MAJOR ROAD PROJECTS VICTORIA

JULY 2020

TECHNICAL REPORT B1 – BIODIVERSITY EXISTING CONDITIONS

YAN YEAN ROAD UPGRADE – STAGE 2: KURRAK ROAD TO BRIDGE INN ROAD

Report No: 2135645A-N-32-ECO-REP-0002 REV00

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Technical Report B1 – Biodiversity Existing Conditions
Yan Yean Road Upgrade – Stage 2: Kurrak Road to Bridge Inn Road

Major Road Projects Victoria

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REV	DATE	DETAILS
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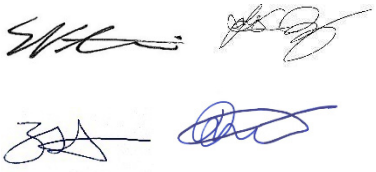
Prepared by:	Samantha Vertucci; Justin Pegg; Zoë Steven; Danelle Scicluna	15/07/2020	
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GLOSSARY

Biodiversity	The biological diversity of life is commonly regarded as being made up of the following three components: — Genetic diversity — the variety of genes (or units of heredity) in any population. — Species diversity — the variety of species. — Ecosystem diversity — the variety of communities or ecosystems.
Biodiversity value	Value relating to biodiversity
Bioregion (region)	A bioregion defined in a national system of bioregionalisation (DELWP 2017a). The Project Area is located mostly within the Highlands Southern Fall bioregion, with the northern part occurring within the Victorian Volcanic Plains.
Canopy Tree	Defined under the *Guidelines for the removal, destruction or lopping of native vegetation* (DELWP 2017b) (Guidelines 2017) as a native mature tree (i.e. it can flower) that is greater than 3 metres in height and is normally found in the upper layer of the relevant EVC. It can be a Scattered Tree or a tree in a patch (Refer to 'Scattered Tree' and 'Patch').
Department of Environment, Land, Water and Planning (DELWP)	The Victorian state environment department, which is responsible for Victoria's climate change, energy, environment, water, forests, planning, local government and emergency management. Formerly known as the Department of Environment and Primary Industries (DEPI).
Department of Agriculture, Water and the Environment (DAWE)	The department develops and implements national policy, programs and legislation to protect and conserve Australia's natural environment and cultural heritage and administers the EPBC Act. Most recent previous names include: — Department of the Environment and Energy (DoEE) — Department of the Environment (DoE) — Department of Sustainability, Environment, Water, Population and Communities (DSEWPAC) — Department of the Environment, Water, Heritage and the Arts (DEWHA).
Ecological community	An assemblage of species occupying a particular area.
Ecological value	Value relating to ecology.
Ecological Vegetation Class (EVC)	A type of native vegetation classification that is described through a combination of its floristics, life form and ecological characteristics, and through an inferred fidelity to particular environmental attributes. Each EVC includes a collection of floristic communities (i.e. lower level in the classification that is based solely on groups in the same species) that occur across a biogeographic range, and although differing in species, have similar habitat and ecological processes operating.
Ecology	The relationships between organisms and their environment and the study of these relationships.

Environmental weed	Any plant that invades native ecosystems and reduce the diversity and/or abundance of native flora or fauna.
Exotic	Introduced from outside the area. Used in the context of this report to refer to species introduced from overseas.
Habitat	An area or areas occupied, or periodically or occasionally occupied, by a species, population or ecological community, including any biotic or abiotic components.
Indigenous	Native to the area: not introduced.
Introduced	Not native to the area: not indigenous. Refers to both exotic and non-indigenous Australian native species of plants and animals.
Large Tree	Defined under Guidelines 2017 as a native canopy tree with a Diameter at Breast Height (DBH) greater than or equal to the large tree benchmark for the relevant bioregional EVC. A large tree can be either a large Scattered Tree or a large tree contained within a patch.
Likely	Taken to be a real chance or possibility.
Local population	The population that occurs within the site, unless the existence of contiguous or proximal occupied habitat and the movement of individuals or exchange of genetic material across the boundary can be demonstrated. The local population of migratory or nomadic fauna species comprises those individuals likely to occur in the Project Area from time to time or return year to year.
Locality	The area within a 5 km radius of the Project Area.
Migratory species	Capitalisation of the term 'Migratory' in this report refers to those species listed as Migratory under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999.* The listing of these species relates to international agreements to which Australia is a signatory. These include Japan-Australia Migratory Bird Agreement, China-Australia Migratory Bird Agreement, Republic of Korea-Australia Migratory Bird Agreement and the Bonn Convention on the Conservation of Migratory Species of Wild Animals.
Matters of National Environmental Significance (MNES)	Matters listed pursuant to the *Environment Protection and Biodiversity Conservation Act 1999*. These include: listed threatened species and ecological communities, Migratory species protected under international agreements, wetlands of international importance (listed under the Ramsar Convention), Commonwealth marine environment, World Heritage Properties, National Heritage Places, the Great Barrier Reef Marine Park, Commonwealth marine areas, nuclear actions, and a water resource (in relation to coal seam gas development and large coal mining development).
Nocturnal call playback	A survey technique undertaken (at night) which attempts to stimulate fauna species to call by imitating or playing their call at probable breeding sites.
No-go Zones	Areas of native vegetation which will be retained and protected during construction.

Noxious weed	An introduced species listed under the *Catchment and Land Protection Act 1994*. Under the Act, noxious weeds have specific control and reporting requirements.
Patch	Defined under Guidelines 2017 as an area of vegetation where at least 25 per cent of the total perennial understorey plant cover is native, or any area with three or more native trees where the drip line of each tree touches the drip line of at least one other tree, forming a continuous canopy, or any mapped wetland included in the Current Wetlands map, available in DELWP systems and tools.
Potentially Threatening Processes	The state equivalents of Key Threatening Processes, Potentially Threatening Processes are listed under Section 10 of the *Flora and Fauna Guarantee Act 1988* (FFG Act).
Project Area	Defined as the entire extended footprint of the project works. This includes areas of land that are outside the proposed Right of Way where works are expected to be completed.
Protected flora (Victoria)	Protected flora are: — plants that have been declared to be protected under section 46 of the FFG Act — plants that are listed as threatened under section 10 of the FFG Act — plants that belong to communities that are listed as threatened under section 10 of the FFG Act.
Recovery plan	A plan prepared under the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* to assist the recovery of a threatened species, population or ecological community.
Revegetation	Establishment of native vegetation to a minimum standard in formerly cleared areas, outside of a Remnant Patch
Scattered tree	Defined under Guidelines 2017 as a Canopy Tree that does not form part of a remnant patch.
Significant impact	A 'significant impact', as defined by the Commonwealth of Australia (Department of the Environment 2013a) is an impact which is "important, notable, or of consequence, having regard to its context or intensity". For Commonwealth-listed values, this is determined through assessment against the relevant Commonwealth criteria for the species or community. For other values, any impact that permanently affects their quality or viability may be considered significant.
Significant value (biodiversity or ecological)	Important, weighty or more than ordinary; typically used to describe a species, community, habitat or ecological relationship which is important at a local, regional, state or federal level. A significant species in this report is one which is listed under the relevant environmental legislation or by DELWP.
Small Tree	Defined under Guidelines 2017 as a native canopy tree with a Diameter at Breast Height (DBH) less than the large tree benchmark for the relevant bioregional EVC.

Species richness	Species richness is simply the number of species present in a sample, community, or taxonomic group. Species richness is one component of the concept of species diversity, which also incorporates evenness, that is, the relative abundance of species.
Study area	The study area for this assessment is the Project Area plus additional land where required to provide context or account for potential tree impacts.
The Project	The Yan Yean Road Upgrade Stage 2 project.
Threatened species, populations and ecological communities	Species, populations and ecological communities listed as Vulnerable, Endangered or Critically Endangered (collectively referred to as Threatened) under state and/or Commonwealth legislation (including FFG Act or the EPBC Act).
Weed	A plant growing out of place or where it is not wanted, often characterized by high seed production and the ability to colonise disturbed ground quickly. Weeds include both exotic and Australian native species of plant naturalised outside of their natural range.

ABBREVIATIONS

CaLP Act	*Catchment and Land Protection Act 1994*
CMA	Catchment Management Area
DELWP	Victorian Department of Environment, Land, Water and Planning
DAWE	Commonwealth Department of Agriculture, Water and the Environment
EPA	Environment Protection Authority Victoria
EVC	Ecological Vegetation Class
EE Act	*Environment Effects Act 1978*
EES	Environment Effects Statement
EMF	Environmental Management Framework
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
FFG Act	Victorian *Flora and Fauna Guarantee Act 1988*
GDE	Groundwater-dependent ecosystem
GIS	Geographic Information System. a system for storing and manipulating geographical information on computer
GPS	Global Positioning System- a navigational tool which uses radio receivers to pick up signals from four or more special satellites to provide precise determination of location
Guidelines 2017	*Guidelines for the removal, destruction or lopping of native vegetation* (DELWP 2017b)
MNES	Matters of National Environmental Significance - Matters listed pursuant to the *Environment Protection and Biodiversity Conservation Act 1999*
MRPV	Major Road Projects Victoria
NGZ	No-go Zone
P&E Act	*Planning and Environment Act 1987*
PMST	Protected Matters Search Tool
sp.	Abbreviation of species (single)
spp.	Abbreviation of species (multiple)
SRZ	Structural Root Zone
subsp.	Abbreviation of subspecies
TPZ	Tree Protection Zone
TRG	Technical Reference Group
VBA	Victorian Biodiversity Atlas
VicAdv	Species on the Victorian Advisory List (Victorian rare or threatened advisory lists administered by DELWP)
WoNS	Weed of National Significance – weed listed by the Commonwealth of Australia based on invasiveness, potential for spread and environmental, social and/or economic impacts
WVC	Wildlife-vehicle collisions

EXECUTIVE SUMMARY

INTRODUCTION

WSP Australia Pty Limited (WSP) was engaged by MRPV to prepare an assessment of existing flora and fauna values for the proposed Yan Yean Road Upgrade – Stage 2 (the 'Project'). Located in outer north east Melbourne, Victoria, the Project consists of approximately 5.5 km of road infrastructure upgrades to Yan Yean Road between Kurrak Road, Yarrambat and Bridge Inn Road, Doreen.

The objective of this study was to address the Environment Effects Statement (EES) Scoping Requirements with regard to existing conditions for biodiversity. This has been done through detailing the significant biodiversity and ecological values of the Project Area. The significant values include those listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), *Flora and Fauna Guarantee Act 1988* (FFG Act) and the Victorian Rare or Threatened Species Advisory Lists (DEPI 2014; DSE 2009, 2013), and their habitat.

PROJECT AREA

The Project Area is located 25 km north east of the Melbourne CBD. The existing road runs in a north south direction through the townships of Yarrambat and Plenty within the Local Government Areas of Nillumbik and Whittlesea. The Project occurs largely within the Highlands Southern Fall Bioregion with a small area within the Victorian Volcanic Plains Bioregion. It includes some agricultural land to the north, larger rural residential blocks and smaller urban residential blocks. It also includes some large areas of public land, including the Yarrambat Park Public Golf Course and Plenty Gorge Parklands.

The Project Area and surrounds has been subject to high levels of historical vegetation clearance, however still maintains moderate biodiversity values such as intact stands of native vegetation in the road reserve, a high number of large hollow bearing trees and habitat for threatened species.

At the time of this assessment, several design options are being examined. As such, this Project Area includes the area required for all options.

SCOPE OF ASSESSMENT

WSP have built upon an initial Biodiversity Technical Assessment Report was produced by Arcadis (Arcadis 2018) for this study.

The following was completed for this existing conditions assessment report:

- A database and literature review used to prepare a list of threatened flora and fauna species, ecological vegetation classes (EVCs), threatened communities, listed migratory species and any significant habitat previously recorded or predicted to occur in the Project Area and the broader locality.
- Field surveys to determine the significant values present including:
  - targeted flora survey
  - building upon previous vegetation assessment and mapping that had been completed, verification of previous mapping and update of habitat hectare assessment
  - targeted fauna survey and habitat mapping.
- Assessment of existing conditions including consolidation of records, likelihood of occurrence and habitat assessment.

LEGISLATION AND POLICY

ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999

The Project supports Matters of National Environmental Significance (MNES), recognised under the EPBC Act, in the form of listed flora and fauna species. The Project is being assessed through a bilateral agreement between the Commonwealth of Australia and the State of Victoria. As such. this study includes consideration of both state and Commonwealth listed ecological values.

ENVIRONMENT EFFECTS ACT 1978

A self-assessment against the criteria was completed in 2018. This assessment, based on the information available at the time, identified that one or more individual effects may be triggered. Subsequently, the Project was the subject of an EES Referral, and a determination was made by the Minister for Planning that an EES was required.

FLORA AND FAUNA GUARANTEE ACT 1988

An FFG Act permit will be required. Based on this assessment, several FFG Act values will require permits:

- eight Protected flora species
- one listed flora species: Matted Flax-lily (if proposed for removal)
- species in one listed community: Western Basalt Plains (River Red Gum) Grassy Woodland/

GUIDELINES FOR THE REMOVAL, DESTRUCTION OR LOPPING OF NATIVE VEGETATION

Native vegetation impacts will need to be calculated in accordance with the Guidelines 2017 to determine the offsets required for the Project.

WILDLIFE ACT 1975

The Project Area supports hollow-bearing trees and other fauna habitat. Any persons involved in fauna removal, salvage, capture or relocation of fauna must hold a current Management Authorisation under this Act.

CATCHMENT AND LAND PROTECTION ACT 1994 (CALP ACT)

The field surveys identified that the Project Area supports six regionally controlled (C) and three restricted (R) weeds pursuant to the CaLP Act. It is the responsibility of the landowner to control these weeds on their property, and of state government (including Department of Transport) to control them on state roads. Seven of these weed species are also listed as Weeds of National Significance (WoNS) by the Australian Government.

PLANNING SCHEMES

The Project Area spans multiple zones in both the Whittlesea and Nillumbik planning schemes, with much of the existing road reserve zoned as Road Development Zone (RDZ1 & RDZ2). In Nillumbik Shire, other zones include Low Density residential and Rural Conservation, with a large area of Public Park and Recreation zone for Yarrambat Park and the Golf Course. In the City of Whittlesea, the north-western part of the Project Area is zoned General Residential and Mixed Use.

The Project Area is also partly located within an Environmental Significance Overlay Schedule 1 (ESO1) of the Nillumbik Planning Scheme and a Vegetation Protection Overlay Schedule 1 (VPO1) of the Whittlesea Planning Scheme.

There are a number of areas with planted indigenous, Victorian and other Australian native species within the Project Area. Under Section 52.17-7 of all Victorian Planning Schemes, there is an exemption to obtaining a planning permit for planted vegetation, unless the vegetation was planted with government funding. DELWP interprets vegetation planted along a roadside by a road authority not to be for conservation purposes, and therefore exempt from a planning permit and offsets.

EXISTING CONDITIONS

VEGETATION AND TREES

A total of 17.307 ha of native vegetation and 2499 Canopy Trees were mapped in the Project Area, with 211 of the trees being Large Trees as defined under the *Guidelines for the removal, destruction or lopping of native vegetation* (DELWP 2017b) ('Guidelines 2017'). These Large Trees included 47 large Scattered Trees and 164 large trees in patches. 187 of the Canopy Trees within the Project Area were mapped as small Scattered Trees. See glossary for definitions of tree types.

Seven EVCs were recorded within the Project Area, with the most commonly recorded EVC being EVC 22: Grassy Dry Forest.

No EPBC Act threatened ecological communities were recorded in the Project Area. One FFG Act listed community, Western (Basalt) Plains Grassy Woodland, occurs within the Project Area in a modified condition. The extent of this community is 0.233 ha.

There are 6203 trees and shrubs >3 m in the Project Area, including indigenous, planted native and exotic trees. This includes all vegetation, not just that defined as native under the Guidelines 2017 as described above.

SIGNIFICANT FLORA

A total of 182 vascular plant species were recorded in the Project Area during field assessments, of which 118 (65%) are indigenous, 3 (2%) are planted and 61 (33%) are introduced.

Targeted orchid surveys and other targeted flora surveys were undertaken. One species listed under the FFG Act and EPBC Act occurs within the Project Area: Matted Flax-lily *Dianella amoena*. Two species listed on the Victorian Advisory List of Threatened Flora Species were recorded in the Project Area: Studley Park Gum *Eucalyptus studleyensis* and Pale-flowered Crane's Bill *Geranium* sp 3.

FAUNA

Eighty-eight fauna species were recorded in the Project Area, either during targeted fauna surveys or incidental sightings during vegetation assessments. Habitat assessments and/or targeted surveys were conducted for Eltham Copper Butterfly *Paralucia pyrodiscus lucida*, Brush-tailed Phascogale *Phascogale tapoatafa*, Growling Grass Frog *Litoria raniformis*, Southern Toadlet *Pseudophryne semimarmorata*, Brown Toadlet *Pseudophryne bibronii* and the Powerful Owl *Ninox strenua*, Masked Owl *Tyto novaehollandiae* and Barking Owl *Ninox connivens*. None of the above species were recorded during these assessments, although one EPBC Act and FFG Act listed species, Grey-headed Flying-fox *Pteropus poliocephalus*, was recorded.

The Project Area is likely or known to be foraging habitat for several fauna species, including the EPBC Act listed Grey-headed Flying-fox and Swift Parrot *Lathamus discolor*. The FFG Act listed Brush-tailed Phascogale *Phascogale tapoatafa* may periodically disperse from or between local populations via vegetation in the Project Area, although is unlikely to be a regular resident.

CONCLUSION

The following key biodiversity values have been identified in the Project Area:

- 17.307 ha of native vegetation (patches) from seven EVCs. his includes some areas of more intact native vegetation as well as degraded native vegetation.
- 0.233 ha of an FFG Act listed community, Western Basalt Plains (River Red Gum) Grassy Woodland, in a modified condition.
- 2499 native Canopy Trees. 211 of these are Large Trees as per the relevant EVC benchmark, including 47 large Scattered Trees and 164 Large Trees in patches. 187 of these Canopy Trees within the Project Area are small Scattered Trees.
- Potential habitat for the Swift Parrot, listed under the EPBC Act and FFG Act, including 1.82 ha of key habitat (potential floral resources) and 5.48 ha of secondary habitat (potential lerp resources), totalling 2315 trees.
- Foraging habitat for the Grey-headed Flying-fox, listed under the EPBC Act and FFG Act, including both planted and remnant trees.
- Potential dispersal habitat for the FFG Act listed Brush-tailed Phascogale, particularly in the southern part of the Project Area.
- Potential habitat for other listed fauna species, although no habitat of high value is likely to be present.
- Two Matted Flax-lily plants, listed under the EPBC Act and FFG Act, and one Studley Park Gum, listed as endangered on the Victorian Advisory List of threatened plants.
- Habitat and connectivity for numerous non-listed fauna species including in the remnant and planted native vegetation, exotic vegetation, 99 trees with medium-large hollows (as estimated by the arborist from the ground), and small wetlands/drainage lines.

1 INTRODUCTION

Major Road Projects Victoria (MRPV) proposes to duplicate Yan Yean Road from Kurrak Road to Bridge Inn Road as part of the Yan Yean Road Upgrade – Stage 2 (the Project).

On 14 October 2018, the Minister for Planning decided that an Environment Effects Statement (EES) is required under the *Environment Effects Act 1978* (EE Act) to assess the potential environmental effects of the Project. The EES process provides for identification and analysis of the potential environment effects of the Project and the means of avoiding, minimising and managing adverse effects. It includes public involvement and allows stakeholders to understand the likely environmental effects of the Project and how they will be managed.

This flora and fauna existing conditions assessment report has been prepared for the EES in accordance with the Scoping Requirements released by the Minister for Planning in June 2019.

The Project is being assessed through a Bilateral agreement between the Commonwealth of Australia and the State of Victoria. As such. this study includes consideration of both state and Commonwealth listed biodiversity values.

1.1 BACKGROUND

Yan Yean Road is a primary north-south arterial road and connects the growth suburb of Doreen, with major east west arterials such as Bridge Inn Road, Kurrak Road and Diamond Creek Road. The road runs through the townships of Yarrambat and Plenty and connects with established areas of Diamond Creek and Greensborough. There is a high demand for north-south travel from Doreen and surrounding towns to established northern suburbs for employment and services.

Stage 1 of the Yan Yean Road upgrade (Diamond Creek Road to Kurrak Road) was completed in 2019, and Stage 2 (this Project) is a continuation of the works to the north of Stage 1, up to the intersection of Yan Yean Road with Bridge Inn Road.

1.2 PROJECT DESCRIPTION

The Project would duplicate a 5.5 km portion of Yan Yean Road between Kurrak Road and Bridge Inn Road increasing the existing two lanes to four lanes (comprising two lanes in each direction). The design speed along Yan Yean Road is 70 km/h, with the exception of north of Bridge Inn Road which is 80 km/h. The design for the Project has 3.5 metre wide lanes with the majority of the Project using a 2.2 metre-wide central median. This cross section was adopted in design due to various constraints ranging from road safety issues, steep and rolling terrain, high cut and fill batters and subsequent retaining walls at certain locations, as well as seeking to limit impacts to existing properties, local accesses and trees along Yan Yean Road.

The Project will include:

- two new roundabouts (at Heard Avenue, and Youngs Road)
- five new signalised intersections (Bannons Lane, Jorgensen Avenue, North Oatlands, Orchard and Bridge Inn Roads)
- upgrades to one existing signalised intersection, including an additional right hand turning lane, slip lane, and traffic island (Ironbark Road)
- new street lighting at all intersections, road signage and landscaping.

The Project will also include a new 3 metre wide shared user path on the western side and 1.2 metre wide footpath on the eastern side of Yan Yean Road. The paths links Diamond Creek to Doreen and would improve safety and connectivity for pedestrians and cyclists.

Continuous safety barriers would run along the Project's length and are proposed in the median and behind outer kerbs along the mid-block sections of the carriageways.

The Project Area and key Project components are shown in Figure 1.1. Refer to Appendix A *Project Description – Draft Yan Yean Road Upgrade – Stage 2* for further details.

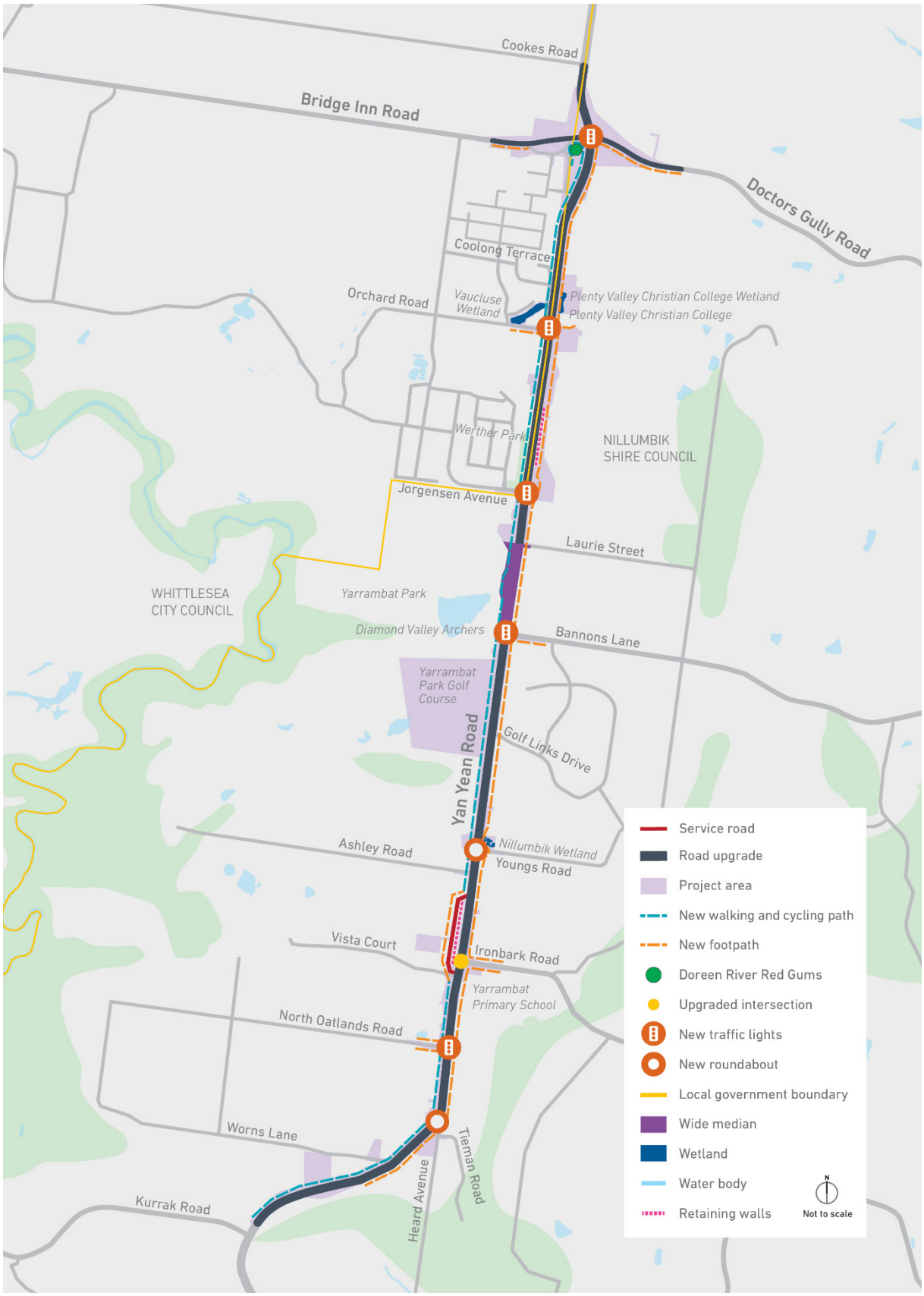
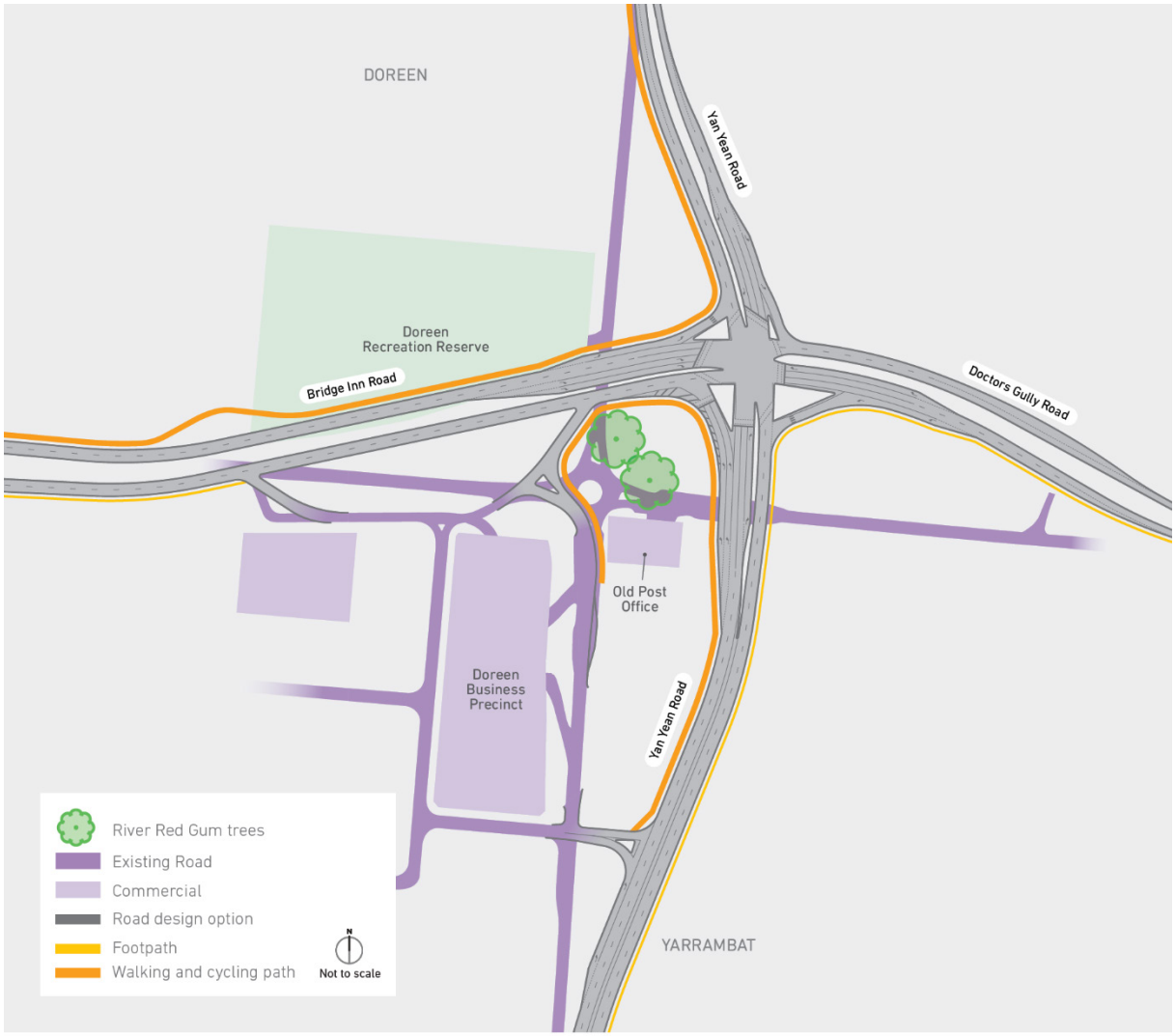


Figure 1.1 Project area

1.2.1 YAN YEAN / BRIDGE INN / DOCTORS GULLY ROAD INTERSECTION

The Yan Yean/Bridge Inn/Doctors Gully Road intersection has been designed to retain the two Doreen River Red Gums, General Store and Pet Supply/Stockfeed business situated adjacent to the current Doctors Gully and Yan Yean Road intersection by shifting the whole intersection to the north east (see Figure 1.2). This intersection design has been developed following community consultation and in response to arboricultural advice on the Doreen River Red Gums.



For illustrative purposes only and subject to change

Figure 1.2 Bridge Inn Road intersection design

1.2.2 CONSTRUCTION ACTIVITIES

Proposed construction activities would likely be standard road construction activities to be undertaken in accordance with the Environmental Performance Requirements for the Project. These construction activities would include:

- tree clearance and vegetation lopping and removal
- establishment of construction site compounds
- clearing and grubbing, temporary sediment and erosion control works
- establishment of environmental and traffic controls
- earthworks, including:
  - remediation of any existing contamination and removal of any hazardous material
  - protecting and relocating services
  - widening of existing rock cuttings (approximately 750 m of existing cut along the Project would be widened by approximately 20 metres)
  - new cuttings (approximately 1300 m of new rock cut would be required to a width of approximately 5 metres along the Project)
  - bulk earthworks and haulage
- civil and structure works, including:
  - roundabouts and intersection upgrades
  - shared user path and pedestrian path construction and connections
  - retaining walls
  - drainage works
  - pavement works
- 30–36 metre high fence along the edge of the Yarrambat Park Golf Course to avoid golf ball collisions with pedestrians, cyclists or vehicles
- traffic management systems and landscaping.

1.3 PROJECT OBJECTIVES

The Project aims to improve travel times and reliability to and from growing residential areas in Doreen and Mernda, enhance north-south travel in the area, and improve safety along the corridor. The objectives of the Project are set out below:

- **To improve road safety**: The Project will achieve this by isolating road users from hazards and improving access control through signalised intersections. Congestion and the complex road environment (poor sight lines due to undulating linear/perpendicular grades and adjacent terrain) are presently contributing to the poor safety record on Yan Yean Road.
- **To improve the customer experience**: The Project will achieve this by improving access, improving network connectivity, opportunities for active transport, and providing more road capacity.
- **To improve network efficiency**: The Project will achieve improved traffic flow and a reduction in travel times by increasing road capacity and reducing congestion.

1.4 PROJECT AREA

The Project Area is the area for which planning and environmental approvals are being sought for the Project and within which all impacts are proposed. This is shown in Figure 1.1.

For the ecological study, land beyond the Project Area was also examined to provide context for the assessment. For example:

- for trees assessed in this report, the Project arborist examined trees at least 15 m from the Project boundary to account for any potential impacts to tree roots
- for database assessment, a 5 km buffer of the Project Area was searched
- for habitat linkages, aerials were examined, including land up to two kilometres away
- for vegetation and habitat, the immediate surrounds were examined (up to around 20 m), although was not mapped.

The north-western extent of the Project Area, in the City of Whittlesea (Cookes Road to Jorgensen Avenue), consists of residential development and some larger rural-residential blocks. The surrounding landscape has been substantially altered from pre-European condition through land clearing for agricultural uses, however several large trees remain.

The remainder and majority of the Project Area occurs within Nillumbik Shire Council and contains low-density semi-rural residential blocks and land supporting a range of public land uses. The landscape is characterised by open space, remnant patches of vegetation in the road reserve, planted vegetation and a number of large trees.

The Project Area, being associated with an established road passing through a semi-rural and residential landscape, is predominantly moderately to highly modified. However, it supports patches of remnant vegetation, scattered remnant trees, a large number of planted trees, and some modified dams and drainage lines with poor connectivity.

The Project Area is primarily within the Highlands Southern Fall bioregion, with the northern part occurring within the Victorian Volcanic Plains. For more information regarding the local context of the Project Area, refer to Section 5.1.

The Project Area is not located within the Melbourne Strategic Assessment area.

1.5 STUDY OBJECTIVES AND SCOPE

The objective of this study was to detail the significant biodiversity and ecological values of the Project Area and surrounds that may be relevant to the Project.

This report provides results from all biodiversity surveys completed for this Project to date by WSP and its subconsultants.

It incorporates and builds upon the work completed previously for the Biodiversity Impact Assessment undertaken by Arcadis (2018) who subconsulted to WSP for the earlier stage of assessment. This work, and work by other subconsultants, is referenced throughout where relevant.

The following scope of works has been undertaken by WSP to expand upon the previous study:

- desktop review of flora and fauna databases and relevant biodiversity strategies, policies and legislation
- review of Habitat Hectare assessments and verification and refining of previous mapping (Arcadis 2018) and mapping of additions to the Project boundary
- targeted flora survey
- fauna habitat assessment and targeted surveys
- new likelihood of occurrence assessment of threatened flora, fauna and communities listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) the *Flora and Fauna Guarantee Act 1988* (FFG Act) and/or listed on the Victorian Rare or Threatened Species Advisory Lists (DEPI 2014; DSE 2009, 2013).

2 EES SCOPING REQUIREMENTS

The *Scoping Requirements for Yan Yean Road (Stage 2) Upgrade Environment Effects Statement* (June 2019) (DELWP 2019a) were issued by the Minister for Planning. The Scoping Requirements set out the specific environmental matters to be investigated and documented in the EES, which informs the scope of the EES technical studies. This study has been undertaken against these requirements.

The Project is being assessed through a Bilateral agreement between the Commonwealth of Australia and the State of Victoria. As such, the scoping requirements include consideration of both state and Commonwealth listed ecological values. Further information regarding relevant legislation is provided in Section 4.

2.1 THE MINISTER'S REQUIREMENTS FOR THE EES

The Minister's decision to require an EES included the procedures and requirements applicable to its preparation, in accordance with section 8B(5) of the EE Act. These requirements included the following key matters for the EES to examine:

- *projected traffic growth volumes and related uncertainties for Yan Yean Road and related roads in the network;*
- *design alternatives and refinements and their associated impacts, particularly how they avoid and minimise native tree loss with proposed locations of tree and vegetation removal, no go zones and offset requirements and a demonstration that avoid and minimise principles have been applied; and*
- *consideration of carriageways, medians, shared pathways, footpaths, intersections and other treatments to minimise the loss of preferred foraging trees for the critically endangered Lathamus discolor (Swift Parrot) and avoidance of high retention trees of ecological and cultural value.*

In line with the scoping requirements relevant to existing conditions of flora and fauna, this report responds to the scoping requirement: *Characterises the existing environment to underpin impact assessments having regard to the level of risk.*

2.2 DRAFT EVALUATION OBJECTIVE

The Minister's Scoping Requirements included the following draft evaluation objective:

To avoid or, at least, minimise adverse effects on native vegetation (including remnant, planted, regenerated and large old trees), listed migratory and protected species/ecological communities and then to address offset requirements consistent with relevant state and commonwealth policies.

2.3 SPECIFIC REQUIREMENTS FOR ASSESSMENT OF EFFECTS

Table 2.1 provides the specific requirements for assessing effects as defined in the EES Scoping Requirements relating to biodiversity. This report addresses those related to the Existing Environment only.

Table 2.1 Biodiversity assessment requirements for the Project

BIODIVERSITY ASSESSMENT REQUIREMENTS
Key issues
Potential for significant effects on biodiversity values including effects associated with threatening processes listed under the EPBC Act and/or *Flora and Fauna Guarantee Act 1988* (FFG Act) including, but not limited to, Swift Parrot, Matted Flax Lily, Studley Park Gum and large old trees.
Potential for direct or indirect impact on vegetation and other landscape elements used by fauna listed under the EPBC Act, FFG Act and/or DELWP Advisory List.
Potential loss or degradation of habitat (and/or habitat connectivity) including tree hollows, existing canopy and woody debris, due to removal of trees.
Potential impacts to MNES through erosion, sedimentation and contamination of watercourses and groundwater near and downstream from the project site resulting from the construction and operation of the project.
Existing environment
Characterise species, origin, dimension, health and lifespan of trees that may be affected by the project assuming current conditions continue, and appropriate care is provided.
Describe the biodiversity values that could be directly or indirectly affected by the project, including: — native vegetation and ecological communities listed under the EPBC Act, FFG Act and DELWP Advisory List; and — native flora and fauna species (including assessment of likelihood of presence), particularly those listed under the EPBC Act, FFG Act and DELWP Advisory Lists — adequate surveys for EPBC Act listed threatened species and ecological communities should be undertaken in accordance with Commonwealth Conservation Advices and Threatened Species Recovery Plans and completed prior to exhibition of the EES.
Likely effects
Assess the potential effects (including facilitated) of the project (and feasible alternatives) on trees (including remnant, planted, regenerated and large old trees).
Assess the potential effects (including facilitated) of the project (and feasible alternatives) on native vegetation, ecological communities and flora species, in particular any listed under the EPBC Act, FFG Act and DELWP Advisory list.

BIODIVERSITY ASSESSMENT REQUIREMENTS
Assess the potential effects (including facilitated) of the project (and feasible alternatives) to biodiversity values, including but not limited to: — removal or destruction of habitat (including remnant, regenerated or planted vegetation) — disturbance or alteration of habitat conditions or other sources of increased habitat threat — initiating and/or exacerbating potentially threatening processes under the EPBC Act and FFG Act — increasing risk of mortality of fauna listed under the EPBC Act, FFG Act and DELWP Advisory List (e.g., through increased car strikes of fauna) — introduction and/or spread of declared weeds or pathogens within or near the Project Area; and — impacts to MNES caused by water quality changes within and downstream of the Project Area.
Assess the potential effects (including facilitated) on habitat connectivity and wildlife movement of fauna species listed under the EPBC Act, FFG Act and DELWP Advisory List.
Design and mitigation
Develop design options and measures that can avoid or minimise significant direct and indirect effects on trees and develop strategies to address the loss of trees or effects of further habitat fragmentation.
Identify design options and measures that could avoid or minimise significant direct and indirect effects on native vegetation, listed ecological communities, or protected flora and fauna species and their habitat, including habitat connectivity and associated wildlife movement.
Develop rehabilitation strategies to enable the recovery or restoration/replanting of vegetation that can provide habitat for protected and listed threatened species and amenity to local community, consistent with any relevant threat abatement plan or conservation action plan.
Develop offset strategies to offset loss of native vegetation consistent with state and commonwealth policies. If translocation of Matted Flax-lily is proposed, detailed information and justification about the proposed recipient site, risks of transfer, expected losses, likelihood of long-term success of translocated plants, and any uncertainties should be provided, with reference to current scientific advice and evidence from previous examples of translocations of the species.
Justify and describe the assumptions and level of uncertainty associated with the proposed measures achieving their desired outcomes.
Performance objectives
Describe and evaluate the approach to monitoring and subsequent contingency measures to be implemented in the event of adverse residual effects on biodiversity values requiring further management.
Describe and evaluate proposed measures to manage residual effects of the project on biodiversity values, including an outline of an offset strategy and offset management plan that sets out proposed environmental offsets to satisfy commonwealth offset policy requirements.

3 METHODOLOGY

This chapter provides the methodology for the flora and fauna assessment and the specific methods for each component of this study.

3.1 PERSONNEL

The contributors to this study, their qualifications and project roles are provided in Table 3.1.

Table 3.1 Contributors and their roles

NAME	QUALIFICATIONS	POSITION AND ROLE/S ON PROJECT
Samantha Vertucci	BSc (Hons)	Ecologist – ecology project lead, fauna specialist Field survey, lead report preparation
Justin Pegg	BSc, MEnv & Sus	Senior Ecologist – botanical specialist Field survey, vegetation assessment and reporting
Nic McCaffrey	BSc	Principal Ecologist – Ecology project director Flora field survey, report review
Zoë Steven	BSc (Hons), M. ENV	Ecologist – Report preparation
Allan Richardson	BEnv (Hons)	Senior Ecologist and avifauna specialist Swift Parrot survey and habitat assessment
Jake Urlus	BEnvSc Hons	Principal Zoologist – terrestrial fauna Terrestrial fauna review. Growling Grass Frog survey and habitat assessment
Rob Gration	M. Wildlife Mgmt (Habitat), GradCertApSc (Wildlife Ecology/ Mgmt), DipApSc (NRM)	Principal Ecologist (subconsultant) Terrestrial fauna survey (Brush-tailed Phascogale) and data analysis
Rodney van der Ree	PhD	Ecology Technical Executive Contribution to mitigation strategy particularly connectivity measures
Ed McNabb	GradCertAppSc (Ornithology)	Wildlife ecologist – nocturnal fauna (subconsultant – Ninox Pursuits) Owl habitat assessment and surveys
Danelle Scicluna	BEnvSc	Graduate Ecologist Desktop searches, data management and report preparation
Karl Just	Dip Cons & Land Mgmt	Orchid survey (subconsultant)
Roanne Pancho	BSc (Geospatial Science) (Hons)	GIS Consultant Mapping and data processing

3.2 TAXONOMY

Fauna taxonomy in this report predominantly follows the Australian Faunal Directory (AFD), a Commonwealth DAWE database maintained and updated by the Australian Biological Resources Study (ABRS 2009).

Flora taxonomy predominantly follows the Victorian Biodiversity Atlas (DELWP 2019b).

Plant and animal species in this report are initially cited by both common and scientific name, with scientific name in italics. Subsequent references to a species cite the common name only. Introduced species are identified within text with an asterisk, for example Quaking Grass **Briza maxima*.

3.3 EXISTING CONDITIONS

3.3.1 DATABASE AND LITERATURE REVIEW

A database search and literature review was undertaken by Arcadis (Arcadis 2018) to inform an initial understanding on the ecological values of the Project Area and surrounds. Relevant databases were searched for records of threatened species within 5 km of the Project Area. WSP conducted another search of relevant databases in April 2019 for more up to date results, including species listed on the Victorian Advisory Lists of Threatened Flora and Fauna (DEPI 2014; DSE 2009) which were omitted from the earlier assessment.

This review was used to prepare a list of threatened flora and fauna species, ecological communities, migratory species and any significant habitat previously recorded or predicted to occur in the Project Area and the broader locality (listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and *Flora and Fauna Guarantee Act 1988* (FFG Act). The following sources of information were consulted:

- The Victorian Department of Environment, Land, Water and Planning (DELWP) Biodiversity Interactive Map (now NatureKit) (DELWP 2018b)
- The Victorian Biodiversity Atlas (VBA) (DELWP 2018c) – 5 km radius of the Project Area
- Birddata (Birdlife Australia database) – used to examine bird records near the Project Area
- Ebird (online birdwatching database) – used to examine Swift Parrot and other bird records near the Project Area
- The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) Protected Matters Search Tool – 5 km radius of the Project Area (DoEE 2019)
- The Commonwealth Department of the Environment Species Profile and Threats Database
- Victorian Rare or Threatened Species Advisory Lists (DEPI 2014; DSE 2009, 2013)
- *Guidelines for the removal, destruction or lopping of native vegetation* (DELWP 2017b) Native Vegetation Information Management System (DELWP 2020)
- aerial imagery to determine habitat extents and linkages
- relevant legislation, government policy and strategies
- publicly available geospatial datasets
- several previous ecology studies had been conducted within the Project Area for this current Project and the immediately adjacent area. These reports were consulted to assist in the determination of likely threatened species present and targeted surveys likely to be required.

3.3.2 FIELD SURVEY SUMMARY

Table 3.2 provides a summary of the various surveys and assessments completed by WSP and other consultants for this Project. They are described in more detail in the following sections under Vegetation (Section 3.3.3), Flora (3.3.4) and Fauna (3.3.5).

Table 3.2 Summary of field surveys and assessments conducted for the Project

SPECIES AND ASSESSOR	SURVEY METHODOLOGY	RELEVANT GUIDELINES	DATES
Vegetation			
Initial vegetation assessment (Ecology and Heritage Partners)	Vegetation mapping and habitat hectare assessments	*Vegetation Quality Assessment Manual-Guidelines for applying the habitat hectares scoring method* (DSE 2004).	April, May and September 2017
Further vegetation assessment, verification and general flora surveys (Arcadis)	Further mapping and habitat hectare assessments	*Vegetation Quality Assessment Manual-Guidelines for applying the habitat hectares scoring method* (DSE 2004).	Spring/early summer 2018
Vegetation ground-truthing (WSP)	Vegetation value assessment and refining of the vegetation mapping, habitat hectare assessments and GIS shapefiles.	*Vegetation Quality Assessment Manual-Guidelines for applying the habitat hectares scoring method* (DSE 2004).	15 May 2019
Further vegetation assessment (additions to Project Area) (WSP)	Vegetation assessment for new areas and further refinement of the vegetation mapping, habitat hectare assessments and GIS shapefiles. Incorporation of new arborist data for trees.	*Vegetation Quality Assessment Manual-Guidelines for applying the habitat hectares scoring method* (DSE 2004).	Survey on 30 March, 7 April 2020
Flora			
Listed Orchids (Karl Just)	Targeted surveys were conducted during the flowering season (late July – early August) for three listed orchid species. Three repeats of the survey were conducted to maximise likelihood of the survey timing coinciding with flowering time for the species.	*Survey guidelines for Australia's threatened orchids – Guidelines for detecting orchids listed as threatened under the EPBC Act 1999* (Department of Environment 2013)	14 August 2018 22 August 2018 7 September 2018
Various other threatened flora species (WSP)	Further surveys were conducted to verify records of two threatened flora species and search for other significant species, especially those listed on the Victorian Advisory List. Surveys were undertaken using the random meander method (Cropper 1993).	No guidelines for the target species.	21 December 2018 11 January 2019

SPECIES AND ASSESSOR	SURVEY METHODOLOGY	RELEVANT GUIDELINES	DATES
Fauna			
Brown and Southern Toadlet (Practical Ecology)	Nine sites, comprising wetlands, dams and gullies, were assessed for presence of likely habitat and for evidence of calling toadlets.	There are no relevant survey guidelines for either species. Reference was made to current research and previously published studies were consulted to inform of habitat requirements and potential sites in the Project Area.	21 May 2018
Brush-tailed Phascogale (EcoAerial)	Habitat assessment conducted in September 2017. Targeted surveys involved the combined use of remote sensing cameras (deployed at seven locations) and hair tubes (deployed at five locations).	There are no relevant survey guidelines for this species.	September 2017 7 November – 6 December 2017
Eltham Copper Butterfly (Practical Ecology)	Habitat assessment conducted to determine presence of host plant, Sweet Bursaria, and associated ants.	None	January 2018
Growling Grass Frog (WSP)	Surveys consisting of call playback and listening, followed by hand searching (where possible) were undertaken twice at eight primary sites, with an additional ninth site included on the second survey only.	*Survey guidelines for Australia's threatened frogs* (DEWHA 2010a)	15 January 2019 31 January 2019
Threatened Owls (Ninox Pursuits Environmental Services)	Call playback and spotlighting surveys for three target species were conducted on one occasion at six locations within the vicinity of the Project Area.	*Approved survey standards for Masked Owl Tyto novaehollandiae, Powerful Owl Ninox strenua and Sooty Owl Tyto tenebricosa* (DELWP 2011a, 2011b, 2011c)	2–3 November 2017 20 November 2017
Swift Parrot (WSP)	Formal survey points or meander transects, and habitat assessments at nine sites when the species is most likely to be present in winter.	*Survey Guidelines for Australia's Threatened Birds* (DEWHA 2010b).	4–5 July 2018 28–30 August 2018 5–7 August 2019

3.3.3 VEGETATION

Initial vegetation mapping was undertaken by Ecology and Heritage Partners over several days in April, May and September 2017 as stated in Arcadis (2018). This included mapping and habitat hectare assessments using the process described below for publicly-accessible land in the Project Area and some private property. Arcadis (2018) undertook further mapping and habitat hectare assessments in spring/early summer 2018. The mapping and habitat hectare assessments were ground-truthed and refined in the field by WSP on 15 May 2019 followed by further refining of the GIS files. Following changes to the Project boundary in early 2020, WSP ecologists conducted additional mapping and habitat hectare assessments on 30 March and 7 April 2020, followed by incorporation of new arborist data and further refinement of all vegetation data.

Further details on the process and methods are provided below.

3.3.3.1 PLANT IDENTIFICATION (WSP PROTOCOL)

During fieldwork conducted by WSP, flora species that could not be identified on site were recorded to the nearest possible family or genus. These were then collected and identified where possible as per protocols of WSP's Flora and Fauna Guarantee permit (10007800) for the collection of plant material.

3.3.3.2 DETERMINATION OF ECOLOGICAL VEGETATION CLASSES

An Ecological Vegetation Class (EVC) is a unit of consistent vegetation displaying broadly similar botanical characteristics reflecting consistent environmental and structural conditions (Oates & Taranto 2001). Field validation (or ground-truthing) of the DELWP modelled vegetation layer NV2005_EXTANT (DELWP 2018b) was undertaken to determine the site specific classification of the vegetation structure, floristics, wetland formations, dominant canopy species, native diversity and condition.

Terrestrial and wetland EVCs were mapped where the vegetation met the requirements for a remnant patch or scattered tree under the *Guidelines for the removal, destruction or lopping of native vegetation* (DELWP 2017b):

A *patch* of native vegetation is either:

- an area of vegetation where at least 25 per cent of the total perennial understorey plant cover is native
- any area with three or more native trees where the drip line of each tree touches the drip line of at least one other tree, forming a continuous canopy, or
- any mapped wetland included in the Current wetlands map, available in DELWP systems and tools.

A *scattered tree* is:

- a native canopy tree that does not form part of a remnant patch. Where they did not meet the criteria for remnant patches, scattered trees were recorded with a handheld GPS.

3.3.3.3 REVEGETATION CATEGORISATION

Revegetation and planting is extensive at some sites and there can be different implications and exemptions for clearing of revegetation under planning laws and other biodiversity legislation. Table 3.3 was considered for the purposes of assessing revegetation in the Project Area. The planning implications for all native vegetation recorded in the Project Area are provided in Section 4.3.

Table 3.3 Revegetation categories used for mapping

VEGETATION TYPE	DESCRIPTION	SCORING
Site indigenous	Indigenous to a local area. Described by (Pyšek, Richardson & Williamson 2004) and adopted by (Royal Botanic Gardens Melbourne 2016), defined as 'taxa that have originated in a given area without human involvement or that have arrived there without intentional or unintentional intervention of humans from an area in which they are native'.	There are exemptions for requiring a planning permit under Victorian Planning Schemes, Clause 52.17 'planted vegetation', if the vegetation has been planted for aesthetic or amenity purposes. Indigenous trees in the arborist tree dataset were scored by ecologists as 'Planted indigenous', if the trees were clearly planted for aesthetic or amenity purposes and not for conservation. Site indigenous revegetation can also meet criteria for FFG Act and/or EPBC Act communities. If not planted for aesthetic or amenity purposes, indigenous revegetation was mapped as native vegetation as per the Guidelines, and, where required, assessed for the potential to meet FFG Act community descriptions or EPBC Act community criteria – see Section 3.3.3.6.
Native to Victoria	Non-indigenous to the local area but native to Victoria (e.g. Mahogany Gums, Giant Honey-myrtle). Defined in Victorian Planning Provisions – Definitions – Clause 72 as *'Plants that are indigenous to Victoria, including trees, shrubs, herbs, and grasses'.*	For non-local vegetation, particularly shrubs and trees, it is usually evident that they have been planted for aesthetic or amenity purposes and therefore do not require a permit. However, these trees may still require permits if within a vegetation protection overlay or similar. Non-local trees are scored in the arborist dataset as 'Native'.
Native to Australia	Non-indigenous Australian native plants or vegetation (non-indigenous to Victoria) (e.g. Sugar Gums)	Usually does not require a permit for removal, although may under some circumstances, including if in a particular vegetation protection overlay. Non-Victorian native trees are scored as 'Native to Australia' in the tree dataset.

3.3.3.4 HABITAT HECTARE ASSESSMENTS

Habitat hectare assessments were undertaken to determine the condition of the vegetation in the context of the local area and the relevant bioregions. This methodology is outlined in *Vegetation Quality Assessment Manual-Guidelines for applying the habitat hectares scoring method* (DSE 2004). The habitat hectare method involves making visual and quantitative assessments on various characteristics of native vegetation according to established criteria that are set against an optimum benchmark. This process aims to establish the significance of native vegetation through an objective and repeatable methodology using working documents (benchmark data and field assessment score sheets) that are uniformly applied across Victoria.

This process begins with the identification of the EVC. Each EVC, found on DELWP's website (DELWP 2018a), has a benchmark of optimal values. Site assessments are undertaken using the *Vegetation Quality Field Assessment Sheet* (Version 1.3 October 2004) from (DSE 2004). Further to the site condition criteria, the habitat hectare process also requires an assessment of the site in a landscape context (DSE 2004).

If a site meets or exceeds all benchmark criteria it will receive a total score of 100, which is a total of the above condition and landscape scores in pristine undisturbed condition. However, in many cases in the urban-influenced ecosystems in the Melbourne area, sites receive a score less than 60, due to their relatively high level of modification, and modified surrounds. The final habitat score is presented as a percentage and then converted to a score out of 1.00. All areas defined as a 'patch' were subject to habitat hectare assessments.

Site assessments were initially undertaken over several days in April, May and September 2017 by Ecology and Heritage Partners (EHP). This mapping was only undertaken across publicly accessible road reserves and open space reserves. Further survey was required due to property access limitations across much of the Project Area. This was subsequently undertaken following private property access by Arcadis. During assessment of these additional areas by Arcadis, EHP Habitat Hectare assessment results were verified.

3.3.3.5 TREES

Tree surveys were conducted by the Project arborist and data were provided in GIS shapefiles and the *Preliminary tree assessment report* (Ryder Arboriculture and Environment 2020). All living and dead trees and shrubs 3 m and taller were assessed, and locations from the Project feature survey or a DGPS were used for maximum accuracy. A number of metrics were used to measure and record tree data including those consistent with *Guidelines for the removal, destruction or lopping of native vegetation (DELWP 2017b)* ('Guidelines 2017') including Diameter at Breast Height (DBH) (diameter in centimetres measured at 1.3 metres above ground level). The Tree Protection Zone (TPZ) was calculated by the arborist (12 x DBH up to a maximum of 15 m). The arborist also estimated the average canopy width for each tree.

Arborist tree data were used to determine the location and size class of all Canopy Trees (indigenous trees >3 m which are canopy species for the relevant EVC) as per the Guidelines 2017. This included 'Scattered Trees' and 'Trees in patches'. Large Trees were assessed as Canopy Trees which met or exceeded the DBH benchmark for the relevant EVC. One of three DBH benchmarks (60, 70 or 80 cm) was used to classify each tree as 'large' or 'small', depending on the applicable EVC.

The arborist also recorded any trees with medium-large hollows (i.e. hollow openings at least 5 x 15 cm) to help inform habitat assessment for owls. Hollows were recorded from the ground (visible to the naked eye without binoculars). Small hollows were not recorded.

3.3.3.6 THREATENED ECOLOGICAL COMMUNITIES

Several EPBC Act and FFG Act listed communities identified from the database and literature review were considered to have the potential to occur within the Project Area. For those with the potential to correspond to vegetation mapped on site, assessment of vegetation patches against the community descriptions or criteria was undertaken.

For EPBC Act communities, vegetation patches must meet the scientific determination criteria including certain condition thresholds to constitute the community. All vegetation mapped as Plains Grassy Woodland EVC within the Victorian Volcanic Plains bioregion section of the Project Area was assessed against the criteria for Grassy Eucalypt Woodland of the Victorian Volcanic Plain, as defined by Threatened Species Scientific Committee (TSSC 2009).

There are no specific criteria which determine the presence of FFG Act communities except for an informal method of comparing site characteristics and floristics with community descriptions in *Characteristics of Threatened Communities – Flora and Fauna Guarantee Act 1988 – Threatened List* (DELWP undated). All vegetation mapped as Plains Grassy Woodland EVC was assessed against the description for Western (Basalt) Plains Grassy Woodland.

3.3.3.7 WSP VEGETATION ASSESSMENT VERIFICATION – MAY 2019

WSP undertook verification of the previous vegetation mapping and quality assessments. Verification was to ensure that the previous quality assessments were still correct, and that mapping reflected current values. Verification was undertaken in two steps being:

- One day field verification was undertaken on 15 May 2019. Spot checks of native vegetation patches were undertaken. Habitat hectare scoring and extents of patches was verified and corrected were required, as was the identification of scattered trees. The overlap area between stages 1 and 2 was examined to remove the vegetation cleared for Stage 1 of the Yan Yean Road upgrade from the Stage 2 upgrade files.
- Desktop revision of vegetation mapping was undertaken using high resolution aerial imagery to correct the mapped extent of native vegetation patches where required.

3.3.3.8 WSP VEGETATION ASSESSMENT– EARLY 2020

Following substantial changes to the Project boundary in early 2020, WSP undertook vegetation assessment and mapping of all the new areas and further work to update the vegetation data. This included:

- two days of field survey on 30 March and 7 April 2020 to map and score native vegetation in the additional areas. Further verification and edits to previous mapping and scoring was also undertaken where required
- further desktop revision of vegetation mapping using high resolution aerial imagery
- incorporation and scoring of new arborist data.

3.3.4 SIGNIFICANT FLORA

3.3.4.1 INITIAL GENERAL FLORA SURVEY

Targeted surveys were not undertaken by Arcadis for the previous Flora and fauna assessment (Arcadis 2018); however, general flora surveys (including vegetation assessment and mapping) were undertaken on 6 September, 20 October, 4 December and 11 December 2017. During these surveys, Arcadis ecologists examined the Project Area for potential habitat for significant flora, compiled a species inventory for the Project Area, and recorded noxious weeds.

3.3.4.2 TARGETED ORCHID SURVEY

A targeted survey was conducted for three threatened orchid species by Karl Just on 14 and 22 August and 7 September 2018 (Just 2018). Karl Just is an independant consultant with specialist orchid experience in the local area of the Project, and an author of the *Guidelines for the management of threatened orchid species in the Shire of Nillumbik* (Just K & Beardsell C. 2015). The target species for these surveys were Charming Spider-orchid *Caladenia amoena*, Little Pink Spider-orchid *Caladenia rosella* and Wine-lipped Spider-orchid *Caladenia oenochila.* Surveys were conducted on four properties that supported potential habitat for these threatened orchid taxa (as determined through preliminary assessment by Arcadis), including 577, 581 and 585 Yan Yean Road Yarrambat and 790A Yan Yean Road, Doreen. No other patches of potential habitat were identified in the Project Area. These sites are shown in Figure 3.1.

The survey followed the Guidelines, '*Survey guidelines for Australia's threatened orchids – Guidelines for detecting orchids listed as threatened under the EPBC Act 1999'.* Surveys were conducted under the following conditions:

- The surveys were conducted by a botanist with a high level of orchid survey experience.
- The surveys were conducted during the optimal flowering period for the target species.
- Reference sites in the region were checked to determine when target species were flowering in 2018. This revealed that Little Pink Spider-orchid began flowering in late July-early August (at Eltham South), Charming Spider-orchid in mid-August (Plenty Gorge and Wattle Glen) and Wine-lipped Spider-orchid in mid-August (Panton Hill).
- Multiple (three) surveys were conducted to maximise the chance of detecting plants in bud or flower.
- Survey design was informed by analysis of suitable habitat and micro-features of the site.
- Although the three species listed above were specifically targeted, the botanist recorded any orchids present, as well as any other species of conservation significance observed on the properties.

3.3.4.3 ADDITIONAL SIGNIFICANT FLORA SURVEY AND VERIFICATION

Survey was undertaken on 21 December 2018 and 11 January 2019 by WSP ecologists to do the following:

- Verify the records of the Matted Flax-lily made by Jacobs for Yarra Valley Water (Jacobs 2017).
- Verify the record of the Studley Park Gum made by the Project arborist (Ryder Arboriculture and Environment 2020)
- Conduct an additional targeted survey for a number of significant species, mostly Victorian Advisory List species) in the higher quality patches of potential flora habitat and the key (higher quality) wetlands within or near the Project Area. The areas surveyed and the survey tracks are provided in Figure 3.1 and the target species list is provided in Table 3.4. Although several species were targeted, the detection of any additional Matted Flax-lily plants (should they occur) was of a high priority. Survey was completed using the random meander method. The random meander technique involves targeting a particular or several, threatened plant species and traversing areas of suitable habitat in no set pattern (Cropper 1993). Ecologists aimed for thorough coverage of the potential habitat present.

Table 3.4 Target species list for additional threatened flora survey

COMMON NAME	SCIENTIFIC NAME	CONSERVATION STATUS		
		EPBC	FFG	Vic Adv
Austral Crane's-bill	*Geranium solanderi var. solanderi s.s.*			vu
Bamboo Spear-grass	*Austrostipa verticillata*			k
Bear's-ear	*Cymbonotus lawsonianus*			r
Clover Glycine	*Glycine latrobeana*	VU	L	vu
Flax-lily	*Dianella longifolia var. grandis* (syn)			vu
Matted Flax-lily	*Dianella amoena*	EN	L	en
Pale-flower Crane's-bill	*Geranium sp. 3*			r
Rosemary Grevillea	*Grevillea rosmarinifolia subsp. rosmarinifolia*			r #
Rye Beetle-grass	*Tripogonella loliiformis*			r
Slender Bindweed	*Convolvulus angustissimus subsp. omnigracilis*			k
Slender Tick-trefoil	*Desmodium varians*			k
Valley Crane's-bill	*Geranium sp. aff. retrorsum (Nillumbik)*			k
Veined Spear-grass	*Austrostipa rudis subsp. australis*			r
Velvet Apple-berry	*Billardiera scandens s.s.*			r
Yarra Gum	*Eucalyptus yarraensis*		X	r

EPBC: *EN= endangered, VU = Vulnerable;* ***FFG Act:*** *L= listed, X = Rejected for listing as threatened; taxon ineligible;* ***Vic Advisory List:*** *en = Endangered, vu = Vulnerable, r = Rare, k = Poorly Known, P = All infraspecific taxa included in Advisory List, # = native but some strands may be alien*

Figure 3.1 Threatened flora survey effort Map 1 of 4

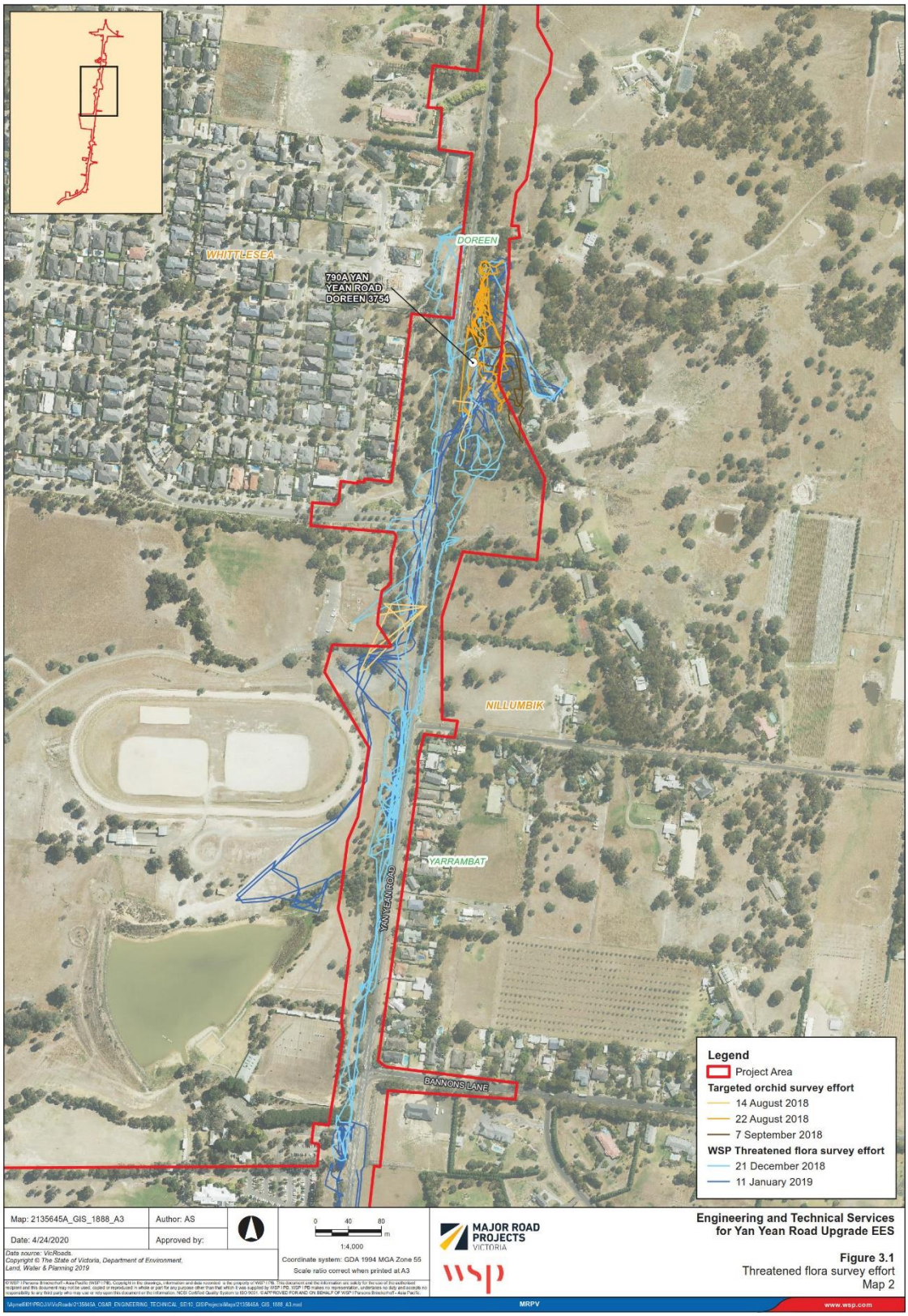


Figure 3.1 Threatened flora survey effort – Map 2 of 4

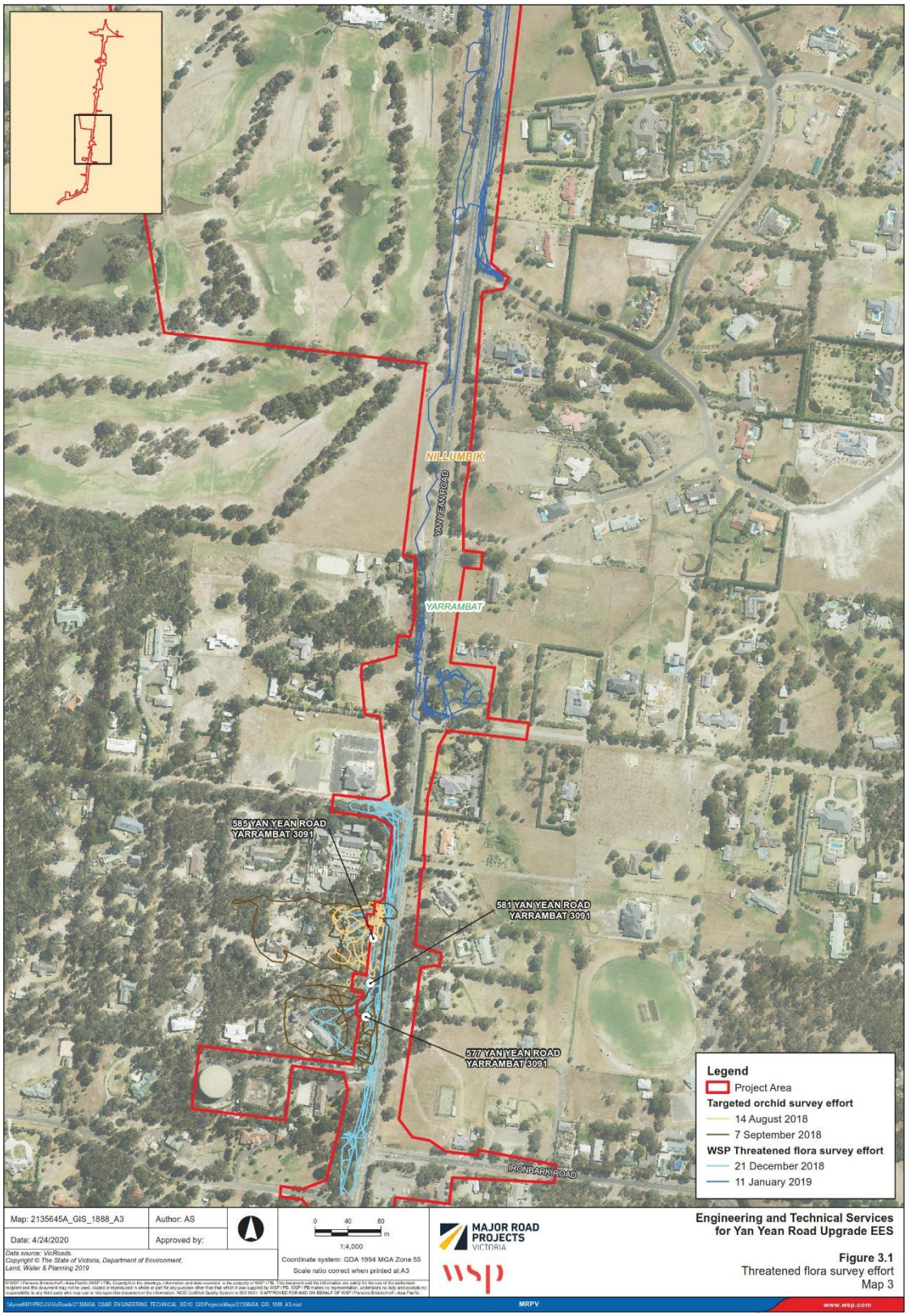


Figure 3.1 Threatened flora survey effort – Map 3 of 4

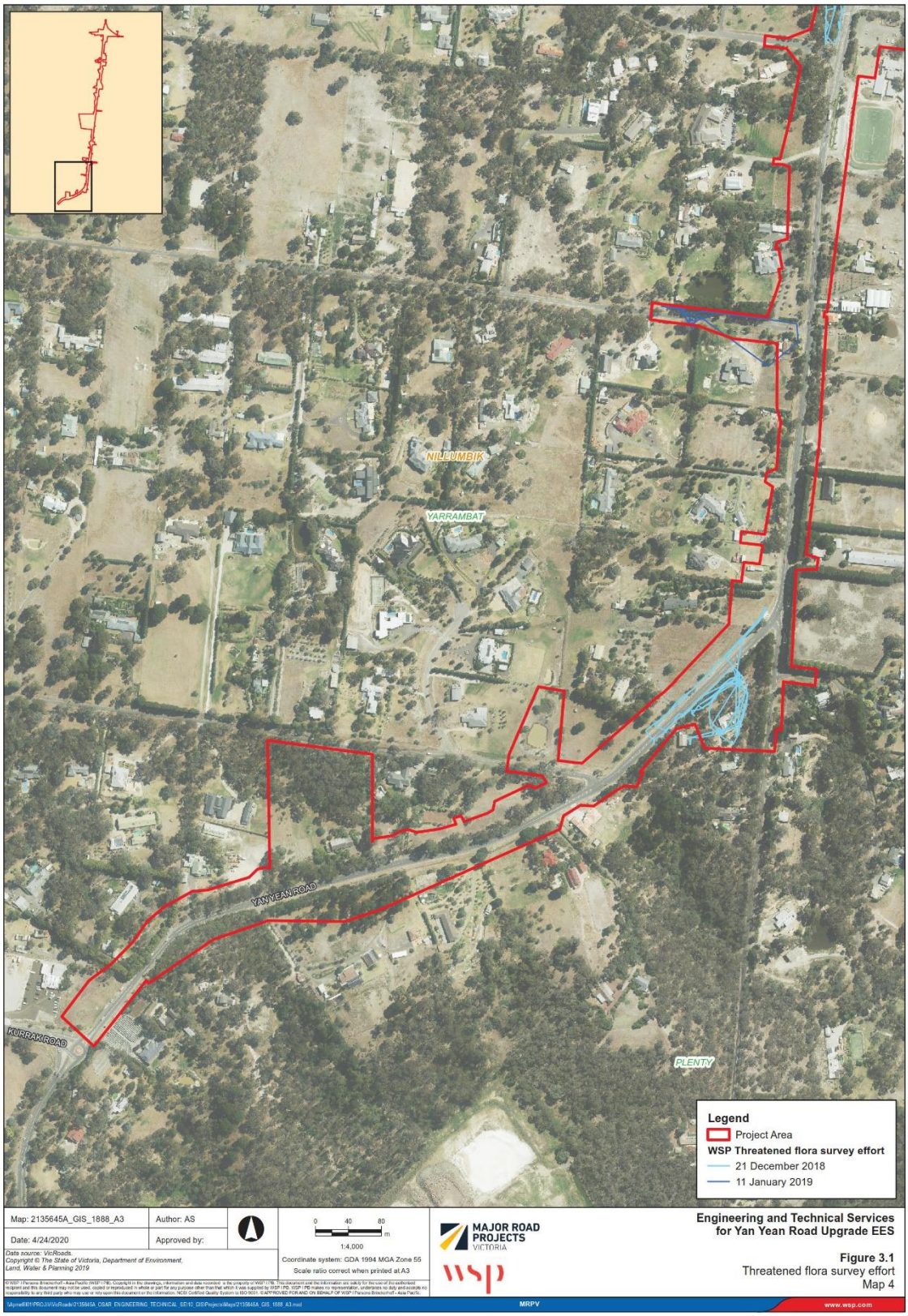


Figure 3.1 Threatened flora survey effort – Map 4 of 4

3.3.5 FAUNA

Targeted habitat assessment and/or surveys were conducted for Brush-tailed Phascogale, Powerful, Masked and Barking Owls, Swift Parrot, Eltham Copper Butterfly, Growling Grass Frog and Brown and Southern Toadlet.

3.3.5.1 BROWN AND SOUTHERN TOADLET

Habitat assessments were conducted by Practical Ecology on 21 May 2018 (Practical Ecology 2018a). Nine sites which appeared to contain suitable habitat for the Brown Toadlet and Southern Toadlet were selected for the site assessment using aerial imagery up to 200 m from the existing road. These sites are shown in Figure 3.2 and included wetlands, dams and gullies. Habitat features were recorded at each site including vegetation type, cover and structure, water permanence and presence of coarse woody debris. The site assessments were conducted during the calling season for both toadlet species (March to May). Both species are known to call during the day and the survey was conducted under suitable calling conditions (i.e. rainy weather with little to no wind).

3.3.5.2 BRUSH-TAILED PHASCOGALE

Brush-tailed Phascogale surveys were conducted by Rob Gration, and ecologist with extensive experience with the species (EcoAerial 2018). The assessment was conducted in two stages. Stage one consisted of a habitat assessment and was conducted in September 2017 and Stage 2 was a targeted survey in November and December 2017.

The habitat assessment (i.e. Stage 1) entailed:

- assessing and mapping the extent and quality of potential Brush-tailed Phascogale habitat based on aerial images, on ground assessment and the location of historical records
- inspection of a subset of tree hollows using pole mounted inspection camera.

During this Stage 1 assessment, potential habitat was identified through the presence of suitable tree hollows with connectivity to historical records. This potential habitat was classified as medium and low quality (no high quality habitat was identified), based on:

- Medium quality: “vegetation that generally still retains its structural integrity but has been disturbed and has lost some component of its original species complement. Weed invasion can be significantly minor in such remnants. Historical records (last 8–10 years) in close proximity to the Study Area”.
- Low quality: “vegetation that has lost most of its species and is significantly modified structurally. Often such areas now have a discontinuous vegetation cover, very few shrubs and exotic species such as introduced pasture grasses or weed dominating indigenous ground cover”.

The habitat assessment helped inform the locations chosen to conduct the targeted surveys (Stage 2) which consisted of baited remote sensing cameras and hair tubes installed in the medium quality potential habitat patches. Remote sensing cameras were deployed at seven locations from 7 November 2017 to 6 December 2017, for a total of 29 nights (equal to 116 camera nights). The timing of the survey coincided with the dispersal of sub-adults (EcoAerial 2018). Sixteen hair tubes were deployed across five locations for a period of 10 nights. These sites are shown in Figure 3.2.

3.3.5.3 ELTHAM COPPER BUTTERFLY

A habitat assessment was conducted across the study area by Andrea Canzano (Practical Ecology Pty Ltd) (Practical Ecology 2018b), an entomologist who coordinates the Eltham Copper Butterfly recovery team. The habitat assessment aimed to identify if any potential habitat was present in the Project Area and immediate surrounds. The parameters assessed included weed cover, extent of native vegetation cover, presence and cover of suitable host plants (Sweet Bursaria *Bursaria spinosa*), cover of bare ground, soil hydrology, grass and moss cover. Presence of the associated ants was also considered as a habitat indicator for this species.

An initial assessment of aerial photography and EVC mapping was first undertaken. Three properties were selected for detailed survey due to their potential to support habitat for the species. In addition, the study area was inspected from a vehicle to identify any other areas of potential habitat for detailed assessment. The eight properties identified were inspected on foot.

Based on the results of habitat assessment, no further targeted surveys were considered to be warranted.

3.3.5.4 GROWLING GRASS FROG

The Growling Grass Frog was considered to have a low likelihood of occurrence in the Arcadis report (Arcadis 2018). Nevertheless, surveys were considered by WSP to be justified as a precaution due to the significance of the species. Growling Grass Frog survey and detailed habitat assessment was conducted by WSP on 15 January and 31 January 2019. Eight primary sites were selected as potential habitat for survey based on preliminary habitat assessment and aerial imagery, and were surveyed twice. An additional ninth site was assessed on the second survey only. The surveys were conducted as per the DEWHA survey guidelines for threatened frogs (DEWHA 2010a) and consisted of call playback and listening followed by hand searching for all sites that could be accessed. Detailed descriptions of the potential habitat values of the wetlands were made.

The sites surveyed are provided in Figure 3.2.

3.3.5.5 OWL SURVEYS

Ed McNabb, a nocturnal fauna specialist, conducted a preliminary habitat assessment and follow-up targeted surveys for three threatened owl species: Barking Owl *Ninox connivens*, Masked Owl *Tyto novaehollandiae* and Powerful Owl *Ninox strenua* (Ninox Pursuits Environmental Services 2018). The preliminary assessment consisted of a diurnal site inspection along the Project alignment, focussing on potential nesting habitat, hollow bearing trees, and suitable roosting areas such as unmodified gullies that could provide habitat. The targeted survey locations were chosen with reference to the following:

- prior records of threatened owl species near or within the general locality using the VBA and the Atlas of Living Australia.
- current Naturekit modelled habitat for the three target species
- results from preliminary site habitat assessments including presence of potential nesting habitat, hollow bearing trees, and suitable roosting areas.

Site selection was limited by:

- proximity to housing or infrastructure
- proximity to high levels of ambient noise, i.e. next to roads
- private property was only accessed with permission from the owner.

The targeted surveys were conducted on 2, 3 and 20 November 2017 during periods of dry weather and low winds as per the DELWP protocol (DELWP 2011a, 2011b, 2011c). Six sites, including forested areas, open landscapes, roadsides and the Plenty Gorge Parklands were surveyed once using a combination of call playback followed by spotlighting of the site (< 1 ha area around the site) to determine if any owls had flown in following the calls and to record potential prey species. Call playback could not be effective where traffic was heavy and noise levels high. Therefore, call playback sessions near roads and houses were conducted between 2200 – 0400 hrs to allow efficient call broadcast, improve detection and minimise disturbance of or by passersby (Ninox Pursuits Environmental Services 2018).

Figure 3.2 identifies the location of the survey sites in relation to the Project Area.

3.3.5.6 SWIFT PARROT

Swift Parrot habitat assessments and targeted surveys were led by Allan Richardson (WSP), a zoologist with specialist expertise in birds. The surveys included opportunistic survey of the entire Project Area, formal surveys at fixed points, as well as habitat assessments. The survey method was based on the recommendations for Swift Parrot in the *Survey Guidelines for Australia's Threatened Birds* (DEWHA 2010b) to meet the EES Scoping Requirements. However, these surveys were not undertaken solely to determine the presence or absence of the species. Due to the presence of nearby records, at the Project Area it is assumed that the species may periodically utilise any habitat present. During the surveys, the ecologist assessed the type and likely value of habitat in the Project Area relative to nearby known habitat (i.e. where there have been previous records of the species). They included recording of any flowering (or recently flowering) eucalypts and lerp infestations and observations of all nectivorous birds present.

The 2018 targeted surveys were conducted in early July and late August 2018 and further surveys were undertaken in August 2019. Surveys were timed to coincide with Swift Parrot presence on the mainland, with the August surveys being specifically timed to coincide with the species' movement through Melbourne as they commence their return journey to Tasmania.

During each survey, the Project Area and the Plenty Gorge area were surveyed opportunistically (driving and walking, stopping to inspect areas with flowering eucalypts or concentrations of nectivorous species). The locations of recent records in the locality were also visited. Formal surveys and/or habitat assessment was conducted at specific sites during the survey. These sites were selected based on whether the species had been recorded in the past, whether potential habitat (flowering eucalypts or lerps) were observed during opportunistic survey, or in key areas where habitat was modelled or mapped. Additional formal sites were added in 2019 to increase the number of formal surveys in the Project Area and visit other areas of known habitat in the locality. Survey types included two-hectare 20 minute surveys, 5 minute surveys, and meander surveys, selected based on the extent and quality of habitat and on the visibility and background noise levels at each site.

The survey sites and dates of survey are provided in Table 3.5 and shown on Figure 3.3.

Table 3.5 Swift Parrot survey sites

SITE ID (FIGURE 3.3)	SITE DESCRIPTION	DATE/S SURVEYED 2018	SURVEY TYPE 2018	DATE/S SURVEYED 2019	SURVEY TYPE 2019	DOMINANT NATIVE TREES AT SURVEY POINT
1	Yan Yean Road, Yarrambat (Project Area)	05/07/2018 28/08/2018 29/08/2018	Formal 20 min 2 ha survey	6/08/2019	Formal 20 min 2 ha survey	Red Box *Eucalyptus. polyanthemos*
2	Yan Yean Road, Doreen (Project Area)	05/07/2018 28/08/2018 29/08/2018	Formal 20 min 2 ha survey	7/08/2019	Formal 20 min 2 ha survey	River Red Gum *E. camaldulensis*
3	Yan Yean Road, Plenty 1 (reference site)	05/07/2018 28/08/2018 29/08/2018	Formal 20 min 2 ha survey	6/08/2019	Formal 20 min 2 ha survey	Red Box Bundy *E. goniocalyx*
4	Yan Yean Road, Plenty 2 (reference site)	05/07/2018 28/08/2018 29/08/2018	Formal 20 min 2 ha survey	6/08/2019	Formal 20 min 2 ha survey	Red Box Sugar Gum **E. cladocalyx*

SITE ID (FIGURE 3.3)	SITE DESCRIPTION	DATE/S SURVEYED 2018	SURVEY TYPE 2018	DATE/S SURVEYED 2019	SURVEY TYPE 2019	DOMINANT NATIVE TREES AT SURVEY POINT
5	Bridge Inn Road (reference site)	04/07/2018 29/08/2018 30/08/2018	Formal 20 min 2 ha survey	Not resurveyed (habitat poor quality)	-	Sugar Gum Manna Gum *E. viminalis*
6	Dry Creek Drive Plenty (reference site)	30/08/2018	Meander survey	6/08/2019	5 minute survey	Yellow Gum *E. leucoxylon*
7	Hakea Close Plenty (reference site)	29/08/2018	Meander survey	7/08/2019	Informal survey (10–15 mins)	Sugar Gum **E. cladocalyx*
8	La Trobe Sanctuary (reference site)	04/07/2018 28/08/2018	Meander survey	5/08/2019 6/08/2019	Formal 20 min 2 ha survey (although onsite for >1 hr each time total to maximise chance of detection)	Yellow Gum Sugar Gum Mugga Ironbark **E. sideroxylon* Spotted Gum **Corymbia maculata*
9	Yellow Gum Park (reference site)	28/08/2018 30/08/2018	Meander survey	6/08/2019	Formal 20 min 2 ha survey	Yellow Gum
10	Yan Yean Road Opportunistic (Project Area)	05/07/2018 30/08/2018	Opportunistic survey	6/08/2019 7/08/2019	Opportunistic survey	Various along alignment but mainly Red Box and Bundy
11	Plenty Gorge Opportunistic (locality)	04/07/2018 28/08/2018	Opportunistic survey	6/08/2019	Opportunistic survey	Yellow Gum, Mugga Ironbark, Spotted Gum
12	River Avenue (reference site)	N/A	N/A	6/08/2019	5 minute survey	Various, not recorded
13	Mclaughlans Lane (reference site	N/A	N/A	6/08/2019 7/08/2019	5 minute survey Formal 20 min 2 ha survey	Yellow Gum
14	Yan Yean Road Yarrambat 2 (Project Area)	N/A	Part of opportunistic survey in 2018	6/08/2019	Formal 20 min 2 ha survey	Bundy
15	Winton Vale Road (reference site)	N/A	N/A	7/08/2019	Formal 20 min 2 ha survey	Unknown planted eucalyptus

SITE ID (FIGURE 3.3)	SITE DESCRIPTION	DATE/S SURVEYED 2018	SURVEY TYPE 2018	DATE/S SURVEYED 2019	SURVEY TYPE 2019	DOMINANT NATIVE TREES AT SURVEY POINT
16	Yan Yean Road Yarrambat 3 (Project Area)	N/A	Part of opportunistic survey in 2018	7/08/2019	Formal 20 min 2 ha survey	River Red Gum
17	Yan Yean Road	N/A	Part of opportunistic survey in 2018	7/08/2019	Formal 20 min 2 ha survey	Red Box
18	Yan Yean Road	N/A	Part of opportunistic survey in 2018	7/08/2019	Formal 20 min 2 ha survey	
19	Yan Yean Road Christian college Carpark (Project Area)	N/A	Part of opportunistic survey in 2018	7/08/2019	5 minute survey	Spotted Gum Lemon Scented Gum **Corymbia citriodora*

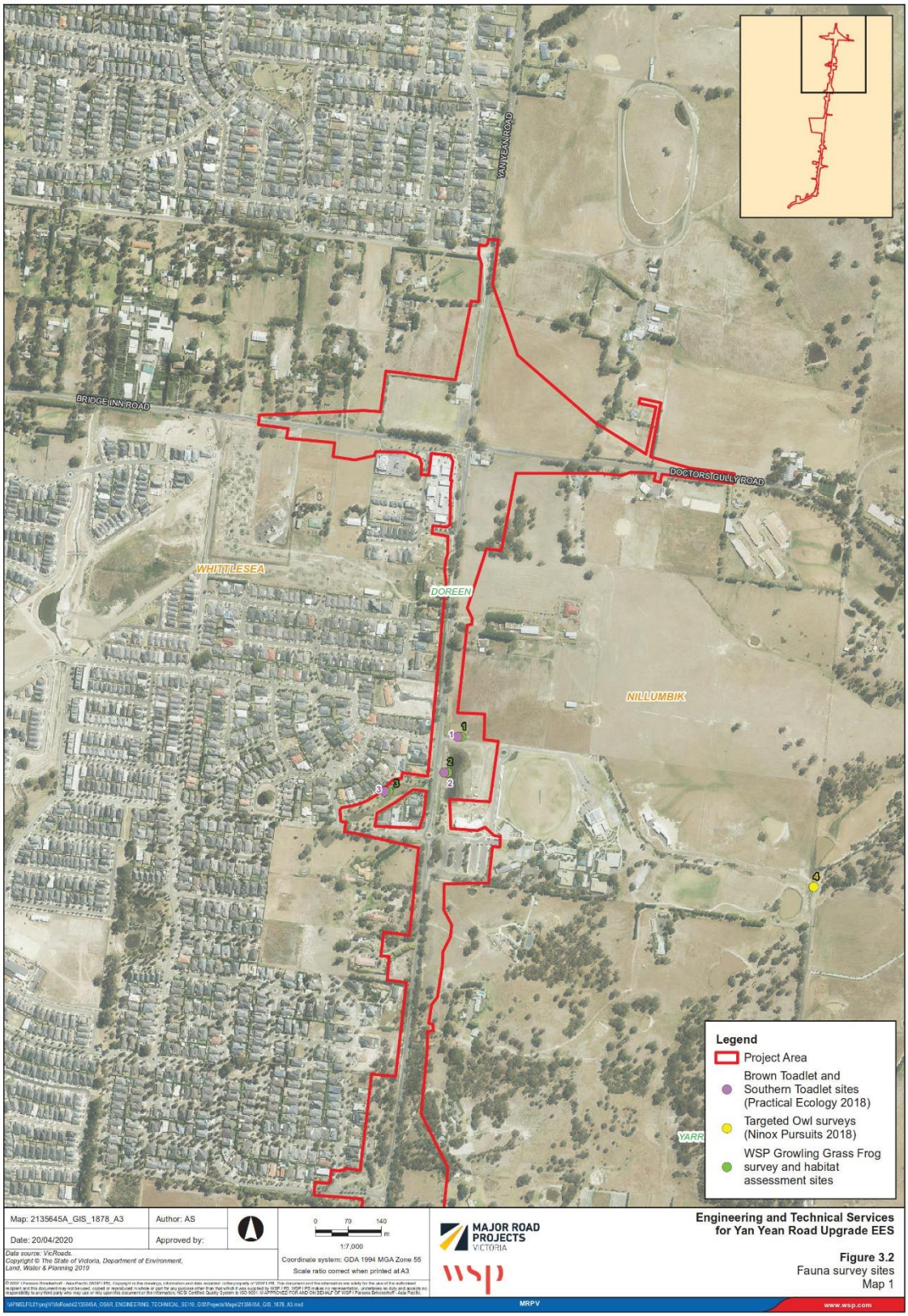


Figure 3.2 Fauna survey sites Map 1 of 3

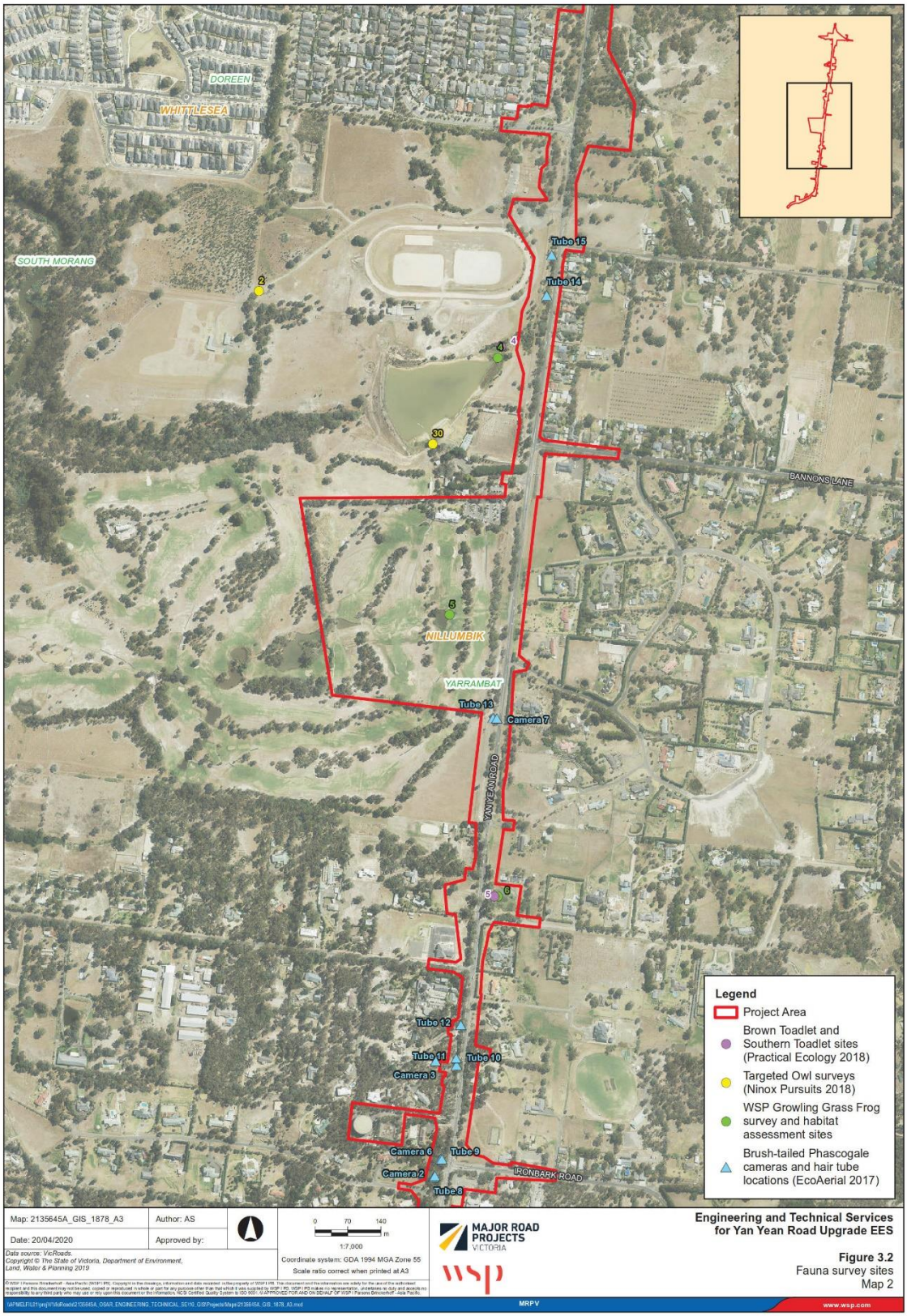


Figure 3.2. Fauna survey sites – Map 2 of 3

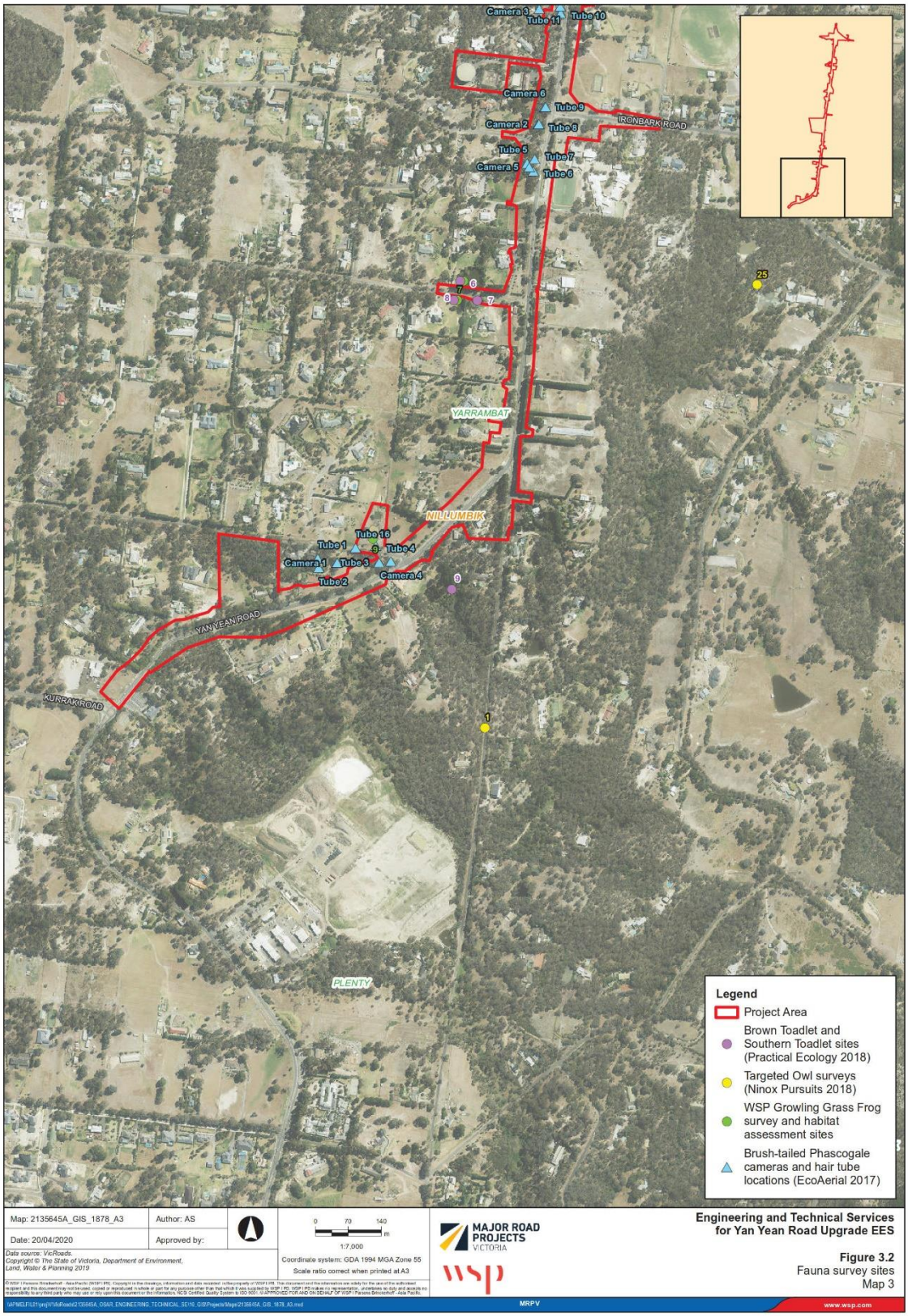


Figure 3.2. Fauna survey sites – Map 3 of 3

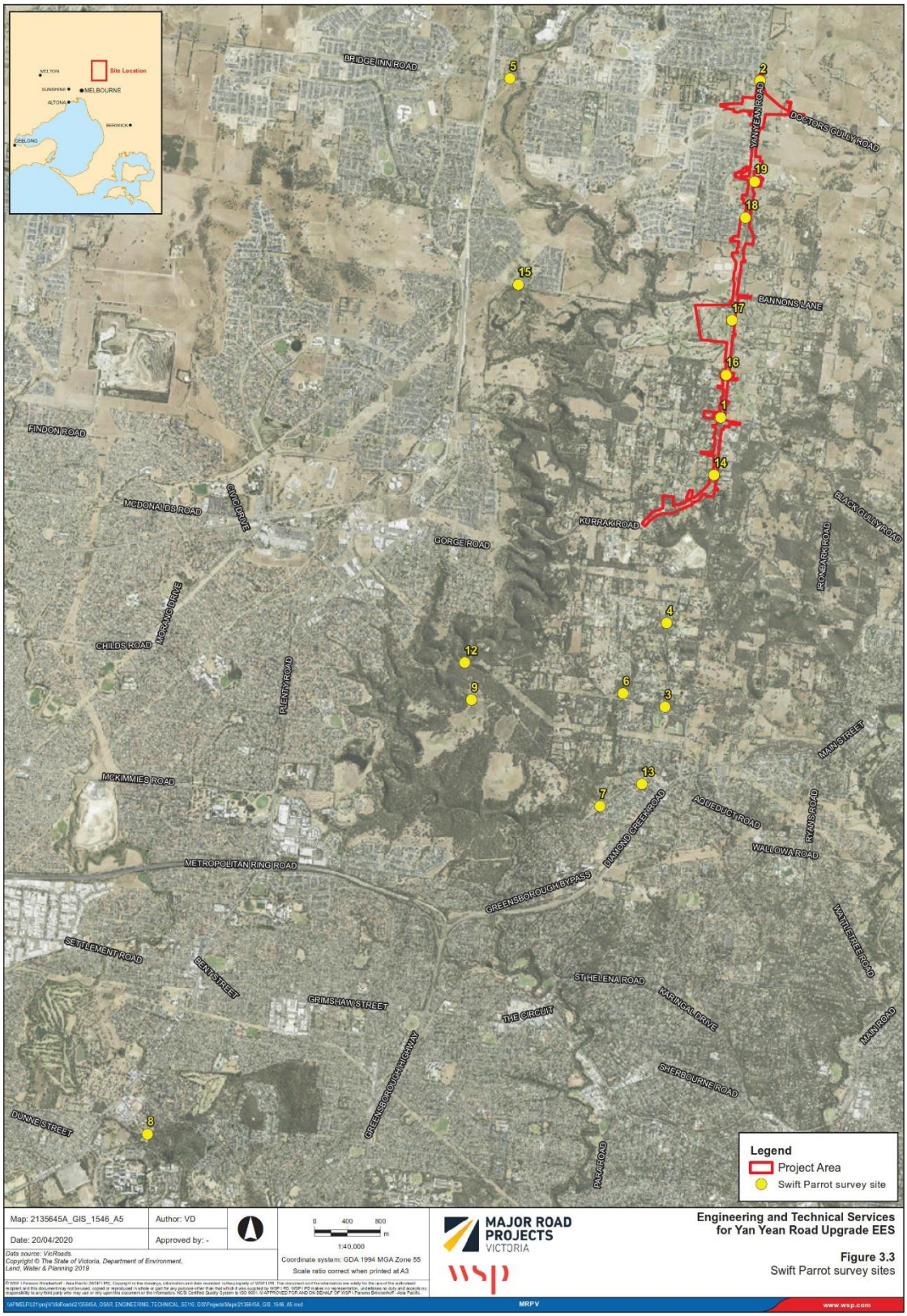


Figure 3.3 Swift Parrot survey sites (opportunistic survey not shown)

3.3.6 LIKELIHOOD OF OCCURRENCE

The presence or absence of a species cannot be definitively determined during a relative short survey timeline. For this study, the likelihood of occurrence of threatened and migratory species and populations was determined based on the criteria shown in Table 3.6 below. This method utilises the known habitat requirements of the species, outcomes of a habitat assessment, habitat connectivity at the Project Area, Victorian Biodiversity Atlas (and other database) records, Protected Matters Search Tool habitat modelling, and the results of targeted surveys (if undertaken), to allow an ecologist to best predict the potential for the species to occur.

The likelihood of occurrence assessment was preliminarily used to determine which targeted surveys were required and has been continually revised/updated as new surveys are completed.

Table 3.6 Likelihood of occurrence criteria for threatened flora and fauna species

LIKELIHOOD	DESCRIPTION
Low	Species considered to have a low likelihood of occurrence include species not recorded during the field surveys that fit one or more of the following criteria: — have not been recorded previously in the study area and surrounds and for which the study area is beyond the current distribution range — rely on specific habitat types or resources that are not present in the study area — are considered locally extinct — are a non-cryptic perennial flora species that were specifically targeted by surveys and not recorded — are fauna species that have been specifically targeted by appropriate survey and have not been recorded.
Moderate	Species considered to have a moderate likelihood of occurrence include species not recorded during the field surveys that fit one or more of the following criteria: — have infrequently been recorded previously in the study area and surrounds — use habitat types or resources that are present in the study area, although generally in a poor or modified condition — are unlikely to maintain sedentary populations, however, may seasonally use resources within the study area opportunistically during variable seasons or migration — are cryptically flowering flora species that were not seasonally targeted by surveys and that have not been recorded — are cryptic fauna species that have not been seasonally targeted by surveys and have not been recorded — may periodically visit the site during seasonal movements or migration.
High	Species considered to have a high likelihood of occurrence include species not recorded during the field surveys that fit one or more of the following criteria: — have frequently been recorded previously in the study area and surrounds — use habitat types or resources that are present in the study area, and that are abundant and/or in good condition within the study area — are known to, or considered likely to, maintain resident populations surrounding the study area — are known or likely to regularly visit the site during regular seasonal movements or migration.
Recorded	Any threatened species recorded during field surveys. Some of the relevant significant fauna species are known to periodically occur in the area, and the regularity and number of past records are more important than presence in any one survey in determining the likelihood of the species to occur, and/or the importance of the habitat present. As such, fauna species recorded during field surveys are given a likelihood as well as labelled as 'recorded'.

3.3.7 LIMITATIONS

A common limitation of ecological surveys is the short period over which they are undertaken and the lack of multi-seasonal sampling, which can lead to lack of detection of some species. This study does not rely solely on one survey, drawing on previous survey work to help inform the assessment, however, not all species present will have been detected. Some survey types, such as microbat survey, were not undertaken as part of the assessment. This means that the species list will be biased toward those easy to survey opportunistically and those for which targeted survey was undertaken.

The potential for threatened species was determined through habitat assessment, targeted survey and a detailed examination of the high number of common and threatened species records from the locality. This assessment contains some results which vary from the Arcadis (2018) assessment. This is a standard process, to update the likelihood of occurrence assessment based on further research and new information. It should be seen to supersede the earlier assessment. Where possible, the revised determination has been explained.

Survey results are indicative of the environmental conditions at the time of assessment. Site conditions, including the presence of threatened species, can change with time.

Hollow-bearing tree assessment was undertaken by the arborist from the ground and did not include small hollows, fissures, loose bark etc. It should not replace hollow survey during any pre-clearing works.

3.3.8 PERMITS

All relevant WSP staff are covered under the Victorian *Flora and Fauna Guarantee Act 1988* Permit to take/keep protected flora purposes of identification and lodging herbarium specimens (permit no. 10007800). Also, all relevant WSP staff are covered under the Standard Operating Procedures approved by the Department of Economic Development, Jobs, Transport and Resources, Wildlife and Small Institutions Animal Ethics Committee approval (08.17) and Victorian *Wildlife Act 1975* Research Permit (permit no. 10007800).

4 LEGISLATION AND POLICY

This chapter details the Commonwealth, State, and regional/local environmental legislation, policy, and strategies relevant to the Project and details the implications for the Project.

4.1 COMMONWEALTH

4.1.1 ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the Australian Government's central piece of environmental legislation. It provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places defined in the Act as matters of national environmental significance (MNES). There are nine matters of national environmental significance to which the EPBC Act applies, these are:

- world heritage sites
- national heritage places
- wetlands of international importance (often called 'Ramsar' wetlands after the international treaty under which such wetlands are listed)
- nationally threatened species and ecological communities
- migratory species
- Commonwealth marine areas
- nuclear actions
- the Great Barrier Reef Marine Park, and
- a water resource, in relation to coal seam gas development and large coal mining development.

A 'significant impact' is defined under the EPBC Act as 'an impact that is important, notable, or of consequence, having regard to its context or intensity' (Department of the Environment 2013b). If a Project is likely to have a significant impact on one of the nine MNES, the 'action' must be referred to DAWE. This 'referral' is then released to the public for comment.

One out of the nine matters are relevant to the Project: nationally threatened species and ecological communities.

To assess whether an impact is significant or not, the following policy documents and guidelines are used:

- Significant Impact Guidelines 1.1 – Matters of National Environmental Significance for EPBC Act listed biodiversity (Department of the Environment 2013b) (the 'significant impact guidelines').
- Referral guidelines for individual species listed under the EPBC Act, if available.

The Project was referred to DoEE (now DAWE) in December 2018. The decision from the then DoEE, dated 2 April 2019, was that the Project would be considered a controlled action and that the assessment would be conducted under a bilateral agreement with the Victorian Government through an EES. The referral decision letter identified two EPBC Act listed species with the potential to be significantly impacted; Swift Parrot and Matted Flax-lily. Other Commonwealth-listed species, not identified in the Referral decision letter, have been included in this report.

Table 4.1 provides a summary of the surveys and habitat assessment completed for all EPBC Act-listed species relevant to the Project Area (i.e. surveyed for or otherwise considered to have the potential to occur).

Table 4.1 Summary of survey and habitat assessment for Matters of National Environmental Significance

EPBC ACT LISTED SPECIES	RELEVANT SURVEY GUIDELINES	RELEVANT RECOVERY PLAN	IDENTIFIED IN REFERRAL LETTER BY DAWE (THEN DOEE)?	PRESENCE
Matted Flax-lily	No survey guidelines.	National Recovery Plan for the Matted Flax-lily *Dianella amoena* (Carter, 2010).	Yes Additional work completed since referral includes further targeted flora survey.	Yes. Two plants recorded within the Project Area. No other plants considered likely to occur.
All other EPBC Act listed flora	*Survey guidelines for Australia's threatened orchids – Guidelines for detecting orchids listed as threatened under the EPBC Act 1999 (Department of Environment 2013).*	Not relevant	No Additional work completed since referral includes further targeted flora survey.	No other EPBC Act listed flora species were recorded or are considered likely to occur.
Swift Parrot	Survey Guidelines for Australia's threatened birds: Guidelines for detecting birds listed as threatened under the EPBC Act (DEWHA 2010b).	National recovery plan for the Swift Parrot *Lathamus discolor* (Saunders, D & Tzaros 2011).	Yes Additional work completed since referral includes further survey and habitat assessment.	Not recorded, but species may periodically forage on trees within the Project Area when present on the mainland.
Grey-headed Flying-fox	No survey guidelines. Surveys were not considered necessary as Grey-headed Flying-foxes are likely to intermittently forage on trees within the Project Area.	Draft Recovery Plan for the Grey-headed Flying-fox *Pteropus poliocephalus* (Commonwealth of Australia 2017).	No	Yes. Recorded during nocturnal arboreal mammal surveys for the Project and likely to intermittently forage on trees within the Project Area.

EPBC ACT LISTED SPECIES	RELEVANT SURVEY GUIDELINES	RELEVANT RECOVERY PLAN	IDENTIFIED IN REFERRAL LETTER BY DAWE (THEN DOEE)?	PRESENCE
Growling Grass Frog	Survey guidelines for Australia's threatened frogs: Guidelines for detecting frogs listed as threatened under the EPBC Act (DEWHA 2010).	National Recovery Plan for the Southern Bell Frog *Litoria raniformis* (Clemann & Gillespie 2012).	No	Not recorded or considered likely to occur.
Threatened ecological communities	N/A	Community-dependant	No	No EPBC Act listed threatened ecological communities were recorded during vegetation surveys.

4.2 STATE

4.2.1 ENVIRONMENT EFFECTS ACT 1978

Under Victoria's *Environment Effects Act 1978* (EE Act), projects that could have a 'significant effect' on Victoria's environment can potentially require an Environment Effects Statement (EES). The Minister for Planning is the responsible person for assessing whether this Act applies.

Before commencing any public works to which this Act applies, the proponent must initiate an EES to be prepared and submit it to the Minister for the Minister's assessment of the environmental effects of the works.

The criteria for the types of potential effects on the environment that might be significant are provided in the *Ministerial Guidelines for Assessment of Environmental Effects under the Environment Effects Act 1978* (DSE 2006).

A self-assessment against the criteria was completed in 2018. This assessment, based on the information available at the time, identified that one or more individual effects may be triggered. Subsequently, the Yan Yean Road Upgrade – Stage 2 was the subject of an EES Referral, and a determination was made by the Minister for Planning that an EES was required.

4.2.2 FLORA AND FAUNA GUARANTEE ACT 1988

The Victorian *Flora and Fauna Guarantee Act 1988* (FFG Act) was established to provide a legal framework for enabling and promoting the conservation of all Victoria's native flora and fauna, and to enable management of potentially threatening processes. One of the main features of the Act is the listing process, whereby native species and communities of flora and fauna, and the processes that threaten native flora and fauna are listed in the schedules of the Act. This assists in identifying those species and communities that require management to survive, and identifies the processes that require management to minimise the threat to native flora and fauna species and communities within Victoria.

A permit from the DELWP is required to 'take' protected flora from public land. Protected flora include all flora species listed on the FFG Act Threatened List, species which belong to listed communities, and other species which have been included on the protected flora list, managed by the DELWP. A permit is not required under the FFG Act for private land, unless listed species are present and the land is declared 'critical habitat' for the species.

As protected flora occur in the study area, including those listed in Appendix D on the Protect Flora list and those found in the listed community Western Basalt Plains (River Red Gum) Grassy Woodland, an FFG permit is required to 'take' them. In addition, Matted Flax-lily *Dianella amoena* is listed under the FFG Act Threatened List and as such, will require a protected flora permit if these plants are proposed for removal.

Protected flora:

Some flora species recorded at the Project Area are listed on the protected flora list (refer Appendix D). The species which require a permit (assuming that all species recorded will be impacted) are:

- *Acacia acinacea s.l.* Gold-dust Wattle
- *Acacia genistifolia,* Spreading Wattle
- *Acacia mearnsii*, Black Wattle
- *Acacia pycnantha*, Golden Wattle
- *Acacia stricta*, Hop Wattle
- *Brunonia australis,* Blue Pincushion
- *Dianella amoena,* Matted Flax-lily
- *Hardenbergia violacea*, Purple Coral-pea.

The process for impacts to fauna listed on the FFG Act Threatened List, including those which may occur in the Project Area (Swift Parrot and Grey-headed Flying-fox), is managed under the Wildlife Act 1975 – see section below.

4.2.3 THE GUIDELINES FOR THE REMOVAL, DESTRUCTION OR LOPPING OF NATIVE VEGETATION

The *Guidelines for the removal, destruction or lopping of native vegetation* (DELWP 2017b) (the Guidelines) are designed to manage the risk to Victoria's biodiversity associated with the removal of native vegetation. They provide the mechanism for offsetting residual native vegetation and habitat loss, with emphasis on avoiding and minimising impacts prior to offsetting. The guidelines are incorporated into the Victoria Planning Provisions and all planning schemes in Victoria.

The risk to biodiversity from vegetation/habitat loss, and therefore the pathway that the Project will be assessed under, is determined via:

- location category, which is determined by assessing the likelihood that the removal of a small amount of native vegetation may impact the persistence of a rare or threatened species. The native vegetation location risk map is available from the Native Vegetation Information Management tool (DELWP 2020)
- extent of the native vegetation that is proposed to be removed.

Together, these are used to determine the assessment pathway for assessing a permit application to remove native vegetation. The pathway determines the process to be followed for the assessment of planning permit applications and dictates the types of offsets that are required for the vegetation removal.

Under the guidelines, the Project should be considered under the 'Detailed' assessment pathway as it requires the clearance of greater than 0.5 ha of native vegetation.

4.2.4 WILDLIFE ACT 1975

The *Wildlife Act 1975* is the primary legislation in Victoria for the protection of wildlife. All native fauna in Victoria are protected under this Act. The Act requires that wildlife research (including fauna salvage and translocation) is regulated through a permit system, which is managed by DELWP.

Authorisation for impacting wildlife must be obtained under the *Wildlife Act 1975* through a licence granted by DELWP. Any persons involved in fauna removal, salvage capture or relocation of fauna (e.g. from hollows) prior to/during construction must hold a current Management Authorisation under the Act. A suitably qualified person with a permit under the Wildlife Act is likely to be needed to conduct search and relocation prior to construction.

4.2.5 CATCHMENT AND LAND PROTECTION ACT 1994

Plants declared noxious under the *Catchment and Land Protection Act 1994* (CaLP Act) are known to or have the potential to result in detrimental environmental and / or economic effects.

Under the CaLP Act, declared noxious weeds are categorised into four groups depending on their known and potential impact and specific circumstances for each region. These categories are:

- State Prohibited Weeds (S) – Plants that do not occur in Victoria but would pose a significant threat if they did invade. If found they are to be eradicated with responsibility falling on the Victorian Government.
- Regionally Prohibited Weeds (P) – Weeds that are not widely distributed in a region but are capable of spreading further. Land owners, including public authorities responsible for managing land must take all reasonable steps to eradicate Regionally Prohibited weeds on their land.

- Regionally Controlled Weeds (C) – Invasive plants that are usually widespread in a region. Ongoing control measures are required to prevent their spread. Land owners, including public authorities responsible for managing land, must take all reasonable steps to prevent growth and spread of Regionally Controlled weeds on their land.
- Restricted Weeds (R) – Plants that pose an unacceptable risk of spreading in this state and are a serious threat to another State or Territory. Trade in these weeds and their propagules, either as plants, seeds or contaminants in other materials is prohibited.

Restricted and regionally controlled weeds were recorded within the Project Area and immediate surrounds as detailed in Section 5.4.5. The responsibilities for overall response management, on-site management, and funding for the weed categories (aside from Restricted Weeds) for State roads are provided in Table 4.2. Restricted weeds should also be controlled; however, there are no legal requirements. Minimisation of their spread is the primary concern.

Table 4.2 CaLP Act weed control responsibilities for State road reserves

WEED CATEGORY	OVERALL MANAGEMENT OF RESPONSE	ON-SITE MANAGEMENT	FUNDING
State prohibited weeds (S)	State Government (DJPR)	DJPR	State Government (100%)
Regionally prohibited weeds (P)	State Government (DJPR)	VicRoads	State Government [VicRoads] (100%)
Regionally controlled weeds & rabbits (C)	State Government (DJPR)	VicRoads	State Government [VicRoads] (100%)

Source: Roadside Weeds and Pests Report (DJPR 2011)

4.3 REGIONAL AND LOCAL

4.3.1 NILLUMBIK AND WHITTLESEA PLANNING SCHEMES

The *Planning and Environment Act 1987* (P&E Act) provides the legal framework for the operation of Victoria's planning system, commonly referred to as the Planning Scheme. The Project will require approval under the Nillumbik and Whittlesea planning schemes.

Some of the zoning, overlays, Victoria Planning Provisions and local planning schemes of most relevance to biodiversity and the Project Area are detailed below. For more information, refer to Technical Report H – Planning and Land Use Impact Assessment (WSP 2020).

4.3.1.1 ZONING AND OVERLAYS

Aside from Road Development Zone (RDZ1 & RDZ2), which includes much of the existing road reserve, the following zoning is also present.

In Nillumbik Shire, much of the Project Area is zoned Low Density Residential (LDRZ), and Rural Conservation (RCZ), with a large area of Public Park and Recreation Zone (PPRZ) for Yarrambat Park and the Golf Course.

In the City of Whittlesea, the north-western part of the Project Area is zoned General Residential (GRZ1) and Mixed Use (MUZ2).

In addition to the above general land use zones, there are vegetation and environmental overlays that may also determine approval pathways for development activities. The following are relevant to the Project Area and are shown on Figure 4.1:

- Nillumbik Planning Scheme – Clause 42.01 – ESO 1 Environmental Significance Overlay Schedule 1 (ESO1) – Sites of Faunal and Habitat Significance.

  This overlay is for the purpose of identifying where development of land may have environmental constraints and to ensure that the development is compatible with identified environmental values. Schedule 1 to this overlay is for sites of faunal and habitat significance. ESO1 applies to three broad locations with partially overlap with the Project Area. These areas are broadly consistent with the higher quality native vegetation and habitat. Under this Schedule a permit is required to remove any vegetation unless the vegetation is identified as a pest plant in the Shire of Nillumbik Environmental Weed List 2009, if the vegetation is Yarra Burgan *Kunzea leptospermoides* and is being removed for fire prevention purposes or if the vegetation has been grown for aesthetic or amenity purposes. The exemption does not apply to the last point if public funding was used to plant or manage the vegetation and the terms of the funding did not anticipate the vegetation's removal. This is consistent with the way in which vegetation has been mapped in this report, with planted indigenous and other vegetation usually being for amenity purposes along roadsides or parks, in which case the removal of the vegetation has been anticipated (or not precluded). No vegetation planted specifically for conservation purposes was recorded, aside from wetland vegetation which was mapped as native EVCs.

- Whittlesea Planning Scheme – Clause 42.02 – Vegetation Protection Overlay Schedule 1 (VPO1) – Significant Vegetation (River Redgum Grassy Woodland). VPO1 applies to only the north-western section of the Project, to the north of Jorgenson Avenue. This overlay is designed to protect significant vegetation and requires a permit for the removal of any vegetation unless specified otherwise in a Schedule to the overlay. Schedule 1 recognises the value the native vegetation associated with River Red Gum Woodlands provides for environmental function and rural character, however provides exemption from permit requirements for the removal of any vegetation which is not native.

4.3.1.2 VICTORIA PLANNING PROVISION CLAUSE 52.17 – NATIVE VEGETATION

This clause is designed to "*ensure there is no net loss to biodiversity as a result of the removal, destruction or lopping of native vegetation*". It stipulates that impacts must be avoided, minimised and offset (if a permit is granted) in accordance with the Guidelines 2017.

Exemptions to the requirement for a permit (52.17-7) include for planted vegetation, unless planted or managed with public funding for the purpose of land protection or enhancing biodiversity.

All indigenous vegetation within the Project Area that has not been planted has been categorised as EVCs or as scattered trees. This vegetation will require a permit to impact and will need to be offset. All other vegetation and trees have been mapped and assessed but are unlikely to require a permit to remove.

4.3.1.3 VICTORIA PLANNING PROVISION CLAUSE 12.01-1S PROTECTION OF BIODIVERSITY

This State Planning Policy Framework stipulates that important areas of biodiversity must be identified, strategically planned for, protected and managed. It states that decision making should take impacts on biodiversity into account, including cumulative impacts, fragmentation, and pests, weeds and disease spread.

4.3.1.4 NILLUMBIK PLANNING SCHEME CLAUSE 22.06 ROADSIDE MANAGEMENT POLICY

This policy recognises the value of roadside vegetation and habitat. It requires that conservation values of roadside vegetation be fully considered, and that roadside vegetation removal occurs with minimal impact and disturbance to the roadside's conservation values.

4.3.1.5 NILLUMBIK PLANNING SCHEME 21.05-3 – ENVIRONMENT, CONSERVATION & LANDSCAPE

This policy details objectives and strategies for maintaining and enhancing environmental, conservation and landscape values. It includes strategies such as restricting development that impacts flora and fauna, ensuring roadside planting used indigenous vegetation instead of exotics, protecting waterways from pollution and disturbance, encouraging habitat links etc.

4.3.1.6 WHITTLESEA PLANNING SCHEME CLAUSE 22.10 – RIVER RED GUM PROTECTION POLICY

The Whittlesea Planning Scheme has a River Red Gum Protection Policy (Clause 22.10) which recognises the ecological significance of this species within the landscape and aims to ensure the trees are properly assessed and their protection considered with development design. This policy requires "*A comprehensive site analysis and arborist's report with any planning proposal for development on land which contains one or more remnant River Red Gum trees."*

It also requires that retention of River Red Gums be prioritised and protected during construction.

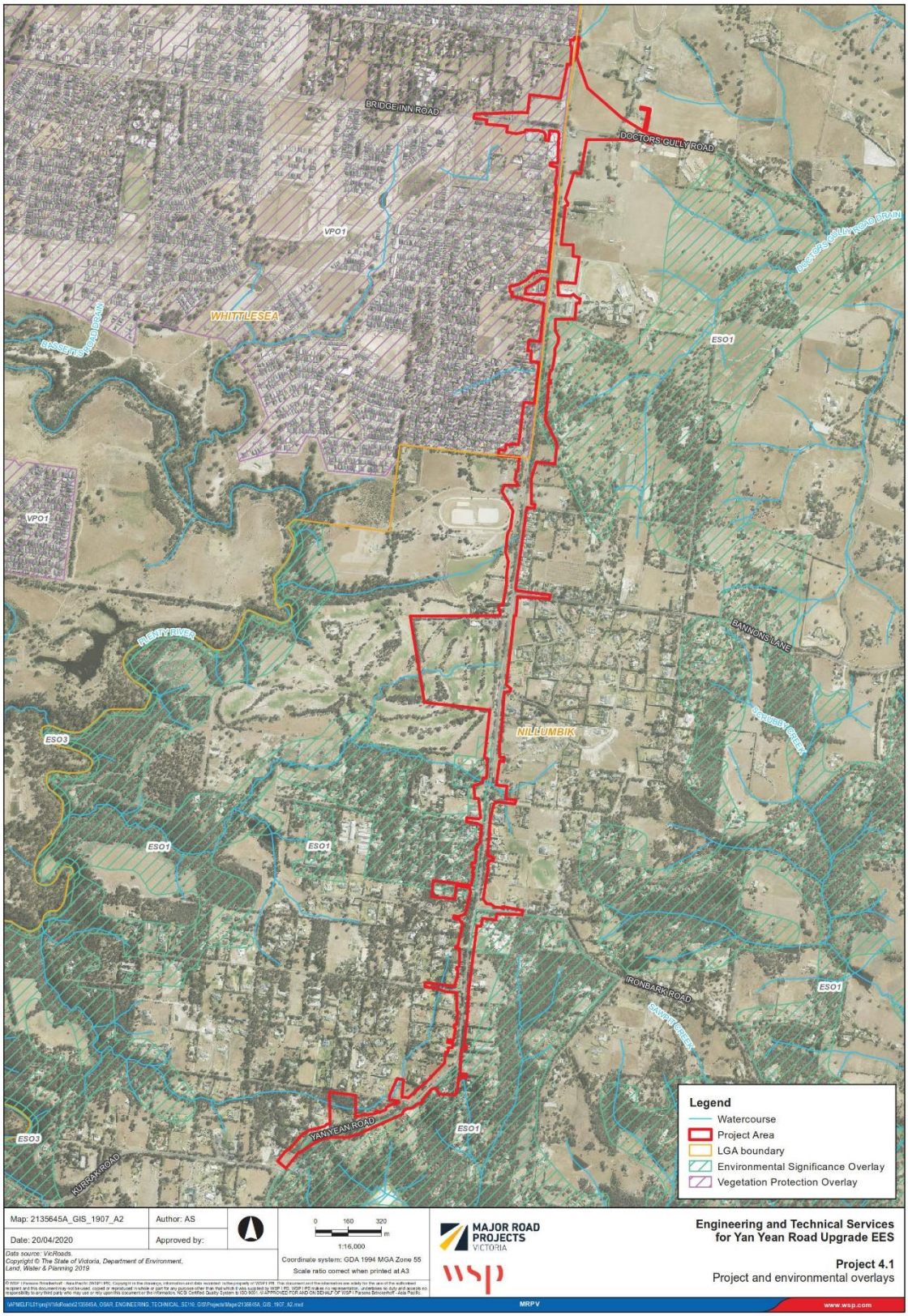


Figure 4.1 Project and environmental overlays

5 EXISTING CONDITIONS

This chapter describes the current condition of the Project Area and surrounds with regard to biodiversity and ecological values, and details the results of surveys conducted for this Project.

5.1 LANDSCAPE OVERVIEW

The Project Area is surrounded by various land-uses, including open space and recreation areas such as Yarrambat Golf Course and sports ovals, rural residential blocks, and higher density residential developments. Nearby habitats of value include Plenty River and the Plenty Gorge Parklands to the west and southwest of the Project Area, Sawpit Creek to the east, remnant vegetation on some of the larger rural blocks surrounding the Project Area, and Diamond Creek Catchment and reserves. The Yarrambat Golf Course may also provide habitat for wildlife in the area with patches of native vegetation and dams.

Plenty River runs to the west of Yan Yean Road, 1 km from the Project Area at the closest point. There are several small drainage lines which intersect the Project Area and flow to this river. On either side of the river is the Plenty Gorge Parklands, which extends 11 km along the river from Mernda to Bundoora. The parklands includes part of Yarrambat Park which intersects the Project Area, however this section is mostly cleared and highly modified, with poor treed connectivity with the part of the park that intersects the Project Area.

The Plenty Gorge Parklands are managed by Parks Victoria and support significant landforms, native vegetation, fauna habitat and cultural heritage values for the traditional owners, the Wurundjeri People. It is one of the largest parks in the northern suburbs of Melbourne making it particularly important for flora and fauna habitat due to the highly fragmented landscape surrounding it. It is regarded as an important corridor for movement and foraging for Swift Parrots (Practical Ecology 2017b). Parts of the Plenty Gorge Parklands support Box-Ironbark Woodland, which is key habitat for the species.

These values can be seen on Figure 5.1. Figure 5.1 also shows the DELWP modelled EVCs and the Bioregion boundaries.

5.2 LANDFORM AND GEOLOGY

General topography along the alignment is undulating, with several hills and gullies. The Project Area is largely underlain by Dargile Formations, a Silurian aged sedimentary (marine) geology consisting of sandstone with interbedded siltstone and shale. In addition, there are areas of Quaternary age river alluvium deposits comprising sand, silt, clay and minor gravel (WSP 2018).

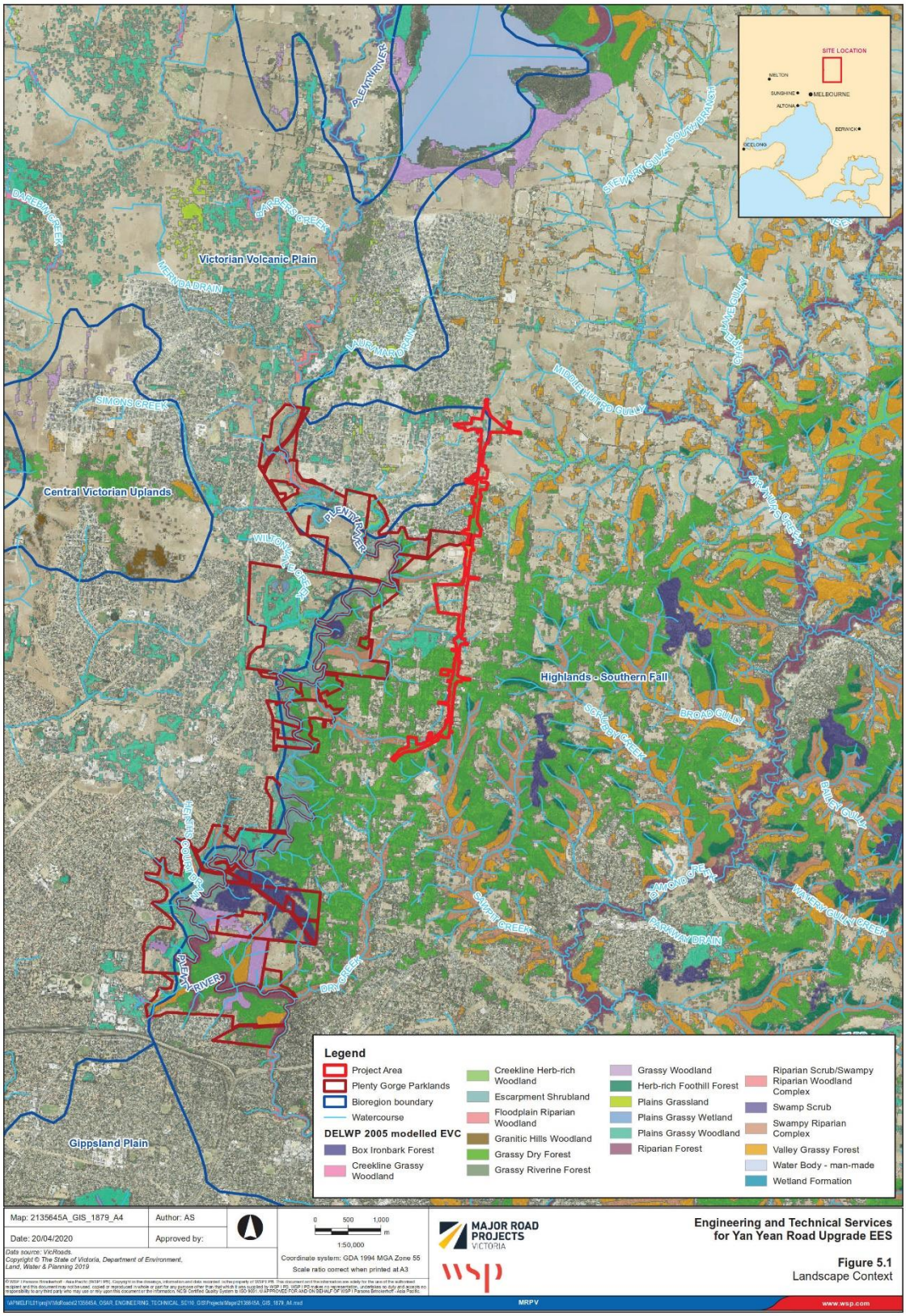


Figure 5.1 Landscape context

5.3 LITERATURE REVIEW

Database search results have been incorporated into the following sections, with the locations of VBA records from the locality shown in Appendix B-1. Previous ecological surveys and assessment of the Project Area were reviewed to provide an overview of the known ecological values and systems of the area. The reports are summarised in Appendix C. The species and habitat recorded (or not recorded) in these assessments were considered when assessing the likelihood of occurrence of threatened species within the study area.

5.4 VEGETATION

The Project Area has been heavily impacted by past and current land use. Much of the Project Area has been cleared, with approximately 20% of the Project Area supporting remnant native vegetation patches (i.e. not counting scattered remnant trees). The road verge has been reformed as a part of previous road construction for the management of surface hydrology and the installation of services, and is regularly slashed/mown. The remaining groundcover further from the road edge is subject to varying degrees of grazing from both natural and introduced herbivores, and in some cases is also regularly mown. All wetlands/waterbodies within or adjacent to the Project Area are constructed or highly modified.

Although there are many trees occurring along the roadside, many have been planted for amenity, including some non-local and exotic species. Weeds, spread along the roadside by slashers, vehicles, or birds, or spread from nearby gardens, are prolific in some parts of the Project Area. Some patches of vegetation in the Project Area, part of rural blocks that have not been cleared, support a relatively intact canopy, shrub and ground layer. However, vegetation of this high quality covers only approximately 3 ha. The highest quality native vegetation was recorded on the properties opposite Wether Park, northeast of the Jorgensen Avenue intersection. Several other properties (the properties targeted for threatened orchid surveys) also supported patches of relatively intact vegetation.

Further information regarding the vegetation within the Project Area and the immediate surrounds is provided below.

5.4.1 ECOLOGICAL VEGETATION CLASSES PRESENT

The following seven EVCs were recorded within the Project Area:

- EVC 22 Grassy Dry Forest
- EVC 47 Valley Grassy Forest
- EVC 55 Plains Grassy Woodland
- EVC 653 Aquatic Herbland
- EVC 821 Tall Marsh
- EVC 647 Plains Sedgy Wetland
- EVC 937 Swampy Woodland.

Their conservation statuses, potential equivalence to threatened communities, and extent within the Project Area are provided in Table 5.1. Mapping showing the coverage of native vegetation and location of EVCs is provided in Appendix B-2.

17.307 ha of native vegetation patches were recorded within the Project Area. A high degree of variation in quality between the patches was recorded, with Habitat Hectare scores ranging between 9 and 62. Habitat Hectare results are provided in Appendix H.

Table 5.1 Areas of native vegetation patches mapped within the Project Area as attributed to Ecological Vegetation Classes

EVC NO.	ECOLOGICAL VEGETATION CLASS	BIOREGION	BIOREGION CONSERVATION STATUS (DELWP 2018A)*	POTENTIAL FFG ACT COMMUNITY EQUIVALENT*	POTENTIAL EPBC ACT COMMUNITY EQUIVALENT**	AREA WITHIN PROJECT AREA (HA)
653	Aquatic Herbland	Highlands Southern Fall	Endangered	None	EVC may constitute Seasonal Herbaceous Wetlands (freshwater) of the Temperate Lowland Plains Refer to Section 5.4.3	0.172
22	Grassy Dry Forest	Highlands Southern Fall	Least Concern	None	None	14.301
55	Plains Grassy Woodland	Victorian Volcanic Plain and Highlands Southern Fall	Endangered	Western Basalt Plains (River Red Gum) Grassy Woodland Refer to Section 5.4.3	EVC may constitute Grassy Eucalypt Woodland of the Victorian Volcanic Plains Refer to Section 5.4.3	0.295
647	Plains Sedgy Wetland	Victorian Volcanic Plain	Endangered	None	None	0.049
937	Swampy Woodland	Highlands Southern Fall	Endangered	None	None	0.501
821	Tall Marsh	Victorian Volcanic Plain and Highlands Southern Fall	Vulnerable	None	None	0.395
47	Valley Grassy Forest	Highlands Southern Fall	Vulnerable	None	EVC may constitute White Box -Yellow Box _ Blakely's Red Gum Grassy Woodland and Derived Grassland Refer to Section 5.4.3	1.595

* Where an EVC did not have a conservation status in the relevant bioregion/s, the status from a nearby bioregion is provided or the status used in (Frood & Papas 2016).

**The assessment against FFG Act and EPBC Act community descriptions/criteria is provided in Section 5.4.3 (threatened vegetation communities)

5.4.2 ECOLOGICAL VEGETATION CLASS DESCRIPTIONS

The seven EVCs recorded within the Project Area and immediate surrounds are described in Table 5.2. EVC descriptions have been adapted from Arcadis (2018) and verified by WSP during ground-truthing and assessment in May 2019 and April 2020.

Table 5.2 Ecological vegetation class descriptions – adapted from Arcadis (2018)

EVC	DESCRIPTION
Aquatic Herbland (EVC 653)	Semi-permanent to seasonal wetland vegetation dominated by herbaceous aquatic plant species. Occurs in several locations within dams, as well as at the Orchard Road wetlands where it occurs in from the wetland edge as emergent and floating vegetation. Typical species include Small-fruit Pondweed *Potamogeton cheesemanii*, Upright Water-milfoil *Myriophyllum crispatum* and Common Spike-sedge *Eleocharis acuta*.
EVC 653 photo	

EVC	DESCRIPTION
Grassy Dry Forest (EVC22)	Grassy Dry Forest is most common EVC within the study area. It was located primarily on upper slopes and ridge tops and was identified by the dominant eucalypt species; Red Box *Eucalyptus polyanthemos* in association with Long-leaf Box *E goniocalyx* s.l, and less commonly Red Stringybark *E macrorhyncha* and Yellow Box *E melliodora*. The majority of patches supported modified vegetation with one or two eucalypt species, one or a few shrub species such as Blackwood *Acacia melanoxylon*, Common Cassinia *Cassinia aculeata*, Hedge Wattle *Acacia paradoxa*, Sweet Bursaria *Bursaria spinosa*, Golden Wattle *Acacia pycnantha* and Cherry Ballarat *Exocarpus cupressiformis* and a weedy groundstorey dominated by grassy/herbaceous weed species such as Panic Veldt-grass **Ehrharta erecta*, Sweet Vernal-grass **Anthoraxum odoratum* and Cocksfoot **Dactylis glomerata*.
EVC 22 photograph	

EVC	DESCRIPTION
Plains Grassy Woodland (EVC 55)	Plains Grassy Woodland EVC was only recorded at the northern end of the Project Area, and it occurs in both the Victorian Volcanic Plain and Highlands Southern Fall bioregions. As bioregions are mostly determined by topography, it is likely all patches of Plains Grassy Woodland occur in the Victorian Volcanic Plain bioregion; further evidenced by remnant patch locations in the flat northern plains section of the study area, and similarities of vegetation composition and canopy structure. All of the patches occur in grazing land or within the road reserves, and contained mature River Red Gum *Eucalyptus camaldulensis*, sometimes with one of two shrub species (Blackwoods, Black Wattles and/or Hedge Wattles) and a few scattered groundstorey species such as Rush *Juncus* spp or Spinyheaded Mat-rush *Lomandra longifolia*. All patches of Plains Grassy Woodland are heavily modified and dominated by a weedy grassy/herbaceous groundstorey cover.
EVC 55 photograph	 *Source: Arcadis 2018*

EVC	DESCRIPTION
Plains Sedgy Wetland (EVC 647)	Sedge-dominated wetland characteristically associated with wet sites on fertile soils. Appear to have a more reliable moisture supply that sites supporting more seasonal wetlands. Recorded at the Orchard Road wetland in the north of the Project Area as well as around dams in the golf course. In the Project Area, this EVC is dominated by Poong'ort *Carex tereticaulis*, Common Spike-sedge *Eleocharis acuta,* Rushes *Juncus spp.* and other species.
EVC 647 photo	

EVC	DESCRIPTION
Swampy Woodland (EVC 937)	Two patches of riparian woodland were identified within the Project Area in two lower lying areas along land that would have once been intermittent waterways/drainage lines. These sites included strips/patches of River Red Gums with the occasional Manna Gum *Eucalyptus viminalis*. These patches also contain scattered Yellow Box and Red Box, which are the dominant eucalypt species typical of the surrounding EVCs - Grassy Dry Forest and Valley Grassy Forest. These patches of Swampy Woodland are highly modified and supported River Red Gums with one to two other eucalypt species, the occasional Blackwood and a groundstorey dominated by weedy grassy/ herbaceous species. The created water treatment wetland at the intersection with Youngs Road has been assessed as Swampy Woodland (without canopy), as it is part of a larger patch of this EVC.
EVC 937 photograph	 *Source: Arcadis 2018*

EVC	DESCRIPTION
Tall Marsh (EVC 821)	Aquatic vegetation was recorded in several locations including Orchard Road where there were dams/recently constructed wetlands that contained indigenous wetland vegetation. The common species within these constructed dams included Narrowleaf Cumbungi *Typha domingensis,* River Club-sedge *Schoenoplectus tabernaemontani,* Tall Sedge *Carex appressa*, Broom Rush *Juncus sarophorus* and Tall Spike-sedge *Eleocharis spathulata*.
EVC 821 photograph	

EVC	DESCRIPTION
Valley Grassy Forest (EVC 47)	Valley Grassy Forest EVC was mostly recorded on the valley floors and lower slopes across the study area. The EVC was generally identified by two co-dominant eucalypt species within the study area: Yellow Box and Long-leaf Box. Due to vegetation modification, patches of Grassy Dry Forest and Valley Grassy Forest often appeared with ecotonal vegetation characteristics and structure, making differentiation of the EVCs difficult in some circumstances. Due to these similarities, it was determined that the dominant eucalypt species would be utilised as the key identification characteristic between Grassy Dry Forest and Valley Grassy Forest, although sometimes Yellow Box and Red Box were present in the same habitat zone. In these cases, topography and the dominant eucalypt species were utilised to determine the EVC present. This was considered appropriate during WSP mapping verification. The majority of patches of EVC 47: Valley Grassy Forest consisted of modified vegetation with one or two eucalypt canopy species, one or a few shrub species such as Blackwood, Common Cassinia, Hedge Wattle, Sweet Bursaria, Golden Wattle and Cherry Ballarat, and a weedy groundstorey dominated by grassy/herbaceous species.
EVC 47 photograph	 *Source: Arcadis 2018*

5.4.3 THREATENED ECOLOGICAL COMMUNITIES

The Protected Matters Search Tool (PMST) identified four EPBC Act listed threatened communities as potentially occurring within the Project Area. One FFG Act listed community was also considered to have the potential to occur based on the EVCs recorded onsite. The potential for these communities to occur on site has been assessed in Table 5.3.

Based on this assessment, one threatened community, the FFG Act listed Western (Basalt) Plains Grassy Woodland, occurs within the Project Area. The extent of this community, constituting 0.233 ha, is shown on Appendix B-2.

Table 5.3 Threatened ecological community assessment

COMMUNITY	STATUS	SOURCE	PRESENCE AND RATIONALE
Grassy Eucalypt Woodland of the Victorian Volcanic Plain	EPBC Act – Critically Endangered	PMST search: *Community known to occur within the area*	This community can be synonymous with relatively intact EVC 55, which was mapped within the study area. Seven small patches most attributable to EVC 55 were mapped in the Victorian Volcanic Plain bioregion (DSEWPaC 2011). Arcadis (Arcadis 2018) found that the patches do not constitute the threatened community as they have all been heavily modified with little remaining (<25%) indigenous groundstorey vegetation, and all were less than 0.5 hectares in patch size. This was confirmed by WSP during vegetation ground-truthing, with all of these patches observed to be dominated by introduced grasses (coverage of indigenous species well below 50%). No additional areas of potential Grassy Eucalypt Woodland were mapped. No patches of EVC 55 scored over a 5 for 'Understory', or over a 6 for 'Lack of Weeds' during Habitat Hectare assessments (DSE 2004). See Appendix H. Given the above, the patches do not meet one of the key diagnostic criteria for this community, which is that coverage of indigenous grasses and herbs is dominant across the ground layer (DSEWPaC 2011). Nor do the patches meet the condition thresholds, due to their small size, lack of native cover, and high cover of exotic perennials (Arcadis 2018). As such, further assessment was not deemed to be warranted. **Based on the small size of patches and the low coverage of indigenous species in the understorey, no vegetation in the Project Area is considered to qualify as this EPBC Act listed community.**
Natural Temperate Grassland of the Victorian Volcanic Plain	EPBC Act – Critically Endangered	PMST search: *Community likely to occur within the area*	**Community not found within Project Area. No primary (natural) native grassland was recorded.** **Detailed assessment not required.**

COMMUNITY	STATUS	SOURCE	PRESENCE AND RATIONALE
Seasonal Herbaceous Wetlands (freshwater) of the Temperate Lowland Plains	EPBC Act – Critically Endangered	PMST search: *Community likely to occur within the area*	All vegetation most attributable to EVC 653 Aquatic Herbland is the result of revegetation across modified watercourses, with the exception of some patches being naturally recruiting Rushes *Juncus* spp. around a farm-style dam. Patches of EVC 653 aligning with the description of Seasonal Herbaceous Wetlands (freshwater) of the Temperate Lowland Plains (SHW) support aquatic wetland species such as Water Ribbons *Cycnogeton procerum,* and Swamp Crassula *Crassula helmsii.* While areas dominated by species such as Tall Spike-rush *Eleocharis sphacelata* River Club-sedge *Schoenoplectus tabernaemontani*. are contra-indicative of the vegetation community (TSSC 2012). No occurrences of EVC 653 meet the size requirements as detailed on page 13 of the listing advice for SHW (TSSC 2012), with all but one zone being less than 0.1 ha in size and zone 28 being 0.314 ha, and not part of a larger remnant. **Community not found within Project Area.**
White Box - Yellow Box _ Blakely's Red Gum Grassy Woodland and Derived Grassland	EPBC Act – Critically Endangered	PMST search: *Community likely to occur within the area*	White Box *Eucalyptus albens* and Blakely's Red Gum *E. blakelyi* are not present in southern Victoria near the Project Area. Within the Project Area, Yellow Box *E. melliodora* is (or may once have been) a dominant or co-dominant canopy species in some parts of the Project Area. This threatened ecological community was not considered to be present by Arcadis (Arcadis 2018). However, areas of Valley Grassy Forest EVC 47 may constitute this community if Yellow Box is (or was) a dominant or co-dominant species, and if other criteria are met. The community can occur as a woodland or derived native grassland. To meet the criteria for this community, patches must have a predominantly native understorey (i.e. more than 50% of the perennial vegetative groundlayer must comprise native species), and be 0.1 hectare (ha) or greater in size and contain 12 or more native understorey species (excluding grasses), including one or more identified important species; or be 2 ha or greater in size and have either natural regeneration of the overstorey species or an average of 20 or more mature trees per ha (DoEH 2006).

COMMUNITY	STATUS	SOURCE	PRESENCE AND RATIONALE
			Five patches of Valley Grassy Forest were Yellow Box-dominated (Yellow Box currently or historically likely to be at least co-dominant based on arborist data). The patch numbers are: HZ5, 6, 11, 12 and 22. However, all of these patches were <0.1 ha, even when considering contiguous vegetation and canopy outside of the project area, with all but Patch 22 under 0.05 ha. As such, these patches do not require detailed assessment against the other community criteria, although they were observed to be predominantly exotic and low-diversity. **Based on the small size of patches, no vegetation in the Project Area is considered to qualify as this EPBC Act listed community.**
Western Basalt Plains (River Red Gum) Grassy Woodland	FFG Act Listed	Community may correspond with EVC recorded on site.	This community can be synonymous with Plains Grassy Woodland EVC 55. EVC 55 was mapped within the Project Area, mostly in the north within the Victorian Volcanic Plain Bioregion. The description of this community includes a River Red Gum canopy with a shrubby midstorey and grassy understorey, with forbs between the tussocks (DELWP undated). While there are no quantitative diagnostic criteria for FFG act communities, the patches of EVC 55 are of poor quality with low cover of native species in the understorey. The description does include patches with a high cover of exotic species; however, it does not seem to include patches which are almost completely dominated by exotics with no diverse indigenous component, as seen in the small modified patches within the Project Area. **However, advice from DELWP has indicated that the presence of the FFG Act listed community should be assumed regardless of the condition of the patch. As such, all patches of EVC 55 within or near the Victorian Volcanic Plain bioregion are assumed to constitute Western Basalt Plains (River Red Gum) Grassy Woodland. This amounts to 0.233 ha of the listed community within the Project Area (**Patches 1-4 and 7-10 on Appendix B-2 and Appendix H**.** Most of the EVC 55 that occurs in the Project Area is in the northern part within or close to the Victorian Volcanic Plain Bioregion boundary. The two small patches of EVC 55 which occur near Youngs Road in the Highlands – Southern Fall bioregion (Patches 93 and 94 on Appendix B-2 and Appendix H) are sufficiently far from known basalt geology that they are unlikely to represent the listed community.

5.4.4 TREES

There are a total of 7,030 trees and shrubs (>3 m) in the tree dataset as of July 2020, based on the arborist assessment and WSP surveys. 6203 of these trees occur within the Project Area and the remaining 827 occur just outside of the Project boundary and were recorded by the arborist to account for any potential tree protection zone (TPZ) or root impacts.

Of the total trees recorded (Project Area and immediately outside), 1,435 were exotic, 3,482 indigenous, 312 planted indigenous and 1,801 planted native. The breakdown of trees within and just outside the Project Area is provided in Table 5.4.

This does not include any trees removed as part of Yan Yean Stage 1 Upgrade or otherwise observed to be removed during surveys. It does not include trees known to have been recently removed for the Yarra Valley Water Doreen to Diamond Creek Sewerage Project, although this project is ongoing. The only trees which were not recorded by the arborist in the Project Area are those at the back of the golf course and at the rear of the Yarra Valley Water tank site, where no impacts are anticipated to occur.

Table 5.4 Existing trees recorded at the Project Area

	WITHIN PROJECT AREA	OUTSIDE PROJECT AREA	GRAND TOTAL
Exotic	1144	291	1435
Indigenous (Canopy Trees as well as understorey trees and shrubs)	3161	321	3482
Planted native	1597	204	1801
Planted indigenous (planted for amenity purposes)	301	11	312
Grand Total	**6203**	**827**	**7030**

5.4.4.1 NATIVE CANOPY TREES

Of importance are the trees which are considered under the Guidelines 2017 for impact assessment and offsetting purposes. These ‘Canopy Trees’ are defined under Guidelines 2017 as native trees over 3 m, and a species typical of the canopy in the relevant EVC. Canopy trees are further classified as ‘Scattered Trees’ and ‘trees within patches’.

Of the 3482 indigenous trees and shrubs present, 2775 are Canopy Trees. 2499 of these trees occur within the Project boundary, with the remainder (276) just outside (within approximately 15 m). A breakdown of the Canopy Trees is provided in Table 5.5.

Within the Project Area, 211 of these Canopy Trees are Large Trees as per the relevant EVC benchmark, including 47 large Scattered Trees and 164 Large Trees in patches. 187 of the Canopy Trees within the Project Area are small Scattered Trees.

A list of Large and Scattered Trees is provided in Appendix G. The locations of all Canopy Trees are shown in Appendix B-2 and for all indigenous trees and shrubs in Appendix B-3.

Table 5.5 Canopy Trees recorded

GUIDELINES TREE CATEGORY	WITHIN PROJECT AREA	OUTSIDE PROJECT AREA	TOTAL
Trees in Patches	**2265**	**240**	**2505**
Large	164	23	187
Small	2101	217	2318
Scattered Trees	**234**	**36**	**270**
Large	47	11	58
Small	187	25	212
Total	**2499**	**276**	**2775**

5.4.5 WEEDS

Arcadis and WSP field surveys identified that the Project Area supports at least nine CaLP Act listed weed species. This includes five regionally controlled (C) and three restricted (R) weeds. These weeds are listed in Table 5.6. Six of these weed species are also listed as Weeds of National Significance (WoNS) by the Australian Government. Native weedy species such as Cootamundra Wattle *Acacia baileyana* and *Pittosporum undulatum* also occur in the Project Area.

Table 5.6 Noxious weeds in the Project Area

SCIENTIFIC NAME	COMMON NAME	PRESENCE	CALP ACT STATUS	WONS STATUS
Asparagus asparagoides	Bridal Creeper	Scattered in roadside vegetation	R	Yes
Chrysanthemoides monilifera	Boneseed	Scattered in roadside vegetation	C	Yes
Cytisus scoparius	English Broom	Scattered in roadside vegetation	C	Yes
Genista monspessulana	Montpellier Broom	Scattered in roadside vegetation	C	Yes
Nassella neesiana	Chilean Needle Grass	On roadsides and mown lawns	R	Yes
Opuntia stricta	Prickly Pear	Recorded along a fenceline in the south-east of the Project Area – originally planted but now spreading	C	Yes
Oxalis pes-caprae	Soursob	Infestations amongst more modified understory	R	
Rubus polyanthemus spp. agg.	Blackberry	Scattered in roadside vegetation, particularly near drainage lines	C	Yes
Watsonia meriana var. *bulbillifera*	Wild Watsonia	Isolated occurrences	C	

5.5 SIGNIFICANT FLORA

5.5.1 FLORA SPECIES RECORDED

A total of 182 vascular plant species have been recorded within the Project Area and immediate surrounds, of which 118 (65%) are native, 3 (2%) are planted street trees/shrubs and 61 (33%) are introduced species or weedy natives. The full list of flora species recorded from multiple sources is included as Appendix D.

Three significant flora species were recorded within the Project Area, shown on Figure 5.2.

1. Two Matted Flax-lily *Dianella amoena* are located within the Project Area, on the west side of Yan Yean Road, just south of Laurie St. These plants were recorded by Jacobs during a targeted survey conducted on behalf of Yarra Valley Water in 2017 (Jacobs 2017). WSP conducted a site assessment to verify these records in December 2018 and confirmed their presence. This species is listed under the EPBC Act as Endangered, FFG Act listed, and listed as endangered on the *Victorian Advisory List of Threatened Plants* (VicAdv) (DEPI 2014).
2. A single Studley Park Gum *Eucalyptus x studleyensis*, which was recorded by the Project arborist near the Matted Flax-lily plants. This species is a hybrid between River Red Gum *Eucalyptus camaldulensis* and Swamp Gum *Eucalyptus ovata,* it is VicAdv endangered. It is not known whether this tree represents a different hybridisation events from other occurrences of Studley Park Gum, and therefore whether this tree is fertile.
3. Pale-flowered Crane's Bill *Geranium* sp.3 was detected during the targeted orchid surveys within the Project Area at 790A Yan Yean Road. This species is listed as VicAdv rare and is not considered to be a threatened species.

In addition to the above, four significant species: Melbourne Yellow Gum *Eucalyptus leucoxylon* subsp. *connata*, Spotted Gum *Corymbia maculata,* Giant Honey-myrtle *Melaleuca armillaris* subsp. *armillaris*, and Rosemary Grevillea *Grevillea rosmarinifolia* were also recorded as non-indigenous planted specimens within the Project Area. No remnant individuals were recorded or are considered likely to occur.

Figure 5.2 Significant flora recorded

5.5.2 SIGNIFICANT FLORA LIKELIHOOD OF OCCURRENCE

Fifty-two flora species of state and/or national significance were returned from the database search of the VBA and PMST. Table 5.7 provides a summary of the significant flora species with a moderate or higher pre or post-survey likelihood of occurrence. Additional flora species listed only on the Victorian Advisory list were also considered to have a moderate likelihood of occurrence prior to any surveys, but are now considered unlikely to occur. The full (post-survey) likelihood of occurrence assessment is provided in Appendix F.

Following surveys, only one species aside from the three recorded within the Project Area has a moderate or higher potential to occur as natural or remnant specimens.

Maps of VBA records of threatened species from within 5 km of the Project Area are provided as Appendix B.

Table 5.7 Significant flora likelihood summary

COMMON NAME	SCIENTIFIC NAME	STATUS* (EPBC, FFG, VICADV)	PRE-SURVEY LIKELIHOOD	POST-SURVEY LIKELIHOOD AND RATIONALE
Charming Spider-orchid	*Caladenia amoena*	EN L en	Moderate – 3 records within 5 km, most recently in 1997. Some potential habitat was identified in the Project Area.	Low – following targeted surveys, the likelihood of occurrence for this species has been re-classified as low.
Clover Glycine	*Glycine latrobeana*	VU L vu	Moderate – 2 records in locality. Species may be overlooked.	Low – Whilst some fragmented patches of suitable habitat may occur within the Project Area, the species occurs sporadically and the lack of detection during surveys for the Project, combined with the lack of recent and abundant records within a 5 km radius means this species is unlikely occur within the Project Area.
Little Pink Spider-orchid	*Caladenia rosella*	EN L en	Moderate – no records on VBA but disjunct populations known in north east Melbourne and some potential habitat was identified in the Project Area.	Low – following targeted surveys, the likelihood of occurrence for this species has been re-classified as low.
Matted Flax-lily	*Dianella amoena*	EN L en	High – 22 records in the locality. Considered to have a low likelihood in the previous biodiversity assessment as it was not recorded during site assessments (Arcadis 2018).	**Recorded** – recorded by Jacobs for another survey in overlapping area that is regularly mown (Jacobs 2017). Two plants confirmed by WSP within the Project Area for this Project. No additional plants likely.

COMMON NAME	SCIENTIFIC NAME	STATUS* (EPBC, FFG, VICADV)	PRE-SURVEY LIKELIHOOD	POST-SURVEY LIKELIHOOD AND RATIONALE
Pale-flower Crane's-bill	*Geranium sp. 3*	– – r	Moderate – 7 records in the vicinity, found in open grassy woodlands.	**Recorded** by Karl Just during targeted orchid surveys at 790A Yan Yean Road (at least three plants).
Slender Bindweed	*Convolvulus angustissimus subsp. omnigracilis*	– – k	Moderate – 2 records in locality.	**Moderate –** Although not recorded during surveys, this species is relatively common and may occur in the Project Area, including in disturbed sites.
Slender Tick-trefoil	*Desmodium varians*	– – k	Moderate – 15 records in the vicinity, uncommon species found in open woodland.	Low – not detected during site assessments or threatened flora survey, habitat present within the Project Area is poor quality for this species.
Studley Park Gum	*Eucalyptus ×studleyensis*	– – en	Low – no records in locality.	**Recorded** – one remnant tree recorded by arborist (Ryder Arboriculture and Environment 2020) and verified by WSP. No additional trees recorded.
Wine-lipped Spider-orchid	*Caladenia oenochila*	– – vu	Moderate – 4 records within 5 km, most recently in 2005. Some potential habitat was identified in the study area.	Low – following targeted surveys, the likelihood of occurrence for this species has been re-classified as low.

**Key to the conservation statuses in the above table.*

- **Commonwealth EPBC Act:** Shown as EN = Endangered or VU = Vulnerable
- **Victorian FFG Act:** Shown as L = Listed as threatened
- **Victorian Advisory List** (DEPI 2014)**:** Shown as en = Endangered, vu = Vulnerable, r = Rare, k = Poorly Known

5.5.3 TARGETED SURVEY RESULTS

5.5.3.1 ORCHIDS

A targeted orchid survey was conducted by Karl Just (Just 2018) in August and September 2018. Three threatened orchid species were considered to have the potential to occur within the Project Area:

- Charming Spider Orchid *Caladenia amoena*
- Little Pink Spider Orchid *Caladenia rosella*
- Wine-lipped Spider Orchid *Caladenia oenochila.*

Based on the vegetation mapping conducted, potential habitat for these species was identified at several properties along Yan Yean Road. The surveys were conducted as per the '*Survey guidelines for Australia's threatened orchids – Guidelines for detecting orchids listed as threatened under the EPBC Act 1999'* (Department of Environment 2013).

Three surveys were conducted during the late winter flowering season with reference sites checked to determine if the species was flowering. None of the target orchid species were detected during the surveys and the species are considered unlikely to occur within the Project Area. Non-target orchids detected during the surveys are detailed in Table 5.8 (Just 2018). In addition, several Pale-flowered Crane's Bill *Geranium* sp.3 (VicAdv – rare) were detected during the targeted orchid surveys within the Project Area at 790A Yan Yean Road.

Table 5.8 Targeted orchid survey results (Just 2018)

SCIENTIFIC NAME	COMMON NAME	577 YAN YEAN RD	581 YAN YEAN RD	585 YAN YEAN RD	790A YAN YEAN RD
Acianthus pusillus	Small Mosquito-orchid			x	x
Cyanicula caerulea	Blue Fairy			x	
Diuris pardina	Leopard Orchid	x			
Eriochilus cucullatus	Parsons Bands	x		x	
Glossodia major	Wax-lip Orchid	x	x	x	x
Pterostylis concinna	Trim Greenhood			x	x
Pterostylis nutans	Nodding Greenhood	x	x	x	
Pterostylis pedunculata	Maroonhood		x		
Pterostylis squamata	Common Ruddyhood	x		x	
Thelymitra spp.	Sun-orchid				x

5.5.3.2 MATTED FLAX-LILY AND OTHER THREATENED FLORA

MATTED FLAX-LILY

Surveys verified two Matted Flax-lily plants, previously recorded by Yarra Valley Water in December 2017 (Jacobs 2017). Both plants occur within the road reserve in an area which is regularly mown. While multiple ramets where observed at each location (100+ ramets for Matted Flax-lily 1 and 75–100 ramets for Matted Flax-lily 2), due to the rhizomatous nature of Matted Flax-lily, each recording is assumed to be an individual plant.

No additional Matted Flax-lilies were detected during targeted surveys and it is expected that if other plants were present at the time of the survey, they would have been detected in the areas searched. No other threatened or Advisory List flora were detected during these surveys. Table 5.9 provides photographs and coordinates of the plants recorded and Figure 5.3 shows the location of the plants in relation to the Project.

OTHER SIGNIFICANT FLORA

The ecologists confirmed the presence and classification of the Studley Park Gum recorded by the Project arborist.

The previously recorded Geranium sp. 3, detected by Karl Just during orchid surveys, could not be re-located by WSP ecologists due to its partial dieback over summer. Nevertheless, the species is still assumed to be present on that property.

No other threatened or otherwise significant flora were detected during surveys.

Table 5.9 Matted Flax-lily photographs and coordinates from surveys in December 2018

MATTED FLAX-LILY 1 (E:335420.71, N:5834377.98)	MATTED FLAX-LILY 2 (E:335431.29, N:5834428.77)
The red circle identifies Matted Flax-lily plant number one in the below image, comprised of approximately 100+ ramets, assuming individual shoots arise from shared rhizomes of one parent plant. The extent of the plant was approximately 1 m x 0.5 m. This plant is growing at the base of a tree and does not appear to be mown.	The red circle identifies Matted Flax-lily plant number two in the below image, comprised of approximately 75-100 ramets, assuming individual shoots arise from shared rhizomes of one parent plant. The extent of the plant was approximately 1 m x 1 m growing up to 10 cm high. This area is regularly mown.
	

5.6 FAUNA

5.6.1 FAUNA SPECIES RECORDED

A total of 88 fauna species were recorded during the site assessments for the Project, including during targeted surveys and incidental sightings by various consultants. The species list includes 64 birds, eight mammals, five amphibians, one fish, one reptile and nine invertebrates. Ten (11%) of these are introduced species. The full list is provided in Appendix E.

Native non-listed fauna that occur, or are likely to occur, in and adjacent to the Project Area include the following:

- arboreal mammals, including the Common Ringtail Possum *Pseudocheirus peregrinus*, Common Brushtail Possum *Trichosurus vulpecula* and Sugar Glider *Petaurus breviceps*
- small ground-dwelling mammals including the Short-beaked Echidna *Tachyglossus aculeatus* and potentially some common native rodents
- microbats which are likely to forage and roost within the study area
- Eastern Grey Kangaroos *Macropus giganteus* and Common Wombats *Vombatus ursinus*
- a range of common native frogs
- reptiles, including snakes, small scincids and the Eastern Long-necked Turtle *Chelodina longicollis*.

Exotic fauna known or likely to occur include the Red Fox *Vulpes vulpes* European Rabbit *Oryctolagus cuniculus* and several exotic bird species. Rabbits (or their signs) were recorded in high numbers across the Project Area.

One threatened species was recorded during surveys: Grey-headed Flying-fox *Pteropus poliocephalus*, which is listed under the FFG Act and classified as Vulnerable under the EPBC Act and the Victorian Advisory List. This species was recorded incidentally during the threatened owl surveys (Ninox Pursuits Environmental Services 2018).

5.6.2 FAUNA HABITAT

Being a road corridor, the habitat within the Project Area is heavily impacted by weeds, by previous clearing, by reforming for infrastructure and other past development, and by the land management of the adjacent landholders. Despite this, there are patches of low to moderate quality habitat remaining for fauna. The fauna habitat values within the Project Area include:

- hollow bearing trees that provide habitat for a variety of arboreal mammals and hollow nesting birds and bats. 109 trees with medium-large sized hollows were recorded by the arborist, with 99 of these trees within the project boundary and the remainder just outside (refer to Figure 5.3 below). Small hollows also occur but a detailed hollow-bearing trees survey was not conducted
- patches of remnant native vegetation which would provide foraging and nesting habitat for a variety of bird species. Some higher quality patches support midstorey vegetation which provides shelter and breeding resources for small bird species, with a diverse groundcover. Other patches support trees only over a cleared and maintained (slashed or heavily grazed) groundcover
- planted trees, including eucalypts, some of which are likely to provide habitat for nectarivous birds and other fauna (including Swift Parrot and Grey-headed Flying-fox)
- farm dams and landscaped wetlands of varying quality. Some of these provide habitat for a range of native frogs and waterbirds (Note: there is minimal wetland or aquatic habitat within the Project Area itself)

- planted gardens, which provide non-local and exotic shrubs and trees and may be of some habitat value for native species, particularly birds and possums
- native and exotic-dominated secondary grassland. This habitat is likely to support common reptiles and some native bird species, as well as wombats, kangaroos, and echidnas.

Higher quality habitat for fauna can found in larger patches of remnant vegetation in the surrounding landscape, such as along Plenty Gorge (see Section 5.1), however the vegetation and habitat in the Project Area and immediate surrounds is likely to provide valuable stepping-stone habitat between some of these higher quality patches. Connectivity is discussed further in Section 5.6.5.

Figure 5.3 Trees with medium-large hollows (Ryder 2020)

5.6.3 SIGNIFICANT FAUNA LIKELIHOOD OF OCCURRENCE AND HABITAT

Database searches of the VBA and PMST returned 78 significant fauna species previously recorded or predicted to occur within 5 km of the Project Area. Table 5.10 provides a summary of the fauna species with a moderate or higher pre or post-survey likelihood of occurrence, as well as a brief description of the habitat present. Overall, eight species are considered moderately likely (post-survey) to occur within the Project Area.

The full (post-survey) likelihood of occurrence assessment is provided as Appendix F2. Maps of VBA records of threatened species from within 5 km of the Project Area are provided in Appendix B .

Table 5.10 Significant fauna likelihood summary

COMMON NAME	SCIENTIFIC NAME	STATUS (EPBC, FFG, VIC ADV)*	PRE-SURVEY LIKELIHOOD	POST-SURVEY LIKELIHOOD AND HABITAT RECORDED
Birds				
Barking Owl	*Ninox connivens*	– L en	Moderate – 4 records within 5 km, most recently 2015	Low – targeted surveys were conducted for threatened owls (Section 5.6.4.5). None were detected and it is considered unlikely that this species would utilise habitat within the Project Area to a significant extent.
Masked Owl	*Tyto novaehollandiae*	– L en	Moderate – 2 records within 5 km, most recently 1990	Low – targeted surveys were conducted for threatened owls (Section 5.6.4.5). No Masked Owls were detected and it is considered unlikely that this species would utilise habitat within the Project Area.
Powerful Owl	*Ninox strenua*	– L vu	Moderate – 6 records within 5 km, most recently 2008	Low – targeted surveys were conducted for threatened owls (Section 5.6.4.5). None were detected and it is considered unlikely that this species would utilise habitat within the Project Area to a significant extent.
Rufous Fantail	*Rhipidura rufifrons*	M – -	Moderate – several recent records	**Moderate** There are several recent records of this species in the locality (Ebird) although these are sporadic. The species is more likely to frequent nearby gullies and parks but may periodically occur within the Project Area.

COMMON NAME	SCIENTIFIC NAME	STATUS (EPBC, FFG, VIC ADV)*	PRE-SURVEY LIKELIHOOD	POST-SURVEY LIKELIHOOD AND HABITAT RECORDED
Swift Parrot	*Lathamus discolor*	CR L en	High – 30 records within 5 km, most recently 2017, large number of habitat tree species within Project Area. There are additional and more recent local records in the Birddata database and in Ebird.	**Moderate** – although not recorded during targeted or other surveys, the species may utilise habitat on a temporary basis, passing through the area foraging on flowering Eucalypts. The Project Area supports a low proportion of (mostly planted) winter-flowering trees, however under some flowering situations, these trees may be utilised. Refer to Section 5.6.4.6.
White-throated Needletail	*Hirundapus caudacutus*	M & VU L vu	Moderate – 21 records, most recently in 2013.	**Moderate** A mostly aerial bird that occurs across a wide variety of habitat types. It is unlikely to utilise resources within the Project Area but may be seen flying over from time to time. Targeted surveys not warranted.
Reptiles, amphibians and invertebrates				
Brown Toadlet	*Pseudophryne bibronii*	– L en	Moderate – 11 records within 5 km, most recent in 1992	Low – suitable habitat was not found during habitat assessment. Refer Section 5.6.4.1.
Eastern Snake-necked Turtle	*Chelodina longicollis*	– – dd	Moderate – 33 records within 5 km, most recent 2016. Could utilise farm dams and been found crossing between dams in the vicinity.	**High** Targeted surveys not warranted as species is likely to occur in dams at the site and is listed as data-deficient, not threatened.
Eltham Copper Butterfly	*Paralucia pyrodiscus lucida*	EN L en	Moderate – 2 records within 5 km, most recent being 2017	Low – habitat assessment and targeted survey (Section 5.6.4.3) did not locate any potential habitat or evidence of this species.

COMMON NAME	SCIENTIFIC NAME	STATUS (EPBC, FFG, VIC ADV)*	PRE-SURVEY LIKELIHOOD	POST-SURVEY LIKELIHOOD AND HABITAT RECORDED
Growling Grass Frog	*Litoria raniformis*	VU L en	Low – 36 records within 5 km, most recent in 2007, however no recent records with connectivity to the Project Area. Surveys completed as a precaution.	Low – habitat assessment and targeted survey was undertaken. No Growling Grass Frogs were recorded and the aquatic habitat is considered unlikely to support the species. Refer Section 5.6.4.4.
Southern Toadlet	*Pseudophryne semimarmorata*	– – vu	Moderate – 90 records within 5 km, most recent in 1989	Low – suitable habitat was not found during habitat assessment. Refer Section 5.6.4.1
Tussock Skink	*Pseudemoia pagenstecheri*	– – vu	Moderate – 4 records within 5 km, most recent in 2018	**Moderate** Project Area supports a small amount of moderate-high quality potential habitat in the patches of grassy dry forest with native grassy understorey northeast of the Jorgensen Avenue intersection. Additional areas of lower quality potential habitat are also present where there is grassy woodland with native understorey. Targeted survey was not conducted for this species due to the poorly connected nature and small size of the potential habitat patches. Potential habitat is also either difficult to access or too exposed for tile survey.

COMMON NAME	SCIENTIFIC NAME	STATUS (EPBC, FFG, VIC ADV)*	PRE-SURVEY LIKELIHOOD	POST-SURVEY LIKELIHOOD AND HABITAT RECORDED
Mammals				
Common Bent-wing Bat	*Miniopterus schreibersii*	CR L cr	Moderate – 4 records within 5 km, most recent 1992	**Moderate** Although there are few past records, the Common Bent-wing Bat may occasionally fly through/over and forage within the Project Area, however there are no known roosts (or any potential roost caves or structures) within or nearby the Project Area. Due to the lack of known or potential nearby roosts for this species, targeted surveys were not considered to be warranted.
Brush-tailed Phascogale	*Phascogale tapoatafa*	– L vu	Moderate – 8 records within 5 km, most recently 2017, potential habitat found within Project Area	**Moderate** Low likelihood of resident population, but moderate likelihood of occurrence. The potential habitat was found to be highly disturbed and fragmented, and targeted surveys (Section 5.6.4.2) did not detect this species. The species was also not detected during arboreal mammal surveys conducted for Stage 1 (van der Ree 2018), However, there are records in the locality, and the potential for periodic dispersal through the Project Area from nearby known habitat to the east and south-east of the Project Area. As such, the overall likelihood is conservatively considered to be Moderate.

COMMON NAME	SCIENTIFIC NAME	STATUS (EPBC, FFG, VIC ADV)*	PRE-SURVEY LIKELIHOOD	POST-SURVEY LIKELIHOOD AND HABITAT RECORDED
Grey-headed Flying-fox	*Pteropus poliocephalus*	VU L vu	High – 2 records within 5 km, most recent in 2013	**High (Recorded)** The species was recorded in the Project Area on 2 November 2017 during nocturnal fauna surveys conducted by Ninox pursuits. It is likely to periodically forage on flowering eucalypts and planted trees within the Project Area and to regularly fly over the Project Area. As the species is already known to forage in the area, and no Grey-headed Flying-fox camps occur within or nearby the Project Area (nearby camp is approx. 17 km away) targeted surveys were not considered warranted.

**Key to the conservation statuses in the above table.*

- **Commonwealth EPBC Act:** Shown as CR = Critically Endangered, EN = Endangered, VU = Vulnerable, or M = Migratory
- **Victorian FFG Act:** Shown as L = Listed as threatened
- **Victorian Advisory List** (DEPI 2014)**:** Shown as cr = Critically Endangered, en = Endangered, vu = Vulnerable, dd = data deficient

5.6.4 TARGETED SURVEY AND HABITAT ASSESSMENT RESULTS

Results of targeted surveys and targeted habitat assessments are detailed below. The potential or known habitat available for each species is described.

5.6.4.1 BROWN TOADLET AND SOUTHERN TOADLET

Practical Ecology conducted habitat assessments for Brown Toadlet and Southern Toadlet in May 2018 (Practical Ecology 2018a). The assessments were conducted during weather conditions favourable for calling. Nine sites were assessed for presence of suitable habitat and for evidence of the target species. None of the sites assessed were considered to be appropriate habitat for these species due to the permanent nature of the waterbodies, lack of suitable vegetation, and the highly disturbed, cleared land surrounding the sites. No individuals of either species were heard calling. The survey results are presented below in Table 5.11.

Table 5.11 Toadlet habitat assessment results (Practical Ecology 2018a)

	SITE 1	SITE 2	SITE 3	SITE 4	SITE 5	SITE 6	SITE 7	SITES 8	SITE 9
Site type	Farm dam	Constructed wetland	Constructed wetland	Dam soak zone/drainage line	Wetland	Ornamental dam	Ornamental dam	Depression	Gully
Hydroperiod	Permanent	Permanent	Permanent	Permanent	Permanent	Permanent	Dry - filled in	Permanent	No capacity to retain water
Emergent Vegetation (%)	0	25	10	20	90	0	0	15	0
Fringing Vegetation (%)	20	100	100	100	100	0	0	0	0
Coarse Woody Debris	0	0	0	Logs, leaf litter	0	0	0	0	Logs, leaf litter
Terrestrial Surrounds	Pasture	Cleared	Residential	Sports field	Lawn	Lawn	Lawn	Lawn	Modified Woodland
Frog Species	None	*Crinia signifera*	*Crinia signifera*	*Crinia signifera*	None	None	None	*Crinia signifera*	None
Habitat connectivity	None	Drainage line under Yan Yean Rd to Site 3	Drainage line	Drainage line to large dam	Drainage line to Yan Yean Rd	None	None	None	Connected downslope through modified woodland

5.6.4.2 BRUSH-TAILED PHASCOGALE

The habitat assessment by EcoAerial identified six sites with medium quality potential habitat and two sites of low quality potential habitat for the species (EcoAerial 2017). A total of 21 trees with hollows were identified during the habitat assessment in the potential habitat patches. A Common Ringtail Possum was recorded in a hollow and nesting material consistent with a Sugar Glider was found in another hollow.

The patches of medium quality potential habitat were targeted for remote sensing cameras (seven locations) and hair tubes (five locations)(EcoAerial 2018). No Brush-tailed Phascogales were recorded during the targeted surveys. The cameras picked up five species: Common Ringtail Possum, Common Brush-tailed Possum, Sugar Glider, Southern Boobook *Ninox boobook* and a microbat. No fauna were detected with the hair tubes. The full results are provided in Appendix E4 Phascogale Survey Results.

Overall, the habitat within and adjacent to the study area was considered highly fragmented and of poor quality for Brush-tailed Phascogales, with minimal woody debris to provide protection from predators.

We acknowledge that spring is sometimes considered a suboptimal time to survey for this species, as adult males are not present in the population in late spring/summer. However, the survey is still suitable for detecting females (if present) and the timing should coincide with the dispersal of sub-adults (EcoAerial 2018). In addition, the species was not detected during arboreal mammal surveys conducted in autumn for Yan Yean Road Upgrade Stage 1 (van der Ree 2018).

Based on the results of this and previous survey, it is unlikely that the species regularly occupies the Project Area or that the Project Area supports any critical habitat. Nevertheless, given that the species occurs in the broader locality, the potential for the Project Area to occasionally support dispersing individuals should not be discounted.

5.6.4.3 ELTHAM COPPER BUTTERFLY

A habitat assessment was conducted by Andrea Canzano (Practical Ecology) (Practical Ecology 2018b), an entomologist who coordinates the Eltham Copper Butterfly Recovery Team. No Eltham Copper Butterflies were recorded during this assessment (Practical Ecology 2018b).

The habitat assessment determined that there were several patches within the study area that supported potential habitat for the butterfly (Grassy Dry Forest or Valley Grassy Forest with the host plant Sweet Bursaria), however these patches were not of the same habitat quality as the known colony sites in the Nillumbik area. The presence of the butterfly can be indicated by the presence of the attendant ant, (in Melbourne this is *Notoncus capitatus*), which lives in a symbiotic relationship with the butterfly. Searches for the ant did not uncover any within the potential habitat patches. If the ant is not present it is highly unlikely that the butterfly is present.

The known colony sites for this species are well documented and while the Project Area is close to several known colonies of this species, it is considered unlikely that a new colony of this declining species would be found. The Nillumbik area has been thoroughly assessed over the years by entomologists looking for new colonies of this species.

Based on the above, and as determined by Practical Ecology (Practical Ecology 2018b), the Eltham Copper Butterfly is considered unlikely to occur within the Project Area and further targeted survey is not warranted.

5.6.4.4 GROWLING GRASS FROG

Habitat assessments and targeted surveys were conducted on 15 January and 31 January 2019. No Growling Grass Frogs were recorded (seen or heard) during the targeted surveys conducted for this Project, or during any other surveys conducted for the Project at the wetlands supporting potential habitat. Non-target fauna recorded included common bird species and several common frog species. The species (and numbers) recorded, survey timing, photographs of the wetlands targeted, and survey conditions are provided in Appendix E2.

As the survey season was unusually dry, the lack of records alone is not solely relied upon to determine the likelihood of occurrence of this species. From the habitat assessment of the sites (Table 5.12), most of the sites examined do not provide the habitat features usually required by the species. None of the sites are well-connected to each other or to any current known sites.

Overall, Growling Grass Frog is considered unlikely to occur within the Project Area, nor is it likely that a population occurs nearby the Project Area that could be affected by the Project directly or through a reduction in connectivity.

Table 5.12 Growling Grass Frog survey site habitat assessment results

SURVEY POINT (FIGURE 3.2)	HABITAT AND SURVEY NOTES	HABITAT QUALITY FOR GGF
1	Very bare, unlikely to support GGF.	Unlikely
2	Very dense (*Typha* spp.), unlikely to support GGF.	Unlikely
3	Landscaped wetland, however provides potential habitat (including shelter sites, emergent veg etc.).	Possible (but still low likelihood)
4	Impacted from use of the lake for recreation. Only a small area of emergent veg.	Unlikely
5	Dam in the golf course. High quality frog habitat but not high quality habitat for GGF. Deep pond with fringing vegetation but minimal floating or emergent vegetation or shelter.	Unlikely
6	Very little water during first survey. None during second. Otherwise, some potential to support GGF. Poor connectivity to other habitat areas.	Possible (but still low likelihood)
7	Northern pond is ornamental with steep rock sides and no emergent or fringing vegetation. Southern pond is also ornamental but supports emergent vegetation and sides less steep with rocks and other shelter. Poor quality nearby habitat and poor connectivity.	Unlikely
8	Bridge over Plenty River on Bridge Inn Road. Added to survey sites to provide an additional nearby point. Habitat on northern side more open and of higher quality.	Possible (but still low likelihood)
9	Farm dams. Appears to be minimal shelter and emergent vegetation. Added to survey later so was only surveyed once through playback and listening. Outside of Project Area and unlikely to support GGF.	Unlikely

5.6.4.5 OWL SURVEYS

Habitat assessment and targeted surveys were conducted for three threatened owl species: Powerful, Barking and Masked Owls, by Ed McNabb, a nocturnal fauna specialist (Ninox Pursuits Environmental Services 2018). The initial habitat assessment identified six locations in the vicinity of Yan Yean Road to target with call playback and spotlighting, due to the presence of potential habitat (roosting habitat, foraging habitat, or hollow-bearing trees), and based on the location of past records. No target owl species were recorded during the surveys. Survey results are provided in Table 5.13.

Based on the results of the surveys and habitat assessment by Ninox Pursuits (2018), the target species are considered unlikely to utilise the habitat in the Project Area in a regular or meaningful way. Although there is potential threatened owl habitat in the nearby Plenty Gorge Parklands, there have been extensive changes in land use in the locality. With local habitat loss for development, combined with the lack of recent records and the lack of records during this targeted survey, the likelihood of occurrence of these species in the Project Area is considered to be low.

Table 5.13 Targeted owl survey results

SITE	LOCATION	DATE	START TIME	TEMP (˚C)	CLOSEST RECORD (m)	DISTANCE TO PROJECT AREA (m)	OWLS RECORDED	NON-TARGET SPECIES RECORDED
1	Heard Ave, forested roadside	2.11.17	23:23	11	1,700	350	None	Grey-headed Flying-fox
2	Yarrambat Park, open woodland	3.11.17	01:15	9	1,400	600	Southern Boobook	None
4	Edward Henty Ave, open woodland	2.11.17	22:10	11		700	None	None
25	Glenvale School, large patch of remnant forest	20.11.17	22:10	23	2,500	450	None	Owlet-nightjar, 5 frog species
26	Roadside, patchy woodland	3.11.17	02:15	9	2,400 and 2,900	800	None	Grey-headed Flying-fox and 2 Ringtail Possums
30	Plenty Gorge Parklands adjacent Yarrambat Park Golf Course	3.11.17	00:20	11	1,600	200	None	None
31	Treed parkland off Gorge Rd	08.11.17	00:01	11	800	1000	Southern Boobook	None

5.6.4.6 SWIFT PARROT

Swift Parrots are a migratory parrot, breeding in Tasmania and returning to forage on the mainland between the cooler months, roughly March-October. On the mainland, the species occurs in Victoria, the ACT, NSW and into southern Queensland. Highest numbers are usually recorded foraging in inland Victoria (box-ironbark habitat) and NSW (coastal and western slopes regions) across most of the winter period (Saunders, D & Tzaros 2011).

When on the mainland, the species forages opportunistically on nectar (predominantly from flowering eucalypts) and on lerp, and may utilise scattered trees, remnant vegetation and continuous forests (Saunders, DL & Heinsohn 2008). As nectar production and lerp densities are dependent on various factors including seasonal conditions, occurrence across the range is difficult to predict and may vary substantially between years (Saunders, D & Tzaros 2011).

SURVEY AND HABITAT ASSESSMENT RESULTS

No Swift Parrots were recorded during the surveys. However, as detailed in the methods, these surveys were not undertaken solely to determine the presence or absence of the species, which, based on local records, is assumed to periodically utilise any habitat present in the area. As well as surveying for Swift Parrots, the ecologist also assessed the type and likely value of habitat in the Project Area relative to nearby known habitat. The bird species recorded have been incorporated into the species list in Appendix E, and the results from the habitat assessment for each site (2019 only) are provided in Appendix E3. Full results of both surveys can be provided as Excel spreadsheets on request. The habitat assessment results are summarised below.

The dominant tree within the Project Area is Red Box *Eucalyptus polyanthemos* with small occurrences of other species including planted trees of the winter blossoming species Yellow Gum *E. leucoxylon*, which is listed as a key feed species in the recovery plan for the Swift Parrot (Saunders, D & Tzaros 2011). Yellow Box *E. melliodora* is also present in reasonable numbers, including some large trees. This species is also listed as a key feed species, although flowering is usually over the warmer months and may only occasionally partly overlap with the Swift Parrot's presence in mainland Australia. No flowering Yellow Box were observed during the surveys. Two non-local native species which occur locally as planted individuals and for which flowering could potentially overlap with Swift Parrot Presence, Sugar Gum *E. cladocalyx* and Spotted Gum *Corymbia maculata*, are present in small numbers along the Project alignment. In 2018, Sugar Gum was beyond its blossoming period and Spotted Gum was flowering and attracting local nectarivorous birds in at least one location. In 2019, neither species was observed in flower during the surveys.

The importance of local resources, as part of the greater Melbourne locality, is likely to be due to their proximity to Bass Strait, and therefore their suitability as arrival and departure locations for replenishing depleted energy reserves. Observations from this survey and from an examination of records in the locality suggest that the significance of habitats associated with the Project Area will be closely tied to the occurrence of winter blossom resources. While no direct observations of Swift Parrots were made within the Project Area during the 2018 or 2019 surveys, records from the locality earlier in the season and in previous years show that some of the blossom producing trees in the Project Area and immediate surrounds may be important to Swift Parrots under some blossom distribution scenarios. For example, should the trees in the Project Area be flowering profusely, but habitat elsewhere (such as at Latrobe Sanctuary) that the species usually relies on more heavily is having a poor flowering season, these trees may become more important to the species. Similarly, should habitat in inland Victoria or NSW be flowering poorly, the habitat in the Melbourne region in general may become more important to the species, and the Swift Parrot may be more likely to visit the Project Area.

The trees in the Project Area are unlikely to regularly provide important or critical foraging habitat for the species, particularly when compared with the resources available in the locality at sites where the species has previously been recorded. However, even small amounts of winter blossom providing canopy strata could become locally important to individual Swift Parrots under some climatically determined scenarios of blossom resource distribution.

POTENTIAL FORAGING TREES AND HABITAT MAPPING AT THE STUDY AREA

Swift Parrot habitat recorded in the study area has been mapped in line with Arcadis (2018) using the presence of 'key' habitat trees as defined in the recovery plan (Saunders, D & Tzaros 2011) and 'secondary' habitat trees as defined in (Practical Ecology 2017a). These trees and the numbers in the study area are provided in Table 5.14. The study area for the Swift Parrot habitat assessment is the Project boundary plus approximately 15–20 metres to account for any potential tree protection zone impacts. 272 of the 2587 habitat trees are located outside of the Project Area, in this buffer assessed by the arborist. The remaining 2315 habitat trees occur within the Project Area, with 596 of these being 'key' trees.

Most of the trees are small, defined as <60 cm DBH (60 cm DBH being the large tree benchmark for the dominant EVC in the Project Area, Grassy Dry Forest). Swift Parrots have been shown to preferentially forage in larger trees, which provide more reliable resources (J. Kennedy & L. Tzaros 2005).

An estimated average tree canopy width was collected for each tree by the arborist (Ryder Arboriculture and Environment 2020). This has been used to calculate an approximate canopy area for each habitat tree, which has been summed to provide a total area of key and secondary canopy in the study area. This has resulted in a total area of approximately **2.03 ha** of key canopy (1.82 ha within Project boundary) and **6.38 ha** of secondary canopy (5.48 ha within Project boundary). Canopy area of Yellow Gums, the species most preferred by Swift Parrots in the locality (Practical Ecology 2017b), is estimated at 0.46 ha total, with 0.40 ha within the Project Area. Only one of these Yellow Gums in the Project Area is large.

We note that the above approximate areas do not include other potential habitat values (e.g. trees, midstorey and understorey) which may either be utilised directly by the Swift Parrot for foraging or roosting, or which may contribute to the values of the identified key and secondary trees. They are also reliant on the accuracy of the approximate canopy widths provided by the arborist and do not account for gaps in the canopy of each tree. The areas will include some overlap in tree canopies; however, this can be seen to more accurately present the amount of potential foraging canopy available to the species. Removing overlap may undervalue areas of dense key or secondary trees. This simplified approach has been taken due to the high degree of modification of the Project Area and the prevalence of planted trees, particularly key trees, which should be given similar weighting to remnant vegetation patches when assessing stepping stone foraging habitat for this species.

The locations of the key and secondary foraging trees are shown on Figure 5.4.

Connectivity and movement for this species is discussed in Section 5.6.5.1.

Table 5.14 Swift Parrot potential habitat tree species and numbers recorded by the arborist in the Project Area and immediate vicinity

SCIENTIFIC NAME	COMMON NAME	HABITAT TYPE	WITHIN PROJECT AREA			OUTSIDE PROJECT AREA			GRAND TOTAL
			Small <60 DBH	Large ≥60 DBH	Total Within	Small <60 DBH	Large ≥60 DBH	Total Outside	
Corymbia maculata	Spotted Gum	Key	123	2	125	7	1	8	133
Eucalyptus leucoxylon	Yellow Gum	Key	134	1	135	21		21	156
Eucalyptus melliodora	Yellow Box	Key	209	15	224	20	3	23	247
Eucalyptus microcarpa	Grey Box	Key		1	1		1	1	2
Eucalyptus robusta	Swamp Mahogany	Key	8		8	1		1	9
Eucalyptus sideroxylon	Red Ironbark	Key	92	5	97	6		6	103
Eucalyptus tereticornis	Forest Red Gum	Key	1		1				1
Eucalyptus tricarpa	Ironbark	Key	5		5				5
Total Key Habitat trees recorded			**572**	**24**	**596**	**55**	**5**	**60**	**656**
Acacia pycnantha	Golden Wattle	Secondary	185		185	7		7	192
Eucalyptus camaldulensis	River Red Gum	Secondary	171	32	203	20	16	36	239
Eucalyptus macrorhyncha	Red Stringybark	Secondary	240	4	244	33		33	277
Eucalyptus polyanthemos	Red Box	Secondary	1027	60	1087	126	10	136	1223
Total secondary habitat trees recorded			**1623**	**96**	**1719**	**186**	**26**	**212**	**1931**
Grand Total			**2195**	**120**	**2315**	**241**	**31**	**272**	**2587**

LINK WITH EVC MAPPING

As stated in Arcadis (2018):

> *Only two of the vegetation communities strongly associated with Swift Parrots occur within the Study Area; EVC 22: Grassy Dry Forest and EVC 55: Plains Grassy Woodland. Both are communities where the dominant tree species are secondary foraging species for the Swift Parrot; namely, Red Box and Red Stringybark in EVC 22: Grassy Dry Forest, and River Red Gums in EVC 55: Plains Grassy Woodland.*

As explained above, the habitat within the study area, although supporting some key foraging species, mostly consists of trees that are summer-flowering but may provide supplementary lerp resources for Swift Parrot (i.e. 'secondary' feed species as described in (Practical Ecology 2017a). No flowering of 'key' trees was observed within the study area itself during the surveys, however timing and degree of flowering would vary between years.

As stated in Arcadis (2018):

> *EVC 61: Box Ironbark Forest is absent from the study area, but does occur within the Plenty River/Plenty Gorge Parklands, which is considered to be a core movement pathway for the Swift Parrot (O'Malley 2017), as evidenced by the number of records, principal foraging species and EVCs present.*

The presence of EVC 61 Box Ironbark Forest appears to be highly linked to the records of the Swift Parrot in the locality, although there are records of the species in stands of planted key foraging trees, as well as in secondary habitat trees providing lerp resources (Practical Ecology 2017a).

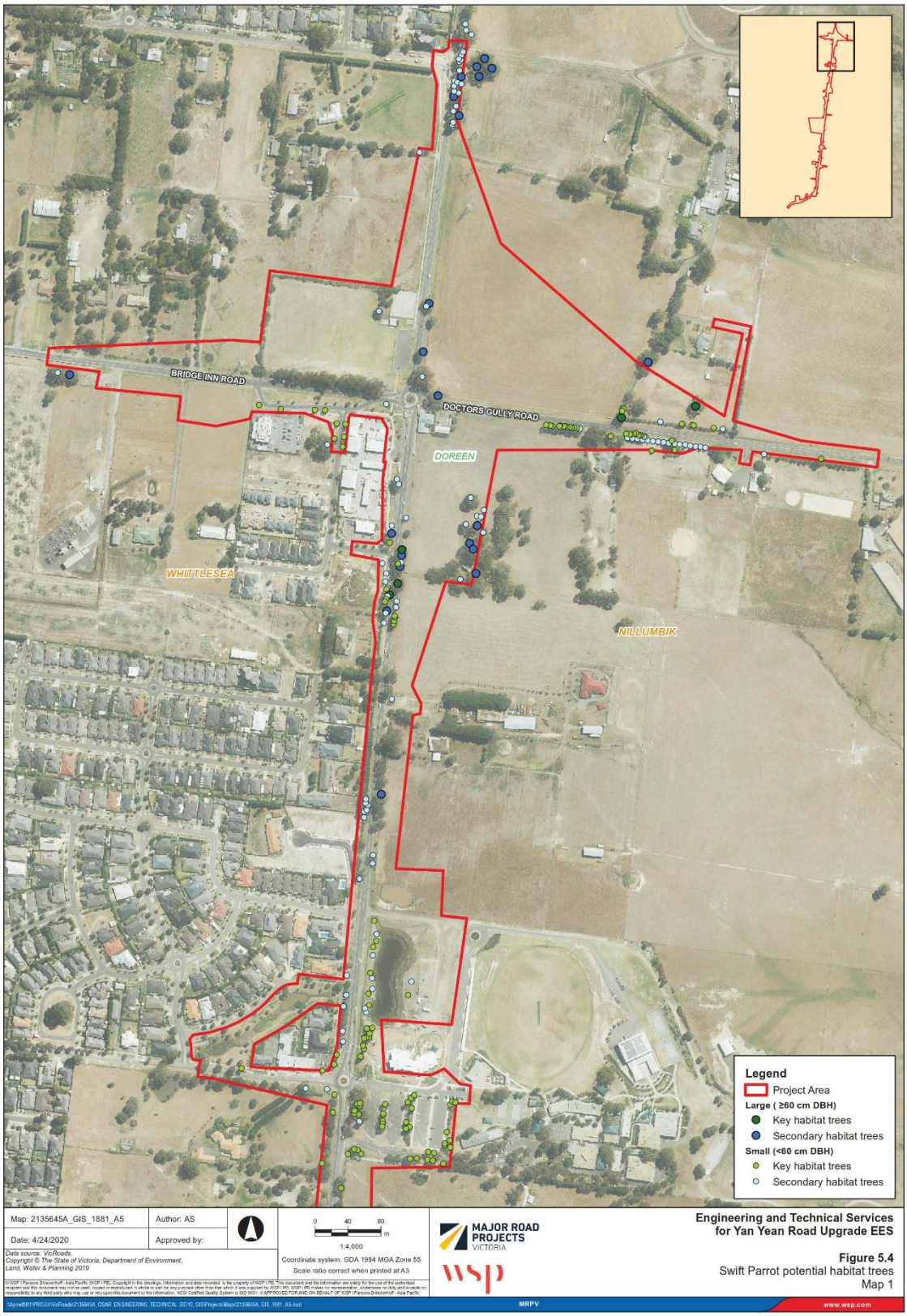


Figure 5.4 Swift Parrot potential habitat trees Map 1 of 4

Figure 5.4 Swift Parrot potential habitat trees – Map 2 of 4

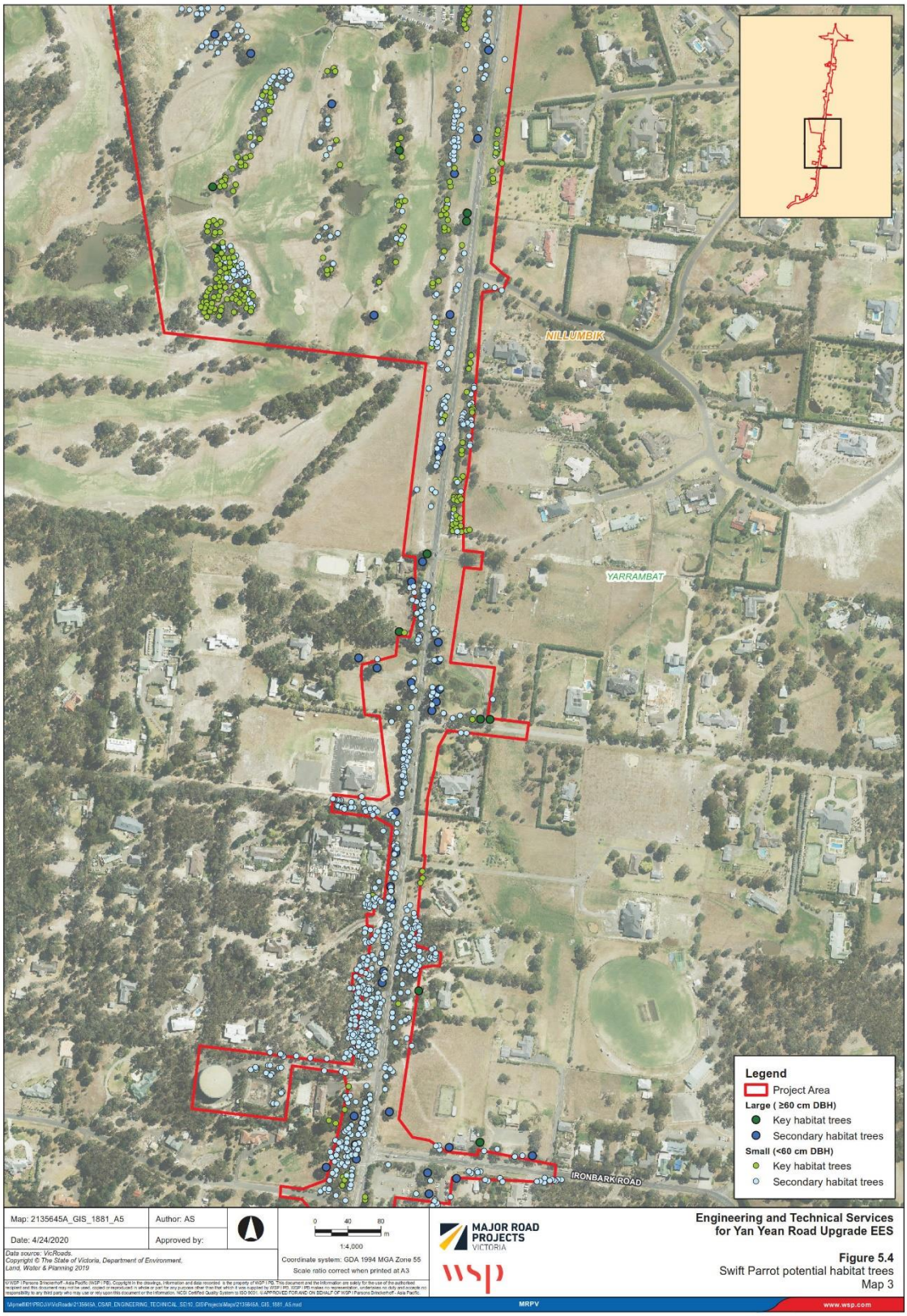


Figure 5.4 Swift Parrot potential habitat trees – Map 3 of 4

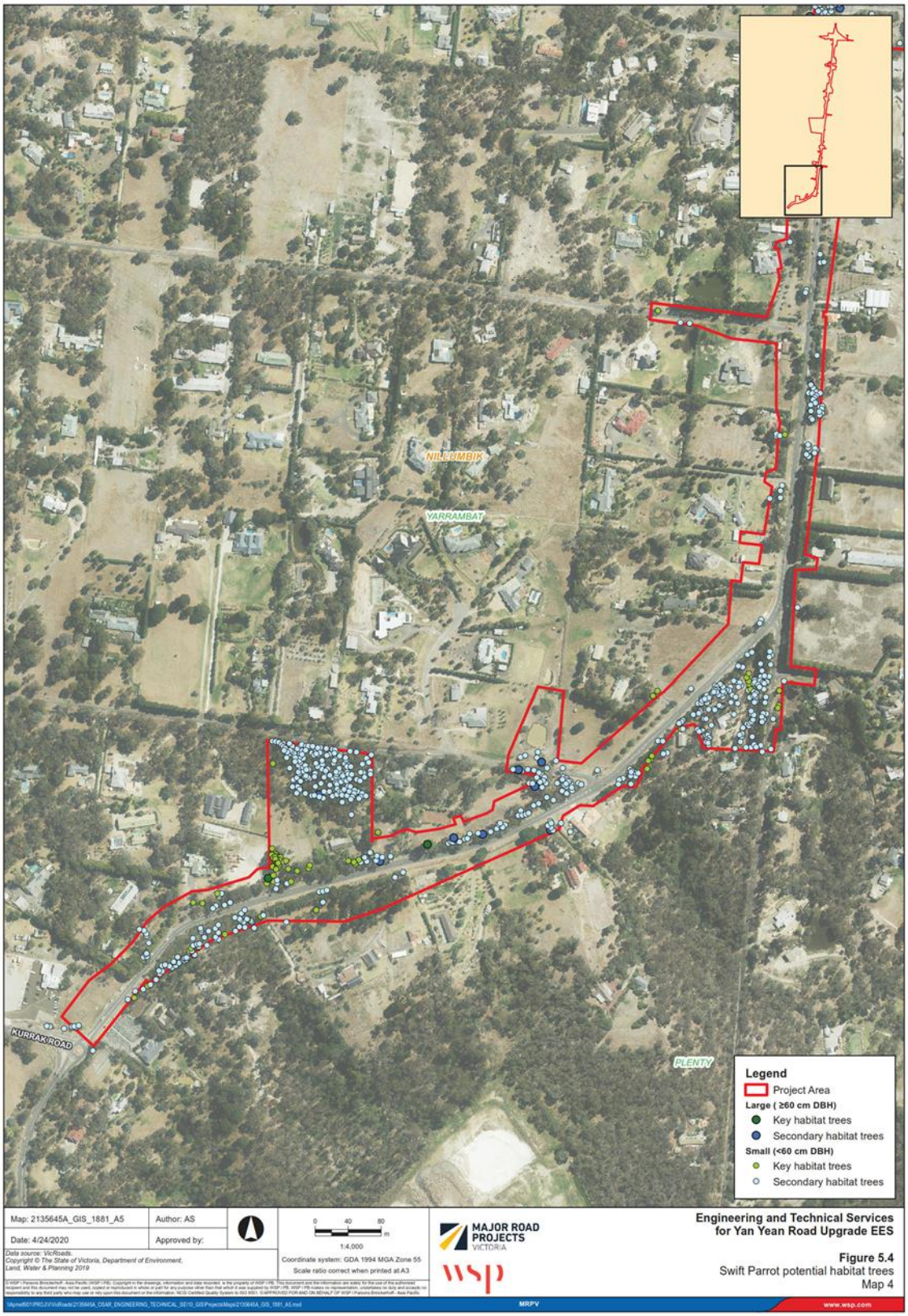


Figure 5.4 Swift Parrot potential habitat trees – Map 4 of 4

5.6.5 CONNECTIVITY AND FAUNA MOVEMENT

Connectivity for the native fauna groups at the study area is discussed in Table 5.15 and some key links or hotspots for crossing the existing road are provided on Figure 5.5. The existing road currently provides a barrier to movement for several fauna groups, and the rate of wildlife-vehicle collisions appears to be high.

Table 5.15 Native fauna connectivity and movement at the study area, including across the existing road

FAUNA GROUP	CONNECTIVITY IN THE STUDY AREA AND SURROUNDING LANDSCAPE
Arboreal mammals	Arboreal mammals, particularly Common Ringtail Possums and Common Brushtail Possums, are likely widespread throughout the study area, and will move readily through residential areas. The home ranges of individuals of these possum species may also occur wholly or partly within residential areas, unlike most other native fauna species. Sugar Gliders are also present but are less likely to occur in residential areas and will rely on patches of native trees for movement. Similarly, Brush-tailed Phascogales, if they move through the study area, are more heavily reliant on remnant native vegetation. While arboreal mammals are largely reliant on canopy connectivity they will cross short gaps where necessary. They are likely to cross the existing road periodically, particularly in areas where there is habitat on either side of the road. For Sugar Gliders, which are at high risk of predation on the ground, the average glide ratio (glide distance divided by height dropped) has been calculated as 1.82:1 (Jackson 1999). For safety (i.e. to avoid collision with vehicles) they would need to land at least 2.5–3 metres above the ground. This means that a gap of 25 m (approximately the closest distance between two trees on either side of Yan Yean Road, measured trunk to trunk) can currently be crossed, provided that a Sugar Glider can launch from above 15 metres. There are several locations where sufficiently high trees occur on one or both sides of the road, and where these trees have reasonable connectivity to other areas of potential habitat. Figure 5.5 identifies some of these potential key arboreal mammal habitat linkages. Roadside vegetation may also provide north-south connectivity for arboreal mammals and this should be considered in assessment of impacts of tree removal.
Small woodland/ forest birds (e.g. small honeyeaters, treecreepers, silvereyes etc.)	As for arboreal mammals, small woodland birds may be somewhat reliant on canopy and other vegetation connectivity to move around. Some species may not utilise modified or landscaped vegetation. The arboreal mammal links identified on Figure 5.5 are likely to be important to these species. For some species that rely on higher quality native vegetation with shrubs, only a subset of these links, depending on the nature of the other strata, will be used. Due to the habitat modification in the locality, limited connectivity for these more specialised bird species remains in the area. The study area is unlikely to provide critical links as the habitat between the study area and larger areas of remnant native vegetation (such as Plenty Gorge Parklands) is already fragmented.
Larger native birds, native bats	Larger bird species in this category, such as parrots, may be less likely to require canopy connectivity to move around and may move larger distances between patches of habitat. Similarly, bats are highly mobile and not reliant on vegetation cover to move around. The habitat in the study area is unlikely to be critical to larger birds or to bats for connectivity. Existing connectivity for Swift Parrots is discussed in Section 5.6.5.1.

FAUNA GROUP	CONNECTIVITY IN THE STUDY AREA AND SURROUNDING LANDSCAPE
Reptiles and amphibians and other small terrestrial fauna	Typically, movement of smaller mammals and herpetofauna between habitat patches will be limited to those areas that are relatively well connected by vegetation cover, waterbodies or drainage lines. It is likely that these fauna groups do not cross the existing road. Roadside vegetation may provide north-south connectivity and this should be considered in assessment of impacts of vegetation removal.
Larger terrestrial mammals	Extensive habitat for large terrestrial mammals occurs in the area. Eastern Grey Kangaroos in particular are regularly seen in the landscaped, open space, and rural properties adjacent to the Project Area, such as the golf course and school. Kangaroos are likely to regularly attempt to cross the existing road, as evidenced by the regular Kangaroo roadkill observed along Yan Yean Road. Two roadkill roos were recorded on 11 January 2019 (WSP flora survey) and four on 15 May 2019 (WSP vegetation verification survey). Figure 5.5 identifies likely existing kangaroo crossing hotspots, informed by the presence of habitat on either side and the types of fencing present. These do not necessarily correspond to roadkill hotspots, which is influenced heavily by visibility. Wildlife Victoria injury callout data available for the area is also displayed on Figure 5.5. These data would be a tiny subset of the wildlife-vehicle accidents occurring, as they are only the incidents where Wildlife Victoria have location data (many incidents only record suburb or road), they are only incidents that are reported to Wildlife Victoria, and they are only incidents that result in injury (rather than mortality). In the Wildlife Victoria rescue dataset, there are 231 rescues with 'Yan Yean Road' listed as the rescue street, with 197 of these within the suburbs of Yarrambat or Doreen (i.e. the stretch of Yan yean road associated with the Project). The vast majority are for Kangaroos hit by vehicles. Wombats, Echidnas and Swamp Wallabies are also likely to be present in the area and may cross the existing road. Echidnas and Swamp Wallabies in particular are more likely to cross in areas where there is native vegetation, including understorey, on either side of the road, and less likely in open paddock areas (i.e. unlike Kangaroos).

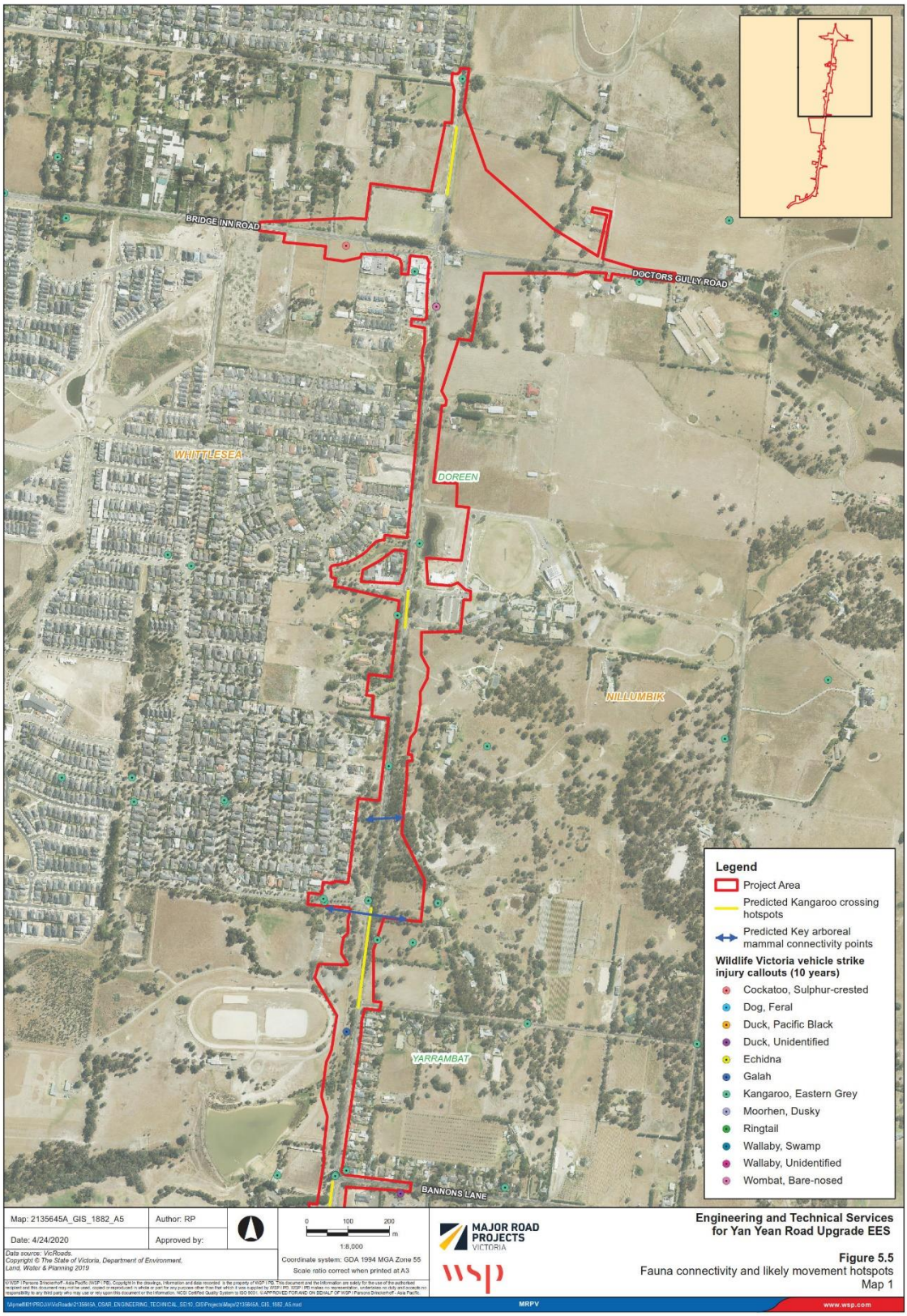


Figure 5.5 Fauna connectivity and likely movement hotspots Map 1 of 2

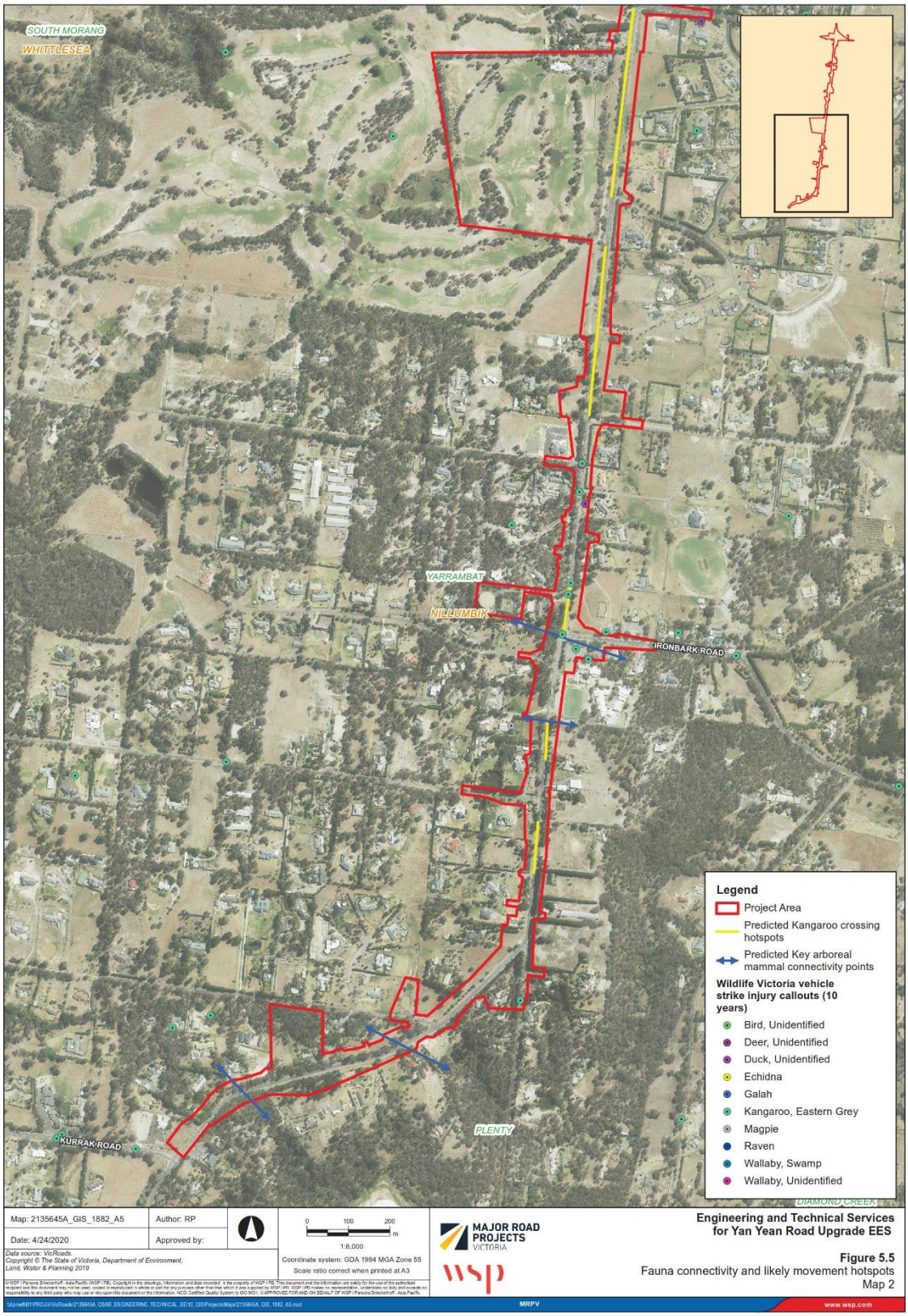


Figure 5.5 Fauna connectivity and likely movement hotspots – Map 2 of 2

5.6.5.1 CONNECTIVITY FOR SWIFT PARROT

Swift Parrot movement corridors near the Project Area as identified in the *Swift Parrots in Banyule and Surrounds* (Practical Ecology 2017b) follow Plenty River, Diamond Creek, Darebin Creek, the Yarra River and several smaller linked tributaries throughout the Local Government areas of Banyule and Nillumbik. The closest of these movement corridors – Plenty River, runs parallel to Yan Yean Road approximately 1 km to the west (see Figure 5.6).

In order to discuss the contiguous relationship between the Swift Parrot movement corridor and the Project, preferred and secondary habitat for the Swift Parrot has been associated with EVCs modelled to occur in the landscape. The EVC documented to provide key foraging species within the Plenty Gorge Swift Parrot movement corridor and the Project based on State modelled EVC data is Box Ironbark Forest, being preferred in the locality and supporting the highest number of records of the species (Practical Ecology 2017). In addition, Grassy Dry Forest and Plains Grassy Woodland have been identified as supporting secondary Swift Parrot feed trees and are associated with records of the species in the area as per *Swift Parrots in Banyule and Surrounds* (Practical Ecology 2017b).

The remainder of the EVCs present in the locality of the Project have no local or Commonwealth published association with Swift Parrot preferred or secondary habitat. We note that Valley Grassy Forest EVC 47 is often dominated by Yellow Box (a 'key' feed species) but a strong association with this EVC was not found in the local area (Practical Ecology 2017b).

Based on modelled EVC distribution, EVCs associated with secondary Swift Parrot foraging habitat are contiguous at several locations with the southern part of the Project Area and there is some connectivity between the Project and key Box-Ironbark habitat. This can be seen on Figure 5.6.

Notwithstanding the above, from an examination of aerial photography, residential and recreational development between the Project and the Plenty Gorge Parklands has fragmented much of this habitat between the Swift Parrot movement corridor and the Project. There are planted and remnant patches or strips of vegetation in this area, however no broad high-quality movement corridors linking these areas as it appears in the EVC modelling. Nevertheless, being a highly mobile species, Swift Parrots could utilise any patches of trees in the area providing good foraging resources with or without direct connectivity to the Plenty Gorge movement corridor.

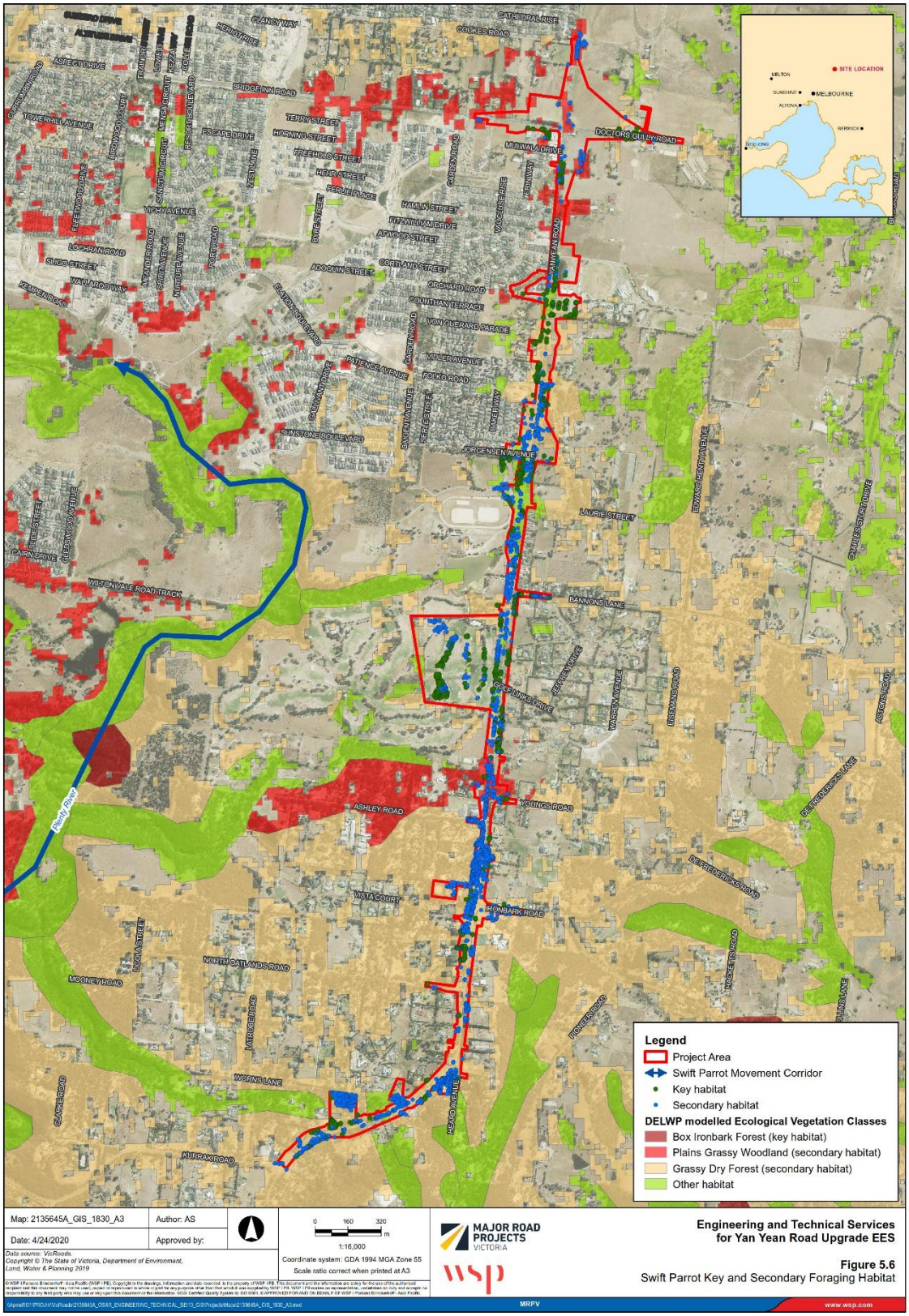


Figure 5.6 Swift Parrot key and secondary foraging habitat

5.7 GROUNDWATER DEPENDANT ECOSYSTEMS

The Yan Yean Road (Stage 2) Upgrade, Kurrak Road to Bridge Inn Road Groundwater Impact Assessment has identified several groundwater-dependant ecosystems (GDEs) in the vicinity of the Project (Arcadis 2020). Plenty River, Scrubby Creek, Sawpit Creek and Dry Creek have been identified as GDEs reliant on surface presence of groundwater within a 2 km buffer of the Project. Seven EVCs that are potentially reliant on subsurface presence of groundwater were identified within a 2 km buffer. Four of these have been mapped within the Project Area and immediate surrounds:

- Grassy Dry Forest
- Plains Grassy Woodland
- Swampy Woodland (modelled as Swampy Riparian Forest)
- Valley Grassy Forest.

Notwithstanding the above, the Groundwater Impact Assessment found that the groundwater at the Project Area is deep (>60 m in the southern part of the Project), therefore these identified potential GDEs may not be truly highly reliant on groundwater (Arcadis 2020).

6 CONCLUSION

The Project Area is highly modified and there are numerous existing threats to ecological values including land clearing, vehicle strike, weeds, and pests.

The main biodiversity values of the Project Area can be summarised as:

- 17.307 ha of native vegetation (patches) from seven EVCs. This includes some areas of more intact native vegetation as well as degraded native vegetation.
- 0.233 ha of an FFG Act listed community, Western Basalt Plains (River Red Gum) Grassy Woodland in a modified condition.
- 2499 native Canopy Trees, with an additional 276 recorded just outside of the Project boundary. 211 of these trees are Large Trees as per the relevant EVC benchmark, including 47 large Scattered Trees and 164 Large Trees in patches. 187 of these Canopy Trees within the Project Area are small Scattered Trees.
- Potential habitat for the Swift Parrot, listed under the EPBC Act and FFG Act, including 1.82 ha of key habitat (potential floral resources) and 5.48 ha of secondary habitat (potential lerp resources), totalling 2315 trees within the Project boundary.
- Foraging habitat for the Grey-headed Flying-fox, listed under the EPBC Act and FFG Act, including both planted and remnant trees.
- Potential dispersal habitat for the FFG Act listed Brush-tailed Phascogale, particularly in the southern part of the Project Area.
- Potential habitat for other listed fauna species, although no habitat of high value is likely to be present.
- Two Matted Flax-lily plants, listed under the EPBC Act and FFG Act, and one Studley Park Gum, listed as endangered on the Victorian Advisory List of threatened plants.
- Habitat and connectivity for numerous non-listed fauna species including in the remnant and planted native vegetation, exotic vegetation, 99 trees with medium-large hollows (as estimated by the arborist from the ground), and small wetlands/drainage lines.

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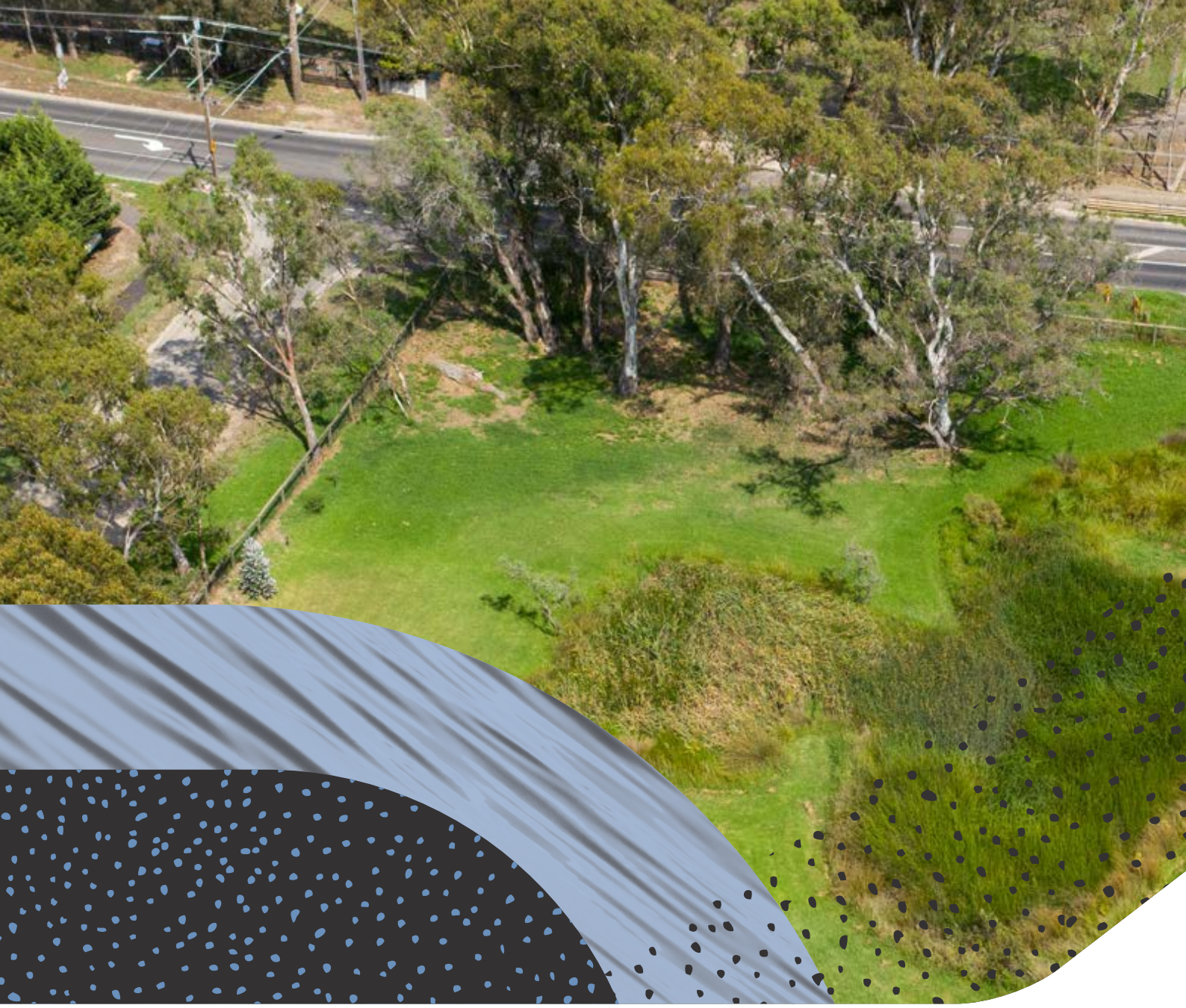
APPENDIX A

PROJECT DESCRIPTION: DRAFT YAN YEAN ROAD UPGRADE – STAGE 2



PART 1 INTRODUCTORY CHAPTERS

5 Project Description

5.1 Introduction

This chapter describes the proposed design, construction and operation of the duplication of Yan Yean Road between Kurrak Road and Bridge Inn Road (the Project). The chapter should be read in conjunction with Attachment VI *Map Book*, which contains detailed plans and drawings of key elements of the Project.

This Project description has been developed to provide an understanding of all components, processes and development stages of the Project to enable assessment of the Project's potential environmental effects. The description includes specific design elements to address the potential for the Project to generate adverse environmental effects and impacts.

5.2 Project overview

Yan Yean Road is a significant north-south arterial road servicing the Shire of Nillumbik and the City of Whittlesea, providing connectivity for the City of Whittlesea's growing suburbs of Doreen and Mernda to the townships of Plenty and Yarrambat. Yan Yean Road connects with major east-west arterials such as Bridge Inn Road, Kurrak Road and Diamond Creek Road and also provides a connection to employment and services in established neighbouring suburbs such as Greensborough and Diamond Creek.

Stage 1 of the Yan Yean Road upgrade (Diamond Creek Road to Kurrak Road) was completed in 2019, and construction on Stage 2 (the subject of this EES) is scheduled for completion by 2025.

The Project seeks to upgrade an existing road in hilly terrain, largely within the existing road reserve. The surrounding environment is characterised by low density residential and rural living areas such as farmland and agricultural areas, with the suburb of Doreen experiencing rapid change from rural living to higher density residential developments. The Project alignment and immediate surrounds intersect a range of land uses including residential, open space, rural living, commercial and education.

Key land uses along the alignment include Yarrambat Park and the Yarrambat Park Golf Course, Plenty Valley Christian College, Yarrambat Primary School, St Macarius Coptic Orthodox Church and the Doreen business precinct.

Terms used in this project description

Carriageway: lanes where traffic would be travelling, plus shoulders and auxiliary lanes

Cross section: shows the width of the road with the position and number of traffic lanes, medians, walking and cycling paths and footpaths

Cutting: ground excavation that is required to create a smooth base for construction of a road

Land parcel: the smallest unit of land able to be transferred within Victoria's cadastral system

Median: the area between two opposing carriageways

Mid-block: a section of road between key intersections

Outer edge / shoulder: the area next to a roadway that provides clearance between the roadway and roadside

Road reserve: all the area of land that is within the boundaries of a road

Roadside: any land that is within the boundaries of a road (other than the shoulders of the road) which is not a roadway or pathway

Roadway: the area of the public road that is open to or used by members of the public and is developed by a road authority for the driving or riding of motor vehicles

Signalised intersections: intersections controlled by traffic lights

The Project would duplicate a 5.5 kilometre section of Yan Yean Road between Kurrak Road and Bridge Inn Road, increasing the existing two lanes to four lanes (comprising two lanes in each direction). The design speed along Yan Yean Road within the extent of the project area is 70 kilometres per hour, with the exception of north of Bridge Inn Road where the design speed is 80 kilometres per hour. This is consistent with existing speed limits. The design for the Project assessed in this EES has 3.5-metre-wide lanes, with the majority of the Project using a central 2.2 metre-wide median. This design was adopted due to various constraints: road safety issues, steep and rolling terrain, high cut and fill batters and subsequent retaining walls at certain locations.

The design also seeks to limit impacts to existing properties, local accesses and trees along Yan Yean Road. The existing road alignment has been retained due to constraints around the topography and land uses adjacent to the road corridor. The exception is at the Bridge Inn Road intersection, which would be shifted to the north east to retain two River Red Gums (referred to as the Doreen River Red Gums) and two businesses. The project area is shown in Figure 5.1 and key components of the Project are shown in Figure 5.2.

The Project includes:

- Two new roundabouts: one at Heard Avenue and one at Youngs Road
- Five new signalised intersections at Bannons Lane, Jorgensen Avenue, North Oatlands Road, Orchard Road and Bridge Inn Road
- Upgrades to one existing signalised intersection at Ironbark Road, including an additional right-hand turning lane, slip lane and traffic island
- New street lighting at all intersections, road signage and landscaping
- A new walking and cycling path on the western side and a footpath on the eastern side of Yan Yean Road, linking Diamond Creek to Doreen and improving safety and connectivity for pedestrians and cyclists
- Continuous safety barriers running along the Project's length, proposed in the median and behind outer kerbs along the mid-block sections of the carriageways
- A wide median between Bannons Lane and Jorgensen Avenue to provide for additional landscaping opportunities and potential avoidance of existing biodiversity values and large trees.

Figure 5.1 Project area

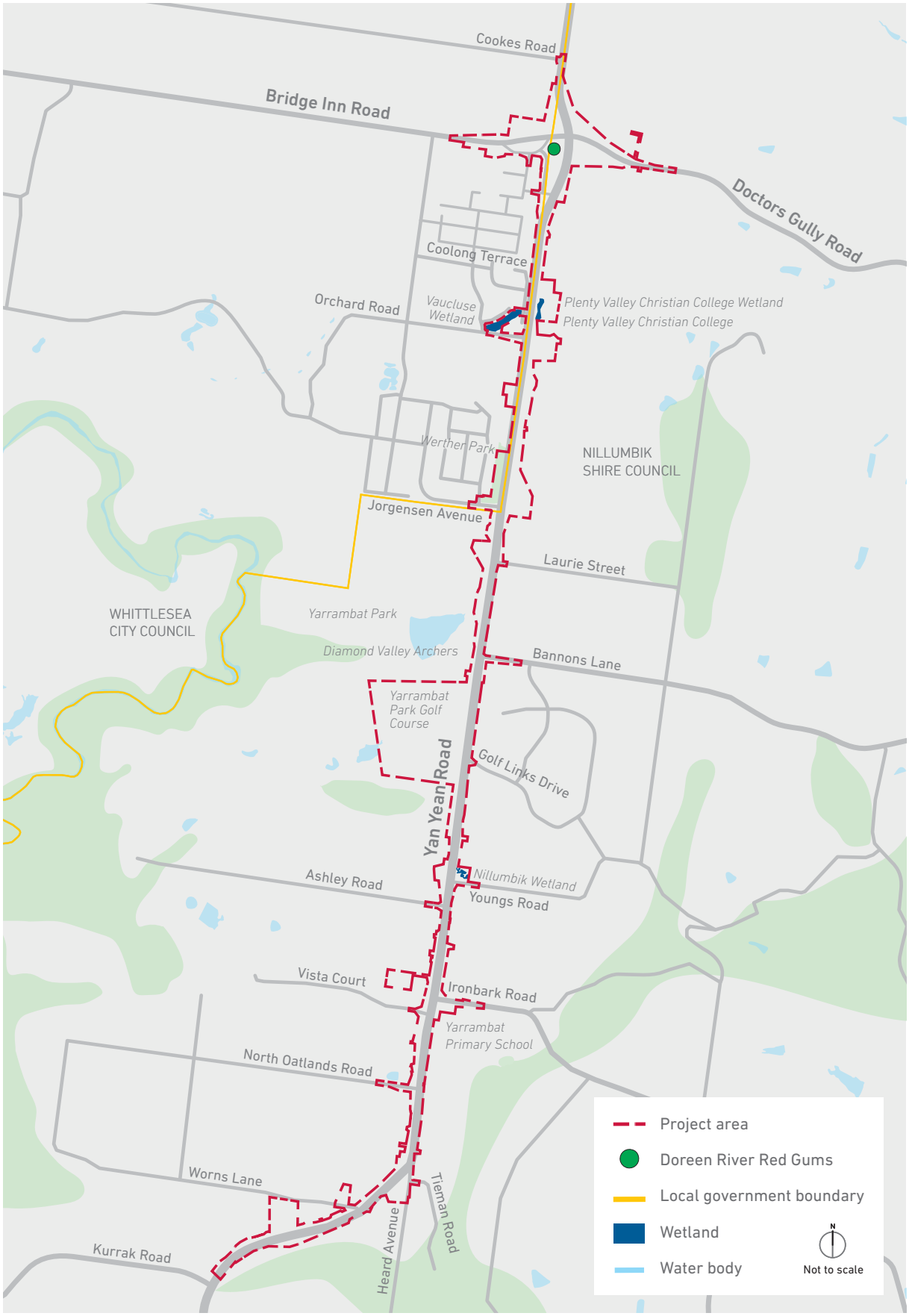
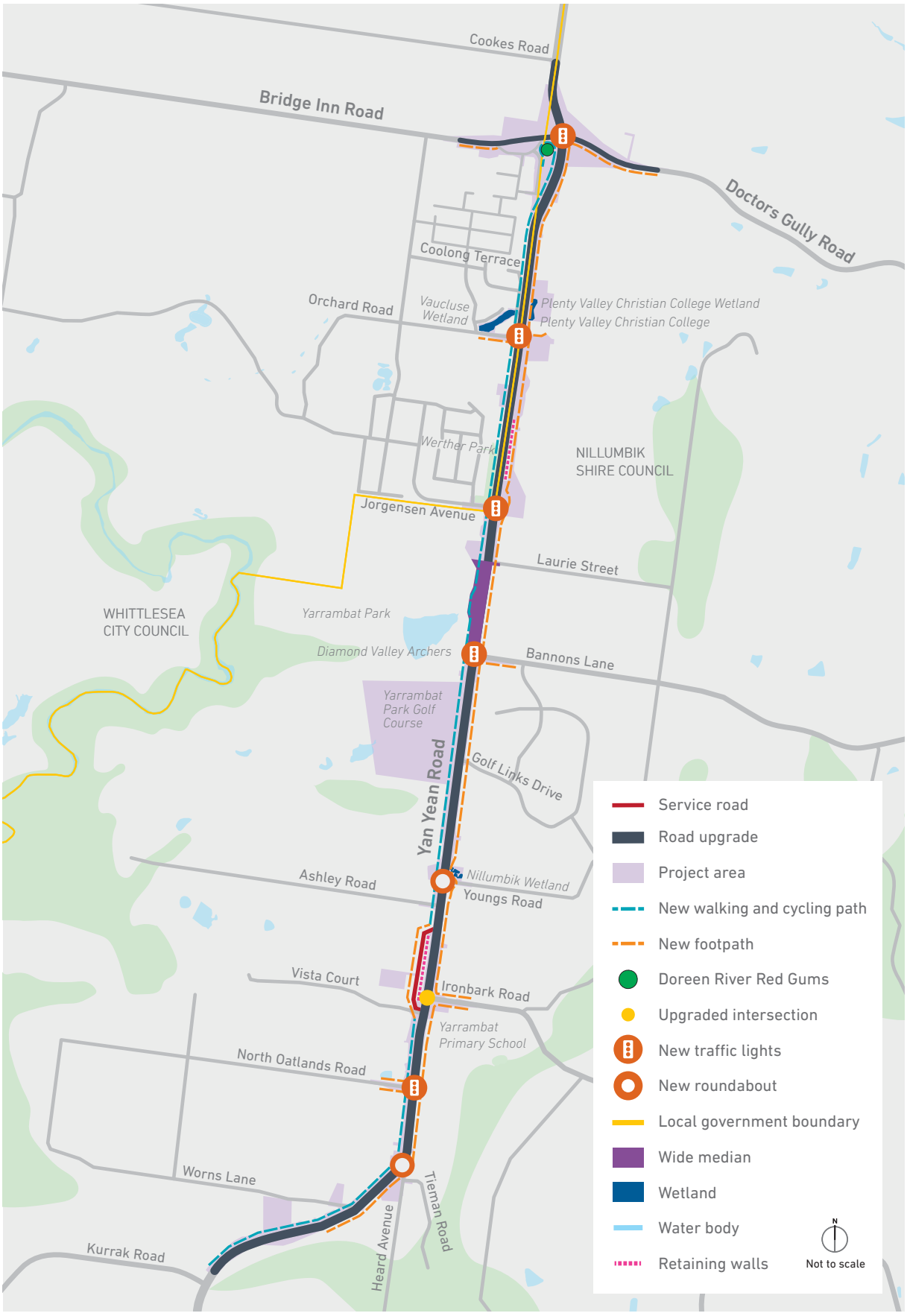


Figure 5.2 Key components of the Project



5.3 Project design

5.3.1 Road design

There are a number of elements to the road design of Yan Yean Road:

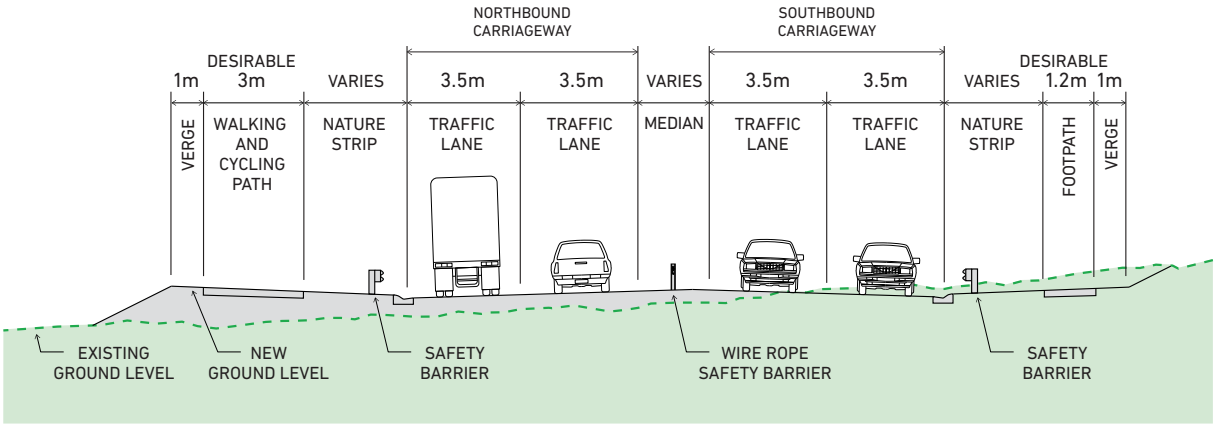
- Typical cross section
- Intersections
- Access
- Wide median
- Safety barriers
- Retaining walls
- Fencing
- Car parks
- Bus facilities.

Typical cross section

The following diagram indicates the typical cross section of the road design for the Project. At some locations along the alignment, such as intersections or roundabouts, this cross section would be slightly different and wider. Figure 5.3 shows the preferred mid-block cross section design, which allows for duplication with a 2.2 metre median with safety barriers.

The installation of safety barriers provides opportunities for tree planting in closer proximity to the road carriageway than would be otherwise permissible, in accordance with the Project's Landscape Strategy (Technical Report G). The total road reserve width along most of the proposed design is 24.2 metres increasing to 33 metres between Bannons Lane and Jorgensen Avenue to accommodate the widened median at this location. The current typical roadway width is eight metres.

Figure 5.3 Yan Yean Road preferred cross section design



For illustrative purposes only.

Intersection design

The scope of the Project includes modifications to a number of intersections. Signalised intersections are proposed to improve safety, provide U-turn opportunities and increase the capacity of existing intersections, and roundabouts are proposed to improve safety and provide larger U-turn opportunities. Intersection works include:

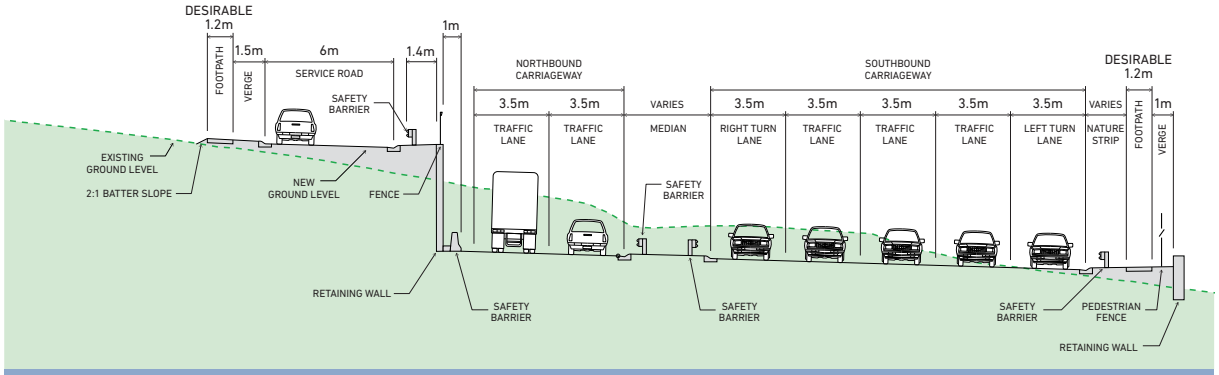
- Signalised intersections at North Oatlands Road, Ironbark Road (refer to Figure 5.4), Bannons Lane, Jorgensen Avenue, Orchard Road and Bridge Inn Road (refer to Figure 5.5)
- Roundabouts at Heard Avenue and Youngs Road
- Proposed left in / left out arrangements at all other intersections, including:
  - Yan Yean Road / Activity Way
  - Yan Yean Road / Laurie Street
  - Yan Yean Road / Golf Links Drive
  - Yan Yean Road / Ashley Road
  - Yan Yean Road / Service Road A exit (left out only)
  - Yan Yean Road / Vista Court
  - Yan Yean Road / Worns Lane
  - Yan Yean Road / 807 Yan Yean Road access
  - Yan Yean Road / Service Road B (between Kurrak Road and Worns Lane)
  - Residential properties and businesses along the alignment
- Auxiliary lanes provided for all left turns (and where applicable, right turns) from Yan Yean Road into key intersections to separate turning traffic from the main traffic flow to reduce collisions and improve the road capacity.

The project design at Bridge Inn Road would retain the two Doreen River Red Gums situated adjacent to the Bridge Inn Road and Yan Yean Road T-intersection and the General Store / former post office and Pet Supplies and Stockfeeds Store on the corner of Doctors Gully Road. It proposes shifting the whole intersection to the north-east corner of Yan Yean Road / Bridge Inn Road with two lanes in each direction.

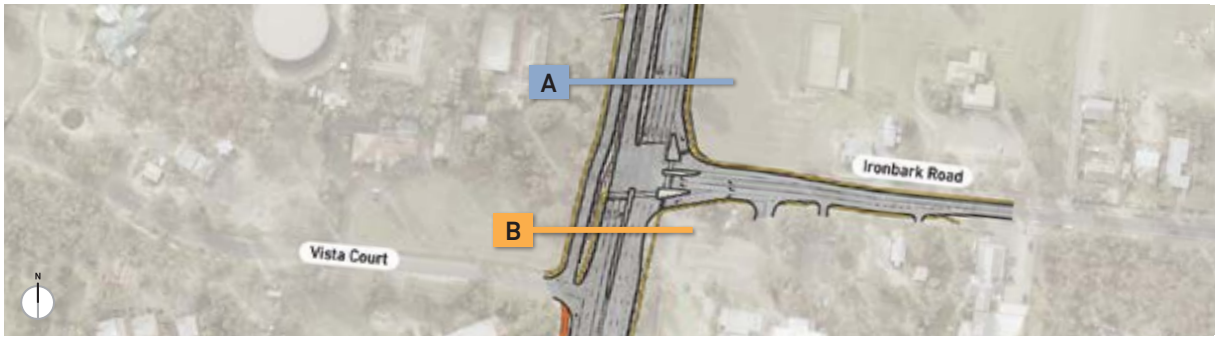
The design at Bridge Inn Road has been refined following community consultation and in response to additional arboriculture advice on the Doreen River Red Gums, which are situated south-west of the proposed intersection (refer to Figure 5.5).

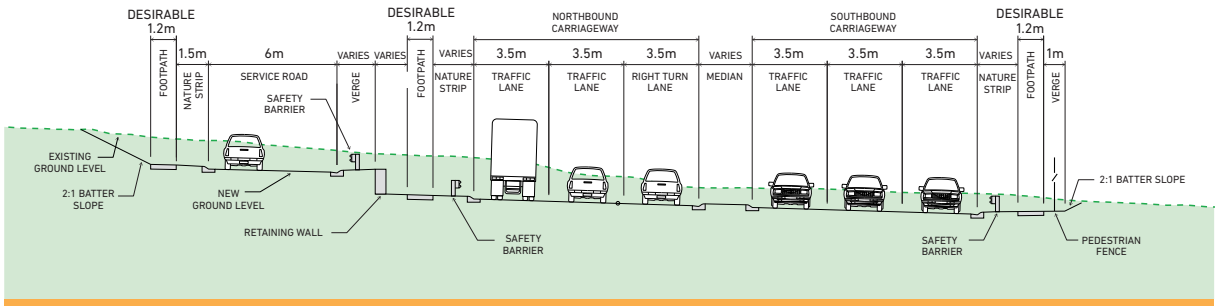
The project design at Bridge Inn Road would retain the two Doreen River Red Gums situated adjacent to the Bridge Inn Road – Yan Yean Road T-intersection and the General Store.

Figure 5.4 Typical signalised intersection cross section – Ironbark Road (northbound)



A: IRONBARK ROAD INTERSECTION DEPARTURE

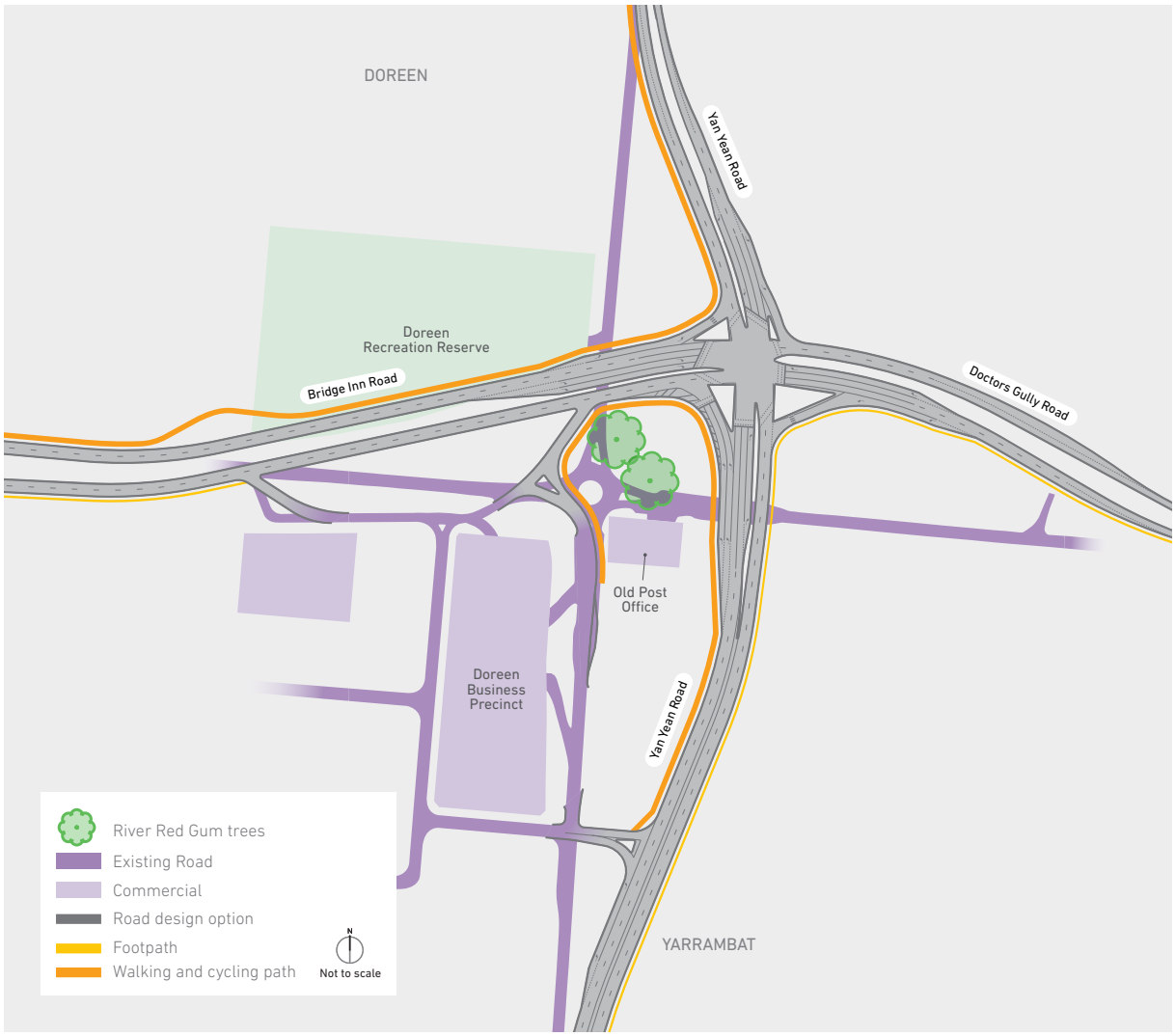




B: IRONBARK ROAD INTERSECTION APPROACH

For illustrative purposes only.

Figure 5.5 Bridge Inn Road intersection design



For illustrative purposes only.

Access design

All existing accesses would be changed to left in / left out arrangements to allow for the installation of a centre median and safety barriers. U-turn lanes would be provided at the following locations to allow for the safe turning of vehicles wishing to travel in the opposite direction:

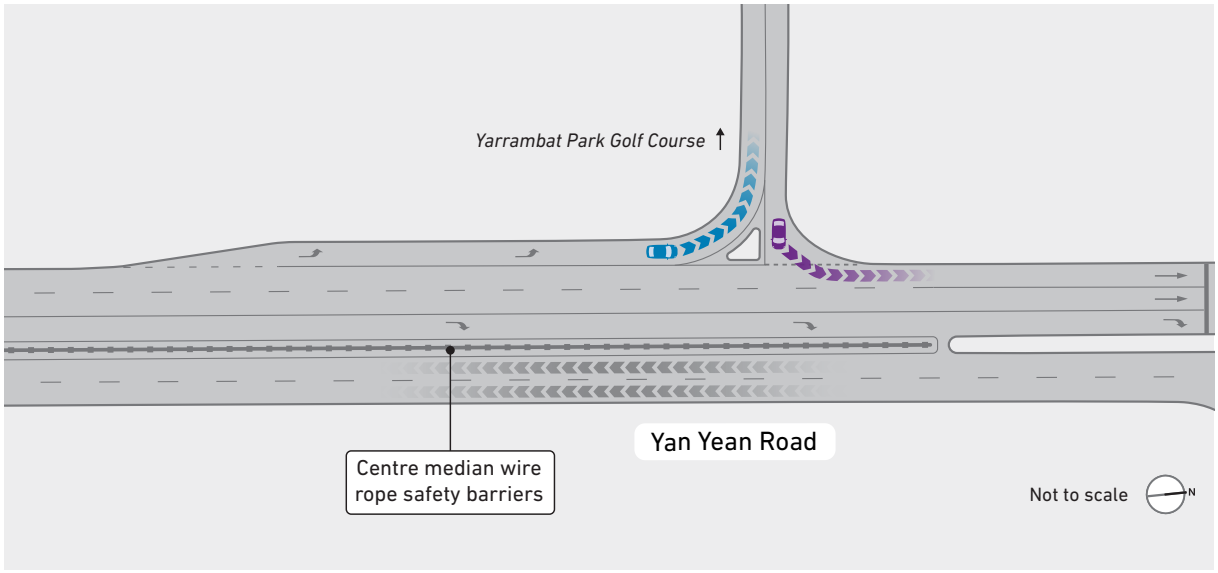
- Bridge Inn Road signalised intersection (cars only)
- Orchard Road signalised intersection (cars only)
- Jorgensen Avenue signalised intersection (cars only)
- Bannons Lane signalised intersection (cars only)
- Youngs Road roundabout (cars, cars with trailers / horse floats, semi-trailers and trucks)
- Ironbark Road signalised intersection (cars only)
- North Oatlands Road signalised intersection (cars only)
- Heard Avenue roundabout (cars, cars with trailers / horse floats, semi-trailers and trucks).

All existing Council approved property access and driveways are proposed to be maintained with minor tie-in works. Access for properties at the western side of Yan Yean Road from Vista Court to Ashley Road would be via a service road due to the steep grade and level differences between properties and Yan Yean Road (refer to Figure 5.4 and Attachment VI *Map Book*).

Access conditions at Yarrambat Primary School and Plenty Valley Christian College would be revised due to intersection upgrades impacting existing access and carpark arrangements.

The proposed design includes a left in / left out arrangement (refer to Figure 5.6) to the Yarrambat Park Golf Course.

Figure 5.6 Left in / left out arrangement – Access to Yarrambat Park Golf Course



For illustrative purposes only.

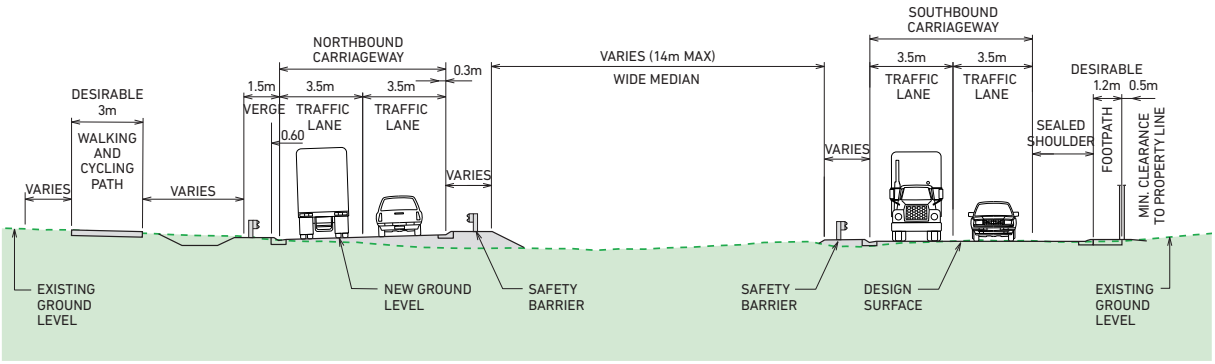
Wide median

A divided carriageway (boulevard design) increases the median width of Yan Yean Road from 2.2 metres to approximately 14 metres by realigning the northbound carriageway between Bannons Lane and Jorgensen Avenue (refer to Figure 5.7). The maximum road reserve width at this point would be approximately 33 metres, although the cross section would taper at either end to tie back into the standard cross section of 24.2 metres, as described above. A wider median at this location would provide for additional landscaping opportunities and potential avoidance of existing biodiversity values (including Matted Flax-lily) and large trees in accordance with the Project's Landscape Strategy (Technical Report G).

The southbound carriageway is aligned to follow the existing carriageway edge to retain the existing separation distance between driveways, residences and Yan Yean Road.

The wide median section of the road design tapers back to the standard cross section width at Bannons Lane. This allows the safe tapering of the road back to the standard road width while avoiding private land acquisition further south of the golf course.

Figure 5.7 Wide median cross section design



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Safety barrier design

Continuous safety barriers are proposed in the median and behind most outer kerbs (where there are not intersections). Safety barriers would be installed at various setbacks from the kerb ranging from 0.6 to 1 metre, depending on factors such as speed limit, topography and barrier type. Safety barriers require a cleared area behind them to maintain the integrity of their effectiveness. This includes clearance from walking and cycling paths, as well as footpaths. Proposed safety barriers include guardrail, wire rope and concrete barriers if deemed required.

Retaining walls design

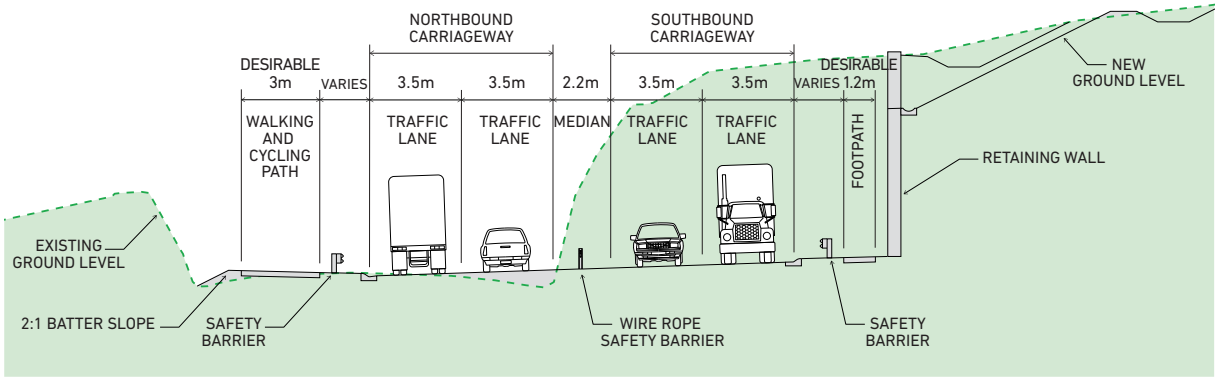
Retaining walls have been proposed at selected locations along Yan Yean Road to minimise the extent of land acquisition on adjacent properties, provide access to properties abutting Yan Yean Road, maximise the retention of existing trees and reduce the extent of cut earthworks. The design of retaining walls would be carried out in accordance with guidelines in the Project's Landscape Strategy (Technical Report G). Retaining walls are likely to be installed at the following locations (refer to Figure 5.8 and Figure 5.9):

- Between Service Road A and Yan Yean Road: a 270 metre long wall with an approximate maximum height of 3.6 metres. This retaining wall has been proposed to retain access to existing properties abutting Yan Yean Road and minimise impacts to existing trees
- At the north-east corner of Ironbark Road: a 230 metre long wall with an approximate maximum height of 2.4 metres. This retaining wall has been proposed to minimise the extent of land acquisition at the adjacent property
- North of North Oatlands Road along the western verge of Yan Yean Road: a 50 metre long wall with an approximate maximum height of 1.1 metres. This retaining wall has been proposed to minimise the extent of land acquisition at the adjacent property and minimise the impact to the existing driveway arrangement
- North of Jorgensen Avenue along the eastern verge of Yan Yean Road: a 220 metre long wall with an approximate maximum height of 8 metres. This retaining wall has been proposed to avoid impacting the existing telecommunication tower on the abutting property, maintain access to the adjacent property and telecommunication tower, maximise the retention of existing trees and reduce the extent of cut works.

Figure 5.8 Retaining wall locations

For illustrative purposes only.

Figure 5.9 Retaining wall cross section – north of Jorgensen Avenue intersection (northbound)



For illustrative purposes only.

Fencing design

The Project is required to ensure adequate safety measures are in place so that golf balls from Yarrambat Park Golf Course do not land on the walking and cycling path or road. This EES assumes that a 30-36 metre-high and 360 metre long fence along the edge of the golf course is included in the design to avoid golf ball collisions with pedestrians, cyclists or vehicles.

The proposed fence would incorporate elements to increase its visibility to Swift Parrot and other bird species. The alternative option to building a fence is to reconfigure golf course holes 1, 10 and 18 to increase their distance from the road and reduce the risk of golf balls landing on the new road and walking and cycling path to an acceptable level. This would not reduce the number of holes at the golf course.

A 1.8 metre timber paling fence has been designed to mitigate the risk of arrows from the Diamond Valley Archers facility affecting the road or walking and cycling path.

Plenty Valley Christian College and Yarrambat Primary School

Access to Plenty Valley Christian College and Yarrambat Primary School directly adjacent to the project area would be maintained during the Project's construction and operation. Some temporary arrangements may be required during construction to manage roadworks adjacent to the schools.

The Project would reconfigure and reinstate an existing car park at Plenty Valley Christian College. This includes a new access road to tie into the existing road. The dam at Plenty Valley Christian College would also require reconfiguration. This would be completed in collaboration with the school.

Land currently used by Yarrambat Primary School for informal car parking would require reconfiguration.

To facilitate these changes, partial land acquisition would be required along the frontage of both schools. This would be limited in extent and would not result in a long-term change to the existing land use; however, it would result in a permanent reduction in the land area on both school sites (refer to Attachment VI *Map Book*).

Bus facilities

Existing bus stops are proposed to be reinstated at the same location or within close proximity, in consultation with the Department of Transport and Public Transport Victoria. The project area allows for indentations around bus stops along the alignment if required.

5.3.2 Active transport design elements

Walking and cycling path and footpath

The design provides a walking and cycling path on the western side of Yan Yean Road in the following locations (refer to Figure 5.2):

- Adjacent to the northbound carriageway of Yan Yean Road from Kurrak Road to Bridge Inn Road, connecting to the existing walking and cycling path at both ends
- Adjacent to the eastbound carriageway of Bridge Inn Road, to be connected to existing walking and cycling paths.

Between Bannons Lane and Jorgensen Avenue, the walking and cycling path is realigned through Yarrambat Park and Shire of Nillumbik land to avoid the removal of more trees on the western side of Yan Yean Road. The walking and cycling path north of Jorgensen Avenue follows the existing footpath for the same purpose. The walking and cycling path would generally be three metres wide and would reduce slightly in width at various locations to allow the retention of trees.

In addition, a footpath, generally 1.2 metres wide, is proposed on the eastern side of Yan Yean Road in the following locations (refer to Figure 5.2):

- Adjacent to the southbound carriageway of Yan Yean Road from Bridge Inn Road to Kurrak Road to connect into the existing footpath
- Adjacent to the northbound carriageway of Yan Yean Road, along Service Road A from Vista Court to Ashley Road to connect to the proposed walking and cycling path extents
- Along Doctors Gully Road to Yan Yean Road to connect into the existing footpath.

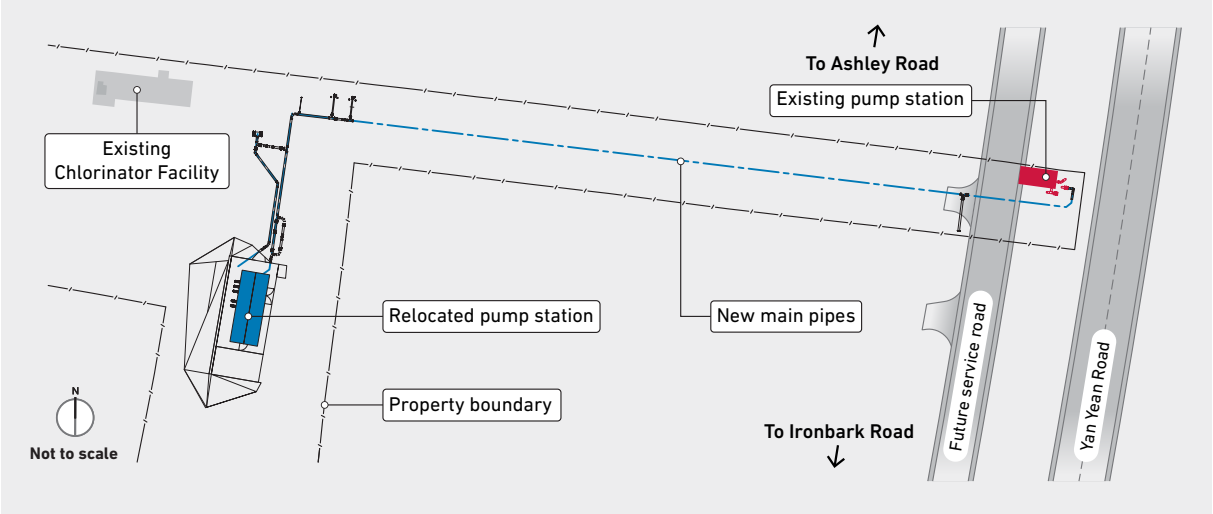
5.3.3 Utilities

New utility service upgrades, relocations and protection works may be required along the length of the Project. Where utility services cannot be avoided, protection / relocation / diversion works would occur adjacent to the proposed road pavement. Relocation of power lines along the alignment is anticipated to involve a combination of above ground and underground power. Works associated with existing water mains, sewer, gas and telecommunications assets may also require relocation and/or diversion adjacent to the road pavement. As such, a minimum allowance of five metres from the outermost construction extent (toe / top of batter, retaining wall, etc.) has been made to allow for potential utility upgrades and service relocations within the project area.

Relocation of Yarra Valley Water pump station

The project area includes a Yarra Valley Water pump station, near Ironbark Road on the western side of the existing Yan Yean Road, which the Project may be required to relocate. The tank may be re-located and new connecting infrastructure installed, all on existing Yarra Valley Water land. Refer to Figure 5.10 for the indicative relocation plan. MRPV continue to investigate design opportunities that could avoid the requirement to relocate the pump station.

Figure 5.10 Yarrambat pump station relocation indicative plan



For illustrative purposes only.

5.3.4 Drainage design

New drainage works, upgrades and relocations would occur along the length of the Project. Drainage along the alignment has been developed based on a flood model and expected outfall locations (which were determined by existing topography); however, the Project is also required to comply with water sensitive urban design (WSUD) requirements from Melbourne Water. This approach aims to make better use of stormwater in urban areas and reduce the harm it causes to the natural water cycle, rivers and creeks. Meeting Melbourne Water's requirements is likely to comprise grassed swale drains (where practicable), detention basins and water treatment basins.

The project area provides for a minimum 10 metres offset from the top of each drainage swale to allow for construction. In areas where drainage swales are not required, a minimum allowance of five metres from the outermost construction extent (toe / top of batter, retaining wall, etc.) has been provided in the project area to allow adequate construction space. The Project would coordinate closely with local schools to ensure the functionality of existing car parks and outdoor playing fields is maintained if these areas are impacted by drainage works.

Detention basin sites for surface water management have also been allowed for within the project area in proximity to Worns Lane, Heard Avenue, Youngs Road, Orchard Road (Melbourne Water wetland) and Bridge Inn Road.

5.3.5 Landscaping and urban design

A Landscape Strategy (Technical Report G) has been developed in consultation with Councils and other key stakeholders to ensure that the Project fits sensitively into the built, natural and cultural environment of Doreen and Yarrambat. The strategy would ensure that landscaping undertaken as part of the Project is well designed and contributes to the character and functioning of the Yan Yean Road corridor and the surrounding area, as well as to the accessibility and connectivity of people within the wider region and community. The Project would provide new and reinstated landscapes that are appropriate to the local conditions and consistent with the existing varied character of the area. Wherever possible, the Project would provide opportunities to increase canopy cover and improve amenity in the public realm.

The Landscape Strategy provides overarching principles to guide the Project landscape design, with a particular focus on minimising impacts on trees along the road corridor. Planting typologies have been considered to enhance the experience of drivers, pedestrians and cyclists, provide visual interest, screen infrastructure elements, improve habitat values and provide subtle wayfinding clues. Planting adjacent to the shared path would provide shelter and shade to improve user amenity. The activation of remnant open space would be explored to provide increased amenity to the local community where feasible.

5.3.6 Sustainability and climate change

MRPV is committed to delivering projects that optimise social, economic and environmental outcomes over the long term. To fulfil this commitment, MRPV would ensure:

- Sustainability risks and opportunities are identified and refined into project-appropriate performance objectives and requirements
- Delivery partners are monitored to ensure achievement of sustainability performance objectives and requirements
- Project sustainability performance is measured, verified and publicly reported on.

Key sustainability opportunities for the Project include:

- Ensuring the Project is resilient to the challenges of climate change by preparing and implementing a climate risk assessment and adaptation plan
- Optimising the use of recycled content in infrastructure materials
- Reducing greenhouse gas emissions, material lifecycle impacts and waste generation during the Project's construction and operation
- Protecting and enhancing the built, natural and cultural environment within and adjacent to the project area.

5.3.7 Land acquisition

The existing road corridor is not of sufficient width to accommodate the duplication and supporting infrastructure such as service roads, walking and cycling path and drainage. The Project would require the partial or full acquisition of 96 parcels of land. In most cases, partial acquisition of the land would be required along the frontages of landholdings.

This acquisition would be limited in extent and would not result in a long-term change in the existing land use, but it would result in a permanent reduction in the land area on those land parcels.

The land acquisition process would be undertaken in accordance with the *Land Acquisition and Compensation Act 1986* and would include consultation with affected landowners. Compensation would be provided for all land acquired for the Project. Refer to Attachment VI *Map Book* for the proposed Public Acquisition Overlay (PAO).

The landowner status of proposed land acquisition for the Project includes:

- Shire of Nillumbik: 24 land parcels
- City of Whittlesea: four land parcels
- Private: 60 land parcels
- Public Authorities / State: eight land parcels.

5.4 Project construction

5.4.1 Construction activities

Construction details would be subject to further refinement as the Project progresses; however, any changes to the activities and requirements outlined below would need to be in accordance with the Environmental Performance Requirements (EPRs) set out in Chapter 12 *Environmental Management Framework*.

Proposed construction activities would be standard road construction activities to be undertaken in accordance with the EPRs for the Project.

Site establishment would involve tree clearance and vegetation lopping and removal within the project area, establishment of construction site compounds, clearing and grubbing, temporary sediment and erosion control works, and establishment of environmental and traffic controls.

Earthworks would involve remediation of any existing contamination and removal of any hazardous material, as appropriate, protecting and relocating services, widening of existing rock cuttings (approximately 750 metres of existing cut along the Project would be widened by approximately 20 metres), new cuttings (approximately 1,300 metres of new rock cut would be required to a width of approximately five metres along the Project), and bulk earthworks and haulage. Some of the cutting locations would require retaining walls. Refer to Figure 5.8 for the location of proposed retaining walls in the Project and Figure 5.9 for a representative retaining wall cross section.

Civil and structure works would involve construction of infrastructure, including intersection upgrades, walking and cycling paths, retaining walls, drainage works and pavement works.

Reinstatement would involve implementing traffic management systems and landscaping in accordance with the Landscape Strategy (Technical Report G) for the Project.

5.4.2 Construction laydown areas

To minimise disruption at and around the Project site, one or more separate site compounds (or 'laydown areas') would be established for site offices, storage of materials and plant, amenities for workers, secure container storage, short-term storage for waste and potentially workforce parking. The laydown area(s) would be required to be in use for the full duration of Project construction.

Construction laydown areas have not yet been identified for the Project, other than those included in the project area. Following the engagement of a contractor, they would identify one or more sites that are suitable for this purpose on the basis of minimal environmental impact. Depending on the site(s) selected, a separate planning approval process may be required which would need to be informed by site investigation and consultation.

The project area has allowed for a site on the western side of Yan Yean Road in close proximity to the Yarrambat Horse and Pony Club, which is currently being used as laydown area by Yarra Valley Water. The Project may also utilise the existing Department of Transport owned land at 423-437 Yan Yean Road Yarrambat at the southern end of the project area. Vegetation removal would avoid the no-go zones identified in Attachment VI *Map Book*.

The laydown area(s) would be reinstated following works to their pre-Project condition, or as agreed with the landholder. The nature of reinstatement and any improvement works would be agreed with the landowner and any other relevant stakeholders, potentially Council and the Department of Transport.

5.4.3 Construction method

The construction methods adopted would seek to develop the Project in discrete stages to the extent practicable. This would assist with localising construction impacts for each stage of works. Maintaining traffic flow throughout the Project would be a key component of the construction methodology. Constructing new lanes 'offline' would be integral to maintaining traffic flow, including diverting traffic into new lanes as staged sections were completed. As traffic is diverted into newly constructed lanes, old lanes would be upgraded to assist in maintaining traffic flow.

Temporary road closures and diversions would be required for the construction of intersections. Road closures and diversions would be managed through community consultation and detailed traffic management plans.

Spoil is defined as waste soil or rock resulting from excavation activities. Spoil generated by construction activities would be managed in accordance with EPA requirements applicable at the time of construction.

The final spoil disposal strategy would be developed in accordance with EPA Victoria requirements, particularly in regard to managing any contamination entrained within the soil, and whether spoil would be stockpiled or taken immediately to landfill. Haulage routes would be constrained to arterial roads, including Yan Yean Road. Where roads other than Yan Yean Road or designated arterials are required to be used, this would be done in consultation with the Department of Transport and the relevant local authority, with appropriate notice given to any affected residents.

5.4.4 Working hours

Construction work for the Project would be undertaken in accordance with EPA requirements applicable at the time of construction. Standard construction work hours are:

- Monday to Friday, 7am to 6pm
- Saturday, 7am to 1pm.

Construction outside standard hours might occur at discrete stages to enable particular tasks to be undertaken more safely than could otherwise be achieved. Night works would also be required to minimise impacts on traffic or nearby stakeholders. Works proposed for outside standard hours would need to be approved in advance by MRPV, following consultation with all relevant stakeholders.

5.5 Project operation and maintenance

When complete, Yan Yean Road would be owned by the Department of Transport and operated in accordance with its environmental management approach. Ongoing monitoring and associated management and mitigation measures set out in the EPRs would be implemented during operation of the Project by the relevant organisation.

Maintenance of the infrastructure would be undertaken by Department of Transport, or local Councils for pathways and service roads, in accordance with the *Road Management Act 2004 – Code of Practice*.

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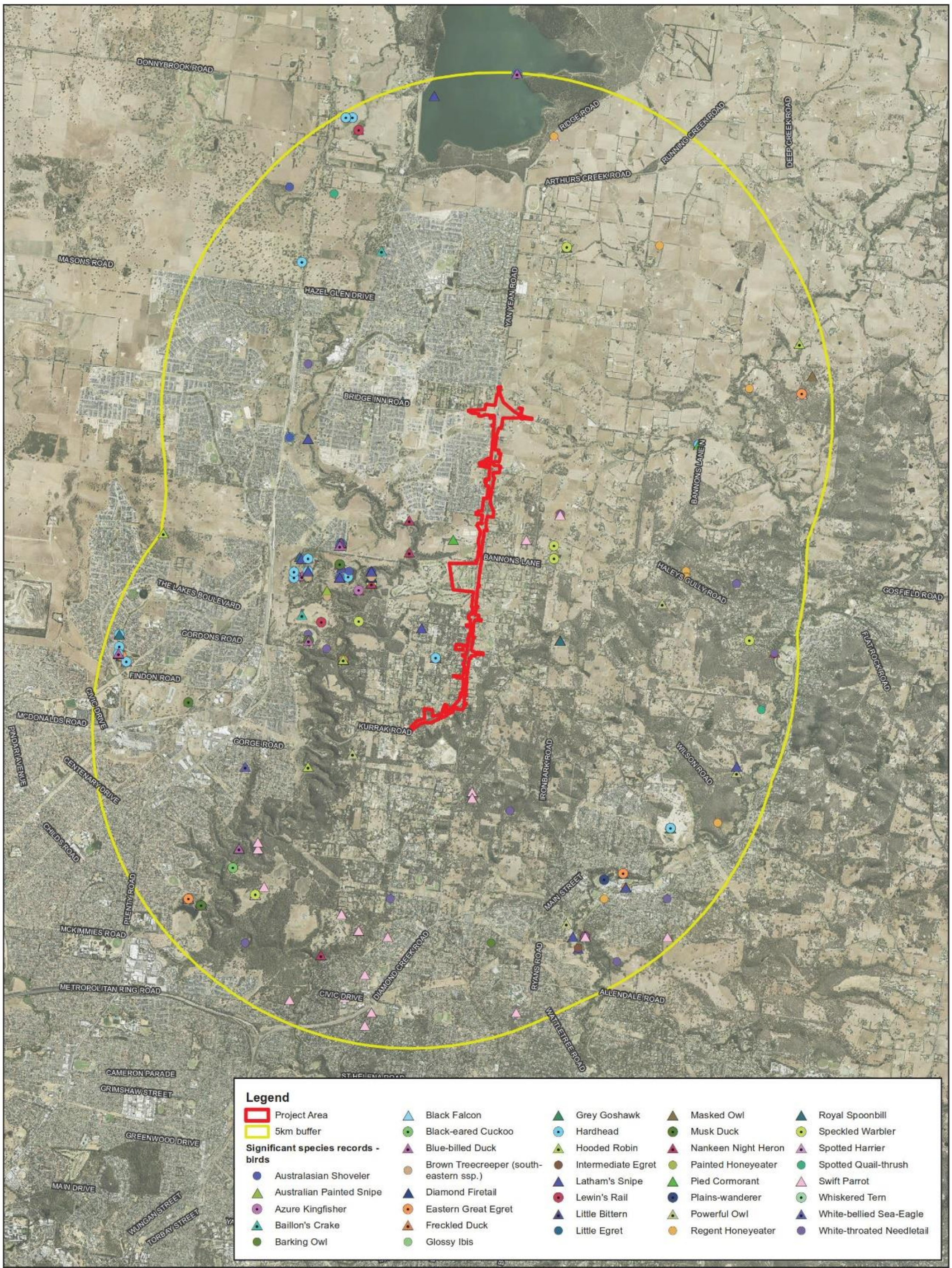
APPENDIX B

SUPPLEMENTARY FIGURES

APPENDIX B-1
THREATENED FLORA AND FAUNA VBA RECORDS



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Date: 20/04/2020	Approved by:	

Data source: VicRoads.
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Figure B1.2
VBA records - birds

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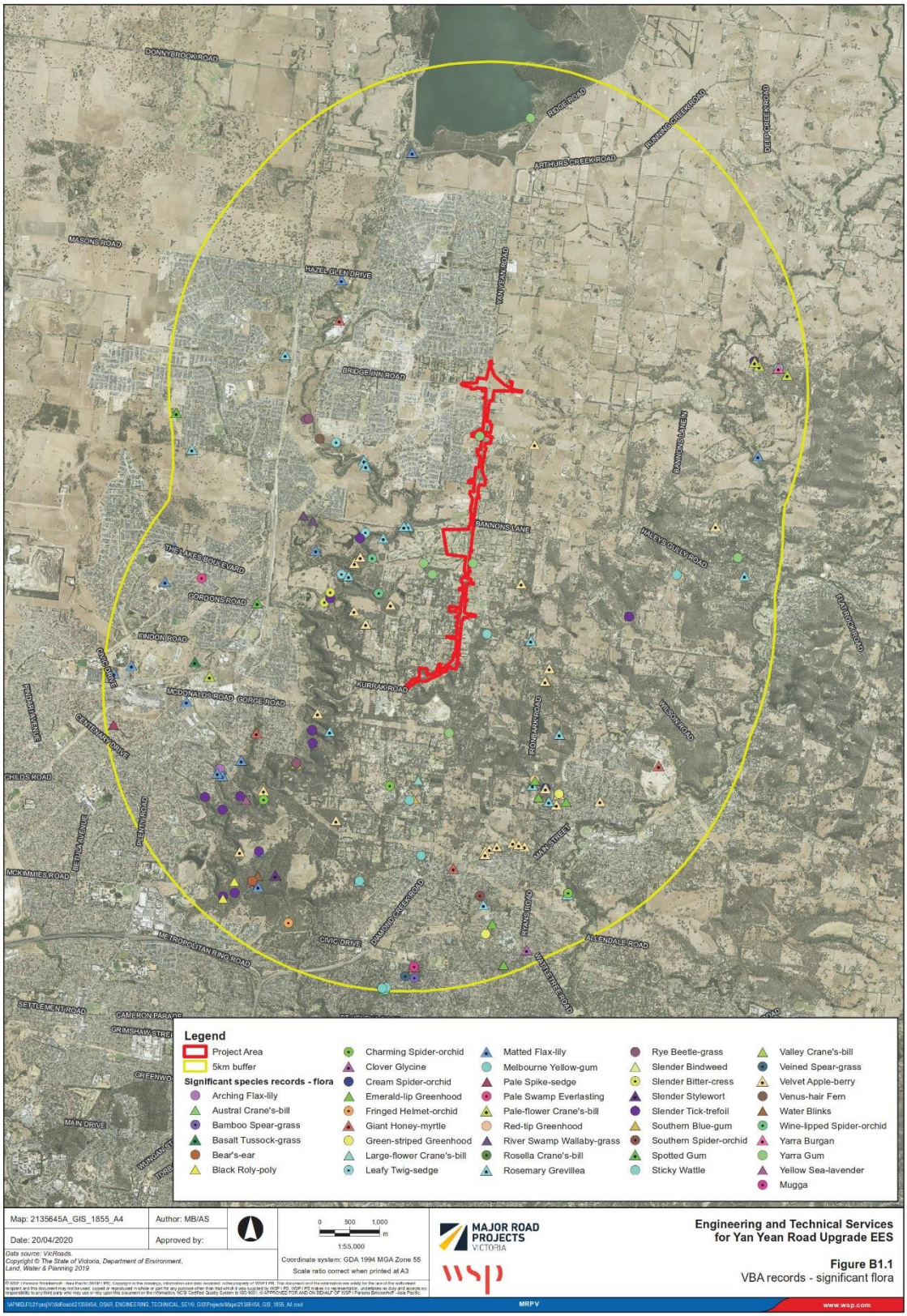

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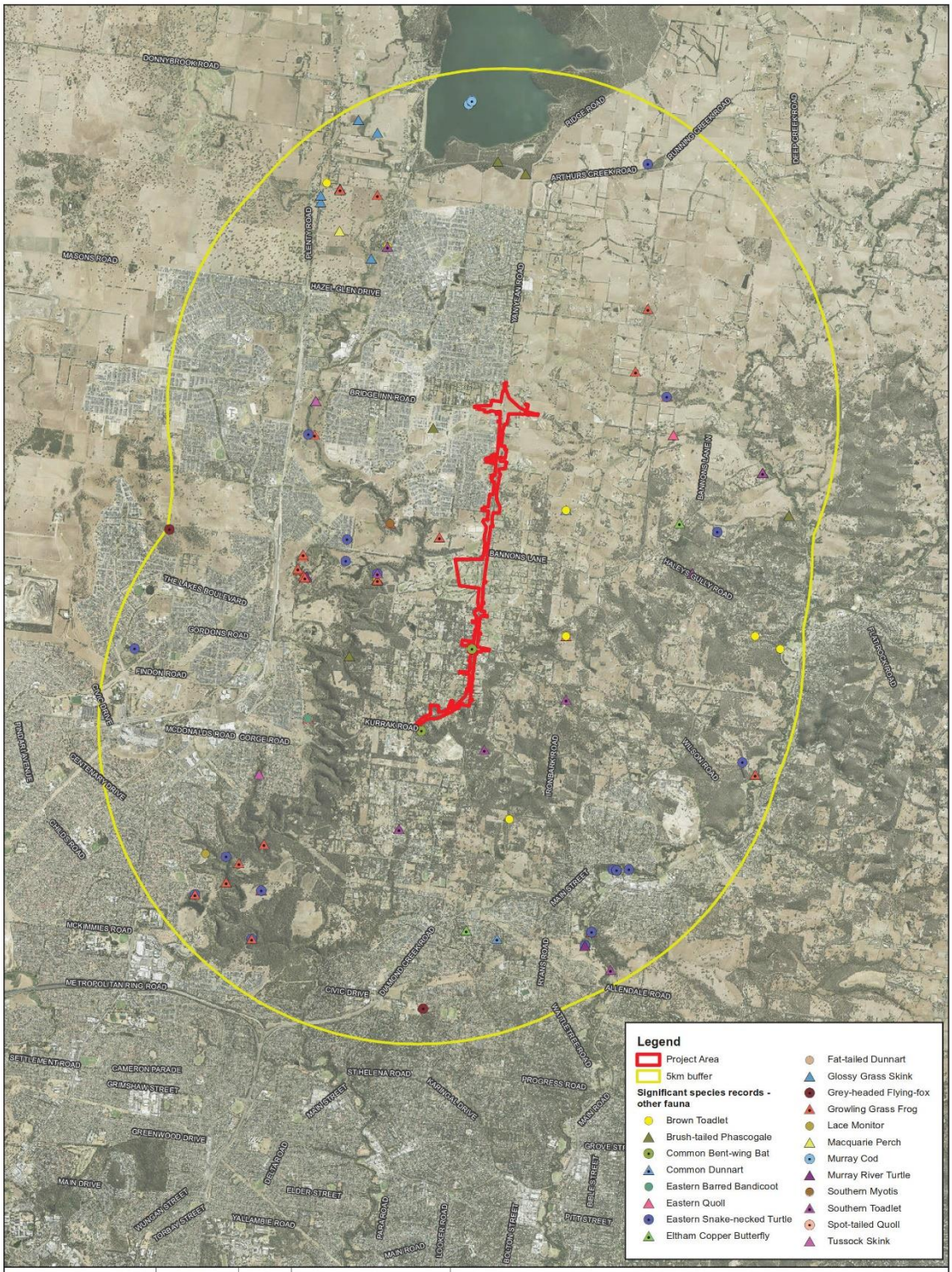
Figure B1.1
VBA records - significant flora



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Data source: VicRoads.

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Figure B1.3
VBA records - other fauna

APPENDIX B-2
NATIVE VEGETATION

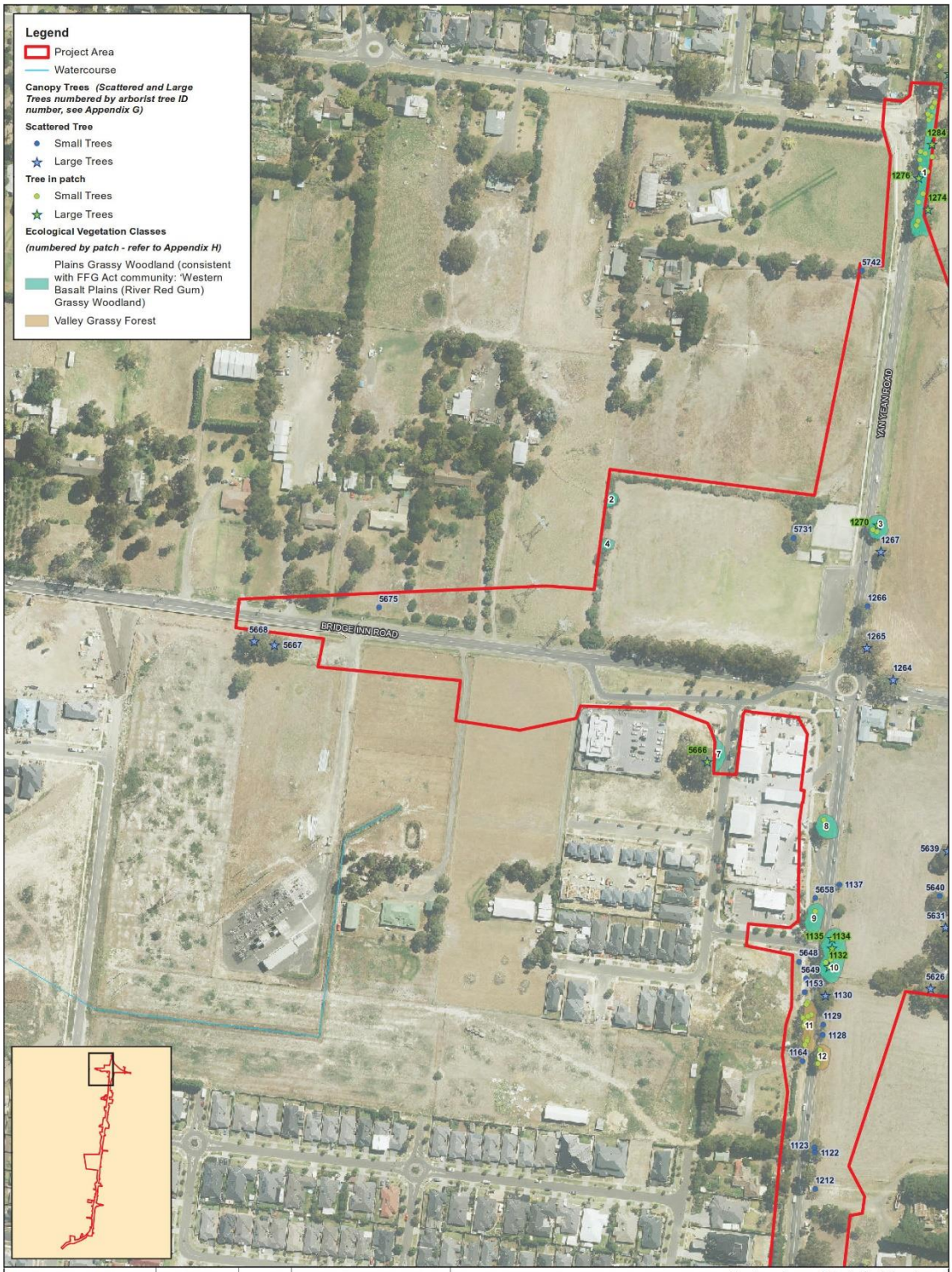

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Figure B2
Native vegetation
Map 1

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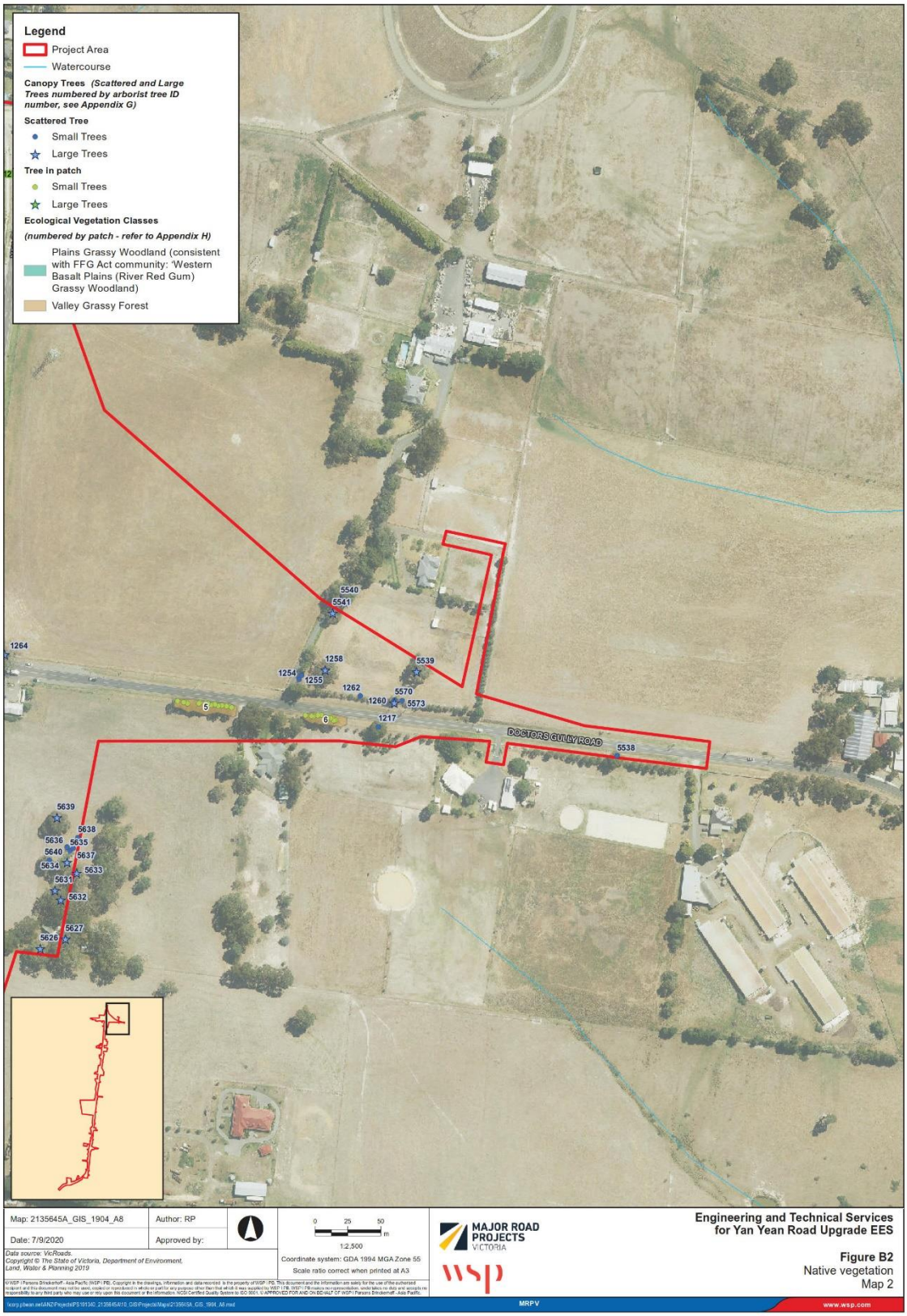

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Figure B2
Native vegetation
Map 2

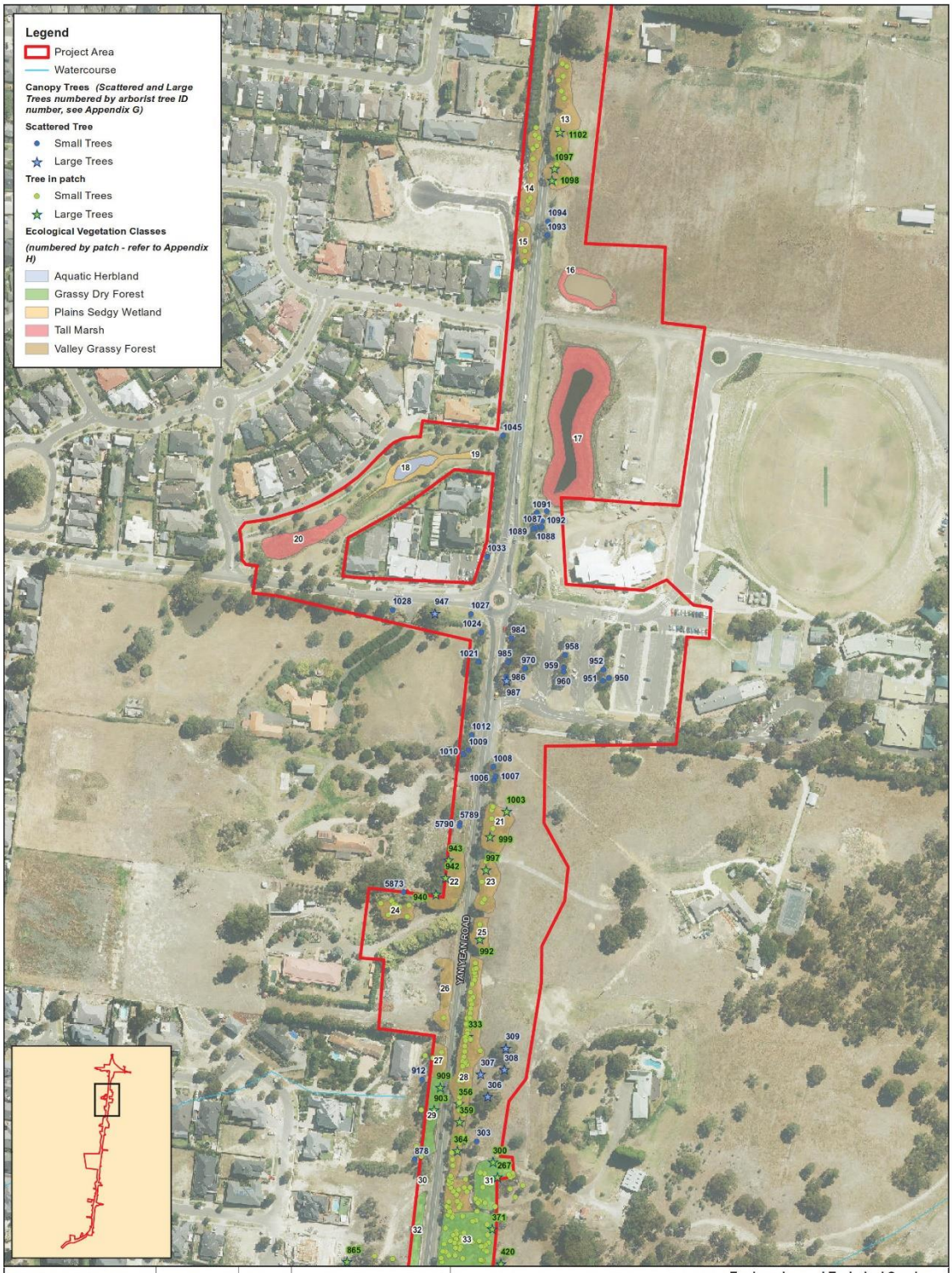

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Figure B2
Native vegetation
Map 3

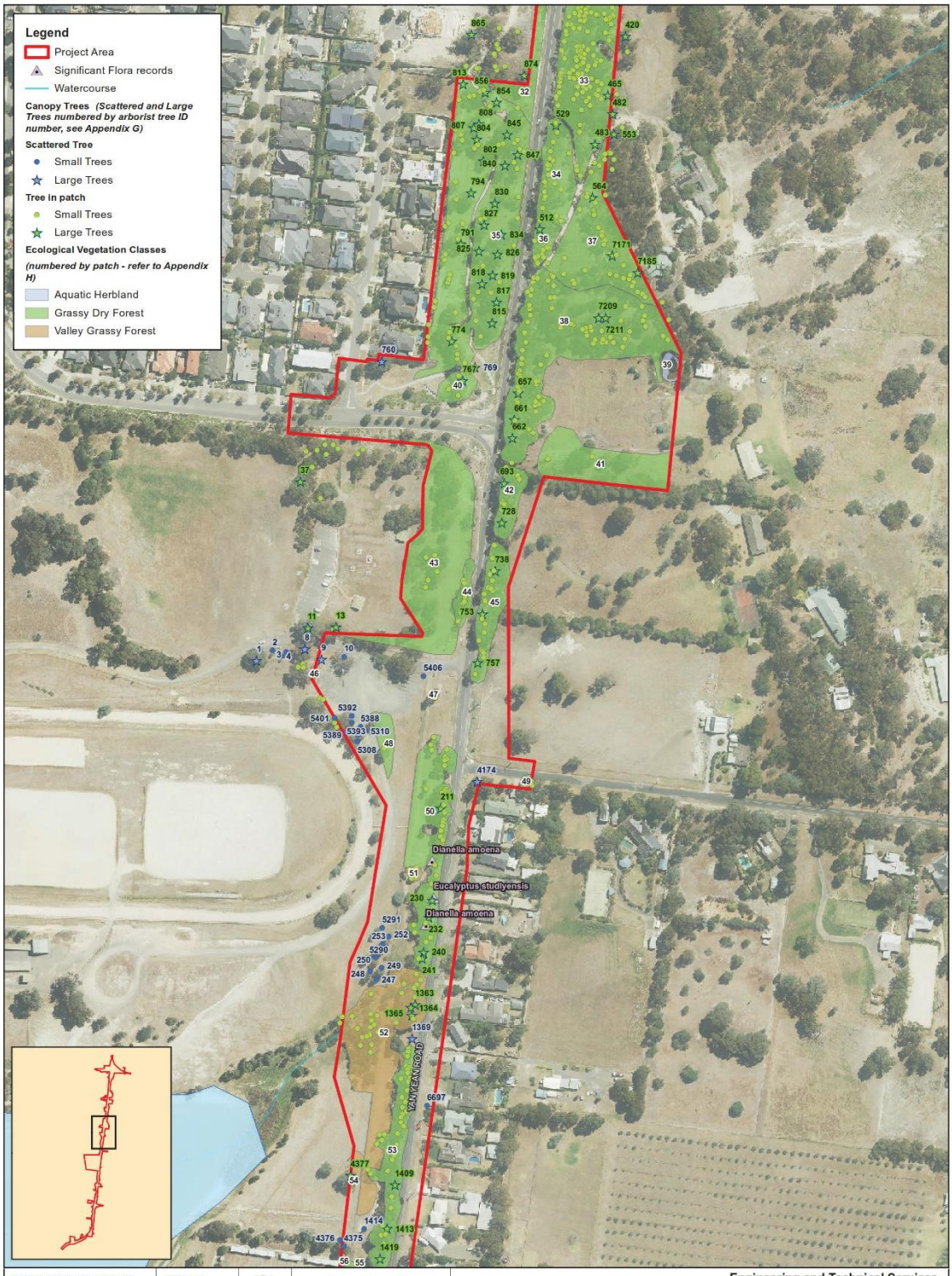

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Figure B2
Native vegetation
Map 4

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Figure B2
Native vegetation
Map 5

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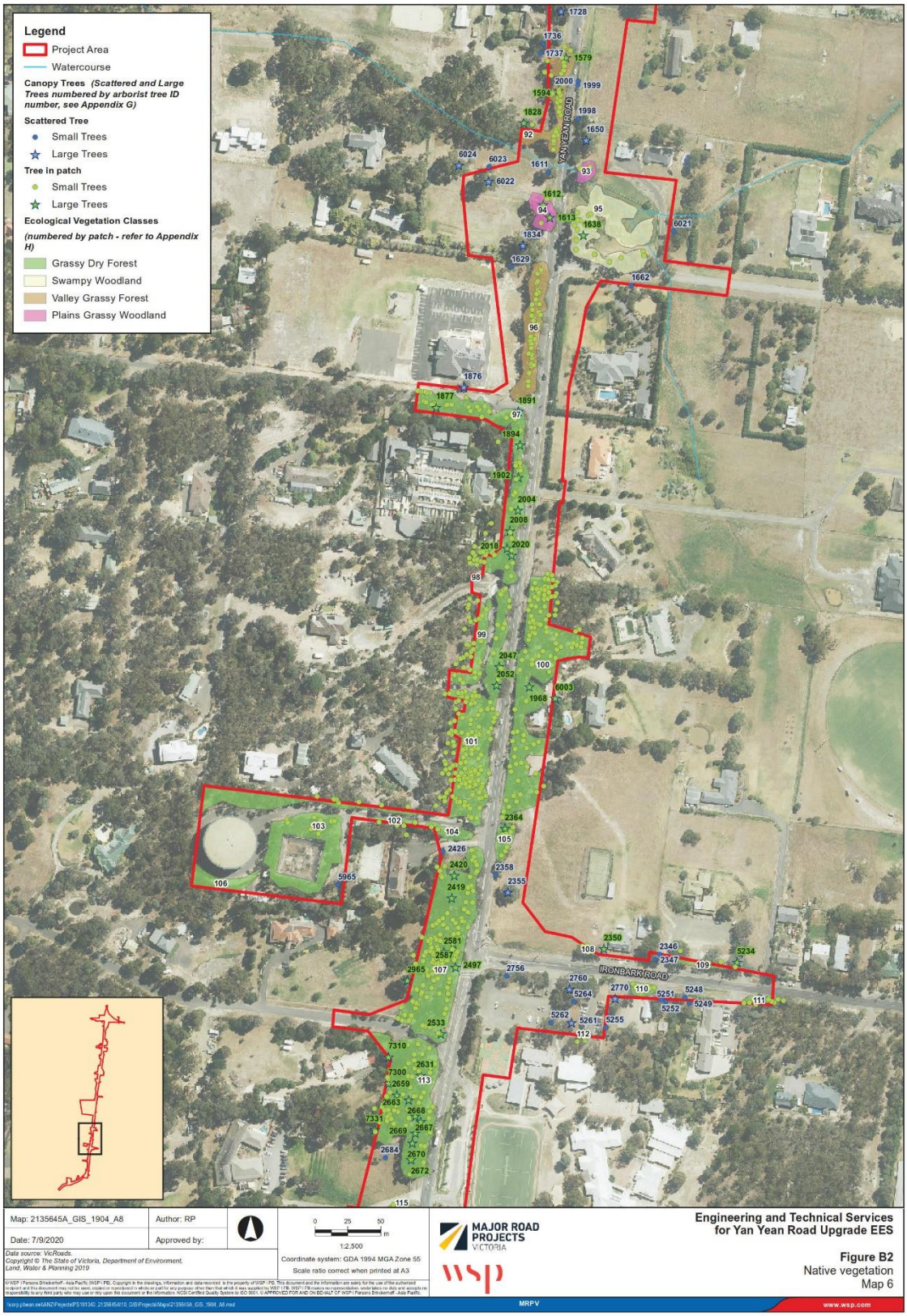

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Figure B2
Native vegetation
Map 6

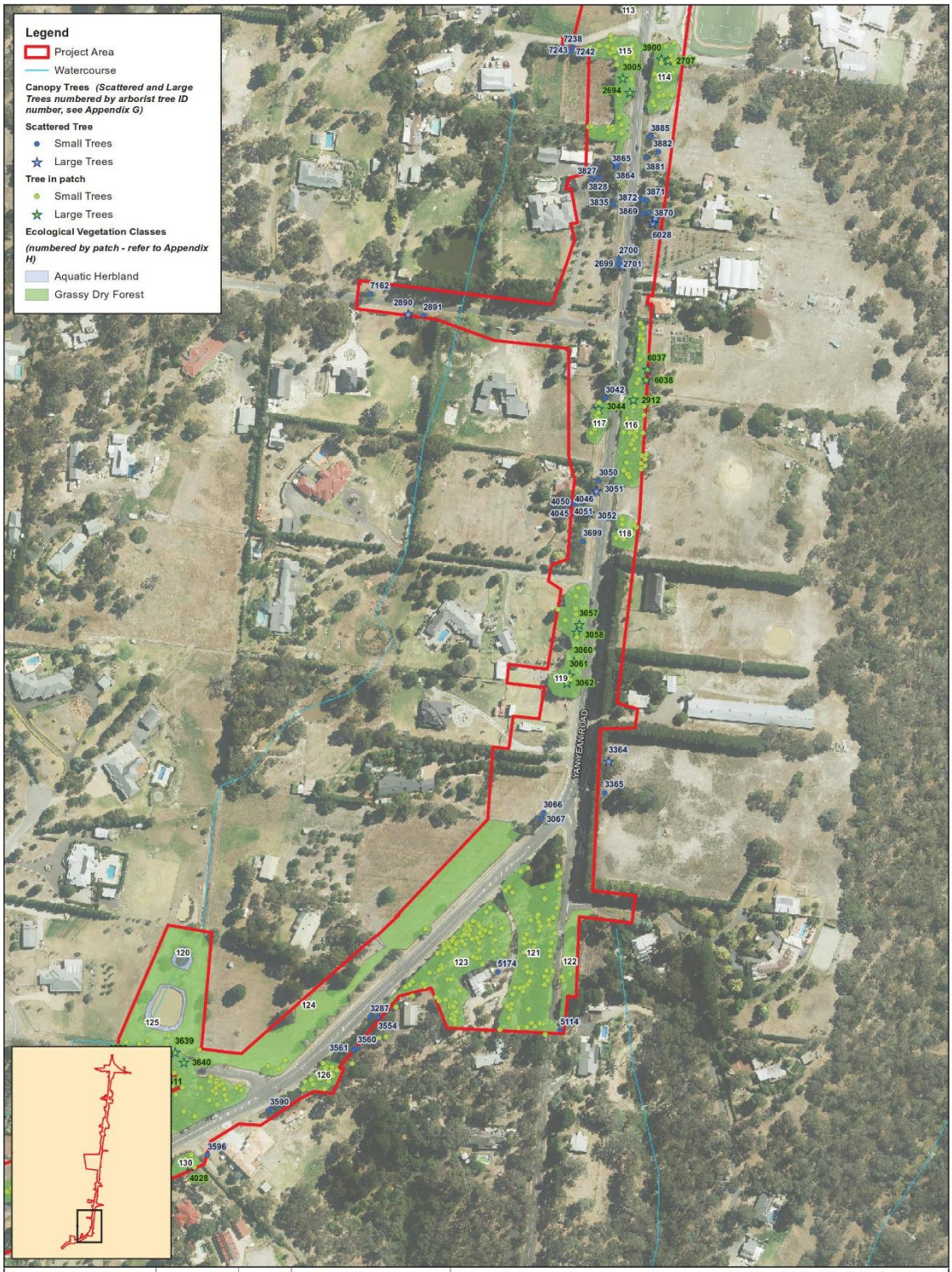

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Figure B2
Native vegetation
Map 7

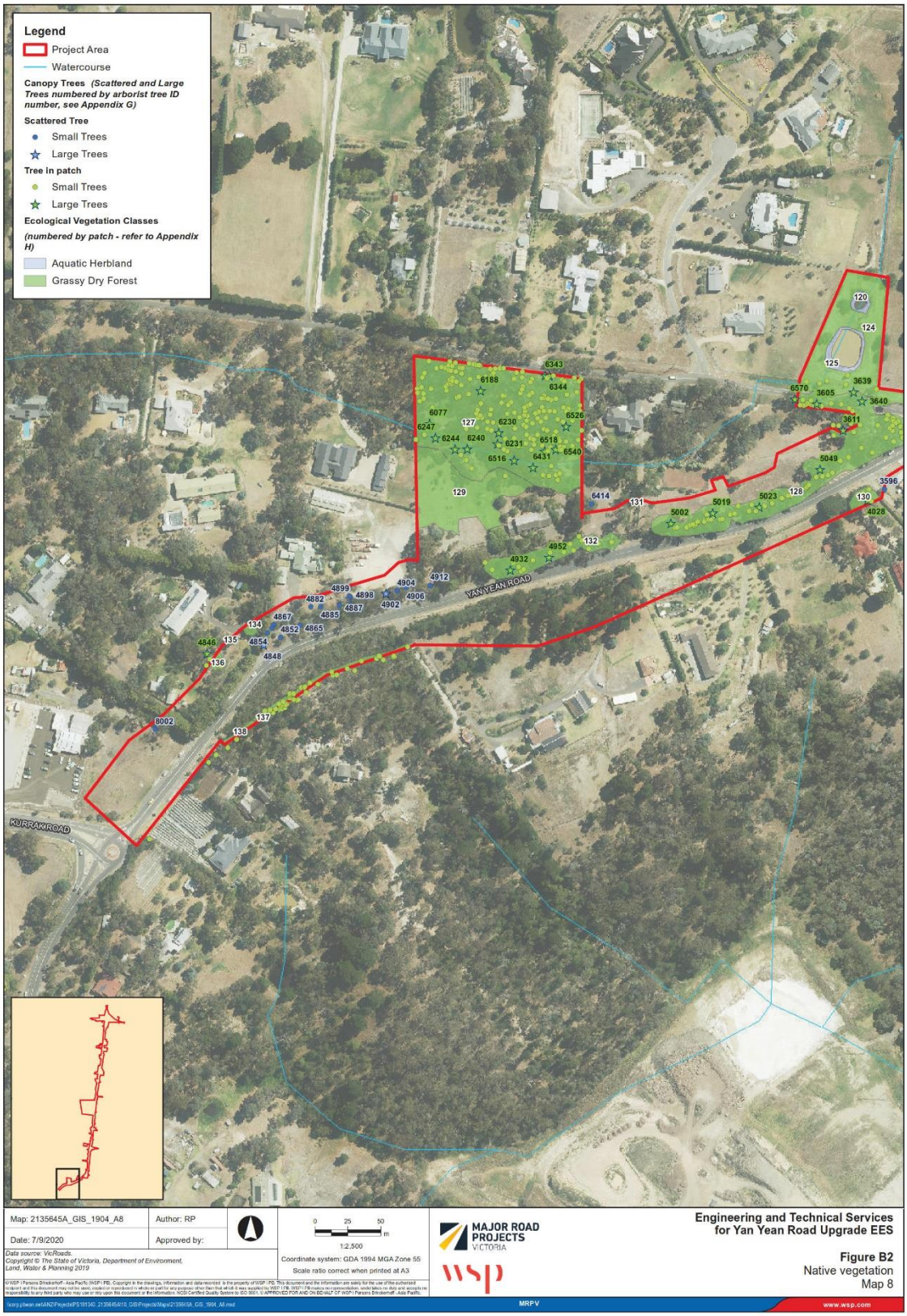

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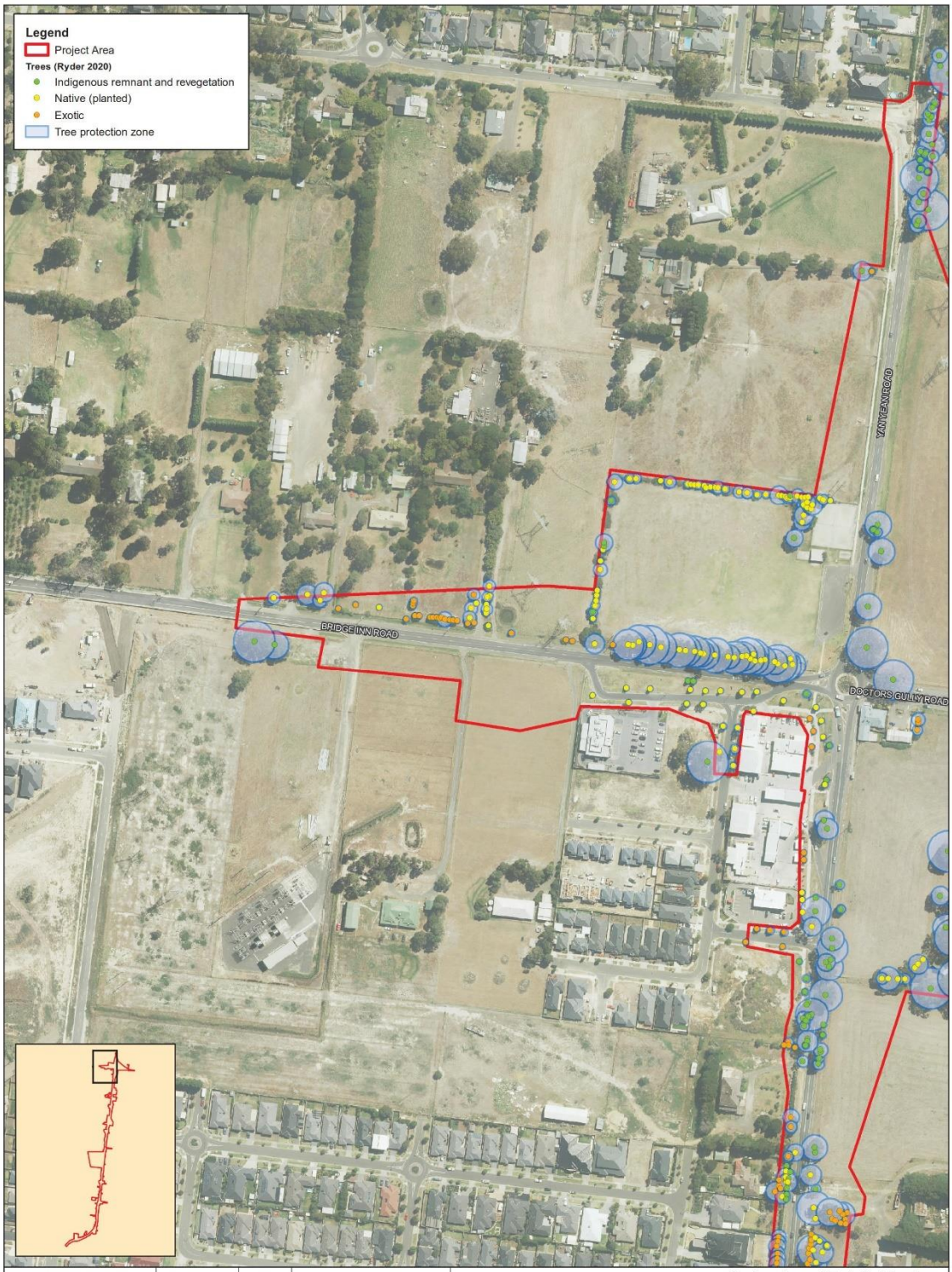
Figure B2
Native vegetation
Map 8

APPENDIX B-3
TREES



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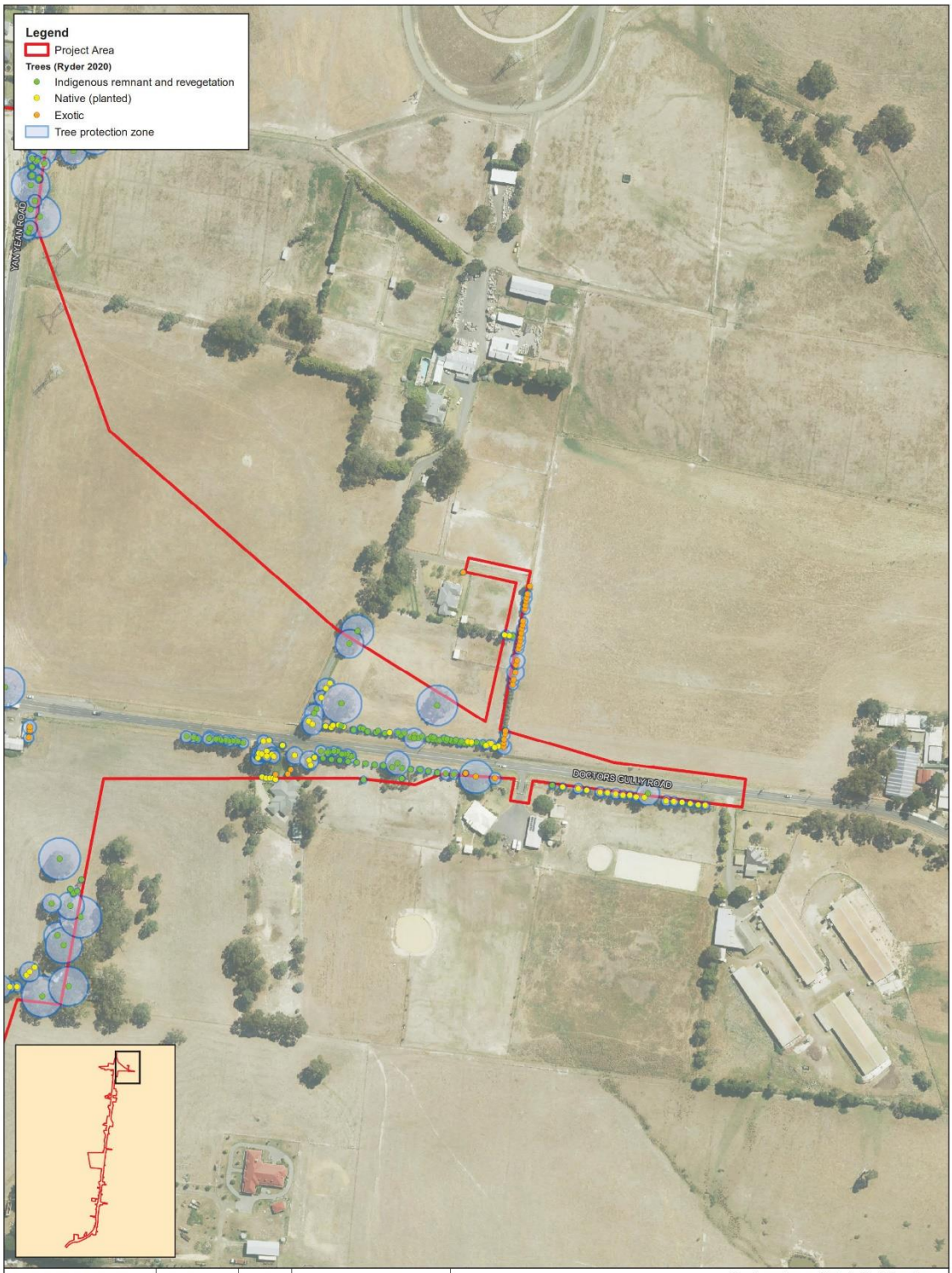
Engineering and Technical Services for Yan Yean Road Upgrade EES

Figure B3
Trees
Map 1



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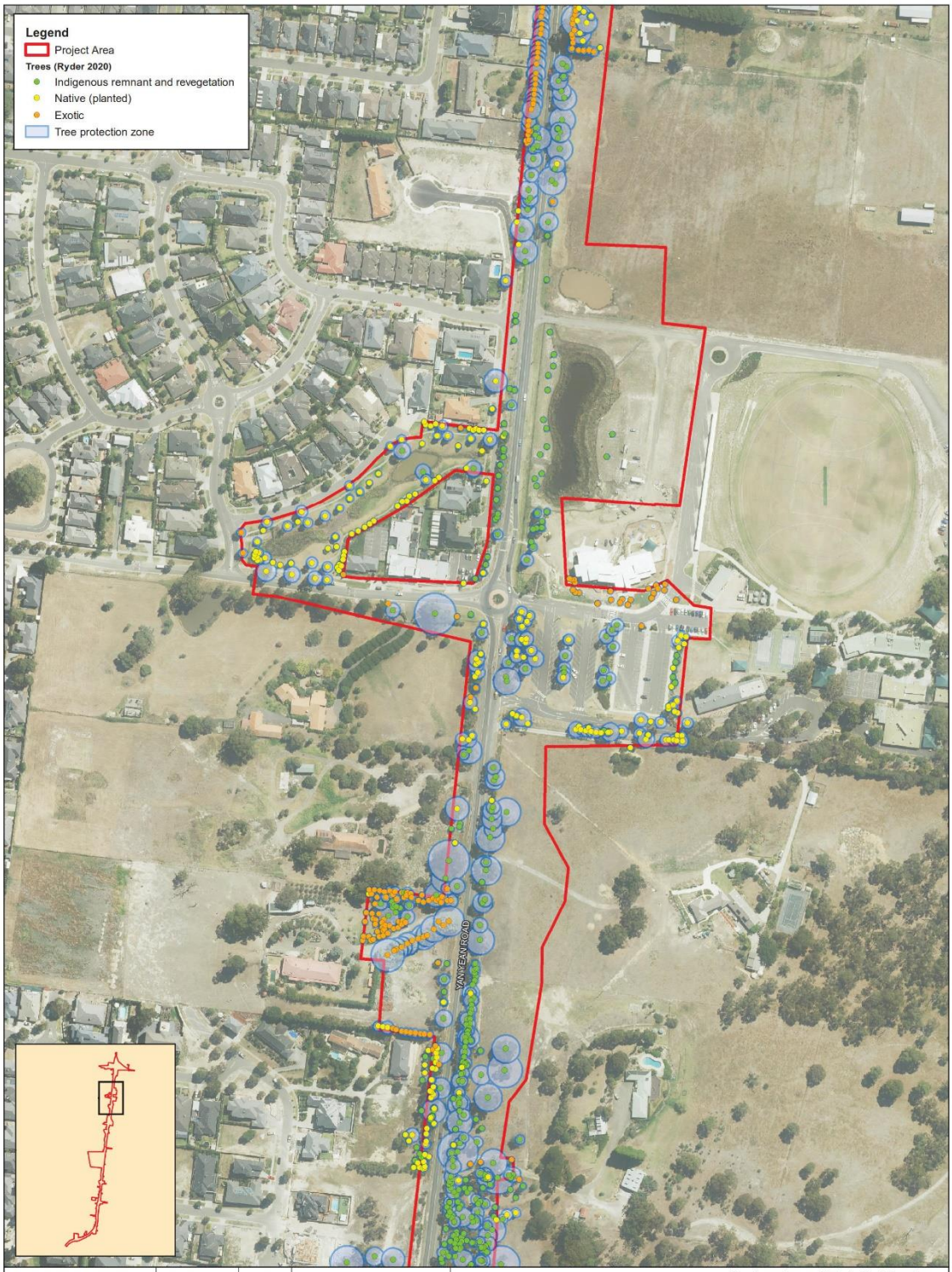
Engineering and Technical Services for Yan Yean Road Upgrade EES

Figure B3
Trees
Map 2



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Engineering and Technical Services for Yan Yean Road Upgrade EES

Figure B3
Trees
Map 3

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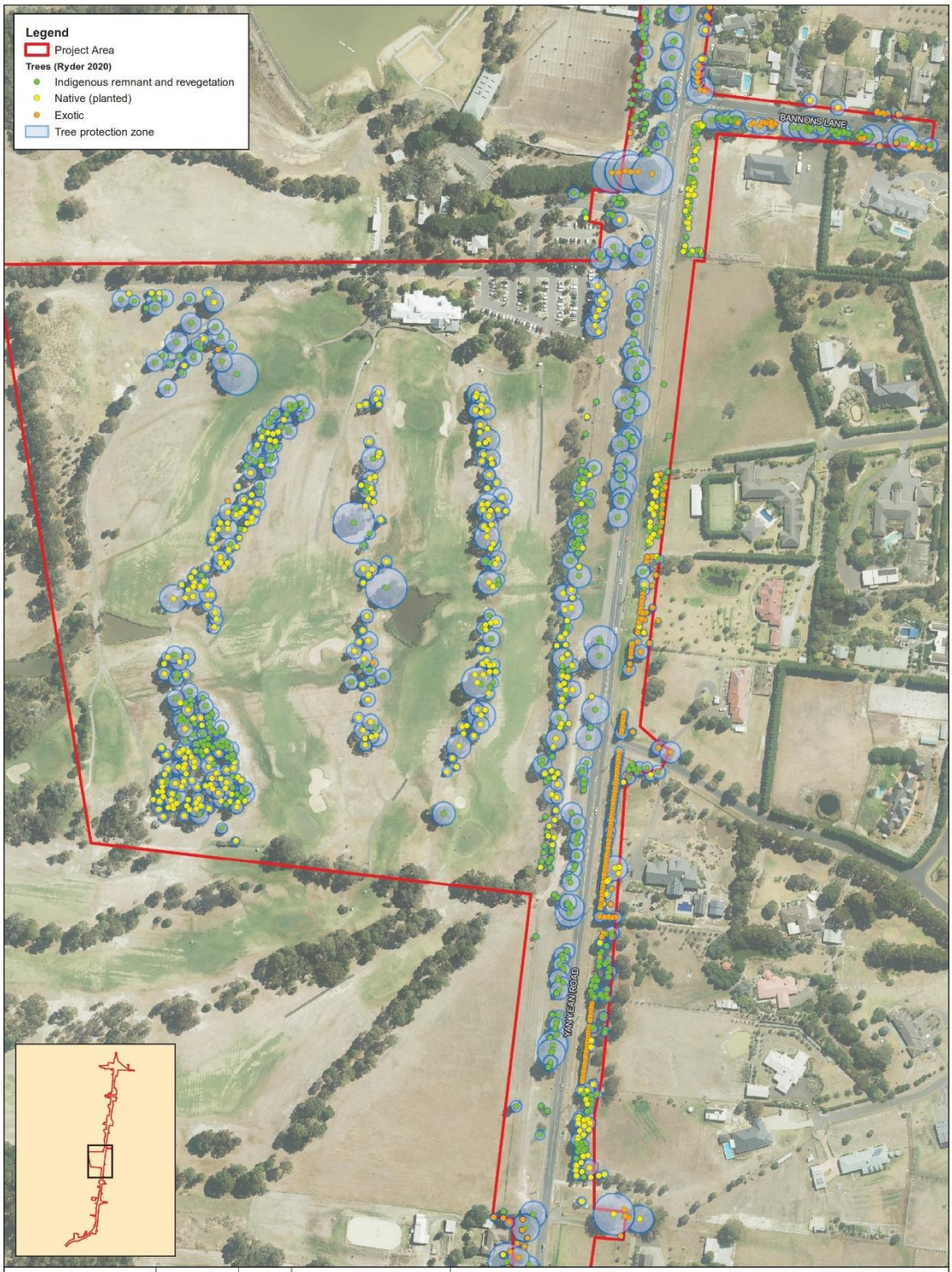
Figure B3
Trees
Map 4



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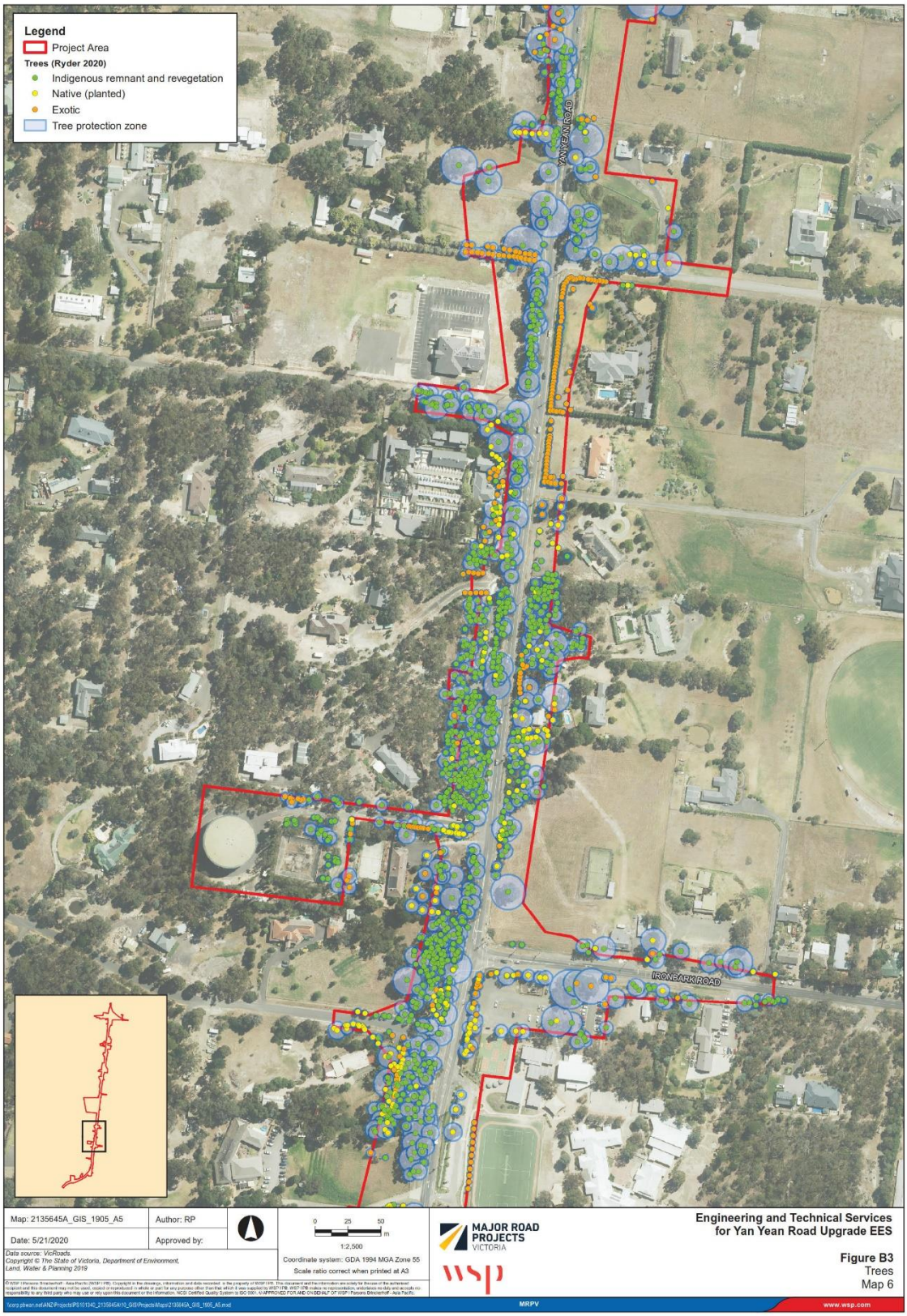
Engineering and Technical Services for Yan Yean Road Upgrade EES

Figure B3
Trees
Map 5



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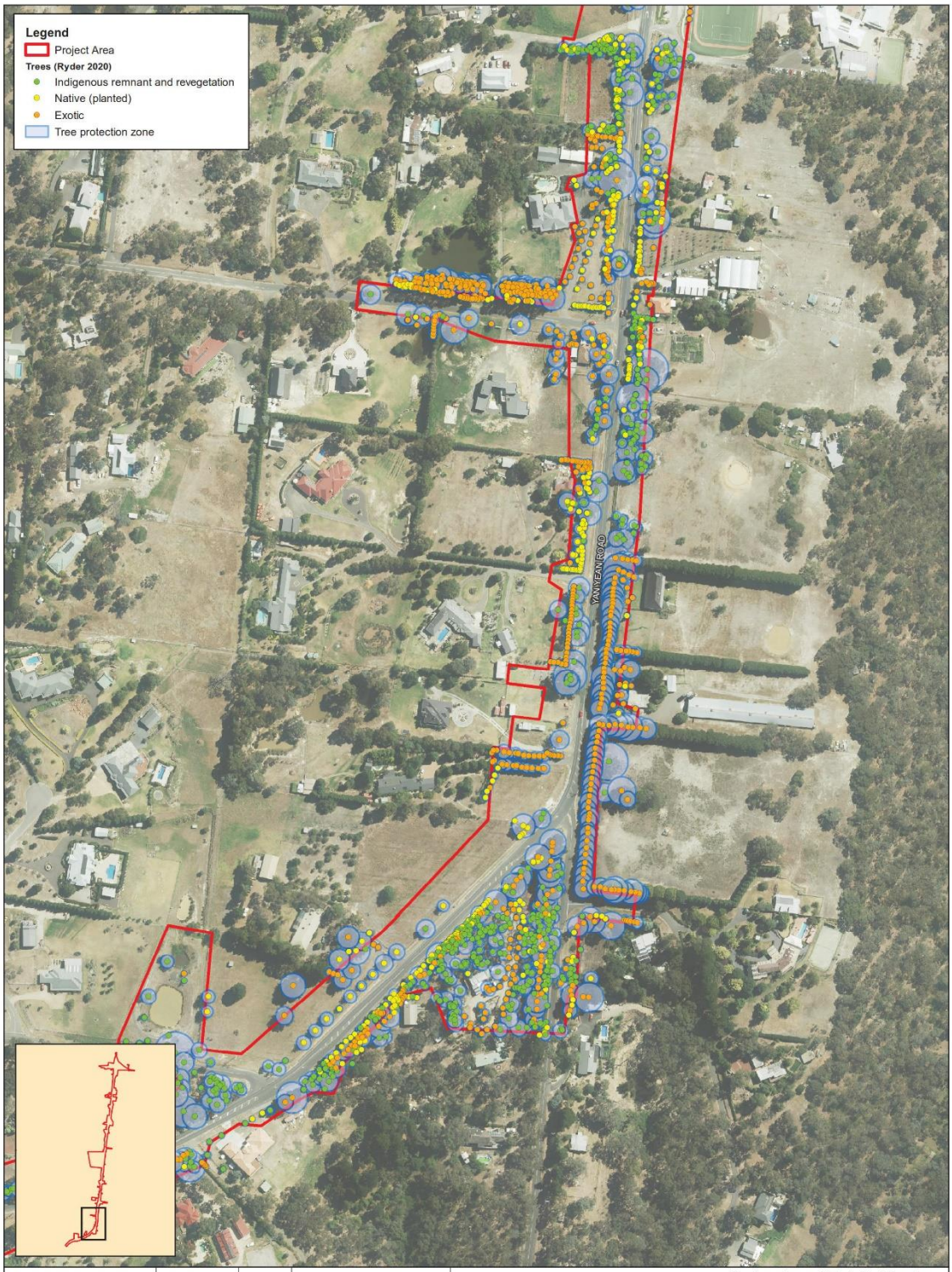
Engineering and Technical Services for Yan Yean Road Upgrade EES

Figure B3
Trees
Map 6



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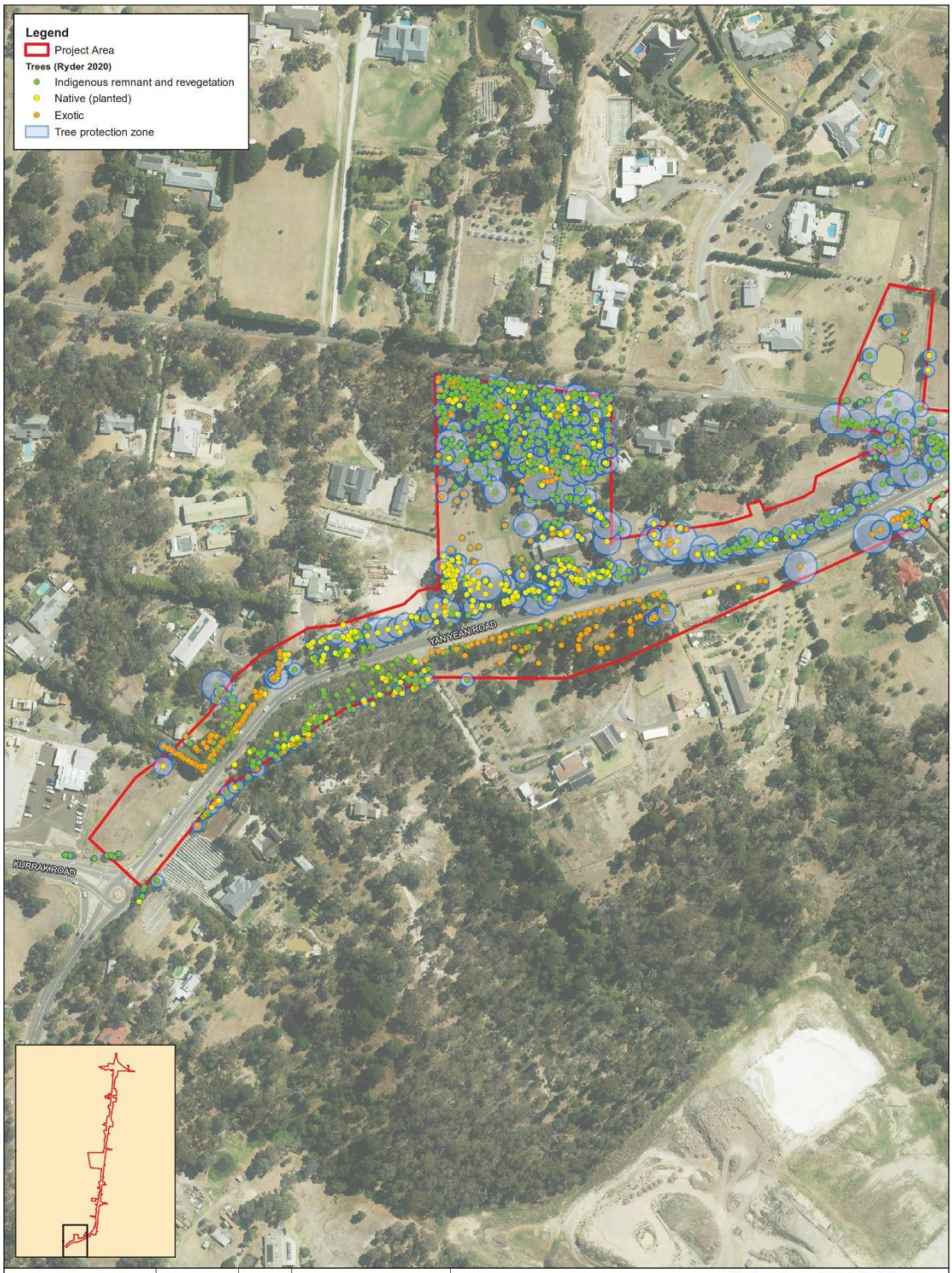
Engineering and Technical Services for Yan Yean Road Upgrade EES

Figure B3
Trees
Map 7



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Engineering and Technical Services for Yan Yean Road Upgrade EES

Figure B3
Trees
Map 8

APPENDIX C

LITERATURE REVIEW

C1.1 MATTED FLAX-LILY TARGETED SURVEY, JACOBS (JACOBS 2017)

Targeted surveys were conducted for Matted Flax-lily by Jacobs in 2017 for the Doreen Transfer Main project for Yarra Valley Water. Part of the study area for this survey intersects with the current Project Area. Two plants were recorded in this intersecting area.

C1.2 TARGETED SURVEYS OF ARBOREAL MARSUPIALS AND THEIR HABITAT AT PRIORITY CROSSING LOCATIONS AND TREE-HOLLOW SURVEYS ALONG YAN YEAN RD – PLENTY, ECOLOGY AND INFRASTRUCTURE INTERNATIONAL PTY LTD (VAN DER REE 2018)

This report, commissioned by VicRoads, details targeted surveys conducted for arboreal mammals for Stage 1 of the Yan Yean Road Upgrade. The study area for this assessment is immediately south of the current Project Area. During surveys for this study, Sugar Gliders were recorded at all four survey points. No Brush-tailed Phascogales were recorded however their presence in this area could not be ruled out.

As the project was impacting habitat for these species and increasing barriers to movement by widening the road, mitigation measures were proposed in the form of rope bridges. The rope bridges should be in the form of rope ladders connecting existing tall hollow-bearing trees to link habitat on both sides of the road.

A total of 224 hollows in 107 trees were identified in the alignment of Stage 1. The van der Ree (2018) report recommends the replacement of these hollows with a combination of hollow logs and hollows carved into standing trees with chainsaws.

C1.3 SWIFT PARROTS IN BANYULE AND SURROUNDS, PRACTICAL ECOLOGY (PRACTICAL ECOLOGY 2017B)

Practical Ecology was engaged by Banyule Council to undertake an assessment of Swift Parrots across the Banyule Local Government Area and surrounds to determine the population distribution, movement, habitat quality and extent. The aim of the report was to provide guidance to council on the protection and enhancement of Swift Parrot habitat and movement corridors across Banyule and to facilitate conservation initiatives (Practical Ecology 2017b).

The study area for this assessment was Banyule LGA with a 5 km buffer. This buffer includes Yan Yean Road, which lies to the north of Banyule, in the City of Whittlesea. Plenty Gorge Parklands, to the west of Yan Yean Road, was identified as key (core) habitat for Swift Parrots. The Sawpit Creek catchment area to the south of the Project Area, the Diamond Creek catchment to the southeast of the Project Area, and Dry Creek to the south of the Project Area were considered corridors for the species. The report stresses the likely importance of habitat in the Melbourne regions for feeding and resting after crossing the Bass Strait.

This report lists tree species that are key (as per the Recovery Plan (Saunders, D & Tzaros 2011)) as well as species considered by the author to be ‘secondary’ feed species. Although the specific rationale for defining ‘secondary’ trees is not provided it is assumed to relate to the tree species associated with records in the area but which do not provide nectar in winter.

C1.4 BIODIVERSITY ASSESSMENT: YAN YEAN ROAD DUPLICATION PROJECT, PLENTY, VICTORIA (ECOLOGY AND HERITAGE PARTNERS PTY LTD 2017A)

This was the Biodiversity Impact Assessment for Yan Yean Stage 1 Upgrade, which is the upgrade of Yan Yean Road between Diamond Creek Road and a point 580 metres north of Kurrak Road. There is an overlap of approximately 750 metres between the project area for Stage 1 and the southern extent of the Project Area for the current project. This report presents an assessment of impacts on ecological values from Stage 1. It classifies Swift Parrot as an 'occasional visitor'. Significant impact criteria assessments were not undertaken for EPBC Act listed species. With regard to native vegetation impacts, the project involved an anticipated loss of 7.94 ha of remnant patches and 121 scattered trees. These native vegetation impacts included 147 Large Trees. This was largely assessed under the *Native Vegetation Management – A Framework for Action*, which is no longer current, aside from a small area of native vegetation which occurred outside of the incorporated document boundary (see below).

Significant impact on listed flora and fauna species was not anticipated and minimal mitigation was recommended. This project was not referred under state or Commonwealth legislation but advice was received from the Commonwealth at the time of the project.

C1.5 TREE ASSESSMENT: YAN YEAN ROAD, PLENTY, VICTORIA (ECOLOGY AND HERITAGE PARTNERS PTY LTD 2017B)

This was a standalone tree assessment for the Yan Yean Stage 1 Upgrade. It includes an assessment of impacts on all trees, including both indigenous and native remnant and planted trees, as well as exotic trees, whereas the biodiversity assessment detailed impacts on indigenous remnant trees only. The report assessed 3,054 trees as being potentially impacted by the project, with most of these trees being indigenous.

APPENDIX D

FLORA SPECIES LIST

D1. FLORA LIST

Table D.1 provides a full list of species recorded within the Project Area during field survey by WSP and other ecological consultants. Note it does not provide all tree species recorded by the arborist, which can be found in the arborist assessment report (Ryder Arboriculture and Environment 2020). A key to the table is provided below.

Table D.1 Flora species lists

ORIGIN	SCIENTIFIC NAME	COMMON NAME	CONSERVATION STATUS	PROTECTED (FFG ACT)	CALP STATUS	ARCADIS	WSP	KARL JUST (ORCHID SURVEY)
	Acacia acinacea s.l.	Gold-dust Wattle		Yes		X	X	
*	*Acacia baileyana*	Cootamundra Wattle		Yes in natural habitat only		X		
	Acacia genistifolia	Spreading Wattle		Yes			X	
	Acacia implexa	Lightwood				X	X	
#	*Acacia longifolia*	Sallow Wattle		Yes is natural habitat only		X		
	Acacia mearnsii	Black Wattle		Yes		X	X	
	Acacia melanoxylon	Blackwood				X	X	
	Acacia paradoxa	Hedge Wattle				X	X	
	Acacia pycnantha	Golden Wattle		Yes		X	X	
	Acacia stricta	Hop Wattle		Yes		X		
	Acaena spp.	Sheep's Burr				X		
	Acianthus pusillus	Small Mosquito-orchid						X

ORIGIN	SCIENTIFIC NAME	COMMON NAME	CONSERVATION STATUS	PROTECTED (FFG ACT)	CALP STATUS	ARCADIS	WSP	KARL JUST (ORCHID SURVEY)
	Acrotriche serrulata	Honey-pots				X	X	
*	*Agapanthus spp.*	Agapanthus				X		
*	*Agave americana*	Century Plant					X	
	Allocasuarina verticillata	Drooping Sheoak				X		
	Anthosachne scabra s.l.	Common Wheatgrass				X	X	
*	*Anthoxanthum odoratum*	Sweet Vernal-grass				X	X	
*	*Arctotheca calendula*	Cape weed				X	X	
	Arthropodium strictum s.l.	Chocolate Lily				X	X	
*	*Asparagus asparagoides*	Bridal Creeper			R	X	X	
*	*Asparagus officinalis*	Asparagus					X	
	Austrostipa mollis	Supple Speargrass				X		
	Austrostipa pubinodis	Tall Spear-grass				X		
	Austrostipa rudis subsp. rudis	Veined Speargrass				X	X	
	Austrostipa semibarbata	Fibrous Spear-grass					X	
	Austrostipa spp.	Spear Grass				X	X	
	Baumea articulata	Jointed Twig-sedge					X	
*	*Billardiera heterophylla*	Bluebell Creeper				X	X	
	Billardiera mutabilis	Velvet Apple-berry	r				X	
	Bolboschoenus caldwellii	Salt Club-sedge					X	

ORIGIN	SCIENTIFIC NAME	COMMON NAME	CONSERVATION STATUS	PROTECTED (FFG ACT)	CALP STATUS	ARCADIS	WSP	KARL JUST (ORCHID SURVEY)
*	*Brassica spp.*	Turnip				X		
*	*Briza maxima*	Large Quaking Grass				X	X	
*	*Briza minor*	Lesser Quakinggrass				X	X	
	Brunonia australis	Blue Pincushion		Yes		X	X	
	Bursaria spinosa	Sweet Bursaria				X	X	
	Calocephalus lacteus	Milky Beauty-heads					X	
	Carex appressa	Tall Sedge					X	
	Carex fascicularis	Tassel Sedge					X	
	Carex tereticaulis	Poong'ort					X	
	Cassinia aculeata subsp. aculeata	Common Cassinia				X	X	
	Cassinia longifolia	Shiny Cassinia					X	
	Cassinia sifton	Drooping Cassinia				X	X	
	Cassytha pubescens s.s.	Downy Dodderlaurel				X	X	
*	*Centaurium erythraea*	Common Centaury				X	X	
*	*Chamaecytisus palmensis*	Tree Lucerne					X	
*	*Chlorophytum comosum*	Spider Plant				X	X	
*	*Chrysanthemoides monilifera*	Boneseed			C	X	X	
	Clematis microphylla s.l.	Small-leaved Clematis				X	X	
	Crassula helmsii	Swamp Crassula					X	

ORIGIN	SCIENTIFIC NAME	COMMON NAME	CONSERVATION STATUS	PROTECTED (FFG ACT)	CALP STATUS	ARCADIS	WSP	KARL JUST (ORCHID SURVEY)
	Crassula sieberiana s.l.	Sieber Crassula				X		
	Cyanicula caerulea	Blue Fairy						X
	Cycnogeton procerum s.s.	Common Water-ribbons					X	
*	*Cynodon dactylon var. dactylon*	Couch				X	X	
	Cyperus lucidus	Leafy Flat-sedge					X	
*	*Cytisus scoparius.*	English Broom			C	X	X	
*	*Dactylis glomerata*	Cocksfoot				X	X	
*	*Danthonia decumbens*	Heath Grass				X		
	Dianella amoena	Matted Flax-lily	EN L en	Yes			X (verification of Jacobs 2018 records)	
	Dianella longifolia s.l.	Pale Flax-lily					X	
	Dianella revoluta var. revoluta s.l.	Black-anther Flax-lily				X	X	
#	*Dianella sp. aff. longifolia (Benambra)*	Arching Flax-lily					X (planted)	
	Dillwynia cinerascens s.l.	Grey Parrot-pea				X		
	Dillwynia glaberrima	Smooth Parrot-pea				X		
	Dipodium roseum s.l.	Rosy Hyacinth-orchid					X	
	Diuris pardina	Leopard Orchid						X
	Diuris sulphurea	Tiger Orchid				X		

ORIGIN	SCIENTIFIC NAME	COMMON NAME	CONSERVATION STATUS	PROTECTED (FFG ACT)	CALP STATUS	ARCADIS	WSP	KARL JUST (ORCHID SURVEY)
	Drosera auriculata	Tall Sundew				X		
*	*Echium plantagineum*	Paterson's Curse			C		X	
*	*Ehrharta erecta var. erecta*	Panic Veldt-grass				X	X	
*	*Ehrharta longiflora*	Annual Veldt-grass				X	X	
	Einadia nutans	Nodding Saltbush				X		
	Elatine gratioloides	Waterwort					X	
	Epilobium billardierianum	Variable Willow-herb					X	
	Eriochilus cucullatus	Parsons Bands						X
	Eucalyptus camaldulensis	River Red-gum				X	X	
	Eucalyptus goniocalyx s.l.	Bundy				X	X	
	Eucalyptus macrorhyncha	Red Stringybark				X	X	
	Eucalyptus melliodora	Yellow Box				X	X	
	Eucalyptus microcarpa	Grey Box				X		
	Eucalyptus polyanthemos	Red Box				X		
	Eucalyptus viminalis	Manna Gum				X		
	Eucalyptus X studleyensis	Studley Park Gum	en			X	X	
*	*Euphorbia peplus*	Petty Spurge				X		
	Exocarpos cupressiformis	Cherry Ballart				X	X	
*	*Fraxinus spp.*	Ash				X		

ORIGIN	SCIENTIFIC NAME	COMMON NAME	CONSERVATION STATUS	PROTECTED (FFG ACT)	CALP STATUS	ARCADIS	WSP	KARL JUST (ORCHID SURVEY)
*	*Freesia alba x Freesia leichtlinii*	Freesia hybrid				X		
*	*Fumaria spp.*	Fumitory				X		
*	*Galenia pubescens var. pubescens*	Galenia				X	X	
*	*Genista monspessulana*	Montpellier Broom			C	X	X	
	Geranium sp. 2	Variable Crane's-bill					X	
	Geranium sp. 3	Pale-flowered Crane's-bill	r					X
	Geranium sp. 5	Naked Crane's-bill					X	
	Glossodia major	Wax-lip Orchid						X
	Glyceria australis	Australian Sweet-grass					X	
	Glycine clandestina	Twining Glycine				X		
	Gonocarpus tetragynus	Common Raspwort				X	X	
	Goodenia ovata	Hop Goodenia				X		
	Goodenia pinnatifida	Cut-leaf Goodenia				X		
#	*Grevillea rosmarinifolia*	Rosemary Grevillea				X	X	
	Hakea spp.	Hakea				X		
	Hakea ulicina	Furze Hakea				X		
	Hardenbergia violacea	Purple Coral-pea		Yes		X	X	
*	*Hedera helix*	English Ivy				X	X	

ORIGIN	SCIENTIFIC NAME	COMMON NAME	CONSERVATION STATUS	PROTECTED (FFG ACT)	CALP STATUS	ARCADIS	WSP	KARL JUST (ORCHID SURVEY)
*	*Heliotropium europaeum*	Common Heliotrope				X		
	Hibbertia spp.	Guinea Flower				X		
*	*Hypochaeris radicata*	Flatweed				X	X	
	Juncus articulatus subsp. articulatus	Jointed Rush					X	
	Juncus ingens	Giant Rush					X	
	Juncus spp.	Rush				X		
*	*Lactuca serriola*	Prickly Lettuce				X		
	Lagenophora spp.	Bottle Daisy				X		
*	*Lolium perenne*	Perennial Ryegrass				X	X	
	Lomandra filiformis subsp. coriacea	Wattle Mat-rush				X	X	
	Lomandra filiformis subsp. filiformis	Wattle Mat-rush				X	X	
	Lomandra longifolia	Spiny-headed Matrush				X	X	
*	*Lythrum salicaria*	Purple Loosestrife					X	
	Microlaena stipoides var. stipoides	Weeping Grass				X		
	Muellerina eucalyptoides	Creeping Mistletoe					X	
	Myriophyllum crispatum	Upright Water-milfoil					X	
*	*Nassella neesiana*	Chilean Needlegrass			R	X	X	
*	*Olea europaea*	Olive				X		
*	*Opuntia ficus-indica*	Indian Fig			R		X	

ORIGIN	SCIENTIFIC NAME	COMMON NAME	CONSERVATION STATUS	PROTECTED (FFG ACT)	CALP STATUS	ARCADIS	WSP	KARL JUST (ORCHID SURVEY)
	Oxalis perennans	Grassland Woodsorrel				X	X	
*	*Oxalis pes-caprae*	Soursob			R	X		
*	*Oxalis purpurea*	Large-flower Wood-sorrel				X	X	
	Ozothamnus ferrugineus	Tree Everlasting				X		
	Ozothamnus obcordatus	Grey Everlasting				X	X	
*	*Paspalum dilatatum*	Paspalum				X	X	
	Persicaria decipiens	Slender Knotweed					X	
	Pimelea humilis	Common Riceflower				X		
*	*Pinus radiata*	Radiata Pine				X	X	
#	*Pittosporum undulatum*	Sweet Pittosporum				X	X	
*	*Plantago lanceolata*	Ribwort				X	X	
	Poa labillardierei	Common Tussock-grass					X	
	Poa sieberiana	Grey Tussockgrass				X		
	Potamogeton ochreatus	Blunt Pondweed					X	
*	*Prunus spp.*	Prunus				X		
	Pterostylis concinna	Trim Greenhood						X
	Pterostylis nutans	Nodding Greenhood						X
	Pterostylis pedunculata	Maroonhood						X

ORIGIN	SCIENTIFIC NAME	COMMON NAME	CONSERVATION STATUS	PROTECTED (FFG ACT)	CALP STATUS	ARCADIS	WSP	KARL JUST (ORCHID SURVEY)
	Pterostylis squamata	Common Ruddyhood						X
	Pultenaea gunnii	Golden Bush-pea				X		
*	*Ranunculus sardous*	Pale Hairy Buttercup					X	
*	*Romulea rosea*	Onion Grass				X		
*	*Rosa rubiginosa*	Sweet Briar			C		X	
*	*Rubus fruticosus spp. agg.*	Blackberry			C	X	X	
*	*Rumex conglomeratus*	Clustered Dock					X	
*	*Rumex spp. (naturalised)*	Dock (naturalised)				X		
	Rytidosperma caespitosum	Common Wallaby grass				X		
	Rytidosperma erianthum	Hill Wallaby-grass				X	X	
	Rytidosperma geniculatum	Kneed Wallaby-grass					X	
	Rytidosperma pallidum	Silvertop Wallaby grass				X		
	Rytidosperma racemosum var. racemosum	Slender Wallabygrass				X		
	Rytidosperma setaceum	Bristly Wallabygrass				X	X	
	Schoenoplectus tabernaemontani	River Club-sedge					X	
	Senecio phelleus	Stony Fireweed					X	
	Senecio quadridentatus	Cotton Fireweed				X		
	Senecio runcinifolius	Tall Fireweed					X	

ORIGIN	SCIENTIFIC NAME	COMMON NAME	CONSERVATION STATUS	PROTECTED (FFG ACT)	CALP STATUS	ARCADIS	WSP	KARL JUST (ORCHID SURVEY)
*	*Solanum nigrum s.l.*	Black Nightshade				X		
*	*Sonchus asper s.l.*	Rough Sow-thistle				X	X	
*	*Sonchus oleraceus*	Common Sowthistle				X	X	
*	*Sporobolus africanus*	Rat-tail Grass				X	X	
	Stackhousia monogyna s.l.	Creamy Stackhousia				X		
*	*Stellaria media*	Chickweed				X		
	Thelymitra spp.	Sun Orchid				X		
	Themeda triandra	Kangaroo Grass				X	X	
*	*Tragopogon porrifolius subsp. porrifolius*	Salsify					X	
	Tricoryne elatior	Yellow Rush-lily					X	
*	*Trifolium repens var. repens*	White Clover				X		
*	*Trifolium spp.*	Clover				X		
	Typha domingensis	Narrow-leaf Cumbungi					X	
	Typha orientalis	Broad-leaf Cumbungi					X	
	Typha spp.	Bulrush				X		
*	*Urtica urens*	Small Nettle				X		
	Veronica gracilis	Slender Speedwell					X	
*	*Vicia spp.*	Vetch				X		

ORIGIN	SCIENTIFIC NAME	COMMON NAME	CONSERVATION STATUS	PROTECTED (FFG ACT)	CALP STATUS	ARCADIS	WSP	KARL JUST (ORCHID SURVEY)
*	*Vulpia spp.*	Fescue				X		
	Wahlenbergia spp.	Bluebell				X		
*	*Watsonia spp.*	Watsonia			C	X		
	Wurmbea dioica	Common Early Nancy				X		

Key to the table above

Origin: * = introduced (exotic or non-local native species), # = native but some strands may be alien

Conservation Status: EN= listed as endangered under the EPBC Act; L= listed under the FFG Act; en = endangered, r = rare under the Victorian Advisory List

CaLP Status: C = regionally controlled weeds R = restricted weeds

APPENDIX E

FAUNA SPECIES LISTS AND SURVEY RESULTS

E1. FAUNA SPECIES LIST

This table provides a full list of fauna species recorded within or nearby the Project Area during surveys conducted for the Project. A key to the table is provided beneath.

Table E.1 Fauna species recorded within or near the Project Area

ORIGIN	COMMON NAME	SCIENTIFIC NAME	CONSERVATION STATUS	WSP (ALL SURVEYS)	SUBCONTRACTOR
Birds					
	Red Wattlebird	*Anthochaera carunculata*		X	Practical Ecology (O)
	Australian King-Parrot	*Alisterus scapularis*		X	
	Australian Magpie	*Cracticus tibicen*		X	Practical Ecology (O)
	Australian Raven	*Corvus coronoides*		X	
	Australian Wood Duck	*Chenonetta jubata*		X	
	Black Swan	*Cygnus atratus*		X	
	Brown Thornbill	*Acanthiza pusilla*		X	Practical Ecology
	Cattle Egret	*Ardea ibis*		X	
	Chestnut Teal	*Anas castanea*		X	
	Collared Sparrowhawk	*Accipiter cirrhocephalus*		X	
*	Common Blackbird	*Turdus merula*		X	Practical Ecology (O)
	Common Bronzewing	*Phaps chalcoptera*			Practical Ecology (O)
*	Common Myna	*Acridotheres tristis*		X	Practical Ecology (O)
*	Common Starling	*Sturnus vulgaris*		X	Practical Ecology (O)
	Crested Pigeon	*Ocyphaps lophotes*		X	
	Crimson Rosella	*Platycercus elegans*		X	
	Dusky Moorhen	*Gallinula tenebrosa*		X	
	Eastern Rosella	*Platycercus eximius*		X	Practical Ecology (O)
	Eastern Spinebill	*Acanthorhynchus tenuirostris*		X	
	Fan-tailed Cuckoo	*Cacomantis flabelliformis*		X	
	Flame Robin	*Petroica phoenicea*		X	
	Galah	*Eolophus roseicapillus*		X	
	Gang-gang Cockatoo	*Callocephalon fimbriatum*		X	

ORIGIN	COMMON NAME	SCIENTIFIC NAME	CONSERVATION STATUS	WSP (ALL SURVEYS)	SUBCONTRACTOR
	Grey Butcherbird	*Cracticus torquatus*		X	
	Grey Fantail	*Rhipidura albiscapa*			Practical Ecology (O)
	Grey Shrike-thrush	*Colluricincla harmonica*		X	Practical Ecology (O)
	Grey Teal	*Anas gracilis*		X	
	Horsfield's Bronze-Cuckoo	*Chrysococcyx basalis*		X	
	Laughing Kookaburra	*Dacelo novaeguineae*		X	Practical Ecology (H)
	Little Corella	*Cacatua sanguinea*		X	
	Little Pied Cormorant	*Microcarbo melanoleucos*		X	
	Little Raven	*Corvus mellori*		X	Practical Ecology (O)
	Long-billed Corella	*Cacatua tenuirostris*		X	
	Magpie-lark	*Grallina cyanoleuca*		X	Practical Ecology (O)
	Masked Lapwing	*Vanellus miles*		X	
	Musk Lorikeet	*Glossopsitta concinna*		X	
	New Holland Honeyeater	*Phylidonyris novaehollandiae*		X	Practical Ecology (O)
	Noisy Miner	*Manorina melanocephala*		X	Practical Ecology (O)
	Owlet-nightjar	*Aegotheles cristatus*			Ninox Pursuits (O)
	Pacific Black Duck	*Anas superciliosa*		X	
	Pied Currawong	*Strepera graculina*		X	
	Purple Swamphen	*Porphyrio porphyrio*		X	
	Rainbow Lorikeet	*Trichoglossus haematodus*		X	Practical Ecology (O)
	Red-browed Finch	*Neochmia temporalis*		X	
	Red-rumped Parrot	*Psephotus haematonotus*		X	

ORIGIN	COMMON NAME	SCIENTIFIC NAME	CONSERVATION STATUS	WSP (ALL SURVEYS)	SUBCONTRACTOR
*	Rock Dove	*Columba livia*		X	
	Rufous Whistler	*Pachycephala rufiventris*			Practical Ecology (O)
	Silvereye	*Zosterops lateralis*			Practical Ecology (H)
	Southern Boobook Owl	*Ninox boobook*		X	Ninox Pursuits (H) EcoAerial (O)
*	Spotted Dove	*Streptopelia chinensis*		X	
	Spotted Pardalote	*Pardalotus punctatus punctatus*		X	Practical Ecology (H)
	Straw-necked Ibis	*Threskiornis spinicollis*		X	
	Striated Pardalote	*Pardalotus striatus*			Practical Ecology (H)
	Sulphur-crested Cockatoo	*Cacatua galerita*		X	Practical Ecology (O)
	Superb Fairy-wren	*Malurus cyaneus*		X	
	Wedge-tailed Eagle	*Aquila audax*		X	
	Weebill	*Smicrornis brevirostris*		X	
	Welcome Swallow	*Hirundo neoxena*		X	
	White-browed Scrubwren	*Sericornis frontalis*		X	
	White-faced Heron	*Egretta novaehollandiae*		X	
	White-plumed Honeyeater	*Lichenostomus penicillatus*		X	
	Willie Wagtail	*Rhipidura leucophrys*		X	Practical Ecology (O)
	Yellow Thornbill	*Acanthiza nana*		X	
	Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*		X	

ORIGIN	COMMON NAME	SCIENTIFIC NAME	CONSERVATION STATUS	WSP (ALL SURVEYS)	SUBCONTRACTOR
Mammals					
	Common Brushtail Possum	*Trichosurus vulpecula*			EcoAerial (O)
	Common Ringtail Possum	*Pseudocheirus peregrinus*			Practical Ecology (R) Ninox Pursuits (O) EcoAerial (O)
	Eastern grey Kangaroo	*Macropus giganteus*		X	Practical Ecology (O)
*	European Rabbit	*Oryctolagus cuniculus*		X	
	Grey-headed Flying-fox	*Pteropus poliocephalus*	VU L vu		Ninox Pursuits (O)
*	Red Fox	*Vulpes Vulpes*			Practical Ecology (S)
	Short-beaked Echidna	*Tachyglossus aculeatus*			Practical Ecology (D)
	Sugar Glider	*Petaurus breviceps*			EcoAerial (O)
Reptiles, Amphibians & Fish					
	Common Froglet	*Crinia signifera*		X	
*	Eastern Gambusia	*Gambusia holbrooki*		X	
	Garden Skink	*Lampropholis guichenoti*			Practical Ecology (O)
	Peron's Tree Frog	*Litoria peronii*		X	
	Pobblebonk Frog	*Limnodynastes dumerilii*		X	
	Spotted Marsh Frog	*Limnodynastes tasmaniensis*		X	
	Striped Marsh Frog	*Limnodynastes peroni*		X	
Invertebrates					
	Australian Admiral Butterfly	*Vanessa itea*			Practical Ecology (O)
	Australian Painted Lady Butterfly	*Vanessa kershawi*			Practical Ecology (O)
*	Cabbage White Butterfly	*Pieris rapae*			Practical Ecology (O)

ORIGIN	COMMON NAME	SCIENTIFIC NAME	CONSERVATION STATUS	WSP (ALL SURVEYS)	SUBCONTRACTOR
	Common Yabby	*Cherax destructor*		X (Claws & burrows observed)	
	Emerald Dragonfly	*Hemicordulia tau Tau*			Practical Ecology (O)
*	Feral Honeybee	*Apis mellifera*			Practical Ecology (O)
	Grapevine Moth	*Phalaenoides glycinae*			Practical Ecology (O)
	Lerp	*Cardiaspina sp.*		X	Practical Ecology (O)
	Sugar ant	*Camponotus sp.*			Practical Ecology (O)

Origin: * = Introduced (exotic or non-local native species)

Conservation status: VU = listed as vulnerable under the EPBC Act; L= listed under the FFG Act; vu = listed as vulnerable under the Victorian Advisory List

Species recorded by subcontractors during surveys: O = Observed; H = Heard, R= Roadkill, S= Scat, D= Diggings

E2. GROWLING GRASS FROG SURVEY RESULTS

E2.1 SURVEY DATA

DATE	SURVEY POINT	TEMP	WIND (km/h)	TIME	HEARD	SIGHTED
Survey 1						
15/01/2019	1	25.1	<5	20:58	N/A	Wood ducks (6) Magpie (1)
15/01/2019	2	25.1	0	21:15	Pobblebonk (0-5)	Swamp moorhen (3)
15/01/2019	3	23.1	<5	21:53	Peron's tree frog (0-5)	Chestnut teal duck (3)
15/01/2019	4	22.4	0	22:52	N/A	Plover
15/01/2019	5	22.2	0	22:58	Pobblebonk (0-5) Peron's tree frog (10-15) Striped marsh frog (5-10)	Swamp moorhen (2) Striped marsh frog (1)
15/01/2019	6	21.8	0	23:23	N/A	N/A
16/01/2019	7	21.5	0	12:00	Peron's tree frog (5-10) Pobblebonk (0-5) Most in northern ornamental pond	N/A
16/01/2019	8	21.4	0	12:12	N/A	N/A
Survey 2						
31/01/2019	6	15.6	11	21:30	N/A	N/A
31/01/2019	2	15.3	13	21:50		
31/01/2019	1	14.9	11	22:10		
31/01/2019	3	14.9	13	22:21		
31/01/2019	4	14.8	13	22:47		Kangaroos
31/01/2019	5	14.8	13	23:10	Striped Marsh Frog (5-10) Cormorant (probably Little Pied)	
31/01/2019	7	14.5	9	23:37		
31/01/2019	9	14.4	9	23:50	Striped Marsh Frog (5-10)	
31/01/2019	8	13.5	5	0:10		

E2.2 SITE PHOTOGRAPHS

SURVEY POINT (FIGURE 3.2)	PHOTOGRAPH
1	
2	

SURVEY POINT (FIGURE 3.2)	PHOTOGRAPH
3	

SURVEY POINT (FIGURE 3.2)	PHOTOGRAPH
4	 
5	No photograph. Dam within golf course.

SURVEY POINT (FIGURE 3.2)	PHOTOGRAPH
6	 

SURVEY POINT (FIGURE 3.2)	PHOTOGRAPH
7	 Southern side of road (above), northern side of road (below) 

SURVEY POINT (FIGURE 3.2)	PHOTOGRAPH
8	Plenty River, Bridge Inn Road. No photograph
9	Site surveyed from roadside only. 

E3. SWIFT PARROT 2019 SURVEY RESULTS SUMMARY

A summary of the 2019 survey results is provided below. Full results for both 2018 and 2019 can be provided as Excel spreadsheets on request.

SITE ID	HABITAT DESCRIPTION	PRESENCE OF NECTIVOROUS BIRDS
1	Red Box, not in flower	Lorikeet activity in the local area due to flowering yellow gum in the vicinity but no such resources associated with the Project Area. At this location only common birds recorded, including a Noisy Miner and Little Raven
2	Not in blossom; very little lerp observed	Flyover Musk lorikeet
3	Red box not flowering	Rainbow Lorikeets and Musk Lorikeets
4	Sugar Gum not in flower	
6	Not good habitat for Swift Parrot. Yellow Gum flowering on memorial drive/ McLennans Road	Musk Lorikeet and King Parrot
7	No Eucalypts in blossom – suggests that the lorikeets are here for the hollows (for nesting). Swift Parrots unlikely to visit (no significant amounts of lerps observed)	Musk and Rainbow Lorikeet present
8	Yellow Gum and Mugga Ironbark flowering Sugar Gums not flowering but buds developing No trees in bloom near the river	Abundance of rainbow lorikeets and musk lorikeets. Swift Parrot was sighted at the Sanctuary earlier on the 5/8/19. They seem to have just arrived in the area. Large numbers (150 observed) of musk lorikeets are in the area and were going to roost in the university car park
9	Yellow Gum flowering	Rainbow Lorikeet and Yellow-faced honeyeater recorded but overall, not many lorikeets present
12	Flowering eucalypts not recorded	Abundance of honeyeaters
13	Yellow Gum flowering	Many Musk Lorikeets
13	Yellow Gums flowering	Plenty of Musk Lorikeets
14	Poor habitat for Swift Parrot (no flowering Eucs)	
15	Unknown Eucalyptus tree flowering. Some evidence of lerps	One record of Swift Parrot on the roadside earlier in the season in Ebird
16	River Red Gum, not in flower but infested with lerps – see pictures	
17	Red Box not in flower and no lerps	

SITE ID	HABITAT DESCRIPTION	PRESENCE OF NECTIVOROUS BIRDS
18	No flowering Eucs along the alignment. Given the birds that were present, it is likely that there are ornamental planted trees in the housing estate	Number of nectar eating birds present (Spinebill/Wattlebird)
19	Spotted Gum and Lemon Scented Gum were not in blossom in carpark but some Eucalyptus trees on the other side of the roundabout were in blossom. Yellow Gum and Mugga Ironbark also in blossom in the carpark	Musk lorikeets and Rainbow Lorikeets present

E4. PHASCOGALE SURVEY RESULTS

Results of Brush-tailed Phascogale targeted surveys by Eco Aerial. No fauna were recorded using hair tubes.

CAMERA	DATE	SPECIES
3	10/11/2017	Common Ringtail Possum
3	15/11/2017	Microbat
3	15/11/2017	Southern Boobook Owl
5	21/11/2017	Sugar Glider
5	26/11/2017	Sugar Glider
5	28/11/2017	Common Brushtail Possum
5	29/11/2017	Sugar Glider
5	1/12/2017	Sugar Glider
5	4/12/2017	Sugar Glider
5	5/12/2017	Sugar Glider
5	6/12/2017	Sugar Glider
6	21/11/2017	Common Ringtail Possum
7	21/11/2017	Sugar Glider
7	22/11/2017	Sugar Glider
7	23/11/2017	Sugar Glider
7	24/11/2017	Sugar Glider

APPENDIX F

LIKELIHOOD OF OCCURRENCE ASSESSMENT

F1. LIKELIHOOD OF OCCURRENCE ASSESSMENT – FLORA

A search of the DELWP's VBA and the EPBC Act Protected Matters Search Tool was undertaken within a 5 km radius of the Project Area to identify threatened species with the potential to occur. The results of these searches and an assessment of their likelihood of occurring within the Project Area is provided below in Table F.1 for flora. The likelihood is based on past records, species' habitat preferences, the availability of habitat observed during the site survey, and the results of surveys undertaken for this Project.

The brief habitat descriptions for flora are derived from the species descriptions on VicFlora (Royal Botanic Gardens of Victoria 2017), and species-specific publicly-available Commonwealth and State government resources, including conservation advice.

Table F.1 Likelihood of occurrence assessment for significant flora

SCIENTIFIC NAME	COMMON NAME	SOURCE	EPBC ACT	FFG ACT	VICTORIAN ADVISORY LIST	COUNT OF RECORDS	LAST RECORD	HABITAT	LIKELIHOOD OF OCCURRENCE
Acacia howittii	Sticky Wattle	VBA			r #	5	2/11/2017	Confined to eastern Victoria from the upper Macalister River area near Mt Howitt south to near Yarram and east to near Tabberabbera. Collections from near Daylesford and Melbourne are presumably of cultivated origin. Grows in moist forest.	Low – Project Area is outside of the species natural range. Records in the area are likely of planted specimens.

SCIENTIFIC NAME	COMMON NAME	SOURCE	EPBC ACT	FFG ACT	VICTORIAN ADVISORY LIST	COUNT OF RECORDS	LAST RECORD	HABITAT	LIKELIHOOD OF OCCURRENCE
Adiantum capillus-veneris	Venus-hair Fern	VBA		L	e #	1	14/03/1991	In Victoria known only from three isolated localities: near Cape Schanck, just outside Bendigo and in the Plenty River Gorge near Greensborough. Often growing on calcareous soils. Possibly a garden escape in Victoria.	Low – Project Area lacks suitable habitat to support this species. Furthermore, there has only ever been one recorded sighting more than 20 years ago at Plenty River Gorge which is located approx. 2 km to the west of the Project Area.
Amphibromus fluitans	River Swamp Wallaby-grass	VBA, PMST	VU	X		2	22/02/1996	Largely confined to permanent swamps, principally along the Murray River between Wodonga and Echuca, uncommon to rare in the south (e.g. Casterton, Moe, Yarram), probably due to historic drainage of wetlands.	Low – The Project Area lacks suitable habitat for the species and there is a lack of recent and abundant records within 5 km.
Austrostipa rudis subsp. australis	Veined Spear-grass	VBA			r	2	22/03/2008	Uncommon, mostly in cool areas of southern Victoria. Usually at moderate altitude, in open-forest on sandy or sandstone-derived soils.	Low – Low number of records, not recorded during targeted flora surveys, and poor quality potential habitat for this species.

SCIENTIFIC NAME	COMMON NAME	SOURCE	EPBC ACT	FFG ACT	VICTORIAN ADVISORY LIST	COUNT OF RECORDS	LAST RECORD	HABITAT	LIKELIHOOD OF OCCURRENCE
Austrostipa verticillata	Bamboo Spear-grass	VBA			k	1	29/04/2010	In Victoria the species is known from areas such as Brunswick, Greensborough and Monbulk where it may occur spontaneously near gardens or disturbed sites. The species is also known to occur north of Benalla and near Wodonga, however these occurrences are thought to be introduced as the species is occasionally grown for ornamental purposes and is known to spread beyond cultivation.	Low – Low number of records in the area and the species was not recorded during targeted flora surveys.
Billardiera scandens s.s.	Velvet Apple-berry	VBA			r	30	12/10/2016	Uncommon in Victoria, occurring chiefly in dry open-forests and woodlands in the north-east (Beechworth, Whitfield etc.), with isolated occurrences near Mt Macedon, Eltham-Hurstbridge area, Eildon and Orbost.	Low – Although potential habitat for this species was identified in the more intact patches of woodland/forest within the Project Area, it was not detected during targeted surveys in December 2018/January 2019, or during previous vegetation assessments.

SCIENTIFIC NAME	COMMON NAME	SOURCE	EPBC ACT	FFG ACT	VICTORIAN ADVISORY LIST	COUNT OF RECORDS	LAST RECORD	HABITAT	LIKELIHOOD OF OCCURRENCE
Caladenia amoena	Charming Spider-orchid	VBA, PMST	EN	L	e	3	1/09/1997	Endemic to south-central Victoria where it occurs to the north east of Melbourne in the Greensborough-Plenty-Hurstbridge area. Known to occur at a few sites in open, grassy dry forests on ridges and sheltered slopes.	Low – The Project Area is generally highly modified and is mostly subject to grazing or slashing, meaning the species is unlikely to occur. Targeted surveys were undertaken in August 2018 in potential habitat. The species was not detected.
Caladenia australis	Southern Spider-orchid	VBA			k	1	15/08/1931	This species is widespread, occurring on well-drained sandy soils in coastal and subcoastal heathy woodland environments.	Low – The Project Area is generally highly modified and is subject to various levels of grazing meaning the species is unlikely to occur. Targeted surveys were undertaken in August 2018 in potential habitat. The species was not detected.

SCIENTIFIC NAME	COMMON NAME	SOURCE	EPBC ACT	FFG ACT	VICTORIAN ADVISORY LIST	COUNT OF RECORDS	LAST RECORD	HABITAT	LIKELIHOOD OF OCCURRENCE
Caladenia oenochila	Wine-lipped Spider-orchid	VBA			v	4	24/10/2005	Endemic to Victoria where apparently confined to the southern foothills of the Great Dividing Range between the Latrobe Valley and Kilmore, with an isolated record from Anglesea. Relatively common in moist, often grassy forest or woodland, often in shaded habitats.	Low – The Project Area is generally highly modified and is subject to various levels of grazing meaning the species is unlikely to occur. Targeted surveys were undertaken in August 2018 in potential habitat. The species was not detected.
Caladenia patersonii s.s.	Cream Spider-orchid	VBA			e	1	24/10/2005	Occurs in areas east of Wilson's Promontory in coastal heathland and heathy woodland environments where it grows in well-drained sandy soils.	Low – The Project Area is generally highly modified and is subject to various levels of grazing meaning the species is unlikely to occur. Targeted surveys were undertaken in August 2018 in potential habitat. The species was not detected.

SCIENTIFIC NAME	COMMON NAME	SOURCE	EPBC ACT	FFG ACT	VICTORIAN ADVISORY LIST	COUNT OF RECORDS	LAST RECORD	HABITAT	LIKELIHOOD OF OCCURRENCE
Caladenia rosella	Rosella Spider-orchid	PMST	EN	L	e			Found in a few disjunct populations north east of Melbourne in heath woodlands and woodlands on well-drained sandy soils that are moist in winter and dry in summer.	Low – The Project Area is generally highly modified and is subject to various levels of grazing meaning the species is unlikely to occur. Targeted surveys were undertaken in August 2018 in potential habitat. The species was not detected.
Cardamine tenuifolia	Slender Bitter-cress	VBA			p = All infraspecific taxa included in Advisory List	2	22/01/1987	Scattered across southern Victoria in swamps or streams.	Low – Project Area lacks suitable habitat and there have been no recent recorded sightings within 5 km of the Project Area for over 30 years.
Cladium procerum	Leafy Twig-sedge	VBA			r	3	12/02/1996	Occasional in swampy areas and margins of streams and lakes near the coast, tolerating low to moderate levels of salinity.	Low – This species may occur around dams but is unlikely to occur within the Project Area itself due to a lack of suitable habitat.
Convolvulus angustissimus subsp. omnigracilis	Slender Bindweed	VBA			k	2	24/11/2016	Apparently endemic to Victoria where found mostly around and west of Melbourne in grassland and grassy woodland on heavy clay soils.	**Moderate** – The species is poorly known and not recorded during surveys but may occur within the Project Area.

SCIENTIFIC NAME	COMMON NAME	SOURCE	EPBC ACT	FFG ACT	VICTORIAN ADVISORY LIST	COUNT OF RECORDS	LAST RECORD	HABITAT	LIKELIHOOD OF OCCURRENCE
Coronidium gunnianum	Pale Swamp Everlasting	VBA			v	2	24/11/2016	Widespread throughout the state except for the north-west and the alpine and adjacent mountainous areas, and usually at low elevations (under c. 100m) where mostly in grasslands and riverine Eucalyptus camaldulensis woodland on soils that are prone to inundation.	Low – Based on its habitat requirements, this species is unlikely to occur within the Project Area as there are no intact wetlands to support it.
Corybas fimbriatus	Fringed Helmet-orchid	VBA			r	1	5/02/1996	Usually forming colonies on moist, shaded sandy soil near the coast and generally east of Western Port, but with isolated occurrences near Melbourne at Gembrook, Warrandyte and Greensborough.	Low – The Project Area is generally highly modified and is subject to various levels of grazing meaning the species is unlikely to occur. Targeted surveys were undertaken in August 2018 in potential habitat. The species was not detected.
Corymbia maculata	Spotted Gum	VBA			v #	4	1/03/2016	Only known in Victoria from the Tara Range, south of Buchan. Widely planted as an ornamental.	**Recorded** – planted **Low/Not applicable** – Project Area is outside of the species' natural range. Records are likely of planted specimens. 64 Spotted Gums were recorded in the arborist ass

SCIENTIFIC NAME	COMMON NAME	SOURCE	EPBC ACT	FFG ACT	VICTORIAN ADVISORY LIST	COUNT OF RECORDS	LAST RECORD	HABITAT	LIKELIHOOD OF OCCURRENCE
Cymbonotus lawsonianus	Bear's-ear	VBA			r	1	7/12/1995	Scattered in woodland communities across northern Victoria from the 'Upper Murray' to the Hattah-Kulkyne National Park and south to the Little Desert, with a few eastern collections from dryish areas south of the Great Dividing Range	Low – Low number of records in the area and the species was not recorded during targeted flora surveys.
Desmodium varians	Slender Tick-trefoil	VBA			k	15	20/08/2015	An uncommon species mostly from inland parts of eastern Victoria where found mainly in woodland and open-forest.	**Moderate** – potential habitat present in Project Area and a high number of records, however not detected in potential habitat areas during targeted flora surveys.
Dianella amoena	Matted Flax-lily	VBA, PMST	EN	L	e	22	24/11/2016	Occurs mainly in lowland grasslands, grassy woodlands, valley grassy forest and creeklines of herb-rich woodland.	**Recorded** – Although not detected by Arcadis, two plants were recorded in the Project Area by Jacobs during surveys conducted for a Yarra Valley Water sewer pipeline upgrade (Jacobs 2017). These plants were visited and confirmed by WSP during flora surveys.

SCIENTIFIC NAME	COMMON NAME	SOURCE	EPBC ACT	FFG ACT	VICTORIAN ADVISORY LIST	COUNT OF RECORDS	LAST RECORD	HABITAT	LIKELIHOOD OF OCCURRENCE
Dianella longifolia var. grandis	Flax-lily	VBA			v	1	28/04/2011	Species occurs along the east coast of Australia through to South Australia. In Victoria, it can be found in lowland plains grassland and grassy woodland environments. At higher altitude, the species can also be found growing in rocky outcrops (e.g. between Swifts Creek and Omeo).	Low – Low number of nearby records, species not detected during site assessments. There is minimal potential habitat within the Project Area.
Eleocharis pallens	Pale Spike-sedge	VBA			k	1	1/02/1997	Uncommon in the state but usually occurs in the north of Victoria in seasonally wet environments such as floodways and usually on clay soils.	Low – No habitat within Project Area and not recorded during surveys.
Eucalyptus globulus subsp. globulus	Southern Blue-gum	VBA		#	r	1	10/02/2010	Populations of typical subsp. Globulus occur in Victoria only in the area south of the Strzelecki Range, e.g. Port Franklin, Wilsons Promontory.	Low – Project Area is outside of the species natural range. Records in the area are likely of planted specimens.
Eucalyptus leucoxylon subsp. connata	Melbourne Yellow-gum	VBA		X	v	9	5/03/2014	Occurs on volcanic plains, west of Melbourne, mainly between Bacchus Marsh and Geelong.	**Recorded, planted only** **Low** – There are 96 Yellow Gums in the arborist dataset, however these have all been planted. There are no remnant trees present on site.

SCIENTIFIC NAME	COMMON NAME	SOURCE	EPBC ACT	FFG ACT	VICTORIAN ADVISORY LIST	COUNT OF RECORDS	LAST RECORD	HABITAT	LIKELIHOOD OF OCCURRENCE
Eucalyptus ×studleyensis	Studley Park Gum				e			A hybrid between River Red Gum *E. camaldulensis* and Swamp Gum *E. ovata*, occurring only in the north-east of Melbourne. Morphological characteristics are variable, and intermediate between the parent species.	**Recorded** One tree recorded by the arborist (Ryder Arboriculture and Environment 2020) and verified by WSP. No additional trees recorded.
Eucalyptus yarraensis	Yarra Gum	VBA		X	r	7	4/11/2005	Extending west from Glengarry (near Traralgon) to Melbourne and north-west to Daylesford and Ararat.	Low – This species was not recorded by the arborist or recorded during the ecological surveys. It is considered unlikely to occur within the Project Area.
Geranium aff. sp. 3	Rosella Crane's-bill	VBA			k	1	22/03/2008	Usually found growing in open grassy patches within Grassy Dry Forest and Valley Grassy Forest environments.	Low – the species was not recorded during threatened flora surveys.
Geranium solanderi var. solanderi s.s.	Austral Crane's-bill	VBA			v	1	31/08/2009	An uncommon species that occurs in damp to dryish, usually sheltered sites in grassy woodlands, often along drainage lines or in seepage areas.	Low – the species was not recorded during threatened flora surveys.

SCIENTIFIC NAME	COMMON NAME	SOURCE	EPBC ACT	FFG ACT	VICTORIAN ADVISORY LIST	COUNT OF RECORDS	LAST RECORD	HABITAT	LIKELIHOOD OF OCCURRENCE
Geranium sp. 1	Large-flower Crane's-bill	VBA		L	e	1	13/10/2009	Known only from basaltic grassland (which are now generally weedy) in the Riddells Creek, Malmsbury and Glenroy-Broadmeadows area. Was presumed to be extinct until 2000. Formally known from the far north-east near Wodonga.	Low – no potential habitat (basaltic grassland) within the Project Area.
Geranium sp. 14	Valley Crane's-bill	VBA			k	2	20/08/2015	Little known species found in grassy to woodland habitats	Low – the species was not recorded during targeted threatened flora surveys.
Geranium sp. 3	Pale-flower Crane's-bill	VBA			r	7	20/08/2016	In Victoria, currently known only from Stawell, Yan Yean, Eltham, and Bonegilla areas. Incomplete specimens from near Goroke and Hamilton areas may be of this species. Found in open, grassy areas of dry woodland to forest.	**Recorded** – Species was recorded during the orchid survey by Karl Just at 790A Yan Yean Rd.

SCIENTIFIC NAME	COMMON NAME	SOURCE	EPBC ACT	FFG ACT	VICTORIAN ADVISORY LIST	COUNT OF RECORDS	LAST RECORD	HABITAT	LIKELIHOOD OF OCCURRENCE
Glycine latrobeana	Clover Glycine	VBA, PMST	VU	L	v	2	7/12/1995	Widespread but of sporadic occurrence and rarely encountered. Occurs in lowland grasslands, grassy woodlands and sometimes in grassy heath environments in the north-east, Gippsland, central Victoria and western Victoria regions of the state.	Low – Whilst some fragmented patches of suitable habitat may occur within the Project Area, the species occurs sporadically and the lack of detection during surveys for the project, combined with the lack of recent and abundant records within a 5 km radius means this species is unlikely occur within the Project Area.
Grevillea rosmarinifolia	Rosemary Grevillea	VBA			p #	18	12/07/2007	In western Victoria on sandy soils in mallee or shrub associations, or occasionally on basaltic soils. The species is naturalized in several areas from cultivated plants.	**Recorded** – planted specimens only Low – Project Area lacks the natural habitat for this species. It is likely that any plants in the area are planted cultivars.

SCIENTIFIC NAME	COMMON NAME	SOURCE	EPBC ACT	FFG ACT	VICTORIAN ADVISORY LIST	COUNT OF RECORDS	LAST RECORD	HABITAT	LIKELIHOOD OF OCCURRENCE
Grevillea rosmarinifolia subsp. rosmarinifolia	Rosemary Grevillea	VBA			r #	5	6/05/2008	Grows in open eucalypt forest or woodland or in riparian shrub associations, on rocky slopes or near creeks.	**Potentially recorded** – planted specimens only Low – Project Area lacks the natural habitat for this species. It is likely that any plants in the area are cultivars.
Kunzea leptospermoides	Yarra Burgan	VBA			k	4	14/10/2017	Apparently restricted to the Yarra Valley and south-eastern suburbs of Melbourne, generally in riparian areas or damp forest.	Low – Project Area is outside of the species' natural range. Records in the area are likely of planted specimens.
Lachnagrostis adamsonii	Adamson's Blown-grass	PMST	EN	L	v			Occurs in and around saline depressions on the Volcanic Plain where recorded from Portarlington west almost to the South Australian border.	Low – Project Area is outside of the species usual range and lacks the preferred habitat for this species, being brackish wetlands. Furthermore, there have been no previous recorded sightings of this species within 5 km of the Project Area.

SCIENTIFIC NAME	COMMON NAME	SOURCE	EPBC ACT	FFG ACT	VICTORIAN ADVISORY LIST	COUNT OF RECORDS	LAST RECORD	HABITAT	LIKELIHOOD OF OCCURRENCE
Levenhookia sonderi	Slender Stylewort	VBA			r	1	7/12/1995	Apparently endemic in Victoria. In seasonally damp ground and drying swamps in lowland areas, mostly in the south-west (Little Desert, lower Glenelg River, Stawell areas), but extending eastward to Rushworth in the north and Beaconsfield in the south.	Low – Project Area lacks suitable habitat to support this species. Combined with the lack of recent and abundant records, it is considered unlikely to be present.
Limonium australe var. australe	Yellow Sea-lavender	VBA			r	1	2/12/1991	In Victoria apparently confined to mangrove and saltmarsh communities near Point Lonsdale, Western Port, Shallow Inlet and Corner Inlet.	Low – Project Area is outside of the species natural range. In addition, the species is highly unlikely to be present given that it is a saltmarsh variety.
Melaleuca armillaris subsp. armillaris	Giant Honey-myrtle	VBA			r #	10	11/07/2017	Mainly confined to near-coastal sandy heaths, scrubs slightly raised above saltmarsh, riparian scrubs, rocky coastlines and foothill outcrops eastwards from about Marlo. Occurrences to the west are naturalized from cultivated stock. Commonly grown for ornament, as a windbreak or street tree and sometimes giving rise to seedlings, particularly after fire.	**Recorded** as planted specimens by arborist (Ryder Arboriculture and Environment 2020). Low/Not applicable – Project Area is outside of the species' natural range. Records are likely of planted specimens.

SCIENTIFIC NAME	COMMON NAME	SOURCE	EPBC ACT	FFG ACT	VICTORIAN ADVISORY LIST	COUNT OF RECORDS	LAST RECORD	HABITAT	LIKELIHOOD OF OCCURRENCE
Microseris scapigera s.s.	Plains Yam-daisy	VBA			v	1	24/11/2016	Formerly widespread in moist depressions on the basalt plains of western Victoria, but now very rare due to loss of habitat.	Low – Project Area lacks suitable habitat to support this species. Combined with the lack of recent and abundant records, it is considered unlikely to be present.
Montia fontana subsp. fontana	Water Blinks	VBA			k	1	7/12/1995	Known in Victoria by only four collections from mossy bogs on the eastern half of the Baw Baw Plateau.	Low – Project Area is outside of the species natural range. Combined with the lack of recent and abundant records, it is considered unlikely to be present.
Poa labillardierei var. (Volcanic Plains)	Basalt Tussock-grass	VBA			k	1	15/06/2012	Commonly found throughout most of Victoria along watercourses and alluvial flats where conditions are moist. Also found in forests extending up on sheltered slopes. Rare in areas above 1500 m and in the Wimmera and Swan Hill regions.	Low – The Project Area lacks the required habitat features, such as clay soil, to support this species. Combined with the lack of abundant records, it is considered unlikely to be present.

SCIENTIFIC NAME	COMMON NAME	SOURCE	EPBC ACT	FFG ACT	VICTORIAN ADVISORY LIST	COUNT OF RECORDS	LAST RECORD	HABITAT	LIKELIHOOD OF OCCURRENCE
Pomaderris vacciniifolia	Round-leaf Pomaderris	PMST	CR	L	e			Largely confined to moist forest and scrubs in the upper catchment of the Yarra, Plenty and Yea Rivers in an area bounded by Healesville, Marysville and Whittlesea, but also in the Tyers-Walhalla areas.	Low – Project Area lacks suitable habitat to support this species and there have been no previous recorded sightings within 5 km. The species is considered unlikely to occur.
Prasophyllum frenchii	Maroon Leek-orchid	PMST	EN	L	e			Widespread across southern Victoria, but rare. Occurs in grassland, heathland and open forest on well-drained or water-retentive sand or clay loams.	Low – The Project Area is generally highly modified and is subject to various levels of grazing meaning the species is unlikely to occur. Targeted surveys were undertaken in August 2018 in potential habitat. The species was not detected.
Pterostylis chlorogramma	Green-striped Greenhood	VBA, PMST	VU	L	v	2	10/09/1995	Apparently localized in Victoria, but exact range uncertain due to confusion with closely allied species. Grows in moist areas of heathy and shrubby forest, on well-drained soils.	Low – The Project Area is generally highly modified and is subject to various levels of grazing meaning the species is unlikely to occur. Targeted surveys were undertaken in August 2018 in potential habitat. The species was not detected.

SCIENTIFIC NAME	COMMON NAME	SOURCE	EPBC ACT	FFG ACT	VICTORIAN ADVISORY LIST	COUNT OF RECORDS	LAST RECORD	HABITAT	LIKELIHOOD OF OCCURRENCE
Pterostylis clivosa	Red-tip Greenhood	VBA			r	1	15/05/2014	Occurs across southern Victoria where it grows on slopes and ridges in drier open forests and woodlands on well-drained soils.	Low – The Project Area is generally highly modified and is subject to various levels of grazing meaning the species is unlikely to occur. Targeted surveys were undertaken in August 2018 in potential habitat. The species was not detected.
Pterostylis smaragdyna	Emerald-lip Greenhood	VBA			r	10	12/10/2016	Apparently localized in Victoria (e.g. outer north-eastern suburbs of Melbourne, Brisbane Ranges, Ararat), but exact range uncertain due to confusion with allied species. Grows in drier forests and woodlands on well-drained shallow clay loam.	Low – The Project Area is generally highly modified and is subject to various levels of grazing meaning the species is unlikely to occur. Flora surveys in August 2018 by Karl Just in potential habitat did not detected the species. Nor was the species detected during any other visit to the Project Area.

SCIENTIFIC NAME	COMMON NAME	SOURCE	EPBC ACT	FFG ACT	VICTORIAN ADVISORY LIST	COUNT OF RECORDS	LAST RECORD	HABITAT	LIKELIHOOD OF OCCURRENCE
Sclerolaena muricata var. muricata	Black Roly-poly	VBA			k	2	16/01/1987	Occasional along the Murray River and associated lakes and floodplains from near Kerang downstream toward the South Australian border, with isolated records from Sunbury (but not recorded from there since 1920).	Low – Project Area is outside of the species' natural range and there is a lack of recent and abundant records within 5 km.
Senecio macrocarpus	Large-fruit Fireweed	PMST	VU	L	e			In Victoria largely confined to remnant *Themeda* grasslands on loamy clay soils derived from basalt from near Melbourne west to Skipton area. Also known from auriferous ground near Stawell.	Low – Project Area lacks suitable grassland habitat. Combined with the absence of any previous records within a 5 km radius, it is considered unlikely to be present.
Thelymitra matthewsii	Spiral Sun-orchid	PMST	VU	L	v			Widely distributed but rare, in coastal sandy flats or slightly elevated sites (to 400 m) in well-drained soils (sandy loams to gravelly limestone soils) in open forest. Plants colonise disturbed sites and slowly disappear as these sites stabilise.	Low – The Project Area is generally highly modified and is subject to various levels of grazing or modification meaning the species is unlikely to occur. Flora surveys in August 2018 by Karl Just in potential habitat did not detected the species. Nor was the species detected during any other visit to the Project Area.

SCIENTIFIC NAME	COMMON NAME	SOURCE	EPBC ACT	FFG ACT	VICTORIAN ADVISORY LIST	COUNT OF RECORDS	LAST RECORD	HABITAT	LIKELIHOOD OF OCCURRENCE
Tripogonella loliiformis	Rye Beetle-grass	VBA			r	5	24/11/2016	Species occurs across all mainland states. In Victoria, it is an uncommon grass of scattered distribution where it grows through drier areas on shallow soil over rock. Areas of occurrence include the basalt plains west of Melbourne, the Strathbogie Ranges, Killawarra Forest near Wangaratta, Beechworth, Suggan Buggan and Mt Arapiles.	Low – Project Area is poor quality potential habitat for this species. Species was not recorded during surveys.
Xerochrysum palustre	Swamp Everlasting	PMST	VU	L	v			Occurs in lowland swamps, usually on black cracking clay soils, scattered from near the South Australian border north-west of Portland to Bairnsdale district, but rare due to habitat depletion.	Low – The Project Area lacks potential habitat and there have been no previous records within a 5 km radius.

F2. LIKELIHOOD OF OCCURRENCE ASSESSMENT – FAUNA

A search of the DELWP's VBA and the EPBC Act Protected Matters Search Tool was undertaken for a 5 km radius of the Project Area to identify threatened species with the potential to occur. The results of these searches for fauna and an assessment of each species' likelihood of occurring within the Project Area is provided below in Table F.2. This is based on records, ecology, habitat assessment and the outcomes of targeted survey (where relevant).

The brief habitat descriptions for fauna have been sourced from several sources, including Birdlife Australia species profiles, Commonwealth DAWE species profiles (SPRAT) and other publicly-available Commonwealth and State government resources.

Table F.2 Fauna likelihood of occurrence assessment

SCIENTIFIC NAME	COMMON NAME	SOURCE	EPBC ACT	FFG ACT	VIC ADVISORY LIST	COUNT OF RECORDS	LAST RECORD	HABITAT DESCRIPTION	LIKELIHOOD OF OCCURRENCE
Accipiter novaehollandiae	Grey Goshawk	VBA		L	vu	3	27/02/1997	Found in most forest types, especially tall closed forests, including rainforests.	Low – Project Area lacks suitable habitat to support this species and there is a lack of recent and abundant records within 5 km.
Actitis hypoleucos	Common Sandpiper	PMST	M		vu			The species utilises a wide range of coastal wetlands and some inland wetlands, with varying levels of salinity, and is mostly found around muddy margins or rocky shores and rarely on mudflats.	Low – Project Area lacks suitable habitat for this species.

SCIENTIFIC NAME	COMMON NAME	SOURCE	EPBC ACT	FFG ACT	VIC ADVISORY LIST	COUNT OF RECORDS	LAST RECORD	HABITAT DESCRIPTION	LIKELIHOOD OF OCCURRENCE
Alcedo azurea	Azure Kingfisher	VBA			nt	4	13/11/2005	Habitat includes the banks of vegetated creeks, lakes, swamps, tidal estuaries and mangroves.	Low – Project Area lacks suitable riparian habitat for this species, although it may occur at nearby Plenty Gorge
Anas rhynchotis	Australasian Shoveler	VBA			vu	33	17/09/2017	Uses a wide variety of wetlands; prefers large permanent lakes or swamps that have abundant cover.	Low – May frequent dams in the vicinity but Project Area itself lacks suitable habitat.
Antechinus minimus maritimus	Swamp Antechinus	PMST	VU	L	nt			Habitat includes dense wet heathlands, tussock grasslands, sedgelands, damp gullies, swamps and some shrubby woodlands, often in landscape settings with little exposure to the sun.	Low – Project Area lacks suitable habitat to support this species and there are no previous records within 5 km.
Anthochaera phrygia	Regent Honeyeater	VBA, PMST	CR	L	cr	16	12/11/1998	Occurs mostly in box-ironbark forests and woodland and prefers wet, fertile sites such as along creek flats, broad river valleys and foothills. Riparian forests with *Casuarina cunninghamiana* and *Amyema cambagei* are important for feeding and breeding.	Low – Species relies on specific habitat types or resources that are not present in the Project Area.

SCIENTIFIC NAME	COMMON NAME	SOURCE	EPBC ACT	FFG ACT	VIC ADVISORY LIST	COUNT OF RECORDS	LAST RECORD	HABITAT DESCRIPTION	LIKELIHOOD OF OCCURRENCE
Apus pacificus	Fork-tailed Swift	PMST	M					It is almost exclusively aerial, flying from less than 1 m to at least 300 m above ground. It mostly occurs over inland plains but sometimes above foothills or in coastal areas over cliffs, beaches, islands and well out to sea. It also occurs over towns and cities. It mostly occurs over dry and/or open habitats, including riparian woodland and tea-tree swamps, low scrub, heathland or saltmarsh, grassland, spinifex sandplains, farmland and sand-dunes. It sometimes occurs above forests.	Low – Although a mostly aerial bird that occurs across a wide variety of habitat types, the habitat features supported by the Project Area are not consistent with those preferred by this species.
Ardea alba modesta	Eastern Great Egret	VBA		L	vu	14	20/08/2015	Prefer shallow water, particularly when flowing, but may be seen on any watered area, including damp grasslands.	Low – Project Area itself lacks suitable habitat although nearby larger/more open wetlands may periodically support the species.
Ardea intermedia	Intermediate Egret	VBA		L	en	2	15/08/2012	Shallow waters in terrestrial wetlands, prefers freshwater swamps, billabongs, floodplains and wet grasslands with dense aquatic vegetation.	Low – Project Area itself lacks suitable habitat to support this species.

SCIENTIFIC NAME	COMMON NAME	SOURCE	EPBC ACT	FFG ACT	VIC ADVISORY LIST	COUNT OF RECORDS	LAST RECORD	HABITAT DESCRIPTION	LIKELIHOOD OF OCCURRENCE
Aythya australis	Hardhead	VBA			vu	62	17/09/2017	On terrestrial wetlands and occasionally sheltered estuarine and inshore waters. Almost entirely aquatic, preferring large deep fresh waters with abundant aquatic vegetation; particularly deep swamps, lakes, creeks, billabongs and alluvial plains.	Low – Project Area lacks suitable habitat to support this species.
Biziura lobata	Musk Duck	VBA			vu	40	16/06/2011	Widespread in Southeast and Southwest parts of continent, on terrestrial wetlands, estuarine habitats and sheltered inshore waters. Almost entirely aquatic; preferring deep water of large permanent swamps, lakes and estuaries, where conditions stable and aquatic flora abundant.	Low – Project Area lacks suitable habitat to support this species.
Botaurus poiciloptilus	Australasian Bittern	PMST	EN	L	en			Occurs in shallow, vegetated freshwater or brackish swamps. Requires permanent wetlands with tall dense vegetation, particularly bulrushes and spike rushes.	Low – Project Area lacks suitable habitat to support this species and there are no previous records within 5 km.

SCIENTIFIC NAME	COMMON NAME	SOURCE	EPBC ACT	FFG ACT	VIC ADVISORY LIST	COUNT OF RECORDS	LAST RECORD	HABITAT DESCRIPTION	LIKELIHOOD OF OCCURRENCE
Calidris acuminata	Sharp-tailed Sandpiper	PMST	M					Prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation. This includes lagoons, swamps, lakes and pools near the coast, and dams, waterholes, soaks, bore drains and bore swamps, saltpans and hypersaline salt lakes inland.	Low – Project Area lacks suitable habitat for this species.
Calidris ferruginea	Curlew Sandpiper	PMST	M CR	L	en			Occurs in inter-tidal mudflats of estuaries, lagoons, mangrove channels and also around lakes, dams, floodwaters and flooded saltbush surrounding inland lakes.	Low – Project Area lacks suitable habitat to support this species.
Calidris melanotos	Pectoral Sandpiper	PMST	M		nt			Prefers shallow fresh to saline wetlands. The species is found at coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands. The species is usually found in coastal or near coastal habitat but occasionally found further inland. It prefers wetlands that have open fringing mudflats and low, emergent or fringing vegetation, such as grass or samphire. The species has also been recorded in swamp overgrown with lignum. They forage in shallow water or soft mud at the edge of wetlands.	Low – Project Area lacks suitable habitat to support this species.

SCIENTIFIC NAME	COMMON NAME	SOURCE	EPBC ACT	FFG ACT	VIC ADVISORY LIST	COUNT OF RECORDS	LAST RECORD	HABITAT DESCRIPTION	LIKELIHOOD OF OCCURRENCE
Chelodina longicollis	Eastern Snake-necked Turtle	VBA			dd	33	11/01/2016	Typically inhabiting swamps, lagoons and slow-moving rivers and creeks, but often seen wandering overland far from any apparent water.	**High** – high number of nearby records, could inhabit farms dams surrounding the Project Area or be found moving through the Project Area between dams.
Chlidonias hybridus	Whiskered Tern	VBA			nt	2	25/10/1988	Prefer shallow terrestrial freshwater wetlands, either permanent or ephemeral, including lakes swamps, billabongs, river pools, reservoirs, large dams, sewage ponds, flooded saltmarsh and farmland; often around floodwaters. Usually in wetlands with much submerged and emergent vegetation, such as grass, sedges, reeds and rushes, occasionally also in swamps of lignum, bluebush, canegrass or saltmarsh.	Low – Project Area lacks suitable habitat to support this species.
Chrysococcyx osculans	Black-eared Cuckoo	VBA			nt	3	11/09/1999	Mainly open vegetation associations, especially open woodlands and open shrublands. Often in open woodlands dominated by Eucalyptus, particularly stunted mallee communities; Open woodlands of River Red Gum or Coolibah along rivers or around other wetlands in otherwise open grasslands.	Low – Project Area lacks suitable habitat to support this species and there is a lack of recent and abundant records within 5 km.

SCIENTIFIC NAME	COMMON NAME	SOURCE	EPBC ACT	FFG ACT	VIC ADVISORY LIST	COUNT OF RECORDS	LAST RECORD	HABITAT DESCRIPTION	LIKELIHOOD OF OCCURRENCE
Chthonicola sagittatus	Speckled Warbler	VBA		L	vu	18	23/11/1991	Occurs in a wide range of eucalypt dominated vegetation with a grassy understorey and is often found on rocky ridges or in gullies.	Low – Based on the habitat present and the lack of recent records in the area, it is unlikely that the Project Area would support this species.
Cinclosoma punctatum	Spotted Quail-thrush	VBA			nt	5	12/06/1988	Subtropical, tropical and temperate dry forests. Range extends from South east Queensland along the south east coast and through most of Southern and Eastern Victoria.	Low – Habitat within the Project Area is too fragmented and disturbed for this species and there is a lack of recent and abundant records within 5 km.
Circus assimilis	Spotted Harrier	VBA			nt	1	1/01/1986	Found in open grasslands, woodland including mallee country, inland riparian woodland and shrubland particularly in arid and semi-arid areas.	Low – There is a lack of recent and abundant records within 5 km of the Project Area.

SCIENTIFIC NAME	COMMON NAME	SOURCE	EPBC ACT	FFG ACT	VIC ADVISORY LIST	COUNT OF RECORDS	LAST RECORD	HABITAT DESCRIPTION	LIKELIHOOD OF OCCURRENCE
Climacteris affinis	White-browed Treecreeper	VBA		L	vu	1	13/05/2009	Usually inhabit shrublands and woodlands in arid and semi-arid regions. They mostly occur in tall shrubland and low woodland dominated by acacias, such as Mulga, Western Myall and Gidgee, or casuarinas, such as Buloke and Belah, or woodlands dominated by cypress-pines Callitris. The species sometimes inhabits Coolibah, River Red Gum or Black Box woodlands near wetlands. The understorey of suitable woodlands may be closed and dominated by a lower layer of shrubs, open and dominated by grasses, or absent altogether.	Low – Project Area lacks suitable habitat to support this species and there is a lack of recent and abundant records within 5 km.
Climacteris picumnus	Brown Treecreeper	VBA			nt	13	21/12/1990	Found in eucalypt woodlands and dry open forest of the inland slopes and plains inland of the Great Dividing Range; mainly inhabits woodlands dominated by stringybarks or other rough-barked eucalypts.	Low – all nearby records are old (corroborated on the birdwatching database Ebird). The potential habitat at the Project Area is likely to be too highly modified and disturbed to currently support the species.

SCIENTIFIC NAME	COMMON NAME	SOURCE	EPBC ACT	FFG ACT	VIC ADVISORY LIST	COUNT OF RECORDS	LAST RECORD	HABITAT DESCRIPTION	LIKELIHOOD OF OCCURRENCE
Dasyurus maculatus maculatus	Spot-tailed Quoll	VBA, PMST	EN	L	en	1	1/01/1930	Occurs in wide range of forest types, although appears to prefer moist sclerophyll and rainforest forest types, and riparian habitat. Most common in large unfragmented patches of forest. It has also been recorded from dry sclerophyll forest, open woodland and coastal heathland, and despite its occurrence in riparian areas, it also ranges over dry ridges.	Low – Project Area is highly fragmented and modified and lacks suitable habitat to support this species and there are no recent records in the area.
Dasyurus viverrinus	Eastern Quoll	VBA	EN	L	rx	2	1/01/1930	Extinct in the wild in Victoria.	Low – Species is considered to be regionally extinct.

SCIENTIFIC NAME	COMMON NAME	SOURCE	EPBC ACT	FFG ACT	VIC ADVISORY LIST	COUNT OF RECORDS	LAST RECORD	HABITAT DESCRIPTION	LIKELIHOOD OF OCCURRENCE
Delma impar	Striped Legless Lizard	PMST	VU	L	en			Inhabits both native and exotic dominant grasslands including secondary/derived grasslands, particularly where they occur nearby primary grassland. Requires tussocky grasses, rocks, or soil cracks for shelter.	Low – The Project Area does not support potential habitat for this species. Although the species has been known to occur in Plains Grassy Woodland (and EVC present at the Project Area), there are no derived grassland areas at the Project Area with the habitat features required by the species. There are also no nearby records, and the Project Area is distant from and not connected to primary grassland habitat.

SCIENTIFIC NAME	COMMON NAME	SOURCE	EPBC ACT	FFG ACT	VIC ADVISORY LIST	COUNT OF RECORDS	LAST RECORD	HABITAT DESCRIPTION	LIKELIHOOD OF OCCURRENCE
Egretta garzetta	Little Egret	VBA		L	en	4	21/01/2006	Little Egrets inhabit mudflats, saltworks and shallow margins of tidal estuaries and inland rivers and lakes.	Low – There is potential habitat adjacent to the Project Area at Yarrambat Park wetland (Arcadis 2018), however the Project Area itself lacks suitable habitat to support this species.
Emydura macquarii	Murray River Turtle	VBA			vu	3	3/01/2015	Primarily found in the Murray River Basin and its major tributaries.	Low – Project Area outside primary known range for this species.
Falco subniger	Black Falcon	VBA		L	vu	1	1/01/1986	Found in the arid and semi arid zones. It is usually found near watercourses or utilizing patches of isolated trees. It hunts over open wooded grasslands, saltbush plains, bluebush plains and other low vegetation.	Low – There is a lack of recent and abundant records within 5 km of the Project Area. Species occurrence is unlikely.
Galaxiella pusilla	Dwarf Galaxias	PMST	VU	L	en			Occurs in slow flowing and still, shallow, permanent and temporary freshwater habitats such as swamps, drains and the backwaters of streams and creeks, often (but not always) containing dense aquatic macrophytes and emergent plants.	Low – Project Area lacks suitable aquatic habitat to support this species and there are no previous records within 5 km.

SCIENTIFIC NAME	COMMON NAME	SOURCE	EPBC ACT	FFG ACT	VIC ADVISORY LIST	COUNT OF RECORDS	LAST RECORD	HABITAT DESCRIPTION	LIKELIHOOD OF OCCURRENCE
Gallinago hardwickii	Latham's Snipe	VBA, PMST	M		nt	25	30/12/2012	Occurs in freshwater or brackish wetlands generally near protective vegetation cover.	Low – Project Area is highly modified and lacks suitable aquatic habitat with vegetation cover to support this species.
Grantiella picta	Painted Honeyeater	VBA, PMST	VU	L	vu	1	21/12/1990	Lives in dry forests and woodlands. Primary food is the mistletoes in the genus *Amyema*, though it will take some nectar and insects. Its breeding distribution is dictated by presence of mistletoes which are largely restricted to older trees.	Low – Species relies on specific habitat types or resources that are not present in the Project Area. Furthermore there is a lack of recent and abundant records.
Haliaeetus leucogaster	White-bellied Sea-Eagle	VBA		L	vu	10	13/11/2005	Occurs in coastal areas including islands, estuaries, inlets, large rivers, inland lakes and reservoirs.	Low – Project Area lacks suitable habitat to support this species.
Hirundapus caudacutus	White-throated Needletail	VBA	VU M	L	vu	21	22/02/2013	Occurs in airspace over forests, woodlands, farmlands, plains, lakes, coasts and towns.	**Moderate** – A mostly aerial bird that occurs across a wide variety of habitat types. It is unlikely to utilise resources within the Project Area but may be seen flying over from time to time.

SCIENTIFIC NAME	COMMON NAME	SOURCE	EPBC ACT	FFG ACT	VIC ADVISORY LIST	COUNT OF RECORDS	LAST RECORD	HABITAT DESCRIPTION	LIKELIHOOD OF OCCURRENCE
Ixobrychus dubius	Australian Little Bittern	VBA		L	en	1	1/01/1986	Species is found in a range of freshwater swamp habitats that are inundated by at least 30cm of water and support tall rushes, reeds, Typha, shrub thickets or other dense cover. Being cryptic in nature, the species prefers smaller patches of dense vegetation along drains or small urban lakes where it remains within or on the edge of wetland vegetation.	Low – Project Area is highly modified and lacks suitable aquatic habitat with vegetation cover to support this species.
Lathamus discolor	Swift Parrot	VBA, PMST	CR	L	en	30	25/09/2017	In mainland Australia is semi-nomadic, foraging in flowering eucalypts in eucalypt associations, particularly box-ironbark forests and woodlands. Preference for sites with highly fertile soils where large trees have high nectar production, including along drainage lines and isolated rural or urban remnants, and for sites with flowering Acacia pycnantha.	**Moderate** – Recent and numerous records suggest that the Swift Parrot occurs in the local area. During annual migration, the Swift Parrot may forage on flowering eucalypt species within the Project Area.
Lewinia pectoralis	Lewin's Rail	VBA		L	vu	4	9/01/2006	Coastal saltwater areas, also freshwater wetlands and swamps.	Low – Project Area lacks suitable habitat to support this species.

SCIENTIFIC NAME	COMMON NAME	SOURCE	EPBC ACT	FFG ACT	VIC ADVISORY LIST	COUNT OF RECORDS	LAST RECORD	HABITAT DESCRIPTION	LIKELIHOOD OF OCCURRENCE
Litoria raniformis	Growling Grass Frog	VBA, PMST	VU	L	en	36	3/01/2007	Usually found amongst emergent vegetation such as Typha, Phragmites and Eleocharis within or at the edges of still or slow-flowing water bodies such as lagoons, swamps, lakes, ponds, and farm dams. It also occurs in irrigation channels and crops, lignum shrublands, black box and river red gum woodlands and at the periphery of rivers.	Low – although the species has been recorded in the locality, targeted surveys and habitat assessment undertaken in Jan-Feb 2019 did not record any individuals or higher quality potential habitat in or adjacent to the Project Area.
Maccullochella peelii	Murray Cod	VBA, PMST	VU	L	vu	4	01/01/1867	Occurs in lower reaches of the Murray-Darling Basin, where the water temperature is warm. The diverse range of habitats frequented by the Murray Cod includes slow moving rivers, murky billabongs and clear, rocky rivers.	Low – Project Area lacks suitable aquatic habitat to support this species.
Macquaria australasica	Macquarie Perch	VBA	EN	L	en	1	1/01/1912	Small discreet populations remain in the Murray Darling Catchment in Northern Victoria with a larger translocated population occurring in the Yarra River near Warrandyte.	Low – Project Area lacks suitable aquatic habitat to support this species.

SCIENTIFIC NAME	COMMON NAME	SOURCE	EPBC ACT	FFG ACT	VIC ADVISORY LIST	COUNT OF RECORDS	LAST RECORD	HABITAT DESCRIPTION	LIKELIHOOD OF OCCURRENCE
Melanodryas cucullata	Hooded Robin	VBA		L	nt	7	20/08/2015	Found in south-eastern Australia, generally east of the Great Dividing Range. Found in eucalypt woodland and mallee and acacia shrubland.	Low – Any potential habitat within the Project Area is highly fragmented and is considered unlikely to support a population.
Miniopterus schreibersii GROUP	Common Bent-wing Bat	VBA	CR	L	cr	4	25/06/1992	Three subspecies, which may occur in various ecosystems including forests, plains, wetlands, and coastal vegetation. Roosts in caves, crevices, or man-made structures. The two recognised maternity caves in Victoria are near Warrnambool (Southern Bent-wing Bat) and in East Gippsland near Bairnsdale (Eastern Bent-wing Bat).	**Moderate** – Although the past records are old, the Common Bent-wing Bat may occasionally fly through and forage within the Project Area, however there are no potential roosts within or nearby the Project Area.
Monarcha melanopsis	Black-faced Monarch	PMST	M					Mainly occurs in rainforest ecosystems, and sometimes in nearby open eucalypt forest with a dense, shrubby understorey. In Victoria mainly found in East Gippsland, it is a vagrant in the west.	Low – Project Area lacks suitable habitat to support this species and is outside of the species normal distribution range.

SCIENTIFIC NAME	COMMON NAME	SOURCE	EPBC ACT	FFG ACT	VIC ADVISORY LIST	COUNT OF RECORDS	LAST RECORD	HABITAT DESCRIPTION	LIKELIHOOD OF OCCURRENCE
Motacilla flava	Yellow Wagtail	PMST	M					This species occurs in a range of habitats including estuarine habitats such as sand dunes, mangrove forests and coastal saltmarshes. This species also occurs in open grassy areas including disturbed sites such as sports grounds and has been recorded on the edges of wetlands, swamps, lakes and farm dams.	Low – Project Area lacks suitable habitat to support this species and there have been no previous recorded sightings within 5 km.
Myiagra cyanoleuca	Satin Flycatcher	PMST	M					Occurs in heavily vegetated gullies, in forests and taller woodlands. During migration it is found in coastal forests, woodlands, mangroves, trees in open country and gardens.	Low – Project Area lacks suitable aquatic habitat to support this species.
Myotis macropus	Southern Myotis	VBA			nt	1	24/01/1991	Found in the coastal band from the north-west of Australia, across the top end and south to western Victoria. They usually forage over streams and pools and inhabit areas close to water (in caves, mine shafts, hollow bearing trees etc.). Rarely found more than 100 km inland except when occupying areas around major rivers.	Low – There is a lack of recent and abundant recorded sightings within 5 km. The species is unlikely to utilise the Project Area.

SCIENTIFIC NAME	COMMON NAME	SOURCE	EPBC ACT	FFG ACT	VIC ADVISORY LIST	COUNT OF RECORDS	LAST RECORD	HABITAT DESCRIPTION	LIKELIHOOD OF OCCURRENCE
Ninox connivens	Barking Owl	VBA		L	en	4	20/08/2015	Found in open woodlands and the edges of forests, often adjacent to farmland. They are less likely to use the interior of forested habitat. They are usually found in habitats that are dominated by Eucalyptus species, particularly red gum, and, in the tropics, paperbark species. They prefer woodlands and forests with a high density of large trees and particularly sites with hollows that are used by the owls as well as their prey.	Low – Species not detected during targeted surveys that were undertaken by Ninox Pursuits. May occasionally occur but unlikely to be regularly utilising the Project Area
Ninox strenua	Powerful Owl	VBA		L	vu	6	4/10/2008	Typically found in open forests and woodlands, sheltered gullies in wet forests with dense understoreys along watercourses. Will sometimes be found in open areas near forests such as farmland, parks and suburban areas, as well as in remnant bushland patches.	Low – Species not detected during targeted surveys that were undertaken by Ninox Pursuits. May occasionally occur but unlikely to be regularly utilising the Project Area.
Numenius madagascariensis	Eastern Curlew	PMST	CR M	L	vu			Primarily coastal in distribution, commonly associated with sheltered coasts, estuaries, harbours and lagoons. Breeds in the northern hemisphere, returning to Australia for the non-breeding season.	Low – Project Area lacks suitable habitat to support this species.

SCIENTIFIC NAME	COMMON NAME	SOURCE	EPBC ACT	FFG ACT	VIC ADVISORY LIST	COUNT OF RECORDS	LAST RECORD	HABITAT DESCRIPTION	LIKELIHOOD OF OCCURRENCE
Nycticorax caledonicus	Nankeen Night Heron	VBA			nt	39	22/11/2008	The Nankeen Night Heron frequents well-vegetated wetlands, and is found along shallow river margins, mangroves, floodplains, swamps, and parks and gardens.	Low – Project Area lacks suitable habitat to support this species.
Oxyura australis	Blue-billed Duck	VBA		L	en	47	27/09/2014	Found on temperate, fresh to saline, terrestrial wetlands, and occupies artificial wetlands. Prefers deep permanent open water, within or near dense vegetation. Nest in rushes, sedge, Lignum, (Muehlenbeckia cunninghami) and paperbark Melaleuca.	Low – Dams in the vicinity may provide some potential habitat but Project Area itself lacks suitable habitat.
Pandion haliaetus	Osprey	PMST	M					Tolerates a wide variety of habitats, nesting in any location near a body of water providing an adequate food supply.	Low – There have been no previous recorded sightings within 5 km of the Project Area.
Paralucia pyrodiscus lucida	Eltham Copper Butterfly	VBA, PMST	EN	L	en	2	15/03/2017	Known from several discreet population, including Castlemaine in Central Victoria. Found in sparse dry woodland consisting mainly of Red Stringybark, Red Box, Long-leaved Box. Lays its eggs on Sweet Bursaria.	Low – The results of the habitat assessment conducted by Practical Ecology indicate that the species is unlikely to be present within the Project Area.

SCIENTIFIC NAME	COMMON NAME	SOURCE	EPBC ACT	FFG ACT	VIC ADVISORY LIST	COUNT OF RECORDS	LAST RECORD	HABITAT DESCRIPTION	LIKELIHOOD OF OCCURRENCE
Pedionomus torquatus	Plains-wanderer	VBA, PMST	CR	L	cr	1	6/09/1997	Sparse grasslands that have 50% bare ground, widely spaced plants up to 10 cm high and remaining standing vegetation less than 5 centimetres in height. Occasionally uses cereal stubble but cannot persist in agricultural landscape. Suitable habitat tends to be restricted to small (50-300 ha) patches that do not support dense pasture growth under any seasonal conditions.	Low – Project Area lacks suitable habitat to support this species.
Perameles gunnii	Eastern Barred Bandicoot	VBA	VU	L	ew	1	1/01/1930	Extinct in the wild in Victoria.	Low – Species is considered to be extinct in the wild.
Petauroides volans	Greater Glider	PMST	VU		vu			The greater glider favours forests with a diversity of eucalypt species, due to seasonal variation in its preferred tree species.	Low – Species unlikely to occur due to the lack of dense forest habitat within the Project Area.
Phalacrocorax varius	Pied Cormorant	VBA			nt	12	10/01/2007	Inhabit terrestrial wetlands and coastal waters. Inland on lakes, swamps, rivers, billabongs, pools and sewage ponds. Associated with large sheets of open water, particularly permanent freshwater lakes and reservoirs and open water in deep freshwater marshes.	Low – Project Area lacks suitable habitat to support this species.

SCIENTIFIC NAME	COMMON NAME	SOURCE	EPBC ACT	FFG ACT	VIC ADVISORY LIST	COUNT OF RECORDS	LAST RECORD	HABITAT DESCRIPTION	LIKELIHOOD OF OCCURRENCE
Phascogale tapoatafa	Brush-tailed Phascogale	VBA		L	vu	8	15/04/2017	Largely arboreal it occurs in a range of habitats which have reliable rainfall (500–2000 mm), but has preference for open dry sclerophyll forest on ridges (up to 600 m alt) with little/sparse ground cover.	**Low (resident) Moderate (dispersal)-** As the species is known to occur to the south of the Project Area, the habitat in the Project Area may periodically support dispersing individuals. However, as no Brush-tailed Phascogales were recorded during targeted surveys conducted by EcoAerial for the project, or during arboreal mammal surveys conducted for Stage 1 (van der Ree 2018), it is unlikely to support a regular population.

SCIENTIFIC NAME	COMMON NAME	SOURCE	EPBC ACT	FFG ACT	VIC ADVISORY LIST	COUNT OF RECORDS	LAST RECORD	HABITAT DESCRIPTION	LIKELIHOOD OF OCCURRENCE
Platalea regia	Royal Spoonbill	VBA			nt	15	14/03/2008	Found in terrestrial wetlands, sheltered marine habitats and wet grasslands; permanent and ephemeral waters used where available in arid interior. Feeds in shallow waters (less than 0.4 m) over substrate of sand, mud or clay.	Low – Dams in the vicinity may provide some potential habitat but Project Area itself lacks suitable habitat.
Plegadis falcinellus	Glossy Ibis	VBA	M		nt	1	10/11/2002	The Glossy Ibis' preferred habitat for foraging and breeding are fresh water marshes at the edges of lakes and rivers, lagoons, flood-plains, wet meadows, swamps, reservoirs, sewage ponds, rice-fields and cultivated areas under irrigation. The species is occasionally found in coastal locations such as estuaries, deltas, saltmarshes and coastal lagoons.	Low – Project Area lacks suitable habitat to support this species.
Porzana pusilla	Baillon's Crake	VBA		L	vu	5	22/11/2008	Baillon’s Crakes inhabit vegetated wetlands, usually with fresh or brackish water, including swamps, billabongs, lakes and reservoirs and temporarily inundated areas. They often prefer wetlands with floating aquatic vegetation.	Low – Project Area lacks suitable habitat to support this species.
Prototroctes maraena	Australian Grayling	PMST	VU	L	vu			It is a mid-water, freshwater species that occurs most commonly in clear, gravelly streams with a moderate flow. Prefers deep, slow flowing pools.	Low – Project Area lacks suitable aquatic habitat to support this species.

SCIENTIFIC NAME	COMMON NAME	SOURCE	EPBC ACT	FFG ACT	VIC ADVISORY LIST	COUNT OF RECORDS	LAST RECORD	HABITAT DESCRIPTION	LIKELIHOOD OF OCCURRENCE
Pseudemoia pagenstecheri	Tussock Skink	VBA			vu	4	19/03/2018	Found in the Grampians in the west through the basalt plains west of Melbourne to the North-east Victoria. Among medium to long grass tussocks in open grasslands where trees are absent or sparse.	**Moderate** – Project Area supports one patch of high quality potential habitat. Additional areas of lower quality potential habitat are also present.
Pseudemoia rawlinsoni	Glossy Grass Skink	VBA			vu	6	14/12/1988	In Victoria, Glossy Grass Skinks are found in the north-east alpine region and also in southern regions of the state in lowland areas. Preferred habitat includes swampy environments that are humid and densely vegetated, such as marshlands and margins of watercourses.	Low – Project Area lacks suitable habitat to support this species and there is a lack of recent and abundant recorded sightings within 5 km.
Pseudomys fumeus	Smoky Mouse	PMST	EN	L	en			The Smoky Mouse occurs in a variety of vegetation communities, ranging from coastal heath to dry ridgeline forest, sub-alpine heath and, occasionally, wetter gullies (Menkhorst, 1981). Except for the wetter sites, a consistent feature of Smoky Mouse habitats is the diversity of heath and bush-pea species present, combined with potential shelter sites in the form of woody debris or rocks.	Low – Species relies on specific habitat types or resources that are not present in the Project Area. Furthermore there are no previously recorded sightings within 5 km.

SCIENTIFIC NAME	COMMON NAME	SOURCE	EPBC ACT	FFG ACT	VIC ADVISORY LIST	COUNT OF RECORDS	LAST RECORD	HABITAT DESCRIPTION	LIKELIHOOD OF OCCURRENCE
Pseudophryne bibronii	Brown Toadlet	VBA		L	en	11	25/06/1992	Usually found singly under rocks and logs on slopes in grasslands or beside ditches. Found both in wet and dry sclerophyll forest. Breeding congregations usually occur in inundated grassy areas beside gutters, small creeks etc.	Low – A habitat assessment and targeted survey was conducted by Practical Ecology in May 2018 (Practical Ecology 2018a). Through this assessment it was determined that the species was unlikely to occur.
Pseudophryne semimarmorata	Southern Toadlet	VBA			vu	98	19/05/1989	It occurs mainly to the north, east and south-east of Melbourne. It is found in forested areas, where it hides under fallen timber, rocks, etc.	Low – A habitat assessment and targeted survey was conducted by Practical Ecology in May 2018 (Practical Ecology 2018a). Through this assessment it was determined that the species was unlikely to occur.

SCIENTIFIC NAME	COMMON NAME	SOURCE	EPBC ACT	FFG ACT	VIC ADVISORY LIST	COUNT OF RECORDS	LAST RECORD	HABITAT DESCRIPTION	LIKELIHOOD OF OCCURRENCE
Pteropus poliocephalus	Grey-headed Flying-fox	VBA, PMST	VU	L	vu	2	22/04/2013	Occurs in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps. Urban gardens and cultivated fruit crops also provide habitat for this species.	**High (Recorded)** – Species was recorded in the Project Area on 2 November 2017 during nocturnal fauna surveys conducted by Ninox pursuits. It is likely to periodically forage on flowering eucalypts within the Project Area.
Rhipidura rufifrons	Rufous Fantail	PMST	M					Occurs in a range of habitats including the undergrowth of rainforests/wetter eucalypt forests/gullies, monsoon forests paperbarks, sub-inland and coastal scrubs, mangroves, watercourses, parks and gardens.	**Moderate** – there are several recent records of this species in the locality (Ebird) although these are sporadic. The species is more likely to frequent nearby gullies and parks but may periodically occur within the Project Area.

SCIENTIFIC NAME	COMMON NAME	SOURCE	EPBC ACT	FFG ACT	VIC ADVISORY LIST	COUNT OF RECORDS	LAST RECORD	HABITAT DESCRIPTION	LIKELIHOOD OF OCCURRENCE
Rostratula australis	Australian Painted Snipe	VBA, PMST	EN	L	cr	1	1/01/1977	Inhabits shallow, vegetated, temporary or infrequently filled wetlands, including where there are trees such as *Eucalyptus camaldulensis* (River Red Gum), *Eucalyptus Populnea* (Poplar Box) or shrubs such as *Muehlenbeckia florulenta* (Lignum) or *Sarcocornia quinqueflora* (Samphire).	Low – There is potential habitat adjacent to the Project Area at Yarrambat Park wetland (Arcadis 2018), however the Project Area itself lacks suitable habitat to support this species. There are no recent records in the locality.
Sminthopsis crassicaudata	Fat-tailed Dunnart	VBA			nt	1	24/01/1991	In a variety of open vegetation habitats including open woodland, low shrublands of saltbush and bluebush, tussock grasslands on clay or sandy soils, glibber plain and, in southern parts of its range, farmlands.	Low – Project Area lacks suitable habitat to support this species and there is a lack of recent and abundant recorded sightings within 5 km.
Sminthopsis murina murina	Common Dunnart	VBA			vu	3	14/11/1991	Mallee scrub, dry forests, woodlands and dry heath with sparse ground and shrub cover by dense leaf and bark litter.	Low – Project Area lacks suitable habitat to support this species and there is a lack of recent and abundant recorded sightings within 5 km.

SCIENTIFIC NAME	COMMON NAME	SOURCE	EPBC ACT	FFG ACT	VIC ADVISORY LIST	COUNT OF RECORDS	LAST RECORD	HABITAT DESCRIPTION	LIKELIHOOD OF OCCURRENCE
Stagonopleura guttata	Diamond Firetail	VBA		L	nt	3	30/05/1988	Occurs in a range of eucalypt dominated communities with a grassy understorey including woodland, forest and mallee.	Low – Although potential habitat is present, the lack of recent records indicates that the area is too highly modified to currently support this species.
Stictonetta naevosa	Freckled Duck	VBA		L	en	3	17/09/2017	In most years this species appear to be nomadic between ephemeral inland wetlands. In dry years they congregate on permanent wetlands while in wet years they breed prolifically and disperse widely, generally towards the coast.	Low – May frequent dams in the vicinity but Project Area itself lacks suitable habitat.
Synemon plana	Golden Sun Moth	PMST	CR	L	cr	None (although one in the Atlas of Living Australia)		This species occurs where wallaby grasses Rytidosperma spp. dominate the understory, such as grassy Box-Gum Woodlands or Natural Temperate Grasslands, as larvae feed exclusively on the roots of wallaby grass or the introduced Chilean Needle-grass. Bare ground separating low tussocks of wallaby grass are key microhabitat features for the Golden Sun Moth, as courting behaviour occurs here.	Low – Although there are some areas of *Rytidosperma* and/or Chilean Needle-grass-dominated grassland within the Project Area, these patches have no connectivity with primary habitat (natural temperate grassland) and are far from any confirmed records.

SCIENTIFIC NAME	COMMON NAME	SOURCE	EPBC ACT	FFG ACT	VIC ADVISORY LIST	COUNT OF RECORDS	LAST RECORD	HABITAT DESCRIPTION	LIKELIHOOD OF OCCURRENCE
Tringa nebularia	Common Greenshank	PMST	M		vu			The Common Greenshank is found in a wide variety of inland wetlands and sheltered coastal habitats of varying salinity. It occurs in sheltered coastal habitats, typically with large mudflats and saltmarsh, mangroves or seagrass.	Low – Project Area lacks suitable habitat.
Tyto novaehollandiae	Masked Owl	VBA		L	en	2	1/05/1990	Found in forests, woodlands, timbered waterways and open country on the fringe of these areas. They prefer tall trees with hollows for nesting and roosting.	Low – Species not detected during targeted surveys that were undertaken by Ninox Pursuits. May occasionally occur but unlikely to be regularly utilising the Project Area.
Varanus varius	Lace Monitor	VBA			en	1	21/11/2005	Occurs in well-timbered areas, from dry woodlands to cool temperate southern forests. Arboreal, ascending large trees when disturbed.	Low – not frequently recorded in the locality. Potential habitat in the Project Area is of poor quality for this species with minimal terrestrial connectivity to higher quality areas.

APPENDIX G

CANOPY TREES (GUIDELINES 2017)

G1. LIST OF CANOPY TREES

Trees listed in this appendix are an extract of the full list of trees assessed in the arborist assessment (Ryder Arboriculture and Environment 2020) to address the requirements in *Guidelines for the removal, destruction or lopping of native vegetation* (DELWP 2017b) (Guidelines 2017).

This table includes all Scattered Trees (Large Trees and small trees) and the additional 187 Large Trees in patches that were recorded within and just outside of the Project Area.

ID Number = trees located on Appendix B-2. These numbers relate to the arborist assessment for the Project (Ryder Arboriculture and Environment 2020) for those trees which were located within the arborist study area.

Table G.1 Indigenous Scattered and Large Canopy Trees

ID NUMBER (APPENDIX B-2 AND RYDER 2020)	BOTANICAL	COMMON_NAM	HEIGHT	WIDTH	HEALTH	TPZ M	LARGEST_ STEM DBH	MED-LGE HOLLOWS	CATEGORY	LARGE TREE (LT)	SWIFT PARROT	PROJECT AREA (TRUNK POSITION)
1	*Eucalyptus polyanthemos*	Red Box	14	14	Fair	9.84	82	No	ST	LT	Secondary	Out
2	*Eucalyptus polyanthemos*	Red Box	6	4	Good	2	11	No	ST		Secondary	Out
3	*Eucalyptus polyanthemos*	Red Box	6	4	Good	2	8	No	ST		Secondary	Out
4	*Eucalyptus polyanthemos*	Red Box	4	2	Good	2	7	No	ST		Secondary	Out
8	*Eucalyptus polyanthemos*	Red Box	18	15	Fair	8.76	73	No	ST	LT	Secondary	Out
9	*Eucalyptus polyanthemos*	Red Box	17	17	Dead	14.4	120	No	ST	LT	Secondary	In
10	*Eucalyptus polyanthemos*	Red Box	18	19	Fair	9.6	58	No	ST		Secondary	In
11	*Eucalyptus polyanthemos*	Red Box	17	20	Fair	14.52	85	Yes	HZ	LT	Secondary	Out
13	*Eucalyptus polyanthemos*	Red Box	16	11	Fair	9	75	Yes	HZ	LT	Secondary	Out
37	*Eucalyptus camaldulensis*	River Red Gum	20	9	Good	8.4	70	No	HZ	LT	Secondary	Out
211	*Eucalyptus goniocalyx*	Long-leaved Box	8	3	Dead	7.92	66	No	HZ	LT		In
230	*Eucalyptus studleyensis*	Studley Park Gum	18	14	Good	15	90	No	HZ	LT		In
232	*Eucalyptus goniocalyx*	Long-leaved Box	15	11	Good	11.64	74	No	HZ	LT		In

ID NUMBER (APPENDIX B-2 AND RYDER 2020)	BOTANICAL	COMMON_NAM	HEIGHT	WIDTH	HEALTH	TPZ M	LARGEST_ STEM DBH	MED-LGE HOLLOWS	CATEGORY	LARGE TREE (LT)	SWIFT PARROT	PROJECT AREA (TRUNK POSITION)
240	*Eucalyptus goniocalyx*	Long-leaved Box	18	12	Good	13.68	90	Yes	HZ	LT		In
241	*Eucalyptus goniocalyx*	Long-leaved Box	14	8	Poor	9.48	79	Yes	HZ	LT		In
247	*Eucalyptus melliodora*	Yellow Box	5	5	Fair	2.04	10	No	ST		Key	In
248	*Eucalyptus melliodora*	Yellow Box	10	3	Fair	3.6	30	No	ST		Key	In
249	*Eucalyptus polyanthemos*	Red Box	10	4	Fair	3.48	29	No	ST		Secondary	In
250	*Eucalyptus polyanthemos*	Red Box	8	3	Fair	2.52	14	No	ST		Secondary	In
252	*Eucalyptus polyanthemos*	Red Box	11	3	Good	3.48	29	No	ST		Secondary	In
253	*Eucalyptus melliodora*	Yellow Box	12	6	Good	4.68	24	No	ST		Key	In
267	*Eucalyptus goniocalyx*	Long-leaved Box	16	14	Good	11.76	86	No	HZ	LT		In
300	*Eucalyptus goniocalyx*	Long-leaved Box	14	11	Fair	10.08	66	Yes	HZ	LT		In
303	*Eucalyptus goniocalyx*	Long-leaved Box	13	7	Good	4.32	36	No	ST			In
306	*Eucalyptus goniocalyx*	Long-leaved Box	15	12	Fair	10.2	85	No	ST	LT		In
307	*Eucalyptus goniocalyx*	Long-leaved Box	4	1	Dead	7.2	60	Yes	ST	LT		In
308	*Eucalyptus goniocalyx*	Long-leaved Box	6	6	Poor	12.6	105	Yes	ST	LT		In
309	*Eucalyptus goniocalyx*	Long-leaved Box	12	9	Fair	10.2	85	Yes	ST	LT		In
333	*Eucalyptus goniocalyx*	Long-leaved Box	9	6	Fair	7.92	66	Yes	HZ	LT		In
356	*Eucalyptus macrorhyncha*	Red Stringybark	6	2	Dead	8.28	69	Yes	HZ	LT	Secondary	In
359	*Eucalyptus melliodora*	Yellow Box	16	8	Fair	9.48	79	No	HZ	LT	Key	In
364	*Eucalyptus goniocalyx*	Long-leaved Box	10	7	Fair	14.64	105	Yes	HZ	LT		In
371	*Eucalyptus goniocalyx*	Long-leaved Box	15	7	Poor	9.72	71	No	HZ	LT		In
420	*Eucalyptus goniocalyx*	Long-leaved Box	14	12	Fair	13.56	82	Yes	HZ	LT		Out
465	*Eucalyptus goniocalyx*	Long-leaved Box	16	10	Fair	15	125	Yes	HZ	LT		In

ID NUMBER (APPENDIX B-2 AND RYDER 2020)	BOTANICAL	COMMON_NAM	HEIGHT	WIDTH	HEALTH	TPZ M	LARGEST_ STEM DBH	MED-LGE HOLLOWS	CATEGORY	LARGE TREE (LT)	SWIFT PARROT	PROJECT AREA (TRUNK POSITION)
482	*Eucalyptus goniocalyx*	Long-leaved Box	16	12	Good	12.36	82	No	HZ	LT		Out
483	*Eucalyptus goniocalyx*	Long-leaved Box	16	12	Poor	15	127	No	HZ	LT		In
512	*Eucalyptus goniocalyx*	Long-leaved Box	17	12	Fair	12.72	86	No	HZ	LT		In
529	*Eucalyptus goniocalyx*	Long-leaved Box	12	9	Fair	7.68	64	No	HZ	LT		In
553	*Eucalyptus goniocalyx*	Long-leaved Box	16	12	Fair	13.2	85	No	HZ	LT		Out
564	*Eucalyptus goniocalyx*	Long-leaved Box	8	6	Dead	7.92	66	No	HZ	LT		In
657	*Eucalyptus goniocalyx*	Long-leaved Box	17	9	Fair	8.88	74	No	HZ	LT		In
661	*Eucalyptus goniocalyx*	Long-leaved Box	10	7	Poor	7.68	64	No	HZ	LT		In
662	*Eucalyptus polyanthemos*	Red Box	16	10	Fair	7.92	66	No	HZ	LT	Secondary	In
693	*Eucalyptus polyanthemos*	Red Box	15	5	Good	8.76	73	No	HZ	LT	Secondary	In
728	*Eucalyptus polyanthemos*	Red Box	13	10	Good	15	130	Yes	HZ	LT	Secondary	In
738	*Eucalyptus polyanthemos*	Red Box	14	9	Good	8.64	65	No	HZ	LT	Secondary	In
753	*Eucalyptus polyanthemos*	Red Box	15	11	Good	12.72	106	Yes	HZ	LT	Secondary	In
757	*Eucalyptus goniocalyx*	Long-leaved Box	9	2	Poor	7.32	61	No	HZ	LT		In
760	*Eucalyptus polyanthemos*	Red Box	20	8	Good	8.76	73	No	ST	LT	Secondary	In
767	*Eucalyptus polyanthemos*	Red Box	16	4	Good	7.8	65	No	HZ	LT	Secondary	In
769	*Eucalyptus polyanthemos*	Red Box	11	3	Dead	9.12	76	No	ST	LT	Secondary	In
774	*Eucalyptus polyanthemos*	Red Box	17	3	Fair	7.2	60	No	HZ	LT	Secondary	In
791	*Eucalyptus goniocalyx*	Long-leaved Box	14	5	Fair	7.56	62	Yes	HZ	LT		In
794	*Eucalyptus goniocalyx*	Long-leaved Box	14	8	Good	8.76	73	No	HZ	LT		In
802	*Eucalyptus goniocalyx*	Long-leaved Box	7	6	Fair	7.44	62	No	HZ	LT		In
804	*Eucalyptus goniocalyx*	Long-leaved Box	12	7	Fair	7.2	60	No	HZ	LT		In

ID NUMBER (APPENDIX B-2 AND RYDER 2020)	BOTANICAL	COMMON_NAM	HEIGHT	WIDTH	HEALTH	TPZ M	LARGEST_ STEM DBH	MED-LGE HOLLOWS	CATEGORY	LARGE TREE (LT)	SWIFT PARROT	PROJECT AREA (TRUNK POSITION)
807	*Eucalyptus goniocalyx*	Long-leaved Box	15	7	Fair	8.16	67	Yes	HZ	LT		In
808	*Eucalyptus goniocalyx*	Long-leaved Box	16	8	Fair	8.88	62	No	HZ	LT		In
813	*Eucalyptus goniocalyx*	Long-leaved Box	12	2	Dead	7.56	63	No	HZ	LT		In
815	*Eucalyptus polyanthemos*	Red Box	12	10	Fair	9.6	80	Yes	HZ	LT	Secondary	In
817	*Eucalyptus polyanthemos*	Red Box	13	11	Fair	8.4	70	No	HZ	LT	Secondary	In
818	*Eucalyptus polyanthemos*	Red Box	16	5	Fair	7.56	63	Yes	HZ	LT	Secondary	In
819	*Eucalyptus polyanthemos*	Red Box	18	7	Fair	9.84	82	Yes	HZ	LT	Secondary	In
825	*Eucalyptus goniocalyx*	Long-leaved Box	11	6	Fair	10.44	87	No	HZ	LT		In
826	*Eucalyptus goniocalyx*	Long-leaved Box	13	7	Fair	7.92	66	No	HZ	LT		In
827	*Eucalyptus goniocalyx*	Long-leaved Box	12	7	Fair	10.2	85	No	HZ	LT		In
830	*Eucalyptus goniocalyx*	Long-leaved Box	15	6	Fair	8.04	67	No	HZ	LT		In
834	*Eucalyptus macrorhyncha*	Red Stringybark	12	7	Fair	8.28	69	Yes	HZ	LT	Secondary	In
840	*Eucalyptus goniocalyx*	Long-leaved Box	14	6	Fair	8.76	73	No	HZ	LT		In
845	*Eucalyptus melliodora*	Yellow Box	22	10	Good	9.12	76	No	HZ	LT	Key	In
847	*Eucalyptus goniocalyx*	Long-leaved Box	12	6	Good	7.56	63	No	HZ	LT		In
854	*Eucalyptus goniocalyx*	Long-leaved Box	10	5	Poor	7.68	64	Yes	HZ	LT		In
856	*Eucalyptus goniocalyx*	Long-leaved Box	11	4	Poor	7.2	60	No	HZ	LT		In
865	*Eucalyptus goniocalyx*	Long-leaved Box	17	10	Good	12.12	101	No	HZ	LT		Out
874	*Eucalyptus camaldulensis*	River Red Gum	18	10	Good	12	100	No	HZ	LT	Secondary	Out
878	*Eucalyptus melliodora*	Yellow Box	5	2	Very good	2	9	No	ST		Key	Out
903	*Eucalyptus goniocalyx*	Long-leaved Box	12	10	Fair	8.76	73	No	HZ	LT		In
909	*Eucalyptus goniocalyx*	Long-leaved Box	14	11	Fair	7.68	64	No	HZ	LT		In

ID NUMBER (APPENDIX B-2 AND RYDER 2020)	BOTANICAL	COMMON_NAM	HEIGHT	WIDTH	HEALTH	TPZ M	LARGEST_ STEM DBH	MED-LGE HOLLOWS	CATEGORY	LARGE TREE (LT)	SWIFT PARROT	PROJECT AREA (TRUNK POSITION)
912	*Eucalyptus melliodora*	Yellow Box	7	2	Good	2	10	No	ST		Key	Out
940	*Eucalyptus melliodora*	Yellow Box	21	14	Fair	8.52	71	No	HZ	LT	Key	Out
942	*Eucalyptus melliodora*	Yellow Box	23	13	Fair	10.56	88	No	HZ	LT	Key	In
943	*Eucalyptus melliodora*	Yellow Box	18	13	Good	15	96	No	HZ	LT	Key	In
947	*Eucalyptus camaldulensis*	River Red Gum	19	14	Fair	15	144	Yes	ST	LT	Secondary	In
950	*Eucalyptus melliodora*	Yellow Box	13	6	Very good	4.44	37	No	ST		Key	In
951	*Eucalyptus melliodora*	Yellow Box	13	6	Very good	4.56	22	No	ST		Key	In
952	*Eucalyptus melliodora*	Yellow Box	9	5	Very good	3.72	31	No	ST		Key	In
958	*Eucalyptus melliodora*	Yellow Box	13	7	Good	4.68	39	No	ST		Key	In
959	*Eucalyptus melliodora*	Yellow Box	12	7	Good	4.68	39	No	ST		Key	In
960	*Eucalyptus melliodora*	Yellow Box	10	6	Fair	4.56	38	No	ST		Key	In
970	*Eucalyptus polyanthemos*	Red Box	12	6	Good	4.68	33	No	ST		Secondary	In
984	*Eucalyptus goniocalyx*	Long-leaved Box	4	2	Dead	5.04	42	Yes	ST			In
985	*Eucalyptus goniocalyx*	Long-leaved Box	8	6	Fair	4.92	41	No	ST			In
986	*Eucalyptus goniocalyx*	Long-leaved Box	10	8	Fair	6.96	41	No	ST			In
987	*Eucalyptus goniocalyx*	Long-leaved Box	9	7	Fair	9.84	82	No	ST	LT		In
992	*Eucalyptus goniocalyx*	Long-leaved Box	10	12	Fair	10.32	63	Yes	HZ	LT		In
997	*Eucalyptus goniocalyx*	Long-leaved Box	13	14	Fair	10.92	91	No	HZ	LT		In
999	*Eucalyptus melliodora*	Yellow Box	17	9	Good	10.56	88	No	HZ	LT	Key	In
1003	*Eucalyptus goniocalyx*	Long-leaved Box	11	6	Poor	10.08	84	Yes	HZ	LT		In
1006	*Eucalyptus melliodora*	Yellow Box	13	7	Good	6.48	44	No	ST		Key	In
1007	*Eucalyptus goniocalyx*	Long-leaved Box	8	7	Good	6.48	54	No	ST			In

ID NUMBER (APPENDIX B-2 AND RYDER 2020)	BOTANICAL	COMMON_NAM	HEIGHT	WIDTH	HEALTH	TPZ M	LARGEST_ STEM DBH	MED-LGE HOLLOWS	CATEGORY	LARGE TREE (LT)	SWIFT PARROT	PROJECT AREA (TRUNK POSITION)
1008	*Eucalyptus goniocalyx*	Long-leaved Box	12	6	Fair	5.04	42	No	ST			In
1009	*Eucalyptus viminalis*	Manna Gum	17	11	Good	9.12	42	No	ST			In
1010	*Eucalyptus goniocalyx*	Long-leaved Box	7	4	Poor	3.72	31	No	ST			In
1012	*Eucalyptus sp.*	Gum	7	7	Fair	3.12	26	No	ST			In
1021	*Eucalyptus sp.*	Gum	12	5	Fair	3.48	29	No	ST			In
1024	*Eucalyptus viminalis*	Manna Gum	10	9	Good	4.44	37	No	ST			In
1027	*Eucalyptus camaldulensis*	River Red Gum	3	2	Poor	2	6	No	ST		Secondary	In
1028	*Eucalyptus viminalis*	Manna Gum	15	8	Good	5.28	44	No	ST			In
1033	*Eucalyptus melliodora*	Yellow Box	6	2	Good	2	10	No	ST		Key	In
1045	*Eucalyptus sp.*	Gum	6	3	Good	2	10	No	ST			In
1087	*Eucalyptus melliodora*	Yellow Box	14	6	Good	2.64	16	No	ST		Key	In
1088	*Eucalyptus melliodora*	Yellow Box	13	5	Good	2.4	17	No	ST		Key	In
1089	*Eucalyptus melliodora*	Yellow Box	8	5	Good	2.52	12	No	ST		Key	In
1090	*Eucalyptus melliodora*	Yellow Box	8	5	Good	2.04	17	No	ST		Key	In
1091	*Eucalyptus melliodora*	Yellow Box	10	5	Good	3.12	24	No	ST		Key	In
1092	*Eucalyptus melliodora*	Yellow Box	8	5	Fair	2.4	16	No	ST		Key	In
1093	*Eucalyptus macrorhyncha*	Red Stringybark	7	6	Good	2.04	10	No	ST		Secondary	In
1094	*Eucalyptus camaldulensis*	River Red Gum	13	7	Poor	6.96	58	No	ST		Secondary	In
1097	*Eucalyptus goniocalyx*	Long-leaved Box	10	8	Fair	7.2	60	No	HZ	LT		In
1098	*Eucalyptus goniocalyx*	Long-leaved Box	9	6	Fair	10.32	86	No	HZ	LT		In
1102	*Eucalyptus goniocalyx*	Long-leaved Box	14	6	Fair	7.44	62	Yes	HZ	LT		In
1122	*Eucalyptus goniocalyx*	Long-leaved Box	12	10	Fair	5.76	31	No	ST			In

ID NUMBER (APPENDIX B-2 AND RYDER 2020)	BOTANICAL	COMMON_NAM	HEIGHT	WIDTH	HEALTH	TPZ M	LARGEST_ STEM DBH	MED-LGE HOLLOWS	CATEGORY	LARGE TREE (LT)	SWIFT PARROT	PROJECT AREA (TRUNK POSITION)
1123	*Eucalyptus goniocalyx*	Long-leaved Box	13	11	Fair	9.24	50	No	ST			In
1128	*Eucalyptus camaldulensis*	River Red Gum	10	4	Poor	2.28	16	No	ST		Secondary	In
1129	*Eucalyptus camaldulensis*	River Red Gum	8	4	Fair	2.16	18	No	ST		Secondary	In
1130	*Eucalyptus melliodora*	Yellow Box	17	8	Fair	11.88	99	No	ST	LT	Key	In
1132	*Eucalyptus camaldulensis*	River Red Gum	17	12	Poor	9.84	82	Yes	HZ	LT	Secondary	In
1134	*Eucalyptus camaldulensis*	River Red Gum	18	13	Poor	11.16	93	No	HZ	LT	Secondary	In
1135	*Eucalyptus melliodora*	Yellow Box	15	11	Good	8.4	70	No	HZ	LT	Key	In
1137	*Eucalyptus camaldulensis*	River Red Gum	7	5	Fair	3.36	28	No	ST		Secondary	In
1153	*Eucalyptus camaldulensis*	River Red Gum	9	4	Poor	2.64	22	No	ST		Secondary	In
1164	*Eucalyptus camaldulensis*	River Red Gum	8	4	Fair	4.2	25	No	ST		Secondary	In
1212	*Eucalyptus camaldulensis*	River Red Gum	8	5	Poor	3.48	24	No	ST		Secondary	In
1217	*Eucalyptus melliodora*	Yellow Box	16	12	Very good	8.76	47	No	ST		Key	In
1254	*Eucalyptus melliodora*	Yellow Box	7	2	Dead	2.4	20	No	ST		Key	In
1255	*Eucalyptus melliodora*	Yellow Box	11	5	Dead	6.84	57	No	ST		Key	In
1258	*Eucalyptus goniocalyx*	Long-leaved Box	14	15	Fair	14.4	120	Yes	ST	LT		In
1260	*Eucalyptus goniocalyx*	Long-leaved Box	14	8	Fair	7.32	61	No	ST	LT		In
1262	*Eucalyptus camaldulensis*	River Red Gum	6	2	Poor	2	12	No	ST		Secondary	In
1264	*Eucalyptus camaldulensis*	River Red Gum	18	17	Poor	14.4	120	Yes	ST	LT	Secondary	In
1265	*Eucalyptus camaldulensis*	River Red Gum	22	18	Fair	15	180	No	ST	LT	Secondary	In
1266	*Eucalyptus camaldulensis*	River Red Gum	6	12	Poor	9.36	78	No	ST		Secondary	In
1267	*Eucalyptus ovata*	Swamp Gum	14	8	Fair	9.72	81	Yes	ST	LT		In
1270	*Eucalyptus camaldulensis*	River Red Gum	14	12	Poor	9.72	81	No	HZ	LT	Secondary	In

ID NUMBER (APPENDIX B-2 AND RYDER 2020)	BOTANICAL	COMMON_NAM	HEIGHT	WIDTH	HEALTH	TPZ M	LARGEST_ STEM DBH	MED-LGE HOLLOWS	CATEGORY	LARGE TREE (LT)	SWIFT PARROT	PROJECT AREA (TRUNK POSITION)
1274	*Eucalyptus camaldulensis*	River Red Gum	16	13	Fair	15	128	No	HZ	LT	Secondary	Out
1276	*Eucalyptus camaldulensis*	River Red Gum	19	14	Fair	13.8	115	Yes	HZ	LT	Secondary	In
1284	*Eucalyptus camaldulensis*	River Red Gum	19	13	Fair	9.72	81	No	HZ	LT	Secondary	In
1293	*Eucalyptus camaldulensis*	River Red Gum	22	16	Fair	15	170	Yes	HZ	LT	Secondary	Out
1363	*Eucalyptus goniocalyx*	Long-leaved Box	13	8	Fair	8.64	72	No	HZ	LT		In
1364	*Eucalyptus goniocalyx*	Long-leaved Box	14	7	Fair	9.96	83	No	HZ	LT		In
1365	*Eucalyptus goniocalyx*	Long-leaved Box	14	7	Fair	8.52	71	No	HZ	LT		In
1369	*Eucalyptus goniocalyx*	Long-leaved Box	6	4	Dead	11.04	92	Yes	ST	LT		In
1409	*Eucalyptus melliodora*	Yellow Box	19	12	Good	11.64	82	No	HZ	LT	Key	In
1413	*Eucalyptus melliodora*	Yellow Box	21	14	Good	10.68	89	No	HZ	LT	Key	In
1414	*Eucalyptus polyanthemos*	Red Box	6	2	Good	2	11	No	ST		Secondary	In
1419	*Eucalyptus polyanthemos*	Red Box	19	12	Good	8.16	68	No	HZ	LT	Secondary	In
1422	*Eucalyptus polyanthemos*	Red Box	8	3	Poor	2.76	23	No	ST		Secondary	In
1423	*Eucalyptus polyanthemos*	Red Box	15	9	Fair	7.2	39	No	ST		Secondary	In
1424	*Eucalyptus polyanthemos*	Red Box	14	8	Fair	8.4	52	No	ST		Secondary	In
1432	*Eucalyptus polyanthemos*	Red Box	17	11	Fair	7.44	62	No	HZ	LT	Secondary	In
1448	*Eucalyptus viminalis*	Manna Gum	9	2	Poor	2.16	18	No	ST			In
1450	*Eucalyptus viminalis*	Manna Gum	10	3	Fair	3	25	No	ST			In
1452	*Eucalyptus melliodora*	Yellow Box	12	5	Fair	4.44	37	No	ST		Key	Out
1453	*Eucalyptus melliodora*	Yellow Box	10	3	Fair	2	15	No	ST		Key	Out
1457	*Eucalyptus goniocalyx*	Long-leaved Box	7	3	Fair	2	9	No	ST			In
1458	*Eucalyptus goniocalyx*	Long-leaved Box	7	5	Fair	2	10	No	ST			In

ID NUMBER (APPENDIX B-2 AND RYDER 2020)	BOTANICAL	COMMON_NAM	HEIGHT	WIDTH	HEALTH	TPZ M	LARGEST_ STEM DBH	MED-LGE HOLLOWS	CATEGORY	LARGE TREE (LT)	SWIFT PARROT	PROJECT AREA (TRUNK POSITION)
1460	*Eucalyptus polyanthemos*	Red Box	15	10	Fair	10.32	68	No	HZ	LT	Secondary	In
1462	*Eucalyptus polyanthemos*	Red Box	14	10	Good	8.28	58	No	ST		Secondary	In
1463	*Eucalyptus polyanthemos*	Red Box	7	6	Good	4.8	24	No	ST		Secondary	In
1473	*Eucalyptus polyanthemos*	Red Box	15	11	Good	9.84	64	No	HZ	LT	Secondary	In
1477	*Eucalyptus goniocalyx*	Long-leaved Box	15	7	Poor	9	75	No	HZ	LT		In
1482	*Eucalyptus goniocalyx*	Long-leaved Box	13	9	Fair	8.64	72	No	HZ	LT		In
1488	*Eucalyptus goniocalyx*	Long-leaved Box	15	12	Fair	9.72	81	No	HZ	LT		In
1491	*Eucalyptus polyanthemos*	Red Box	14	10	Fair	7.44	62	No	HZ	LT	Secondary	In
1501	*Eucalyptus polyanthemos*	Red Box	9	6	Dead	7.56	63	No	HZ	LT	Secondary	In
1502	*Eucalyptus polyanthemos*	Red Box	9	6	Dead	7.56	63	No	HZ	LT	Secondary	In
1510	*Eucalyptus melliodora*	Yellow Box	13	6	Good	5.16	36	No	ST		Key	In
1511	*Eucalyptus melliodora*	Yellow Box	8	5	Dead	12	100	Yes	ST	LT	Key	In
1512	*Eucalyptus melliodora*	Yellow Box	18	9	Very good	9	75	No	ST	LT	Key	In
1514	*Eucalyptus polyanthemos*	Red Box	12	12	Poor	9.96	51	No	ST		Secondary	In
1517	*Eucalyptus polyanthemos*	Red Box	16	11	Poor	9.24	48	No	ST		Secondary	In
1518	*Eucalyptus polyanthemos*	Red Box	11	5	Dead	4.56	38	No	ST		Secondary	In
1519	*Eucalyptus polyanthemos*	Red Box	10	5	Dead	4.32	36	No	ST		Secondary	In
1520	*Eucalyptus polyanthemos*	Red Box	13	6	Fair	3.36	28	No	ST		Secondary	In
1524	*Eucalyptus polyanthemos*	Red Box	17	12	Fair	7.56	63	No	HZ	LT	Secondary	In
1538	*Eucalyptus goniocalyx*	Long-leaved Box	18	15	Poor	9.96	83	No	HZ	LT		In
1539	*Eucalyptus goniocalyx*	Long-leaved Box	15	9	Poor	9.36	78	No	HZ	LT		In
1544	*Eucalyptus polyanthemos*	Red Box	6	2	Good	2	8	No	ST		Secondary	In

ID NUMBER (APPENDIX B-2 AND RYDER 2020)	BOTANICAL	COMMON_NAM	HEIGHT	WIDTH	HEALTH	TPZ M	LARGEST_ STEM DBH	MED-LGE HOLLOWS	CATEGORY	LARGE TREE (LT)	SWIFT PARROT	PROJECT AREA (TRUNK POSITION)
1561	*Eucalyptus polyanthemos*	Red Box	15	8	Good	7.32	61	No	HZ	LT	Secondary	In
1564	*Eucalyptus polyanthemos*	Red Box	16	11	Fair	10.68	89	No	HZ	LT	Secondary	In
1572	*Eucalyptus polyanthemos*	Red Box	12	6	Fair	4.08	25	No	ST		Secondary	In
1577	*Eucalyptus melliodora*	Yellow Box	18	16	Good	9.6	64	No	ST	LT	Key	In
1579	*Eucalyptus polyanthemos*	Red Box	15	8	Good	8.04	67	No	HZ	LT	Secondary	In
1594	*Eucalyptus goniocalyx*	Long-leaved Box	12	9	Fair	7.32	61	No	HZ	LT		In
1611	*Eucalyptus camaldulensis*	River Red Gum	12	7	Good	7.56	52	No	ST		Secondary	In
1612	*Eucalyptus camaldulensis*	River Red Gum	16	10	Good	10.44	87	No	HZ	LT	Secondary	In
1613	*Eucalyptus camaldulensis*	River Red Gum	15	8	Good	15	150	No	HZ	LT	Secondary	In
1629	*Eucalyptus camaldulensis*	River Red Gum	9	5	Fair	3.24	20	No	ST		Secondary	In
1638	*Eucalyptus camaldulensis*	River Red Gum	20	11	Good	10.08	84	No	HZ	LT	Secondary	In
1650	*Eucalyptus camaldulensis*	River Red Gum	19	10	Good	12.84	107	No	ST	LT	Secondary	In
1662	*Eucalyptus camaldulensis*	River Red Gum	3	1	Fair	2	5	No	ST		Secondary	Out
1728	*Eucalyptus camaldulensis*	River Red Gum	14	10	Good	10.08	84	No	ST	LT	Secondary	In
1736	*Eucalyptus camaldulensis*	River Red Gum	18	12	Good	13.68	75	No	ST		Secondary	Out
1737	*Eucalyptus camaldulensis*	River Red Gum	13	7	Fair	4.2	35	No	ST		Secondary	Out
1828	*Eucalyptus microcarpa*	Grey Box	15	10	Good	9	75	No	HZ	LT	Key	Out
1834	*Eucalyptus camaldulensis*	River Red Gum	25	18	Very good	15	178	No	ST	LT	Secondary	In
1876	*Eucalyptus polyanthemos*	Red Box	11	7	Fair	4.32	33	No	ST	LT	Secondary	Out
1877	*Eucalyptus polyanthemos*	Red Box	20	8	Good	9.24	74	No	HZ	LT	Secondary	In
1891	*Eucalyptus polyanthemos*	Red Box	16	12	Good	8.76	73	No	HZ	LT	Secondary	In
1894	*Eucalyptus polyanthemos*	Red Box	17	8	Good	9.6	61	No	HZ	LT	Secondary	In

ID NUMBER (APPENDIX B-2 AND RYDER 2020)	BOTANICAL	COMMON_NAM	HEIGHT	WIDTH	HEALTH	TPZ M	LARGEST_ STEM DBH	MED-LGE HOLLOWS	CATEGORY	LARGE TREE (LT)	SWIFT PARROT	PROJECT AREA (TRUNK POSITION)
1902	*Eucalyptus polyanthemos*	Red Box	15	11	Good	8.16	68	No	HZ	LT	Secondary	In
1968	*Eucalyptus polyanthemos*	Red Box	20	10	Good	7.2	60	No	HZ	LT	Secondary	In
1998	*Eucalyptus camaldulensis*	River Red Gum	5	3	Fair	2	7	No	ST		Secondary	In
1999	*Eucalyptus camaldulensis*	River Red Gum	5	1	Fair	2	5	No	ST		Secondary	In
2000	*Eucalyptus goniocalyx*	Long-leaved Box	5	1	Fair	2	5	No	ST			In
2004	*Eucalyptus polyanthemos*	Red Box	15	8	Very poor	7.2	60	No	HZ	LT	Secondary	In
2008	*Eucalyptus macrorhyncha*	Red Stringybark	12	6	Poor	7.44	62	No	HZ	LT	Secondary	In
2018	*Eucalyptus polyanthemos*	Red Box	18	9	Good	9.12	60	No	HZ	LT	Secondary	In
2020	*Eucalyptus polyanthemos*	Red Box	13	13	Good	8.64	72	No	HZ	LT	Secondary	In
2047	*Eucalyptus polyanthemos*	Red Box	15	12	Good	10.68	89	No	HZ	LT	Secondary	In
2052	*Eucalyptus polyanthemos*	Red Box	18	12	Good	10.32	86	No	HZ	LT	Secondary	In
2346	*Eucalyptus polyanthemos*	Red Box	12	6	Good	4.32	35	No	ST		Secondary	In
2347	*Eucalyptus goniocalyx*	Long-leaved Box	14	8	Fair	6.6	43	No	ST			In
2350	*Eucalyptus polyanthemos*	Red Box	15	7	Fair	8.8	73	No	HZ	LT	Secondary	Out
2355	*Eucalyptus polyanthemos*	Red Box	12	10	Fair	13.2	95	No	ST	LT	Secondary	In
2358	*Eucalyptus goniocalyx*	Long-leaved Box	6	5	Fair	3.48	29	No	ST			In
2364	*Eucalyptus goniocalyx*	Long-leaved Box	14	6	Dead	10.2	85	No	HZ	LT		In
2419	*Eucalyptus polyanthemos*	Red Box	20	13	Good	9	75	No	HZ	LT	Secondary	In
2420	*Eucalyptus polyanthemos*	Red Box	17	10	Good	7.2	60	No	HZ	LT	Secondary	In
2426	*Eucalyptus melliodora*	Yellow Box	13	7	Good	3.84	32	No	ST		Key	In
2497	*Eucalyptus polyanthemos*	Red Box	15	8	Dead	12	100	No	HZ	LT	Secondary	In
2533	*Eucalyptus goniocalyx*	Long-leaved Box	14	8	Good	8.76	73	No	HZ	LT		In

ID NUMBER (APPENDIX B-2 AND RYDER 2020)	BOTANICAL	COMMON_NAM	HEIGHT	WIDTH	HEALTH	TPZ M	LARGEST_ STEM DBH	MED-LGE HOLLOWS	CATEGORY	LARGE TREE (LT)	SWIFT PARROT	PROJECT AREA (TRUNK POSITION)
2581	*Eucalyptus macrorhyncha*	Red Stringybark	13	6	Dead	7.2	60	No	HZ	LT	Secondary	In
2587	*Eucalyptus polyanthemos*	Red Box	15	12	Good	8.16	68	No	HZ	LT	Secondary	In
2631	*Eucalyptus goniocalyx*	Long-leaved Box	16	9	Fair	9.36	78	No	HZ	LT		In
2659	*Eucalyptus goniocalyx*	Long-leaved Box	20	10	Poor	9.6	80	No	HZ	LT		In
2663	*Eucalyptus goniocalyx*	Long-leaved Box	20	10	Good	9.6	80	Yes	HZ	LT		In
2667	*Eucalyptus goniocalyx*	Long-leaved Box	20	7	Fair	8.04	67	Yes	HZ	LT		In
2668	*Eucalyptus goniocalyx*	Long-leaved Box	20	12	Fair	12.84	73	No	HZ	LT		In
2669	*Eucalyptus goniocalyx*	Long-leaved Box	20	12	Fair	9.36	78	No	HZ	LT		In
2670	*Eucalyptus goniocalyx*	Long-leaved Box	17	12	Fair	7.92	66	No	HZ	LT		In
2672	*Eucalyptus goniocalyx*	Long-leaved Box	20	12	Fair	9.48	79	Yes	HZ	LT		In
2684	*Eucalyptus goniocalyx*	Long-leaved Box	13	6	Good	2.28	19	No	ST			In
2694	*Eucalyptus goniocalyx*	Long-leaved Box	14	10	Fair	9.48	79	No	HZ	LT		In
2699	*Eucalyptus goniocalyx*	Long-leaved Box	16	10	Poor	7.68	64	No	ST	LT		In
2700	*Eucalyptus polyanthemos*	Red Box	13	10	Fair	6.36	50	No	ST		Secondary	In
2701	*Eucalyptus polyanthemos*	Red Box	12	8	Poor	5.4	45	Yes	ST		Secondary	In
2707	*Eucalyptus polyanthemos*	Red Box	20	10	Good	7.2	60	No	HZ	LT	Secondary	In
2756	*Eucalyptus polyanthemos*	Red Box	12	10	Fair	6.72	49	No	ST		Secondary	In
2760	*Eucalyptus polyanthemos*	Red Box	20	20	Good	15	73	No	ST	LT	Secondary	In
2770	*Eucalyptus polyanthemos*	Red Box	16	10	Good	7.44	62	No	ST	LT	Secondary	Out
2890	*Eucalyptus polyanthemos*	Red Box	20	10	Fair	8.4	62	No	ST	LT	Secondary	In
2891	*Eucalyptus polyanthemos*	Red Box	16	10	Fair	6.96	39	No	ST		Secondary	In
2912	*Eucalyptus goniocalyx*	Long-leaved Box	16	11	Fair	12.6	105	No	HZ	LT		In

ID NUMBER (APPENDIX B-2 AND RYDER 2020)	BOTANICAL	COMMON_NAM	HEIGHT	WIDTH	HEALTH	TPZ M	LARGEST_ STEM DBH	MED-LGE HOLLOWS	CATEGORY	LARGE TREE (LT)	SWIFT PARROT	PROJECT AREA (TRUNK POSITION)
2965	*Eucalyptus polyanthemos*	Red Box	19	14	Fair	10.8	86	No	HZ	LT	Secondary	Out
3005	*Eucalyptus goniocalyx*	Long-leaved Box	15	12	Fair	9	75	No	HZ	LT		In
3042	*Eucalyptus goniocalyx*	Long-leaved Box	7	5	Dead	3.48	20	No	ST			In
3044	*Eucalyptus goniocalyx*	Long-leaved Box	10	8	Poor	7.44	62	Yes	HZ	LT		In
3050	*Eucalyptus goniocalyx*	Long-leaved Box	16	15	Fair	6.48	40	No	ST			In
3051	*Eucalyptus goniocalyx*	Long-leaved Box	7	2	Dead	7.8	60	No	ST	LT		In
3052	*Eucalyptus goniocalyx*	Long-leaved Box	14	12	Poor	8.4	70	No	ST	LT		In
3057	*Eucalyptus goniocalyx*	Long-leaved Box	20	10	Poor	7.8	65	No	HZ	LT		In
3058	*Eucalyptus goniocalyx*	Long-leaved Box	16	10	Fair	9.12	76	No	HZ	LT		In
3060	*Eucalyptus goniocalyx*	Long-leaved Box	18	12	Good	8.16	68	No	HZ	LT		In
3061	*Eucalyptus goniocalyx*	Long-leaved Box	18	20	Good	12	100	No	HZ	LT		In
3062	*Eucalyptus goniocalyx*	Long-leaved Box	14	12	Fair	9.24	77	No	HZ	LT		In
3066	*Eucalyptus polyanthemos*	Red Box	12	5	Fair	3.12	26	No	ST		Secondary	In
3067	*Eucalyptus polyanthemos*	Red Box	16	12	Good	6.6	40	No	ST		Secondary	In
3287	*Eucalyptus polyanthemos*	Red Box	9	2	Fair	2	15	No	ST		Secondary	In
3364	*Eucalyptus goniocalyx*	Long-leaved Box	17	20	Good	13.68	114	No	ST	LT		Out
3365	*Eucalyptus polyanthemos*	Red Box	14	10	Dead	7.08	59	No	ST		Secondary	Out
3554	*Eucalyptus polyanthemos*	Red Box	7	6	Poor	3.48	26	No	ST		Secondary	In
3560	*Eucalyptus melliodora*	Yellow Box	9	4	Fair	2	10	No	ST		Key	Out
3561	*Eucalyptus melliodora*	Yellow Box	10	4	Fair	2	10	No	ST		Key	In
3590	*Eucalyptus goniocalyx*	Long-leaved Box	11	7	Fair	2.88	24	No	ST			In
3596	*Eucalyptus polyanthemos*	Red Box	8	7	Fair	2.64	22	No	ST		Secondary	Out

ID NUMBER (APPENDIX B-2 AND RYDER 2020)	BOTANICAL	COMMON_NAM	HEIGHT	WIDTH	HEALTH	TPZ M	LARGEST_ STEM DBH	MED-LGE HOLLOWS	CATEGORY	LARGE TREE (LT)	SWIFT PARROT	PROJECT AREA (TRUNK POSITION)
3605	*Eucalyptus polyanthemos*	Red Box	18	12	Fair	11.04	92	No	HZ	LT	Secondary	In
3611	*Eucalyptus polyanthemos*	Red Box	25	9	Good	7.56	63	No	HZ	LT	Secondary	Out
3639	*Eucalyptus polyanthemos*	Red Box	18	12	Good	15	112	Yes	HZ	LT	Secondary	In
3640	*Eucalyptus polyanthemos*	Red Box	16	8	Good	7.2	60	No	HZ	LT	Secondary	In
3699	*Eucalyptus goniocalyx*	Long-leaved Box	10	7	Fair	2.4	20	No	ST			In
3827	*Eucalyptus polyanthemos*	Red Box	20	10	Dead	6.24	52	No	ST		Secondary	In
3828	*Eucalyptus goniocalyx*	Long-leaved Box	13	7	Poor	5.52	46	No	ST			In
3835	*Eucalyptus sp.*	Gum	10	6	Fair	2.76	15	No	ST			In
3864	*Eucalyptus goniocalyx*	Long-leaved Box	20	12	Good	11.88	99	No	ST	LT		In
3865	*Eucalyptus goniocalyx*	Long-leaved Box	12	8	Poor	6.6	55	No	ST			In
3866	*Eucalyptus goniocalyx*	Long-leaved Box	17	12	Good	10.8	90	No	ST	LT		In
3869	*Eucalyptus polyanthemos*	Red Box	12	7	Good	5.28	35	No	ST		Secondary	In
3870	*Eucalyptus polyanthemos*	Red Box	12	6	Good	3	25	No	ST		Secondary	In
3871	*Eucalyptus goniocalyx*	Long-leaved Box	13	7	Fair	3.6	20	No	ST			In
3872	*Eucalyptus macrorhyncha*	Red Stringybark	7	6	Poor	2.88	12	No	ST		Secondary	In
3881	*Eucalyptus goniocalyx*	Long-leaved Box	3	1	Fair	2	4	No	ST			In
3882	*Eucalyptus goniocalyx*	Long-leaved Box	10	6	Poor	6	50	No	ST			In
3885	*Eucalyptus goniocalyx*	Long-leaved Box	12	10	Fair	6	25	No	ST			In
3900	*Eucalyptus polyanthemos*	Red Box	15	9	Good	8.4	70	No	HZ	LT	Secondary	In
4028	*Eucalyptus polyanthemos*	Red Box	20	12	Good	11.28	72	No	HZ	LT	Secondary	In
4045	*Eucalyptus macrorhyncha*	Red Stringybark	12	5	Fair	2.4	20	No	ST		Secondary	Out
4046	*Eucalyptus macrorhyncha*	Red Stringybark	10	7	Fair	2.28	15	No	ST		Secondary	Out

ID NUMBER (APPENDIX B-2 AND RYDER 2020)	BOTANICAL	COMMON_NAM	HEIGHT	WIDTH	HEALTH	TPZ M	LARGEST_ STEM DBH	MED-LGE HOLLOWS	CATEGORY	LARGE TREE (LT)	SWIFT PARROT	PROJECT AREA (TRUNK POSITION)
4050	*Eucalyptus macrorhyncha*	Red Stringybark	8	2	Fair	2	8	No	ST		Secondary	In
4051	*Eucalyptus melliodora*	Yellow Box	13	8	Poor	3.6	30	No	ST		Key	In
4121	*Eucalyptus polyanthemos*	Red Box	12	4	Fair	2.76	23	No	ST		Secondary	In
4150	*Eucalyptus camaldulensis*	River Red Gum	18	12	Fair	13.68	90	No	HZ	LT	Secondary	Out
4174	*Eucalyptus goniocalyx*	Long-leaved Box	17	10	Poor	10.8	90	No	ST	LT		In
4175	*Eucalyptus polyanthemos*	Red Box	14	12	Good	7.2	60	Yes	HZ	LT	Secondary	In
4235	*Eucalyptus goniocalyx*	Long-leaved Box	17	12	Fair	10.08	66	No	HZ	LT		In
4236	*Eucalyptus polyanthemos*	Red Box	15	12	Fair	8.76	73	No	HZ	LT	Secondary	In
4265	*Eucalyptus camaldulensis*	River Red Gum	3	1	Fair	2	4	No	ST		Secondary	In
4282	*Eucalyptus polyanthemos*	Red Box	4	3	Fair	2	10	No	ST		Secondary	In
4283	*Eucalyptus polyanthemos*	Red Box	7	4	Fair	2	8	No	ST		Secondary	In
4289	*Eucalyptus polyanthemos*	Red Box	3	2	Fair	2	6	No	ST		Secondary	In
4290	*Eucalyptus polyanthemos*	Red Box	4	2	Fair	2	6	No	ST		Secondary	In
4296	*Eucalyptus melliodora*	Yellow Box	20	10	Fair	6.96	42	No	ST		Key	In
4297	*Eucalyptus melliodora*	Yellow Box	14	6	Fair	3.84	32	No	ST		Key	In
4298	*Eucalyptus melliodora*	Yellow Box	13	5	Fair	2.4	20	No	ST		Key	In
4303	*Eucalyptus camaldulensis*	River Red Gum	14	10	Fair	6.36	53	No	ST		Secondary	In
4308	*Eucalyptus goniocalyx*	Long-leaved Box	12	1	Dead	4.08	34	No	ST			In
4315	*Eucalyptus melliodora*	Yellow Box	15	5	Fair	3	25	No	ST		Key	In
4316	*Eucalyptus melliodora*	Yellow Box	17	6	Fair	4.44	37	No	ST		Key	In
4317	*Eucalyptus melliodora*	Yellow Box	12	6	Fair	2.64	22	No	ST		Key	In
4324	*Eucalyptus camaldulensis*	River Red Gum	11	6	Fair	3	25	No	ST		Secondary	In

ID NUMBER (APPENDIX B-2 AND RYDER 2020)	BOTANICAL	COMMON_NAM	HEIGHT	WIDTH	HEALTH	TPZ M	LARGEST_ STEM DBH	MED-LGE HOLLOWS	CATEGORY	LARGE TREE (LT)	SWIFT PARROT	PROJECT AREA (TRUNK POSITION)
4325	*Eucalyptus polyanthemos*	Red Box	10	7	Fair	3.24	27	No	ST		Secondary	In
4332	*Eucalyptus camaldulensis*	River Red Gum	15	12	Good	8.64	72	No	HZ	LT	Secondary	In
4355	*Eucalyptus polyanthemos*	Red Box	8	3	Good	2	12	No	ST		Secondary	In
4357	*Eucalyptus polyanthemos*	Red Box	7	2	Good	2	7	No	ST		Secondary	In
4358	*Eucalyptus polyanthemos*	Red Box	7	1	Good	2	6	No	ST		Secondary	In
4375	*Eucalyptus polyanthemos*	Red Box	13	8	Good	4.2	35	No	ST		Secondary	In
4376	*Eucalyptus goniocalyx*	Long-leaved Box	8	9	Fair	3.84	20	No	ST			Out
4377	*Eucalyptus polyanthemos*	Red Box	13	11	Good	9	75	No	HZ	LT	Secondary	In
4846	*Eucalyptus goniocalyx*	Long-leaved Box	16	10	Poor	11.04	92	N/A	HZ	LT		Out
4848	*Eucalyptus sp.*	Gum	4	3	Dead	8.52	71	N/A	ST	LT		In
4852	*Eucalyptus goniocalyx*	Long-leaved Box	9	8	Very poor	4.8	40	N/A	ST			In
4854	*Eucalyptus sp.*	Gum	8	3	Dead	3.36	28	N/A	ST			In
4860	*Eucalyptus sp.*	Gum	12	6	Dead	4.8	40	N/A	ST			In
4865	*Eucalyptus goniocalyx*	Long-leaved Box	10	7	Fair	2.52	21	N/A	ST			In
4867	*Eucalyptus goniocalyx*	Long-leaved Box	9	5	Poor	2.64	22	N/A	ST			In
4882	*Eucalyptus goniocalyx*	Long-leaved Box	8	5	Poor	2.52	21	N/A	ST			In
4885	*Eucalyptus goniocalyx*	Long-leaved Box	11	6	Poor	5.28	44	N/A	ST			In
4887	*Eucalyptus sp.*	Gum	9	1	Dead	3.72	31	N/A	ST			In
4889	*Eucalyptus sp.*	Gum	8	2	Dead	3.36	28	N/A	ST			In
4898	*Eucalyptus goniocalyx*	Long-leaved Box	5	3	Fair	2	13	N/A	ST			In
4899	*Eucalyptus goniocalyx*	Long-leaved Box	4	2	Fair	2	10	N/A	ST			In
4902	*Eucalyptus sp.*	Gum	11	6	Dead	7.44	62	N/A	ST	LT		In

ID NUMBER (APPENDIX B-2 AND RYDER 2020)	BOTANICAL	COMMON_NAM	HEIGHT	WIDTH	HEALTH	TPZ M	LARGEST_ STEM DBH	MED-LGE HOLLOWS	CATEGORY	LARGE TREE (LT)	SWIFT PARROT	PROJECT AREA (TRUNK POSITION)
4904	*Eucalyptus goniocalyx*	Long-leaved Box	15	8	Fair	4.8	40	N/A	ST			In
4906	*Eucalyptus goniocalyx*	Long-leaved Box	20	7	Fair	4.92	41	N/A	ST			In
4912	*Eucalyptus polyanthemos*	Red Box	16	10	Fair	6.96	58	N/A	ST		Secondary	In
4932	*Eucalyptus goniocalyx*	Long-leaved Box	15	13	Poor	11.64	97	N/A	HZ	LT		In
4952	*Eucalyptus goniocalyx*	Long-leaved Box	13	9	Fair	9.12	76	N/A	HZ	LT		In
5002	*Eucalyptus melliodora*	Yellow Box	30	11	Good	10.08	84	N/A	HZ	LT	Key	In
5019	*Eucalyptus polyanthemos*	Red Box	18	10	Fair	7.44	62	N/A	HZ	LT	Secondary	In
5023	*Eucalyptus polyanthemos*	Red Box	16	13	Good	9.12	76	N/A	HZ	LT	Secondary	In
5049	*Eucalyptus polyanthemos*	Red Box	20	11	Fair	7.2	60	N/A	HZ	LT	Secondary	In
5114	*Eucalyptus polyanthemos*	Red Box	16	14	Good	5.52	46	No	ST		Secondary	In
5174	*Eucalyptus polyanthemos*	Red Box	12	8	Dead	5.76	31	No	ST		Secondary	In
5234	*Eucalyptus polyanthemos*	Red Box	18	18	Good	11.52	69	No	HZ	LT	Secondary	Out
5248	*Eucalyptus polyanthemos*	Red Box	11	7	Very good	5.16	43	No	ST		Secondary	In
5249	*Eucalyptus polyanthemos*	Red Box	16	10	Good	6.6	55	No	ST		Secondary	Out
5251	*Eucalyptus polyanthemos*	Red Box	12	10	Good	5.64	47	No	ST		Secondary	Out
5252	*Eucalyptus polyanthemos*	Red Box	8	12	Good	5.04	42	No	ST		Secondary	Out
5255	*Eucalyptus polyanthemos*	Red Box	8	10	Fair	5.16	43	No	ST		Secondary	Out
5261	*Eucalyptus polyanthemos*	Red Box	13	8	Good	8.16	68	No	ST	LT	Secondary	In
5262	*Eucalyptus polyanthemos*	Red Box	9	6	Good	3.96	33	No	ST		Secondary	In
5264	*Eucalyptus polyanthemos*	Red Box	7	5	Dead	3.72	24	No	ST		Secondary	In
5290	*Eucalyptus melliodora*	Yellow Box	10	6	Fair	3.96	33	No	ST		Key	In
5291	*Eucalyptus melliodora*	Yellow Box	11	6	Good	5.52	36	No	ST		Key	In

ID NUMBER (APPENDIX B-2 AND RYDER 2020)	BOTANICAL	COMMON_NAM	HEIGHT	WIDTH	HEALTH	TPZ M	LARGEST_ STEM DBH	MED-LGE HOLLOWS	CATEGORY	LARGE TREE (LT)	SWIFT PARROT	PROJECT AREA (TRUNK POSITION)
5308	*Eucalyptus camaldulensis*	River Red Gum	14	8	Good	6.36	53	No	ST		Secondary	In
5309	*Eucalyptus camaldulensis*	River Red Gum	12	6	Good	5.4	45	No	ST		Secondary	In
5310	*Eucalyptus camaldulensis*	River Red Gum	10	6	Good	4.2	35	No	ST		Secondary	In
5388	*Eucalyptus camaldulensis*	River Red Gum	12	5	Good	4.32	31	No	ST		Secondary	In
5389	*Eucalyptus camaldulensis*	River Red Gum	13	4	Good	3.24	27	No	ST		Secondary	In
5392	*Eucalyptus polyanthemos*	Red Box	9	3	Fair	2.28	19	No	ST		Secondary	In
5393	*Eucalyptus polyanthemos*	Red Box	8	5	Fair	2.76	23	No	ST		Secondary	In
5401	*Eucalyptus camaldulensis*	River Red Gum	15	6	Good	4.56	38	No	ST		Secondary	In
5406	*Eucalyptus camaldulensis*	River Red Gum	4	2	Good	2	5	No	ST		Secondary	In
5538	*Eucalyptus melliodora*	Yellow Box	20	11	Good	8.28	51	No	ST		Key	In
5539	*Eucalyptus melliodora*	Yellow Box	22	15	Fair	14.52	121	Yes	ST	LT	Key	In
5540	*Eucalyptus camaldulensis*	River Red Gum	20	20	Good	11.64	97	Yes	ST	LT	Secondary	Out
5541	*Eucalyptus goniocalyx*	Long-leaved Box	12	13	Fair	10.2	85	No	ST	LT		In
5570	*Eucalyptus melliodora*	Yellow Box	5	1	Good	2	6	No	ST		Key	In
5573	*Eucalyptus radiata*	Narrow-leaved Peppermint	3	2	Good	2	14	No	ST			In
5626	*Eucalyptus camaldulensis*	River Red Gum	20	17	Good	15	134	No	ST	LT	Secondary	In
5627	*Eucalyptus camaldulensis*	River Red Gum	20	18	Good	14.28	119	No	ST	LT	Secondary	Out
5631	*Eucalyptus camaldulensis*	River Red Gum	20	20	Good	9.72	81	No	ST	LT	Secondary	In
5632	*Eucalyptus camaldulensis*	River Red Gum	25	20	Good	13.2	110	Yes	ST	LT	Secondary	In
5633	*Eucalyptus camaldulensis*	River Red Gum	25	15	Fair	15	207	Yes	ST	LT	Secondary	Out
5634	*Eucalyptus camaldulensis*	River Red Gum	23	12	Fair	9.96	83	No	ST	LT	Secondary	In
5635	*Eucalyptus camaldulensis*	River Red Gum	7	3	Good	2.28	19	No	ST		Secondary	In

ID NUMBER (APPENDIX B-2 AND RYDER 2020)	BOTANICAL	COMMON_NAM	HEIGHT	WIDTH	HEALTH	TPZ M	LARGEST_ STEM DBH	MED-LGE HOLLOWS	CATEGORY	LARGE TREE (LT)	SWIFT PARROT	PROJECT AREA (TRUNK POSITION)
5636	*Eucalyptus camaldulensis*	River Red Gum	6	3	Poor	2	13	No	ST		Secondary	In
5637	*Eucalyptus camaldulensis*	River Red Gum	6	3	Poor	2	8	No	ST		Secondary	In
5638	*Eucalyptus camaldulensis*	River Red Gum	7	4	Good	2.04	17	No	ST		Secondary	In
5639	*Eucalyptus camaldulensis*	River Red Gum	17	16	Good	15	130	No	ST	LT	Secondary	In
5640	*Eucalyptus camaldulensis*	River Red Gum	13	12	Good	6.72	45	No	ST		Secondary	In
5648	*Eucalyptus camaldulensis*	River Red Gum	5	4	Good	2	9	No	ST		Secondary	In
5649	*Eucalyptus camaldulensis*	River Red Gum	5	5	Good	3.12	18	No	ST		Secondary	In
5658	*Eucalyptus camaldulensis*	River Red Gum	6	2	Poor	2.76	18	No	ST		Secondary	In
5666	*Eucalyptus camaldulensis*	River Red Gum	25	20	Good	15	179	No	HZ	LT	Secondary	Out
5667	*Eucalyptus camaldulensis*	River Red Gum	15	12	Good	10.2	85	No	ST	LT	Secondary	Out
5668	*Eucalyptus camaldulensis*	River Red Gum	20	15	Good	15	154	No	ST	LT	Secondary	Out
5675	*Eucalyptus sp.*	Gum	5	4	Good	2.04	17	No	ST			In
5731	*Eucalyptus polyanthemos*	Red Box	10	9	Good	6.24	52	No	ST		Secondary	In
5742	*Eucalyptus camaldulensis*	River Red Gum	8	9	Good	6.84	43	No	ST		Secondary	In
5789	*Eucalyptus melliodora*	Yellow Box	3	1	Good	2	6	No	ST		Key	In
5790	*Eucalyptus melliodora*	Yellow Box	4	2	Good	2	12	No	ST		Key	In
5873	*Eucalyptus goniocalyx*	Long-leaved Box	6	2	Dead	2	14	No	ST			In
5965	*Eucalyptus goniocalyx*	Long-leaved Box	6	8	Poor	5.88	49	No	ST			In
6003	*Eucalyptus melliodora*	Yellow Box	18	12	Fair	10.92	91	No	HZ	LT	Key	Out
6021	*Eucalyptus camaldulensis*	River Red Gum	14	9	Good	6	50	No	ST		Secondary	Out
6022	*Eucalyptus camaldulensis*	River Red Gum	19	14	Good	9.72	81	No	ST	LT	Secondary	In
6023	*Eucalyptus camaldulensis*	River Red Gum	12	8	Good	5.76	48	No	ST		Secondary	Out

ID NUMBER (APPENDIX B-2 AND RYDER 2020)	BOTANICAL	COMMON_NAM	HEIGHT	WIDTH	HEALTH	TPZ M	LARGEST_ STEM DBH	MED-LGE HOLLOWS	CATEGORY	LARGE TREE (LT)	SWIFT PARROT	PROJECT AREA (TRUNK POSITION)
6024	*Eucalyptus camaldulensis*	River Red Gum	17	20	Good	13.8	85	No	ST	LT	Secondary	Out
6028	*Eucalyptus goniocalyx*	Long-leaved Box	15	20	Fair	10.8	90	No	ST	LT		In
6037	*Eucalyptus goniocalyx*	Long-leaved Box	18	25	Good	15	135	No	HZ	LT		In
6038	*Eucalyptus goniocalyx*	Long-leaved Box	12	18	Good	9	75	No	HZ	LT		In
6077	*Eucalyptus viminalis*	Manna Gum	22	16	Good	11.4	74	No	HZ	LT		In
6188	*Eucalyptus goniocalyx*	Long-leaved Box	15	15	Dead	8.76	73	No	HZ	LT		In
6230	*Eucalyptus goniocalyx*	Long-leaved Box	15	15	Very poor	12.12	101	No	HZ	LT		In
6231	*Eucalyptus polyanthemos*	Red Box	20	14	Good	9.24	77	No	HZ	LT	Secondary	In
6240	*Eucalyptus goniocalyx*	Long-leaved Box	10	8	Poor	9.12	70	No	HZ	LT		In
6244	*Eucalyptus goniocalyx*	Long-leaved Box	16	9	Fair	7.68	64	No	HZ	LT		In
6247	*Eucalyptus goniocalyx*	Long-leaved Box	17	15	Good	8.88	74	No	HZ	LT		In
6343	*Eucalyptus goniocalyx*	Long-leaved Box	12	10	Dead	7.2	60	No	HZ	LT		In
6344	*Eucalyptus goniocalyx*	Long-leaved Box	15	12	Poor	8.04	67	No	HZ	LT		In
6414	*Eucalyptus melliodora*	Yellow Box	20	11	Good	7.2	44	No	ST		Key	Out
6431	*Eucalyptus goniocalyx*	Long-leaved Box	18	15	Good	10.44	87	No	HZ	LT		In
6516	*Eucalyptus goniocalyx*	Long-leaved Box	18	13	Good	12.6	105	No	HZ	LT		In
6518	*Eucalyptus goniocalyx*	Long-leaved Box	20	8	Good	8.88	68	No	HZ	LT		In
6526	*Eucalyptus goniocalyx*	Long-leaved Box	17	13	Dead	7.92	66	No	HZ	LT		In
6540	*Eucalyptus goniocalyx*	Long-leaved Box	16	10	Dead	8.04	67	No	HZ	LT		In
6570	*Eucalyptus goniocalyx*	Long-leaved Box	18	14	Fair	11.28	69	No	HZ	LT		Out
6596	*Eucalyptus radiata*	Narrow-leaved Peppermint	13	10	Good	4.92	41	No	ST			Out

ID NUMBER (APPENDIX B-2 AND RYDER 2020)	BOTANICAL	COMMON_NAM	HEIGHT	WIDTH	HEALTH	TPZ M	LARGEST_ STEM DBH	MED-LGE HOLLOWS	CATEGORY	LARGE TREE (LT)	SWIFT PARROT	PROJECT AREA (TRUNK POSITION)
6597	*Eucalyptus radiata*	Narrow-leaved Peppermint	8	5	Good	3	20	No	ST			In
6601	*Eucalyptus viminalis*	Manna Gum	15	6	Good	5.04	34	No	ST			In
6629	*Eucalyptus melliodora*	Yellow Box	14	9	Good	3.36	28	No	ST		Key	In
6697	*Eucalyptus melliodora*	Yellow Box	7	5	Fair	3.48	29	No	ST		Key	In
6750	*Eucalyptus polyanthemos*	Red Box	7	3	Good	2	11	No	ST		Secondary	In
6751	*Eucalyptus polyanthemos*	Red Box	3	2	Good	2	9	No	ST		Secondary	In
6829	*Eucalyptus polyanthemos*	Red Box	15	16	Good	8.4	70	No	ST	LT	Secondary	In
6846	*Eucalyptus blakelyi*	Blakely's Red Gum	15	10	Good	6.12	51	No	ST			In
6847	*Eucalyptus blakelyi*	Blakely's Red Gum	15	6	Fair	5.76	48	No	ST			In
6848	*Eucalyptus blakelyi*	Blakely's Red Gum	15	9	Good	6.84	57	No	ST			In
6849	*Eucalyptus blakelyi*	Blakely's Red Gum	12	10	Good	4.68	39	No	ST			In
6854	*Eucalyptus goniocalyx*	Long-leaved Box	15	15	Good	15	154	No	ST	LT		In
6863	*Eucalyptus polyanthemos*	Red Box	15	15	Good	15	140	Yes	ST	LT	Secondary	In
6872	*Eucalyptus camaldulensis*	River Red Gum	16	18	Good	8.4	70	No	HZ	LT	Secondary	In
7108	*Eucalyptus polyanthemos*	Red Box	15	20	Good	15	99	Yes	ST	LT	Secondary	In
7162	*Eucalyptus melliodora*	Yellow Box	17	7	Fair	7.2	45	No	ST		Key	In
7171	*Eucalyptus goniocalyx*	Long-leaved Box	6	4	Dead	9	75	Yes	HZ	LT		In
7185	*Eucalyptus goniocalyx*	Long-leaved Box	12	20	Good	9	75	No	HZ	LT		In
7209	*Eucalyptus goniocalyx*	Long-leaved Box	14	11	Fair	7.2	60	No	HZ	LT		In
7211	*Eucalyptus goniocalyx*	Long-leaved Box	15	17	Fair	10.92	77	No	HZ	LT		In
7238	*Eucalyptus polyanthemos*	Red Box	12	6	Good	4.08	34	No	ST		Secondary	In
7242	*Eucalyptus polyanthemos*	Red Box	12	5	Fair	3.72	31	No	ST		Secondary	Out

ID NUMBER (APPENDIX B-2 AND RYDER 2020)	BOTANICAL	COMMON_NAM	HEIGHT	WIDTH	HEALTH	TPZ M	LARGEST_ STEM DBH	MED-LGE HOLLOWS	CATEGORY	LARGE TREE (LT)	SWIFT PARROT	PROJECT AREA (TRUNK POSITION)
7243	*Eucalyptus polyanthemos*	Red Box	12	5	Fair	3	25	No	ST		Secondary	In
7300	*Eucalyptus goniocalyx*	Long-leaved Box	18	12	Dead	11.4	95	No	HZ	LT		In
7310	*Eucalyptus goniocalyx*	Long-leaved Box	15	13	Good	8.28	69	No	HZ	LT		Out
7331	*Eucalyptus viminalis*	Manna Gum	22	8	Good	7.2	60	No	HZ	LT		Out
8002	*Eucalyptus sp.*	Gum	0	0		6.96	58		ST			In

APPENDIX H

NATIVE VEGETATION PATCHES; HABITAT HECTARE DATA

H1. VEGETATION PATCHES AND HABITAT HECTARE DATA

The follow table provides data from the Vegetation Quality Assessments completed for the Project (i.e. habitat hectare data). ID numbers refer to those on Appendix B-2.

Table H.1 Habitat hectare assessment results of Patches of native vegetation within the study area

HH_SI	AREA (HA)	EVC	LARGE TREE SCORE	TREE CANOPY	LACK OF WEEDS	UNDERSTORY	RECRUITMENT	ORGANIC LITTER	LOGS	SITE CONDITION	STANDARDISED SITE CONDITION	LANDSCAPE CONTEXT	FINAL HABITAT SCORE
1	0.0845	Plains Grassy Woodland	9	4	2	5	0	3	0	23	23	6	29
2	0.0069	Plains Grassy Woodland	0	0	0	5	0	2	0	7	7	2	9
3	0.0195	Plains Grassy Woodland	9	4	2	0	0	2	2	19	19	2	21
4	0.0065	Plains Grassy Woodland	0	0	0	5	0	2	0	7	7	2	9
5	0.0409	Valley Grassy Forest	0	2	6	5	0	5	2	20	20	2	22
6	0.0242	Valley Grassy Forest	0	2	6	5	0	5	2	20	20	2	22
7	0.0143	Plains Grassy Woodland	0	4	0	5	0	0	0	9	9	2	11
8	0.0221	Plains Grassy Woodland	0	2	6	5	0	3	0	16	16	2	18
9	0.0227	Plains Grassy Woodland	0	2	6	5	0	3	0	16	16	2	18
10	0.0562	Plains Grassy Woodland	9	4	2	5	0	5	0	25	25	2	27
11	0.0320	Valley Grassy Forest	0	4	4	5	3	5	0	21	21	2	23
12	0.0149	Valley Grassy Forest	0	4	4	5	3	5	0	21	21	2	23
13	0.1287	Valley Grassy Forest	3	2	2	5	0	5	0	17	17	2	19
14	0.0592	Valley Grassy Forest	0	2	2	5	0	5	0	14	14	2	16
15	0.0267	Valley Grassy Forest	0	2	2	5	0	5	0	14	14	2	16

HH_SI	AREA (HA)	EVC	LARGE TREE SCORE	TREE CANOPY	LACK OF WEEDS	UNDERSTORY	RECRUITMENT	ORGANIC LITTER	LOGS	SITE CONDITION	STANDARDISED SITE CONDITION	LANDSCAPE CONTEXT	FINAL HABITAT SCORE
16	0.0349	Tall Marsh	0	0	6	5	3	2	0	16	21.76	2	23.76
17	0.2822	Tall Marsh	0	0	6	15	6	5	0	32	43.52	2	45.52
18	0.0254	Aquatic Herbland	0	0	15	5	6	0	0	26	35.36	2	37.36
19	0.0486	Plains Sedgy Wetland	0	0	9	15	3	3	0	30	40.8	2	42.8
20	0.0775	Tall Marsh	0	0	4	15	3	5	0	27	36.72	2	38.72
21	0.0617	Valley Grassy Forest	9	4	2	5	0	3	0	23	23	6	29
22	0.0677	Valley Grassy Forest	9	4	2	5	0	3	0	23	23	6	29
23	0.0532	Valley Grassy Forest	7	4	6	10	0	5	0	32	32	2	34
24	0.0327	Valley Grassy Forest	0	4	2	5	3	3	0	17	17	2	19
25	0.0265	Valley Grassy Forest	9	4	6	10	0	5	0	34	34	2	36
26	0.0484	Valley Grassy Forest	0	4	6	10	0	5	0	25	25	2	27
27	0.0255	Valley Grassy Forest	0	4	6	10	0	5	0	25	25	6	31
28	0.2251	Valley Grassy Forest	7	4	6	10	0	5	0	32	32	6	38
29	0.0519	Grassy Dry Forest	9	2	2	5	0	5	2	25	25	9	34
30	0.0046	Grassy Dry Forest	0	2	11	10	5	5	4	37	37	5	42
31	0.0737	Grassy Dry Forest	9	2	6	10	0	5	2	34	34	9	43
32	0.1044	Grassy Dry Forest	0	2	11	15	5	5	4	42	42	5	47
33	0.4569	Grassy Dry Forest	3	2	2	5	0	5	2	19	19	9	28
34	0.1609	Grassy Dry Forest	2	2	2	15	10	5	0	36	36	9	45
35	0.9995	Grassy Dry Forest	10	4	6	5	0	5	2	32	32	5	37
36	0.0472	Grassy Dry Forest	9	2	2	15	10	5	0	43	43	9	52
37	0.3700	Grassy Dry Forest	5	2	7	20	10	5	4	53	53	9	62

HH_SI	AREA (HA)	EVC	LARGE TREE SCORE	TREE CANOPY	LACK OF WEEDS	UNDERSTORY	RECRUITMENT	ORGANIC LITTER	LOGS	SITE CONDITION	STANDARDISED SITE CONDITION	LANDSCAPE CONTEXT	FINAL HABITAT SCORE
38	0.7327	Grassy Dry Forest	4	4	2	10	5	5	2	32	32	9	41
39	0.0136	Aquatic Herbland	0	0	9	5	3	3	0	20	27.2	3	30.2
40	0.0485	Grassy Dry Forest	9	4	2	5	0	5	2	27	27	5	32
41	0.2623	Grassy Dry Forest	0	0	4	5	1	2	0	12	12	5	17
42	0.0774	Grassy Dry Forest	9	2	2	10	3	5	2	33	33	9	42
43	0.5625	Grassy Dry Forest	0	0	9	5	0	2	0	16	16	5	21
44	0.0436	Grassy Dry Forest	0	4	2	15	3	3	2	29	29	5	34
45	0.1421	Grassy Dry Forest	9	4	2	10	3	3	2	33	33	9	42
46	0.0013	Grassy Dry Forest	0	3	2	5	0	3	0	13	13	4	17
47	0.0044	Valley Grassy Forest	0	5	13	5	0	5	0	28	28	6	34
48	0.0461	Grassy Dry Forest	0	2	6	5	0	3	0	16	16	6	22
49	0.0078	Grassy Dry Forest	0	4	2	10	3	3	0	22	22	6	28
50	0.3346	Grassy Dry Forest	7	4	2	5	0	5	2	25	25	6	31
51	0.0093	Valley Grassy Forest	0	0	7	5	0	5	0	17	17	6	23
52	0.4558	Valley Grassy Forest	7	4	2	10	3	5	0	31	31	6	37
53	0.2333	Grassy Dry Forest	5	4	0	5	1	5	0	20	20	6	26
54	0.0169	Valley Grassy Forest	9	0	7	5	0	5	0	26	26	6	32
55	0.0056	Grassy Dry Forest	0	0	0	5	1	5	0	11	11	6	17
56	0.0839	Grassy Dry Forest	0	0	11	10	5	5	0	31	31	6	37
57	0.0355	Grassy Dry Forest	9	0	11	10	5	5	0	40	40	6	46
58	0.0555	Grassy Dry Forest	7	4	2	5	0	5	2	25	25	6	31
59	0.0590	Grassy Dry Forest	0	4	2	5	0	5	2	18	18	6	24

HH_SI	AREA (HA)	EVC	LARGE TREE SCORE	TREE CANOPY	LACK OF WEEDS	UNDERSTORY	RECRUITMENT	ORGANIC LITTER	LOGS	SITE CONDITION	STANDARDISED SITE CONDITION	LANDSCAPE CONTEXT	FINAL HABITAT SCORE
60	0.0330	Grassy Dry Forest	0	0	11	10	5	5	0	31	31	6	37
61	0.0176	Grassy Dry Forest	9	4	2	5	0	5	2	27	27	6	33
62	0.0438	Grassy Dry Forest	9	4	6	5	0	5	0	29	29	4	33
63	0.0181	Grassy Dry Forest	0	2	0	5	0	3	0	10	10	4	14
64	0.0186	Grassy Dry Forest	0	4	0	5	0	3	0	12	12	4	16
65	0.2806	Grassy Dry Forest	0	2	6	5	0	5	0	18	18	4	22
66	0.0218	Grassy Dry Forest	0	2	0	5	1	3	0	11	11	4	15
67	0.0280	Grassy Dry Forest	0	4	4	5	0	5	0	18	18	4	22
68	0.3767	Grassy Dry Forest	0	4	0	5	5	3	0	17	17	4	21
69	0.1397	Grassy Dry Forest	9	4	4	5	0	5	0	27	27	4	31
70	0.2709	Grassy Dry Forest	0	0	0	5	0	2	0	7	7	4	11
71	0.0708	Grassy Dry Forest	6	2	6	5	0	3	0	22	22	4	26
72	0.1825	Swampy Woodland	4	4	4	5	0	5	0	22	22	4	26
73	0.1713	Grassy Dry Forest	0	0	4	5	0	4	0	13	13	4	17
74	0.0643	Aquatic Herbland	0	0	6	5	3	3	0	17	23.12	4	27.12
75	0.0279	Aquatic Herbland	0	0	6	5	3	0	0	14	19.04	4	23.04
76	0.0230	Grassy Dry Forest	0	0	0	5	0	2	0	7	7	4	11
77	0.0830	Swampy Woodland	0	3	4	15	1	3	2	28	28	4	32
78	0.2262	Grassy Dry Forest	0	0	4	5	0	2	0	11	11	4	15
79	0.0682	Grassy Dry Forest	0	0	0	5	0	2	0	7	7	4	11
80	0.0491	Grassy Dry Forest	9	4	9	15	3	5	0	45	45	4	49
81	0.1202	Grassy Dry Forest	0	2	0	5	0	3	0	10	10	4	14

HH_SI	AREA (HA)	EVC	LARGE TREE SCORE	TREE CANOPY	LACK OF WEEDS	UNDERSTORY	RECRUITMENT	ORGANIC LITTER	LOGS	SITE CONDITION	STANDARDISED SITE CONDITION	LANDSCAPE CONTEXT	FINAL HABITAT SCORE
82	0.0303	Grassy Dry Forest	0	4	9	15	3	5	0	36	36	4	40
83	0.0636	Grassy Dry Forest	0	4	4	5	3	3	0	19	19	4	23
84	0.0123	Grassy Dry Forest	0	4	9	15	3	5	0	36	36	4	40
85	0.1242	Grassy Dry Forest	0	4	11	5	0	5	0	25	25	4	29
86	0.0325	Grassy Dry Forest	9	4	9	15	3	5	0	45	45	4	49
87	0.0645	Grassy Dry Forest	0	4	4	10	3	5	0	26	26	7	33
88	0.1576	Grassy Dry Forest	0	2	9	5	3	5	0	24	24	2	26
89	0.0565	Grassy Dry Forest	9	4	4	10	3	5	0	35	35	7	42
90	0.0055	Grassy Dry Forest	0	0	6	5	5	5	0	21	21	7	28
91	0.0044	Grassy Dry Forest	0	0	6	5	5	5	0	21	21	7	28
92	0.1071	Valley Grassy Forest	7	2	4	5	3	5	2	28	28	7	35
93	0.0182	Plains Grassy Woodland	0	4	2	5	0	5	0	16	16	7	23
94	0.0437	Plains Grassy Woodland	9	4	2	5	0	3	0	23	23	7	30
95	0.2357	Swampy Woodland	4	4	9	5	3	5	0	30	30	4	34
96	0.1341	Valley Grassy Forest	0	4	2	5	0	5	0	16	16	7	23
97	0.2615	Grassy Dry Forest	8	4	2	5	0	5	0	24	24	10	34
98	0.0028	Grassy Dry Forest	0	4	2	5	0	5	0	16	16	10	26
99	0.0690	Grassy Dry Forest	0	4	7	15	10	5	2	43	43	11	54
100	0.4318	Grassy Dry Forest	3	4	2	10	3	5	0	27	27	6	33
101	0.4483	Grassy Dry Forest	3	4	7	15	10	5	2	46	46	11	57
102	0.0165	Grassy Dry Forest	0	4	4	5	0	5	0	18	18	11	29
103	0.1910	Grassy Dry Forest	0	3	7	15	10	5	2	42	42	5	47

HH_SI	AREA (HA)	EVC	LARGE TREE SCORE	TREE CANOPY	LACK OF WEEDS	UNDERSTORY	RECRUITMENT	ORGANIC LITTER	LOGS	SITE CONDITION	STANDARDISED SITE CONDITION	LANDSCAPE CONTEXT	FINAL HABITAT SCORE
104	0.0281	Grassy Dry Forest	0	4	4	5	3	5	0	21	21	11	32
105	0.0321	Grassy Dry Forest	9	4	4	5	3	5	0	30	30	6	36
106	0.0509	Grassy Dry Forest	0	4	7	15	10	5	2	43	43	11	54
107	0.4501	Grassy Dry Forest	4	4	4	5	3	5	0	25	25	9	34
108	0.0049	Grassy Dry Forest	0	2	0	5	0	5	0	12	12	5	17
109	0.0130	Grassy Dry Forest	0	4	4	5	0	3	0	16	16	5	21
110	0.0167	Grassy Dry Forest	0	4	0	5	0	3	0	12	12	5	17
111	0.0134	Grassy Dry Forest	0	4	7	15	6	3	0	35	35	13	48
112	0.0039	Grassy Dry Forest	0	4	0	5	0	3	0	12	12	5	17
113	0.3489	Grassy Dry Forest	8	4	4	5	0	5	0	26	26	6	32
114	0.0941	Grassy Dry Forest	9	4	4	10	0	5	0	32	32	6	38
115	0.1579	Grassy Dry Forest	5	2	2	10	3	5	0	27	27	6	33
116	0.1711	Grassy Dry Forest	7	4	4	10	0	5	0	30	30	6	36
117	0.0360	Grassy Dry Forest	9	4	2	5	0	5	0	25	25	6	31
118	0.0408	Grassy Dry Forest	0	4	4	10	0	5	0	23	23	6	29
119	0.1461	Grassy Dry Forest	9	4	4	5	0	5	0	27	27	6	33
120	0.0130	Aquatic Herbland	0	0	7	15	5	5	0	32	43.52	6	49.52
121	0.3864	Grassy Dry Forest	0	2	4	10	3	5	2	26	26	13	39
122	0.0808	Grassy Dry Forest	0	4	2	10	5	5	4	30	30	6	36
123	0.3048	Grassy Dry Forest	0	2	4	10	3	5	2	26	26	13	39
124	0.8645	Grassy Dry Forest	0	2	7	5	1	3	0	18	18	6	24
125	0.0275	Aquatic Herbland	0	0	7	15	5	5	0	32	43.52	6	49.52

HH_SI	AREA (HA)	EVC	LARGE TREE SCORE	TREE CANOPY	LACK OF WEEDS	UNDERSTORY	RECRUITMENT	ORGANIC LITTER	LOGS	SITE CONDITION	STANDARDISED SITE CONDITION	LANDSCAPE CONTEXT	FINAL HABITAT SCORE
126	0.0450	Grassy Dry Forest	0	2	4	10	3	5	2	26	26	13	39
127	1.0177	Grassy Dry Forest	6	4	0	15	3	3	4	35	35	10	45
128	0.4889	Grassy Dry Forest	7	4	4	10	3	5	0	33	33	6	39
129	0.3174	Grassy Dry Forest	0	0	7	5	0	0	0	12	12	10	22
130	0.0259	Grassy Dry Forest	9	5	7	5	0	2	0	28	28	7	35
131	0.0015	Grassy Dry Forest	0	4	4	10	3	5	0	26	26	13	39
132	0.1292	Grassy Dry Forest	9	2	4	5	3	5	2	30	30	6	36
133	0.0005	Grassy Dry Forest	0	2	2	5	3	3	0	15	15	13	28
134	0.0085	Grassy Dry Forest	0	2	2	5	3	3	0	15	15	13	28
135	0.0016	Grassy Dry Forest	0	2	2	5	3	3	0	15	15	13	28
136	0.0101	Grassy Dry Forest	0	2	2	5	3	3	0	15	15	13	28
137	0.0491	Grassy Dry Forest	0	2	2	10	10	5	2	31	31	13	44
138	0.0104	Grassy Dry Forest	0	2	2	10	10	5	2	31	31	13	44

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