	Fair	Fair	10-20 years	Medium	4.8	2.25		0%	0
214	Eucalyptus viminalis subsp. Cygnetensis	Rough-barked Manna Gum	Indigenous	Mature	18m x 6m	59	Good	Fair	20+ years	Very high	7.08	2.65		1-10%	2
215	Eucalyptus viminalis subsp. Cygnetensis	Rough-barked Manna Gum	Indigenous	Mature	20m x 4m	43	Good	Fair	20+ years	High	5.16	2.32		0%	0
216	Eucalyptus splendens	Apple Jack	Native	Mature	18m x 5m	40	Good	Fair	20+ years	High	4.8	2.25		1-10%	1

ID	Botanical Name	Common Name	Origin	Age	H x W	DBH (cm)	Health	Structure	ULE	Retention Value	TPZ (m radius)	SRZ (m radius)	Comments	Retain/ remove	Encroach. %
217	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	19m x 4m	31	Good	Fair	20+ years	Medium	3.72	2.02		0%	0
218	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	18m x 3m	30	Fair	Fair	10-20 years	Medium	3.6	2.00		0%	0
219	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	18m x 5m	38	Fair	Fair	10-20 years	Low	4.56	2.20		0%	0
220	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	16m x 2m	32	Fair	Fair	10-20 years	Very high	3.84	2.05		0%	0
221	Eucalyptus splendens	Apple Jack	Native	Mature	24m x 7m	67	Fair	Very poor	10-20 years	Medium	8.04	2.80		1-10%	6
222	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	18m x 3m	34	Fair	Poor	5-10 years	Very high	4.08	2.10		0%	0
223	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	18m x 10m	54	Fair	Fair	10-20 years	Medium	6.48	2.55		> 10%	14
224	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	17m x 8m	40	Good	Fair	20+ years	Medium	4.8	2.25		0%	0
225	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	15m x 3m	28	Good	Fair	20+ years	Low	3.36	1.94		0%	0
226	Eucalyptus splendens	Apple Jack	Native	Semi mature	16m x 5m	54	Good	Fair	20+ years	Medium	6.48	2.55		> 10%	14
227	Eucalyptus splendens	Apple Jack	Native	Mature	23m x 5m	44	Good	Fair	20+ years	Medium	5.28	2.34		0%	0
228	Eucalyptus splendens	Apple Jack	Native	Mature	20m x 3m	40	Good	Fair	20+ years	Medium	4.8	2.25		0%	0
229	Eucalyptus splendens	Apple Jack	Native	Mature	20m x 5m	46	Good	Fair	20+ years	Medium	5.52	2.39		0%	0
230	Eucalyptus splendens	Apple Jack	Native	Mature	20m x 5m	46	Good	Fair	20+ years	Medium	5.52	2.39		1-10%	7
231	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	18m x 3m	26	Good	Fair	20+ years	Medium	3.12	1.88		0%	0
232	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	22m x 6m	54	Good	Fair	20+ years	Medium	6.48	2.55		0%	0
233	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	18m x 5m	42	Good	Fair	20+ years	Medium	5.04	2.30		0%	0
234	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	22m x 6m	46	Good	Fair	20+ years	Medium	5.52	2.39		0%	0
235	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	22m x 3m	37	Good	Fair	20+ years	Medium	4.44	2.18		0%	0
236	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	25m x 10m	85	Good	Fair	20+ years	Medium	10.2	3.09		0%	0
237	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	22m x 6m	50	Good	Fair	20+ years	Medium	6	2.47		0%	0
238	Eucalyptus splendens	Apple Jack	Native	Mature	18m x 8m	42	Good	Fair	20+ years	Medium	5.04	2.30		0%	0
239	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	18m x 5m	42	Good	Fair	20+ years	Medium	5.04	2.30		0%	0
240	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	17m x 3m	28	Good	Fair	20+ years	Medium	3.36	1.94		0%	0
241	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Young	10m x 2m	17	Good	Fair	20+ years	Low	2.04	1.57		0%	0
242	Eucalyptus splendens	Apple Jack	Native	Mature	28m x 12m	101	Good	Fair	20+ years	Very high	12.12	3.32		> 10%	23
243	Eucalyptus splendens	Apple Jack	Native	Mature	15m x 5m	41	Good	Fair	20+ years	Medium	4.92	2.28		0%	0
244	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	14m x 5m	33	Good	Fair	20+ years	Medium	3.96	2.08		0%	0
245	Eucalyptus splendens	Apple Jack	Native	Mature	25m x 8m	89	Good	Fair	20+ years	High	10.68	3.15		> 10%	13
246	Eucalyptus splendens	Apple Jack	Native	Mature	22m x 14m	92	Good	Good	20+ years	Very high	11.04	3.20		> 10%	21
247	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	22m x 5m	51	Good	Good	20+ years	Medium	6.12	2.49		0%	0
248	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	19m x 3m	30	Good	Good	20+ years	Low	3.6	2.00		0%	0
249	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	20m x 2m	27	Fair	Fair	20+ years	Medium	3.24	1.91		0%	0
250	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	22m x 3m	37	Fair	Fair	20+ years	Medium	4.44	2.18		0%	0
251	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	26m x 7m	55	Good	Fair	20+ years	High	6.6	2.57		0%	0
252	Eucalyptus splendens	Apple Jack	Native	Semi mature	18m x 4m	26	Good	Fair	20+ years	Medium	3.12	1.88		0%	0

ID	Botanical Name	Common Name	Origin	Age	H x W	DBH (cm)	Health	Structure	ULE	Retention Value	TPZ (m radius)	SRZ (m radius)	Comments	Retain/ remove	Encroach. %
253	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	25m x 4m	40	Good	Good	20+ years	Medium	4.8	2.25		0%	0
254	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	20m x 5m	41	Good	Good	20+ years	Medium	4.92	2.28		0%	0
255	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	28m x 15m	89	Good	Good	20+ years	Very high	10.68	3.15		> 10%	21
256	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	23m x 14m	112	Fair	Poor	20+ years	High	13.44	3.47		> 10%	15
257	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	14m x 3m	36	Good	Good	20+ years	Medium	4.32	2.15		0%	0
258	Eucalyptus falciformis	Western Peppermint	Indigenous	Young	10m x 2m	16	Good	Good	20+ years	Low	2	1.53		0%	0
259	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	15m x 4m	33	Good	Good	20+ years	Medium	3.96	2.08		0%	0
260	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	10m x 2m	33	Fair	Poor	5-10 years	Low	3.96	2.08		0%	0
261	Eucalyptus ovata	Swamp Gum	Indigenous	Semi mature	14m x 3m	44	Poor	Poor	10-20 years	Medium	5.28	2.34		0%	0
262	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	20m x 12m	56	Good	Fair	20+ years	High	6.72	2.59		1-10%	4
263	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	16m x 3m	30	Good	Fair	20+ years	Medium	3.6	2.00		0%	0
264	Eucalyptus ovata	Swamp Gum	Indigenous	Mature	18m x 4m	40	Poor	Fair	5-10 years	Medium	4.8	2.25		0%	0
265	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	24m x 7m	74	Fair	Fair	20+ years	High	8.88	2.92		0%	0
266	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	4m x 1m	55	Dead	Poor	0 years	Low	6.6	2.57		1-10%	9
267	Eucalyptus ovata	Swamp Gum	Indigenous	Semi mature	18m x 6m	43	Fair	Fair	20+ years	Medium	5.16	2.32		0%	0
268	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	15m x 4m	31	Good	Good	20+ years	Medium	3.72	2.02		0%	0
269	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	14m x 4m	33	Good	Good	20+ years	Medium	3.96	2.08		0%	0
270	Eucalyptus ovata	Swamp Gum	Indigenous	Mature	18m x 6m	35	Fair	Fair	20+ years	Medium	4.2	2.13		0%	0
271	Eucalyptus ovata	Swamp Gum	Indigenous	Mature	18m x 5m	35	Fair	Fair	20+ years	Medium	4.2	2.13		0%	0
272	Failed	Failed	Native	Failed	24m x 7m	64	Failed	Failed	Failed	High	7.68	2.74		Failed	0
273	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	28m x 12m	92	Fair	Poor	10-20 years	Medium	11.04	3.20		> 10%	22
274	Eucalyptus splendens	Apple Jack	Native	Mature	29m x 12m	89	Good	Fair	10-20 years	Very high	10.68	3.15		> 10%	14
275	Eucalyptus splendens	Apple Jack	Native	Semi mature	20m x 5m	53	Good	Fair	10-20 years	Very high	6.36	2.53		> 10%	15
276	Eucalyptus splendens	Apple Jack	Native	Semi mature	19m x 4m	29	Good	Fair	10-20 years	Medium	3.48	1.97		0%	0
277	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	22m x 3m	32	Good	Fair	10-20 years	Medium	3.84	2.05		0%	0
278	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	24m x 4m	49	Good	Fair	10-20 years	Medium	5.88	2.45		1-10%	1
279	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	26m x 7m	77	Good	Fair	10-20 years	Medium	9.24	2.97		0%	0
280	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	25m x 7m	88	Fair	Fair	10-20 years	High	10.56	3.14		0%	0
281	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	23m x 10m	92	Fair	Fair	10-20 years	Medium	11.04	3.20		1-10%	4
282	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	25m x 8m	149	Fair	Fair	10-20 years	Very high	15	3.91		1-10%	3
283	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	20m x 9m	73	Fair	Poor	10-20 years	Medium	8.76	2.90		> 10%	13
284	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	20m x 9m	59	Fair	Fair	20+ years	Medium	7.08	2.65		> 10%	27
285	Failed	Failed	Native	Failed	18m x 9m	60	Failed	Failed	Failed	Medium	7.2	2.67		Failed	0
286	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	24m x 9m	63	Good	Fair	20+ years	High	7.56	2.73		> 10%	11
287	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	22m x 5m	78	Poor	Poor	5-10 years	High	9.36	2.98		> 10%	15
288	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	18m x 3m	28	Good	Good	20+ years	Medium	3.36	1.94		0%	0

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289	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	25m x 3m	37	Good	Good	20+ years	Medium	4.44	2.18		0%	0
290	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	22m x 3m	33	Good	Good	20+ years	Medium	3.96	2.08		0%	0
291	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	20m x 6m	35	Good	Good	20+ years	Medium	4.2	2.13		0%	0
292	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	17m x 7m	104	Dead	Poor	0 years	Low	12.48	3.36		> 10%	12
293	Eucalyptus ovata	Swamp Gum	Indigenous	Semi mature	16m x 8m	55	Fair	Fair	0 years	Medium	6.6	2.57		1-10%	2
294	Failed	Failed	Native	Failed	23m x 5m	43	Failed	Failed	Failed	Medium	5.16	2.32		Failed	0
295	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	22m x 3m	35	Fair	Fair	0 years	Medium	4.2	2.13		0%	0
296	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	22m x 3m	32	Fair	Fair	0 years	Medium	3.84	2.05		0%	0
297	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	23m x 7m	36	Good	Good	0 years	High	4.32	2.15		0%	0
298	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	22m x 5m	66	Good	Fair	0 years	Medium	7.92	2.78		> 10%	15
299	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	20m x 5m	69	Poor	Poor	5-10 years	Low	8.28	2.83		1-10%	5
300	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	18m x 2m	29	Dead	Poor	0 years	Low	3.48	1.97		0%	0
301	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	24m x 9m	70	Fair	Fair	20+ years	Medium	8.4	2.85		0%	0
302	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	20m x 8m	65	Fair	Fair	10-20 years	High	7.8	2.76		0%	0
303	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	18m x 3m	26	Good	Fair	20+ years	Low	3.12	1.88		0%	0
304	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	20m x 12m	60	Good	Fair	20+ years	Medium	7.2	2.67		0%	0
305	Eucalyptus ovata	Swamp Gum	Indigenous	Semi mature	20m x 3m	25	Good	Fair	20+ years	Very high	3	1.85		0%	0
306	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	22m x 5m	50	Good	Fair	20+ years	High	6	2.47		0%	0
307	Failed	Failed	Native	Failed	22m x 3m	38	Failed	Failed	Failed	Medium	4.56	2.20		Failed	0
308	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	20m x 12m	84	Fair	Fair	10-20 years	Very high	10.08	3.08		0%	0
309	Failed	Failed	Native	Failed	21m x 1m	45	Failed	Failed	Failed	Low	5.4	2.37		Failed	0
310	Eucalyptus ovata	Swamp Gum	Indigenous	Semi mature	19m x 4m	27	Poor	Poor	5-10 years	Low	3.24	1.91		0%	0
311	Eucalyptus ovata	Swamp Gum	Indigenous	Semi mature	17m x 4m	38	Fair	Fair	1-5 years	Medium	4.56	2.20		0%	0
312	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	23m x 7m	66	Fair	Poor	20+ years	Medium	7.92	2.78		1-10%	2
313	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	19m x 5m	69	Fair	Fair	10-20 years	High	8.28	2.83		1-10%	3
314	Eucalyptus splendens	Apple Jack	Native	Semi mature	14m x 3m	37	Good	Fair	20+ years	Medium	4.44	2.18		0%	0
315	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	19m x 3m	38	Good	Fair	20+ years	Medium	4.56	2.20		0%	0
316	Eucalyptus splendens	Apple Jack	Native	Semi mature	25m x 7m	44	Good	Fair	20+ years	Medium	5.28	2.34		0%	0
317	Eucalyptus splendens	Apple Jack	Native	Semi mature	18m x 3m	37	Good	Fair	20+ years	Very high	4.44	2.18		0%	0
318	Eucalyptus ovata	Swamp Gum	Indigenous	Semi mature	7m x 1m	27	Good	Poor	5-10 years	Low	3.24	1.91		0%	0
319	Eucalyptus viminalis subsp. Cygnetensis	Rough-barked Manna Gum	Indigenous	Semi mature	16m x 3m	42	Poor	Poor	10-20 years	Low	5.04	2.30		0%	0
320	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	22m x 4m	45	Good	Good	20+ years	Medium	5.4	2.37		0%	0
321	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	18m x 12m	75	Fair	Fair	10-20 years	High	9	2.93		1-10%	9
322	Failed	Failed	Native	Failed	20m x 5m	51	Failed	Failed	Failed	Low	6.12	2.49		Failed	0
323	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	24m x 6m	54	Fair	Fair	10-20 years	Medium	6.48	2.55		1-10%	3
324	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	22m x 5m	48	Fair	Fair	10-20 years	Medium	5.76	2.43		0%	0

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325	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	20m x 5m	62	Fair	Poor	5-10 years	Medium	7.44	2.71		1-10%	5
326	Eucalyptus splendens	Apple Jack	Native	Mature	28m x 4m	69	Good	Good	20+ years	High	8.28	2.83		> 10%	13
327	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	26m x 5m	75	Poor	Fair	10-20 years	Medium	9	2.93		0%	0
328	Eucalyptus splendens	Apple Jack	Native	Mature	25m x 10m	59	Good	Fair	20+ years	High	7.08	2.65		0%	0
329	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	27m x 7m	69	Poor	Fair	10-20 years	Medium	8.28	2.83		0%	0
330	Failed	Failed	Native	Failed	24m x 7m	72	Failed	Failed	Failed	High	8.64	2.88		Failed	0
331	Failed	Failed	Native	Failed	20m x 5m	67	Failed	Failed	Failed	Medium	8.04	2.80		Failed	0
332	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	23m x 5m	40	Poor	Fair	10-20 years	Medium	4.8	2.25		0%	0
333	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	24m x 8m	74	Fair	Fair	20+ years	High	8.88	2.92		1-10%	1
334	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	26m x 9m	70	Fair	Fair	20+ years	High	8.4	2.85		0%	0
335	Failed	Failed	Native	Failed	28m x 9m	92	Failed	Failed	Failed	Very high	11.04	3.20		Failed	0
336	Failed	Failed	Native	Failed	18m x 5m	80	Failed	Failed	Failed	High	9.6	3.01		Failed	0
337	Eucalyptus splendens	Apple Jack	Native	Mature	24m x 5m	48	Good	Fair	20+ years	High	5.76	2.43		1-10%	3
338	Eucalyptus splendens	Apple Jack	Native	Mature	25m x 4m	53	Good	Fair	20+ years	High	6.36	2.53		1-10%	1
339	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	10m x 2m	21	Good	Fair	20+ years	Very high	2.52	1.72		0%	0
340	Eucalyptus splendens	Apple Jack	Native	Mature	20m x 3m	33	Good	Fair	20+ years	High	3.96	2.08		0%	0
341	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	20m x 3m	28	Good	Fair	20+ years	Low	3.36	1.94		0%	0
342	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	23m x 5m	36	Good	Fair	20+ years	Medium	4.32	2.15		0%	0
343	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	18m x 3m	33	Good	Fair	20+ years	Medium	3.96	2.08		0%	0
344	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	20m x 3m	33	Good	Fair	20+ years	Very high	3.96	2.08		1-10%	6
345	Acacia melanoxylon	Blackwood	Indigenous	Semi mature	24m x 3m	33	Good	Fair	20+ years	Medium	3.96	2.08		1-10%	1
346	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	25m x 3m	34	Good	Fair	20+ years	Very high	4.08	2.10		0%	0
347	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	23m x 3m	35	Good	Fair	20+ years	Medium	4.2	2.13		1-10%	1
348	Eucalyptus splendens	Apple Jack	Native	Mature	24m x 4m	42	Good	Fair	20+ years	Medium	5.04	2.30		1-10%	10
349	Eucalyptus splendens	Apple Jack	Native	Mature	26m x 5m	58	Good	Fair	20+ years	High	6.96	2.63		> 10%	13
350	Eucalyptus splendens	Apple Jack	Native	Mature	24m x 5m	47	Good	Fair	20+ years	High	5.64	2.41		> 10%	28
351	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	27m x 6m	91	Good	Fair	20+ years	High	10.92	3.18		> 10%	14
352	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	20m x 5m	41	Fair	Fair	20+ years	Medium	4.92	2.28		0%	0
353	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	18m x 2m	25	Fair	Fair	10-20 years	Medium	3	1.85		0%	0
354	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	22m x 5m	39	Fair	Fair	10-20 years	Medium	4.68	2.23		0%	0
355	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	25m x 4m	47	Good	Fair	20+ years	High	5.64	2.41		1-10%	1
356	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	25m x 4m	42	Good	Fair	20+ years	Medium	5.04	2.30		0%	0
357	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	18m x 4m	37	Good	Fair	20+ years	Medium	4.44	2.18		0%	0
358	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	23m x 7m	53	Good	Fair	20+ years	Medium	6.36	2.53		0%	0
359	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	24m x 14m	69	Good	Poor	20+ years	High	8.28	2.83		0%	0
360	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	18m x 4m	40	Good	Poor	10-20 years	Medium	4.8	2.25		0%	0

ID	Botanical Name	Common Name	Origin	Age	H x W	DBH (cm)	Health	Structure	ULE	Retention Value	TPZ (m radius)	SRZ (m radius)	Comments	Retain/ remove	Encroach. %
361	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	20m x 4m	30	Good	Fair	20+ years	Medium	3.6	2.00		0%	0
362	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	30m x 10m	73	Good	Fair	20+ years	High	8.76	2.90		1-10%	8
363	Eucalyptus splendens	Apple Jack	Native	Mature	25m x 3m	41	Good	Fair	20+ years	Medium	4.92	2.28		1-10%	1
364	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	26m x 3m	42	Good	Fair	20+ years	High	5.04	2.30		0%	0
365	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	28m x 7m	64	Good	Fair	20+ years	High	7.68	2.74		1-10%	4
366	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	32m x 10m	80	Good	Fair	20+ years	High	9.6	3.01		> 10%	18
367	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	30m x 9m	76	Good	Fair	20+ years	High	9.12	2.95		> 10%	18
368	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	26m x 5m	35	Good	Fair	20+ years	Very high	4.2	2.13		0%	0
369	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Young	16m x 3m	20	Good	Good	20+ years	Low	2.4	1.68		0%	0
370	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	26m x 3m	36	Fair	Fair	10-20 years	Low	4.32	2.15		0%	0
371	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	26m x 3m	53	Good	Fair	20+ years	Medium	6.36	2.53		0%	0
372	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	28m x 5m	45	Good	Fair	20+ years	High	5.4	2.37		0%	0
373	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	32m x 15m	92	Good	Fair	20+ years	High	11.04	3.20		0%	0
374	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	8m x 1m	100	Dead	Poor	0 years	Low	12	3.31		1-10%	7
375	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	24m x 7m	52	Fair	Fair	10-20 years	Medium	6.24	2.51		0%	0
376	Eucalyptus splendens	Apple Jack	Native	Mature	18m x 6m	46	Good	Fair	20+ years	Medium	5.52	2.39		0%	0
377	Eucalyptus splendens	Apple Jack	Native	Semi mature	15m x 3m	25	Good	Good	20+ years	Low	3	1.85		0%	0
378	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	23m x 7m	93	Poor	Poor	5-10 years	Low	11.16	3.21		0%	0
379	Eucalyptus splendens	Apple Jack	Native	Semi mature	20m x 4m	36	Good	Fair	20+ years	Medium	4.32	2.15		0%	0
380	Eucalyptus splendens	Apple Jack	Native	Semi mature	22m x 4m	37	Good	Fair	20+ years	Medium	4.44	2.18		0%	0
381	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	21m x 2m	27	Good	Fair	20+ years	Medium	3.24	1.91		0%	0
382	Eucalyptus splendens	Apple Jack	Native	Mature	23m x 7m	47	Good	Fair	20+ years	High	5.64	2.41		0%	0
383	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	28m x 12m	100	Good	Poor	10-20 years	High	12	3.31		1-10%	5
384	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	25m x 6m	47	Fair	Fair	20+ years	High	5.64	2.41		0%	0
385	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	24m x 20m	131	Fair	Poor	20+ years	High	15	3.71		1-10%	6
386	Eucalyptus splendens	Apple Jack	Native	Mature	24m x 6m	47	Fair	Fair	20+ years	High	5.64	2.41		1-10%	3
387	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	28m x 5m	47	Good	Fair	20+ years	High	5.64	2.41		1-10%	6
388	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	26m x 5m	54	Fair	Fair	20+ years	Medium	6.48	2.55		1-10%	10
389	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Young	20m x 3m	25	Poor	Fair	10-20 years	Low	3	1.85		0%	0
390	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	28m x 7m	56	Fair	Fair	20+ years	Medium	6.72	2.59		> 10%	11
391	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	27m x 3m	42	Fair	Fair	20+ years	High	5.04	2.30		1-10%	5
392	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	26m x 5m	54	Fair	Fair	20+ years	High	6.48	2.55		1-10%	9
393	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	25m x 9m	65	Fair	Fair	20+ years	High	7.8	2.76		1-10%	4
394	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	25m x 7m	60	Fair	Fair	20+ years	Medium	7.2	2.67		0%	0
395	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	24m x 4m	45	Fair	Fair	20+ years	Medium	5.4	2.37		0%	0
396	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	16m x 1m	21	Fair	Fair	20+ years	Low	2.52	1.72		0%	0

ID	Botanical Name	Common Name	Origin	Age	H x W	DBH (cm)	Health	Structure	ULE	Retention Value	TPZ (m radius)	SRZ (m radius)	Comments	Retain/ remove	Encroach. %
397	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	26m x 7m	46	Fair	Fair	20+ years	Medium	5.52	2.39		0%	0
398	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	26m x 6m	46	Fair	Fair	20+ years	Medium	5.52	2.39		0%	0
399	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	25m x 7m	45	Good	Fair	20+ years	Medium	5.4	2.37		0%	0
400	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	22m x 3m	35	Good	Fair	10-20 years	Medium	4.2	2.13		0%	0
401	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	26m x 6m	43	Good	Fair	20+ years	High	5.16	2.32		0%	0
402	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	30m x 9m	58	Good	Fair	20+ years	High	6.96	2.63		1-10%	6
403	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	25m x 7m	47	Good	Fair	20+ years	High	5.64	2.41		0%	0
404	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	28m x 7m	65	Good	Fair	20+ years	High	7.8	2.76		0%	0
405	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	22m x 6m	44	Good	Fair	20+ years	Medium	5.28	2.34		1-10%	1
406	Eucalyptus viminalis subsp. Cygnetensis	Rough-barked Manna Gum	Indigenous	Semi mature	18m x 2m	30	Good	Fair	20+ years	Medium	3.6	2.00		0%	0
407	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	18m x 6m	53	Good	Fair	20+ years	Medium	6.36	2.53		1-10%	1
408	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	24m x 6m	100	Fair	Fair	10-20 years	High	12	3.31		1-10%	1
409	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	22m x 12m	64	Good	Fair	20+ years	High	7.68	2.74		1-10%	2
410	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	24m x 7m	53	Good	Fair	20+ years	High	6.36	2.53		0%	0
411	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	24m x 6m	56	Good	Fair	20+ years	High	6.72	2.59		0%	0
412	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Young	16m x 3m	22	Good	Good	20+ years	Low	2.64	1.75		0%	0
413	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	20m x 3m	35	Good	Good	20+ years	Low	4.2	2.13		0%	0
414	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	20m x 3m	39	Good	Fair	20+ years	Very high	4.68	2.23		0%	0
415	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	18m x 14m	27	Good	Fair	20+ years	Medium	3.24	1.91		0%	0
416	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	30m x 15m	134	Good	Fair	20+ years	Very high	15	3.74		> 10%	22
417	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Young	16m x 3m	25	Good	Good	20+ years	Low	3	1.85		0%	0
418	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	30m x 18m	77	Good	Fair	20+ years	Medium	9.24	2.97		1-10%	1
419	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	25m x 9m	62	Fair	Fair	20+ years	High	7.44	2.71		> 10%	14
420	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	35m x 6m	68	Fair	Fair	20+ years	High	8.16	2.81		1-10%	2
421	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	35m x 12m	84	Fair	Fair	20+ years	Very high	10.08	3.08		> 10%	11
422	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	35m x 10m	79	Fair	Fair	20+ years	High	9.48	3.00		0%	0
423	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	28m x 4m	53	Fair	Fair	20+ years	High	6.36	2.53		1-10%	6
424	Eucalyptus viminalis subsp. Cygnetensis	Rough-barked Manna Gum	Indigenous	Semi mature	12m x 5m	40	Poor	Poor	5-10 years	Medium	4.8	2.25		0%	0
425	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	18m x 2m	20	Poor	Poor	5-10 years	Low	2.4	1.68		0%	0
426	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	28m x 5m	53	Good	Fair	20+ years	Very high	6.36	2.53		0%	0
427	Eucalyptus viminalis subsp. Cygnetensis	Rough-barked Manna Gum	Indigenous	Mature	28m x 5m	47	Good	Fair	20+ years	Medium	5.64	2.41		1-10%	1
428	Eucalyptus falciformis	Western Peppermint	Indigenous	Young	15m x 1m	14	Poor	Poor	5-10 years	Low	2	1.50		0%	0
429	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	30m x 5m	41	Fair	Fair	20+ years	Medium	4.92	2.28		0%	0
430	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	28m x 5m	45	Fair	Fair	20+ years	Medium	5.4	2.37		0%	0
431	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	26m x 5m	28	Good	Fair	20+ years	Medium	3.36	1.94		0%	0
432	Eucalyptus splendens	Apple Jack	Native	Mature	23m x 7m	46	Good	Fair	20+ years	High	5.52	2.39		0%	0

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433	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	26m x 12m	71	Good	Fair	20+ years	High	8.52	2.87		1-10%	4
434	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	24m x 6m	42	Good	Fair	20+ years	Medium	5.04	2.30		0%	0
435	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	16m x 7m	100	Fair	Poor	10-20 years	Medium	12	3.31		> 10%	13
436	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	18m x 2m	22	Fair	Fair	20+ years	Medium	2.64	1.75		0%	0
437	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	14m x 1m	17	Poor	Good	20+ years	Very high	2.04	1.57		0%	0
438	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	20m x 4m	33	Fair	Fair	10-20 years	Medium	3.96	2.08		0%	0
439	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	38m x 14m	82	Good	Fair	20+ years	Very high	9.84	3.04		1-10%	2
440	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	28m x 6m	55	Good	Fair	20+ years	High	6.6	2.57		1-10%	2
441	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	28m x 10m	72	Good	Fair	20+ years	Very high	8.64	2.88		0%	0
442	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	28m x 14m	74	Good	Fair	20+ years	Very high	8.88	2.92		1-10%	6
443	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	25m x 5m	32	Good	Fair	20+ years	Medium	3.84	2.05		0%	0
444	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	32m x 10m	64	Good	Fair	20+ years	Very high	7.68	2.74		1-10%	6
445	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	32m x 8m	74	Good	Good	20+ years	Very high	8.88	2.92		0%	0
446	Eucalyptus splendens	Apple Jack	Native	Mature	28m x 12m	89	Fair	Fair	10-20 years	High	10.68	3.15		> 10%	15
447	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	32m x 8m	65	Good	Fair	20+ years	High	7.8	2.76		1-10%	8
448	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	28m x 7m	51	Good	Fair	20+ years	High	6.12	2.49		0%	0
449	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	28m x 5m	51	Good	Fair	20+ years	High	6.12	2.49		1-10%	4
450	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	26m x 3m	34	Good	Fair	20+ years	Medium	4.08	2.10		0%	0
451	Eucalyptus viminalis subsp. Cygnetensis	Rough-barked Manna Gum	Indigenous	Semi mature	24m x 5m	56	Good	Fair	20+ years	High	6.72	2.59		1-10%	6
452	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	26m x 3m	34	Good	Fair	20+ years	Medium	4.08	2.10		0%	0
453	Eucalyptus splendens	Apple Jack	Native	Semi mature	24m x 5m	43	Good	Fair	20+ years	High	5.16	2.32		1-10%	4
454	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	24m x 5m	43	Good	Fair	20+ years	Medium	5.16	2.32		1-10%	5
455	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	28m x 10m	93	Fair	Fair	10-20 years	High	11.16	3.21		> 10%	18
456	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	20m x 4m	75	Fair	Poor	10-20 years	Medium	9	2.93		> 10%	16
457	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	26m x 6m	44	Fair	Fair	20+ years	High	5.28	2.34		0%	0
458	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	32m x 16m	82	Fair	Fair	20+ years	Very high	9.84	3.04		> 10%	16
459	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	22m x 9m	62	Fair	Fair	20+ years	Medium	7.44	2.71		> 10%	12
460	Eucalyptus ovata	Swamp Gum	Indigenous	Mature	25m x 5m	53	Fair	Fair	20+ years	High	6.36	2.53		> 10%	26
461	Eucalyptus splendens	Apple Jack	Native	Mature	27m x 7m	74	Fair	Fair	20+ years	High	8.88	2.92		> 10%	13
462	Eucalyptus splendens	Apple Jack	Native	Mature	28m x 7m	63	Good	Fair	20+ years	High	7.56	2.73		1-10%	10
463	Eucalyptus ovata	Swamp Gum	Indigenous	Mature	20m x 3m	41	Poor	Fair	20+ years	Medium	4.92	2.28		0%	0
464	Eucalyptus ovata	Swamp Gum	Indigenous	Mature	26m x 5m	56	Fair	Fair	20+ years	High	6.72	2.59		1-10%	6
465	Eucalyptus ovata	Swamp Gum	Indigenous	Semi mature	16m x 3m	31	Poor	Fair	10-20 years	Low	3.72	2.02		0%	0
466	Eucalyptus ovata	Swamp Gum	Indigenous	Mature	24m x 8m	49	Fair	Fair	10-20 years	High	5.88	2.45		1-10%	4
467	Eucalyptus ovata	Swamp Gum	Indigenous	Mature	27m x 4m	50	Fair	Fair	10-20 years	High	6	2.47		1-10%	2
468	Eucalyptus ovata	Swamp Gum	Indigenous	Mature	24m x 4m	38	Fair	Fair	10-20 years	Medium	4.56	2.20		0%	0

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469	Eucalyptus ovata	Swamp Gum	Indigenous	Mature	20m x 5m	56	Fair	Poor	5-10 years	Medium	6.72	2.59		> 10%	18
470	Eucalyptus ovata	Swamp Gum	Indigenous	Mature	25m x 5m	72	Fair	Fair	20+ years	Very high	8.64	2.88		> 10%	12
471	Eucalyptus ovata	Swamp Gum	Indigenous	Mature	20m x 5m	44	Fair	Fair	20+ years	Medium	5.28	2.34		> 10%	19
472	Eucalyptus ovata	Swamp Gum	Indigenous	Mature	25m x 12m	75	Fair	Fair	20+ years	High	9	2.93		1-10%	3
473	Eucalyptus ovata	Swamp Gum	Indigenous	Mature	18m x 4m	39	Fair	Poor	20+ years	Medium	4.68	2.23		0%	0
474	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	5m x 2m	36	Fair	Poor	5-10 years	Low	4.32	2.15		0%	0
475	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	23m x 8m	39	Good	Fair	20+ years	Medium	4.68	2.23		0%	0
476	Eucalyptus splendens	Apple Jack	Native	Mature	28m x 7m	54	Good	Good	20+ years	High	6.48	2.55		> 10%	18
477	Eucalyptus ovata	Swamp Gum	Indigenous	Mature	22m x 5m	45	Fair	Fair	20+ years	High	5.4	2.37		> 10%	26
478	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	36m x 14m	94	Good	Fair	20+ years	High	11.28	3.22		> 10%	17
479	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	25m x 5m	41	Good	Fair	20+ years	High	4.92	2.28		0%	0
480	Eucalyptus splendens	Apple Jack	Native	Semi mature	23m x 5m	39	Good	Fair	20+ years	Medium	4.68	2.23		0%	0
481	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	24m x 5m	44	Good	Fair	20+ years	High	5.28	2.34		0%	0
482	Eucalyptus splendens	Apple Jack	Native	Mature	24m x 6m	89	Good	Fair	20+ years	High	10.68	3.15		> 10%	14
483	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	25m x 20m	108	Fair	Poor	20+ years	Very high	12.96	3.42		> 10%	18
484	Eucalyptus splendens	Apple Jack	Native	Mature	27m x 9m	57	Good	Fair	20+ years	High	6.84	2.61		> 10%	26
485	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	25m x 5m	49	Good	Fair	20+ years	High	5.88	2.45		> 10%	18
486	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	25m x 5m	39	Good	Fair	20+ years	High	4.68	2.23		1-10%	5
487	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	20m x 3m	43	Good	Fair	20+ years	Medium	5.16	2.32		> 10%	17
488	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	22m x 4m	38	Good	Fair	20+ years	Medium	4.56	2.20		> 10%	14
489	Eucalyptus splendens	Apple Jack	Native	Mature	20m x 4m	42	Good	Fair	20+ years	Medium	5.04	2.30		0%	0
490	Eucalyptus splendens	Apple Jack	Native	Mature	22m x 6m	54	Good	Fair	20+ years	Medium	6.48	2.55		0%	0
491	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	21m x 4m	33	Good	Fair	20+ years	Medium	3.96	2.08		0%	0
492	Eucalyptus splendens	Apple Jack	Native	Semi mature	24m x 3m	46	Good	Fair	20+ years	Medium	5.52	2.39		0%	0
493	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	24m x 7m	56	Good	Fair	20+ years	High	6.72	2.59		1-10%	2
494	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	28m x 9m	68	Good	Fair	20+ years	High	8.16	2.81		> 10%	12
495	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	28m x 4m	43	Good	Fair	20+ years	Medium	5.16	2.32		0%	0
496	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	25m x 4m	40	Good	Fair	20+ years	Medium	4.8	2.25		> 10%	11
497	Eucalyptus splendens	Apple Jack	Native	Semi mature	23m x 3m	39	Good	Fair	20+ years	Medium	4.68	2.23		1-10%	7
498	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	28m x 3m	43	Good	Fair	20+ years	Medium	5.16	2.32		> 10%	17
499	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	25m x 3m	27	Good	Fair	20+ years	Medium	3.24	1.91		1-10%	2
500	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	28m x 5m	48	Good	Fair	20+ years	Medium	5.76	2.43		1-10%	5
501	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	25m x 5m	35	Fair	Fair	10-20 years	Medium	4.2	2.13		1-10%	4
502	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	13m x 4m	74	Poor	Fair	5-10 years	Medium	8.88	2.92		> 10%	19
503	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	18m x 3m	26	Fair	Fair	10-20 years	Medium	3.12	1.88		0%	0
504	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	27m x 5m	46	Good	Fair	20+ years	High	5.52	2.39		0%	0

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505	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	35m x 7m	135	Fair	Poor	5-10 years	Low	15	3.75		> 10%	17
506	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	32m x 12m	93	Fair	Poor	5-10 years	Low	11.16	3.21		> 10%	13
507	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	27m x 4m	51	Fair	Fair	10-20 years	Medium	6.12	2.49		0%	0
508	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	32m x 8m	57	Good	Fair	20+ years	High	6.84	2.61		0%	0
509	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	27m x 5m	53	Good	Fair	20+ years	High	6.36	2.53		0%	0
510	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	30m x 9m	77	Fair	Fair	20+ years	High	9.24	2.97		1-10%	3
511	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	20m x 2m	23	Fair	Fair	20+ years	Medium	2.76	1.79		0%	0
512	Eucalyptus splendens	Apple Jack	Native	Mature	27m x 5m	53	Fair	Fair	20+ years	Medium	6.36	2.53		0%	0
513	Eucalyptus splendens	Apple Jack	Native	Semi mature	25m x 3m	32	Good	Good	20+ years	Medium	3.84	2.05		0%	0
514	Eucalyptus splendens	Apple Jack	Native	Mature	28m x 7m	49	Good	Fair	20+ years	High	5.88	2.45		0%	0
515	Eucalyptus splendens	Apple Jack	Native	Mature	23m x 7m	62	Good	Fair	20+ years	Medium	7.44	2.71		0%	0
516	Eucalyptus splendens	Apple Jack	Native	Mature	18m x 7m	46	Good	Fair	20+ years	Medium	5.52	2.39		0%	0
517	Eucalyptus splendens	Apple Jack	Native	Mature	28m x 18m	110	Good	Fair	20+ years	High	13.2	3.44		1-10%	1
518	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	25m x 8m	73	Fair	Fair	20+ years	High	8.76	2.90		0%	0
519	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	30m x 8m	55	Good	Fair	20+ years	High	6.6	2.57		0%	0
520	Eucalyptus splendens	Apple Jack	Native	Mature	27m x 7m	48	Good	Fair	20+ years	High	5.76	2.43		1-10%	5
521	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	26m x 5m	102	Fair	Fair	10-20 years	High	12.24	3.34		1-10%	8
522	Eucalyptus ovata	Swamp Gum	Indigenous	Mature	26m x 8m	53	Fair	Fair	20+ years	Medium	6.36	2.53		1-10%	5
523	Eucalyptus ovata	Swamp Gum	Indigenous	Semi mature	22m x 3m	30	Fair	Fair	20+ years	Medium	3.6	2.00		0%	0
524	Eucalyptus ovata	Swamp Gum	Indigenous	Semi mature	24m x 3m	35	Fair	Fair	20+ years	Medium	4.2	2.13		0%	0
525	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	26m x 4m	50	Dead	Poor	0 years	Low	6	2.47		0%	0
526	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	20m x 3m	30	Good	Fair	20+ years	Medium	3.6	2.00		0%	0
527	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	23m x 3m	31	Good	Fair	20+ years	Low	3.72	2.02		0%	0
528	Eucalyptus ovata	Swamp Gum	Indigenous	Mature	26m x 3m	52	Fair	Fair	10-20 years	Medium	6.24	2.51		1-10%	1
529	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	27m x 3m	37	Good	Good	20+ years	Medium	4.44	2.18		0%	0
530	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	29m x 5m	44	Good	Fair	20+ years	Medium	5.28	2.34		0%	0
531	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	25m x 6m	37	Good	Fair	20+ years	High	4.44	2.18		0%	0
532	Eucalyptus splendens	Apple Jack	Native	Mature	30m x 16m	113	Good	Fair	20+ years	Very high	13.56	3.48		0%	0
533	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	23m x 4m	31	Good	Fair	20+ years	Medium	3.72	2.02		0%	0
534	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	27m x 4m	37	Good	Fair	20+ years	Medium	4.44	2.18		0%	0
535	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	27m x 4m	50	Good	Fair	20+ years	Very high	6	2.47		0%	0
536	Eucalyptus falciformis	Western Peppermint	Indigenous	Young	17m x 1m	17	Good	Good	20+ years	Low	2.04	1.57		0%	0
537	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	26m x 9m	46	Good	Fair	20+ years	Medium	5.52	2.39		0%	0
538	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	27m x 5m	42	Good	Fair	20+ years	Medium	5.04	2.30		0%	0
539	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	16m x 1m	24	Fair	Poor	5-10 years	Low	2.88	1.82		0%	0
540	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	29m x 4m	67	Fair	Fair	20+ years	High	8.04	2.80		> 10%	11

ID	Botanical Name	Common Name	Origin	Age	H x W	DBH (cm)	Health	Structure	ULE	Retention Value	TPZ (m radius)	SRZ (m radius)	Comments	Retain/ remove	Encroach. %
541	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	30m x 14m	70	Good	Fair	20+ years	High	8.4	2.85		1-10%	6
542	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	18m x 2m	23	Good	Fair	20+ years	Low	2.76	1.79		0%	0
543	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	29m x 14m	79	Good	Fair	20+ years	High	9.48	3.00		1-10%	8
544	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	27m x 10m	57	Good	Fair	20+ years	High	6.84	2.61		1-10%	2
545	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	28m x 10m	69	Good	Fair	20+ years	High	8.28	2.83		1-10%	5
546	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	28m x 5m	37	Good	Fair	20+ years	High	4.44	2.18		0%	0
547	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	25m x 3m	37	Fair	Poor	20+ years	Medium	4.44	2.18		0%	0
548	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	14m x 3m	51	Dead	Poor	0 years	Low	6.12	2.49		1-10%	3
549	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	32m x 7m	76	Good	Fair	20+ years	Very high	9.12	2.95		1-10%	6
550	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	32m x 5m	46	Good	Fair	20+ years	High	5.52	2.39		0%	0
551	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	22m x 14m	35	Good	Fair	20+ years	Medium	4.2	2.13		0%	0
552	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	32m x 10m	45	Good	Fair	20+ years	High	5.4	2.37		0%	0
553	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	22m x 3m	29	Good	Fair	20+ years	Medium	3.48	1.97		0%	0
554	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	22m x 5m	39	Good	Fair	20+ years	High	4.68	2.23		0%	0
555	Eucalyptus splendens	Apple Jack	Native	Mature	22m x 5m	76	Poor	Poor	5-10 years	Low	9.12	2.95		> 10%	12
556	Eucalyptus splendens	Apple Jack	Native	Mature	25m x 5m	50	Good	Fair	20+ years	High	6	2.47		0%	0
557	Eucalyptus splendens	Apple Jack	Native	Mature	28m x 5m	62	Good	Fair	20+ years	High	7.44	2.71		> 10%	24
558	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Young	29m x 3m	26	Good	Good	20+ years	Low	3.12	1.88		0%	0
559	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	30m x 4m	52	Good	Good	20+ years	High	6.24	2.51		1-10%	7
560	Eucalyptus splendens	Apple Jack	Native	Semi mature	24m x 3m	39	Good	Good	20+ years	Medium	4.68	2.23		1-10%	5
561	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	27m x 4m	47	Good	Good	20+ years	High	5.64	2.41		1-10%	1
562	Eucalyptus splendens	Apple Jack	Native	Mature	28m x 5m	80	Fair	Fair	20+ years	Very high	9.6	3.01		> 10%	13
563	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	28m x 5m	51	Good	Fair	20+ years	High	6.12	2.49		0%	0
564	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	28m x 5m	81	Dead	Poor	0 years	Low	9.72	3.03		> 10%	19
565	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	28m x 9m	78	Good	Fair	20+ years	Very high	9.36	2.98		1-10%	7
566	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	25m x 5m	52	Good	Fair	20+ years	High	6.24	2.51		1-10%	6
567	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	25m x 8m	108	Dead	Poor	0 years	Low	12.96	3.42		1-10%	8
568	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	32m x 7m	80	Good	Fair	20+ years	High	9.6	3.01		> 10%	13
569	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	22m x 7m	44	Fair	Fair	10-20 years	Medium	5.28	2.34		0%	0
570	Eucalyptus splendens	Apple Jack	Native	Mature	25m x 7m	52	Good	Fair	20+ years	High	6.24	2.51		1-10%	10
571	Eucalyptus splendens	Apple Jack	Native	Mature	24m x 12m	90	Fair	Fair	10-20 years	Very high	10.8	3.17		> 10%	28
572	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	30m x 10m	93	Fair	Fair	20+ years	High	11.16	3.21		> 10%	25
573	Eucalyptus splendens	Apple Jack	Native	Mature	22m x 5m	48	Good	Fair	20+ years	High	5.76	2.43		0%	0
574	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	24m x 5m	99	Dead	Poor	0 years	Low	11.88	3.30		1-10%	1
575	Eucalyptus splendens	Apple Jack	Native	Semi mature	22m x 3m	39	Fair	Fair	20+ years	Medium	4.68	2.23		1-10%	1
576	Eucalyptus splendens	Apple Jack	Native	Semi mature	22m x 5m	49	Fair	Fair	20+ years	Medium	5.88	2.45		1-10%	1

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577	Eucalyptus splendens	Apple Jack	Native	Semi mature	20m x 3m	42	Fair	Fair	10-20 years	Very high	5.04	2.30		1-10%	1
578	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	20m x 3m	45	Fair	Fair	10-20 years	Medium	5.4	2.37		0%	0
579	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	24m x 6m	87	Poor	Fair	10-20 years	High	10.44	3.12		1-10%	3
580	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	22m x 25m	79	Poor	Fair	20+ years	High	9.48	3.00		1-10%	10
581	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	25m x 28m	90	Fair	Fair	20+ years	High	10.8	3.17		> 10%	11
582	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	23m x 3m	44	Good	Fair	20+ years	High	5.28	2.34		1-10%	7
583	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	25m x 5m	37	Good	Fair	20+ years	Medium	4.44	2.18		0%	0
584	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	23m x 5m	37	Good	Fair	20+ years	Medium	4.44	2.18		0%	0
585	Eucalyptus splendens	Apple Jack	Native	Mature	28m x 9m	125	Fair	Fair	20+ years	Very high	15	3.63		> 10%	17
586	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	15m x 3m	26	Good	Fair	20+ years	Low	3.12	1.88		0%	0
587	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	15m x 2m	25	Good	Fair	20+ years	Medium	3	1.85		0%	0
588	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	15m x 2m	24	Good	Fair	20+ years	Very high	2.88	1.82		0%	0
589	Eucalyptus splendens	Apple Jack	Native	Mature	22m x 5m	54	Good	Fair	20+ years	High	6.48	2.55		1-10%	8
590	Eucalyptus splendens	Apple Jack	Native	Semi mature	18m x 3m	29	Good	Fair	20+ years	Medium	3.48	1.97		0%	0
591	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	25m x 3m	67	Fair	Fair	20+ years	Medium	8.04	2.80		0%	0
592	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	15m x 2m	20	Good	Good	20+ years	Low	2.4	1.68		0%	0
593	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	22m x 7m	65	Fair	Fair	20+ years	Medium	7.8	2.76		1-10%	5
594	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	20m x 3m	50	Fair	Fair	20+ years	Medium	6	2.47		1-10%	1
595	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	23m x 5m	45	Good	Good	20+ years	Medium	5.4	2.37		0%	0
596	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	23m x 5m	39	Good	Good	20+ years	Medium	4.68	2.23		0%	0
597	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	32m x 10m	94	Good	Fair	20+ years	Very high	11.28	3.22		> 10%	21
598	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	22m x 2m	33	Fair	Fair	20+ years	Medium	3.96	2.08		0%	0
599	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	22m x 3m	28	Good	Good	20+ years	Medium	3.36	1.94		0%	0
600	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	23m x 6m	44	Good	Fair	20+ years	Medium	5.28	2.34		1-10%	2
601	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	20m x 3m	29	Good	Fair	20+ years	Medium	3.48	1.97		0%	0
602	Eucalyptus splendens	Apple Jack	Native	Mature	20m x 10m	53	Good	Fair	20+ years	High	6.36	2.53		1-10%	1
603	Eucalyptus splendens	Apple Jack	Native	Semi mature	10m x 1m	27	Fair	Poor	5-10 years	Low	3.24	1.91		0%	0
604	Eucalyptus splendens	Apple Jack	Native	Semi mature	22m x 7m	44	Good	Fair	20+ years	High	5.28	2.34		1-10%	1
605	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	28m x 8m	97	Fair	Fair	20+ years	High	11.64	3.27		1-10%	10
606	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	14m x 2m	30	Good	Fair	10-20 years	Medium	3.6	2.00		0%	0
607	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	26m x 9m	72	Good	Good	20+ years	High	8.64	2.88		1-10%	7
608	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	18m x 3m	35	Fair	Fair	20+ years	Medium	4.2	2.13		0%	0
609	Eucalyptus splendens	Apple Jack	Native	Semi mature	20m x 3m	32	Good	Fair	20+ years	Medium	3.84	2.05		0%	0
610	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	25m x 5m	60	Fair	Fair	20+ years	High	7.2	2.67		> 10%	20
611	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	28m x 10m	90	Fair	Fair	20+ years	Very high	10.8	3.17		1-10%	1
612	Eucalyptus splendens	Apple Jack	Native	Mature	25m x 14m	96	Fair	Fair	20+ years	Very high	11.52	3.25		> 10%	25

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613	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	24m x 7m	80	Fair	Fair	20+ years	Very high	9.6	3.01		0%	0
614	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	22m x 12m	105	Fair	Very poor	10-20 years	Medium	12.6	3.38		> 10%	18
615	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	20m x 8m	58	Fair	Fair	20+ years	Medium	6.96	2.63		0%	0
616	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	24m x 12m	67	Good	Good	20+ years	High	8.04	2.80		1-10%	3
617	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	18m x 3m	34	Poor	Fair	10-20 years	Low	4.08	2.10		0%	0
618	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	24m x 5m	46	Good	Fair	20+ years	High	5.52	2.39		0%	0
619	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	14m x 3m	39	Poor	Fair	10-20 years	Low	4.68	2.23		0%	0
620	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	25m x 9m	61	Fair	Fair	20+ years	High	7.32	2.69		0%	0
621	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	25m x 14m	86	Good	Fair	20+ years	High	10.32	3.11		> 10%	11
622	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	24m x 18m	97	Fair	Fair	20+ years	High	11.64	3.27		> 10%	15
623	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	22m x 7m	68	Fair	Poor	10-20 years	Medium	8.16	2.81		1-10%	4
624	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	22m x 7m	52	Good	Fair	20+ years	High	6.24	2.51		0%	0
625	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	25m x 5m	58	Good	Good	20+ years	High	6.96	2.63		1-10%	10
626	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	25m x 4m	40	Good	Good	20+ years	High	4.8	2.25		0%	0
627	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	24m x 5m	41	Good	Good	20+ years	High	4.92	2.28		1-10%	6
628	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	27m x 5m	50	Good	Good	20+ years	High	6	2.47		1-10%	2
629	Eucalyptus splendens	Apple Jack	Native	Semi mature	18m x 5m	40	Good	Fair	20+ years	High	4.8	2.25		0%	0
630	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	28m x 15m	137	Fair	Fair	20+ years	Very high	15	3.78		> 10%	19
631	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	14m x 2m	28	Fair	Fair	20+ years	Medium	3.36	1.94		0%	0
632	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	24m x 12m	88	Fair	Fair	20+ years	High	10.56	3.14		1-10%	5
633	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	14m x 2m	21	Fair	Fair	20+ years	Medium	2.52	1.72		0%	0
634	Failed	Failed	Native	Failed	6m x 1m	23	Failed	Failed	Failed	Low	2.76	1.79		Failed	0
635	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	18m x 5m	40	Good	Good	20+ years	Medium	4.8	2.25		> 10%	17
636	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	20m x 5m	40	Good	Good	20+ years	Medium	4.8	2.25		0%	0
637	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	27m x 12m	94	Good	Good	20+ years	Very high	11.28	3.22		> 10%	16
638	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	30m x 12m	86	Good	Good	20+ years	High	10.32	3.11		1-10%	2
639	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	37m x 8m	75	Good	Fair	20+ years	High	9	2.93		1-10%	2
640	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	18m x 5m	33	Good	Fair	20+ years	Medium	3.96	2.08		0%	0
641	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	20m x 5m	40	Fair	Fair	10-20 years	Medium	4.8	2.25		0%	0
642	Eucalyptus splendens	Apple Jack	Native	Semi mature	22m x 3m	40	Fair	Fair	10-20 years	Very high	4.8	2.25		0%	0
643	Eucalyptus splendens	Apple Jack	Native	Semi mature	18m x 5m	43	Fair	Fair	10-20 years	Medium	5.16	2.32		0%	0
644	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	20m x 5m	36	Fair	Poor	5-10 years	Low	4.32	2.15		0%	0
645	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	18m x 15m	64	Fair	Fair	20+ years	Medium	7.68	2.74		> 10%	15
646	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	26m x 10m	88	Good	Fair	20+ years	Very high	10.56	3.14		0%	0
647	Eucalyptus splendens	Apple Jack	Native	Semi mature	18m x 5m	41	Good	Fair	20+ years	Medium	4.92	2.28		0%	0
648	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	25m x 8m	104	Fair	Fair	10-20 years	Very high	12.48	3.36		> 10%	13

ID	Botanical Name	Common Name	Origin	Age	H x W	DBH (cm)	Health	Structure	ULE	Retention Value	TPZ (m radius)	SRZ (m radius)	Comments	Retain/ remove	Encroach. %
649	Eucalyptus splendens	Apple Jack	Native	Mature	28m x 14m	128	Fair	Fair	20+ years	Very high	15	3.67		1-10%	10
650	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	18m x 5m	38	Good	Good	10-20 years	Medium	4.56	2.20		0%	0
651	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	26m x 5m	90	Fair	Fair	20+ years	High	10.8	3.17		> 10%	20
652	Eucalyptus splendens	Apple Jack	Native	Semi mature	27m x 5m	58	Good	Good	20+ years	High	6.96	2.63		1-10%	8
653	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	27m x 7m	68	Fair	Fair	20+ years	High	8.16	2.81		1-10%	3
654	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	27m x 7m	67	Good	Fair	20+ years	High	8.04	2.80		1-10%	3
655	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	28m x 7m	55	Good	Fair	20+ years	High	6.6	2.57		> 10%	18
656	Eucalyptus splendens	Apple Jack	Native	Semi mature	18m x 6m	41	Good	Fair	20+ years	Medium	4.92	2.28		0%	0
657	Eucalyptus splendens	Apple Jack	Native	Semi mature	27m x 5m	51	Good	Fair	20+ years	High	6.12	2.49		0%	0
658	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	24m x 5m	76	Poor	Poor	5-10 years	Medium	9.12	2.95		> 10%	12
659	Eucalyptus splendens	Apple Jack	Native	Semi mature	18m x 3m	30	Good	Fair	20+ years	Low	3.6	2.00		0%	0
660	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	26m x 8m	88	Fair	Fair	20+ years	High	10.56	3.14		1-10%	3
661	Eucalyptus splendens	Apple Jack	Native	Mature	24m x 5m	46	Fair	Fair	20+ years	High	5.52	2.39		0%	0
662	Eucalyptus splendens	Apple Jack	Native	Semi mature	18m x 5m	39	Good	Fair	20+ years	Medium	4.68	2.23		0%	0
663	Eucalyptus splendens	Apple Jack	Native	Semi mature	27m x 15m	116	Fair	Poor	10-20 years	Very high	13.92	3.52		> 10%	19
664	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	18m x 6m	129	Dead	Poor	0 years	Low	15	3.68		> 10%	14
665	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	27m x 14m	91	Fair	Fair	20+ years	High	10.92	3.18		1-10%	9
666	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	20m x 3m	59	Dead	Poor	0 years	Low	7.08	2.65		> 10%	15
667	Eucalyptus splendens	Apple Jack	Native	Semi mature	24m x 3m	41	Good	Good	20+ years	Medium	4.92	2.28		0%	0
668	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	22m x 3m	32	Good	Good	20+ years	Low	3.84	2.05		0%	0
669	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	25m x 6m	71	Good	Fair	20+ years	Medium	8.52	2.87		> 10%	13
670	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	22m x 6m	82	Dead	Poor	0 years	Low	9.84	3.04		1-10%	4
671	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	9m x 1m	15	Fair	Fair	20+ years	Medium	2	1.50		0%	0
672	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	14m x 2m	16	Fair	Fair	20+ years	Low	2	1.53		0%	0
673	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	18m x 2m	22	Fair	Fair	20+ years	Medium	2.64	1.75		0%	0
674	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	18m x 2m	22	Fair	Fair	20+ years	Medium	2.64	1.75		0%	0
675	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	20m x 2m	27	Fair	Fair	20+ years	Medium	3.24	1.91		0%	0
676	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	24m x 4m	79	Fair	Fair	20+ years	High	9.48	3.00		> 10%	17
677	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	15m x 3m	28	Good	Good	20+ years	Medium	3.36	1.94		0%	0
678	Eucalyptus splendens	Apple Jack	Native	Mature	24m x 9m	78	Fair	Fair	20+ years	Medium	9.36	2.98		> 10%	11
679	Eucalyptus splendens	Apple Jack	Native	Mature	28m x 15m	83	Good	Fair	20+ years	Very high	9.96	3.06		1-10%	10
680	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	18m x 3m	34	Good	Good	20+ years	Medium	4.08	2.10		0%	0
681	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	20m x 9m	77	Good	Fair	20+ years	Medium	9.24	2.97		1-10%	1
682	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	20m x 7m	67	Fair	Fair	10-20 years	High	8.04	2.80		0%	0
683	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	23m x 5m	70	Fair	Poor	20+ years	High	8.4	2.85		0%	0
684	Eucalyptus splendens	Apple Jack	Native	Mature	22m x 10m	65	Good	Good	20+ years	High	7.8	2.76		0%	0

ID	Botanical Name	Common Name	Origin	Age	H x W	DBH (cm)	Health	Structure	ULE	Retention Value	TPZ (m radius)	SRZ (m radius)	Comments	Retain/ remove	Encroach. %
685	Eucalyptus splendens	Apple Jack	Native	Semi mature	20m x 3m	41	Good	Fair	20+ years	Medium	4.92	2.28		0%	0
686	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	22m x 4m	55	Good	Fair	20+ years	Low	6.6	2.57		1-10%	6
687	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	20m x 4m	32	Good	Fair	20+ years	Medium	3.84	2.05		0%	0
688	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	22m x 7m	46	Good	Fair	20+ years	Medium	5.52	2.39		0%	0
689	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	22m x 5m	41	Good	Fair	20+ years	Medium	4.92	2.28		0%	0
690	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	18m x 3m	51	Dead	Poor	0 years	Low	6.12	2.49		0%	0
691	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	18m x 3m	32	Good	Fair	20+ years	Medium	3.84	2.05		0%	0
692	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	20m x 9m	111	Poor	Fair	20+ years	High	13.32	3.46		> 10%	28
693	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	20m x 5m	54	Good	Fair	20+ years	High	6.48	2.55		1-10%	8
694	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	15m x 15m	42	Good	Fair	20+ years	High	5.04	2.30		0%	0
695	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	20m x 3m	44	Good	Good	20+ years	Medium	5.28	2.34		0%	0
696	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	14m x 2m	50	Poor	Poor	5-10 years	Low	6	2.47		1-10%	2
697	Eucalyptus splendens	Apple Jack	Native	Mature	25m x 8m	56	Good	Fair	20+ years	High	6.72	2.59		1-10%	1
698	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	23m x 8m	55	Good	Fair	20+ years	Very high	6.6	2.57		1-10%	3
699	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	24m x 4m	42	Fair	Fair	20+ years	Medium	5.04	2.30		0%	0
700	Eucalyptus splendens	Apple Jack	Native	Mature	24m x 8m	74	Fair	Fair	20+ years	Very high	8.88	2.92		1-10%	4
701	Eucalyptus splendens	Apple Jack	Native	Mature	18m x 3m	43	Fair	Fair	10-20 years	Medium	5.16	2.32		0%	0
702	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	18m x 3m	53	Fair	Fair	10-20 years	Very high	6.36	2.53		0%	0
703	Eucalyptus splendens	Apple Jack	Native	Mature	20m x 10m	59	Fair	Fair	10-20 years	Very high	7.08	2.65		1-10%	4
704	Eucalyptus splendens	Apple Jack	Native	Mature	20m x 3m	45	Good	Fair	20+ years	High	5.4	2.37		1-10%	8
705	Eucalyptus splendens	Apple Jack	Native	Mature	23m x 7m	59	Good	Fair	20+ years	High	7.08	2.65		> 10%	20
706	Eucalyptus splendens	Apple Jack	Native	Mature	22m x 7m	58	Good	Fair	20+ years	High	6.96	2.63		> 10%	19
707	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	22m x 16m	68	Good	Fair	20+ years	High	8.16	2.81		0%	0
708	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	26m x 6m	56	Good	Fair	20+ years	High	6.72	2.59		0%	0
709	Eucalyptus splendens	Apple Jack	Native	Mature	25m x 8m	62	Good	Fair	20+ years	Medium	7.44	2.71		0%	0
710	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	20m x 7m	49	Good	Fair	20+ years	High	5.88	2.45		0%	0
711	Eucalyptus ovata	Swamp Gum	Indigenous	Semi mature	15m x 3m	38	Poor	Poor	5-10 years	Low	4.56	2.20		0%	0
712	Eucalyptus splendens	Apple Jack	Native	Mature	30m x 15m	86	Good	Fair	20+ years	Very high	10.32	3.11		> 10%	11
713	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	10m x 2m	25	Fair	Fair	10-20 years	Low	3	1.85		0%	0
714	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	20m x 14m	78	Fair	Fair	10-20 years	High	9.36	2.98		1-10%	2
715	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	20m x 18m	73	Fair	Poor	20+ years	High	8.76	2.90		1-10%	2
716	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	22m x 18m	64	Good	Fair	20+ years	High	7.68	2.74		0%	0
717	Eucalyptus splendens	Apple Jack	Native	Mature	25m x 12m	70	Good	Fair	20+ years	High	8.4	2.85		0%	0
718	Eucalyptus splendens	Apple Jack	Native	Mature	18m x 10m	111	Poor	Fair	10-20 years	High	13.32	3.46		> 10%	28
719	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	18m x 3m	39	Fair	Fair	10-20 years	Medium	4.68	2.23		0%	0
720	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	20m x 4m	54	Poor	Fair	10-20 years	Low	6.48	2.55		0%	0

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721	Failed	Failed	Native	Failed	20m x 6m	54	Failed	Failed	Failed	High	6.48	2.55		Failed	0
722	Eucalyptus splendens	Apple Jack	Native	Semi mature	10m x 2m	46	Poor	Poor	5-10 years	Low	5.52	2.39		0%	0
723	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	7m x 12m	47	Dead	Poor	0 years	Low	5.64	2.41		0%	0
724	Eucalyptus splendens	Apple Jack	Native	Mature	20m x 7m	48	Good	Fair	20+ years	High	5.76	2.43		0%	0
725	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	22m x 5m	33	Good	Good	20+ years	Medium	3.96	2.08		0%	0
726	Eucalyptus splendens	Apple Jack	Native	Mature	24m x 8m	55	Good	Good	20+ years	High	6.6	2.57		0%	0
727	Eucalyptus splendens	Apple Jack	Native	Mature	25m x 14m	123	Poor	Fair	10-20 years	Very high	14.76	3.61		1-10%	4
728	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	25m x 12m	56	Good	Good	20+ years	High	6.72	2.59		0%	0
729	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	25m x 10m	55	Good	Good	20+ years	High	6.6	2.57		0%	0
730	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	25m x 8m	76	Poor	Poor	5-10 years	Low	9.12	2.95		0%	0
731	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	18m x 15m	123	Fair	Fair	20+ years	Very high	14.76	3.61		> 10%	18
732	Eucalyptus splendens	Apple Jack	Native	Mature	24m x 6m	53	Good	Fair	20+ years	High	6.36	2.53		1-10%	4
733	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	25m x 7m	66	Good	Fair	20+ years	High	7.92	2.78		1-10%	4
734	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	28m x 8m	75	Fair	Fair	20+ years	High	9	2.93		> 10%	15
735	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	22m x 3m	32	Good	Good	20+ years	Medium	3.84	2.05		0%	0
736	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	22m x 3m	38	Good	Good	20+ years	Medium	4.56	2.20		0%	0
737	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	27m x 6m	57	Good	Good	20+ years	High	6.84	2.61		0%	0
738	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	25m x 3m	35	Fair	Fair	10-20 years	Medium	4.2	2.13		0%	0
739	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	23m x 5m	43	Good	Fair	20+ years	Medium	5.16	2.32		0%	0
740	Eucalyptus splendens	Apple Jack	Native	Semi mature	20m x 7m	49	Fair	Fair	20+ years	Medium	5.88	2.45		0%	0
741	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	28m x 5m	53	Good	Fair	20+ years	High	6.36	2.53		0%	0
742	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	17m x 3m	44	Good	Fair	20+ years	Medium	5.28	2.34		0%	0
743	Eucalyptus splendens	Apple Jack	Native	Semi mature	24m x 3m	40	Good	Fair	20+ years	Medium	4.8	2.25		0%	0
744	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	26m x 5m	57	Good	Fair	20+ years	Medium	6.84	2.61		1-10%	3
745	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	27m x 6m	65	Fair	Poor	10-20 years	Medium	7.8	2.76		0%	0
746	Eucalyptus splendens	Apple Jack	Native	Mature	26m x 10m	81	Good	Good	20+ years	Very high	9.72	3.03		1-10%	5
747	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	27m x 14m	108	Good	Fair	20+ years	Very high	12.96	3.42		1-10%	10
748	Eucalyptus splendens	Apple Jack	Native	Mature	26m x 5m	61	Good	Fair	20+ years	High	7.32	2.69		1-10%	2
749	Eucalyptus splendens	Apple Jack	Native	Mature	27m x 4m	65	Good	Fair	20+ years	Medium	7.8	2.76		1-10%	6
750	Eucalyptus splendens	Apple Jack	Native	Mature	27m x 15m	56	Good	Fair	20+ years	High	6.72	2.59		0%	0
751	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	24m x 3m	32	Fair	Fair	20+ years	Medium	3.84	2.05		0%	0
752	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	28m x 12m	82	Good	Fair	20+ years	Very high	9.84	3.04		0%	0
753	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	23m x 8m	55	Good	Good	20+ years	High	6.6	2.57		0%	0
754	Failed	Failed	Native	Failed	23m x 8m	120	Failed	Failed	Failed	Low	14.4	3.57		Failed	0
755	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	20m x 4m	36	Good	Fair	20+ years	Medium	4.32	2.15		0%	0
756	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	25m x 20m	94	Good	Fair	20+ years	High	11.28	3.22		1-10%	10

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757	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	18m x 3m	29	Fair	Fair	20+ years	Medium	3.48	1.97		0%	0
758	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	25m x 5m	52	Good	Good	20+ years	High	6.24	2.51		0%	0
759	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	25m x 6m	56	Good	Good	20+ years	Medium	6.72	2.59		1-10%	8
760	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	20m x 3m	38	Good	Fair	20+ years	Medium	4.56	2.20		> 10%	15
761	Eucalyptus splendens	Apple Jack	Native	Mature	22m x 4m	45	Good	Fair	20+ years	Medium	5.4	2.37		> 10%	25
762	Eucalyptus splendens	Apple Jack	Native	Mature	25m x 5m	54	Good	Fair	20+ years	Medium	6.48	2.55		> 10%	29
763	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	24m x 4m	52	Good	Fair	20+ years	Medium	6.24	2.51		1-10%	6
764	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	8m x 8m	69	Good	Fair	20+ years	High	8.28	2.83		> 10%	22
765	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	26m x 5m	42	Good	Fair	20+ years	Medium	5.04	2.30		1-10%	4
766	Eucalyptus splendens	Apple Jack	Native	Semi mature	14m x 3m	32	Good	Fair	20+ years	Medium	3.84	2.05		1-10%	1
767	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	28m x 7m	54	Good	Fair	20+ years	High	6.48	2.55		> 10%	23
768	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	28m x 14m	102	Good	Fair	20+ years	High	12.24	3.34		> 10%	25
769	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	28m x 8m	73	Good	Fair	20+ years	High	8.76	2.90		> 10%	12
770	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	18m x 3m	37	Good	Fair	20+ years	Low	4.44	2.18		1-10%	4
771	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	30m x 15m	146	Good	Fair	20+ years	Very high	15	3.88		> 10%	24
772	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	26m x 6m	85	Good	Fair	20+ years	High	10.2	3.09		> 10%	19
773	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	27m x 8m	72	Good	Fair	20+ years	High	8.64	2.88		1-10%	1
774	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	30m x 6m	67	Good	Fair	20+ years	High	8.04	2.80		> 10%	13
775	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	28m x 15m	89	Good	Fair	20+ years	High	10.68	3.15		1-10%	4
776	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	30m x 5m	65	Good	Good	20+ years	High	7.8	2.76		> 10%	19
777	Eucalyptus splendens	Apple Jack	Native	Semi mature	22m x 4m	44	Good	Good	20+ years	High	5.28	2.34		1-10%	7
778	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	30m x 5m	65	Good	Good	20+ years	High	7.8	2.76		1-10%	8
779	Eucalyptus splendens	Apple Jack	Native	Semi mature	18m x 3m	28	Fair	Fair	20+ years	Medium	3.36	1.94		0%	0
780	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	20m x 3m	34	Good	Fair	20+ years	Medium	4.08	2.10		0%	0
781	Eucalyptus splendens	Apple Jack	Native	Mature	38m x 5m	55	Good	Fair	20+ years	High	6.6	2.57		0%	0
782	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	25m x 5m	44	Good	Fair	20+ years	High	5.28	2.34		1-10%	4
783	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	6m x 5m	54	Good	Fair	20+ years	High	6.48	2.55		0%	0
784	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	24m x 7m	50	Good	Fair	20+ years	High	6	2.47		> 10%	14
785	Eucalyptus splendens	Apple Jack	Native	Mature	28m x 9m	54	Good	Fair	20+ years	High	6.48	2.55		1-10%	4
786	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	27m x 7m	67	Good	Fair	20+ years	High	8.04	2.80		> 10%	12
787	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	26m x 6m	54	Good	Fair	20+ years	Medium	6.48	2.55		0%	0
788	Eucalyptus splendens	Apple Jack	Native	Mature	32m x 14m	97	Good	Fair	20+ years	High	11.64	3.27		> 10%	25
789	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	18m x 4m	36	Good	Fair	20+ years	High	4.32	2.15		0%	0
790	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	26m x 3m	43	Good	Fair	20+ years	High	5.16	2.32		1-10%	7
791	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	28m x 7m	55	Good	Good	20+ years	High	6.6	2.57		1-10%	10
792	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	25m x 3m	23	Good	Good	20+ years	Medium	2.76	1.79		0%	0

ID	Botanical Name	Common Name	Origin	Age	H x W	DBH (cm)	Health	Structure	ULE	Retention Value	TPZ (m radius)	SRZ (m radius)	Comments	Retain/ remove	Encroach. %
793	Eucalyptus splendens	Apple Jack	Native	Mature	25m x 4m	42	Good	Good	20+ years	High	5.04	2.30		1-10%	5
794	Eucalyptus splendens	Apple Jack	Native	Semi mature	23m x 4m	32	Good	Fair	20+ years	High	3.84	2.05		0%	0
795	Eucalyptus splendens	Apple Jack	Native	Mature	28m x 12m	97	Good	Good	20+ years	High	11.64	3.27		> 10%	14
796	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	24m x 3m	35	Good	Good	20+ years	Medium	4.2	2.13		0%	0
797	Eucalyptus splendens	Apple Jack	Native	Mature	18m x 7m	52	Good	Good	20+ years	High	6.24	2.51		> 10%	12
798	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	22m x 7m	55	Good	Good	20+ years	High	6.6	2.57		1-10%	3
799	Eucalyptus ovata	Swamp Gum	Indigenous	Mature	18m x 18m	77	Good	Fair	20+ years	High	9.24	2.97		1-10%	6
800	Eucalyptus splendens	Apple Jack	Native	Semi mature	18m x 5m	42	Good	Good	20+ years	High	5.04	2.30		0%	0
801	Eucalyptus splendens	Apple Jack	Native	Mature	23m x 14m	105	Good	Fair	20+ years	High	12.6	3.38		> 10%	25
802	Eucalyptus splendens	Apple Jack	Native	Mature	20m x 6m	60	Good	Fair	20+ years	High	7.2	2.67		> 10%	13
803	Eucalyptus splendens	Apple Jack	Native	Mature	20m x 7m	50	Good	Fair	20+ years	High	6	2.47		0%	0
804	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	24m x 5m	121	Poor	Poor	10-20 years	Medium	14.52	3.59		> 10%	16
805	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	22m x 4m	54	Fair	Fair	20+ years	Medium	6.48	2.55		1-10%	2
806	Eucalyptus splendens	Apple Jack	Native	Mature	25m x 5m	54	Good	Good	20+ years	High	6.48	2.55		0%	0
807	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	24m x 5m	47	Good	Good	20+ years	High	5.64	2.41		0%	0
808	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	20m x 4m	44	Good	Fair	20+ years	Medium	5.28	2.34		0%	0
809	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	18m x 14m	65	Fair	Poor	10-20 years	Medium	7.8	2.76		1-10%	5
810	Eucalyptus splendens	Apple Jack	Native	Mature	26m x 20m	112	Good	Fair	20+ years	Very high	13.44	3.47		> 10%	23
811	Eucalyptus splendens	Apple Jack	Native	Mature	23m x 18m	72	Good	Fair	20+ years	High	8.64	2.88		1-10%	10
812	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	28m x 14m	91	Good	Fair	20+ years	Very high	10.92	3.18		> 10%	24
813	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	28m x 10m	67	Good	Fair	20+ years	High	8.04	2.80		> 10%	11
814	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	25m x 6m	50	Good	Fair	20+ years	High	6	2.47		1-10%	4
815	Eucalyptus splendens	Apple Jack	Native	Mature	18m x 5m	76	Good	Fair	20+ years	High	9.12	2.95		0%	0
816	Eucalyptus splendens	Apple Jack	Native	Mature	28m x 7m	108	Good	Fair	20+ years	Very high	12.96	3.42		1-10%	6
817	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	23m x 4m	34	Good	Good	20+ years	Low	4.08	2.10		0%	0
818	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	20m x 3m	41	Dead	Poor	0 years	Low	4.92	2.28		0%	0
819	Eucalyptus splendens	Apple Jack	Native	Semi mature	22m x 3m	45	Good	Fair	20+ years	Medium	5.4	2.37		0%	0
820	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	25m x 8m	78	Good	Fair	20+ years	High	9.36	2.98		1-10%	4
821	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	20m x 3m	35	Good	Fair	20+ years	Medium	4.2	2.13		0%	0
822	Eucalyptus splendens	Apple Jack	Native	Mature	19m x 9m	53	Good	Fair	20+ years	High	6.36	2.53		0%	0
823	Eucalyptus splendens	Apple Jack	Native	Semi mature	22m x 3m	46	Fair	Fair	20+ years	Medium	5.52	2.39		1-10%	2
824	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	16m x 3m	40	Poor	Poor	5-10 years	Low	4.8	2.25		0%	0
825	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	28m x 6m	68	Good	Good	20+ years	High	8.16	2.81		> 10%	14
826	Eucalyptus splendens	Apple Jack	Native	Mature	26m x 6m	54	Good	Fair	20+ years	High	6.48	2.55		1-10%	4
827	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	25m x 5m	64	Fair	Fair	20+ years	High	7.68	2.74		> 10%	13
828	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	28m x 10m	89	Good	Fair	20+ years	Very high	10.68	3.15		1-10%	10

ID	Botanical Name	Common Name	Origin	Age	H x W	DBH (cm)	Health	Structure	ULE	Retention Value	TPZ (m radius)	SRZ (m radius)	Comments	Retain/ remove	Encroach. %
829	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	14m x 2m	34	Good	Fair	20+ years	Medium	4.08	2.10		0%	0
830	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	26m x 10m	101	Fair	Fair	20+ years	Very high	12.12	3.32		1-10%	3
831	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	26m x 7m	55	Good	Fair	20+ years	Medium	6.6	2.57		1-10%	8
832	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	24m x 5m	49	Fair	Fair	20+ years	High	5.88	2.45		1-10%	1
833	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	20m x 3m	43	Fair	Good	20+ years	Medium	5.16	2.32		> 10%	13
834	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	20m x 7m	85	Fair	Fair	20+ years	High	10.2	3.09		> 10%	15
835	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	24m x 4m	47	Fair	Fair	20+ years	Medium	5.64	2.41		> 10%	14
836	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	27m x 5m	52	Fair	Fair	20+ years	Medium	6.24	2.51		1-10%	6
837	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	26m x 4m	37	Good	Good	20+ years	High	4.44	2.18		0%	0
838	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	25m x 3m	43	Good	Fair	20+ years	Medium	5.16	2.32		1-10%	2
839	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	28m x 9m	68	Good	Good	20+ years	Very high	8.16	2.81		> 10%	30
840	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	28m x 4m	43	Good	Good	20+ years	Medium	5.16	2.32		1-10%	8
841	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	28m x 8m	52	Fair	Fair	20+ years	High	6.24	2.51		> 10%	11
842	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	28m x 5m	54	Fair	Fair	20+ years	Medium	6.48	2.55		1-10%	5
843	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	28m x 5m	52	Fair	Fair	20+ years	High	6.24	2.51		1-10%	9
844	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	28m x 4m	55	Fair	Fair	20+ years	Medium	6.6	2.57		1-10%	6
845	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	26m x 10m	116	Fair	Fair	20+ years	Very high	13.92	3.52		> 10%	23
846	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	28m x 10m	114	Fair	Fair	20+ years	Very high	13.68	3.50		> 10%	18
847	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	28m x 7m	74	Good	Good	20+ years	High	8.88	2.92		> 10%	12
848	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	28m x 9m	117	Fair	Fair	20+ years	Very high	14.04	3.53		1-10%	4
849	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	26m x 3m	39	Good	Good	20+ years	Medium	4.68	2.23		0%	0
850	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	23m x 3m	55	Good	Good	20+ years	Medium	6.6	2.57		1-10%	1
851	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	30m x 12m	105	Good	Fair	20+ years	Very high	12.6	3.38		> 10%	19
852	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	30m x 8m	67	Good	Good	20+ years	High	8.04	2.80		1-10%	8
853	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	26m x 3m	40	Good	Good	20+ years	Medium	4.8	2.25		0%	0
854	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	28m x 5m	58	Good	Good	20+ years	High	6.96	2.63		1-10%	9
855	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	35m x 12m	107	Good	Good	20+ years	Very high	12.84	3.40		1-10%	10
856	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	22m x 5m	37	Good	Good	20+ years	Medium	4.44	2.18		0%	0
857	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	34m x 10m	86	Good	Good	20+ years	Very high	10.32	3.11		1-10%	10
858	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	23m x 6m	57	Fair	Fair	20+ years	Medium	6.84	2.61		> 10%	11
859	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	35m x 10m	107	Good	Fair	20+ years	Very high	12.84	3.40		> 10%	14
860	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	26m x 5m	48	Good	Good	20+ years	High	5.76	2.43		1-10%	1
861	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	28m x 7m	60	Good	Good	20+ years	Very high	7.2	2.67		0%	0
862	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	25m x 8m	71	Fair	Poor	5-10 years	Medium	8.52	2.87		1-10%	2
863	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	26m x 5m	54	Good	Fair	20+ years	Medium	6.48	2.55		0%	0
864	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	28m x 5m	54	Good	Fair	20+ years	Medium	6.48	2.55		1-10%	4

ID	Botanical Name	Common Name	Origin	Age	H x W	DBH (cm)	Health	Structure	ULE	Retention Value	TPZ (m radius)	SRZ (m radius)	Comments	Retain/ remove	Encroach. %
865	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	35m x 15m	120	Good	Fair	20+ years	Very high	14.4	3.57		> 10%	11
866	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	25m x 4m	41	Good	Good	20+ years	Medium	4.92	2.28		1-10%	1
867	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	28m x 10m	71	Fair	Fair	10-20 years	Medium	8.52	2.87		1-10%	5
868	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	34m x 8m	81	Fair	Fair	20+ years	Very high	9.72	3.03		1-10%	4
869	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	28m x 5m	51	Good	Good	20+ years	Medium	6.12	2.49		1-10%	3
870	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	28m x 5m	52	Good	Good	20+ years	High	6.24	2.51		0%	0
871	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	28m x 4m	46	Good	Good	20+ years	Medium	5.52	2.39		0%	0
872	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	30m x 7m	76	Good	Fair	20+ years	High	9.12	2.95		> 10%	15
873	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	28m x 7m	69	Good	Fair	20+ years	High	8.28	2.83		1-10%	4
874	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	28m x 3m	57	Good	Fair	20+ years	Medium	6.84	2.61		1-10%	1
875	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	28m x 9m	58	Good	Fair	20+ years	Medium	6.96	2.63		> 10%	15
876	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	30m x 5m	58	Good	Fair	20+ years	High	6.96	2.63		0%	0
877	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	34m x 10m	67	Good	Fair	20+ years	High	8.04	2.80		> 10%	17
878	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	34m x 14m	108	Good	Fair	20+ years	Very high	12.96	3.42		> 10%	15
879	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	40m x 10m	85	Good	Fair	20+ years	Very high	10.2	3.09		1-10%	9
880	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	40m x 14m	71	Good	Fair	20+ years	High	8.52	2.87		> 10%	11
881	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	38m x 24m	144	Good	Fair	20+ years	Very high	15	3.86	1m below GL	> 10%	24
882	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	20m x 2m	44	Fair	Fair	20+ years	Medium	5.28	2.34		0%	0
883	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	34m x 8m	73	Good	Fair	20+ years	High	8.76	2.90		1-10%	2
884	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	32m x 8m	71	Good	Fair	20+ years	High	8.52	2.87		1-10%	7
885	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	28m x 5m	69	Good	Fair	20+ years	Medium	8.28	2.83		1-10%	2
886	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	26m x 5m	44	Good	Fair	20+ years	High	5.28	2.34		0%	0
887	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	30m x 5m	62	Good	Fair	20+ years	High	7.44	2.71		1-10%	3
888	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	24m x 3m	39	Fair	Fair	20+ years	Medium	4.68	2.23		1-10%	4
889	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	25m x 5m	34	Good	Fair	20+ years	Medium	4.08	2.10		0%	0
890	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	30m x 7m	66	Good	Good	20+ years	High	7.92	2.78		1-10%	10
891	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	28m x 7m	49	Good	Good	20+ years	High	5.88	2.45		1-10%	10
892	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	30m x 5m	67	Good	Good	20+ years	High	8.04	2.80		1-10%	1
893	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	26m x 4m	42	Good	Good	20+ years	Medium	5.04	2.30		0%	0
894	Eucalyptus splendens	Apple Jack	Native	Semi mature	30m x 5m	60	Good	Good	20+ years	High	7.2	2.67		1-10%	7
895	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	34m x 9m	71	Good	Good	20+ years	High	8.52	2.87		> 10%	14
896	Eucalyptus splendens	Apple Jack	Native	Semi mature	20m x 5m	46	Fair	Fair	20+ years	Medium	5.52	2.39		> 10%	11
897	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	28m x 5m	41	Good	Fair	20+ years	Medium	4.92	2.28		> 10%	23
898	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	34m x 7m	67	Good	Fair	20+ years	Medium	8.04	2.80		1-10%	10
899	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	35m x 9m	78	Good	Fair	20+ years	Very high	9.36	2.98		> 10%	22
900	Eucalyptus splendens	Apple Jack	Native	Semi mature	26m x 7m	57	Good	Fair	20+ years	Medium	6.84	2.61		1-10%	4

ID	Botanical Name	Common Name	Origin	Age	H x W	DBH (cm)	Health	Structure	ULE	Retention Value	TPZ (m radius)	SRZ (m radius)	Comments	Retain/ remove	Encroach. %
901	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	32m x 7m	58	Good	Fair	20+ years	High	6.96	2.63		> 10%	12
902	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	28m x 8m	51	Fair	Fair	20+ years	Medium	6.12	2.49		1-10%	7
903	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	26m x 3m	58	Good	Fair	20+ years	Medium	6.96	2.63		> 10%	11
904	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	35m x 8m	84	Good	Fair	20+ years	High	10.08	3.08		> 10%	17
905	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	24m x 3m	38	Good	Fair	20+ years	Very high	4.56	2.20		0%	0
906	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	28m x 9m	60	Good	Fair	20+ years	Medium	7.2	2.67		> 10%	22
907	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	28m x 9m	78	Good	Fair	20+ years	Very high	9.36	2.98		> 10%	13
908	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	20m x 7m	44	Good	Fair	20+ years	Medium	5.28	2.34		0%	0
909	Eucalyptus splendens	Apple Jack	Native	Mature	24m x 20m	85	Good	Fair	20+ years	Very high	10.2	3.09		1-10%	5
910	Eucalyptus splendens	Apple Jack	Native	Mature	24m x 7m	57	Fair	Fair	20+ years	High	6.84	2.61		1-10%	2
911	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	24m x 3m	45	Good	Fair	20+ years	Medium	5.4	2.37		0%	0
912	Eucalyptus splendens	Apple Jack	Native	Mature	32m x 10m	88	Good	Fair	20+ years	High	10.56	3.14		0%	0
913	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	20m x 4m	39	Good	Good	20+ years	Medium	4.68	2.23		0%	0
914	Eucalyptus splendens	Apple Jack	Native	Mature	23m x 4m	45	Good	Good	20+ years	Medium	5.4	2.37		1-10%	1
915	Eucalyptus viminalis subsp. Cygnetensis	Rough-barked Manna Gum	Indigenous	Mature	38m x 12m	106	Good	Good	20+ years	High	12.72	3.39		1-10%	10
916	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	23m x 7m	75	Fair	Fair	20+ years	High	9	2.93		> 10%	14
917	Eucalyptus splendens	Apple Jack	Native	Mature	25m x 6m	58	Good	Fair	20+ years	Medium	6.96	2.63		> 10%	11
918	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	23m x 4m	42	Good	Fair	20+ years	Medium	5.04	2.30		1-10%	2
919	Eucalyptus splendens	Apple Jack	Native	Mature	20m x 9m	71	Good	Fair	20+ years	High	8.52	2.87		1-10%	10
920	Eucalyptus splendens	Apple Jack	Native	Mature	24m x 12m	70	Poor	Fair	5-10 years	Medium	8.4	2.85		> 10%	11
921	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	24m x 6m	63	Fair	Fair	20+ years	Medium	7.56	2.73		1-10%	5
922	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	20m x 5m	40	Good	Good	20+ years	Medium	4.8	2.25		0%	0
923	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	22m x 5m	92	Fair	Poor	10-20 years	High	11.04	3.20		1-10%	6
924	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	18m x 2m	38	Fair	Poor	10-20 years	Low	4.56	2.20		0%	0
925	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	22m x 14m	94	Fair	Fair	20+ years	Very high	11.28	3.22		> 10%	26
926	Eucalyptus splendens	Apple Jack	Native	Mature	20m x 5m	100	Fair	Poor	20+ years	High	12	3.31		> 10%	20
927	Eucalyptus ovata	Swamp Gum	Indigenous	Semi mature	12m x 5m	40	Fair	Poor	5-10 years	Low	4.8	2.25		0%	0
928	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	23m x 5m	54	Fair	Fair	20+ years	High	6.48	2.55		0%	0
929	Eucalyptus splendens	Apple Jack	Native	Mature	22m x 4m	64	Fair	Fair	20+ years	High	7.68	2.74		0%	0
930	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	22m x 7m	39	Fair	Fair	20+ years	Medium	4.68	2.23		0%	0
931	Eucalyptus splendens	Apple Jack	Native	Mature	20m x 6m	50	Good	Good	20+ years	Medium	6	2.47		1-10%	4
932	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	23m x 4m	47	Good	Fair	20+ years	Medium	5.64	2.41		0%	0
933	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	22m x 5m	96	Fair	Poor	10-20 years	Low	11.52	3.25		1-10%	7
934	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	26m x 6m	76	Fair	Poor	10-20 years	Medium	9.12	2.95		> 10%	19
935	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	28m x 5m	49	Good	Fair	20+ years	Medium	5.88	2.45		1-10%	5
936	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	28m x 5m	58	Good	Fair	20+ years	High	6.96	2.63		1-10%	7

ID	Botanical Name	Common Name	Origin	Age	H x W	DBH (cm)	Health	Structure	ULE	Retention Value	TPZ (m radius)	SRZ (m radius)	Comments	Retain/ remove	Encroach. %
937	Eucalyptus splendens	Apple Jack	Native	Semi mature	24m x 6m	59	Good	Fair	20+ years	High	7.08	2.65		1-10%	10
938	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	26m x 12m	102	Fair	Fair	10-20 years	Medium	12.24	3.34		1-10%	4
939	Eucalyptus viminalis subsp. Cygnetensis	Rough-barked Manna Gum	Indigenous	Mature	30m x 10m	98	Good	Fair	20+ years	High	11.76	3.28		> 10%	22
940	Eucalyptus splendens	Apple Jack	Native	Mature	24m x 9m	68	Good	Fair	20+ years	High	8.16	2.81		1-10%	3
941	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	25m x 4m	64	Fair	Poor	1-5 years	Low	7.68	2.74		1-10%	7
942	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	18m x 4m	37	Good	Good	20+ years	Medium	4.44	2.18		0%	0
943	Eucalyptus splendens	Apple Jack	Native	Mature	34m x 10m	108	Good	Fair	20+ years	Very high	12.96	3.42		1-10%	7
944	Eucalyptus splendens	Apple Jack	Native	Mature	22m x 5m	80	Good	Fair	20+ years	High	9.6	3.01		> 10%	16
945	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	22m x 3m	43	Dead	Poor	0 years	Low	5.16	2.32		1-10%	2
946	Eucalyptus splendens	Apple Jack	Native	Mature	40m x 9m	99	Good	Good	20+ years	Very high	11.88	3.30		1-10%	1
947	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	23m x 5m	54	Good	Good	20+ years	High	6.48	2.55		0%	0
948	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	22m x 3m	32	Good	Good	20+ years	Medium	3.84	2.05		0%	0
949	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	40m x 8m	92	Good	Fair	20+ years	Very high	11.04	3.20		> 10%	21
950	Eucalyptus splendens	Apple Jack	Native	Mature	30m x 12m	116	Good	Fair	20+ years	High	13.92	3.52		> 10%	26
951	Eucalyptus splendens	Apple Jack	Native	Mature	34m x 12m	86	Good	Fair	20+ years	High	10.32	3.11		0%	0
952	Eucalyptus splendens	Apple Jack	Native	Semi mature	25m x 3m	53	Good	Good	20+ years	Medium	6.36	2.53		1-10%	3
953	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	28m x 4m	53	Good	Good	20+ years	High	6.36	2.53		0%	0
954	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	28m x 3m	47	Good	Good	20+ years	Medium	5.64	2.41		1-10%	5
955	Eucalyptus splendens	Apple Jack	Native	Semi mature	26m x 5m	42	Good	Good	20+ years	Medium	5.04	2.30		0%	0
956	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	26m x 4m	47	Good	Fair	20+ years	Medium	5.64	2.41		0%	0
957	Eucalyptus splendens	Apple Jack	Native	Mature	38m x 7m	78	Good	Fair	20+ years	Very high	9.36	2.98		1-10%	5
958	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	35m x 7m	77	Good	Fair	20+ years	High	9.24	2.97		> 10%	11
959	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	40m x 5m	75	Dead	Poor	0 years	Low	9	2.93		> 10%	31
960	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	24m x 5m	56	Poor	Poor	5-10 years	Low	6.72	2.59		> 10%	24
961	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	40m x 7m	86	Fair	Fair	10-20 years	High	10.32	3.11		> 10%	30
962	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	23m x 5m	47	Good	Fair	20+ years	Medium	5.64	2.41		> 10%	17
963	Eucalyptus splendens	Apple Jack	Native	Mature	25m x 8m	65	Good	Fair	20+ years	High	7.8	2.76		1-10%	10
964	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	25m x 5m	48	Good	Good	20+ years	High	5.76	2.43		0%	0
965	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	28m x 3m	48	Good	Good	20+ years	Medium	5.76	2.43		1-10%	5
966	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	35m x 10m	97	Fair	Fair	20+ years	Very high	11.64	3.27		1-10%	1
967	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	28m x 4m	42	Good	Good	20+ years	Medium	5.04	2.30		0%	0
968	Eucalyptus splendens	Apple Jack	Native	Mature	26m x 7m	51	Good	Good	20+ years	High	6.12	2.49		1-10%	4
969	Eucalyptus splendens	Apple Jack	Native	Mature	38m x 14m	96	Good	Fair	20+ years	High	11.52	3.25		> 10%	15
970	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	45m x 15m	142	Fair	Fair	20+ years	Very high	15	3.83		> 10%	19
971	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	42m x 12m	110	Fair	Fair	20+ years	Very high	13.2	3.44		> 10%	21
972	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	28m x 4m	79	Poor	Poor	5-10 years	High	9.48	3.00		> 10%	14

ID	Botanical Name	Common Name	Origin	Age	H x W	DBH (cm)	Health	Structure	ULE	Retention Value	TPZ (m radius)	SRZ (m radius)	Comments	Retain/ remove	Encroach. %
973	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	26m x 5m	48	Fair	Fair	20+ years	High	5.76	2.43		0%	0
974	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	20m x 3m	56	Dead	Poor	0 years	Low	6.72	2.59		1-10%	7
975	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	28m x 8m	82	Good	Fair	20+ years	Very high	9.84	3.04		> 10%	12
976	Eucalyptus splendens	Apple Jack	Native	Semi mature	23m x 7m	70	Good	Fair	20+ years	Very high	8.4	2.85		> 10%	20
977	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	32m x 5m	51	Good	Good	20+ years	Medium	6.12	2.49		1-10%	4
978	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	26m x 5m	42	Good	Good	20+ years	Medium	5.04	2.30		1-10%	1
979	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	32m x 5m	52	Good	Good	20+ years	Medium	6.24	2.51		1-10%	1
980	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	32m x 7m	69	Good	Good	20+ years	High	8.28	2.83		> 10%	20
981	Eucalyptus splendens	Apple Jack	Native	Mature	23m x 6m	55	Good	Fair	20+ years	Medium	6.6	2.57		1-10%	9
982	Eucalyptus splendens	Apple Jack	Native	Mature	34m x 14m	64	Good	Fair	20+ years	High	7.68	2.74		> 10%	20
983	Eucalyptus splendens	Apple Jack	Native	Mature	35m x 6m	65	Good	Fair	20+ years	High	7.8	2.76		1-10%	5
984	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	32m x 9m	82	Good	Fair	20+ years	High	9.84	3.04		> 10%	12
985	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	42m x 12m	80	Good	Fair	20+ years	High	9.6	3.01		1-10%	6
986	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	28m x 3m	34	Good	Good	20+ years	Medium	4.08	2.10		1-10%	6
987	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	28m x 4m	54	Good	Good	20+ years	High	6.48	2.55		1-10%	9
988	Eucalyptus splendens	Apple Jack	Native	Mature	24m x 5m	64	Fair	Fair	20+ years	High	7.68	2.74		> 10%	11
989	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	26m x 5m	69	Good	Fair	20+ years	High	8.28	2.83		1-10%	5
990	Eucalyptus splendens	Apple Jack	Native	Mature	25m x 14m	56	Good	Fair	20+ years	High	6.72	2.59		1-10%	6
991	Eucalyptus splendens	Apple Jack	Native	Mature	28m x 7m	63	Good	Fair	20+ years	Very high	7.56	2.73		> 10%	27
992	Eucalyptus splendens	Apple Jack	Native	Semi mature	23m x 4m	43	Good	Good	20+ years	Medium	5.16	2.32		1-10%	5
993	Eucalyptus splendens	Apple Jack	Native	Semi mature	26m x 4m	50	Good	Fair	20+ years	Medium	6	2.47		0%	0
994	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	30m x 7m	74	Good	Fair	20+ years	Medium	8.88	2.92		0%	0
995	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	28m x 3m	41	Good	Good	20+ years	Medium	4.92	2.28		0%	0
996	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	30m x 5m	68	Good	Fair	20+ years	High	8.16	2.81		0%	0
997	Eucalyptus splendens	Apple Jack	Native	Mature	16m x 7m	47	Good	Fair	20+ years	Medium	5.64	2.41		0%	0
998	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	30m x 7m	70	Good	Fair	20+ years	High	8.4	2.85		1-10%	3
999	Eucalyptus splendens	Apple Jack	Native	Semi mature	28m x 3m	38	Good	Fair	20+ years	Medium	4.56	2.20		0%	0
1000	Eucalyptus splendens	Apple Jack	Native	Semi mature	28m x 2m	30	Good	Fair	20+ years	Medium	3.6	2.00		0%	0
1001	Eucalyptus splendens	Apple Jack	Native	Mature	25m x 7m	48	Good	Fair	20+ years	High	5.76	2.43		1-10%	7
1002	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	35m x 10m	88	Fair	Fair	20+ years	High	10.56	3.14		0%	0
1003	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	35m x 14m	109	Fair	Poor	5-10 years	Medium	13.08	3.43		> 10%	28
1004	Eucalyptus splendens	Apple Jack	Native	Semi mature	22m x 3m	26	Fair	Fair	20+ years	Medium	3.12	1.88		0%	0
1005	Eucalyptus splendens	Apple Jack	Native	Semi mature	20m x 3m	35	Fair	Fair	20+ years	Medium	4.2	2.13		0%	0
1006	Eucalyptus splendens	Apple Jack	Native	Semi mature	24m x 3m	43	Good	Fair	20+ years	Medium	5.16	2.32		0%	0
1007	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	38m x 6m	76	Good	Fair	20+ years	High	9.12	2.95		1-10%	3
1008	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	28m x 8m	97	Fair	Fair	20+ years	High	11.64	3.27		> 10%	16

ID	Botanical Name	Common Name	Origin	Age	H x W	DBH (cm)	Health	Structure	ULE	Retention Value	TPZ (m radius)	SRZ (m radius)	Comments	Retain/ remove	Encroach. %
1009	Eucalyptus splendens	Apple Jack	Native	Mature	38m x 14m	101	Good	Good	20+ years	Very high	12.12	3.32		> 10%	19
1010	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	40m x 4m	38	Good	Good	20+ years	Medium	4.56	2.20		0%	0
1011	Eucalyptus splendens	Apple Jack	Native	Mature	32m x 16m	122	Good	Fair	20+ years	High	14.64	3.60		> 10%	21
1012	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	25m x 8m	87	Fair	Poor	10-20 years	High	10.44	3.12		> 10%	12
1013	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	30m x 7m	77	Fair	Fair	20+ years	High	9.24	2.97		1-10%	3
1014	Eucalyptus ovata	Swamp Gum	Indigenous	Mature	29m x 6m	53	Good	Fair	20+ years	Medium	6.36	2.53		0%	0
1015	Eucalyptus ovata	Swamp Gum	Indigenous	Semi mature	29m x 4m	52	Good	Good	20+ years	High	6.24	2.51		1-10%	2
1016	Eucalyptus ovata	Swamp Gum	Indigenous	Mature	30m x 7m	70	Good	Good	20+ years	High	8.4	2.85		> 10%	15
1017	Acacia melanoxylon	Blackwood	Indigenous	Mature	27m x 4m	45	Good	Good	20+ years	Medium	5.4	2.37		1-10%	1
1018	Eucalyptus splendens	Apple Jack	Native	Mature	28m x 7m	65	Good	Good	20+ years	High	7.8	2.76		> 10%	19
1019	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	38m x 12m	138	Fair	Fair	20+ years	High	15	3.79		> 10%	19
1020	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	35m x 12m	98	Fair	Fair	20+ years	Very high	11.76	3.28		> 10%	15
1021	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	38m x 6m	88	Poor	Fair	20+ years	High	10.56	3.14		> 10%	13
1022	Eucalyptus splendens	Apple Jack	Native	Mature	20m x 3m	46	Fair	Fair	20+ years	Medium	5.52	2.39		1-10%	1
1023	Eucalyptus splendens	Apple Jack	Native	Semi mature	20m x 3m	46	Fair	Fair	20+ years	Medium	5.52	2.39		0%	0
1024	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	22m x 5m	38	Good	Good	20+ years	Medium	4.56	2.20		0%	0
1025	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	35m x 5m	65	Fair	Fair	20+ years	High	7.8	2.76		1-10%	4
1026	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	45m x 7m	145	Fair	Fair	20+ years	Very high	15	3.87		> 10%	25
1027	Eucalyptus splendens	Apple Jack	Native	Semi mature	28m x 5m	46	Fair	Fair	20+ years	Medium	5.52	2.39		> 10%	12
1028	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	34m x 4m	48	Good	Good	20+ years	High	5.76	2.43		0%	0
1029	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	32m x 6m	64	Good	Fair	20+ years	High	7.68	2.74		1-10%	4
1030	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	28m x 4m	43	Good	Fair	20+ years	High	5.16	2.32		0%	0
1031	Eucalyptus splendens	Apple Jack	Native	Mature	25m x 14m	103	Good	Fair	20+ years	High	12.36	3.35		> 10%	24
1032	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	35m x 8m	95	Good	Fair	20+ years	Very high	11.4	3.24		> 10%	15
1033	Eucalyptus splendens	Apple Jack	Native	Semi mature	26m x 3m	46	Poor	Fair	10-20 years	Medium	5.52	2.39		0%	0
1034	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	30m x 8m	74	Poor	Fair	10-20 years	Medium	8.88	2.92	1m aboive road	0%	0
1035	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	34m x 9m	65	Good	Fair	20+ years	High	7.8	2.76		1-10%	7
1036	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	25m x 8m	82	Fair	Fair	20+ years	High	9.84	3.04		1-10%	5
1037	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	16m x 5m	47	Fair	Fair	20+ years	Medium	5.64	2.41		0%	0
1038	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	28m x 14m	74	Good	Fair	20+ years	High	8.88	2.92		0%	0
1039	Eucalyptus splendens	Apple Jack	Native	Mature	20m x 7m	62	Good	Good	20+ years	Medium	7.44	2.71		1-10%	1
1040	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	28m x 9m	78	Poor	Fair	20+ years	High	9.36	2.98		0%	0
1041	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	26m x 5m	40	Good	Good	20+ years	Medium	4.8	2.25		0%	0
1042	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	32m x 5m	42	Good	Good	20+ years	Medium	5.04	2.30		0%	0
1043	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	24m x 12m	57	Fair	Fair	20+ years	Medium	6.84	2.61		1-10%	1
1044	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	35m x 6m	74	Good	Good	20+ years	High	8.88	2.92		1-10%	5

ID	Botanical Name	Common Name	Origin	Age	H x W	DBH (cm)	Health	Structure	ULE	Retention Value	TPZ (m radius)	SRZ (m radius)	Comments	Retain/ remove	Encroach. %
1045	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	32m x 5m	55	Good	Good	20+ years	High	6.6	2.57		0%	0
1046	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	38m x 10m	87	Good	Fair	20+ years	High	10.44	3.12		1-10%	8
1047	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	45m x 12m	74	Good	Fair	20+ years	High	8.88	2.92		> 10%	13
1048	Eucalyptus splendens	Apple Jack	Native	Mature	26m x 12m	59	Good	Fair	20+ years	High	7.08	2.65		> 10%	14
1049	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	35m x 8m	75	Good	Fair	20+ years	Medium	9	2.93		1-10%	10
1050	Eucalyptus ovata	Swamp Gum	Indigenous	Mature	28m x 5m	54	Good	Fair	20+ years	High	6.48	2.55		0%	0
1051	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	32m x 6m	64	Good	Fair	20+ years	High	7.68	2.74		1-10%	9
1052	Eucalyptus ovata	Swamp Gum	Indigenous	Mature	22m x 4m	48	Fair	Fair	10-20 years	Medium	5.76	2.43	1m below	0%	0
1053	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	28m x 6m	55	Poor	Fair	10-20 years	High	6.6	2.57		1-10%	2
1054	Eucalyptus ovata	Swamp Gum	Indigenous	Semi mature	20m x 3m	38	Good	Fair	20+ years	Medium	4.56	2.20		> 10%	18
1055	Acacia melanoxylon	Blackwood	Indigenous	Mature	26m x 5m	43	Good	Good	20+ years	Medium	5.16	2.32		0%	0
1056	Eucalyptus ovata	Swamp Gum	Indigenous	Mature	24m x 8m	82	Fair	Fair	10-20 years	High	9.84	3.04		> 10%	14
1057	Eucalyptus ovata	Swamp Gum	Indigenous	Mature	25m x 7m	65	Fair	Fair	10-20 years	High	7.8	2.76		1-10%	7
1058	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	15m x 10m	99	Poor	Poor	5-10 years	Medium	11.88	3.30		1-10%	9
1059	Eucalyptus ovata	Swamp Gum	Indigenous	Mature	25m x 9m	73	Fair	Fair	20+ years	High	8.76	2.90		1-10%	7
1060	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	20m x 10m	65	Good	Good	20+ years	High	7.8	2.76		1-10%	9
1061	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	23m x 9m	72	Good	Fair	20+ years	Medium	8.64	2.88		> 10%	15
1062	Eucalyptus splendens	Apple Jack	Native	Mature	18m x 3m	40	Fair	Fair	20+ years	Medium	4.8	2.25		1-10%	8
1063	Eucalyptus splendens	Apple Jack	Native	Mature	25m x 5m	47	Fair	Fair	20+ years	High	5.64	2.41		1-10%	8
1064	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	27m x 5m	48	Good	Fair	20+ years	High	5.76	2.43		> 10%	15
1065	Eucalyptus viminalis subsp. Cygnetensis	Rough-barked Manna Gum	Indigenous	Mature	23m x 5m	55	Good	Fair	20+ years	Medium	6.6	2.57		1-10%	10
1066	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	28m x 6m	64	Good	Fair	20+ years	High	7.68	2.74		> 10%	28
1067	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	30m x 6m	65	Good	Fair	20+ years	High	7.8	2.76		> 10%	32
1068	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	28m x 3m	36	Good	Good	20+ years	Medium	4.32	2.15		> 10%	12
1069	Eucalyptus splendens	Apple Jack	Native	Mature	27m x 8m	87	Fair	Fair	20+ years	High	10.44	3.12	1m below road	> 10%	24
1070	Eucalyptus splendens	Apple Jack	Native	Semi mature	18m x 3m	32	Fair	Fair	20+ years	Medium	3.84	2.05		> 10%	17
1071	Eucalyptus splendens	Apple Jack	Native	Semi mature	18m x 3m	47	Fair	Fair	20+ years	Medium	5.64	2.41		> 10%	19
1072	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	30m x 3m	38	Good	Good	20+ years	Medium	4.56	2.20		1-10%	6
1073	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	26m x 5m	48	Good	Good	20+ years	Medium	5.76	2.43		> 10%	13
1074	Eucalyptus splendens	Apple Jack	Native	Mature	27m x 8m	56	Good	Fair	20+ years	High	6.72	2.59		> 10%	20
1075	Eucalyptus splendens	Apple Jack	Native	Mature	27m x 7m	79	Good	Fair	20+ years	High	9.48	3.00		> 10%	29
1076	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	28m x 7m	84	Good	Fair	20+ years	High	10.08	3.08		> 10%	19
1077	Eucalyptus splendens	Apple Jack	Native	Mature	27m x 14m	107	Good	Fair	20+ years	Very high	12.84	3.40		> 10%	13
1078	Eucalyptus splendens	Apple Jack	Native	Mature	25m x 10m	49	Good	Fair	20+ years	Medium	5.88	2.45		> 10%	15
1079	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	35m x 5m	59	Good	Fair	20+ years	High	7.08	2.65		> 10%	12
1080	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	35m x 12m	90	Good	Fair	20+ years	High	10.8	3.17		> 10%	12

ID	Botanical Name	Common Name	Origin	Age	H x W	DBH (cm)	Health	Structure	ULE	Retention Value	TPZ (m radius)	SRZ (m radius)	Comments	Retain/ remove	Encroach. %
1081	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	40m x 8m	111	Good	Fair	20+ years	High	13.32	3.46		> 10%	28
1082	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	40m x 7m	94	Good	Fair	20+ years	High	11.28	3.22		> 10%	18
1083	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	36m x 5m	43	Good	Good	20+ years	Medium	5.16	2.32		0%	0
1084	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	40m x 6m	98	Good	Fair	20+ years	High	11.76	3.28		> 10%	20
1085	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	40m x 6m	68	Good	Fair	20+ years	High	8.16	2.81		1-10%	6
1086	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	38m x 7m	68	Good	Fair	20+ years	High	8.16	2.81		> 10%	17
1087	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	40m x 7m	70	Good	Fair	20+ years	High	8.4	2.85		1-10%	4
1088	Eucalyptus ovata	Swamp Gum	Indigenous	Mature	34m x 7m	65	Good	Fair	20+ years	High	7.8	2.76		0%	0
1089	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	35m x 6m	58	Good	Fair	20+ years	High	6.96	2.63		0%	0
1090	Eucalyptus ovata	Swamp Gum	Indigenous	Mature	34m x 6m	69	Good	Fair	20+ years	High	8.28	2.83		> 10%	16
1091	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	45m x 10m	138	Good	Fair	20+ years	High	15	3.79		> 10%	11
1092	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	34m x 4m	48	Good	Fair	20+ years	Medium	5.76	2.43		1-10%	1
1093	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	32m x 5m	43	Good	Fair	20+ years	Medium	5.16	2.32		> 10%	18
1094	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	32m x 5m	53	Good	Fair	20+ years	High	6.36	2.53		> 10%	27
1095	Eucalyptus splendens	Apple Jack	Native	Mature	40m x 7m	96	Good	Fair	20+ years	Medium	11.52	3.25		0%	0
1096	Eucalyptus splendens	Apple Jack	Native	Mature	32m x 4m	90	Good	Poor	20+ years	Medium	10.8	3.17		0%	0
1097	Eucalyptus splendens	Apple Jack	Native	Semi mature	20m x 5m	36	Fair	Fair	10-20 years	Medium	4.32	2.15		0%	0
1098	Eucalyptus splendens	Apple Jack	Native	Semi mature	27m x 5m	46	Fair	Fair	20+ years	Medium	5.52	2.39		0%	0
1099	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	30m x 6m	43	Good	Fair	20+ years	Medium	5.16	2.32		1-10%	1
1100	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	29m x 4m	38	Good	Fair	20+ years	Very high	4.56	2.20		0%	0
1101	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	29m x 5m	42	Good	Fair	20+ years	Medium	5.04	2.30		1-10%	3
1102	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	30m x 4m	44	Good	Fair	20+ years	High	5.28	2.34		1-10%	4
1103	Eucalyptus splendens	Apple Jack	Native	Semi mature	28m x 7m	68	Good	Fair	20+ years	Very high	8.16	2.81	1m above road	> 10%	16
1104	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	35m x 15m	110	Good	Fair	20+ years	Very high	13.2	3.44		> 10%	21
1105	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	36m x 12m	102	Good	Fair	20+ years	Very high	12.24	3.34		1-10%	8
1106	Eucalyptus ovata	Swamp Gum	Indigenous	Semi mature	27m x 4m	42	Fair	Fair	20+ years	Medium	5.04	2.30		0%	0
1107	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	40m x 12m	83	Good	Good	20+ years	High	9.96	3.06		1-10%	4
1108	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	35m x 6m	64	Fair	Fair	20+ years	High	7.68	2.74		> 10%	22
1109	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	32m x 5m	48	Fair	Fair	20+ years	Medium	5.76	2.43		> 10%	16
1110	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	38m x 9m	65	Good	Good	20+ years	High	7.8	2.76		1-10%	8
1111	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	38m x 7m	50	Good	Good	20+ years	Medium	6	2.47		0%	0
1112	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	34m x 4m	38	Good	Good	20+ years	Medium	4.56	2.20		0%	0
1113	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	36m x 5m	46	Good	Good	20+ years	Medium	5.52	2.39		0%	0
1114	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	42m x 9m	75	Good	Good	20+ years	High	9	2.93		0%	0
1115	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	38m x 5m	45	Good	Good	20+ years	Medium	5.4	2.37		0%	0
1116	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	38m x 7m	72	Good	Good	20+ years	High	8.64	2.88		> 10%	23

ID	Botanical Name	Common Name	Origin	Age	H x W	DBH (cm)	Health	Structure	ULE	Retention Value	TPZ (m radius)	SRZ (m radius)	Comments	Retain/ remove	Encroach. %
1117	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	38m x 4m	42	Good	Good	20+ years	Medium	5.04	2.30		0%	0
1118	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	27m x 7m	47	Fair	Fair	20+ years	Medium	5.64	2.41		0%	0
1119	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	35m x 12m	71	Fair	Fair	20+ years	High	8.52	2.87		1-10%	2
1120	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	25m x 4m	49	Fair	Fair	20+ years	Medium	5.88	2.45		0%	0
1121	Eucalyptus splendens	Apple Jack	Native	Semi mature	26m x 4m	47	Fair	Fair	20+ years	Medium	5.64	2.41		1-10%	5
1122	Eucalyptus splendens	Apple Jack	Native	Mature	28m x 6m	61	Good	Fair	20+ years	Medium	7.32	2.69		> 10%	11
1123	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	26m x 3m	37	Good	Good	20+ years	Medium	4.44	2.18		0%	0
1124	Failed	Failed	Native	Failed	15m x 4m	43	Failed	Failed	Failed	Low	5.16	2.32		Failed	0
1125	Eucalyptus splendens	Apple Jack	Native	Mature	18m x 12m	62	Fair	Fair	20+ years	High	7.44	2.71		1-10%	1
1126	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	38m x 7m	75	Fair	Fair	20+ years	High	9	2.93		> 10%	15
1127	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	28m x 4m	53	Fair	Fair	20+ years	Medium	6.36	2.53		1-10%	1
1128	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	38m x 16m	126	Fair	Poor	20+ years	Very high	15	3.65		> 10%	37
1129	Eucalyptus splendens	Apple Jack	Native	Mature	25m x 5m	41	Good	Fair	20+ years	Medium	4.92	2.28		0%	0
1130	Eucalyptus splendens	Apple Jack	Native	Mature	24m x 7m	60	Good	Fair	20+ years	Medium	7.2	2.67		0%	0
1131	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	37m x 8m	92	Fair	Fair	20+ years	Very high	11.04	3.20		> 10%	22
1132	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	36m x 10m	62	Fair	Fair	20+ years	Very high	7.44	2.71		1-10%	7
1133	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	34m x 14m	63	Good	Good	20+ years	Very high	7.56	2.73		0%	0
1134	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	26m x 3m	36	Fair	Fair	20+ years	Medium	4.32	2.15		0%	0
1135	Eucalyptus splendens	Apple Jack	Native	Semi mature	24m x 6m	58	Fair	Fair	20+ years	Medium	6.96	2.63		> 10%	13
1136	Eucalyptus splendens	Apple Jack	Native	Semi mature	28m x 5m	48	Fair	Fair	20+ years	Medium	5.76	2.43		1-10%	2
1137	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	26m x 7m	45	Fair	Fair	20+ years	Medium	5.4	2.37		1-10%	1
1138	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	26m x 5m	49	Good	Fair	20+ years	Medium	5.88	2.45		1-10%	2
1139	Eucalyptus splendens	Apple Jack	Native	Semi mature	18m x 6m	45	Good	Fair	20+ years	Medium	5.4	2.37		1-10%	1
1140	Eucalyptus splendens	Apple Jack	Native	Mature	28m x 5m	72	Good	Fair	20+ years	High	8.64	2.88		> 10%	13
1141	Eucalyptus splendens	Apple Jack	Native	Semi mature	22m x 5m	50	Good	Good	20+ years	Medium	6	2.47		1-10%	2
1142	Eucalyptus splendens	Apple Jack	Native	Mature	34m x 7m	63	Good	Good	20+ years	High	7.56	2.73		> 10%	15
1143	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	28m x 6m	46	Fair	Good	20+ years	High	5.52	2.39		1-10%	7
1144	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	35m x 7m	62	Good	Fair	20+ years	High	7.44	2.71		> 10%	12
1145	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	35m x 5m	44	Good	Fair	20+ years	High	5.28	2.34		> 10%	12
1146	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	34m x 5m	43	Good	Fair	20+ years	Medium	5.16	2.32		1-10%	2
1147	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	36m x 5m	58	Good	Fair	20+ years	High	6.96	2.63		> 10%	19
1148	Eucalyptus splendens	Apple Jack	Native	Mature	22m x 5m	45	Poor	Fair	10-20 years	Medium	5.4	2.37		1-10%	7
1149	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	32m x 5m	39	Poor	Fair	10-20 years	Medium	4.68	2.23		1-10%	8
1150	Eucalyptus splendens	Apple Jack	Native	Mature	25m x 20m	58	Fair	Fair	20+ years	Medium	6.96	2.63		> 10%	17
1151	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	35m x 7m	56	Good	Fair	20+ years	High	6.72	2.59		1-10%	5
1152	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	35m x 7m	55	Fair	Fair	20+ years	Medium	6.6	2.57		1-10%	8

ID	Botanical Name	Common Name	Origin	Age	H x W	DBH (cm)	Health	Structure	ULE	Retention Value	TPZ (m radius)	SRZ (m radius)	Comments	Retain/ remove	Encroach. %
1153	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	34m x 12m	79	Fair	Fair	20+ years	High	9.48	3.00		> 10%	12
1154	Eucalyptus splendens	Apple Jack	Native	Mature	32m x 6m	65	Fair	Fair	20+ years	High	7.8	2.76		1-10%	10
1155	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	32m x 5m	57	Good	Fair	20+ years	High	6.84	2.61		1-10%	10
1156	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	32m x 5m	59	Good	Fair	20+ years	High	7.08	2.65		> 10%	11
1157	Eucalyptus splendens	Apple Jack	Native	Mature	28m x 12m	67	Good	Fair	20+ years	Medium	8.04	2.80		> 10%	16
1158	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	32m x 7m	45	Good	Fair	20+ years	High	5.4	2.37		0%	0
1159	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	34m x 7m	61	Good	Fair	20+ years	High	7.32	2.69		> 10%	12
1160	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	36m x 7m	86	Good	Fair	20+ years	High	10.32	3.11		> 10%	21
1161	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	35m x 8m	59	Fair	Fair	20+ years	High	7.08	2.65		1-10%	8
1162	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	25m x 10m	78	Poor	Poor	5-10 years	Medium	9.36	2.98		1-10%	10
1163	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	20m x 15m	64	Fair	Poor	10-20 years	High	7.68	2.74		0%	0
1164	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	34m x 9m	64	Fair	Fair	20+ years	High	7.68	2.74		1-10%	3
1165	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	20m x 7m	39	Fair	Fair	20+ years	Medium	4.68	2.23		0%	0
1166	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	32m x 8m	53	Fair	Fair	20+ years	High	6.36	2.53		0%	0
1167	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	25m x 7m	46	Good	Good	20+ years	Low	5.52	2.39		0%	0
1168	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	28m x 15m	80	Good	Good	20+ years	High	9.6	3.01		> 10%	11
1169	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	25m x 6m	45	Good	Good	20+ years	High	5.4	2.37		0%	0
1170	Eucalyptus splendens	Apple Jack	Native	Mature	28m x 10m	118	Fair	Poor	20+ years	High	14.16	3.55		> 10%	17
1171	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	25m x 6m	57	Good	Good	20+ years	Medium	6.84	2.61		0%	0
1172	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	23m x 6m	48	Good	Good	20+ years	Medium	5.76	2.43		1-10%	6
1173	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	25m x 8m	63	Good	Good	20+ years	Very high	7.56	2.73		1-10%	4
1174	Eucalyptus splendens	Apple Jack	Native	Mature	25m x 6m	75	Good	Fair	20+ years	Medium	9	2.93		> 10%	22
1175	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	23m x 6m	50	Good	Fair	20+ years	Medium	6	2.47		0%	0
1176	Eucalyptus ovata	Swamp Gum	Indigenous	Semi mature	20m x 4m	40	Poor	Poor	5-10 years	Medium	4.8	2.25		0%	0
1177	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	25m x 6m	60	Good	Fair	20+ years	Medium	7.2	2.67		0%	0
1178	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	28m x 7m	71	Good	Fair	20+ years	High	8.52	2.87		1-10%	9
1179	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	23m x 4m	38	Good	Fair	20+ years	Medium	4.56	2.20		0%	0
1180	Eucalyptus ovata	Swamp Gum	Indigenous	Semi mature	24m x 4m	46	Fair	Fair	20+ years	Very high	5.52	2.39		1-10%	2
1181	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	26m x 5m	54	Good	Fair	20+ years	High	6.48	2.55		0%	0
1182	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	20m x 6m	51	Good	Fair	20+ years	Medium	6.12	2.49		0%	0
1183	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	35m x 12m	94	Good	Good	20+ years	Very high	11.28	3.22		1-10%	4
1184	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	32m x 12m	103	Fair	Poor	10-20 years	High	12.36	3.35		> 10%	26
1185	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	32m x 10m	79	Good	Fair	20+ years	High	9.48	3.00		> 10%	20
1186	Eucalyptus ovata	Swamp Gum	Indigenous	Semi mature	26m x 5m	53	Fair	Fair	20+ years	High	6.36	2.53		0%	0
1187	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	32m x 5m	46	Good	Good	20+ years	High	5.52	2.39		1-10%	5
1188	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	35m x 5m	65	Good	Good	20+ years	High	7.8	2.76		1-10%	8

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1189	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	36m x 6m	79	Good	Good	20+ years	High	9.48	3.00		0%	0
1190	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	35m x 15m	85	Good	Fair	20+ years	High	10.2	3.09		> 10%	12
1191	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	26m x 10m	59	Good	Fair	20+ years	High	7.08	2.65		0%	0
1192	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	22m x 4m	42	Fair	Fair	20+ years	Medium	5.04	2.30		0%	0
1193	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	36m x 10m	81	Good	Fair	20+ years	Very high	9.72	3.03		1-10%	4
1194	Eucalyptus splendens	Apple Jack	Native	Mature	34m x 10m	81	Good	Fair	20+ years	Medium	9.72	3.03		1-10%	7
1195	Eucalyptus ovata	Swamp Gum	Indigenous	Semi mature	26m x 5m	38	Fair	Fair	10-20 years	Medium	4.56	2.20		0%	0
1196	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	32m x 8m	55	Fair	Fair	20+ years	Medium	6.6	2.57		0%	0
1197	Eucalyptus splendens	Apple Jack	Native	Mature	25m x 8m	63	Good	Good	20+ years	High	7.56	2.73		1-10%	5
1198	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	34m x 10m	90	Fair	Good	20+ years	Very high	10.8	3.17		1-10%	7
1199	Eucalyptus ovata	Swamp Gum	Indigenous	Semi mature	28m x 5m	52	Good	Fair	20+ years	High	6.24	2.51		1-10%	5
1200	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	30m x 9m	96	Good	Fair	20+ years	High	11.52	3.25		1-10%	6
1201	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	35m x 12m	71	Fair	Fair	20+ years	High	8.52	2.87		0%	0
1202	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	34m x 6m	63	Fair	Fair	20+ years	High	7.56	2.73		1-10%	3
1203	Eucalyptus ovata	Swamp Gum	Indigenous	Semi mature	28m x 5m	38	Fair	Fair	20+ years	High	4.56	2.20		0%	0
1204	Eucalyptus ovata	Swamp Gum	Indigenous	Mature	28m x 6m	50	Fair	Fair	20+ years	High	6	2.47		0%	0
1205	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	23m x 5m	44	Fair	Fair	20+ years	Medium	5.28	2.34		0%	0
1206	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	18m x 5m	33	Good	Fair	20+ years	Medium	3.96	2.08		0%	0
1207	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	26m x 6m	56	Good	Fair	20+ years	High	6.72	2.59		1-10%	1
1208	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	18m x 5m	42	Good	Fair	20+ years	High	5.04	2.30		0%	0
1209	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	34m x 8m	57	Good	Fair	20+ years	High	6.84	2.61		1-10%	2
1210	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	10m x 3m	26	Fair	Fair	10-20 years	Medium	3.12	1.88		0%	0
1211	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	24m x 8m	59	Good	Good	20+ years	High	7.08	2.65		0%	0
1212	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	30m x 5m	45	Good	Good	20+ years	Very high	5.4	2.37		0%	0
1213	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	25m x 6m	55	Good	Fair	20+ years	Medium	6.6	2.57		0%	0
1214	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	23m x 6m	37	Good	Fair	20+ years	Medium	4.44	2.18		0%	0
1215	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	34m x 7m	64	Good	Fair	20+ years	High	7.68	2.74		1-10%	3
1216	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	32m x 5m	73	Good	Fair	20+ years	High	8.76	2.90		1-10%	4
1217	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	24m x 5m	42	Good	Fair	20+ years	High	5.04	2.30		0%	0
1218	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	34m x 7m	58	Good	Fair	20+ years	High	6.96	2.63		0%	0
1219	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	32m x 6m	52	Good	Fair	20+ years	High	6.24	2.51		0%	0
1220	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	25m x 6m	55	Good	Fair	20+ years	High	6.6	2.57		0%	0
1221	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	34m x 14m	73	Good	Fair	20+ years	High	8.76	2.90		1-10%	2
1222	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	36m x 8m	56	Good	Fair	20+ years	High	6.72	2.59		0%	0
1223	Eucalyptus splendens	Apple Jack	Native	Mature	30m x 9m	65	Good	Fair	20+ years	Very high	7.8	2.76		0%	0
1224	Eucalyptus splendens	Apple Jack	Native	Mature	28m x 15m	70	Good	Fair	20+ years	High	8.4	2.85		1-10%	10

ID	Botanical Name	Common Name	Origin	Age	H x W	DBH (cm)	Health	Structure	ULE	Retention Value	TPZ (m radius)	SRZ (m radius)	Comments	Retain/ remove	Encroach. %
1225	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	32m x 5m	39	Good	Fair	20+ years	Medium	4.68	2.23		0%	0
1226	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	32m x 9m	58	Good	Good	20+ years	High	6.96	2.63		0%	0
1227	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	28m x 6m	47	Fair	Fair	20+ years	Medium	5.64	2.41		0%	0
1228	Eucalyptus splendens	Apple Jack	Native	Mature	30m x 9m	80	Good	Fair	20+ years	High	9.6	3.01		1-10%	6
1229	Eucalyptus splendens	Apple Jack	Native	Mature	18m x 8m	50	Good	Fair	20+ years	Medium	6	2.47		0%	0
1230	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	25m x 12m	58	Good	Fair	20+ years	High	6.96	2.63		0%	0
1231	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	34m x 6m	76	Good	Fair	20+ years	High	9.12	2.95		0%	0
1232	Eucalyptus ovata	Swamp Gum	Indigenous	Semi mature	20m x 5m	50	Good	Fair	20+ years	Medium	6	2.47		0%	0
1233	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	23m x 5m	37	Good	Fair	20+ years	Medium	4.44	2.18		0%	0
1234	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	16m x 3m	100	Dead	Fair	20+ years	Very high	12	3.31		> 10%	13
1235	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	36m x 12m	122	Good	Fair	20+ years	High	14.64	3.60		> 10%	18
1236	Eucalyptus splendens	Apple Jack	Native	Mature	23m x 7m	88	Good	Fair	20+ years	High	10.56	3.14		> 10%	16
1237	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	25m x 6m	52	Good	Fair	20+ years	Medium	6.24	2.51		1-10%	2
1238	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	27m x 6m	56	Good	Fair	20+ years	High	6.72	2.59		0%	0
1239	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	27m x 7m	57	Good	Fair	20+ years	High	6.84	2.61		> 10%	17
1240	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	25m x 9m	77	Good	Fair	20+ years	Medium	9.24	2.97		1-10%	10
1241	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	22m x 9m	62	Good	Fair	20+ years	Medium	7.44	2.71		1-10%	5
1242	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	28m x 7m	74	Good	Fair	20+ years	High	8.88	2.92		1-10%	7
1243	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	18m x 3m	28	Fair	Fair	20+ years	Low	3.36	1.94		0%	0
1244	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	28m x 5m	46	Good	Fair	20+ years	Medium	5.52	2.39		1-10%	3
1245	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	20m x 7m	55	Good	Fair	20+ years	Medium	6.6	2.57		1-10%	2
1246	Eucalyptus splendens	Apple Jack	Native	Mature	27m x 7m	63	Good	Fair	20+ years	High	7.56	2.73		1-10%	5
1247	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	25m x 7m	38	Good	Fair	20+ years	Medium	4.56	2.20		1-10%	2
1248	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	23m x 4m	34	Good	Fair	20+ years	Medium	4.08	2.10		0%	0
1249	Eucalyptus splendens	Apple Jack	Native	Semi mature	22m x 7m	59	Good	Fair	20+ years	Medium	7.08	2.65		1-10%	7
1250	Eucalyptus splendens	Apple Jack	Native	Semi mature	28m x 9m	65	Good	Fair	20+ years	High	7.8	2.76		1-10%	4
1251	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	34m x 8m	79	Good	Fair	20+ years	High	9.48	3.00		> 10%	20
1252	Eucalyptus splendens	Apple Jack	Native	Mature	30m x 5m	51	Good	Fair	20+ years	High	6.12	2.49		0%	0
1253	Eucalyptus splendens	Apple Jack	Native	Mature	32m x 5m	54	Good	Fair	20+ years	High	6.48	2.55		1-10%	8
1254	Eucalyptus splendens	Apple Jack	Native	Semi mature	32m x 5m	57	Good	Good	20+ years	High	6.84	2.61		1-10%	9
1255	Eucalyptus splendens	Apple Jack	Native	Semi mature	20m x 6m	40	Good	Fair	20+ years	Medium	4.8	2.25		0%	0
1256	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	27m x 12m	82	Good	Fair	20+ years	High	9.84	3.04		> 10%	16
1257	Eucalyptus splendens	Apple Jack	Native	Semi mature	20m x 4m	38	Fair	Fair	10-20 years	Medium	4.56	2.20		0%	0
1258	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	28m x 5m	48	Good	Good	20+ years	Medium	5.76	2.43		0%	0
1259	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	20m x 6m	36	Good	Good	20+ years	Medium	4.32	2.15		0%	0
1260	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	32m x 7m	62	Good	Fair	20+ years	High	7.44	2.71		> 10%	15

ID	Botanical Name	Common Name	Origin	Age	H x W	DBH (cm)	Health	Structure	ULE	Retention Value	TPZ (m radius)	SRZ (m radius)	Comments	Retain/ remove	Encroach. %
1261	Eucalyptus splendens	Apple Jack	Native	Mature	33m x 5m	61	Good	Fair	20+ years	High	7.32	2.69		1-10%	6
1262	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	35m x 10m	83	Good	Fair	20+ years	High	9.96	3.06		> 10%	12
1263	Eucalyptus splendens	Apple Jack	Native	Semi mature	18m x 5m	37	Fair	Fair	20+ years	Medium	4.44	2.18		0%	0
1264	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	36m x 14m	80	Good	Good	20+ years	High	9.6	3.01		1-10%	9
1265	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	28m x 3m	39	Good	Good	20+ years	Medium	4.68	2.23		0%	0
1266	Eucalyptus splendens	Apple Jack	Native	Mature	26m x 6m	54	Good	Fair	20+ years	High	6.48	2.55		1-10%	2
1267	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	34m x 8m	72	Good	Fair	20+ years	Medium	8.64	2.88		> 10%	16
1268	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	36m x 7m	60	Good	Fair	20+ years	High	7.2	2.67		0%	0
1269	Eucalyptus splendens	Apple Jack	Native	Mature	32m x 12m	84	Good	Fair	20+ years	High	10.08	3.08		> 10%	17
1270	Eucalyptus splendens	Apple Jack	Native	Mature	27m x 6m	56	Good	Fair	20+ years	High	6.72	2.59		0%	0
1271	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	27m x 10m	65	Good	Fair	20+ years	High	7.8	2.76		0%	0
1272	Eucalyptus splendens	Apple Jack	Native	Mature	26m x 5m	53	Good	Fair	20+ years	High	6.36	2.53		0%	0
1273	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	32m x 10m	68	Fair	Fair	20+ years	High	8.16	2.81		0%	0
1274	Eucalyptus splendens	Apple Jack	Native	Semi mature	22m x 6m	39	Good	Fair	20+ years	Medium	4.68	2.23		0%	0
1275	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	30m x 7m	61	Good	Fair	20+ years	High	7.32	2.69		0%	0
1276	Eucalyptus viminalis subsp. Cygnetensis	Rough-barked Manna Gum	Indigenous	Mature	23m x 12m	58	Fair	Fair	20+ years	Medium	6.96	2.63		0%	0
1277	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	32m x 14m	75	Good	Good	20+ years	High	9	2.93		> 10%	13
1278	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	35m x 12m	87	Good	Good	20+ years	High	10.44	3.12		> 10%	16
1279	Eucalyptus viminalis subsp. Cygnetensis	Rough-barked Manna Gum	Indigenous	Mature	20m x 5m	48	Good	Good	10-20 years	Medium	5.76	2.43		0%	0
1280	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	35m x 14m	86	Good	Good	10-20 years	High	10.32	3.11		0%	0
1281	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	30m x 10m	76	Fair	Good	20+ years	High	9.12	2.95		> 10%	15
1282	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	26m x 5m	42	Fair	Fair	10-20 years	Medium	5.04	2.30		0%	0
1283	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	34m x 7m	36	Good	Fair	20+ years	High	4.32	2.15		0%	0
1284	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	32m x 8m	65	Good	Fair	20+ years	High	7.8	2.76		0%	0
1285	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	30m x 6m	53	Good	Fair	20+ years	High	6.36	2.53		0%	0
1286	Eucalyptus splendens	Apple Jack	Native	Mature	28m x 5m	55	Good	Fair	20+ years	High	6.6	2.57		0%	0
1287	Eucalyptus splendens	Apple Jack	Native	Semi mature	26m x 3m	32	Good	Fair	20+ years	Medium	3.84	2.05		0%	0
1288	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	26m x 4m	32	Good	Fair	20+ years	Medium	3.84	2.05		0%	0
1289	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	34m x 12m	89	Good	Fair	20+ years	High	10.68	3.15		> 10%	17
1290	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	32m x 5m	46	Good	Fair	20+ years	Medium	5.52	2.39		0%	0
1291	Eucalyptus splendens	Apple Jack	Native	Mature	27m x 7m	47	Good	Fair	20+ years	Medium	5.64	2.41		0%	0
1292	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	34m x 6m	66	Good	Fair	20+ years	High	7.92	2.78		0%	0
1293	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	30m x 3m	38	Fair	Fair	10-20 years	Medium	4.56	2.20		0%	0
1294	Eucalyptus splendens	Apple Jack	Native	Mature	25m x 12m	47	Good	Fair	20+ years	Medium	5.64	2.41		0%	0
1295	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	32m x 6m	46	Good	Fair	20+ years	Medium	5.52	2.39		1-10%	2
1296	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	32m x 8m	48	Good	Fair	20+ years	Medium	5.76	2.43		0%	0

ID	Botanical Name	Common Name	Origin	Age	H x W	DBH (cm)	Health	Structure	ULE	Retention Value	TPZ (m radius)	SRZ (m radius)	Comments	Retain/ remove	Encroach. %
1297	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	28m x 4m	44	Good	Fair	20+ years	Medium	5.28	2.34		0%	0
1298	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	34m x 7m	74	Good	Fair	20+ years	High	8.88	2.92		0%	0
1299	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	32m x 7m	54	Good	Fair	20+ years	Medium	6.48	2.55		1-10%	1
1300	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	32m x 7m	36	Good	Fair	20+ years	Medium	4.32	2.15		0%	0
1301	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	32m x 7m	48	Good	Fair	20+ years	Medium	5.76	2.43		0%	0
1302	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	33m x 7m	73	Good	Fair	20+ years	High	8.76	2.90		1-10%	2
1303	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	35m x 8m	58	Good	Fair	20+ years	Very high	6.96	2.63		0%	0
1304	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	33m x 7m	65	Good	Fair	20+ years	High	7.8	2.76		1-10%	7
1305	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	32m x 6m	63	Good	Fair	20+ years	Medium	7.56	2.73		0%	0
1306	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	35m x 10m	67	Good	Fair	20+ years	High	8.04	2.80		0%	0
1307	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	32m x 8m	65	Good	Fair	20+ years	Medium	7.8	2.76		0%	0
1308	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	28m x 9m	50	Good	Fair	20+ years	High	6	2.47		0%	0
1309	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	32m x 6m	55	Good	Fair	20+ years	Medium	6.6	2.57		0%	0
1310	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	27m x 5m	43	Good	Fair	20+ years	Medium	5.16	2.32		0%	0
1311	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	34m x 7m	66	Good	Fair	20+ years	High	7.92	2.78		1-10%	6
1312	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	35m x 7m	75	Good	Fair	20+ years	High	9	2.93		> 10%	15
1313	Eucalyptus splendens	Apple Jack	Native	Mature	26m x 5m	39	Good	Fair	20+ years	High	4.68	2.23		0%	0
1314	Eucalyptus splendens	Apple Jack	Native	Mature	30m x 5m	57	Good	Fair	20+ years	High	6.84	2.61		0%	0
1315	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	36m x 9m	68	Good	Fair	20+ years	High	8.16	2.81		0%	0
1316	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	23m x 4m	40	Good	Fair	20+ years	Medium	4.8	2.25		0%	0
1317	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	18m x 2m	22	Fair	Fair	10-20 years	Low	2.64	1.75		0%	0
1318	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	20m x 3m	32	Fair	Fair	10-20 years	Medium	3.84	2.05		0%	0
1319	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	32m x 9m	74	Good	Fair	20+ years	High	8.88	2.92		1-10%	6
1320	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	33m x 8m	73	Good	Fair	20+ years	High	8.76	2.90		1-10%	6
1321	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	33m x 8m	74	Good	Fair	20+ years	Medium	8.88	2.92		0%	0
1322	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	32m x 9m	70	Good	Fair	20+ years	High	8.4	2.85		0%	0
1323	Eucalyptus splendens	Apple Jack	Native	Semi mature	32m x 5m	41	Good	Fair	20+ years	Medium	4.92	2.28		0%	0
1324	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	30m x 4m	31	Good	Fair	20+ years	Medium	3.72	2.02		0%	0
1325	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	32m x 5m	50	Good	Fair	20+ years	High	6	2.47		0%	0
1326	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	32m x 8m	63	Fair	Fair	20+ years	High	7.56	2.73		1-10%	1
1327	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	22m x 9m	58	Fair	Fair	20+ years	Medium	6.96	2.63		0%	0
1328	Eucalyptus splendens	Apple Jack	Native	Mature	28m x 5m	50	Fair	Fair	20+ years	Medium	6	2.47		0%	0
1329	Eucalyptus splendens	Apple Jack	Native	Mature	30m x 5m	40	Fair	Fair	20+ years	Medium	4.8	2.25		0%	0
1330	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	28m x 4m	33	Good	Fair	20+ years	Medium	3.96	2.08		0%	0
1331	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	32m x 7m	59	Good	Fair	20+ years	Medium	7.08	2.65		1-10%	2
1332	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	32m x 5m	37	Good	Fair	20+ years	High	4.44	2.18		0%	0

ID	Botanical Name	Common Name	Origin	Age	H x W	DBH (cm)	Health	Structure	ULE	Retention Value	TPZ (m radius)	SRZ (m radius)	Comments	Retain/ remove	Encroach. %
1333	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	28m x 6m	42	Good	Fair	20+ years	High	5.04	2.30		0%	0
1334	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	29m x 5m	36	Good	Fair	20+ years	Medium	4.32	2.15		0%	0
1335	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	30m x 7m	100	Dead	Poor	0 years	Low	12	3.31		> 10%	15
1336	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	34m x 7m	50	Fair	Fair	20+ years	Medium	6	2.47		0%	0
1337	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	28m x 3m	107	Dead	Fair	20+ years	Very high	12.84	3.40		1-10%	8
1338	Eucalyptus splendens	Apple Jack	Native	Semi mature	24m x 5m	47	Good	Fair	20+ years	Medium	5.64	2.41		0%	0
1339	Eucalyptus splendens	Apple Jack	Native	Semi mature	30m x 4m	39	Good	Fair	20+ years	Medium	4.68	2.23		0%	0
1340	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	30m x 7m	6	Good	Fair	20+ years	Medium	2	1.50		0%	0
1341	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	35m x 7m	45	Good	Fair	20+ years	High	5.4	2.37		0%	0
1342	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	38m x 10m	60	Good	Fair	20+ years	High	7.2	2.67		1-10%	2
1343	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	38m x 9m	61	Good	Fair	20+ years	High	7.32	2.69		1-10%	2
1344	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	38m x 7m	72	Good	Fair	20+ years	High	8.64	2.88		> 10%	11
1345	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	38m x 14m	69	Good	Fair	20+ years	High	8.28	2.83		1-10%	2
1346	Eucalyptus splendens	Apple Jack	Native	Semi mature	18m x 3m	27	Fair	Fair	20+ years	Low	3.24	1.91		0%	0
1347	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	27m x 3m	32	Fair	Fair	20+ years	Medium	3.84	2.05		0%	0
1348	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	32m x 18m	88	Good	Fair	20+ years	High	10.56	3.14		1-10%	7
1349	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	25m x 7m	42	Good	Fair	20+ years	Medium	5.04	2.30		0%	0
1350	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	40m x 14m	87	Good	Good	20+ years	High	10.44	3.12		1-10%	4
1351	Eucalyptus splendens	Apple Jack	Native	Semi mature	32m x 5m	47	Good	Fair	20+ years	Medium	5.64	2.41		0%	0
1352	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	28m x 12m	62	Good	Fair	20+ years	Medium	7.44	2.71		1-10%	8
1353	Eucalyptus splendens	Apple Jack	Native	Semi mature	24m x 6m	32	Good	Fair	20+ years	Medium	3.84	2.05		0%	0
1354	Eucalyptus splendens	Apple Jack	Native	Semi mature	26m x 6m	33	Good	Fair	20+ years	Medium	3.96	2.08		0%	0
1355	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	36m x 10m	77	Good	Fair	20+ years	High	9.24	2.97		1-10%	3
1356	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	40m x 8m	62	Good	Fair	20+ years	High	7.44	2.71		1-10%	4
1357	Eucalyptus splendens	Apple Jack	Native	Semi mature	27m x 5m	43	Good	Fair	20+ years	Medium	5.16	2.32		0%	0
1358	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	38m x 9m	67	Good	Good	20+ years	High	8.04	2.80		1-10%	5
1359	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	40m x 7m	47	Good	Good	20+ years	High	5.64	2.41		0%	0
1360	Eucalyptus splendens	Apple Jack	Native	Semi mature	32m x 4m	38	Good	Fair	20+ years	Medium	4.56	2.20		0%	0
1361	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	33m x 5m	43	Good	Fair	20+ years	Medium	5.16	2.32		0%	0
1362	Eucalyptus splendens	Apple Jack	Native	Semi mature	30m x 7m	41	Good	Good	20+ years	Medium	4.92	2.28		1-10%	2
1363	Eucalyptus splendens	Apple Jack	Native	Semi mature	32m x 5m	37	Good	Good	20+ years	High	4.44	2.18		0%	0
1364	Eucalyptus viminalis subsp. Cygnetensis	Rough-barked Manna Gum	Indigenous	Semi mature	28m x 5m	36	Good	Fair	20+ years	Medium	4.32	2.15		0%	0
1365	Eucalyptus viminalis subsp. Cygnetensis	Rough-barked Manna Gum	Indigenous	Semi mature	27m x 4m	47	Good	Fair	20+ years	Medium	5.64	2.41		0%	0
1366	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	32m x 6m	42	Good	Fair	20+ years	Medium	5.04	2.30		0%	0
1367	Eucalyptus splendens	Apple Jack	Native	Semi mature	25m x 9m	41	Good	Fair	20+ years	Medium	4.92	2.28		0%	0
1368	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	35m x 6m	43	Good	Fair	20+ years	Medium	5.16	2.32	1m above road level	0%	0

ID	Botanical Name	Common Name	Origin	Age	H x W	DBH (cm)	Health	Structure	ULE	Retention Value	TPZ (m radius)	SRZ (m radius)	Comments	Retain/ remove	Encroach. %
1369	Eucalyptus splendens	Apple Jack	Native	Semi mature	20m x 3m	33	Good	Fair	20+ years	Medium	3.96	2.08		0%	0
1370	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	30m x 5m	44	Good	Fair	20+ years	Medium	5.28	2.34	1m above road	0%	0
1371	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	28m x 6m	55	Good	Fair	20+ years	High	6.6	2.57	1m above road	0%	0
1372	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	28m x 4m	37	Good	Fair	20+ years	Medium	4.44	2.18		0%	0
1373	Eucalyptus splendens	Apple Jack	Native	Semi mature	30m x 5m	47	Good	Fair	20+ years	Medium	5.64	2.41		0%	0
1374	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	22m x 6m	49	Dead	Fair	20+ years	Very high	5.88	2.45		0%	0
1375	Eucalyptus splendens	Apple Jack	Native	Semi mature	24m x 5m	43	Good	Fair	20+ years	Medium	5.16	2.32		0%	0
1376	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	36m x 8m	58	Good	Good	20+ years	High	6.96	2.63		1-10%	5
1377	Eucalyptus splendens	Apple Jack	Native	Semi mature	28m x 4m	40	Good	Fair	20+ years	Medium	4.8	2.25		0%	0
1378	Eucalyptus splendens	Apple Jack	Native	Mature	38m x 5m	76	Good	Fair	20+ years	Medium	9.12	2.95		1-10%	5
1379	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	35m x 7m	68	Dead	Poor	0 years	Low	8.16	2.81		1-10%	1
1380	Eucalyptus splendens	Apple Jack	Native	Mature	28m x 7m	52	Fair	Fair	20+ years	High	6.24	2.51		0%	0
1381	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	45m x 9m	70	Good	Fair	20+ years	High	8.4	2.85		1-10%	3
1382	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	38m x 12m	60	Good	Fair	20+ years	High	7.2	2.67	1m above road	1-10%	6
1383	Eucalyptus splendens	Apple Jack	Native	Mature	32m x 10m	78	Good	Fair	20+ years	High	9.36	2.98		> 10%	18
1384	Eucalyptus splendens	Apple Jack	Native	Mature	28m x 5m	52	Good	Fair	20+ years	High	6.24	2.51		1-10%	3
1385	Eucalyptus splendens	Apple Jack	Native	Mature	25m x 5m	55	Good	Fair	20+ years	High	6.6	2.57		0%	0
1386	Eucalyptus splendens	Apple Jack	Native	Mature	26m x 5m	47	Good	Fair	20+ years	High	5.64	2.41		0%	0
1387	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	28m x 7m	52	Poor	Fair	20+ years	Medium	6.24	2.51		0%	0
1388	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	24m x 5m	34	Good	Fair	10-20 years	Medium	4.08	2.10		0%	0
1389	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	32m x 6m	55	Good	Fair	20+ years	High	6.6	2.57		0%	0
1390	Eucalyptus splendens	Apple Jack	Native	Mature	32m x 6m	66	Good	Fair	20+ years	High	7.92	2.78		1-10%	3
1391	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	28m x 3m	101	Dead	Poor	0 years	Low	12.12	3.32		1-10%	7
1392	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	30m x 4m	33	Good	Fair	20+ years	Medium	3.96	2.08		0%	0
1393	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	38m x 12m	79	Good	Fair	20+ years	High	9.48	3.00		> 10%	14
1394	Eucalyptus splendens	Apple Jack	Native	Semi mature	32m x 5m	42	Good	Good	20+ years	Medium	5.04	2.30		0%	0
1395	Eucalyptus splendens	Apple Jack	Native	Semi mature	32m x 5m	42	Good	Good	20+ years	Medium	5.04	2.30		0%	0
1396	Eucalyptus viminalis subsp. Cygnetensis	Rough-barked Manna Gum	Indigenous	Mature	32m x 10m	63	Good	Good	20+ years	Medium	7.56	2.73		> 10%	12
1397	Eucalyptus splendens	Apple Jack	Native	Semi mature	32m x 4m	46	Good	Good	20+ years	Medium	5.52	2.39		0%	0
1398	Eucalyptus splendens	Apple Jack	Native	Semi mature	28m x 9m	55	Good	Good	20+ years	High	6.6	2.57		1-10%	1
1399	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	40m x 10m	75	Good	Fair	20+ years	High	9	2.93		> 10%	11
1400	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	32m x 5m	51	Good	Fair	20+ years	Medium	6.12	2.49		1-10%	7
1401	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	40m x 6m	57	Good	Fair	20+ years	Medium	6.84	2.61		1-10%	2
1402	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	40m x 7m	58	Good	Fair	20+ years	Medium	6.96	2.63		1-10%	2
1403	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	34m x 4m	40	Good	Fair	20+ years	Medium	4.8	2.25		0%	0
1404	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	36m x 7m	60	Good	Fair	20+ years	High	7.2	2.67		> 10%	11

ID	Botanical Name	Common Name	Origin	Age	H x W	DBH (cm)	Health	Structure	ULE	Retention Value	TPZ (m radius)	SRZ (m radius)	Comments	Retain/ remove	Encroach. %
1405	Eucalyptus splendens	Apple Jack	Native	Mature	32m x 5m	59	Good	Fair	20+ years	Medium	7.08	2.65		0%	0
1406	Eucalyptus viminalis subsp. Cygnetensis	Rough-barked Manna Gum	Indigenous	Mature	28m x 10m	63	Good	Fair	20+ years	High	7.56	2.73		1-10%	3
1407	Eucalyptus splendens	Apple Jack	Native	Mature	28m x 9m	59	Good	Fair	20+ years	High	7.08	2.65		0%	0
1408	Eucalyptus splendens	Apple Jack	Native	Mature	33m x 12m	52	Good	Fair	20+ years	High	6.24	2.51		0%	0
1409	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	30m x 6m	46	Good	Good	20+ years	Medium	5.52	2.39		0%	0
1410	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	30m x 6m	43	Good	Good	20+ years	Medium	5.16	2.32		1-10%	5
1411	Eucalyptus splendens	Apple Jack	Native	Semi mature	28m x 6m	45	Good	Good	20+ years	Medium	5.4	2.37		1-10%	2
1412	Eucalyptus splendens	Apple Jack	Native	Semi mature	30m x 5m	49	Good	Fair	20+ years	High	5.88	2.45		1-10%	2
1413	Eucalyptus splendens	Apple Jack	Native	Semi mature	25m x 6m	46	Good	Fair	20+ years	Medium	5.52	2.39		0%	0
1414	Eucalyptus splendens	Apple Jack	Native	Semi mature	23m x 5m	40	Good	Fair	20+ years	Medium	4.8	2.25		0%	0
1415	Eucalyptus splendens	Apple Jack	Native	Semi mature	28m x 6m	56	Good	Fair	20+ years	High	6.72	2.59		1-10%	10
1416	Eucalyptus splendens	Apple Jack	Native	Semi mature	28m x 7m	49	Good	Fair	20+ years	High	5.88	2.45		1-10%	4
1417	Eucalyptus splendens	Apple Jack	Native	Semi mature	28m x 5m	54	Good	Fair	20+ years	Medium	6.48	2.55		1-10%	4
1418	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	38m x 10m	67	Good	Fair	20+ years	High	8.04	2.80		> 10%	17
1419	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	38m x 9m	53	Good	Fair	20+ years	High	6.36	2.53		1-10%	8
1420	Eucalyptus splendens	Apple Jack	Native	Mature	32m x 12m	77	Good	Fair	20+ years	High	9.24	2.97		> 10%	24
1421	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	36m x 10m	62	Good	Fair	20+ years	High	7.44	2.71		> 10%	13
1422	Eucalyptus viminalis subsp. Cygnetensis	Rough-barked Manna Gum	Indigenous	Mature	33m x 12m	86	Good	Fair	20+ years	High	10.32	3.11		1-10%	6
1423	Eucalyptus splendens	Apple Jack	Native	Mature	34m x 14m	70	Good	Fair	20+ years	High	8.4	2.85		> 10%	13
1424	Eucalyptus splendens	Apple Jack	Native	Mature	32m x 6m	58	Good	Fair	20+ years	Medium	6.96	2.63		1-10%	4
1425	Eucalyptus splendens	Apple Jack	Native	Mature	32m x 9m	78	Good	Fair	20+ years	High	9.36	2.98		1-10%	6
1426	Eucalyptus splendens	Apple Jack	Native	Mature	30m x 16m	71	Good	Fair	20+ years	High	8.52	2.87		1-10%	3
1427	Eucalyptus splendens	Apple Jack	Native	Mature	34m x 12m	67	Good	Fair	20+ years	High	8.04	2.80		0%	0
1428	Eucalyptus splendens	Apple Jack	Native	Mature	30m x 6m	63	Good	Fair	20+ years	High	7.56	2.73		1-10%	4
1429	Eucalyptus splendens	Apple Jack	Native	Mature	35m x 14m	98	Good	Fair	20+ years	High	11.76	3.28		> 10%	20
1430	Eucalyptus splendens	Apple Jack	Native	Mature	27m x 10m	73	Good	Fair	20+ years	High	8.76	2.90		> 10%	14
1431	Eucalyptus splendens	Apple Jack	Native	Mature	36m x 12m	63	Good	Fair	20+ years	High	7.56	2.73		> 10%	12
1432	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	36m x 7m	63	Good	Fair	20+ years	Medium	7.56	2.73		1-10%	1
1433	Eucalyptus splendens	Apple Jack	Native	Semi mature	32m x 8m	41	Good	Fair	20+ years	Medium	4.92	2.28		0%	0
1434	Eucalyptus splendens	Apple Jack	Native	Mature	38m x 10m	86	Good	Fair	20+ years	High	10.32	3.11		> 10%	19
1435	Eucalyptus splendens	Apple Jack	Native	Semi mature	35m x 7m	45	Good	Good	20+ years	Medium	5.4	2.37		0%	0
1436	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	34m x 7m	53	Good	Good	20+ years	Medium	6.36	2.53		1-10%	2
1437	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	36m x 5m	58	Good	Fair	20+ years	Medium	6.96	2.63		> 10%	15
1438	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	36m x 5m	44	Good	Fair	20+ years	Medium	5.28	2.34		1-10%	9
1439	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	28m x 2m	21	Good	Fair	20+ years	Low	2.52	1.72		0%	0
1440	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	34m x 6m	45	Good	Good	20+ years	Medium	5.4	2.37		1-10%	9

ID	Botanical Name	Common Name	Origin	Age	H x W	DBH (cm)	Health	Structure	ULE	Retention Value	TPZ (m radius)	SRZ (m radius)	Comments	Retain/ remove	Encroach. %
1441	Eucalyptus splendens	Apple Jack	Native	Semi mature	30m x 4m	41	Good	Fair	20+ years	Medium	4.92	2.28		0%	0
1442	Eucalyptus splendens	Apple Jack	Native	Semi mature	32m x 15m	78	Good	Fair	20+ years	Medium	9.36	2.98		> 10%	12
1443	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	27m x 7m	58	Good	Fair	20+ years	Medium	6.96	2.63		1-10%	3
1444	Eucalyptus splendens	Apple Jack	Native	Mature	32m x 12m	47	Good	Good	20+ years	High	5.64	2.41		0%	0
1445	Eucalyptus splendens	Apple Jack	Native	Mature	38m x 7m	52	Good	Good	20+ years	High	6.24	2.51		0%	0
1446	Eucalyptus splendens	Apple Jack	Native	Mature	36m x 9m	70	Good	Good	20+ years	High	8.4	2.85		> 10%	20
1447	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	25m x 3m	34	Poor	Poor	5-10 years	Low	4.08	2.10		0%	0
1448	Eucalyptus ovata	Swamp Gum	Indigenous	Mature	35m x 7m	50	Good	Good	20+ years	High	6	2.47		1-10%	7
1449	Eucalyptus splendens	Apple Jack	Native	Mature	36m x 7m	69	Fair	Fair	10-20 years	Medium	8.28	2.83		1-10%	3
1450	Eucalyptus splendens	Apple Jack	Native	Mature	30m x 7m	50	Good	Fair	20+ years	High	6	2.47		0%	0
1451	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	38m x 10m	55	Good	Fair	20+ years	High	6.6	2.57		0%	0
1452	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	24m x 5m	24	Fair	Fair	10-20 years	Low	2.88	1.82		0%	0
1453	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	40m x 12m	64	Good	Fair	20+ years	High	7.68	2.74		1-10%	7
1454	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	40m x 6m	57	Good	Fair	20+ years	High	6.84	2.61		> 10%	19
1455	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	40m x 6m	58	Good	Fair	20+ years	High	6.96	2.63		1-10%	9
1456	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	37m x 5m	57	Good	Fair	20+ years	Medium	6.84	2.61		0%	0
1457	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Young	32m x 3m	31	Good	Fair	20+ years	Low	3.72	2.02		0%	0
1458	Eucalyptus splendens	Apple Jack	Native	Mature	36m x 5m	42	Good	Fair	20+ years	High	5.04	2.30		0%	0
1459	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	45m x 12m	75	Good	Good	20+ years	Very high	9	2.93		> 10%	17
1460	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	40m x 6m	50	Good	Good	20+ years	High	6	2.47		0%	0
1461	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	40m x 30m	92	Fair	Poor	20+ years	High	11.04	3.20		> 10%	15
1462	Eucalyptus splendens	Apple Jack	Native	Mature	36m x 7m	43	Good	Fair	20+ years	High	5.16	2.32		1-10%	7
1463	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	45m x 7m	46	Good	Fair	20+ years	High	5.52	2.39		0%	0
1464	Eucalyptus splendens	Apple Jack	Native	Mature	36m x 9m	58	Good	Fair	20+ years	High	6.96	2.63		0%	0
1465	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	39m x 12m	76	Good	Fair	20+ years	High	9.12	2.95		1-10%	2
1466	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	35m x 10m	63	Good	Fair	20+ years	High	7.56	2.73		0%	0
1467	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	32m x 6m	44	Good	Fair	20+ years	High	5.28	2.34		0%	0
1468	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	38m x 14m	92	Good	Fair	20+ years	High	11.04	3.20		1-10%	1
1469	Eucalyptus splendens	Apple Jack	Native	Mature	28m x 4m	39	Good	Fair	20+ years	Medium	4.68	2.23		0%	0
1470	Eucalyptus splendens	Apple Jack	Native	Mature	36m x 8m	57	Good	Fair	20+ years	High	6.84	2.61		0%	0
1471	Eucalyptus ovata	Swamp Gum	Indigenous	Semi mature	28m x 4m	46	Fair	Fair	20+ years	Medium	5.52	2.39		1-10%	5
1472	Eucalyptus ovata	Swamp Gum	Indigenous	Mature	34m x 7m	68	Good	Good	20+ years	High	8.16	2.81		> 10%	16
1473	Eucalyptus ovata	Swamp Gum	Indigenous	Mature	34m x 6m	49	Good	Fair	20+ years	High	5.88	2.45		1-10%	5
1474	Eucalyptus ovata	Swamp Gum	Indigenous	Mature	34m x 6m	55	Good	Fair	20+ years	High	6.6	2.57		> 10%	24
1475	Eucalyptus ovata	Swamp Gum	Indigenous	Mature	40m x 10m	74	Fair	Fair	20+ years	High	8.88	2.92		> 10%	35
1476	Eucalyptus ovata	Swamp Gum	Indigenous	Mature	40m x 7m	58	Good	Fair	20+ years	High	6.96	2.63		> 10%	34

ID	Botanical Name	Common Name	Origin	Age	H x W	DBH (cm)	Health	Structure	ULE	Retention Value	TPZ (m radius)	SRZ (m radius)	Comments	Retain/ remove	Encroach. %
1477	Eucalyptus ovata	Swamp Gum	Indigenous	Mature	38m x 5m	51	Fair	Fair	20+ years	High	6.12	2.49		> 10%	28
1478	Eucalyptus ovata	Swamp Gum	Indigenous	Mature	36m x 5m	56	Fair	Fair	20+ years	Very high	6.72	2.59		1-10%	9
1479	Eucalyptus splendens	Apple Jack	Native	Mature	36m x 9m	59	Good	Good	20+ years	High	7.08	2.65		1-10%	10
1480	Eucalyptus splendens	Apple Jack	Native	Mature	32m x 6m	49	Good	Fair	20+ years	High	5.88	2.45		1-10%	8
1481	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	26m x 6m	44	Good	Fair	20+ years	High	5.28	2.34		1-10%	6
1482	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	32m x 9m	53	Good	Fair	20+ years	High	6.36	2.53		> 10%	17
1483	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	30m x 5m	39	Fair	Fair	5-10 years	Medium	4.68	2.23		1-10%	5
1484	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	32m x 6m	44	Good	Fair	20+ years	Medium	5.28	2.34		1-10%	2
1485	Eucalyptus splendens	Apple Jack	Native	Semi mature	6m x 5m	37	Fair	Poor	5-10 years	Low	4.44	2.18		0%	0
1486	Eucalyptus splendens	Apple Jack	Native	Mature	32m x 6m	50	Good	Fair	20+ years	Medium	6	2.47		0%	0
1487	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	28m x 5m	37	Good	Fair	20+ years	Medium	4.44	2.18		1-10%	2
1488	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	35m x 10m	72	Good	Fair	20+ years	High	8.64	2.88		> 10%	22
1489	Eucalyptus splendens	Apple Jack	Native	Mature	34m x 7m	60	Good	Fair	20+ years	High	7.2	2.67		1-10%	5
1490	Eucalyptus splendens	Apple Jack	Native	Mature	32m x 7m	54	Good	Fair	20+ years	High	6.48	2.55		> 10%	18
1491	Eucalyptus splendens	Apple Jack	Native	Semi mature	20m x 6m	42	Fair	Fair	20+ years	Medium	5.04	2.30		1-10%	1
1492	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	32m x 5m	41	Good	Fair	20+ years	Medium	4.92	2.28		0%	0
1493	Eucalyptus splendens	Apple Jack	Native	Semi mature	30m x 5m	50	Good	Fair	20+ years	Medium	6	2.47		1-10%	4
1494	Eucalyptus splendens	Apple Jack	Native	Semi mature	28m x 3m	37	Good	Fair	20+ years	Medium	4.44	2.18		0%	0
1495	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	35m x 9m	82	Good	Fair	20+ years	High	9.84	3.04		1-10%	8
1496	Eucalyptus splendens	Apple Jack	Native	Semi mature	32m x 5m	46	Good	Fair	20+ years	Medium	5.52	2.39		0%	0
1497	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	36m x 6m	55	Good	Fair	20+ years	High	6.6	2.57		0%	0
1498	Eucalyptus splendens	Apple Jack	Native	Semi mature	28m x 5m	39	Good	Fair	20+ years	Medium	4.68	2.23		0%	0
1499	Eucalyptus splendens	Apple Jack	Native	Semi mature	30m x 5m	47	Good	Fair	20+ years	Medium	5.64	2.41		0%	0
1500	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	32m x 9m	72	Dead	Fair	20+ years	Low	8.64	2.88		> 10%	11
1501	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	23m x 7m	45	Good	Fair	20+ years	Low	5.4	2.37		0%	0
1502	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	34m x 6m	47	Good	Fair	20+ years	Medium	5.64	2.41		0%	0
1503	Eucalyptus splendens	Apple Jack	Native	Mature	36m x 8m	59	Good	Fair	20+ years	High	7.08	2.65		> 10%	14
1504	Eucalyptus splendens	Apple Jack	Native	Semi mature	32m x 5m	45	Good	Fair	20+ years	Medium	5.4	2.37		1-10%	4
1505	Eucalyptus ovata	Swamp Gum	Indigenous	Semi mature	33m x 5m	44	Good	Fair	20+ years	Medium	5.28	2.34		1-10%	2
1506	Eucalyptus ovata	Swamp Gum	Indigenous	Semi mature	30m x 3m	31	Good	Fair	20+ years	Medium	3.72	2.02		0%	0
1507	Eucalyptus splendens	Apple Jack	Native	Mature	34m x 7m	58	Good	Fair	20+ years	High	6.96	2.63		1-10%	3
1508	Eucalyptus splendens	Apple Jack	Native	Mature	32m x 7m	51	Good	Fair	20+ years	High	6.12	2.49		> 10%	33
1509	Failed	Failed	Native	Failed	34m x 10m	81	Failed	Failed	Failed	High	9.72	3.03		Failed	0
1510	Acacia melanoxylon	Blackwood	Indigenous	Mature	32m x 7m	47	Good	Good	20+ years	High	5.64	2.41		0%	0
1511	Eucalyptus ovata	Swamp Gum	Indigenous	Mature	35m x 8m	68	Good	Fair	20+ years	High	8.16	2.81		1-10%	9
1512	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	35m x 7m	57	Fair	Fair	20+ years	High	6.84	2.61		1-10%	2

ID	Botanical Name	Common Name	Origin	Age	H x W	DBH (cm)	Health	Structure	ULE	Retention Value	TPZ (m radius)	SRZ (m radius)	Comments	Retain/ remove	Encroach. %
1513	Eucalyptus ovata	Swamp Gum	Indigenous	Mature	35m x 8m	53	Fair	Fair	20+ years	Medium	6.36	2.53		0%	0
1514	Eucalyptus ovata	Swamp Gum	Indigenous	Mature	36m x 9m	65	Fair	Fair	20+ years	High	7.8	2.76		1-10%	2
1515	Eucalyptus ovata	Swamp Gum	Indigenous	Mature	36m x 12m	79	Fair	Fair	20+ years	High	9.48	3.00		1-10%	10
1516	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	40m x 7m	57	Fair	Fair	20+ years	High	6.84	2.61		0%	0
1517	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	37m x 6m	55	Fair	Fair	20+ years	High	6.6	2.57		1-10%	7
1518	Eucalyptus ovata	Swamp Gum	Indigenous	Mature	35m x 8m	60	Fair	Fair	20+ years	High	7.2	2.67		1-10%	10
1519	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	35m x 15m	78	Good	Fair	20+ years	High	9.36	2.98		1-10%	6
1520	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	35m x 15m	85	Good	Fair	20+ years	High	10.2	3.09		1-10%	6
1521	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	18m x 3m	31	Poor	Fair	10-20 years	Low	3.72	2.02		1-10%	9
1522	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	37m x 9m	55	Fair	Fair	20+ years	High	6.6	2.57		1-10%	6
1523	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	30m x 5m	55	Fair	Fair	20+ years	Medium	6.6	2.57		1-10%	5
1524	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	25m x 2m	21	Fair	Fair	20+ years	Low	2.52	1.72		1-10%	9
1525	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	24m x 2m	33	Dead	Poor	20+ years	Very high	3.96	2.08		0%	0
1526	Eucalyptus ovata	Swamp Gum	Indigenous	Semi mature	18m x 1m	43	Dead	Poor	20+ years	Low	5.16	2.32		0%	0
1527	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	25m x 5m	47	Fair	Fair	20+ years	Medium	5.64	2.41		0%	0
1528	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	25m x 5m	44	Fair	Fair	20+ years	Medium	5.28	2.34		0%	0
1529	Eucalyptus ovata	Swamp Gum	Indigenous	Semi mature	23m x 5m	41	Fair	Poor	20+ years	Medium	4.92	2.28		1-10%	2
1530	Eucalyptus splendens	Apple Jack	Native	Mature	25m x 15m	84	Good	Fair	20+ years	High	10.08	3.08		> 10%	17
1531	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	26m x 6m	55	Fair	Fair	20+ years	Medium	6.6	2.57		1-10%	5
1532	Eucalyptus splendens	Apple Jack	Native	Mature	25m x 9m	48	Fair	Fair	20+ years	Medium	5.76	2.43		1-10%	1
1533	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	32m x 8m	59	Good	Fair	20+ years	High	7.08	2.65		> 10%	11
1534	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	15m x 3m	40	Good	Poor	10-20 years	Low	4.8	2.25		1-10%	4
1535	Eucalyptus splendens	Apple Jack	Native	Mature	28m x 14m	63	Good	Fair	20+ years	High	7.56	2.73		> 10%	18
1536	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	20m x 5m	40	Fair	Fair	20+ years	Medium	4.8	2.25		0%	0
1537	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	21m x 4m	33	Fair	Fair	20+ years	Medium	3.96	2.08		0%	0
1538	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	25m x 7m	42	Good	Fair	20+ years	Medium	5.04	2.30		0%	0
1539	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	29m x 10m	55	Good	Fair	20+ years	High	6.6	2.57		1-10%	4
1540	Eucalyptus splendens	Apple Jack	Native	Semi mature	26m x 5m	41	Poor	Poor	5-10 years	Low	4.92	2.28		1-10%	1
1541	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	32m x 5m	37	Fair	Fair	20+ years	Medium	4.44	2.18		0%	0
1542	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	22m x 6m	52	Dead	Poor	0 years	Low	6.24	2.51		0%	0
1543	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	14m x 12m	44	Good	Fair	20+ years	Medium	5.28	2.34		0%	0
1544	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	20m x 3m	369	Good	Fair	20+ years	Medium	15	5.73		> 10%	28
1545	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	21m x 5m	38	Good	Fair	20+ years	Medium	4.56	2.20		0%	0
1546	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	36m x 14m	80	Good	Fair	20+ years	High	9.6	3.01		1-10%	1
1547	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	25m x 7m	44	Good	Fair	20+ years	Medium	5.28	2.34		0%	0
1548	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	25m x 5m	46	Good	Fair	20+ years	Medium	5.52	2.39		0%	0

ID	Botanical Name	Common Name	Origin	Age	H x W	DBH (cm)	Health	Structure	ULE	Retention Value	TPZ (m radius)	SRZ (m radius)	Comments	Retain/ remove	Encroach. %
1549	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	28m x 9m	49	Good	Fair	20+ years	Medium	5.88	2.45		0%	0
1550	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	28m x 6m	49	Good	Fair	20+ years	Medium	5.88	2.45		0%	0
1551	Eucalyptus splendens	Apple Jack	Native	Semi mature	26m x 5m	45	Good	Fair	20+ years	Medium	5.4	2.37		0%	0
1552	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	35m x 7m	88	Good	Fair	20+ years	High	10.56	3.14		> 10%	24
1553	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	23m x 4m	36	Good	Fair	20+ years	Medium	4.32	2.15		0%	0
1554	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	26m x 7m	39	Fair	Fair	20+ years	Medium	4.68	2.23		0%	0
1555	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	24m x 4m	36	Good	Fair	10-20 years	Low	4.32	2.15		0%	0
1556	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	34m x 12m	90	Good	Fair	20+ years	High	10.8	3.17		0%	0
1557	Eucalyptus splendens	Apple Jack	Native	Semi mature	28m x 5m	64	Poor	Fair	10-20 years	Medium	7.68	2.74		1-10%	6
1558	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	35m x 8m	56	Good	Fair	20+ years	High	6.72	2.59		0%	0
1559	Eucalyptus splendens	Apple Jack	Native	Semi mature	26m x 6m	65	Good	Fair	20+ years	Medium	7.8	2.76		1-10%	8
1560	Eucalyptus splendens	Apple Jack	Native	Mature	23m x 8m	56	Good	Fair	20+ years	Medium	6.72	2.59		1-10%	1
1561	Eucalyptus splendens	Apple Jack	Native	Semi mature	15m x 4m	35	Fair	Fair	10-20 years	Medium	4.2	2.13		0%	0
1562	Eucalyptus splendens	Apple Jack	Native	Mature	32m x 8m	58	Good	Fair	20+ years	High	6.96	2.63		1-10%	9
1563	Eucalyptus splendens	Apple Jack	Native	Semi mature	24m x 5m	44	Good	Fair	20+ years	Medium	5.28	2.34		1-10%	1
1564	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	32m x 5m	32	Good	Fair	20+ years	Medium	3.84	2.05		0%	0
1565	Eucalyptus splendens	Apple Jack	Native	Semi mature	28m x 7m	45	Good	Fair	20+ years	High	5.4	2.37		0%	0
1566	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	36m x 9m	93	Good	Fair	20+ years	High	11.16	3.21		> 10%	14
1567	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	40m x 8m	68	Good	Fair	20+ years	High	8.16	2.81		1-10%	5
1568	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	24m x 7m	41	Good	Fair	20+ years	High	4.92	2.28		1-10%	1
1569	Eucalyptus ovata	Swamp Gum	Indigenous	Semi mature	23m x 3m	38	Poor	Poor	5-10 years	Low	4.56	2.20		0%	0
1570	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	28m x 5m	42	Good	Good	20+ years	High	5.04	2.30		0%	0
1571	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	32m x 12m	88	Poor	Very poor	1-5 years	Low	10.56	3.14		1-10%	10
1572	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	36m x 15m	91	Good	Fair	20+ years	High	10.92	3.18		> 10%	13
1573	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	30m x 6m	66	Poor	Poor	5-10 years	Low	7.92	2.78		1-10%	9
1574	Eucalyptus ovata	Swamp Gum	Indigenous	Mature	36m x 6m	62	Poor	Fair	20+ years	High	7.44	2.71		1-10%	7
1575	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	43m x 9m	76	Good	Fair	20+ years	Very high	9.12	2.95		> 10%	11
1576	Eucalyptus ovata	Swamp Gum	Indigenous	Mature	48m x 10m	88	Good	Fair	20+ years	High	10.56	3.14		1-10%	2
1577	Eucalyptus ovata	Swamp Gum	Indigenous	Mature	40m x 12m	62	Good	Fair	20+ years	High	7.44	2.71		0%	0
1578	Eucalyptus ovata	Swamp Gum	Indigenous	Semi mature	8m x 2m	34	Fair	Poor	5-10 years	Low	4.08	2.10		0%	0
1579	Eucalyptus ovata	Swamp Gum	Indigenous	Mature	33m x 18m	100	Fair	Fair	20+ years	High	12	3.31		> 10%	14
1580	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	35m x 14m	73	Good	Fair	20+ years	High	8.76	2.90		> 10%	16
1581	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	38m x 7m	65	Good	Fair	20+ years	High	7.8	2.76		> 10%	11
1582	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	42m x 9m	65	Good	Fair	20+ years	High	7.8	2.76		> 10%	15
1583	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	34m x 5m	54	Good	Fair	20+ years	High	6.48	2.55		0%	0
1584	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	42m x 10m	87	Good	Fair	20+ years	High	10.44	3.12		> 10%	13

ID	Botanical Name	Common Name	Origin	Age	H x W	DBH (cm)	Health	Structure	ULE	Retention Value	TPZ (m radius)	SRZ (m radius)	Comments	Retain/ remove	Encroach. %
1585	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	28m x 5m	48	Good	Good	20+ years	High	5.76	2.43		0%	0
1586	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	28m x 5m	50	Good	Good	20+ years	High	6	2.47		0%	0
1587	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	30m x 5m	50	Good	Good	20+ years	Very high	6	2.47		0%	0
1588	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	30m x 9m	61	Good	Fair	20+ years	High	7.32	2.69		0%	0
1589	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	38m x 15m	97	Good	Fair	20+ years	High	11.64	3.27		> 10%	20
1590	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	40m x 14m	104	Good	Fair	20+ years	High	12.48	3.36		1-10%	3
1591	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	40m x 10m	119	Good	Fair	20+ years	Medium	14.28	3.56		> 10%	27
1592	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	36m x 6m	49	Good	Fair	20+ years	High	5.88	2.45		0%	0
1593	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	40m x 14m	76	Good	Fair	20+ years	High	9.12	2.95		> 10%	15
1594	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	40m x 15m	100	Good	Fair	20+ years	High	12	3.31		> 10%	26
1595	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	36m x 7m	55	Good	Fair	20+ years	High	6.6	2.57		0%	0
1596	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	33m x 9m	53	Good	Fair	20+ years	High	6.36	2.53		0%	0
1597	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	28m x 5m	36	Good	Fair	20+ years	Very high	4.32	2.15		0%	0
1598	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	35m x 5m	52	Good	Fair	20+ years	Medium	6.24	2.51		1-10%	9
1599	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	38m x 12m	65	Good	Fair	20+ years	High	7.8	2.76		1-10%	10
1600	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	34m x 5m	74	Fair	Fair	10-20 years	High	8.88	2.92		1-10%	6
1601	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	29m x 8m	63	Fair	Fair	10-20 years	Medium	7.56	2.73		1-10%	1
1602	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	23m x 7m	51	Good	Fair	20+ years	High	6.12	2.49		0%	0
1603	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	35m x 8m	63	Good	Fair	20+ years	High	7.56	2.73		> 10%	15
1604	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	20m x 3m	40	Poor	Fair	10-20 years	Medium	4.8	2.25		0%	0
1605	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	34m x 12m	64	Good	Good	20+ years	High	7.68	2.74		1-10%	6
1606	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	28m x 7m	46	Good	Fair	20+ years	High	5.52	2.39		1-10%	4
1607	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	32m x 7m	49	Good	Fair	20+ years	High	5.88	2.45		1-10%	9
1608	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	32m x 8m	53	Good	Fair	20+ years	High	6.36	2.53		1-10%	3
1609	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	30m x 3m	48	Poor	Fair	10-20 years	Medium	5.76	2.43		0%	0
1610	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	34m x 6m	74	Fair	Fair	10-20 years	High	8.88	2.92		> 10%	13
1611	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	34m x 8m	55	Fair	Fair	20+ years	High	6.6	2.57		1-10%	4
1612	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	38m x 8m	71	Good	Fair	20+ years	High	8.52	2.87		> 10%	11
1613	Eucalyptus splendens	Apple Jack	Native	Mature	34m x 9m	60	Good	Fair	20+ years	High	7.2	2.67		> 10%	12
1614	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	40m x 12m	110	Good	Fair	20+ years	High	13.2	3.44		> 10%	30
1615	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	36m x 7m	41	Good	Good	20+ years	High	4.92	2.28		0%	0
1616	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	35m x 8m	76	Good	Good	20+ years	High	9.12	2.95		> 10%	12
1617	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	38m x 8m	60	Good	Good	20+ years	High	7.2	2.67		> 10%	22
1618	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	35m x 12m	121	Good	Fair	20+ years	High	14.52	3.59		> 10%	19
1619	Eucalyptus ovata	Swamp Gum	Indigenous	Mature	32m x 15m	67	Fair	Fair	10-20 years	High	8.04	2.80		1-10%	1
1620	Eucalyptus ovata	Swamp Gum	Indigenous	Mature	45m x 14m	123	Fair	Fair	20+ years	Very high	14.76	3.61		> 10%	16

ID	Botanical Name	Common Name	Origin	Age	H x W	DBH (cm)	Health	Structure	ULE	Retention Value	TPZ (m radius)	SRZ (m radius)	Comments	Retain/ remove	Encroach. %
1621	Eucalyptus ovata	Swamp Gum	Indigenous	Semi mature	30m x 12m	52	Poor	Fair	10-20 years	Medium	6.24	2.51		0%	0
1622	Eucalyptus ovata	Swamp Gum	Indigenous	Semi mature	26m x 14m	52	Poor	Fair	10-20 years	Medium	6.24	2.51		0%	0
1623	Acacia melanoxylon	Blackwood	Indigenous	Semi mature	24m x 6m	39	Good	Fair	20+ years	Medium	4.68	2.23		0%	0
1624	Eucalyptus ovata	Swamp Gum	Indigenous	Semi mature	35m x 5m	52	Good	Fair	20+ years	High	6.24	2.51		1-10%	2
1625	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	36m x 9m	64	Good	Fair	20+ years	High	7.68	2.74		> 10%	14
1626	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	32m x 6m	70	Good	Fair	20+ years	High	8.4	2.85		> 10%	17
1627	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	38m x 9m	79	Good	Fair	20+ years	High	9.48	3.00		> 10%	13
1628	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	35m x 10m	85	Good	Fair	20+ years	High	10.2	3.09		> 10%	13
1629	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	35m x 9m	52	Fair	Fair	20+ years	Medium	6.24	2.51		1-10%	3
1630	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	36m x 6m	51	Good	Fair	20+ years	High	6.12	2.49		0%	0
1631	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	36m x 9m	59	Good	Fair	20+ years	High	7.08	2.65		1-10%	5
1632	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	35m x 14m	171	Poor	Poor	20+ years	Very high	15	4.15		> 10%	11
1633	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	24m x 20m	108	Poor	Poor	10-20 years	High	12.96	3.42		> 10%	17
1634	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	35m x 6m	41	Good	Good	20+ years	Medium	4.92	2.28		0%	0
1635	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	35m x 3m	35	Good	Good	20+ years	Medium	4.2	2.13		0%	0
1636	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	34m x 14m	65	Good	Fair	20+ years	High	7.8	2.76		> 10%	14
1637	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	34m x 4m	40	Fair	Fair	20+ years	Medium	4.8	2.25		0%	0
1638	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	28m x 4m	39	Fair	Fair	20+ years	Medium	4.68	2.23		1-10%	1
1639	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	37m x 12m	61	Good	Fair	20+ years	High	7.32	2.69		1-10%	3
1640	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	36m x 12m	66	Good	Fair	20+ years	High	7.92	2.78		> 10%	16
1641	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	23m x 5m	39	Fair	Fair	20+ years	Medium	4.68	2.23		0%	0
1642	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	38m x 9m	57	Fair	Fair	20+ years	High	6.84	2.61		1-10%	7
1643	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	34m x 7m	75	Fair	Fair	20+ years	High	9	2.93		0%	0
1644	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	28m x 4m	30	Good	Fair	20+ years	Medium	3.6	2.00		0%	0
1645	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	32m x 6m	49	Good	Fair	20+ years	Medium	5.88	2.45		0%	0
1646	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	32m x 4m	38	Fair	Fair	10-20 years	Very high	4.56	2.20		0%	0
1647	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	32m x 6m	38	Fair	Fair	10-20 years	Medium	4.56	2.20		0%	0
1648	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	32m x 12m	86	Fair	Fair	10-20 years	High	10.32	3.11		> 10%	15
1649	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	26m x 4m	32	Good	Good	20+ years	Medium	3.84	2.05		0%	0
1650	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	25m x 4m	28	Good	Good	20+ years	Medium	3.36	1.94		0%	0
1651	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	24m x 3m	34	Good	Good	20+ years	Medium	4.08	2.10		0%	0
1652	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	32m x 4m	35	Good	Good	20+ years	Medium	4.2	2.13		0%	0
1653	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	32m x 4m	34	Good	Good	20+ years	Medium	4.08	2.10		0%	0
1654	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	30m x 4m	37	Good	Good	20+ years	Medium	4.44	2.18		0%	0
1655	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	34m x 8m	47	Good	Good	20+ years	Medium	5.64	2.41		0%	0
1656	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	16m x 6m	98	Dead	Poor	0 years	Low	11.76	3.28		> 10%	14

ID	Botanical Name	Common Name	Origin	Age	H x W	DBH (cm)	Health	Structure	ULE	Retention Value	TPZ (m radius)	SRZ (m radius)	Comments	Retain/ remove	Encroach. %
1657	Eucalyptus splendens	Apple Jack	Native	Mature	34m x 14m	89	Good	Fair	20+ years	High	10.68	3.15		> 10%	20
1658	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	30m x 5m	54	Fair	Fair	20+ years	Medium	6.48	2.55		0%	0
1659	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	32m x 12m	102	Fair	Fair	20+ years	High	12.24	3.34		1-10%	2
1660	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	30m x 5m	42	Good	Fair	20+ years	Medium	5.04	2.30		0%	0
1661	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	28m x 4m	32	Good	Fair	20+ years	Medium	3.84	2.05		0%	0
1662	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	28m x 4m	34	Good	Fair	20+ years	Medium	4.08	2.10		0%	0
1663	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	34m x 12m	70	Good	Fair	20+ years	High	8.4	2.85		1-10%	2
1664	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	30m x 4m	31	Good	Fair	20+ years	Medium	3.72	2.02		0%	0
1665	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	32m x 4m	56	Good	Fair	20+ years	Medium	6.72	2.59		1-10%	2
1666	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	30m x 6m	54	Good	Fair	20+ years	Medium	6.48	2.55		> 10%	14
1667	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	32m x 5m	49	Good	Fair	20+ years	Medium	5.88	2.45		1-10%	3
1668	Eucalyptus ovata	Swamp Gum	Indigenous	Semi mature	24m x 6m	43	Fair	Fair	10-20 years	Medium	5.16	2.32		0%	0
1669	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	36m x 12m	70	Good	Fair	20+ years	High	8.4	2.85		1-10%	5
1670	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	30m x 5m	43	Good	Fair	20+ years	Medium	5.16	2.32		0%	0
1671	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	28m x 5m	28	Good	Fair	20+ years	Medium	3.36	1.94		0%	0
1672	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	8m x 2m	31	Good	Fair	20+ years	Low	3.72	2.02		0%	0
1673	Eucalyptus splendens	Apple Jack	Native	Mature	28m x 12m	54	Good	Good	20+ years	High	6.48	2.55		1-10%	6
1674	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	18m x 2m	31	Fair	Poor	5-10 years	Low	3.72	2.02		0%	0
1675	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	27m x 6m	43	Good	Fair	20+ years	Medium	5.16	2.32		1-10%	1
1676	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	32m x 6m	68	Good	Fair	20+ years	High	8.16	2.81		> 10%	14
1677	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	18m x 2m	27	Fair	Fair	10-20 years	Medium	3.24	1.91		0%	0
1678	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	28m x 5m	46	Good	Good	20+ years	Medium	5.52	2.39		1-10%	3
1679	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	32m x 5m	44	Good	Fair	20+ years	Medium	5.28	2.34		1-10%	9
1680	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	28m x 15m	88	Good	Fair	20+ years	High	10.56	3.14		1-10%	2
1681	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	25m x 5m	39	Good	Good	20+ years	Medium	4.68	2.23		1-10%	6
1682	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	35m x 9m	85	Fair	Fair	20+ years	High	10.2	3.09		> 10%	14
1683	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	32m x 4m	42	Good	Good	20+ years	Low	5.04	2.30		1-10%	6
1684	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	26m x 3m	30	Fair	Fair	10-20 years	Medium	3.6	2.00		0%	0
1685	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	28m x 3m	32	Good	Fair	20+ years	Low	3.84	2.05		0%	0
1686	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	28m x 4m	32	Good	Fair	20+ years	Medium	3.84	2.05		0%	0
1687	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	28m x 4m	39	Good	Fair	20+ years	Low	4.68	2.23		1-10%	3
1688	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	16m x 7m	47	Good	Fair	20+ years	High	5.64	2.41		1-10%	3
1689	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	27m x 6m	35	Poor	Fair	10-20 years	Medium	4.2	2.13		1-10%	5
1690	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	28m x 14m	75	Good	Good	20+ years	High	9	2.93		1-10%	3
1691	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	20m x 4m	38	Fair	Fair	20+ years	Medium	4.56	2.20		0%	0
1692	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	20m x 3m	30	Fair	Fair	20+ years	Medium	3.6	2.00		0%	0

ID	Botanical Name	Common Name	Origin	Age	H x W	DBH (cm)	Health	Structure	ULE	Retention Value	TPZ (m radius)	SRZ (m radius)	Comments	Retain/ remove	Encroach. %
1693	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	30m x 6m	50	Fair	Fair	20+ years	Medium	6	2.47		0%	0
1694	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	28m x 7m	65	Good	Good	20+ years	Medium	7.8	2.76		> 10%	30
1695	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	28m x 7m	44	Good	Fair	20+ years	Medium	5.28	2.34		1-10%	1
1696	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	40m x 12m	91	Good	Fair	20+ years	High	10.92	3.18		> 10%	23
1697	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	32m x 5m	41	Good	Fair	20+ years	Medium	4.92	2.28		0%	0
1698	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	33m x 7m	65	Good	Fair	20+ years	Medium	7.8	2.76		1-10%	7
1699	Eucalyptus splendens	Apple Jack	Native	Semi mature	18m x 4m	34	Fair	Fair	20+ years	Medium	4.08	2.10		0%	0
1700	Eucalyptus splendens	Apple Jack	Native	Semi mature	23m x 4m	37	Fair	Fair	20+ years	Medium	4.44	2.18		0%	0
1701	Eucalyptus ovata	Swamp Gum	Indigenous	Semi mature	17m x 4m	55	Fair	Fair	20+ years	Medium	6.6	2.57		0%	0
1702	Eucalyptus splendens	Apple Jack	Native	Mature	36m x 12m	94	Fair	Fair	20+ years	High	11.28	3.22		> 10%	17
1703	Eucalyptus splendens	Apple Jack	Native	Semi mature	32m x 5m	46	Good	Good	20+ years	Medium	5.52	2.39		0%	0
1704	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	30m x 6m	47	Good	Good	20+ years	Medium	5.64	2.41		0%	0
1705	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	20m x 5m	33	Good	Fair	20+ years	Medium	3.96	2.08		0%	0
1706	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	20m x 8m	53	Good	Fair	20+ years	Medium	6.36	2.53		0%	0
1707	Eucalyptus splendens	Apple Jack	Native	Semi mature	26m x 6m	48	Good	Fair	20+ years	Medium	5.76	2.43		0%	0
1708	Eucalyptus splendens	Apple Jack	Native	Mature	24m x 10m	93	Good	Poor	20+ years	Medium	11.16	3.21		1-10%	8
1709	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	45m x 7m	75	Good	Fair	20+ years	High	9	2.93		0%	0
1710	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	42m x 8m	76	Good	Fair	20+ years	High	9.12	2.95		1-10%	2
1711	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	22m x 5m	41	Good	Fair	20+ years	Medium	4.92	2.28		0%	0
1712	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	23m x 3m	25	Good	Fair	20+ years	Medium	3	1.85		0%	0
1713	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	26m x 5m	47	Good	Fair	20+ years	Medium	5.64	2.41		1-10%	1
1714	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	30m x 7m	54	Good	Fair	20+ years	Medium	6.48	2.55		1-10%	6
1715	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	30m x 6m	54	Good	Fair	20+ years	Medium	6.48	2.55		> 10%	11
1716	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	30m x 7m	52	Good	Fair	20+ years	Medium	6.24	2.51		1-10%	3
1717	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	27m x 5m	36	Good	Fair	20+ years	Medium	4.32	2.15		0%	0
1718	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	34m x 7m	48	Good	Fair	20+ years	High	5.76	2.43		0%	0
1719	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	35m x 9m	76	Good	Fair	20+ years	High	9.12	2.95		1-10%	3
1720	Eucalyptus splendens	Apple Jack	Native	Semi mature	32m x 6m	50	Good	Fair	20+ years	High	6	2.47		0%	0
1721	Eucalyptus splendens	Apple Jack	Native	Semi mature	32m x 7m	53	Good	Fair	20+ years	Medium	6.36	2.53		0%	0
1722	Eucalyptus splendens	Apple Jack	Native	Semi mature	28m x 5m	44	Good	Fair	20+ years	Medium	5.28	2.34		0%	0
1723	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	35m x 8m	63	Good	Fair	20+ years	High	7.56	2.73		0%	0
1724	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	28m x 5m	34	Good	Fair	20+ years	Medium	4.08	2.10		0%	0
1725	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	40m x 25m	98	Good	Fair	20+ years	High	11.76	3.28		1-10%	1
1726	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	28m x 4m	34	Good	Good	20+ years	Medium	4.08	2.10		0%	0
1727	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	28m x 4m	36	Good	Good	20+ years	Medium	4.32	2.15		0%	0
1728	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	40m x 10m	76	Good	Fair	20+ years	High	9.12	2.95		> 10%	15

ID	Botanical Name	Common Name	Origin	Age	H x W	DBH (cm)	Health	Structure	ULE	Retention Value	TPZ (m radius)	SRZ (m radius)	Comments	Retain/ remove	Encroach. %
1729	Eucalyptus splendens	Apple Jack	Native	Semi mature	22m x 3m	47	Fair	Fair	10-20 years	Medium	5.64	2.41		0%	0
1730	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	18m x 3m	34	Fair	Fair	20+ years	Medium	4.08	2.10		0%	0
1731	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	28m x 3m	53	Dead	Fair	20+ years	Low	6.36	2.53		0%	0
1732	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	26m x 3m	35	Fair	Fair	20+ years	Medium	4.2	2.13		0%	0
1733	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	32m x 10m	57	Good	Fair	20+ years	Medium	6.84	2.61		0%	0
1734	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	30m x 12m	72	Fair	Fair	20+ years	High	8.64	2.88		> 10%	19
1735	Eucalyptus splendens	Apple Jack	Native	Mature	24m x 7m	50	Good	Fair	20+ years	High	6	2.47		1-10%	2
1736	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	35m x 12m	83	Poor	Fair	10-20 years	Low	9.96	3.06		> 10%	15
1737	Eucalyptus splendens	Apple Jack	Native	Semi mature	13m x 5m	32	Fair	Fair	20+ years	Medium	3.84	2.05		0%	0
1738	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	22m x 3m	33	Fair	Fair	20+ years	Medium	3.96	2.08		0%	0
1739	Eucalyptus ovata	Swamp Gum	Indigenous	Mature	17m x 6m	59	Fair	Fair	10-20 years	Medium	7.08	2.65		1-10%	8
1740	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	20m x 5m	33	Fair	Fair	10-20 years	Medium	3.96	2.08		0%	0
1741	Eucalyptus splendens	Apple Jack	Native	Mature	30m x 15m	70	Good	Fair	10-20 years	High	8.4	2.85		> 10%	13
1742	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	24m x 7m	39	Good	Fair	10-20 years	Medium	4.68	2.23		0%	0
1743	Eucalyptus splendens	Apple Jack	Native	Mature	28m x 8m	50	Good	Good	20+ years	High	6	2.47		0%	0
1744	Eucalyptus splendens	Apple Jack	Native	Mature	28m x 7m	48	Good	Fair	20+ years	High	5.76	2.43		0%	0
1745	Eucalyptus splendens	Apple Jack	Native	Mature	30m x 7m	50	Good	Fair	20+ years	High	6	2.47		0%	0
1746	Eucalyptus splendens	Apple Jack	Native	Mature	26m x 5m	44	Good	Fair	20+ years	High	5.28	2.34		0%	0
1747	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	28m x 7m	42	Good	Fair	20+ years	High	5.04	2.30		1-10%	1
1748	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	34m x 9m	48	Good	Fair	20+ years	High	5.76	2.43		0%	0
1749	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	18m x 4m	32	Good	Fair	20+ years	Medium	3.84	2.05		0%	0
1750	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	22m x 5m	30	Good	Fair	20+ years	Medium	3.6	2.00		0%	0
1751	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	38m x 8m	64	Good	Fair	20+ years	High	7.68	2.74		1-10%	1
1752	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	35m x 12m	67	Good	Fair	20+ years	High	8.04	2.80		1-10%	7
1753	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	30m x 7m	59	Good	Fair	20+ years	High	7.08	2.65		> 10%	14
1754	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	18m x 3m	35	Fair	Fair	20+ years	Low	4.2	2.13		0%	0
1755	Eucalyptus ovata	Swamp Gum	Indigenous	Semi mature	25m x 3m	38	Fair	Fair	20+ years	Medium	4.56	2.20		0%	0
1756	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	20m x 4m	38	Good	Fair	20+ years	Low	4.56	2.20		0%	0
1757	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	23m x 5m	38	Good	Fair	20+ years	Medium	4.56	2.20		0%	0
1758	Eucalyptus splendens	Apple Jack	Native	Semi mature	22m x 8m	51	Fair	Fair	10-20 years	Medium	6.12	2.49		0%	0
1759	Eucalyptus ovata	Swamp Gum	Indigenous	Semi mature	24m x 5m	43	Fair	Fair	10-20 years	Medium	5.16	2.32		1-10%	1
1760	Eucalyptus ovata	Swamp Gum	Indigenous	Semi mature	26m x 5m	50	Fair	Fair	10-20 years	Medium	6	2.47		0%	0
1761	Eucalyptus ovata	Swamp Gum	Indigenous	Semi mature	22m x 3m	39	Fair	Fair	10-20 years	Medium	4.68	2.23		0%	0
1762	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	34m x 7m	69	Good	Fair	20+ years	High	8.28	2.83		0%	0
1763	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	37m x 9m	74	Good	Fair	20+ years	High	8.88	2.92		1-10%	2
1764	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	35m x 10m	56	Good	Fair	20+ years	High	6.72	2.59		> 10%	14

ID	Botanical Name	Common Name	Origin	Age	H x W	DBH (cm)	Health	Structure	ULE	Retention Value	TPZ (m radius)	SRZ (m radius)	Comments	Retain/ remove	Encroach. %
1765	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	28m x 6m	36	Good	Fair	20+ years	Medium	4.32	2.15		0%	0
1766	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	25m x 3m	30	Good	Fair	20+ years	Medium	3.6	2.00		0%	0
1767	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	30m x 8m	52	Good	Fair	20+ years	Medium	6.24	2.51		0%	0
1768	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	25m x 3m	37	Good	Fair	20+ years	Medium	4.44	2.18		0%	0
1769	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	20m x 4m	27	Good	Fair	20+ years	Medium	3.24	1.91		0%	0
1770	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	30m x 7m	51	Good	Fair	20+ years	High	6.12	2.49		0%	0
1771	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	36m x 12m	93	Good	Good	20+ years	High	11.16	3.21		1-10%	7
1772	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	27m x 6m	50	Good	Fair	20+ years	Medium	6	2.47		1-10%	5
1773	Eucalyptus ovata	Swamp Gum	Indigenous	Semi mature	24m x 3m	54	Poor	Poor	5-10 years	Low	6.48	2.55		1-10%	2
1774	Eucalyptus ovata	Swamp Gum	Indigenous	Semi mature	24m x 3m	38	Good	Fair	20+ years	Medium	4.56	2.20		0%	0
1775	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	30m x 7m	58	Good	Fair	20+ years	High	6.96	2.63		1-10%	2
1776	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	26m x 7m	40	Good	Fair	20+ years	Medium	4.8	2.25		0%	0
1777	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	24m x 5m	38	Good	Fair	20+ years	Medium	4.56	2.20		0%	0
1778	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	18m x 5m	33	Good	Fair	20+ years	Medium	3.96	2.08		0%	0
1779	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	18m x 5m	29	Good	Fair	20+ years	Medium	3.48	1.97		0%	0
1780	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	34m x 12m	101	Good	Fair	20+ years	High	12.12	3.32		> 10%	19
1781	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	40m x 16m	76	Good	Fair	20+ years	High	9.12	2.95		1-10%	5
1782	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	36m x 12m	61	Good	Fair	20+ years	High	7.32	2.69		0%	0
1783	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	32m x 8m	46	Fair	Fair	10-20 years	Medium	5.52	2.39		0%	0
1784	Eucalyptus ovata	Swamp Gum	Indigenous	Semi mature	25m x 5m	36	Good	Fair	20+ years	High	4.32	2.15		0%	0
1785	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	36m x 12m	66	Fair	Fair	20+ years	Medium	7.92	2.78		0%	0
1786	Eucalyptus ovata	Swamp Gum	Indigenous	Mature	32m x 12m	70	Fair	Fair	10-20 years	High	8.4	2.85		1-10%	2
1787	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	32m x 18m	82	Fair	Fair	20+ years	High	9.84	3.04		> 10%	21
1788	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	40m x 12m	85	Fair	Fair	20+ years	High	10.2	3.09		> 10%	17
1789	Eucalyptus splendens	Apple Jack	Native	Mature	32m x 12m	74	Good	Fair	20+ years	High	8.88	2.92		0%	0
1790	Eucalyptus splendens	Apple Jack	Native	Semi mature	22m x 5m	51	Good	Fair	20+ years	Medium	6.12	2.49		0%	0
1791	Eucalyptus splendens	Apple Jack	Native	Semi mature	22m x 10m	54	Fair	Fair	20+ years	Medium	6.48	2.55		1-10%	3
1792	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	40m x 10m	81	Fair	Fair	20+ years	High	9.72	3.03		1-10%	10
1793	Eucalyptus ovata	Swamp Gum	Indigenous	Semi mature	22m x 7m	41	Fair	Fair	10-20 years	Medium	4.92	2.28		0%	0
1794	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	34m x 5m	53	Good	Fair	20+ years	Medium	6.36	2.53		1-10%	5
1795	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	32m x 5m	46	Good	Fair	20+ years	Medium	5.52	2.39		0%	0
1796	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	40m x 7m	78	Good	Fair	20+ years	High	9.36	2.98		> 10%	18
1797	Eucalyptus ovata	Swamp Gum	Indigenous	Semi mature	25m x 4m	36	Fair	Fair	10-20 years	Medium	4.32	2.15		1-10%	1
1798	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	32m x 7m	58	Good	Fair	20+ years	High	6.96	2.63		> 10%	19
1799	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	18m x 4m	33	Poor	Fair	10-20 years	Medium	3.96	2.08		0%	0
1800	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	32m x 8m	84	Fair	Poor	10-20 years	High	10.08	3.08		> 10%	13

ID	Botanical Name	Common Name	Origin	Age	H x W	DBH (cm)	Health	Structure	ULE	Retention Value	TPZ (m radius)	SRZ (m radius)	Comments	Retain/ remove	Encroach. %
1801	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	32m x 9m	63	Good	Fair	20+ years	High	7.56	2.73		1-10%	4
1802	Eucalyptus splendens	Apple Jack	Native	Semi mature	25m x 6m	83	Fair	Fair	20+ years	High	9.96	3.06		1-10%	7
1803	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	18m x 4m	32	Good	Fair	20+ years	Medium	3.84	2.05		0%	0
1804	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	38m x 18m	103	Fair	Fair	20+ years	High	12.36	3.35		> 10%	27
1805	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	26m x 9m	41	Good	Good	20+ years	High	4.92	2.28		1-10%	2
1806	Eucalyptus splendens	Apple Jack	Native	Mature	35m x 15m	96	Fair	Fair	20+ years	High	11.52	3.25		> 10%	19
1807	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	45m x 12m	92	Fair	Fair	20+ years	High	11.04	3.20		1-10%	8
1808	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	32m x 14m	65	Fair	Fair	20+ years	High	7.8	2.76		1-10%	6
1809	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	33m x 9m	67	Fair	Fair	20+ years	High	8.04	2.80		> 10%	16
1810	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	16m x 4m	34	Fair	Fair	10-20 years	Medium	4.08	2.10		0%	0
1811	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	20m x 4m	36	Good	Fair	10-20 years	Very high	4.32	2.15		0%	0
1812	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	24m x 5m	37	Good	Fair	20+ years	Medium	4.44	2.18		0%	0
1813	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	30m x 10m	59	Good	Fair	20+ years	High	7.08	2.65		1-10%	2
1814	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	34m x 20m	115	Fair	Fair	20+ years	High	13.8	3.51		> 10%	24
1815	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	26m x 10m	78	Fair	Fair	20+ years	High	9.36	2.98		> 10%	13
1816	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	40m x 14m	93	Good	Fair	20+ years	High	11.16	3.21		> 10%	11
1817	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	38m x 10m	72	Fair	Fair	20+ years	Medium	8.64	2.88		1-10%	4
1818	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	35m x 9m	81	Fair	Fair	20+ years	Medium	9.72	3.03		> 10%	13
1819	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	38m x 12m	93	Fair	Fair	20+ years	High	11.16	3.21		> 10%	14
1820	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	34m x 9m	79	Poor	Fair	10-20 years	Medium	9.48	3.00		> 10%	17
1821	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	38m x 6m	43	Fair	Fair	20+ years	Medium	5.16	2.32		0%	0
1822	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	28m x 3m	39	Poor	Fair	5-10 years	Low	4.68	2.23		0%	0
1823	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	38m x 10m	60	Fair	Fair	20+ years	High	7.2	2.67		0%	0
1824	Eucalyptus splendens	Apple Jack	Native	Semi mature	24m x 4m	43	Good	Fair	20+ years	Medium	5.16	2.32		0%	0
1825	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	38m x 12m	72	Good	Fair	20+ years	High	8.64	2.88		1-10%	8
1826	Eucalyptus splendens	Apple Jack	Native	Semi mature	18m x 5m	39	Poor	Fair	20+ years	Medium	4.68	2.23		0%	0
1827	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	32m x 6m	68	Poor	Good	10-20 years	Medium	8.16	2.81		> 10%	15
1828	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	23m x 4m	33	Poor	Fair	10-20 years	Medium	3.96	2.08		0%	0
1829	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	24m x 4m	27	Fair	Fair	20+ years	Low	3.24	1.91		0%	0
1830	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	36m x 13m	60	Good	Fair	20+ years	High	7.2	2.67		0%	0
1831	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	18m x 2m	27	Poor	Poor	5-10 years	Low	3.24	1.91		0%	0
1832	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	28m x 5m	42	Fair	Fair	20+ years	Medium	5.04	2.30		0%	0
1833	Eucalyptus splendens	Apple Jack	Native	Mature	25m x 10m	50	Good	Fair	20+ years	Medium	6	2.47		1-10%	2
1834	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	38m x 12m	73	Poor	Fair	20+ years	High	8.76	2.90		> 10%	24
1835	Eucalyptus viminalis subsp. Cygnetensis	Rough-barked Manna Gum	Indigenous	Semi mature	20m x 12m	42	Good	Fair	20+ years	Medium	5.04	2.30		0%	0
1836	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	34m x 15m	89	Good	Good	20+ years	High	10.68	3.15		1-10%	1

ID	Botanical Name	Common Name	Origin	Age	H x W	DBH (cm)	Health	Structure	ULE	Retention Value	TPZ (m radius)	SRZ (m radius)	Comments	Retain/ remove	Encroach. %
1837	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	30m x 10m	68	Good	Fair	20+ years	High	8.16	2.81		0%	0
1838	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	42m x 17m	95	Good	Fair	20+ years	High	11.4	3.24		> 10%	27
1839	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	27m x 6m	50	Fair	Fair	20+ years	High	6	2.47		0%	0
1840	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	40m x 18m	117	Fair	Fair	20+ years	High	14.04	3.53		> 10%	25
1841	Eucalyptus ovata	Swamp Gum	Indigenous	Semi mature	18m x 4m	37	Fair	Fair	10-20 years	Medium	4.44	2.18		1-10%	1
1842	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	30m x 7m	54	Fair	Fair	20+ years	Medium	6.48	2.55		1-10%	9
1843	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	38m x 14m	78	Fair	Fair	20+ years	High	9.36	2.98		1-10%	4
1844	Eucalyptus splendens	Apple Jack	Native	Mature	28m x 7m	64	Poor	Fair	10-20 years	High	7.68	2.74		0%	0
1845	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	33m x 8m	53	Good	Fair	10-20 years	Very high	6.36	2.53		0%	0
1846	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	35m x 6m	53	Good	Fair	10-20 years	High	6.36	2.53		0%	0
1847	Eucalyptus ovata	Swamp Gum	Indigenous	Semi mature	24m x 6m	53	Fair	Fair	10-20 years	Medium	6.36	2.53		0%	0
1848	Eucalyptus ovata	Swamp Gum	Indigenous	Semi mature	25m x 5m	50	Fair	Fair	20+ years	Low	6	2.47		0%	0
1849	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	20m x 3m	27	Good	Fair	20+ years	Low	3.24	1.91		0%	0
1850	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	18m x 5m	37	Poor	Poor	5-10 years	Low	4.44	2.18		0%	0
1851	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	38m x 18m	96	Good	Fair	20+ years	High	11.52	3.25		> 10%	21
1852	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	22m x 4m	38	Good	Fair	20+ years	Medium	4.56	2.20		0%	0
1853	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	26m x 4m	39	Good	Fair	20+ years	Medium	4.68	2.23		0%	0
1854	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	18m x 3m	29	Good	Fair	20+ years	Medium	3.48	1.97		0%	0
1855	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	23m x 7m	53	Poor	Poor	5-10 years	Low	6.36	2.53		1-10%	5
1856	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	26m x 7m	62	Good	Good	20+ years	High	7.44	2.71		1-10%	1
1857	Eucalyptus ovata	Swamp Gum	Indigenous	Semi mature	25m x 3m	40	Good	Fair	20+ years	Medium	4.8	2.25		0%	0
1858	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	27m x 5m	47	Good	Fair	20+ years	Medium	5.64	2.41		0%	0
1859	Eucalyptus splendens	Apple Jack	Native	Semi mature	32m x 8m	97	Good	Fair	20+ years	High	11.64	3.27		> 10%	17
1860	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	40m x 18m	88	Good	Fair	20+ years	High	10.56	3.14		1-10%	5
1861	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	22m x 6m	31	Fair	Fair	10-20 years	Medium	3.72	2.02		0%	0
1862	Eucalyptus ovata	Swamp Gum	Indigenous	Semi mature	26m x 5m	41	Good	Fair	20+ years	Medium	4.92	2.28		0%	0
1863	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	38m x 16m	87	Good	Fair	20+ years	High	10.44	3.12		> 10%	24
1864	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	32m x 10m	97	Poor	Poor	20+ years	Medium	11.64	3.27		1-10%	9
1865	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	25m x 6m	41	Good	Good	20+ years	High	4.92	2.28		0%	0
1866	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	24m x 10m	91	Dead	Poor	0 years	Low	10.92	3.18		> 10%	14
1867	Eucalyptus ovata	Swamp Gum	Indigenous	Semi mature	10m x 3m	33	Fair	Poor	5-10 years	Low	3.96	2.08		0%	0
1868	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	18m x 7m	65	Fair	Poor	20+ years	Medium	7.8	2.76		> 10%	15
1869	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	30m x 9m	65	Fair	Fair	20+ years	High	7.8	2.76		> 10%	12
1870	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	30m x 10m	46	Fair	Fair	20+ years	Medium	5.52	2.39		0%	0
1871	Eucalyptus ovata	Swamp Gum	Indigenous	Semi mature	18m x 4m	31	Fair	Fair	10-20 years	Low	3.72	2.02		0%	0
1872	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	38m x 17m	85	Fair	Fair	20+ years	High	15	3.09		> 10%	13

ID	Botanical Name	Common Name	Origin	Age	H x W	DBH (cm)	Health	Structure	ULE	Retention Value	TPZ (m radius)	SRZ (m radius)	Comments	Retain/ remove	Encroach. %
1873	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	34m x 14m	76	Fair	Poor	10-20 years	High	9.12	2.95		0%	0
1874	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	28m x 8m	52	Good	Fair	20+ years	High	6.24	2.51		1-10%	3
1875	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	34m x 12m	80	Good	Fair	20+ years	High	9.6	3.01		1-10%	5
1876	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	18m x 5m	38	Good	Fair	20+ years	Medium	4.56	2.20		0%	0
1877	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	25m x 8m	54	Good	Fair	20+ years	High	6.48	2.55		0%	0
1878	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	34m x 14m	65	Good	Fair	20+ years	High	7.8	2.76		0%	0
1879	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	36m x 10m	58	Fair	Fair	20+ years	High	6.96	2.63		0%	0
1880	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	40m x 15m	84	Fair	Fair	20+ years	High	10.08	3.08		0%	0
1881	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	36m x 14m	61	Fair	Fair	20+ years	High	7.32	2.69		1-10%	6
1882	Eucalyptus ovata	Swamp Gum	Indigenous	Mature	24m x 16m	63	Fair	Fair	20+ years	Medium	7.56	2.73		1-10%	4
1883	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	34m x 7m	69	Fair	Fair	20+ years	High	8.28	2.83		1-10%	2
1884	Eucalyptus ovata	Swamp Gum	Indigenous	Semi mature	30m x 12m	58	Fair	Fair	20+ years	Medium	6.96	2.63		1-10%	2
1885	Eucalyptus ovata	Swamp Gum	Indigenous	Mature	32m x 16m	60	Fair	Fair	20+ years	High	7.2	2.67		0%	0
1886	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	36m x 15m	85	Fair	Fair	20+ years	High	10.2	3.09		0%	0
1887	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	26m x 8m	54	Fair	Fair	20+ years	Medium	6.48	2.55		0%	0
1888	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	24m x 5m	59	Poor	Fair	20+ years	Medium	7.08	2.65		1-10%	1
1889	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	24m x 3m	48	Fair	Fair	20+ years	Medium	5.76	2.43		0%	0
1890	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	32m x 6m	58	Fair	Fair	20+ years	Medium	6.96	2.63		0%	0
1891	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	35m x 7m	71	Fair	Fair	20+ years	High	8.52	2.87		1-10%	6
1892	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	34m x 14m	58	Good	Good	20+ years	High	6.96	2.63		1-10%	2
1893	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	32m x 12m	64	Good	Good	20+ years	High	7.68	2.74		1-10%	3
1894	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	18m x 5m	41	Fair	Fair	20+ years	Medium	4.92	2.28		0%	0
1895	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	24m x 5m	45	Fair	Fair	20+ years	Medium	5.4	2.37		0%	0
1896	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	24m x 1m	40	Fair	Fair	20+ years	Medium	4.8	2.25		0%	0
1897	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	28m x 7m	58	Fair	Fair	20+ years	High	6.96	2.63		0%	0
1898	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	32m x 15m	68	Fair	Fair	20+ years	High	8.16	2.81		0%	0
1899	Eucalyptus viminalis subsp. Cygnetensis	Rough-barked Manna Gum	Indigenous	Semi mature	5m x 2m	38	Fair	Poor	5-10 years	Low	4.56	2.20		0%	0
1900	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	34m x 15m	70	Good	Fair	20+ years	High	8.4	2.85		0%	0
1901	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	9m x 2m	30	Fair	Poor	10-20 years	Low	3.6	2.00		0%	0
1902	Eucalyptus splendens	Apple Jack	Native	Mature	18m x 8m	89	Fair	Poor	10-20 years	High	10.68	3.15		> 10%	17
1903	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	42m x 12m	69	Good	Fair	20+ years	High	8.28	2.83		0%	0
1904	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	34m x 12m	67	Good	Fair	20+ years	High	8.04	2.80		1-10%	3
1905	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	38m x 10m	81	Good	Fair	20+ years	High	9.72	3.03		0%	0
1906	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	32m x 20m	71	Fair	Fair	10-20 years	High	8.52	2.87		0%	0
1907	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	38m x 9m	59	Fair	Fair	10-20 years	High	7.08	2.65		0%	0
1908	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	38m x 9m	61	Fair	Fair	10-20 years	High	7.32	2.69		1-10%	4

ID	Botanical Name	Common Name	Origin	Age	H x W	DBH (cm)	Health	Structure	ULE	Retention Value	TPZ (m radius)	SRZ (m radius)	Comments	Retain/ remove	Encroach. %
1909	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	36m x 7m	51	Good	Good	20+ years	High	6.12	2.49		0%	0
1910	Eucalyptus ovata	Swamp Gum	Indigenous	Semi mature	15m x 5m	31	Good	Fair	20+ years	Low	3.72	2.02		0%	0
1911	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	27m x 7m	52	Good	Fair	20+ years	High	6.24	2.51		0%	0
1912	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	22m x 5m	32	Good	Fair	20+ years	Medium	3.84	2.05		0%	0
1913	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	22m x 4m	32	Good	Fair	20+ years	Medium	3.84	2.05		0%	0
1914	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	14m x 3m	45	Fair	Poor	5-10 years	Low	5.4	2.37		0%	0
1915	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	24m x 6m	46	Fair	Fair	5-10 years	Medium	5.52	2.39		0%	0
1916	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	20m x 3m	32	Fair	Fair	5-10 years	Medium	3.84	2.05		0%	0
1917	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	24m x 6m	40	Good	Good	20+ years	Medium	4.8	2.25		0%	0
1918	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	30m x 7m	50	Good	Good	20+ years	High	6	2.47		0%	0
1919	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	26m x 7m	32	Good	Fair	20+ years	Low	3.84	2.05		0%	0
1920	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	38m x 14m	77	Very Poor	Very poor	1-5 years	Medium	9.24	2.97		> 10%	12
1921	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	36m x 14m	69	Fair	Fair	20+ years	High	8.28	2.83		0%	0
1922	Eucalyptus ovata	Swamp Gum	Indigenous	Semi mature	7m x 1m	22	Fair	Fair	20+ years	Low	2.64	1.75		0%	0
1923	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	15m x 3m	28	Good	Fair	20+ years	Low	3.36	1.94		0%	0
1924	Eucalyptus ovata	Swamp Gum	Indigenous	Mature	25m x 10m	41	Fair	Fair	20+ years	High	4.92	2.28		0%	0
1925	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	32m x 12m	71	Good	Fair	20+ years	High	8.52	2.87		1-10%	8
1926	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	4m x 1m	27	Fair	Poor	5-10 years	Low	3.24	1.91		0%	0
1927	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	36m x 7m	64	Good	Fair	20+ years	High	7.68	2.74		1-10%	7
1928	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	36m x 7m	77	Good	Fair	20+ years	High	9.24	2.97		> 10%	15
1929	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	40m x 8m	80	Good	Fair	20+ years	High	9.6	3.01		0%	0
1930	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	20m x 5m	40	Good	Fair	20+ years	High	4.8	2.25		0%	0
1931	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	32m x 5m	40	Poor	Poor	10-20 years	Medium	4.8	2.25		0%	0
1932	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	40m x 25m	129	Fair	Fair	20+ years	High	15	3.68		> 10%	15
1933	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	34m x 15m	144	Poor	Poor	5-10 years	Low	15	3.86		1-10%	5
1934	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	10m x 12m	69	Fair	Fair	20+ years	High	8.28	2.83		1-10%	8
1935	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	30m x 14m	88	Fair	Fair	20+ years	Medium	10.56	3.14		> 10%	11
1936	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	38m x 7m	48	Fair	Fair	20+ years	High	5.76	2.43		0%	0
1937	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	35m x 6m	48	Fair	Fair	20+ years	Medium	5.76	2.43		0%	0
1938	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	18m x 7m	48	Good	Fair	20+ years	Medium	5.76	2.43		0%	0
1939	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	14m x 4m	66	Dead	Poor	0 years	Low	7.92	2.78		0%	0
1940	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	30m x 6m	53	Good	Good	20+ years	High	6.36	2.53		0%	0
1941	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	25m x 4m	36	Good	Good	20+ years	Medium	4.32	2.15		0%	0
1942	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	35m x 7m	61	Good	Fair	20+ years	High	7.32	2.69		0%	0
1943	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	33m x 6m	47	Good	Fair	20+ years	High	5.64	2.41		0%	0
1944	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	32m x 8m	100	Poor	Poor	10-20 years	High	12	3.31		> 10%	18

ID	Botanical Name	Common Name	Origin	Age	H x W	DBH (cm)	Health	Structure	ULE	Retention Value	TPZ (m radius)	SRZ (m radius)	Comments	Retain/ remove	Encroach. %
1945	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	28m x 10m	70	Dead	Poor	0 years	Low	8.4	2.85		> 10%	12
1946	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	14m x 4m	22	Good	Good	20+ years	Medium	2.64	1.75		0%	0
1947	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	20m x 3m	59	Good	Poor	10-20 years	Medium	7.08	2.65		1-10%	1
1948	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	27m x 15m	63	Good	Fair	20+ years	High	7.56	2.73		0%	0
1949	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	18m x 5m	43	Fair	Fair	10-20 years	Low	5.16	2.32		1-10%	1
1950	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	22m x 7m	39	Good	Good	20+ years	Medium	4.68	2.23		0%	0
1951	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	12m x 3m	28	Good	Good	20+ years	Low	3.36	1.94		0%	0
1952	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	18m x 4m	40	Good	Good	20+ years	High	4.8	2.25		0%	0
1953	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	20m x 3m	44	Fair	Fair	10-20 years	Low	5.28	2.34		1-10%	1
1954	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	22m x 3m	38	Poor	Fair	5-10 years	Medium	4.56	2.20		0%	0
1955	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	22m x 3m	50	Dead	Poor	0 years	Low	6	2.47		0%	0
1956	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	12m x 3m	44	Fair	Poor	10-20 years	Medium	5.28	2.34		0%	0
1957	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	12m x 3m	38	Good	Good	10-20 years	Medium	4.56	2.20		0%	0
1958	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	25m x 5m	44	Fair	Fair	20+ years	Medium	5.28	2.34		1-10%	3
1959	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	25m x 10m	95	Fair	Fair	20+ years	High	11.4	3.24		1-10%	9
1960	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	32m x 14m	81	Good	Fair	20+ years	High	9.72	3.03		1-10%	1
1961	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	36m x 7m	81	Fair	Fair	20+ years	High	9.72	3.03		0%	0
1962	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	33m x 12m	70	Fair	Fair	20+ years	High	8.4	2.85		0%	0
1963	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	28m x 6m	50	Fair	Fair	20+ years	Medium	6	2.47		0%	0
1964	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	28m x 6m	50	Fair	Fair	20+ years	Medium	6	2.47		1-10%	1
1965	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	23m x 4m	35	Fair	Fair	20+ years	Medium	4.2	2.13		0%	0
1966	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	32m x 6m	50	Fair	Fair	20+ years	Medium	6	2.47		1-10%	3
1967	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	36m x 12m	83	Good	Fair	20+ years	High	9.96	3.06		1-10%	1
1968	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	22m x 6m	54	Fair	Fair	20+ years	Medium	6.48	2.55		> 10%	16
1969	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	20m x 5m	56	Fair	Fair	20+ years	Medium	6.72	2.59		> 10%	13
1970	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	22m x 4m	35	Dead	Poor	0 years	Low	4.2	2.13		0%	0
1971	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	24m x 7m	44	Good	Fair	20+ years	High	5.28	2.34		0%	0
1972	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	28m x 9m	49	Fair	Fair	20+ years	Medium	5.88	2.45		0%	0
1973	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	34m x 9m	70	Fair	Fair	20+ years	High	8.4	2.85		1-10%	7
1974	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	32m x 7m	51	Fair	Fair	20+ years	High	6.12	2.49		0%	0
1975	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	36m x 12m	77	Fair	Fair	20+ years	High	9.24	2.97		> 10%	13
1976	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	28m x 6m	44	Fair	Fair	20+ years	Medium	5.28	2.34		0%	0
1977	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	25m x 14m	58	Fair	Fair	10-20 years	Medium	6.96	2.63		0%	0
1978	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	26m x 6m	47	Fair	Fair	10-20 years	Medium	5.64	2.41		0%	0
1979	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	24m x 5m	34	Fair	Fair	20+ years	Medium	4.08	2.10		0%	0
1980	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	32m x 8m	52	Fair	Fair	20+ years	High	6.24	2.51		0%	0

ID	Botanical Name	Common Name	Origin	Age	H x W	DBH (cm)	Health	Structure	ULE	Retention Value	TPZ (m radius)	SRZ (m radius)	Comments	Retain/ remove	Encroach. %
1981	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	26m x 7m	67	Good	Fair	20+ years	High	8.04	2.80		1-10%	10
1982	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	25m x 5m	41	Good	Fair	20+ years	High	4.92	2.28		0%	0
1983	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	22m x 7m	38	Fair	Fair	10-20 years	Medium	4.56	2.20		0%	0
1984	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	22m x 5m	37	Fair	Fair	20+ years	Medium	4.44	2.18		0%	0
1985	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	32m x 25m	95	Poor	Fair	10-20 years	High	11.4	3.24		1-10%	4
1986	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	24m x 6m	39	Good	Fair	20+ years	Low	4.68	2.23		0%	0
1987	Eucalyptus splendens	Apple Jack	Native	Semi mature	18m x 3m	42	Good	Good	20+ years	Low	5.04	2.30		0%	0
1988	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	20m x 7m	82	Fair	Fair	20+ years	Very high	9.84	3.04		> 10%	18
1989	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	20m x 5m	64	Fair	Fair	20+ years	Very high	7.68	2.74		> 10%	24
1990	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	16m x 7m	42	Fair	Fair	20+ years	Low	5.04	2.30		0%	0
1991	Eucalyptus splendens	Apple Jack	Native	Mature	22m x 8m	79	Fair	Fair	20+ years	Very high	9.48	3.00		> 10%	31
1992	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	22m x 8m	42	Fair	Fair	20+ years	Very high	5.04	2.30		0%	0
1993	Eucalyptus splendens	Apple Jack	Native	Semi mature	18m x 3m	35	Good	Good	20+ years	Very high	4.2	2.13		0%	0
1994	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	18m x 3m	28	Good	Good	20+ years	Low	3.36	1.94		0%	0
1995	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	22m x 5m	87	Fair	Fair	20+ years	Very high	10.44	3.12		> 10%	34
1996	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	18m x 2m	24	Fair	Fair	20+ years	Very high	2.88	1.82		0%	0
1997	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	22m x 5m	54	Fair	Fair	20+ years	Very high	6.48	2.55		> 10%	17
1998	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	22m x 6m	97	Poor	Poor	5-10 years	Very high	11.64	3.27		> 10%	15
1999	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	20m x 5m	33	Good	Fair	20+ years	Very high	3.96	2.08		0%	0
2000	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	24m x 5m	64	Fair	Fair	20+ years	Very high	7.68	2.74		0%	0
2001	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	26m x 6m	86	Fair	Fair	20+ years	Very high	10.32	3.11		1-10%	6
2002	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	18m x 4m	43	Fair	Fair	20+ years	Very high	5.16	2.32		0%	0
2003	Eucalyptus falciformis	Western Peppermint	Indigenous	Young	14m x 2m	21	Good	Good	20+ years	Very high	2.52	1.72		0%	0
2004	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	20m x 3m	33	Good	Good	20+ years	Very high	3.96	2.08		0%	0
2005	Eucalyptus splendens	Apple Jack	Native	Mature	20m x 5m	60	Poor	Fair	1-5 years	Very high	7.2	2.67		> 10%	18
2006	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	20m x 8m	71	Poor	Fair	1-5 years	Very high	8.52	2.87		> 10%	34
2007	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	17m x 3m	36	Good	Fair	20+ years	Very high	4.32	2.15		0%	0
2008	Failed	Failed	Native	Failed	12m x 2m	17	Failed	Failed	Failed	Very high	2.04	1.57		Failed	0
2009	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	19m x 6m	74	Fair	Fair	20+ years	Very high	8.88	2.92		0%	0
2010	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Young	18m x 2m	31	Good	Good	20+ years	Very high	3.72	2.02		1-10%	10
2011	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Young	18m x 2m	31	Good	Good	20+ years	Very high	3.72	2.02		1-10%	4
2012	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Young	18m x 2m	33	Good	Good	20+ years	Very high	3.96	2.08		0%	0
2013	Eucalyptus viminalis subsp. Cygnetensis	Rough-barked Manna Gum	Indigenous	Mature	21m x 6m	42	Good	Good	20+ years	Very high	5.04	2.30		1-10%	1
2014	Eucalyptus splendens	Apple Jack	Native	Mature	18m x 9m	82	Good	Fair	20+ years	Very high	9.84	3.04		> 10%	27
2015	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	22m x 5m	61	Good	Fair	20+ years	Very high	7.32	2.69		> 10%	21
2016	Eucalyptus splendens	Apple Jack	Native	Mature	18m x 8m	104	Poor	Poor	10-20 years	Very high	12.48	3.36		> 10%	19

ID	Botanical Name	Common Name	Origin	Age	H x W	DBH (cm)	Health	Structure	ULE	Retention Value	TPZ (m radius)	SRZ (m radius)	Comments	Retain/ remove	Encroach. %
2017	Eucalyptus splendens	Apple Jack	Native	Mature	17m x 7m	57	Good	Fair	10-20 years	Low	6.84	2.61		0%	0
2018	Eucalyptus splendens	Apple Jack	Native	Mature	22m x 5m	54	Good	Fair	10-20 years	Very high	6.48	2.55		0%	0
2019	Eucalyptus falciformis	Western Peppermint	Indigenous	Mature	20m x 5m	57	Fair	Fair	10-20 years	Low	6.84	2.61		> 10%	23
2020	Eucalyptus falciformis	Western Peppermint	Indigenous	Young	15m x 3m	22	Good	Good	20+ years	Very high	2.64	1.75		0%	0
2021	Eucalyptus falciformis	Western Peppermint	Indigenous	Young	15m x 3m	25	Good	Good	20+ years	Very high	3	1.85		0%	0
2022	Exocarpos cupressiformis	Cherry Ballart	Indigenous	Semi mature	7m x 3m	20	Good	Fair	20+ years	Very high	2.4	1.68		0%	0
2023	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	15m x 2m	24	Fair	Fair	20+ years	Very high	2.88	1.82		0%	0
2024	Eucalyptus falciformis	Western Peppermint	Indigenous	Semi mature	16m x 10m	43	Fair	Fair	20+ years	Very high	5.16	2.32		0%	0
2025	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	20m x 5m	48	Good	Fair	20+ years	Very high	5.76	2.43		0%	0
2026	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	22m x 3m	59	Poor	Fair	20+ years	Very high	7.08	2.65		1-10%	5
2027	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	24m x 5m	104	Fair	Fair	5-10 years	Very high	12.48	3.36		> 10%	22
2028	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	22m x 4m	62	Fair	Fair	20+ years	Very high	7.44	2.71		> 10%	13
2029	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	22m x 5m	76	Fair	Fair	20+ years	Very high	9.12	2.95		> 10%	23
2030	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	20m x 5m	82	Fair	Fair	20+ years	Very high	9.84	3.04		1-10%	7
2031	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Semi mature	18m x 2m	26	Fair	Fair	20+ years	Very high	3.12	1.88		0%	0
2032	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	22m x 9m	56	Fair	Fair	20+ years	Very high	6.72	2.59		1-10%	7
2033	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	26m x 8m	102	Poor	Fair	20+ years	Very high	12.24	3.34		> 10%	28
2034	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	26m x 8m	102	Poor	Fair	20+ years	Very high	12.24	3.34		> 10%	13
2035	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	20m x 4m	45	Fair	Fair	20+ years	Very high	5.4	2.37		0%	0
2036	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	17m x 3m	48	Dead	Poor	0 years	Low	5.76	2.43		0%	0
2037	Eucalyptus obliqua	Messmate Stringybark	Indigenous	Mature	22m x 3m	43	Fair	Fair	20+ years	Very high	5.16	2.32		0%	0

5.3 TPZ Maps

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Tree Management Pty Ltd

Drawn and Plotted by: TDC
Date: 27/03/2024
Geographic Projection:
GDA 1994 MGA Zone 55

TPZ and Site Map

Boiler Swamp Road
Cobbboboonee
National Park

Scale: 1:870

Legend

Trees-Encroachment %

- 0%
- 1-10%
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- Failed

- TPZ
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- Road_Verge

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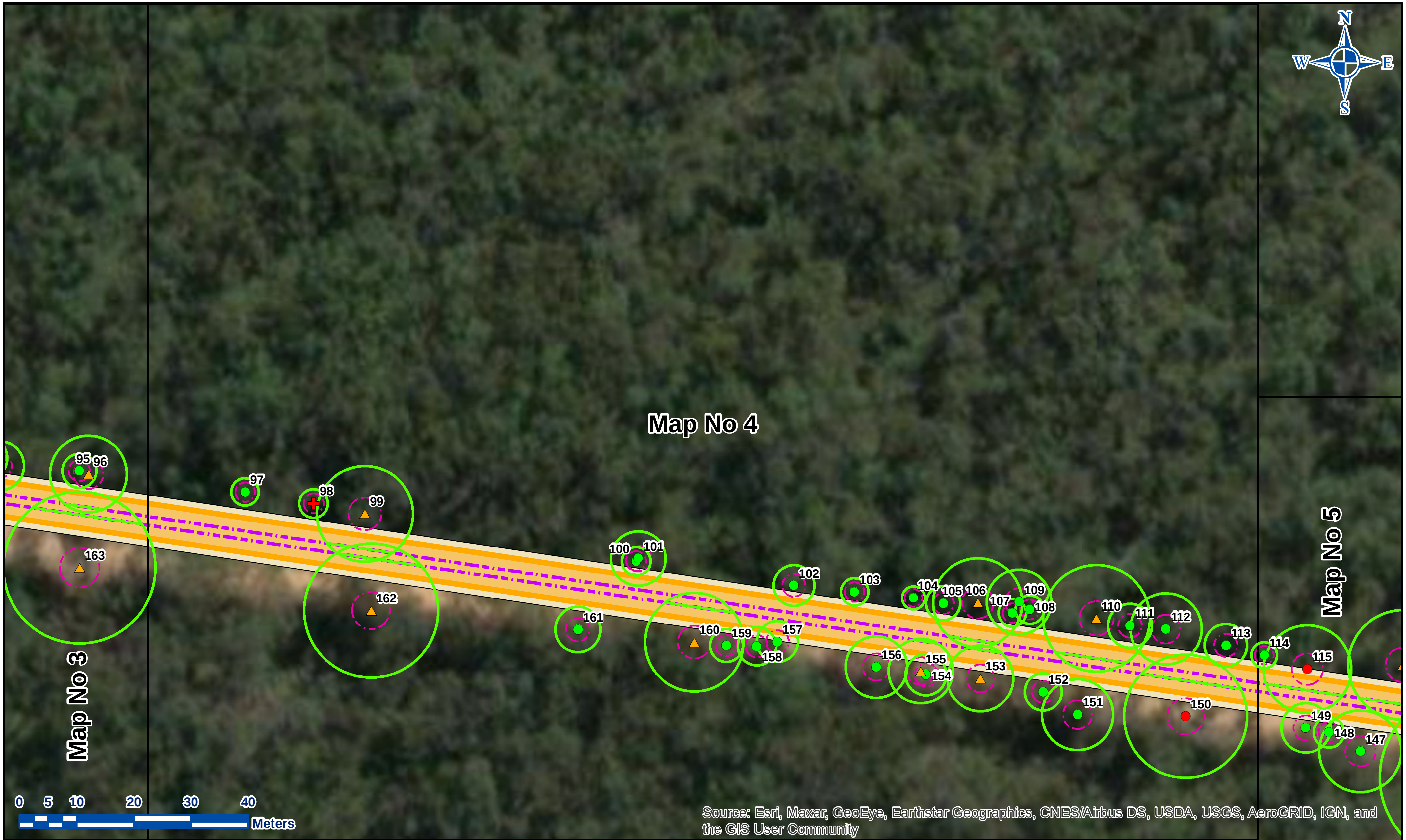

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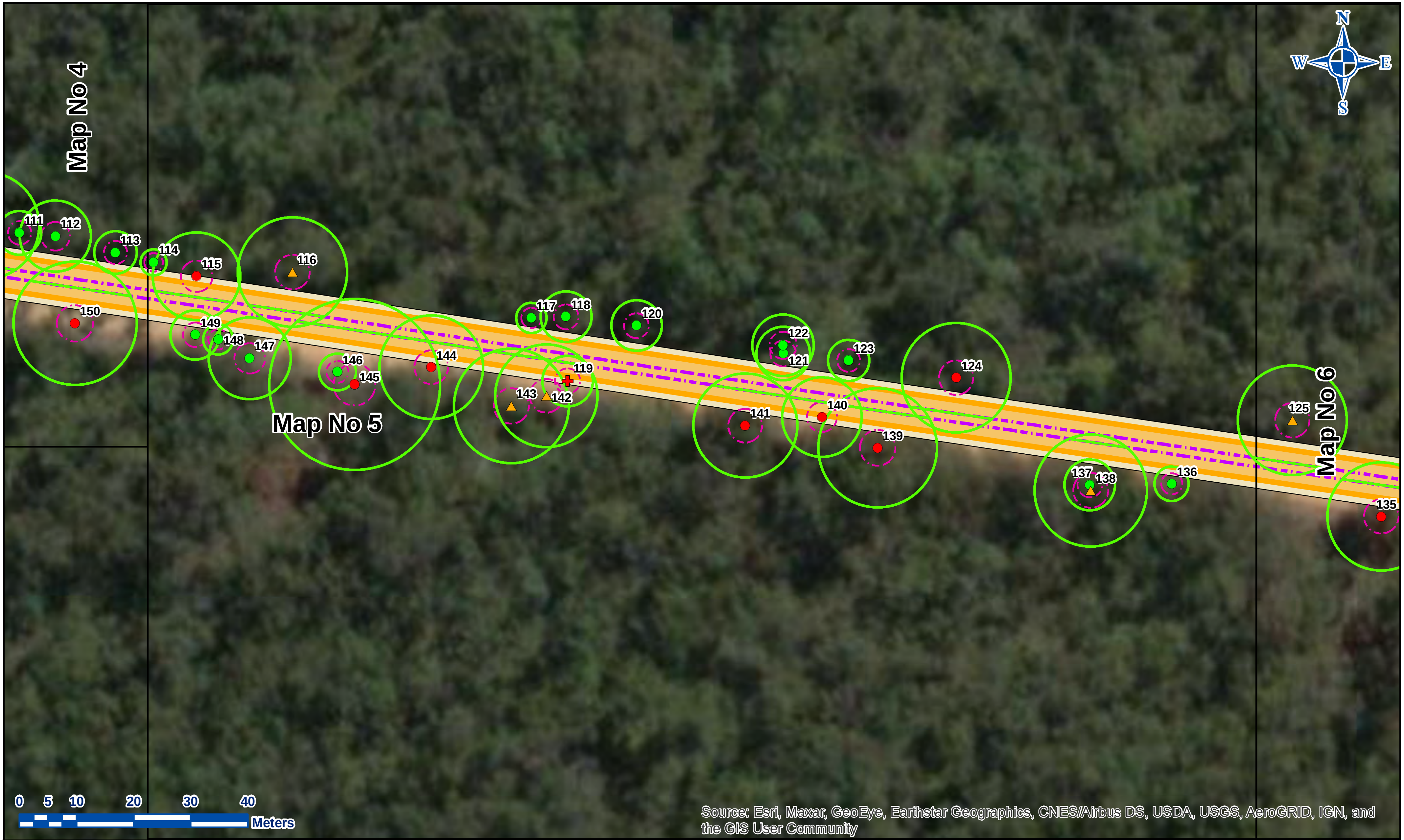

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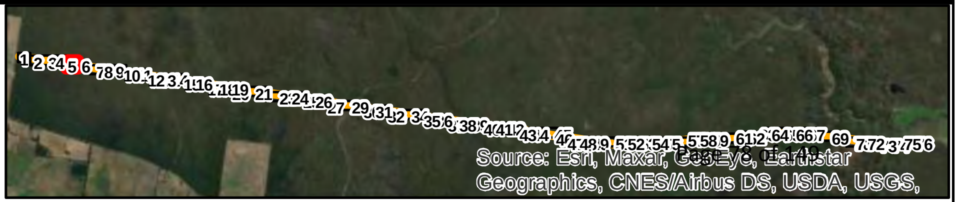

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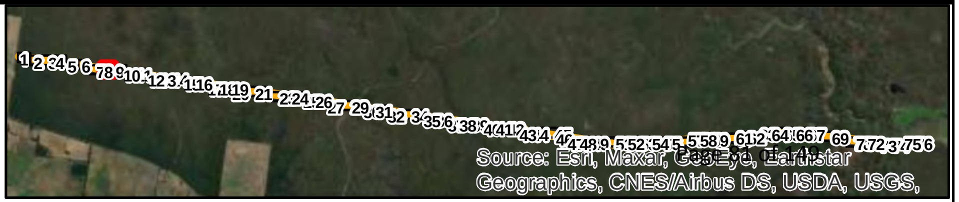

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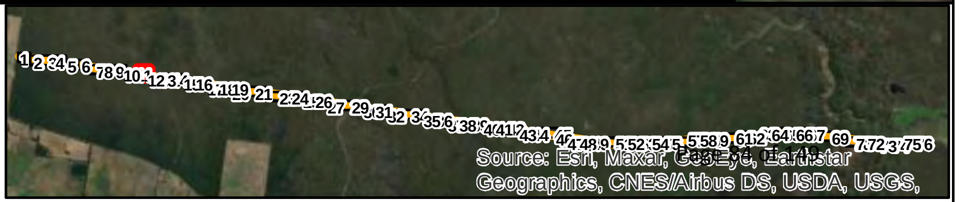

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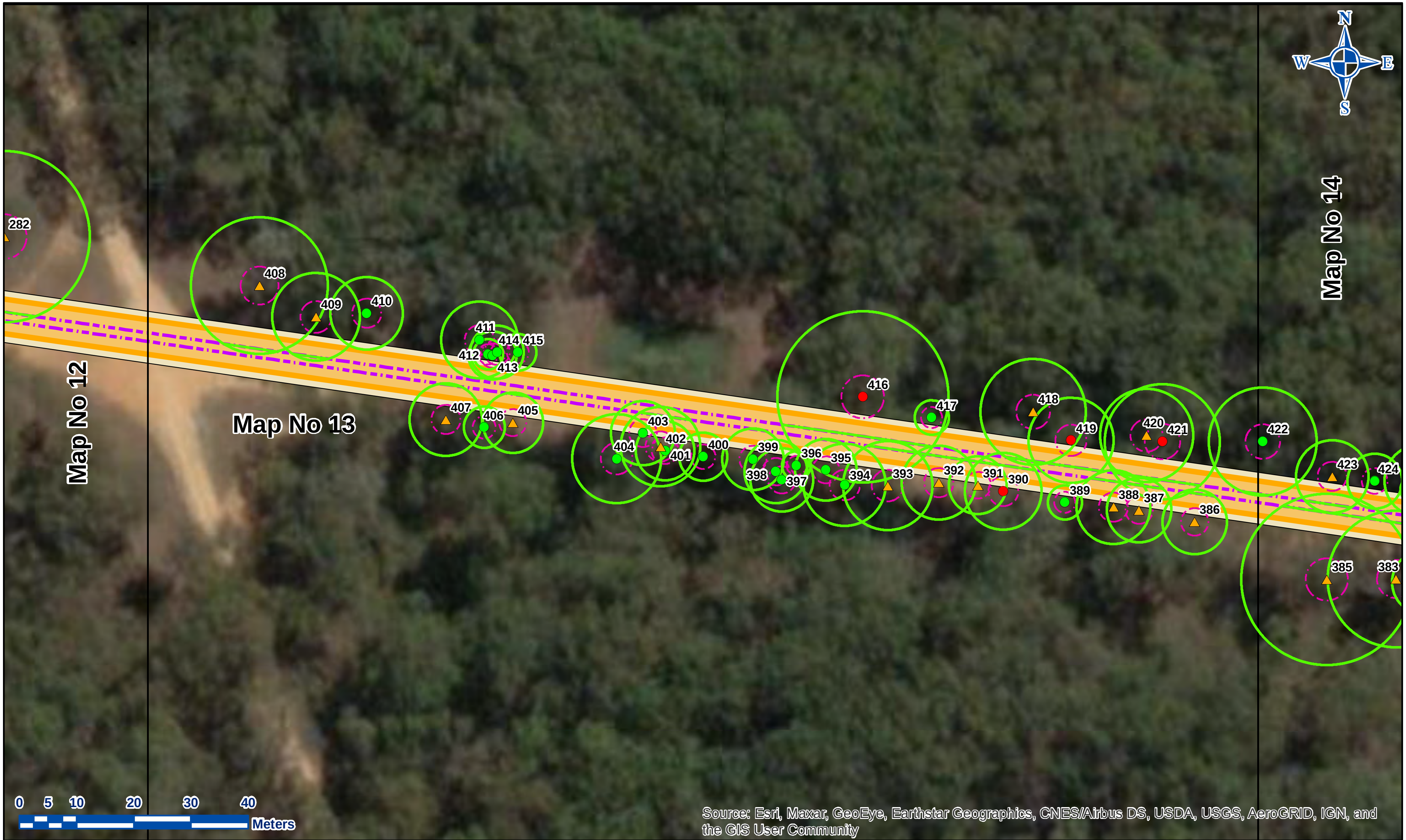

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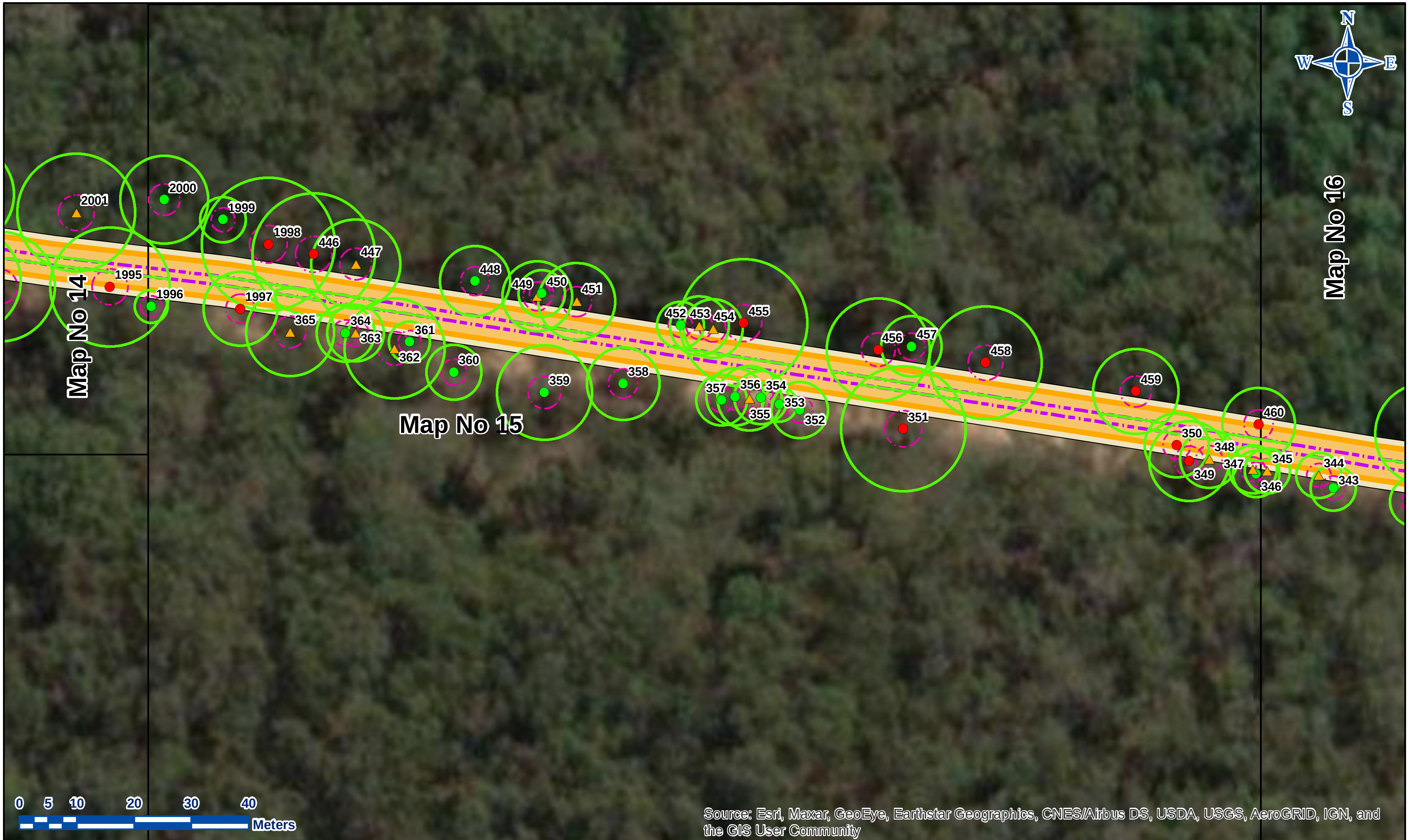

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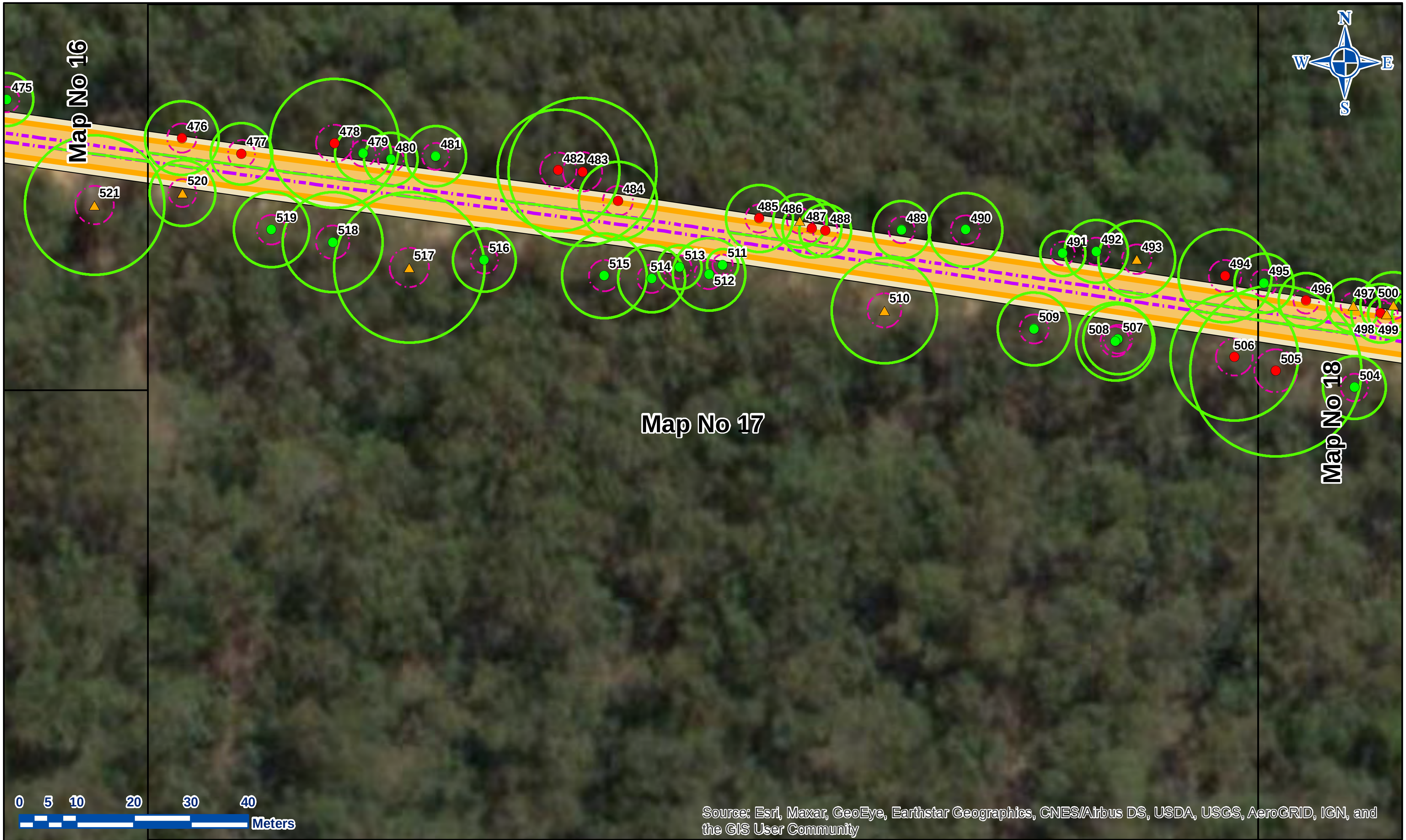

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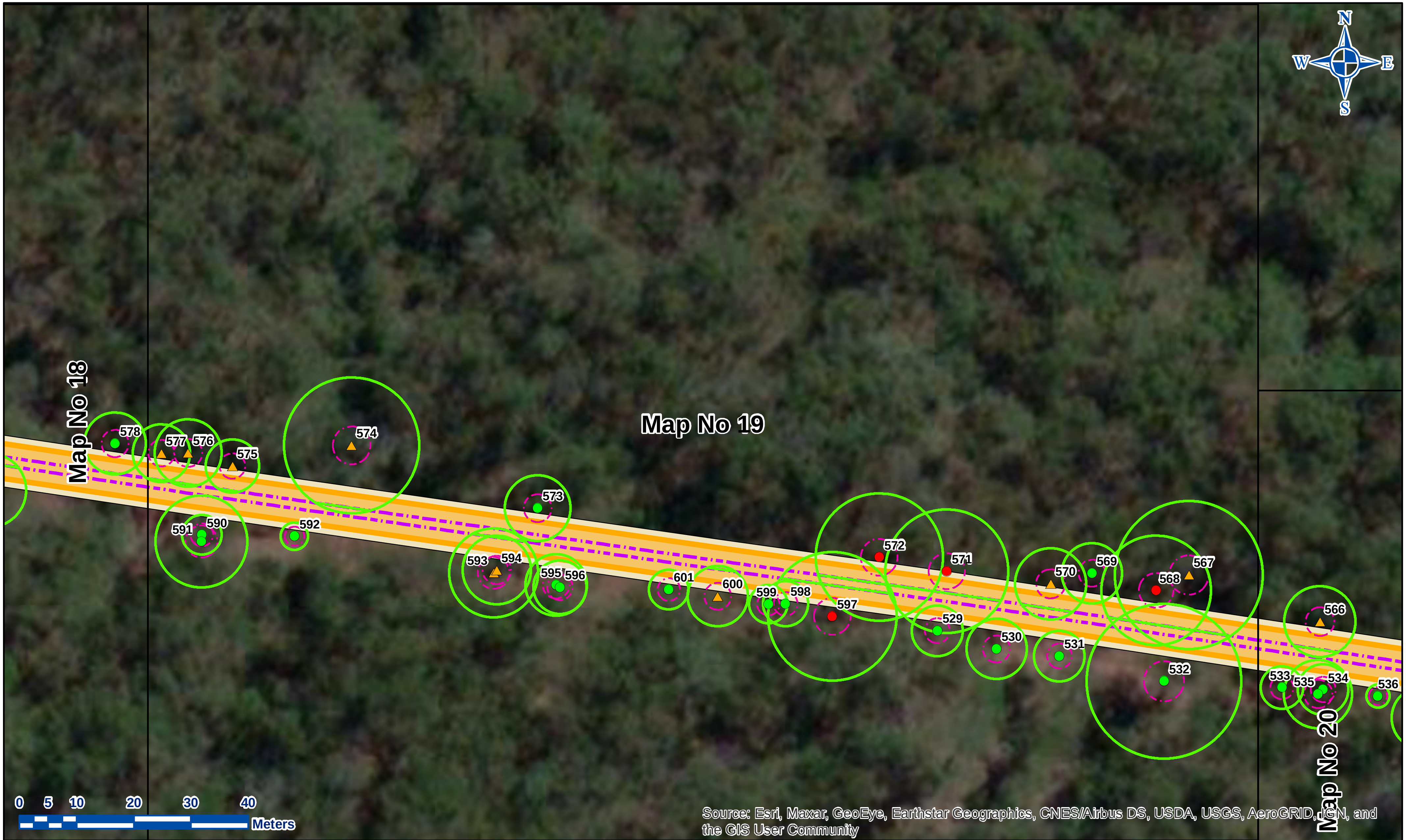

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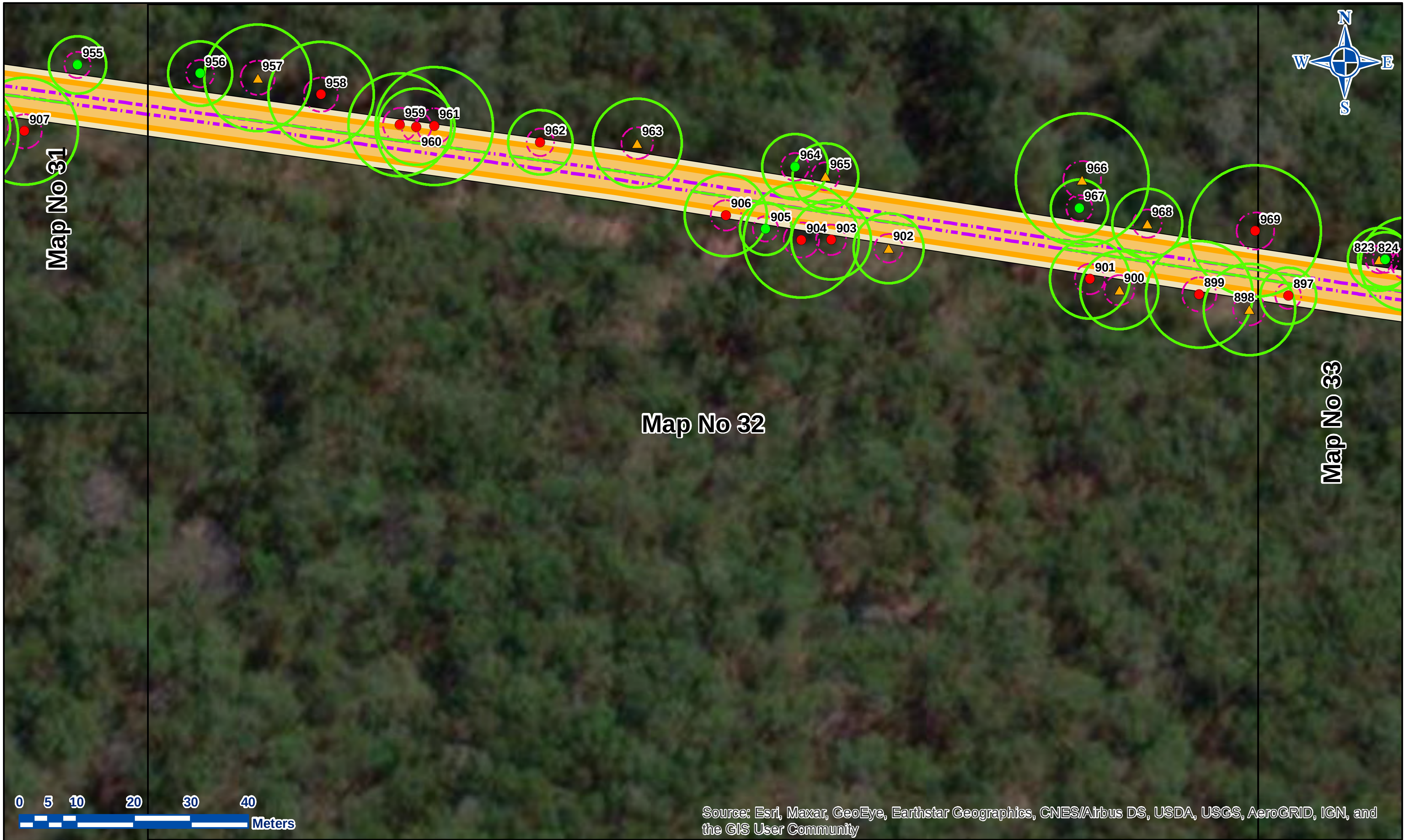

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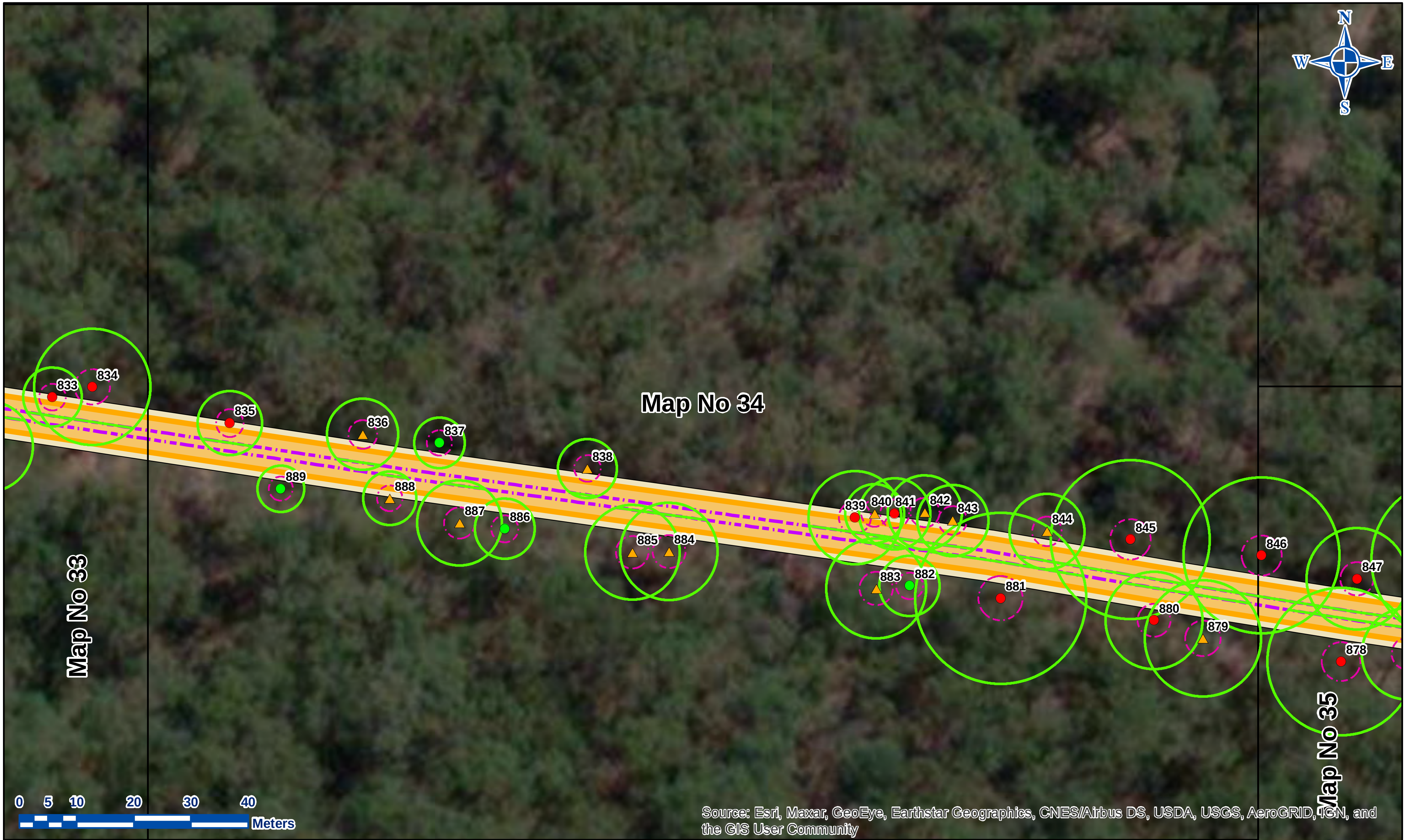

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Geographic Projection:
GDA 1994 MGA Zone 55

TPZ and Site Map

Boiler Swamp Road
Cobbobonee
National Park

Scale: 1:870

Legend

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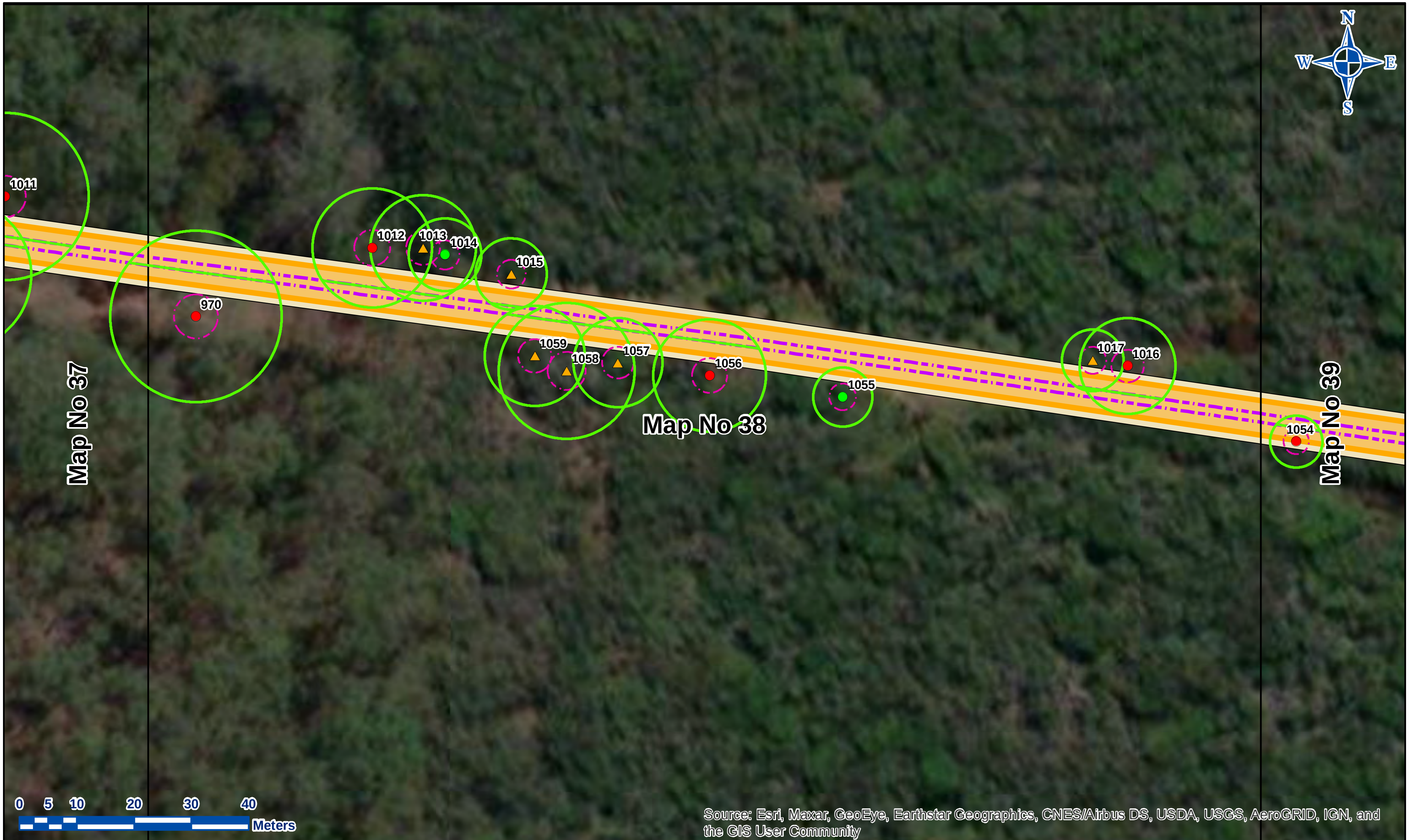

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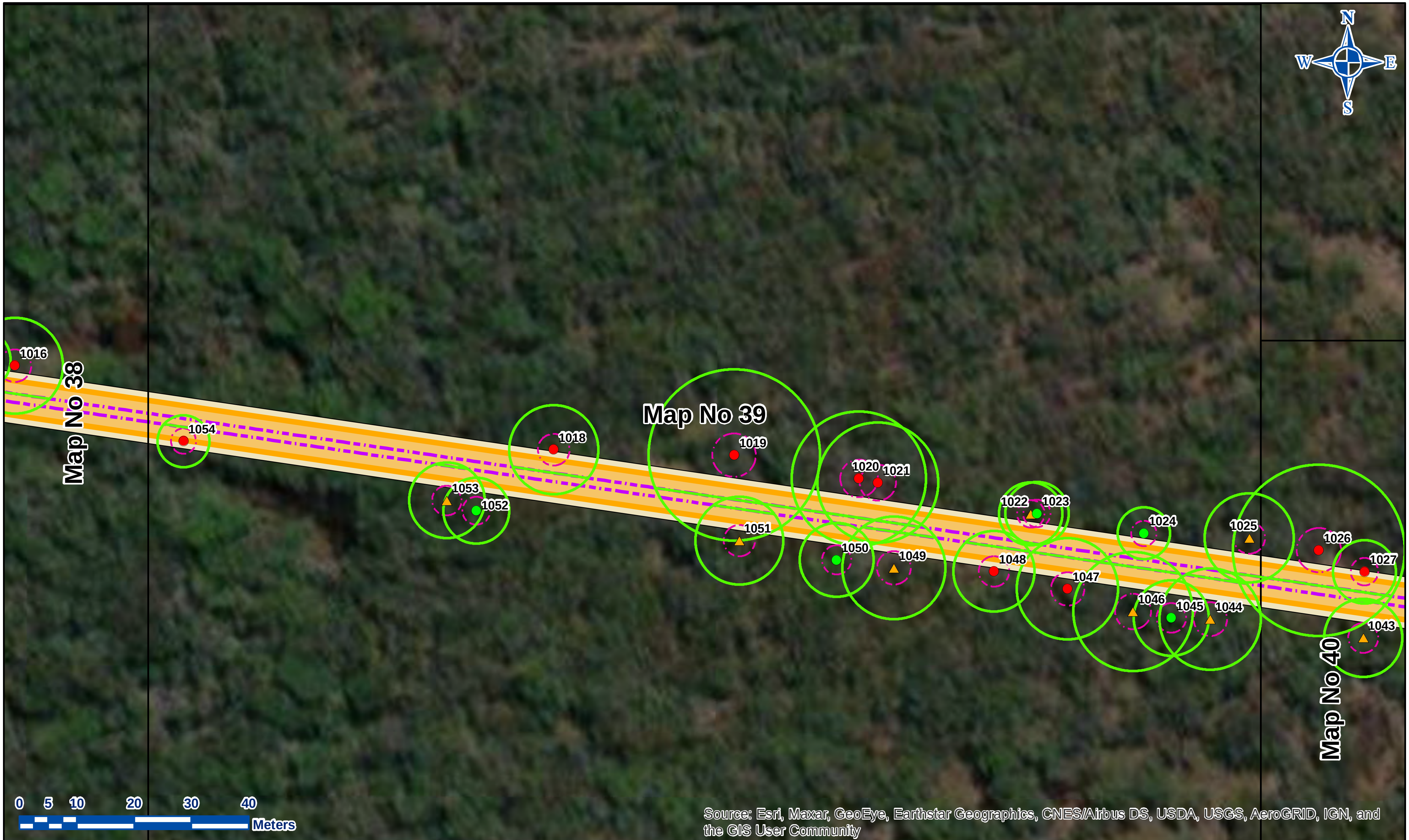

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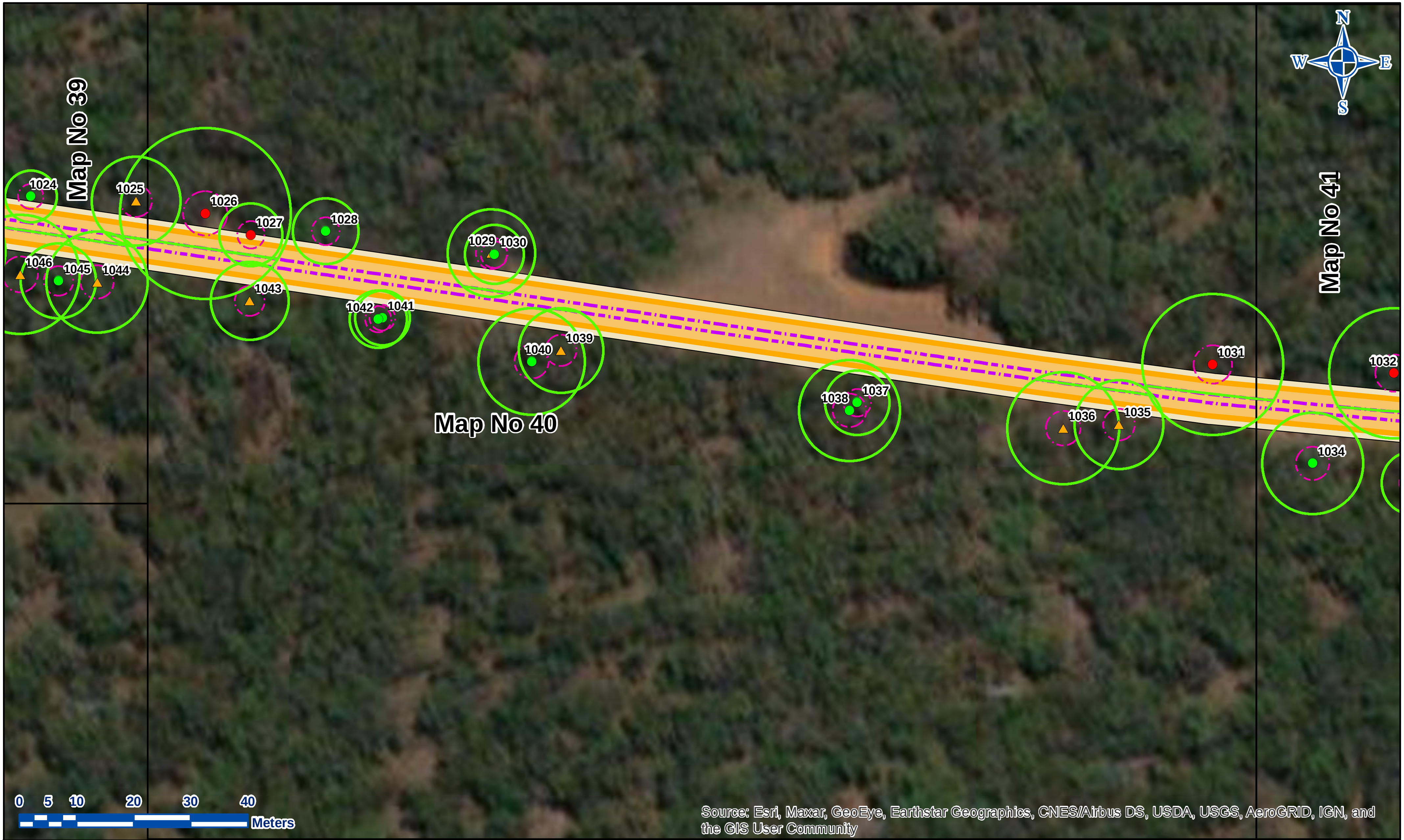

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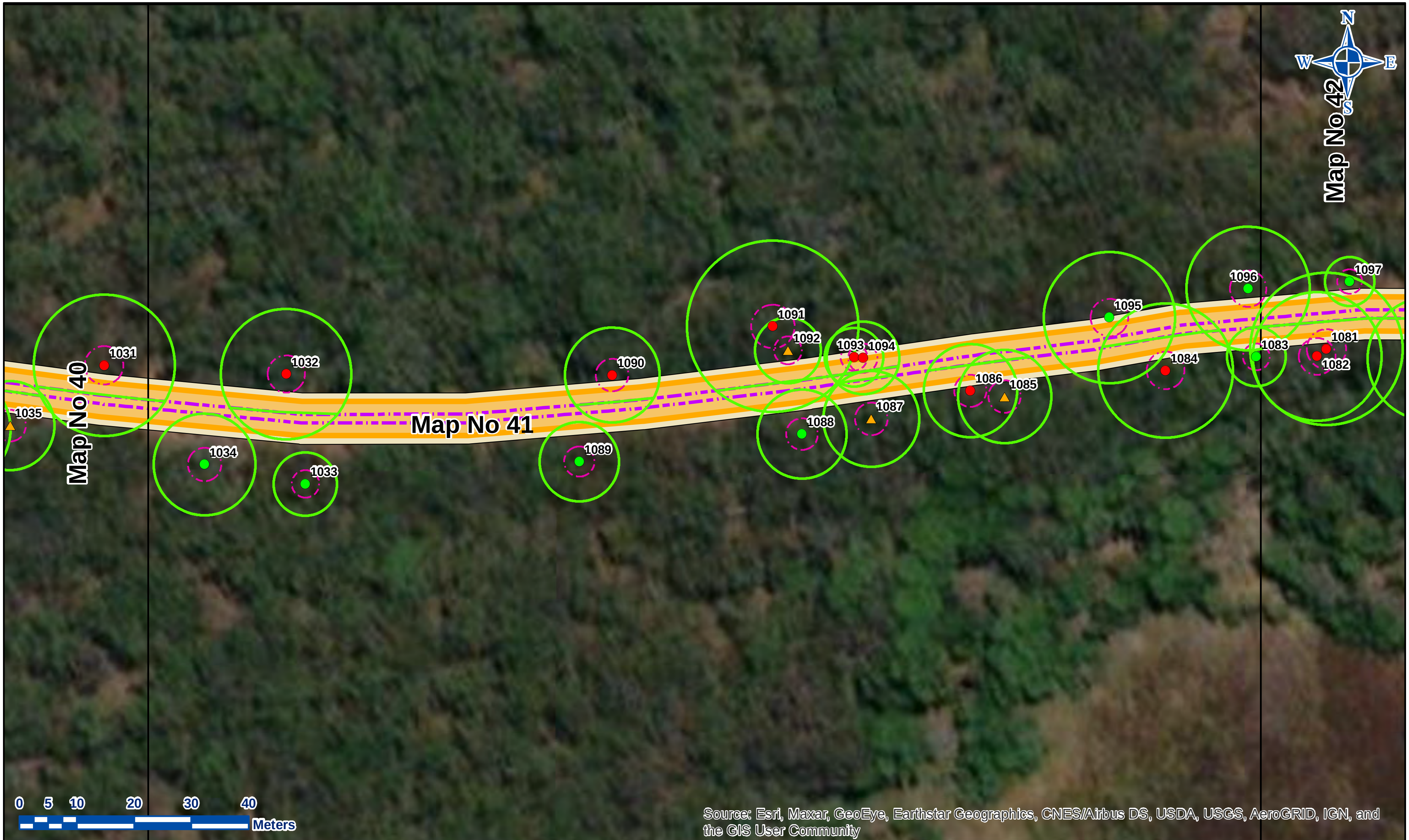

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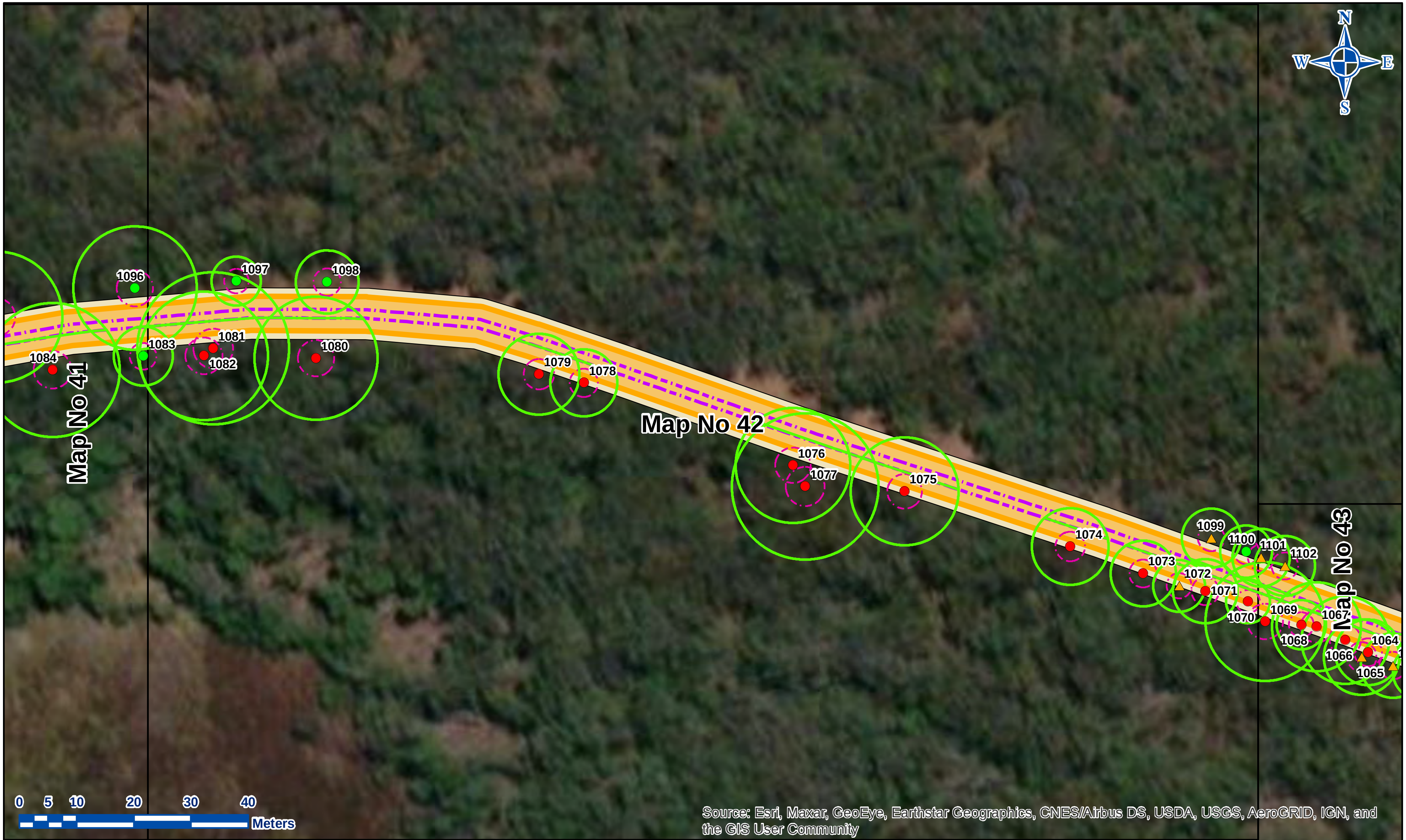

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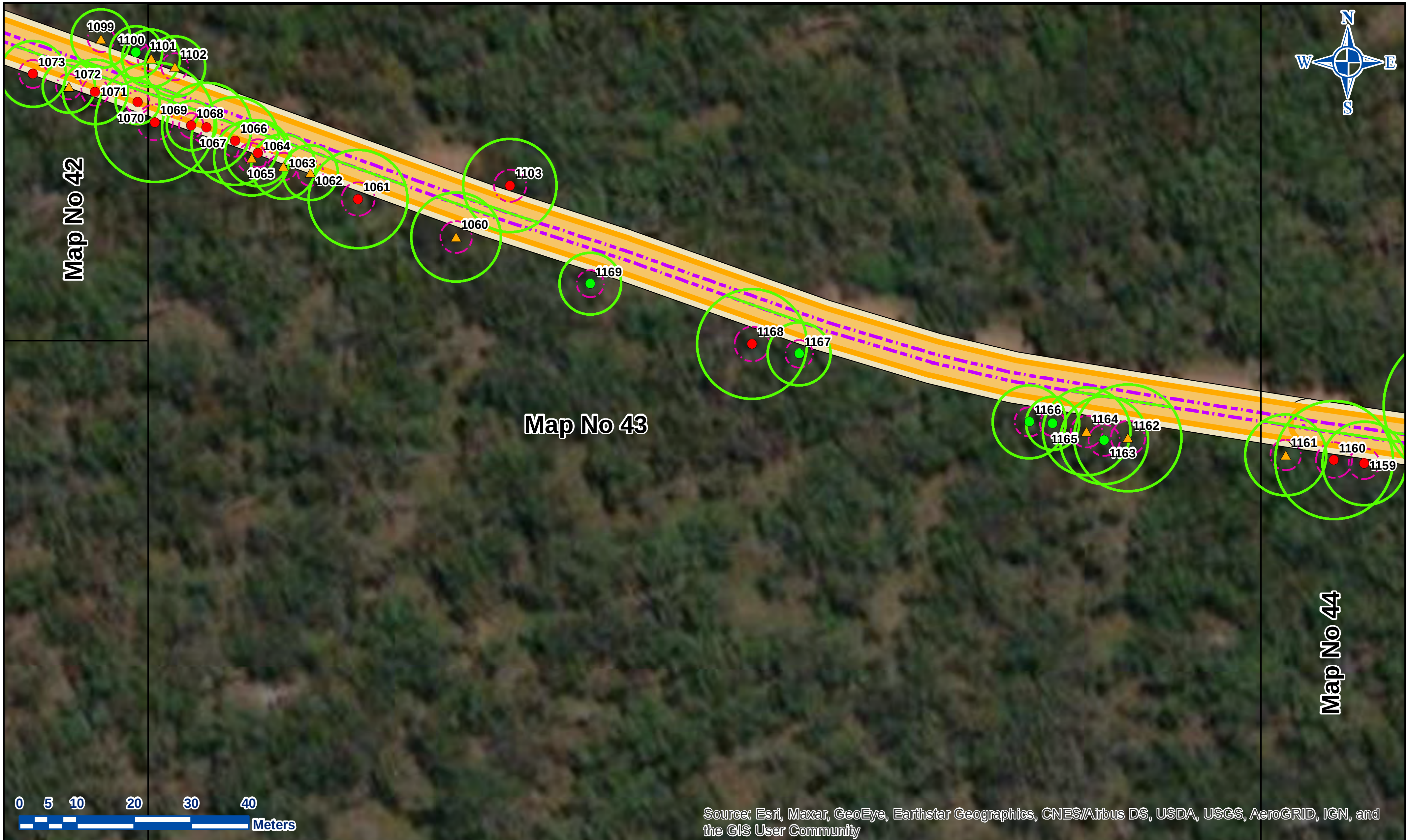

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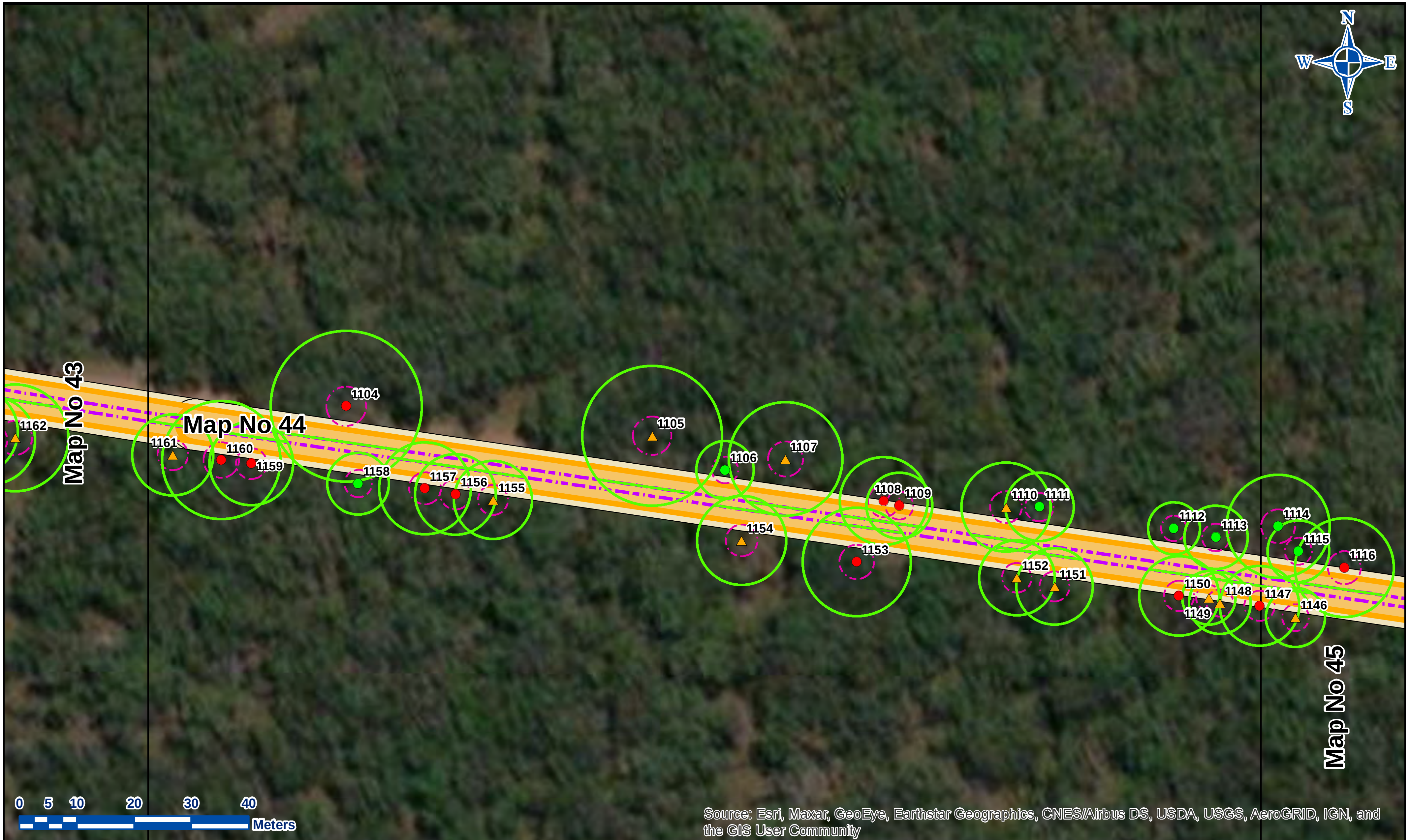

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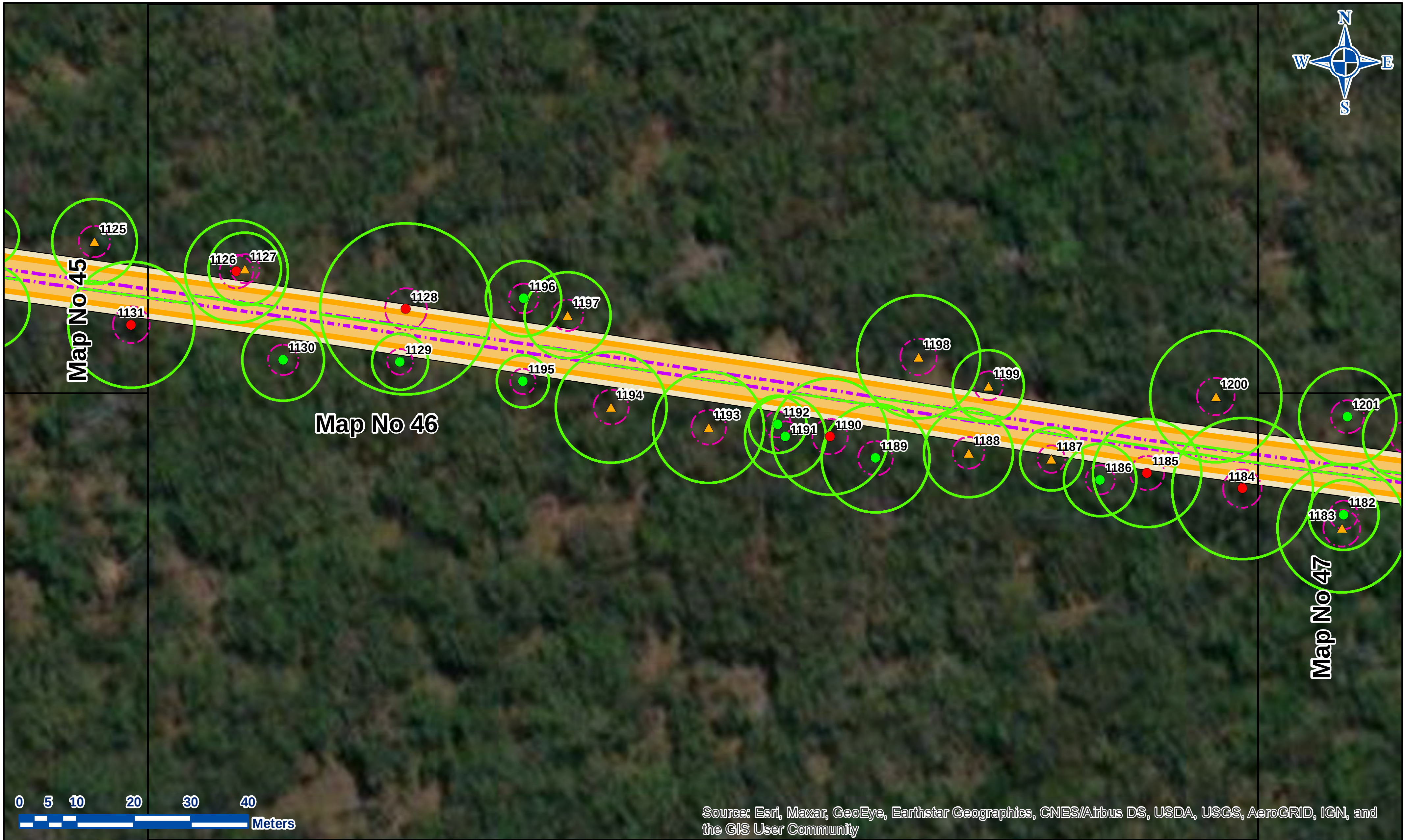

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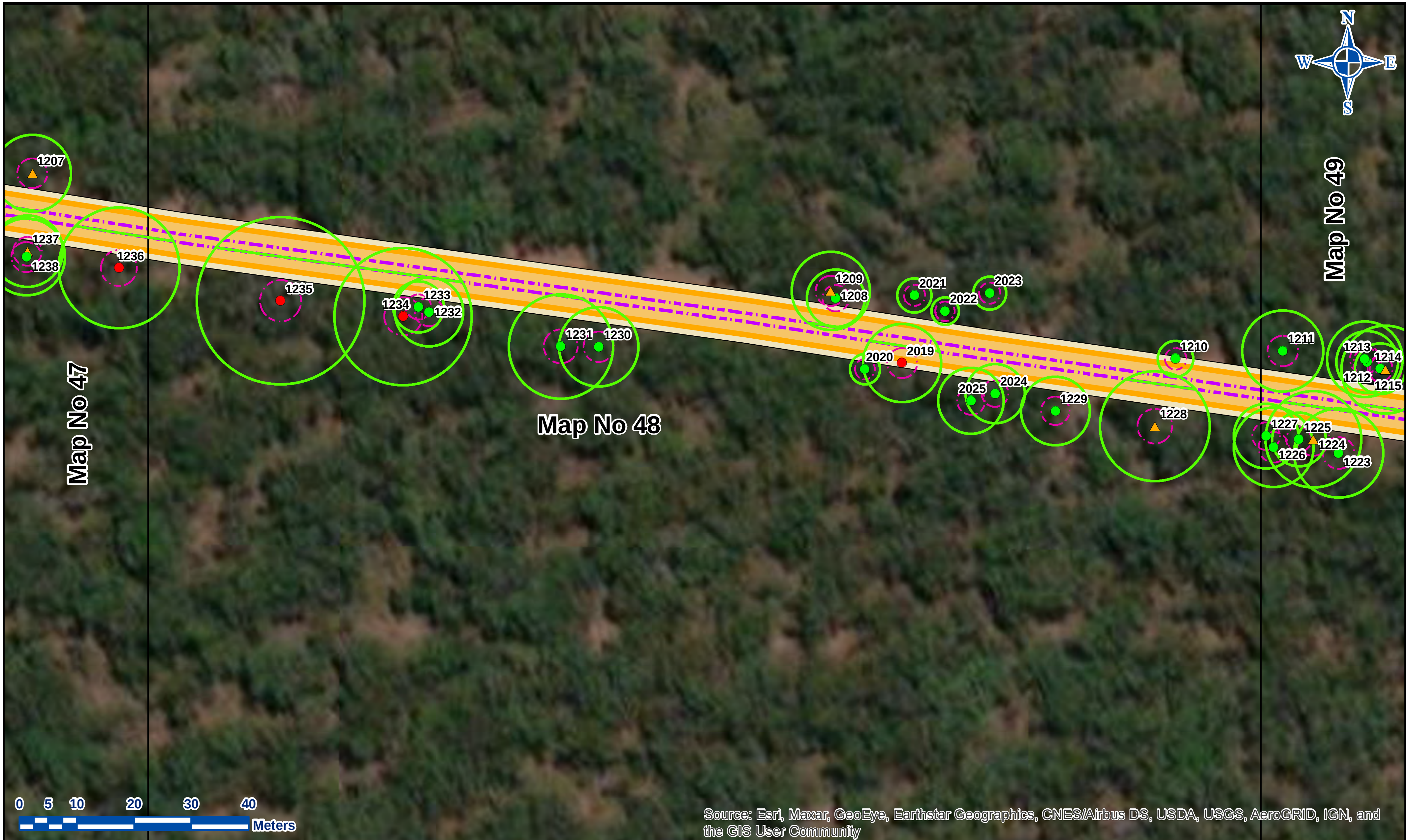

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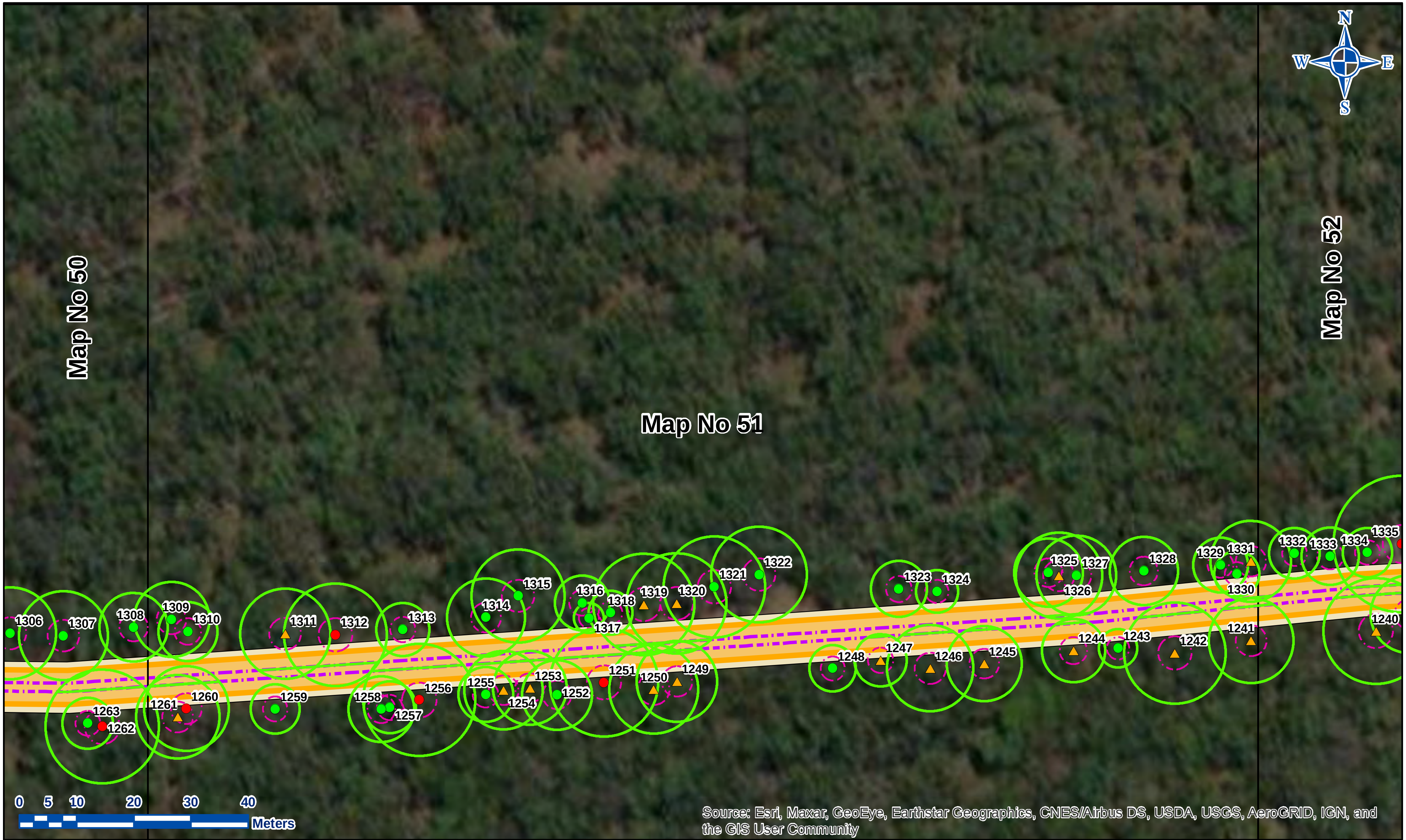

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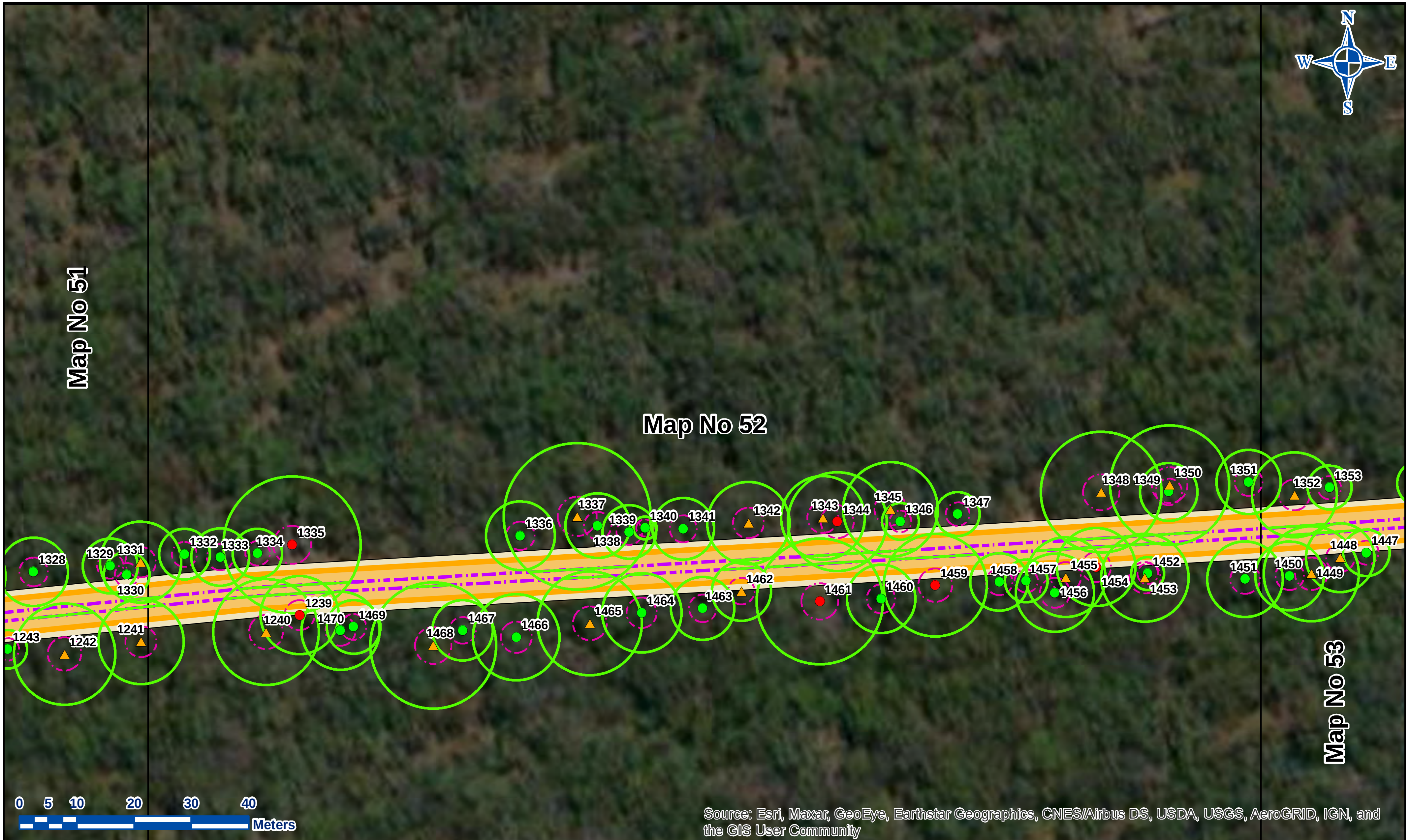

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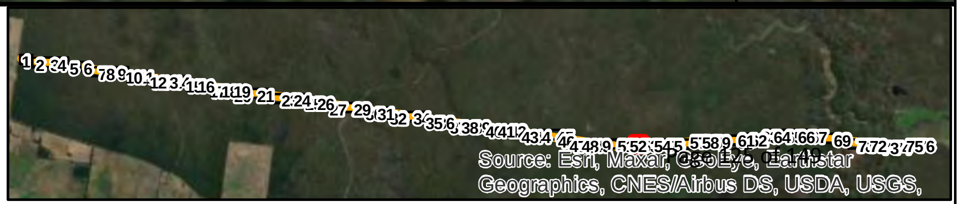

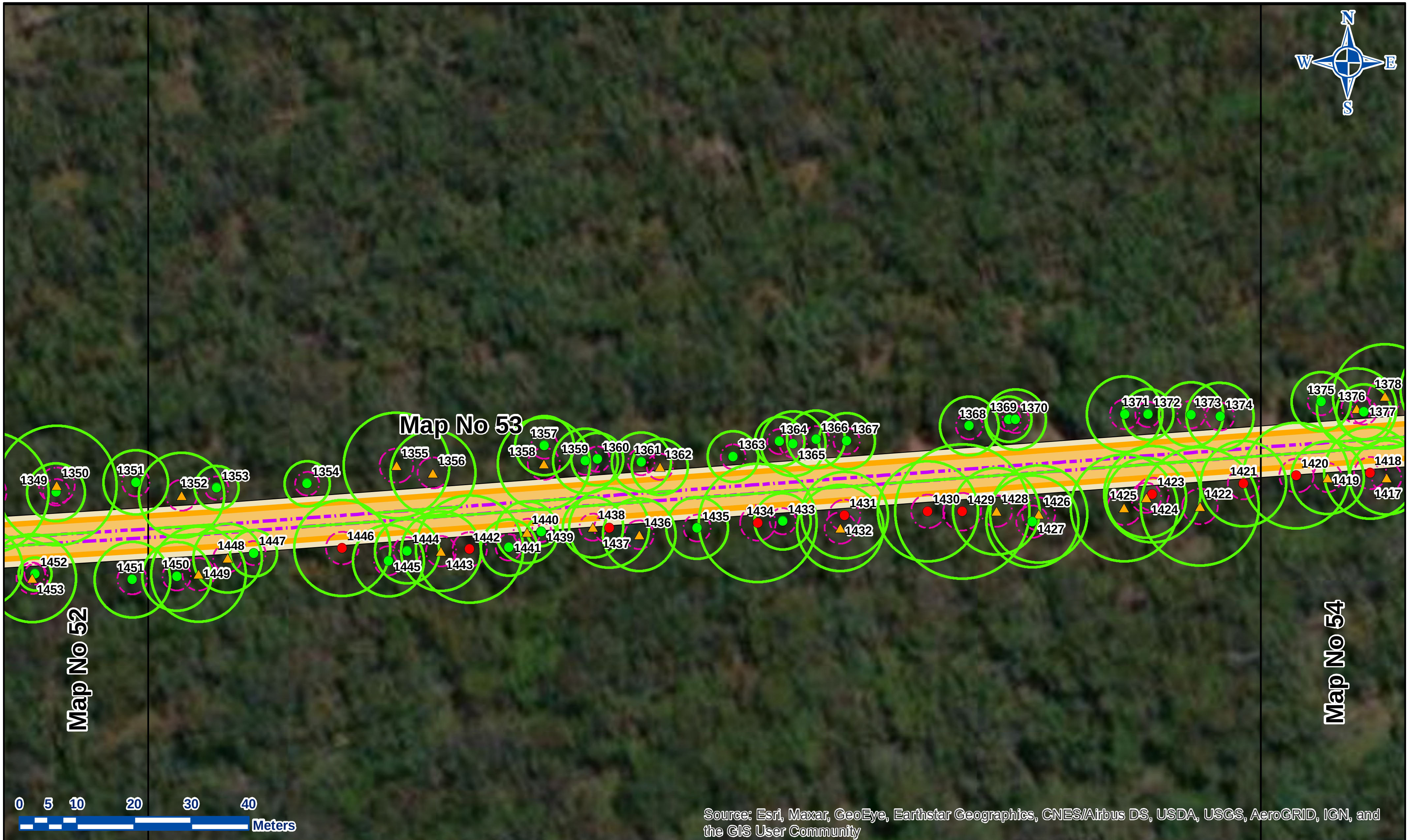

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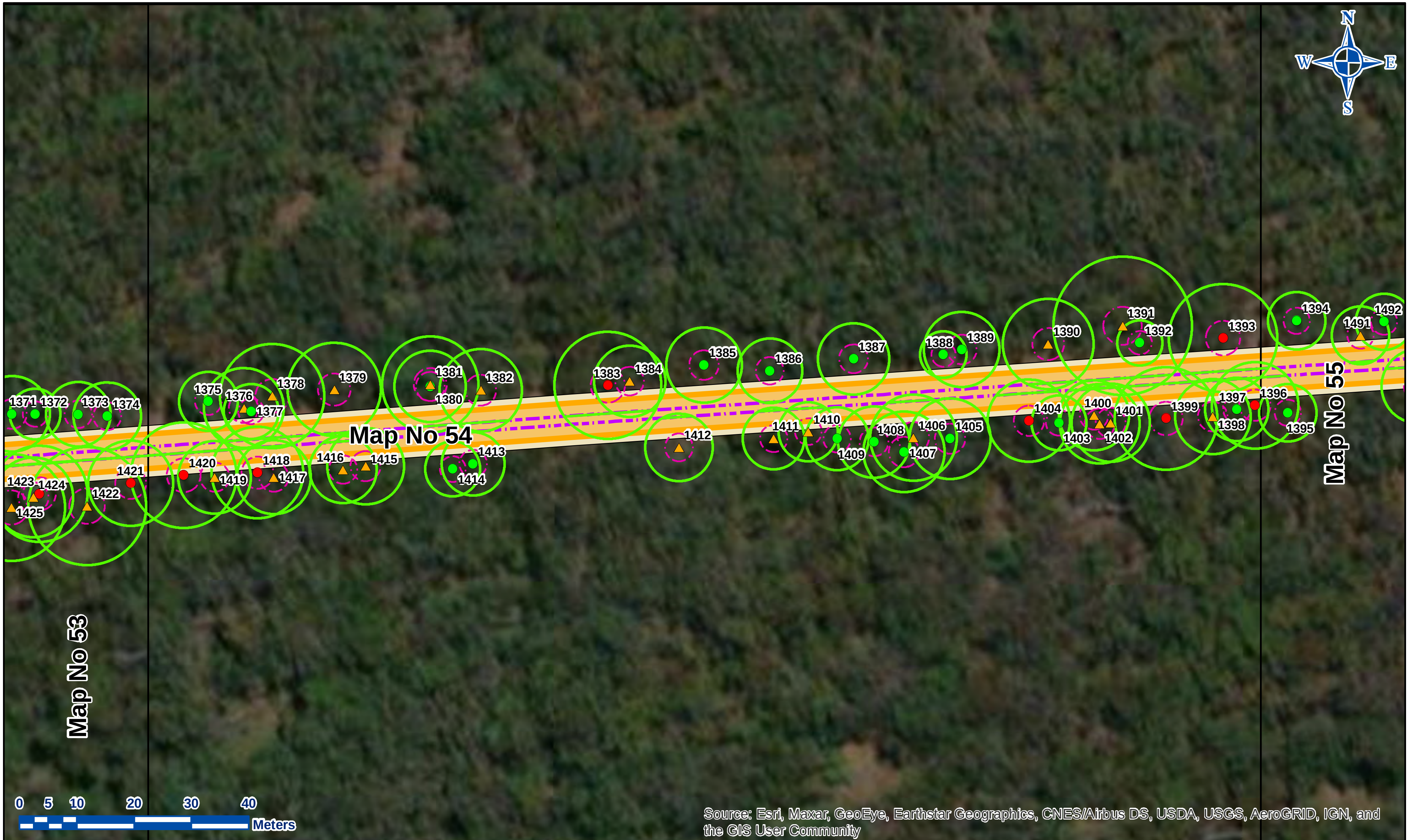

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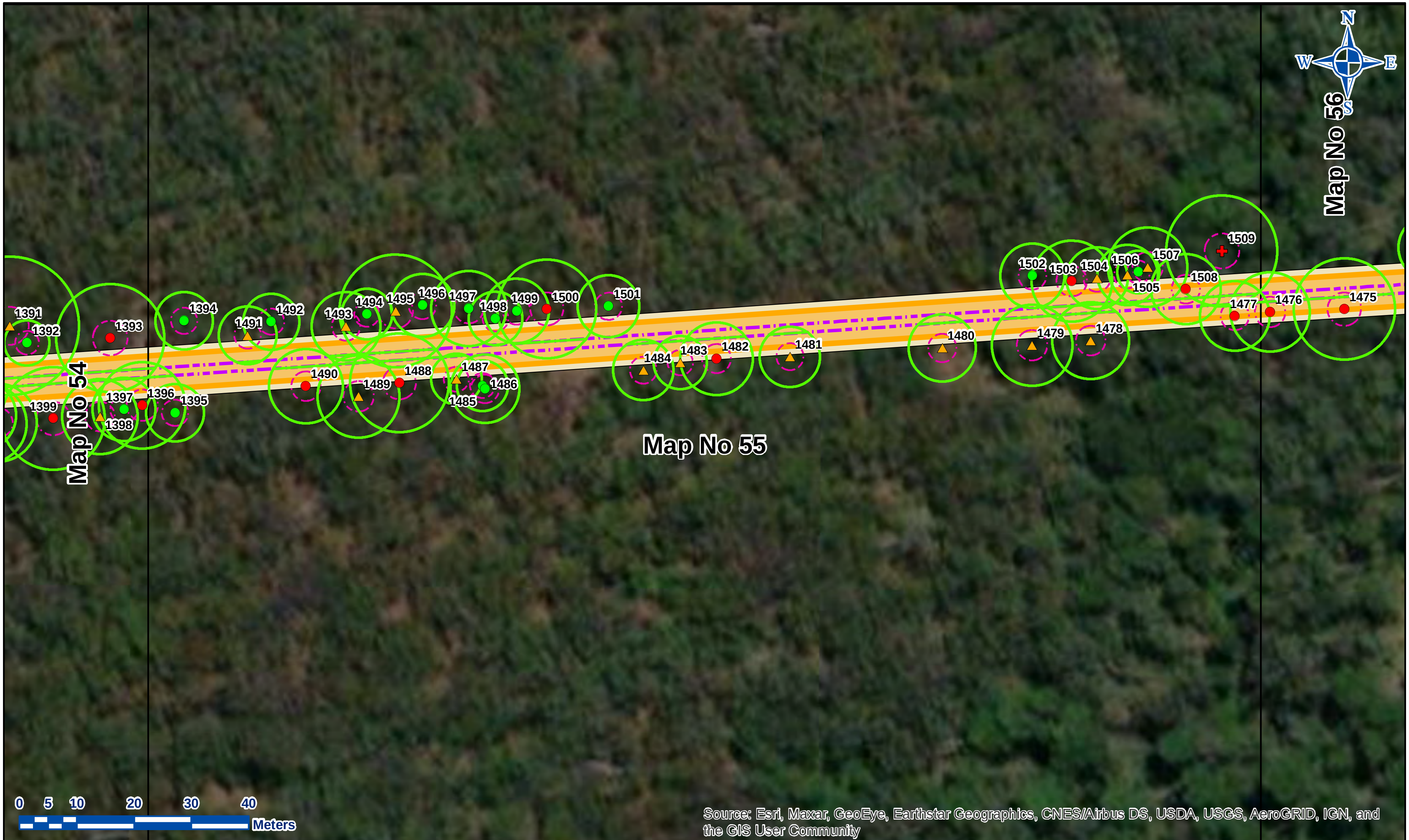

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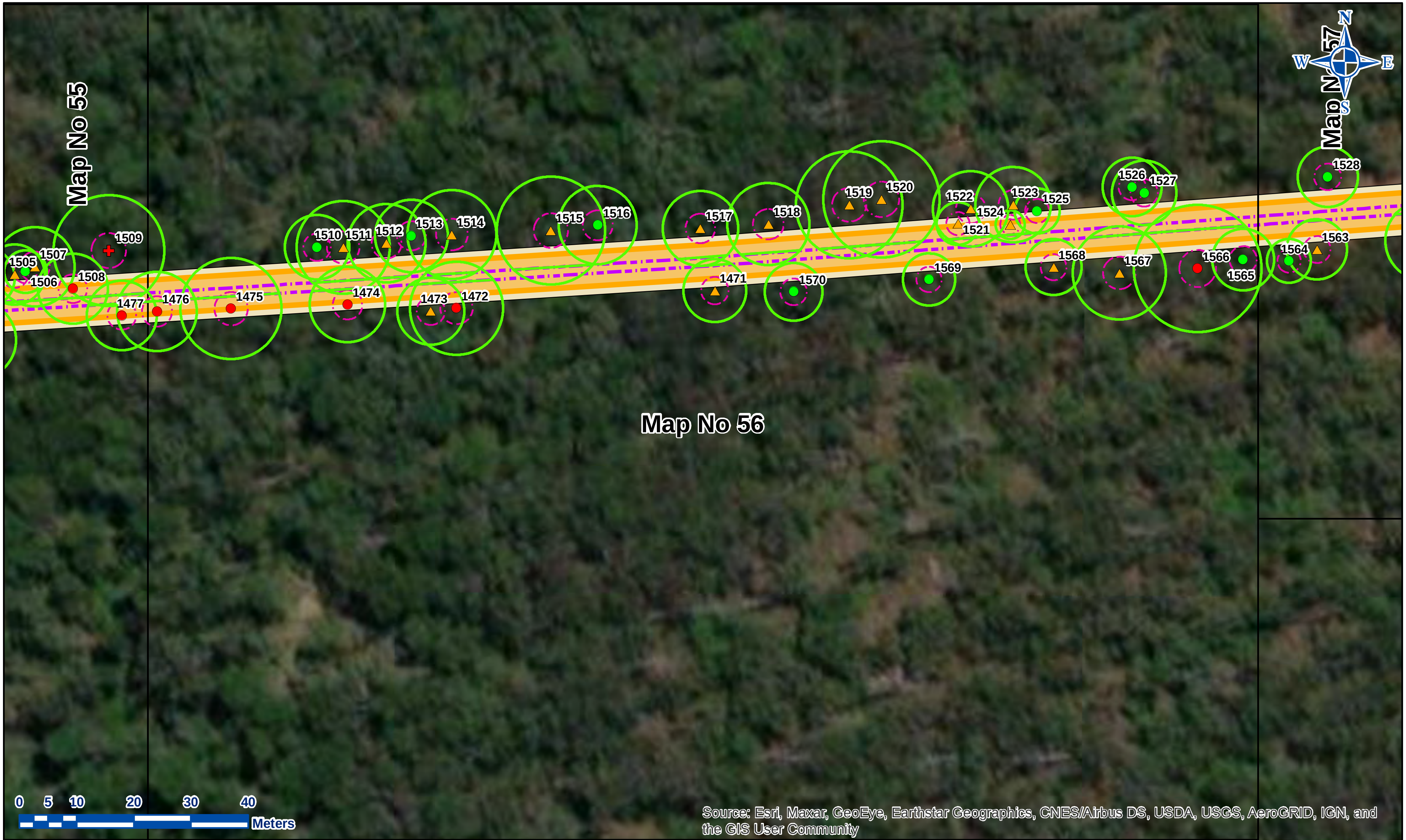

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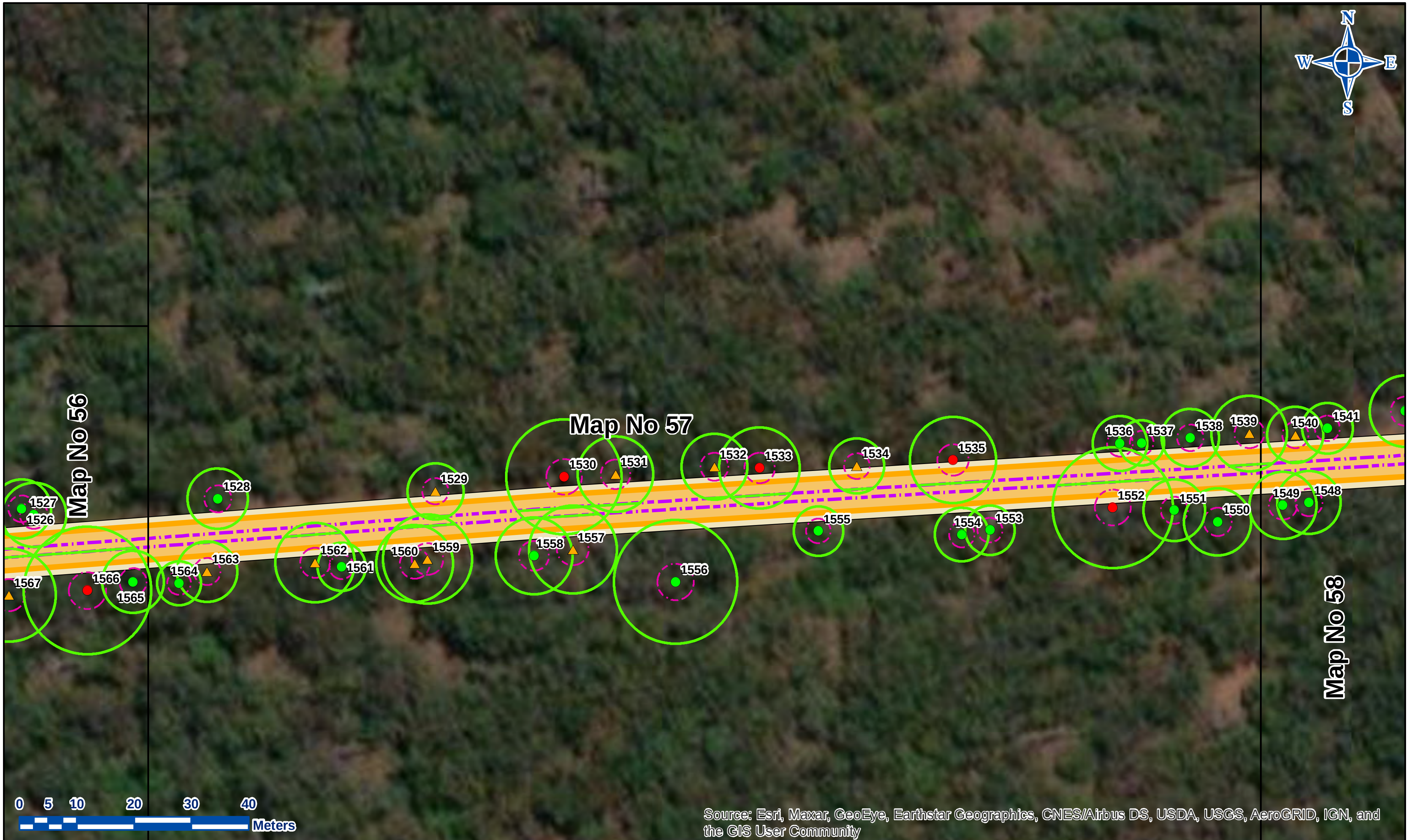

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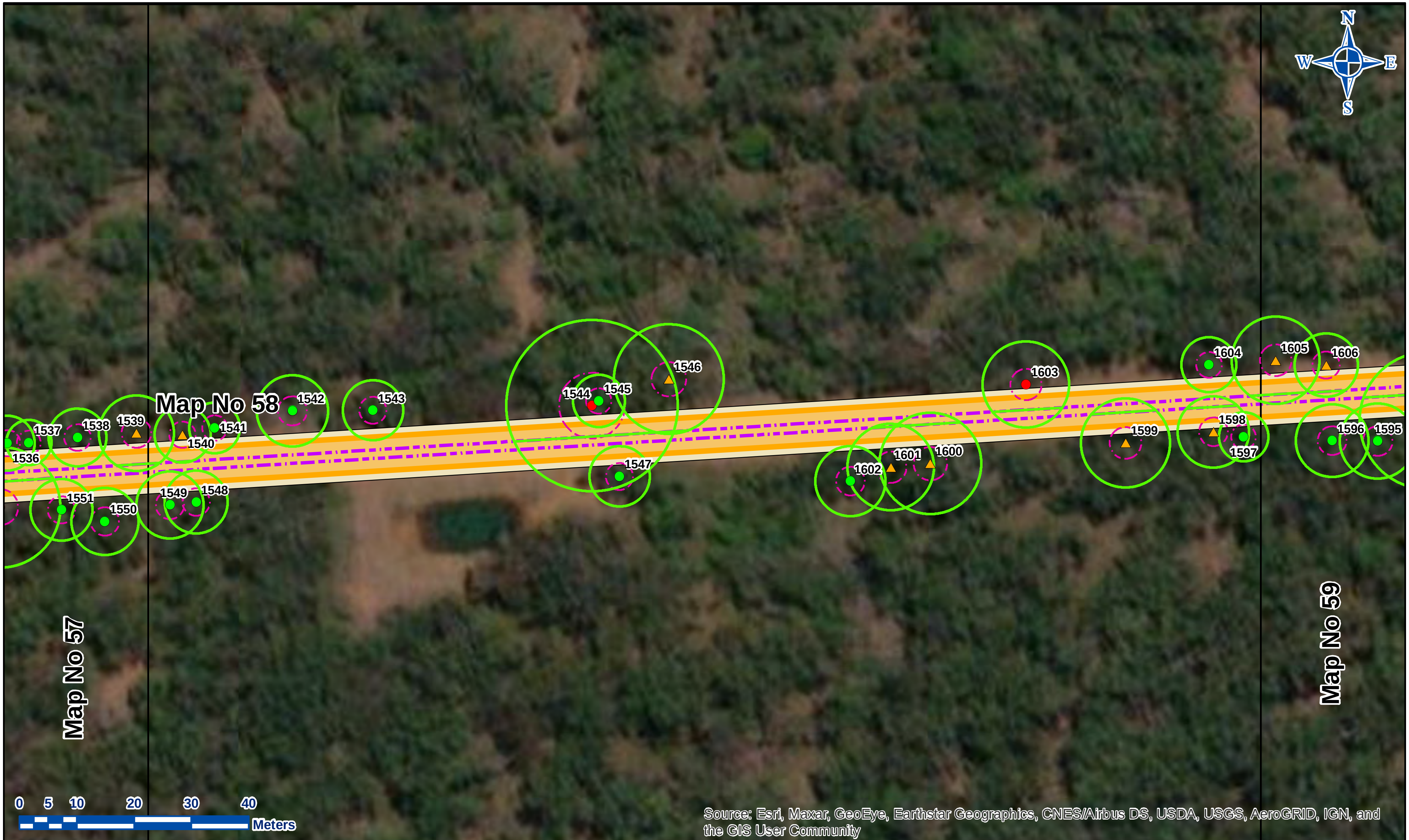

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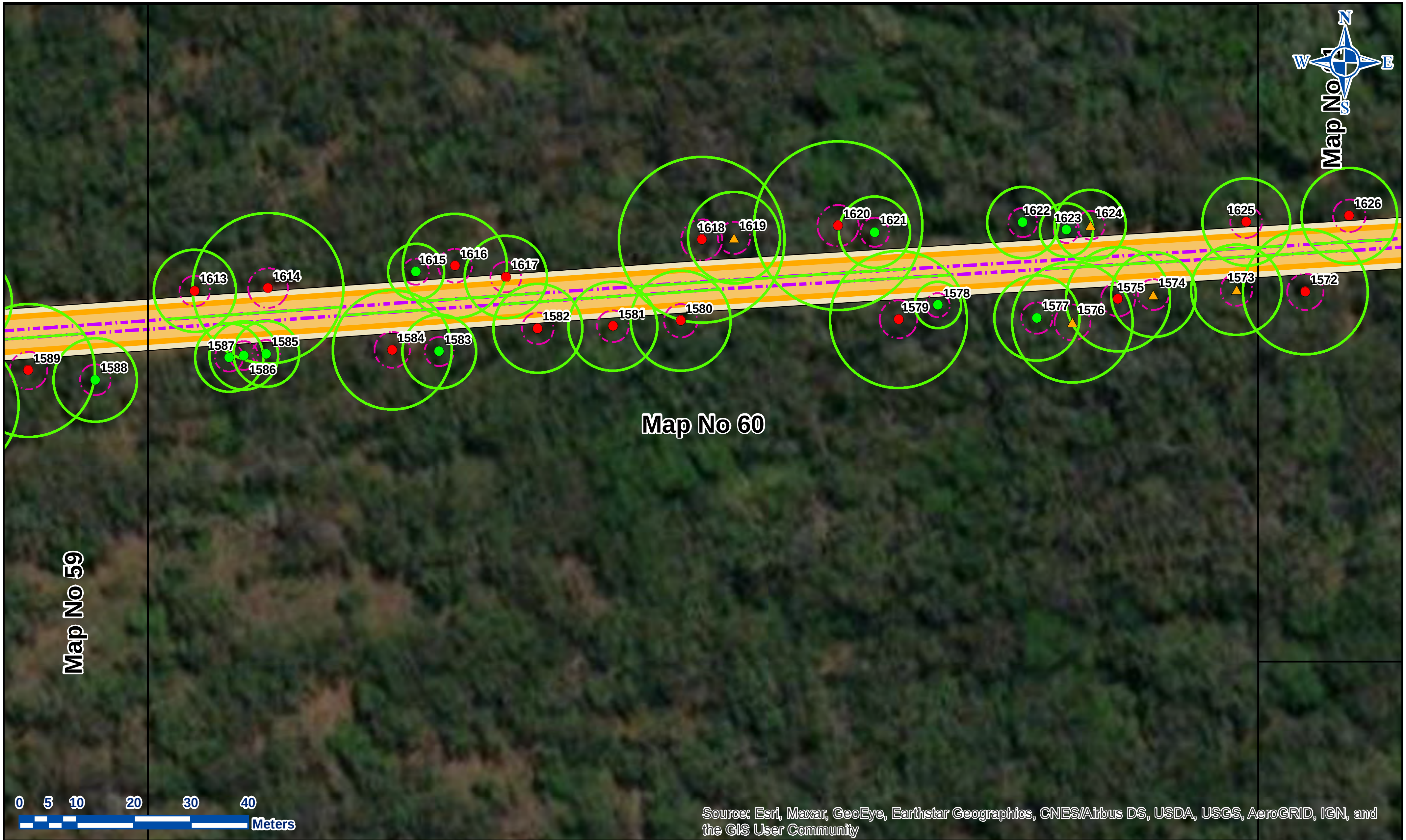

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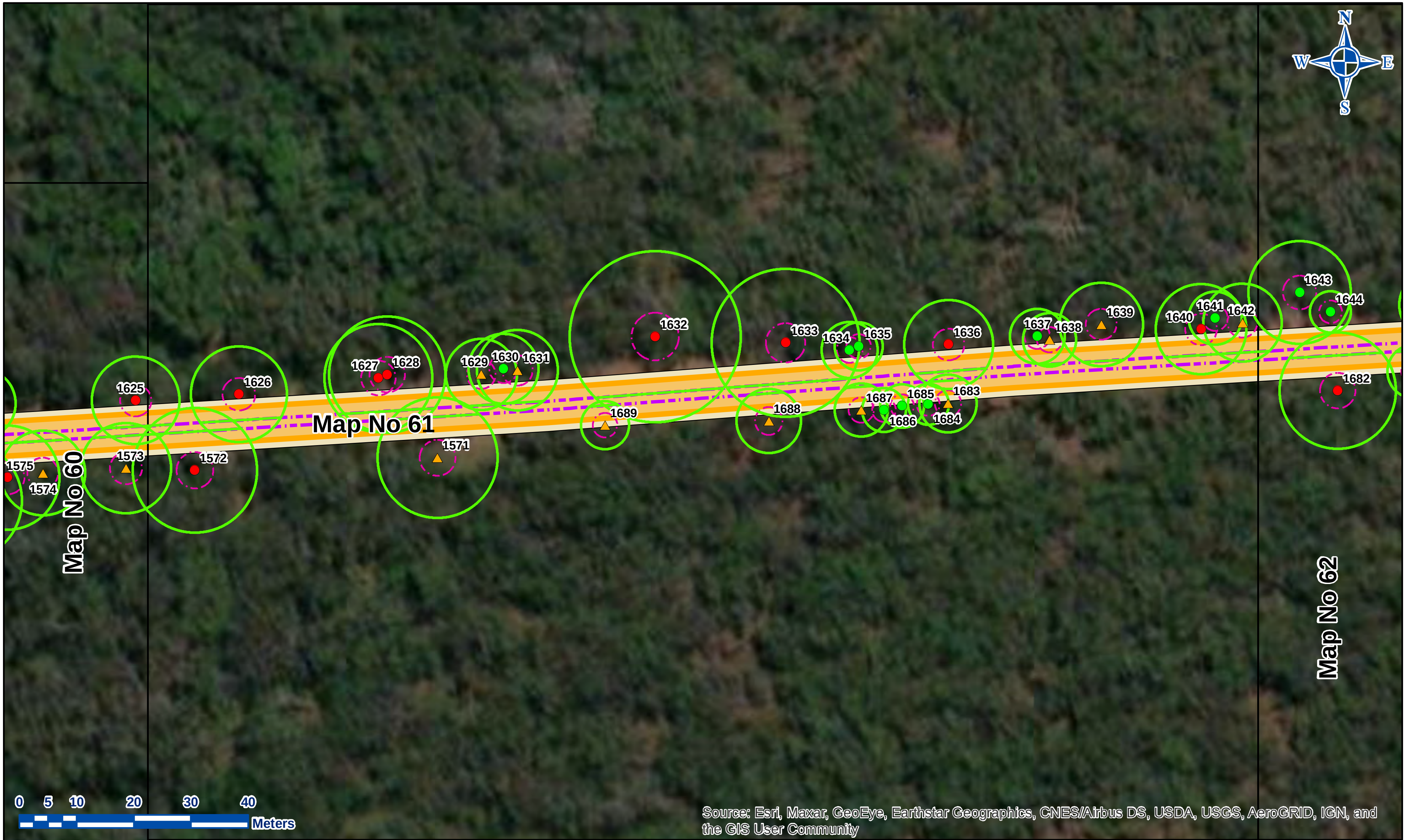

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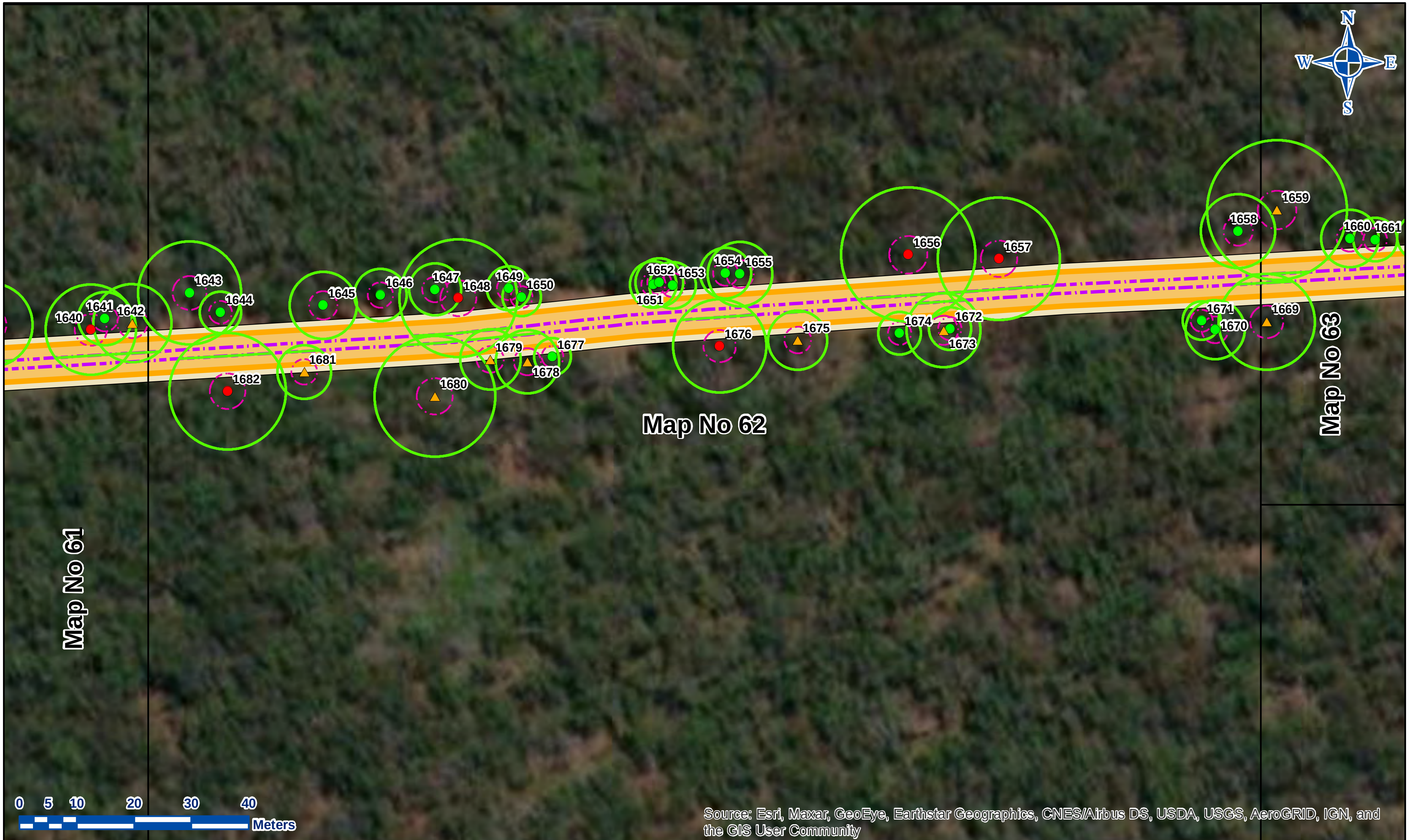

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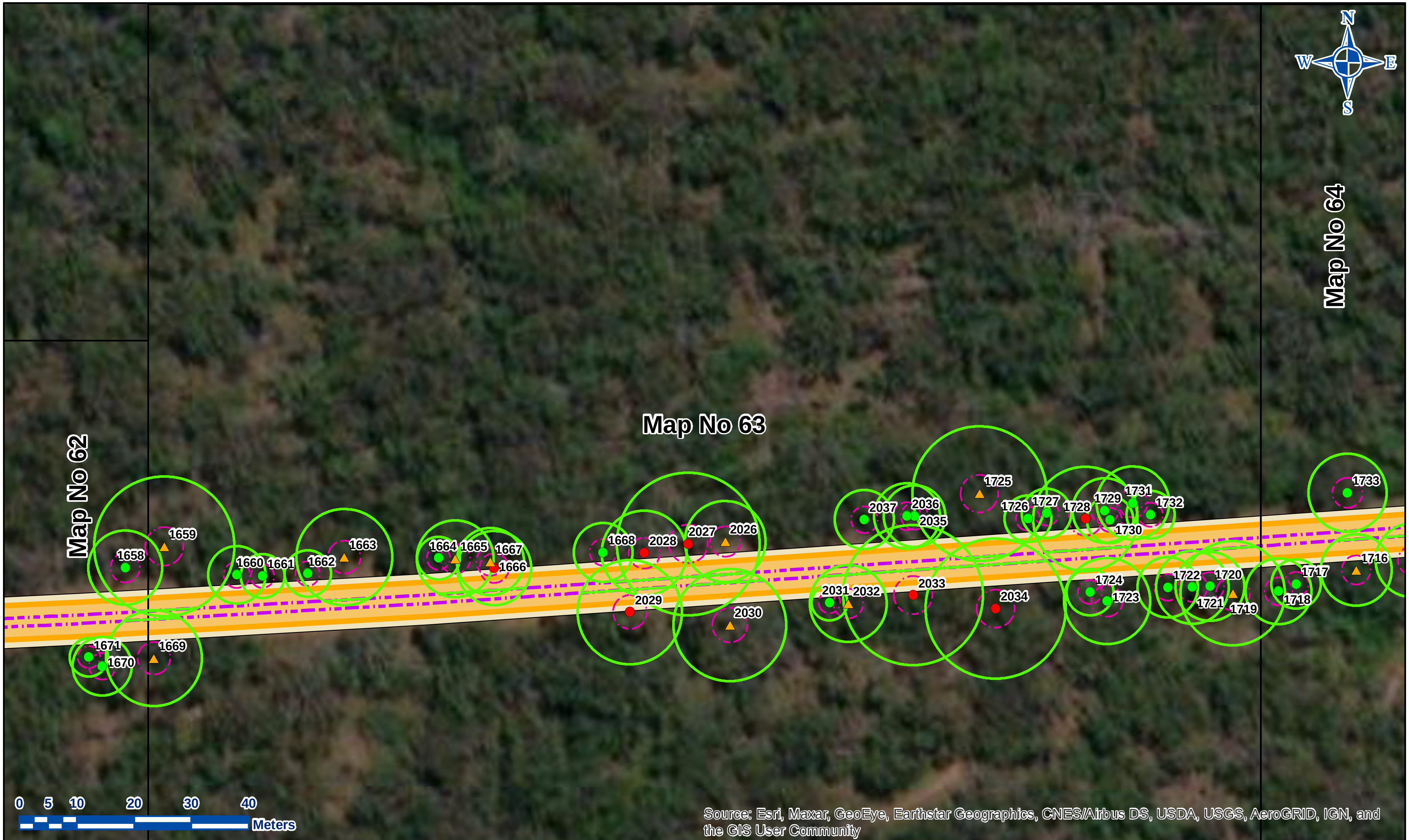

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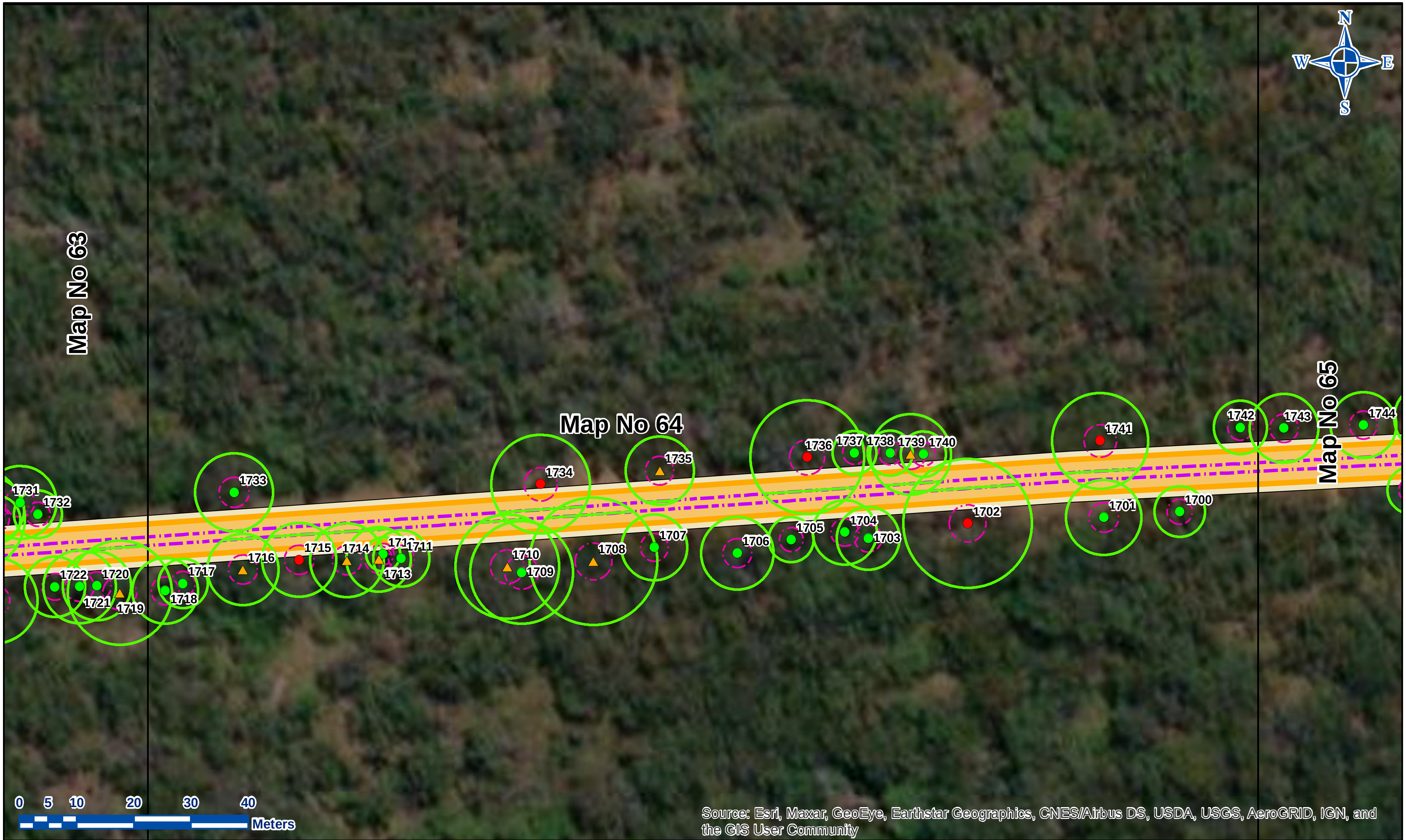

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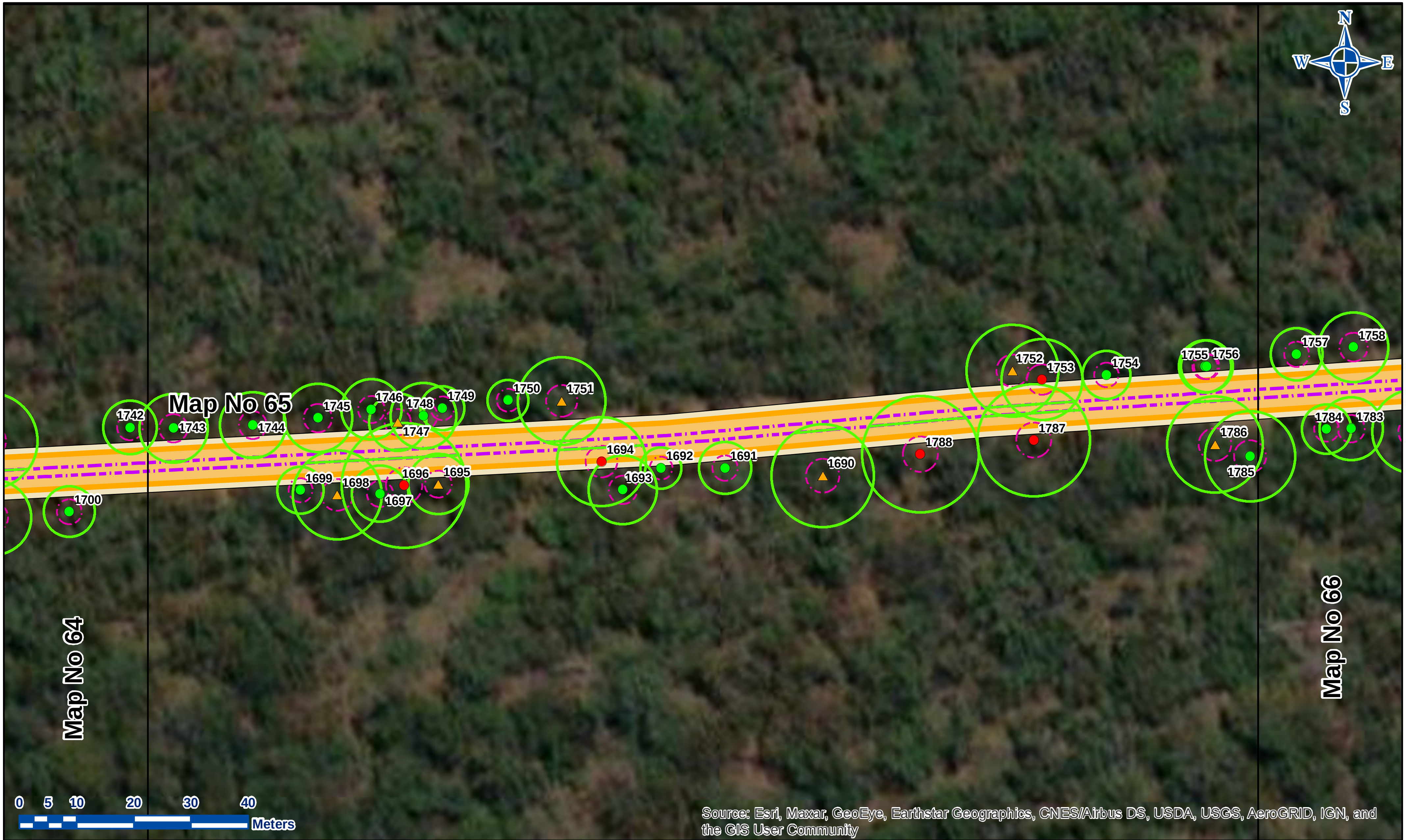

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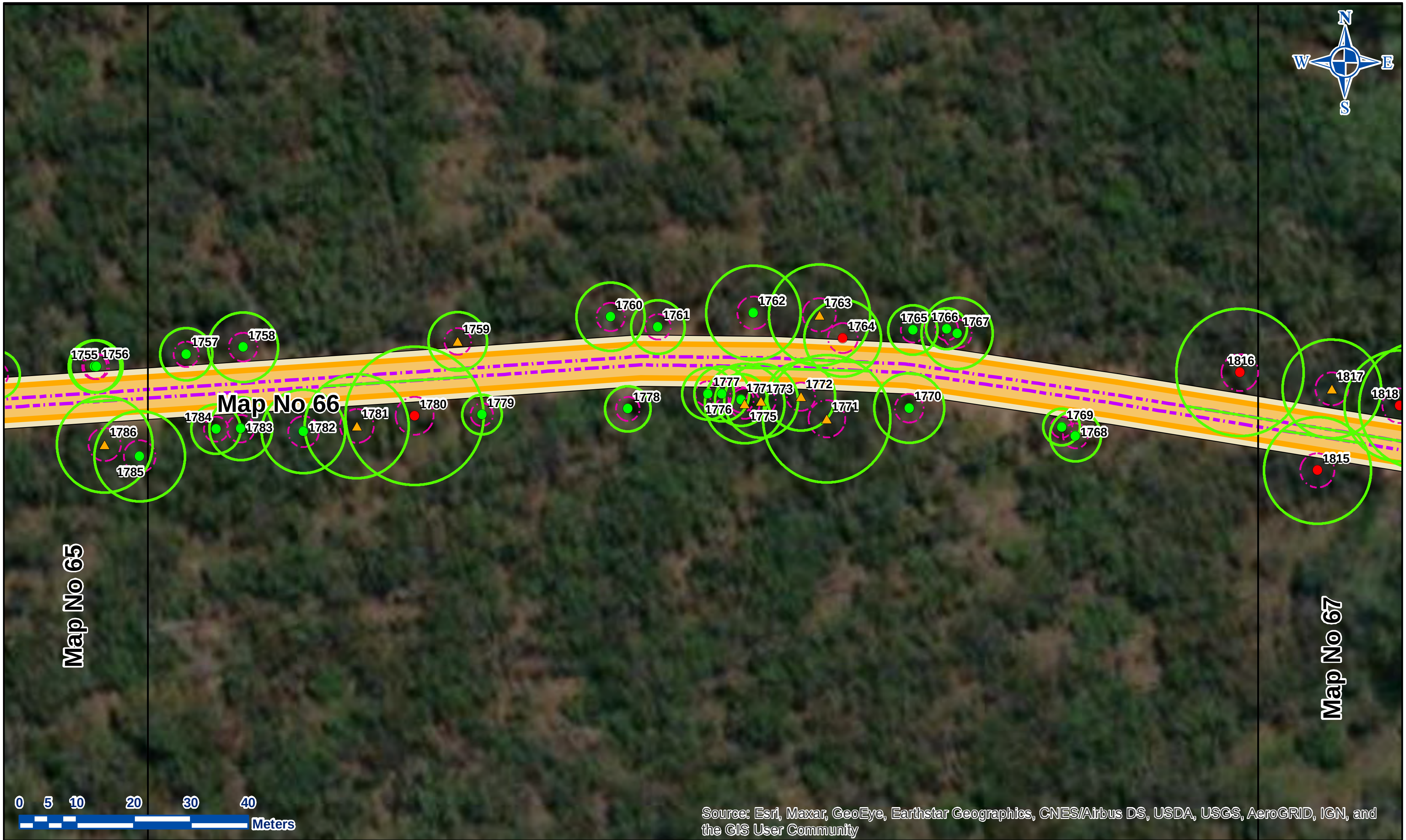

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Trees-Encroachment %
- 0%
- 1-10%
- > 10%
- Failed

- TPZ
- SRZ
- Maps
- Trench
- Formed_Road
- Road_Verge

AXIOM Tree Management Pty Ltd

Drawn and Plotted by: TDC
Date: 27/03/2024
Geographic Projection:
GDA 1994 MGA Zone 55

TPZ and Site Map

Boiler Swamp Road
Cobboboonee
National Park

Scale: 1:870

Legend

Trees-Encroachment %
- 0%
- 1-10%
- > 10%
- Failed

- TPZ
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AXIOM Tree Management Pty Ltd

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GDA 1994 MGA Zone 55

TPZ and Site Map

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Scale: 1:870

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Appendix 13 Review of wind farm mitigation technology

Table A13.1 Review of wind farm mitigation technology relevant to microbats

Basic approach	Study type	Citation	Title	Method	Trigger / measure employed	Faunal group	Summary
Deterrent	Results of management of operational wind farm(s) / commercial system(s)	(May et al. 2020)	Paint it black: Efficacy of increased wind turbine rotor blade visibility to reduce avian fatalities	Visual deterrent	Bird response to blade colour	Birds	Painted 1 blade black, reduced mortality by over 70% compared with controls. Largest reduction in raptors. Data on 7 years prior and 3 years after painting. Needs further research as only small sample size.
Deterrent	Meta-analysis / review of operational wind farms	(Stokke et al. 2020)	Effect of tower base painting on Willow Ptarmigan collision rates with wind turbines	Visual deterrent	Bird response to tower colour	Birds	Examined effects of painting tower in reducing collisions. Found 48% reduction in carcasses between control and painted towers, but significant variation between years and seasons.
Deterrent	Experiment / pilot study	(Gorresen et al. 2015)	Use of dim ultraviolet light as a means of deterring activity by the Hawaiian hoary bat near turbines	Visual deterrent	Bat response to ultrasonic signal	Bats	Illuminated trees with dim flickering ultraviolet (UV) light. Bat activity was reduced but experimental treatment did not completely inhibit bat activity near trees, nor did all measures of bat activity show statistically significant differences due to high variance in bat activity among sites.
Deterrent	Meta-analysis / review of operational wind farms	(Kinzie & Miller 2018)	Ultrasonic Bat Deterrent Technology	Acoustic deterrent	Bat response to ultrasonic signal	Bats	Tested effect of ultrasonic signals (pulsed and continuous) on bats in a bat flight room. Found pulsed and continuous both deterred foraging behaviour. Then deployed on a turbine and found reduced bat fatalities by 38% for all species. Water vapour was a significant issue, potentially affecting the frequency of the device.

Basic approach	Study type	Citation	Title	Method	Trigger / measure employed	Faunal group	Summary
Deterrent	Results of management of operational wind farm(s) / commercial system(s)	(Schirmacher 2020)	Evaluating the Effectiveness of an Ultrasonic Acoustic Deterrent in Reducing Bat Fatalities at Wind Energy Facilities	Acoustic deterrent	Bat response to ultrasonic signal	Bats	Tested ultrasonic deterrents by placing on the nacelle. Two turbines were used for 70 nights and cameras were deployed to map 3D bat movements. Found no significant difference between control and acoustic deterrent, however, much of the data was removed due to survey issues.
Deterrent	Results of management of operational wind farm(s) / commercial system(s)	(Cooper et al. 2020)	Bat Impact Minimization Technology: An Improved Bat Deterrent for the Full Rotor Swept Area of Any Wind Turbine	Acoustic deterrent	Bat response to ultrasonic signal	Bats	Project report for the "Strike Free" system. Ultrasonic coverage to the entire area of the turbine blade as opposed to broadcasting ultrasonic transmission to the centre of the turbine. Designed specifically for echolocation frequency of four main bat species in USA. Transmitters can be customised to different frequencies as needed. Requires further testing before it can be commercialised.
Deterrent	Results of management of operational wind farm(s) / commercial system(s)	(Sievert et al. 2021)	A Biomimetic Ultrasonic Whistle for Use as a Bat Deterrent on Wind Turbines	Acoustic deterrent	Bat response to ultrasonic signal	Bats	Designed and tested biomimetic bat whistle which can be attached to the blades and passively create noise. Currently still in test/design phase. Has been designed, created and tested on lab bats to assess deterrence. Has also been deployed on small turbines to test wind speeds and rotation effects. Still missing real world applications.
Deterrent	Results of management of operational wind farm(s) / commercial system(s)	(Romano et al. 2019)	Evaluation of an acoustic deterrent to reduce bat mortalities at an Illinois wind farm	Acoustic deterrent	Bat response to ultrasonic signal	Bats	Air-jet ultrasonic emitters with frequency range of 30-100kHz mounted on nacelles and towers. Deterrents were rotated out every 3 days. Observed significant reduction in overall bat mortality in 2014-2015, but not 2016. Also found deterrent was species specific. 35-56% of rotor swept area was within ensonified zone.

Basic approach	Study type	Citation	Title	Method	Trigger / measure employed	Faunal group	Summary
Deterrent	Results of management of operational wind farm(s) / commercial system(s)	(Weaver et al. 2020)	Ultrasonic acoustic deterrents significantly reduce bat fatalities at wind turbines	Acoustic deterrent	Bat response to ultrasonic signal	Bats	Tested ultrasonic deterrents which emit six frequencies (20-50kHz) on wind turbines. Found significantly reduced bat fatalities of 54 and 78% for two species, but no impact on other species.
Deterrent	Results of management of operational wind farm(s) / commercial system(s)	(Voigt et al. 2021)	Limitations of acoustic monitoring at wind turbines to evaluate fatality risk of bats	Acoustic deterrent	Bat response to ultrasonic signal	Bats	Concludes that technical, physical, and biological factors severely constrain acoustic monitoring in its current form.
Deterrent	Results of management of operational wind farm(s) / commercial system(s)	(Gilmour et al. 2020)	Comparing acoustic and radar deterrence methods as mitigation measures to reduce human-bat impacts and conservation conflicts	Acoustic deterrent	Radar detection of bats triggers broadcast of ultrasonic noise deterrent	Bats	Deployed Ultrasonic speakers and radar after 10 minutes (i.e. control) to deter bats. Found no impact of radar, but significant impact of ultrasonic speakers.
Deterrent	Experiment / pilot study	(Georgiev, Marinov, & Zehtindjiev 2022)	The effect of sound on bird behaviour - application in wind farms	Acoustic deterrent	Bird response to 'startle' noise	Birds	Laboratory experiments using acoustic startle reflex (ASR). Found 100% success in altering birds behaviour and being more alert. Could be applied to alter behaviour of birds without invoking stress
Deterrent	Experiment / pilot study	(Dorey, Dicky, & Walker 2019)	Testing efficacy of bird deterrents at wind turbine facilities: a pilot study in Nova Scotia, Canada	Visual & acoustic deterrent	Bird response to visual & acoustic deterrent	Birds	Tested effectiveness of visual and audio deterrents as a mitigation strategy for birds at wind turbines. Tested owl deterrent models and bioacoustic alarm and predator calls. Found no statistical difference between controls and tests in terms of number of birds found at the turbine during the survey.

Basic approach	Study type	Citation	Title	Method	Trigger / measure employed	Faunal group	Summary
Curtailment	Results of management of operational wind farm(s) / commercial system(s)	(Rabie et al. 2022)	Efficacy and cost of acoustic-informed and wind speed-only turbine curtailment to reduce bat fatalities at a wind energy facility in Wisconsin	On demand curtailment	Low wind speed combined with bat call detection triggers curtailment	Bats	TIMR system (ReBAT) implemented using wind speed and bat acoustic presence data to inform curtailment algorithm. Control was curtailment at 4.5m/s, TIMR is active at <8m/s winds. Found reduced mortality up to 75% compared with control. Found higher curtailment night hours due to TIMR system, so revenue losses increased by 280%, however study area is known for low wind speeds.
Curtailment	Experiment / pilot study	(Mantoui et al. 2020)	Wildlife and infrastructure: impact of wind turbines on bats in the Black Sea coast region	Low wind speed curtailment	Prescribed wind speed triggers curtailment	Bats	Examined mortality of wind farms. Implementing curtailment at wind speeds below 6.5m/s reduced fatality rates by 78%.
Curtailment	Experiment / pilot study	(Adams, Gulka, & Williams 2021)	A review of the effectiveness of operational curtailment for reducing bat fatalities at terrestrial wind farms in North America	Low wind speed curtailment	Prescribed wind speed triggers curtailment	Bats	Meta-analysis of curtailment across Canada and USA. Found that in general curtailment reduced bat strikes and that it was most effective at >2m/s curtailment
Curtailment	Experiment / pilot study	(Anderson et al. 2022)	Effects of turbine height and cut-in speed on bat and swallow fatalities at wind energy facilities	Low wind speed curtailment		Birds and bats	Study doesn't focus on curtailment, but includes a section on statistical analysis of curtailment indicating a 33% reduction in bat fatalities. No significant reduction in bird impacts.

Basic approach	Study type	Citation	Title	Method	Trigger / measure employed	Faunal group	Summary
Curtailment	Experiment / pilot study	(Hayes et al. 2019)	A smart curtailment approach for reducing bat fatalities and curtailment time at wind energy facilities	Low wind speed curtailment	Detection of bat activity triggers curtailment	Bats	Use of new system of tools for analysing bat activity and wind speed data to make near real-time curtailment decisions when bats are detected. Found significantly reduced fatality estimates for treatment turbines for each of the five bat species detected. Reduced power generation by <3.2% and estimated reduced curtailment time by 48% if operated under standard rules.
Curtailment	Experiment / pilot study	(Arnett et al. 2010)	Effectiveness of changing wind turbine cut-in speed to reduce bat fatalities at wind facilities.	Low wind speed curtailment	Prescribed wind speed triggers curtailment	Bats	Early review noting the effectiveness of low wind speed curtailment in reduction of bat collisions.
Curtailment	Experiment / pilot study	(Martin et al. 2017)	Reducing bat fatalities at wind facilities while improving the economic efficiency of operational mitigation	Low wind speed curtailment	Prescribed wind speed in combination with prescribed air temperature triggers curtailment	Bats	Incorporation of temperature with wind speed into curtailment regime for bats improved efficiency of curtailment and reduced loss of productivity.
Curtailment	Results of management of operational wind farm(s) / commercial system(s)	(Huso & Maurer 2016)	Smart Curtailment: Improving efficiency by using more than wind speed	Low wind speed combined with temperature for curtailment	Prescribed wind speed in combination with prescribed air temperature triggers curtailment	Bats	Incorporation of temperature with wind speed into curtailment regime for bats improved efficiency of curtailment and reduced loss of productivity.

Basic approach	Study type	Citation	Title	Method	Trigger / measure employed	Faunal group	Summary
Curtailment	Results of management of operational wind farm(s) / commercial system(s)	(Bennett et al. 2022)	Curtailment as a successful method for reducing bat mortality at a southern Australian wind farm	Low wind speed curtailment	Prescribed wind speed triggers curtailment	Bats	Assessed pre and post curtailment, with curtailment significantly reducing pooled species mortality by 54%. Cut-in speed from 3 to 4.5ms
Curtailment	Results of management of operational wind farm(s) / commercial system(s)	(Squires et al. 2021)	Timing and Weather Offer Alternative Mitigation Strategies for Lowering Bat Mortality at Wind Energy Facilities in Ontario	Low wind speed curtailment	Prescribed weather and timing trigger curtailment	Bats	Looked at more detailed region specific weather and timing to predict bat activity and mortality when curtailment was not in effect. Found bat activity occurred in waves, with distinctive peaks during the season. Most activity occurred in first half of the night.
Curtailment	Results of management of operational wind farm(s) / commercial system(s)	(Good et al. 2022)	Curtailment and acoustic deterrents reduce bat mortality at wind farms	Low wind speed curtailment and acoustic deterrent	Prescribed wind speed triggers acoustic deterrent	Bats	Tested combination of curtailment and acoustic deterrent (ultrasonic). Deterrent emits sound at 20-50kHz frequency from 8 speakers. Found significant reduction in bat mortality from just curtailment where wind speeds were <5m/s. Curtailment and acoustic deterrent saw a further decrease of between 31.6 and 66.9% depending on species. Two issues: limited control as could not determine just acoustic effects alone, and effectiveness of deterrent is unknown past 110m due to sound attenuation.
Curtailment	Results of management of operational wind farm(s) / commercial system(s)	(Richardson et al. 2021)	Peaks in bat activity at turbines and the implications for mitigating the impact of wind energy developments on bats	Low wind speed curtailment	Prescribed wind speed triggers curtailment	Bats (Pipistrellus spp.)	Bat activity assessed at paired turbine and control locations at 23 wind farms. P. pipistrellus activity was 37% higher at turbines than control locations, while P. pipistrellus activity showed no change. Discussion suggests that curtailment during high risk may reduce collisions, but further study needed.

Basic approach	Study type	Citation	Title	Method	Trigger / measure employed	Faunal group	Summary
Curtailment	Results of management of operational wind farm(s) / commercial system(s)	(McClure, Martinson, & Allison 2018)	Automated monitoring for birds in flight: Proof of concept with eagles at a wind power facility	On demand curtailment	Camera tracking system integrated with SCADA triggers curtailment	Birds	Testing of IdentiFlight software and hardware. Detected 96% of individual birds found by observers, and 562% more individual birds than observers did. Misclassification rate was 6% for eagles, and misidentification was 28%. Detected birds at median 793m in 0.4s.
Curtailment	Results of management of operational wind farm(s) / commercial system(s)	(Soni, Loske, & Lackmann 2020)	Testing and Evaluation of "SafeWind" A Bird Protection System	On demand curtailment	Camera tracking system integrated with SCADA triggers curtailment	Birds	SafeWind bird protection technology. Realtime detection of flying objects within intrusion area at a certain threshold limit trigger control of the wind turbine. Showed a significant reduction in red kite risk of collision.
Curtailment	Experiment / pilot study	(McClure et al. 2021)	Eagle fatalities are reduced by automated curtailment of wind turbines	On demand curtailment	Camera tracking system integrated with SCADA triggers curtailment	Birds	Used IdentiFlight to automate curtailment of wind farm. Found 63% decrease in mortality. Author does not consider results a panacea, and should be used in conjunction with other mitigation strategies.
Curtailment	Experiment / pilot study	(Rogers 2022)	Assessment of Effectiveness of the IdentiFlight Avian Detection System	On demand curtailment	Camera tracking system integrated with SCADA triggers curtailment	Birds	Report of IdentiFlight avian detection system installed at Cattle Hill WF in Tas. Designed for Golden Eagle in USA, but trialled in Tas for Wedge-tailed eagle and White-bellied sea-eagle. Three mortalities of WTE with reasons for deaths supplied. Appears deaths were caused by human error and poor turbine placement as IdentiFlight detected and attempted to curtail each event.

Basic approach	Study type	Citation	Title	Method	Trigger / measure employed	Faunal group	Summary
Curtailment	Experiment / pilot study	(Tome et al. 2017)	Radar Assisted Shutdown on Demand Ensures Zero Soaring Bird Mortality at a Wind Farm Located in a Migratory Flyway	On demand curtailment	Radar detection triggers curtailment	Birds	Testing RASOD (radar assisted shutdown on demand). Security perimeter with observers was aided by radar, detecting soaring birds approaching the windfarm. Turbines turn off after pre-defined criteria of migration or threatened species were met. Had no collisions in five consecutive Autumns.
Curtailment	Experiment / pilot study	(H.T. Harvey and Associates 2018)	Evaluating a Commercial-Ready Technology for Raptor Detection and Deterrence at a Wind Energy Facility in California	On demand curtailment	Radar detection triggers curtailment	Birds	Testing of the DTBird system to reduce collision risk for Golden Eagles and large raptors. Tests have only been completed using UAVs and video imaging of raptors around turbines.
Curtailment	Experiment / pilot study	(Zehtindjiev & Whitfield 2022a)	Monitoring of Spring Bird Migration in the Integrated System for Protection of Birds 2022	On demand curtailment	Radar detection triggers curtailment	Birds	Annual monitoring of migratory birds using radar and observations. Radar and observations during migration determine shutdown/curtailment procedure, however no shutdowns were necessary in 2022.
Curtailment	Experiment / pilot study	(Georgiev & Zehtindjiev 2022)	Real-time bird detection and collision risk control in wind farms	On demand curtailment	Thermal imaging detection triggers curtailment	Birds	Thermal imaging used to determine presence of birds and bats. Cameras installed on wind turbines and autonomously detected at 500+ meters. Custom-built detection software provides live picture and video logs. Human observations were compared with detection system (post analysis and checking by a human to confirm accuracy). Found 83.1-91.8% accuracy.

Basic approach	Study type	Citation	Title	Method	Trigger / measure employed	Faunal group	Summary
Curtailment	Results of management of operational wind farm(s) / commercial system(s)	(Ferrer et al. 2022)	Significant decline of Griffon Vulture collision mortality in wind farms during 13-year of a selective turbine stopping protocol	On demand curtailment	Human observers detect bird and trigger curtailment	Birds	Examined mortality two years before, and 13 years after stopping protocol implemented. Stopping protocol is human observation calling wind turbine control room. Significant reduction of 61.7% in mortality of soaring birds (raptors and storks), with population counts of Griffon Vultures increasing, but also stops by raptors increasing by 2.5 times which accounted for 0.51% energy production loss. No effect to passerine birds or bats.
Curtailment	Results of management of operational wind farm(s) / commercial system(s)	(Tjomlov et al. 2021)	Resolving Key Uncertainties of Seabird Flight and Avoidance Behaviours at Offshore Wind Farms	On demand curtailment	Radar initially detects birds to steer camera (visual light & thermal imaging) tracking to trigger curtailment	Birds	Integrated radar-camera monitoring unit that collects radar tracks and video footage enabling species identification and analysis of meso- and micro-avoidance behaviours in an operational offshore wind farm. Communication between camera and radar is facilitated by a multi-sensor, high-speed processing software which allows birds discovered by the radar to be automatically targeted by the cameras and followed, using motion detection and video.
Curtailment	Results of management of operational wind farm(s) / commercial system(s)	(Zehtindjiev & Whitfield 2022b)	Summary of Activates and the Results of Ornithological Monitoring in the Integrated system for Protection of Birds, 2021	On demand curtailment	Radar detection triggers curtailment	Birds	Annual monitoring of migratory birds using radar and observations. Radar and human observations during migration determine shutdown/curtailment procedure.
Curtailment	Experiment / pilot study	(Gradolewski et al. 2021)	A Runway Safety System Based on Vertically Oriented Stereovision	On demand curtailment	Stereo camera tracking to detect birds	Birds	Anti-collision software/hardware which uses stereo cameras to detect birds in real-time. Mostly used in airport situations. Tests focussed on drones with GPS recorders, with no testing using birds.

Basic approach	Study type	Citation	Title	Method	Trigger / measure employed	Faunal group	Summary
Review	Experiment / pilot study	(Corbeau, Dupont, & Besnard 2021)	Detection-reaction systems in onshore windfarms, a mitigation solution to reduce bird fatalities: Principles for a relevant assessment of their performances	Methods review	various	Birds	Critical analysis of international scientific publications and 26 unpublished reports. Summarises detection-reaction systems in onshore windfarms.
Review	Experiment / pilot study	(Nicholls et al. 2022)	Review of seabird monitoring technologies for offshore wind farms	Methods review	Various	Birds	Review found no one system can monitor all types of seabird avoidance behaviours. Also, no current study is being undertaken with the sole purpose to utilise monitoring technology/systems to obtain empirical collision rates, with majority of monitoring campaigns focusing on avoidance behaviour.
Review	Meta-analysis / review of operational wind farms	(Dwyer et al. 2019)	Near-ultraviolet light reduced Sandhill Crane collisions with a power line by 98%	Visual deterrent	Bird response to effects of ultraviolet lighting of turbines	Birds	Researchers used randomised design to test collision mitigation effects of a pole-mounted near-ultraviolet light avian collision avoidance system to illuminate power lines. Found significantly reduced (98%) collision and dangerous flights (82%) when collision avoidance system was active.
Review	Meta-analysis / review of operational wind farms	(Niemi & Tanttu 2020)	Deep learning–based automatic bird identification system for offshore wind farms	Radar integrated with camera system	Radar initially detects birds to steer camera tracking to trigger curtailment	Birds	Testing of the ROBIN 3D FLEX v1.6.3. Prototype has been built on the Finnish coast which uses radar to detect potential birds, which provides coordinates to a steering system of a camera. Current deployments indicate that it is able to identify bird species in a test area successfully (0.86 rate), with a video accuracy of 88.91%.

Basic approach	Study type	Citation	Title	Method	Trigger / measure employed	Faunal group	Summary
Test only	Results of management of operational wind farm(s) / commercial system(s)	(Nilsson et al. 2018)	Field validation of radar systems for monitoring bird migration	Radar bird &/or bat detection	Testing only of radar systems	Birds	Testing of BirdScan. Compared nocturnal bird migration movements recorded by four different types of radar systems (weather radar, BirdScan, marine radar and tracking radar) at a Swedish windfarm. Found nightly migration intensity patterns were consistent across three of the radars (including BirdScan) and absolute migration intensity agreed between weather and BirdScan radar.
Test only	Experiment / pilot study	(Moll et al. 2020)	Radar-based detection of birds at wind turbine installations: results from a field study	Radar bird &/or bat detection	Testing only of radar systems	Birds	Installed Ka-band radar system on one wind turbine. Discusses real-time processing pipeline and bird detection capabilities, but very preliminary.
Test only	Experiment / pilot study	(Degraer et al. 2021)	Environmental Impacts of Offshore Wind Farms in the Belgian Part of the North Sea: Attraction, avoidance and habitat use at various spatial scales. Memoirs on the Marine Environment.	Radar bird &/or bat detection	Testing only of radar systems	Birds	Use of semi-real-time radar to detect bird presence at an offshore windfarm. Could not use live data due to weather effects causing false detections which had to be manually checked, but models/ai will be used in future iterations.
Test only	Experiment / pilot study	(Oregon TSate University 2021)	Final Technical Report: A Heterogeneous System for Eagle Detection, Deterrent, and Wildlife Collision Detection for Wind Turbines	Visual deterrent	Bird response to inflatable anthropomorphic sculpture	Birds	Technical report for designing, testing and implementing of anti-collision and strike detection system. Testing has been completed on 3 separate short term field tests, and 1 multi-day on-turbine test. Tested visual deterrent only with drones. Visual deterrent is an inflatable anthropomorphic sculpture.

Basic approach	Study type	Citation	Title	Method	Trigger / measure employed	Faunal group	Summary
Test only	Experiment / pilot study	(Cryan et al. 2021)	Influencing Activity of Bats by Dimly Lighting Wind Turbine Surfaces with Ultraviolet Light	Visual deterrent	Bird & bat responses to projection of different ultraviolet lights	Birds and bats	Deployed UV emitting LED lights which flash a minimum frequency of 0.5 seconds. Placed 20m up the turbines to cast dim UV light on turbine surface and some of the blade. Found no significant difference in present of bats, birds or insects, with insects and bats potentially having a non-significant increase in activity when UV lights were present.
Test only	Experiment / pilot study	(Smallwood & Bell 2020)	Effects of Wind Turbine Curtailment on Bird and Bat Fatalities	Low wind speed curtailment	Tests efficacy of curtailment	Birds and bats	Two studies. Found wind turbine curtailment significantly reduced near-misses and rotor-disrupted flights of bats, and reduced bat deaths but not birds. Study 2 found converting inoperable to operable status had no significant impact on bird deaths, and sheltered-ledge nesters or roosters on turbines died more in vacant towers.
Test only	Experiment / pilot study	(Matzner, Warfel, & Hull 2020)	ThermalTracker-3D: A thermal stereo vision system for quantifying bird and bat activity at offshore wind energy sites	Thermal imaging	Tests efficacy of thermal imaging detection	Birds and bats	Testing of thermal stereo tracking for birds and bats. Deemed effective and cheap, however real world testing still required.
Test only	Experiment / pilot study	(Goller et al. 2018)	Assessing bird avoidance of high-contrast lights using a choice test approach: implications for reducing human-induced avian mortality	Artificial lighting	Bird response to effects of different turbine lighting	Birds	Assessing lights on turbines using a lab based choice test in Cowbirds. Found peaks in ability to visualise spectrum at 380nm, 470nm, 525, 630 and broad spectrum. Found significant avoidance at 470-630nm, and no difference at 380 and 525nm LED lights.

Basic approach	Study type	Citation	Title	Method	Trigger / measure employed	Faunal group	Summary
Test only	Experiment / pilot study	(Rebke et al. 2019)	Attraction of nocturnally migrating birds to artificial light: The influence of colour, intensity and blinking mode under different cloud cover conditions	Artificial lighting	Bird response to effects of different turbine lighting	Birds	Tested attraction of light colour, intensity and blinking on seabirds at North Sea Island. Found no light was avoided, blinking had no effect, intensity had no effect. Continuous light significantly attracted birds when no stars visible. Red light had less effect regardless of blinking or continuous light regime.
Test only	Experiment / pilot study	(May et al. 2017)	Do birds in flight respond to (ultra)violet lighting?	Visual deterrent	Bird response to effects of ultraviolet lighting of turbines	Birds	Deployed two types of UV emitting lights (400nm and 365nm) placed vertically and monitored using avian radar system. UV reduced flights by 27% while violet light decreased flights by 12%, with an average flight altitude change of 7m.
Test only	Experiment / pilot study	(Alqaysi et al. 2021)	A Temporal Boosted YOLO-Based Model for Birds Detection around Wind Farms	Camera detection system		Birds	Testing new software version on bird photos to improve detection rate. Found tiling and temporal stacking improve bird detection

Appendix 14 EPBC Act Protected Matters Search Tool report

This appendix contains the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) Protected Matters Search Tool report, generated 3 May 2023.

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 03-May-2023

Summary

Matters of National Environment Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	1
National Heritage Places:	None
Wetlands of International Importance (Ramsar	2
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	1
Listed Threatened Ecological Communities:	6
Listed Threatened Species:	100
Listed Migratory Species:	58

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at https://www.dcceew.gov.au/parks-heritage/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Lands:	18
Commonwealth Heritage Places:	None
Listed Marine Species:	96
Whales and Other Cetaceans:	13
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have

State and Territory Reserves:	35
Regional Forest Agreements:	1
Nationally Important Wetlands:	4
EPBC Act Referrals:	25
Key Ecological Features (Marine):	1
Biologically Important Areas:	20
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

World Heritage Properties [Resource Information]

Name	State	Legal Status	Buffer Status
Budj Bim Cultural Landscape	VIC	Declared property	In buffer area only

Wetlands of International Importance (Ramsar Wetlands) [Resource Information]

Ramsar Site Name	Proximity	Buffer Status
Glenelg estuary and discovery bay wetlands	Within Ramsar site	In feature area
Piccaninnie ponds karst wetlands	Within Ramsar site	In feature area

Commonwealth Marine Area [Resource Information]

Approval is required for a proposed activity that is located within the Commonwealth Marine Area which has, will have, or is likely to have a significant impact on the environment. Approval may be required for a proposed action taken outside a Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area.

Feature Name	Buffer Status
EEZ and Territorial Sea	In buffer area only

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.
Status of Vulnerable, Disallowed and Ineligible are not MNES under the EPBC Act.

Community Name	Threatened Category	Presence Text	Buffer Status
Assemblages of species associated with open-coast salt-wedge estuaries of western and central Victoria ecological community	Endangered	Community likely to occur within area	In buffer area only
Giant Kelp Marine Forests of South East Australia	Endangered	Community may occur within area	In buffer area only
Grassy Eucalypt Woodland of the Victorian Volcanic Plain	Critically Endangered	Community known to occur within area	In feature area
Karst springs and associated alkaline fens of the Naracoorte Coastal Plain Bioregion	Endangered	Community likely to occur within area	In feature area
Natural Temperate Grassland of the Victorian Volcanic Plain	Critically Endangered	Community may occur within area	In feature area
Subtropical and Temperate Coastal Saltmarsh	Vulnerable	Community likely to occur within area	In buffer area only

Listed Threatened Species [Resource Information]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

Scientific Name	Threatened Category	Presence Text	Buffer Status
BIRD			
Aphelocephala leucopsis Southern Whiteface [529]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area	In feature area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Callocephalon fimbriatum Gang-gang Cockatoo [768]	Endangered	Species or species habitat known to occur within area	In feature area
Calyptorhynchus banksii graptogyne South-eastern Red-tailed Black-Cockatoo [25982]	Endangered	Breeding known to occur within area	In feature area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Climacteris picumnus victoriae Brown Treecreeper (south-eastern) [67062]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area	In feature area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat known to occur within area	In feature area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Roosting known to occur within area	In feature area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat may occur within area	In feature area
Limosa lapponica baueri Nunivak Bar-tailed Godwit, Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat known to occur within area	In feature area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area	In feature area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Melanodryas cucullata cucullata South-eastern Hooded Robin, Hooded Robin (south-eastern) [67093]	Endangered	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Neophema chrysogaster Orange-bellied Parrot [747]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Neophema chrysostoma Blue-winged Parrot [726]	Vulnerable	Species or species habitat known to occur within area	In feature area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat known to occur within area	In feature area
Pedionomus torquatus Plains-wanderer [906]	Critically Endangered	Species or species habitat likely to occur within area	In feature area
Pezoporus occidentalis Night Parrot [59350]	Endangered	Species or species habitat may occur within area	In buffer area only
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Pterodroma leucoptera leucoptera Gould's Petrel, Australian Gould's Petrel [26033]	Endangered	Species or species habitat may occur within area	In feature area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat known to occur within area	In feature area
Stagonopleura guttata Diamond Firetail [59398]	Vulnerable	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Species or species habitat known to occur within area	In feature area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche bulleri platei Northern Buller's Albatross, Pacific Albatross [82273]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche chrysostoma Grey-headed Albatross [66491]	Endangered	Species or species habitat may occur within area	In feature area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Thinornis cucullatus cucullatus			
Eastern Hooded Plover, Eastern Hooded Plover [90381]	Vulnerable	Species or species habitat known to occur within area	In feature area
CRUSTACEAN			
Euastacus bispinosus			
Glenelg Spiny Freshwater Crayfish, Pricklyback [81552]	Endangered	Species or species habitat known to occur within area	In feature area
FISH			
Galaxiella pusilla			
Eastern Dwarf Galaxias, Dwarf Galaxias [56790]	Vulnerable	Species or species habitat known to occur within area	In feature area
Nannoperca obscura			
Yarra Pygmy Perch [26177]	Vulnerable	Species or species habitat known to occur within area	In feature area
Nannoperca variegata			
Variegated Pygmy Perch, Ewens Pygmy Perch, Golden Pygmy Perch [26178]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Prototroctes maraena			
Australian Grayling [26179]	Vulnerable	Species or species habitat known to occur within area	In feature area
Seriolella brama			
Blue Warehou [69374]	Conservation Dependent	Species or species habitat known to occur within area	In feature area
Thunnus maccoyii			
Southern Bluefin Tuna [69402]	Conservation Dependent	Species or species habitat likely to occur within area	In feature area
FROG			
Litoria raniformis			
Growling Grass Frog, Southern Bell Frog, Green and Golden Frog, Warty Swamp Frog, Golden Bell Frog [1828]	Vulnerable	Species or species habitat likely to occur within area	In feature area
MAMMAL			
Antechinus minimus maritimus			
Swamp Antechinus (mainland) [83086]	Vulnerable	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Balaenoptera borealis			
Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
Balaenoptera musculus			
Blue Whale [36]	Endangered	Foraging, feeding or related behaviour known to occur within area	In feature area
Balaenoptera physalus			
Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
Dasyurus maculatus maculatus (SE mainland population)			
Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat known to occur within area	In feature area
Eubalaena australis			
Southern Right Whale [40]	Endangered	Species or species habitat known to occur within area	In feature area
Isoodon obesulus obesulus			
Southern Brown Bandicoot (eastern), Southern Brown Bandicoot (south-eastern) [68050]	Endangered	Species or species habitat known to occur within area	In feature area
Miniopterus orianae bassanii			
Southern Bent-wing Bat [87645]	Critically Endangered	Roosting known to occur within area	In feature area
Neophoca cinerea			
Australian Sea-lion, Australian Sea Lion [22]	Endangered	Species or species habitat may occur within area	In feature area
Petaurus australis australis			
Yellow-bellied Glider (south-eastern) [87600]	Vulnerable	Species or species habitat known to occur within area	In feature area
Potorous tridactylus trisulcatus			
Long-nosed Potoroo (southern mainland) [86367]	Vulnerable	Species or species habitat known to occur within area	In feature area
Pseudomys fumeus			
Smoky Mouse, Konoom [88]	Endangered	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Pseudomys novaehollandiae			
New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Pseudomys shortridgei			
Heath Mouse, Dayang, Heath Rat [77]	Endangered	Species or species habitat known to occur within area	In feature area
Pteropus poliocephalus			
Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour may occur within area	In feature area
OTHER			
Hyridella glenelgensis			
Glenelg Freshwater Mussel [82953]	Critically Endangered	Species or species habitat known to occur within area	In feature area
PLANT			
Amphibromus fluitans			
River Swamp Wallaby-grass, Floating Swamp Wallaby-grass [19215]	Vulnerable	Species or species habitat known to occur within area	In feature area
Caladenia calcicola			
Limestone Spider-orchid [10065]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Caladenia colorata			
Coloured Spider-orchid, Small Western Spider-orchid, Painted Spider-orchid [54999]	Endangered	Species or species habitat known to occur within area	In feature area
Caladenia hastata			
Melblom's Spider-orchid [16118]	Endangered	Species or species habitat likely to occur within area	In feature area
Caladenia ornata			
Ornate Pink Fingers [76213]	Vulnerable	Species or species habitat known to occur within area	In feature area
Cassinia rugata			
Wrinkled Cassinia, Wrinkled Dollybush [21885]	Vulnerable	Species or species habitat known to occur within area	In feature area
Dianella amoena			
Matted Flax-lily [64886]	Endangered	Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Glycine latrobeana			
Clover Glycine, Purple Clover [13910]	Vulnerable	Species or species habitat known to occur within area	In feature area
Haloragis exalata subsp. exalata			
Wingless Raspwort, Square Raspwort [24636]	Vulnerable	Species or species habitat known to occur within area	In feature area
Ixodia achillaeoides subsp. arenicola			
Sand Ixodia, Ixodia [21474]	Vulnerable	Species or species habitat known to occur within area	In feature area
Lepidium aschersonii			
Spiny Peppercress [10976]	Vulnerable	Species or species habitat may occur within area	In feature area
Lepidium hyssopifolium			
Basalt Pepper-cress, Peppercress, Rubble Pepper-cress, Pepperweed [16542]	Endangered	Species or species habitat may occur within area	In feature area
Pomaderris halmaturina subsp. halmaturina			
Kangaroo Island Pomaderris [21964]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Prasophyllum diversiflorum			
Gorae Leek-orchid [13210]	Endangered	Species or species habitat likely to occur within area	In buffer area only
Prasophyllum frenchii			
Maroon Leek-orchid, Slaty Leek-orchid, Stout Leek-orchid, French's Leek-orchid, Swamp Leek-orchid [9704]	Endangered	Species or species habitat known to occur within area	In feature area
Prasophyllum litorale listed as Prasophyllum littorale			
Coastal Leek Orchid [55234]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Prasophyllum spicatum			
Dense Leek-orchid [55146]	Vulnerable	Species or species habitat known to occur within area	In feature area
Pterostylis chlorogramma			
Green-striped Greenhood [56510]	Vulnerable	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Pterostylis cucullata Leafy Greenhood [15459]	Vulnerable	Species or species habitat known to occur within area	In feature area
Pterostylis tenuissima Swamp Greenhood, Dainty Swamp Orchid [13139]	Vulnerable	Species or species habitat known to occur within area	In feature area
Senecio macrocarpus Large-fruit Fireweed, Large-fruit Groundsel [16333]	Vulnerable	Species or species habitat may occur within area	In feature area
Senecio psilocarpus Swamp Fireweed, Smooth-fruited Groundsel [64976]	Vulnerable	Species or species habitat known to occur within area	In feature area
Taraxacum cygnorum Coast Dandelion, Native Dandelion [2508]	Vulnerable	Species or species habitat known to occur within area	In feature area
Thelymitra epipactoides Metallic Sun-orchid [11896]	Endangered	Species or species habitat known to occur within area	In feature area
Thelymitra matthewsii Spiral Sun-orchid [4168]	Vulnerable	Species or species habitat may occur within area	In feature area
Xerochrysum palustre Swamp Everlasting, Swamp Paper Daisy [76215]	Vulnerable	Species or species habitat known to occur within area	In feature area
REPTILE			
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding likely to occur within area	In feature area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat may occur within area	In feature area
Delma impar Striped Legless Lizard, Striped Snake-lizard [1649]	Vulnerable	Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Dermochelys coriacea			
Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area	In feature area
Lissolepis coventryi			
Swamp Skink, Eastern Mourning Skink [84053]	Endangered	Species or species habitat known to occur within area	In feature area
SHARK			
Carcharodon carcharias			
White Shark, Great White Shark [64470]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
Galeorhinus galeus			
School Shark, Eastern School Shark, Snapper Shark, Tope, Soupfin Shark [68453]	Conservation Dependent	Species or species habitat may occur within area	In buffer area only

Listed Migratory Species

[Resource Information]

Scientific Name	Threatened Category	Presence Text	Buffer Status
Migratory Marine Birds			
Apus pacificus			
Fork-tailed Swift [678]		Species or species habitat likely to occur within area	In feature area
Ardenna carneipes			
Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Foraging, feeding or related behaviour likely to occur within area	In feature area
Ardenna grisea			
Sooty Shearwater [82651]		Species or species habitat may occur within area	In feature area
Ardenna tenuirostris			
Short-tailed Shearwater [82652]		Breeding known to occur within area	In buffer area only
Diomedea antipodensis			
Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Diomedea epomophora			
Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area	In feature area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area	In feature area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Sternula albifrons Little Tern [82849]		Breeding known to occur within area	In feature area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche chrysostoma Grey-headed Albatross [66491]	Endangered	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Thalassarche impavida			
Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche melanophris			
Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche salvini			
Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche steadi			
White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
Migratory Marine Species			
Balaenoptera borealis			
Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
Balaenoptera musculus			
Blue Whale [36]	Endangered	Foraging, feeding or related behaviour known to occur within area	In feature area
Balaenoptera physalus			
Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
Caperea marginata			
Pygmy Right Whale [39]		Foraging, feeding or related behaviour likely to occur within area	In feature area
Carcharodon carcharias			
White Shark, Great White Shark [64470]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding likely to occur within area	In feature area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat may occur within area	In feature area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area	In feature area
Eubalaena australis as Balaena glacialis australis Southern Right Whale [40]	Endangered	Species or species habitat known to occur within area	In feature area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area	In feature area
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat likely to occur within area	In feature area
Megaptera novaeangliae Humpback Whale [38]		Species or species habitat likely to occur within area	In feature area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat likely to occur within area	In feature area
Migratory Terrestrial Species			
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Roosting known to occur within area	In feature area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area	In feature area
Myiagra cyanoleuca Satin Flycatcher [612]		Breeding known to occur within area	In feature area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area	In feature area
Migratory Wetlands Species			

Scientific Name	Threatened Category	Presence Text	Buffer Status
Actitis hypoleucos			
Common Sandpiper [59309]		Species or species habitat known to occur within area	In feature area
Arenaria interpres			
Ruddy Turnstone [872]		Roosting known to occur within area	In feature area
Calidris acuminata			
Sharp-tailed Sandpiper [874]		Roosting known to occur within area	In feature area
Calidris alba			
Sanderling [875]		Roosting known to occur within area	In feature area
Calidris canutus			
Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area	In feature area
Calidris ferruginea			
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Calidris melanotos			
Pectoral Sandpiper [858]		Species or species habitat known to occur within area	In feature area
Calidris ruficollis			
Red-necked Stint [860]		Roosting known to occur within area	In feature area
Charadrius bicinctus			
Double-banded Plover [895]		Roosting known to occur within area	In feature area
Charadrius leschenaultii			
Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Gallinago hardwickii			
Latham's Snipe, Japanese Snipe [863]		Species or species habitat known to occur within area	In feature area
Gallinago megala			
Swinhoe's Snipe [864]		Roosting likely to occur within area	In buffer area only
Gallinago stenura			
Pin-tailed Snipe [841]		Roosting likely to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area	In feature area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Numenius minutus Little Curlew, Little Whimbrel [848]		Roosting likely to occur within area	In buffer area only
Pandion haliaetus Osprey [952]		Species or species habitat likely to occur within area	In feature area
Pluvialis fulva Pacific Golden Plover [25545]		Species or species habitat known to occur within area	In buffer area only
Tringa glareola Wood Sandpiper [829]		Species or species habitat known to occur within area	In buffer area only
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area	In feature area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Roosting known to occur within area	In feature area

Other Matters Protected by the EPBC Act

Commonwealth Lands [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Commonwealth Land Name	State	Buffer Status
Defence		
Defence - Training Depot, Darts RD 3305 Portland [21022]	VIC	In buffer area only
Defence - Training Depot, Darts RD 3305 Portland [21010]	VIC	In buffer area only
Defence - Training Depot, Darts RD 3305 Portland [21009]	VIC	In buffer area only
Defence - Training Depot, Darts RD 3305 Portland [21019]	VIC	In buffer area only

Commonwealth Land Name	State	Buffer Status
Defence - Training Depot, Darts RD 3305 Portland [21018]	VIC	In buffer area only
Defence - Training Depot, Darts RD 3305 Portland [21015]	VIC	In buffer area only
Defence - Training Depot, Darts RD 3305 Portland [21024]	VIC	In buffer area only
Defence - Training Depot, Darts RD 3305 Portland [21012]	VIC	In buffer area only
Defence - Training Depot, Darts RD 3305 Portland [21013]	VIC	In buffer area only
Defence - Training Depot, Darts RD 3305 Portland [21007]	VIC	In buffer area only
Defence - Training Depot, Darts RD 3305 Portland [21011]	VIC	In buffer area only
Defence - Training Depot, Darts RD 3305 Portland [21016]	VIC	In buffer area only
Defence - Training Depot, Darts RD 3305 Portland [21017]	VIC	In buffer area only
Defence - Training Depot, Darts RD 3305 Portland [21014]	VIC	In buffer area only
Defence - Training Depot, Darts RD 3305 Portland [21008]	VIC	In buffer area only
Defence - Training Depot, Darts RD 3305 Portland [21023]	VIC	In buffer area only
Defence - Training Depot, Darts RD 3305 Portland [21020]	VIC	In buffer area only
Defence - Training Depot, Darts RD 3305 Portland [21021]	VIC	In buffer area only

Listed Marine Species

[Resource Information]

Scientific Name	Threatened Category	Presence Text	Buffer Status
Bird			
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area	In feature area
Anseranas semipalmata Magpie Goose [978]		Species or species habitat may occur within area overfly marine area	In feature area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area	In feature area
Ardenna carneipes as Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Foraging, feeding or related behaviour likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Ardenna grisea as Puffinus griseus Sooty Shearwater [82651]		Species or species habitat may occur within area	In feature area
Ardenna tenuirostris as Puffinus tenuirostris Short-tailed Shearwater [82652]		Breeding known to occur within area	In buffer area only
Arenaria interpres Ruddy Turnstone [872]		Roosting known to occur within area	In feature area
Bubulcus ibis as Ardea ibis Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area	In feature area
Calidris acuminata Sharp-tailed Sandpiper [874]		Roosting known to occur within area	In feature area
Calidris alba Sanderling [875]		Roosting known to occur within area	In feature area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area overfly marine area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area overfly marine area	In feature area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat known to occur within area overfly marine area	In feature area
Calidris ruficollis Red-necked Stint [860]		Roosting known to occur within area overfly marine area	In feature area
Chalcites osculans as Chrysococcyx osculans Black-eared Cuckoo [83425]		Species or species habitat known to occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Charadrius bicinctus Double-banded Plover [895]		Roosting known to occur within area overfly marine area	In feature area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Charadrius ruficapillus Red-capped Plover [881]		Roosting known to occur within area overfly marine area	In feature area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area	In feature area
Eudyptula minor Little Penguin [1085]		Breeding known to occur within area	In buffer area only
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat known to occur within area overfly marine area	In feature area
Gallinago megala Swinhoe's Snipe [864]		Roosting likely to occur within area overfly marine area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Gallinago stenura Pin-tailed Snipe [841]		Roosting likely to occur within area overfly marine area	In buffer area only
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area	In feature area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Himantopus himantopus Pied Stilt, Black-winged Stilt [870]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Roosting known to occur within area overfly marine area	In feature area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat may occur within area overfly marine area	In feature area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area	In feature area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area	In feature area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area overfly marine area	In feature area
Myiagra cyanoleuca Satin Flycatcher [612]		Breeding known to occur within area overfly marine area	In feature area
Neophema chrysogaster Orange-bellied Parrot [747]	Critically Endangered	Species or species habitat known to occur within area overfly marine area	In feature area
Neophema chrysostoma Blue-winged Parrot [726]	Vulnerable	Species or species habitat known to occur within area overfly marine area	In feature area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Numenius minutus Little Curlew, Little Whimbrel [848]		Roosting likely to occur within area overfly marine area	In buffer area only
Pachyptila turtur Fairy Prion [1066]		Species or species habitat known to occur within area	In feature area
Pandion haliaetus Osprey [952]		Species or species habitat likely to occur within area	In feature area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Pluvialis fulva Pacific Golden Plover [25545]		Species or species habitat known to occur within area	In buffer area only
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Rhipidura rufifrons			
Rufous Fantail [592]		Species or species habitat known to occur within area overfly marine area	In feature area
Rostratula australis as Rostratula benghalensis (sensu lato)			
Australian Painted Snipe [77037]	Endangered	Species or species habitat known to occur within area overfly marine area	In feature area
Stercorarius skua as Catharacta skua			
Great Skua [823]		Species or species habitat may occur within area	In buffer area only
Sternula albifrons as Sterna albifrons			
Little Tern [82849]		Breeding known to occur within area	In feature area
Thalassarche bulleri			
Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche bulleri platei as Thalassarche sp. nov.			
Northern Buller's Albatross, Pacific Albatross [82273]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche carteri			
Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Thalassarche cauta			
Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche chrysostoma			
Grey-headed Albatross [66491]	Endangered	Species or species habitat may occur within area	In feature area
Thalassarche impavida			
Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
Thinornis cucullatus as Thinornis rubricollis Hooded Plover, Hooded Dotterel [87735]		Species or species habitat known to occur within area overfly marine area	In feature area
Thinornis cucullatus cucullatus as Thinornis rubricollis rubricollis Eastern Hooded Plover, Eastern Hooded Plover [90381]	Vulnerable	Species or species habitat known to occur within area overfly marine area	In feature area
Tringa glareola Wood Sandpiper [829]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area overfly marine area	In feature area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Roosting known to occur within area overfly marine area	In feature area
Fish			
Heraldia nocturna Upside-down Pipefish, Eastern Upside-down Pipefish, Eastern Upside-down Pipefish [66227]		Species or species habitat may occur within area	In feature area
Hippocampus abdominalis Big-belly Seahorse, Eastern Potbelly Seahorse, New Zealand Potbelly Seahorse [66233]		Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Hippocampus breviceps Short-head Seahorse, Short-snouted Seahorse [66235]		Species or species habitat may occur within area	In feature area
Histiogamphelus briggsii Crested Pipefish, Briggs' Crested Pipefish, Briggs' Pipefish [66242]		Species or species habitat may occur within area	In feature area
Histiogamphelus cristatus Rhino Pipefish, Macleay's Crested Pipefish, Ring-back Pipefish [66243]		Species or species habitat may occur within area	In feature area
Hypselognathus rostratus Knifesnout Pipefish, Knife-snouted Pipefish [66245]		Species or species habitat may occur within area	In feature area
Kaupus costatus Deepbody Pipefish, Deep-bodied Pipefish [66246]		Species or species habitat may occur within area	In feature area
Leptoichthys fistularius Brushtail Pipefish [66248]		Species or species habitat may occur within area	In feature area
Lissocampus caudalis Australian Smooth Pipefish, Smooth Pipefish [66249]		Species or species habitat may occur within area	In feature area
Lissocampus runa Javelin Pipefish [66251]		Species or species habitat may occur within area	In feature area
Maroubra perserrata Sawtooth Pipefish [66252]		Species or species habitat may occur within area	In feature area
Mitotichthys semistriatus Halfbanded Pipefish [66261]		Species or species habitat may occur within area	In feature area
Mitotichthys tuckeri Tucker's Pipefish [66262]		Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Notiocampus ruber Red Pipefish [66265]		Species or species habitat may occur within area	In feature area
Phycodurus eques Leafy Seadragon [66267]		Species or species habitat may occur within area	In feature area
Phyllopteryx taeniolatus Common Seadragon, Weedy Seadragon [66268]		Species or species habitat may occur within area	In feature area
Pugnaso curtirostris Pugnose Pipefish, Pug-nosed Pipefish [66269]		Species or species habitat may occur within area	In feature area
Solegnathus robustus Robust Pipehorse, Robust Spiny Pipehorse [66274]		Species or species habitat may occur within area	In feature area
Solegnathus spinosissimus Spiny Pipehorse, Australian Spiny Pipehorse [66275]		Species or species habitat may occur within area	In feature area
Stigmatopora argus Spotted Pipefish, Gulf Pipefish, Peacock Pipefish [66276]		Species or species habitat may occur within area	In feature area
Stigmatopora nigra Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area	In feature area
Stipecampus cristatus Ringback Pipefish, Ring-backed Pipefish [66278]		Species or species habitat may occur within area	In feature area
Urocampus carinirostris Hairy Pipefish [66282]		Species or species habitat may occur within area	In feature area
Vanacampus margaritifer Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Vanacampus phillipi			
Port Phillip Pipefish [66284]		Species or species habitat may occur within area	In feature area
Vanacampus poecilolaemus			
Longsnout Pipefish, Australian Long-snout Pipefish, Long-snouted Pipefish [66285]		Species or species habitat may occur within area	In feature area
Mammal			
Arctocephalus forsteri			
Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat may occur within area	In feature area
Arctocephalus pusillus			
Australian Fur-seal, Australo-African Fur-seal [21]		Species or species habitat likely to occur within area	In feature area
Neophoca cinerea			
Australian Sea-lion, Australian Sea Lion [22]	Endangered	Species or species habitat may occur within area	In feature area
Reptile			
Caretta caretta			
Loggerhead Turtle [1763]	Endangered	Breeding likely to occur within area	In feature area
Chelonia mydas			
Green Turtle [1765]	Vulnerable	Species or species habitat may occur within area	In feature area
Dermochelys coriacea			
Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area	In feature area

Whales and Other Cetaceans [Resource Information]

Current Scientific Name	Status	Type of Presence	Buffer Status
Mammal			
Balaenoptera acutorostrata			
Minke Whale [33]		Species or species habitat may occur within area	In feature area
Balaenoptera borealis			
Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area

Current Scientific Name	Status	Type of Presence	Buffer Status
Balaenoptera musculus Blue Whale [36]	Endangered	Foraging, feeding or related behaviour known to occur within area	In feature area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
Caperea marginata Pygmy Right Whale [39]		Foraging, feeding or related behaviour likely to occur within area	In feature area
Delphinus delphis Common Dolphin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area	In feature area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat known to occur within area	In feature area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area	In feature area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area	In feature area
Megaptera novaeangliae Humpback Whale [38]		Species or species habitat likely to occur within area	In feature area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat likely to occur within area	In feature area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area	In feature area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area	In feature area

Extra Information

State and Territory Reserves			[Resource Information]
Protected Area Name	Reserve Type	State	Buffer Status
Balrook B.R.	Natural Features Reserve	VIC	In buffer area only
Bats Ridge W.R	Nature Conservation Reserve	VIC	In buffer area only
Bolwarra H43 B.R.	Natural Features Reserve	VIC	In buffer area only
Bolwarra H44 B.R.	Natural Features Reserve	VIC	In buffer area only
Bolwarra H45 B.R.	Natural Features Reserve	VIC	In buffer area only
Cape Nelson	State Park	VIC	In buffer area only
Cobboboonee	Reference Area	VIC	In buffer area only
Cobboboonee	National Park	VIC	In feature area
Discovery Bay	Marine National Park	VIC	In buffer area only
Discovery Bay Coastal Park	Conservation Park	VIC	In feature area
Glenelg River	Heritage River	VIC	In buffer area only
Glenelg River (1) SS.R.	Natural Features Reserve	VIC	In buffer area only
Gorae B.R.	Natural Features Reserve	VIC	In buffer area only
Hedditch Hill S.R.	Natural Features Reserve	VIC	In feature area
Heywood B.R.	Natural Features Reserve	VIC	In feature area
Johnstones Creek F.R	Nature Conservation Reserve	VIC	In buffer area only

Protected Area Name	Reserve Type	State	Buffer Status
Keegans Bend	Reference Area	VIC	In buffer area only
Kentbruck H14 B.R	Natural Features Reserve	VIC	In feature area
Kentbruck H50 B.R.	Natural Features Reserve	VIC	In feature area
Kentbruck Heath	Reference Area	VIC	In buffer area only
Lower Glenelg	National Park	VIC	In feature area
Lower Glenelg River	Conservation Park	SA	In buffer area only
Lower South East	Marine Park	SA	In buffer area only
Mount Richmond	National Park	VIC	In feature area
Mouzie B.R	Natural Features Reserve	VIC	In buffer area only
Mouzie N.F.R	Natural Features Reserve	VIC	In buffer area only
Mumbannar N.C.R.	Natural Features Reserve	VIC	In buffer area only
Narrawong F.R.	Nature Conservation Reserve	VIC	In buffer area only
Nelson SS.R.	Natural Features Reserve	VIC	In buffer area only
Nine Mile F.F.R.	Nature Conservation Reserve	VIC	In buffer area only
Piccaninnie Ponds	Conservation Park	SA	In buffer area only
Portland H46 B.R.	Natural Features Reserve	VIC	In buffer area only
Portland H47 B.R.	Natural Features Reserve	VIC	In buffer area only
Trewalla H48 B.R.	Natural Features Reserve	VIC	In buffer area only
Trewalla H49 B.R.	Natural Features Reserve	VIC	In feature area

Regional Forest Agreements [Resource Information]

Note that all areas with completed RFAs have been included.

RFA Name	State	Buffer Status
West Victoria RFA	Victoria	In feature area

Nationally Important Wetlands

[Resource Information]

Wetland Name	State	Buffer Status
Glenelg Estuary	VIC	In buffer area only
Glenelg River	VIC	In buffer area only
Long Swamp	VIC	In feature area
Piccaninnie Ponds	SA	In buffer area only

EPBC Act Referrals

[Resource Information]

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Southern Winds Offshore Wind Project	2022/09435		Assessment	In feature area
Southern Winds Offshore Wind Project Initial Marine Field Investigations	2022/09436		Completed	In buffer area only
Spinifex Offshore Surveys	2022/09359		Completed	In buffer area only
Controlled action				
Kentbruck Green Power Hub, Vic	2019/8510	Controlled Action	Assessment Approach	In feature area
Otway Development	2002/621	Controlled Action	Post-Approval	In feature area
Pacific Hydro (Portland) Wind Farm SW Victoria	2000/18	Controlled Action	Post-Approval	In buffer area only
VIC Offshore Windfarm	2021/8966	Controlled Action	Assessment Approach	In feature area
Not controlled action				
Drilling of Callister-1 exploration well in VIC/P51	2004/1633	Not Controlled Action	Completed	In buffer area only
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed	In feature area
INDIGO Central Submarine Telecommunications Cable	2017/8127	Not Controlled Action	Completed	In feature area
Portland Landfill Borehole Installation, Vic	2017/7886	Not Controlled Action	Completed	In buffer area only
Pulp mill and associated infrastructure 3km north of Heywood	2005/2125	Not Controlled Action	Completed	In feature area
Redevelopment Project to Upgrade and Extend the Portland Trawler Wharf	2008/4317	Not Controlled Action	Completed	In buffer area only

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Not controlled action				
Site Extension for the Heywood Pulp Mill Project	2007/3315	Not Controlled Action	Completed	In buffer area only
Not controlled action (particular manner)				
2D Seismic Survey in VIC/P50 and VIC/P46	2004/1810	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
Benbows Paddock residential development, Cape Bridgewater	2007/3247	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
Bernoulli 3D Seismic Survey	2006/3053	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
Deepwater Sorell Basin 2001 Non-Exclusive 2D Seismic Survey	2001/156	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
INDIGO Marine Cable Route Survey (INDIGO)	2017/7996	Not Controlled Action (Particular Manner)	Post-Approval	In feature area
Santos 2D Seismic Survey VIC/P44 & VIC/P51	2003/1213	Not Controlled Action (Particular Manner)	Post-Approval	In feature area
Seismic Survey VIC-P46	2002/826	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
Southern Gas Pipeline Project	2002/619	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
Referral decision				
8 Lot Industrial Subdivision	2008/4527	Referral Decision	Completed	In buffer area only
Portland Wave Energy Project	2008/3946	Referral Decision	Completed	In buffer area only
Wind Farm	2001/139	Referral Decision	Completed	In feature area

Key Ecological Features [Resource Information]

Key Ecological Features are the parts of the marine ecosystem that are considered to be important for the biodiversity or ecosystem functioning and integrity of the Commonwealth Marine Area.

Name	Region	Buffer Status
Bonney Coast Upwelling	South-east	In feature area

Biologically Important Areas

Scientific Name	Behaviour	Presence	Buffer Status
Seabirds			
Ardenna pacifica Wedge-tailed Shearwater [84292]	Foraging	Likely to occur	In buffer area only
Diomedea exulans (sensu lato) Wandering Albatross [1073]	Foraging	Known to occur	In buffer area only
Diomedea exulans antipodensis Antipodean Albatross [82269]	Foraging	Known to occur	In buffer area only
Morus serrator Australasian Gannet [1020]	Aggregation	Known to occur	In buffer area only
Morus serrator Australasian Gannet [1020]	Foraging	Known to occur	In buffer area only
Pelecanoides urinatrix Common Diving-petrel [1018]	Foraging	Known to occur	In feature area
Thalassarche bulleri Bullers Albatross [64460]	Foraging	Known to occur	In buffer area only
Thalassarche cauta cauta Shy Albatross [82345]	Foraging likely	Likely to occur	In feature area
Thalassarche chlororhynchos bassi Indian Yellow-nosed Albatross [85249]	Foraging	Known to occur	In buffer area only
Thalassarche melanophris Black-browed Albatross [66472]	Foraging	Known to occur	In buffer area only
Thalassarche melanophris impavida Campbell Albatross [82449]	Foraging	Known to occur	In buffer area only
Sharks			

Scientific Name	Behaviour	Presence	Buffer Status
Carcharodon carcharias White Shark [64470]	Distribution	Known to occur	In buffer area only
Carcharodon carcharias White Shark [64470]	Distribution (low density)	Likely to occur	In buffer area only
Carcharodon carcharias White Shark [64470]	Foraging	Known to occur	In buffer area only
Carcharodon carcharias White Shark [64470]	Known distribution	Known to occur	In buffer area only
Whales			
Balaenoptera musculus brevicauda Pygmy Blue Whale [81317]	Distribution	Known to occur	In buffer area only
Balaenoptera musculus brevicauda Pygmy Blue Whale [81317]	Foraging (annual high use area)	Known to occur	In feature area
Eubalaena australis Southern Right Whale [40]	Aggregation	Known to occur	In buffer area only
Eubalaena australis Southern Right Whale [40]	Known core range	Known to occur	In feature area
Eubalaena australis Southern Right Whale [40]	Migration and resting on migration	Known to occur	In feature area

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data are available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance

3 DATA SOURCES

Threatened ecological communities

For threatened ecological communities where the distribution is well known, maps are generated based on information contained in recovery plans, State vegetation maps and remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species

Threatened, migratory and marine species distributions have been discerned through a variety of methods. Where distributions are well known and if time permits, distributions are inferred from either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc.) together with point locations and described habitat; or modelled (MAXENT or BIOCLIM habitat modelling) using

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded
- seals which have only been mapped for breeding sites near the Australian continent

The breeding sites may be important for the protection of the Commonwealth Marine environment.

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact us page.

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Appendix 15 Ecological comparison of transmission line options

This appendix provides a summary of the ecological values of the feasible transmission line options. These options consist of two alignments, each with two construction approaches.

The options are:

- **Option 1 – Heywood**
  The Heywood option is the most direct connection between the Project and the Heywood Terminal station. This option heads due east from the wind farm site boundary, passing through sections of Cobboboonee National Park and Cobboboonee State Forest under and existing road, and extending through farmland to the Heywood Terminal Station. Two alternative construction methods have been considered for this alignment, which differ in the length of overhead line:
  - **Option 1a – Underground and Overhead.**
    Underground beneath Boiler Swamp Road (19 kilometres) and overhead to the Terminal Station (9 kilometres)
  - **Option 1b – Underground.**
    Underground beneath Boiler Swamp Road and through farmland (28 kilometres), with a short (<1 kilometre) overhead section into the Heywood Terminal Station.
- **Option2 – Portland**
  The Portland option connects the eastern Project to the existing Heywood-Portland 5600kV transmission line, involving construction of a new Terminal Station. The line would pass through private property in the Mount Richmond and Gorae West localities
  - **Option 2a – Overhead (26 kilometres)**
  - **Option 2b – Underground (26 kilometres)**

Methods

This assessment is based on desktop information and field assessments conducted during the flora and fauna survey program for the EES.

Records from the following databases were collated and reviewed:

- DELWP's Victorian Biodiversity Atlas (VBA) including the 'VBA_FLORA25, FLORA100 & FLORA Restricted' and 'VBA_FAUNA25, FAUNA100 & FAUNA Restricted' datasets, undertaken on 8 July 2022.
- DECCEW's Protected Matters Search Tool (PMST) for matters protected by the EPBC Act (accessed on 8 July 2022).
- BirdLife Shorebird 2020, date of search 12 June 2022.
- BirdLife BirdData, date of search 4 February 2022 The first Atlas of Australian Birds data was excluded as all the data was associated with one of only two location coordinates, which is not meaningful for the impact assessment purposes.

- eBird – date of search 29 June 2022.
- Sheldon 2004 south-west Victorian Brolga flocking database.

Some field assessment was undertaken for both alignments, although more detailed studies were undertaken for the Heywood alignment. A summary of the information sources used, including desktop information (as listed above) and field surveys, is provided in A15.1.

Table A15.1 Information sources

Ecological value	Desktop information Both alignments	Field assessment of the Heywood alignment (Options 1a and 1b)	Field assessment of the Portland alignment (Options 2a and 2b)
Native vegetation and threatened ecological communities	• Aerial photography • EVC mapping • Wetland mapping	• Vegetation mapping and vegetation quality assessment (VQA) of the Boiler Swamp Road section, farmland, road reserves and the vegetation surrounding the Heywood Terminal Station. • Arborists assessment of potential tree impacts along Boiler Swamp Road.	• Vegetation mapping and VQA limited to publicly accessible locations (road reserves).
Threatened flora	• VBA • PMST	• Arborists assessment along Boiler Swamp Road. • Targeted flora surveys along Boiler Swamp Road. • Targeted surveys within publicly accessible locations (road and rail reserves, land surrounding the Heywood Terminal Station).	• Targeted surveys within publicly accessible locations (road reserves).
Terrestrial mammals	• VBA • PMST	• Camera trapping at western end of transmission line. • Camera trapping within proposed powerline easement adjacent to Mount Clay State Forest (no-longer part of the alignment).	• No targeted surveys.
Microbats including Southern Bent-wing Bat	• VBA • PMST	• No survey sites close to transmission line.	• No survey sites close to transmission line.

Ecological value	Desktop information Both alignments	Field assessment of the Heywood alignment (Options 1a and 1b)	Field assessment of the Portland alignment (Options 2a and 2b)
Wetlands	• EVC mapping • Wetland mapping • Aerial photography	• Vegetation surveys and site inspections at publicly accessible locations (road crossing points). • Wetland inspections in November 2021.	• Vegetation surveys and site inspections at publicly accessible locations (road crossing points).
Waterways	• Surface waterway mapping • Aerial photography	• Flora surveys of Surrey River crossing points. • Brief field inspections of other publicly accessible waterways crossing the alignment.	• Brief field inspections of publicly accessible waterways crossing the alignment.
Brolga	• VBA • PMST • BirdData • eBird • Sheldon flocking database.	• Roaming surveys throughout 2020 and October 2021. • Included in aerial survey area (30/11/2020 and 4/12/2020)	• Included in aerial survey area (30/11/2020 and 4/12/2020).
Avifauna	• VBA • PMST • BirdData • eBird	• Bird utilisation survey point within Cobboboonee National Park, 1 km north of Boiler Swamp Road. • Observations during other field assessments of the transmission line.	• Three bird utilisation survey points within 1 km of the alignment, and in similar landscape.

Limitations

The level of field assessment undertaken along the alignments varies, generally with more detailed studies being undertaken along the Heywood alignment, as outlined in Table A15.1.

The transmission options have evolved during the EES process, in response to ecological information collected, or other factors such as land access. Several areas where field assessments were conducted are no longer part of the alternative alignments, and are not considered in this assessment or the broader EES Flora and Fauna Impact Assessment.

This includes:

- Cut-out Dam Road was initially considered as an alternative alignment through the Cobboboonee forest. Field studies conducted along this road were preliminary arborists assessment and targeted surveys for threatened flora.

- Mount Clay State Forest / Narrawong Flora Reserve to the south of the Heywood Terminal Station. One of the initial overhead powerline alignments passed through this area. A range of studies were undertaken in this area, including targeted flora surveys (multiple occasions), vegetation mapping and quality assessment and small mammal camera trapping.

Information collected at these locations is presented in the Flora and Fauna Report where relevant, however these alignment options are not considered in the Impact Assessment.

Ecological values and impacts

A summary of the ecological values present along the two proposed alignments is provided in Table A15.2, and a summary of potential impacts is provided in Table A15.3.

Table A15.2 Summary of ecological values

Ecological value	Heywood alignment (Options 1a and 1b)	Portland alignment (Options 2a and 2b)
Native vegetation	• Extensive area of high quality native vegetation along Boiler Swamp Road through the Cobboboonee National Park and Cobboboonee Forest Park.	• Majority of the alignment passes through farmland, where native vegetation is generally limited to road reserves and some remnant patches.
Threatened flora	• Two threatened eucalypt species (Apple Jack and Western Peppermint) are abundant within the Boiler Swamp Road section. • Several other threatened species present along the Boiler Swamp Road section, including One-flower Early Nancy, Small Sickle Greenhood, Rough Daisy-bush, Hairy Boronia Tiny Violet and Wiry Bossiaea (Section 6.3.2). • Limited habitat for threatened flora within the farmland section.	• Threatened flora not assessed in detail however Western Peppermint is known to be one of the dominant eucalypts within woodland and forest remnants within the area (eg. along road reserves). • Limited habitat for significant flora within farmland areas.
Threatened ecological communities	• None within the alignment. • Lower reaches of the Surrey River support examples of the Salt Wedge Estuary Community (EPBC Act listed – refer to Section 7.1.1).	• None within the alignment.
Terrestrial mammals	• High quality habitat for several significant species along the Boiler Swamp Road section, including Heath Mouse, Southern Brown Bandicoot, Long-nosed Potoroo and Swamp Antechinus.	• Some potential low quality habitat along road reserves and in close proximity to the alignment, but there are very few records outside of large conservation reserves.

Ecological value	Heywood alignment (Options 1a and 1b)	Portland alignment (Options 2a and 2b)
Microbats including Southern Bent-wing Bat	• Likely to be present throughout the region, and expected to forage regularly within the Cobboboonee Forest areas, as well as within farmland.	• Transmission line passes closer to known breeding and non-breeding roosts. Activity of SBWB is expected to be concentrated closer to roosts near the coast.
Wetlands and waterways	• The proposed alignment crosses the Surrey River in three locations. • Alignment passes close to several wetlands in the eastern section.	• The alignment does not cross any major waterways, but passes close to a range of wetlands.
Brolga	• Potential habitat and records of Brolga are limited to farmland in the eastern portion of the transmission line. • Six sites with breeding records are located within 3 kilometres of the proposed alignment.	• Potential habitat for Brolga within farmland areas. Three known breeding sites to the east of Mount Richmond within 3 kilometres of the transmission route, however the occurrence of Brolga along the alignment has not been assessed in detail.
Avifauna	• Diverse range of species present within the Cobboboonee Forest area. • Farmland areas likely to support a range of open-country species, and other species moving through the area. • Threatened species of interest (potentially flying through the area at transmission line height) include Australasian Bittern, White-throated Needletail, Gang-gang Cockatoo, Blue-winged Parrot, Brolga, Owls and Latham's Snipe.	• Farmland areas likely to support a range of open-country species, and other species moving through the area. • Threatened species of interest (potentially flying through the area at transmission line height) include Australasian Bittern, White-throated Needletail, Gang-gang Cockatoo, Blue-winged Parrot, Brolga, Owls and Latham's Snipe.

Table A15.3 Summary of potential impacts

Ecological value	Heywood alignment		Portland alignment	
	1A Overhead/ Underground	1B Underground	2A Overhead	2B Underground
Native vegetation	• Impacts within the underground section (Boiler Swamp Road) estimated to amount to 5 – 7.5 hectares, due to assumed losses of trees (and their canopy area), due to >10% encroachment of trench into tree protection zones.		• Low level impacts due to opportunities to avoid vegetation removal by micrositing of pole positions.	• Impacts expected to low/moderate quality vegetation in farmland due to trenching. Total native vegetation

<table>
<thead>
<tr><th rowspan="2">Ecological value</th><th colspan="2">Heywood alignment</th><th colspan="2">Portland alignment</th></tr>
<tr><th>1A Overhead/ Underground</th><th>1B Underground</th><th>2A Overhead</th><th>2B Underground</th></tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low level impacts in the overhead section due to opportunities to avoid vegetation removal by micrositing of pole positions. Potentially some vegetation removal (trimming) required when crossing road reserves.</td>
<td>Impacts expected to low/moderate quality vegetation in farmland due to trenching.</td>
<td>Potentially some vegetation removal (trimming) required when crossing road reserves.
While complete avoidance of native vegetation may be possible, it is likely that some removal will be required, but this is expected to be less than 3 hectares.</td>
<td>removal expected to be less than 5 hectares.
Impacts to higher quality vegetation could be avoided via directional drilling in specific locations.</td>
</tr>
<tr>
<td rowspan="2">Threatened flora</td>
<td colspan="2">Two threatened species Apple Jack and Western Peppermint likely to be impacted through tree protection zone disturbance in the underground section, however these impacts are unlikely to impact upon populations due to the abundance of these species in the area.
Some threatened understory species present in bushland adjacent to the Boiler Swamp Road reserve, however impacts expected to be unlikely or minor, as works are limited to the existing road formation.</td>
<td rowspan="2">Impacts to higher quality areas of native vegetation are avoidable by micrositing pole locations and using directional drilling.</td>
<td rowspan="2">No significant species recorded within the farmland section, however detailed on-ground studies of the entire alignment have not been conducted.</td>
</tr>
<tr>
<td>No impacts to threatened flora expected in the overhead section.</td>
<td>No significant species recorded within the farmland section, however detailed on-ground studies of the entire alignment have not been conducted.</td>
</tr>
<tr>
<td>Threatened ecological communities</td>
<td>No impacts expected.</td>
<td>No impacts expected.</td>
<td>No impacts expected.</td>
<td>No impacts expected.</td>
</tr>
</tbody>
</table>

Ecological value	Heywood alignment		Portland alignment	
	1A Overhead/ Underground	1B Underground	2A Overhead	2B Underground
Terrestrial mammals	• No impacts expected. • Potential tree deaths due to TPZ incursion are unlikely to result in significant loss of habitat, in the context of the extent of surrounding habitat through the Cobboboonee forest areas.		• No impacts expected.	• No impacts expected.
Microbats including Southern Bent-wing Bat	• Overhead sections pose potential (unquantified) collision risk.	• No impacts expected.	• Overhead sections pose potential (unquantified) collision risk. • Transmission route is closer to known roost locations.	• No impacts expected.
Wetlands and waterways	• Impacts to Surrey River crossings to be avoided by directional drilling.		• Impacts can be avoided by directional drilling and micrositing pole locations.	• Impacts can be avoided by directional drilling.
Brolga	• Potential collision risk for the overhead section only (quantified in Brolga report). • Minor potential for disturbance during construction.	• Collision risk eliminated due to undergrounding of cables. • Minor potential for disturbance during construction.	• Construction of new overhead transmission lines results in collision risk along entire alignment (not quantified). • Minor potential for disturbance to breeding during construction.	• Collision risk eliminated due to undergrounding of cables. • Minor potential for disturbance to breeding during construction.
Avifauna	• Potential collision risk for the overhead section only (not quantified).	• No impacts expected, provided native vegetation areas are also avoided.	• Potential collision risk for the overhead section only (not quantified).	• No impacts expected, provided native vegetation areas are also avoided.

Appendix 16 Description of Biosis collision risk model

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Wind Energy and Wildlife Conservation

A Description of the Biosis Model to Assess Risk of Bird Collisions With Wind Turbines

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ABSTRACT We describe the model of Biosis Propriety Limited for quantifying potential risk to birds of collisions with wind turbines. The description follows the sequence of the model's processes from input parameters, through modules of the model itself. Aspects of the model that differentiate it from similar models are the primary focus of the description. These include its capacity to evaluate risk for multi-directional flights by its calculation of a mean presented area of a turbine; its use of bird flight data to determine annual flux of movements; a mathematical solution to a typical number of turbines that might be encountered in a given bird flight; capacity to assess wind-farm configurations ranging from turbines scattered in the landscape to linear rows of turbines; and the option of assigning different avoidance rates to structural elements of turbines that pose more or less risk. We also integrate estimates of the population of birds at risk with data for numbers of their flights to predict a number of individual birds that are at risk of collision. Our model has been widely applied in assessments of potential wind-energy developments in Australia. We provide a case history of the model's application to 2 eagle species and its performance relative to empirical experience of collisions by those species. © 2013 The Wildlife Society.

KEY WORDS bird, collision, model, risk, turbine, wind energy.

A number of mathematical models have been developed for the purposes of either describing the interaction of a bird with a wind turbine or to predict the risks of bird collisions with turbines (Tucker 1996*a*, *b*; Podolsky 2003, 2005; Bolker et al. 2006; Band et al. 2007). Tucker (1996*a*, *b*) and Band et al. (2007) detailed their models in the peer-reviewed literature. The collision risk model developed by Biosis Propriety Limited has been widely used to assess wind-energy developments in Australia since 2002, but it has not previously been described in detail. Given high levels of interest in effects of wind turbines on fauna, we believe it is important for the model to be accessible.

Our model provides a predicted number of collisions between turbines and a local or migrating population of birds. It has the potential to be modified to accommodate Monte-Carlo simulation, although at its core it uses a deterministic approach. It is modular by design, and allows various customizations, depending upon the unique configuration of the wind facility and characteristics of the taxa modeled.

The initial calculation involves species-specific parameters for speed and size of birds and specifications of the turbine, including its dimensions and rotational speed of its blades. Using these parameters, we derive the mean area of turbine presented to a bird in flight. This allows the model to accommodate flight approaches from any potential direction. Alternatively, unidirectional flights can be modeled by using the relevant turbine surface area presented to birds approaching from a given direction.

Data for bird flights are collected at the wind-farm site according to a specific and consistent field methodology. These data are used to determine the flux (density) of bird flights. When combined with turbine specifications, this yields the probability of collision during a single flight–turbine interaction. The density flux approach has not been used for this application previously.

The number of movements at risk of collision with one turbine is then scaled according to a typical number of turbines that a bird might encounter in a given flight. This is further refined by a metric for the capacity of the particular species to avoid collisions. Where a population census or estimate is available for the number of birds that may be at risk, a further deduction is used to attribute the number of flights-at-risk to individuals, and hence provide a final model output as the number of individuals at risk of collisions. The ability to transform from flights-at-risk to individuals-at-risk has been uniquely developed and applied as a routine component of our model.

DESCRIPTION OF THE MODEL

The model requires data for input parameters and, using these, functions in a sequence of modules (Fig. 1).

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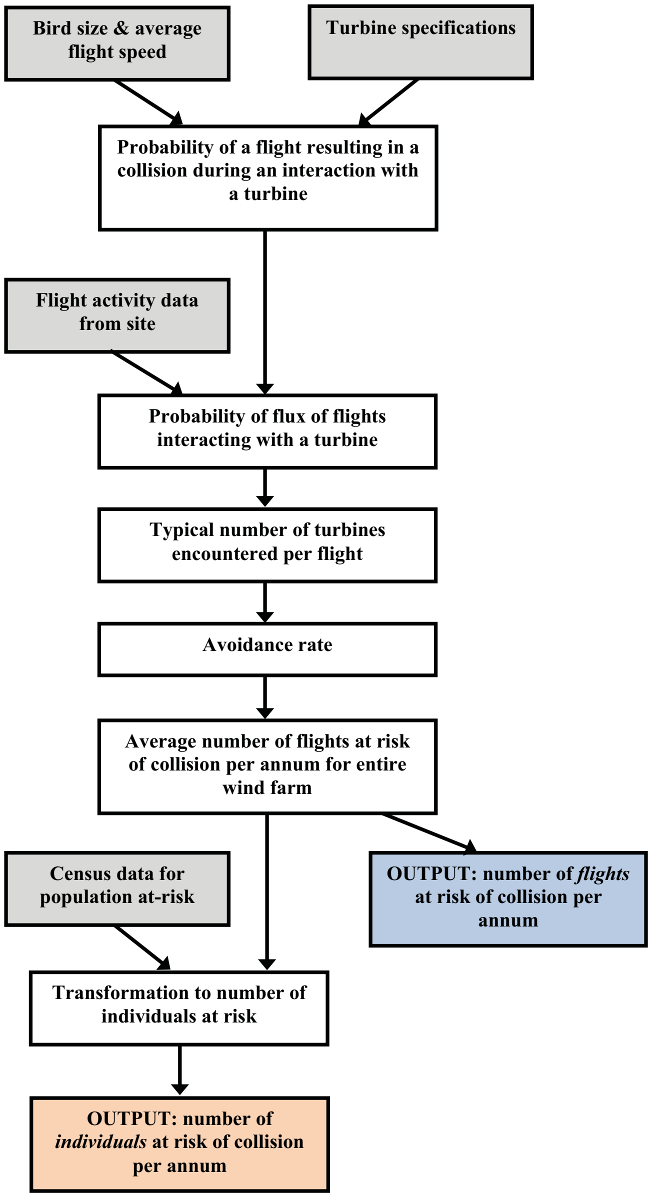

Figure 1. Overview of the collision risk model that quantifies risk to birds of colliding with wind turbines, showing input parameters (gray boxes), modules, and sequence.

Model Inputs

Turbine parameters.—The primary risk faced by a flying bird, whether it may strike or be struck by a turbine, is that the machine presents a potential obstacle in its path. Ultimately this equates to the surface area of the turbine presented to the bird from whatever its angle of approach. Other models, such as probably Band et al. (2007), use individualistic representations of birds. Our model uses a projection of the presented area onto all possible flight angles. For this reason, multiple dimensions of turbine components and rotor speed for the particular type of turbine are used as input values to the risk model. Turbine specifications are as provided by the machine's manufacturer.

The modeled wind turbine consists of 2 fundamental components representing potentially different risks. We refer to these as the static and dynamic components (Fig. 2). The static areas of a turbine include all surfaces of the entire machine comprising a tower, which in current turbines is a simple taper with known base and top diameters; a rectangular nacelle housing the generator; a hemi-spherical hub; and rotor blades that taper in 2 planes. The dynamic component is the area swept by the leading edges of rotor blades during the time that a bird would take to pass through the rotor-swept zone.

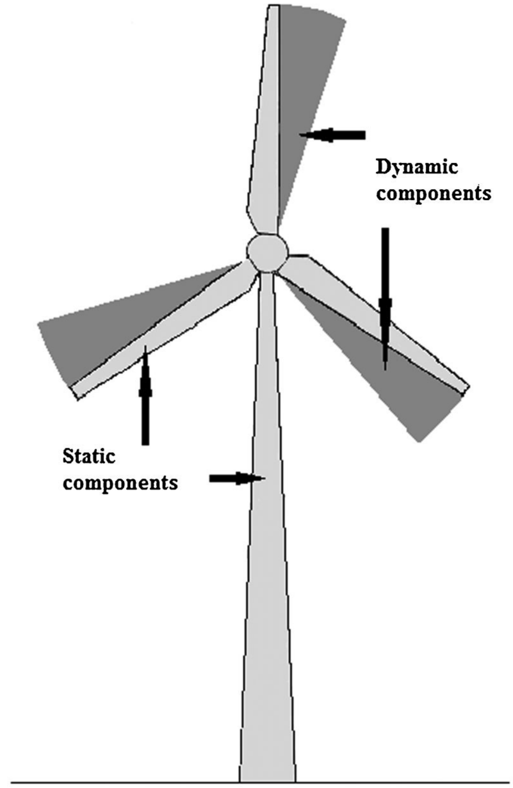

Figure 2. Schematic indication of the static and dynamic components of a wind turbine that may be encountered by a flying bird. The dynamic component is the area swept by rotor blades during the time that a bird of a particular species would take to pass through the rotor-swept zone.

Size and flight speed of birds.—For each taxon, the model requires values for the total length of the bird in flight, from bill tip to tip of the tail or outstretched legs, and the average speed of the species' flights. We obtained bird lengths either from museum specimens or from standard ornithological texts.

Accurate determinations of bird flight speeds can be complex and difficult to obtain (Videler 2005, Pennycuick 2008) and published data are not available for most species. However, published radar studies (e.g., Bruderer 1995, Bruderer and Boldt 2001) provide ranges of flight speeds for a variety of species, including congenerics with similar morphologies and ecological traits to a number of species we have assessed. Use of radar to collect bird flight data at the wind-farm site may provide flight speeds for species of interest. We consider that average ground speed (as opposed to air speed) is appropriate for modeling of multidirectional movements of birds.

Bird flight data.—The model requires data from the wind-farm site for the number of flights made by species of interest within a measured time and volume of airspace. Movement data may be obtained from fixed-time point counts using a methodology adapted from Reynolds et al. (1980), incorporating an effective detection range (Buckland et al. 1993). It may be collected by human observers or by using horizontal and vertical radar combined with call recording or visual species identification (e.g., Gauthreaux and Belser 2003, Desholm et al. 2006). Data represent the number of flights that birds make within a cylinder of airspace that is centered horizontally on the observer and the height of which is the maximum reached by rotor blades of the turbines. The data collection regime is designed with the aim of providing a representative sample of flight activity across the local range of diel, seasonal, and other environmental variables.

Model Modules

Probability of a single flight interacting with a turbine.—In some situations, such as during highly directional migratory passage, the presented area of turbines is determined from the angle of the birds' flight relative to the compass orientation of turbines. However, for the great majority of species (including temporary or permanent residents at an on-shore wind farm) this does not apply, and flights can be expected to approach turbines from any direction. For this situation, all dimensions of the turbine contribute to the area with which a flying bird might collide and the model uses a simple integration to determine a mean presented area. This represents a substantial advance over other collision risk models that depend on the assumption of a specific angle of approach as a bird encounters a turbine (e.g., Tucker 1996*a*, *b*; Bolker et al. 2006; Band et al. 2007).

We calculate the area presented by the static components of a turbine using a conservative assumption that none of them overlap or obscure any others. The area of each component is calculated individually, and these are then summed to determine a total static area for the turbine. Static areas are calculated from the simple length × width dimensions of all components visible by line of sight. These are then projected onto an arbitrary approach direction (effectively scaling by the cosine of the approach angle). For example, viewed directly from one side, only the side panel of the nacelle is visible. However, approached from 45° to the turbine, both the front and side panels are visible, and are thus scaled by $\cos(45)\varrho 1/\sqrt{2}$ to match that particular angle of view.

We calculate the dynamic area, swept during the movement of blades, from the dimensions of the stationary blades and the distance they travel at their average speed during the time taken by a bird to fly through the rotor-swept area. We assume that all flights involve forward movement, so the swept-area is derived from the length and speed of the particular species of bird, in combination with the thickness of the sweeping blade.

Each rotor blade is tapered in 2 planes. Thus the thickness of the blades, used to determine the time taken for a bird to cross through the swept area, is actually a function of the point in the rotor radius at which an individual bird's flight intersects the swept area. This presents a complication that we overcome by defining an effective blade, which is a simple rectangular cross-section that sweeps out precisely the same volume of space as the physical blade. In doing so, we calculate a constant thickness of blade that accounts for the fact that the thinner tips actually sweep far more space than the thicker base of the blade. This ensures also that our flux calculation is not compromised by introduction of a spatial variation at odds with other aspects of the model.

A further input parameter is the percentage of time per annum when rotors are not turning due to inappropriate wind speeds and routine turbine maintenance. Prior to commissioning of a wind farm, wind speed data are usually gathered and the expected percentage of downtime due to inappropriate wind speeds is determined. During downtime periods the rotor simply stops turning; and so risks associated with dynamic components only are reduced by this percentage of time, while all static components of the turbine remain as potential obstacles to flying birds.

Combining all presented areas of the turbine.—Modeling for multidirectional bird movements requires no dependence on approach angles nor on complexities of interactions between flight direction and wind direction. We thus reduce the turbine to its mean presented area. This is solved by the equation

$$\frac{1}{\pi}\int_0^{\pi} A(\theta)\,\mathrm{d}\theta$$

where A is the presented area of the turbine as a function of approach angle θ. We solve this numerically using a trapezoidal integrator (Press et al. 1992).

Probability of multiple flights interacting with a turbine.—Because counts of bird flights have been made across the wind-farm site and there is no obligatory relationship between point-count locations and particular sites proposed for turbines, we combine the data collected from all point counts. This provides a measure of flight activity, which is assumed to be constant across the site. Thus the field data reduce to a single ratio value for the subject species, which is the sum of all flights documented during all counts divided by the total time of observations. This equates to a maximum likelihood estimation of the mean of an assumed Poisson distribution.

To calculate a number of flights at risk of collision, we first reduce documented bird movements (M) to a measure of flux (F) using the equation

$$F = \frac{M}{T_{\text{obs}} A_{\text{obs}}}$$

where T_{obs} is the combined total time of all point counts and A_{obs} is the area of the vertical plane dissecting the observation cylinder. This flux is a measure of bird movements per time per square meter of vertical airspace. The third dimension, volume of airspace, is redundant (or tacit) due to the assumption that, unless involved in a collision, flight paths do not end arbitrarily in space.

We next multiply activity measure by the number of minutes in which the species is active during the 24-hour diel period, T, and the total presented area of the turbine, A. For year-round resident species, the "active minutes" are calculated for the entire year, while for seasonal or migratory species, they are calculated for the portion of the year that the species is present at the site. This then gives a measure of risk to the bird movements, $M_{\text{risk}} = \text{FTA}$.

Because the flight data are a measure of movements by the species in question and do not discriminate the number of individuals making the movements, the measure (M_{risk}) quantifies the total movements-at-risk for the species and does not reflect risk to individual birds.

To determine a risk rate from total of recorded movements-at-risk, it is necessary to extrapolate to a total number of expected bird movements per annum, M_{yearly}. We calculate this from the flight data, extrapolating the movements to a yearly total through the equation

$$M_{\text{yearly}} = M\frac{T_{\text{yearly}}}{T_{\text{obs}}}$$

We then deduce a probability of flights at risk of collision as $M_{\text{risk}}/M_{\text{yearly}}$. Note that T_{year} is the total time in a year, and not the diel activity period of the species, which has already been factored into the calculation of movements at risk.

The resultant value is now a probability of flights being at risk of collision with a single turbine. To this point, no account is taken of the bird's own ability to avert a collision. This is modified later through use of an avoidance factor.

Estimating number of turbines encountered per flight.—Every turbine is presumed to represent some risk for birds, so the total number of turbines proposed for the wind farm is an input to the model. Turbine layout of modern wind farms is primarily determined by the wind resource and turbines are micro-sited accordingly. Consequently, the machines are usually scattered on the landscape. Older wind farms had turbines arrayed in rows, and occasional modern facilities may be linear where they follow a single topographic feature.

To account for the number of turbines with which a single flight might interact, it would be necessary either to know precisely the route of every flight or to make informed assumptions about flight paths. The manner in which turbines are arrayed in the landscape is important to ascertain a typical number of turbines that a bird might encounter in a given flight. This number differs according to whether turbines are in a scattered array or a single row, and these require different calculations.

For a row of turbines, the likely number of encounters can be visualized by considering a row of N turbines in plan view and a flight path at angle Φ to the row. A flight directly along the line of turbines (Φ') will interact with all N turbines. As the angle of flight relative to the row increases toward 90°, flight paths have potential to interact with fewer turbines until an angle (Φ'') is reached at which the path has potential to interact with a maximum of one turbine.

For a single row of turbines, we define the piecewise smooth function, which gives the number of turbines for a given angle of crossing with,

$$n_{\text{interaction}} = \begin{cases} N, & \text{if } \theta \leq \phi\prime \\ \cot(\theta), & \text{if } \phi' < \theta \leq \phi'' \\ 1, & \text{if } \phi'' < \theta \leq \frac{\pi}{2} \end{cases}$$

This gives us an expected number of interactions as

$$\langle n_{\text{interaction}} \rangle = \frac{2}{\pi}$$
$$\left[N\arctan\left(\frac{1}{N}\right) + \frac{\pi}{4} - \ln\left(\sqrt{2}\sin\left(\arctan\left(\frac{1}{N}\right)\right)\right)\right]$$

For scattered turbine arrays it is not realistic to assume that a bird will encounter all turbines in the wind farm in a given flight. We assume each flight has potential to cross between any 2 points on the outer edges of the farm. Given the size of most on-shore wind farms, this is a reasonable assumption for typical species of concern, such as raptors. When multiple flight paths are drawn randomly across the plan view of a wind farm, some paths may be circuitous and have potential to encounter many turbines, while others will pass through a small portion of the site and have potential to encounter relatively few turbines.

To deduce an average number of turbines likely to be encountered by any flight we use a topological, non-affine mapping technique. This spatial transformation can be illustrated as follows: if we were to throw a lasso around the perimeter of the site and shorten it to its minimum, we would find that all the turbines had collected in a circle. A straight flight path through this "lassoed" site is mathematically equivalent to a random walk across the unconstrained layout. The average of all flight paths crossing the center of this remapped farm will intersect with $\sqrt{N}$ turbines (where N is the total no. of turbines in the wind farm). This value is used in the model for the number of turbines that might be encountered per flight within a scattered turbine array.

For arrays that are neither entirely scattered nor linear, the model employs a simple weighted average of the values for fully scattered and entirely linear arrays.

Application of turbine avoidance capacity.—Birds have substantial ability to avoid obstacles; therefore, it is necessary to incorporate this capacity into the model. In common with other workers (Percival et al. 1999), we use "avoidance" in specific reference to behavior on the part of a bird that averts a potential collision with a turbine. The "avoidance rate" equates to the proportion of flights that might otherwise have involved interaction with a turbine but where the bird alters course and the flight does not result in a collision. For the purposes of the model it is of no consequence whether or not this is a result of a cognitive response by the bird to the presence of the turbine.

Turbine avoidance remains little-studied for any species, and empirical information about actual avoidance can be obtained for a given site only by studying the responses of birds in the presence of operational turbines (Chamberlain et al. 2006). One recent investigation has compared flight behaviors of 2 species of eagles in the presence of turbines at

2 operating wind farms with their behaviors at a site without turbines (Hull and Muir 2013).

Avoidance rate is incorporated into the model by scaling the movements at risk by $(1 - v)$, where v is a measure of the bird's ability to avoid objects. In this scenario, $v = 0$ corresponds to a blind, non-responsive projectile, and $v = 1$ represents a perfectly responsive bird able to avoid any object.

A novel feature of our model is its capacity to apply different avoidance values to the static and dynamic portions of a turbine. As noted by Martin (2011), birds are known to collide with both stationary and moving parts of turbines. This aspect of our model allows for differences in capacity of birds to detect and avoid the large, static components of modern turbines relative to their capacity to detect and avoid the small and fast-moving leading edges of rotor blades.

Size of population at risk.—When information about the size of the population at-risk is available, this can be factored directly into our model to provide results in the form of an expected number of individuals at risk of collision per annum. This is an important consideration because an input measured in terms of bird movements cannot provide an output in terms of individual birds. This aspect appears to have been largely overlooked by other workers, although Chamberlain et al. (2006) alluded to the use of a number of flights only, without incorporation of the number of individuals, as a potential issue in evaluation of collision estimates provided by the Band model (Band et al. 2007).

To deduce a predicted number of individual birds that are at risk of collision, a valid estimate is required of the number of individuals that may interact with turbines at the wind farm in the course of a year. If it is not feasible to obtain this for a species, then the output of the collision risk model will necessarily be the number of flights-at-risk per annum. Although this metric is not predictive of the number of individuals that might collide, it permits risk to be compared for various designs of a wind farm or between one facility and another. In rare cases, such as where there is a single migration passage through the site per annum, the number of movements may equate with the number of individual birds that are at risk. The great majority of risk modeling we have undertaken has been for raptors that are year-round residents. Due to their territoriality and relatively low densities, our studies at wind-farm sites have been able to ascertain the number of individuals using a site per annum, including both resident adults and juveniles, with a high level of confidence. For some other species, such as cranes (Gruidae), we have undertaken home-range studies to determine numbers present during the breeding season, and we have obtained local census data to estimate numbers of individuals that might encounter turbines during non-breeding seasons.

Given a population estimate, the number of flights at risk is attributed equally to the relevant number of individuals through the simple relation $M_{\text{individuals}} = \text{Yearly Movements}/\text{Population}$. We can then attribute individual mortality through

$$\text{mortality} = \text{Population}\left(1 - \frac{\text{Movements At Risk}}{\text{Yearly Movements}}\right)^{M_{\text{individuals}}}$$

MODEL VALIDATION

The model we describe here has been used to assess potential turbine collision risk for numerous species of birds for 23 commercial-scale wind farms proposed in Australia and one in Fiji. Eleven of these facilities have subsequently been built and are now operational. The model's projections have been used by regulatory authorities in determination of approval or modification to wind-farm designs for a range of species of concern. These include taxa as diverse as the orange-bellied parrot (*Neophema chrysogaster*), wedge-tailed eagle (*Aquila audax*), brolga (*Grus rubicunda*), and the large and readily observable Pacific fruit-bat (*Pteropus tonganus*) in Fiji.

The model's performance can be validated only when it can be compared with post-construction mortality data that are sufficient to permit calculation of an actual annual mortality rate and a 95% confidence interval for that rate. Conditions of regulatory approval for most wind farms that have been built to-date in Australia have varied considerably between state jurisdictions and over time. Generally they have not required rigorous investigation or public reporting of avian collisions that occur during operation. We have thus had limited opportunity to validate our model against empirical information for actual collisions. However, where these are available, we can compare the model's predicted average estimates with the measured confidence interval for actual mortalities to assess its predictive capacity. We present one such case study below.

Comparing the Model's Predictions With Empirical Data—A Case History

Substantial investigations have been undertaken at Bluff Point and Studland Bay wind farms in northwestern Tasmania entailing a number of studies of wedge-tailed eagle and white-bellied sea-eagle (*Haliaeetus leucogaster*). These have included utilization surveys designed to measure eagle activity before and after development of the wind farm; collision monitoring; eagle breeding success; eagle behaviors and movements relative to turbines and observers; and investigations and trials aimed at reduction of collisions (Hull et al. 2013). Commissioning of turbines began at Bluff Point Wind Farm in 2002 and at Studland Bay Wind Farm in 2007. Bluff Point Wind Farm consisted of 37 Vestas V66 turbines in a scattered array on an area of 1,524 ha. Studland Bay Wind Farm was situated 3 km south of Bluff Point and comprised 25 Vesta V90 turbines in a scattered array over an area of 1,410 ha. Both wind farms were close to the coast of northwestern Tasmania and resident white-bellied sea-eagles and Tasmanian subspecies of wedge-tailed eagle (*A. a. fleayi*) occurred at both sites.

Monitoring Eagle Flights

Movement data for both species were collected during point counts at Bluff Point Wind Farm site in 3 years prior to construction of turbines and in 4 years after they commenced operating. At Studland Bay, they were collected in 6 years prior to turbine construction and in 3 years after turbines commenced operation. As prescribed by regulatory authorities, point counts were undertaken in the austral autumn and spring. Ten replicate point counts were made in each season at 18 locations per wind farm. There were 545 point counts undertaken at Bluff Point between 1999 and 2007 and 854 point counts at Studland Bay between 1999 and 2009.

Collision Risk Model Results

We used the model to estimate risk based on movement data collected prior to construction for populations of 6 wedge-tailed eagles and 4 white-bellied sea-eagles at-risk per annum at each of the 2 wind farms.

State regulatory authorities have required that the collision risk model be re-run with the accumulated sum of eagle movement data obtained during the entire period of both pre-construction and operation of the 2 wind farms spanning the period from 1999 to 2009 (Table 1). We modeled static avoidance rate at 99% in all cases.

Documented Eagle Collisions

Carcass monitoring surveys were conducted at the Bluff Point and Studland Bay wind farms since they commenced operating. Fences to exclude mammalian scavengers were maintained at 27% of turbines across the 2 sites. All turbines, both fenced and unfenced, were searched routinely within a 100-m radius of the tower base. Search frequency was initially informed by trials to determine rates of loss to scavengers and of observers' capacity to detect carcasses. Since 2007, searches were carried out twice weekly during periods that may have represented higher risk to the species (i.e., eagle display period Jun–Aug, inclusive; and eagle fledging period mid-Dec–Feb, inclusive) and fortnightly outside these periods (Hull et al. 2013). Assessment of the extent of undetected eagle collisions (Hydro Tasmania 2012; Hull et al. 2013) concluded that it is unlikely that significant numbers of eagle carcasses were missed because they are conspicuous; the search zone around turbines was adequate to detect eagle carcasses where they will fall after colliding with turbines (Hull and Muir 2010); personnel on site had capacity to detect carcasses that may have been moved from the formal search zones; eagle carcasses in vegetation were found not to decompose readily and, even when scavenged, remains were identifiable; avian scavengers did not remove all evidence of carcasses and, although mammalian scavengers could remove carcasses, this was controlled at the subset of fenced turbines; survey intensity was informed by predetermined scavenger removal rates; and, although a small number of eagles survived collision with a turbine, in all documented cases such birds were unable to fly and are likely to have been detected because both scavenger exclusion and farm fences prevented them from leaving the site.

Table 1. Modeled mean annual turbine collision estimates for 2 eagle species based on movement data collected over the span of pre-construction and operation of 2 wind farms in northwestern Tasmania, Australia, from 1999 to 2009. Estimates are shown for 4 potential dynamic avoidance rates. Static avoidance rate was modeled at 99% in all cases

	White-bellied sea-eagle		Wedge-tailed eagle	
Dynamic avoidance rate (%)	**Bluff Point**	**Studland Bay**	**Bluff Point**	**Studland Bay**
90	0.9	0.8	2.7	1.9
95	0.5	0.4	1.5	1.1
98	0.2	0.2	0.7	0.5
99	0.1	0.1	0.4	0.3

Comparison of Collision Risk Model Estimates With Actual Mortality Rates

Given constraints of statistically low collision numbers, the model's estimates of annual collisions, based on the combined total of movement data from pre-construction and operation of the 2 wind farms from 1999 until 2009 (Table 1), compare well with actual mortality of the 2 eagle species at both wind farms (Table 2). The model's estimate of the number of wedge-tailed eagle collisions per annum at Bluff Point at a 95% avoidance rate was 1.5, which is the same as the mean number of documented mortalities per annum. Estimates provided for this case by model iterations for 90% and 95% avoidance rates fell within the 95% confidence interval of measured mortality rates. The model's estimates for number of collisions at a 95% avoidance rate for white-bellied sea-eagles at Bluff Point (0.5) and for wedge-tailed eagles at Studland Bay (1.1; Table 1) also closely approximated the mean numbers of documented mortalities per annum for the 2 species (0.4 and 1.0, respectively; Table 2). For those cases, the model's estimates for the range of avoidance rates between 90% and 99% fell within the 95% confidence interval of measured mortality rates. No white-bellied sea-eagle collisions have yet been reported from Studland Bay so, to date, the model's estimates are higher than actual experience for that species there.

MANAGEMENT IMPLICATIONS

We consider that there are 2 different, although not mutually exclusive, applications for modeling of bird collision risks at prospective wind farms. These are to provide projections of long-term effects of a particular wind-energy facility on key bird species; and to determine relative risks for key species that are associated with different wind-farm sites, different portions of large wind farms, and different types of turbines and/or turbine configurations.

In many respects, we consider the latter use of collision risk modeling is the most important contribution it offers. This application provides a tool for planning of wind farms to avoid, reduce, or mitigate potential risks to birds. The model we describe here has now been used in such an iterative manner for a number of prospective sites to evaluate relative risks to key species posed by different types, sizes, numbers, and layouts of turbines.

The integration in our model of data for numbers of bird flights with numbers of birds in the population at-risk is key to the accurate prediction of potential numbers of collisions. This aspect appears not to have been adequately considered previously but has real implications to the appropriate determination of actual risks posed by a wind farm. Our model's use of bird flight data to determine annual flux of movements; a mathematical solution to the typical number of turbines that might be encountered in a bird flight; capacity to assess wind-farm configurations ranging from turbines scattered in the landscape to linear rows of turbines; and the option of assigning different avoidance rates to components

Table 2. Average annual mortality rate and variance for 2 eagle species based on carcasses detected at 2 wind farms in northwestern Tasmania, Australia

Wind farm	White-bellied sea-eagle		Wedge-tailed eagle	
	Mean annual mortality	Annual variance (95% CI)	Mean annual mortality	Annual variance (95% CI)
Bluff Point 2002–2012	0.4	0.1–1.0	1.5	0.8–2.6
Studland Bay 2007–2012	0.0	0.0–0.7	1.0	0.3–2.2

of turbines that pose more or less risk, all represent refinements designed to improve the predictive capacity of turbine collision risk modeling.

In the cases outlined here, where long-term mortality data sets have permitted validation of the model's collision estimates at given avoidance rates, the two have closely approximated each other. We will seek further opportunities to compare the results of our model with empirical mortality information from operating wind farms, with a view to wider application of the model.

ACKNOWLEDGMENTS

C. Hull and E. Stark have been constant sources of ideas and valued discussions. C. Hull also facilitated our access to information about Bluff Point and Studland Bay wind farms and provided critical review of 2 drafts of the paper. M. McCarthy provided comment on early incarnations of the model. R. Brereton offered important inputs and S. Allie assisted to improve the model in relation to predicting risk to individual birds. Two early reviews of the model by T. Pople, H. Possingham, L. Joseph, and T. Regan of the Ecology Centre University of Queensland offered ideas for improvements to the model. Assessments of numerous wind-farm sites have been the foundation of development of the model and we are grateful to various wind-energy companies for involvement in their projects.

The model described here is the property of Biosis Propriety Limited, an environmental consultancy business incorporated in Australia. It is used commercially by Biosis Propriety Limited.

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Associate Editor: Smallwood.

Appendix 17 Map figures

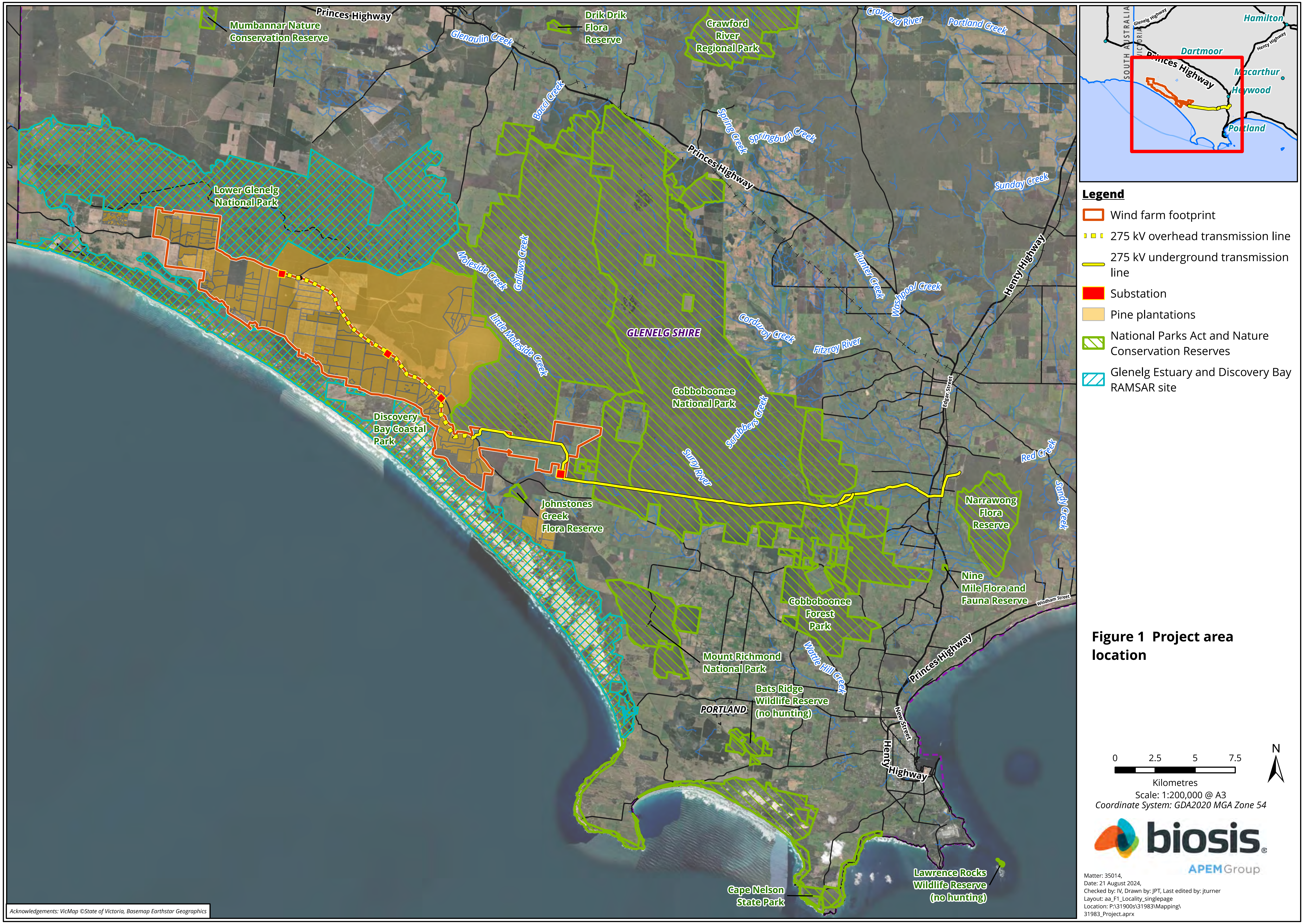
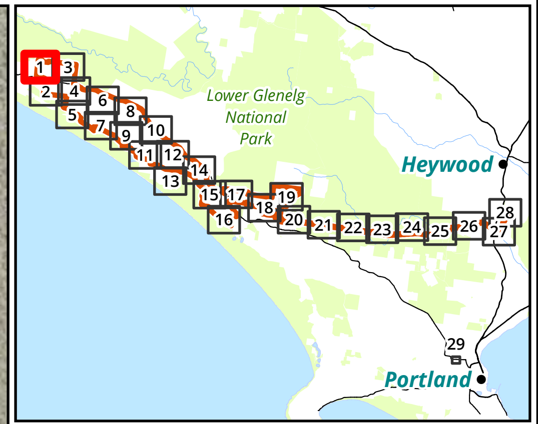


Figure 1 Project area location



Legend

Project area

Trees

Scattered tree

Ecological vegetation classes (EVCs)

3 Damp Sands Herb-rich Woodland

858 Coastal Alkaline Scrub

Figure 4a.1 Native vegetation within the project area

0 100 200 300 400 500 N

Metres

Scale: 1:10,000 @ A3

Coordinate System: GDA2020 MGA Zone 54

APEM Group

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Date: 20 November 2024,
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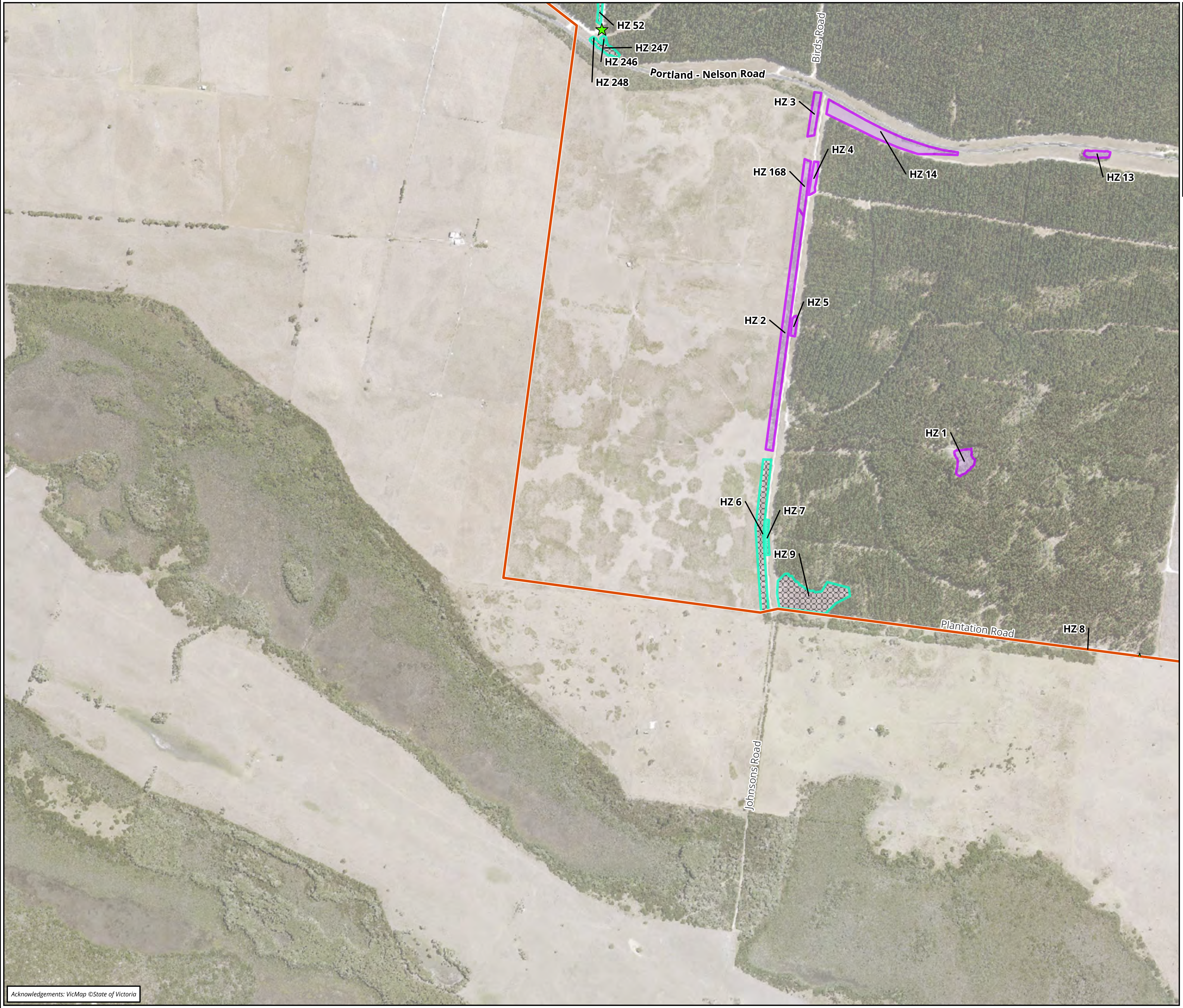

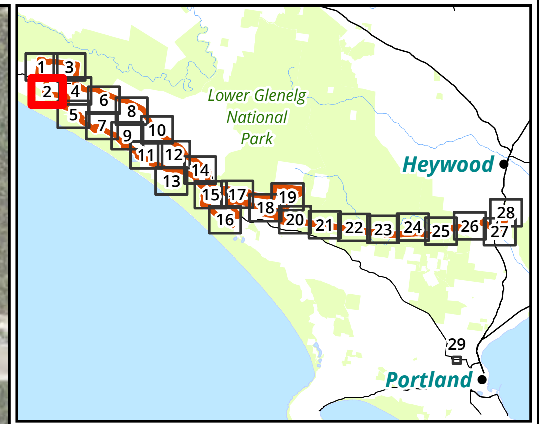

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Project area

Trees

Scattered tree

Ecological vegetation classes (EVCs)

3 Damp Sands Herb-rich Woodland

858 Coastal Alkaline Scrub

Figure 4a.2 Native vegetation within the project area

0 100 200 300 400 500

Metres

N

Scale: 1:10,000 @ A3

Coordinate System: GDA2020 MGA Zone 54

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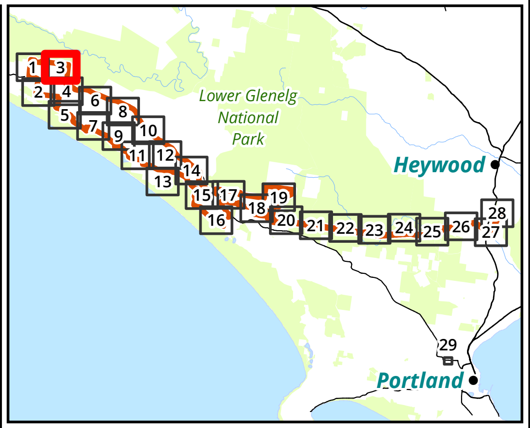

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Project area

Figure 4a.3 Native vegetation within the project area

0 100 200 300 400 500

Metres

N

Scale: 1:10,000 @ A3

Coordinate System: GDA2020 MGA Zone 54

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APEM Group

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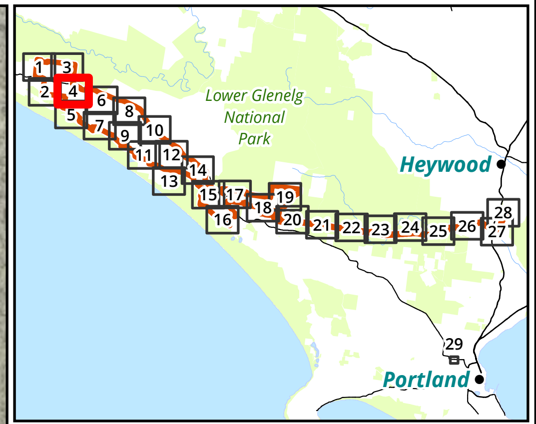

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Project area

Trees

Scattered tree

Ecological vegetation classes (EVCs)

3 Damp Sands Herb-rich Woodland

858 Coastal Alkaline Scrub

Figure 4a.4 Native vegetation within the project area

0 100 200 300 400 500

Metres

N

Scale: 1:10,000 @ A3

Coordinate System: GDA2020 MGA Zone 54

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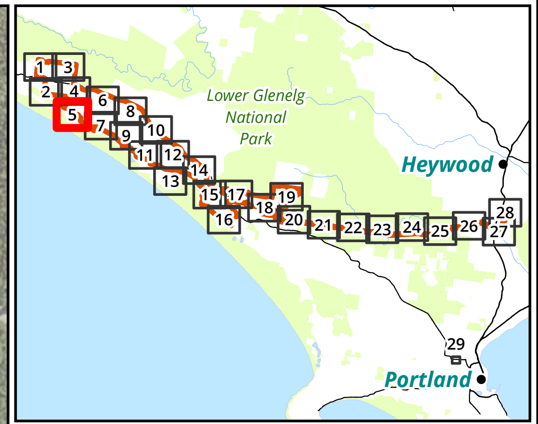

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Project area

Trees

Scattered tree

Figure 4a.5 Native vegetation within the project area

0 100 200 300 400 500

Metres

N

Scale: 1:10,000 @ A3

Coordinate System: GDA2020 MGA Zone 54

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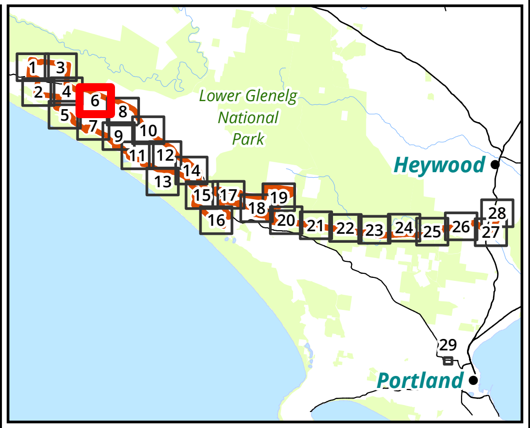

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Project area

Ecological vegetation classes (EVCs)

3 Damp Sands Herb-rich Woodland

858 Coastal Alkaline Scrub

Figure 4a.6 Native vegetation within the project area

0 100 200 300 400 500

Metres

Scale: 1:10,000 @ A3

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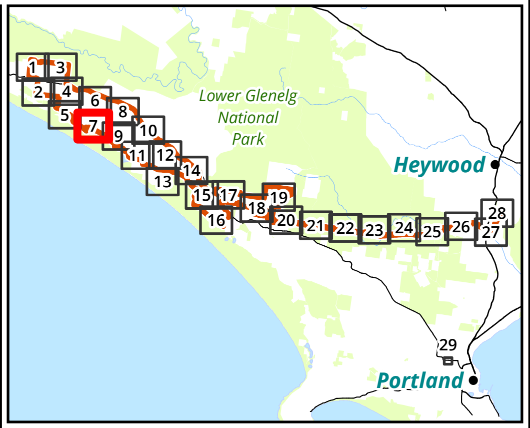

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Project area

Figure 4a.7 Native vegetation within the project area

0 100 200 300 400 500

Metres

N

Scale: 1:10,000 @ A3

Coordinate System: GDA2020 MGA Zone 54

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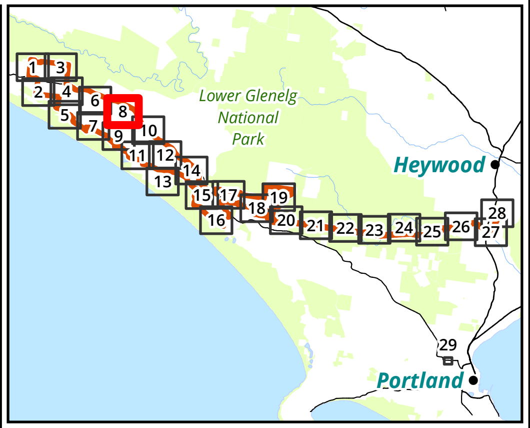

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Project area

Ecological vegetation classes (EVCs)

3 Damp Sands Herb-rich Woodland

858 Coastal Alkaline Scrub

Figure 4a.8 Native vegetation within the project area

0 100 200 300 400 500

Metres

Scale: 1:10,000 @ A3

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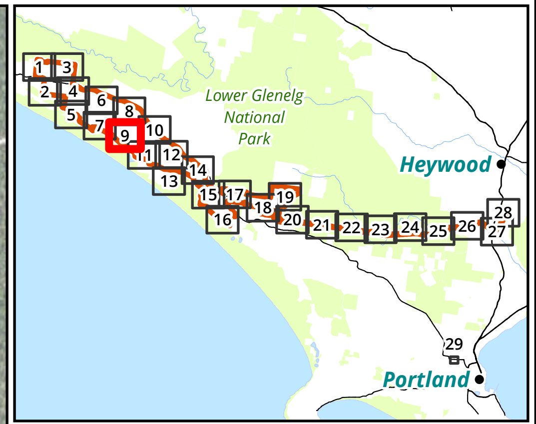

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Project area

Ecological vegetation classes (EVCs)

3 Damp Sands Herb-rich Woodland

858 Coastal Alkaline Scrub

Figure 4a.9 Native vegetation within the project area

0 100 200 300 400 500
Metres
N

Scale: 1:10,000 @ A3
Coordinate System: GDA2020 MGA Zone 54

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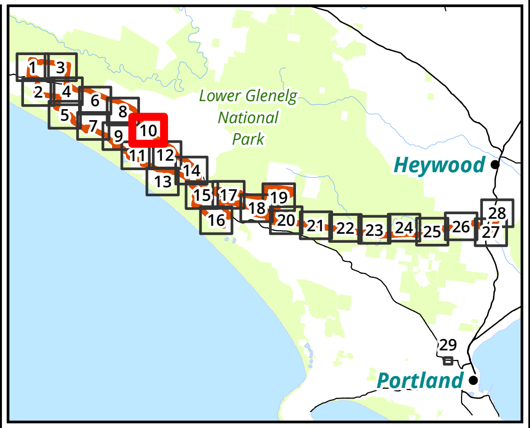

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Project area

Ecological vegetation classes (EVCs)

3 Damp Sands Herb-rich Woodland

858 Coastal Alkaline Scrub

Figure 4a.10 Native vegetation within the project area

0 100 200 300 400 500
Metres

Scale: 1:10,000 @ A3

Coordinate System: GDA2020 MGA Zone 54

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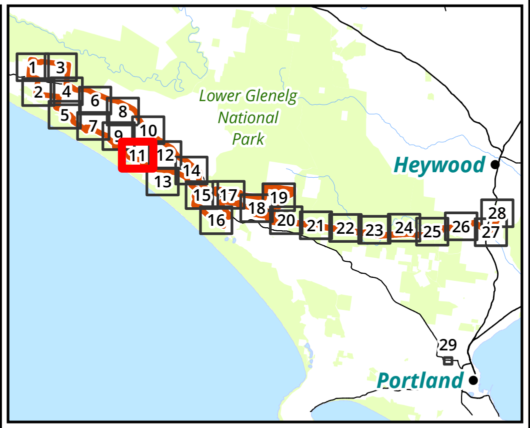

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Project area

Ecological vegetation classes (EVCs)

3 Damp Sands Herb-rich Woodland

858 Coastal Alkaline Scrub

Figure 4a.11 Native vegetation within the project area

0 100 200 300 400 500
Metres
Scale: 1:10,000 @ A3
Coordinate System: GDA2020 MGA Zone 54

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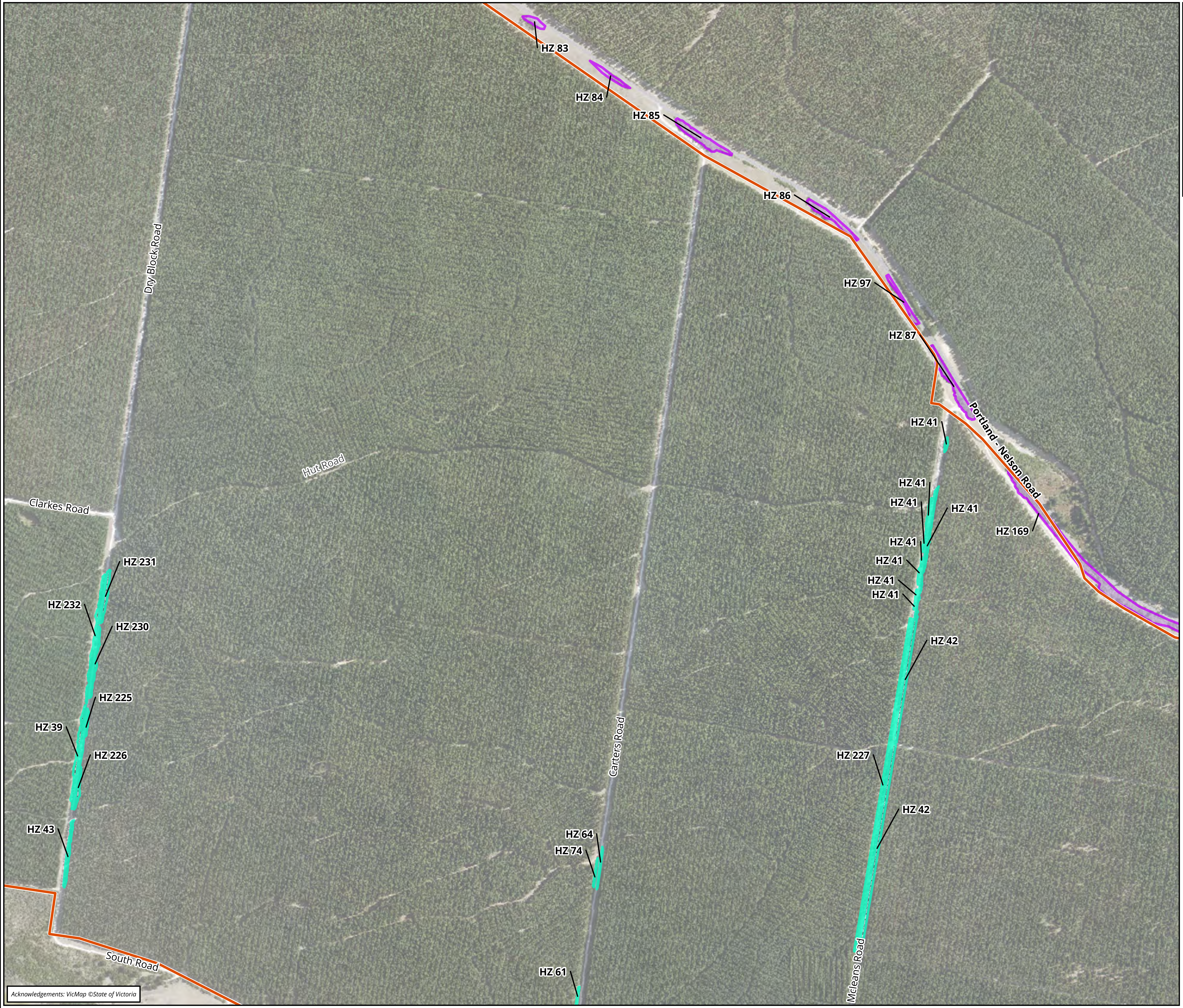

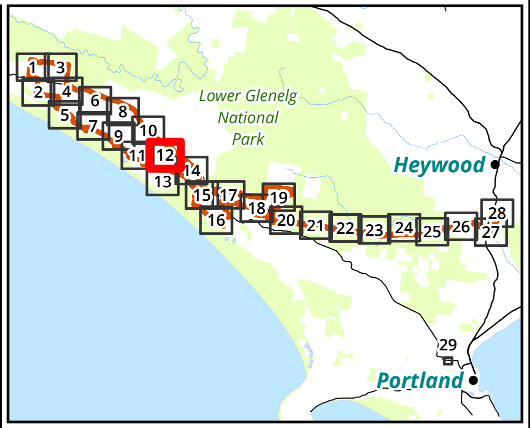

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Project area

Ecological vegetation classes (EVCs)

3 Damp Sands Herb-rich Woodland

858 Coastal Alkaline Scrub

Figure 4a.12 Native vegetation within the project area

0 100 200 300 400 500

Metres

Scale: 1:10,000 @ A3

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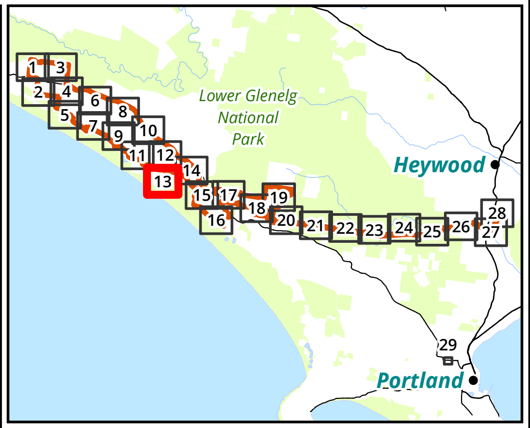

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Project area

Ecological vegetation classes (EVCs)

858 Coastal Alkaline Scrub

Figure 4a.13 Native vegetation within the project area

0 100 200 300 400 500

Metres

N

Scale: 1:10,000 @ A3

Coordinate System: GDA2020 MGA Zone 54

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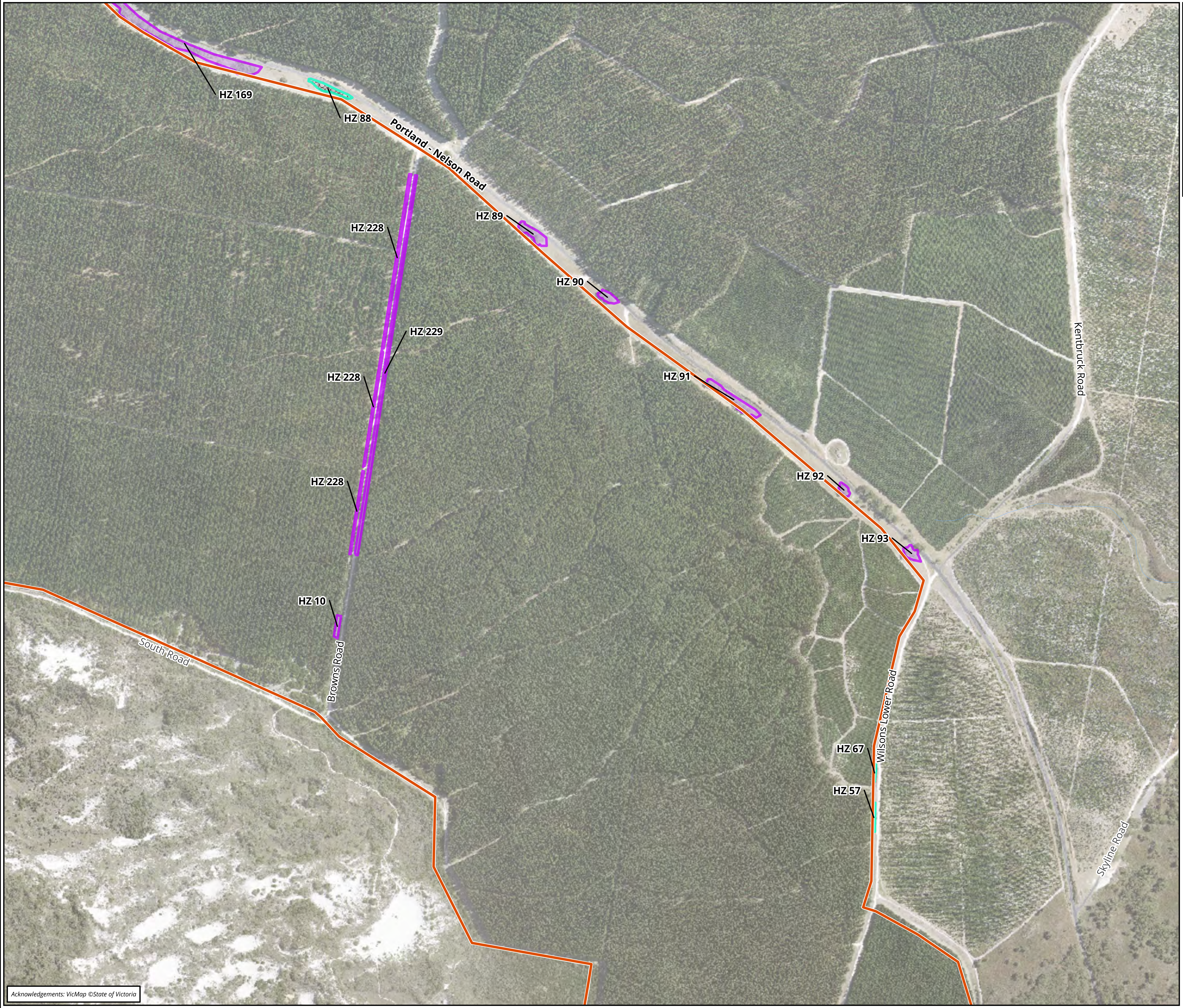
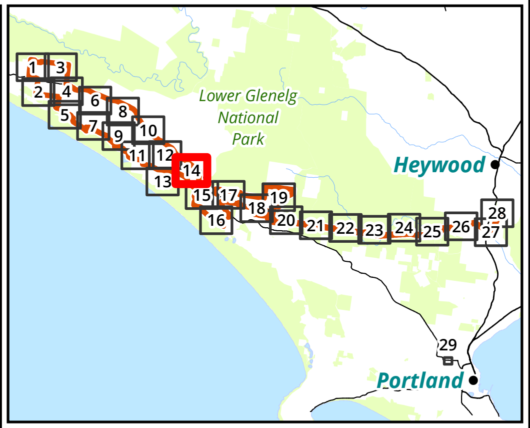




Legend

Project area

Ecological vegetation classes (EVCs)

3 Damp Sands Herb-rich Woodland

858 Coastal Alkaline Scrub

Figure 4a.14 Native vegetation within the project area

0 100 200 300 400 500

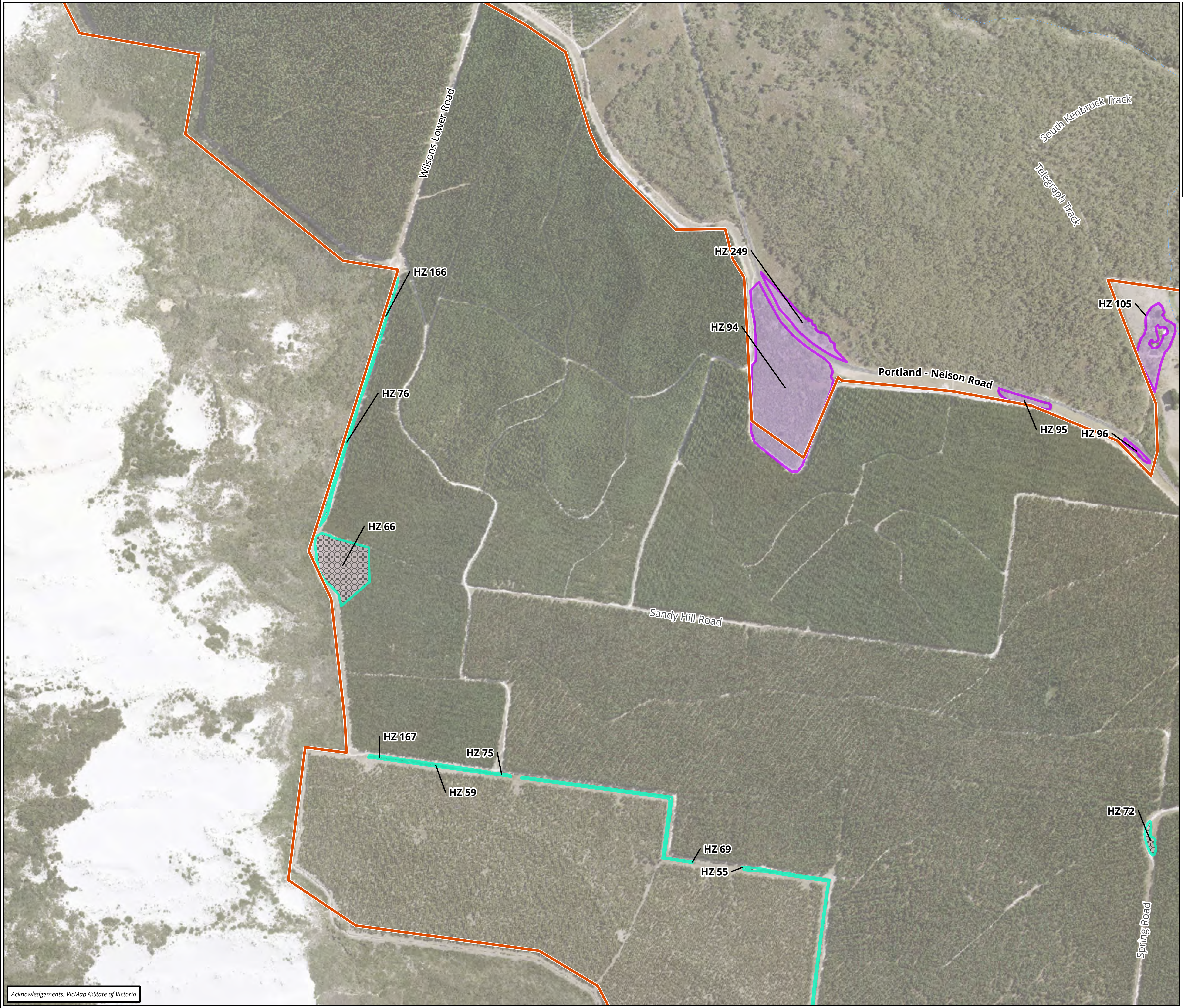
Metres

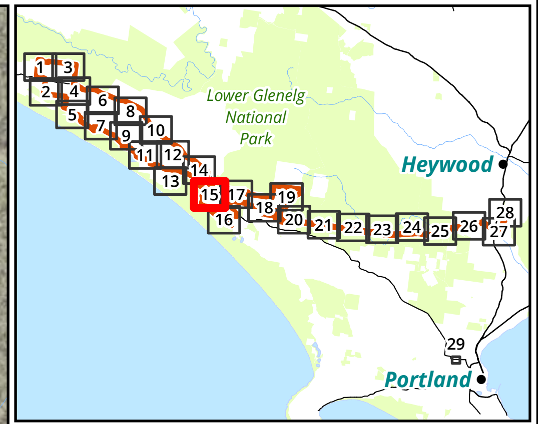
N

Scale: 1:10,000 @ A3

Coordinate System: GDA2020 MGA Zone 54

Matter: 35014,
Date: 20 November 2024,
Checked by: MSG, Drawn by: SP, Last edited by: jturner
Layout: F04a_Ecofeatures
Location: P:\35000s\35014\Mapping\35014_Kentbruck_Flora.aprx





Legend

Project area

Ecological vegetation classes (EVCs)

3 Damp Sands Herb-rich Woodland

858 Coastal Alkaline Scrub

Figure 4a.15 Native vegetation within the project area

0 100 200 300 400 500 N

Metres

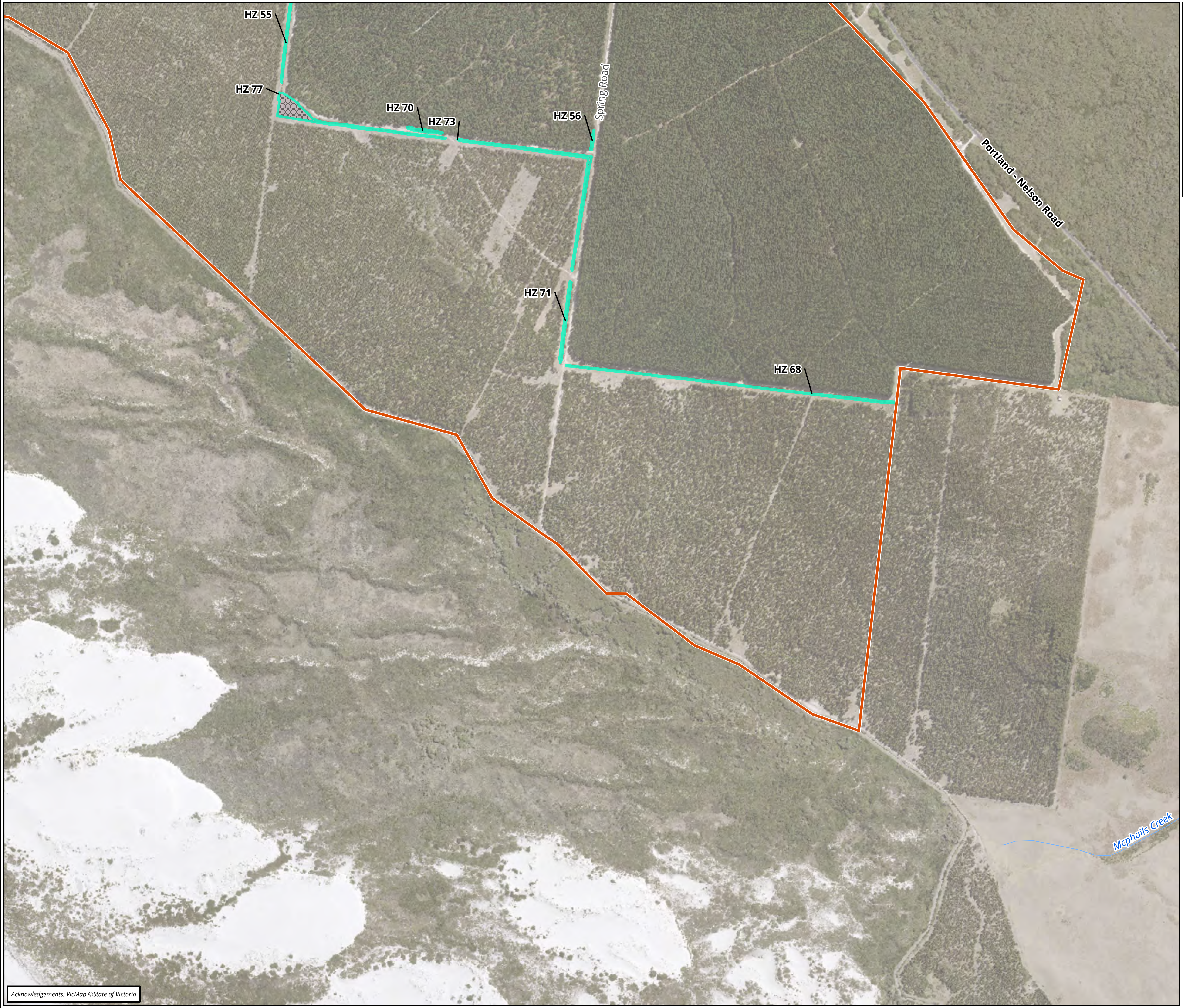
Scale: 1:10,000 @ A3

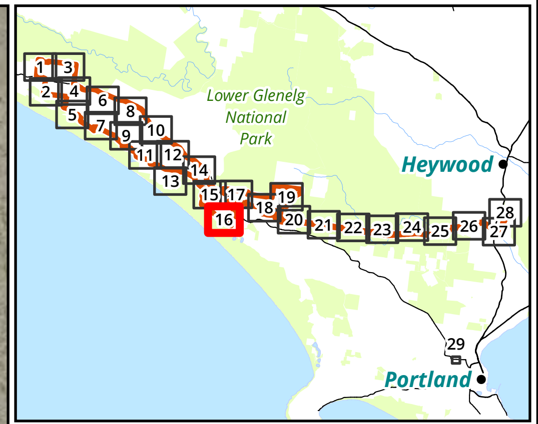
Coordinate System: GDA2020 MGA Zone 54

biosis

APEM Group

Matter: 35014,
Date: 20 November 2024,
Checked by: MSG, Drawn by: SP, Last edited by: jturner
Layout: F04a_Ecofeatures
Location: P:\35000s\35014\Mapping\35014_Kentbruck_Flora.aprx





Legend

Project area

Ecological vegetation classes (EVCs)

858 Coastal Alkaline Scrub

Figure 4a.16 Native vegetation within the project area

0 100 200 300 400 500

Metres

N

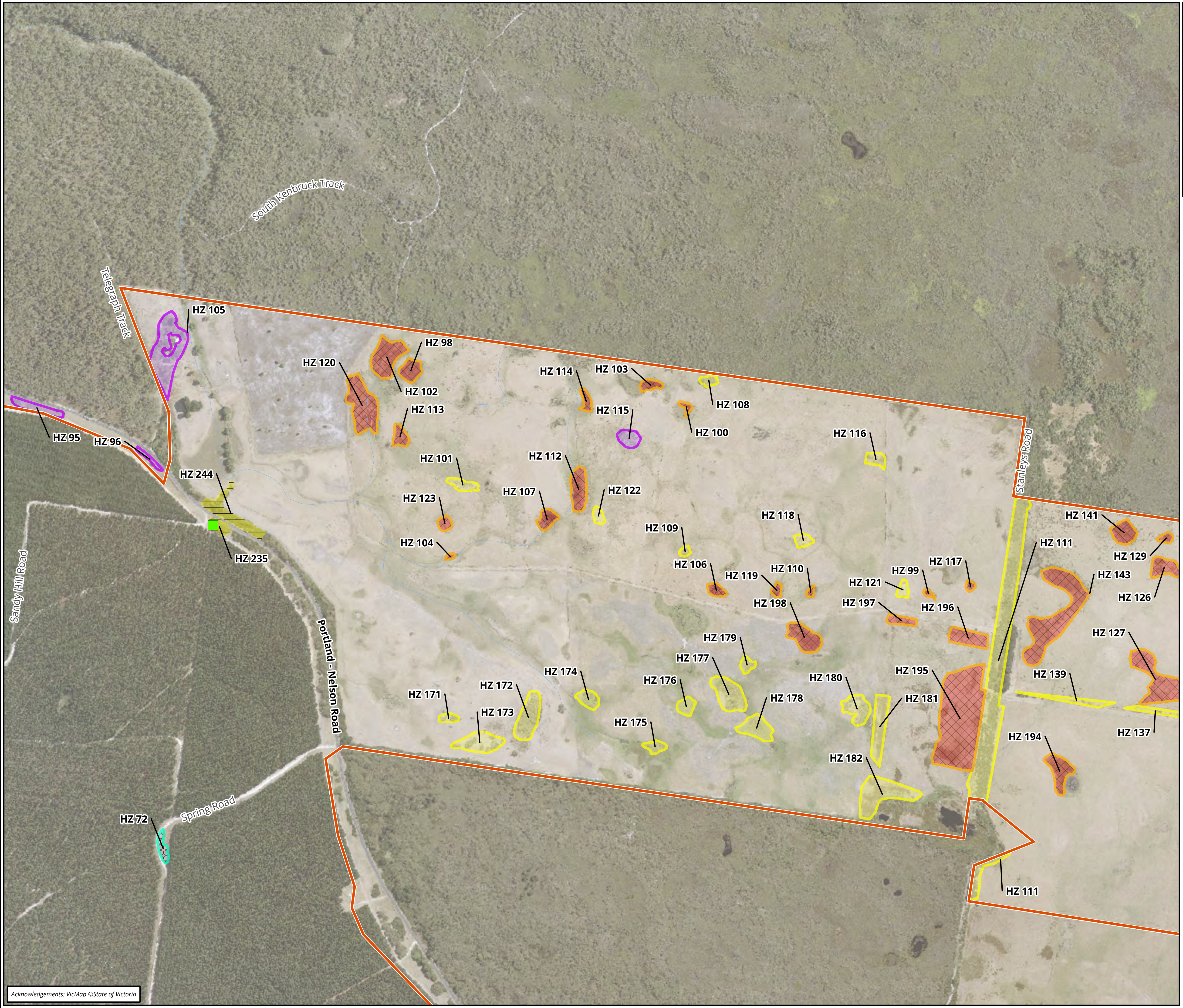
Scale: 1:10,000 @ A3

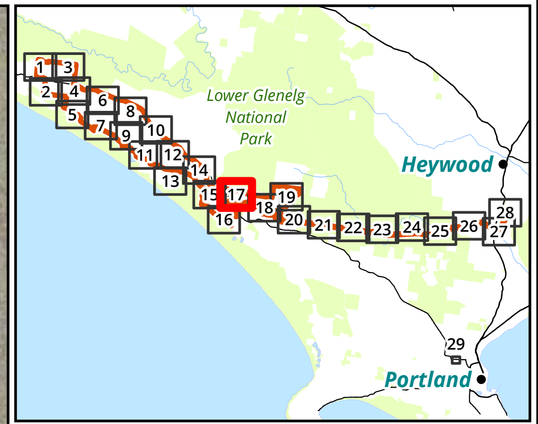
Coordinate System: GDA2020 MGA Zone 54

biosis

APEM Group

Matter: 35014,
Date: 20 November 2024,
Checked by: MSG, Drawn by: SP, Last edited by: jturner
Layout: F04a_Ecofeatures
Location: P:\35000s\35014\Mapping\
35014_Kentbruck_Flora.aprx





Legend

Project area

Trees

Large patch tree

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 4a.17 Native vegetation within the project area

0 100 200 300 400 500

Metres

N

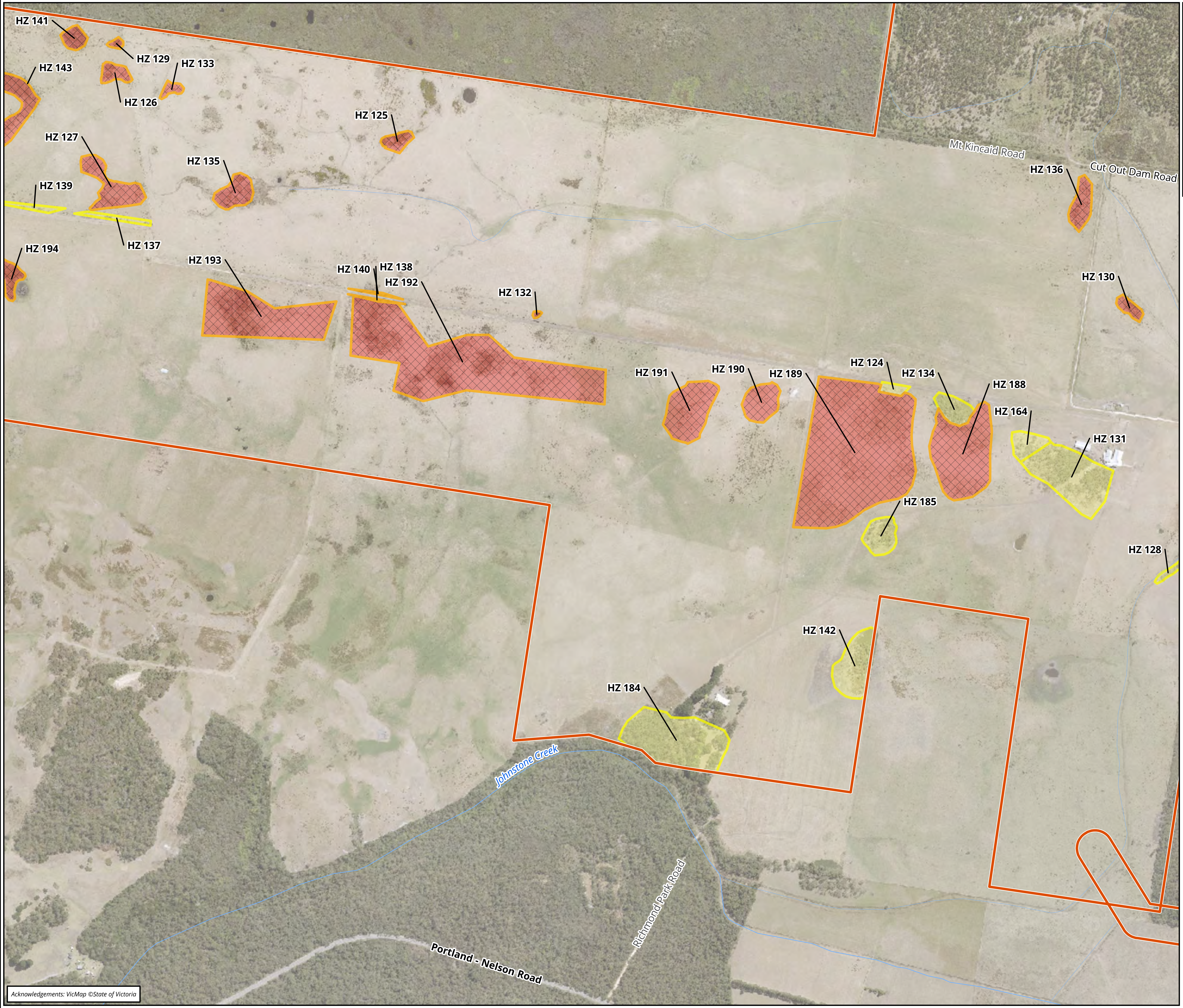
Scale: 1:10,000 @ A3

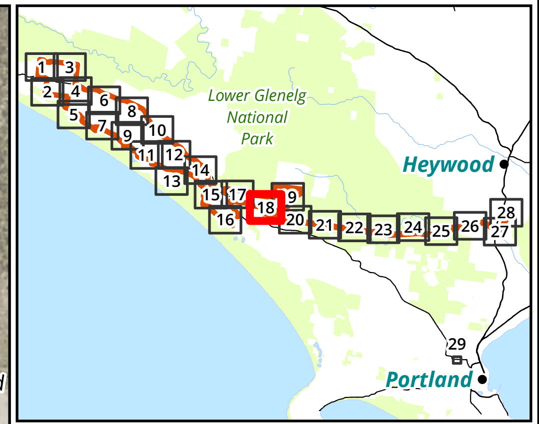
Coordinate System: GDA2020 MGA Zone 54

biosis

APEM Group

Matter: 35014,
Date: 20 November 2024,
Checked by: MSG, Drawn by: SP, Last edited by: jturner
Layout: F04a_Ecofeatures
Location: P:\35000s\35014\Mapping\35014_Kentbruck_Flora.aprx





Legend

Project area

Ecological vegetation classes (EVCs)

8 Wet Heathland

48 Heathy Woodland

Figure 4a.18 Native vegetation within the project area

0 100 200 300 400 500

Metres

N

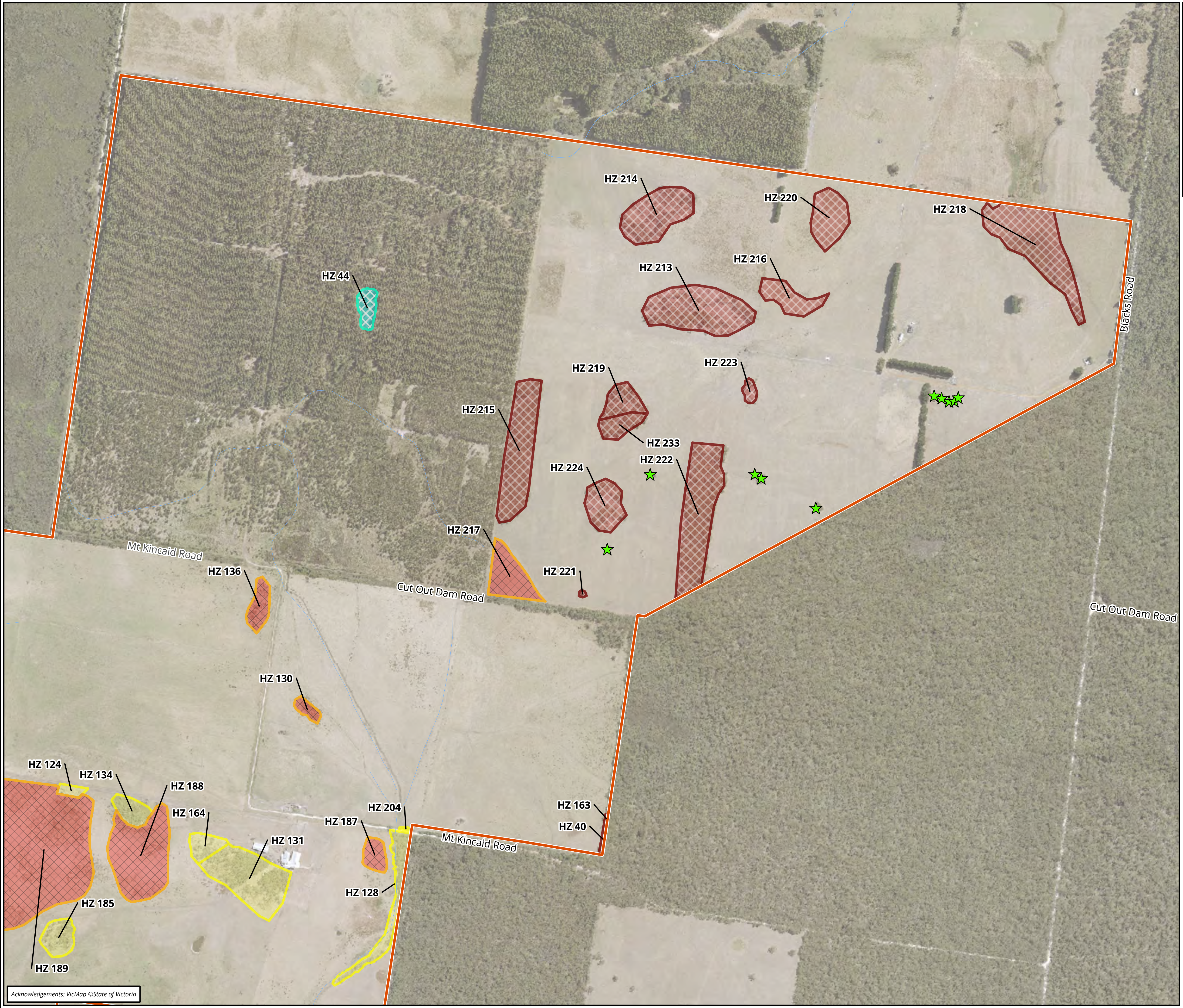
Scale: 1:10,000 @ A3

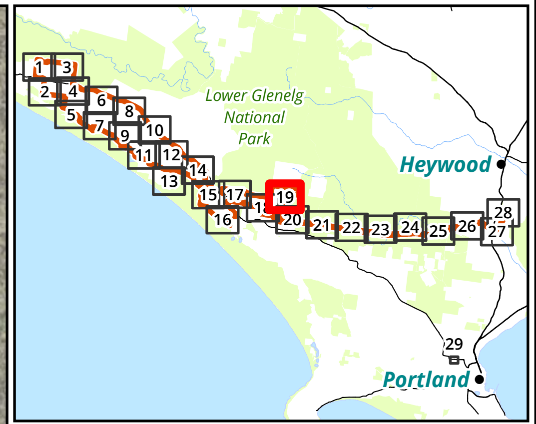
Coordinate System: GDA2020 MGA Zone 54

biosis

APEM Group

Matter: 35014,
Date: 20 November 2024,
Checked by: MSG, Drawn by: SP, Last edited by: jturner
Layout: F04a_Ecofeatures
Location: P:\35000s\35014\Mapping\
35014_Kentbruck_Flora.aprx





Legend

Project area

Trees

Scattered tree

Ecological vegetation classes (EVCs)

8 Wet Heathland

23 Herb-rich Foothill Forest

48 Heathy Woodland

53 Swamp Scrub

Figure 4a.19 Native vegetation within the project area

0 100 200 300 400 500

Metres

N

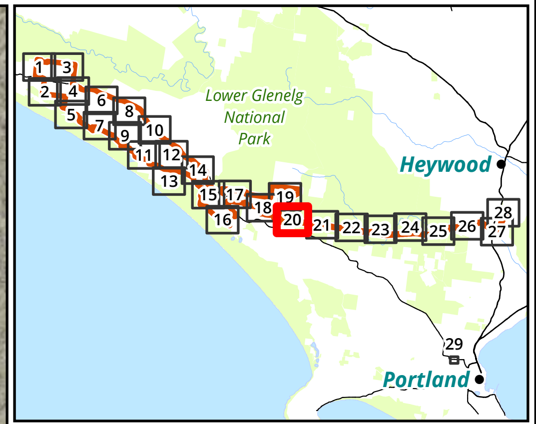
Scale: 1:10,000 @ A3

Coordinate System: GDA2020 MGA Zone 54

biosis

APEM Group

Matter: 35014,
Date: 20 November 2024,
Checked by: MSG, Drawn by: SP, Last edited by: jturner
Layout: F04a_Ecofeatures
Location: P:\35000s\35014\Mapping\
35014_Kentbruck_Flora.aprx



Legend

Project area

Trees

- Large patch tree
- Scattered tree

Ecological vegetation classes (EVCs)

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

Figure 4a.20 Native vegetation within the project area

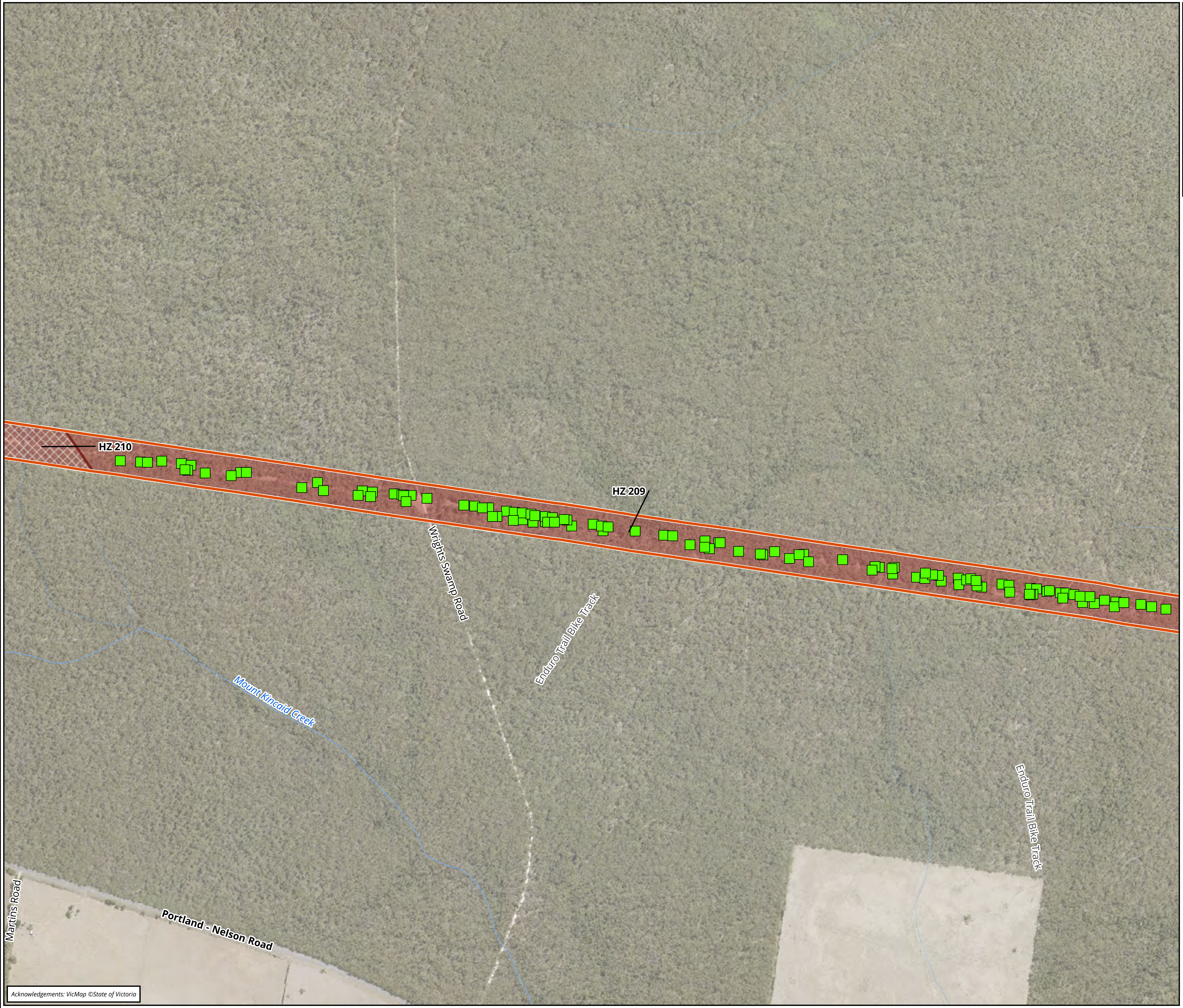
0 100 200 300 400 500 N

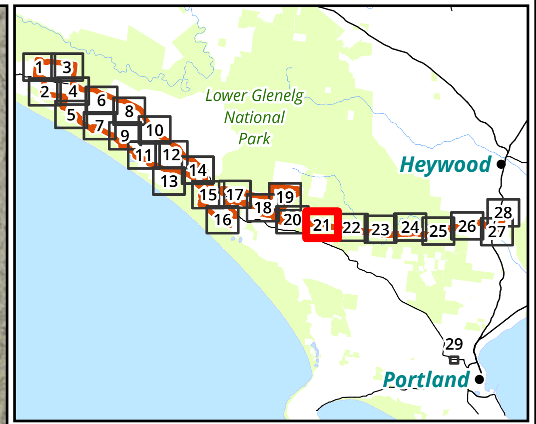
Metres

Scale: 1:10,000 @ A3

Coordinate System: GDA2020 MGA Zone 54

Matter: 35014,
Date: 20 November 2024,
Checked by: MSG, Drawn by: SP, Last edited by: jturner
Layout: F04a_Ecofeatures
Location: P:\35000s\35014\Mapping\
35014_Kentbruck_Flora.aprx





Legend

Project area

Trees

Large patch tree

Ecological vegetation classes (EVCs)

16 Lowland Forest

23 Herb-rich Foothill Forest

Figure 4a.21 Native vegetation within the project area

0 100 200 300 400 500

Metres

N

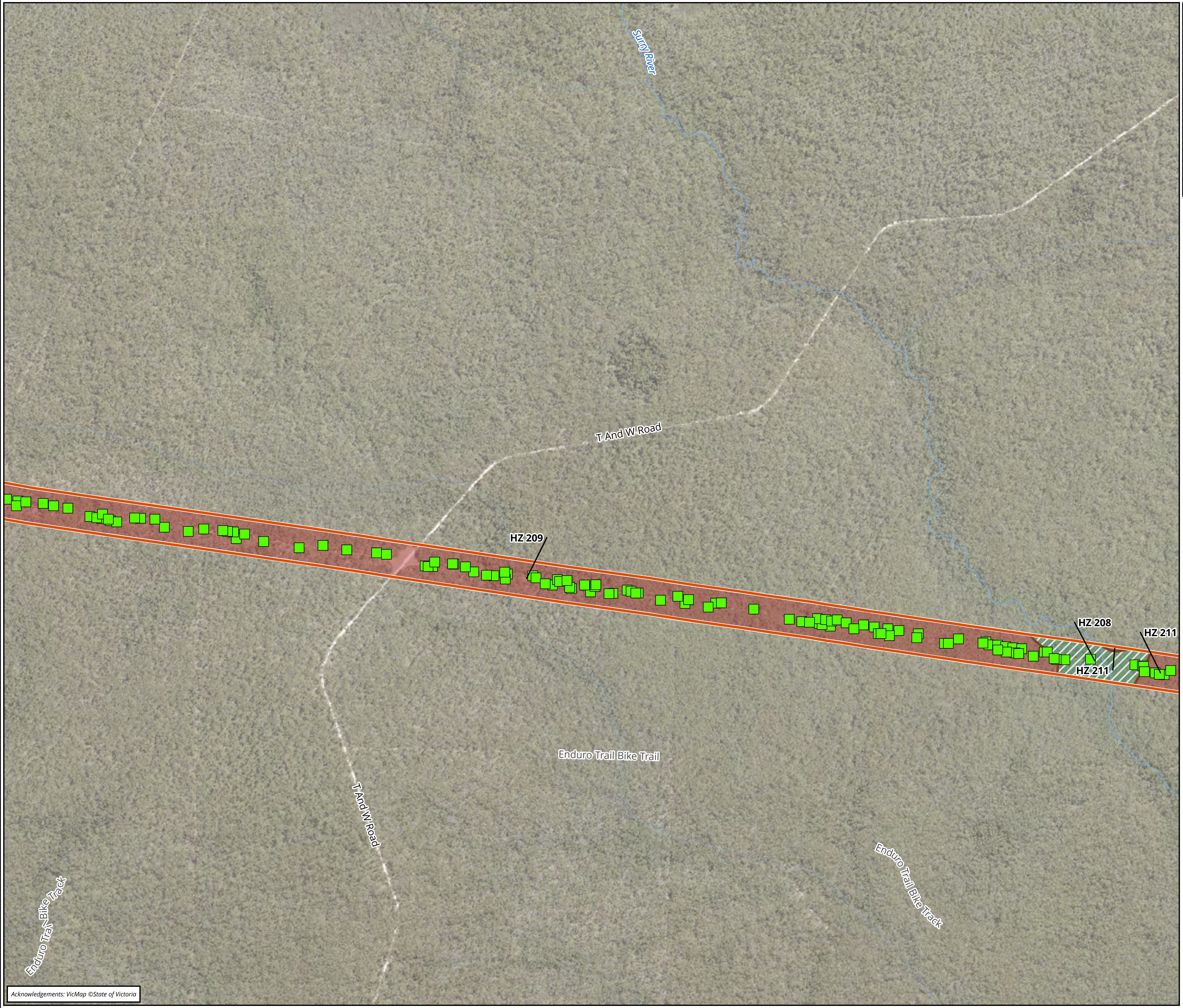
Scale: 1:10,000 @ A3

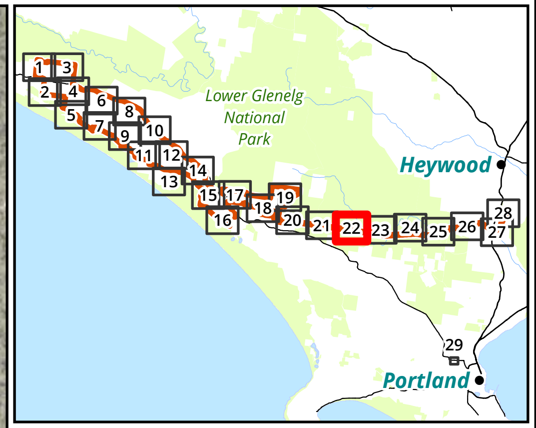
Coordinate System: GDA2020 MGA Zone 54

biosis

APEM Group

Matter: 35014,
Date: 20 November 2024,
Checked by: MSG, Drawn by: SP, Last edited by: jturner
Layout: F04a_Ecofeatures
Location: P:\35000s\35014\Mapping\
35014_Kentbruck_Flora.aprx





Legend

Project area

Trees

Large patch tree

Ecological vegetation classes (EVCs)

16 Lowland Forest

198 Sedgy Riparian Woodland

Figure 4a.22 Native vegetation within the project area

0 100 200 300 400 500

Metres

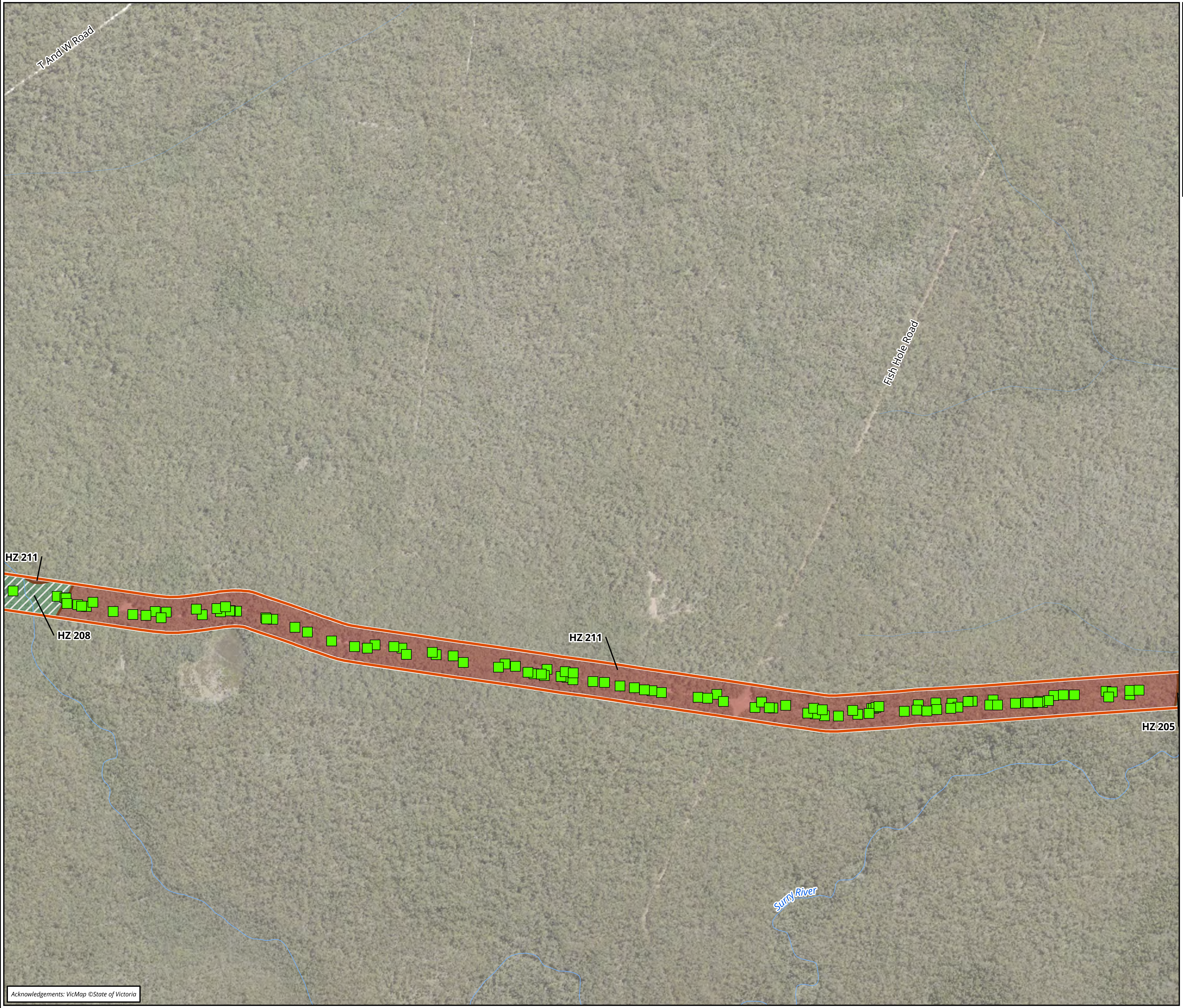
N

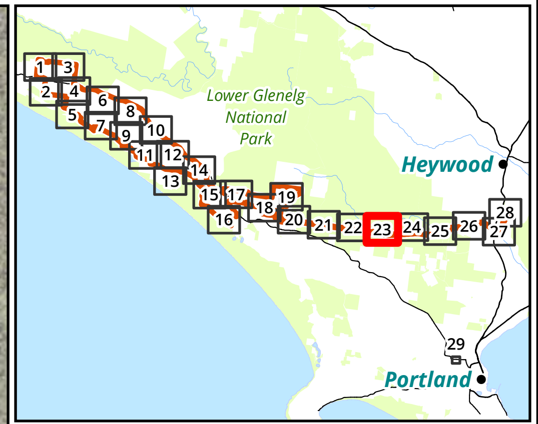
Scale: 1:10,000 @ A3

Coordinate System: GDA2020 MGA Zone 54

biosis APEM Group

Matter: 35014,
Date: 20 November 2024,
Checked by: MSG, Drawn by: SP, Last edited by: jturner
Layout: F04a_Ecofeatures
Location: P:\35000s\35014\Mapping\
35014_Kentbruck_Flora.aprx





Legend

Project area

Trees

Large patch tree

Ecological vegetation classes (EVCs)

16 Lowland Forest

198 Sedgy Riparian Woodland

Figure 4a.23 Native vegetation within the project area

0 100 200 300 400 500

Metres

N

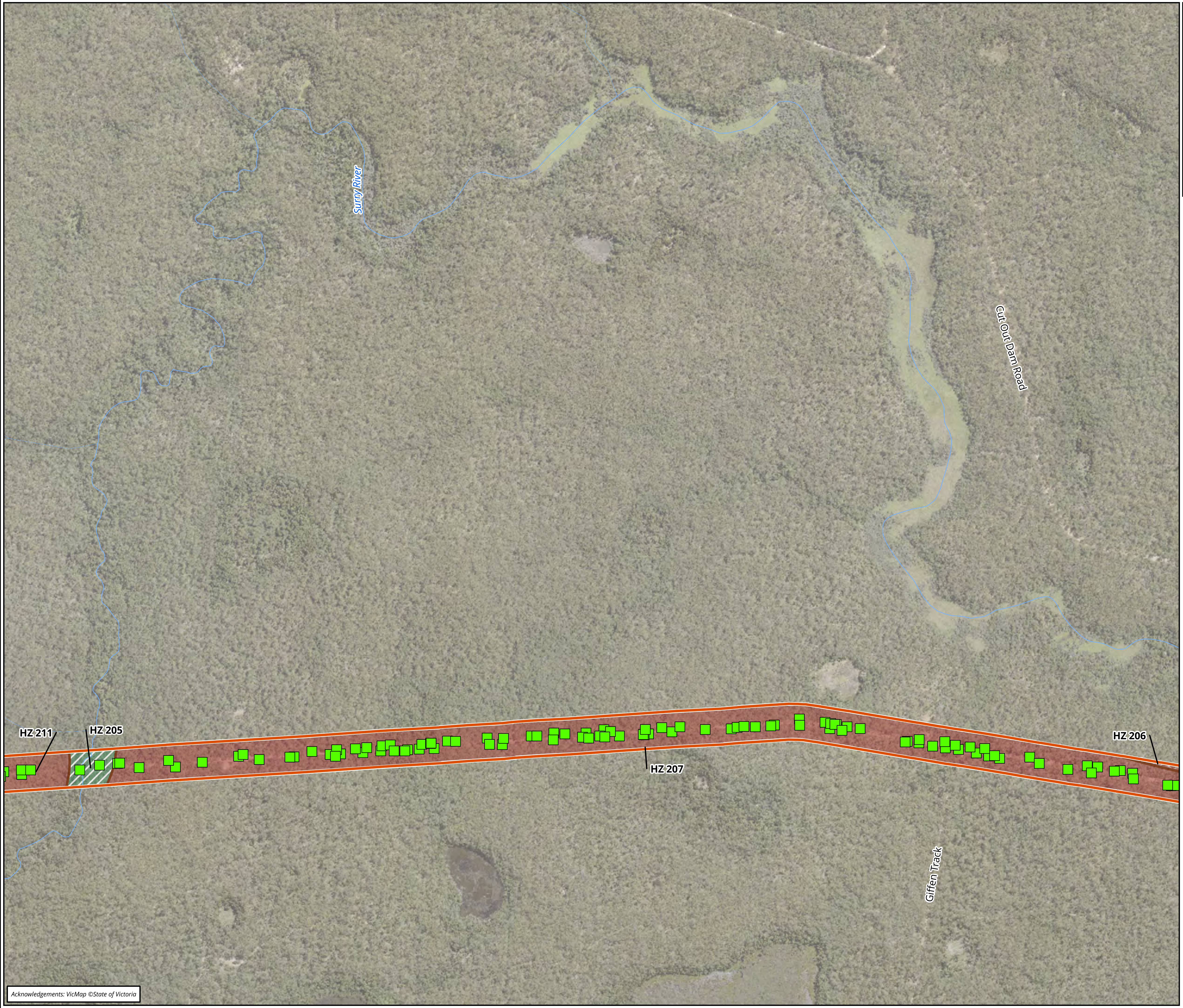
Scale: 1:10,000 @ A3

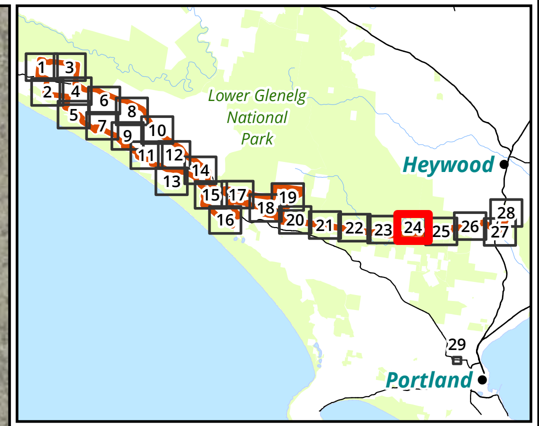
Coordinate System: GDA2020 MGA Zone 54

biosis

APEM Group

Matter: 35014,
Date: 20 November 2024,
Checked by: MSG, Drawn by: SP, Last edited by: jturner
Layout: F04a_Ecofeatures
Location: P:\35000s\35014\Mapping\
35014_Kentbruck_Flora.aprx





Legend

Project area

Trees

Large patch tree

Ecological vegetation classes (EVCs)

16 Lowland Forest

23 Herb-rich Foothill Forest

198 Sedgy Riparian Woodland

Figure 4a.24 Native vegetation within the project area

0 100 200 300 400 500

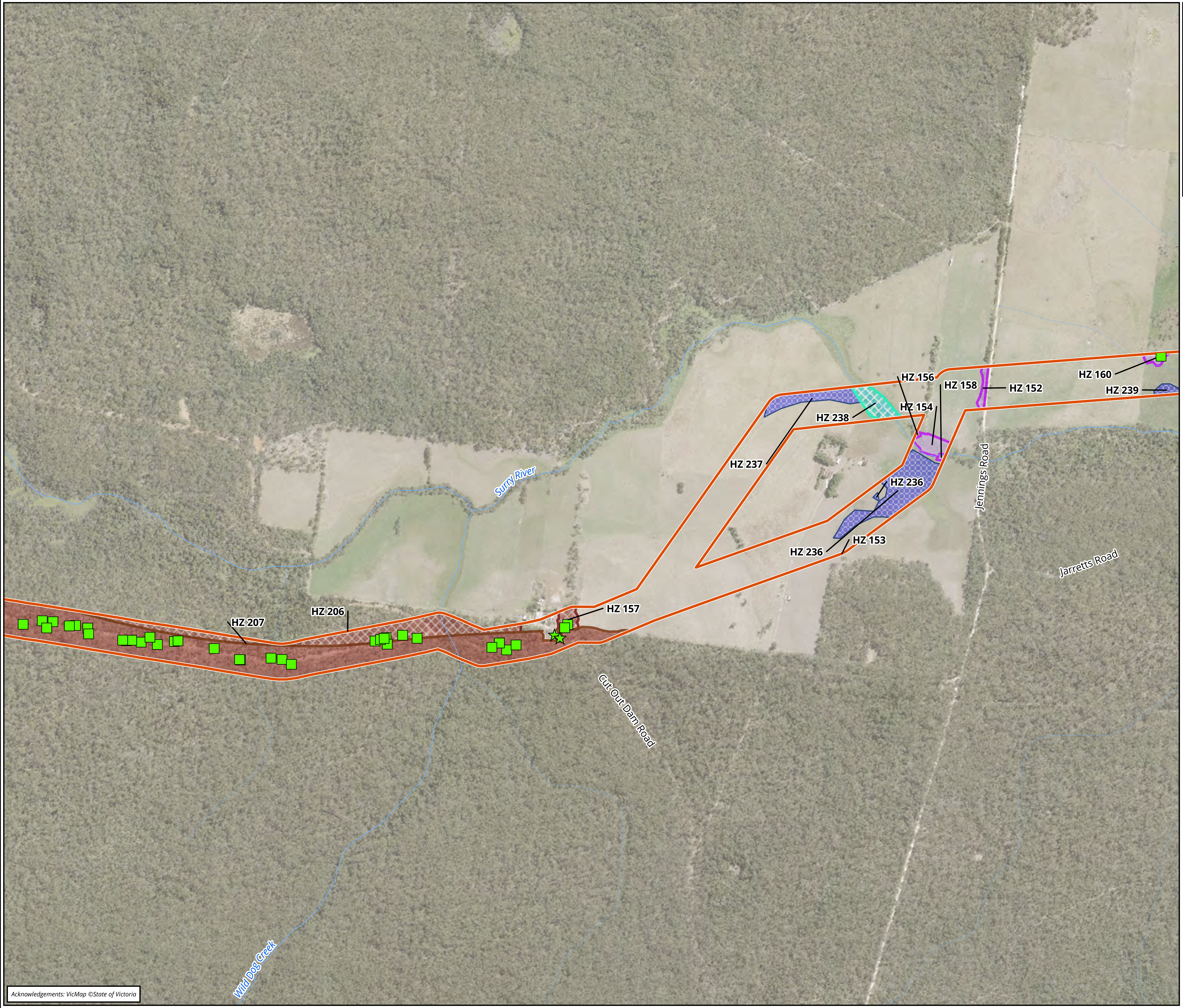
Metres

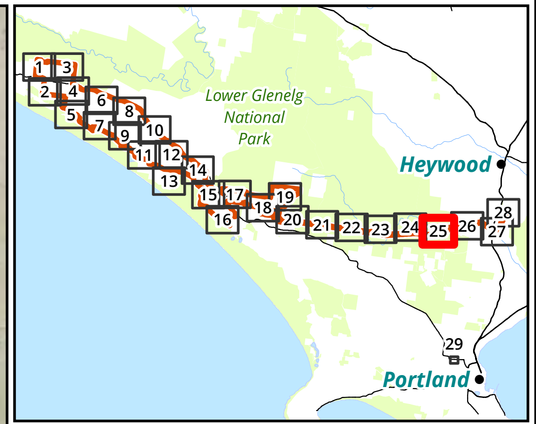
N

Scale: 1:10,000 @ A3

Coordinate System: GDA2020 MGA Zone 54

Matter: 35014,
Date: 20 November 2024,
Checked by: MSG, Drawn by: SP, Last edited by: jturner
Layout: F04a_Ecofeatures
Location: P:\35000s\35014\Mapping\
35014_Kentbruck_Flora.aprx





Legend

Project area

Trees

Large patch tree

Scattered tree

Ecological vegetation classes (EVCs)

3 Damp Sands Herb-rich Woodland

16 Lowland Forest

23 Herb-rich Foothill Forest

53 Swamp Scrub

125 Plains Grassy Wetland

Figure 4a.25 Native vegetation within the project area

0 100 200 300 400 500

Metres

N

Scale: 1:10,000 @ A3

Coordinate System: GDA2020 MGA Zone 54

biosis

APEM Group

Matter: 35014,
Date: 20 November 2024,
Checked by: MSG, Drawn by: SP, Last edited by: jturner
Layout: F04a_Ecofeatures
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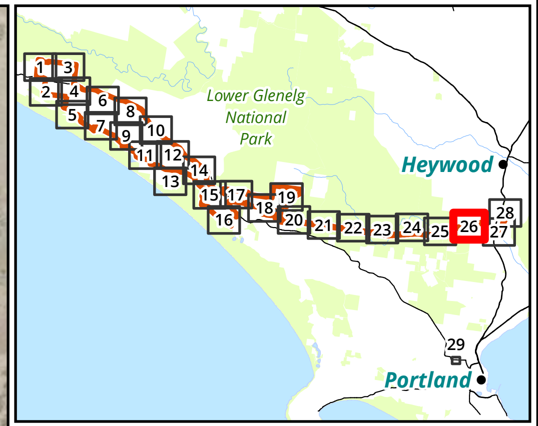


Legend

Project area

Trees

Large patch tree

Scattered tree

Ecological vegetation classes (EVCs)

3 Damp Sands Herb-rich Woodland

125 Plains Grassy Wetland

Figure 4a.26 Native vegetation within the project area

0 100 200 300 400 500

Metres

N

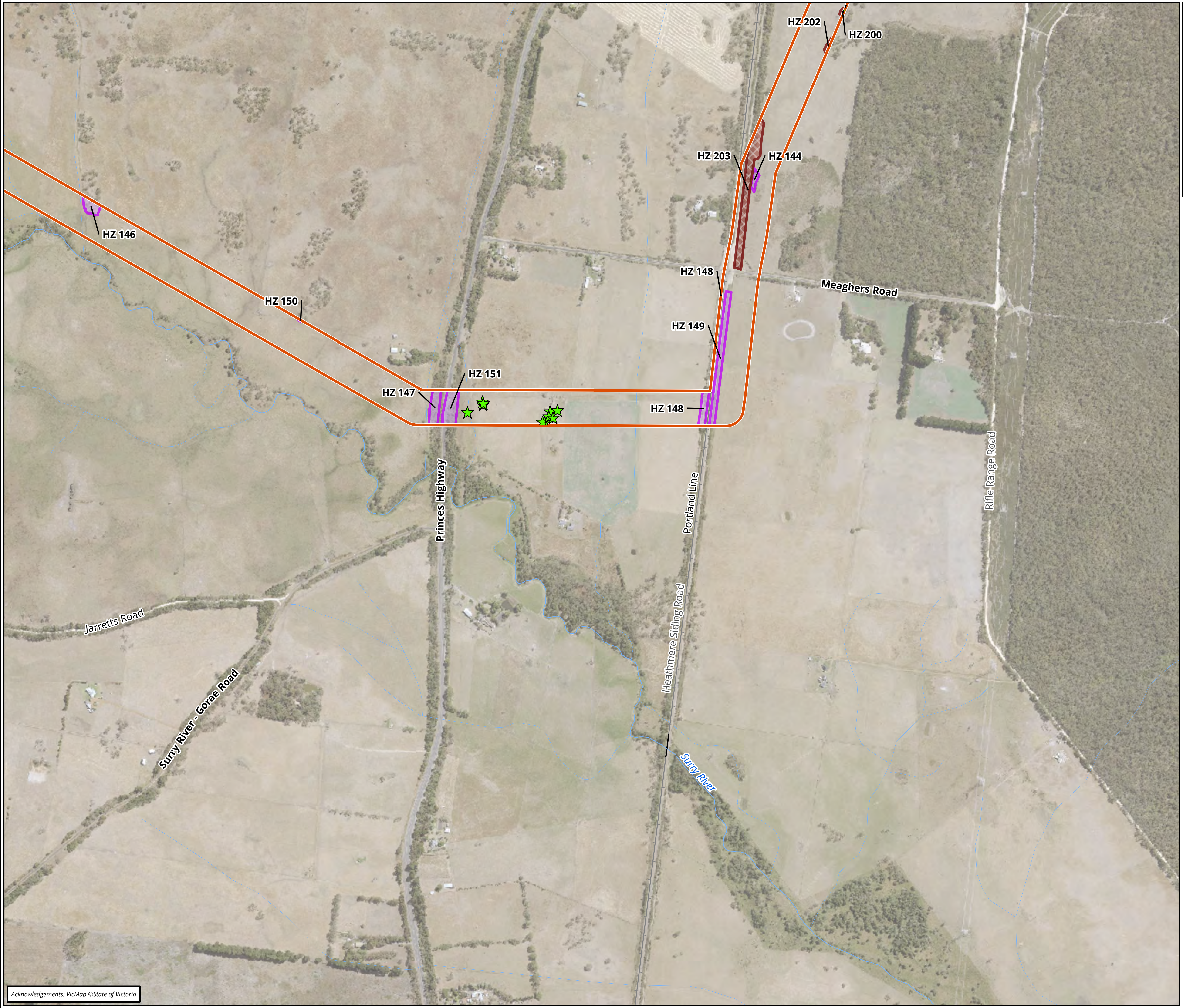
Scale: 1:10,000 @ A3

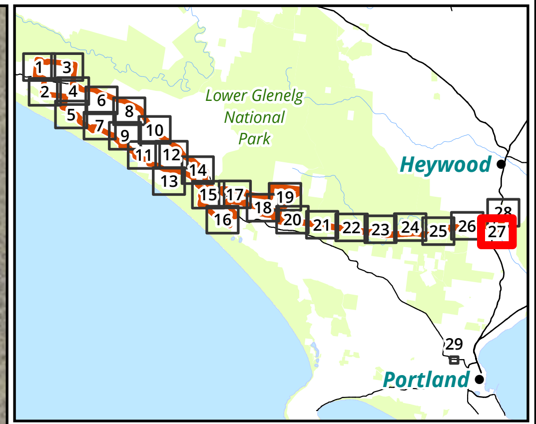
Coordinate System: GDA2020 MGA Zone 54

biosis

APEM Group

Matter: 35014,
Date: 20 November 2024,
Checked by: MSG, Drawn by: SP, Last edited by: jturner
Layout: F04a_Ecofeatures
Location: P:\35000s\35014\Mapping\35014_Kentbruck_Flora.aprx





Legend

Project area

Trees

Large patch tree

Scattered tree

Ecological vegetation classes (EVCs)

3 Damp Sands Herb-rich Woodland

23 Herb-rich Foothill Forest

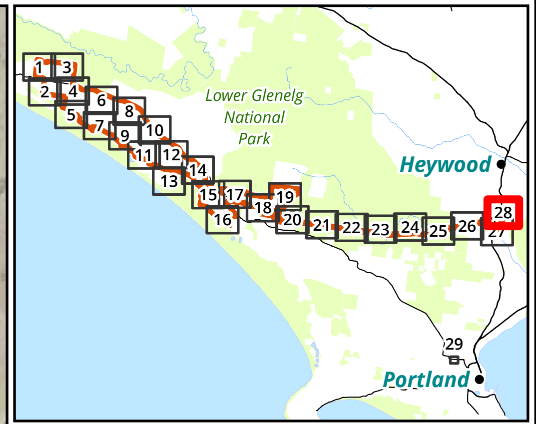
Figure 4a.27 Native vegetation within the project area

0 100 200 300 400 500 Metres

Scale: 1:10,000 @ A3

Coordinate System: GDA2020 MGA Zone 54

Matter: 35014,
Date: 20 November 2024,
Checked by: MSG, Drawn by: SP, Last edited by: jturner
Layout: F04a_Ecofeatures
Location: P:\35000s\35014\Mapping\35014_Kentbruck_Flora.aprx



Legend

Project area

Trees

Large patch tree

Scattered tree

Ecological vegetation classes (EVCs)

3 Damp Sands Herb-rich Woodland

16 Lowland Forest

23 Herb-rich Foothill Forest

48 Heathy Woodland

Figure 4a.28 Native vegetation within the project area

0 100 200 300 400 500

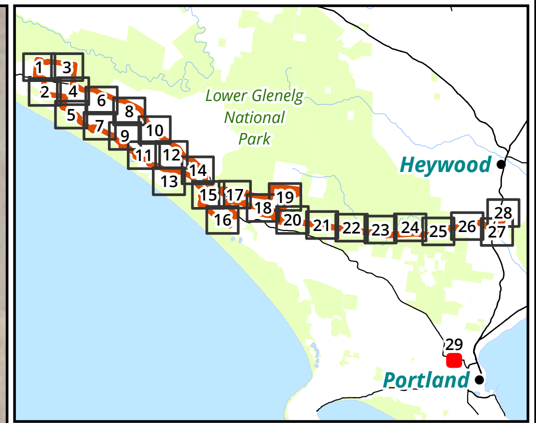
Metres

N

Scale: 1:10,000 @ A3

Coordinate System: GDA2020 MGA Zone 54

Matter: 35014,
Date: 20 November 2024,
Checked by: MSG, Drawn by: SP, Last edited by: jturner
Layout: F04a_Ecofeatures
Location: P:\35000s\35014\Mapping\
35014_Kentbruck_Flora.aprx



Legend

Project area

Ecological vegetation classes (EVCs)

23 Herb-rich Foothill Forest

Figure 4a.29 Native vegetation within the project area

0 100

Metres

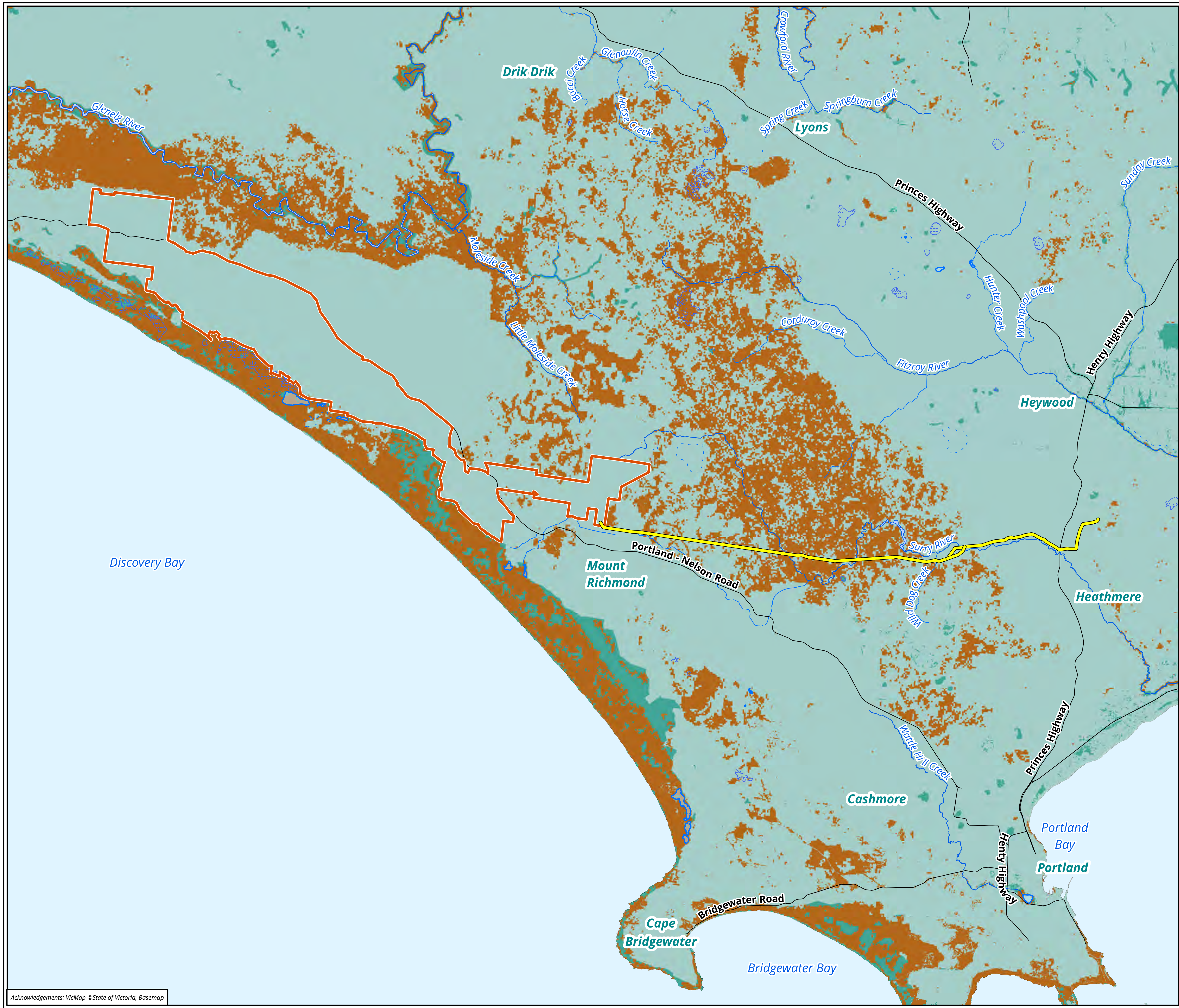
N

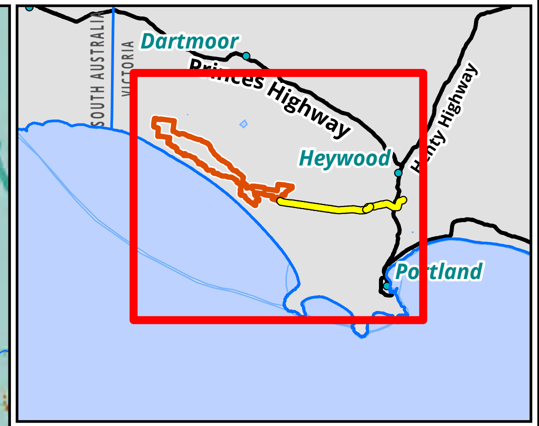
Scale: 1:2,500 @ A3

Coordinate System: GDA2020 MGA Zone 54

biosis APEM Group

Matter: 35014,
Date: 20 November 2024,
Checked by: MSG, Drawn by: SP, Last edited by: jturner
Layout: F04a_Ecofeatures
Location: P:\35000s\35014\Mapping\35014_Kentbruck_Flora.aprx





Legend

- Wind farm footprint
- Transmission line

Location category

- Location 1
- Location 2
- Location 3

Figure 4b Native vegetation location category

0 1 2 3 4 5
Kilometres
Scale: 1:175,000 @ A3
Coordinate System: GDA2020 MGA Zone 54

N

biosis
APEM Group

Matter: 31983,
Date: 22 August 2024,
Checked by: IV, Drawn by: JPT, Last edited by: jturner
Layout: F04b_LocationRisk
Location: P:\35000s\35014\Mapping\
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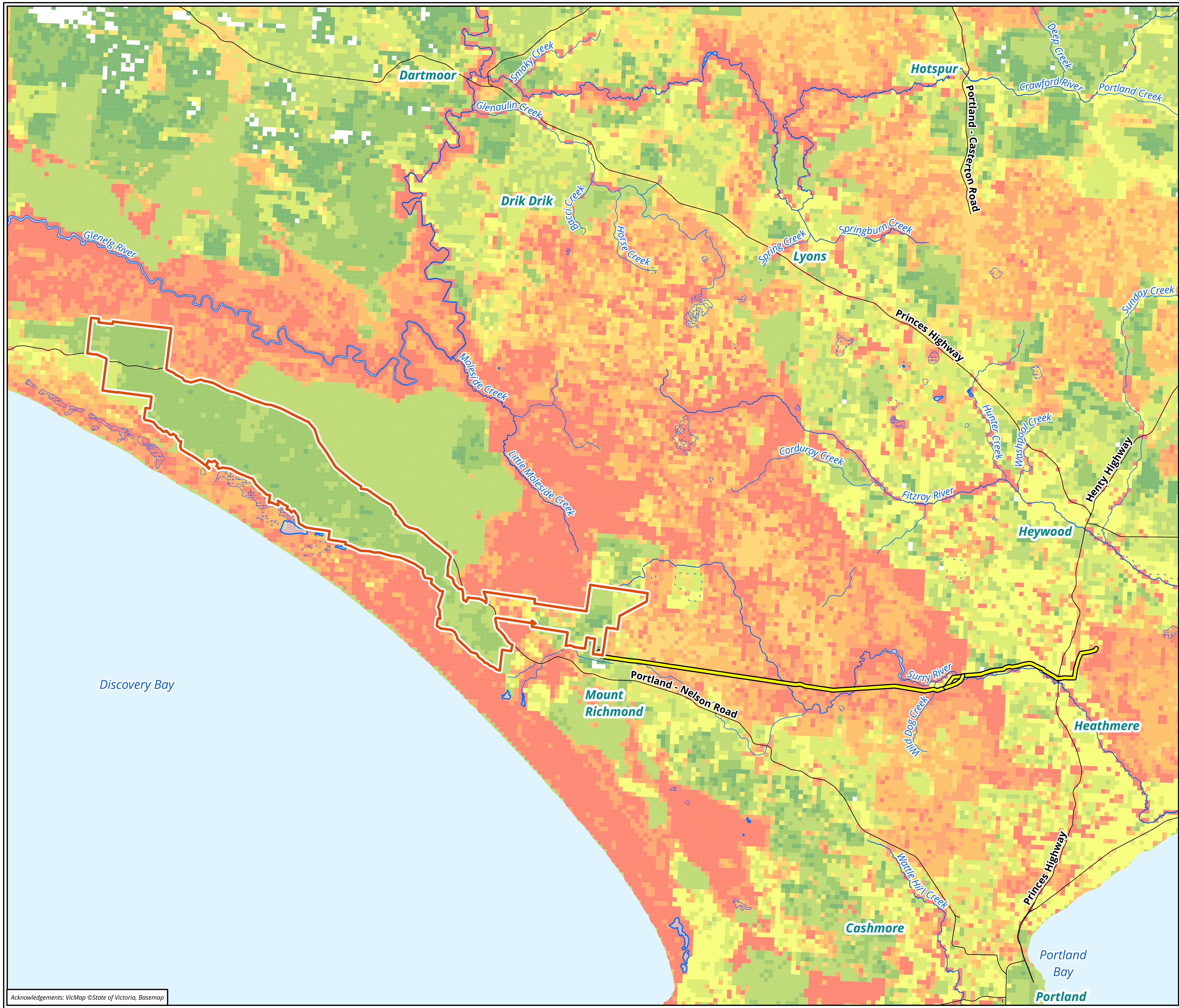

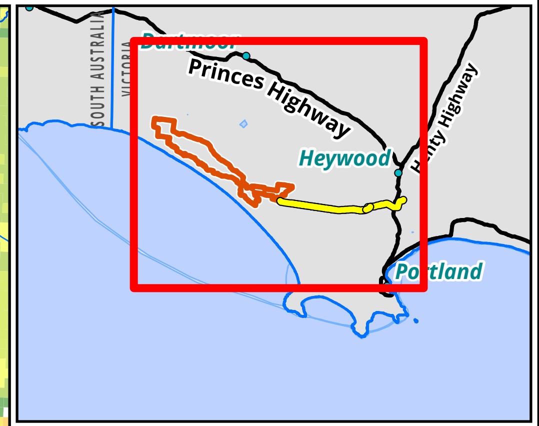

Legend

- Wind farm footprint
- Transmission line

NVR Strategic Biodiversity Score (2017)

- ≤10
- ≤20
- ≤30
- ≤40
- ≤50
- ≤60
- ≤70
- ≤80
- ≤90
- ≤100

Figure 4c Strategic biodiversity value

0 1 2 3 4 5
Kilometres
Scale: 1:175,000 @ A3
Coordinate System: GDA2020 MGA Zone 54

N

biosis
APEM Group

Matter: 31983,
Date: 22 August 2024,
Checked by: IV, Drawn by: JPT, Last edited by: jturner
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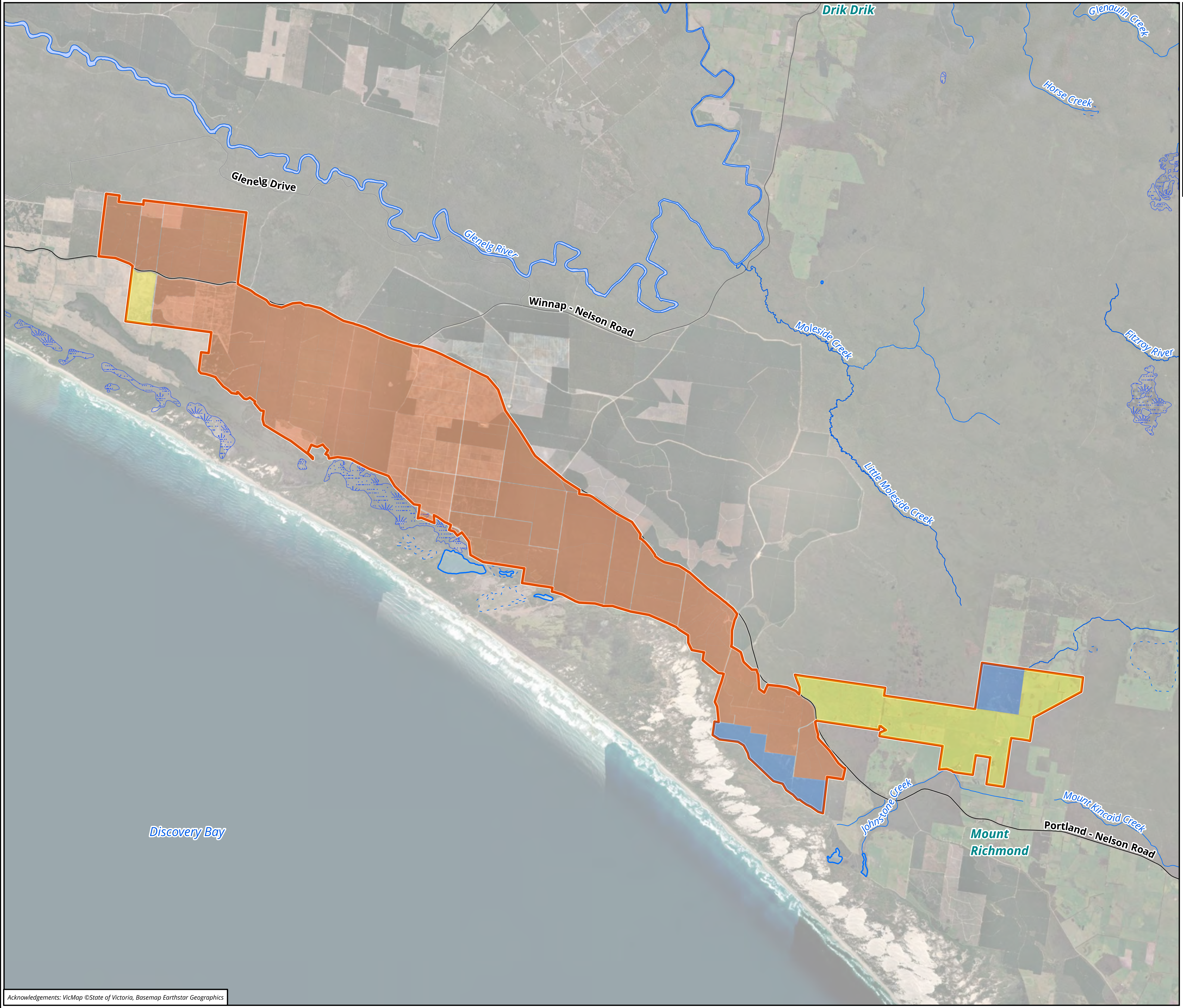
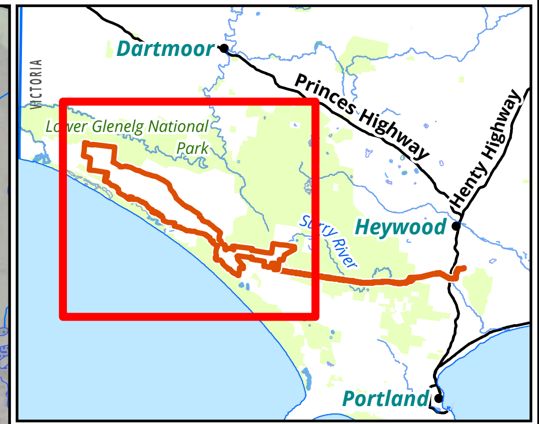


Acknowledgements: VicMap ©State of Victoria, Basemap Earthstar Geographics



Legend

Wind farm footprint

Land type

- Blue-gum plantation
- Farmland
- Pine plantation
- Remnant native vegetation

Figure 4d Wind farm land types

0 1 2 3 4 5 N

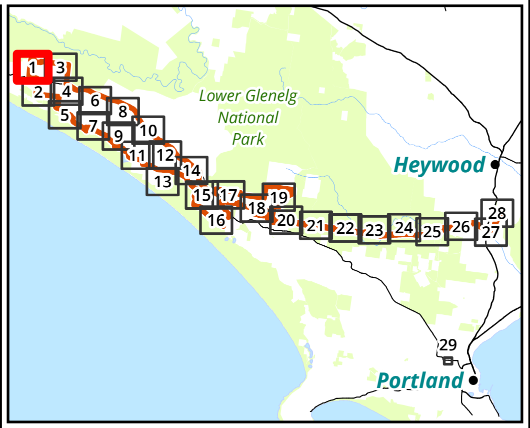
Kilometres

Scale: 1:100,000 @ A3

Coordinate System: GDA2020 MGA Zone 54

biosis APEM Group

Matter: 35014,
Date: 22 August 2024,
Checked by: IV, Drawn by: JPT, Last edited by: jturner
Layout: F04d_LandTypes
Location: P:\35000s\35014\Mapping\
35014_Kentbruck_Flora.aprx



Legend

Project area

Impact area

Full vegetation removal

Native vegetation removal

Patch vegetation proposed to be removed

Ecological vegetation classes (EVCs)

3 Damp Sands Herb-rich Woodland

858 Coastal Alkaline Scrub

Figure 4e.1 Vegetation proposed to be removed within the study area

0 100 200 300 400 500

Metres

N

Scale: 1:10,000 @ A3

Coordinate System: GDA2020 MGA Zone 54

Matter: 35014,
Date: 20 November 2024,
Checked by: MG, Drawn by: JPT, Last edited by: jturner
Layout: F04e_Veg_removal
Location: P:\35000s\35014\Mapping\
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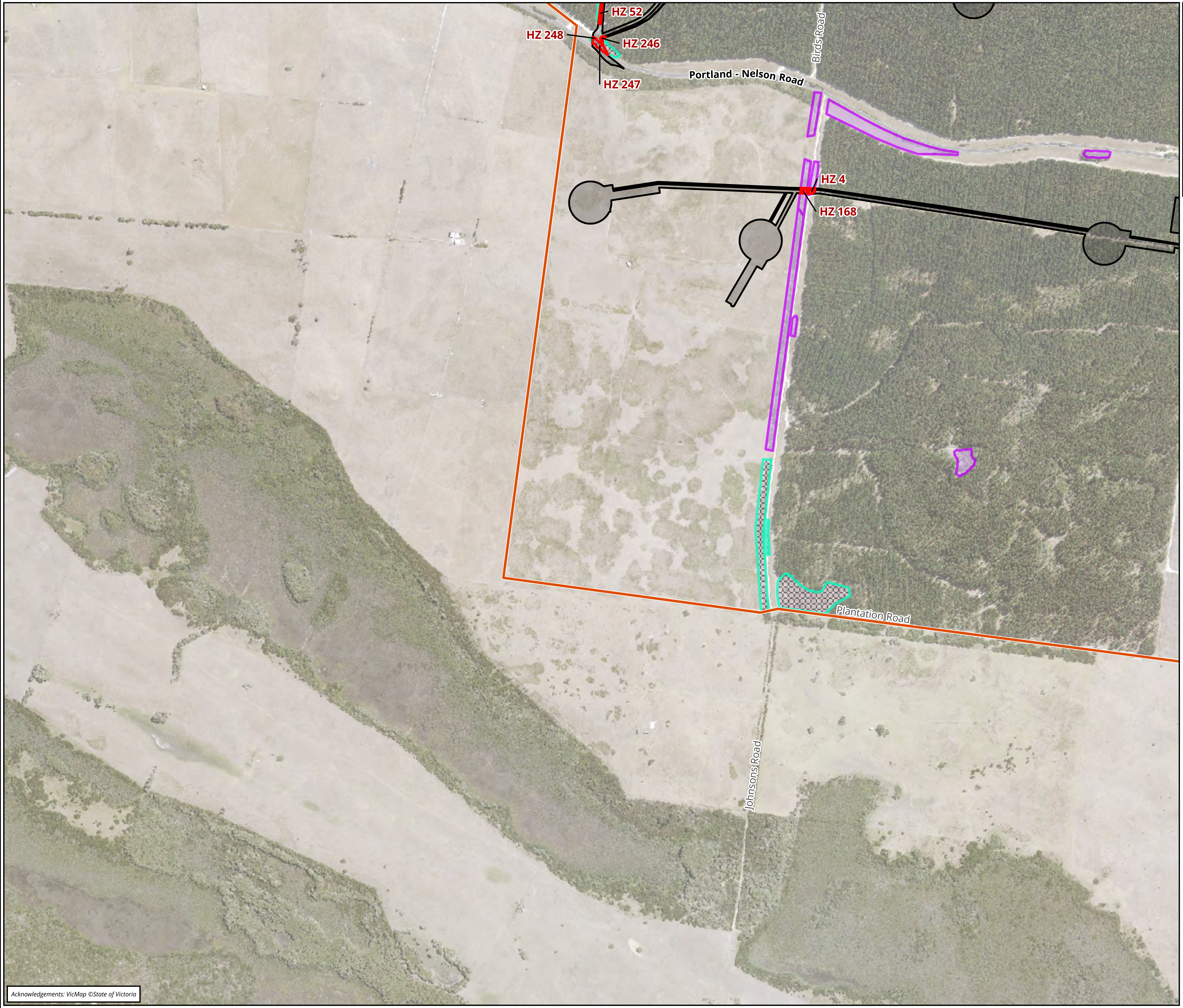
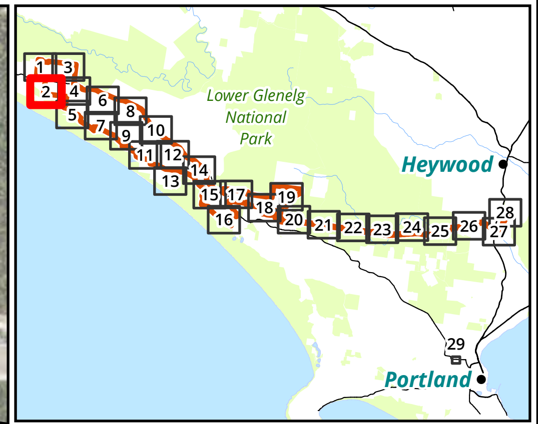




Legend

Project area

Impact area

Full vegetation removal

Native vegetation removal

Patch vegetation proposed to be removed

Ecological vegetation classes (EVCs)

3 Damp Sands Herb-rich Woodland

858 Coastal Alkaline Scrub

Figure 4e.2 Vegetation proposed to be removed within the study area

0 100 200 300 400 500

Metres

N

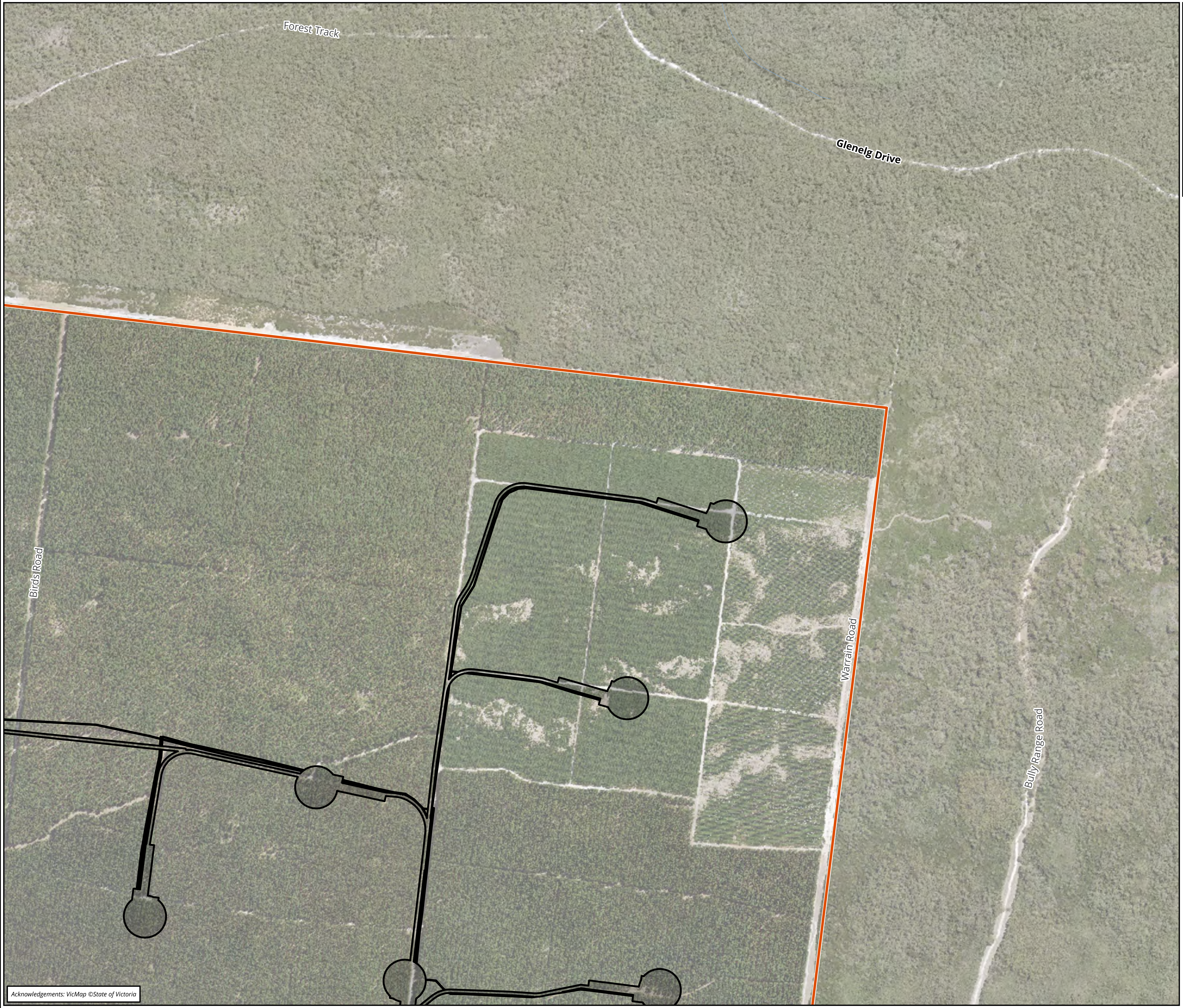
Scale: 1:10,000 @ A3

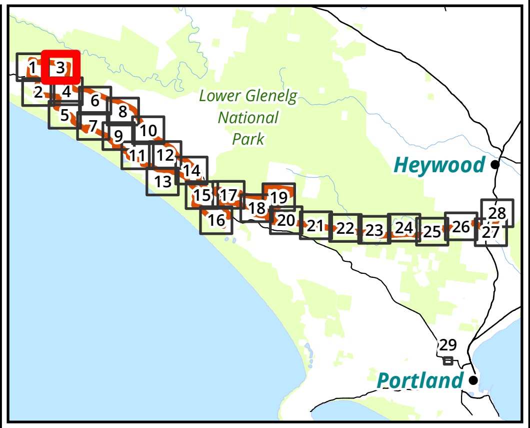
Coordinate System: GDA2020 MGA Zone 54

biosis

APEM Group

Matter: 35014,
Date: 20 November 2024,
Checked by: MG, Drawn by: JPT, Last edited by: jturner
Layout: F04e_Veg_removal
Location: P:\35000s\35014\Mapping\
35014_Kentbruck_Flora.aprx





Legend

Project area

Impact area

Full vegetation removal

Figure 4e.3 Vegetation proposed to be removed within the study area

0 100 200 300 400 500

Metres

N

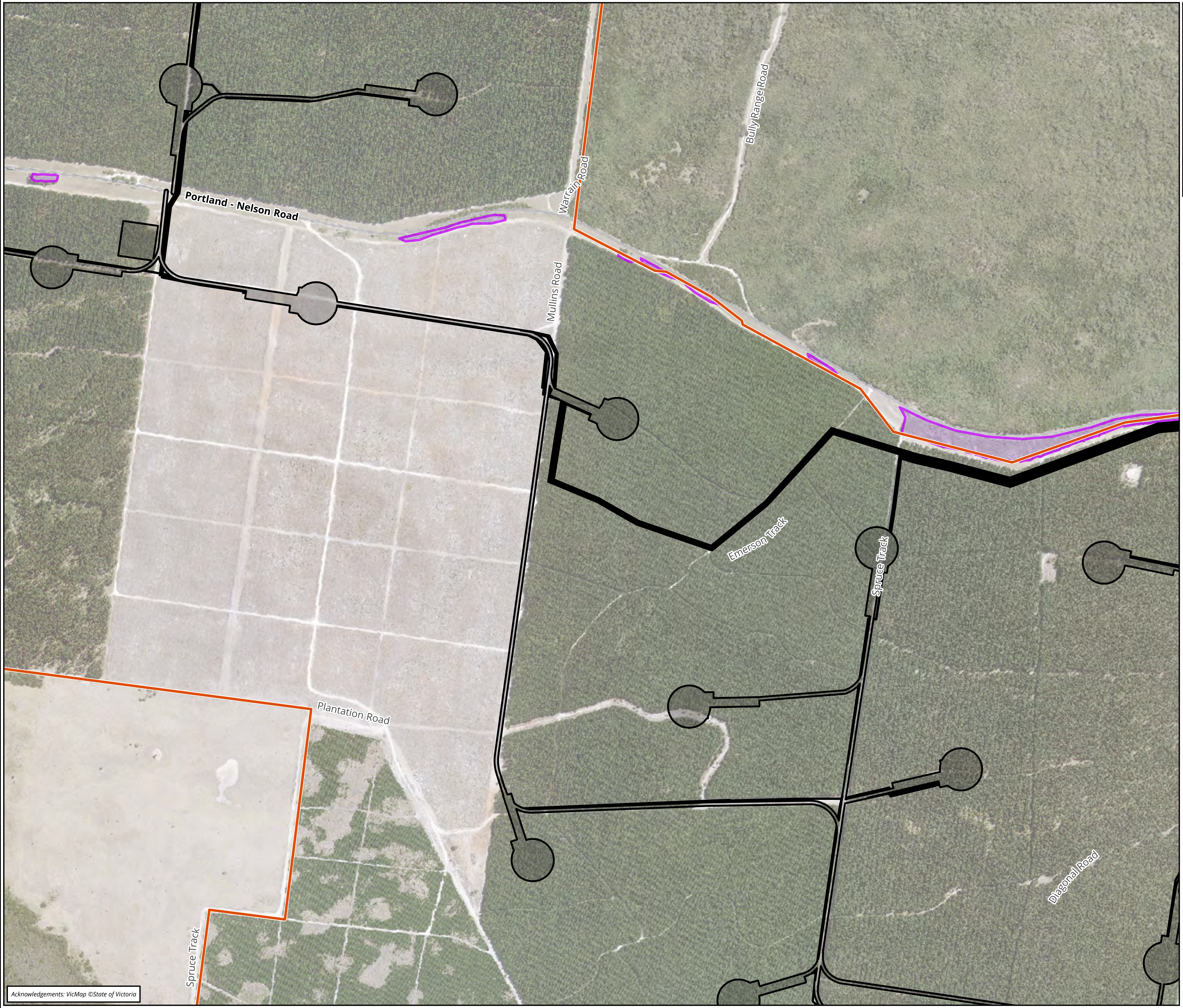
Scale: 1:10,000 @ A3

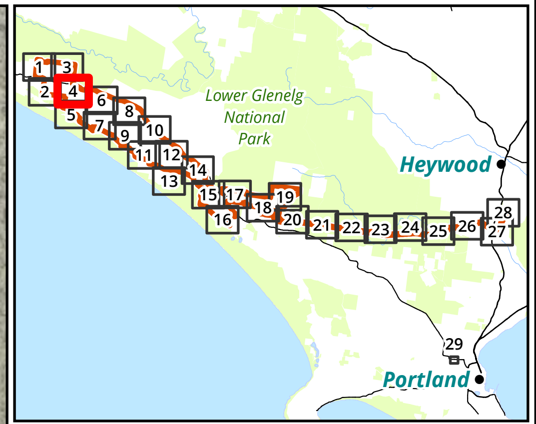
Coordinate System: GDA2020 MGA Zone 54

biosis

APEM Group

Matter: 35014,
Date: 20 November 2024,
Checked by: MG, Drawn by: JPT, Last edited by: jturner
Layout: F04e_Veg_removal
Location: P:\35000s\35014\Mapping\
35014_Kentbruck_Flora.aprx





Legend

Project area

Impact area

Full vegetation removal

Ecological vegetation classes (EVCs)

3 Damp Sands Herb-rich Woodland

858 Coastal Alkaline Scrub

Figure 4e.4 Vegetation proposed to be removed within the study area

0 100 200 300 400 500

Metres

N

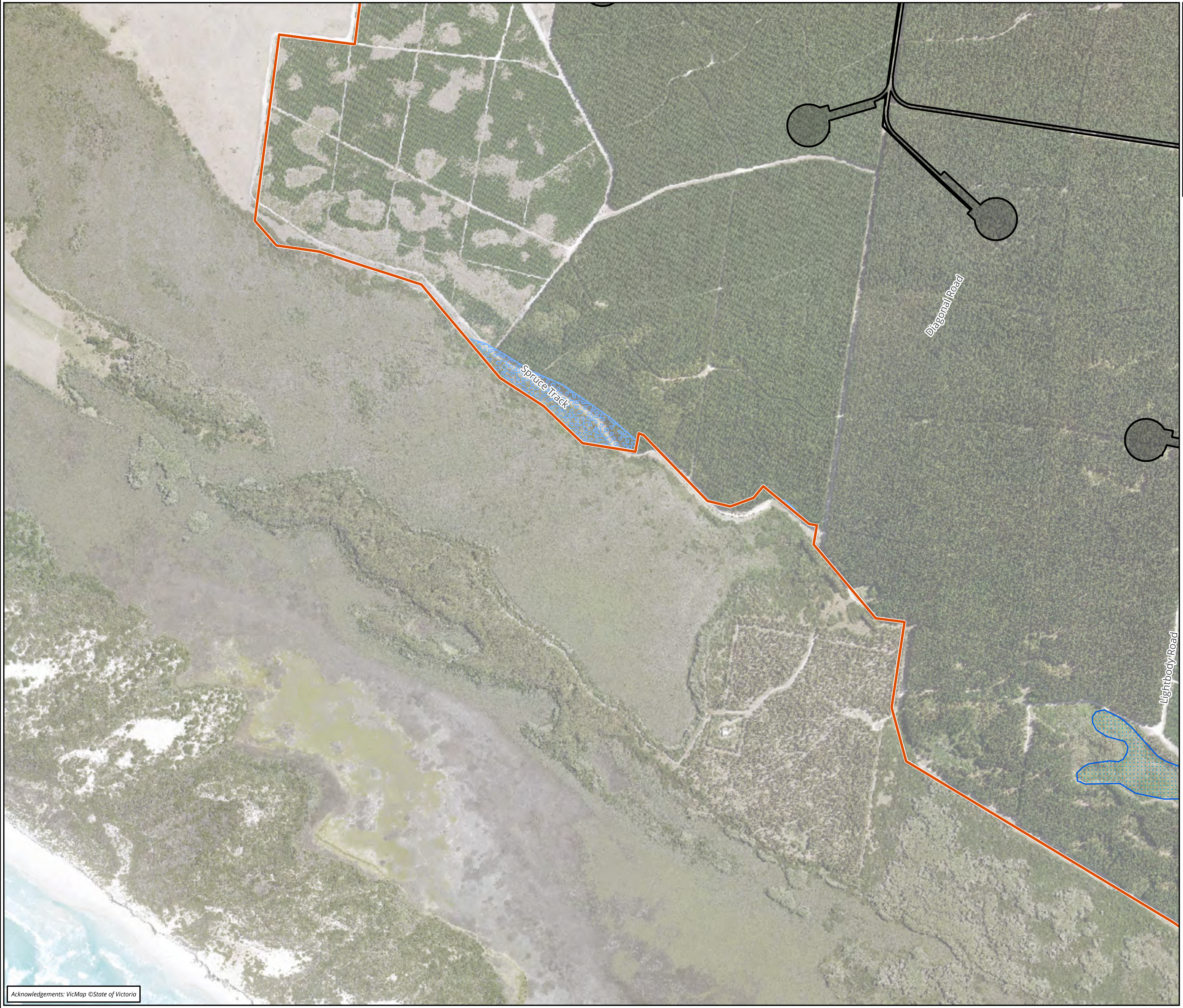
Scale: 1:10,000 @ A3

Coordinate System: GDA2020 MGA Zone 54

biosis

APEM Group

Matter: 35014,
Date: 20 November 2024,
Checked by: MG, Drawn by: JPT, Last edited by: jturner
Layout: F04e_Veg_removal
Location: P:\35000s\35014\Mapping\
35014_Kentbruck_Flora.aprx



Legend

Project area

Impact area

Full vegetation removal

Current wetlands (DEECA)

4 - Deep freshwater marsh

99 - No Category

Figure 4e.5 Vegetation proposed to be removed within the study area

0 100 200 300 400 500

Metres

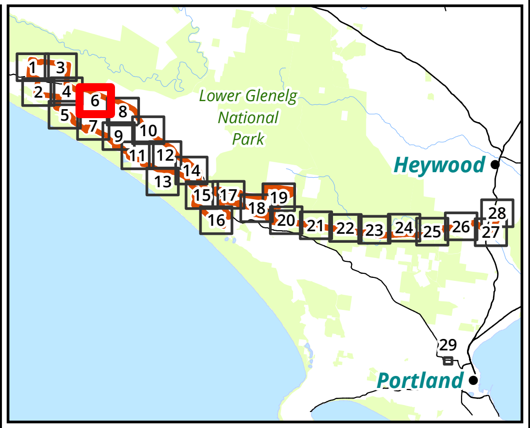
Scale: 1:10,000 @ A3

Coordinate System: GDA2020 MGA Zone 54

biosis

APEM Group

Matter: 35014,
Date: 20 November 2024,
Checked by: MG, Drawn by: JPT, Last edited by: jturner
Layout: F04e_Veg_removal
Location: P:\35000s\35014\Mapping\
35014_Kentbruck_Flora.aprx



Legend

Project area

Impact area

Full vegetation removal

Vegetation removal above 3 m height (275 kV overhead transmission line corridor)

Native vegetation removal

Patch vegetation proposed to be removed

Ecological vegetation classes (EVCs)

3 Damp Sands Herb-rich Woodland

858 Coastal Alkaline Scrub

Figure 4e.6 Vegetation proposed to be removed within the study area

0 100 200 300 400 500

Metres

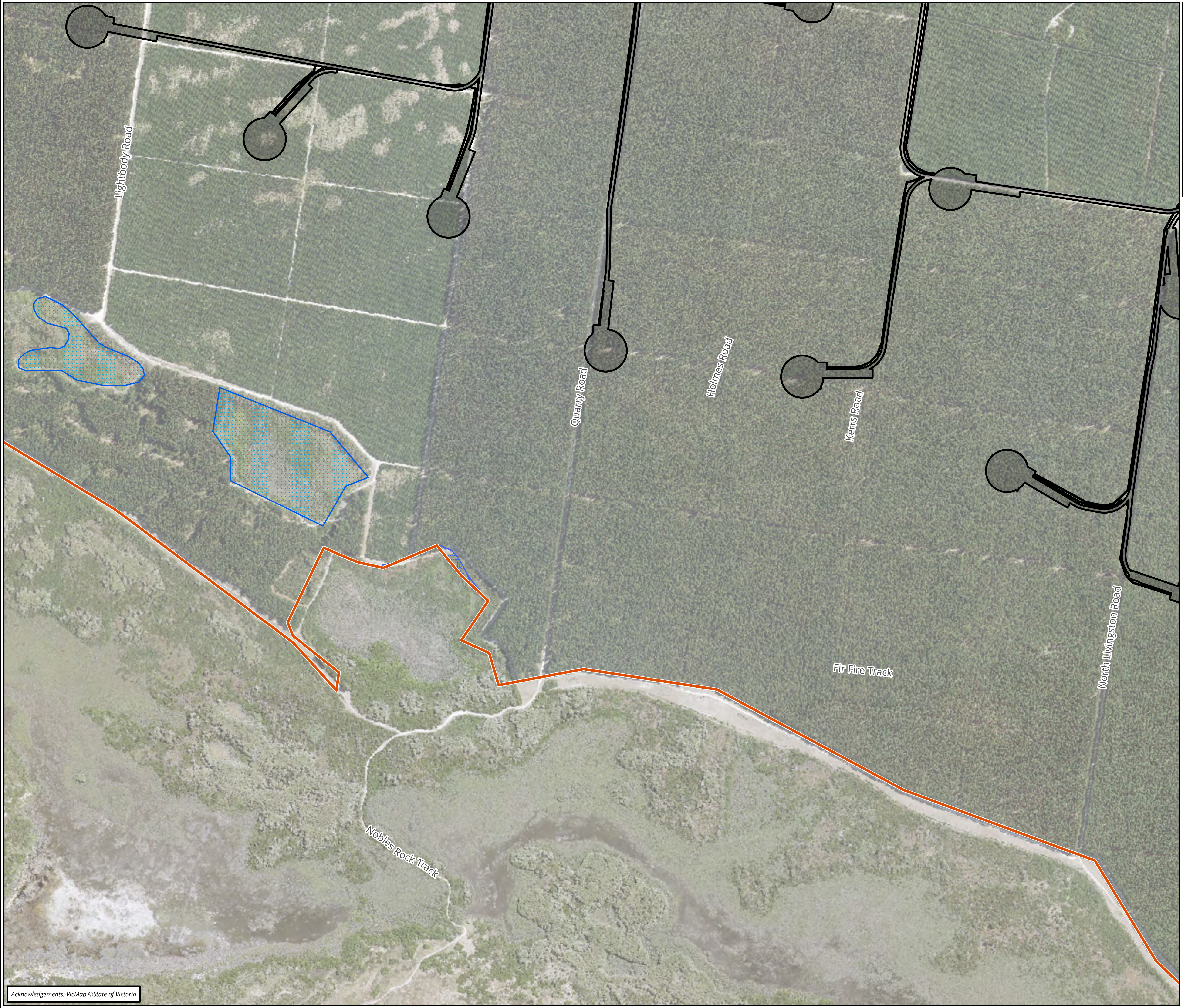
N

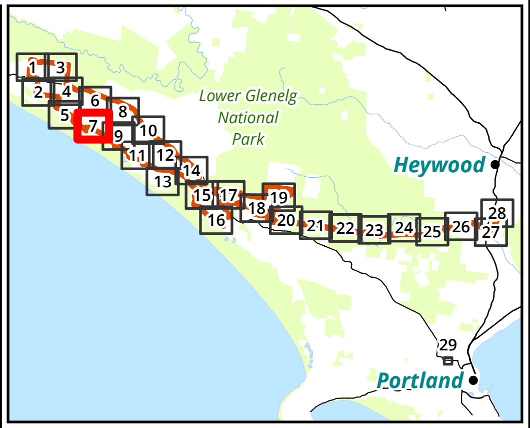
Scale: 1:10,000 @ A3

Coordinate System: GDA2020 MGA Zone 54

biosis APEM Group

Matter: 35014,
Date: 20 November 2024,
Checked by: MG, Drawn by: JPT, Last edited by: jturner
Layout: F04e_Veg_removal
Location: P:\35000s\35014\Mapping\
35014_Kentbruck_Flora.aprx





Legend

Project area

Impact area

Full vegetation removal

Current wetlands (DEECA)

2 - Freshwater meadow

99 - No Category

Figure 4e.7 Vegetation proposed to be removed within the study area

0 100 200 300 400 500

Metres

N

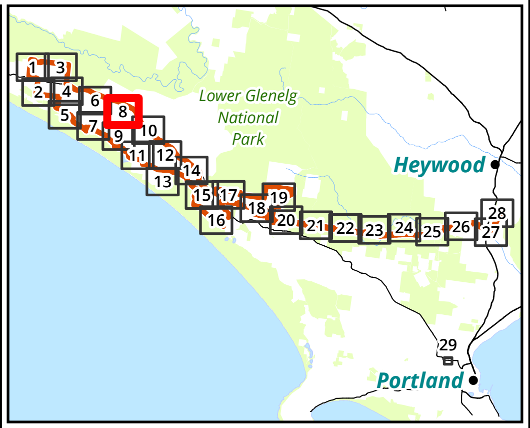
Scale: 1:10,000 @ A3

Coordinate System: GDA2020 MGA Zone 54

biosis

APEM Group

Matter: 35014,
Date: 20 November 2024,
Checked by: MG, Drawn by: JPT, Last edited by: jturner
Layout: F04e_Veg_removal
Location: P:\35000s\35014\Mapping\
35014_Kentbruck_Flora.aprx



Legend

Project area

Impact area

Full vegetation removal

Vegetation removal above 3 m height (275 kV overhead transmission line corridor)

Native vegetation removal

Patch vegetation proposed to be removed

Ecological vegetation classes (EVCs)

3 Damp Sands Herb-rich Woodland

858 Coastal Alkaline Scrub

Figure 4e.8 Vegetation proposed to be removed within the study area

0 100 200 300 400 500

Metres

N

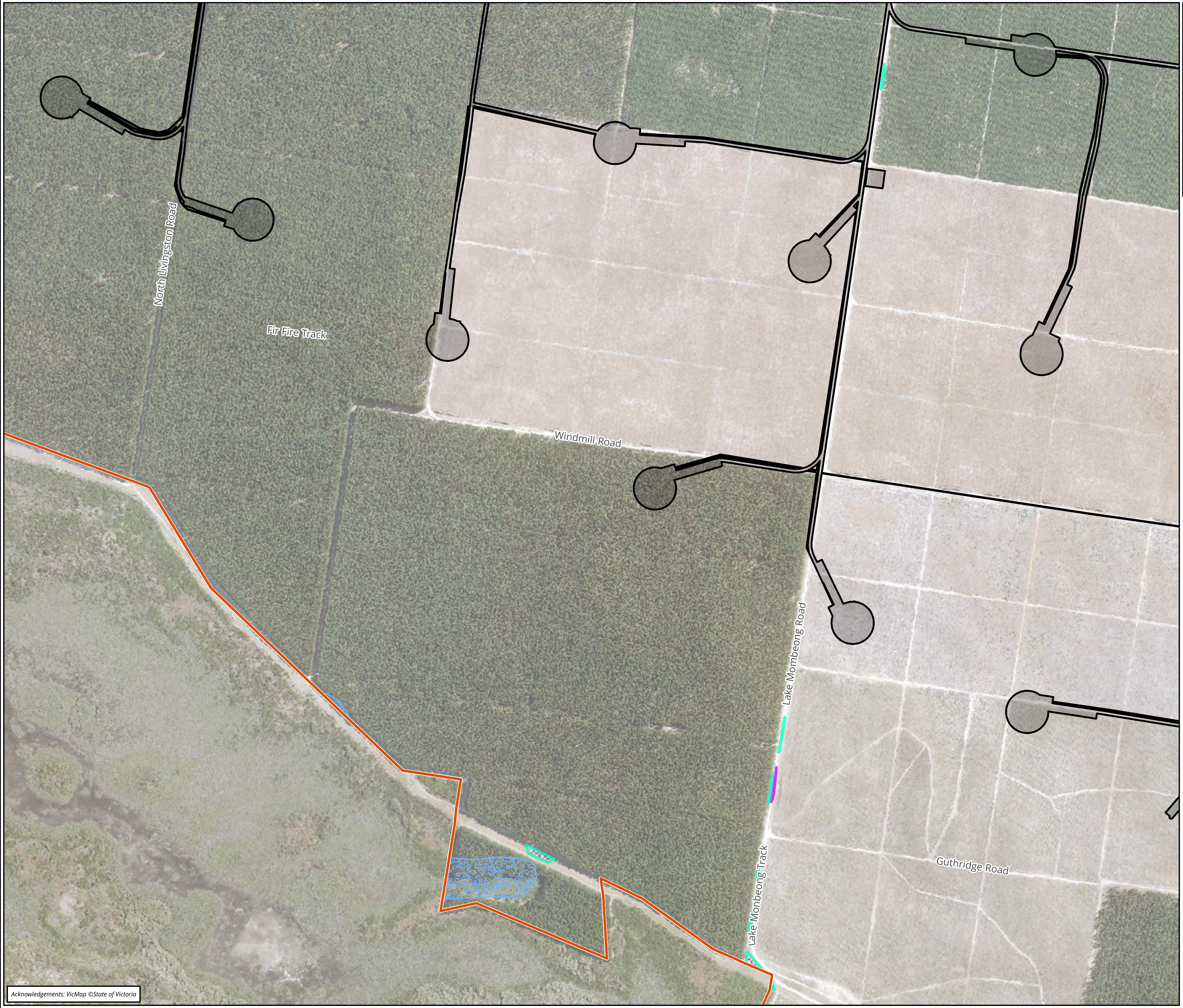
Scale: 1:10,000 @ A3

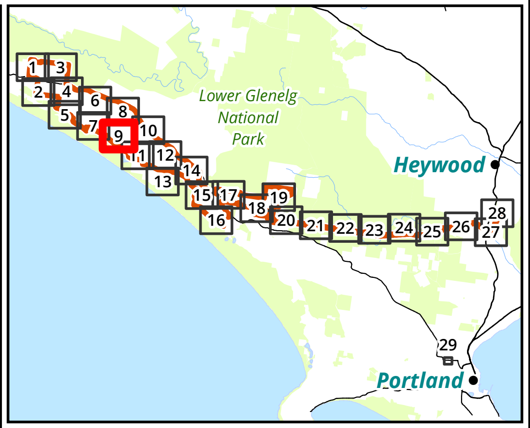
Coordinate System: GDA2020 MGA Zone 54

biosis

APEM Group

Matter: 35014,
Date: 20 November 2024,
Checked by: MG, Drawn by: JPT, Last edited by: jturner
Layout: F04e_Veg_removal
Location: P:\35000s\35014\Mapping\
35014_Kentbruck_Flora.aprx





Legend

Project area

Impact area

Full vegetation removal

Ecological vegetation classes (EVCs)

3 Damp Sands Herb-rich Woodland

858 Coastal Alkaline Scrub

Current wetlands (DEECA)

4 - Deep freshwater marsh

Figure 4e.9 Vegetation proposed to be removed within the study area

0 100 200 300 400 500

Metres

N

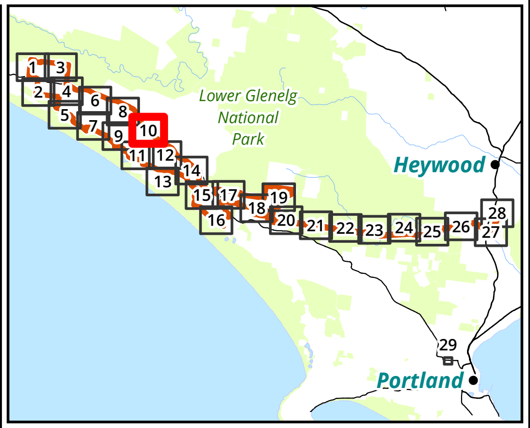
Scale: 1:10,000 @ A3

Coordinate System: GDA2020 MGA Zone 54

biosis

APEM Group

Matter: 35014,
Date: 20 November 2024,
Checked by: MG, Drawn by: JPT, Last edited by: jturner
Layout: F04e_Veg_removal
Location: P:\35000s\35014\Mapping\
35014_Kentbruck_Flora.aprx



Legend

Project area

Impact area

Full vegetation removal

Vegetation removal above 3 m height (275 kV overhead transmission line corridor)

Native vegetation removal

Patch vegetation proposed to be removed

Ecological vegetation classes (EVCs)

3 Damp Sands Herb-rich Woodland

858 Coastal Alkaline Scrub

Figure 4e.10 Vegetation proposed to be removed within the study area

0 100 200 300 400 500

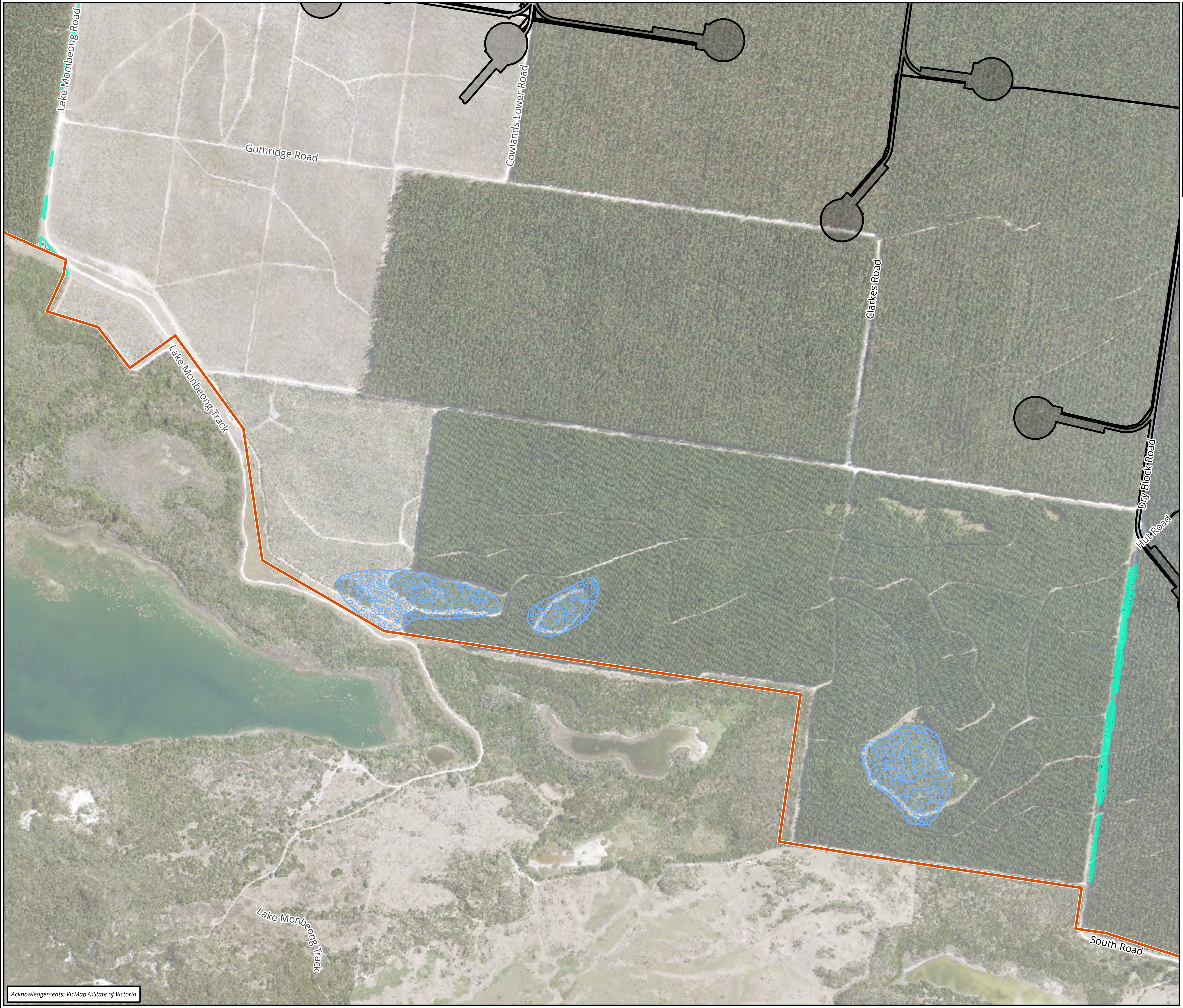
Metres

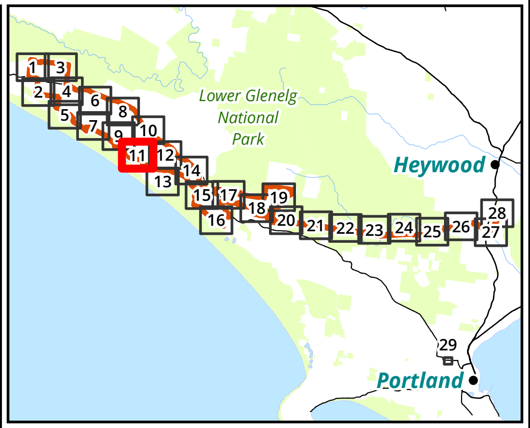
N

Scale: 1:10,000 @ A3

Coordinate System: GDA2020 MGA Zone 54

Matter: 35014,
Date: 20 November 2024,
Checked by: MG, Drawn by: JPT, Last edited by: jturner
Layout: F04e_Veg_removal
Location: P:\35000s\35014\Mapping\35014_Kentbruck_Flora.aprx





Legend

Project area

Impact area

Full vegetation removal

Ecological vegetation classes (EVCs)

3 Damp Sands Herb-rich Woodland

858 Coastal Alkaline Scrub

Current wetlands (DEECA)

4 - Deep freshwater marsh

Figure 4e.11 Vegetation proposed to be removed within the study area

0 100 200 300 400 500

Metres

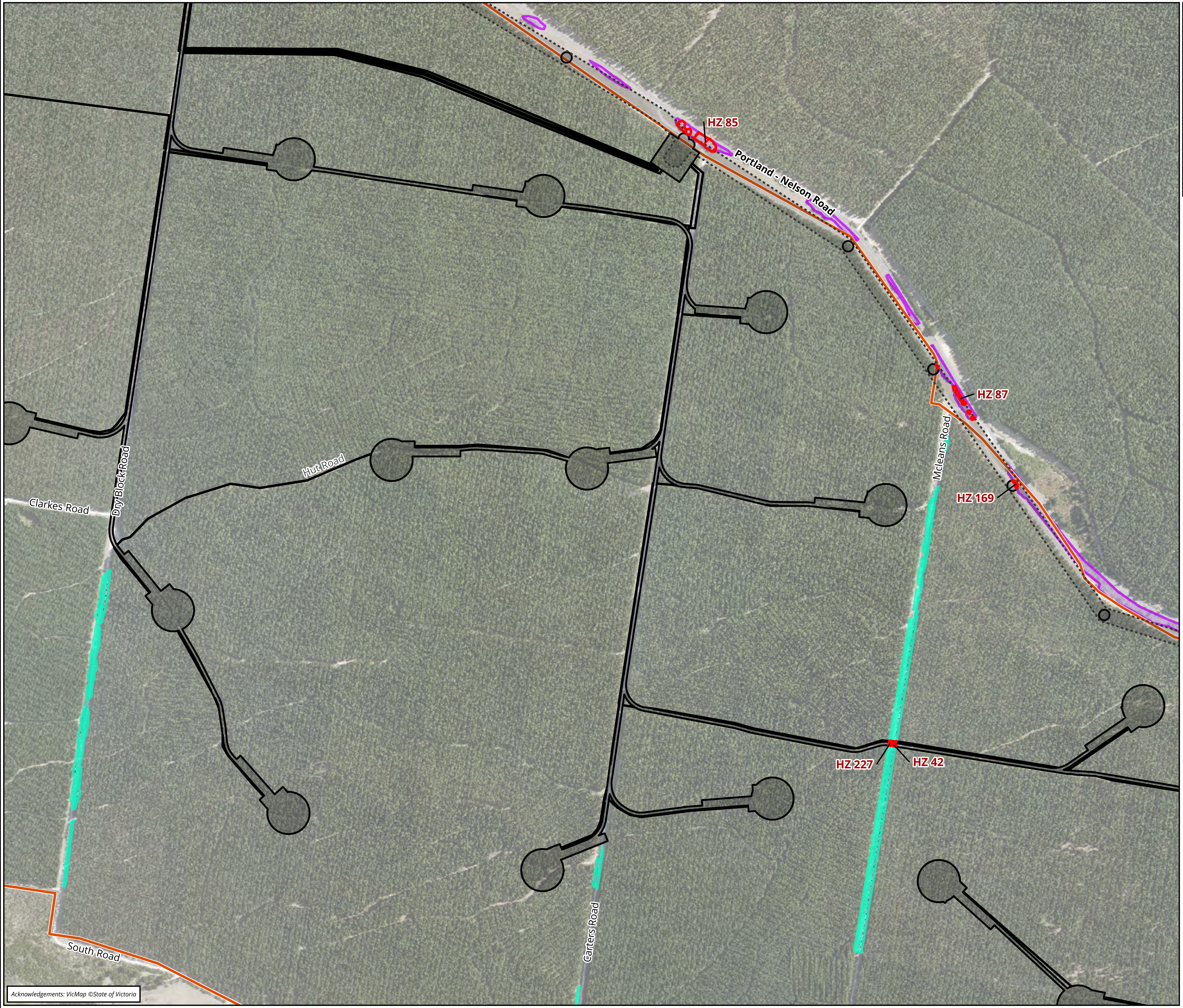
N

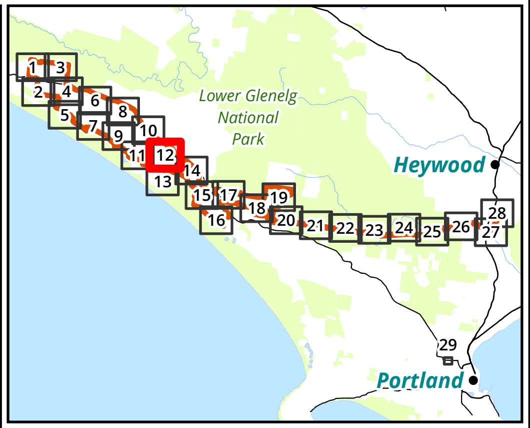
Scale: 1:10,000 @ A3

Coordinate System: GDA2020 MGA Zone 54

biosis
APEM Group

Matter: 35014,
Date: 20 November 2024,
Checked by: MG, Drawn by: JPT, Last edited by: jturner
Layout: F04e_Veg_removal
Location: P:\35000s\35014\Mapping\
35014_Kentbruck_Flora.aprx





Legend

Project area

Impact area

Full vegetation removal

Vegetation removal above 3 m height (275 kV overhead transmission line corridor)

Native vegetation removal

Patch vegetation proposed to be removed

Ecological vegetation classes (EVCs)

3 Damp Sands Herb-rich Woodland

858 Coastal Alkaline Scrub

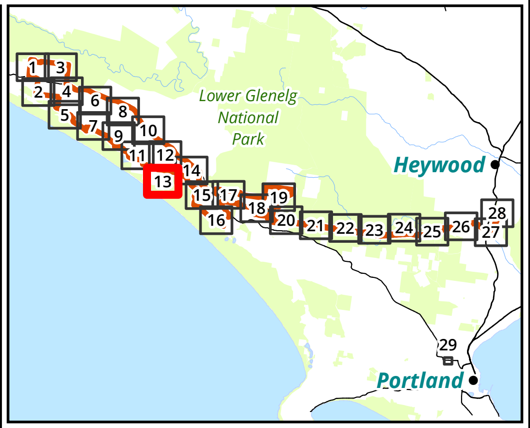
Figure 4e.12 Vegetation proposed to be removed within the study area

0 100 200 300 400 500
Metres

Scale: 1:10,000 @ A3
Coordinate System: GDA2020 MGA Zone 54

biosis APEM Group

Matter: 35014,
Date: 20 November 2024,
Checked by: MG, Drawn by: JPT, Last edited by: jturner
Layout: F04e_Veg_removal
Location: P:\35000s\35014\Mapping\
35014_Kentbruck_Flora.aprx



Legend

Project area

Impact area

Full vegetation removal

Ecological vegetation classes (EVCs)

858 Coastal Alkaline Scrub

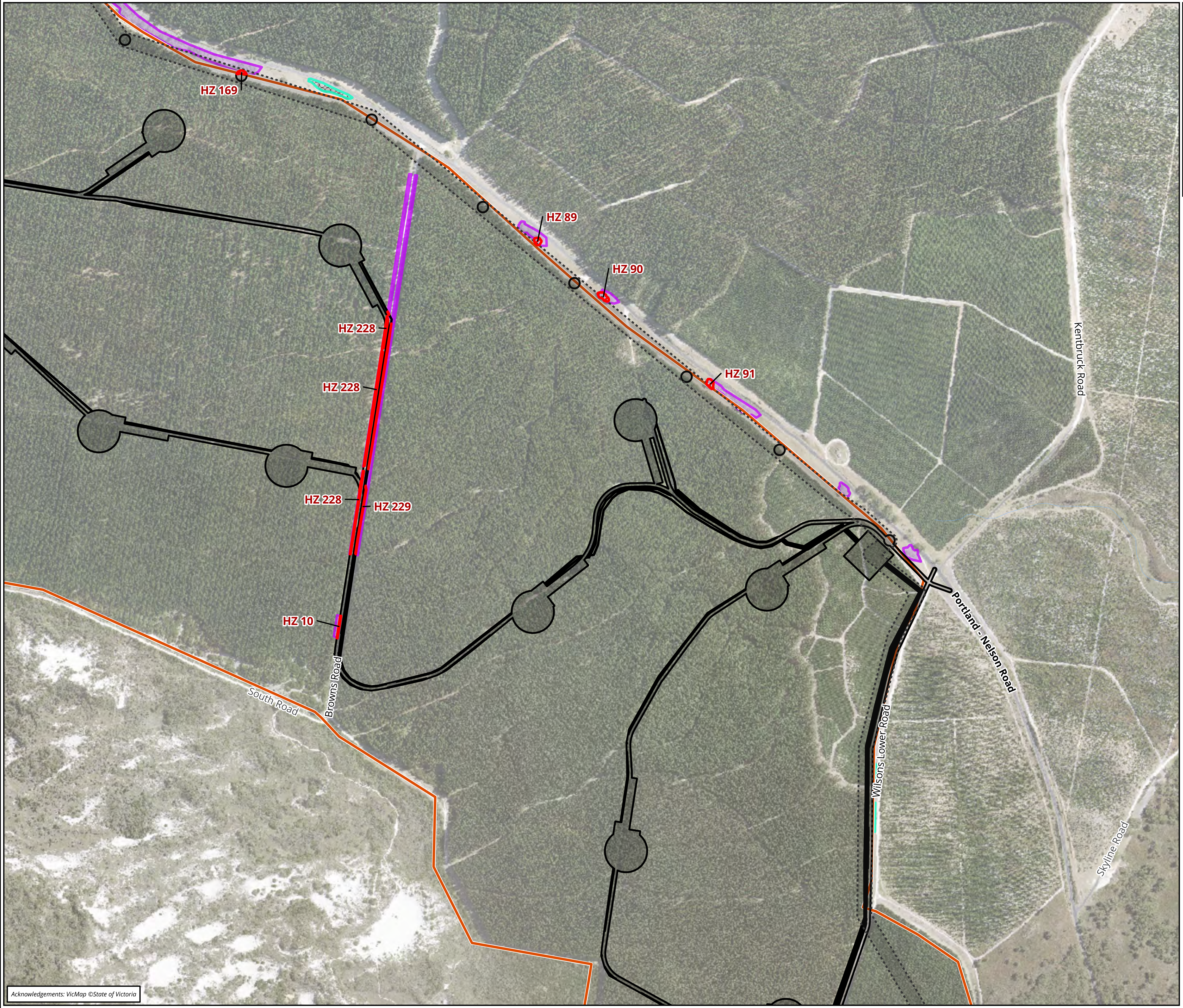
Figure 4e.13 Vegetation proposed to be removed within the study area

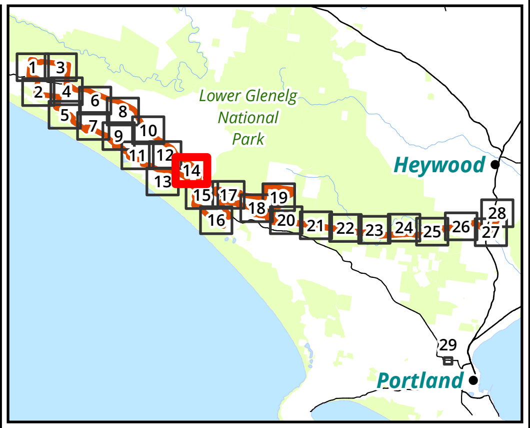
0 100 200 300 400 500
Metres

Scale: 1:10,000 @ A3
Coordinate System: GDA2020 MGA Zone 54

biosis
APEM Group

Matter: 35014,
Date: 20 November 2024,
Checked by: MG, Drawn by: JPT, Last edited by: jturner
Layout: F04e_Veg_removal
Location: P:\35000s\35014\Mapping\35014_Kentbruck_Flora.aprx





Legend

Project area

Impact area

Full vegetation removal

Vegetation removal above 3 m height (275 kV overhead transmission line corridor)

Native vegetation removal

Patch vegetation proposed to be removed

Ecological vegetation classes (EVCs)

3 Damp Sands Herb-rich Woodland

858 Coastal Alkaline Scrub

Figure 4e.14 Vegetation proposed to be removed within the study area

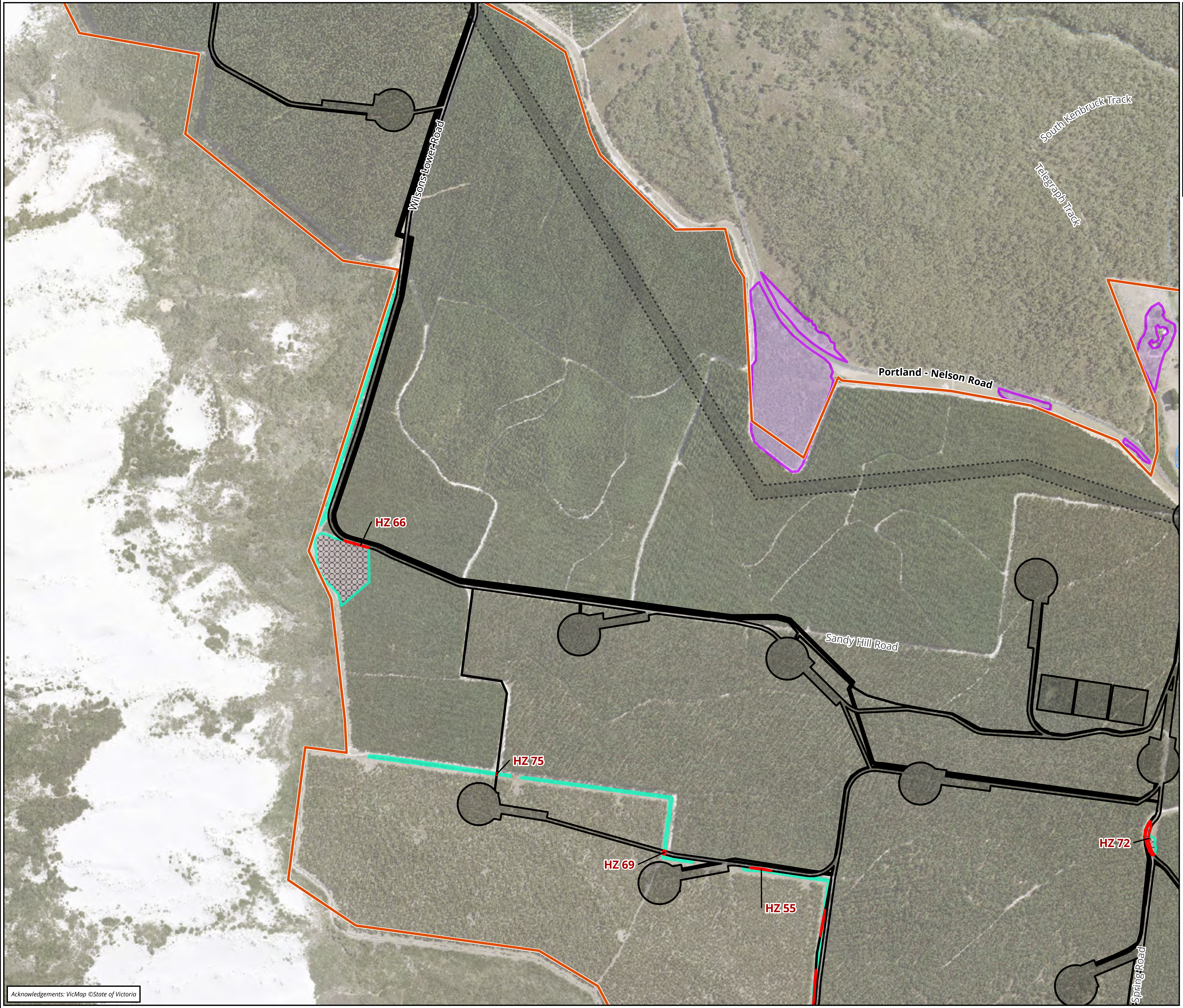
0 100 200 300 400 500
Metres

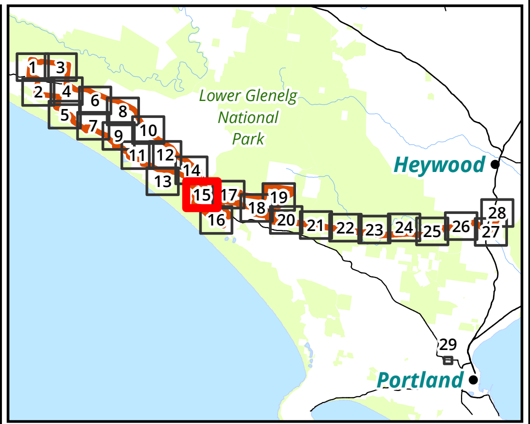
Scale: 1:10,000 @ A3

Coordinate System: GDA2020 MGA Zone 54

biosis. APEM Group

Matter: 35014,
Date: 20 November 2024,
Checked by: MG, Drawn by: JPT, Last edited by: jturner
Layout: F04e_Veg_removal
Location: P:\35000s\35014\Mapping\35014_Kentbruck_Flora.aprx





Legend

Project area

Impact area

Full vegetation removal

Vegetation removal above 3 m height (275 kV overhead transmission line corridor)

Native vegetation removal

Patch vegetation proposed to be removed

Ecological vegetation classes (EVCs)

3 Damp Sands Herb-rich Woodland

858 Coastal Alkaline Scrub

Current wetlands (DEECA)

4 - Deep freshwater marsh

Figure 4e.15 Vegetation proposed to be removed within the study area

0 100 200 300 400 500

Metres

N

Scale: 1:10,000 @ A3

Coordinate System: GDA2020 MGA Zone 54

Matter: 35014,
Date: 20 November 2024,
Checked by: MG, Drawn by: JPT, Last edited by: jturner
Layout: F04e_Veg_removal
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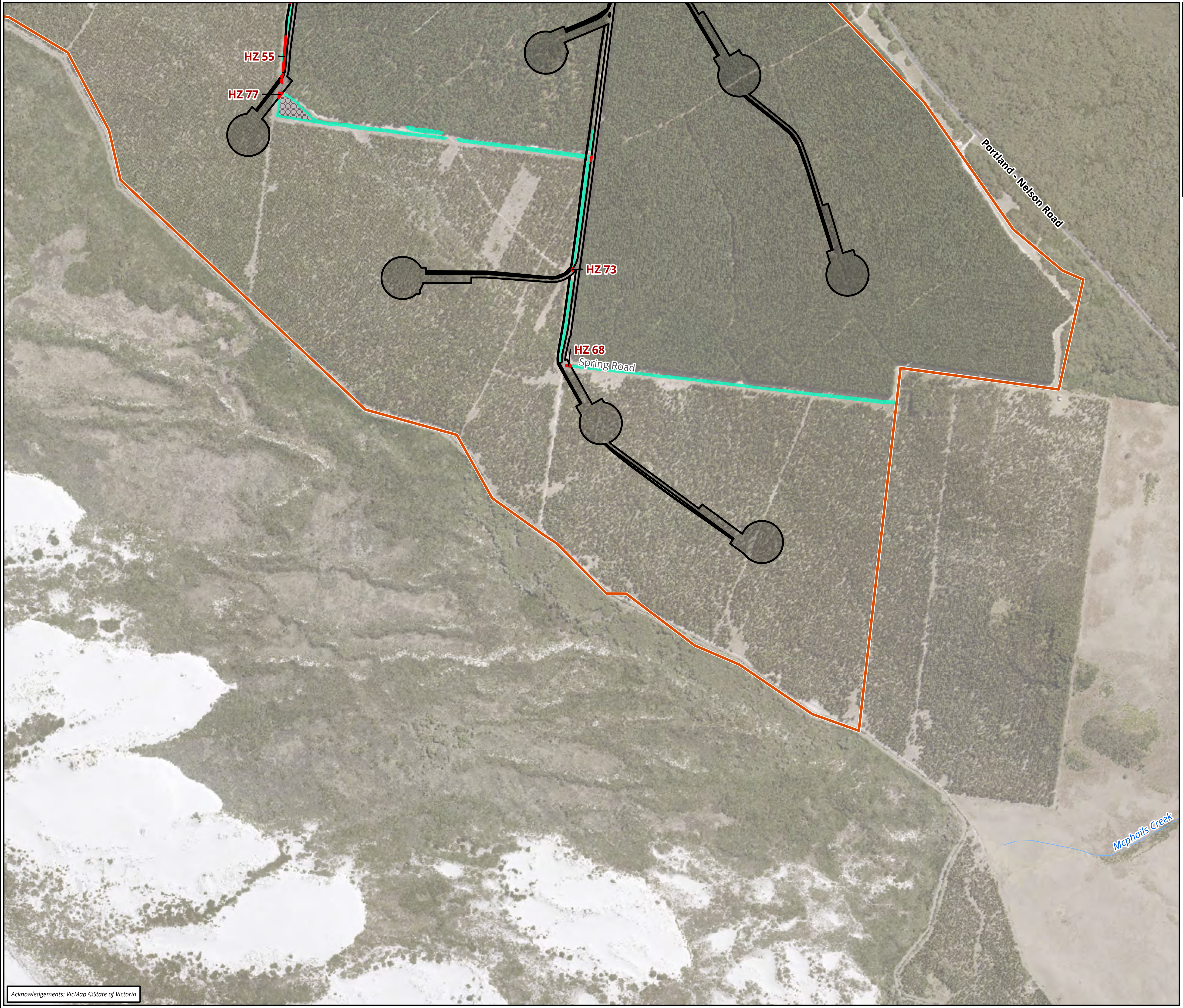
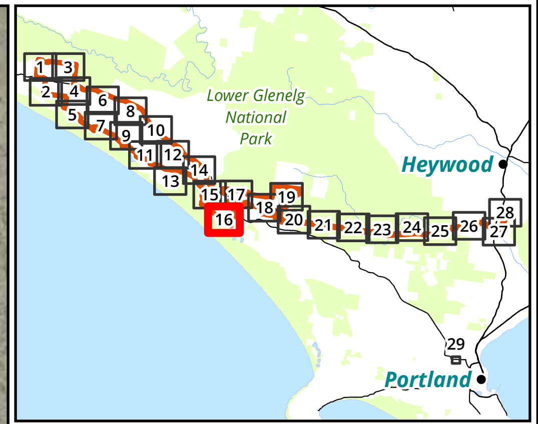




Legend

Project area

Impact area

Full vegetation removal

Native vegetation removal

Patch vegetation proposed to be removed

Ecological vegetation classes (EVCs)

858 Coastal Alkaline Scrub

Figure 4e.16 Vegetation proposed to be removed within the study area

0 100 200 300 400 500

Metres

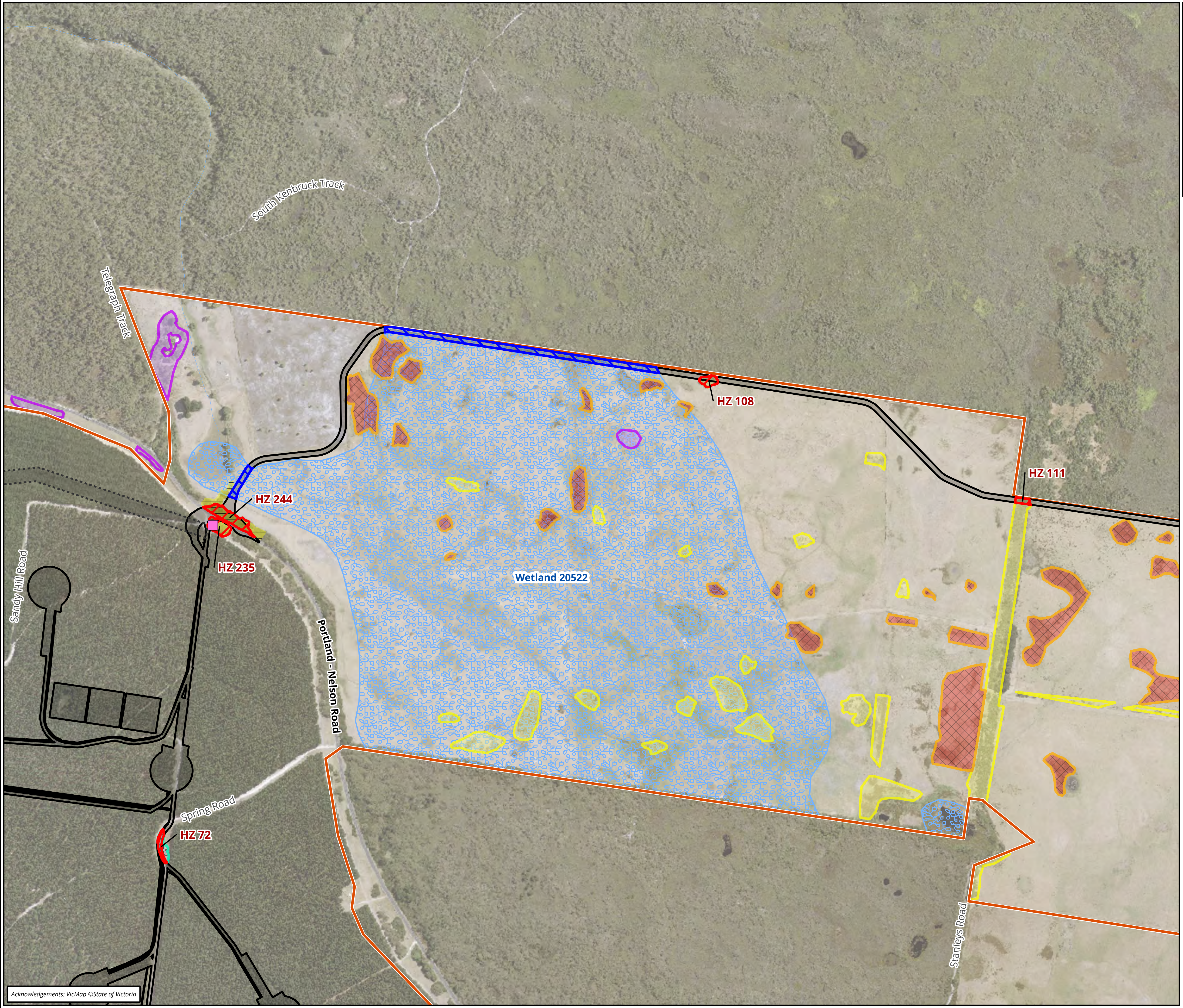
N

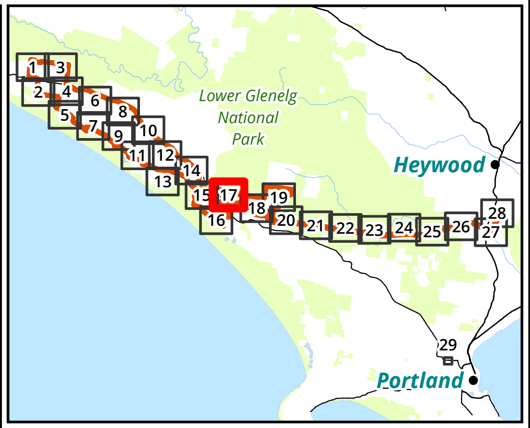
Scale: 1:10,000 @ A3

Coordinate System: GDA2020 MGA Zone 54

biosis APEM Group

Matter: 35014,
Date: 20 November 2024,
Checked by: MG, Drawn by: JPT, Last edited by: jturner
Layout: F04e_Veg_removal
Location: P:\35000s\35014\Mapping\35014_Kentbruck_Flora.aprx





Legend

Project area

Impact area

Full vegetation removal

Vegetation removal above 3 m height (275 kV overhead transmission line corridor)

Native vegetation removal

Patch vegetation proposed to be removed

Current wetland proposed to be impacted

Large canopy trees impacted

Other eucalypt

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

Current wetlands (DEECA)

4 - Deep freshwater marsh

Figure 4e.17 Vegetation proposed to be removed within the study area

0 100 200 300 400 500

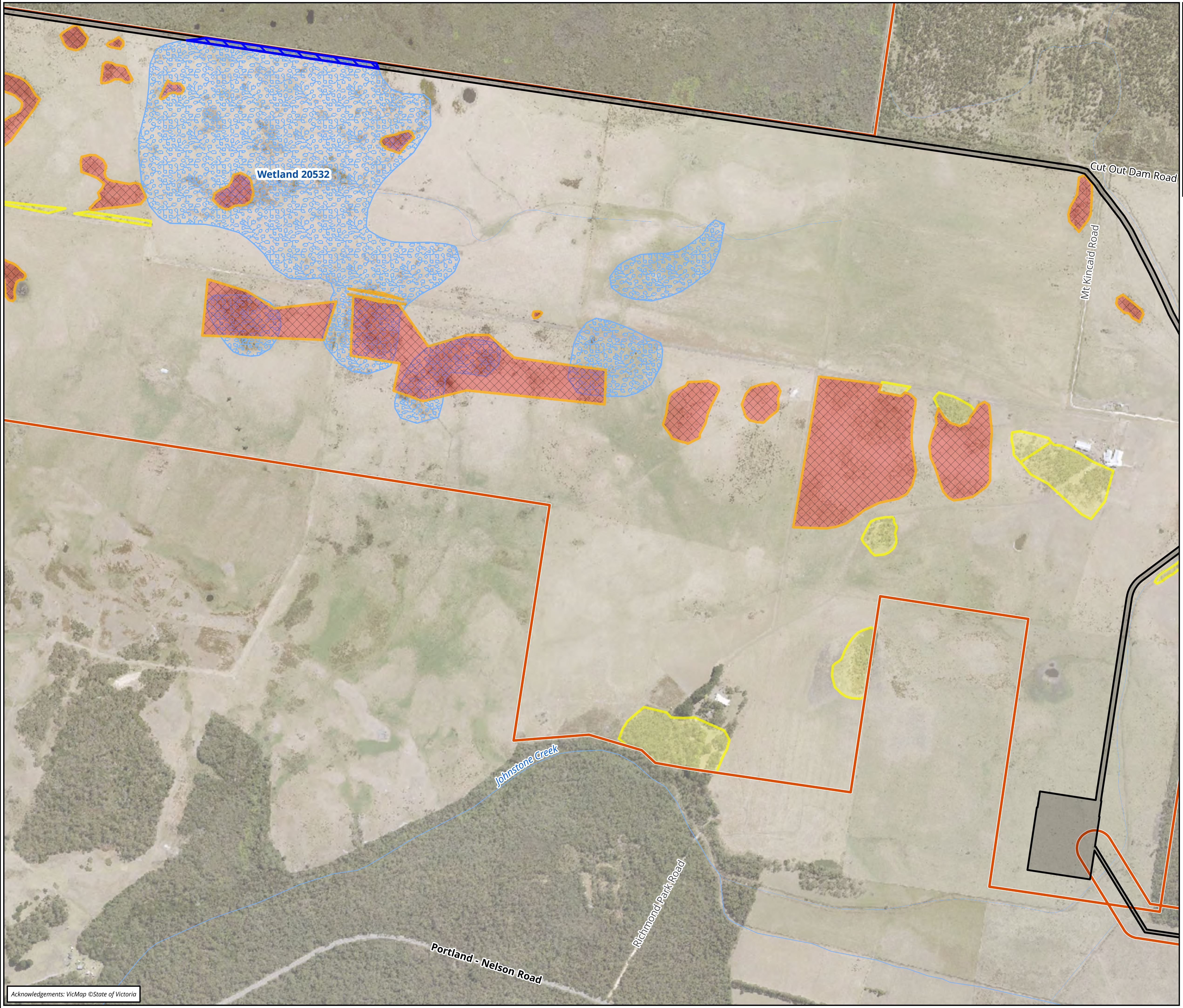
Metres

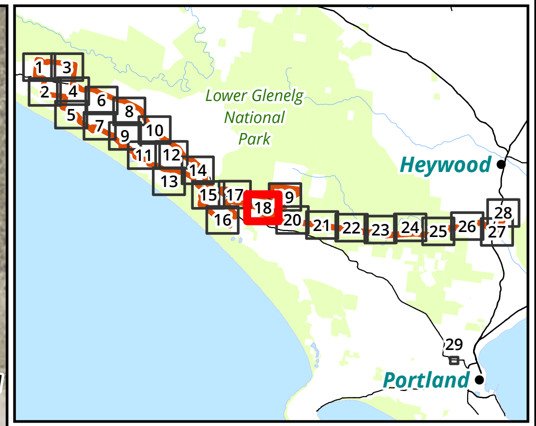
N

Scale: 1:10,000 @ A3

Coordinate System: GDA2020 MGA Zone 54

Matter: 35014,
Date: 20 November 2024,
Checked by: MG, Drawn by: JPT, Last edited by: jturner
Layout: F04e_Veg_removal
Location: P:\35000s\35014\Mapping\35014_Kentbruck_Flora.aprx





Legend

Project area

Impact area

Full vegetation removal

Native vegetation removal

Current wetland proposed to be impacted

Ecological vegetation classes (EVCs)

8 Wet Heathland

48 Heathy Woodland

Current wetlands (DEECA)

4 - Deep freshwater marsh

Figure 4e.18 Vegetation proposed to be removed within the study area

0 100 200 300 400 500

Metres

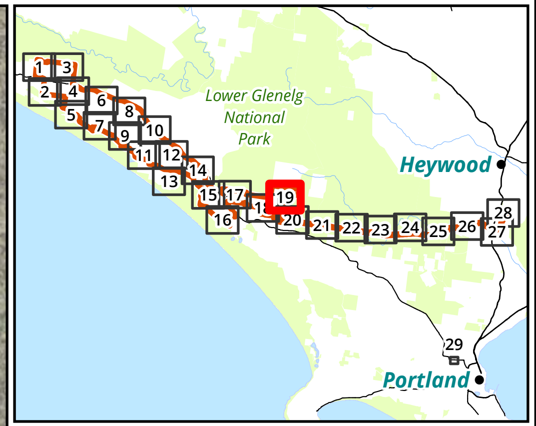
N

Scale: 1:10,000 @ A3

Coordinate System: GDA2020 MGA Zone 54

biosis APEM Group

Matter: 35014,
Date: 20 November 2024,
Checked by: MG, Drawn by: JPT, Last edited by: jturner
Layout: F04e_Veg_removal
Location: P:\35000s\35014\Mapping\
35014_Kentbruck_Flora.aprx



Legend

Project area

Impact area

Full vegetation removal

Native vegetation removal

Patch vegetation proposed to be removed

Ecological vegetation classes (EVCs)

8 Wet Heathland

23 Herb-rich Foothill Forest

48 Heathy Woodland

53 Swamp Scrub

Figure 4e.19 Vegetation proposed to be removed within the study area

0 100 200 300 400 500

Metres

N

Scale: 1:10,000 @ A3

Coordinate System: GDA2020 MGA Zone 54

biosis APEM Group

Matter: 35014,
Date: 20 November 2024,
Checked by: MG, Drawn by: JPT, Last edited by: jturner
Layout: F04e_Veg_removal
Location: P:\35000s\35014\Mapping\
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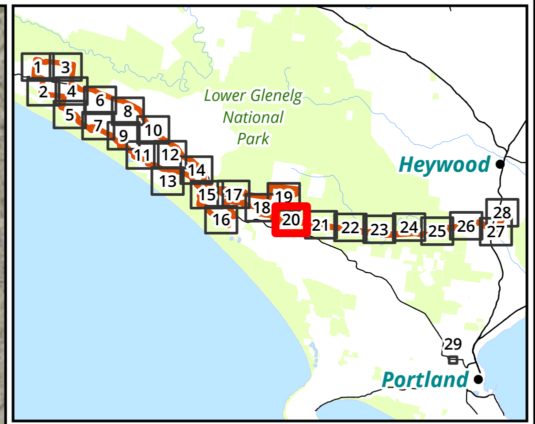


Legend

Project area

Impact area

Full vegetation removal

Native vegetation removal

Patch vegetation proposed to be removed

Large canopy trees impacted

Eucalyptus falciformis - Western Peppermint

Other eucalypt

Small canopy trees impacted

Eucalyptus falciformis - Western Peppermint

Other eucalypts

Ecological vegetation classes (EVCs)

8 Wet Heathland

16 Lowland Forest

23 Herb-rich Foothill Forest

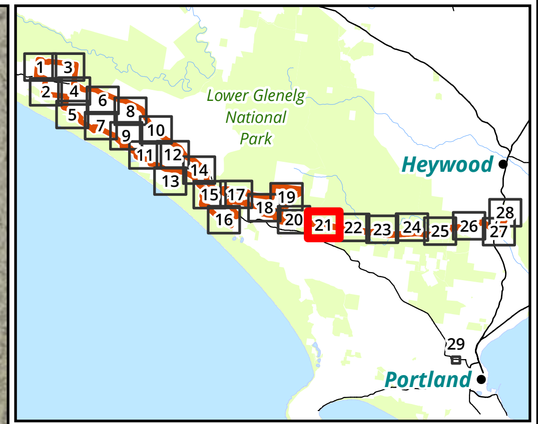
48 Heathy Woodland

Figure 4e.20 Vegetation proposed to be removed within the study area

0 100 200 300 400 500
Metres
N

Scale: 1:10,000 @ A3
Coordinate System: GDA2020 MGA Zone 54

Matter: 35014,
Date: 20 November 2024,
Checked by: MG, Drawn by: JPT, Last edited by: jturner
Layout: F04e_Veg_removal
Location: P:\35000s\35014\Mapping\
35014_Kentbruck_Flora.aprx



Legend

Project area

Impact area

Full vegetation removal

Native vegetation removal

Large canopy trees impacted

- *Eucalyptus falciformis* - Western Peppermint
- Other eucalypt

Small canopy trees impacted

- *Eucalyptus falciformis* - Western Peppermint
- Other eucalypts

Ecological vegetation classes (EVCs)

- 16 Lowland Forest
- 23 Herb-rich Foothill Forest

Figure 4e.21 Vegetation proposed to be removed within the study area

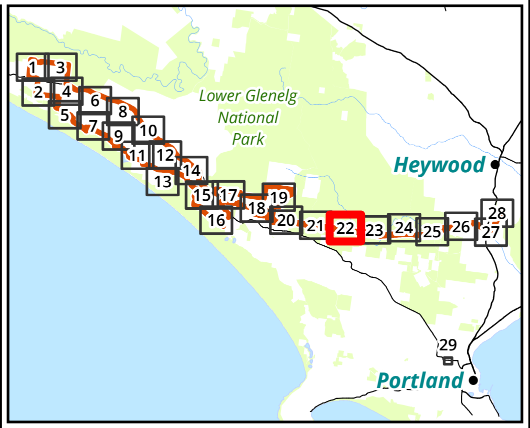
0 100 200 300 400 500

Metres

Scale: 1:10,000 @ A3

Coordinate System: GDA2020 MGA Zone 54

Matter: 35014,
Date: 20 November 2024,
Checked by: MG, Drawn by: JPT, Last edited by: jturner
Layout: F04e_Veg_removal
Location: P:\35000s\35014\Mapping\35014_Kentbruck_Flora.aprx



Legend

Project area

Impact area

Full vegetation removal

Native vegetation removal

Large canopy trees impacted

Eucalyptus falciformis - Western Peppermint

Other eucalypt

Small canopy trees impacted

Eucalyptus falciformis - Western Peppermint

Other eucalypts

Ecological vegetation classes (EVCs)

16 Lowland Forest

198 Sedgy Riparian Woodland

Figure 4e.22 Vegetation proposed to be removed within the study area

0 100 200 300 400 500

Metres

N

Scale: 1:10,000 @ A3

Coordinate System: GDA2020 MGA Zone 54

Matter: 35014,
Date: 20 November 2024,
Checked by: MG, Drawn by: JPT, Last edited by: jturner
Layout: F04e_Veg_removal
Location: P:\35000s\35014\Mapping\
35014_Kentbruck_Flora.aprx

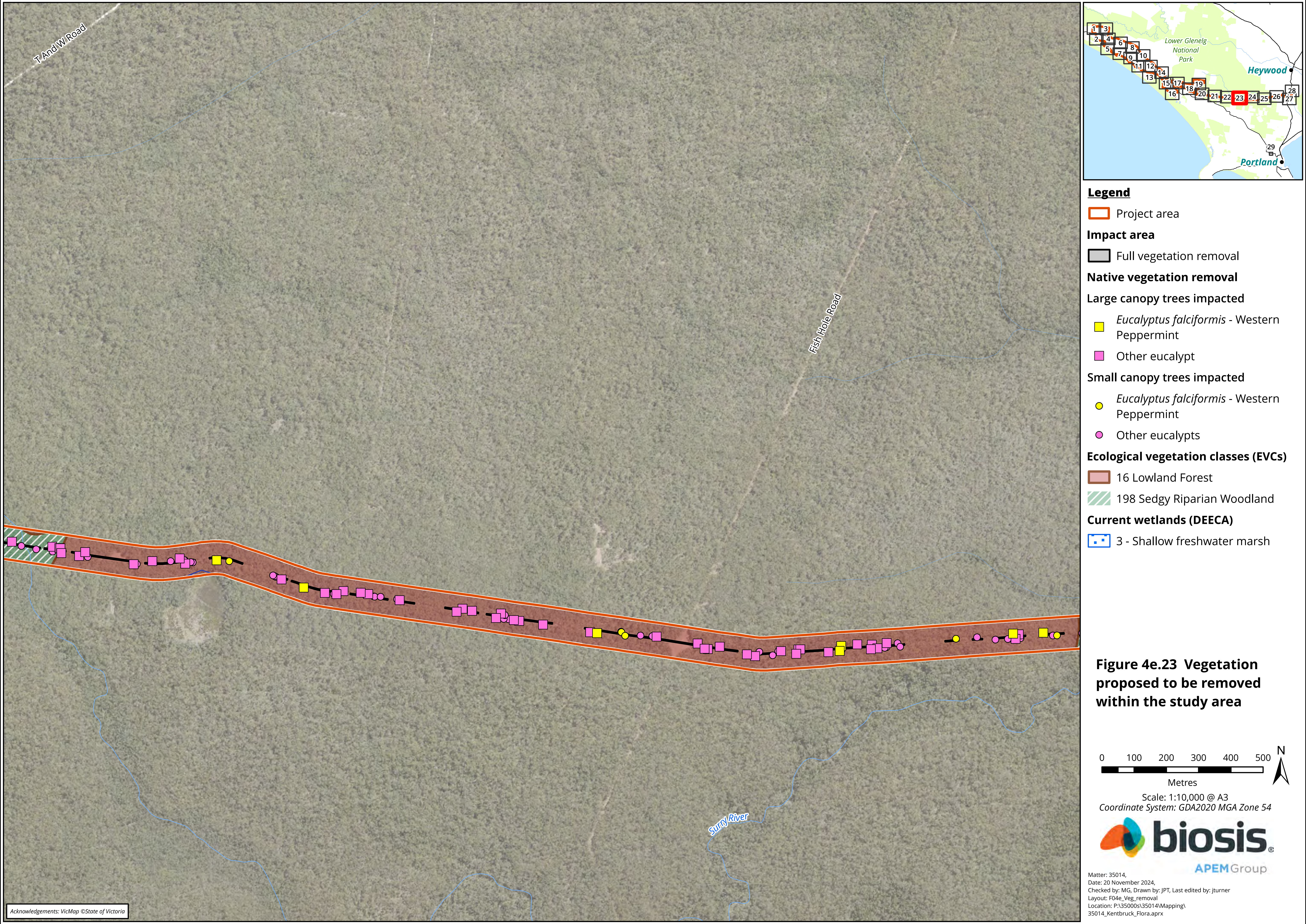
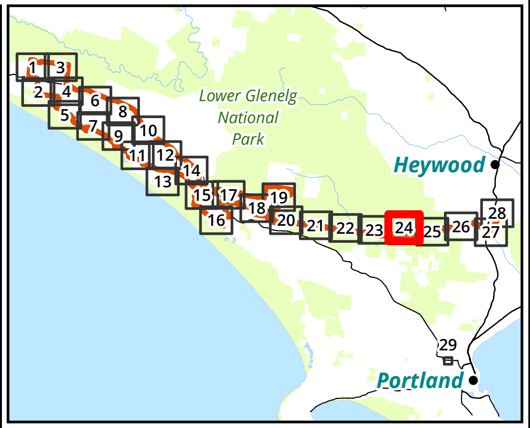


Figure 4e.23 Vegetation proposed to be removed within the study area

biosis
APEM Group

Matter: 35014,
Date: 20 November 2024,
Checked by: MG, Drawn by: JPT, Last edited by: jturner
Layout: F04e_Veg_removal
Location: P:\35000s\35014\Mapping\35014_Kentbruck_Flora.aprx



Legend

Project area

Impact area

Full vegetation removal

Native vegetation removal

Large canopy trees impacted

Eucalyptus falciformis - Western Peppermint

Other eucalypt

Small canopy trees impacted

Eucalyptus falciformis - Western Peppermint

Other eucalypts

Ecological vegetation classes (EVCs)

16 Lowland Forest

23 Herb-rich Foothill Forest

198 Sedgy Riparian Woodland

Figure 4e.24 Vegetation proposed to be removed within the study area

0 100 200 300 400 500

Metres

N

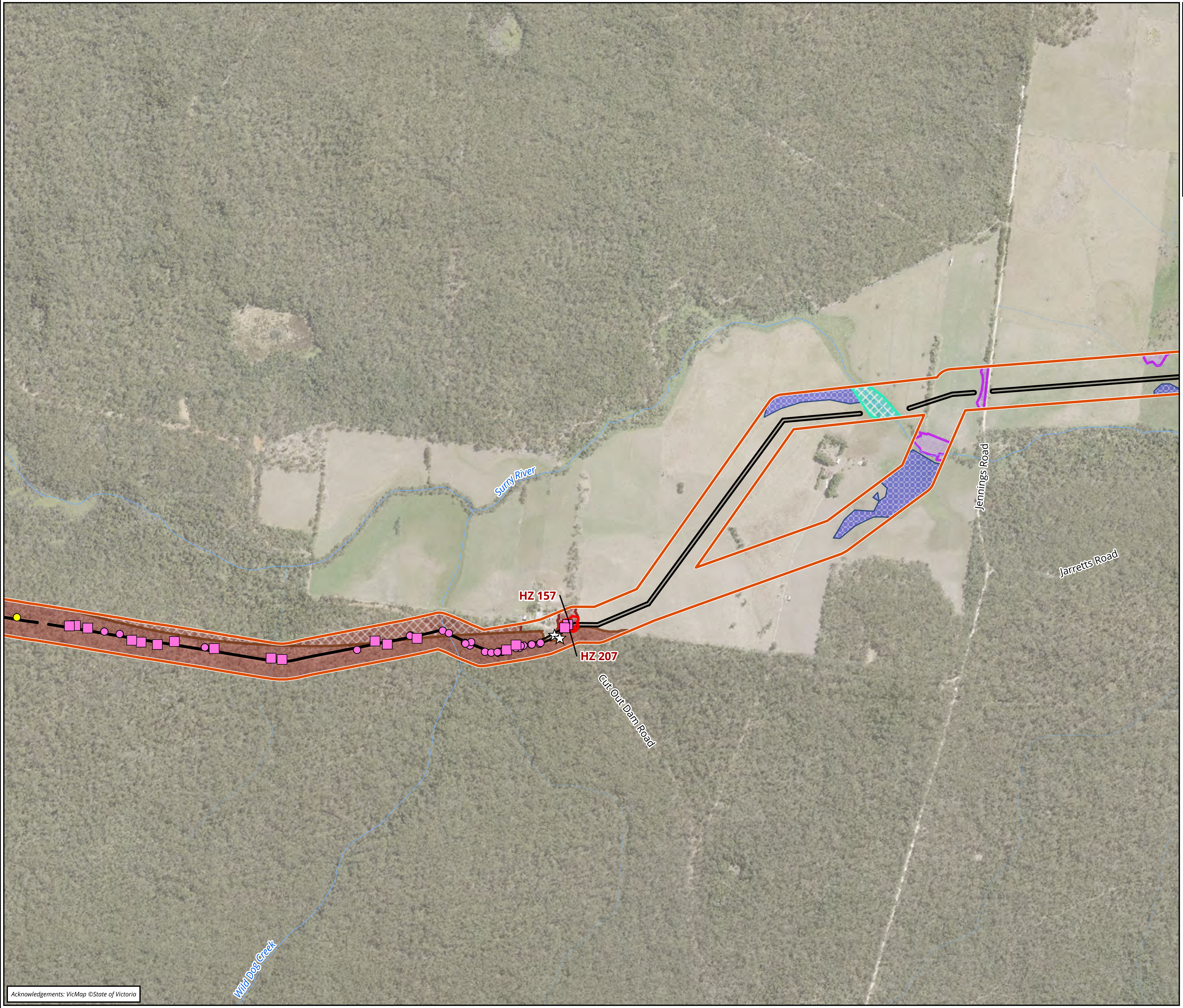
Scale: 1:10,000 @ A3

Coordinate System: GDA2020 MGA Zone 54

biosis

APEM Group

Matter: 35014,
Date: 20 November 2024,
Checked by: MG, Drawn by: JPT, Last edited by: jturner
Layout: F04e_Veg_removal
Location: P:\35000s\35014\Mapping\
35014_Kentbruck_Flora.aprx



Legend

Project area

Impact area

Full vegetation removal

Native vegetation removal

Patch vegetation proposed to be removed

Large canopy trees impacted

Other eucalypt

Small canopy trees impacted

Eucalyptus falciformis - Western Peppermint

Other eucalypts

Ecological vegetation classes (EVCs)

3 Damp Sands Herb-rich Woodland

16 Lowland Forest

23 Herb-rich Foothill Forest

53 Swamp Scrub

125 Plains Grassy Wetland

Figure 4e.25 Vegetation proposed to be removed within the study area

0 100 200 300 400 500 Metres

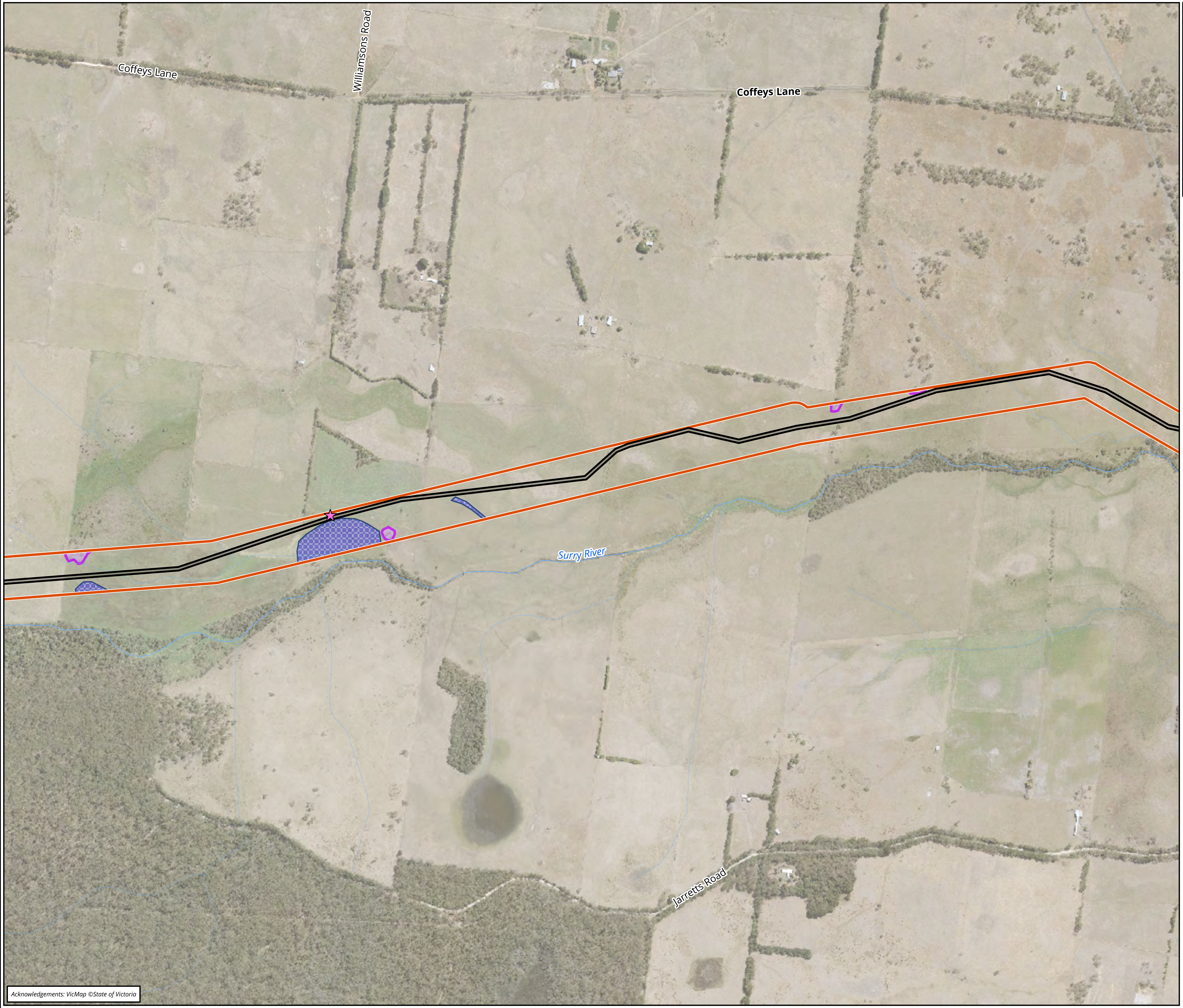
N

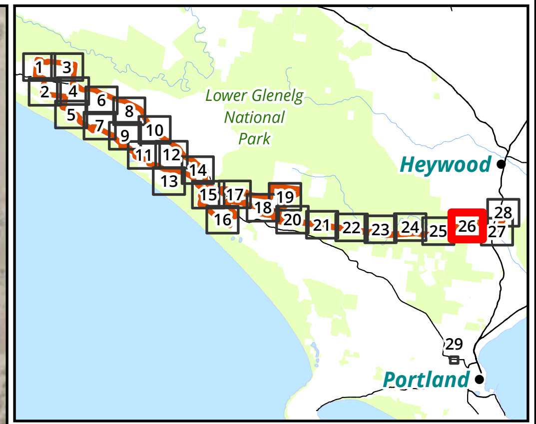
Scale: 1:10,000 @ A3

Coordinate System: GDA2020 MGA Zone 54

biosis APEM Group

Matter: 35014,
Date: 20 November 2024,
Checked by: MG, Drawn by: JPT, Last edited by: jturner
Layout: F04e_Veg_removal
Location: P:\35000s\35014\Mapping\35014_Kentbruck_Flora.aprx





Legend

Project area

Impact area

Full vegetation removal

Ecological vegetation classes (EVCs)

3 Damp Sands Herb-rich Woodland

125 Plains Grassy Wetland

Figure 4e.26 Vegetation proposed to be removed within the study area

0 100 200 300 400 500
Metres

Scale: 1:10,000 @ A3
Coordinate System: GDA2020 MGA Zone 54

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Matter: 35014,
Date: 20 November 2024,
Checked by: MG, Drawn by: JPT, Last edited by: jturner
Layout: F04e_Veg_removal
Location: P:\35000s\35014\Mapping\
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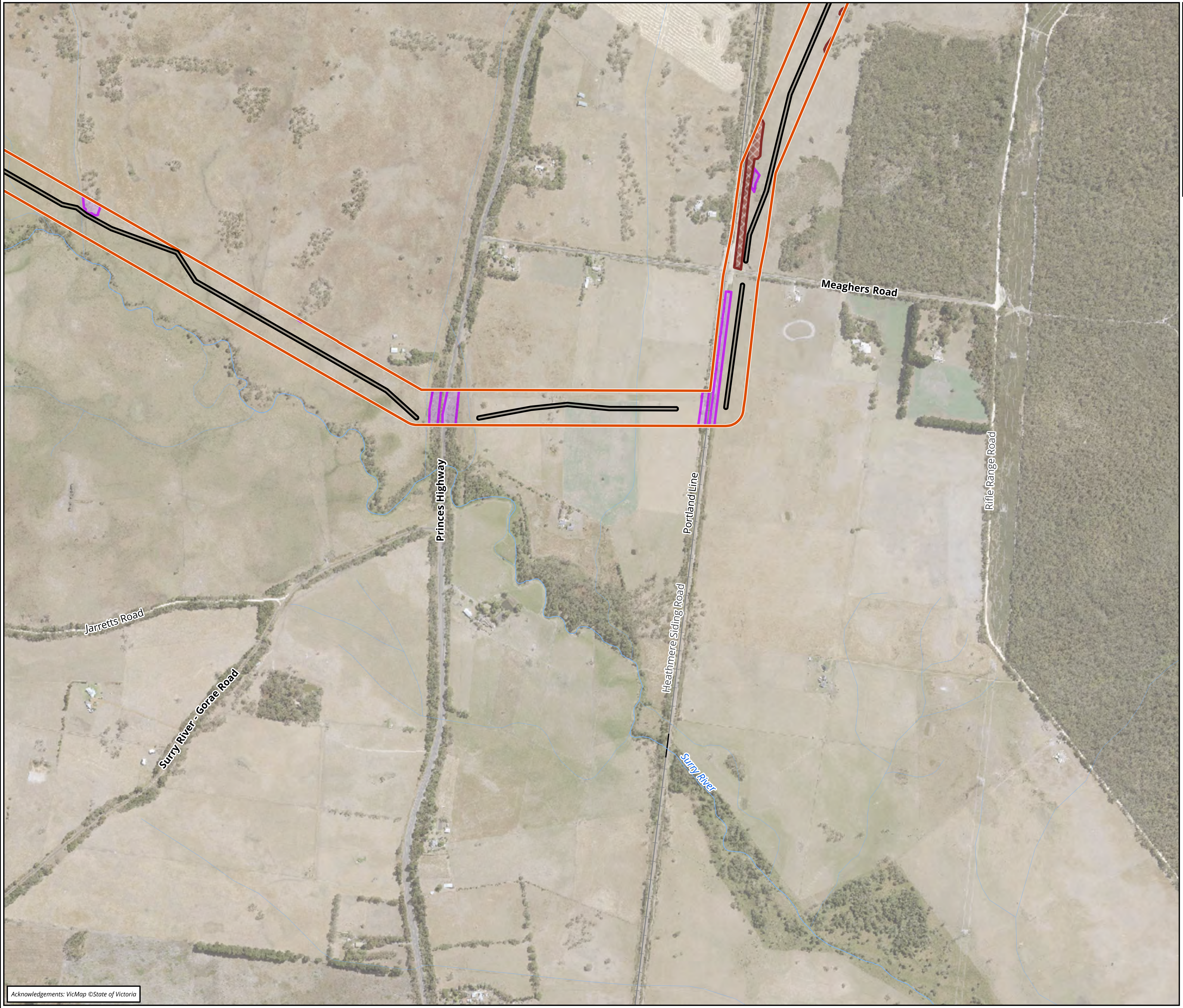


Legend

Project area

Impact area

Full vegetation removal

Ecological vegetation classes (EVCs)

3 Damp Sands Herb-rich Woodland

23 Herb-rich Foothill Forest

Figure 4e.27 Vegetation proposed to be removed within the study area

0 100 200 300 400 500

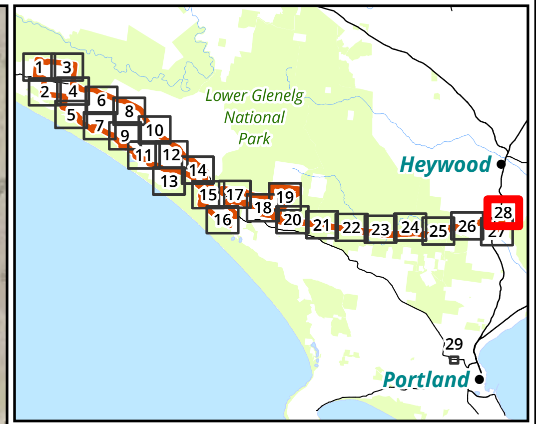
Metres

N

Scale: 1:10,000 @ A3

Coordinate System: GDA2020 MGA Zone 54

Matter: 35014,
Date: 20 November 2024,
Checked by: MG, Drawn by: JPT, Last edited by: jturner
Layout: F04e_Veg_removal
Location: P:\35000s\35014\Mapping\
35014_Kentbruck_Flora.aprx



Legend

Project area

Impact area

Full vegetation removal

Native vegetation removal

Patch vegetation proposed to be removed

Large canopy trees impacted

Other eucalypt

Small canopy trees impacted

Eucalyptus falciformis - Western Peppermint

Ecological vegetation classes (EVCs)

3 Damp Sands Herb-rich Woodland

16 Lowland Forest

23 Herb-rich Foothill Forest

48 Heathy Woodland

Figure 4e.28 Vegetation proposed to be removed within the study area

0 100 200 300 400 500

N

Metres

Scale: 1:10,000 @ A3

Coordinate System: GDA2020 MGA Zone 54

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Date: 20 November 2024,
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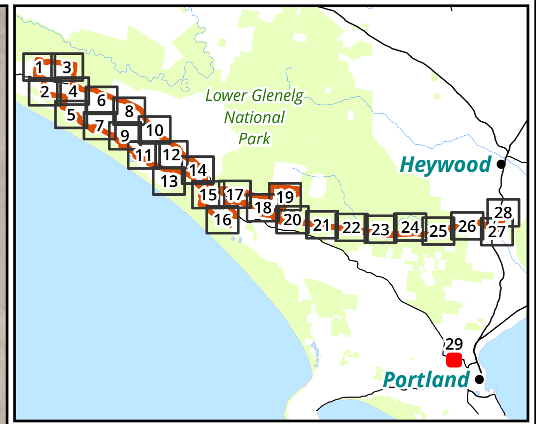
Layout: F04e_Veg_removal
Location: P:\35000s\35014\Mapping\
35014_Kentbruck_Flora.aprx



Legend

Project area

Impact area

Full vegetation removal

Native vegetation removal

Patch vegetation proposed to be removed

Small canopy trees impacted

Other eucalypts

Ecological vegetation classes (EVCs)

23 Herb-rich Foothill Forest

Figure 4e.29 Vegetation proposed to be removed within the study area

0 100

Metres

N

Scale: 1:2,500 @ A3

Coordinate System: GDA2020 MGA Zone 54

Matter: 35014,
Date: 20 November 2024,
Checked by: MG, Drawn by: JPT, Last edited by: jturner
Layout: F04e_Veg_removal
Location: P:\35000s\35014\Mapping\
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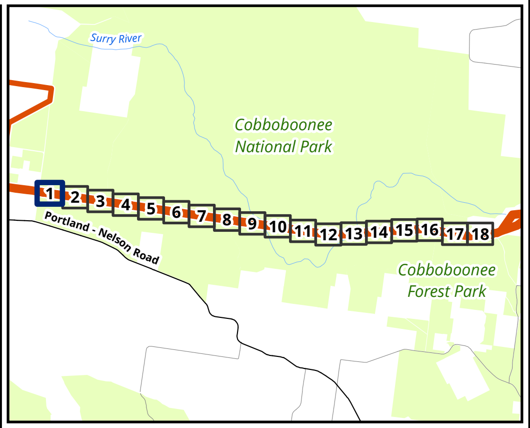

Legend

Project area

Impact area (trench)

Canopy trees: Apple Jack (*Eucalyptus splendens*)

Large; not impacted

Small; not impacted

Tree protection zone (TPZ)

Ecological vegetation classes (EVCs)

23 Herb-rich Foothill Forest

Figure 4f.1 Apple Jacks along Boiler Swamp Road

0 25 50 75 100

Metres

N

Scale: 1:2,500 @ A3

Coordinate System: GDA2020 MGA Zone 54

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Matter: 35014,
Date: 22 August 2024 ,
Prepared for: MSG, Prepared by: SP, Last edited by: jturner
Layout: F04f_Apple_Jacks
Project: P:\35000s\35014\Mapping\
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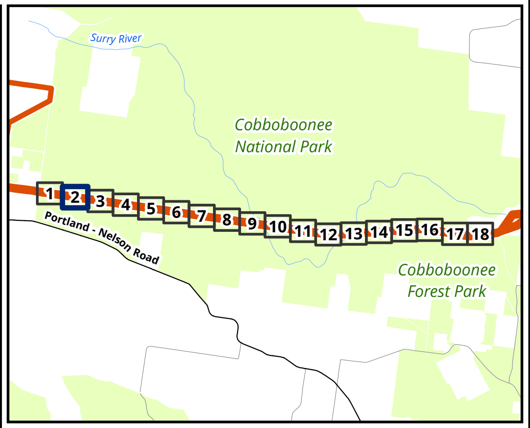

Legend

Project area

Impact area (trench)

Canopy trees: Apple Jack (*Eucalyptus splendens*)

Large; not impacted

Small; not impacted

Tree protection zone (TPZ)

Ecological vegetation classes (EVCs)

16 Lowland Forest

23 Herb-rich Foothill Forest

Figure 4f.2 Apple Jacks along Boiler Swamp Road

0 25 50 75 100

Metres

Scale: 1:2,500 @ A3

Coordinate System: GDA2020 MGA Zone 54

N

Matter: 35014,
Date: 22 August 2024 ,
Prepared for: MSG, Prepared by: SP, Last edited by: jturner
Layout: F04f_Apple_Jacks
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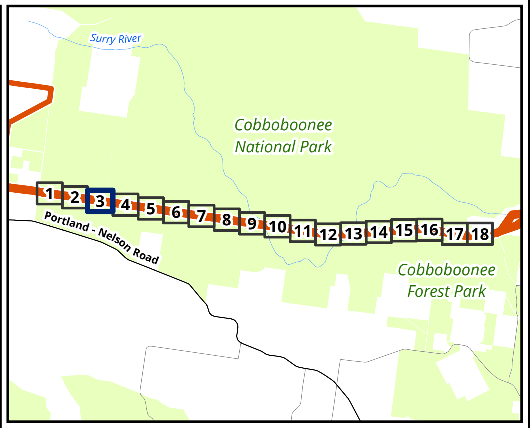

Legend

Project area

Impact area (trench)

Canopy trees: Apple Jack (*Eucalyptus splendens*)

Large; not impacted

Small; not impacted

Tree protection zone (TPZ)

Ecological vegetation classes (EVCs)

16 Lowland Forest

Figure 4f.3 Apple Jacks along Boiler Swamp Road

0 25 50 75 100

Metres

Scale: 1:2,500 @ A3

Coordinate System: GDA2020 MGA Zone 54

N

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Date: 22 August 2024 ,
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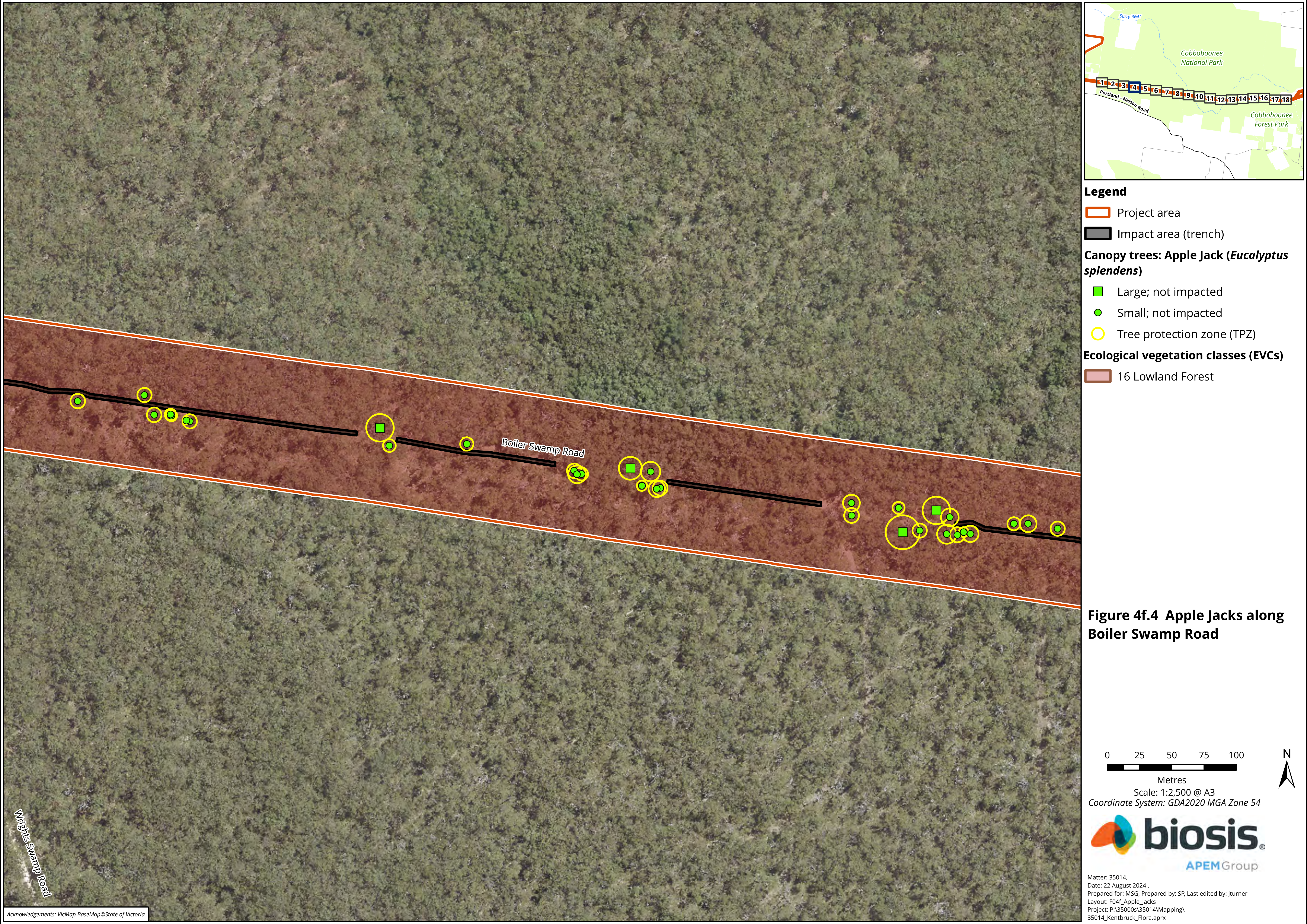
Layout: F04f_Apple_Jacks
Project: P:\35000s\35014\Mapping\35014_Kentbruck_Flora.aprx



Legend

- Project area
- Impact area (trench)

Canopy trees: Apple Jack (*Eucalyptus splendens*)

- Large; not impacted
- Small; not impacted
- Tree protection zone (TPZ)

Ecological vegetation classes (EVCs)

- 16 Lowland Forest

Figure 4f.4 Apple Jacks along Boiler Swamp Road

0 25 50 75 100

Metres

Scale: 1:2,500 @ A3

Coordinate System: GDA2020 MGA Zone 54

N

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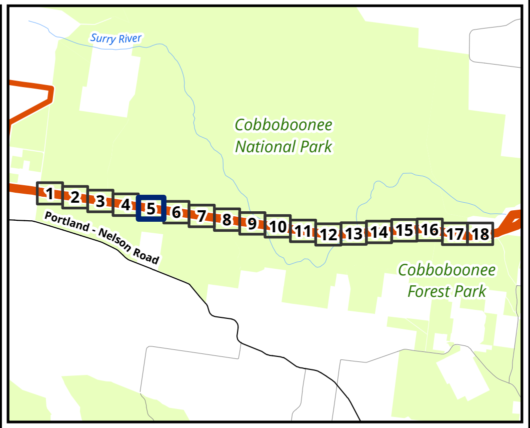
Matter: 35014,
Date: 22 August 2024 ,
Prepared for: MSG, Prepared by: SP, Last edited by: jturner
Layout: F04f_Apple_Jacks
Project: P:\35000s\35014\Mapping\35014_Kentbruck_Flora.aprx



Legend

Project area

Impact area (trench)

Canopy trees: Apple Jack (*Eucalyptus splendens*)

Large; not impacted

Small; not impacted

Tree protection zone (TPZ)

Ecological vegetation classes (EVCs)

16 Lowland Forest

Figure 4f.5 Apple Jacks along Boiler Swamp Road

0 25 50 75 100

Metres

Scale: 1:2,500 @ A3

Coordinate System: GDA2020 MGA Zone 54

N

Matter: 35014,
Date: 22 August 2024 ,
Prepared for: MSG, Prepared by: SP, Last edited by: jturner
Layout: F04f_Apple_Jacks
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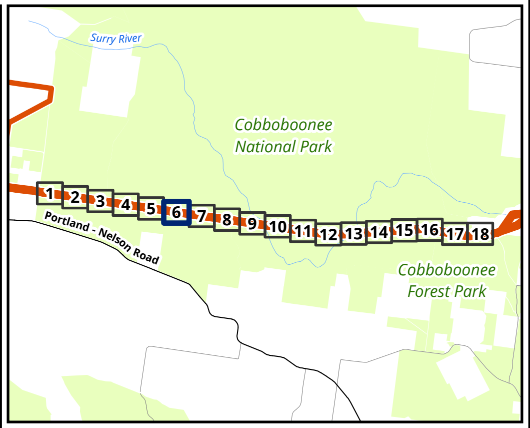

Legend

- Project area
- Impact area (trench)

Canopy trees: Apple Jack (*Eucalyptus splendens*)

- Large; not impacted
- Small; not impacted
- Tree protection zone (TPZ)

Ecological vegetation classes (EVCs)

- 16 Lowland Forest

Figure 4f.6 Apple Jacks along Boiler Swamp Road

0 25 50 75 100

Metres

Scale: 1:2,500 @ A3

Coordinate System: GDA2020 MGA Zone 54

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Date: 22 August 2024 ,
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Layout: F04f_Apple_Jacks
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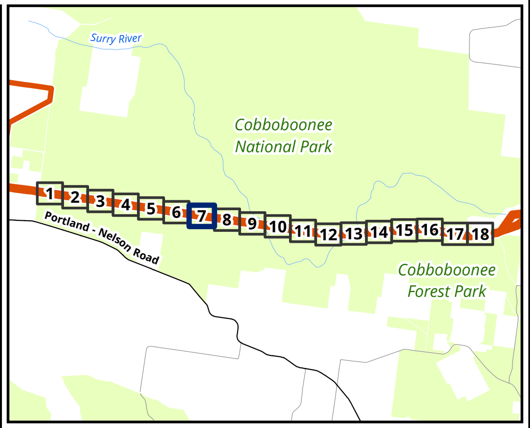

Legend

Project area

Impact area (trench)

Canopy trees: Apple Jack (*Eucalyptus splendens*)

Large; not impacted

Small; not impacted

Tree protection zone (TPZ)

Ecological vegetation classes (EVCs)

16 Lowland Forest

Figure 4f.7 Apple Jacks along Boiler Swamp Road

0 25 50 75 100

Metres

Scale: 1:2,500 @ A3

Coordinate System: GDA2020 MGA Zone 54

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Prepared for: MSG, Prepared by: SP, Last edited by: jturner
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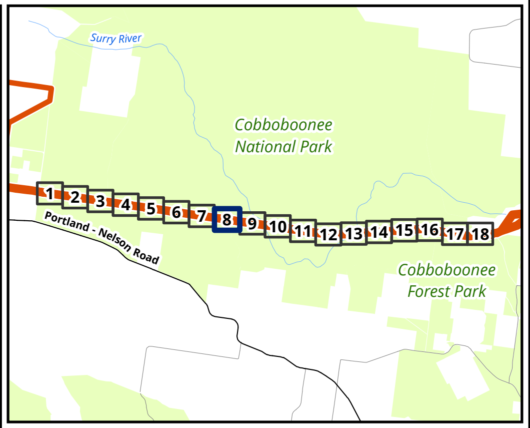

Legend

Project area

Impact area (trench)

Canopy trees: Apple Jack (*Eucalyptus splendens*)

Large; not impacted

Small; not impacted

Tree protection zone (TPZ)

Ecological vegetation classes (EVCs)

16 Lowland Forest

Figure 4f.8 Apple Jacks along Boiler Swamp Road

0 25 50 75 100

Metres

Scale: 1:2,500 @ A3

Coordinate System: GDA2020 MGA Zone 54

N

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Date: 22 August 2024 ,
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Layout: F04f_Apple_Jacks
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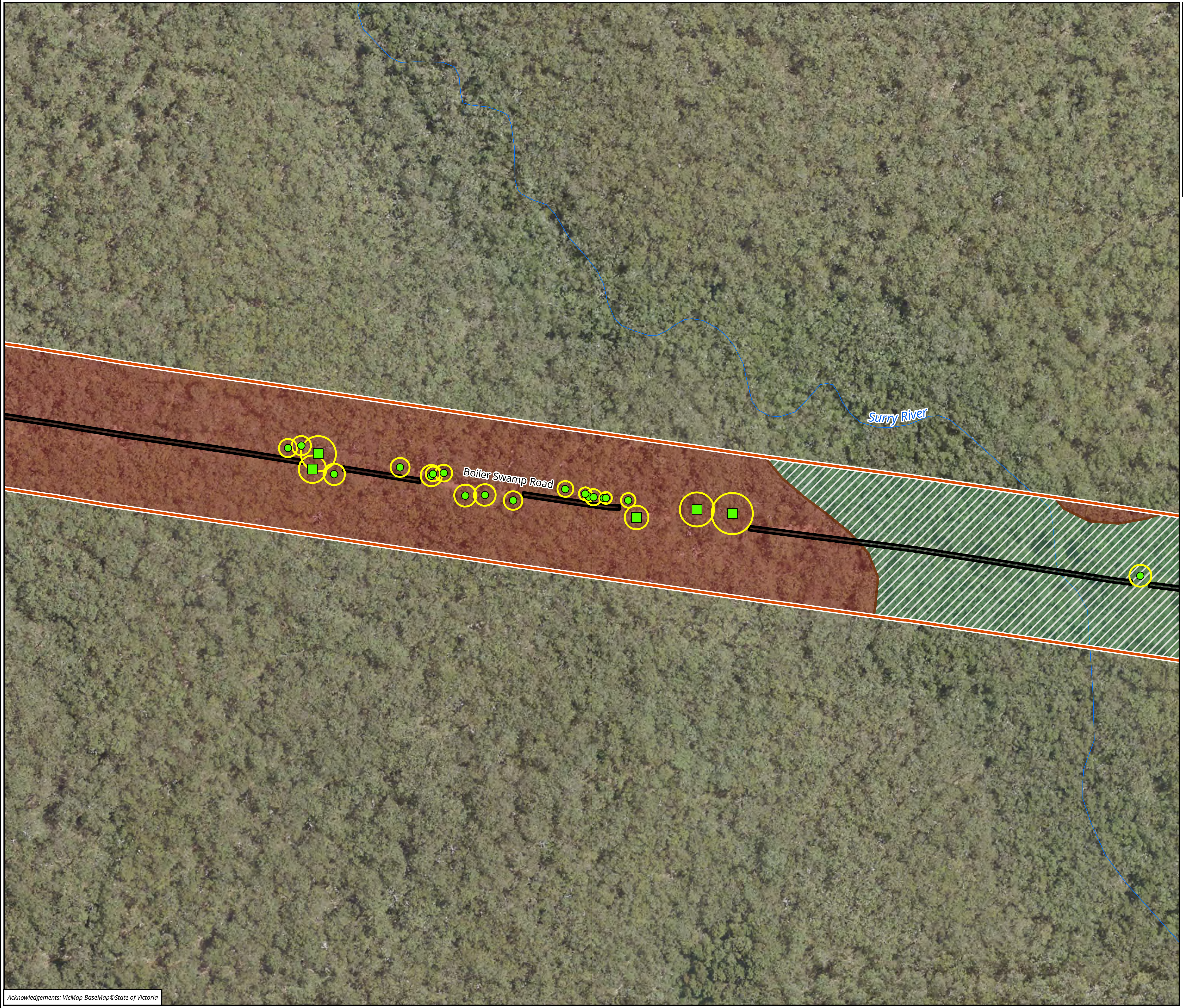

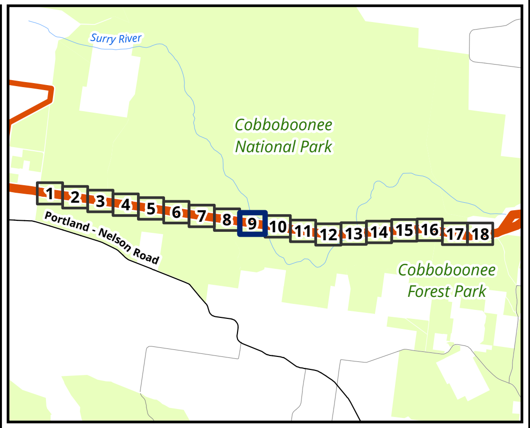

Legend

- Project area
- Impact area (trench)

Canopy trees: Apple Jack (*Eucalyptus splendens*)

- Large; not impacted
- Small; not impacted
- Tree protection zone (TPZ)

Ecological vegetation classes (EVCs)

- 16 Lowland Forest
- 198 Sedgy Riparian Woodland

Figure 4f.9 Apple Jacks along Boiler Swamp Road

0 25 50 75 100
Metres
Scale: 1:2,500 @ A3
Coordinate System: GDA2020 MGA Zone 54

N

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Matter: 35014,
Date: 22 August 2024 ,
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Layout: F04f_Apple_Jacks
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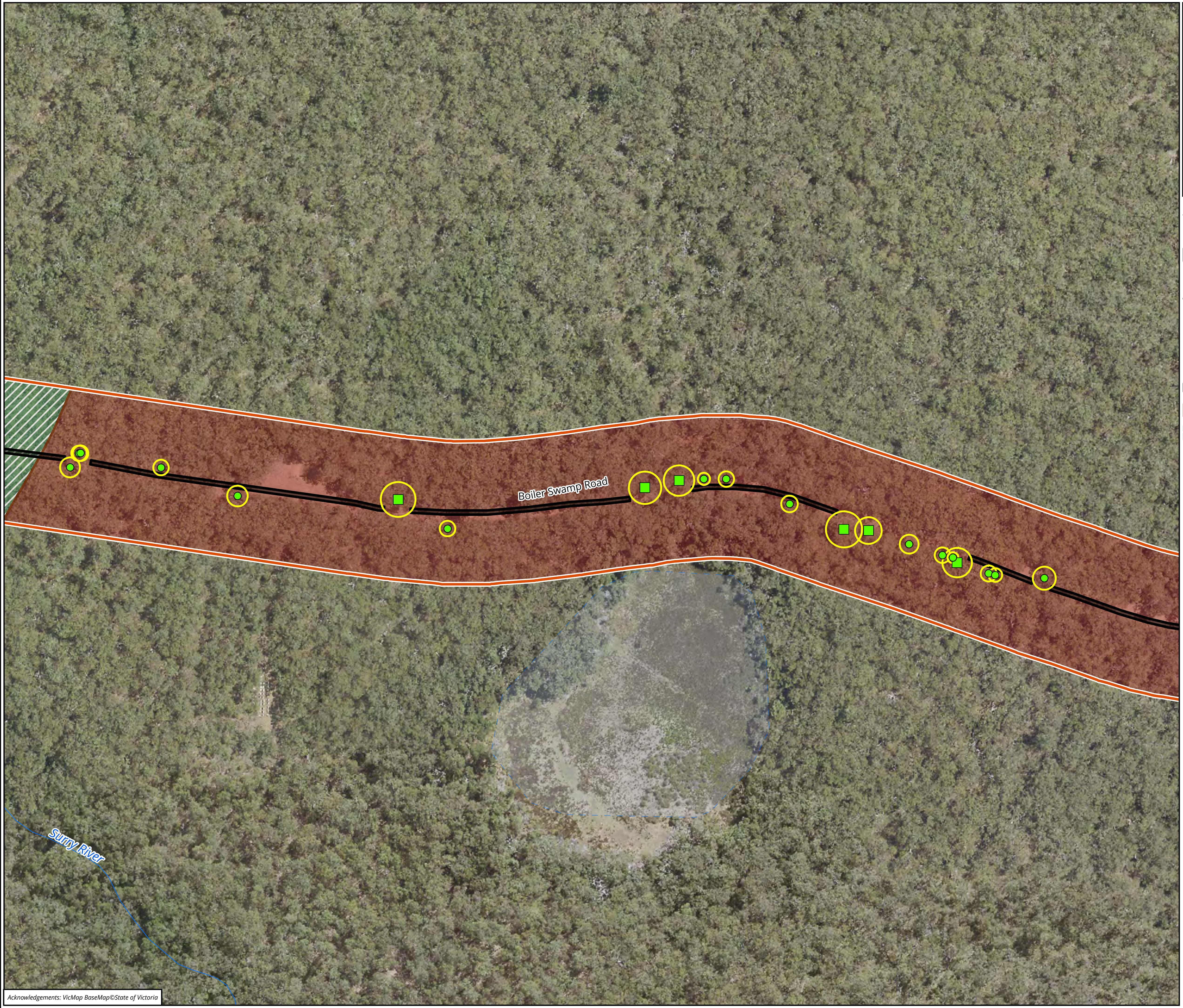

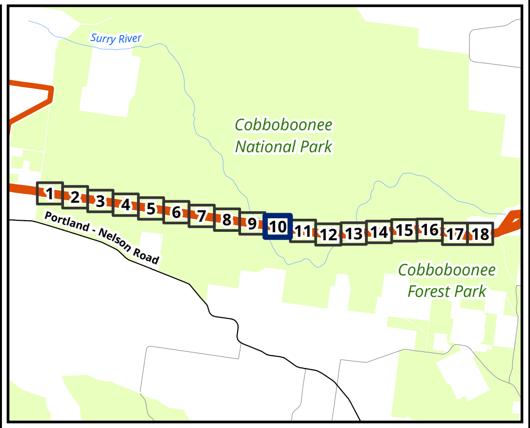

Legend

Project area

Impact area (trench)

Canopy trees: Apple Jack (*Eucalyptus splendens*)

Large; not impacted

Small; not impacted

Tree protection zone (TPZ)

Ecological vegetation classes (EVCs)

16 Lowland Forest

198 Sedgy Riparian Woodland

Figure 4f.10 Apple Jacks along Boiler Swamp Road

0 25 50 75 100

Metres

Scale: 1:2,500 @ A3

Coordinate System: GDA2020 MGA Zone 54

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APEM Group

Matter: 35014,
Date: 22 August 2024 ,
Prepared for: MSG, Prepared by: SP, Last edited by: jturner
Layout: F04f_Apple_Jacks
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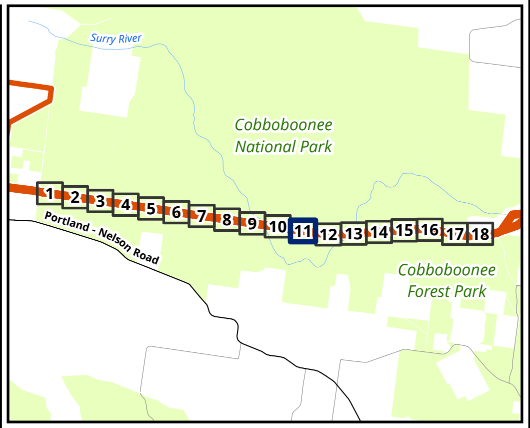

Legend

Project area

Impact area (trench)

Canopy trees: Apple Jack (*Eucalyptus splendens*)

Large; not impacted

Small; not impacted

Tree protection zone (TPZ)

Ecological vegetation classes (EVCs)

16 Lowland Forest

Figure 4f.11 Apple Jacks along Boiler Swamp Road

0 25 50 75 100

Metres

Scale: 1:2,500 @ A3

Coordinate System: GDA2020 MGA Zone 54

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Matter: 35014,
Date: 22 August 2024 ,
Prepared for: MSG, Prepared by: SP, Last edited by: jturner
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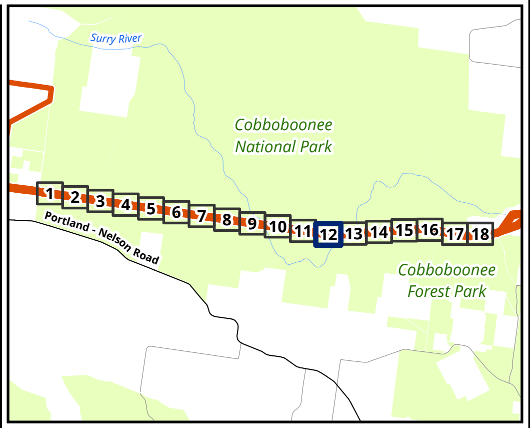

Legend

Project area

Impact area (trench)

Canopy trees: Apple Jack (*Eucalyptus splendens*)

Large; not impacted

Small; not impacted

Tree protection zone (TPZ)

Ecological vegetation classes (EVCs)

16 Lowland Forest

Figure 4f.12 Apple Jacks along Boiler Swamp Road

0 25 50 75 100

Metres

Scale: 1:2,500 @ A3

Coordinate System: GDA2020 MGA Zone 54

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Date: 22 August 2024 ,
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Layout: F04f_Apple_Jacks
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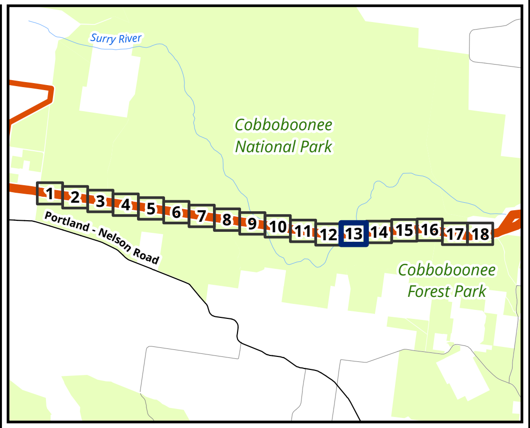

Legend

- Project area
- Impact area (trench)

Canopy trees: Apple Jack (*Eucalyptus splendens*)

- Large; not impacted
- Small; not impacted
- Tree protection zone (TPZ)

Ecological vegetation classes (EVCs)

- 16 Lowland Forest
- 198 Sedgy Riparian Woodland

Figure 4f.13 Apple Jacks along Boiler Swamp Road

0 25 50 75 100

Metres

Scale: 1:2,500 @ A3

Coordinate System: GDA2020 MGA Zone 54

N

Matter: 35014,
Date: 22 August 2024 ,
Prepared for: MSG, Prepared by: SP, Last edited by: jturner
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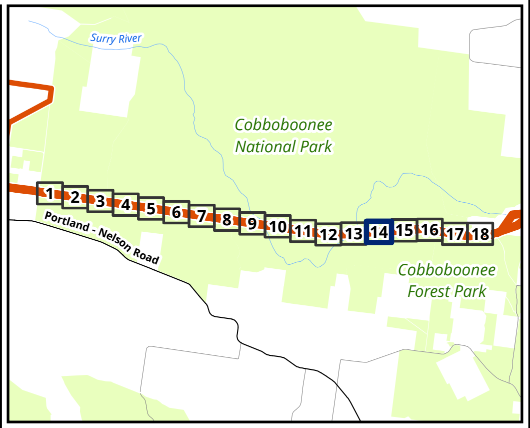

Legend

Project area

Impact area (trench)

Canopy trees: Apple Jack (*Eucalyptus splendens*)

Large; not impacted

Small; not impacted

Tree protection zone (TPZ)

Ecological vegetation classes (EVCs)

16 Lowland Forest

Figure 4f.14 Apple Jacks along Boiler Swamp Road

0 25 50 75 100

Metres

Scale: 1:2,500 @ A3

Coordinate System: GDA2020 MGA Zone 54

N

Matter: 35014,
Date: 22 August 2024 ,
Prepared for: MSG, Prepared by: SP, Last edited by: jturner
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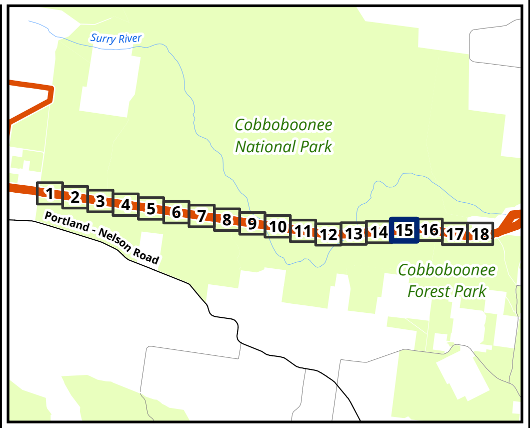

Legend

Project area

Impact area (trench)

Canopy trees: Apple Jack (*Eucalyptus splendens*)

Large; not impacted

Small; not impacted

Tree protection zone (TPZ)

Ecological vegetation classes (EVCs)

16 Lowland Forest

Figure 4f.15 Apple Jacks along Boiler Swamp Road

0 25 50 75 100

Metres

Scale: 1:2,500 @ A3

Coordinate System: GDA2020 MGA Zone 54

Matter: 35014,
Date: 22 August 2024 ,
Prepared for: MSG, Prepared by: SP, Last edited by: jturner
Layout: F04f_Apple_Jacks
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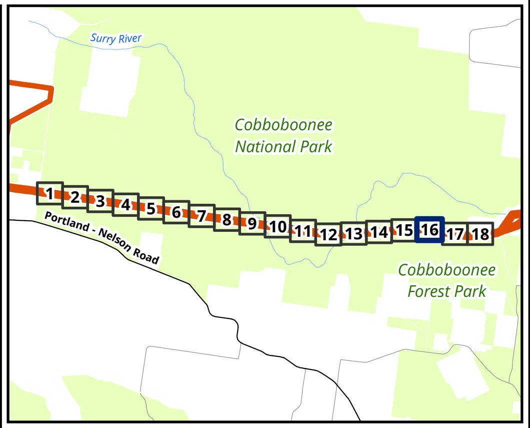

Legend

Project area

Impact area (trench)

Canopy trees: Apple Jack (*Eucalyptus splendens*)

Large; not impacted

Small; not impacted

Tree protection zone (TPZ)

Ecological vegetation classes (EVCs)

16 Lowland Forest

Figure 4f.16 Apple Jacks along Boiler Swamp Road

0 25 50 75 100

Metres

N

Scale: 1:2,500 @ A3

Coordinate System: GDA2020 MGA Zone 54

Matter: 35014,
Date: 22 August 2024 ,
Prepared for: MSG, Prepared by: SP, Last edited by: jturner
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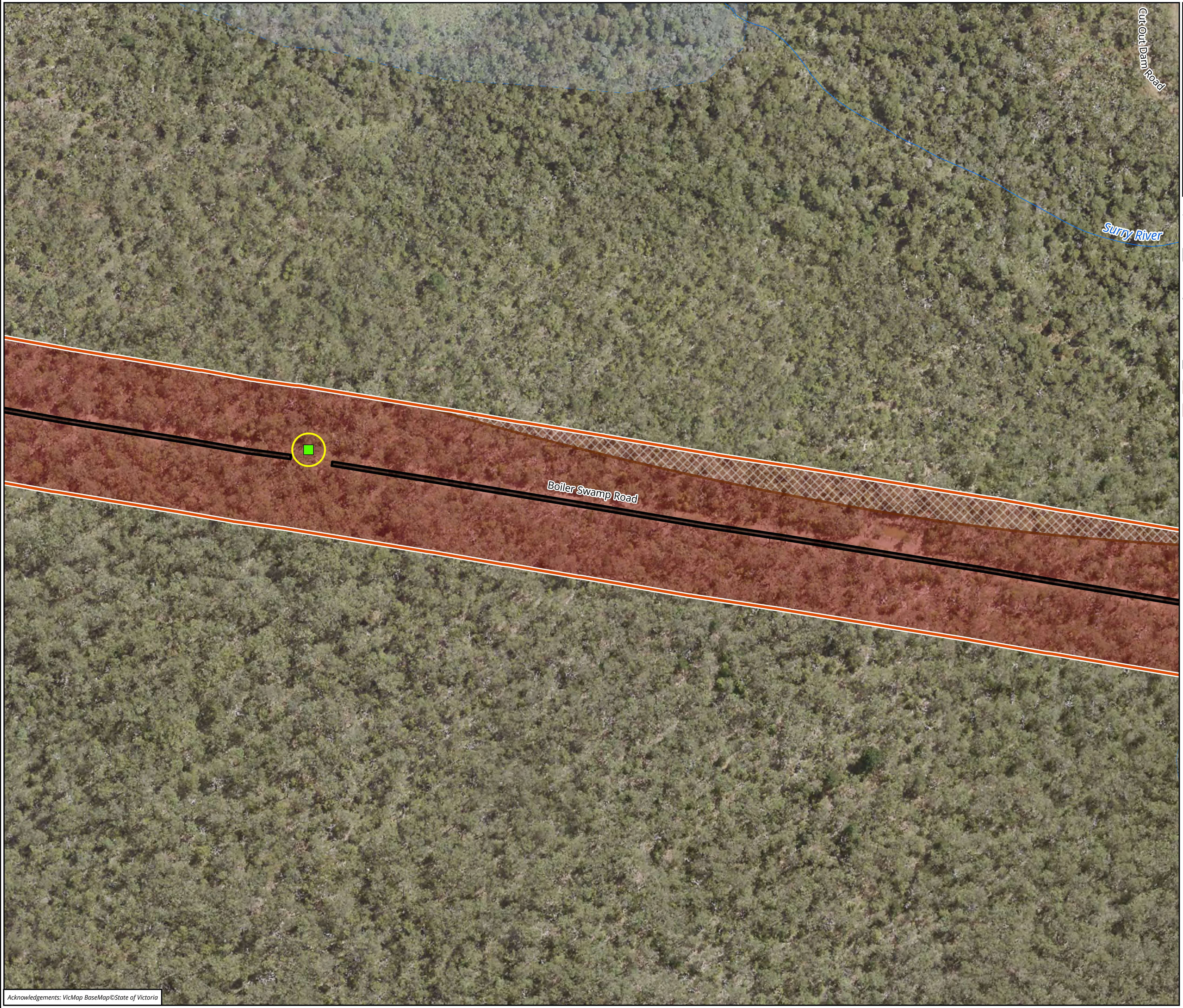

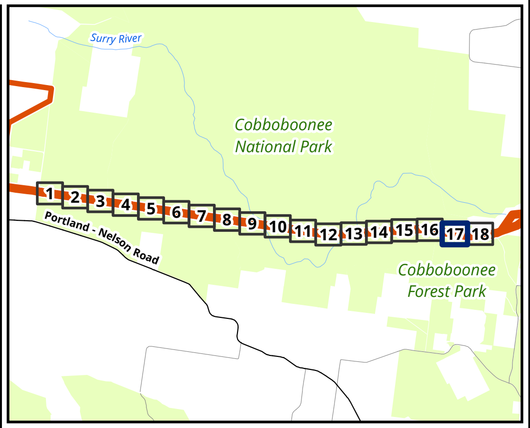

Legend

Project area

Impact area (trench)

Canopy trees: Apple Jack (*Eucalyptus splendens*)

Large; not impacted

Tree protection zone (TPZ)

Ecological vegetation classes (EVCs)

16 Lowland Forest

23 Herb-rich Foothill Forest

Figure 4f.17 Apple Jacks along Boiler Swamp Road

0 25 50 75 100

Metres

Scale: 1:2,500 @ A3

Coordinate System: GDA2020 MGA Zone 54

N

Matter: 35014,
Date: 22 August 2024 ,
Prepared for: MSG, Prepared by: SP, Last edited by: jturner
Layout: F04f_Apple_Jacks
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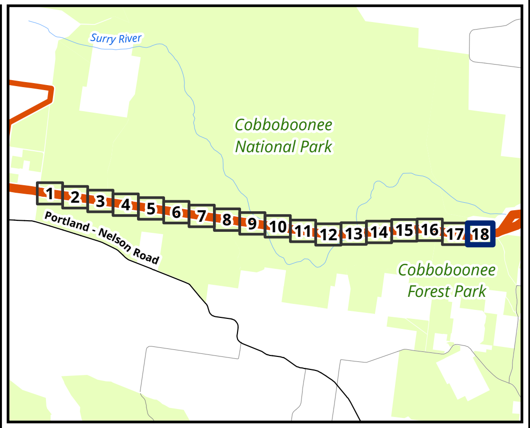

Legend

- Project area
- Impact area (trench)

Ecological vegetation classes (EVCs)

- 16 Lowland Forest
- 23 Herb-rich Foothill Forest

Figure 4f.18 Apple Jacks along Boiler Swamp Road

0 25 50 75 100

Metres

Scale: 1:2,500 @ A3

Coordinate System: GDA2020 MGA Zone 54

Matter: 35014,
Date: 22 August 2024 ,
Prepared for: MSG, Prepared by: SP, Last edited by: jturner
Layout: F04f_Apple_Jacks
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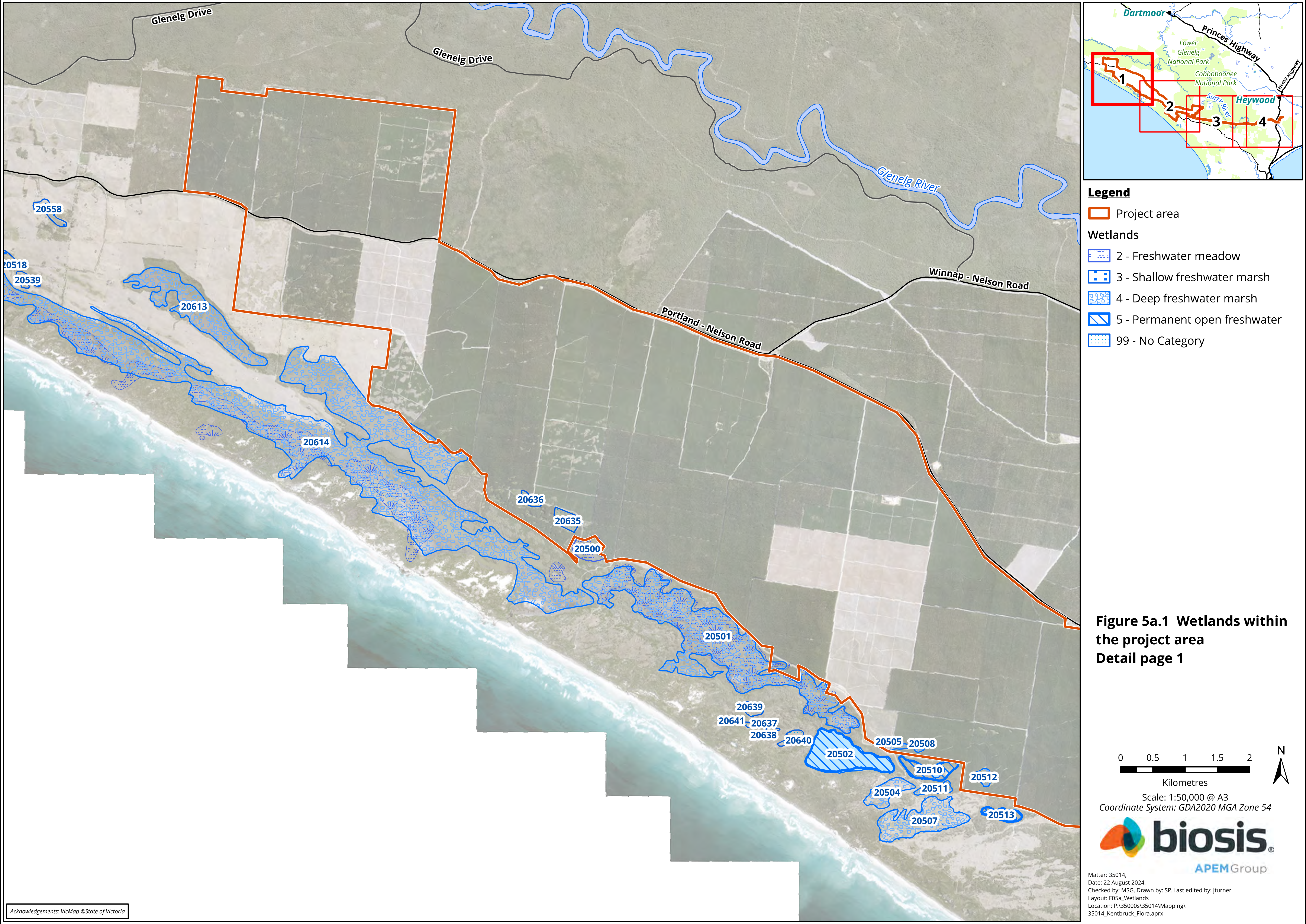

Figure 5a.1 Wetlands within the project area Detail page 1

Scale: 1:50,000 @ A3

Coordinate System: GDA2020 MGA Zone 54

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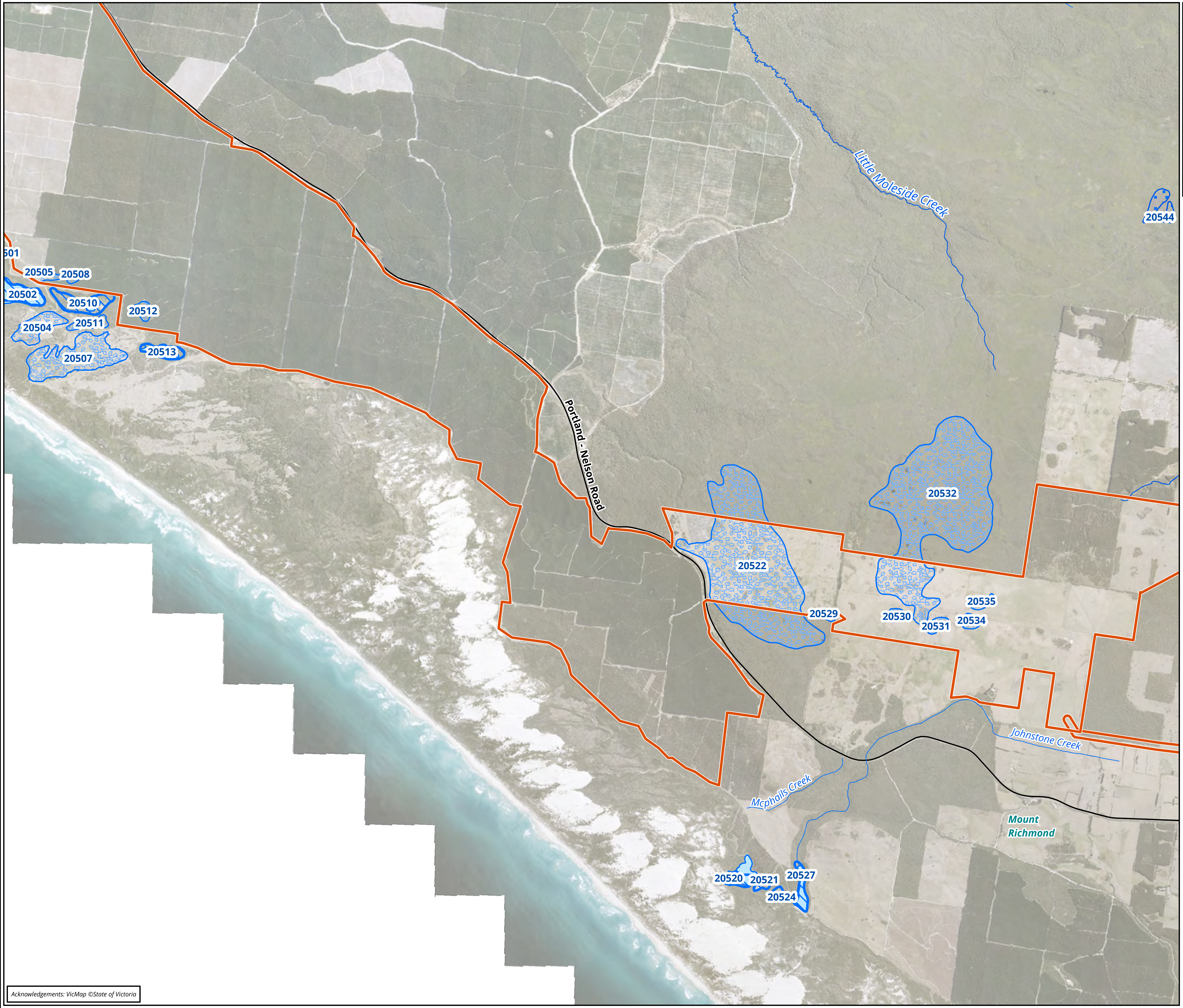
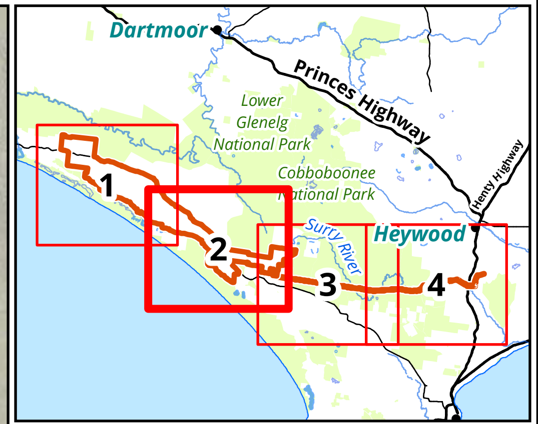
Matter: 35014,
Date: 22 August 2024,
Checked by: MSG, Drawn by: SP, Last edited by: jturner
Layout: F05a_Wetlands
Location: P:\35000s\35014\Mapping\35014_Kentbruck_Flora.aprx





Legend

Project area

Wetlands

3 - Shallow freshwater marsh

4 - Deep freshwater marsh

5 - Permanent open freshwater

Figure 5a.2 Wetlands within the project area Detail page 2

0 0.5 1 1.5 2

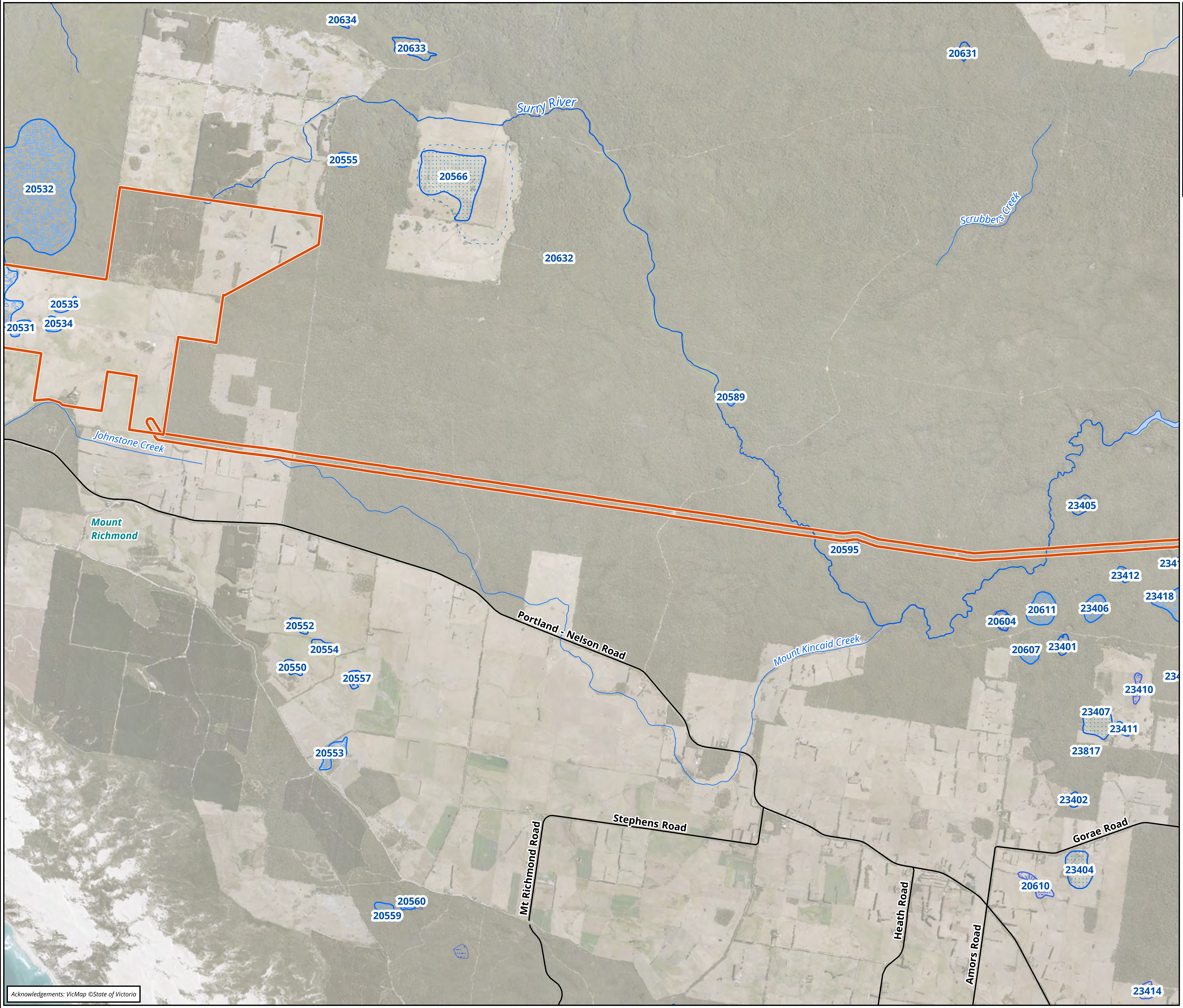
Kilometres

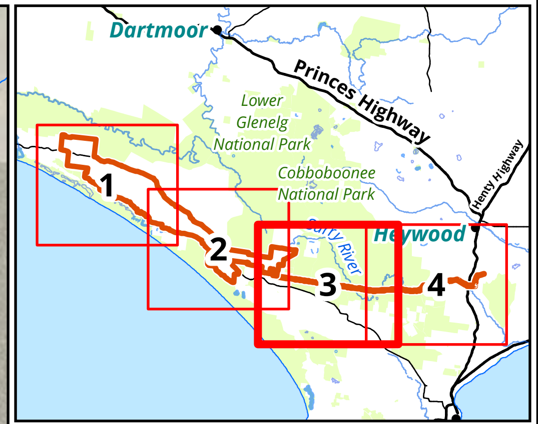
N

Scale: 1:50,000 @ A3

Coordinate System: GDA2020 MGA Zone 54

Matter: 35014,
Date: 22 August 2024,
Checked by: MSG, Drawn by: SP, Last edited by: jturner
Layout: F05a_Wetlands
Location: P:\35000s\35014\Mapping\
35014_Kentbruck_Flora.aprx





Legend

Project area

Wetlands

2 - Freshwater meadow

3 - Shallow freshwater marsh

4 - Deep freshwater marsh

99 - No Category

Figure 5a.3 Wetlands within the project area Detail page 3

0 0.5 1 1.5 2

Kilometres

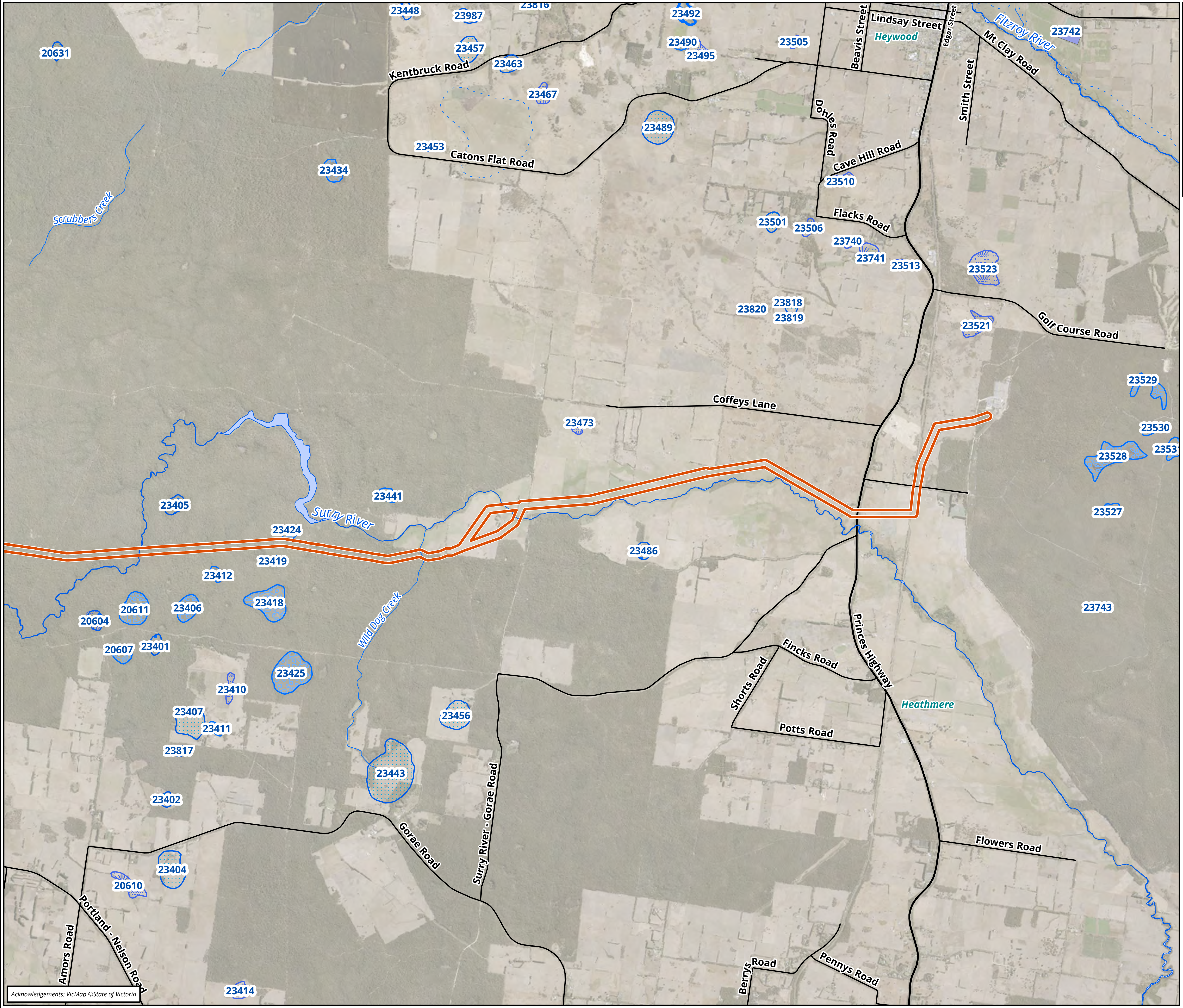
Scale: 1:50,000 @ A3

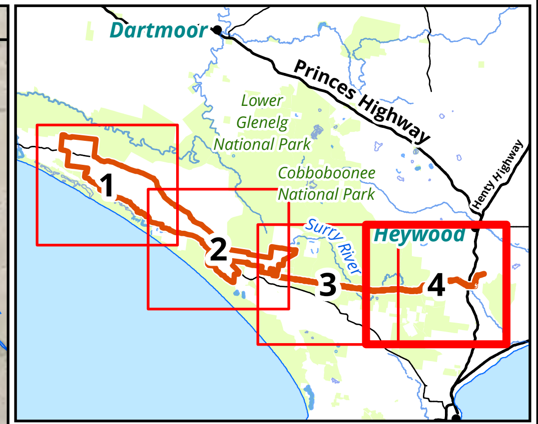
Coordinate System: GDA2020 MGA Zone 54

biosis

APEM Group

Matter: 35014,
Date: 22 August 2024,
Checked by: MSG, Drawn by: SP, Last edited by: jturner
Layout: F05a_Wetlands
Location: P:\35000s\35014\Mapping\35014_Kentbruck_Flora.aprx





Legend

Project area

Wetlands

2 - Freshwater meadow

3 - Shallow freshwater marsh

4 - Deep freshwater marsh

5 - Permanent open freshwater

20 - Sewage oxidation basin

99 - No Category

Figure 5a.4 Wetlands within the project area Detail page 4

0 0.5 1 1.5 2

Kilometres

N

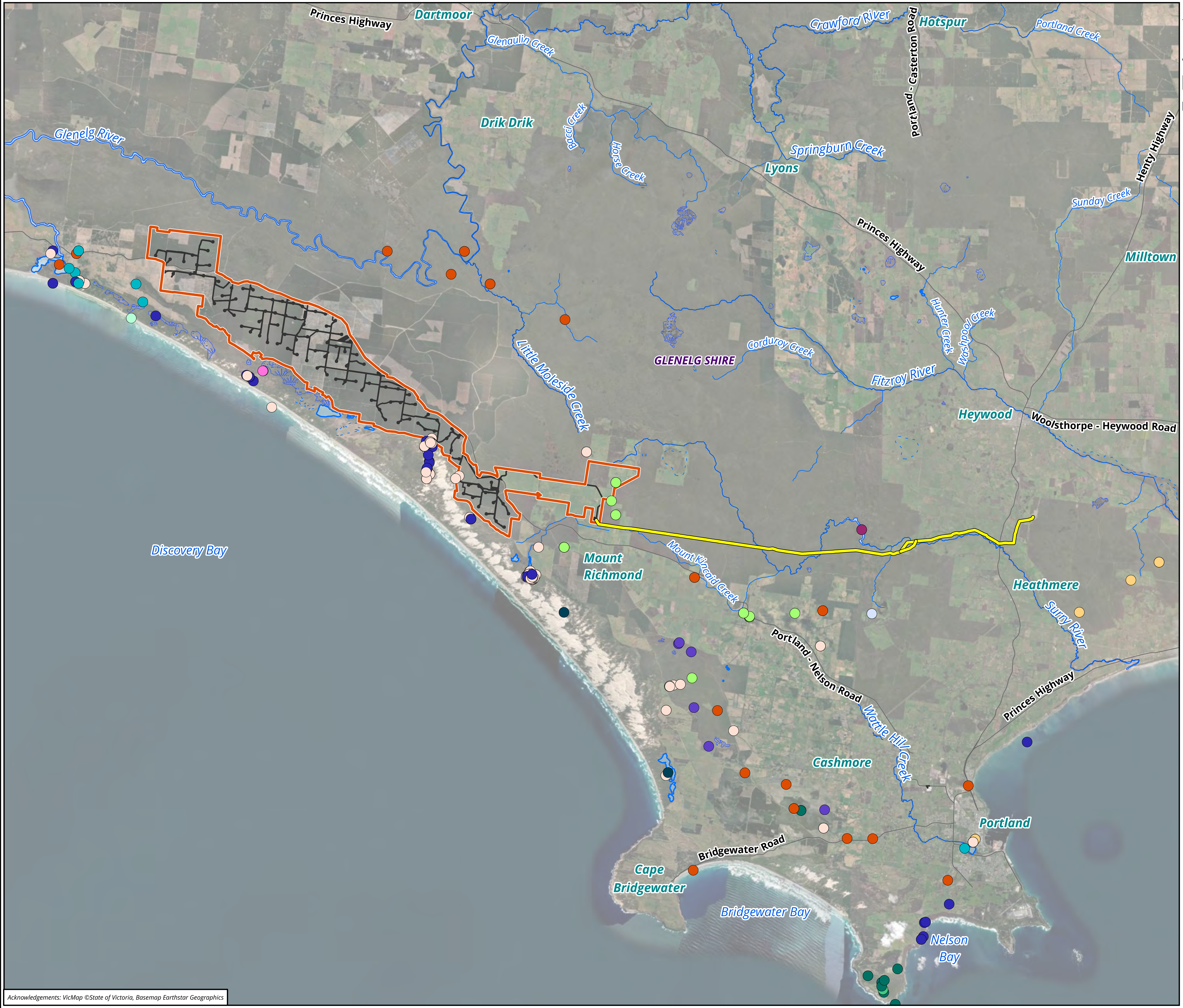
Scale: 1:50,000 @ A3

Coordinate System: GDA2020 MGA Zone 54

biosis

APEM Group

Matter: 35014,
Date: 22 August 2024,
Checked by: MSG, Drawn by: SP, Last edited by: jturner
Layout: F05a_Wetlands
Location: P:\35000s\35014\Mapping\
35014_Kentbruck_Flora.aprx



Legend

- Wind farm footprint
- Transmission line
- Other proposed infrastructure

Flora records (VBA)

- *Caladenia fragrantissima*
- *Comesperma polygaloides*
- *Coronidium gunnianum*
- *Corybas sp. aff. diemenicus (Coastal)*
- *Eucalyptus kitsoniana*
- *Eucalyptus leucoxylon subsp. megalocarpa*
- *Eucalyptus splendens*
- *Grevillea micrantha*
- *Lasiopetalum schulzenii*
- *Microlepidium pilosulum*
- *Olearia passerinoides subsp. glutescens*
- *Prasophyllum litorale*
- *Pterostylis dolichochila*
- *Ranunculus amplus*
- *Thelymitra hiemalis*

Figure 6a.1 VBA FFG Act listed flora locations - Critically Endangered

0 1 2 3 4 5

Kilometres

Scale: 1:200,000 @ A3

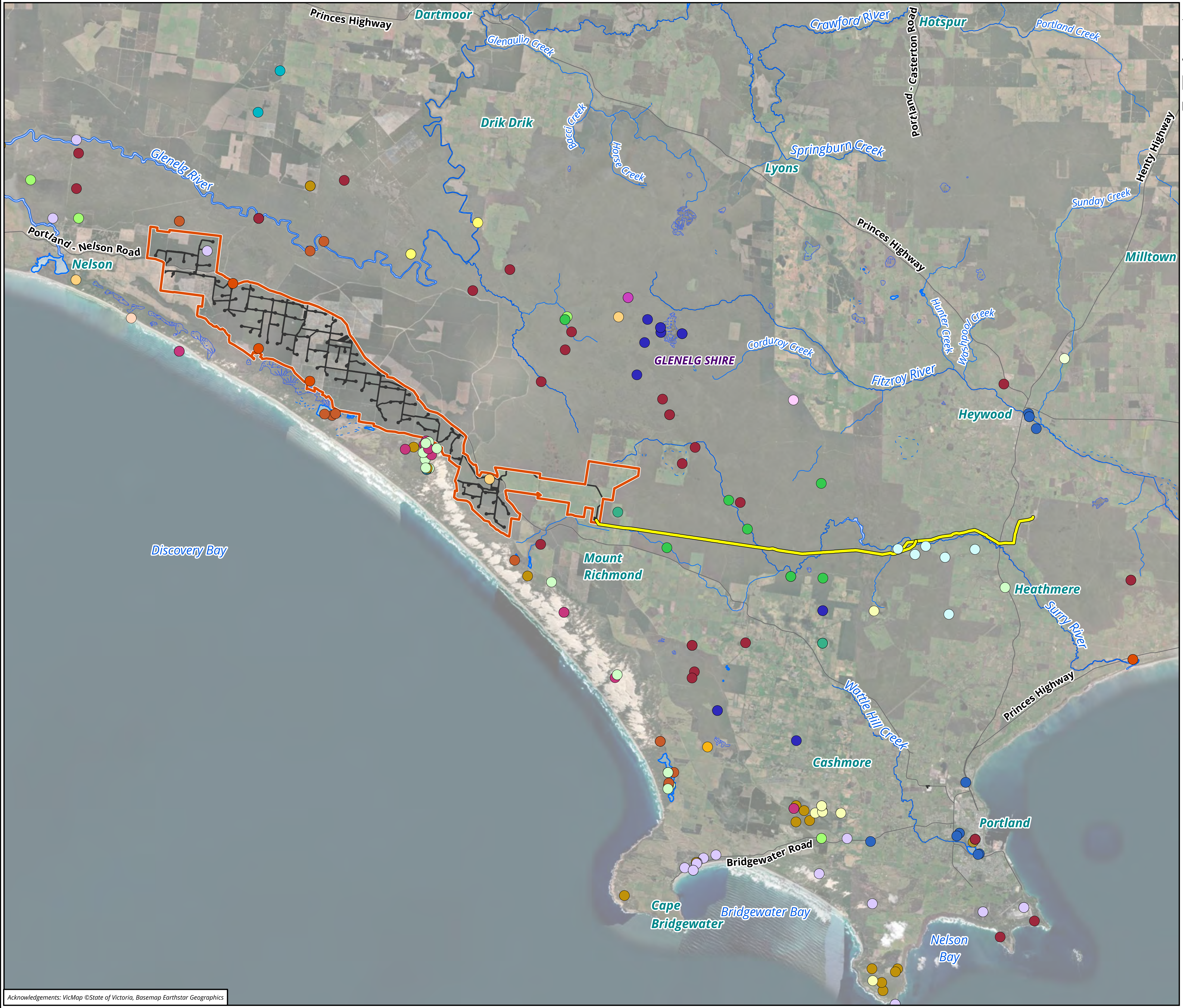
Coordinate System: GDA2020 MGA Zone 54

N

biosis

APEM Group

Matter: 35014,
Date: 22 August 2024,
Checked by: MSG, Drawn by: JPT, Last edited by: jturner
Layout: F06a_Flora_Listed_VBA_FFG
Location: P:\35000s\35014\Mapping\35014_Kentbruck_Flora.aprx



Legend

- Wind farm footprint
- Transmission line
- Other proposed infrastructure

Flora records (VBA)

- *Acacia verticillata subsp. ruscifolia*
- *Acrotriche cordata*
- *Adriana quadripartita*
- *Amphibromus sinuatus*
- *Argentipallium dealbatum*
- *Asplenium trichomanes subsp. quadrivalens*
- *Austrostipa mundula*
- *Boronia pilosa subsp. torquata*
- *Bossiaea cordigera*
- *Burnettia cuneata*
- *Caladenia bicalliata subsp. bicalliata*
- *Caladenia reticulata s.s.*
- *Caladenia venusta*
- *Cardamine papillata*
- *Carex tasmanica*
- *Cladium procerum*
- *Colobanthus apetalus var. apetalus*
- *Correa alba var. pannosa*
- *Corybas despectans*
- *Cyanothamnus nanus var. pubescens*
- *Dianella callicarpa*
- *Dipodium pardalinum*
- *Diuris behrii*
- *Diuris palustris*

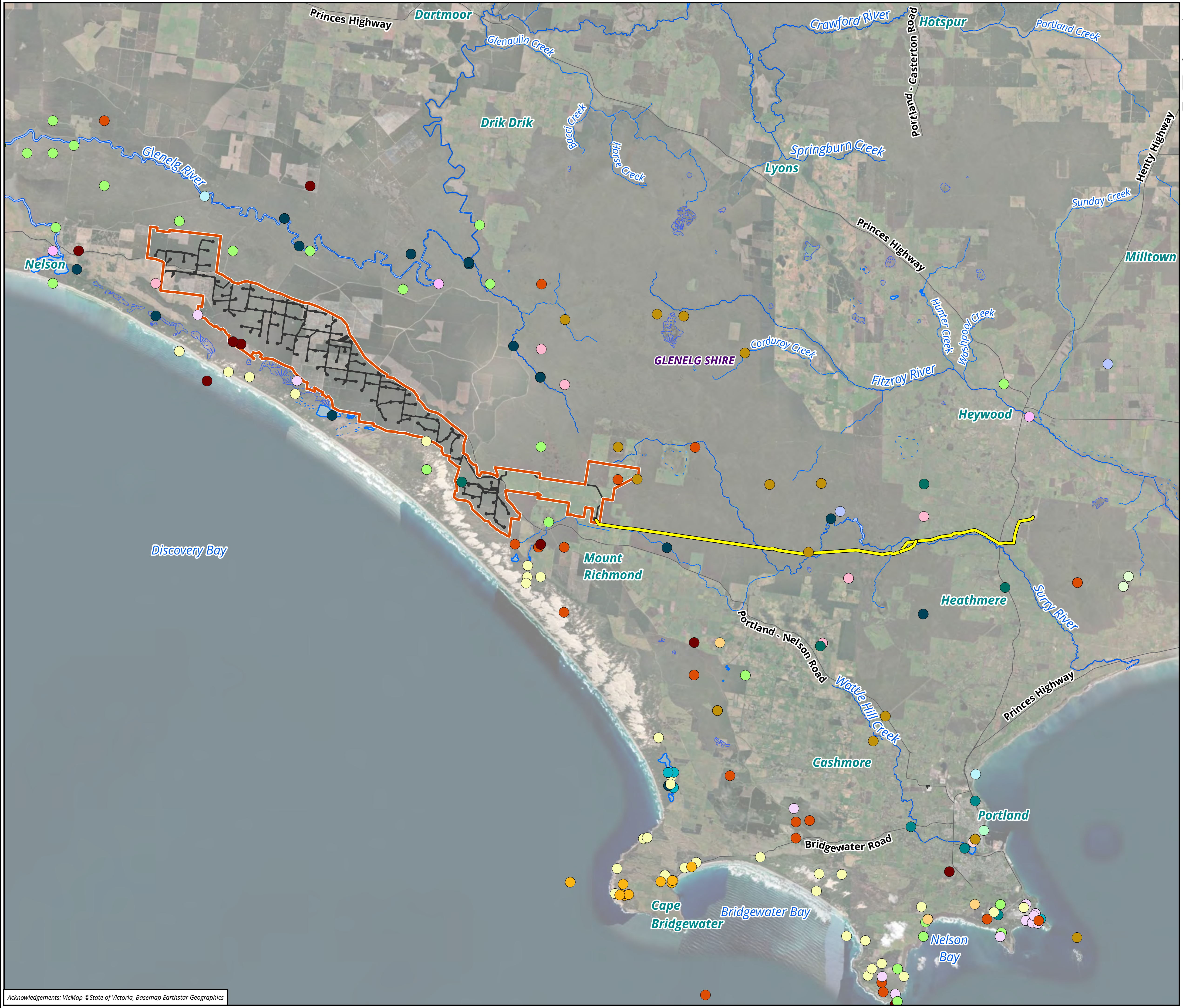
Figure 6a.2 VBA FFG Act listed flora locations - Endangered (1 of 3)

0 1 2 3 4 5
Kilometres
Scale: 1:200,000 @ A3
Coordinate System: GDA2020 MGA Zone 54

N

biosis
APEM Group

Matter: 35014,
Date: 22 August 2024,
Checked by: MSG, Drawn by: JPT, Last edited by: jturner
Layout: F06a_Flora_Listed_VBA_FFG
Location: P:\35000s\35014\Mapping\35014_Kentbruck_Flora.aprx



Legend

- Wind farm footprint
- Transmission line
- Other proposed infrastructure

Flora records (VBA)

- *Eucalyptus ovata subsp. grandiflora*
- *Euphrasia scabra*
- *Exocarpos syrticola*
- *Geranium solanderi var. solanderi s.s.*
- *Goodia medicaginea*
- *Goodia pubescens*
- *Gratiola pumilo*
- *Haloragis myriocarpa*
- *Hibbertia pallidiflora*
- *Isolepis wakefieldiana*
- *Lachnagrostis rudis subsp. rudis*
- *Lepidium desvauxii*
- *Lepidium foliosum*
- *Lepidosperma canescens*
- *Leptospermum turbinatum*
- *Levenhookia sonderi*
- *Logania ovata*
- *Machaerina laxa*
- *Melaleuca armillaris subsp. armillaris*
- *Melaleuca halmaturorum*
- *Microtis orbicularis*
- *Muehlenbeckia gunnii*
- *Olearia asterotricha*
- *Ornduffia umbricola var. umbricola*
- *Orthrosanthus multiflorus*

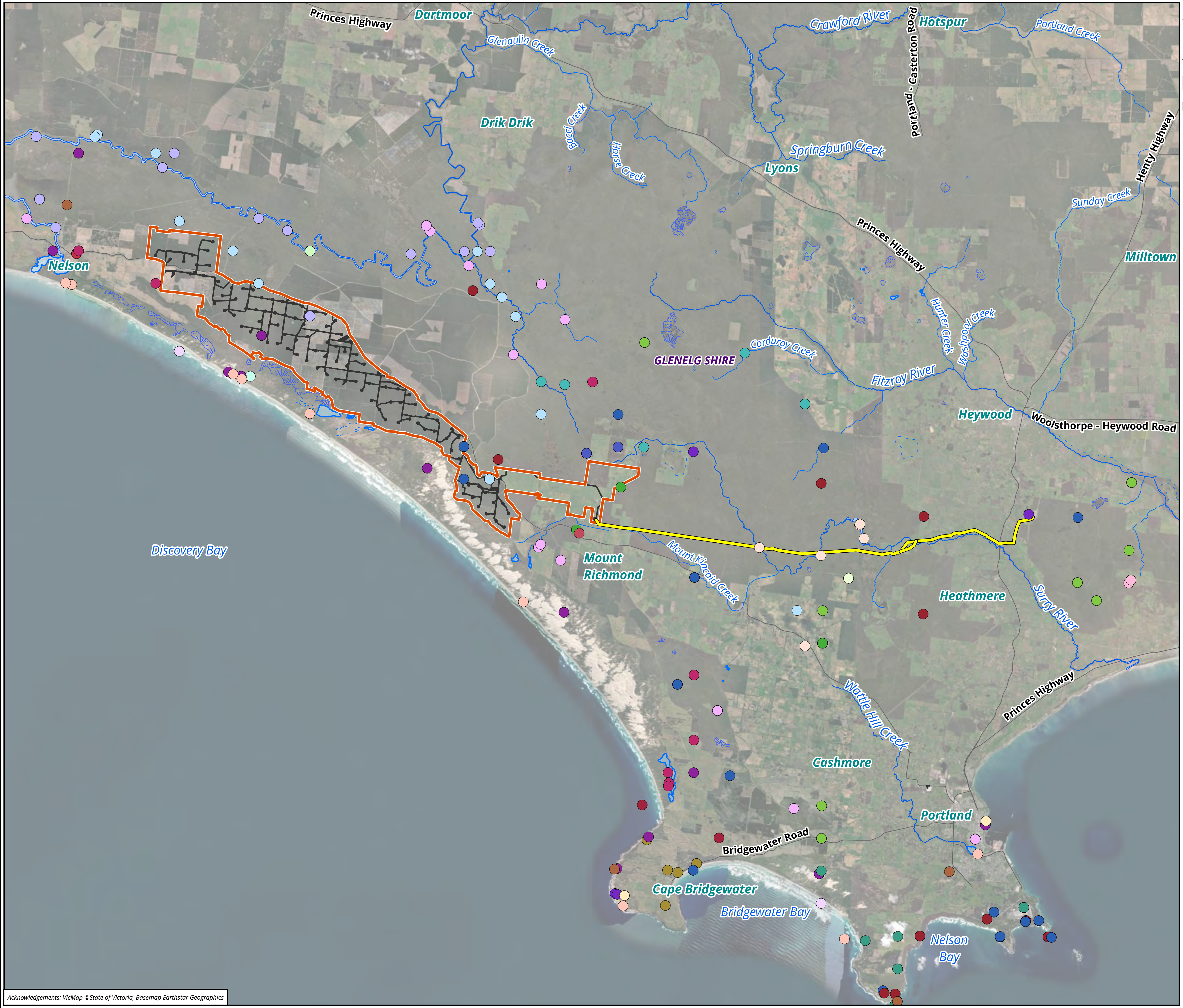
Figure 6a.3 VBA FFG Act listed flora locations - Endangered (2 of 3)

0 1 2 3 4 5
Kilometres
Scale: 1:200,000 @ A3
Coordinate System: GDA2020 MGA Zone 54

N

biosis
APEM Group

Matter: 35014,
Date: 22 August 2024,
Checked by: MSG, Drawn by: JPT, Last edited by: jturner
Layout: F06a_Flora_Listed_VBA_FFG
Location: P:\35000s\35014\Mapping\
35014_Kentbruck_Flora.aprx



Legend

- Wind farm footprint
- Transmission line
- Other proposed infrastructure

Flora records (VBA)

- *Picris squarrosa*
- *Pimelea hewardiana*
- *Pneumatopteris pennigera*
- *Poa billardierei*
- *Poa fax*
- *Poa halmaturina*
- *Poa poiformis var. ramifer*
- *Pomaderris halmaturina subsp. continentis*
- *Prasophyllum lindleyanum*
- *Prasophyllum parviflorum*
- *Pterostylis lustra*
- *Pultenaea canaliculata*
- *Pultenaea prolifera*
- *Roepera billardierei*
- *Salsola tragus subsp. pontica*
- *Scaevola calendulacea*
- *Schoenus carsei*
- *Senecio hispidissimus*
- *Sporadanthus tasmanicus*
- *Thelymitra azurea*
- *Thelymitra benthamiana*
- *Thelymitra inflata*
- *Triglochin mucronata*
- *Veronica hillebrandii*
- *Viola sieberiana s.s.*
- *Xanthosia leiophylla*
- *Xanthosia tasmanica*

Figure 6a.4 VBA FFG Act listed flora locations - Endangered (3 of 3)

N

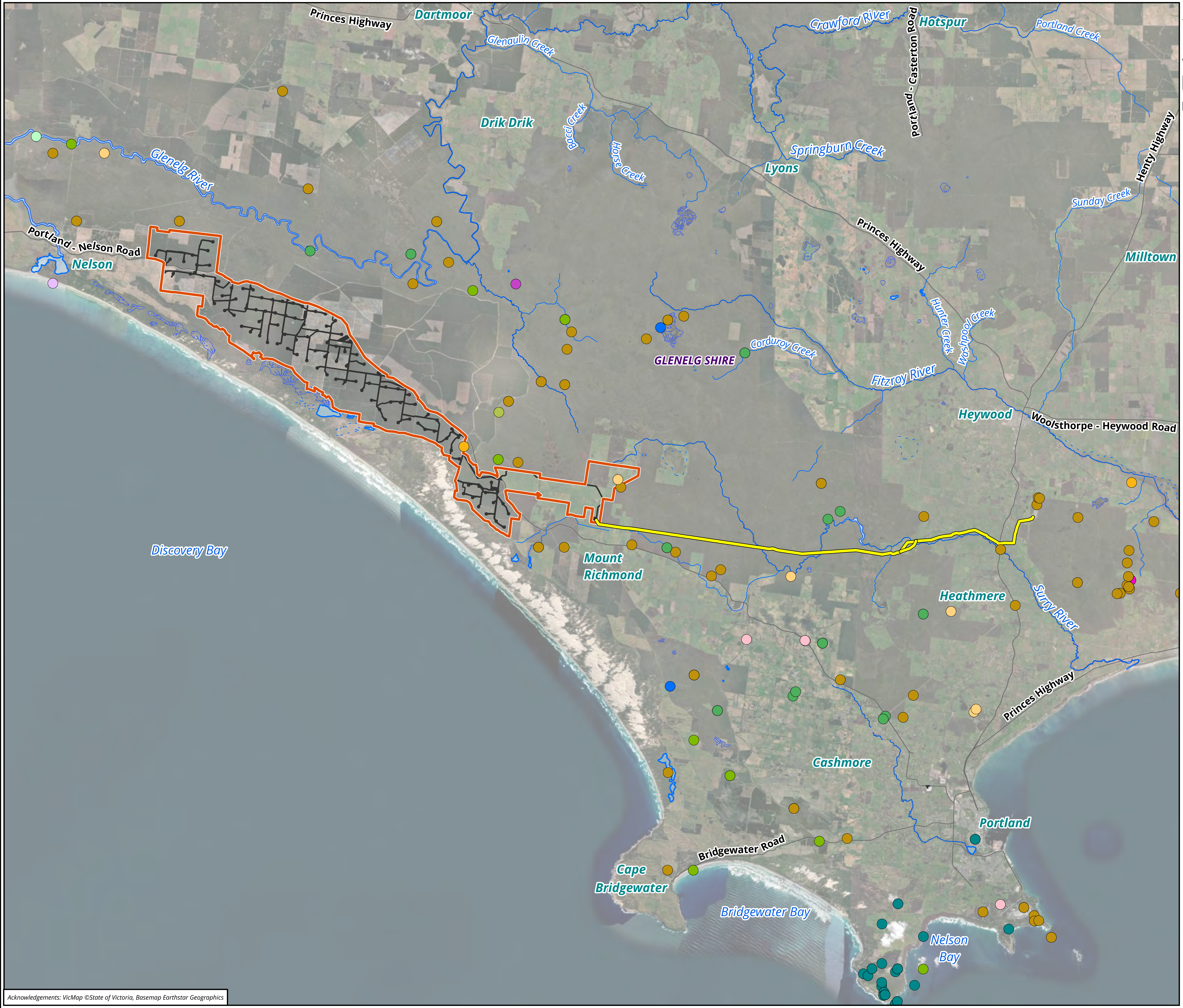
0 1 2 3 4 5

Kilometres

Scale: 1:200,000 @ A3

Coordinate System: GDA2020 MGA Zone 54

Matter: 35014,
Date: 22 August 2024,
Checked by: MSG, Drawn by: JPT, Last edited by: jturner
Layout: F06a_Flora_Listed_VBA_FFG
Location: P:\35000s\35014\Mapping\
35014_Kentbruck_Flora.aprx



Legend

- Wind farm footprint
- Transmission line
- Other proposed infrastructure

Flora records (VBA)

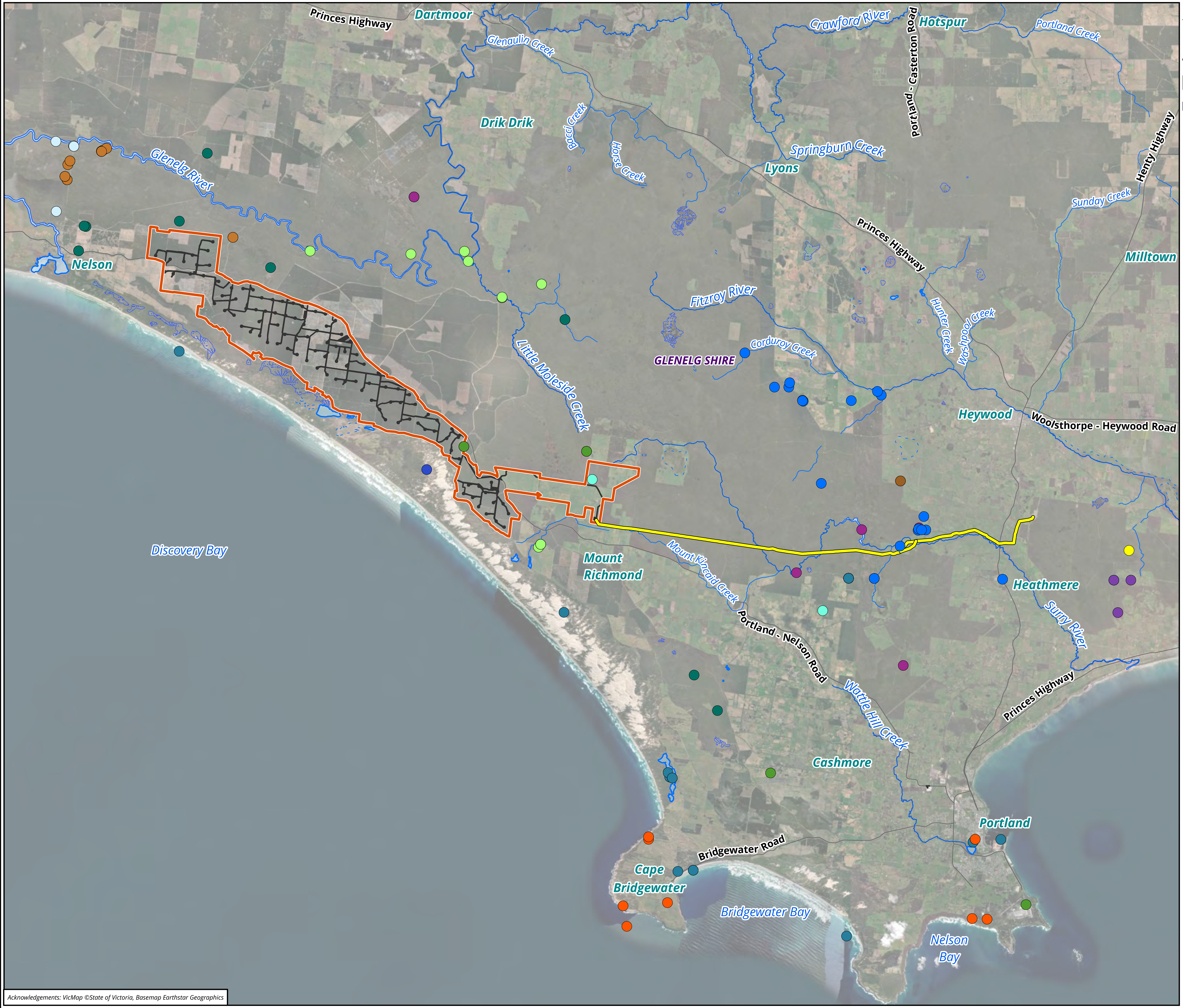
- *Caladenia vulgaris*
- *Chiloglottis seminuda*
- *Corunastylis nuda*
- *Eucalyptus diversifolia subsp. megacarpa*
- *Eucalyptus falciformis*
- *Eucalyptus sabulosa*
- *Euphrasia collina subsp. tetragona*
- *Galium curvihirtum*
- *Goodenia lineata*
- *Haloragis eichleri*
- *Lobelia beaugleholei*
- *Lomandra micrantha subsp. tuberculata*
- *Pterostylis X ingens*
- *Schoenus deformis*
- *Thelionema umbellatum*
- *Thelymitra X macmillanii*
- *Wurmbea uniflora*
- *Xanthorrhoea caespitosa*

Figure 6a.5 VBA FFG Act listed flora locations - Vulnerable

0 1 2 3 4 5
Kilometres
N
Scale: 1:200,000 @ A3
Coordinate System: GDA2020 MGA Zone 54

biosis
APEM Group

Matter: 35014,
Date: 22 August 2024,
Checked by: MSG, Drawn by: JPT, Last edited by: jturner
Layout: F06a_Flora_Listed_VBA_FFG
Location: P:\35000s\35014\Mapping\35014_Kentbruck_Flora.aprx



Legend

- Wind farm footprint
- Transmission line
- Other proposed infrastructure

Flora records (VBA)

- *Amphibromus fluitans*
- *Caladenia ornata*
- *Cassinia rugata*
- *Glycine latrobeana*
- *Haloragis exalata var. exalata*
- *Ixodia achillaeoides subsp. arenicola*
- *Prasophyllum pallidum s.l.*
- *Prasophyllum spicatum*
- *Pterostylis chlorogramma*
- *Pterostylis cucullata subsp. cucullata*
- *Senecio psilocarpus*
- *Stackhousia aspericocca subsp. 1*
- *Taraxacum cygnorum*
- *Xerochrysum palustre*

Figure 6b VBA EPBC Act listed flora locations

0 1 2 3 4 5

Kilometres

Scale: 1:200,000 @ A3

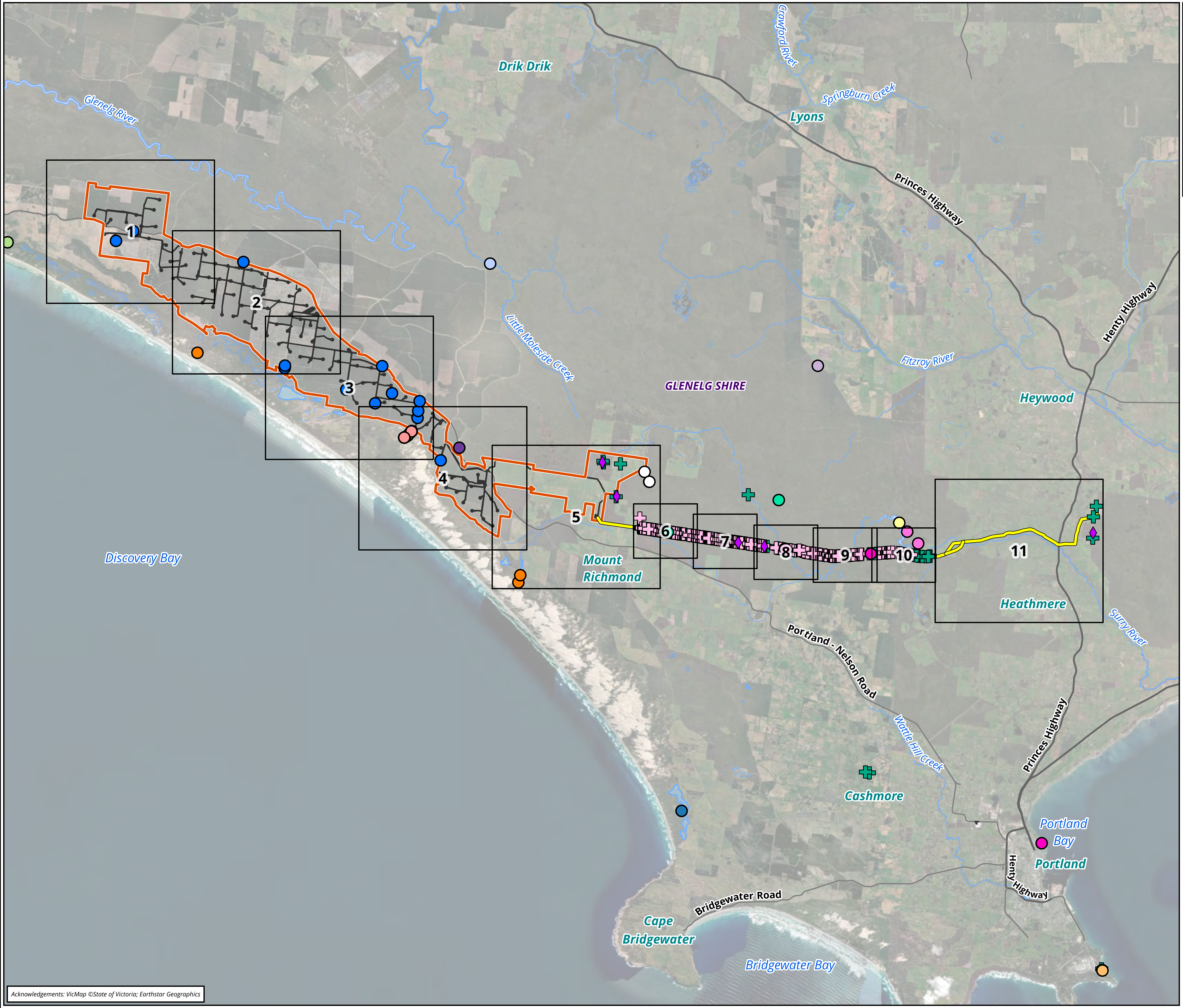
Coordinate System: GDA2020 MGA Zone 54

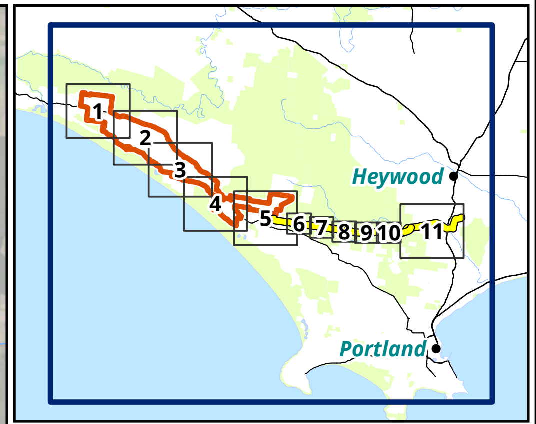
N

biosis

APEM Group

Matter: 35014,
Date: 22 August 2024,
Checked by: MSG, Drawn by: JPT, Last edited by: jturner
Layout: F06b_Flora_Listed_VBA_EPBC
Location: P:\35000s\35014\Mapping\
35014_Kentbruck_Flora.aprx





Legend

- Wind farm footprint
- Transmission line
- Proposed infrastructure

Species

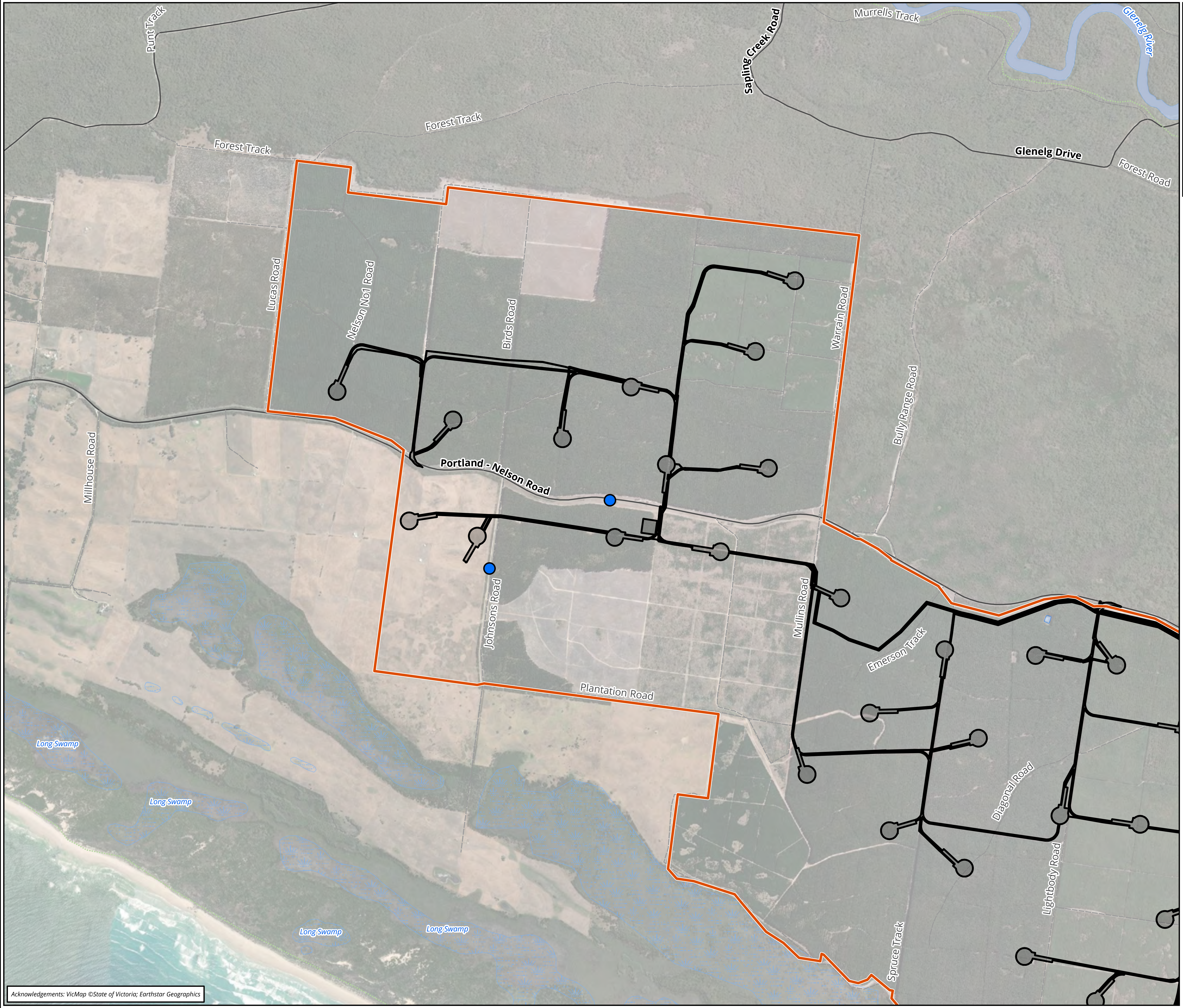
- *Boronia pilosa* subsp. *torquata* - Hairy Boronia
- *Bossiaea cordigera* - Wiry Bossiaea
- *Caladenia fragrantissima* - Scented Spider-orchid
- *Caladenia hastata* - Mellblom's Spider-orchid
- *Caladenia ornata* - Ornate Pink-fingers
- *Cassinia rugata* - Wrinkled Cassinia
- *Eucalyptus falciformis* - Western Peppermint
- *Eucalyptus splendens* - Apple Jack
- *Haloragis exalata* var. *exalata* - Square Raspwort
- *Ixodia achillaeoides* subsp. *arenicola* - Coast Ixodia
- *Olearia asterotricha* - Rough Daisy-bush
- *Olearia asterotricha* subsp. *lobata* - Rough Daisy-bush
- *Prasophyllum litorale* - Coastal Leek-orchid
- *Pterostylis cucullata* - Leafy Greenhood
- *Pterostylis lustra* - Small Sickle Greenhood
- *Pterostylis tenuissima* - Swamp Greenhood
- *Scaevola calendulacea* - Dune Fan-flower
- *Viola sieberiana* - Tiny Violet
- *Wurmbea uniflora* - One-flower Early Nancy

Figure 6c.0 Survey records of listed threatened flora species: overview

0 2 4 6 8
Kilometres
N

Scale: 1:175,000 @ A3
Coordinate System: GDA2020 MGA Zone 54

Matter: 35014,
Date: 22 August 2024,
Checked by: MG, Drawn by: JPT, Last edited by: jturner
Layout: F06c_Flora_Listed_Biosis
Location: P:\35000s\35014\Mapping\
35014_Kentbruck_Flora.aprx



Legend

Wind farm footprint

Proposed infrastructure

Species

Scaevola calendulacea - Dune Fan-flower

Figure 6c.1 Survey records of listed threatened flora species: detail

0 0.25 0.5 0.75 1

Kilometres

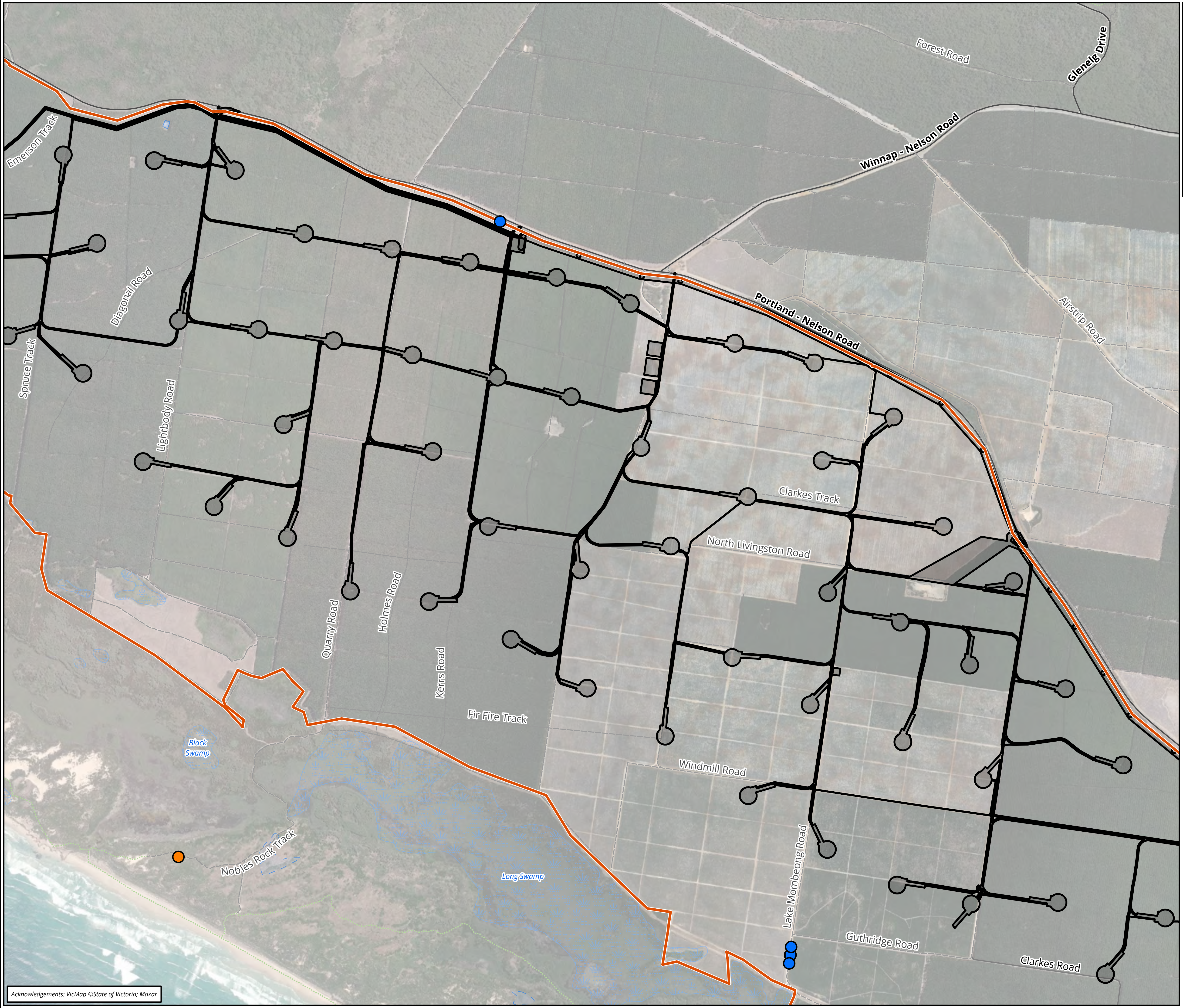
N

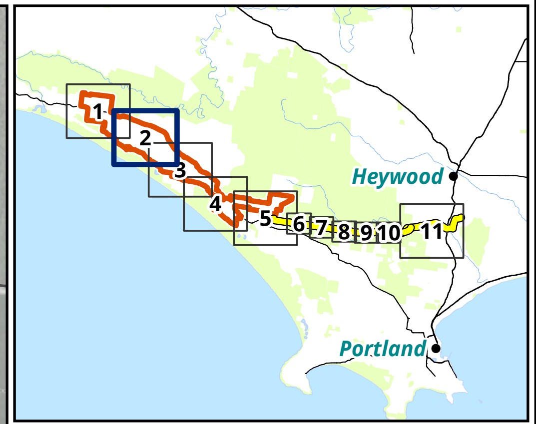
Scale: 1:25,000 @ A3

Coordinate System: GDA2020 MGA Zone 54

biosis. APEM Group

Matter: 35014,
Date: 22 August 2024,
Checked by: MG, Drawn by: JPT, Last edited by: jturner
Layout: F06c_Flora_Listed_Biosis
Location: P:\35000s\35014\Mapping\35014_Kentbruck_Flora.aprx





Legend

- Wind farm footprint
- Proposed infrastructure

Species

- *Caladenia fragrantissima* - Scented Spider-orchid
- *Scaevola calendulacea* - Dune Fan-flower

Figure 6c.2 Survey records of listed threatened flora species: detail

0 0.25 0.5 0.75 1

Kilometres

N

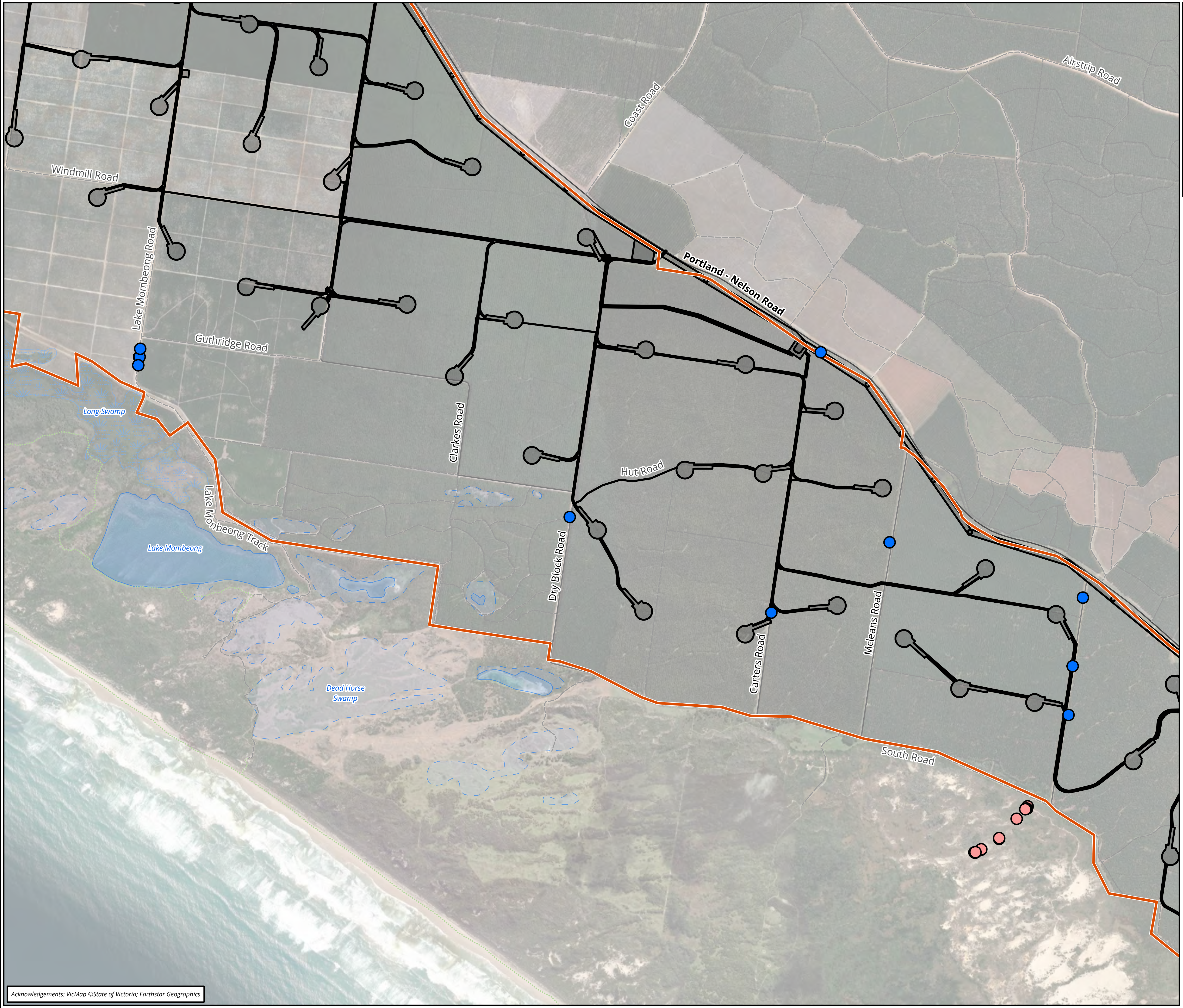
Scale: 1:25,000 @ A3

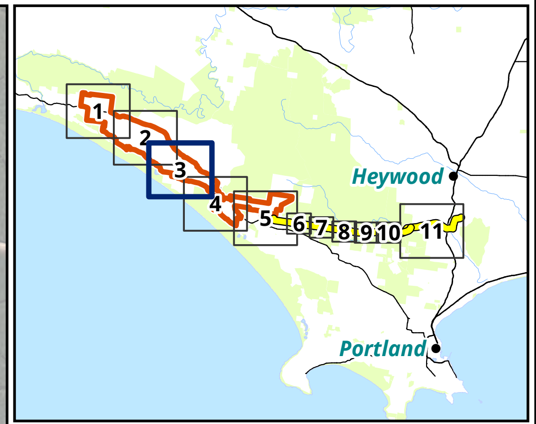
Coordinate System: GDA2020 MGA Zone 54

biosis

APEM Group

Matter: 35014,
Date: 22 August 2024,
Checked by: MG, Drawn by: JPT, Last edited by: jturner
Layout: F06c_Flora_Listed_Biosis
Location: P:\35000s\35014\Mapping\
35014_Kentbruck_Flora.aprx





Legend

Wind farm footprint

Proposed infrastructure

Species

Prasophyllum litorale - Coastal Leek-orchid

Scaevola calendulacea - Dune Fan-flower

Figure 6c.3 Survey records of listed threatened flora species: detail

0 0.25 0.5 0.75 1

Kilometres

N

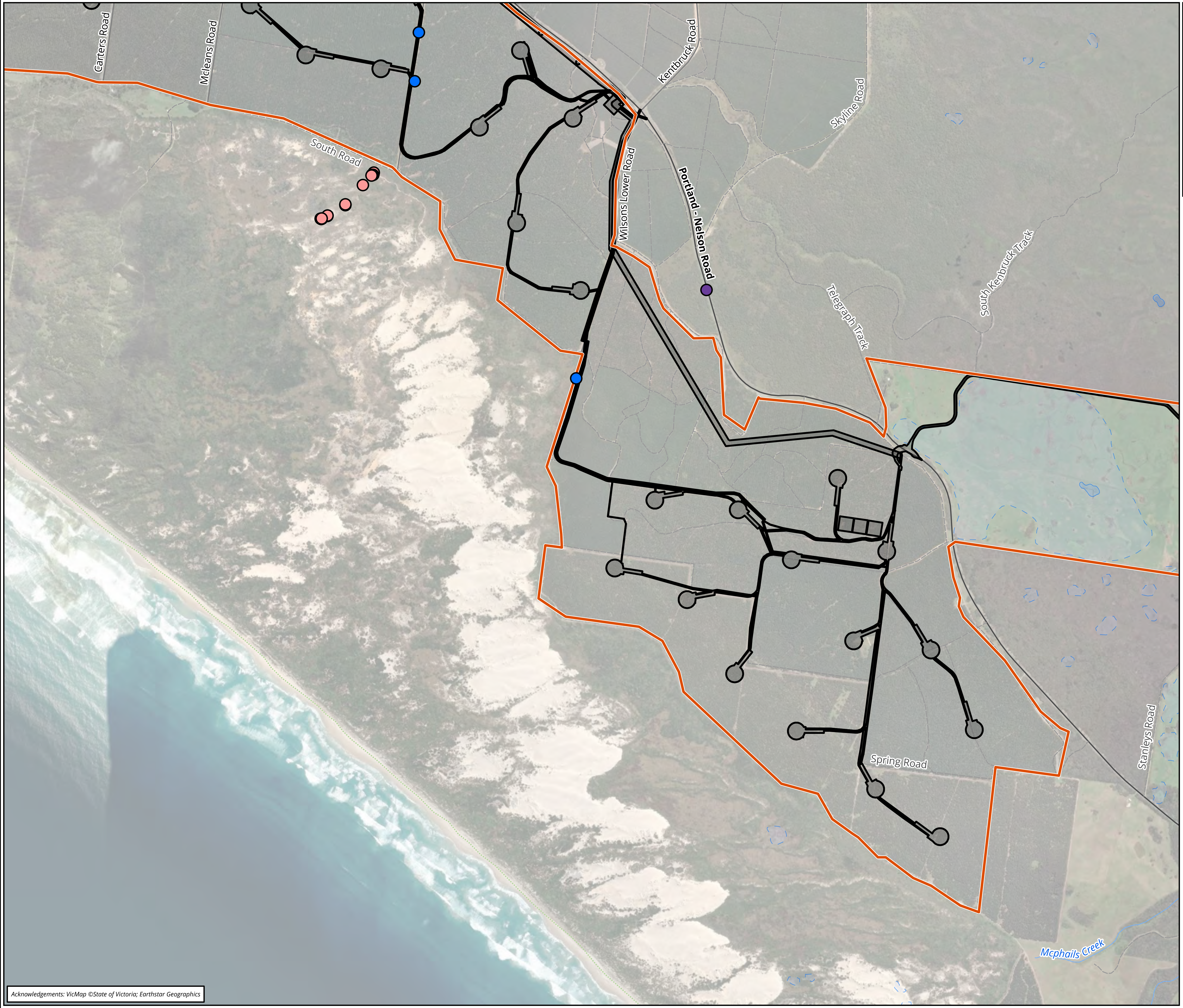
Scale: 1:25,000 @ A3

Coordinate System: GDA2020 MGA Zone 54

biosis

APEM Group

Matter: 35014,
Date: 22 August 2024,
Checked by: MG, Drawn by: JPT, Last edited by: jturner
Layout: F06c_Flora_Listed_Biosis
Location: P:\35000s\35014\Mapping\
35014_Kentbruck_Flora.aprx



Legend

Wind farm footprint

Proposed infrastructure

Species

Ixodia achillaeoides subsp. *arenicola* - Coast Ixodia

Prasophyllum litorale - Coastal Leek-orchid

Scaevola calendulacea - Dune Fan-flower

Figure 6c.4 Survey records of listed threatened flora species: detail

0 0.25 0.5 0.75 1

Kilometres

N

Scale: 1:25,000 @ A3

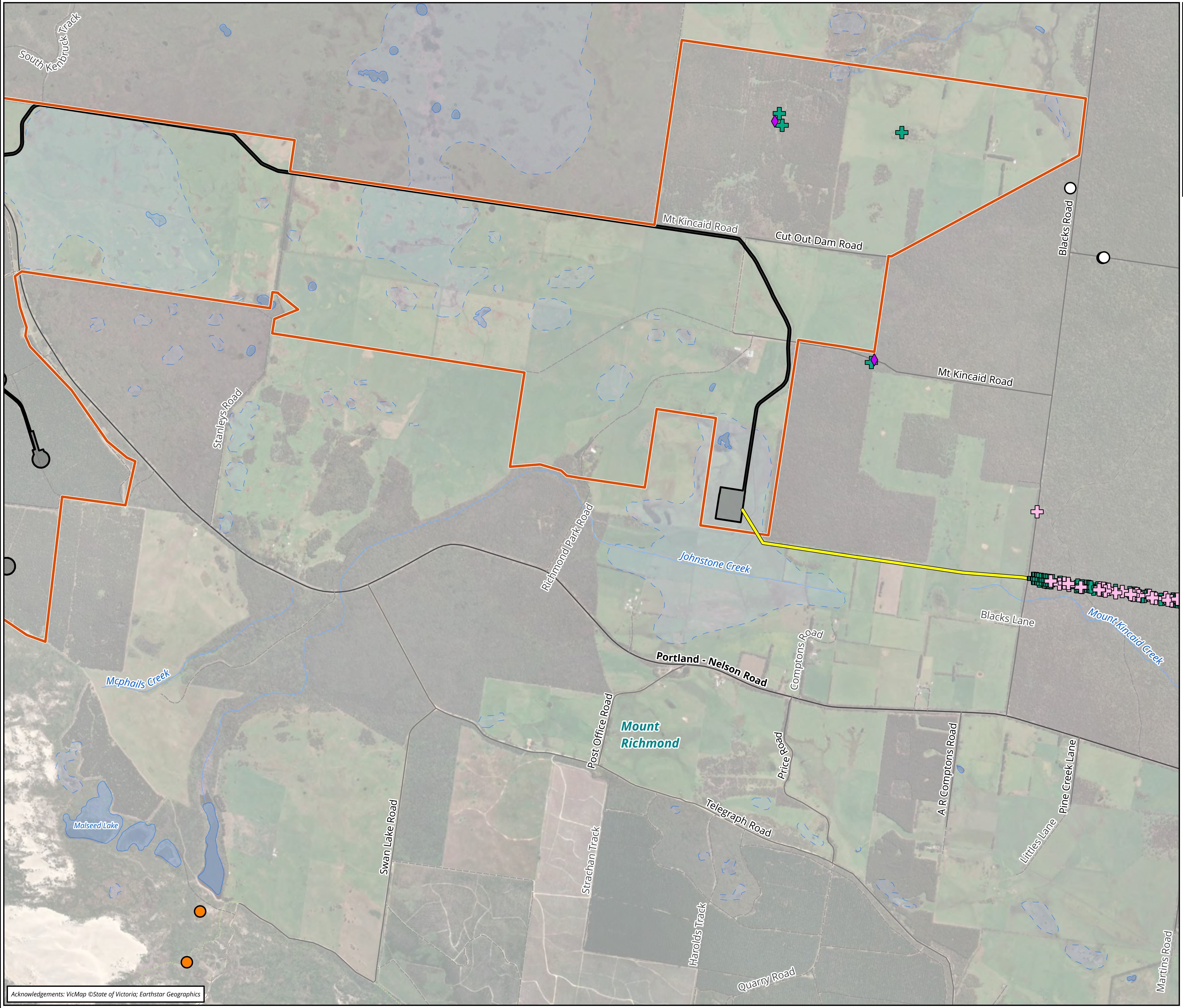
Coordinate System: GDA2020 MGA Zone 54

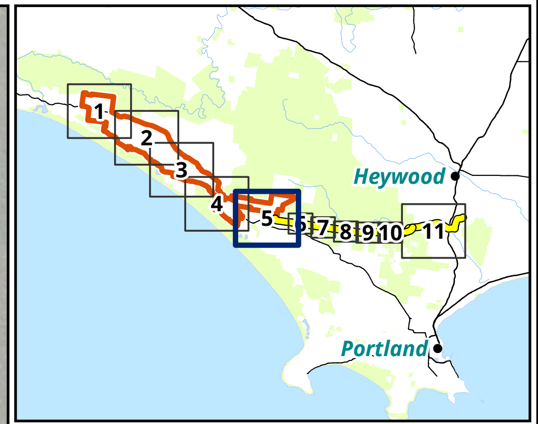
biosis

APEM Group

Matter: 35014,
Date: 22 August 2024,
Checked by: MG, Drawn by: JPT, Last edited by: jturner
Layout: F06c_Flora_Listed_Biosis
Location: P:\35000s\35014\Mapping\35014_Kentbruck_Flora.aprx

Acknowledgements: VicMap ©State of Victoria; Earthstar Geographics





Legend

- Wind farm footprint
- Transmission line
- Proposed infrastructure

Species

- *Caladenia fragrantissima* - Scented Spider-orchid
- *Eucalyptus falciformis* - Western Peppermint
- *Eucalyptus splendens* - Apple Jack
- *Olearia asterotricha* subsp. *lobata* - Rough Daisy-bush
- *Viola sieberiana* - Tiny Violet

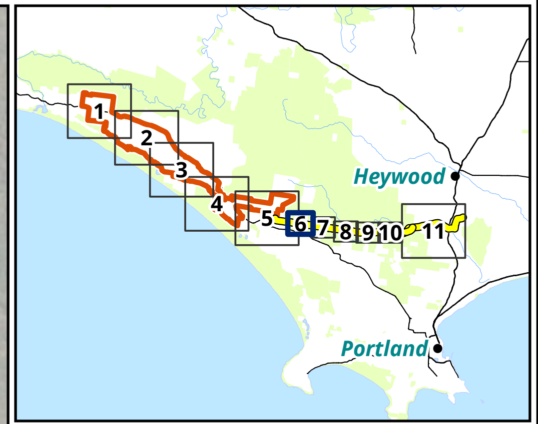
Figure 6c.5 Survey records of listed threatened flora species: detail

0 0.25 0.5 0.75 1
Kilometres

Scale: 1:25,000 @ A3
Coordinate System: GDA2020 MGA Zone 54

biosis. APEM Group

Matter: 35014,
Date: 22 August 2024,
Checked by: MG, Drawn by: JPT, Last edited by: jturner
Layout: F06c_Flora_Listed_Biosis
Location: P:\35000s\35014\Mapping\35014_Kentbruck_Flora.aprx



Legend

Transmission line

Proposed infrastructure

Species

Boronia pilosa subsp. *torquata* - Hairy Boronia

Eucalyptus falciformis - Western Peppermint

Eucalyptus splendens - Apple Jack

Viola sieberiana - Tiny Violet

Figure 6c.6 Survey records of listed threatened flora species: detail

0 0.1 0.2 0.3 0.4

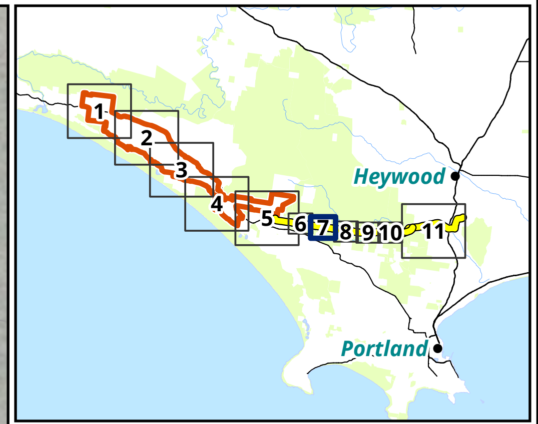
Kilometres

N

Scale: 1:10,000 @ A3

Coordinate System: GDA2020 MGA Zone 54

Matter: 35014,
Date: 22 August 2024,
Checked by: MG, Drawn by: JPT, Last edited by: jturner
Layout: F06c_Flora_Listed_Biosis
Location: P:\35000s\35014\Mapping\
35014_Kentbruck_Flora.aprx



Legend

Transmission line

Proposed infrastructure

Species

Eucalyptus falciformis - Western Peppermint

Eucalyptus splendens - Apple Jack

Viola sieberiana - Tiny Violet

Figure 6c.7 Survey records of listed threatened flora species: detail

0 0.1 0.2 0.3 0.4

Kilometres

N

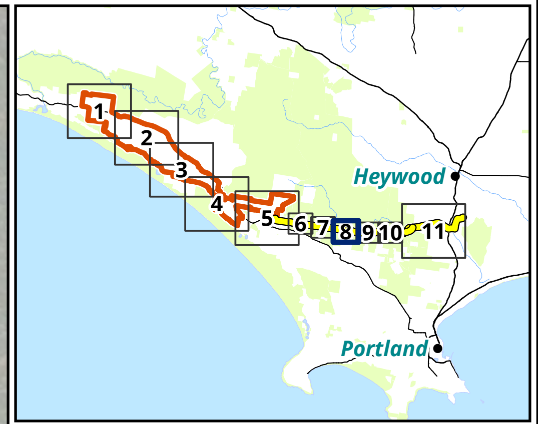
Scale: 1:10,000 @ A3

Coordinate System: GDA2020 MGA Zone 54

biosis

APEM Group

Matter: 35014,
Date: 22 August 2024,
Checked by: MG, Drawn by: JPT, Last edited by: jturner
Layout: F06c_Flora_Listed_Biosis
Location: P:\35000s\35014\Mapping\
35014_Kentbruck_Flora.aprx



Legend

- Transmission line
- Proposed infrastructure

Species

- *Bossiaea cordigera* - Wiry Bossiaea
- *Eucalyptus falciformis* - Western Peppermint
- *Eucalyptus splendens* - Apple Jack
- *Olearia asterotricha* - Rough Daisy-bush
- *Viola sieberiana* - Tiny Violet

Figure 6c.8 Survey records of listed threatened flora species: detail

0 0.1 0.2 0.3 0.4

Kilometres

N

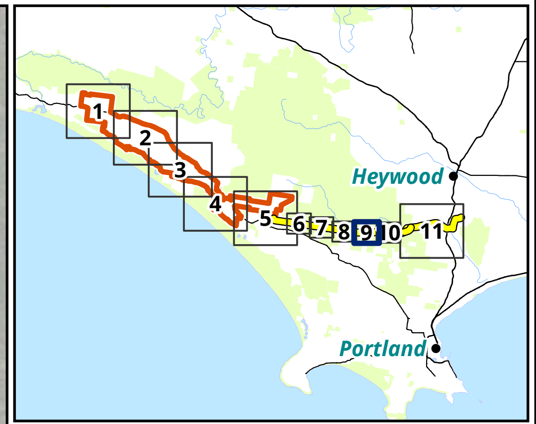
Scale: 1:10,000 @ A3

Coordinate System: GDA2020 MGA Zone 54

biosis

APEM Group

Matter: 35014,
Date: 22 August 2024,
Checked by: MG, Drawn by: JPT, Last edited by: jturner
Layout: F06c_Flora_Listed_Biosis
Location: P:\35000s\35014\Mapping\
35014_Kentbruck_Flora.aprx



Legend

- Transmission line
- Proposed infrastructure

Species

- *Bossiaea cordigera* - Wiry Bossiaea
- *Eucalyptus falciformis* - Western Peppermint
- *Eucalyptus splendens* - Apple Jack
- *Pterostylis lustra* - Small Sickle Greenhood

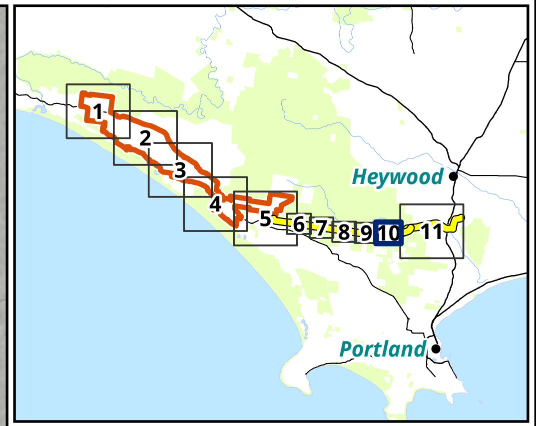
Figure 6c.9 Survey records of listed threatened flora species: detail

0 0.1 0.2 0.3 0.4
Kilometres
N

Scale: 1:10,000 @ A3
Coordinate System: GDA2020 MGA Zone 54

biosis
APEM Group

Matter: 35014,
Date: 22 August 2024,
Checked by: MG, Drawn by: JPT, Last edited by: jturner
Layout: F06c_Flora_Listed_Biosis
Location: P:\35000s\35014\Mapping\35014_Kentbruck_Flora.aprx



Legend

Transmission line

Proposed infrastructure

Species

Bossiaea cordigera - Wiry Bossiaea

Eucalyptus falciformis - Western Peppermint

Eucalyptus splendens - Apple Jack

Wurmbea uniflora - One-flower Early Nancy

Figure 6c.10 Survey records of listed threatened flora species: detail

0 0.1 0.2 0.3 0.4

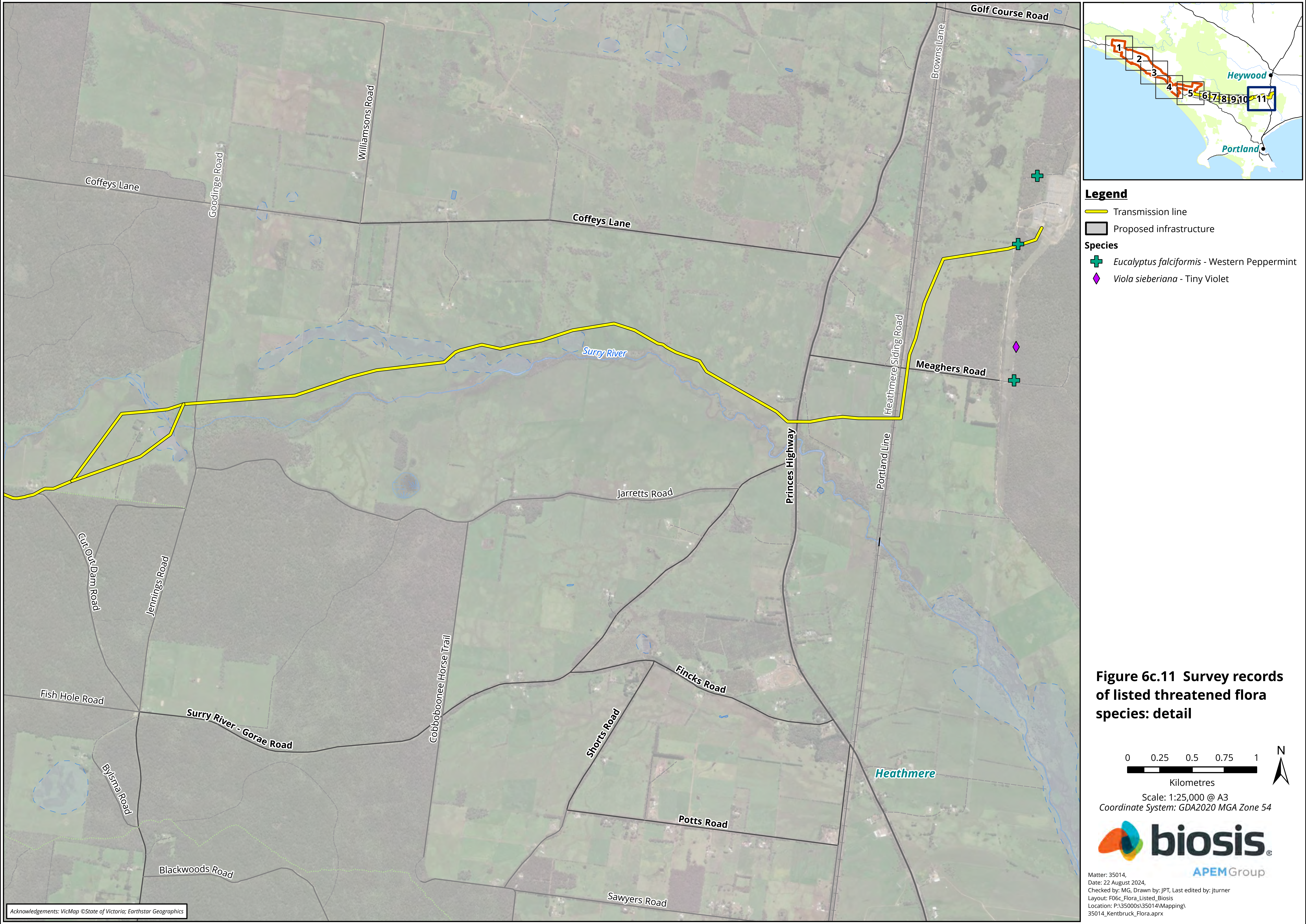
Kilometres

N

Scale: 1:10,000 @ A3

Coordinate System: GDA2020 MGA Zone 54

Matter: 35014,
Date: 22 August 2024,
Checked by: MG, Drawn by: JPT, Last edited by: jturner
Layout: F06c_Flora_Listed_Biosis
Location: P:\35000s\35014\Mapping\35014_Kentbruck_Flora.aprx



Legend

Transmission line

Proposed infrastructure

Species

Eucalyptus falciformis - Western Peppermint

Viola sieberiana - Tiny Violet

Figure 6c.11 Survey records of listed threatened flora species: detail

0 0.25 0.5 0.75 1

Kilometres

N

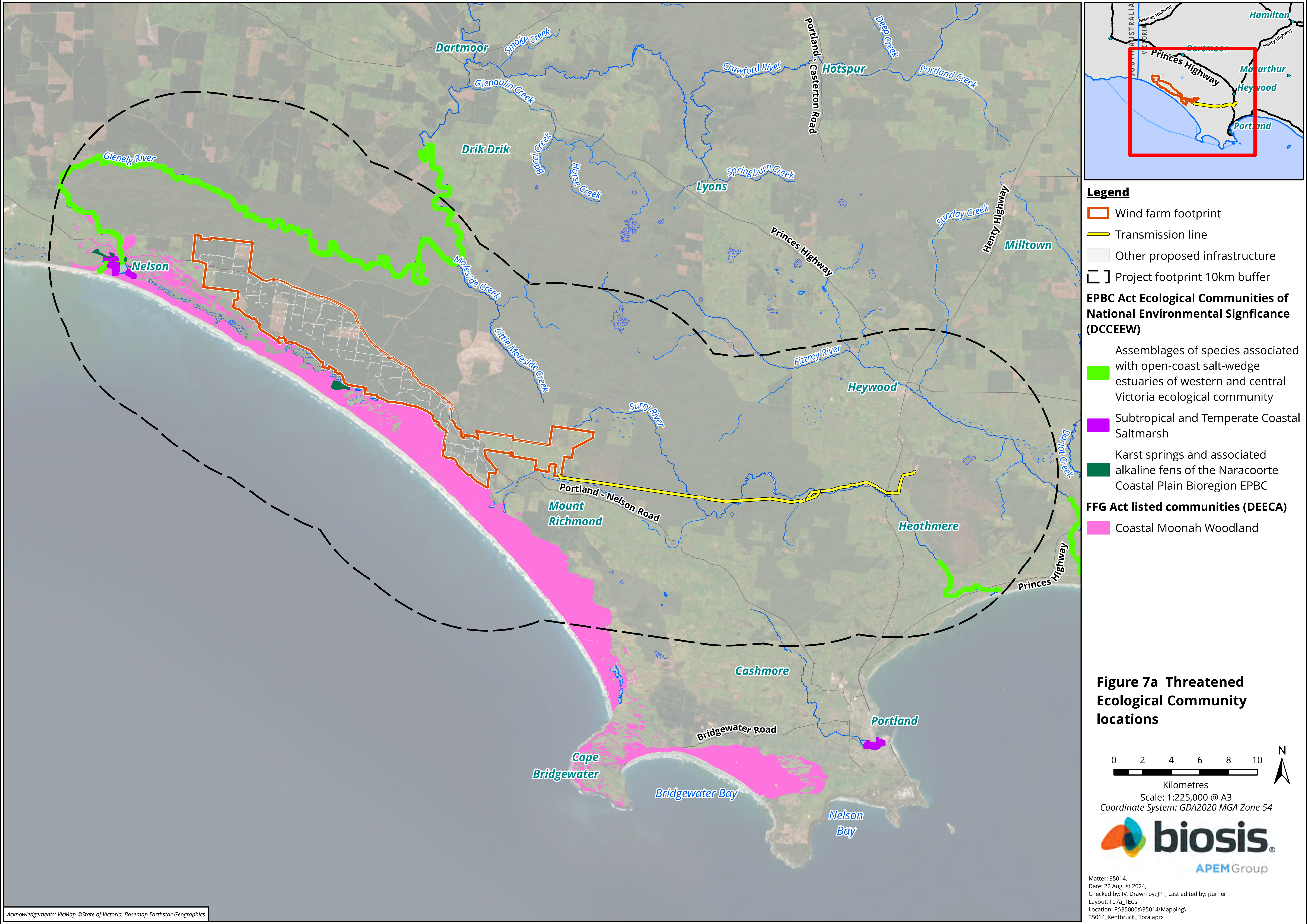
Scale: 1:25,000 @ A3

Coordinate System: GDA2020 MGA Zone 54

biosis

APEM Group

Matter: 35014,
Date: 22 August 2024,
Checked by: MG, Drawn by: JPT, Last edited by: jturner
Layout: F06c_Flora_Listed_Biosis
Location: P:\35000s\35014\Mapping\35014_Kentbruck_Flora.aprx



Legend

- Wind farm footprint
- Transmission line
- Other proposed infrastructure
- Project footprint 10km buffer

EPBC Act Ecological Communities of National Environmental Signficance (DCCEEW)

- Assemblages of species associated with open-coast salt-wedge estuaries of western and central Victoria ecological community
- Subtropical and Temperate Coastal Saltmarsh
- Karst springs and associated alkaline fens of the Naracoorte Coastal Plain Bioregion EPBC

FFG Act listed communities (DEECA)

- Coastal Moonah Woodland

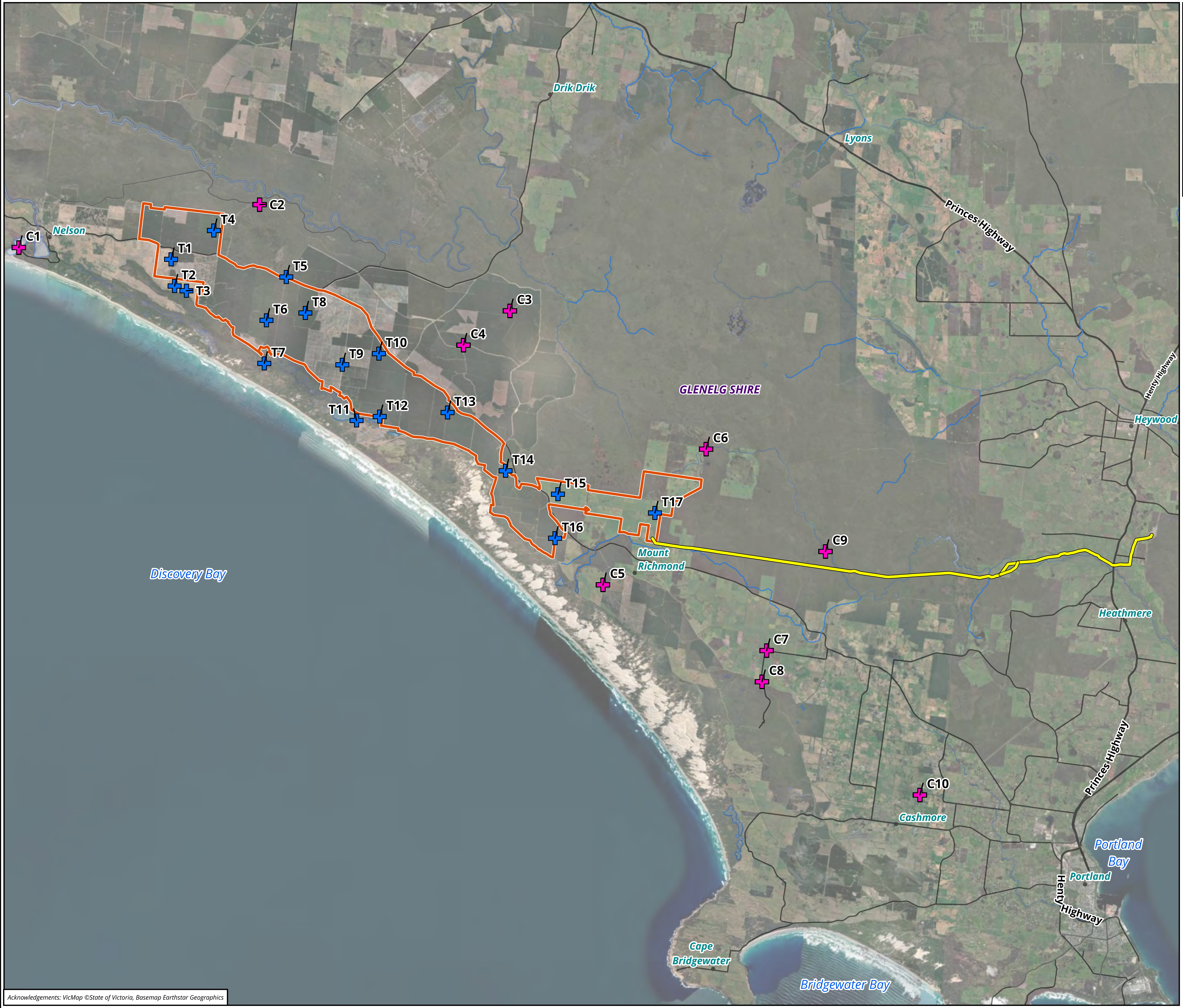
Figure 7a Threatened Ecological Community locations

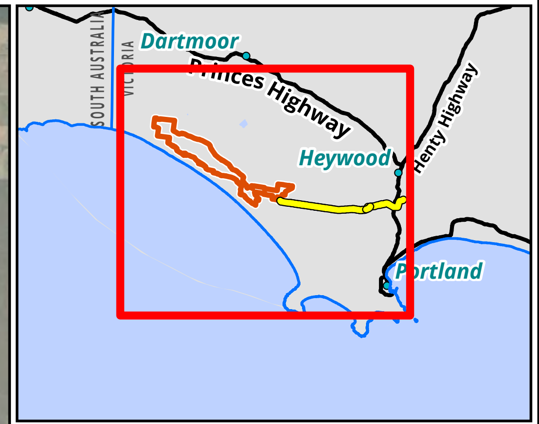
0 2 4 6 8 10
Kilometres
N

Scale: 1:225,000 @ A3
Coordinate System: GDA2020 MGA Zone 54

biosis APEM Group

Matter: 35014,
Date: 22 August 2024,
Checked by: IV, Drawn by: JPT, Last edited by: jturner
Layout: F07a_TECs
Location: P:\35000s\35014\Mapping\35014_Kentbruck_Flora.aprx





Legend

Wind farm footprint

Transmission line

Survey sites

Control

Treatment

Figure 10a Bird utilisation survey points

0 1 2 3 4 5

Kilometres

Scale: 1:175,000 @ A3

Coordinate System: GDA2020 MGA Zone 54

N

Matter: 35014,
Date: 22 August 2024,
Checked by: IV, Drawn by: JPT, Last edited by: jturner
Layout: F10a_BirdUtilisationSurvey
Location: P:\35000s\35014\Mapping\
35014_KentbruckFauna_F10_F19.aprx

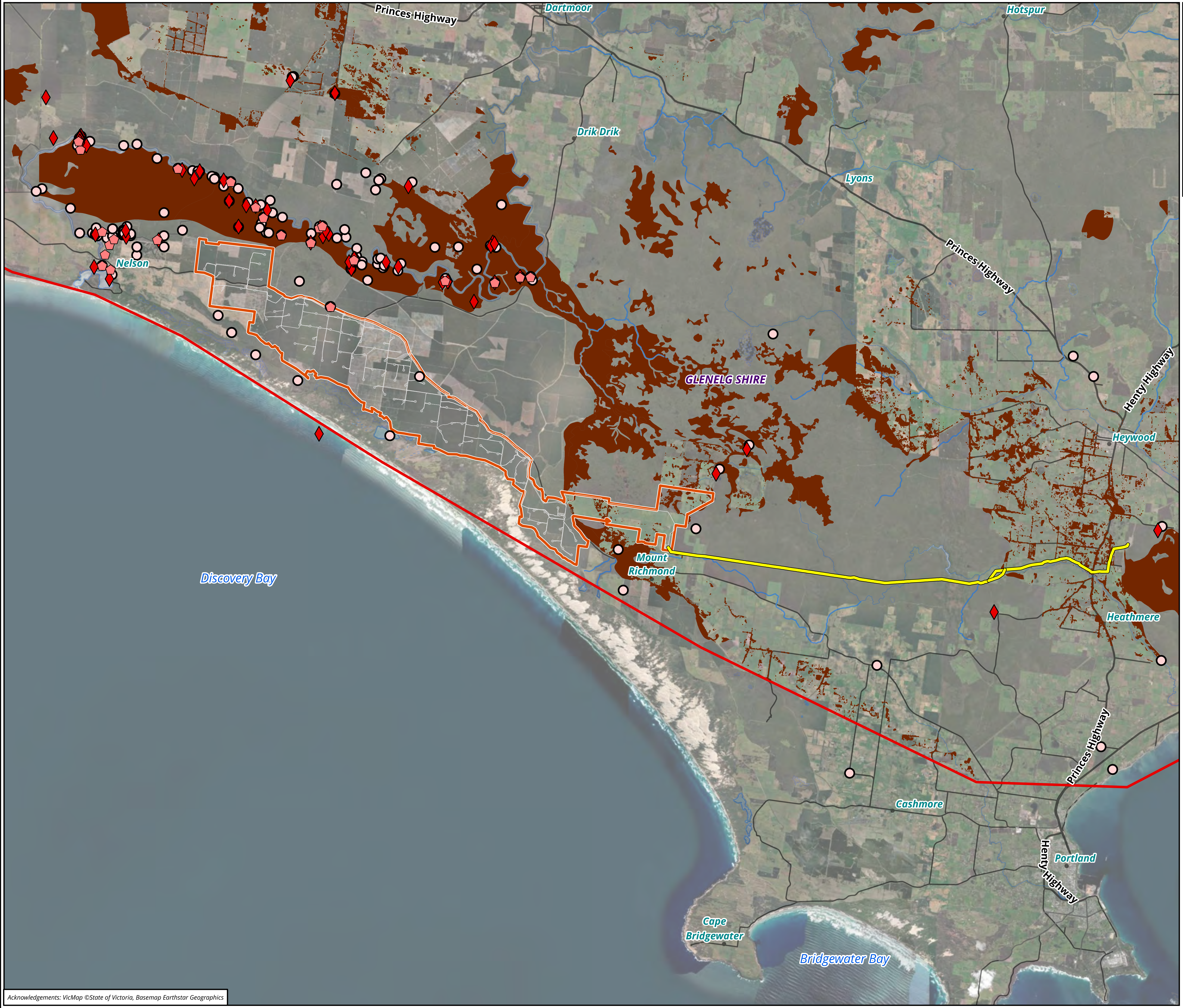
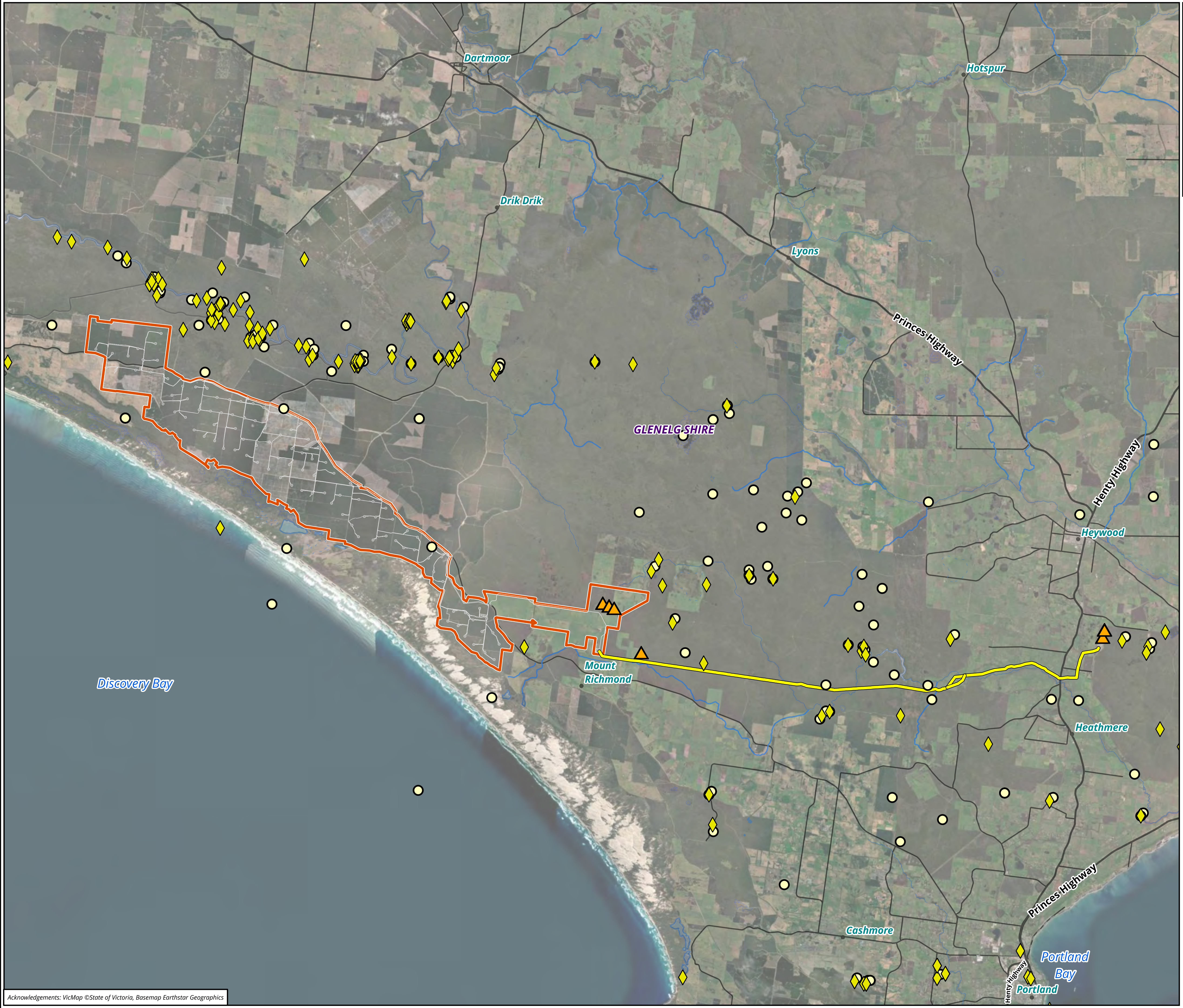
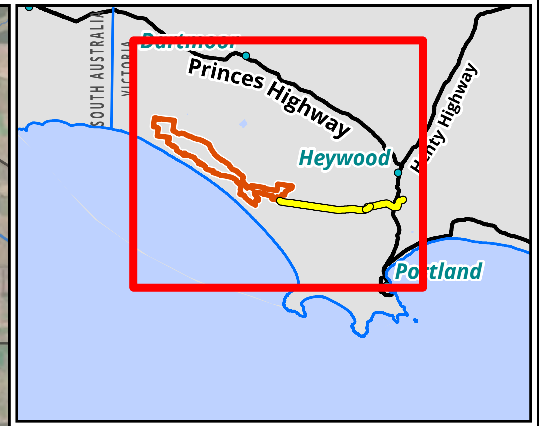


Figure 11a South-eastern Red-tailed Black Cockatoo records

biosis APEM Group

Matter: 33361,
Date: 26 August 2024,
Checked by: IV, Drawn by: JPT, Last edited by: jturner
Layout: F11a_SouthEasternRedTailedBlackCockatoo
Location: P:\35000s\35014\Mapping\
35014_KentbruckFauna_F10_F19.aprx





Legend

- Wind farm footprint
- Transmission line
- Other proposed infrastructure
- Gang-gang Cockatoo (Biosis)
- Gang-gang Cockatoo (BirdLife)
- Gang-gang Cockatoo (VBA)

Figure 12a Gang-gang Cockatoo records

0 1 2 3 4 5
Kilometres
Scale: 1:175,000 @ A3
Coordinate System: GDA2020 MGA Zone 54

N

Matter: 33361,
Date: 22 August 2024,
Checked by: IV, Drawn by: JPT, Last edited by: jturner
Layout: F12a_GangGangCockatoo
Location: P:\35000s\35014\Mapping\
35014_KentbruckFauna_F10_F19.aprx

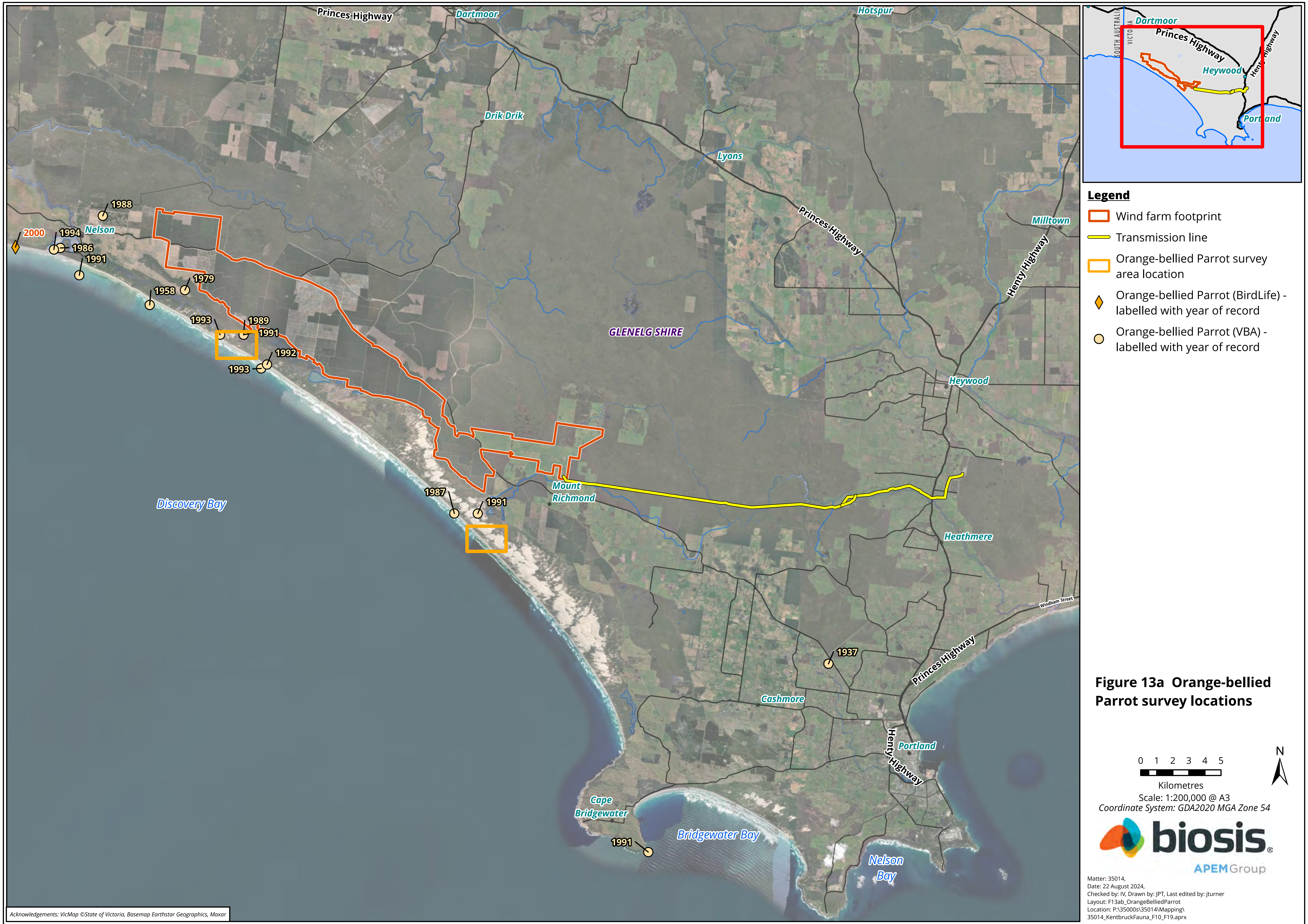
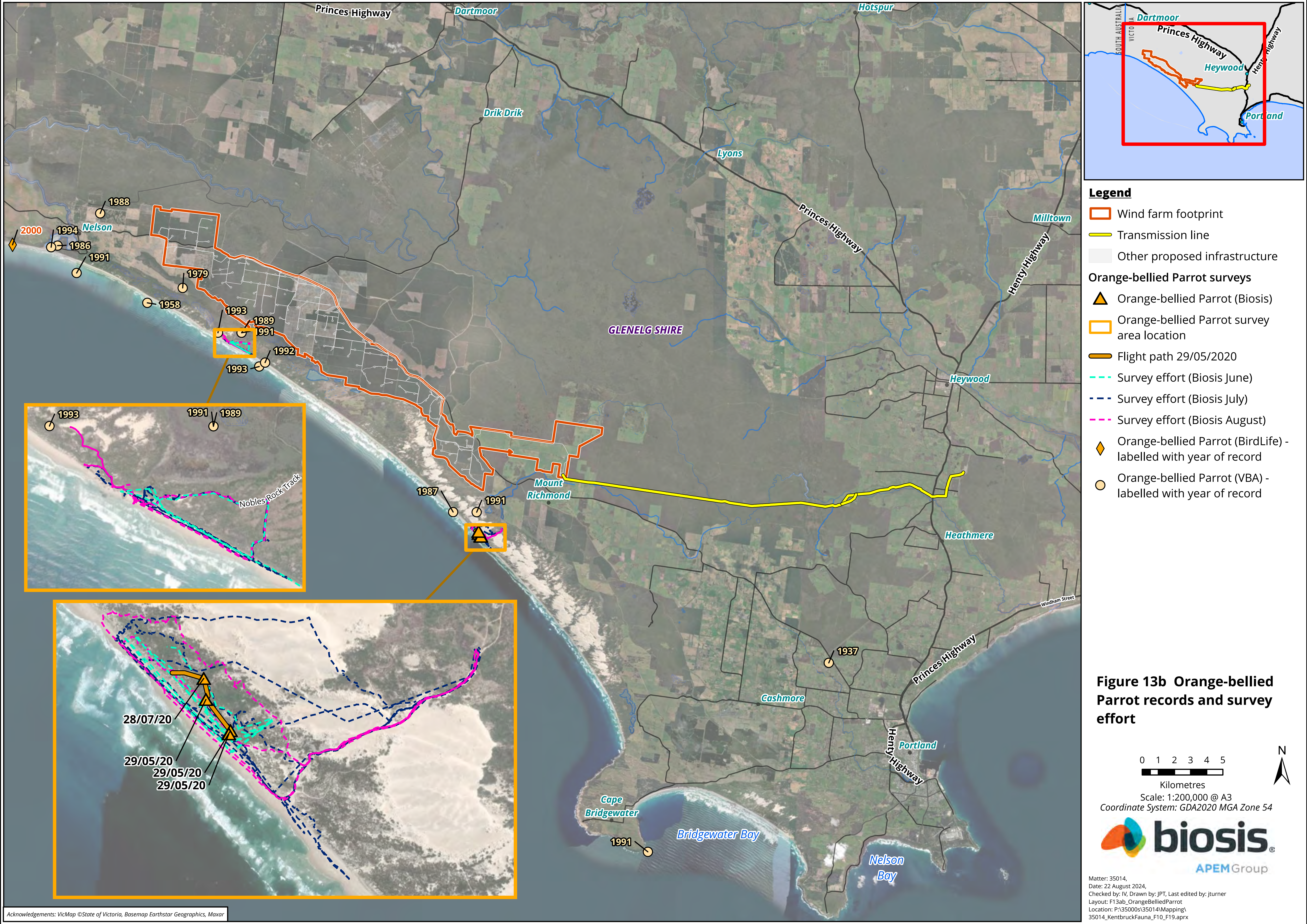


Figure 13a Orange-bellied Parrot survey locations



Legend

- Wind farm footprint
- Transmission line
- Other proposed infrastructure

Orange-bellied Parrot surveys

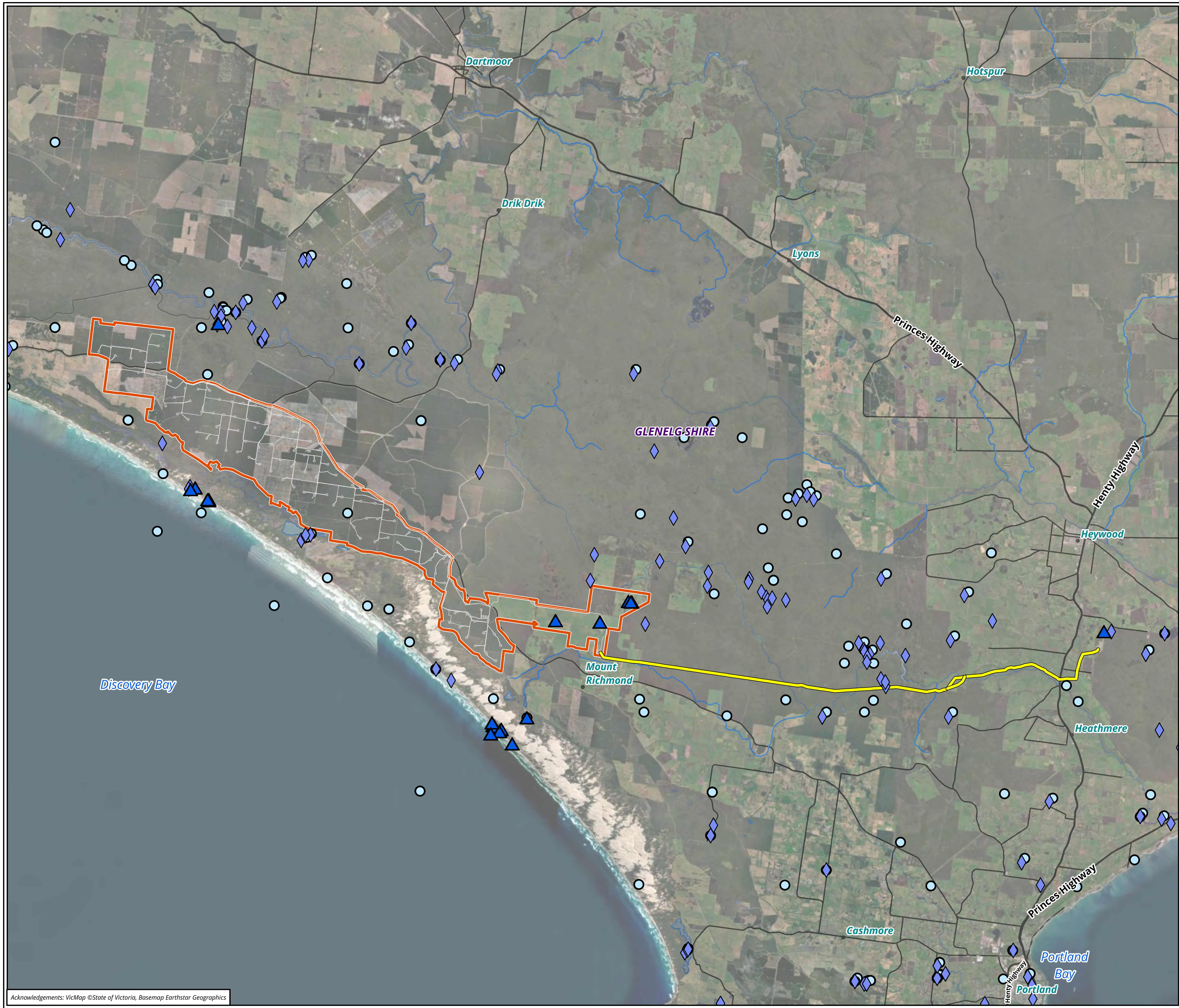
- Orange-bellied Parrot (Biosis)
- Orange-bellied Parrot survey area location
- Flight path 29/05/2020
- Survey effort (Biosis June)
- Survey effort (Biosis July)
- Survey effort (Biosis August)
- Orange-bellied Parrot (BirdLife) - labelled with year of record
- Orange-bellied Parrot (VBA) - labelled with year of record

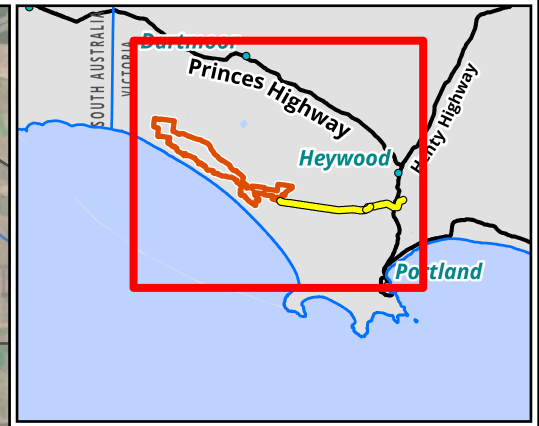
Figure 13b Orange-bellied Parrot records and survey effort

0 1 2 3 4 5
Kilometres
Scale: 1:200,000 @ A3
Coordinate System: GDA2020 MGA Zone 54

biosis
APEM Group

Matter: 35014,
Date: 22 August 2024,
Checked by: IV, Drawn by: JPT, Last edited by: jturner
Layout: F13ab_OrangeBelliedParrot
Location: P:\35000s\35014\Mapping\35014_KentbruckFauna_F10_F19.aprx





Legend

- Wind farm footprint
- Transmission line
- Other proposed infrastructure
- Blue-winged Parrot (Biosis)
- Blue-winged Parrot (BirdLife)
- Blue-winged Parrot (VBA)

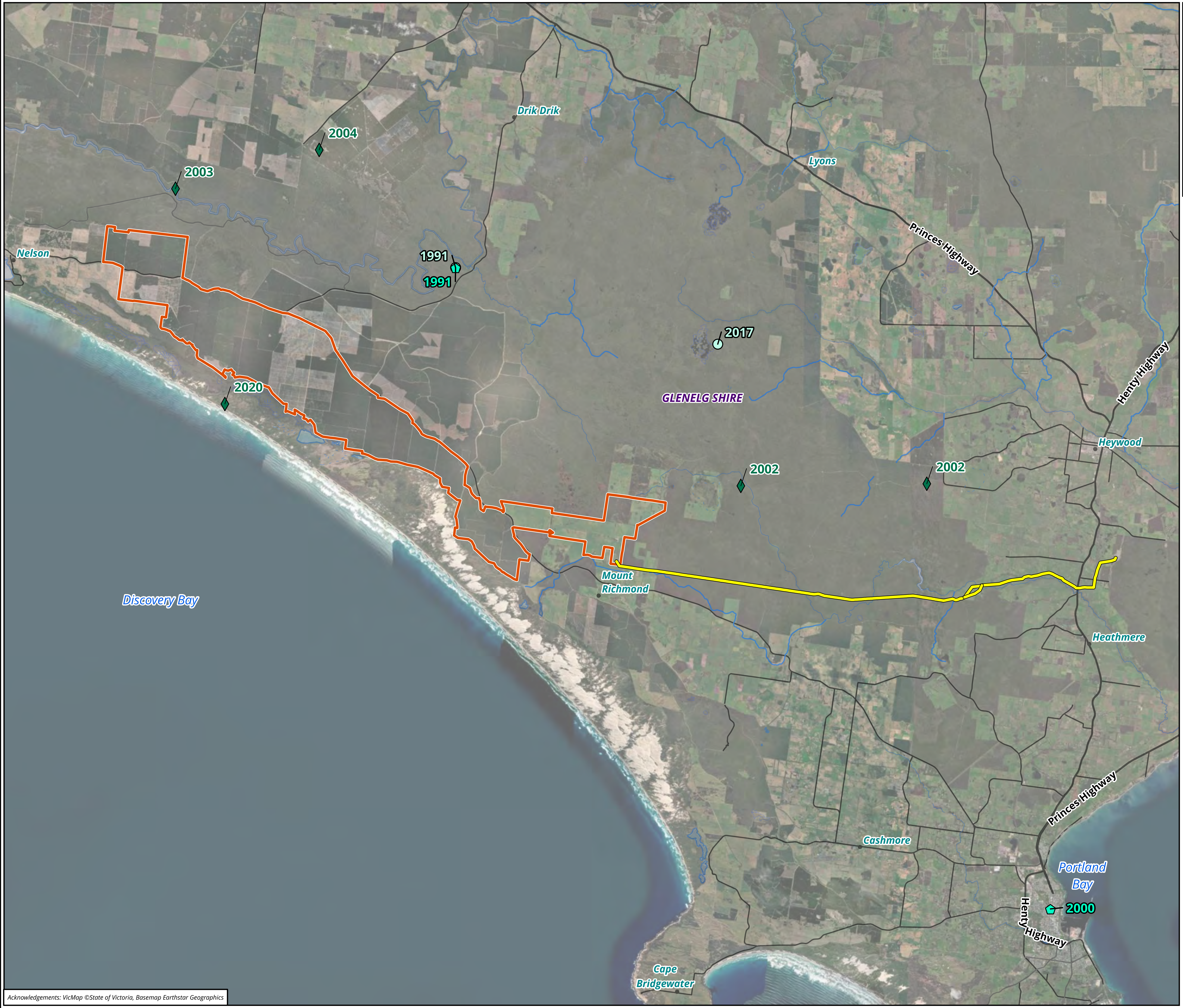
Figure 14a Blue-winged Parrot records

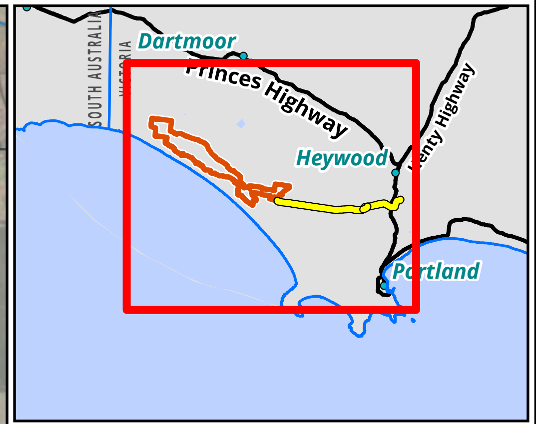
0 1 2 3 4 5
Kilometres
Scale: 1:175,000 @ A3
Coordinate System: GDA2020 MGA Zone 54

N

biosis
APEM Group

Matter: 33361,
Date: 22 August 2024,
Checked by: IV, Drawn by: JPT, Last edited by: jturner
Layout: F14a_BlueWingedParrot
Location: P:\35000s\35014\Mapping\
35014_KentbruckFauna_F10_F19.aprx





Legend

- Wind farm footprint
- Transmission line
- Elegant Parrot (BirdLife) - labelled by year
- Elegant Parrot (eBird) - labelled by year
- Elegant Parrot (VBA) - labelled by year

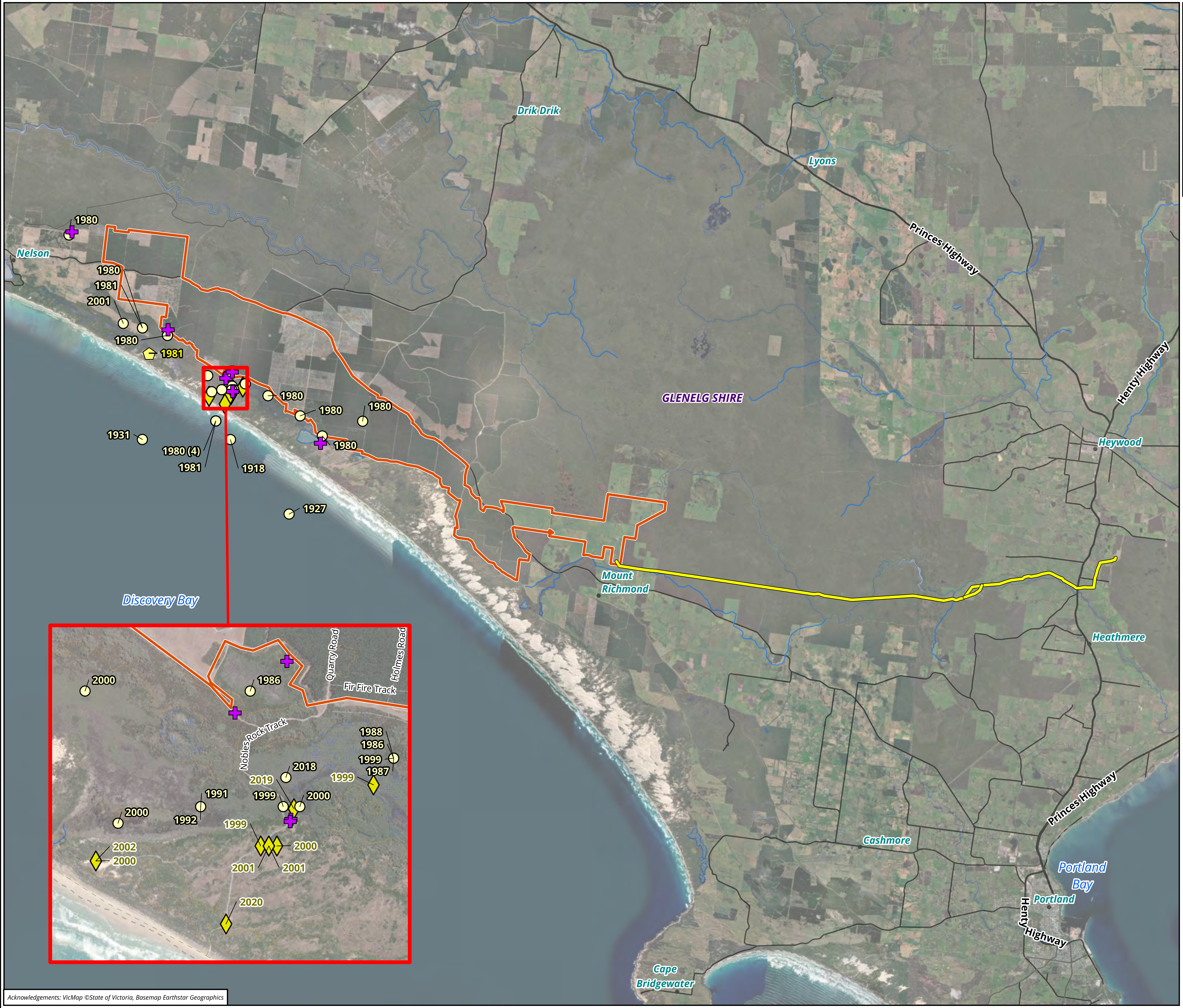
Figure 15a Elegant Parrot records

0 1 2 3 4 5
Kilometres
Scale: 1:175,000 @ A3
Coordinate System: GDA2020 MGA Zone 54

N

biosis
APEM Group

Matter: 33361,
Date: 22 August 2024,
Checked by: IV, Drawn by: JPT, Last edited by: jturner
Layout: F15a_ElegantParrot
Location: P:\35000s\35014\Mapping\35014_KentbruckFauna_F10_F19.aprx



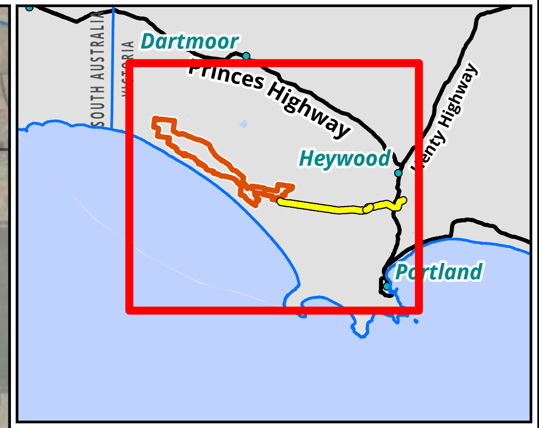


Figure 16a Eastern Ground Parrot survey locations

0 1 2 3 4 5
Kilometres
Scale: 1:175,000 @ A3
Coordinate System: GDA2020 MGA Zone 54

biosis
APEM Group

Matter: 35014,
Date: 22 August 2024,
Checked by: IV, Drawn by: JPT, Last edited by: jturner
Layout: F16ab_EasternGroundParrot
Location: P:\35000s\35014\Mapping\35014_KentbruckFauna_F10_F19.aprx

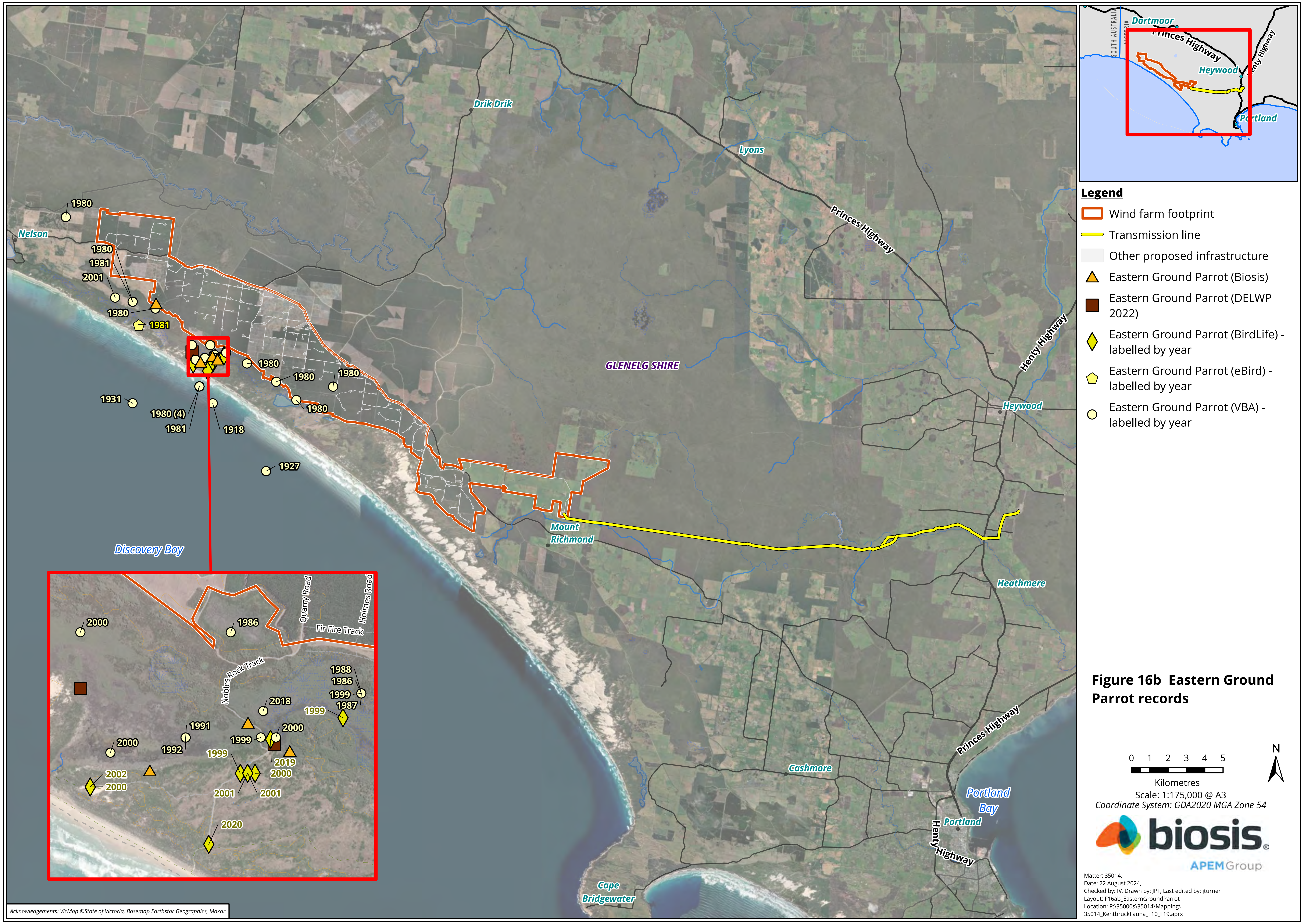
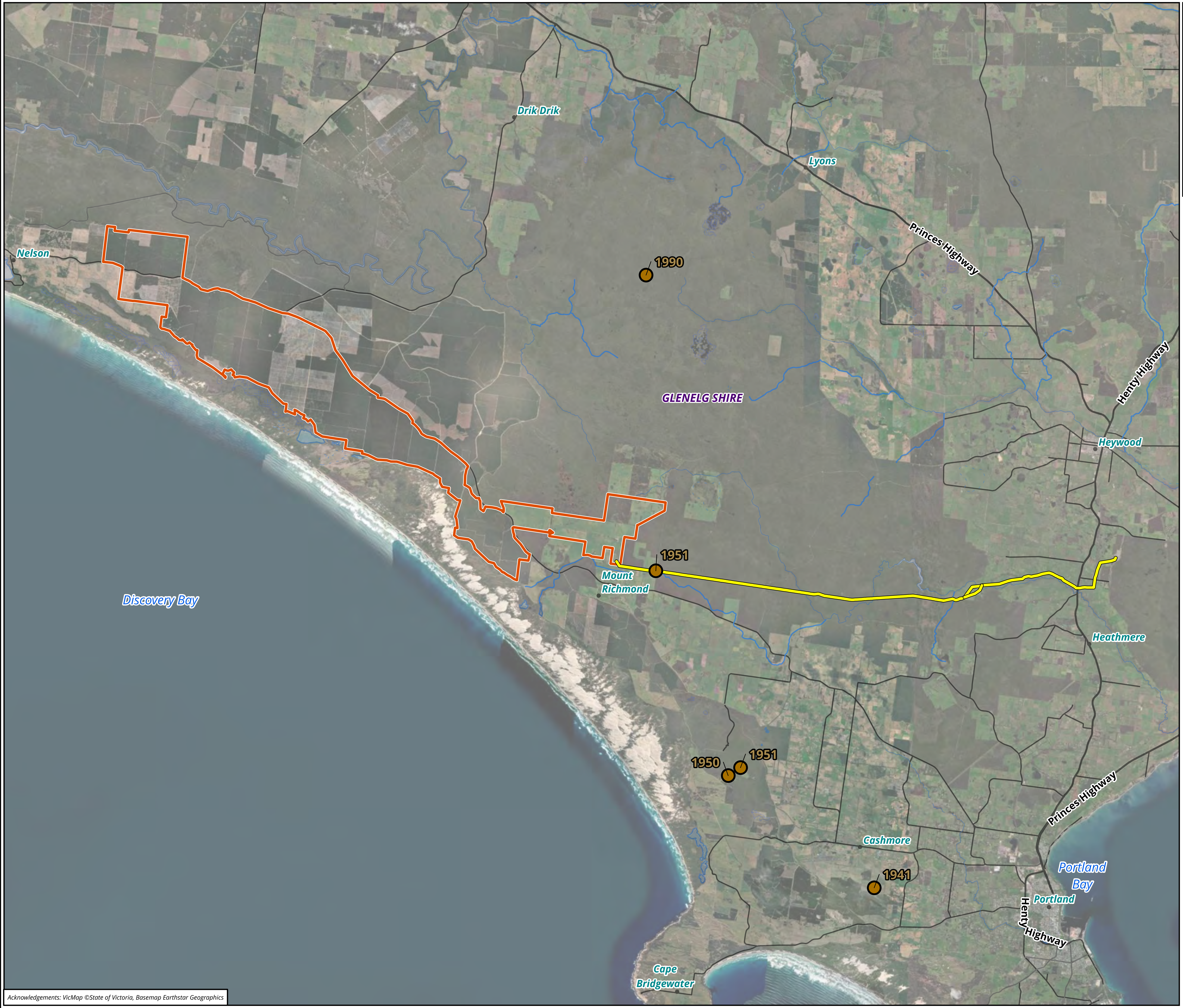
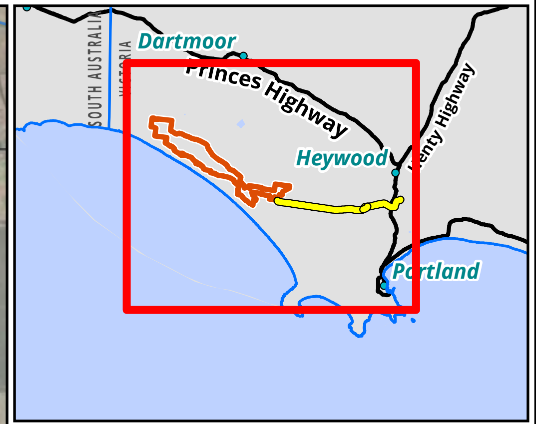


Figure 16b Eastern Ground Parrot records



Acknowledgements: VicMap ©State of Victoria, Basemap Earthstar Geographics



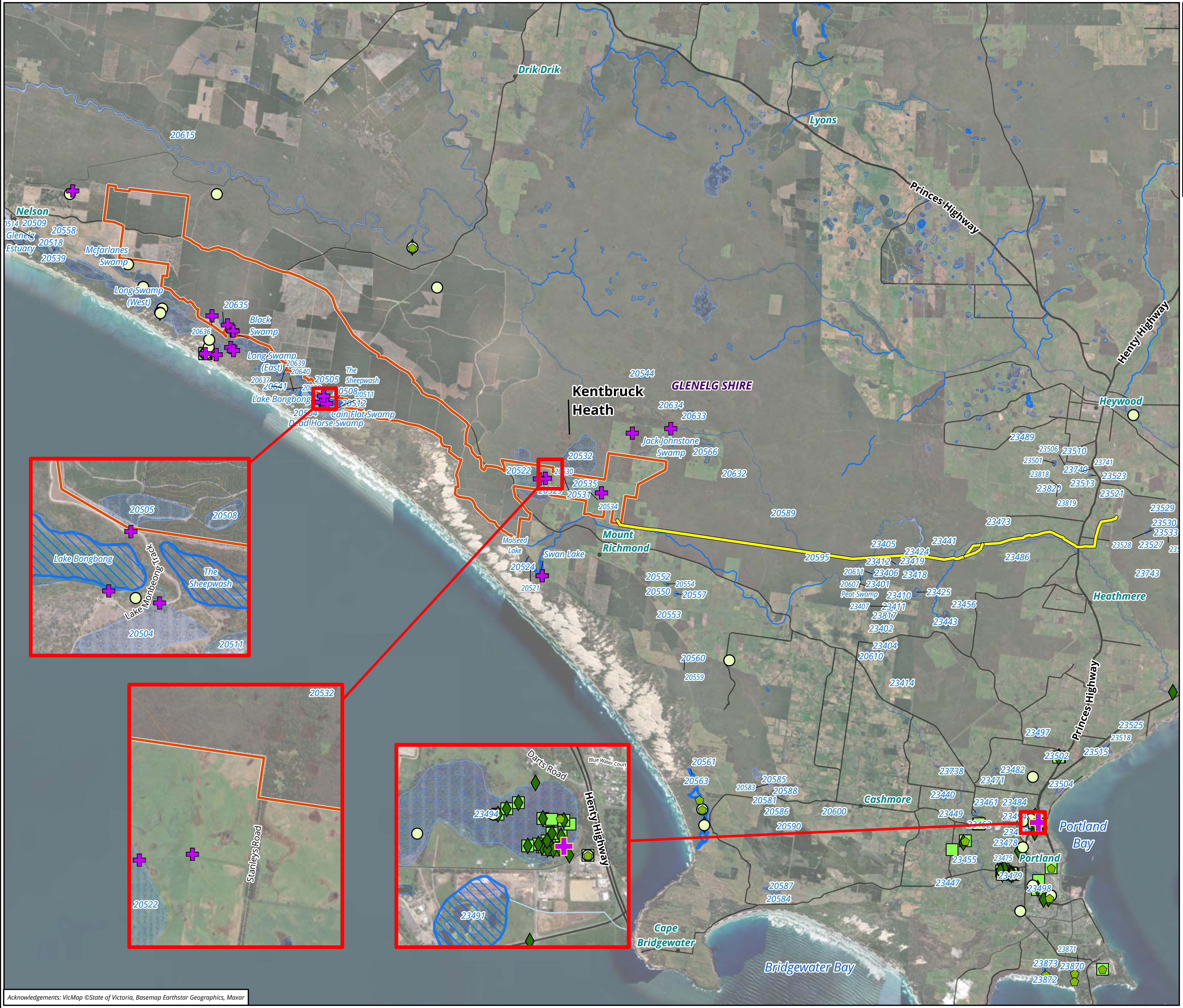
Legend

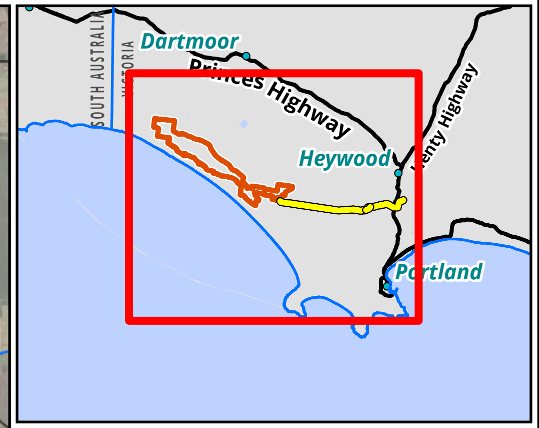
- Wind farm footprint
- Transmission line
- King Quail (VBA) - labelled by year

Figure 17a King Quail records

0 1 2 3 4 5
Kilometres
Scale: 1:175,000 @ A3
Coordinate System: GDA2020 MGA Zone 54

Matter: 33361,
Date: 22 August 2024,
Checked by: IV, Drawn by: JPT, Last edited by: jturner
Layout: F17a_KingQuail
Location: P:\35000s\35014\Mapping\
35014_KentbruckFauna_F10_F19.aprx





Legend

- Wind farm footprint
- Transmission line
- Australasian Bittern survey location
- Walook Swamp reference site
- Australasian Bittern (BirdLife Birdata)
- Australasian Bittern (BirdLife Shorebird data)
- Australasian Bittern (eBird)
- Australasian Bittern record (VBA)

Wetlands

- 2 - Freshwater meadow
- 3 - Shallow freshwater marsh
- 4 - Deep freshwater marsh
- 5 - Permanent open freshwater
- 6 - Semi-permanent saline
- 7 - Permanent saline
- 20 - Sewage oxidation basin
- 99 - No Category

Figure 19a Australasian Bittern survey locations

0 1 2 3 4 5
Kilometres
Scale: 1:175,000 @ A3
Coordinate System: GDA2020 MGA Zone 54

N

biosis
APEM Group

Matter: 33361,
Date: 22 August 2024,
Checked by: IV, Drawn by: JPT, Last edited by: jturner
Layout: F19a_AustralasianBittern_Surveys
Location: P:\35000s\35014\Mapping\
35014_KentbruckFauna_F10_F19.aprx

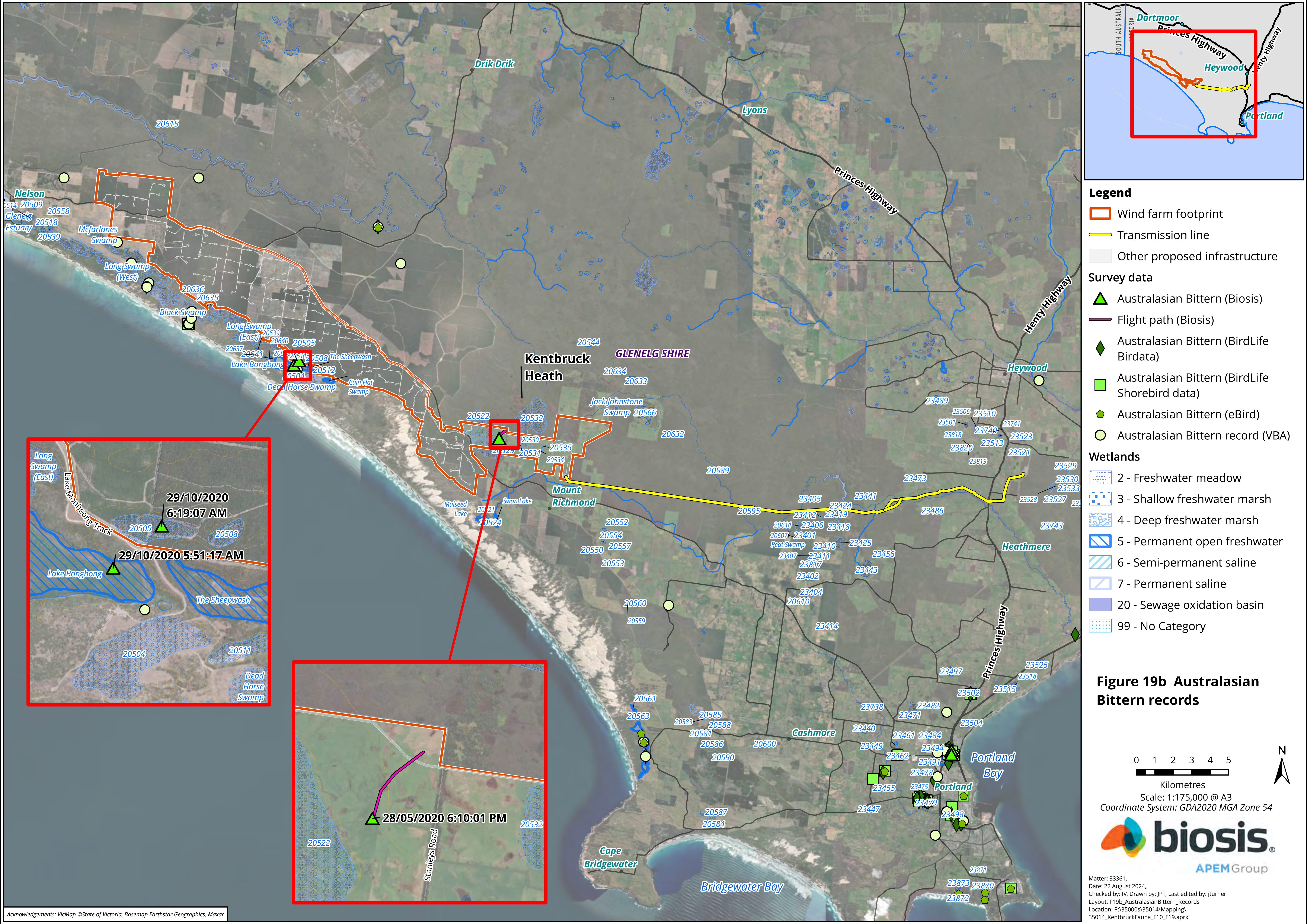
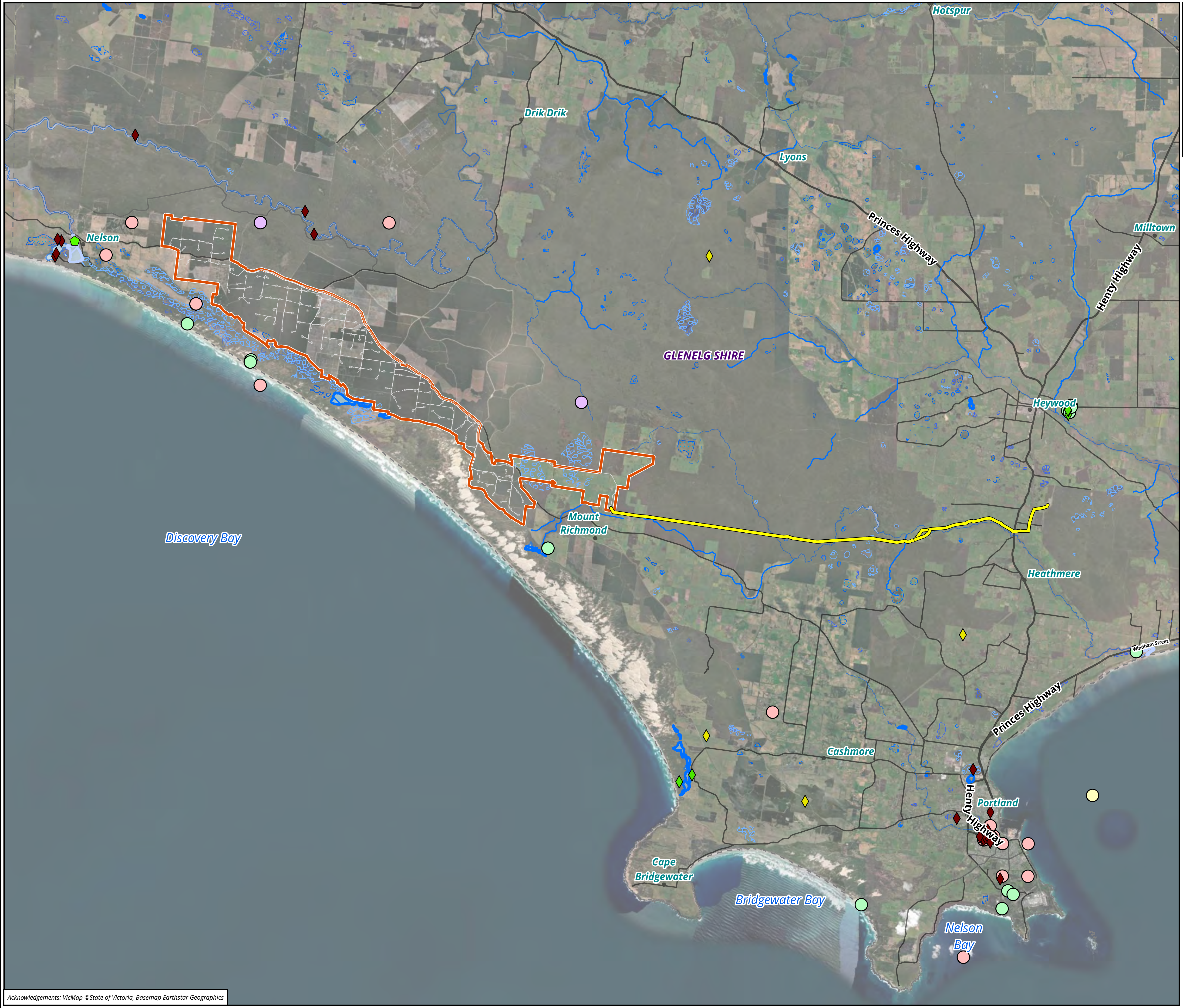
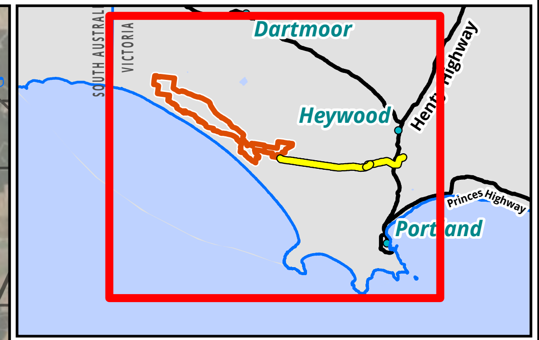


Figure 19b Australasian Bittern records





Legend

- Wind farm footprint
- Transmission line
- Other proposed infrastructure

Species records (BirdLife) - labelled by year
- Australian Painted Snipe
- Lewin's Rail
- Magpie Goose

Species records (eBird) - labelled by year
- Magpie Goose

Species records (VBA) - labelled by year
- Australian Little Bittern
- Australian Painted-snipe
- Baillon's Crake
- Lewin's Rail
- Magpie Goose

Wetlands
- 2 - Freshwater meadow
- 20 - Sewage oxidation basin
- 3 - Shallow freshwater marsh
- 4 - Deep freshwater marsh
- 5 - Permanent open freshwater
- 6 - Semi-permanent saline
- 7 - Permanent saline
- 99 - No Category

Figure 20a Other threatened waterbird records

0 1 2 3 4 5
Kilometres
Scale: 1:200,000 @ A3
Coordinate System: GDA2020 MGA Zone 54

N

Matter: 33361,
Date: 22 August 2024,
Checked by: IV, Drawn by: JPT, Last edited by: jturner
Layout: F20a_ThreatenedWaterbirds
Location: P:\35000s\35014\Mapping\
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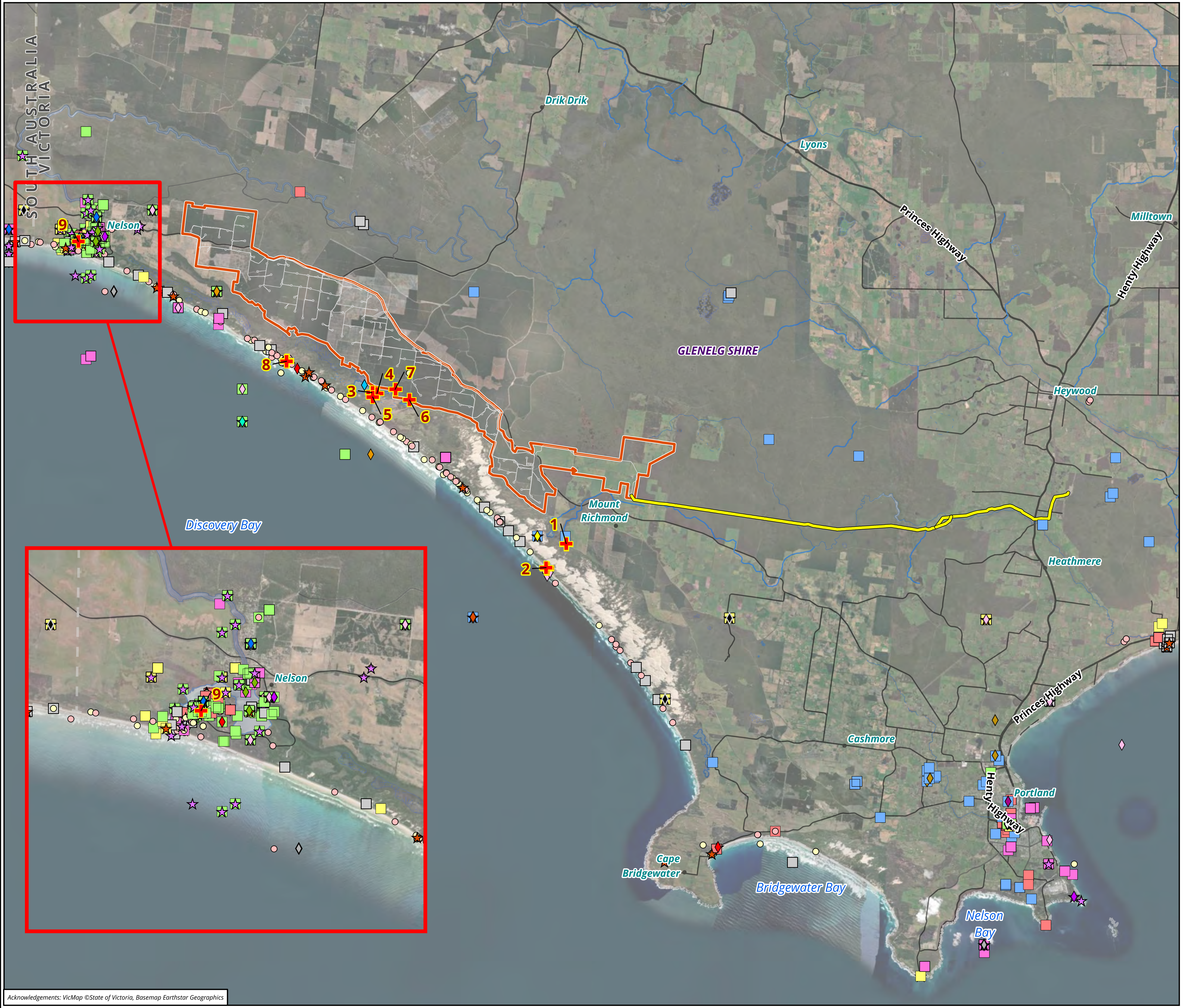


Legend

- Wind farm footprint
- Transmission line
- Other proposed infrastructure
- Biosis shorebird survey location

Database species records (BirdLife, eBird, VBA)

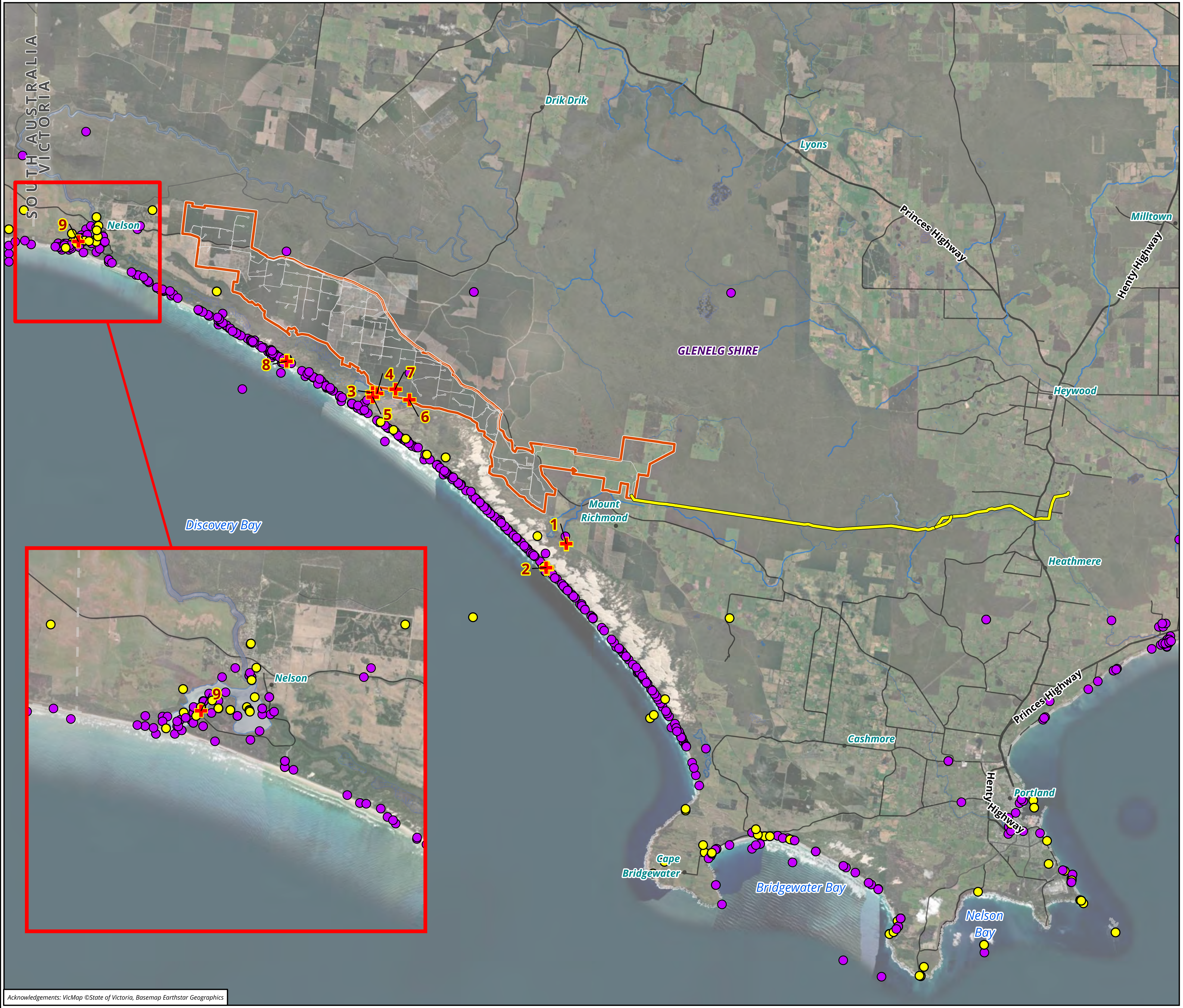
- Bar-tailed Godwit
- Black-tailed Godwit
- Broad-billed Sandpiper
- Common Greenshank
- Common Sandpiper
- Curlew Sandpiper
- Double-banded Plover
- Eastern Curlew
- Great Knot
- Greater Sand Plover
- Grey Plover
- Grey-tailed Tattler
- Latham's Snipe
- Marsh Sandpiper
- Oriental Plover
- Pacific Golden Plover
- Pectoral Sandpiper
- Red Knot
- Red-necked Stint
- Ruddy Turnstone
- Sanderling
- Sharp-tailed Sandpiper
- Terek Sandpiper
- Whimbrel
- Wood Sandpiper

Figure 21a Shorebirds - waders listed and migratory

0 1 2 3 4 5
Kilometres
Scale: 1:200,000 @ A3
Coordinate System: GDA2020 MGA Zone 54

N

Matter: 35014,
Date: 22 August 2024,
Checked by: IV, Drawn by: JPT, Last edited by: jturner
Layout: F21abcd_Shorebirds_Databases
Location: P:\35000s\35014\Mapping\
35014_KentbruckFauna_F20_F27.aprx



Legend

- Wind farm footprint
- Transmission line
- Other proposed infrastructure
- Biosis shorebird survey location

Database species records (BirdLife, eBird, VBA)

- Hooded Plover
- Sooty Oystercatcher

Figure 21b Shorebirds - waders listed non-migratory

0 1 2 3 4 5
Kilometres
Scale: 1:200,000 @ A3
Coordinate System: GDA2020 MGA Zone 54

N

biosis
APEM Group

Matter: 35014,
Date: 22 August 2024,
Checked by: IV, Drawn by: JPT, Last edited by: jturner
Layout: F21abcd_Shorebirds_Databases
Location: P:\35000s\35014\Mapping\
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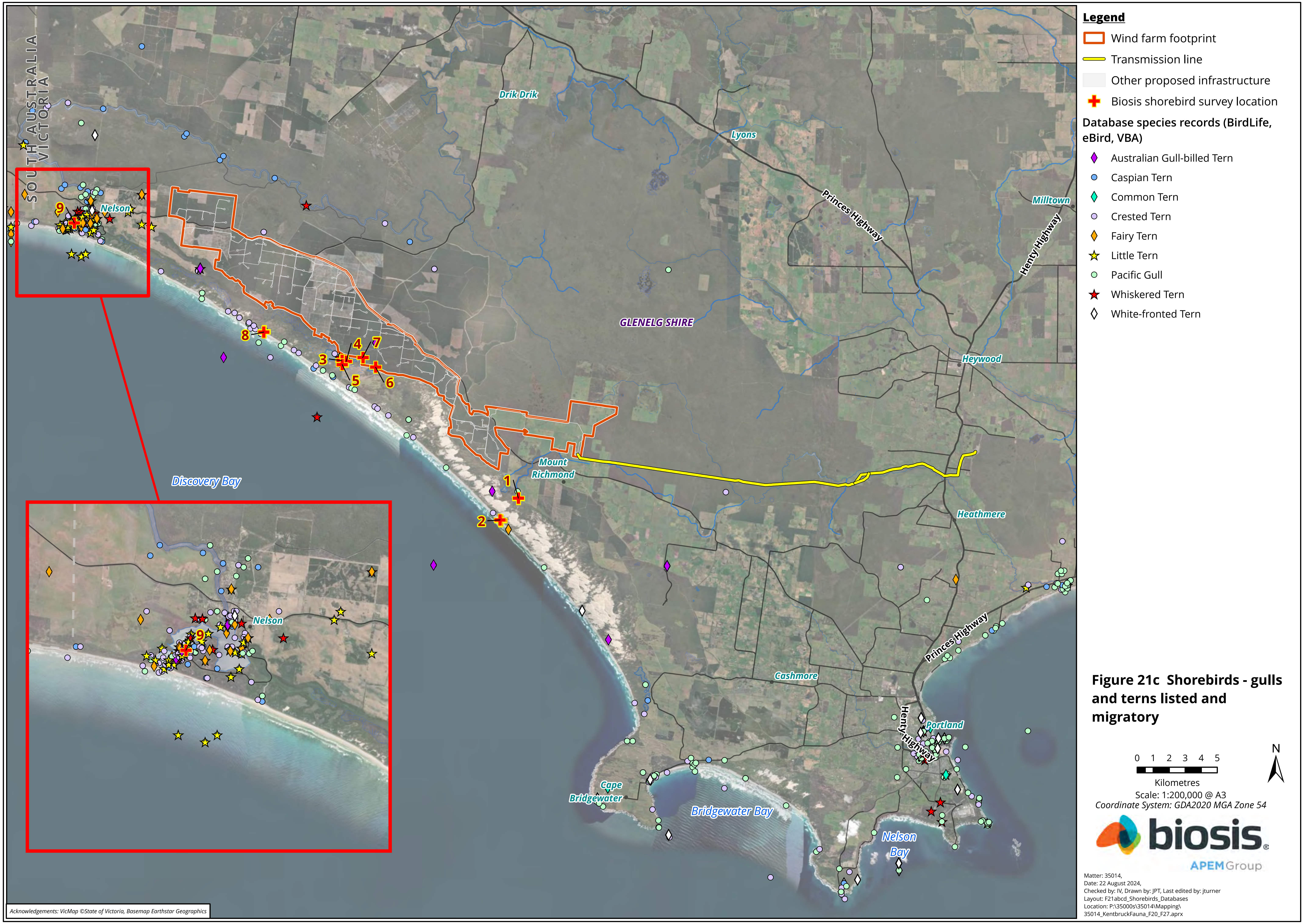
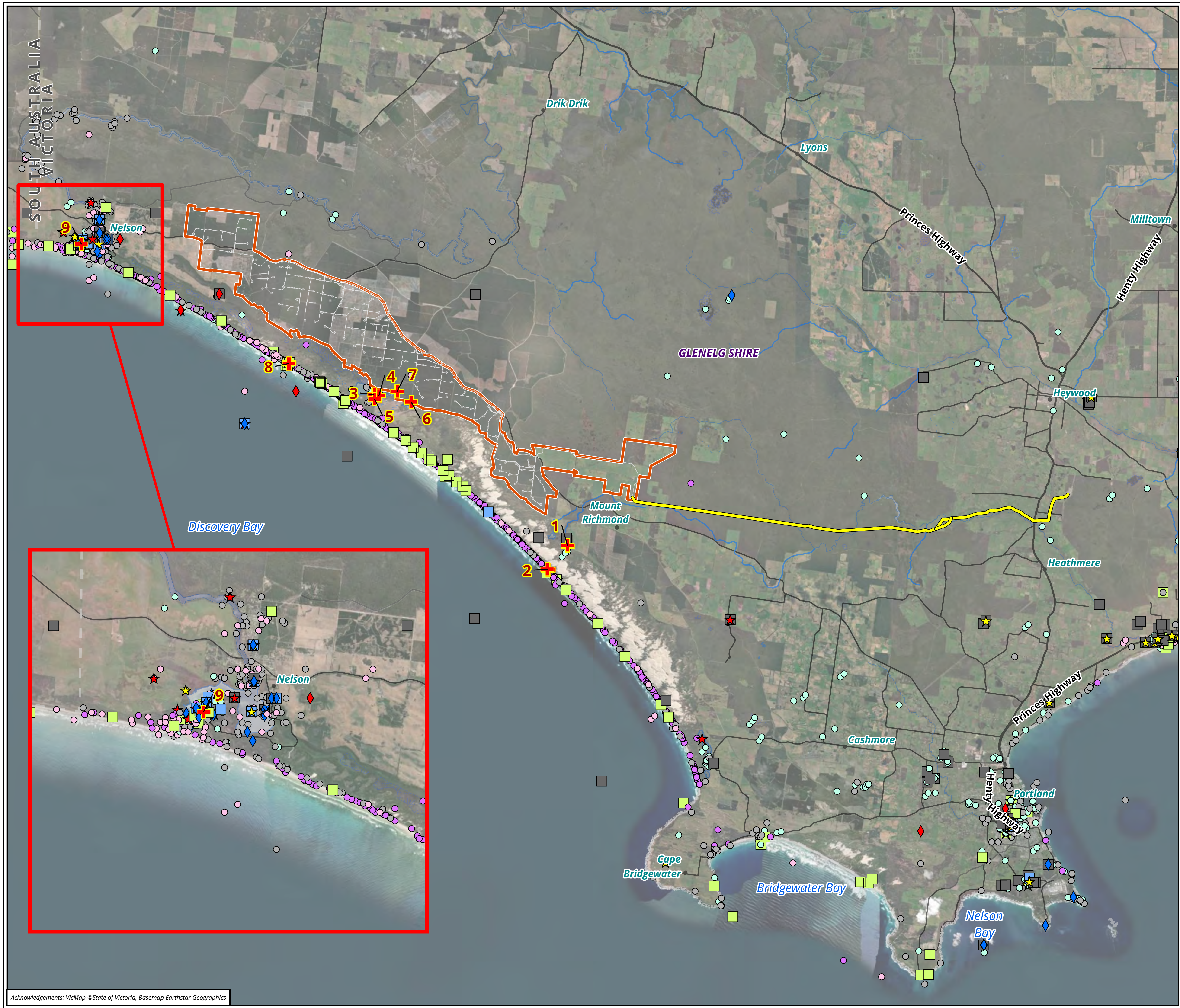


Figure 21c Shorebirds - gulls and terns listed and migratory

Matter: 35014,
Date: 22 August 2024,
Checked by: IV, Drawn by: JPT, Last edited by: jturner
Layout: F21abcd_Shorebirds_Databases
Location: P:\35000s\35014\Mapping\35014_KentbruckFauna_F20_F27.aprx



Legend

- Wind farm footprint
- Transmission line
- Other proposed infrastructure
- Biosis shorebird survey location

Database species records (BirdLife, eBird, VBA)

- Banded Lapwing
- Banded Stilt
- Black-fronted Dotterel
- Masked Lapwing
- Pied Oystercatcher
- Pied Stilt
- Red-capped Plover
- Red-kneed Dotterel
- Red-necked Avocet
- Kelp Gull
- Silver Gull

Figure 21d Shorebirds - waders, gulls and terns not listed

0 1 2 3 4 5

Kilometres

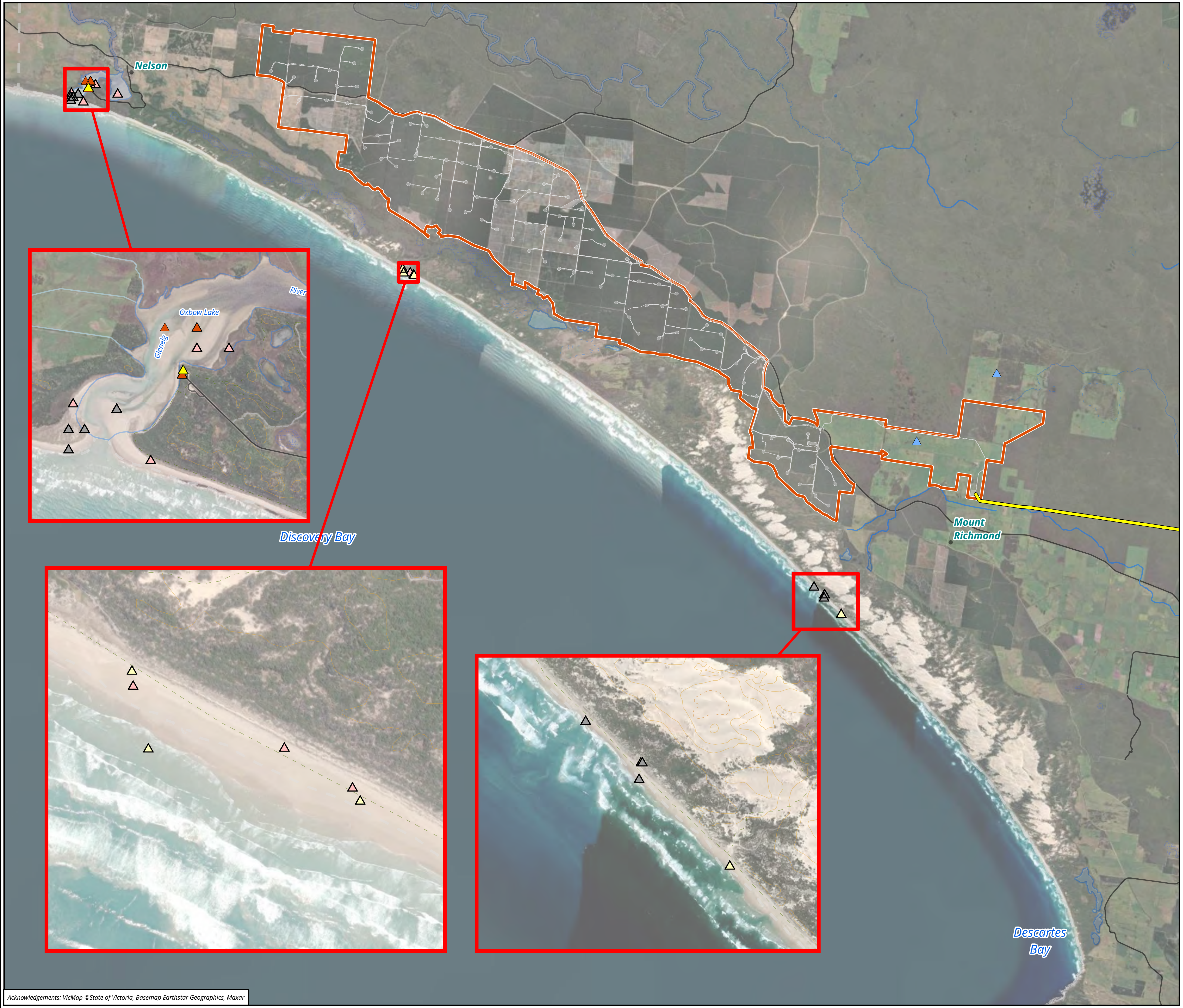
Scale: 1:200,000 @ A3

Coordinate System: GDA2020 MGA Zone 54

N

biosis
APEM Group

Matter: 35014,
Date: 22 August 2024,
Checked by: IV, Drawn by: JPT, Last edited by: jturner
Layout: F21abcd_Shorebirds_Databases
Location: P:\35000s\35014\Mapping\
35014_KentbruckFauna_F20_F27.aprx



Legend

- Wind farm footprint
- Transmission line
- Other proposed infrastructure

Biosis species records

- Bar-tailed Godwit
- Common Greenshank
- Curlew Sandpiper
- Double-banded Plover
- Latham's Snipe
- Red-necked Stint
- Sanderling
- Sharp-tailed Sandpiper

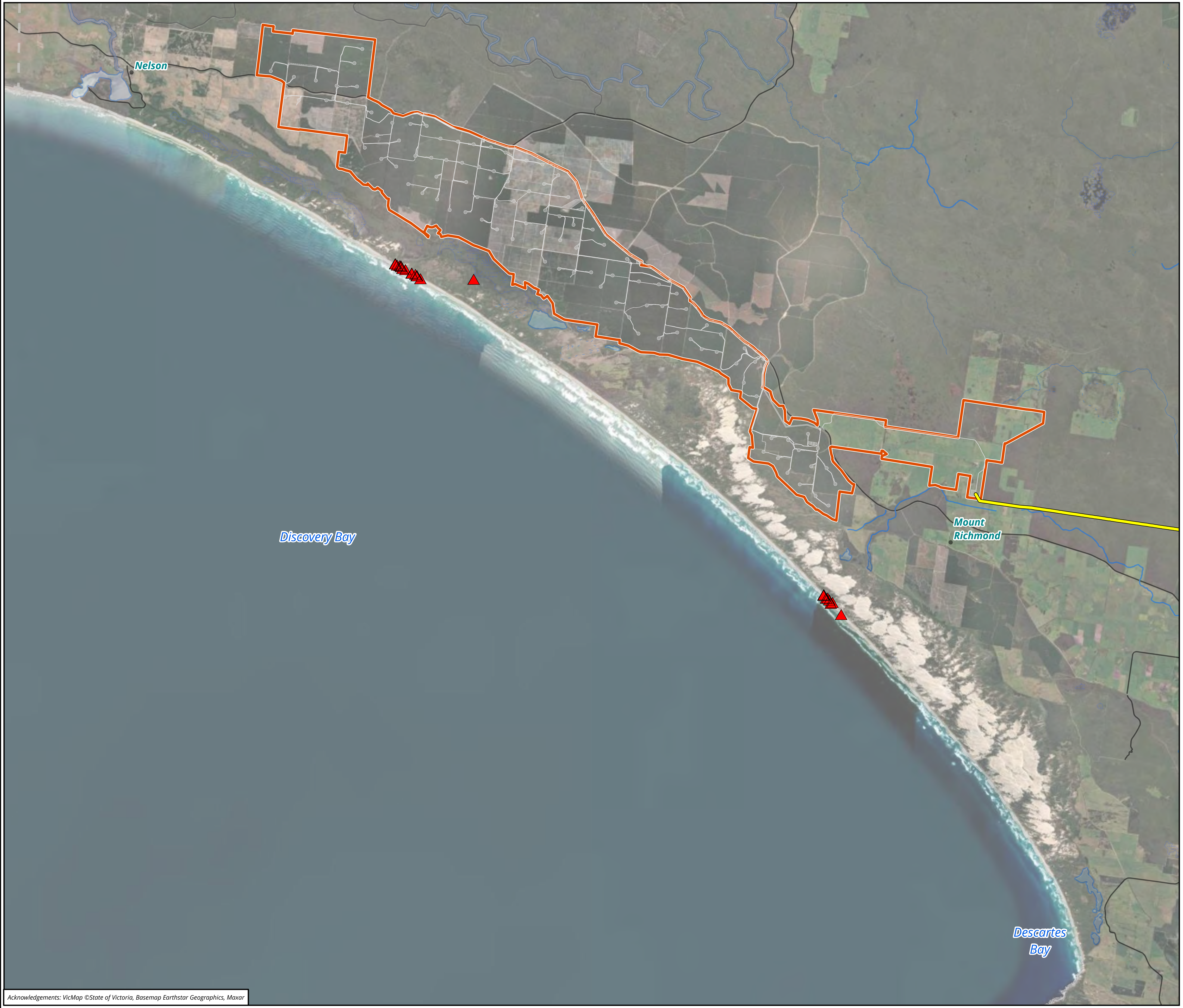
Figure 21e Shorebirds - waders listed and migratory (Biosis records)

0 1 2 3 4 5
Kilometres
N

Scale: 1:125,000 @ A3
Coordinate System: GDA2020 MGA Zone 54

biosis
APEM Group

Matter: 35014,
Date: 22 August 2024,
Checked by: IV, Drawn by: JPT, Last edited by: jturner
Layout: F21efgh_Shorebirds_Biosis
Location: P:\35000s\35014\Mapping\
35014_KentbruckFauna_F20_F27.aprx



Legend

Wind farm footprint

Transmission line

Other proposed infrastructure

Biosis species records

Hooded Plover

Figure 21f Shorebirds - waders listed non-migratory (Biosis records)

0 1 2 3 4 5

Kilometres

Scale: 1:125,000 @ A3

Coordinate System: GDA2020 MGA Zone 54

biosis APEM Group

Matter: 35014,
Date: 22 August 2024,
Checked by: IV, Drawn by: JPT, Last edited by: jturner
Layout: F21efgh_Shorebirds_Biosis
Location: P:\35000s\35014\Mapping\
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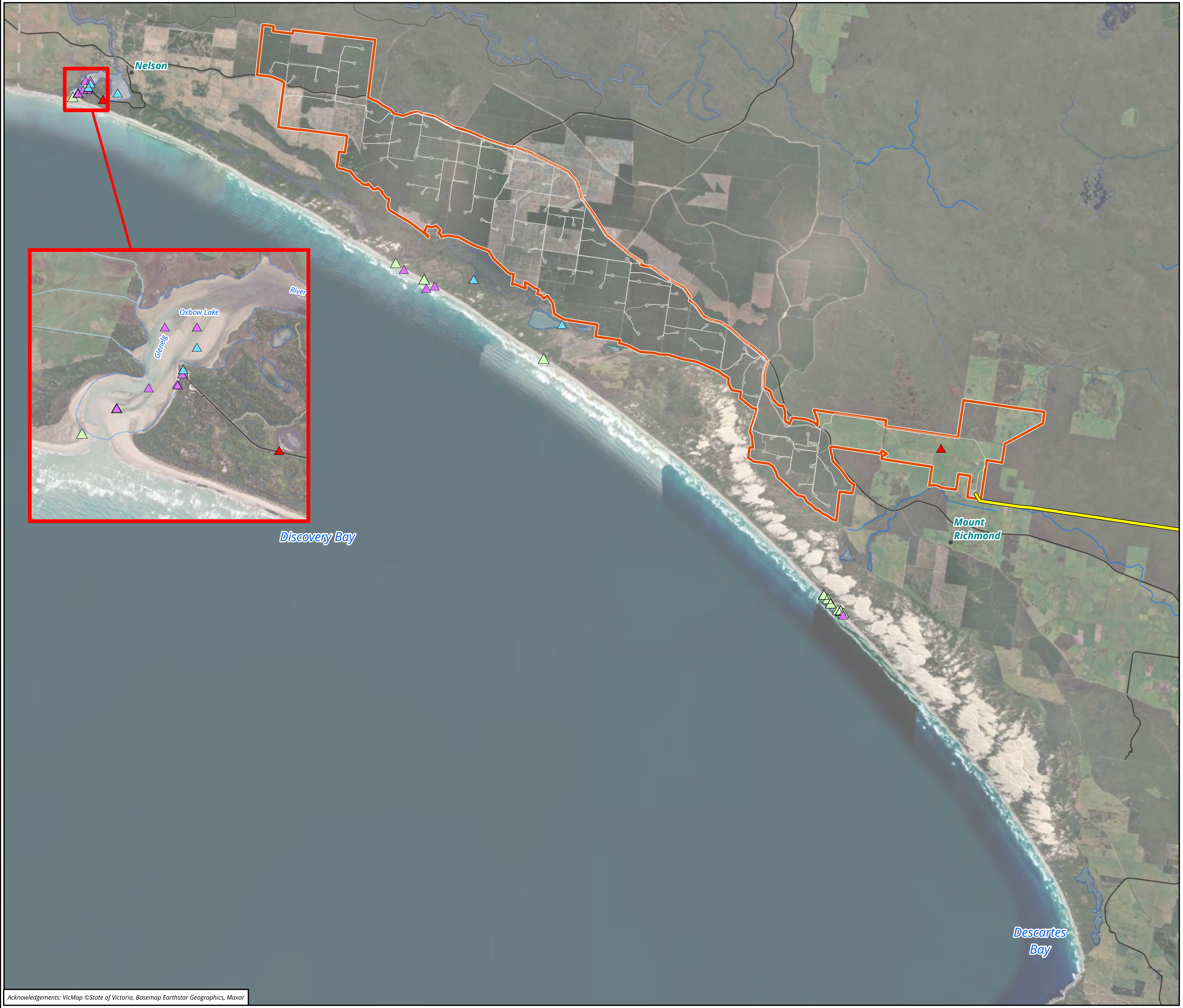

Legend

- Wind farm footprint
- Transmission line
- Other proposed infrastructure

Biosis species records

- Caspian Tern
- Common Tern
- Crested Tern
- Fairy Tern
- Little Tern
- Pacific Gull
- Whiskered Tern

Figure 21g Shorebirds - gulls and terns listed and migratory (Biosis records)

0 1 2 3 4 5

Kilometres

Scale: 1:125,000 @ A3

Coordinate System: GDA2020 MGA Zone 54

N

biosis APEM Group

Matter: 35014,
Date: 22 August 2024,
Checked by: IV, Drawn by: JPT, Last edited by: jturner
Layout: F21efgh_Shorebirds_Biosis
Location: P:\35000s\35014\Mapping\
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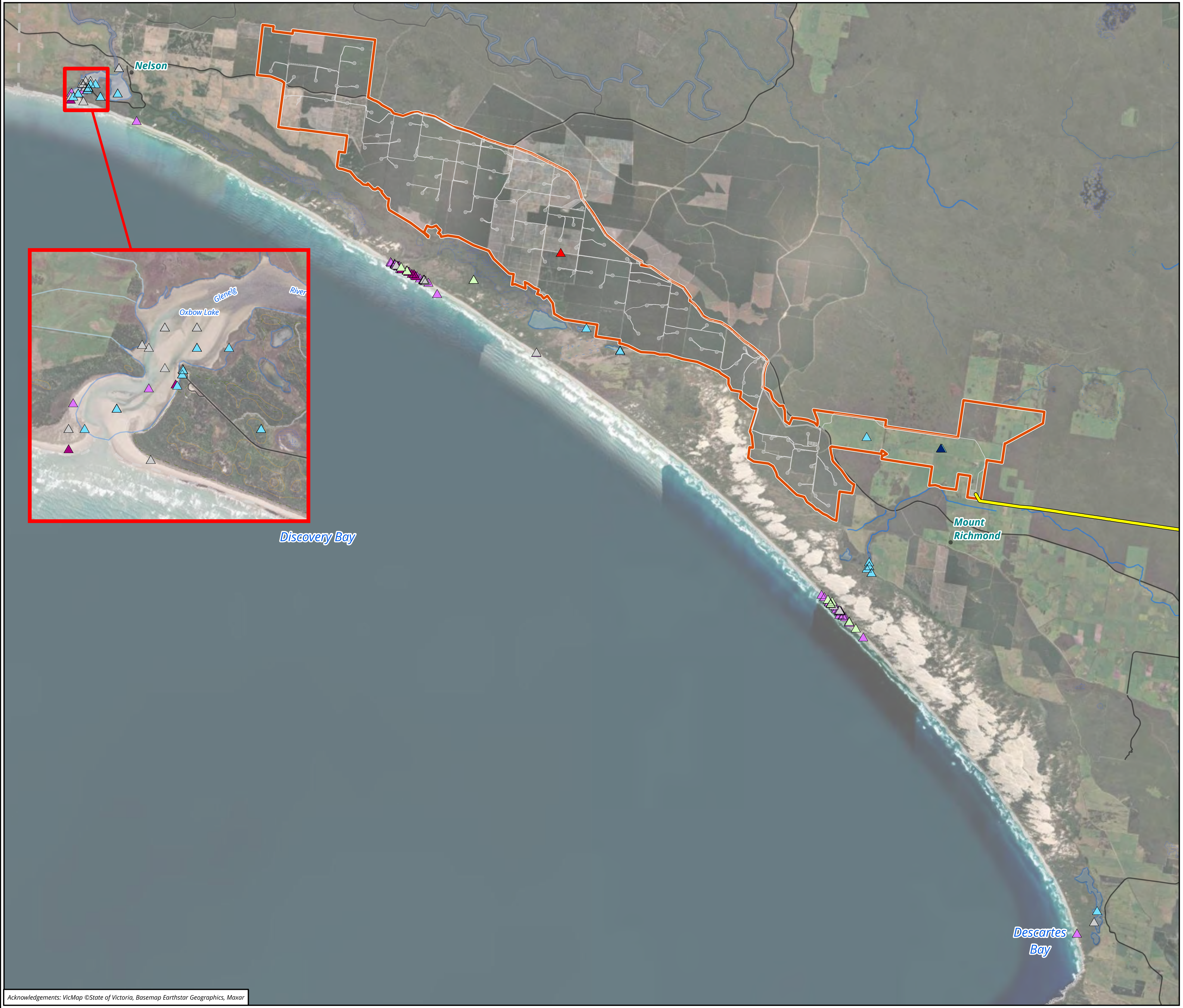


Legend

- Wind farm footprint
- Transmission line
- Other proposed infrastructure

Biosis species records

- Banded Lapwing
- Kelp Gull
- Masked Lapwing
- Pied Oystercatcher
- Pied Stilt
- Red-capped Plover
- Silver Gull

Figure 21h Shorebirds - waders, gulls and terns not listed (Biosis records)

0 1 2 3 4 5

Kilometres

Scale: 1:125,000 @ A3

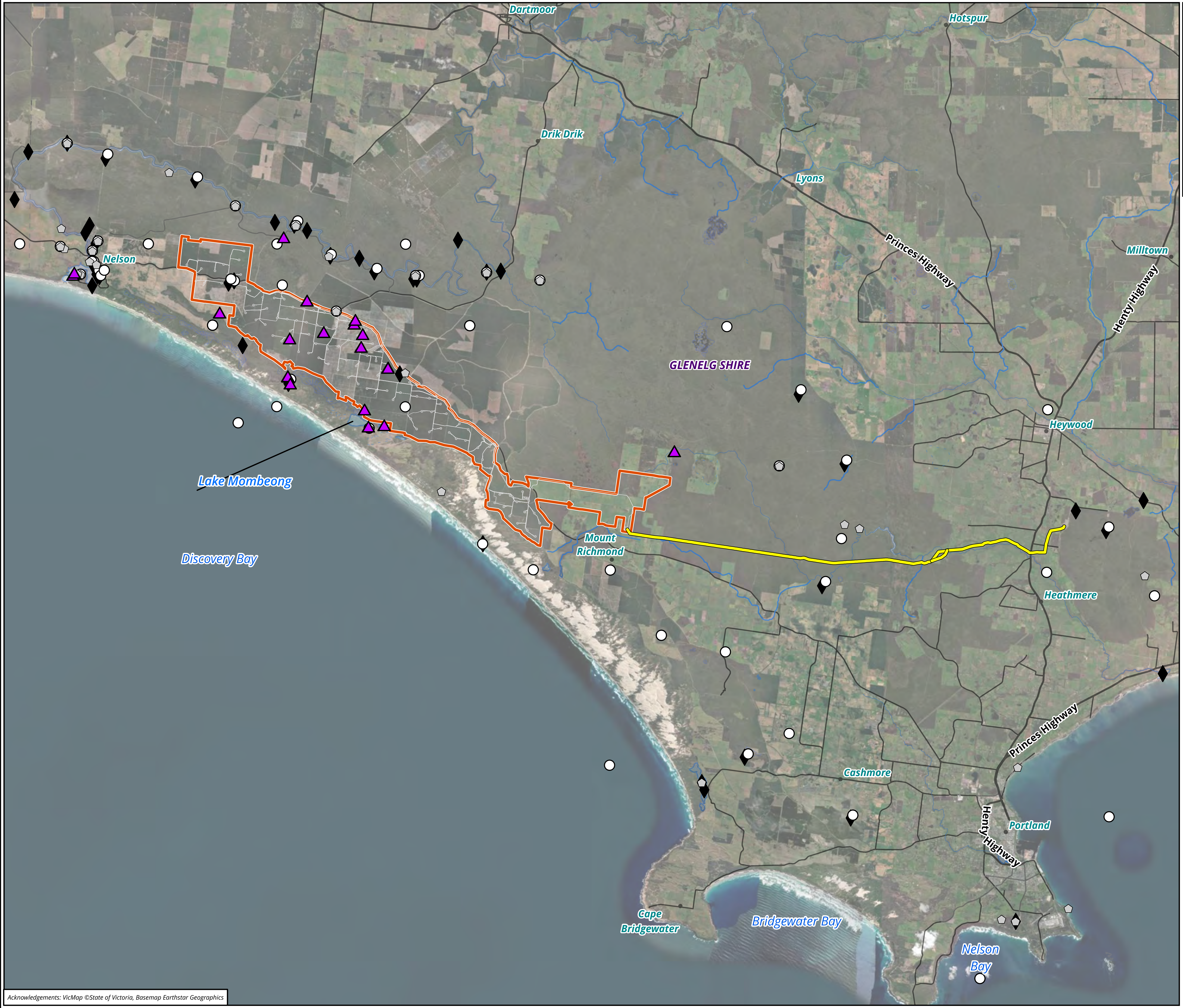
Coordinate System: GDA2020 MGA Zone 54

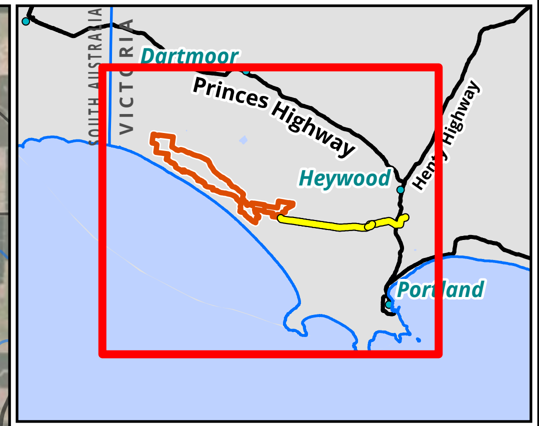
N

biosis

APEM Group

Matter: 35014,
Date: 22 August 2024,
Checked by: IV, Drawn by: JPT, Last edited by: jturner
Layout: F21efgh_Shorebirds_Biosis
Location: P:\35000s\35014\Mapping\
35014_KentbruckFauna_F20_F27.aprx





Legend

- Wind farm footprint
- Transmission line
- Other proposed infrastructure
- White-throated Needletail (Biosis)
- White-throated Needletail (BirdLife)
- White-throated Needletail (eBird)
- White-throated Needletail (VBA)

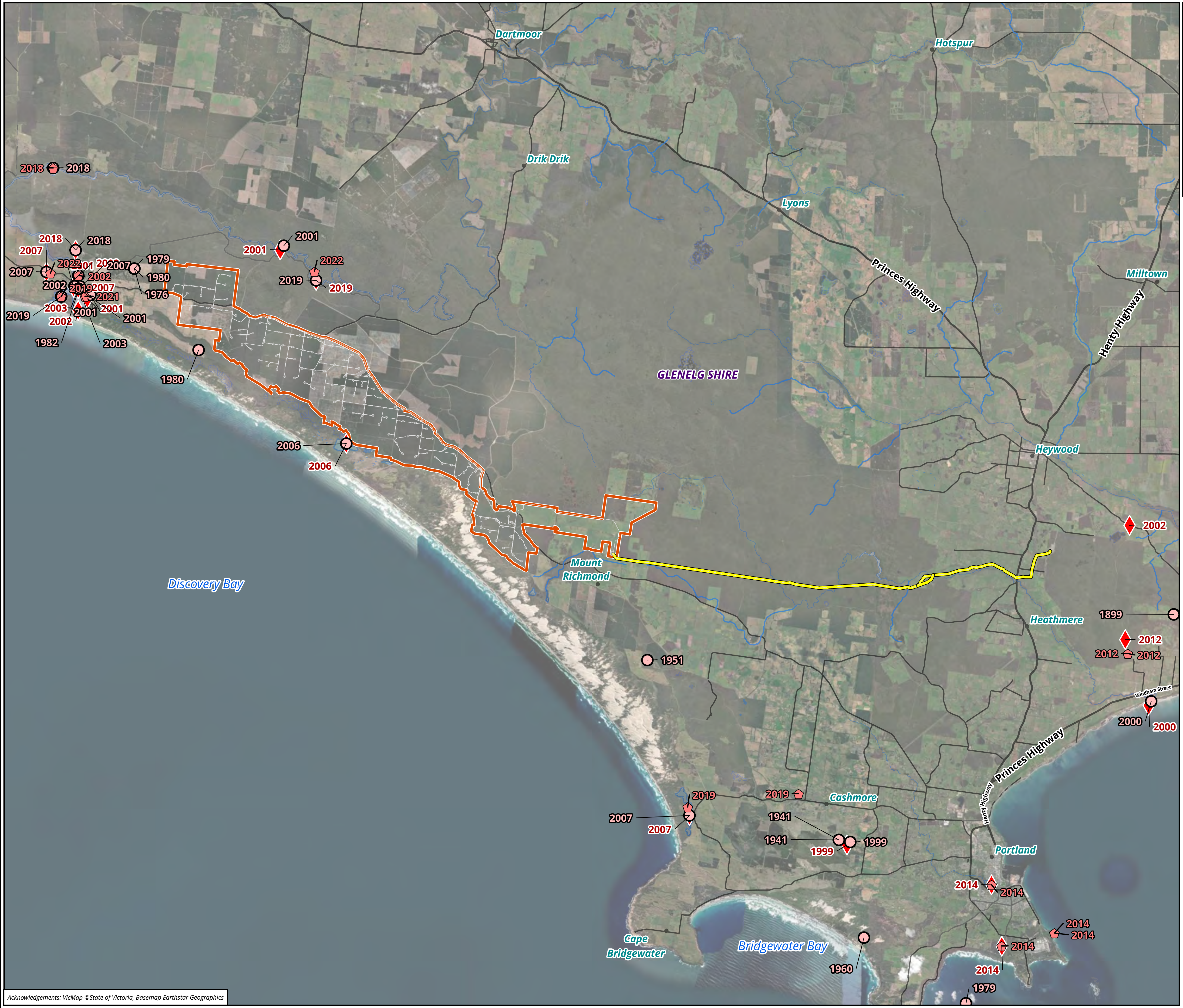
Figure 22a White-throated Needletail records

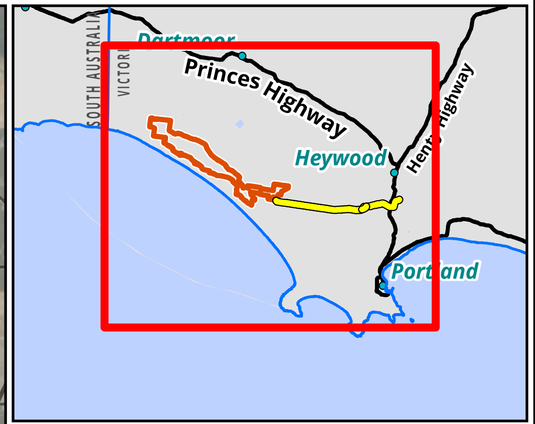
0 1 2 3 4 5
Kilometres
Scale: 1:200,000 @ A3
Coordinate System: GDA2020 MGA Zone 54

N

biosis
APEM Group

Matter: 35014,
Date: 22 August 2024,
Checked by: IV, Drawn by: JPT, Last edited by: jturner
Layout: F22a_WhiteThroatedNeedletail
Location: P:\35000s\35014\Mapping\
35014_KentbruckFauna_F20_F27.aprx





Legend

- Wind farm footprint
- Transmission line
- Other proposed infrastructure
- Fork-tailed Swift (BirdLife) - labelled by year
- Fork-tailed Swift (eBird) - labelled by year
- Fork-tailed Swift (VBA) - labelled by year

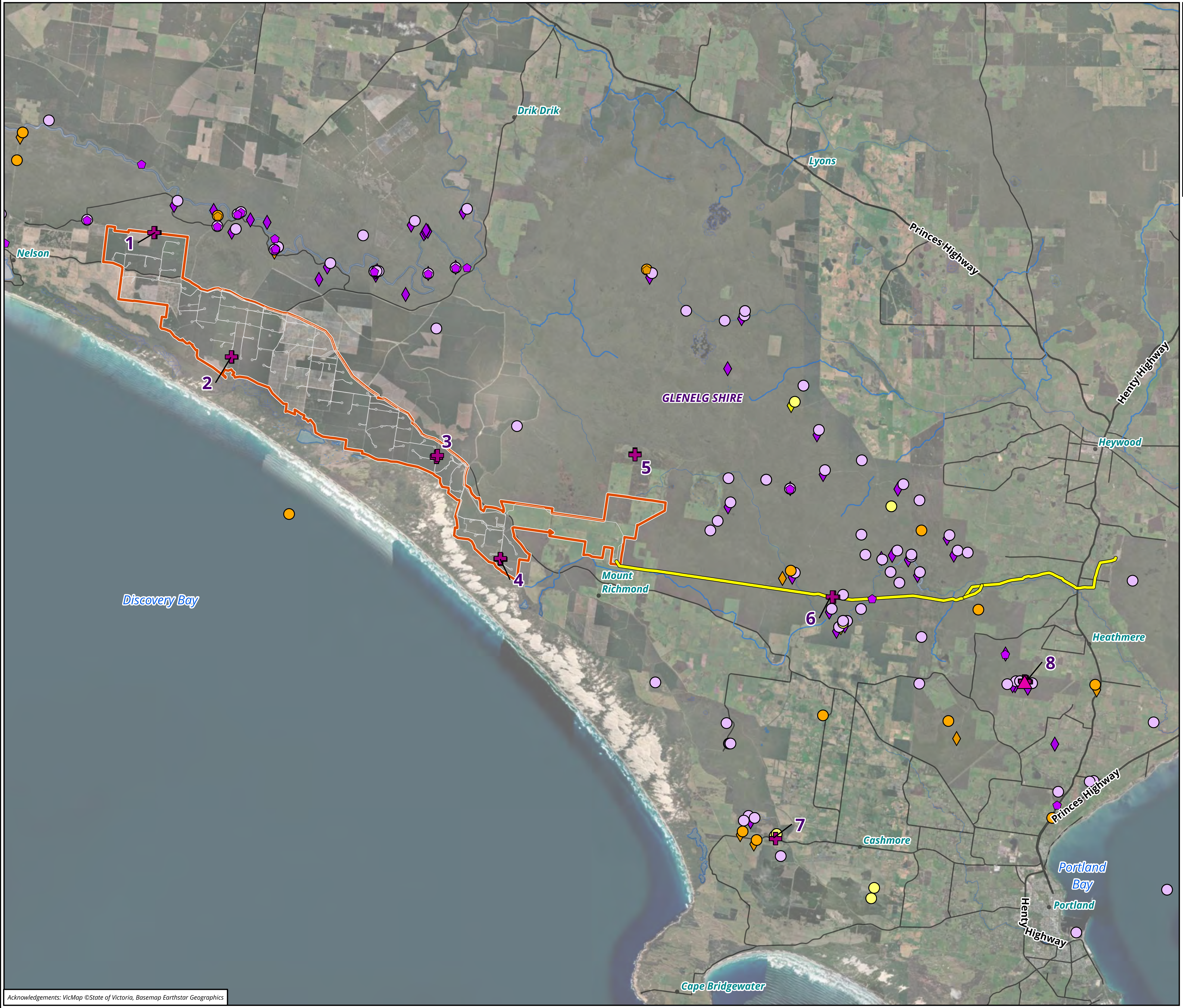
Figure 23a Fork-tailed Swift records

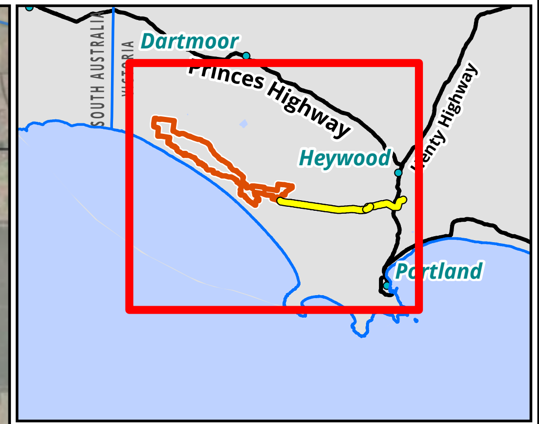
0 1 2 3 4 5
Kilometres
Scale: 1:200,000 @ A3
Coordinate System: GDA2020 MGA Zone 54

N

biosis
APEM Group

Matter: 33361,
Date: 22 August 2024,
Checked by: IV, Drawn by: JPT, Last edited by: jturner
Layout: F23a_ForkTailedSwift
Location: P:\35000s\35014\Mapping\35014_KentbruckFauna_F20_F27.aprx





Legend

- Wind farm footprint
- Transmission line
- Other proposed infrastructure
- Threatened owl survey location

Species records (Biosis)
- Powerful Owl

Species records (BirdLife)
- Barking Owl
- Masked Owl
- Powerful Owl

Species records (eBird)
- Masked Owl
- Powerful Owl

Species records (VBA)
- Barking Owl
- Masked Owl
- Powerful Owl

Figure 24a Threatened owl records

N

0 1 2 3 4 5
Kilometres
Scale: 1:175,000 @ A3
Coordinate System: GDA2020 MGA Zone 54

biosis APEM Group

Matter: 33361,
Date: 22 August 2024,
Checked by: IV, Drawn by: JPT, Last edited by: jturner
Layout: F24ab_ThreatenedOwls
Location: P:\35000s\35014\Mapping\
35014_KentbruckFauna_F20_F27.aprx

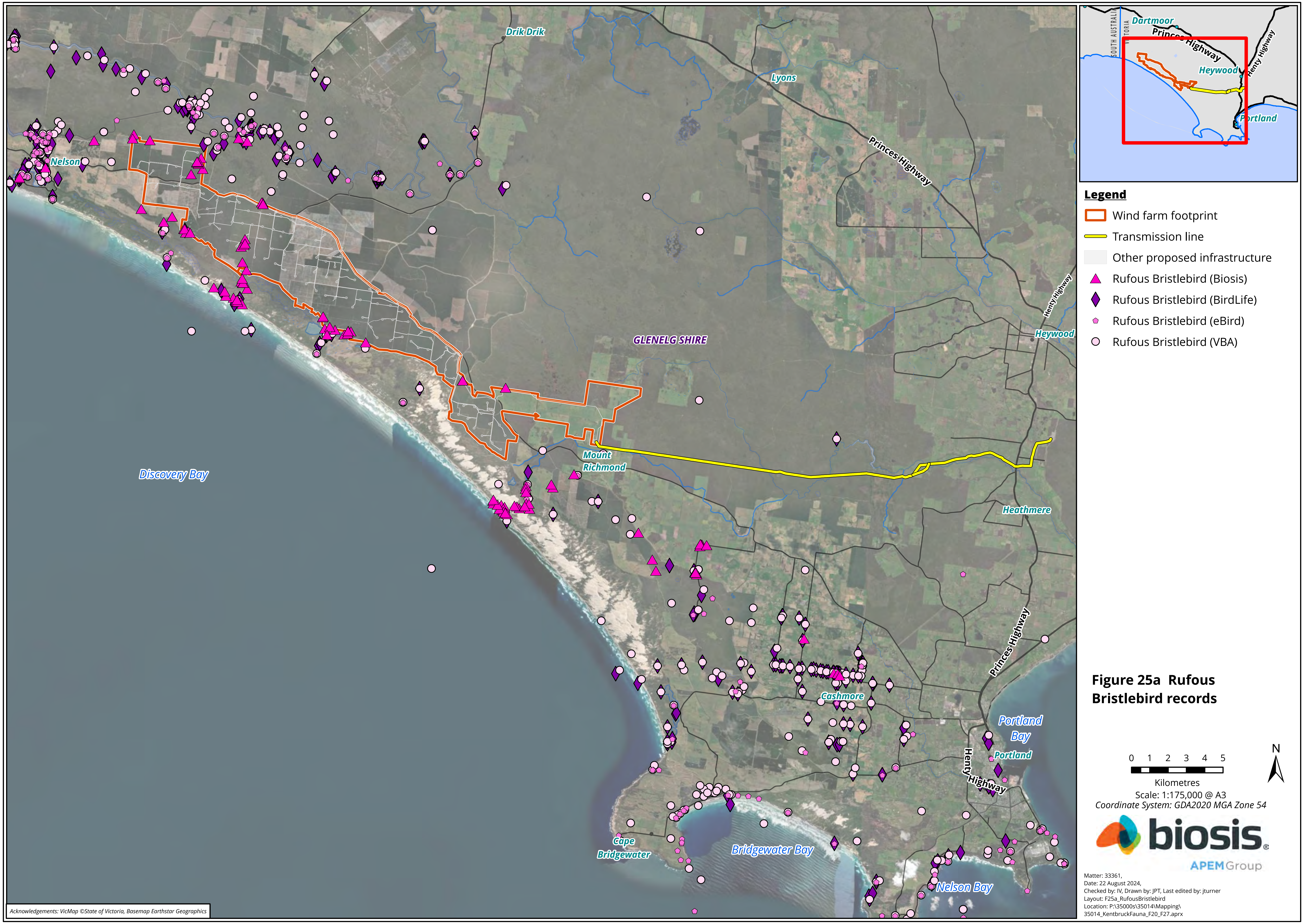


Figure 25a Rufous Bristlebird records

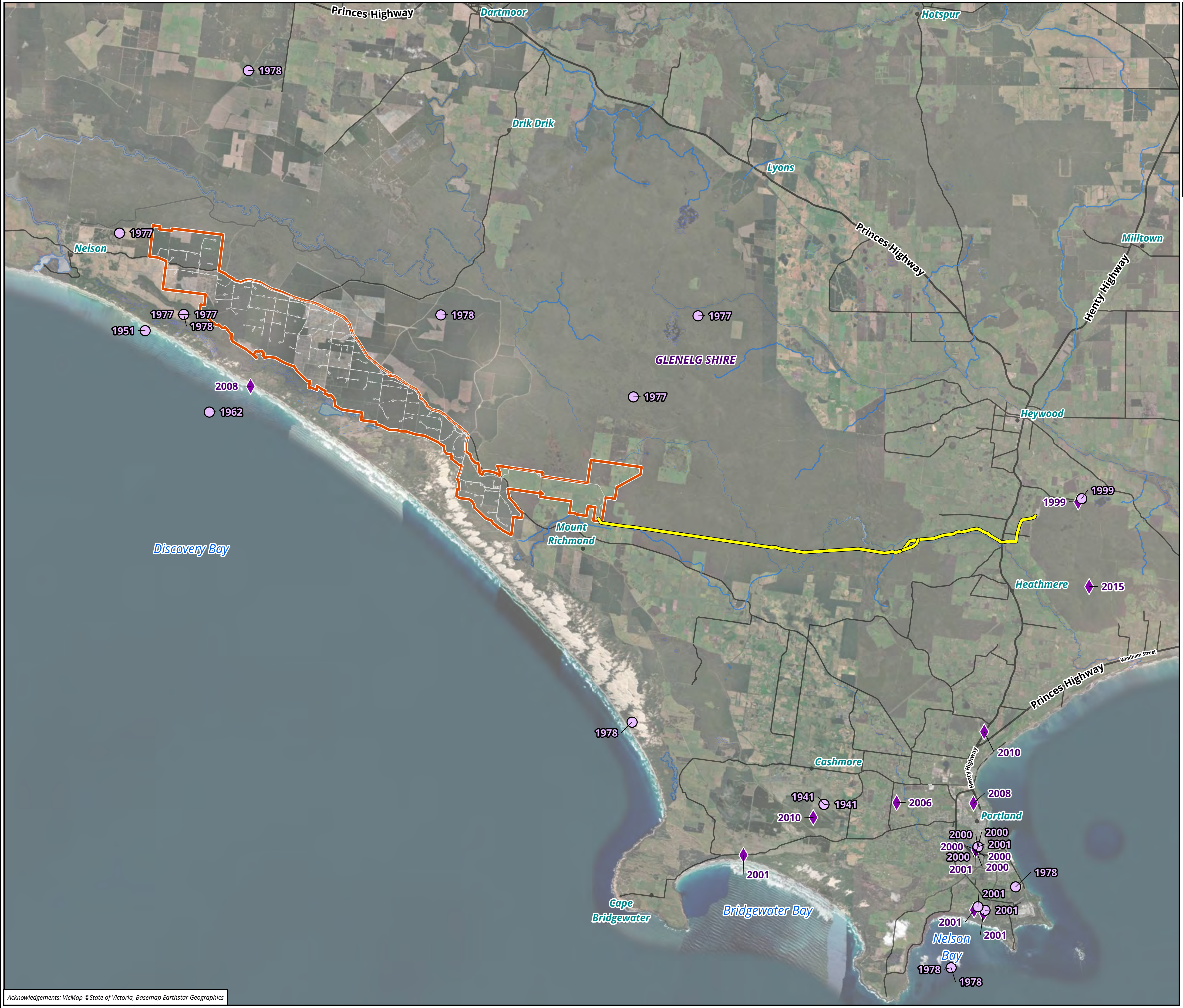
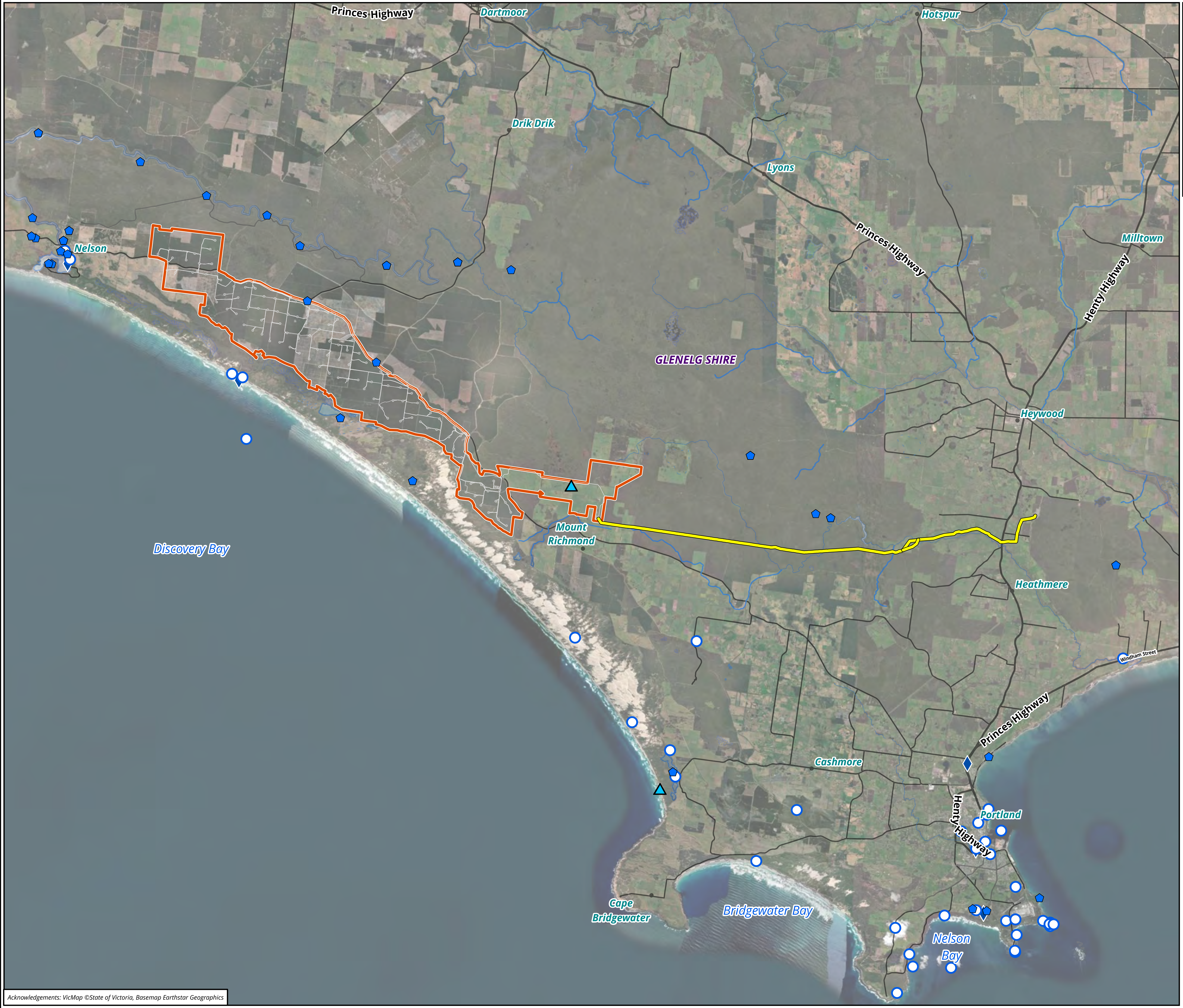


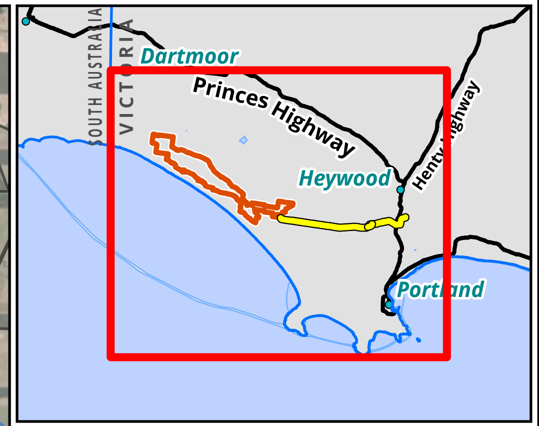
Figure 26a Little Eagle records

Scale: 1:200,000 @ A3
Coordinate System: GDA2020 MGA Zone 54

biosis APEMGroup

Matter: 35014,
Date: 22 August 2024,
Checked by: IV, Drawn by: JPT, Last edited by: jturner
Layout: F26a_LittleEagle
Location: P:\35000s\35014\Mapping\35014_KentbruckFauna_F20_F27.aprx





Legend

- Wind farm footprint
- Transmission line
- Other proposed infrastructure
- White-bellied Sea-Eagle (Biosis)
- White-bellied Sea-Eagle (eBird)
- White-bellied Sea-Eagle (VBA)
- White-bellied Sea-Eagle (BirdLife)

Figure 27a White-bellied Sea-Eagle records

0 1 2 3 4 5

Kilometres

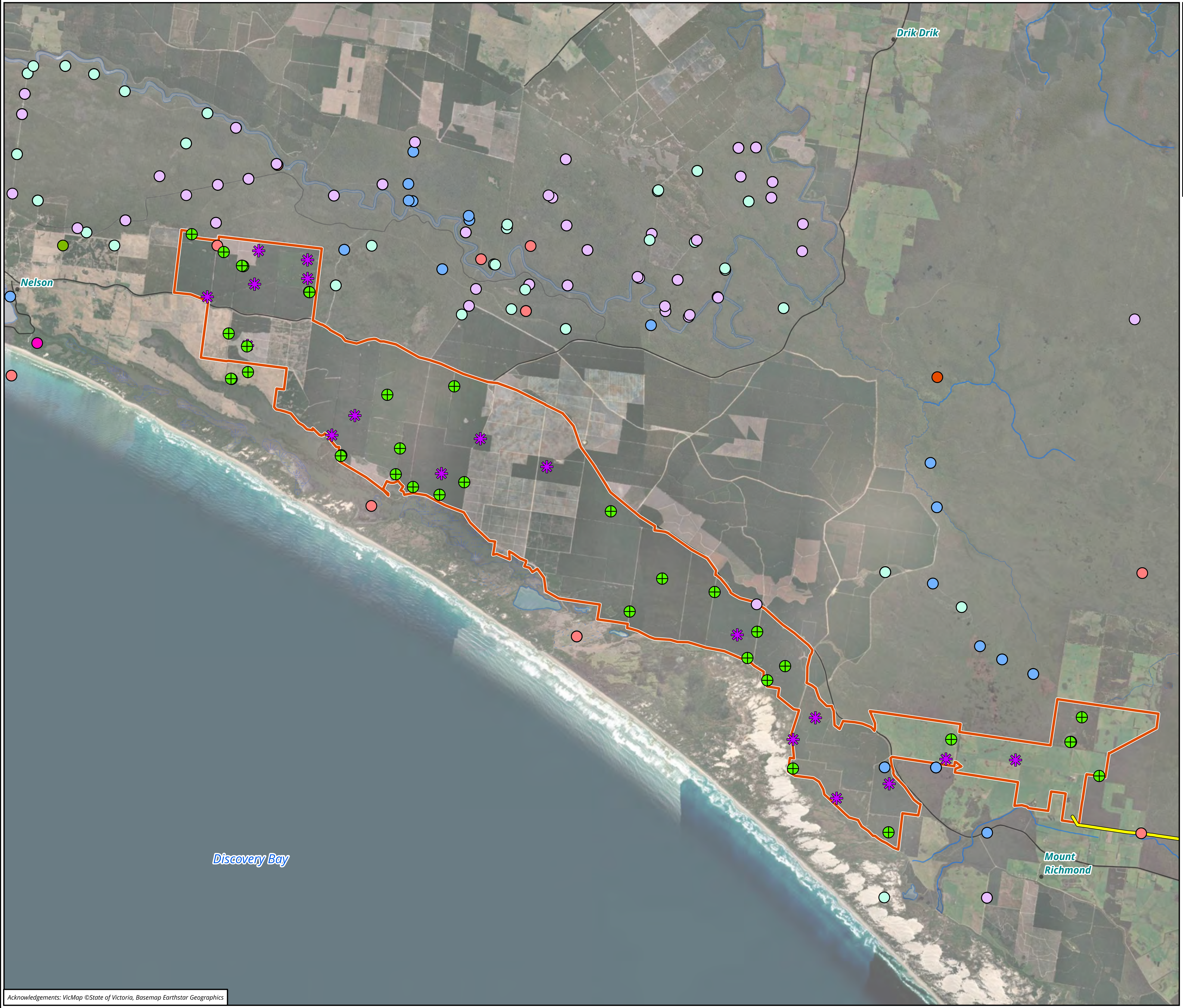
N

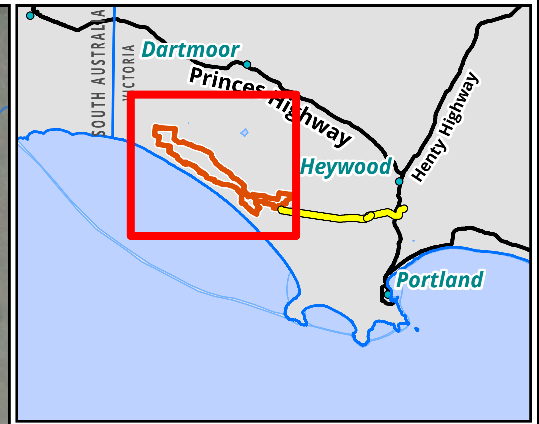
Scale: 1:200,000 @ A3

Coordinate System: GDA2020 MGA Zone 54

biosis® APEM Group

Matter: 35014,
Date: 22 August 2024,
Checked by: IV, Drawn by: JPT, Last edited by: jturner
Layout: F27a_WhiteBelliedSeaEagle
Location: P:\35000s\35014\Mapping\
35014_KentbruckFauna_F20_F27.aprx





Legend

- Wind farm footprint
- Transmission line

Camera traps

- September-October 2020 deployment
- May-June 2020 deployment

Species records (VBA)

- Common Dunnart
- Heath Mouse
- Long-nosed Potoroo
- Rufous-bellied Pademelon
- Smoky Mouse
- Southern Brown Bandicoot
- Spot-tailed Quoll
- Swamp Antechinus
- White-footed Dunnart

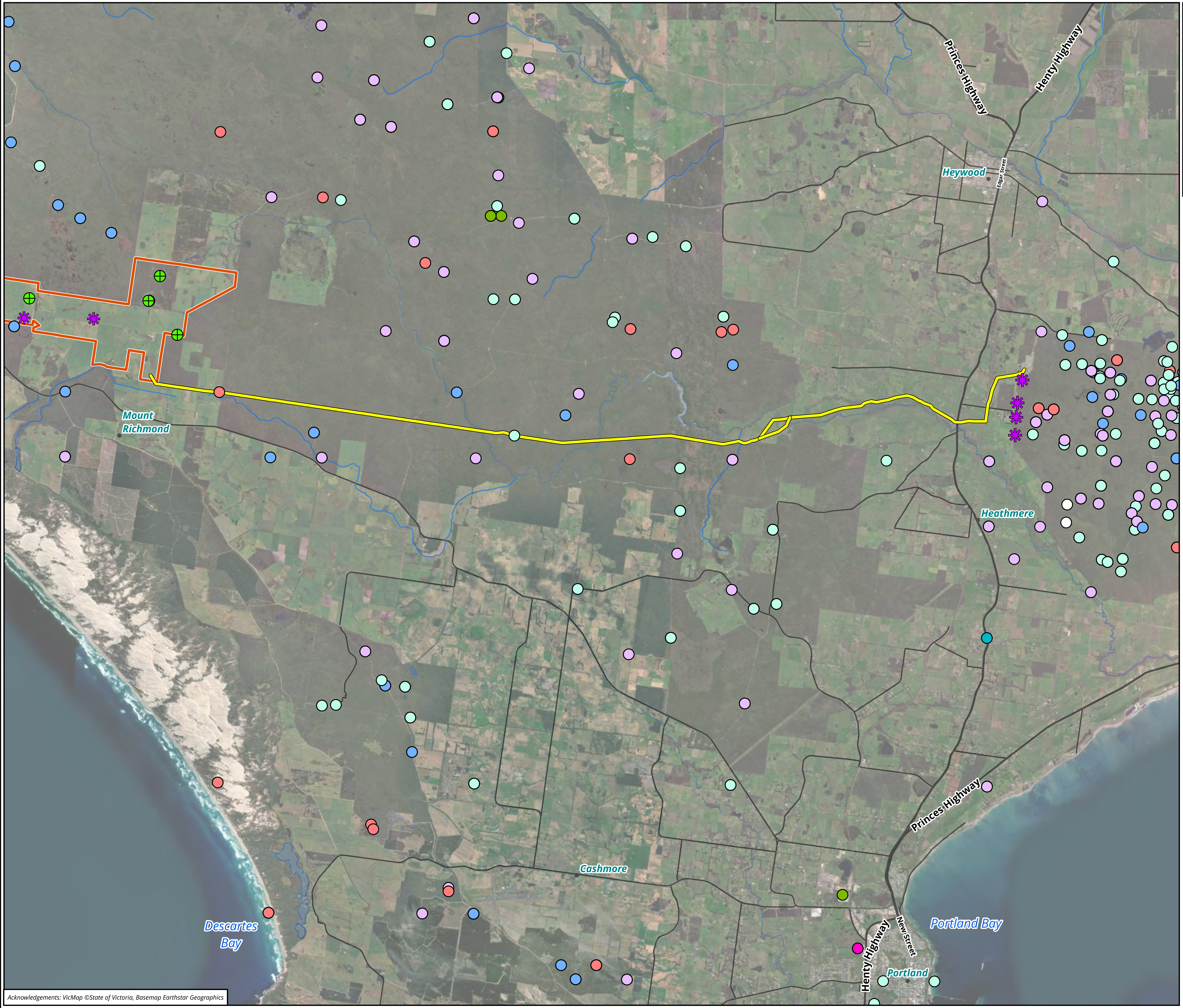
Figure 28a.1 Mammal camera trap locations

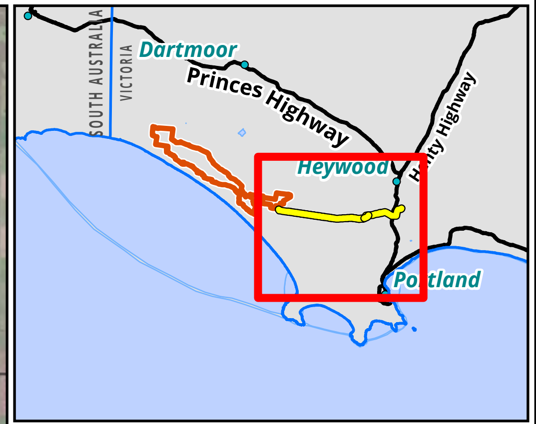
0 1 2 3 4
Kilometres
N

Scale: 1:100,000 @ A3
Coordinate System: GDA2020 MGA Zone 54

biosis
APEM Group

Matter: 33361,
Date: 22 August 2024,
Checked by: IV, Drawn by: JPT, Last edited by: jturner
Layout: F28a_Mammal_CameraTraps
Location: P:\35000s\35014\Mapping\
35014_KentbruckFauna_F28_37.aprx





Legend

- Wind farm footprint
- Transmission line

Camera traps

- September-October 2020 deployment
- May-June 2020 deployment

Species records (VBA)

- Grey-headed Flying-fox
- Heath Mouse
- Long-nosed Potoroo
- Rufous-bellied Pademelon
- Southern Brown Bandicoot
- Spot-tailed Quoll
- Swamp Antechinus
- White-footed Dunnart

Figure 28a.2 Mammal camera trap locations

0 1 2 3 4
Kilometres
Scale: 1:100,000 @ A3
Coordinate System: GDA2020 MGA Zone 54

N

Matter: 33361,
Date: 22 August 2024,
Checked by: IV, Drawn by: JPT, Last edited by: jturner
Layout: F28a_Mammal_CameraTraps
Location: P:\35000s\35014\Mapping\
35014_KentbruckFauna_F28_37.aprx

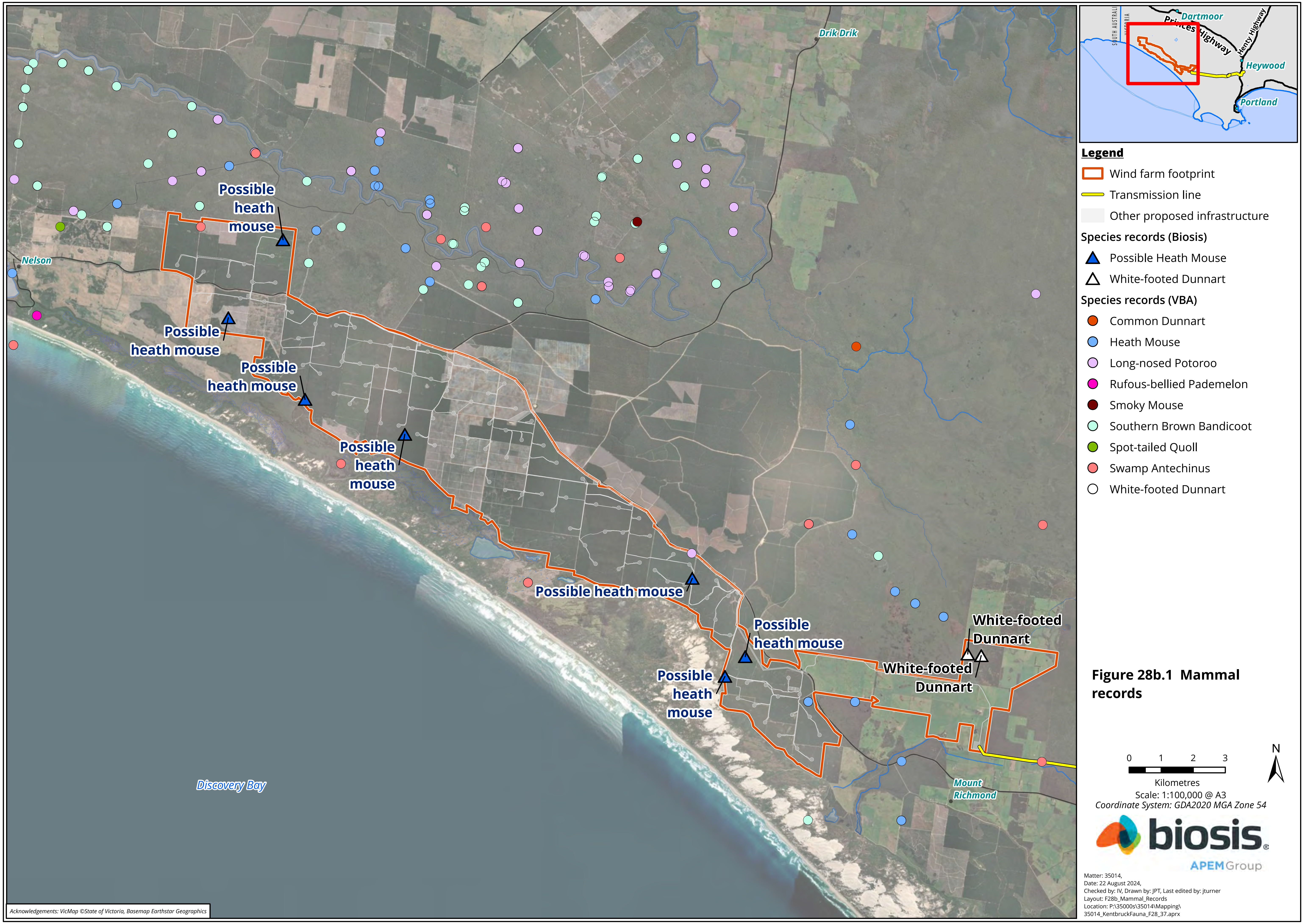
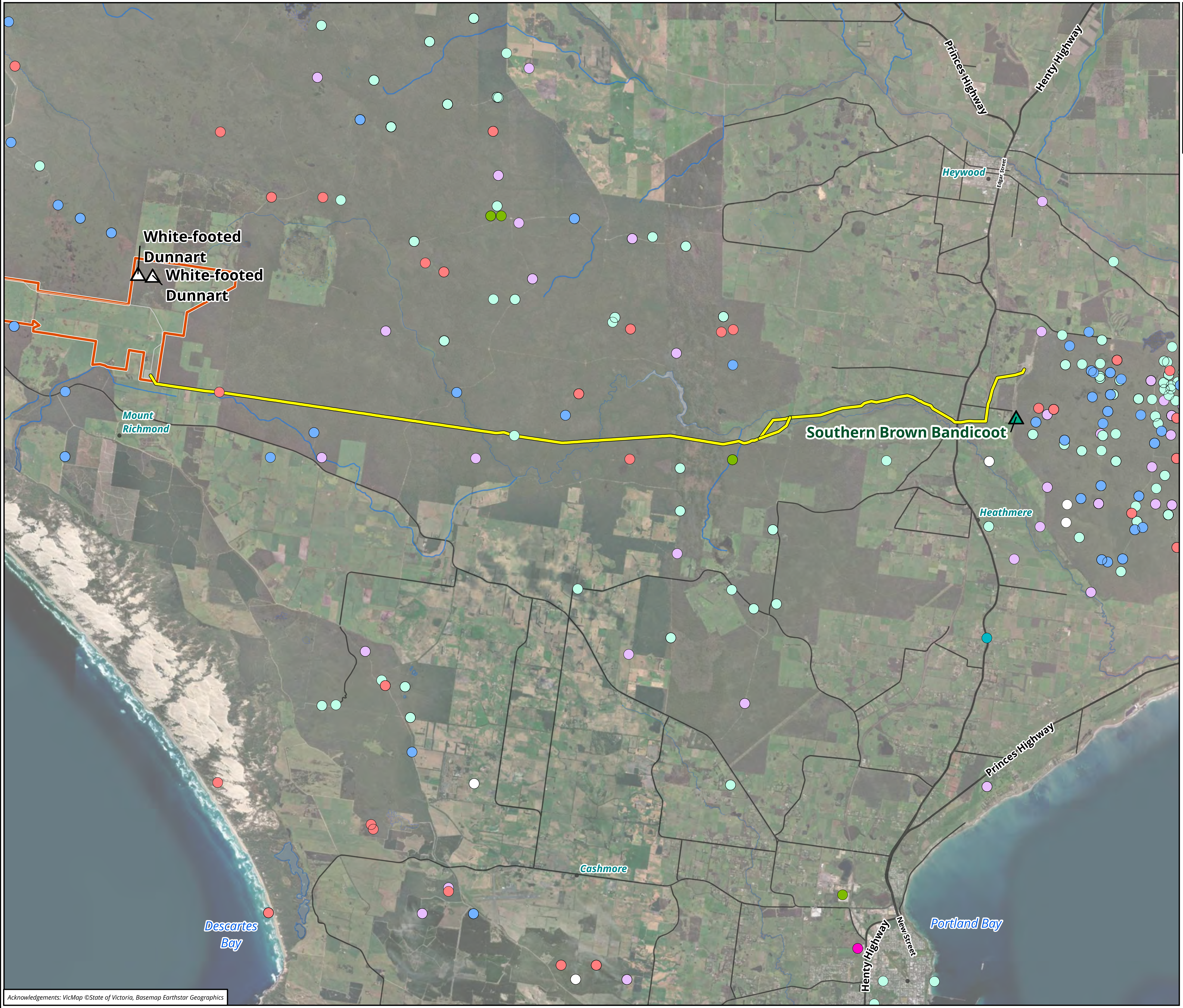
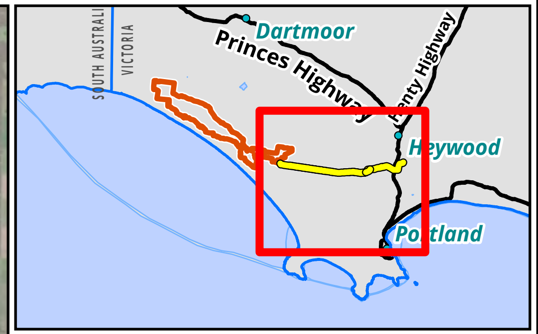


Figure 28b.1 Mammal records





Legend

- Wind farm footprint
- Transmission line
- Other proposed infrastructure

Species records (Biosis)

- Southern Brown Bandicoot
- White-footed Dunnart

Species records (VBA)

- Grey-headed Flying-fox
- Heath Mouse
- Long-nosed Potoroo
- Rufous-bellied Pademelon
- Southern Brown Bandicoot
- Spot-tailed Quoll
- Swamp Antechinus
- White-footed Dunnart

Figure 28b.2 Mammal records

0 1 2 3

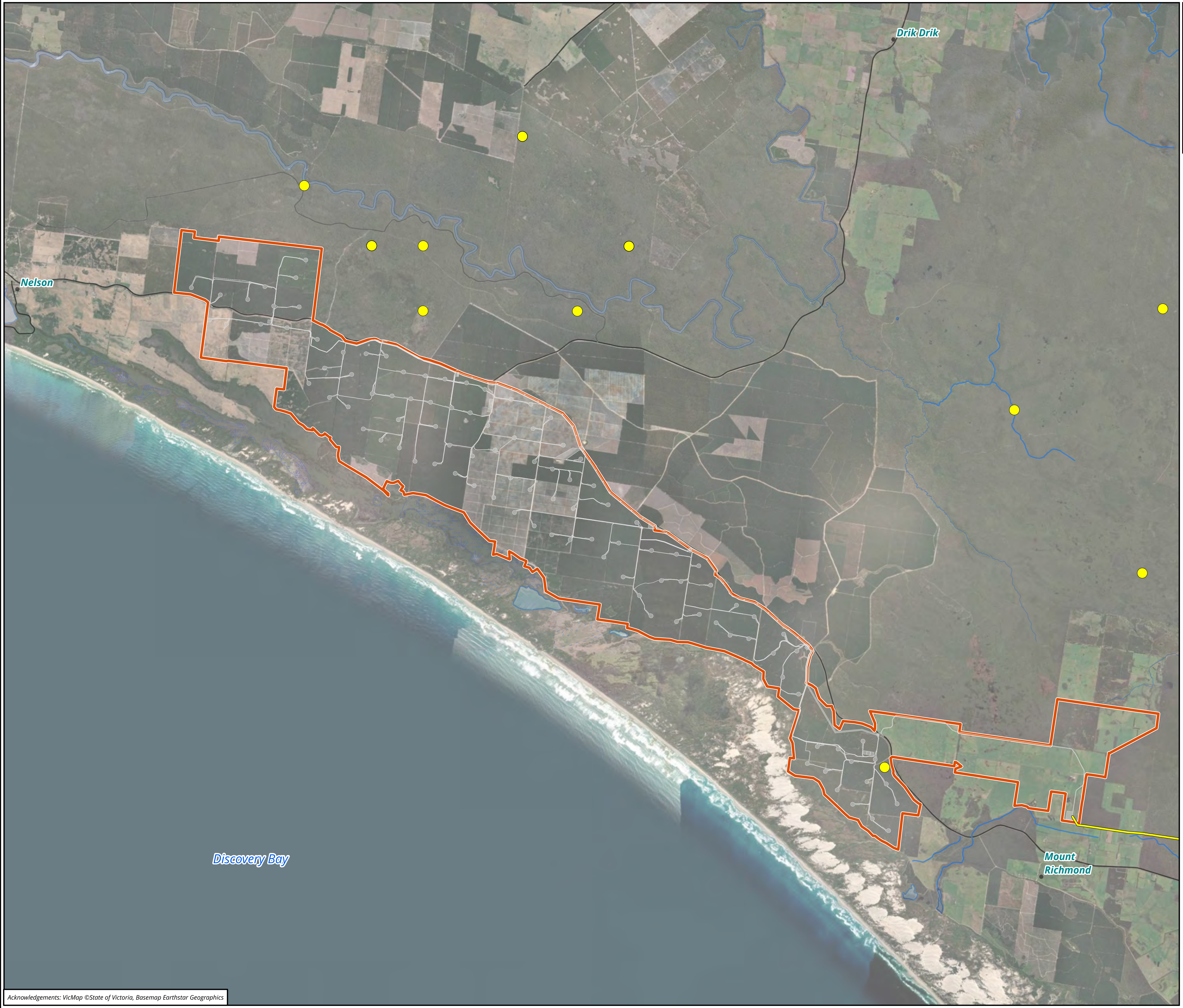
Kilometres

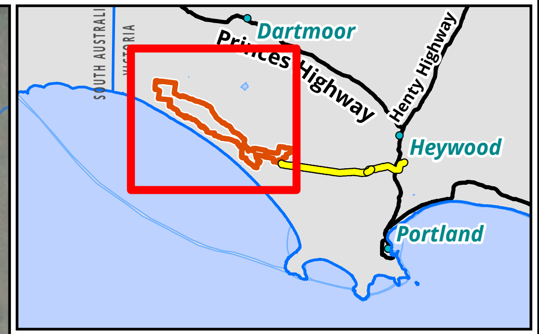
N

Scale: 1:100,000 @ A3

Coordinate System: GDA2020 MGA Zone 54

Matter: 35014,
Date: 22 August 2024,
Checked by: IV, Drawn by: JPT, Last edited by: jturner
Layout: F28b_Mammal_Records
Location: P:\35000s\35014\Mapping\
35014_KentbruckFauna_F28_37.aprx





Legend

- Wind farm footprint
- Transmission line
- Other proposed infrastructure

Species records (VBA)

- Yellow-bellied Glider

Figure 28c.1 Threatened arboreal mammal records

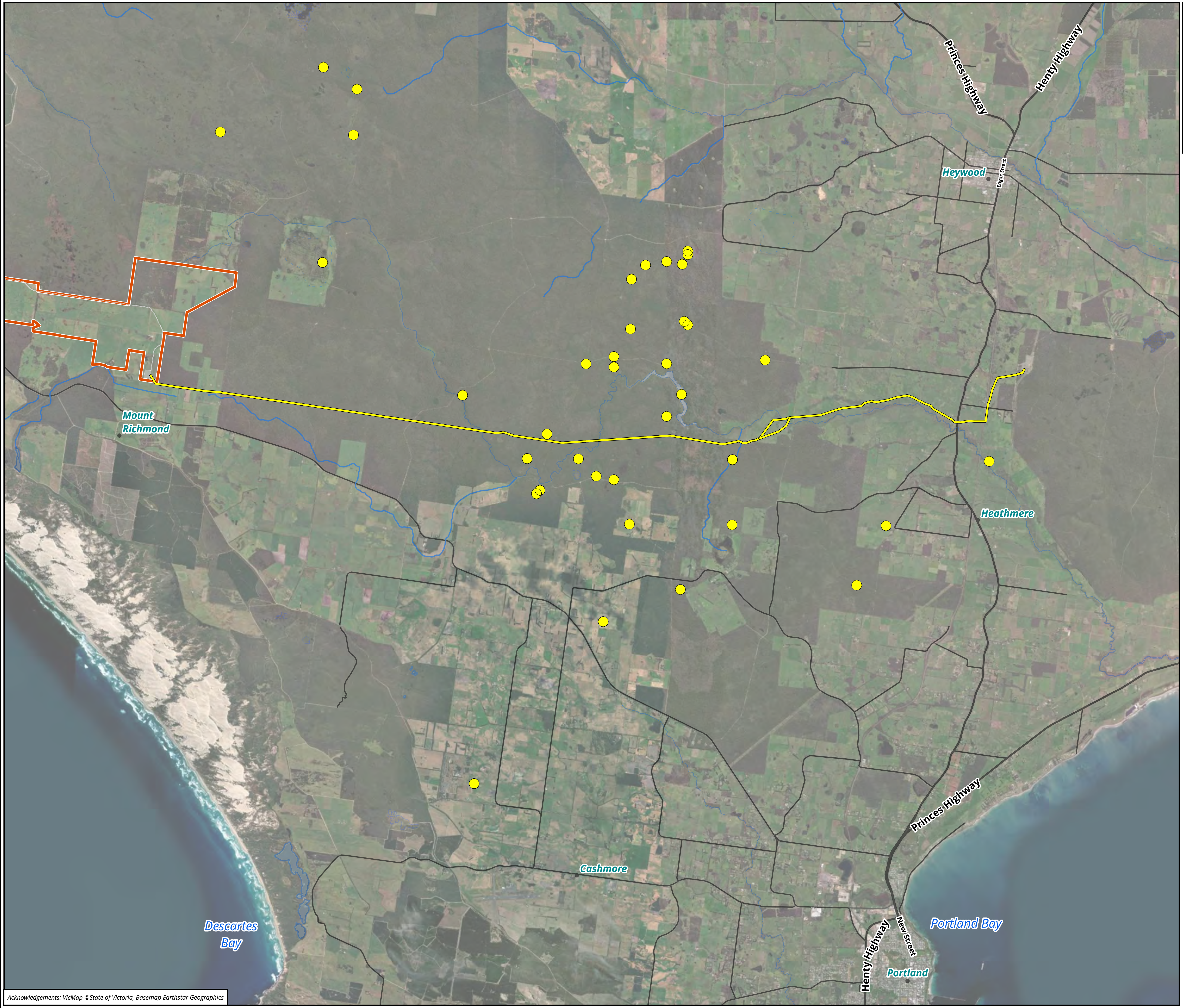
0 1 2 3

Kilometres

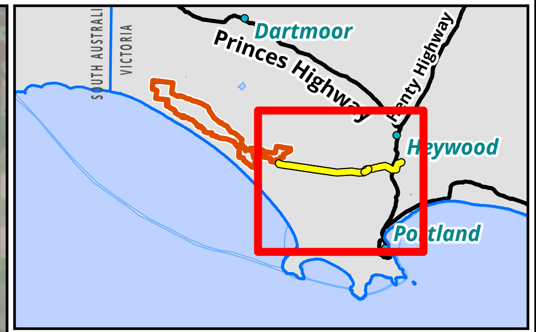
Scale: 1:100,000 @ A3

Coordinate System: GDA2020 MGA Zone 54

Matter: 35014,
Date: 22 August 2024,
Checked by: IV, Drawn by: JPT, Last edited by: jturner
Layout: F28c_Mammals_Arboreal
Location: P:\35000s\35014\Mapping\
35014_KentbruckFauna_F28_37.aprx



Acknowledgements: VicMap ©State of Victoria, Basemap Earthstar Geographics



Legend

- Wind farm footprint
- Transmission line
- Other proposed infrastructure

Species records (VBA)

- Yellow-bellied Glider

Figure 28c.2 Threatened arboreal mammal records

0 1 2 3

Kilometres

Scale: 1:100,000 @ A3

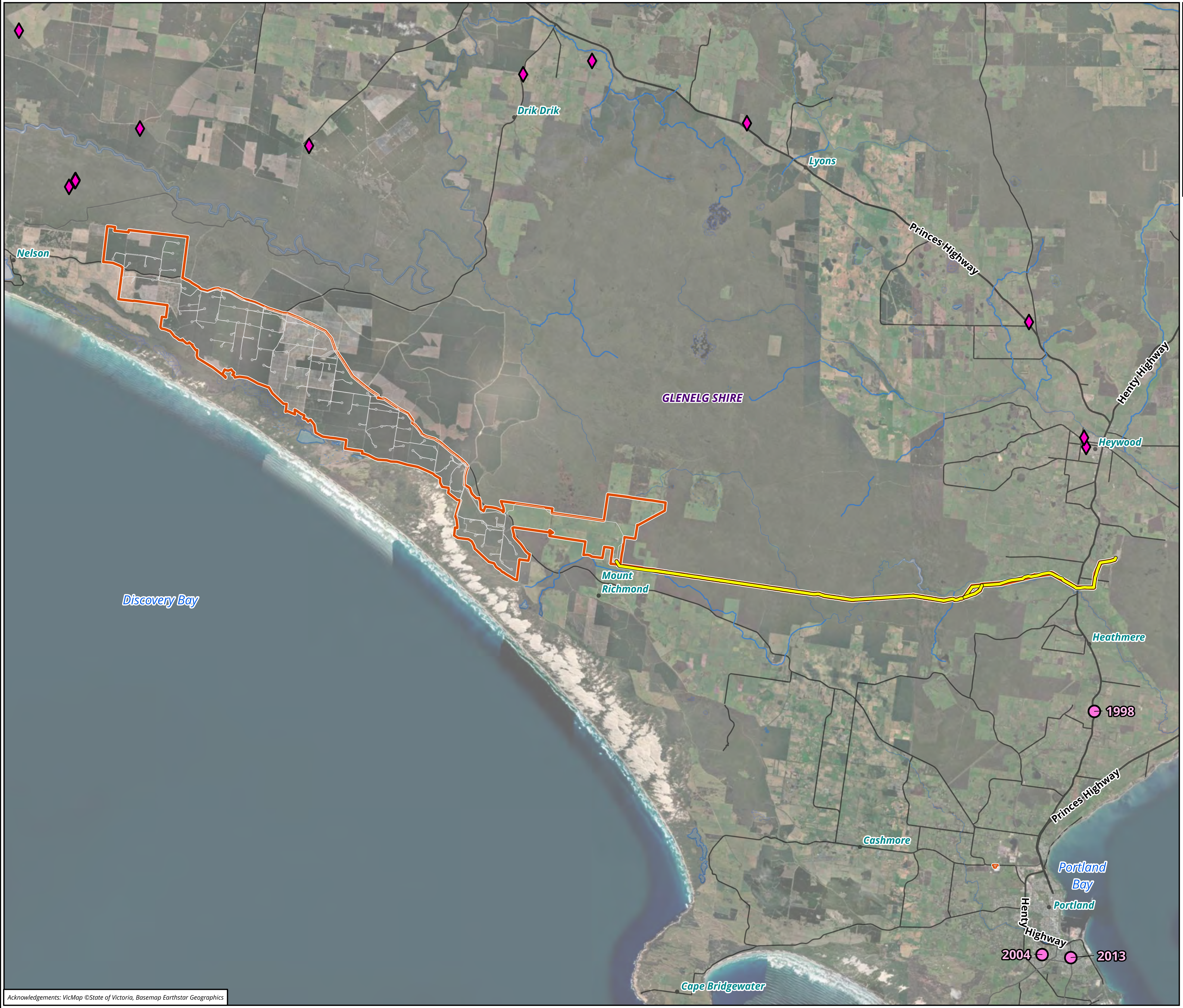
Coordinate System: GDA2020 MGA Zone 54

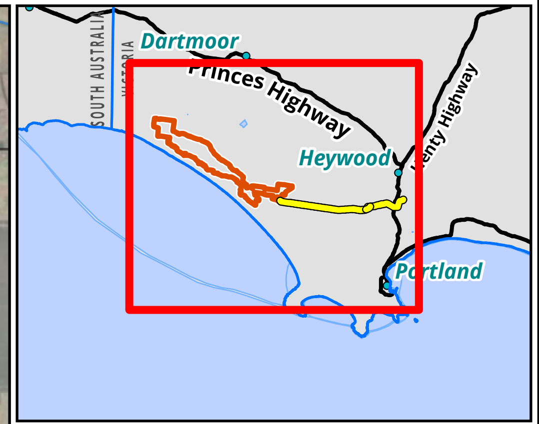
N

biosis

APEM Group

Matter: 35014,
Date: 22 August 2024,
Checked by: IV, Drawn by: JPT, Last edited by: jturner
Layout: F28c_Mammals_Arboreal
Location: P:\35000s\35014\Mapping\35014_KentbruckFauna_F28_37.aprx





Legend

- Wind farm footprint
- Transmission line
- Other proposed infrastructure
- Grey-headed Flying-fox (Atlas of Living Australia 2020)
- Grey-headed Flying-fox (VBA) - labelled by year

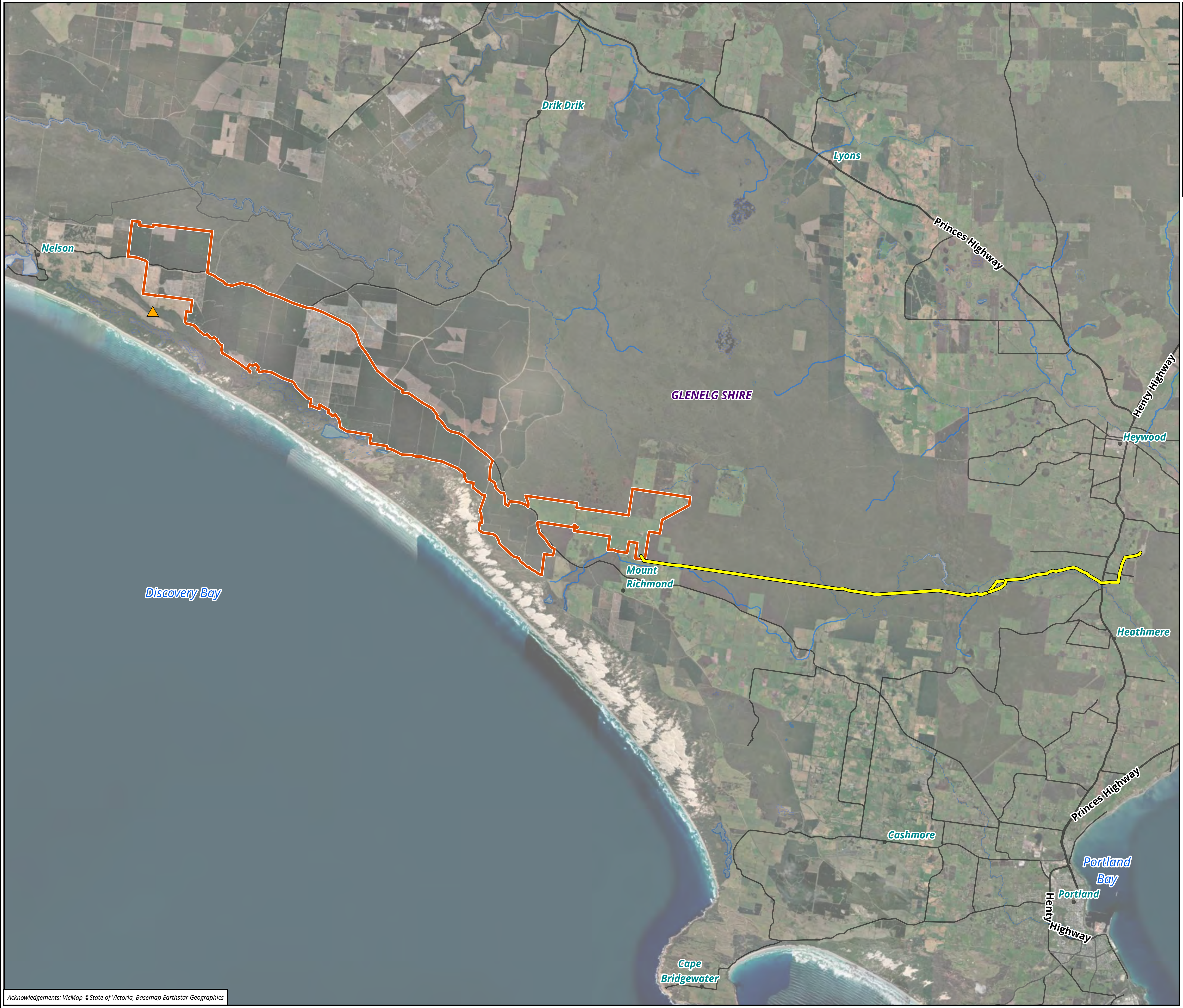
Figure 30a Grey-headed Flying-fox records

0 1 2 3 4 5
Kilometres
Scale: 1:175,000 @ A3
Coordinate System: GDA2020 MGA Zone 54

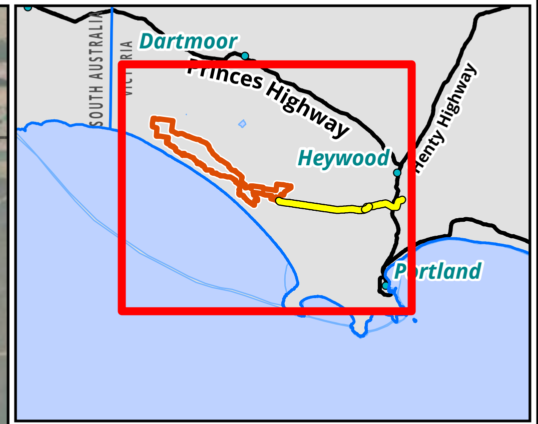
N

biosis APEM Group

Matter: 33361,
Date: 22 August 2024,
Checked by: IV, Drawn by: JPT, Last edited by: jturner
Layout: F30a_GreyHeadedFlyingFox
Location: P:\35000s\35014\Mapping\
35014_KentbruckFauna_F28_37.aprx



Acknowledgements: VicMap ©State of Victoria, Basemap Earthstar Geographics



Legend

Wind farm footprint

Transmission line

Species records (Biosis)

Swamp Skink

Figure 31a Swamp Skink records

0 1 2 3 4 5

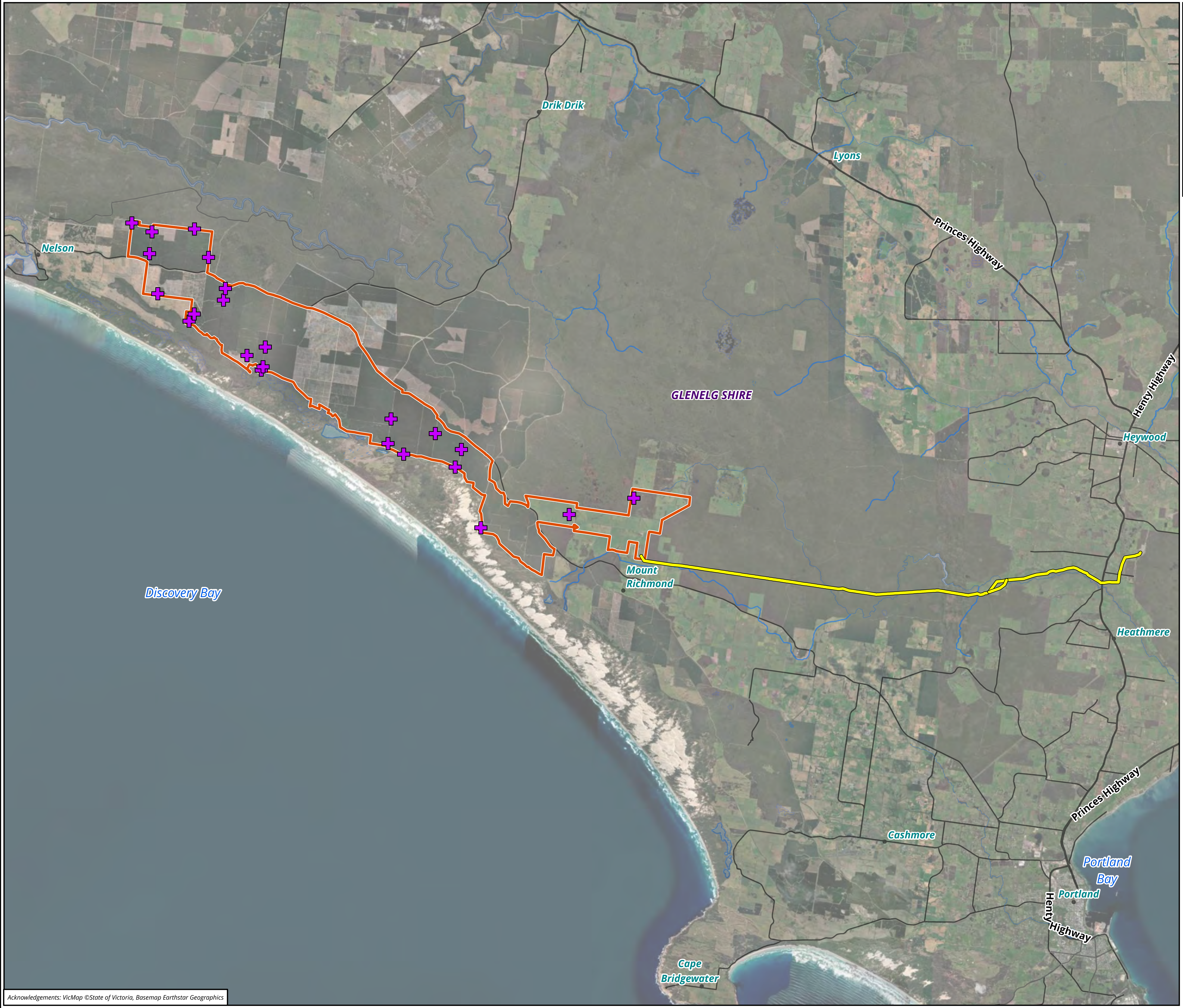
Kilometres

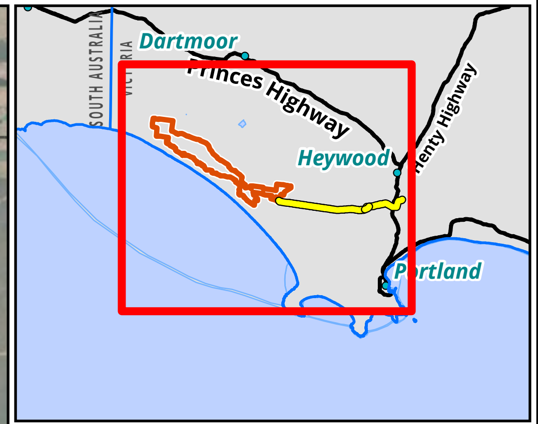
Scale: 1:175,000 @ A3

Coordinate System: GDA2020 MGA Zone 54

N

Matter: 33361,
Date: 22 August 2024,
Checked by: IV, Drawn by: JPT, Last edited by: jturner
Layout: F31a_SwampSkink
Location: P:\35000s\35014\Mapping\
35014_KentbruckFauna_F28_37.aprx





Legend

- Wind farm footprint
- Transmission line
- Tile grid

Figure 32a Reptile survey locations - tiles

0 1 2 3 4 5

Kilometres

Scale: 1:175,000 @ A3

Coordinate System: GDA2020 MGA Zone 54

N

Matter: 33361,
Date: 22 August 2024,
Checked by: IV, Drawn by: JPT, Last edited by: jturner
Layout: F32ab_Reptiles
Location: P:\35000s\35014\Mapping\
35014_KentbruckFauna_F28_37.aprx

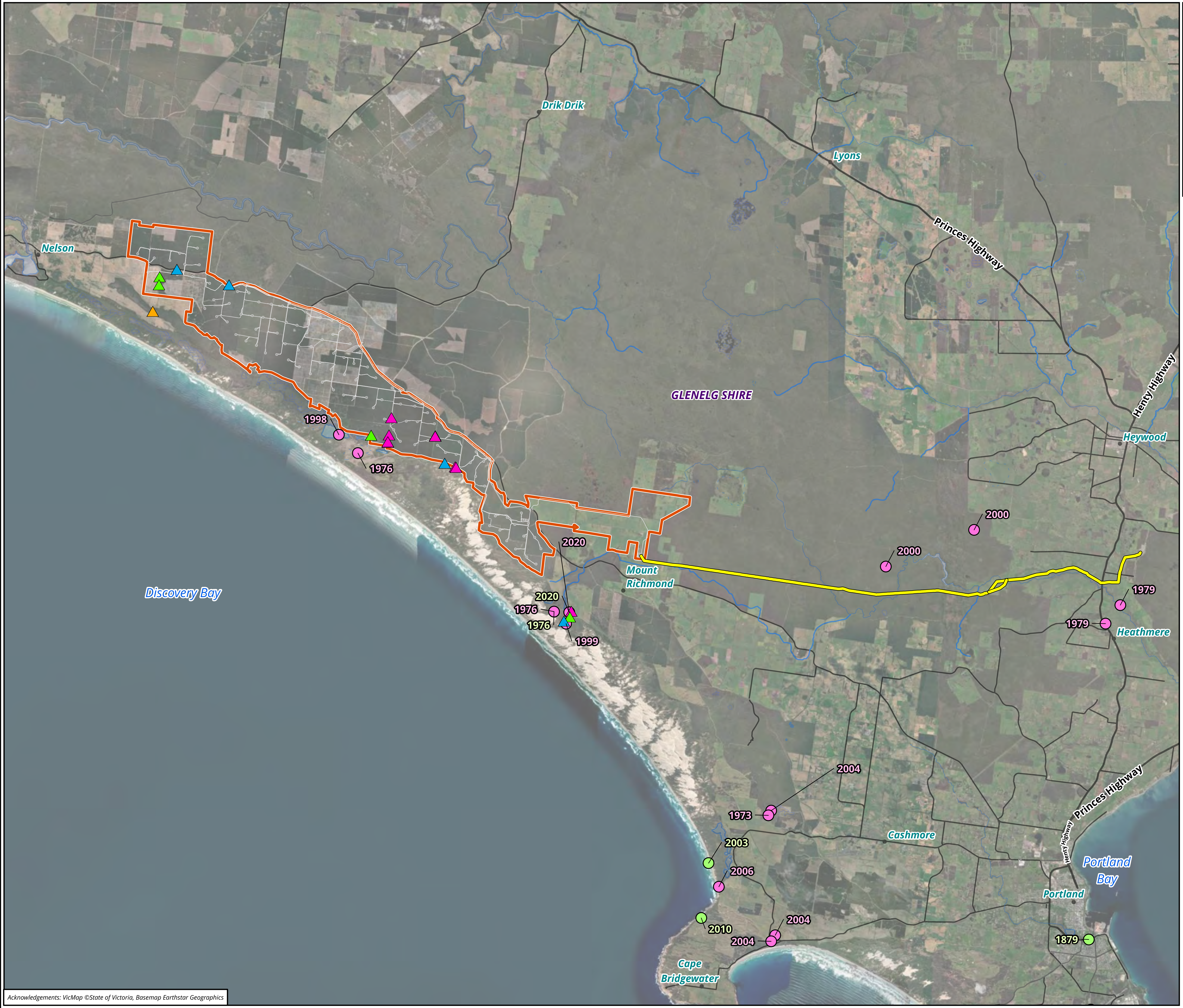


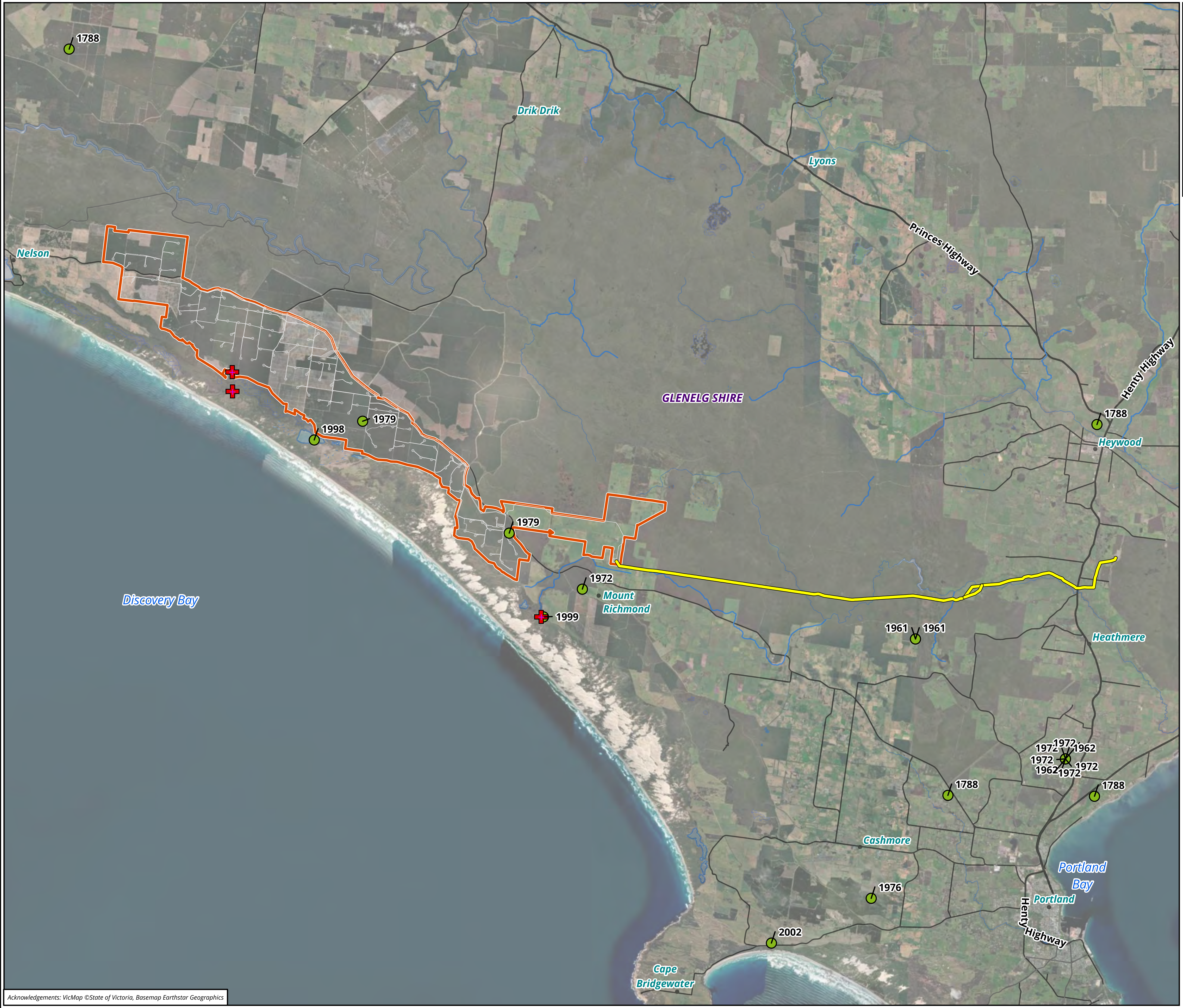
Figure 32b Threatened reptile records

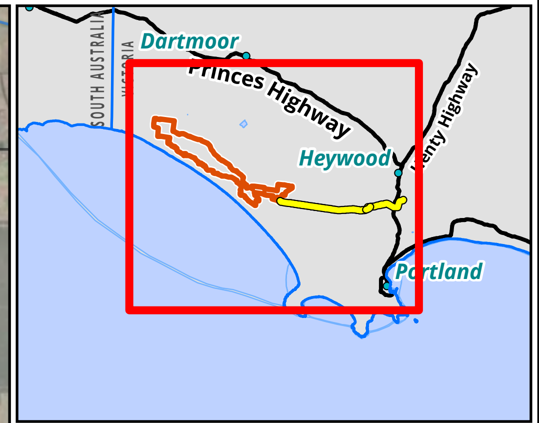
0 1 2 3 4 5
Kilometres
Scale: 1:175,000 @ A3
Coordinate System: GDA2020 MGA Zone 54

N

biosis
APEM Group

Matter: 33361,
Date: 22 August 2024,
Checked by: IV, Drawn by: JPT, Last edited by: jturner
Layout: F32ab_Reptiles
Location: P:\35000s\35014\Mapping\
35014_KentbruckFauna_F28_37.aprx





Legend

- Wind farm footprint
- Transmission line
- Other proposed infrastructure
- Growling Grass Frog survey location
- Growling Grass Frog (VBA) - labelled by year

Figure 33a Growling Grass Frog records and survey locations

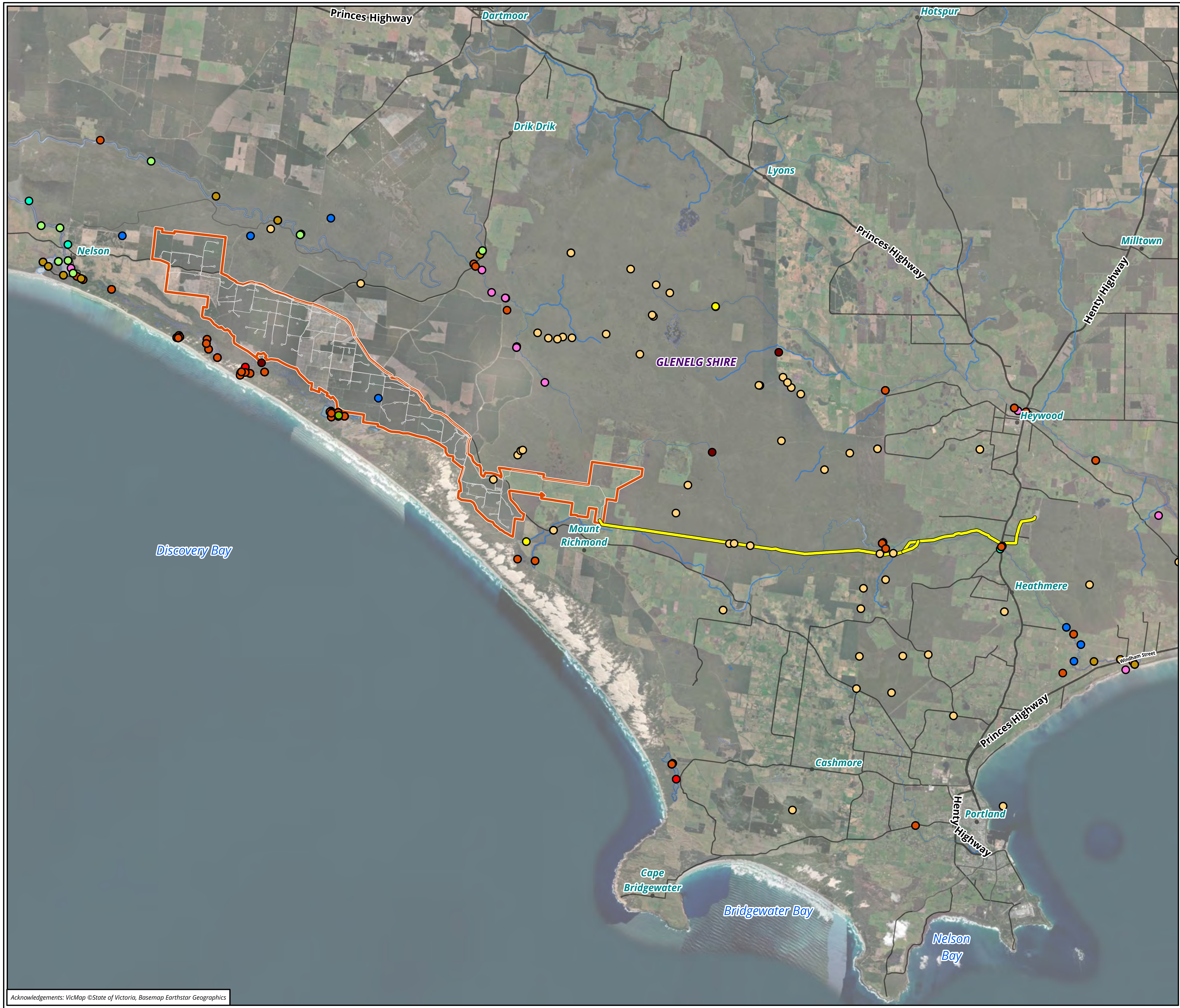
0 1 2 3 4 5

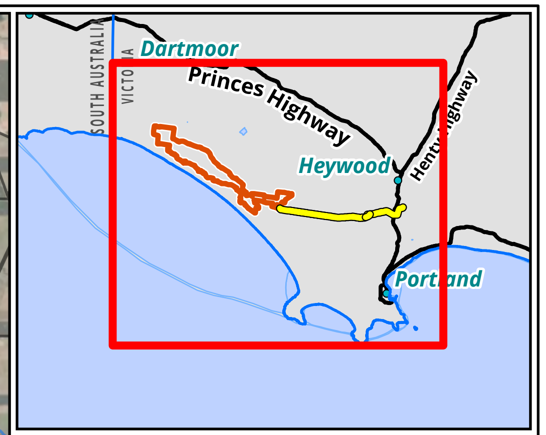
Kilometres

Scale: 1:175,000 @ A3

Coordinate System: GDA2020 MGA Zone 54

Matter: 33361,
Date: 22 August 2024,
Checked by: IV, Drawn by: JPT, Last edited by: jturner
Layout: F33a_GrowlingGrassFrog
Location: P:\35000s\35014\Mapping\
35014_KentbruckFauna_F28_37.aprx





Legend

- Wind farm footprint
- Transmission line
- Other proposed infrastructure

Aquatic species sighting (VBA)

- Black Bream
- Common Galaxias
- Estuary Perch
- Glenelg Spiny Crayfish
- Southern Toadlet
- Little Galaxias
- Mulloway
- Platypus
- Southern Shortfin Eel
- Tupong
- Variegated Pygmy Perch
- Western Plains Bush Yabby
- Yarra Pygmy Perch

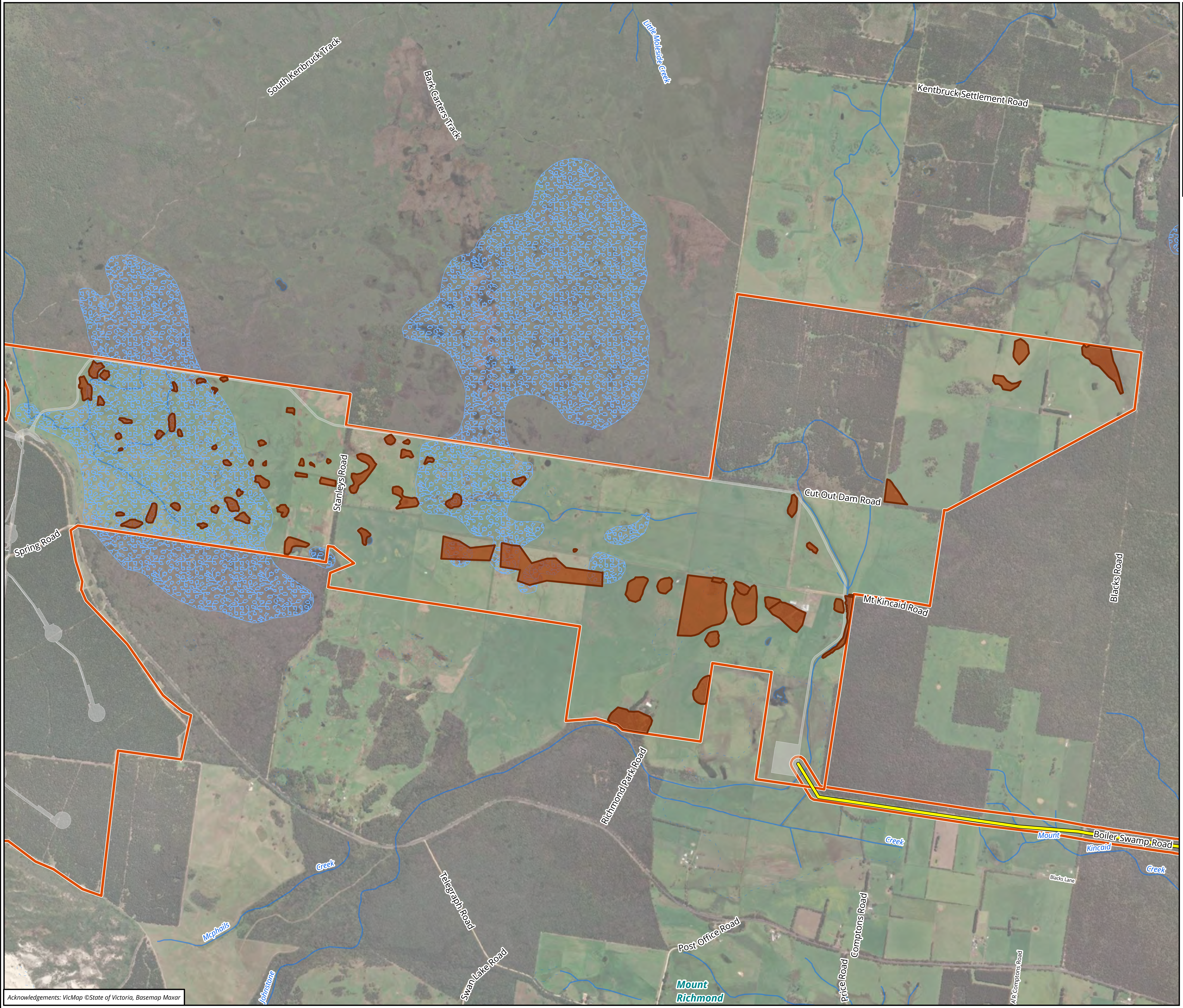
Figure 34a Records of fauna of interest that occur or rely on aquatic environments within the search area

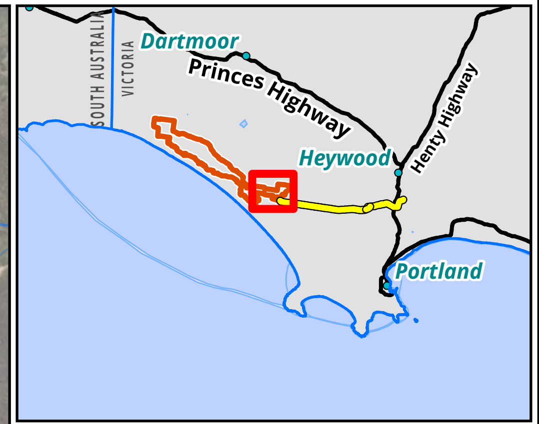
0 1 2 3 4 5
Kilometres
Scale: 1:200,000 @ A3
Coordinate System: GDA2020 MGA Zone 54

N

biosis
APEM Group

Matter: 33361,
Date: 22 August 2024,
Checked by: IV, Drawn by: JPT, Last edited by: jturner
Layout: F34a_Aquatic
Location: P:\35000s\35014\Mapping\
35014_KentbruckFauna_F28_37.aprx





Legend

- Project area
- Transmission line
- Other proposed infrastructure
- Potential habitat

Wetlands

- 4 - Deep freshwater marsh

Figure 34b.1 Potential habitat for burrowing crayfish

0 250 500 750

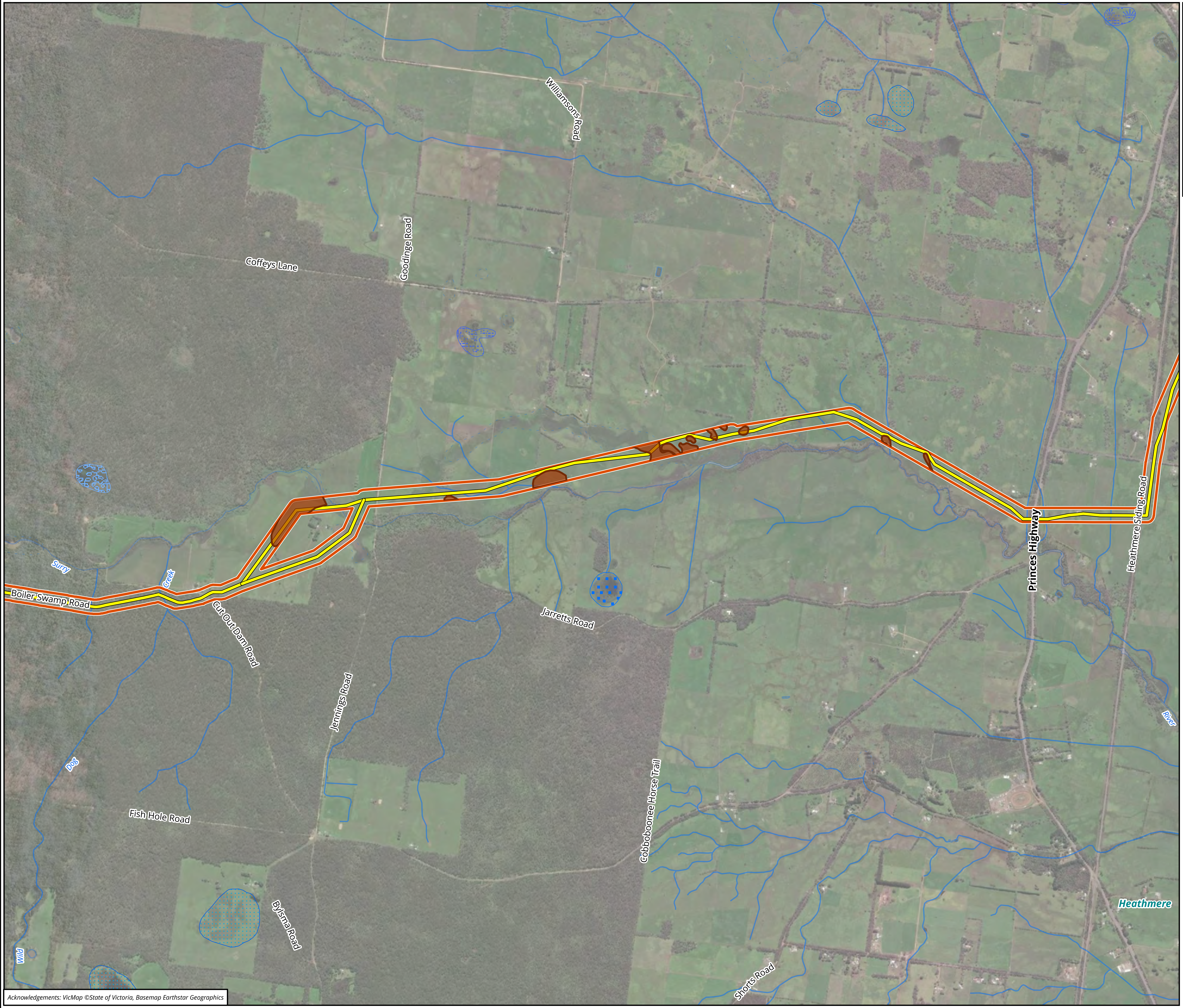
Metres

Scale: 1:25,000 @ A3

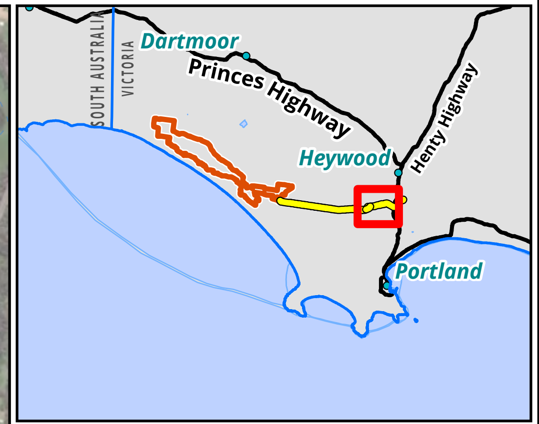
Coordinate System: GDA2020 MGA Zone 54

biosis APEM Group

Matter: 33361,
Date: 22 August 2024,
Checked by: IV, Drawn by: JPT, Last edited by: jturner
Layout: F34b_Aquatic_BurrowingCrayfish
Location: P:\35000s\35014\Mapping\
35014_KentbruckFauna_F28_37.aprx



Acknowledgements: VicMap ©State of Victoria, Basemap Earthstar Geographics



Legend

- Project area
- Transmission line
- Other proposed infrastructure
- Potential habitat

Wetlands

- 2 - Freshwater meadow
- 3 - Shallow freshwater marsh
- 4 - Deep freshwater marsh
- 99 - No Category

Figure 34b.2 Potential habitat for burrowing crayfish

0 250 500 750

Metres

Scale: 1:25,000 @ A3

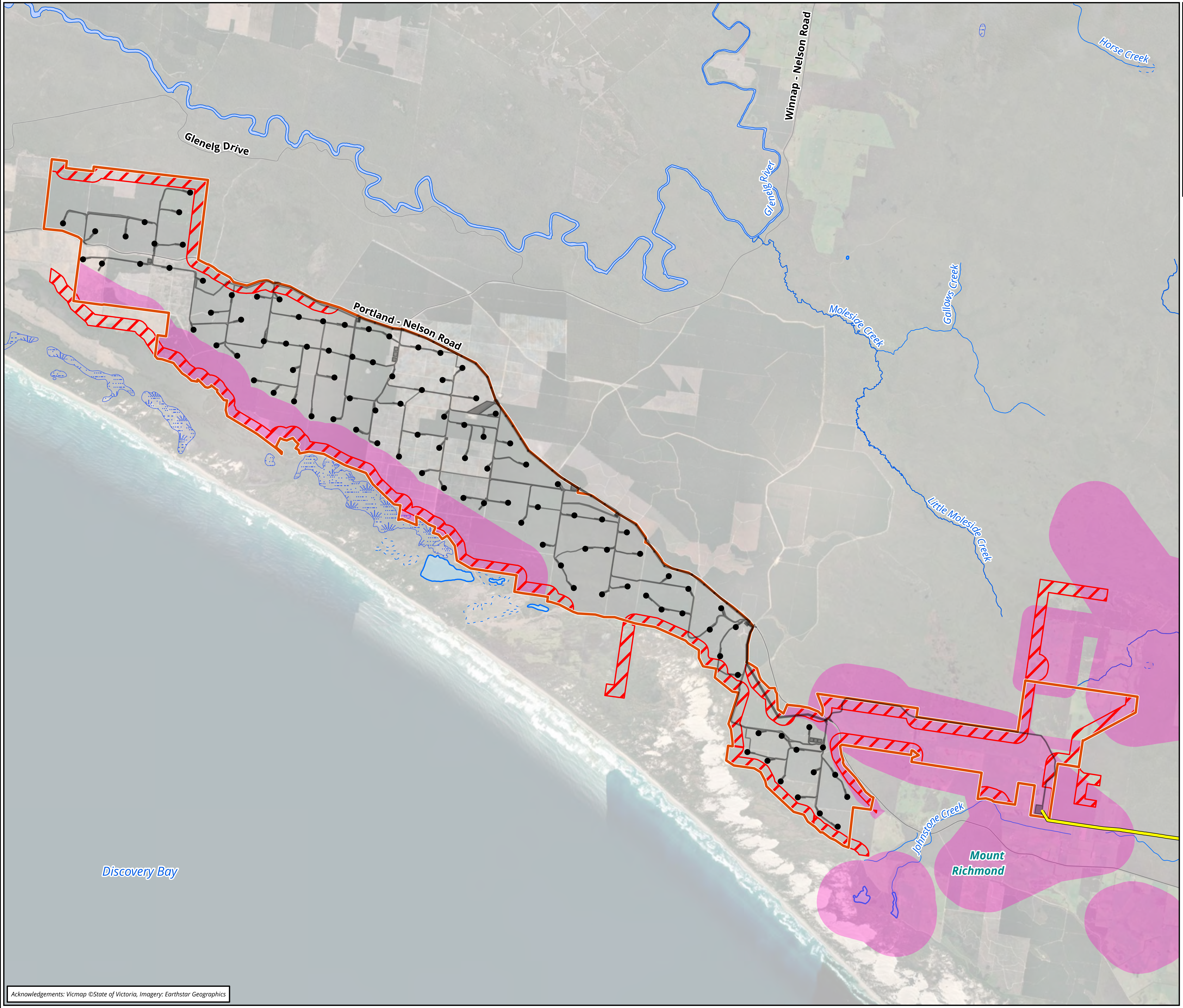
Coordinate System: GDA2020 MGA Zone 54

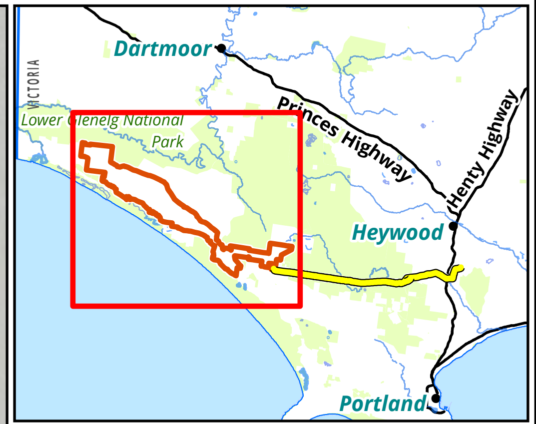
N

biosis

APEM Group

Matter: 33361,
Date: 22 August 2024,
Checked by: IV, Drawn by: JPT, Last edited by: jturner
Layout: F34b_Aquatic_BurrowingCrayfish
Location: P:\35000s\35014\Mapping\
35014_KentbruckFauna_F28_37.aprx





Legend

- Wind farm footprint
- Transmission line
- Turbine
- Other proposed infrastructure

Exclusion areas

- Brolga buffer (breeding buffer, roost buffer, and movement corridor)
- Conservation reserve and public land buffer (300 m)

Figure 37a Turbine exclusion areas

0 1 2 3 4
Kilometres
N

Scale: 1:90,000 @ A3
Coordinate System: GDA2020 MGA Zone 54

Matter: 35014,
Date: 22 August 2024,
Checked by: MSG, Drawn by: SP, Last edited by: jturner
Layout: F37a_Turbine_exclusion
Location: P:\35000s\35014\Mapping\
35014_KentbruckFauna_F28_37.aprx

Appendix 18 Avifauna peer review

The *independent expert peer review of matters relating to selected threatened birds* by Richard Loyn of Eco Insights, is provided in this appendix.

The review is in two parts:

- Stage A: Comments on survey methods, approach and interim results (May 2021)
- Stage B:
  - Comments on EES Technical Report Flora & Fauna existing conditions and impact assessment by Biosis, 22 February 2022 (May 2022)
  - Comments on EES Technical Report Brolga impact assessment by Biosis, 1 February 2022 (May 2022).

Kentbruck Green Energy Hub EES

Independent expert peer review of matters relating to selected threatened birds

Stage A. Comments on survey methods, approach and interim results.

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Summary

The Biosis team has presented a fair picture of the main issues related to bird conservation in the immediate vicinity of the proposed development, based on database records (mainly Birdata and VBA) and their own observations. Clearly the proposed site has relatively low biodiversity values, whereas many surrounding areas have high value for birds and other elements of biodiversity.

Some matters need to be fleshed out further, based on survey work that may be in train but has not yet been reported. This review identifies a need to present more full data on shorebirds, and to take a more strategic approach in identifying flight-paths that may be seasonal, intermittent or nocturnal, and hence hard to detect or quantify using standard methods. One example is the expected seasonal movement of White-throated Needletails *Hirundapus caudacutus*, likely to be in late summer or autumn (late February to early April).

A special need was identified to collate existing additional information on the Kentbruck Heath (from literature or local observers), as that area has the potential to contain important habitat for various threatened species, but appears to have had little recent attention. (It would be great to find that there had been recent surveys, and if so they should be mentioned in the EES, along with historical information.) This is relevant to the windfarm proposal mainly in the event that regular or intermittent bird movements might be expected between habitats in the Kentbruck Heath (north of the proposed development) and complementary habitats in coastal dunes and wetlands south of the proposed development. This could potentially involve shorebirds and parrots (Eastern Ground Parrot *Pezoporus wallicus*, Blue-winged Parrot *Neophema chrysostoma*, Elegant Parrot *N. elegans* and Orange-bellied Parrot *N. chrysogaster*), depending on the nature of particular heaths and wetlands and the frequency of fire, flooding and drying events.

Various comments are made on the report, which can be addressed in the next stage of reporting.

Introduction

This review was initiated by DELWP to provide independent peer review of matters related to conservation of priority listed bird species with respect to a proposed 900 mega-watt wind energy and battery storage facility at Kentbruck in south-west Victoria. The site is located from ~30 km north-west of Portland and from ~3 km east of Nelson, on previously cleared land mostly used for commercial forestry (plantations of Radiata Pine *Pinus radiata*, with some Blue Gum *Eucalyptus globulus* in the east) with the remainder used for agriculture (grazing). The site lies close to several conservation reserves including the Lower Glenelg National Park, Discovery Bay Coastal Park, Cobboboonee National Park and Mount Richmond National Park. The Discovery Bay Coastal Park (south of the site) and the western portion of the Lower Glenelg National Park (north and west of the site) have recently been listed as the Glenelg Estuary and Discovery Bay Ramsar site.

The review is to be done in two stages (A and B), with stage A focusing on the proposed approach, methods and interim results, and stage B focusing on results obtained by the consultants conducting the EES (Biosis) and their implications for facility design and further assessment of likely environmental effects. This report relates to stage A. It is based primarily on a 189 page report by Biosis (2020), authored by Ian Smales, Matt Gibson, Inka Veltheim and Caitlin Potts and dated 21 December 2020 (KGPH-Interim-Flora-and-Fauna-Existing-Conditions-Report). Access was also provided to a range of previous documents, including a report by Nature Advisory in March 2020 (Nature Advisory 2020).

The scope of stage A of the review was to provide a concise report advising DELWP on whether or not the proponent's proposed approach and methodologies:

a) provide a scientifically robust technical response to the matters related to Red-tailed Black-Cockatoo, migratory shorebirds, Australasian Bittern and Orange-bellied Parrot, as specified in the Scoping Requirements, in the context of best practice ecological investigations. This should include consideration of how these birds use the environment within the broad vicinity of the project site and their propensity for passing through the project area;

b) identify and make appropriate use (comparison and extrapolations) of the best available data sources and scientific literature;

c) may be expected to generate empirical data and/or modelled scenarios that enable valid interpretations, predictions and conclusions to be drawn in assessing potential project impacts on the birds listed in the scope;

d) provide a reasonable response to relevant uncertainties related to population ecology and behaviour of this species, including movement (both short and long distance) of the species across the landscape; and

f) could utilise different or better survey techniques, study foci or modelling approaches to better address the Scoping Requirements in a practicable manner.

Bird species

The main focus of the review was requested to be on the following threatened bird species or groups:

- Australasian Bittern *Botaurus poiciloptilus* (listed as Endangered nationally)

- Red-tailed Black-Cockatoo of the south-eastern subspecies *Calyptorhynchus banksii graptogyne* (listed as Endangered nationally)
- Orange-bellied Parrot *Neophema chrysogaster* (listed as Critically Endangered nationally)
- Migratory shorebirds (including threatened species such as Curlew Sandpiper *Calidris ferruginea,* listed as Critically Endangered nationally).

Several other threatened species are known to occur in the general area and are considered to varying degrees in the report. These include:

- Brolga *Grus rubicunda* (listed as Vulnerable in Victoria)
- Lewin's Rail *Lewinia pectoralis* (listed as Vulnerable in Victoria)
- White-throated Needletail *Hirundapus caudacutus* (listed as Vulnerable nationally)
- Eastern Ground Parrot *Pezoporus walicus wallicus* (listed as Endangered in Victoria)
- Powerful Owl *Ninox strenua* (listed as Vulnerable in Victoria)
- Barking Owl *Ninox connivens* (listed as Endangered in Victoria)
- Masked Owl *Tyto novaehollandiae* (listed as Endangered in Victoria)
- Australian Painted-Snipe *Rostratula australis* (listed as Endangered nationally)
- Rufous Bristlebird *Dasyornis broadbenti broadbenti* (listed as Near-threatened in Victoria)

The report also provides details on other threatened bird species that could potentially occur in the area, including King Quail *Excalfactorius chinensis* (listed as Endangered in Victoria). Of the species mentioned above, the report should pay more attention to Lewin's Rail and Australian Painted-Snipe than it has done, as there could be significant habitat for both species in the region. Lewin's Rails are reported regularly from wetlands near Portland, and are known to inhabit wet heaths elsewhere (e.g. Mornington Peninsula, where they have been found during camera-trapping surveys for mammals, M. Antos pers. comm.).

<u>General comments</u>

The report provides a good summary of the threatened species known to be found in the region, based mainly on records in the Victorian Biodiversity Atlas (managed by DELWP), Birdata (managed by Birdlife Australia) and the Atlas of Living Australia (established by the Australian Museum). It is not clear whether records have also been accessed from eBird (another database, managed by Cornell University), which is often used by amateur birders as a repository for their observations. This might add some significant records, but would probably not alter the picture substantially. Nevertheless, it would be desirable to do a systematic search of eBird before finalising the EES.

The report considers migratory shorebirds by species, regardless of whether the species are threatened or not. This is essential, as the EPBC Act refers to migratory species as well as threatened species. Furthermore, most shorebirds are highly social and the distribution and movements of common species (e.g. Red-necked Stint *Calidris ruficollis*) are likely to be broadly similar to those of a range of other species.

The team has supplemented these records by its own observations in and near the proposed site. This has clearly involved diligent fieldwork by experienced observers at selected sites. They succeeded in locating one individual of a Critically Endangered species (Orange-bellied Parrot), which was a significant achievement as the wild population was believed to be <120 at the time, spread over hundreds of kilometres of coast in Victoria, South Australia and Tasmania. The team also made valuable observations on other species including Brolga *Grus rubicunda*, Australasian Bittern *Botaurus poiciloptilus*, Eastern Ground Parrot and a range of threatened or migratory shorebirds.

The authors conclude that the proposed project site has little intrinsic value for biodiversity, as it contains little native vegetation and few threatened species have been recorded there. Hence the main environmental concerns relate to possible indirect effects on adjacent habitats, which are known to support high biodiversity and populations of many threatened species.

Collision risk can be a serious concern for windfarms as the rotor blades rotate at high speed (especially at the tips of the blades) and flying birds or bats may struggle to avoid them. Hence it is essential to locate wind turbines in areas where such risks are minimised, and this is the key issue to address in the EES for this project. Presumably this will be done in more detail at the next stage. Key sites to avoid include steep ridges (where soaring raptors are at particular risk) and flight-paths between habitats used for feeding and roosting at different times of day, season or stages of tide. Powerlines also pose a collision risk, especially for large birds such as Brolgas or Australasian Bitterns as they tend to be less agile in the air than small birds. Those risks can be minimised by careful siting of powerlines, and by adding conspicuous markers to make them more visible to day-flying birds.

The team has taken a standard approach to collecting data to assess collision risk (Smales et al. 2013), with "Bird Utilisation Studies" (BUS) at 27 sites, each surveyed three times every second month from April to December 2020. Each survey consisted of a 20-minute visual point count at various times during daylight, in which all observed flights of threatened or migratory bird species were documented. Hence a total of 5 hours was spent collecting such information at each site over the 8-month period. Seventeen of the sites were within the footprint of the proposed windfarm and ten sites were outside that footprint. In addition, detailed observations were made of flight paths of key threatened species as opportunities arose: this process produced especially useful information for one waterbird species (Brolga) which is susceptible to collisions and listed as Vulnerable in Victoria (though not at a national level).

This approach provides useful data for modelling collision risk for species making regular or random daytime movements over the project site (Smales et al. 2013). However, it does not provide data on species that make regular movements outside daylight hours (e.g. before dawn, after dusk or at night). The approach may not provide adequate data on uncommon species or species that make intermittent movements at particular seasons (e.g. White-throated Needletails in autumn) or when particular ephemeral habitats become available either side of the project site during times of drought, flood or fire. The approach may provide some data on species that make tidal movements (feeding in tidal habitats at low tide and moving to high-tide roosts or alternative feeding habitats at high tide), but more comprehensive information would be gained by careful observation of such species at known coastal feeding sites, in relation to the tidal cycle. These matters are discussed further in the next section.

<u>Suggested enhancements to the report</u>

My main comment relates to bird movements and broader context, as summarised below and discussed in more detail later. I also suggest some less important enhancements on other matters.

Bird movements

It is never easy to identify important flight-paths from random observations, because some of them may only be used at certain times of day or year (e.g. when birds are moving between colonial breeding or roosting sites and feeding grounds). Daily movements of shorebirds and gulls may be related mainly to tidal cycles as these birds feed on tidal mudflats at low tide but move to roost elsewhere at high tide, sometimes choosing sites where they can continue feeding during that period. Shorebirds generally migrate at high altitudes (much higher than wind turbines), but other species regularly make seasonal movements or migrations at about treetop height (perhaps up to twice treetop height), placing them at risk of collision: these include one long-distance migrant (White-throated Needletail) and many species that migrate locally within Australia (e.g. honeyeaters). White-throated Needletails sometimes fly at high altitude (in common with other swift species), but this reviewer has seen hundreds flying east at or below treetop height in south-west Victoria in late March (many years ago), presumably taking flying insects while starting their migration to breed in north-east Asia. Insects such as beetles may be available at different altitudes with different weather conditions, making it hard to predict whether White-throated Needletails will choose to fly at high or low altitude on any given day. The current proposal involves a blade-swept area down to 45m above the ground, and most land birds would quite commonly fly at or above that altitude while making seasonal migrations, even if they sometimes descended to the lower tree canopy levels that prevail in south-west Victoria.

The total effort devoted to the Bird Utilisation Studies (five hours per site, ~135 hours in total not including the 5-minute initial periods) could not be sufficient to identify important flight paths that are only used intermittently. It may be worth taking a more strategic habitat-based approach, and identifying likely flight paths from the distribution of wetlands in the broader landscape. Clues could be gained by recording movements of non-threatened waterbirds such as Silver Gulls, which may respond to tidal cycles in similar manner to shorebirds. It is not clear whether movements of non-threatened waterbirds were recorded during the Bird Utilisation Studies, and this should be stated. I expect the observers would have noticed if there were substantial movements of gulls, ibis or other non-threatened waterbirds, and perhaps it is not too late to report such information, or say if such movements were confined to the coast and did or did not cross the proposed site.

Observations of shorebirds at key sites (Glenelg Estuary and Nobles Rocks) might indicate whether these birds were roosting locally at high tide (which seems likely), or making movements along the beach or flying inland. The latter scenario is the least likely as no regular inland roost sites have been identified, but it is important to check as any such movements could place birds at risk of collision.

The Glenelg River would seem to be an obvious corridor for waterbird movement, and it is located well away from the proposed windfarm. However, rivers of this nature provide limited habitat for waterbirds except at the estuary, as they have few stretches of still shallow water or muddy shore. One of the few waterbirds found to use the Glenelg River in this study was the Caspian Tern *Hydroprogne caspia*, which dives for fish in deep water. The river is also an important habitat for Azure Kingfishers *Ceyx azureus* at the south-western limit of their range, and this species has also been recorded on tributary creeks such as Moleside Creek (J. Krohn pers. comm.). It is possible that this river specialist could occur on tributary creeks within the project site, and this should be mentioned, although the species usually flies low along rivers, and is not expected to be at high risk of collision with wind turbines.   Ephemeral wetlands are more likely to attract waterbirds that may be expected to make flights across the proposed windfarm site.

Broader context (Kentbruck Heath and seabirds)

Maps and satellite images show that there are several wetlands scattered through the Kentbruck Heath south-east of Drik Drik and south-west of Lyons, which appear to be heavily vegetated freshwater wetlands within what is claimed to be the largest expanse of Wet Heath vegetation in Victoria. Few Birdata records are available for that area, probably because there are few roads (sometimes impassable) and some of it is included in a Reference Area where access is discouraged. Vegetated freshwater wetlands are unlikely to attract birds that favour tidal mudflats or coastal habitats, but they may do so occasionally during droughts, when water levels drop to reveal wet mudflats. At such times, it is possible that regular movements of shorebirds, gulls and parrots may occur between coastal dunes and some of these wetlands. More information about these wetlands would be needed to evaluate this risk.

The Kentbruck Heath is said to be the largest area of Wet Heath in Victoria, and hence it may have special value for a range of fauna species. These could include threatened or near-threatened species such as Lewin's Rail *Lewinia pectoralis*, King Quail *Excalifactorius chinensis*, Eastern Ground Parrot, Blue-winged Parrot, Elegant Parrot, Orange-bellied Parrot, Rufous Bristlebird *Dasyornis broadbenti* and the local subspecies of Olive Whistler *Pachycephala olivacea hesperus*. Southern Emu-wrens *Stipiturus malachurus* are known to occur there, and this species has a restricted distribution in Victoria although the species is not listed as threatened. Hopefully those species would not be impacted by the proposed development. However, Lewin's Rail and all four parrot species might undertake regular or intermittent movements between the Kentbruck Heath and complementary habitats close to the coast, putting them at risk of collision. This aspect should be considered in the next report, with reference to local knowledge and previous reports on the fauna of that area (e.g. reports prepared for the Land Conservation Council in the 1970s and 1980s).

In contrast to Kentbruck Heath (which deserves more attention), I support the authors' lack of focus on pelagic seabirds. Pelagic (ocean-going) seabirds were listed in a report on birds to be considered in windfarm proposals mainly in case of proposals for offshore development (Lumsden et al. 2019). Pelagic seabirds occasionally get blown inland during storms but that is rare and not believed to be of conservation significance: most remain at sea even in the wildest of weather. They come ashore only to breed or moult, and some species breed in surprising habitats such as forested mountains on Pacific islands, but this does not apply to the current area. The only pelagic seabirds known to breed in south-west Victoria do so on sea-coasts (e.g. Australasian Gannets *Morus serrator* on clifftops at Point Danger; Little Penguins *Eudyptula minor* in dunes and cliff-bases at various coastal locations) or islands (e.g. Fairy Prions *Pachyptila turtur* and Common Diving-Petrels *Pelecanoides urinatrix* at Lady Julia Percy Island; Short-tailed Shearwaters *Puffinus tenuirostris* at Port Fairy). There is potential breeding habitat for Short-tailed Shearwaters in dunes near Nelson but shearwaters generally breed on islands with few predators. One group of pelagic seabirds (frigatebirds *Fregata* spp.) habitually soar over terrestrial habitats in the tropics but these species are rare vagrants to Victoria and not relevant to the current study.

Other matters

The section on shorebirds would be greatly improved by including data on numbers of birds observed, as discussed below under Shorebirds.

Some native birds have adapted to living in plantations of exotic pines, and while I agree that the biodiversity value of pine plantations is low, it is not zero. One non-threatened species (Yellow-tailed Black-Cockatoo *Calyptorhynchus funereus*) regularly feeds on pine seed (extracted from cones) and appears to have prospered in the pine plantations of south-west Victoria, while moving elsewhere to breed in native forest: flocks >100 can sometimes be seen in these plantations. Wedge-tailed Eagles *Aquila audax* sometimes prey on large cockatoos, and are often seen hunting over pine plantations in south-west Victoria. Both these species could be at risk of colliding with wind turbines. Neither is listed as threatened but both are iconic and their needs should be considered.

Olive Whistlers can sometimes be found residing in young pine plantations in various parts of Victoria, including the Green Triangle which includes south-west Victoria (Loyn et al. 2009). The local Glenelg subspecies has been regarded as near-threatened although it is currently considered as least concern as it was found to be quite numerous in a range of heathy forest habitats (Garnett et al. 2011). Birdata shows numerous records near Nelson and along the Glenelg River, and it is likely to be common in the Kentbruck Heath where few surveys have been done. The dense shrubby structure of young pine plantations could also be attractive to Rufous Bristlebirds (as acknowledged, section 3.14.10) although I do not know if this has been observed. Emus *Dromaius novaehollandiae* often feed in recently logged pine plantations and along tracks and breaks in older plantations where they may breed: this species is listed as near-threatened in Victoria (DSE 2013) but not nationally. Emus, Olive Whistlers and Rufous Bristlebirds are at no risk of colliding with wind turbines (as Emus are flightless and the other two species inhabit dense shrub layers), but they may be affected by changes to the habitat.

Specific comments for priority species and groups

Red-tailed Black-Cockatoo

The report wisely focused on availability of habitat for this species, rather than contemporary records, as the species is known to move widely within its limited range within the Green Triangle of south-west Victoria and south-east South Australia. Annual counts since 1996 reveal that the current population is about 1500 birds, and they sometimes gather in mobile flocks of 100 or more, with over 400 recorded together on rare occasions (e.g. Perryman 2016; Hill 2016), forming a substantial proportion of the population. If a large flock happened to collide with a wind turbine this would have severe consequences for the population of this subspecies.

During the survey period most birds were believed to be in the north part of their range (Wimmera), following a productive season for seed of Desert Stringybark, one of the three main food sources for this subspecies (the others being Brown Stringybark and Buloke). None were observed by the field survey team during the period covered by the current report, though some were seen near Nelson and along the Glenelg River (within the Lower Glenelg National Park) in November 2020 (J. Krohn pers. comm.).

Nevertheless, database records show that the species has occurred in or close to the proposed windfarm site, and this suggests that it is likely to do so again. When that happens, the birds are likely to be using Brown Stringybark trees in remnant native woodland, or the few Buloke trees that remain within the plantation. It is curious that there are apparently no records of Red-tailed Black-Cockatoos eating seed from cones of Radiata Pine. Red-tailed Black-Cockatoos of other subspecies have been recorded eating a wide range of seeds (Higgins 1999), including seeds of a native conifer in Queensland (Hoop Pine *Araucaria cunninghamii*) (Pratt 1979). It is conceivable that Red-tailed Black-Cockatoos will adapt to eating seed from Radiata Pine (in competition with Yellow-tailed Black-Cockatoos), and that would pose new challenges for operating the proposed windfarm.

The main habitat for this species in the region is likely to be native forests along the Glenelg River, as indicated by the database records. Elsewhere in Australia, other subspecies of Red-tailed Black-Cockatoos are known to undertake seasonal movements along well-treed river systems: this was graphically illustrated with respect to the Darling River in New South Wales (Clarke et al. 1999).

<u>Orange-bellied Parrot</u>

The survey team conducted searches for this species over five days at two sites, Nobles Rocks and Swan Lake, where the species had been recorded previously. They succeeded in finding one individual bird in interdunal heath near Swan Lake on 29 May 2020. They also found related Blue-winged Parrots at both sites, with records of 6, 5 and 11 at Nobles Rocks and 7, 3, 1, 1 and 2 at Swan Lake.

The distribution and duration of survey effort would not be expected to locate all Orange-bellied Parrots or Blue-winged Parrots using this area. However, for the purpose of this EES, it may be sufficient to know that both species are present. Orange-bellied Parrots are Critically Endangered and have come perilously close to extinction: the wild population contained as few as three breeding adult females at its lowest point. Happily, as a result of successful interventions and benign weather, the 2020-21 breeding season was the most successful for many years, and it is expected that a record 180 birds may migrate to winter habitats in 2021. Hence it can be expected that increasing numbers of Orange-bellied Parrots will visit coastal habitats near Nelson in future years.

There is some evidence that Blue-winged Parrots have decreased in recent years, and the species is likely to be listed as Vulnerable nationally (Garnett et al. in press). Another closely related species, the Elegant Parrot, has been recorded in the general area and could be a regular visitor to similar habitats to Blue-winged Parrot (heathy woodland for breeding; saltmarsh in winter). It is listed as Vulnerable in Victoria (DSE 2013)

For both species, the main concern with respect to the windfarm is that birds may move between coastal and inland habitats, exposing them to collision risk. Blue-winged Parrots are known to inhabit the Kentbruck Heath, mainly in areas that have been burnt for fuel reduction in the last three years (A. Pritchard pers. comm.), and it is likely that they breed there. Blue-winged Parrots are known to breed in recently burnt or disturbed heathy forest and spend the winter in saltmarsh and coastal habitats, and such movements might be seasonal rather than daily, substantially reducing the collision risk. However, Orange-bellied Parrots and Blue-winged Parrots both tend to move between a range of habitats in winter, as different food resources become available. In some dry years, low water levels in wetlands in the Kentbruck Heath may provide an attractive food source for both these parrots, such as seed of Glaucous Goosefoot *Chenopodium glaucum* growing in partly dried wetlands. We need more information about those wetlands in order to evaluate that risk. The risk may be very low, but we currently don't know.

I'm pleased to see that the authors recognise that Orange-bellied Parrots have been seen ~10km from the coast in recent years, and this opens up the possibility that the species could use suitable habitat on both sides of the proposed windfarm project. A habitat modelling project suggested that there could be suitable habitat for Orange-bellied Parrots several kilometres inland from the coast near Nelson (Ehmke 2009), and the current project team might consider that further in their next report. Note that any modelling exercise involves assumptions and caveats, which should be taken into consideration.

<u>Eastern Ground Parrot</u>

The report plots the distribution of known Ground Parrot records (from Birdata and VBA), which are concentrated in the north-western coastal area including Long Swamp. Most records come from the 1980s, 1990s or early 2000s but one record is shown from 2018, indicating that this cryptic species remains in the region. The Biosis team had not detected Ground Parrots during their work as reported in December 2020, but they did hear one calling at Long Swamp in October 2020 and one was heard at the same site in November 2020 (J. Krohn pers. comm.), and further surveys are planned.

Most of these records are within 2 km of the coast but two of six records from 1980 are ~4 km inland (one near Nelson, and one apparently within the proposed windfarm site). The latter record is in land currently occupied by pine plantations, which seems unlikely unless the plantations were very young at the time. Observers in 1980 did not have access to GPS equipment, so some location records are not precise.

There are no records of Ground Parrot from the Kentbruck Heath, but it is not known if suitable searches were made in that area. Ground Parrots need extensive areas of essentially treeless wet heath, and I do not know the extent of that habitat in the Kentbruck Heath. Information should be sought from local naturalists or land managers.

<u>Australasian Bittern</u>

The report presents data on numerous records of Australasian Bittern from wetlands mainly near Portland and Nelson, showing that they are regular visitors to the area. The survey team observed an Australasian Bittern once (at dusk, while setting up camera traps in the east of the site near Mount Richmond). The bird they saw flew north-east from an unnamed wetland 20522 towards another unnamed wetland 20532. Targeted listening surveys were conducted at 13 strategic sites in 2018 and 2019, and more are planned for 2020-21, some of which will already have been completed.

The report also mentions an important result from Birdlife Australia's Birds in Rice project, in which satellite tracking devices were attached to bitterns breeding in rice paddocks in the NSW Riverina. The study showed that bitterns breeding in the Riverina often dispersed to coastal habitats in the winter. One juvenile Australasian Bittern was satellite-tracked to Long Swamp near Nelson, and it then alternated between Long Swamp and Picaninny Ponds in South Australia (~10 km west). The same bird was occasionally also recorded using wetlands north of Portland (A. Silcocks pers. comm.).

This shows that Australasian Bitterns can be expected to occur regularly at vegetated freshwater wetlands in the vicinity of the proposed windfarm, and to make regular movements between such wetlands. Most suitable wetlands are close to the coast and hence most movements will be along the coast, as observed with the one bird that was fortuitously fitted with a satellite tracking device. However, some suitable wetlands are on the site or close to it (including the unnamed wetland 20522 where the Biosis team made their observation). Some of the wetlands in the Kentbruck Heath may be suitable for Australasian Bitterns, and if so they might make intermittent flights between those wetlands and coastal wetlands such as Long Swamp. Those hypothetical flights would cross the proposed windfarm site, with consequent risk of collision. The team's observation of a bird flying north-east from wetland 20522 appears to be a confirmed record of a flight of that sort.

The cryptic behaviour of bitterns makes them challenging to study, and it is not likely that further fieldwork will provide a comprehensive picture of their occurrence or movements in this area. At least one similar species overseas (the Eurasian or Great Bittern *Botaurus stellaris* in UK) is known to make regular flights between feeding and roosting habitats at dusk and dawn (White et al. 2006). Bitterns often call at night, and it is quite possible that they make flights between wetlands at night as well as by day (in common with many waterbird species). Brolgas are more conspicuous, readily visible while feeding and often calling loudly as they fly between wetlands. Both species inhabit vegetated freshwater wetlands despite very different ecologies: Brolgas feed mainly on vegetation whereas Australasian Bitterns feed on small animals such as fish, frogs and large invertebrates (Marchant and Higgins 1990, 1993; Menkhorst 2012). The Biosis team has collected valuable data showing that Brolgas move readily between freshwater wetlands and nearby farmland close to the coast. This may reflect the pattern for Australasian Bitterns too, but bitterns are more likely to use densely vegetated wetlands such as those in the Kentbruck Heath.

White-throated Needletail

The report presents numerous records of this aerial-feeding migratory swift from all parts of the study region. The species was observed twice during Biosis surveys, with two birds at Lake Mombeong on 23 Jan 2020 and 70 seen 600m north of that lake on 27 Feb 2020. Swifts are notoriously hard to survey systematically because they feed by flying rapidly over long distances, and adjust their foraging height according to weather conditions and the distribution of prey species (flying insects such as beetles). The report correctly mentions that they roost in trees, though there is some uncertainty about whether they do that every night, or sometimes roost on the wing (the normal habit for Fork-tailed Swifts *Apus pacificus*). Little is known about the factors that determine roost choice on any given day. Hence any recommendations about likely effects of the proposed windfarm, and consequent management needs, must be based on more generic information than can be collected from the site itself.

The report correctly states that White-throated Needletails are non-breeding summer migrants to Australia, present in Victoria mainly from November to March-April. However, it is important to note that numbers build up over this period, and large groups are most likely to be seen late in the season (late February to early April, and especially the last fortnight of March). That is also the season when they need to maximise their food intake in preparation for the long migration to their breeding sites in north-east Asia. The vertical distribution of flying insects is affected by weather patterns, and Needletails will feed at whatever height allows them to satisfy their needs most efficiently. I have personally seen hundreds of White-throated Needletails flying fast and low (roughly treetop height) over lightly treed farmland in south-west Victoria in the last fortnight of March (many years ago), presumably catching insects at the same time as commencing their migration east and then north along the Australian coast.

This behaviour could clearly put Needletails at risk of collision with wind turbines. The EES should identify that risk, and the time-frame at which it is most acute (late February to early April). Further examination of Birdata and VBA records would be useful in defining that period of acute risk. Technological solutions (e.g. radar) may be available for detecting mass movements of Needletails and taking appropriate action to minimise the risk (e.g. turning turbines off until the migration has passed). These should be considered further in subsequent reports.

<u>Shorebirds</u>

The report provides a list of shorebird species observed, along with other coastal birds such as gulls and terns. The statement is made that most of these birds were at the Glenelg Estuary. Unfortunately, the report does not provide any numerical information on these species, except for Sanderling where 115 were seen feeding on the beach near Swan Lake, in July 2020. (They were presumably immature birds, as adults would have been at their Arctic breeding sites at that time of year.) This is an important omission as shorebirds can be locally numerous (even when they are listed as threatened) and efforts to conserve them should be commensurate with the numbers likely to be present, compared with other sites. For example, Curlew Sandpipers *Calidris ferruginea* (listed as Critically Endangered nationally) occur in hundreds in Port Phillip Bay and Western Port, but generally in much lower numbers at small estuaries such as the Glenelg estuary. It is essential that the next report should document the numbers seen at each site surveyed.

Some shorebirds feed almost exclusively in coastal habitats in this region (e.g. Australian Pied Oystercatchers *Haematopus longirostris* and Sooty Oystercatchers *H. fuliginosus*, Hooded Plover *Thinornis cucullatus*, Sanderling *Calidris alba* and Bar-tailed Godwit *Limosa lapponica*) while others will make use of inland wetlands (when mudflats are exposed) both for feeding and roosting, in addition to tidal flats (e.g. Red-necked Stint, Curlew Sandpiper and Sharp-tailed Sandpiper *Calidris acuminata*). In some places they may fly up to 20km or more to high-tide roosts or to extend their feeding over high tide (e.g. Rogers et al. 2010). Other species favour vegetated freshwater wetlands and make no use of tidal mudflats (notably Lathams' Snipe *Gallinago hardwickii* and Australian Painted-Snipe *Rostratula australis*). Observations at key shorebird sites would be useful in determining whether any shorebirds in this region make regular movements to inland wetlands at high tide. It is not likely (as no inland high-tide roosts have been reported locally) but it must be clarified, as such movements could put birds at risk of collision with turbines.

No shorebirds were found by the survey team at wetlands close to the site of the proposed windfarm, though it was recognised that some (notably Swan Lake) had potential to attract migratory shorebirds, presumably when water levels had dropped to reveal broader expanses of exposed sand or mud. Some wetlands were not visited because dense vegetation made access difficult: this is unfortunate, and perhaps could be remedied in future surveys. It may be worth examining aerial or satellite images to determine which if any wetlands had extensive exposed shores, and making suitable efforts to access those wetlands.

Collision risk is the main issue related to shorebirds, and that would be most likely to arise if shorebird habitats appear on the landward side of the proposed development, inducing regular movements of shorebirds between them and the coast. Once again this raises the need to find out more about wetlands in the Kentbruck Heath. They are probably too densely vegetated to attract shorebirds (other than Latham's Snipe and conceivably Australian Painted-Snipe), but does that change during a drought? Some may dry out sufficiently to provide expanses of mudflat broad enough to attract migratory shorebirds, and induce movements of those birds between the wetlands and the coast. It may be worth asking local naturalists or DELWP/PV staff about this, or examining satellite images from the Millennium Drought.

Shorebirds could also be at risk of collision when they begin or end their migratory flights between coastal habitats near the project site and distant ephemeral wetlands in inland Australia or breeding grounds in the Northern Hemisphere. Although such migrations are usually done at high altitude, birds take some time and distance to attain those altitudes, and may be at risk of collision with wind turbines close to the coast. The current project involves turbines rotating between 45m and 270m above ground level, which could be within the range used by flocks of shorebirds gaining or losing height before or after long migrations. This issue would apply twice a year for migratory species. There are anecdotal observations of flocks of shorebirds spiralling steeply upwards over water or land, but few if any studies providing quantitative data to evaluate collision risk. At Kentbruck the risk would apply mainly to transequatorial migratory shorebirds, and just a few Australian breeding species that make regular movements between the coast and freshwater wetlands (e.g. Red-capped Plover *Charadrius ruficapillus*, Masked Lapwing *Vanellus miles* and Red-necked Avocet *Recurvirostra novaehollandiae*).

<u>Owls</u>

The report plots the distribution of owl records from the region (from Birdata and VBA). This shows that Powerful Owls *Ninox strenua* were recorded mainly in native forests close to Portland and along the Glenelg and other rivers. This pattern has undoubtedly been influenced by observer bias (especially the association with Portland). Masked Owls *Tyto novaehollandiae* were much less numerous and showed a similar pattern, with several records near Portland and three along the lower Glenelg River (and one at sea, presumably due to imprecise location data). Barking Owls *Ninox connivens* were rarer still, with four records in Portland and one in the Cobobboonee National Park. In Victoria, Barking Owls are found mainly in drier types of forest (e.g. box-ironbark), and some records south of the Great Divide may be due to misidentifications.

The Biosis survey team had not recorded any of these threatened owls at the time this report was written, but further surveys were planned.

All of these three owl species depend primarily on native forest. Powerful Owls sometimes roost by day in pine trees, and Masked Owls have been recorded inhabiting cleared breaks in Hoop Pine plantations in Queensland. It is unlikely that the site of the proposed windfarm contains significant habitat for any of these three owl species.

An even rarer owl species, the Eastern Grass Owl *Tyto longimembris*, has been recorded in marshy farmland near Port Fairy, and could occur in the study area occasionally. It sometimes uses similar treeless heathy habitats to those favoured by Ground Parrots (which it occasionally takes as prey).

<u>Comments on species notes in Appendix 2.</u>

It's good to see the authors think laterally about what species could occur in the area. However, some are more likely to occur than others. I would say there is little chance of finding Malleefowl *Leipoa ocellata*, Plains-wanderer *Pedionomus torquatus* or Night Parrot *Pezoporus occidentalis* in this area as all now inhabit more arid parts of Australia (though I know there are credible unconfirmed historical reports of Malleefowl in the Portland region). Swinhoe's Snipe *Gallinago megala* and Pin-tailed Snipe *G. stenura* are summer migrants to northern and western Australia, and have not been recorded in Victoria: they could occur, but almost certainly just as vagrants. Little Button-quail *Turnix velox*, Major Mitchell's Cockatoo *Lophochroa leadbeateri* and Diamond Dove *Geopelia cuneata* would only be rare visitors from inland.

I really like the way the authors have given brief habitat descriptions. However, I have issues with a few as indicated below:

Hooded Plover, does not use far-inland lakes in eastern Australia, though it does use coastal lakes.

Eastern Curlew, delete "sewage farms, saltworks, harbours" (OK, it uses them occasionally but in trivial numbers unless there are extensive tidal mudflats: at the Western Treatment Plant they are almost invariably on the tidal mudflats not the sewage farm itself).

Bar-tailed Godwit, delete "mangroves" (not important for that species, and certainly not in SW Vic).

Curlew Sandpiper, add "shallow inland lakes with extensive mudflats (often saline)".

Latham's Snipe, well-vegetated wetlands.

Royal Spoonbill *Platalea regia*, add "fresh or saline" (in contrast to Yellow-billed, which favours fresh).

Australian Little Bittern *Ixobrychus dubius*, delete "saltmarsh and coastal lagoons" (I doubt if they favour those habitats unless there are reeds and fresh water)

Magpie Goose *Anseranas semipalmata*, delete "sewage ponds".

Australasian Shoveler *Anas rhynchotis*, delete "with deep water" (not essential).

Black Falcon *Falco subniger*, delete "woodlands" and "areas".

Caspian Tern, delete "sewage ponds" and add "rivers".

Eastern Ground Parrot, add "treeless" before "coastal heaths and swamps", it's the crucial key to their habitat.

Azure Kingfisher, put wetlands after rivers, e.g. "well-vegetated slow-flowing rivers and creeks and nearby wetlands". It really is a river bird.

Grey-tailed Tattler *Tringa brevipes*, delete “sewage farms, saltworks”.

Common Sandpiper *Actitis hypoleucos*, insert “generally narrow” before “muddy margins”: that’s the key feature that sets their habitat apart from that of other shorebirds.

Sanderling, perhaps add “sometimes where sheltered by offshore reefs”.

Pectoral Sandpiper *Calidris melanotus*, the main habitat is partly vegetated freshwater wetlands: I’d say “Partly vegetated freshwater wetlands; tidal mudflats less often”.

Black-tailed Godwit *Limosa limosa*, delete mangroves, add shallow freshwater wetlands. This is a species that often uses both tidal and non-tidal habitats.

Pacific Gull *Larus pacificus*, change second part to read “may occur locally at wetlands and rubbish tips a few km from the coast, though not in south-west Victoria”: I know that happens, but not at many places (and not in south-west Victoria).

<u>Conclusions and Recommendations</u>

The Biosis report presents useful data about the occurrence of priority bird species in the Kentbuck project site and adjacent habitats along the coast east of the Glenelg estuary. It provides convincing evidence that the biodiversity values of the project site are relatively low, with the exception of some wetlands in the eastern part of the site. It describes an approach for visually detecting bird movements across the site, for use in subsequent modelling to assess collision risk (Smales et al. 2013). It describes the recent and historic occurrences of various priority species (notably Orange-bellied Parrot and several shorebird species), and some observed movements of waterbirds (notably Brolga and Australasian Bittern). It also describes plans for further survey and investigation.

The main deficiencies of the report are that:

- It includes too little information about the known or potential value of the Kentbruck Heath (north of the project site) and the potential for movements of birds between habitats in the Kentbruck Heath and complementary habitats near the coast; and
- It does not include information on numbers of shorebirds observed on coastal habitats, either historically or during the Biosis surveys.

The following recommendations are made to improve the utility of this or subsequent reports for evaluating risks associated with the proposed windfarm development:

- The report should pay more attention to the known and potential value of the Kentbruck Heath (north of the project site) and priority bird species for which it could be an important habitat. These include Lewin’s Rail, King Quail, Australian Painted-Snipe, Blue-winged Parrot and Elegant Parrot (which are given inadequate consideration in the whole report) as well as Eastern Ground Parrot and Orange-bellied Parrot.
- The report should pay more attention to the possibility of intermittent, occasional or nocturnal movements of birds across the project site, including between Kentbruck Heath and coastal habitats. It may be worth taking a more strategic habitat-based approach, and identifying likely flight paths from the temporal and spatial distribution of wetlands and other habitats in the broader landscape.

- Local knowledge should be sought to learn more about the Kentbruck Heath and its fauna. Surveys were certainly done in the 1970s and 1980s (for the Land Conservation Council), and it is possible that there have been more recent surveys: this should be checked. In any case, local naturalists and land managers will certainly know more about these areas and their habitats and birds than can be gleaned from the databases alone. Time must be allocated to tapping into those sources of local knowledge.
- More needs to be known specifically about wetlands in the coastal strip and in Kentbruck Heath, and such information should be sought from local naturalists or land managers. Are they always too heavily vegetated to attract shorebirds? Do they sometimes partly dry out and provide habitat for shorebirds or *Neophema* parrots? It may be worth examining aerial or satellite images (from wet and dry years) to determine which if any wetlands had extensive exposed shores, and making suitable efforts to access those wetlands.
- Records from eBird should be considered as well as Birdata, VBA and Atlas of Living Australia. (This is not high priority as such records are likely to mirror other sources fairly well.)
- The BUS studies should consider all bird species (not just priority species) to present as comprehensive picture as possible of visible daytime movements of birds across the site. If this is the plan, it should be stated.
- The report should present data on numbers of shorebirds observed at key habitats, both historically (from databases) and from the Biosis surveys. This is important because many shorebird species can occur in hundreds or thousands at some sites (even if they are threatened), and risk management should be commensurate with the numbers involved.
- Observations should be made over the tidal cycle at key shorebird sites to determine whether any shorebirds in this region make regular movements to inland wetlands at high tide. Such observations should be scheduled for the next summer season. It seems to be not likely (as no inland high-tide roosts have been reported locally) but it must be clarified, as such movements could put birds at risk of collision with turbines.
- The report should identify seasonal risks, e.g. the peak risk for White-throated Needletails is from late February to early April, and the main migration seasons for shorebirds are March-April and August-October. Further examination of Birdata, VBA and eBird records should be done to help define those periods of acute risk.
- Technological solutions (e.g. radar) may be available for detecting mass movements of Needletails or shorebirds (or other birds) and taking appropriate action to minimise the risk (e.g. turning turbines off until the migration has passed). These should be considered further in subsequent reports.
- Some of the habitat descriptions in Appendix 2 should be revised, with consideration of the attached suggestions.

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Kentbruck Green Energy Hub EES

Independent expert peer review of matters relating to birds

Stage B. Comments on EES Technical Report Flora & Fauna existing conditions and impact assessment by Biosis, 22 February 2022.

Richard Loyn, Eco Insights

May 2022

Summary

This is a detailed report befitting a major development proposal for a windfarm in south-west Victoria. The proposed site is on highly modified land (pine plantations and farmland) between significant areas of native vegetation on both the coastal and inland sites of the proposed windfarm. Those areas of native vegetation, and associated wetlands and waterways provide important habitats for birds and other wildlife.

The report identifies a number of habitats that may be directly impacted by the proposed development, including wetlands and areas of native vegetation within the pine plantations, and recommends measures to minimise any damage to those habitats. A companion report deals specifically with habitat for Brolgas, which breed in the area, and will be reviewed separately.

The main impact on bird populations is likely to be through collision with wind turbines, rather than direct loss of habitat, and that is addressed by considering the distribution of habitats for birds, and their known or likely movements between habitats. A standard method (Bird Utilisation Studies) is used to document bird movements and supplement information in standard databases about local bird distributions.

Evidence is presented that various waterbirds make regular movements between wetlands on the coastal side of the proposed development site, and there is less direct evidence of movements across the site. However, there are reasons to expect that some species will make at least occasional movements across the site, putting those species at potential risk of collisions with wind turbines. The report endeavours to evaluate those risks, and in general terms their conclusions seem reasonable.

Many of the suggestions made in Stage A of the review process have been addressed to varying degrees. For example, more information has been provided about the Kentbruck Heath, and due recognition has been given to the likelihood that Eastern Ground Parrots and several other species may make regular use of heathland habitats on the inland side of the proposed site. More information has been included on numbers and movements of shorebirds, though questions still remain to be answered about those movements.

This review suggests a range of possible changes to the report, of varying importance. In my view, the most important issues are as follows:

Protection of migratory swifts (especially White-throated Needletails) from potential collision with turbines, including cumulative impacts from multiple windfarms in eastern Australia and eastern Asia.

Migratory swifts are hard birds to study, because flocks move rapidly between different feeding sites when they are present in Australia, feeding entirely on the wing. That behaviour also puts them at risk of collisions with wind turbines, not just at single sites but cumulatively at all sites within their range. Their Australian range is concentrated on the eastern seaboard and forested ranges, and individual birds are likely to run the gauntlet of numerous windfarm developments while they are here, as well as others during their migrations through eastern Asia.

Hence I would like to see more careful modelling of collision risks, with due regard to their speed of movement between sites, the usual timing of their migrations (narrower than currently modelled) and cumulative effects in Australia and Asia.

Most importantly, I would argue for a much more proactive approach to protecting this species using modern technology. It is likely that movements of big flocks of swifts could be detected by radar, and suitable actions could then be taken to reduce collision risks. This technology could also be useful for other birds and bats.

Clarifying movements of shorebirds

The report provides data from a number of coastal sites that provide shorebird habitat, with the Glenelg Estuary being the most consistently important. Evidence is provided from one date when the estuary was counted both at high tide and low tide, showing that there were almost 400 fewer shorebirds at high tide than low tide. Unfortunately, the destination of those birds remained undiscovered.

It is probably too late in the season to do more fieldwork and watch where birds go as the tide rises, but it is too important an issue to leave unresolved. It is almost certain that local observers and members of the Australasian Wader Study Group would have a wealth of information about shorebird movements in this area, including the locations of alternative high-tide roosts and the circumstances that affect choice of roost site. It is essential that the authors contact suitable people and access such information. The authors will have their own networks but I would recommend Maureen Christie, Roz Jessop, Rob Bush or Rob Farnes. These observers may also have useful knowledge about seasonal movements of cryptic waterbird species such as Lewin's Rail. It is likely that most of the regular shorebird movements will be close to the coast, but if there are alternative high-tide roosts inland from the proposed development site it would be crucial to know about them. If locations of some roosts remain unknown, the conservative assumption is that they may lie inland and hence involve potential flights across the site of the proposed windfarm.

Preparing for intermittent movements of various species across the proposed windfarm site

It is clear that many important threatened species have potential habitat on both sides of the proposed development, and may make flights across the sites on an intermittent or seasonal basis, which might not be detected with the current survey effort. These include various waterbirds and cryptic species such as Australasian Bittern, Lewin's Rail and various parrots. Ideally the report would identify likely flight-paths for such movements so that turbines could be located with minimum risk.   Protocols are needed for detecting such movements in future years, and responding appropriately, especially if any of those species are found to suffer unacceptable levels of mortality during future corpse surveys. Note that corpse surveys should not be relied upon as the sole indicator of mortality, as surrounding pine plantations add to the difficulty of finding corpses: many casualties could become caught in the tree canopy and effectively impossible to find.

Fatality estimates

There is a major discrepancy in the fatality estimates for Wedge-tailed Eagle in the Biosis modelling (0.1-0.5 per year across the whole windfarm) vs the figures presented in Table 24 (which imply 12-26 per year across the 127-turbine windfarm). That discrepancy must be fixed or explained. If the second estimate is correct, further mitigation measures will be needed.

The report does not consider what levels of fatality may be acceptable for any species, although a 1% figure is used as a tacit proxy in the discussion of cumulative impacts. Further public policy input may be needed. A simple suggestion would be that it should never be higher than the natural capacity of the local population to reproduce. For migratory species breeding elsewhere, the same principle could apply to the part of the population that migrates to the region of interest.

Other matters

This review raises various other matters as discussed further in the text.

Contents

Introduction

This review was initiated by the Department of Environment, Land, Water and Planning (DELWP) to provide independent peer review of matters related to conservation of priority listed bird species with respect to a proposed 900 mega-watt wind energy and battery storage facility at Kentbruck in south-west Victoria. The site is located from ~30 km north-west of Portland and from ~3 km east of Nelson, on previously cleared land mostly used for commercial forestry (plantations of Radiata Pine *Pinus radiata*, with some Blue Gum *Eucalyptus globulus* in the east) with the remainder used for agriculture (grazing). The site lies close to several conservation reserves including the Lower Glenelg National Park, Discovery Bay Coastal Park, Cobboboonee National Park and Mount Richmond National Park. The Discovery Bay Coastal Park (south of the site) and the western portion of the Lower Glenelg National Park (north and west of the site) have recently been listed as the Glenelg Estuary and Discovery Bay Ramsar site.

The review has been done in two stages (A and B). Stage A focused on the proposed approach, methods and interim results, and the current stage B focuses on results obtained by the consultants conducting the EES (Biosis) and their implications for facility design and further assessment of likely environmental effects. Stage B has involved reviewing two reports prepared by Neoen's specialist consultants, Biosis.

The output for Stage B was requested to be a report advising whether:

a) the study methods adopted were indeed appropriate and applied/ implemented effectively;
b) the analysis and interpretation of relevant results, conclusions and information relating to the environmental characteristics of the species are scientifically sound;
c) mitigation measures recommended (and assumed for the purposes of impact assessment) are reasonable and could be effective in addressing likely impacts;
d) the results and conclusions provide an adequate level of certainty and confidence to enable an informed impact assessment;
e) the conclusions adequately address and/or take account of current uncertainties relating to local population ecology and species behaviour, including movement (both short and long distance) of the species across the landscape;
f) overall, the range of matters related to the key bird species specified in the scoping document and the EES Scoping Requirements have been addressed as far as practicable.

General comments

The Biosis team has addressed most of the points raised in Stage A to varying extents, including key points with respect to Kentbruck Heath (on the inland side of the proposed development site) and reporting numbers of shorebirds. They have done some impressive work and produced a comprehensive report, which satisfies many of the requirements for an Environment Effects Statement.

As with any report of this size, it is possible to find areas that could be improved, through further fieldwork, consultation, analysis or improved clarity of presentation. In some cases, I feel opportunities have been missed for suggesting proactive new approaches to help the proponent avoid potential damage to bird populations. Although the footprint of the proposed development is mainly on land with low environmental values, it lies close to areas of high environmental value, along the coast and inland. The data presented suggest that there are few important regular bird movements between those areas, but they do not dispel the residual concern that intermittent movements may occur (e.g. seasonal movements of parrots that breed in inland wet heaths and winter in coastal dunes), or regular movements by cryptic bird species (e.g. Australasian Bittern, Lewin's Rail, Eastern Ground Parrot or Masked Owl). I would like to see a proactive approach in identifying possible flight-lines for such birds, so that turbines could be sited to avoid particular potential flight-paths, even though that would have to be based on terrain rather than actual observations of bird movements. I would also like to see more evidence of strategic consultation with local naturalists about known and likely movements of shorebirds and other species. While some individuals may be reluctant to talk to consultants working for a potential developer, many would be willing to share knowledge in the interests of protecting important habitats and using local information to identify flight-paths and reduce mortality.

The report identifies one migratory species (White-throated Needletail) as being at particular risk of collision with turbines, and I strongly support that conclusion. This species is believed to be the fastest-flying bird in the world, and flocks move rapidly over large areas of all habitats (with a preference for well-treed environments). There are no obvious foolproof ways of siting turbines to minimise the risk. Hence the report should flag the need for innovative special measures to protect this species (along with other fast-flying birds and bats), perhaps using radar to detect substantial arrivals of the species, and use of sonic deterrents or rapid shut-downs when they are detected. Such measures would be innovative (though similar measures have been used in Tasmania and overseas), but without them there is little doubt that mortalities of this and other species will occur, and they could be substantial. Mortalities of that sort could be cumulative across windfarms, as individual White-throated Needletails spend short amounts of time at multiple locations during their migratory visits to Australia, all along the eastern seaboard and forested ranges from Tasmania and South Australia to north Queensland.

It is pleasing that the report authors have found an important reference on fauna of the Kentbruck Heath, an Honours thesis from 1970. However, more needs to be said about the potential value of that and other heathland habitats in the region. It has become clear that little recent survey work has been done in the Kentbruck Heath, despite its recognised importance as the largest area of wet heathland in the state. The low survey effort may be partly because road access is limited (especially during wet weather), and the vegetation is hard to penetrate on foot. The main relevance to the proposed windfarm is the possibility that some birds may make regular movements between the heathlands and coastal habitats, placing them at risk of collision with turbines. It is not realistic to expect field surveys over one or two years to detect all such movements. The report should suggest a strategy for ongoing work to determine whether or not that is an issue that may require targeted management in future.

[In the Stage A review, I expressed concern about the possibility of shorebirds making similar movements between inland wetlands and the coast, perhaps when water levels in those wetlands are low. However, inspection of satellite images and brief discussions with local naturalists suggest that those wetlands are too densely vegetated to attract shorebirds. Also, further work by Biosis has revealed no movements of shorebirds between the coast and inland habitats.]

<u>Potential changes in threat status of birds under EPBC Act</u>

The Commonwealth Government (DAWE) is currently reviewing the threat status of Australian birds, following recent publication of the decadal Action Plan (Garnett and Baker 2021). The Action Plan recommends several changes to the national threat status of birds, including some that occur in the vicinity of the current area of investigation. Several of these changes involves migratory shorebirds of species known to occur in this area only in small numbers or as occasional visitors to the coast (mainly the Glenelg Estuary), and seabirds that occur offshore. Those species are unlikely to be impacted by the proposed windfarm.

However, the proposed changes may have more implications for four species of bird that inhabit forests, woodlands and heaths near Kentbruck: Southern Boobook, Eastern Ground Parrot, Gang-gang Cockatoo and Blue-winged Parrot. Southern Boobooks and Eastern Ground Parrots have been recommended for uplisting to Near Threatened (vs Least Concern previously), and Gang-gang Cockatoos and Blue-winged Parrots have been recommended for uplisting to Vulnerable (vs Near Threatened previously). The changes have been proposed in response to national data on reporting rates, along with information on effects of rodenticides on Southern Boobooks in Western Australia and effects of fire regimes on all four species. Southern Boobooks and Gang-gang Cockatoos remain quite common and widespread in south-eastern Australia, whereas the two parrots have more localised distributions.

In addition, two south-eastern Australian subspecies (of Brown Treecreeper and Hooded Robin) have been recommended for uplisting from Near Threatened to Vulnerable on the basis of continuing declines. Both taxa are found mainly in drier woodlands further inland, though Birdata shows a scatter of records of both from this area, and Hooded Robins are known to inhabit heaths as well as woodland in the few places where they occur in southern Victoria (Emison et al. 1987).

The report makes reference to the previous Action Plan (Garnett et al. 2011) and ideally that should be updated to the recent Action Plan (Garnett and Baker 2021). However, the recommendations of the new Plan are under review, and have not yet been accepted by the Commonwealth Government or BirdLife International (although I understand that both review processes are proceeding quite rapidly).

<u>Specific comments</u>

The following comments relate to specific sections of the Biosis report.

9.1.1. I'd be keen to see the summary of common species when it is ready.

<u>10. Bird Utilisation Surveys.</u>

The method used is described in greater detail than in the previous report, revealing some details that need comment.

First, the practice of 20-minute area-searches is usually done with the observer moving actively through the search area, hence finding substantially more birds than they would by remaining stationary.

Second, the method usually gives equal status to birds seen or heard, the latter typically forming 80-90% of birds recorded. In the current surveys, it seems that birds were only counted in the main sample if they were actually seen, with birds that were heard only counted as extras (along with birds seen or heard off-site, or in the initial 5-minute settling period). [Is that correct? If so, I suggest the data in Table 11 be reanalysed with equal status for birds seen or heard.]

Third, how much attention was given to surveying birds on the site vs flying over the site? Normally such searches focus very much on birds using the site, with birds flying over recorded incidentally, but here I understood the main purpose was to document birds flying over to assess the risk of collisions with wind turbines. The main purpose of these counts (as understood by the observers) must be stated clearly.

[Note that there is a semantic issue with the verb "observe", which can be either by sight or sound (or any other sense). This report sometimes refers to birds "observed or heard", which should be replaced by "seen or heard", e.g. in caption to Plate 17.]

The BUS method has become a standard tool for estimating collision risk at windfarms, and collecting standardised data. However, it is not foolproof. There are great challenges in collecting sufficient information to make good predictions for birds that sometimes fly in large flocks, make intermittent movements or make regular movements related to season, tide or weather, or make regular movements at times not covered by the surveys (notably dawn, dusk or night). These limitations are acknowledged (e.g. in section 19.3), but perhaps they could be highlighted more in specific cases.

The list of 10 most common birds confirms the degraded nature of the habitat, as most of them are species typically found in open farmland rather than natural habitats.

In Table 11, a reference is needed for the threat status under the FFG Act. Does that refer to the Advisory List?

Red-tailed Black-Cockatoo

The substance of this section seems fine. Clearly there was no way to get good local data when the bulk of the population was further north in the Wimmera. It's good to see that relevant data were accessed from elsewhere, and from observations on the congeneric Yellow-tailed Black-Cockatoo.

I remain surprised that Red-tailed Black-Cockatoos have not adapted to feeding from pine cones, and if they do learn such behaviour in future the risks of collision will increase, and may require management response if the windfarm has been established. The potential for changes in habitat preference over time should be mentioned, noting that other large Black-Cockatoos (including the endangered Carnaby's Black-Cockatoo *Zanda latirostris* in south-western Australia) use a wide range of food sources and habitats, some of which have changed in recent decades (Garnett and Baker 2021).

Just a few editorial issues. It would be good to see more reference to primary research rather than the synthesis provided by CoA 2006. Typo on p95, t missing from "out". In fact, could simplify the sentence by deleting "carried out on the study program".

Orange-bellied Parrot

The substance of this section seems fine. It rightly emphasises the importance of coastal habitats, and also raises the possibility that some use may occasionally be made of heathland habitats inland from the proposed windfarm site. It rightly emphasises the extreme rarity of the species, and the work of the Recovery Team. Perhaps more could be said about the recent successes of the recovery effort, which could lead to increased occurrence of the species in future years.

Some editorial issues, e.g. I would prefer to see more references to primary research rather than too much reliance on government reports, including the 1986 paper on food sources and movements between sites in response to food availability (Loyn et al. 1986).

Looking at some of the habitats depicted in photographs at the end of this report, I can imagine Orange-bellied Parrots occurring occasionally at habitats shown in Plates 22 & 23 (mapped wetland 20522), 24 (100m west of wetland 20532) and 28 (grazed paddock 500m north-west of Heywood

Terminal Station), as well as Plate 17 where one was actually observed. So I support the authors' view that various habitats may be used on an occasional basis.

I have problems with the four dot-points on p100, attributed to DEWHA 2010 (but then I'm not reviewing that document). The first dot-point mentions "area searches and point observations" as methods for surveying OBP. In fact the best way of finding rare birds of this sort is to search large areas of habitat in a much less structured way. Stationary point counts are less effective than active searches as OBP are often found by flushing: the key is to cover as much suitable habitat as possible. The fourth dot-point makes no sense, referring to searches of <50 ha in 20 hours or 10 days: I'm not sure what that is meant to mean. I would be urging observers to search as much habitat as they possibly could, in whatever time they had available.

<u>Elegant and Blue-winged Parrots</u>

These two species should be considered together as they have very similar requirements. Elegant Parrots have the higher threat status in Victoria (Vulnerable under the Flora & Fauna Guarantee Act), as their main range is further west (South Australia and Western Australia). However, the latest Action Plan for Australian Birds recommends that Blue-winged Parrot be uplisted to Vulnerable nationally (Garnett and Baker 2021).

The text on Elegant Parrot mentions that non-breeding flocks of 200 birds have been recorded: please say which state that was in. If it was in Victoria (which I doubt), please give more details. The current text overlooks the seasonal changes in habitat use by this species (breeding in woodland, wintering in saltmarsh and other open habitats), which in my experience are quite similar to those of Blue-winged Parrot.

I've added notes on Blue-winged Parrot to the text currently included under Protected (non-threatened) land birds.

<u>Eastern Ground Parrot</u>

It is wrong to say there is no documented evidence of long-distance movements by this species. They used to be regular winter visitors to saltmarsh round some of the Gippsland Lakes, many kilometres from the nearest breeding habitats: I found one there myself on one occasion. A vagrant bird was found in saltmarsh at Lake Connewarre in the 1980s or 90s (>20km from the nearest breeding habitat): I went and saw it, and it was published in the Geelong Bird Report (i.e. it is properly documented). [I understand an old record from subalpine heath in Gippsland high country has been discounted.]

It is also wrong to say they rarely leave the dense cover of their habitat. When flushed, they readily fly strongly over several hundred metres, low to the ground, and there is little doubt that they make similar flights to access particular food sources.

Recent radio-tracking work with Night Parrots (congeneric with Ground Parrots) shows that they often fly from safe roosting sites to feed at night among chenopods or other seeding plants, which may be up to 30-40 km from the roost sites.

It's good to see that the authors acknowledge the likelihood that the Eastern Ground Parrots observed spasmodically at Long Swamp in this area could be part of a larger resident population inhabiting sparsely treed heaths in the region, including the Kentbruck Heath where few if any targeted surveys have been done. If that is true, it can be expected that birds will fly regularly between those heaths and coastal habitats, on a seasonal or daily basis (possibly flying at night). Fortunately, Eastern Ground Parrots usually fly low to the ground and are unlikely to collide with wind turbines. I agree with most of the comments made in relation to these points.

Lower-level infrastructure (e.g. power lines and guy-wires) could pose more of a problem for Eastern Ground Parrots and other low-flying birds. It should be noted that a headless dead Night Parrot was found at a fence in south-western Queensland (McDougall *et al*. 2009), and fences could be one of many threats facing both it and Eastern Ground Parrot, although Garnett and Baker (2021) list predation, fire regimes and habitat change as more serious issues, Ground Parrots avoid treed habitats and may be reluctant to make nocturnal flights through wooded areas. Nevertheless, some discussion is needed of mitigation measures for low-level infrastructure, in relation to Ground Parrots and other birds that are likely to fly at low levels (e.g. quail and rails).

<u>King Quail</u>

I think too much is made of the idea that King Quail populations may have originated from introductions. Wheelwright (1861) often found the species round Western Port in the mid 1800s, in places that were not urbanised at the time. In the 20th century, the species was found mainly in places with plenty of natural habitats (wet heath), including the current area of interest and French Island, not round population centres (Wheeler 1967; Emison *et al*. 1987; O'Brien 2006). Some temporary satellite populations may have originated from introductions, but the species should be regarded as a rare native bird.

I also think too much has been made of the idea that it is a poor flier. All quail are reluctant to fly, and they only make short-distance flights when flushed. But many species are long-distance migrants, and that has helped them colonise new continents. King Quail has a broad international distribution (from India, China and south-east Asia to Australia) and I expect it to have similar long-distance flight capability to other quail. So it should remain in the mix of species to be considered in relation to collision risk. Nevertheless, I agree that most local flights will be low to the ground and the collision risk is likely to be very low.

Unfortunately, little (if anything) is known about flight heights of quail when making long-distance flights.

<u>Brolga</u>

See separate comments on the stand-alone report on this species.

<u>Australasian Bittern</u>

The recommended survey methods for this species (DEWHA 2010) involve call playback during the breeding season, but those methods may not be effective for finding birds outside the breeding season. Australasian Bitterns are known to be winter visitors to some Victorian coastal wetlands (Emison et al. 1987), and the authors report that an Australasian Bittern was radio-tracked from breeding habitat in the rice-fields of the NSW Riverina to non-breeding habitat in the current area of interest (Long Swamp) and Picaninny Ponds in South Australia. That proves that any local breeding population is supplemented by additional birds coming from distant breeding sites. Garnett and Baker (2021) report that about half the bitterns that breed in the Riverina move to near-coastal habitats in the winter. We need to be told how much effort went into finding Australasian Bitterns in the main non-breeding season (April to August), when playback and listening for calls would not be expected to be effective.

Targeted surveys using call playback for Australasian Bittern and three other species (Australian Little Bittern, Lewin's Rail and Baillon's Crake) were undertaken at various wetlands on nine dates in spring and summer 2018-19 (Table 15). All those dates were within the usual breeding season for Australasian Bittern (September to March), but the authors report that in 2020 surveys were conducted in months during breeding and non-breeding seasons. Surely those dates should be added to Table 15, with other relevant details, e.g. there may have been little point including call playback in winter surveys, especially for Australian Little Bittern and Baillon's Crake which are both generally regarded as summer visitors to Victoria.

On p115, delete "likely over or through" in two places, leaving it to read "across [the southern part of] the plantation". Bitterns would be most unlikely to fly below tree height through a plantation. The radio-tracking data showed that this bird flew across the plantation, and that surely means that it flew over it.

On p118, the population estimates for Australasian Bittern in the area are based on published home ranges, and the estimates assume that all home ranges are occupied. That is a very optimistic assumption, and if applied across the species' range it would lead to a big upward revision in the national population estimate. Nevertheless, it gives a plausible precautionary estimate for the number of bitterns that could be using these habitats.

I don't understand the second part of the following sentence: "Australasian Bitterns have home ranges of 5–30 hectares, suggesting the number of individuals within the 10 kilometre search area could be approximately 38–228, somewhat higher when wetlands other than Long Swamp and Pick Swamp in the area are included (37–119)". The second range is less than the first range, so it doesn't make sense.

On p119, it would be very helpful to say how high the bittern was flying when it was observed. But I agree with the general conclusion that they may often fly at various heights, including rotor height.

The "drained wetland" near Gorae West where the Biosis team saw this particular bittern should not be dismissed as a potentially important non-breeding habitat for bitterns. Australasian Bitterns have quite often been seen feeding in winter in tall grassland near Melbourne, in the vicinity of wetlands. For example, at the Eastern Treatment Plant one was seen regularly catching House Mice in an area of tall grass and introduced Pale Knotweed *Persicaria lapathifolia* (Mike Carter pers. comm.), notwithstanding their usual preference for dense aquatic vegetation. A new transmission line in this area could pose a significant threat.

I agree that collision with powerlines is a real risk, as documented in this area by Farnes (2019) and elsewhere, e.g. in wetlands in the south-east of Melbourne.

It may be worth mentioning that a very similar Eurasian species (Great Bittern) has been observed making regular flights at dawn and dusk between feeding and roosting habitats in UK (White *et al*. 2006).

<u>Other threatened waterbirds</u>

The selection of species is good, but I would like to see more emphasis on Lewin's Rail as it is known to come and go from saltmarsh habitats near Portland (Fawthrop Lagoon), presumably moving to breed in nearby habitats (which are likely to include wet heaths or coastal wetlands in the current area of interest). It would be very useful to solicit local information on the seasonal movements near Portland. [I think there may have been breeding records from Fawthrop Lagoon in Portland, check Birdata or local info.]

Schmidt et al. (2018) modelled habitat requirements of Lewin's Rail in south-central Victoria, and demonstrated that that shrub cover in adjacent habitats was a positive variable. Most of the places where I have found Lewin's Rail have dense stands of woody shrubs, and I agree that is likely to be a key variable. They have also been found in wet heaths on French Island and the Mornington Peninsula, and in button-grass plains in Tasmania. That information is not readily available in published papers, but it is important in the current context, because it suggests there is a strong possibility of seasonal movements of this species between wet heaths and coastal wetlands, with implications for collision risk. Unfortunately, little is known about flight heights of rails when making long-distance flights. Note that Goldstraw and du Guesclin (1991) found corpses of Spotless Crakes and Baillon's Crakes (then called Marsh Crakes) under 500 kV transmission lines at Orford in south-west Victoria, and the indicative height of those transmission lines was 73m.

The section on Baillon's Crake should mention that it is a summer migrant to Victoria, and found mainly on vegetated freshwater wetlands. Both these points are made clearly by Emison et al. (1987), whereas the references cited (HANZAB and Harrison et al. 1997) make the story unduly complicated by looking at the national picture: there are undoubtedly resident populations further north, but I doubt that they often occur in saline wetlands and suggest that be deleted. They may use brackish wetlands but do not occur in tidal habitats.

There is a typo, signally should be changed to singly.

<u>Shorebirds, gulls and terns</u>

It is good to see more numerical information on shorebirds, and more investigation of alternative habitats in the region, but the account still falls short of giving a clear picture of the shorebird numbers and movements at the Glenelg Estuary and other potential habitats in the region.

The methods section is not clearly written, and I had to read it more than once to realise that at the main shorebird site (Glenelg estuary), counts at both high tide and low tide had only been made on one day (3 December 2020). That is a disappointingly small effort for what could be an important issue. The data from that day (in Table 17) showed that there were 850 Red-necked Stints at low tide but only 465 at high tide, showing that 385 had moved to an unknown high-tide roost. But then the "ocean side" of the estuary was not counted at any high tide because it was not easily accessed, which seems an unfortunate omission (easily remedied by hiring a boat or canoe, or waiting out the tide). Is it possible that that is where the 385 Red-necked Stints had gone?

It is a shame that the field team did not make a point of watching for movements of birds as the tide rose on another occasion, even if they had not done that on the day in question. Neglecting to do that has left a big open question about the likely tidal movements of shorebirds in this area. The authors rightly conclude that several hundred shorebirds moved to an undiscovered roost site on the one day on which tidal movements were investigated. Those sites are probably on the coast (perhaps just across the water at the estuary??) but they could be many kilometres away, which could conceivably involve flight-paths crossing the site of the proposed windfarm. **This question must be addressed before finalising the report, either through field observations or consultation with observers who know the area (e.g. AWSG).**

There are several ways to search for undiscovered high-tide shorebird roosts. One is to identify potential sites from maps or satellite images, and visit them at high tide. The Biosis team visited several candidate wetlands, commendably including Picaninny Ponds in South Australia, without success. A more efficient way is to watch feeding shorebird flocks as the tide rises, and see where they go when the rising tide makes them leave. It is usually possible to determine the flight direction and in some cases it may be possible to follow them visually until they land. (This would be very easy if birds were merely crossing the estuary.) Then (if necessary) the suspected roost sites can be visited at the next high tide to check if those sites were indeed being used.

The most efficient approach of all is to talk to people who already know the local situation. The Australasian Wader Study Group (AWSG, within Birdlife Australia) has been counting and banding shorebirds at numerous sites for the last four decades, and generally their catches are made at high tide. There would surely be some local people with an excellent knowledge of alternative high-tide roost sites for shorebirds in the vicinity of the Glenelg estuary. Such people are usually happy to share their knowledge, especially when it could be useful in ensuring that habitats are protected and collision risks are minimised. **It is essential that efforts should be made to tap into such knowledge.**

The report presents data from counts made by the Biosis team (Table 17) and counts made as part of national surveys by the AWSG (Table 18). However, that does not capture all that is known about shorebirds in this area. For example, I notice that the recent summer newsletter from the AWSG mentions 1000 Sanderling at the Glenelg Estuary in November-December 2021 and reports that the Glenelg Estuary and Discovery Bay Ramsar site supports up to 1.4% of the world population of the species, with counts of up to 1500 in a single flock, making it the most important site in Australia for the species. The article describes the work done by AWSG in a short expedition to catch and radio-track Sanderling in November-December 2021, with detail about local roost sites and how up to access them (they used a canoe to cross the estuary). **The Biosis report must describe the importance of the site for this migratory species.** Happily, Sanderling are not a big issue for the windfarm, because they feed exclusively along the coast and make negligible use of wetlands away from the coast.

Twice-yearly migrations between this coast and Arctic breeding grounds need to be considered for Sanderling as for other migratory species. Those migrations are believed to be made by direct routes (across land, not round the coast), and probably involve crossing the proposed windfarm site at high elevation. The report includes some excellent information from radio-tracking studies that show that migrating flocks rise steeply on departure. **It would be valuable to check with the AWSG to see if their radio-tracking data confirm or refute those findings on how quickly elevation is gained or lost at the start and end of migratory flights.**

Just one migratory shorebird species, Latham's Snipe, was found to be using habitats within the windfarm footprint, with a single bird found within a temporarily flooded Blue Gum plantation on farmland in the far east of the site. Dune slacks and coastal wetlands were also recognised as providing suitable habitat for Latham's Snipe. I agree with the authors' conclusion, that ephemeral wetlands such as this deserve protection through buffers as recommended.

Sections 19.2.2 to 19.2.4 provide lists of non-migratory shorebird species along with gulls and terns observed in the relevant 10 km stretch of coast, but with no information on their numbers or use of particular habitats: that deficiency must be corrected. Most of the species mentioned are strictly coastal and hence unlikely to be impacted by the proposed windfarm (e.g. Pied and Sooty Oystercatchers; Pacific and Kelp Gulls; Common, Little and Fairy Terns). Some of those species may make periodic use of coastal wetlands for roosting or breeding but are unlikely to cross the site of the proposed windfarm. Conversely, one species (Banded Lapwing) inhabits grasslands: it makes some use of associated wetlands (e.g. for loafing on hot days) but makes virtually no use of coastal habitats. It also is unlikely to be impacted by the proposed windfarm.

In my view, just four of the non-migratory species mentioned are possible candidates for moving regularly between habitats on coastal and inland sides of the proposed windfarm. They are Masked Lapwing (a common bird in wetlands and grassland), Red-capped Plover (which feeds both on tidal mudflats and on barren mudflats round inland salt lakes), Caspian Tern (which dives for fish in sheltered tidal waters, inland lakes and along rivers) and Whiskered Tern (which catches invertebrates and small fish in surface waters of estuaries and ephemeral freshwater wetlands). Masked Lapwings are resident in wetlands and farmland on both sides of the proposed windfarm, and could sometimes make flights across it for various reasons. However, such flights would only be made by small numbers of birds, and any mortality would form a very low proportion of the local population. I would not expect Red-capped Plover to make regular flights across the proposed windfarm, as there is little suitable habitat for them nearby on the inland side of the site. Whiskered Terns might occasionally feed in ephemeral wetlands in the general area, but otherwise the main attraction would be the Glenelg estuary itself (and the species is an uncommon visitor to the region, so that is not a major issue). Caspian Terns might sometimes fly overland between the coast and the Glenelg River, as the river flows parallel to the coast for several kilometres, though it is likely that most of their movements would be along the river. In conservation terms, the most serious collision risk among this group is probably for Caspian Tern. Birdata records of Caspian Tern from scattered sites between the sea and the river support that view.

In terms of this report, the lists of non-migratory species should be fleshed out to provide numerical information and basic information on habitat use.

On p127, please say why Lake Malseed does not seem to provide suitable shorebird habitat. For example, is it too vegetated? Or is it for some reason that could change with time (e.g. related to hydrology)? A minor editorial point, on line 1 change “a record of” to “records of”.

Section 19.3.1. describes the limitations of the BUS system well, and it distinguishes between migration flights and local flights for shorebirds. That distinction is very useful as the two types will require quite different types of management.

The comment about daily activities (local flights) “remaining within a single broad area of habitat” is misleading, as many shorebirds travel several kilometres between feeding habitats on tidal mudflats and high-tide roosting habitats that may be quite different in nature. This is described in the following sentences but I would suggest that the first sentence needs to be revised to avoid giving the wrong impression.

On p135, the sentence beginning “The Canadian agency…” needs some editorial attention. Interesting information about rates of ascent and descent for migratory shorebirds, would be good if there was a published reference.

<u>White-throated Needletail</u>

The report identifies this species as being at particular risk of collision with turbines, and I strongly support that conclusion. It is believed to be the fastest-flying bird in the world (in level flight), and flocks move rapidly over large areas of all habitats, with a preference for forests, woodlands or farmland with scattered trees. There are no obvious foolproof ways of siting turbines to minimise the risk. **Hence the report should flag the need for special measures to protect this species (along**

with other fast-flying birds and bats), perhaps using radar to detect substantial arrivals of the species, and sonic deterrents or rapid shut-downs when they are detected.

Such measures would be innovative and experimental, but without them there is little doubt that mortalities of this and other species will occur, and could be substantial. Mortalities of that sort could be cumulative across windfarms, as during their migratory visits to Australia, individual White-throated Needletails spend short amounts of time at multiple locations all along the eastern seaboard and mountains from Tasmania and South Australia to north Queensland.

In Section 20.3, should say it is absent in the period from mid April to mid October, as the species often remains in Victoria into the first week or two of April, and occasionally returns by mid October. (It regularly arrives in northern Australia in October or a bit earlier, but usually spends most of the austral spring in the north before reaching Victoria or Tasmania in December. The northward migration is much more rapid in March-April.)

In Section 20.3.1, were the five "mortalities" reported by Moloney et al. (2019) single corpses or mass events?

It is said that Hull et al. (2013) documented the detection of eleven needletail collisions "at each of the two windfarms" in Tasmania. That implies 22 collisions altogether: is that correct? Note that Tarburton and Garnett (2021) report that those observed mortalities occurred despite little evidence of the species actually using the area.

The model was run assuming a local population of 100 White-throated Needletails present in the area for 6 months. This is far from reality. Although White-throated Needletails can arrive in Victoria as early as mid October (I've seen that happen once in 50 years), it is far more common for them to arrive in December or later, appearing first in the far east of the state and last in the south-west. Numbers do not generally reach their maximum until February or March. The Biosis records are consistent with that pattern. When numbers are maximum, there would probably be 1000-2000 birds or more in the area of interest, and they might remain for a few hours or up to 2-4 weeks, with smaller numbers (say 100) present for a longer period of up to 8 weeks. **I would like to see the model re-run on that basis.** This information has important implications for management, as special measures to protect swifts will only be needed for a relatively short period of time (perhaps 2-4 weeks).

On p139, typo, add space before "At a qualitative level".

<u>Fork-tailed Swift</u>

The text should mention that they are believed to roost on the wing high above ground (>1 km): flocks are often seen gaining height at dusk, and there appear to be no records of flocks roosting on substrates other than air.

In south-west Victoria, this species is seen much less often than White-throated Needletail. Happily, its migration pattern is quite similar, with peak numbers likely to occur in January, February or March. Hence it should benefit from measures proposed to protect White-throated Needletails. Flocks of 1000 or more Fork-tailed Swifts visit parts of Victoria in many years, and smaller flocks are often seen flying along coasts and feeding over nearby vegetation in various parts of the state. Hence the species deserves to be considered in the current context, but it does not need extra measures beyond those proposed for White-throated Needletail. If radar is employed to detect

White-throated Needletails, it will not be necessary to distinguish the two species (both are swifts) as protection measures will be the same.

Owls

I'm pleased to see a paragraph on Masked Owl as the first part of this section, as it is a poorly known species that is known to occur in the area of investigation. However, the text does not really make the point that it is the least-understood and possibly rarest of the five forest owls in Victoria, and deserves special attention wherever it is found to occur. That point should be made more strongly, with reference to HANZAB and state-wide surveys of forest owls (Loyn et al. 2001, 2004) as well as Emison et al. 1987. Masked Owls have sometimes been found to be associated with wet heaths or heathy forest, as well as more open forest habitats and treed farmland: the state-wide models showed a significant aversion to steep country. Ed McNabb observed a pair nesting in treed farmland in south-west Victoria and he did some radio-tracking and wrote a report on it (check reference).

At the end of section 2.3, I'm pleased to see it recognised that Masked Owls may sometimes hunt along roadsides in plantations, as that behaviour has been observed elsewhere (e.g. by Chris Corben in plantations of native Hoop Pine in south-east Queensland). However, the mammal prey species they are seeking are likely to be terrestrial rather than arboreal mammals, and those species do not use hollows, and some of them may occur along roadsides in pine plantations (e.g. rabbits, which are also taken by Barking Owls). Masked Owls are believed to take prey generally from the ground rather than in trees. So please change end of last sentence to "and may hunt for mammals in those habitats". And in the previous paragraph, delete "which do not support their prey species" after "particularly pine plantations". [Pine plantations are not devoid of arboreal mammals either: Common Brushtail Possums have been recorded in them.]

In section 22.3.3, it is said that Masked Owls are expected to fly mainly below the canopy. However, it should also be mentioned that they sometimes make nocturnal display flights in which they circle calling high above treetops (at least twice treetop height). That behaviour is probably not well documented (need to check), but I've seen it in East Gippsland and it has obvious relevance to the current situation.

It is good to see information included on Southern Boobooks, especially if they become listed as Near-threatened.

Typo in line 4, delete full stop after "nesting".

Rufous Bristlebird

The substance of this section seems fine.

On p147, the sentence beginning "The likelihood and matrix scores…" is incomplete: what was the score?

In section 23.3.2, we are told that the transmission line is proposed to run underground along an existing road alignment through Cobbobbonee NP. Is that an actual road or just a cleared strip? If the latter, it could contain significant habitat for Rufous Bristlebirds. If so, measures may be needed to conserve such habitat or ensure its restoration after the cable is laid.

Other threatened land birds

It may be worth adding a new section to deal with two threatened birds of prey (Little Eagle and White-bellied Sea-Eagle): both are listed as threatened under the Flora & Fauna Guarantee Act.

Little Eagles were added to the list as Vulnerable in January 2021, and they are also listed as Vulnerable in New South Wales, on the basis of observed declines. Both these species make broadly similar use of air-space to Wedge-tailed Eagles (discussed in the next section), as do a number of other raptor species. Hence they are likely to face similar risks of collision, and require similar measures to mitigate those risks.

A special issue for White-bellied Sea-Eagles (and Ospreys, which occur along the nearby South Australian coast) is that they may feed along the Glenelg River as well as the coast, and if they take short cuts between those habitats that may put them at risk of collisions with wind turbines (cf Caspian Tern), noting that the river runs parallel to the coast for several kilometres.

30. Protected (non-threatened) land birds

It is good to see this section included, with notes on collision risks for two iconic species that are common in the area (Wedge-tailed Eagle and Yellow-tailed Black-Cockatoo) and one species that has been recommended for uplisting as Vulnerable nationally (Blue-winged Parrot).

It might be more convenient to consider Blue-winged Parrot along with Elegant Parrot in the previous text, as both species share similar ecological needs. Both species breed in woodland and use saltmarsh as an important feeding habitat when not breeding. Blue-winged Parrots favour heathy woodland for breeding, especially in sites recently disturbed by fire or logging. Blue-winged Parrots breed in Tasmania as well as Victoria, and most of the Tasmanian birds migrate to Victoria for the winter (as do Orange-bellied Parrots). Elegant Parrots are essentially the western equivalent of Blue-winged Parrot, with breeding populations in southern South Australia and Western Australia as well as the far west of Victoria (mainly the Wimmera). Both species are likely to make seasonal movements between woodland habitats in spring and summer, and saltmarsh or dune habitats in autumn and winter. Both species winter in habitats close to the coast though Blue-winged Parrots also winter in saltmarsh habitats far inland (e.g. round salt lakes).

At least one other species would be worth including in this section, Azure Kingfisher. As mentioned in the Stage A review, the Glenelg River is an important habitat for Azure Kingfishers *Ceyx azureus* at the south-western limit of their range, and this species has also been recorded on tributary creeks such as Moleside Creek (J. Krohn pers. comm.). It is possible that this river specialist could occur on tributary creeks within the project site, and this should be mentioned, although the species usually flies low along rivers, and is not expected to be at high risk of collision with wind turbines.

A special issue for Wedge-tailed Eagles (and possibly other raptor species, including Little Eagle and White-bellied Sea-Eagle, discussed above) is that they sometimes hunt for cockatoos including Yellow-tailed Black-Cockatoos in pine plantations, and that may put them at risk of collisions with wind turbines in this area.

There is a major discrepancy between the estimated mortality of Wedge-tailed Eagles in the Biosis report (0.1-0.5 per year for the whole windfarm) and the estimated mortality implied by published data reported in Table 24 (0.1-0.2 per turbine per year, = 12-25 per year across the whole windfarm with 127 turbines). **This discrepancy must be fixed. If the latter is correct, the number of turbines must be reduced or other mitigation measures devised.**

A few of the metrics used in the collision models surprised me a bit. In particular, I'd have expected slightly more records of Yellow-tailed Black-Cockatoo and Blue-winged Parrot flying above 60m. This could be influenced by the sampling strategy, which may have been dominated by short movements in response to the observers? Is it possible that longer-distance movements would be done at higher altitudes? Were any observations made about the behaviour of cockatoos in response to attacks by Wedge-tailed Eagles? I'm pleased to see the latter question answered in Appendix 6, and the consequent flights were no higher than 30m.

The flight speeds also seem too low (20 kph for Yellow-tailed Black-Cockatoo and 30 kph for Blue-winged Parrot). I know the flight of Black-Cockatoos looks beautifully effortless, but that does not mean it is as slow as 20 kph. And Blue-winged Parrots surely fly much faster: I would have thought 50-60 kph would have been closer to the mark. But if the data are based on actual measurements, then they should stand of course.

Minor editorial point in section 30.1.3, p174, replace "is suggestive of that" with "suggests".

A general comment could be made about a range of passerine bush-birds known to occur in heaths or other sub-coastal habitats in the region, e.g. Olive Whistler, Southern Emu-wren and Beautiful Firetail. These species have localised distributions in Victoria, with the latter two confined to the south where they favour heathlands (Emison et al. 1987). The local population of Olive Whistlers in south-west Victoria and adjacent areas of South Australia represents a distinct endemic subspecies with a very small range. Olive Whistlers are known to occur in young pine plantations as well as native forest, and they are likely to be present on the proposed site. However, all of these species inhabit low vegetation and rarely if ever make flights more than a few metres above the ground. Hence none of them are expected to be at risk of collision with wind turbines. Similar comments could be made about these species to those made for Rufous Bristlebirds.

<u>31. Cumulative impacts</u>

The report provides a thoughtful discussion on this difficult question. Government documents emphasise the need for a regional approach and that makes sense for sedentary species such as raptors. For those species, the main task should be to estimate the likely mortality from this and other proposed windfarms in the region, and compare that level of mortality with the estimated resident population of the species in question and its capacity to reproduce. If the estimated mortality exceeds the annual reproduction from the regional population, the population is doomed to decline or become a sink for the species over a broader area of south-eastern Australia. In my view, that should be a signal that further measures are needed to reduce the expected mortality. Population Viability Analysis would provide an extra degree of complexity and sophistication, and might enable responses to be modelled allowing for nett immigration to make up for local mortality, and allowing for natural regional mortality. However, I doubt that such analyses would be worth the effort involved. **I would prefer to focus on the simple premise that regional mortality (from natural causes plus the windfarm) should not be allowed to exceed regional reproduction (number of young expected to survive at least a year, from the number of pairs thought to nest each year in the region).** For migratory species breeding elsewhere, the same principle could apply to the part of the population that migrates to the region of interest.

The report does not consider what levels of fatality may be acceptable for any species, although a 1% figure is used as a tacit proxy in the discussion of cumulative impacts. **Further public policy input may be needed in relation to these questions.**

The regional approach could work well for sedentary species (including raptors, assuming any exodus of dispersing juveniles is balanced by influx of juveniles from elsewhere). However, some of the bird species considered here migrate over much longer distances, calling for a broader national or international perspective. In particular, swifts and shorebirds breed mainly in north-east Asia, and may encounter windfarms at various points along their migration routes in Australia and overseas, so any impacts will be cumulative.

For shorebirds, it would be relevant to give some information about the distribution of windfarms near key stopover sites such as the Yellow Sea. There are unlikely to be cumulative impacts within Australia as shorebirds generally migrate directly (mainly overland) from south-eastern Australia to northern Australia, and few windfarms have been built at the main habitats used in northern Australia.

In contrast, swifts face a much greater risk of collision with windfarms at multiple sites within Australia, in addition to any they may encounter on migration through Asia. Two species are relevant to the current project (White-throated Needletail and Fork-tailed Swift), and the former is the species that occurs most regularly in south-west Victoria. Flocks of this species arrive in northern Australia in October each year (perhaps sometimes a bit earlier) and feed along the eastern forested ranges as they move slowly southwards, usually arriving in East Gippsland in early December and south-western Victoria in late December, January or February. Many cross Bass Strait to spend a few weeks in Tasmania (mainly the north-west) before returning to the coasts of south-west Victoria or south-east South Australia. Numbers can often be seen in Victoria in February and March, with a few still being seen into mid April. Then they make a rapid northward migration through eastern Australia to their breeding grounds in the forests of Korea, Japan or north-east Russia.

All of their feeding is done on the wing at various heights above ground. Roosting behaviours are imperfectly understood, but White-throated Needletails are known to descend to roost in forest trees at dusk, whereas Fork-tailed Swifts are often seen to gain height to roost on the wing high above ground level. Further observations are needed to determine whether these behaviours may vary according to local conditions: it is conceivable that both species are capable of roosting either on the wing or in trees. Hence both species are airborne throughout the daylight hours while they are in Australia, and White-throated Needletails may be at special risk of collision as they descend to roost sites in poor light after sunset, and emerge from roost sites in poor light before dawn. Even if they are seen for a few weeks at a particular site, that may represent several different flocks moving through the site, visiting other sites at other times. If there are windfarms at those other sites, any mortality will be cumulative. Mortalities of >10 birds have been recorded in Tasmania, and the flocking behaviour of both swift species suggests that higher mortalities could occur on rare occasions, potentially involving 100 birds or more. Any offshore windfarms will pose an additional risk as the birds move between Tasmania and south-western Victoria.

The global population of White-throated Needletails has been estimated as 41,000 (20,000 to 61,000) (Tarburton and Garnett 2021). Recent declines have been attributed to changes in breeding habitat, but the potential impact of windfarms also needs to be considered. Loose flocks of many hundreds of birds (up to ~1000) are sometimes seen (e.g. 900 in Eltham in February 2022, Rohan Clarke pers. comm.), so there is a potential risk of mortalities involving 100 birds or more (as discussed above). Fork-tailed Swifts are more numerous and in Australia they range more widely over the inland plains (including northern, central and western Australia), so they are much less exposed to windfarms. But the two species can be considered together.

This report should say more about the risks of cumulative impacts on White-throated Needletails, and most importantly what needs to be done to reduce those risks.

I noticed two minor typos. On p176, line 1, need a space after closing the bracket (….Authority n.d.). And what is n.d.?

On p178 (Table 23), need an extra s on Grass in Glossy Grass Skink.

<u>Table 24</u>

The caption is given as "Qualitative assessment of potential for cumulative impacts for key bat and bird species (species in bold are from Appendix A of the Scoping Requirements)". It would help to say what is meant by "key", if that can be done simply.

For Australasian Bittern and Lewin's Rail, I'd say there was "some potential" (not "little potential") for cumulative impacts. That is because there is evidence of long-distance movements for both species, especially the bittern.

For Little Eagle, I'm not sure why we would expect the species to be much safer than Wedge-tailed Eagle. Perhaps it's just because the species is scarcer and hence less likely to appear in surveys of bird corpses? I'd prefer a similar text to Wedge-tailed Eagle, unless there is robust evidence that the species is unlikely to be hit. Note that Little Eagles do not occur in Tasmania, so would not be expected to feature in data from Tasmanian windfarms.

For Wedge-tailed Eagle, I find the mortality rates quite alarming, as calculated by Moloney et al. (0.1 per turbine per year) and independently by Symbolix (0.1-0.2 per turbine per year). Are these figures reported accurately, or are the decimal points wrong, or the units? If accurate, they imply an annual mortality of more than 10 eagles per year from the 127 proposed turbines (vs <0.5 from the modelling reported in the current report). A mortality of >10 birds from a population of 40 (the local population figure used by Biosis) is clearly unsustainable as it exceeds the plausible rate of reproduction from 40 birds (10-15 pairs allowing for some being immature). **This discrepancy must be identified and corrected (or explained). If the predicted annual mortality is higher than 10, that is not sustainable (or socially acceptable) and further mitigation measures must be applied.**

Note also that Wedge-tailed Eagles have cultural (totemic) significance for some traditional owner groups this should be checked for local groups, and suitable comments made. It would be worth checking if there are other species of local cultural significance.

I would have preferred to see the list include all transcontinental migratory bird species, including many of the more common shorebird species that are not currently listed (e.g. Red-necked Stint, Sharp-tailed Sandpiper). But I admit that this would make little difference to the recommendations for management of the site: most of those species can be considered as a group.

The text for each of the migratory shorebirds says "Present in Australia during spring to autumn months only". That is not correct for any species, as first-year birds typically remain here over their first austral winter, and the first migrating adults often return in August (late winter). For most species, some can be found all year, as the Biosis team found for Sanderling during this project. (There are three exceptions: few if any Latham's Snipe, Sharp-tailed Sandpiper or Pacific Golden Plover remain in Victoria over winter. But some adults return in August, so the sentence needs revising for all species.) I would recommend replacing the sentence above with something such as: "Mainly present in southern Australia from August to April, but young birds may remain all year." Should delete the last bit for Latham's Snipe, Sharp-tailed Sandpiper or Pacific Golden Plover.

Similarly, the text for Double-banded Plover says "Present in Australia during winter months only". With this species (that breeds in New Zealand) there is no problem with young birds staying all year (they don't), but "winter" is too narrow: Double-banded Plover visit Australia from February (rarely January) to September or October. Change "during winter months only" to "from February to October".

The text for Curlew Sandpiper, Common Greenshank, Marsh Sandpiper and Black-tailed Godwit wrongly claims that these species only occur on the coastal fringe of Australia. These species (along with two other common small shorebirds, Red-necked Stint and Sharp-tailed Sandpiper) also make extensive use of inland wetlands with suitable bare mudflats: these conditions usually arise on the margins of ephemeral wetlands where high salinity restricts the growth of vegetation. This is an important point because it is possible that such conditions could arise at times in wetlands close to the proposed windfarm, resulting in movements of these and other shorebirds between the coast and those wetlands. A range of other shorebirds make occasional use of inland wetlands in the same way, e.g. Red Knot. Indeed, almost all migratory shorebirds have been recorded on rare occasions at inland wetlands. Sharp-tailed Sandpipers actually prefer inland wetlands (especially if they have some vegetation), but we don't need that detail here. Similarly, Marsh Sandpipers favour inland wetlands (preferably without vegetation) and they avoid tidal mudflats in southern Australia, although they are often found on wetlands close to the coast. For the current report, all that is needed is to change the text for Curlew Sandpiper, Common Greenshank and Black-tailed Godwit, perhaps saying "Substantially confined to narrow coastal zone and inland ephemeral wetlands away from most windfarms", and for Marsh Sandpiper saying "Substantially confined to coastal and inland ephemeral wetlands away from most windfarms".

32. Mitigation.

The report focuses strongly on a set of well-proven mitigation measures, namely protection of native vegetation and other important habitats; maintaining suitable hydrology at local wetlands; creating a buffer with no turbines to protect special habitats and potential flight-paths; and marking powerlines to reduce collisions.

That is fine but I believe there is a strong chance that it will not be sufficient to avoid significant mortality for at least one pair of bird species (swifts), with potentially serious consequences for one of them (White-throated Needletail). I strongly recommend a more proactive approach for that pair of species, through use of radar to detect substantial arrivals of these species, which are likely at a quite limited time of year (January to April, especially in February and March, probably on only a few days each year). It might be appropriate to share the costs of radar installation (or other such measures) between different windfarms in the region, or to investigate ways of gaining timely relevant information from radar systems already installed at local airports.

A radar system may also prove useful for reducing risks for other species, including bats, raptors, shorebirds and parrots. Protocols would need to be developed for reducing risks when substantial movements of any of these groups of species are detected. Those protocols might involve slowing or stopping certain turbines.

It could be worth investigating innovative methods for deterring or deflecting bird flights, such as use of lights or sonic devices.

These matters need to be discussed and recommended for inclusion in the Bat and Avifauna Management Plan.

On p196 there is a minor grammatical error, "to be comprised of" should be written as just "comprised".

On p198, I'm pleased to see that the proposed Bat and Avifauna Management Plan will include not only searches for corpses, but also carcass persistence trials and searcher efficiency trials. However, I would like to see more detail about how the carcass efficiency trials will be designed to allow for the special challenges of finding corpses in pine plantations, when many will be caught in upper branches.

33. Conclusion

I would like to see this when it is ready.

Appendix A2.1. List of fauna species recorded from the investigation area

I have two serious editorial comments on the species list, which I may have made at Stage A.

One is the order in which they are listed (alphabetical by genus). This leads to a nonsensical mixing of unrelated birds and makes it hard to check which species have been recorded in related multi-generic groups (e.g. raptors, seabirds or shorebirds). The issue has special importance for windfarms where groups such as raptors, swifts or waterbirds are likely to have similar risk profiles and need similar management actions. I believe all such lists should be reported in taxonomic order. I can help reorder the lists in this report if needed.

The second point is that bald lists like this say nothing about bird abundance, habitat or other aspects of species ecology that were undoubtedly observed by the field observers. I believe all such lists should be annotated so that information of that sort is captured and made available to the land managers. Information on local habitat use can be very valuable in planning any mitigation measures that may prove to be needed.

Both these points apply to mammals and herps as well as birds, but the point about order is especially important for birds as there are more species than for other groups.

Appendix A2.2. Listed fauna species

These seem to be listed in a very strange order (perhaps in relation to threat status). That should be explained in the caption. Once again, I'd prefer taxonomic order, perhaps grouped separately for seabirds, other waterbirds, land birds, bats, other mammals, etc.

The caption should also describe what is meant by the "project area" (to save the reader from having to refer back to Introduction): it seems to be the area of the proposed development, rather than the area surveyed by Biosis, is that right? I notice Appendix A2.1 includes species recorded within 10 km of the area of investigation: does that rule also apply here? Many of the seabirds are likely to occur at sea within 10 km of the coast, but (as discussed before) I completely agree that the likelihood of their occurrence over the proposed windfarm area is negligible.

I have quibbles with some of the scores for "Likely occurrence in project area", as follows:

I'm a bit surprised to see Little Egret given a High rating, as in southern Victoria it is very much a coastal bird, usually present in low numbers. It is conceivable that some might breed in nearby wetlands and perhaps that is the justification for the High rating (and if so, that needs to be said). But my general feeling is that it should be rated as Medium.

I would suggest Low as the best rating for Australian Little Bittern (rather than Medium), as there are extremely few records for the region.

Some of the migratory shorebirds would be expected to be extremely rare in this area, and very much confined to the coast on the rare occasions when they do occur (e.g. Greater Sand Plover, Great Knot, Grey-tailed Tattler, Terek Sandpiper). I would classify their likelihood of occurrence on the proposed windfarm site as Negligible, not Low.

In contrast, we know there are small numbers of Hooded Plover resident on this coast, and they sometimes use near-coastal wetlands for roosting, breeding or shelter on windy days. There is a small but real chance that occasional birds of that species will venture over the proposed windfarm site. Hence I would classify them as Low, not Negligible. Their strong liking for the coast is similar to the four species mentioned in the previous paragraph, but with Hooded Plover there is a resident population present all year every year, compared with just occasional visits from the other species.

This report estimates a substantial resident population of Australasian Bitterns in coastal wetlands close to the site (38-228), and there is known potential habitat close to the site on the inland side. It also reports documented movements of the species between wetlands in the area, and an observation of a bird flying on or close to the site near Gorae West. So surely the likelihood of occurrence is High not Medium.

The likelihood of occurrence is given as Negligible for four species that are known to have occurred in heathland or woodland habitats in this region: King Quail, Powerful Owl, Masked Owl and Eastern Ground Parrot. I would rate their likelihood of occurrence as Low for King Quail, Low or Medium for both owls and Medium for Eastern Ground Parrot.

The likelihood of occurrence is given as Low for Caspian Tern but there are Birdata records from habitats between the coast and the river, making it very likely that birds sometimes take short cuts between the coast and the river (which flows parallel to the coast for a few kilometres). Hence I would rate its likelihood of occurrence as Medium or High. I would also add rivers to the list of habitats favoured by this species.

Appendix A2.4. Migratory species predicted to occur

No further comment. (I understand why Swinhoe's and Pin-tailed Snipe have to be included, although it would be quite astonishing if they ever occur. Taxonomic order would be preferable, as above.)

Table A2.4. BUS survey results

This would be better presented as a table with numerical data for each species. In its present form, it is very hard to digest this information.

Appendix 5. EPBC Act significant impact assessments

Table A5.2. Orange-bellied Parrot

I agree that turbine collision risk is the main concern, and I agree that the risk is very low. Personally I would say Very low rather than Negligible, as there is a residual small risk of birds moving across the site to access potential habitats in wetlands or heathlands close to the site or on the inland side of the site.

Table A5.3. Australasian Bittern

The south-east Australian population is currently estimated as 1200 (650-1750) (Garnett and Baker 2021), which includes several birds that breed in rice paddocks in the NSW Riverina (those birds were overlooked in the 2011 action plan). So 1% becomes 6.5, 12 or 17.5.

There is a tricky semantic issue in the next sentence. Any fatal collision affects individual mortality, especially for that individual. The real question concerns its impact on the population. Some rewriting is needed.

Table A5.4. White-throated Needletail

The global population of the subspecies that visits Australia is currently estimated as 41,000 (20,000-61,000) (Tarburton and Garnett 2021), so the 1% values are 200, 410, 610. I agree that amount of mortality is unlikely at a single windfarm (though not inconceivable if atmospheric conditions compelled flocks of birds to fly at just the wrong height on a particular day). However, there is a real risk from cumulative mortalities at multiple windfarms (including offshore and overseas), and measures should be taken to reduce that risk.

[The other subspecies inhabits the Himalayas, and its population is likely to be much lower.]

Appendix 6. South-eastern Red-tailed Black-Cockatoo study

This is an excellent short study and provides reassuring information. The daily rhythm of movements is interesting, and could become important in the event of any unexpected movement of these birds into the vicinity of the windfarm. It’s good to see responses to Wedge-tailed Eagles too, as I had worried that could be a problem.

Just a couple of points may need clarifying. On p346 (last sentence, about the disturbance by eagles), please clarify if the measurements (15, 20 and 30m) were above ground level (as I suspect) or above canopy level? If the latter, please say how far above the ground (and if the former, perhaps say how far above the canopy).

On p348, it would be good to have more detail about the highest flight observation (54m). How many birds were involved, and were they flying over a long distance? Any other special circumstances?

Appendix 7. Habitat importance models.

The caption should say a bit more about the process, e.g. were these models only prepared for listed threatened species?

It’s reassuring to see most of the species discussed above included in this list, including Lewin’s Rail, Orange-bellied Parrot, Elegant Parrot, Eastern Ground Parrot, King Quail and Masked Owl. I would expect Blue-winged Parrot to be on the list if models had been prepared for that species.

From my knowledge of the species distributions and habitats, there are some species on the list that would be expected to occur only occasionally or in very small numbers in this area, e.g. Plumed Egret, Barking Owl, Grey Plover and Terek Sandpiper. However, the list merely reports the results of a particular process (intersecting models with the area of interest) and so it should not be changed, unless the authors choose to add comments.

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Kentbruck Green Energy Hub EES

Independent expert peer review of matters relating to Brolgas

Stage B. Comments on EES Technical Report Brolga Impact Assessment by Biosis, 1 February 2022.

Richard Loyn, Eco Insights

May 2022

Summary

This is a detailed report supporting the main Biosis EES report on the proposed windfarm (Kentbruck Green Power Hub). The report relates to one of the bird species (Brolga *Antigone rubicunda*) that may be adversely impacted by the windfarm and associated infrastructure (powerlines).

The report on Brolgas provides a thorough picture of the local population and likely effects of proposed windfarm operation. It identifies seven breeding sites close to the proposed windfarm, with a population of 14 adult birds, and six more close to the proposed powerline (giving a total population of ~26 adult birds). Most of the proved or potential breeding sites are close to the eastern end of the proposed windfarm (in wetlands near Gorae East) or in wetlands in and near Long Swamp on the coastal side of the proposed windfarm. Most of the breeding wetlands are in farmland though some are within the Discovery Bay Coastal Park or embedded in Blue Gum plantations. Wetlands and farmland are used for feeding.

A very useful section is included on demography of local Brolgas as well as risk modelling. The annual production from the local population is estimated as 10% (3-15% in different years), so on average it is expected that 2 or 3 young birds would be successfully fledged each year. Brolgas are known to be at risk of fatal collisions with powerlines, and powerlines are considered to be four times as dangerous as turbines with the current design. The combined mortality from turbines and powerlines is estimated as about one bird per year in the absence of mitigation measures. A PVA for the population of Brolgas in south-west Victoria predicted a small annual decline in populations if there were no new developments (11% over 25 years), and a slightly higher rate of decline if modelled windfarm mortality occurred (~13% over 25 years).

The report recommends establishing buffer zones with no turbines or overhead powerlines within 900m of known breeding wetlands, 900m of Long Swamp and adjacent wetlands (where there is potential breeding habitat) and 300m of likely movement corridors in the eastern part of the area. It also recommends fitting flight diverter markers to powerlines in crucial areas, or re-routing them or putting them underground if possible. The buffer distances are based on draft guidelines issued by DELWP (2020) and more information should be given on why those distances were recommended. Otherwise, these all seem to be sound recommendations for reducing collision risk and protecting the local population. The buffers will have an added benefit of protecting a wide range of other waterbirds that may use these wetlands seasonally or intermittently.

Comments on Brolga report

This report presents results from detailed observations and studies of Brolgas at the site and elsewhere in south-west Victoria. One of the project team (Inka Veltheim) recently completed a PhD on Brolga ecology in this region, and she has unparalleled knowledge of the species' ecology in the region. Data were collected both from field observations (including surveys from the air and ground) and consultation with local observers, and I believe a comprehensive picture has been obtained of the main habitats used in this area and the likely flight-paths. A specific Population Viability Analysis for Brolgas in south-west Victoria was completed by McCarthy (2008), which provides useful context.

The report is impressive in its detail, and it raises some important questions about mitigation measures (buffer width). I also make various suggestions, some of which are minor editorial points. The numbering below refers to section numbers and page numbers in the draft Biosis report on Brolgas.

2. Background.

P17, para 1, rephrase “ranging from about one pair per 2-7 km^2”, perhaps to “ranging from ~1.4 to 5 pairs per 10 km^2”, or “with pairs often having sole occupancy of 2-7 km^2”.

P17, para 3, add year to Dingee & Corop reference.

3. Level One assessment, methods happily superseded (e.g. eBird, Birdata, and community consultation eventually did produce more info).

4. Level Two assessment.

P22, what are “gradient studies”?

P27 Good to see that eBird was consulted too.

NB concentration of records at NE end of windfarm footprint.

5. Level Three assessment.

P41, selection of areas for buffers sounds good. It would be good to provide some extra detail, e.g. could say that the wetland within blue gum plantations has been used for breeding for many years (I assume it’s the same one?), and in third dot-point after “A number of Brolgas” add in brackets (up to 9, or whatever it was).

5.2.2 Buffer design.

The selection of areas for buffering seems great. But why 900m for breeding sites and 300m for movement corridors? This was explained later in the report (p54) by reference to draft guidelines issued by DELWP (2020). It is important to refer to that document here where the buffer widths are first discussed. It would also be very useful to give a brief precis of why those widths were considered appropriate, noting that they are much narrower than earlier recommendations in DSE (2012) (3.2-5 km).

5.2.3 Powerline.

As the proposed powerline passes close to six known breeding sites, and Brolgas are known to be susceptible to fatal collisions, I agree it is clearly important to take mitigation measures to reduce collision risks. Three possible measures are proposed, with flight diverter markers perhaps being the simplest to implement. **It is very important to know if such markers are effective.** Is there relevant literature on that subject? If there is doubt about their effectiveness, more consideration should be given to the alternative measures (re-routing or putting underground, or use of near-ultraviolet light as tested successfully in North America by Dwyer et al. 2019).

5.3 Step Two.

P45, I agree the BUS studies are inadequate for modelling Brolga movements. Good that lots of field observations of Brolgas were made, even though they didn't amount to the 100 observations ambitiously recommended by Natural England (2013). I'd like to see more detail about the flight observations that were made, e.g. did some of them involve birds that were flushed by the observers? Were the two Brolgas flying at 70m making a long-distance movement? Perhaps tabulate all such detail in an appendix.

P46 Good to see that overseas data were used in the modelling where needed.

P47 Not clear how "population estimate for the site" is incorporated into collision risk?

P48. Good that potential breeding sites have been included.

A few minor edits: Para 2, Static components **are** included; delete "flights" from "different avoidance rates flights to them"; delete "Account is taken of" from third dot-point.

5.5.3. Good that regression weights points appropriately.

P52, para 2, line 5, need to insert "immature to total birds" (or whatever is appropriate) between "of" and "in".

P55, line 4, need full-stop after "period".

P52. I really like the demographic information presented in this section. It shows that annual production of young is ~10% on average (3-18%), perhaps a bit less as some of the immatures may be 2 years old rather than one year (or perhaps a bit more, if some first-year birds had already moulted into adult plumage, or were overlooked as young birds). So the local population of ~28 adult birds (considering the powerline easement as well as the windfarm site) would be expected to successfully rear 2 or 3 young in an average year. If mortality from the windfarm and associated powerlines comes close to that level the local population would not thrive, and could become a sink for the regional population. Table 8 shows that mortality from turbines may be quite low (I hope that's right) but Table 9 shows that mortality from the short proposed length of powerline could bring total mortality up to ~1 per year, which I would say was dangerously high. So there is a clear need for mitigation measures. I would like to see strong mitigation measures spelled out, including undergrounding the crucial segment of powerline (surely preferable) or applying measures such as near-ultraviolet light (Dwyer et al. 2019).

Notwithstanding the comments above, it is a bit surprising that annual production would be as low as 10% of the total population, and that may need some further explanation. Rates of fledgling survival are known to be high (100% of banded chicks survived to fledging, Veltheim 2018), so the low rate of annual production implies that other factors are involved. It is likely that a high proportion of the local population is not breeding (perhaps 50%, as birds do not become reproductively mature until the age of 4 or 5 years) and it is also likely that young birds suffer high mortality soon after hatching and between fledging and reaching the age of one year (quite plausible as they may be vulnerable to predation by foxes and other predators in that period, when they have left the nest but not gained good skills at flying or evading predators). Young birds may also be vulnerable to collisions with powerlines during that period, though I am not aware of empirical evidence in support of that hypothesis.

5.2.2. The opening paragraph refers to the interim Brolga guidelines (presumably DSE 2012), as stating that:

"As a general recommendation, these guidelines recommend that a 3.2 km and 5 km radius turbine-free buffer from breeding sites and flock roost sites respectively, will adequately meet the objectives set for these habitats. However, recognising that the spatial requirements of Brolgas are not well understood, a proponent may propose to meet the objectives set for breeding and nonbreeding habitats. Proposed buffer distances should meet with the satisfaction of the DSE."

Some comment is needed about whether those distances were still recommended in the interim and final guidelines as published in 2020 (DELWP 2020a, b). A brief summary of the rationale would also be useful.

Those distances are used in the current report in the context of powerlines as well as turbines (section 5.6), and I wonder if that may risk giving a false sense of security in some cases where breeding Brolgas were more than 3.2 km from proposed powerlines? For example, "site 8" is deemed not to need special measures, but we are not told how far it actually is from proposed infrastructure. Also, the proposed internal powerline is >3.2 km from any known breeding site, and so no special measures are proposed for it.

I realise sharp cutoffs may be needed for the quantitative modelling, and may be a useful baseline for the buffers, but I would like to see a more nuanced qualitative look at identifying any additional places where the potential for collisions may be particularly high, based on the known behaviour of Brolgas and the local distribution of habitats. If there are chains of potential feeding habitat it can be expected that birds may sometimes fly between them, over substantially greater distances than 3.2 km (a mere 4-minute flight for a Brolga). Inka and the Biosis team are well placed to make such judgements, and they could be very helpful for identifying places where extra mitigation measures may be needed.

5.8 Step Three PVA.

This provides a useful regional perspective, though in my view it is secondary to the analysis provided in the previous section.

Table 10, caption mentions brackets but none are given.

P61, The text should include a narrative sentence to explain Table 10, as done above for the situation with no windfarm mortality. For example, could say "The PVA predicts that the south-west Victorian population (currently 625-907 birds) would decline by 11% over 25 years under existing conditions, or slightly faster (13% over 25 years) if the proposed windfarm added an additional source of mortality". [I tabulated the results below: avoidance rate makes little difference.]

Did McCarthy provide any comment about why the population was predicted to decline even without new hazards? If so, it would be useful to mention what he said. And has such a decline been observed in the impressive set of data collected on the population?

Brolgas, SW Vic, after McCarthy 2008	Min	Max
Initial SW Vic population	625	907
25 years no project mortality	556	807
25 years with project mortality	543	795
No project mortality as % initial	88.96	88.97
With project mortality as % of initial	86.88	87.65

6. Impact assessment.

P63, last para raises questions of effects of disturbance, possibly for the first time in this report. I agree the subject needs to be raised, though I doubt that its effects will be severe, especially if buffers are implemented as proposed.

P66, line 1, minor edit, replace “is” with “are” before “unknown” and “considered possible”.

P68-69 may be worth referring to a paper by Dwyer et al (2019), an honours thesis by Kristie King (2008) and a report by Wilson and Organ (2015), refs below.

Dwyer, J.F., Pandey, A.K., McHale, L.A. and Harness, R.E., 2019. Near-ultraviolet light reduced Sandhill Crane collisions with a power line by 98%. *The Condor*, *121*(2).

King, K., 2008. Behaviour Patterns and Habitat Use of the Brolga Grus rubicundus at Two Flocking Sites in South-west Victoria. *BSc (Hons) thesis. Deakin University, Geelong, Vic*.

Wilson, D. and Organ, A., 2015. The Use of Aerial Surveys for the Detection of the Brolga Grus rubicunda Through South-West Victoria: Key Considerations for the Wind Industry. In *Wind and Wildlife* (pp. 59-68). Springer, Dordrecht.

Appendix 4, the PVA is dated 2022 here, 2008 earlier. Was it done twice?

<u>Additional comments</u>

The main mitigation measures proposed relate to buffers, aiming to keep new infrastructure away from Brolga habitat. That makes sense, but is there also a need for more innovative measures, such as the use of near-ultraviolet light to avoid powerline collisions, as reported by Dwyer et al (2019)? It would be good to see some discussion of such measures.