Final Report

Ecological Assessment: Watta Wella Renewable Energy Project, Joel Joel, Victoria

Prepared for

Umwelt (Australia) Pty Ltd

July 2022

Ecology and Heritage Partners Pty Ltd

MELBOURNE: 292 Mt Alexander Road, Ascot Vale VIC 3032 **GEELONG:** 230 Latrobe Terrace, Geelong West VIC 3218
BRISBANE: Level 22, 127 Creek Street, Brisbane QLD 4000 **ADELAIDE**: 78 Edmund Avenue, Unley SA 5061
CANBERRA: 19-23 Moor Street, Turner ACT 2612 **SYDNEY:** Level 5, 616 Harris Street, Ultimo NSW 2007
www.ehpartners.com.au | 1300 839 325

DOCUMENT CONTROL

Assessment type	Ecological Assessment
Address	Watta Wella Renewable Energy Project, Victoria
Project number	13637
Project manager	Shannon LeBel (Associate Ecologist)
Report reviewer	Shannon LeBel (Associate Ecologist); Andrew Hill (Principal Ecologist)
Other EHP staff	Alex Wilkinson (Consultant Zoologist), Callum Luke (Senior Zoologist), Anneke Martin (Consultant Botanist), Jordan Whitmore (Consultant Botanist), Samantha Barron (Consultant Botanist); Claire Ranyard (Senior Botanist)
Mapping	Monique Elsley (GIS Coordinator), Sanda Pannipitiya (GIS Officer)
File name	13637_EHP_EA_WattaWellaRenewableProject_Finalv2_27072022
Client	Umwelt (Australia) Pty Ltd
Bioregion	Goldfields and Wimmera
Catchment Management Authority	Wimmera
Council	Northern Grampians Shire

VERSION CONTROL

Report versions	Comments	Comments made by:	Date submitted
Draft	Report sent to the client for review	AW, AM, JW, SL	17/03/2022
Preliminary Final	Updated Development Footprint; Inclusion of TEC Mapping; Updates to comments provides by Umwelt	SLB; CR	15/06/2022
PrelimFinal v2	Updates to comments provided by Umwelt and RES; Inclusion of significant impact tables for MNES.	SLB	30/06/2022
Final	Minor updates and clarifications responding to comments provided by Umwelt and RES	SLB	19/07/2022
Final v2	Minor updates and clarifications responding to comments provided by Umwelt and RES	SLB	27/07/2022

Acknowledgements

We thank the following people for their contribution to the project:

- The landowners who provided access to the Project Site;
- Renee Brozovich, Mark Herod, Kaylah Malishev and Caroline Funnell (Umwelt Australia Pty Ltd) for project and site information;
- Nathan Kelly and Marton Kalocsay (RES Australia) for project and site information;
- Rob Gration (EcoAerial Environmental Services) for Anabat call analysis.
- BirdLife Australia for the use of the data available on the Birdlife New Atlas pertaining to the Project Site and immediate surrounds.
- The Victorian Department of Environment, Land, Water and Planning for access to ecological databases, and assistance is refining the scope of the ecological assessment program.

The Commonwealth Department of Climate Change, Energy, the Environment and Water for access to ecological databases.

EXECUTIVE SUMMARY

Introduction

Ecology and Heritage Partners Pty Ltd was commissioned by Umwelt (Australia) Pty Ltd on behalf of RES Australia Pty Ltd (RES) to undertake an Ecological Assessment to determine the ecological values present within, and inform the ecological planning and legislative implications of the proposed Watta Wella Renewable Energy Project (the Project) located in Joel Joel, Victoria (the Project Site).

We understand that Umwelt (Australia) Pty Ltd have been engaged by RES Australia Pty Ltd (RES) to manage the planning and approvals process for the Project.

The assessment was undertaken to identify and characterise the vegetation on-site, determine the presence (or likelihood thereof) of any significant flora and fauna species and/or ecological communities, and address any implications under Commonwealth and State environmental legislation and policy.

Methods

The ecological field assessment program detailed in this report commenced in July 2019, and was completed in March 2022. The field assessments sought primarily to assess the extent and condition of native vegetation communities and potential flora and fauna habitat, with particular consideration given to significant ecological communities and species of conservation concern, such as threatened and migratory species. The survey program was designed to optimise the survey timing, methods and frequency to enable sampling of those flora and fauna species which occur seasonally.

Flora

Targeted surveys for the nationally significant Tawny Spider-orchid *Caladenia fulva* and River Swamp Wallaby-grass *Amphibromus fluitans* were undertaken within areas of potential habitat along and adjacent to the infrastructure footprint.

Fauna

Fauna surveys included:

- Bird Utilisation Surveys;
- Microbat surveys using Anabat detector and Songmeter units;
- Golden Sun Moth *Synemon plana* targeted surveys;
- Level 1 Brolga Antigone rubicunda Assessments to address the potential risk posed to the species by the proposed Wind Farm
- eDNA sampling and analysis for Growling Grass Frog *Litoria raniformis* and Platypus *Ornithorhynchus anatinus*; and
- Swift Parrot *Lathamus discolor* habitat assessments;

Results

Flora

A total of 137.131 hectares of native vegetation was recorded within the Assessment Area, representative of seven EVC's: Plains Woodland (EVC 803), Grassy Woodland (EVC 175), *Low Rises* Grassy Woodland (EVC 175_61), Creekline Grassy Woodland (EVC 68), Heathy Woodland (EVC 48), Alluvial Terraces Herb-rich Woodland (EVC 67), and Box Ironbark Forest (EVC 61). These patches contained 619 Large Trees. A total of 329 scattered trees were recorded within the Project Site, which consisted of 280 Large and 49 Small scattered trees.

A total of 73 flora species were recorded, comprising 47 native and 26 non-native species. The nationally significant River Swamp Wallaby-grass was recorded, as well as the Grey Box Grassy Woodland nationally significant ecological community. The State significant Victorian Temperate Woodland Bird Community is also present throughout the Assessment Area.

Targeted surveys did not record Tawny Spider-orchid within the Assessment Area, although this was observed within a nearby reference site.

Two State significant flora species; Buloke *Allocasuarina luehmannii* and Hairy Tails *Ptilotis erebescens* were recorded within the Project Site during the field surveys.

Fauna

A total of 89 fauna species were recorded comprising 84 native and five non-native species.

Systematic surveys for Golden Sun Moth identified 164.53 hectares of Golden Sun Moth habitat in five discrete areas within the Assessment Area. Of this, approximately 9.75 hectares is proposed to be impacted.

No Swift Parrot were observed. However, the Project Site supports suitable foraging habitat for the species.

Three State significant fauna: Hardhead *Aythya australis*, Speckled Warbler *Chthonicola sagittate* and Hooded Robin *Melanodryas cucullata cucullata* were recorded during bird utilisation surveys.

No DNA from Growling Grass Frog or Platypus were detected in any of the samples analysed from 13 waterbodies.

No significant bats were recorded, and based on the Level 1 Brolga Assessment, a Level 2 Assessment is not required.

Legislative and Policy Implications

Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act – Commonwealth)

Based on the Preliminary Impact Assessment, there is a proposed impact 9.75 hectares of confirmed Golden Sun Moth habitat, and 1.671 hectares of the Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia ecological community.

All impacts to River Swamp Wallaby-grass have been avoided through micrositing of infrastructure and the inclusion of overhead/below ground reticulation. No Tawny Spider-orchid were recorded within the Assessment Area.

The Project Site also contains suitable foraging habitat for Swift Parrot. Any impacts to Swift Parrot through turbine collision could potentially represent a significant impact to the species. While turbines have been configured to reduce the risk of collision to the species, overall there is a low to moderate risk to the species from turbine collision.

The Project will be referral under the EPBC Act to the Commonwealth for further assessment.

Flora and Fauna Guarantee Act 1988 (FFG Act – Victoria)

Four fauna species (Golden Sun Moth, Hardhead, Hooded Robin, and Speckled Warbler), two flora species (Buloke, Hairy Tails) and one ecological community (Victorian Temperate Woodland Bird Community) listed as threatened under the FFG Act were recorded during the field surveys. Where impacts to these species or communities occur on private land, a permit under the FFG Act is not required. However, where impacts are proposed on public land (i.e. road reserves), an FFG Act permit will be required.

Environment Effects Act 1978 (Victoria)

It is unlikely that an EES will be triggered based on ecological impacts alone as:

- None of the thresholds relating to any of the individual ecological criteria are likely to be exceeded; and,
- None of the thresholds relating to the combination of ecological criteria are likely to be exceeded.

Implications relating to other legislation and policy are detailed in Section 6.

CONTENTS

1 INTRODUCTION

1.1 Background

Ecology and Heritage Partners Pty Ltd was commissioned by Umwelt (Australia) Pty Ltd (herein referred to as Umwelt) to undertake an Ecological Assessment to determine the ecological values present within, and inform the future ecological planning and legislative implications of the proposed Watta Wella Renewable Energy Project (the Project), located in Joel Joel, Victoria (the Project Site) (Figure 1).

The Project is proposed to have a combined output of approximately 460 megawatts to be fed into the Bulgana substation located south-east of the Project Site. The Project also includes a Battery Energy Storage System (BESS) with an anticipated 400MW / 1,200MWh of storage capacity.

The following describes the location details of the three components that form the proposed Project:

- The wind farm component covers the majority of the Project site, approximately 5,200 hectares and 13 landholdings:
    - The wind farm will include to 47 wind turbines generators (WTGs) with a generation capacity of approximately 376 megawatts (MW) and a anticipated turbine tip height up to 255 metres.
- The solar farm component of the Project covers approximately 170 hectares and is located in the south-eastern portion of the project site bordering the Wimmera River:
    - The solar farm will comprise solar photovoltaic (PV) panels on single axis tracker tables, utilising either single or bifacial solar panels with a generation capacity of up to 85MW direct current of electricity (MWdc).
- The BESS facility covers approximately 12 hectares and is located in the south-eastern portion of the Project site, west of the Bulgana Terminal Station:
    - The BESS will capture energy from one or both or the wind and solar components. The BESS is anticipated to have storage capacity of 400MW / 1,200MWh of storage capacity (3 hours at 400MW).

In addition, the Project will include:

- On-site substations for both the wind farm and solar farm, and BESS (220 kilovolt (kV) / 33kV);
- Overhead 220kV connection from both the wind farm and solar farm, and BESS to the existing Bulgana substation (approximately 600 metres in length pending final design detail of the Western Victoria Transmission Network Project (WVTNP); and,
- Associated ancillary infrastructure (onsite concrete batching plant, access tracks, overhead and underground cabling, an operational and maintenance facility and hardstand/laydown areas).

The exact turbine model has not yet been selected, therefore a turbine envelope approach has been applied using the upper limits of dimensions for the current turbines available in the market. The maximum dimensions include a 166 metre hub height with a blade length of 89 metres, resulting in a 255 metre tip height and 76 metre ground clearance. Therefore, the Rotor Swept Area (RSA) is expected to be between 77 metres and 255 metres in height.

We understand that Umwelt (Australia) Pty Ltd have been engaged by RES Australia Pty Ltd (RES) to manage the planning and approvals process for the Project, and that Emerge Associates were engaged to undertake the initial ecological investigations for the project, including preliminary ecological investigations (Emerge Associates 2020a), and a suite of targeted surveys (Emerge Associates 2020b). The ecological assessments documented within this report provide further detail and clarity about the ecological values present within the Project Site, the ecological and legislative implications of the proposed project including the associated approvals pathways, and detail regarding options to avoid and minimise impacts to native vegetation and any significant flora, fauna, and/or ecological communities present.

1.2 Objectives

The objectives of the ecological assessments were to:

- Review the previous ecological assessments to identify areas for further investigation;
- Conduct detailed field assessments to identify the extent and quality of any native vegetation present within the development footprint, according to the Habitat Hectares methodology;
- Conduct targeted surveys for significant flora and fauna identified to potentially occur on or utilise the site;
- Provide detailed maps showing any areas of native vegetation and locations of any significant flora and fauna species, and/or fauna habitat (if present);
- Classify any flora and fauna species, and vegetation communities identified or considered likely to occur within the Project Site in accordance with Commonwealth and State legislation;
- Document the implications of the proposed works with respect to relevant environmental legislation and policy; and,
- Document any opportunities and recommendations to avoid and minimise the potential ecological impacts, and any constraints associated with the proposed Project.

1.3 Project Site

The Project Site is located near Joel Joel, approximately 16 kilometres north-east of Stawell and 30 kilometres north of Ararat, Victoria (Figure 1).

The Project Site is located in the upper catchment of the Wimmera River, and comprises predominantly agricultural land (cropping and grazing), with scattered dams, sheds and dwellings present. The Wimmera River loosely tracks the northern and eastern boundaries of the Project Site, and many tributaries such as Greens Creek, Seven Mile Creek and many smaller drainage lines are scattered across the site. Vegetation is

largely confined to these riparian corridors, though scattered paddock trees and pockets of vegetation are also dotted across the landscape. The Project Site skirts Joel Joel Nature Conservation Reserve in the south, surrounds Seven Mile Creek Streamside Reserve in the west, and covers part of an ephemeral wetland in the east. Greens Creek Swamp Wildlife Reserve lies approximately two kilometres north east of the Project Site. The terrain is predominantly flat with some gentle slopes to the south west.

Surrounding land use is consistent with the Project Site, being predominantly agricultural with associated infrastructure. Several bushland reserves exist in the landscape, including Greens Creek Streamside Reserve to the north, Malakoff Bushland Reserve to the east, Holden Bushland to the south, and Watta Wella I18 Bushland Reserve to the west.

According to the Department of Environment, Land, Water and Planning (DELWP) NatureKit Map (DELWP 2022a), the Project Site intersects both the Goldfields and Wimmera bioregions, and is located within the Wimmera Catchment Management Authority (CMA) and Northern Grampians Shire municipality.

1.3.1 Assessment Area

Due to the size of the Project Site, the native vegetation assessment (including the detailed habitat hectares assessment) was only undertaken within the proposed impact footprint, but included a 100 metre buffer around each turbine, a 25 metre buffer along each side of all tracks and reticulation, and a 50 metre buffer around all other infrastructure, as stipulated by Umwelt. This area is referred to throughout the report as the 'Assessment Area'.

2 METHODS

Throughout the assessment process, consideration has been given to the following Commonwealth and Victorian environmental policy and legislation.

- *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act);
- *Environment Effects Act 1978* (EE Act);
- *Flora and Fauna Guarantee Act 1988* (FFG Act);
- *Planning and Environment Act 1987* (P&E Act);
- The Guidelines for the removal, destruction and lopping of native vegetation (DELWP 2017a);
- Solar Energy Facilities Design and Development Guidelines (DELWP 2019c);
- Development of Wind Energy Facilities in Victoria: Policy and Planning Guidelines (DELWP 2022f);
- Interim Guidelines for the Assessment, Avoidance, Mitigation and Offsetting of Potential Wind Farm Impacts on the Victorian Brolga Population (DSE 2012);
- Draft Brolga Assessment and Mitigation Standards for Wind Energy Facilities (DELWP 2020a);
- Northern Grampians Planning Scheme; including,
    - Clause 52.17 Native Vegetation; and,
    - Clause 52.32 Wind Energy Facility.
    - Clause 53.13 Renewable Energy Facility (other than Wind Energy Facility)
- *Wildlife Act 1975* (Wildlife Act); and,
- *Catchment and Land Protection Act 1994* (CaLP Act).

2.1 Desktop Assessment

Relevant literature, online-resources and databases were reviewed to provide an assessment of flora and fauna values associated with the Project Site. The following information sources were reviewed:

- The DELWP NatureKit Map (DELWP 2022a) and Native Vegetation Information Management (NVIM) Tool (DELWP 2022b) for:
    - Modelled data for location risk, native vegetation patches, scattered trees and habitat for rare or threatened species; and,
    - The extent of historic and current Ecological Vegetation Classes (EVCs).
    - EVC benchmarks (DELWP 2022c) for descriptions of EVCs within the relevant bioregion;
- The Victorian Biodiversity Atlas (VBA) for previously documented flora and fauna records within the project locality (DELWP 2021a);

- The Atlas of Living Australia (ALA) (ALA 2022) for assistance with the distribution and identification of flora species;
- BirdLife New Atlas Bird Data Extraction for significant birds within 20 kilometres of the Project Site (BirdLife Australia 2020);
- The Commonwealth Department of Agriculture, Water and the Environment (DAWE) Protected Matters Search Tool (PMST) for matters of National Environmental Significance (NES) protected under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) (DCCEEW 2022);
- Relevant listings under the Victorian *Flora and Fauna Guarantee Act 1988* (FFG Act), including the latest Threatened (DELWP 2022e) and Protected (DELWP 2019a) Lists;
- The online VicPlan Map (DELWP 2022d) to ascertain current zoning and environmental overlays in the Project Site;
- Aerial photography of the Project Site;
- Previous ecological assessments relevant to the Project Site; including;
    - Phase 1 Ecological Study – Joel Joel Wind and Solar Farm Phase 1. Project No: VEP19-014. Emerge Associates 2020a;
    - Phase 2 Targeted Ecological Assessments – Joel Joel Wind and Solar Farm. Project No: VEP19-014. Emerge Associates 2020b.
    - Bulgana Wind Farm Flora and Fauna Assessment. Brett Lane & Associated Pty Ltd (BL&A) 2014.
- Relevant environmental legislation and policies pertaining to target species including EPBC Act Policy Statements, FFG Act Action Statements, National Recovery Plans, Advisory Lists; including:
    - DEWHA 2009a. Significant impact guidelines for the critically endangered Golden Sun Moth (*Synemon plana*);
    - DEWHA 2008. Approved Conservation Advice for *Amphibromus fluitans* River Swamp Wallaby-grass;
    - DEWHA 2010a. Commonwealth Survey guidelines for Australia's threatened bats;
    - DEWHA 2010b. Commonwealth Survey guidelines for Australia's threatened birds; and,
    - DoE 2013. Commonwealth Draft Survey Guidelines for Australia's Threatened Orchids.

2.1.1 Literature Review

Several ecological assessments have previously been undertaken within the Project Site that describe the ecological values present, or that are considered likely to occur. The following summarises the key ecological implications and recommendations related to the below, relevant assessments:

Emerge Associates 2020a: Phase 1 Ecological Study – Joel Joel Wind and Solar Farm

Emerge Associates were engaged by Umwelt on behalf of RES Australia to conduct a baseline ecological assessment within the Project Site with the aim of establishing the baseline ecological condition in order to

inform the future design of the proposal, and determine which additional surveys would likely be required to inform the future planning and approvals phase. Umwelt undertook a desktop assessment followed by field assessments.

Emerge Associates identified the potential presence of four nationally significant ecological communities (Grey Box *Eucalyptus microcarpa* Grassy Woodlands or White Box-Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grasslands; Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions, and Seasonal Herbaceous Wetlands [Freshwater] of the Temperate Lowland Plains).

Umwelt confirmed the presence of four significant flora species (Buloke *Allocasuarina luehmannii*, River Swamp Wallaby-grass *Amphibromus fluitans*, Broad-lip Diuris *Diuris X palachila* and Hairy Tails *Ptilotus erubescens*) and identified the potential for additional significant flora species on site. One significant fauna species Golden Sun Moth *Synemon plana* was also detected on site.

The findings and recommendations contained in the Baseline Ecological Assessment report (Emerge Associates 2020a), as well as the results of the desktop assessment were used to inform the basis of the ecological survey program undertaken by Ecology and Heritage Partners as detailed in this report.

Emerge Associates 2020b. Phase 2 Targeted Ecological Assessment – Joel Joel Wind and Solar Farm

Emerge Associates undertook a targeted ecological assessment to determine the presence of any significant ecological communities, and flora and fauna species within the proposed Joel Joel Wind and Solar Farm site, located approximately ten kilometres north-east of Stawell.

While a total of 83 fauna species were recorded during the survey period, no significant fauna species – excluding the previously detected Golden Sun Moth – were recorded. In addition to the three flora species detected in Phase 1, targeted surveys identified a further four significant flora species (Tawny Spider-orchid *Caladenia fulva*, Arching Flax-lily *Dianella longifolia var.grandis*, River Swamp Wallaby-grass *Amphibromus fluitans*, Grassland Bindweed *Convolvulus graminetinus*) present within the Project Site.

Further investigation was recommended to confirm the presence of significant ecological values within the Project Site.

2.2 Consultation

DELWP was consulted throughout the pre-application process to inform the development of the project and discuss the survey design to ensure that a full understanding of potential impacts can be ascertained.

Table 1 summarises the stakeholder liaison activities that occurred during the pre-application process in relation to ecology, and a summary of the outcomes of the meeting.

Table 1. Stakeholder engagement activities undertaken in relation to ecological investigations.

Activity	Date	Matters Discussed	Outcomes
Virtual pre-application meeting with DELWP **Attendees:** Sam Mason, Mitch Connolly, Mark Dold, Nathan McDonald, Nihal Altuntas, Monique Claasz), Lisa McCauley, Geoff Ralphs, Rob Piccinin, Talia Schlen, Kathy Friday)	10/12/2020	• Proposed development footprint; • Broad planning framework; • Ecological survey program • Ecological survey findings to date;	• DELWP generally happy with proposed survey timing and schedule; • DELWP confirmed 3 bird utilisation surveys was appropriate for the project • Acknowledged that Swift Parrot collision risk modelling was unlikely to be useful given the discrete nature of the species; • Recommended additional surveys be undertaken for Platypus
Virtual pre-referral meeting with Commonwealth DAWE (now DCCEEW). **Attendees:** William Bonney, Alex Curtis, Chris Hicks, Alison McKinlay, Jessica Millett-Riley	24/06/2021	• Proposed development footprint; • Broad planning framework; • Ecological survey program • Ecological survey findings to date;	• DAWE generally happy with proposed survey timing and schedule; • Acknowledged that Swift Parrot collision risk modelling was unlikely to be useful given the discrete nature of the species;
Pre-application meeting with DELWP Major Project Assessment Team **Attendees:** Geoff Ralphs, Mitch Connolly, Sam mason, Kathy Friday, Rob Piccinin	04/04/2022	• Proposed development footprint; • Broad planning framework; • Ecological survey program • Ecological survey findings to date; • EES Referral Triggers	• DELWP generally happy with proposed survey timing and schedule; • DELWP welcome a draft EES referral submission prior to formal submission of documentation.

2.3 Field Assessments

The ecological field assessment program detailed in this report commenced in July 2019, and was completed in March 2022. The field assessments sought primarily to assess the extent and condition of native vegetation communities and potential flora and fauna habitat, with particular consideration given to significant ecological communities and species of conservation concern, such as threatened and migratory species. The survey program was designed to optimise the survey timing, methods and frequency to enable sampling of those flora and fauna species which occur seasonally.

All areas of the proposed infrastructure footprint and immediate surrounds were subject to field assessments, with a particular focus on the areas likely to support native vegetation and habitat for significant ecological

values as identified by Emerge Associates (Emerge Associates 2020a; 2020b), and as part of the desktop assessment.

All fieldwork was carried out under the appropriate licences, including a Research Permit (1008283) and Scientific Procedures Fieldwork Licence (SPFL20005) issued by DELWP under the *Wildlife Act 1975,* and an Animal Research permit issued by the Wildlife and Small Institutions Animal Ethics Committee (05.17).

The timing and effort utilised for each survey event is summarised in Table 2.

Further detail on the methodology used is provided in Sections 2.4, 2.5 and 2.6.

Table 2. Summary of Field Surveys.

Category	Survey dates	Resources
Habitat hectare and Large Tree assessments, general fauna assessments	- 5 – 9 October 2020 - 23 – 25 June 2021 - 18 – 21 October 2021	2 x ecologists
Targeted surveys for Tawny Spider-orchid	- 5 – 9 October 2020 - 18 – 21 October 2021	2 x ecologists
Targeted surveys for River Swamp Wallaby-grass	- 5-9 October 2020 - 19 October 2021 - 4 March 2022	2 x ecologists
Targeted flora surveys – other significant flora	- 5 – 9 October 2020 - 23 – 25 June 2021 - 18 – 21 October 2021	2 x ecologists
Targeted Golden Sun Moth surveys	- 26 November; 11, 13 and 15 December 2020 - 2, 10, 17 and 20 December 2021	2 x ecologists
eDNA sampling for Platypus and Growling Grass Frog	- 18 – 21 October 2021	1 ecologist
Bird Utilisation surveys	- 11 – 15 May 2020 - 23 – 27 November 2020 - 22 – 25 February 2021	2 x ecologists
Targeted Swift Parrot Habitat Assessment	- 11 – 15 May 2020 - 19 – 21 August 2020	2 x ecologists
Targeted Bat surveys	- 9 April 2020 to 6 May 2020	2 x ecologists
Brolga Level 1 Assessment (roaming survey component)	- 22-26 June 2020	2 x ecologists

2.3.1 Biodiversity Assessment (including Habitat Hectare Assessment)

Given the size of the Project Site and the type and extent of the proposed development (i.e. only a very small proportion of the Project Site is proposed to be disturbed), vegetation surveys and targeted surveys primarily focused in areas within or adjacent to the infrastructure layout. Native vegetation, scattered trees and large trees within 50 meters of each iteration of the infrastructure design disturbance areas were assessed to ensure that all indirect impacts of the project footprint alignments could be fully assessed.

The Biodiversity Assessment was conducted by ecologists accredited by DELWP in the habitat hectare methodology (DSE 2004) to quantify the quality and extent of native vegetation values within the Assessment Area (a 100 metre buffer around each turbine, a 25 metre buffer along each side of all tracks and reticulation, and a 50 metre buffer around all other infrastructure was assessed as stipulated by Umwelt), identify flora and fauna habitat values, and to determine conditions with reference to findings of the desk-based assessment, including the preliminary assessment conducted by Emerge Associates (2020a).

Native vegetation in the local area was also investigated to assist in determining the pre-European vegetation within the Project Site. Ecological Vegetation Classes were determined with reference to DELWP pre-1750 and extant EVC mapping and their published descriptions (DELWP 2021d).

The surveys sought primarily to assess the extent and condition of native vegetation communities and potential flora and fauna habitat, with particular consideration given to significant ecological communities and species of conservation concern, such as threatened and migratory species.

Native vegetation was classified in accordance with the definitions provided in Table 4, as defined in the 'Guidelines for the removal, destruction or lopping of native vegetation' (the Guidelines) (DELWP 2017a).

2.3.2 Removal, Destruction or Lopping of Native Vegetation (the Guidelines)

Under the *Planning and Environment Act 1987,* Clause 52.17 of the Northern Grampians Planning Scheme requires a planning permit to remove, destroy or lop native vegetation. The assessment process for the clearing of vegetation follows the '*Guidelines for the removal, destruction or lopping of native vegetation*' (the Guidelines) (DELWP 2017a). The '*Assessor's handbook: Applications to remove, destroy or lop native vegetation*' (Assessor's handbook) (DELWP 2018) provides clarification regarding the application of the Guidelines.

Assessment Pathway

The Guidelines manage the impacts on biodiversity from native vegetation removal using an assessment-based approach. Two factors – extent risk and location category – are used to determine the risk associated with an application for a permit to remove native vegetation. The location category (1, 2 or 3) has been determined for all areas in Victoria and is available on DELWP's NVIM Tool (DELWP 2022a). Determination of assessment pathway is summarised in Table 3.

Table 3. Assessment pathways for applications to remove, destroy or lop native vegetation (DELWP 2017).

Extent		Location		
		1	2	3
Native Vegetation	Less than 0.5 hectares and not including any large trees	Basic	Intermediate	Detailed
	Less than 0.5 hectares and including one or more large trees	Intermediate	Intermediate	Detailed
	0.5 hectares or more	Detailed	Detailed	Detailed

Notes: For the purpose of determining the assessment pathway of an application to remove native vegetation the extent includes any other native vegetation that was permitted to be removed on the same contiguous parcel of land with the same ownership as the native vegetation to be removed, where the removal occurred in the five year period before an application to remove native vegetation is lodged.

Vegetation Assessment

Native vegetation (as defined in Table 4) is assessed using two key parameters: extent (in hectares) and condition. For the purposes of this assessment, both condition and extent were determined as part of the habitat hectare assessment.

Table 4. Determination of a patch of native vegetation (DELWP 2017).

Category	Definition	Extent	Condition
Patch of native vegetation	An area of vegetation where at least 25 per cent of the total perennial understorey plant cover is native; OR An area with three or more native canopy 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.	Measured in hectares. Based on hectare area of the native patch.	Vegetation Quality Assessment Manual (DSE 2004). Modelled condition for *Current Wetlands*.
Scattered tree	A native canopy tree that does not form part of a native patch.	Measured in hectares. Each Large scattered tree is assigned an extent of 0.071 hectares (15m radius). Each Small scattered tree is assigned a default extent of 0.031 hectares (10 metre radius)	Scattered trees are assigned a default condition score of 0.2 (outside a patch).

Notes: Native vegetation is defined in the Victoria Planning Provisions as 'plants that are indigenous to Victoria, including trees, shrubs, herbs and grasses'.

Current Wetlands (DELWP)

Wetlands can be difficult to map and assess accurately as they respond quite quickly to changes in environmental condition, especially rainfall. After a period of no or low rainfall they can disappear or appear very degraded. They do, however, recover rapidly after periods of increased rainfall. As a result, under the Guidelines (DELWP 2017) all mapped wetlands (based on 'Current Wetlands' layer in the DELWP NatureKit Map) that are to be impacted must be included as native vegetation, with the modelled condition score assigned to them (DELWP 2022b).

Note that mapped wetlands do not apply if they are covered by a hardened, man-made surface, for example, a roadway. If covered by any vegetation including crops, bare soil, a mapped wetland must be treated as a native patch.

Large Tree and Habitat Assessment

Large tree and habitat assessments were undertaken concurrently with the habitat hectare assessments to quantify the number of scattered trees and Large Trees within native vegetation, as well as to collate data

pertaining to the presence of hollows and/or nests and significant 'habitat trees' that may provide habitat for fauna. Where present, hollows, nests or other relevant features were noted during the assessments.

Large Tree benchmarks relating to the EVCs present within the Project Site are summarised below (Table 5).

Table 5. Benchmark sizes for large trees within the Project Site.

EVC	Species	Large Tree (DBH)	Small Tree (DBH)
Plains Woodland (EVC 803)	*Eucalyptus* spp.	≥ 70 cm	< 70cm
	Allocasuarina luehmannii	≥ 40 cm	< 40 cm
Alluvial Terraces Herb-rich Woodland (EVC 67)	*Eucalyptus* spp.	≥ 70 cm	< 70cm
	Allocasuarina luehmannii	≥ 50 cm	< 50 cm
Creekline Grassy Woodland (EVC 68)	*Eucalyptus* spp.	≥ 80 cm	< 80cm
Low Rises Grassy Woodland (EVC 175)	*Eucalyptus* spp.	≥ 70 cm	< 70cm
Box Ironbark Forest (EVC 61)	*Eucalyptus* spp.	≥ 70 cm	< 70cm
Heathy Woodland (EVC 48)	*Eucalyptus* spp.	≥ 60 cm	< 60cm
	Allocasuarina luehmannii	≥ 40 cm	< 40 cm
Plains Grassy Wetland (EVC 125)	N/A		

Note. DBH = Diameter at Breast Height (ie – 1.3 metres above ground level).

2.4 Targeted Flora Surveys

Based on the findings of the desktop assessment, and recommendations provided in the Baseline Ecological Assessment report (Emerge Associates 2020a), targeted surveys for the nationally significant Tawny Spider-orchid *Caladenia fulva* and River Swamp Wallaby-grass *Amphibromus fluitans* were undertaken.

Several State significant flora have previously been recorded within, or in close proximity to the Project Site (Table 6), with the potential presence of these species subject to specific attention during habitat hectare assessments undertaken in suitable habitats throughout the Assessment Area, as well as during the targeted surveys undertaken for Tawny Spider-orchid and River Swamp Wallaby-grass..

Table 6. Significant flora species considered to have the highest likelihood of occurrence (Appendix 1.4).

Common name	Species Name	Significance #	Optimal Survey Timing *
Nationally Significant			
Tawny Spider-orchid	*Caladenia fulva*	EN e	August – October
River Swamp Wallaby-grass	*Amphibromus fluitans*	VU	November – March
State Significant			
Buloke	*Allocasuarina luehmannii*	ce	Year round
Buloke Mistletoe	*Amyema linophylla* subsp. *orientalis*	ce	Year round
Flax-lily	*Dianella longifolia* var. *grandis*	ce	November – December
Broad-lip Diuris	*Diuris X palochila*	e	September – November

Common name	Species Name	Significance #	Optimal Survey Timing *
Golden Cowslips	*Diuris behrii*	e	September – November
Hairy Tails	*Ptilotus erubescens*	ce	November – February
Grassland Bindweed	*Convolvulus graminetinus*	e	December – March

Note: * Optimal timing based on flowering season, or when the species can be reliably identified using other morphological features. # EPBC Act Significance: CR – Critically Endangered; VU – Vulnerable; State Significance (DELWP 2022e): ce – Critically Endangered; e – Endangered.

2.4.1 *Tawny Spider-orchid Surveys*

Tawny Spider-orchid is a relatively large orchid currently known to be restricted to approximately four sites near Ararat and Stawell, Victoria (Backhouse *et. Al.,* 2016)

The species grows in woodland and open forest habitats, and is generally 25-30 centimetres tall, with one or two creamy white to pale yellow flowers, and a single leaf that is between 12-25 centimetres long (TSSC 2016). The species tends to flower from late August to October (Backhouse *et. Al.,* 2016)

Targeted surveys for Tawny Spider-orchid were undertaken by two botanists between 5-10 October 2020 in areas of potential habitat within the assessment area (i.e. undisturbed roadsides, creeklines, patches of vegetation with moderate to high quality understorey) at five metre intervals. Reliable line of sight was at least 2.5 metres either side of each surveyor to enable sufficient coverage of habitat between transects. Handheld GPS units were used to record the location of any significant species encountered.

Targeted surveys were also undertaken in additional areas of potential habitat between 18 – 21 October 2021 that were not surveyed in 2021.

The surveys were undertaken in accordance with the methods outlined in the Commonwealth of Australia's *Survey Guidelines for Australia's Threatened Orchids* (Commonwealth of Australia 2013) and the Biodiversity Precinct Structure Planning Kit (DSE 2010).

Prior to the surveys being undertaken, a known reference site near Watta Wella Bushland Reserve was visited to confirm the species was flowering. The purpose for this was twofold: 1) to confirm the relevant species were flowering in the locality, and 2) to assist with the identification of species. Several specimens were observed at the reference site, confirming that the species was flowering (and seeding), and conspicuous within the landscape. This confirmed that the targeted surveys were undertaken at the appropriate seasonal timeframe to detect the species should it be present within the Assessment Area.

2.4.2 *River Swamp Wallaby-grass*

River Swamp Wallaby-grass is an aquatic, or semi-aquatic perennial grass with arching, slender stems usually longer than one metre, with flowering and fruiting usually occurring between November and March (DEWHA 2008).

The species is known to occur in several populations within New South Wales, and Victoria, as well as a single population within Tasmania (TSSC 2012). Within Victoria, it is generally found within floodplains, and along

creeklines around eastern and northern Melbourne, as well as major riparian corridors along the Goulburn River and the Murray River (DELWP 2021a).

Targeted surveys for the species were undertaken by two botanists between 5-9 October 2020 within the assessment area in locations where the species has previously been recorded by Emerge Associates (2020a). at five metre intervals. Reliable line of sight was at least 2.5 metres either side of each surveyor to enable sufficient coverage of habitat between transects. Handheld GPS units were used to record the location of any significant species encountered.

Additional surveys were undertaken on 19 October 2021 and 4 March 2022 for the species immediately to the west of Six Mile Creek, and north of the proposed BESS where the infrastructure footprint was located in close proximity to confirmed records of the species previously recorded by Emerge Associates (2020b) (Figure 2k; Figure 4).

In the absence of specific targeted survey guidelines for the species, the survey methodology followed the methods outlined in the Biodiversity Precinct Structure Planning Kit (DSE 2010).

2.4.3 Other Significant flora

Several State significant species known to occur, or those considered to have a high likelihood of occurrence (Appendix 1.4), were surveyed for in areas of potential habitat concurrently with the habitat hectare assessments.

The State significant species listed in Table 6 have previously been recorded within the Project Site, or within the broader locality (i.e. within 10 kilometres).

The habitat hectare assessments, targeted flora surveys and Golden Sun Moth surveys conducted in November and December 2020 captured the flowering period for the majority of State significant flora that have the potential to occur within the Assessment Area. Handheld GPS units were used to record the location of any significant species encountered.

2.5 Fauna Surveys

Based on the findings of the desktop assessment, and recommendations provided in the Baseline Ecological Assessment report (Emerge Associates 2020a), targeted surveys for the nationally significant Golden Sun Moth *Synemon plana* were undertaken.

Several State significant fauna have previously been recorded within, or in close proximity to the Project Site (Table 7), with the potential presence of habitat for these species subject to specific attention during habitat hectare assessments and other field surveys undertaken in suitable habitats throughout the Assessment Area.

Table 7. Significant fauna species considered to have the highest likelihood of occurrence (Appendix 2.1).

Common name	Species Name	Significance #	Optimal Survey Timing *
Nationally Significant			
Golden Sun Moth	*Synemon plana*	CR v	August – October
Swift Parrot	*Lathamus discolor*	CR	April – August

Common name	Species Name	Significance #	Optimal Survey Timing *
State Significant			
Brolga	*Grus rubicunda*	ce	June – December (Breeding season)
Platypus	*Ornithorhynchus anatinus*	v	February – October
Powerful Owl	*Ninox strenua*	v	March- December
Barking Owl	*Ninox connivens*	ce	July – October
Squirrel Glider	*Petaurus norfolcensis*	v	All Year

Note: * Optimal timing based on breeding/active season, or when the species can be reliably identified using other morphological features. # EPBC Act Significance: CR – Critically Endangered; State Significance (DELWP 2022e): ce – Critically Endangered; e – Endangered; v – vulnerable

2.5.1 *Targeted Fauna Surveys*

Golden Sun Moth *Synemon plana*

Golden Sun Moth typically occur in native grassland, grassy woodland, dominated by greater than 40% cover of wallaby-grass, in particular *Rytidosperma* spp. (DSE 2004b), but may also inhabit areas dominated by Kangaroo Grass *Themeda triandra* (Endersby and Koehler 2006) and introduced grassland dominated by Chilean Needle-grass *Nassella neesiana* and other introduced species (A. Organ pers. obs.). Male flight is typically low, to about a metre above the ground, fast and can be prolonged, but they are generally not recorded flying more than 100 metres from suitable habitat (Clarke and O'Dwyer 1999). The male of this species generally flies between 11am and 3pm on calm, warm (over 20°C), sunny days.

Prior to European settlement, the Golden Sun Moth was widespread and relatively continuous throughout its range, inhabiting grassy open woodlands and grassland, although it now mainly inhabits small isolated sites (DSE 2004b). The species is threatened by habitat loss, disturbance and fragmentation due to agricultural expansion and urbanisation. Many populations are isolated and fragmented, impeding the ability of the relatively immobile females to recolonise areas, thereby reducing the likelihood of genetic exchange (DSE 2004b). Such populations are therefore vulnerable as there is little likelihood of recolonisation in the event of a local extinction.

Golden Sun Moth surveys have previously been completed within several areas of potential habitat (Emerge Associates 2020b). As such, additional targeted surveys focused on all areas of potential habitat for Golden Sun Moth identified Emerge Associates (2020b), as well as additional areas of potential habitat identified during the habitat hectare assessments that are proposed to be directly impacted, or have the potential to be indirectly impacted by windfarm infrastructure.

A total of four days of surveys were undertaken during 2020 in areas of potential habitat (November 26, and 11, 13 and 15 December 2020). Following further habitat hectare assessments in June 2021 due to a change in the proposed infrastructure footprint, Golden Sun Moth surveys were undertaken in additional areas of potential habitat in 2021 (2, 10, 17 and 20 December 2021).

Survey procedures followed those outlined in the *Significant Impact Guidelines for the Critically Endangered Golden Sun Moth* (DEWHA 2009a). The following methods were followed:

- Surveys were conducted by ecologists experienced in the detection and identification of Golden Sun Moth;
- Surveys focused on all potential habitat for Golden Sun Moth identified Emerge Associates (2020b), as well as additional areas of potential habitat identified during the habitat hectare assessments in 2020 and 2021;
- Each area of potential habitat was surveyed on four separate occasions, during the species' confirmed flight season;
- A reference site located immediately south of Ararat – where the species is known to be present – was confirmed that moths were active on each day of assessment;
- Surveys were undertaken during weather conditions suitable for detecting the species. Male moths generally fly between 10am and 3pm on warm (over 20˚C by 10am) days with minimal cloud cover and still conditions. However, if males are observed flying on site after 3pm or during moderately windy conditions surveys can continue until males are no longer observed flying;
- Surveys were conducted using parallel transects at distances prescribed by the Commonwealth (DEWHA 2009a) with observers walking or, if terrain permits, driving in a car at < 10 km / hour (flying male moths can be readily seen from a vehicle) until moths are observed; and,
- A broad habitat assessments was completed detailing information on habitat quality, biomass levels, presence of weeds and floristic diversity.

Swift Parrot *Lathamus discolor*

Swift Parrot is a slim, medium-sized nectarivorous parrot measuring approximately 25 centimeters with angular pointed wings and long tapering tail feathers. It is predominantly green with a dark blue crown and a red face, chin and throat. The adult female is slightly duller than the male, with less red blotching on the underbelly, while juveniles can be distinguished by their dark brown iris and pale orange bill (Higgins 1999).

Swift Parrot occurs as a single, migratory population that was estimated to be declining, and consist of approximately 1000 pairs (Saunders and Tzaros 2011). There have not been any recent reliable estimates of the numbers of Swift Parrot in the wild. However, it has been estimated that numbers in the wild may be as few as 300 individuals (Olah *et. Al.,* 2020).

The species breeds in Tasmania between September and April after which the entire population migrates north to mainland Australia during March/April, and returns to Tasmania during August/ September.

Within Victoria, the distribution of the species varies on a year to year basis, depending on the availability of foraging resources. While there are some areas that they'll revisit in most years, generally there are considerable year-to-year variations in Swift Parrot use of habitat across the south-east mainland Australia (Kennedy and Tzaros 2005). Even within a year, there can be considerable variation, depending upon changing patterns of food availability (e.g., flowering of preferred eucalypt species, lerp availability). As such, it is not possible to conclude that an area of suitable habitat is not important, or is not utilised as foraging habitat based on a discrete, isolated survey period.

The National Recovery Plan (Saunders and Tzaros 2011) identifies several 'priority habitats' within Victoria that are of particular importance for conservation management of the species. Within Victoria, a total of 41

Local/Regional/State Parks, Nature Conservation Reserves/State parks and State Forests are identified as 'priority habitat', with Deep Lead Nature Conservation Reserve being located within 20 kilometres of the Project Site.

Important eucalypt species known to provide a food source for Swift Parrot in Victoria include Yellow Gum *Eucalyptus leucoxylon*, Red Ironbark *Eucalyptus tricarpa*, Mugga *Eucalyptus sideroxylon*, Yellow Box *Eucalyptus melliodora*, White Box *Eucalyptus albens*, and Grey Box *Eucalyptus microcarpa.*

To determine the extent of potential site utilisation within the Project Site, a series of assessments were undertaken over several months. These included a combination of:

- The Autumn bird utilisation survey was undertaken during a period where the species was confirmed to be on mainland Australia (11-15 May 2020) (further details provided in Section 2.5.3);
- A detailed habitat assessment and roaming survey was undertaken over three days between 19-21 August 2020.

Roaming surveys focussed on areas supporting preferred habitat characteristics (i.e. woodlands supporting typical foraging species including Yellow Gum, Grey Box and Red Ironbark. The assessment noted the presence of any flowering eucalypts, budding of flowers, presence of lerps or congregations of other nectar-feeding birds.

Call playback was undertaken along slow moving vehicle transects in areas supporting potential habitats within the Project Site, as well as in areas within the broader locality where the species has previously been recorded (Figure 3). Call playback and roaming involved driving slowly through suitable habitats and stopping every 200 metres to conduct call playback for at least five minutes. These locations included Deep Lead Nature Conservation Reserve, Watta Wella Bushland Reserve, Joel Joel Nature Conservation Reserve, Glynwylln State Forest. Roadside reserves within the Project Site that support an intact eucalypt canopy (i.e. Vineyard Road, Vances Crossing Road) were also assessed.

Active searching and call playback for 60 minutes at dusk (twice) and dawn (twice) were also undertaken within areas in areas identified as supporting preferred habitat suitability.

The timing of the surveys, as well as the weather conditions in which they were undertaken were considered to be suitable for detecting the species (if present), and to assess the suitability of habitat within the Assessment Area and adjacent areas.

2.5.2 eDNA Sampling

Water samples from 13 waterbodies within the Assessment Area, as well as upstream and downstream were collected between 18-21 October 2021 (Figure 3). The water samples were collected in accordance with the protocol developed by EnviroDNA (Appendix 4).

At each site, two samples were collected by passing up to 230 mL water (average 96 mL) through a 0.22 µm filter (Sterivex) on site. Filtering on site reduces DNA degradation that may occur during transport of water (Yamanaka *et al*. 2016). A small amount of 100% ethanol was flushed through the filters to minimise sample degradation. Clean sampling protocols were employed to minimise contamination including new sampling equipment at each site, not entering water, and taking care not to transfer soil, water or vegetation between

sites. Filters were stored cool, dry, and out of sunlight before being transported to the laboratory for processing.

Water samples were specifically analysed for the presence of DNA from the nationally significant Growling Grass Frog *Litoria raniformis* and State significant Platypus *Ornithorhynchus anatinus*.

Further details on the sampling methodology are provided in Appendix 4 (EnviroDNA 2021).

2.5.3 Bird Utilisation Surveys

Bird utilisation surveys are the most commonly used method for generating quantitative data on bird use of a potential wind farm site. The bird utilisation surveys for the Project were designed to comply with the guidelines described in *AusWEA – Wind Farms and Birds: Interim Standards for Risk Assessment* (2005). According to these guidelines, bird utilisation surveys are undertaken to ascertain:

- The species composition of birds that use the Project Site;
- The frequency with which each of those species use the Project Site;
- The height at which each of these species fly in the Project Site; and,
- The distribution of these species across the landscape.

Bird utilisation surveys are a minimum requirement for proposed wind farm sites and are used to inform the design of higher-level investigations, if required. The total number of point counts was determined based on both the habitat conditions of the Project Site and the number of turbines proposed, in addition to any existing data that has already been collected (e.g. detailed significant species data).

As agreed with DELWP at the pre-application meeting, a total of three bird utilisation survey events were conducted (Table 2), with nine fixed point count locations (seven within the Project Site, and two outside the Project Site) (Figure 3).

AusWEA Wind Farms and Birds: Interim Standards for Risk Assessment

The Australian Wind Energy Association (AusWEA 2005) has developed interim standards for risk assessment of birds for wind farm developments in Australia. This document outlines the type of investigations required, the order in which they should be undertaken and a systematic approach for assessing risk of bird impact at wind farms. This process allows for more detailed studies should a potentially significant risk be identified during preliminary studies.

The AusWEA (2005) interim standards recommend three levels of investigations, with each level involving increasing levels of detail. These levels include:

- **Level 1** investigations provide an initial assessment of the risk of significant bird impacts from the operation of the proposed wind farm; Level One investigations involve a regional overview, review of existing data, an indicative bird utilisation survey and roaming surveys.
- **Level 2** investigations refine the risk assessment from the Level One investigation, using more intensive methods. Level Two investigations involve roaming surveys and risk modelling.

- **Level 3** investigations are initiated if the results of the Level Two investigations indicate a greater than low level of residual risk of significant bird impacts from the operation of the proposed wind farm. Level Three investigations involve population assessment and population viability analysis.

For the proposed wind farm development a Level One investigation was undertaken.

The interim standards also recommend consultation with the wind farm developer and key representatives of agencies that assess and approve development to:

- Agree on the issues, questions and objectives of bird impact risk assessment studies;
- Agree on the consequence and, where relevant, likelihood criteria that apply to the results of the studies; and,
- Where required, agree on the nature and effectiveness of mitigation measures.

Fixed Point Bird Counts

Two Zoologists, experienced in bird identification, undertook the fixed-point count surveys to the specifications outlined below. Birds were identified to species level using 10 × 42 binoculars where able, or otherwise recorded to genus (e.g. non-calling Raven species).

The following was undertaken as part of the fixed-point bird counts:

- Nine locations were established at which to undertake fixed point counts with two of these located outside of the Project Site. The locations chosen were to ensure that the entire Project Site was sampled and that a range of habitat types represented in that sample (Figure 3);
    - The search radius from the point was at least 100 metres for small birds and up to 800 metres for large birds (e.g. birds of prey, waterbirds), or further, if accurate identification to species level was achievable, using prominent landmarks;
    - The duration of each fixed-point count was 20 minutes;
    - The height at which each bird flew through the survey area was estimated to the nearest 10 metres;
    - The direction of flight of each bird was recorded to the nearest 45 degrees of the compass;
    - Each point was surveyed at different times of day (e.g. early morning, late morning, early afternoon and late afternoon) to account for diurnal differences in bird activity; and,
    - Each point was surveyed at least 20-times over the course of the survey period.

Incidental observations and roaming surveys

In addition to bird species recorded during the fixed-point count surveys, incidental observations of bird species were recorded while travelling between point counts and during other field-based activities. Birds seen adjacent to the Project Site were also recorded. Where suitable habitat for wading birds (principally Chradriiformes) and other waterbirds (ducks and herons) was observed, this habitat was surveyed for these

species as per the '*Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species*' (DoEE 2017).

Statistical Analyses

Species accumulation curves were generated from the point count data and is presented as graphs. This, along with a measure of completeness provides an overall account of the survey efficacy in predicting the species likely to occur within the Project Site.

Completeness follows the methods of Watson (2003) which is widely used in the manufacturing industry and ecology-based projects (Watson 2003) and is calculated as the actual richness (A) divided by the predicted richness *(P)* expressed as a percentage. The predicted species richness was calculated computed with the EstimateS 9.1.0 program, using the Michaelis–Menten richness estimator (MMMeans) using 1000 runs and estimates of 76, which uses the ratio of species seen once (singletons) to the species seen more than once (doubletons) to predict species richness (Raaijmakers 1987; Colwell *et. Al.,* 2004; Colwell 2013).

The analysis was based on 217 bird point counts and 76 bird species.

Observations of birds were classified, according to their height, into four categories:

- ground;
- Below (RSA (1–77 metres);
- Within RSA (between 77 – 255 metres); and,
- Above RSA (> 255 metres).

Analysis of the bird utilisation survey data is provided in Section 3.8.

2.5.4 Brolga Surveys

The *Interim Guidelines for the Assessment of Potential Windfarm Impacts on the Brolga* (DSE 2012) establish a stepped approach to determining the use of a proposed wind farm site by Brolga to assess the likely impact of the development on this species. Level 1 Assessments are triggered by the presence of Brolgas or their habitat within the proposed area (DSE 2012). Level 2 Assessments are triggered by the use of the proposed site by Brolgas for nesting or flocking or an assessment that the development may create a barrier between such areas (DSE 2012). The final step is a Level 3 Assessment, which if triggered, should mitigation measures, based on the findings of the Level 2 Assessment, not satisfy the DELWP's goal of a "zero net impact" on Victorian Brolga populations (DSE 2012).

There is one confirmed record of Brolga from 2008 within the Project Site, with additional records located approximately two kilometres north-east of the Project Site in Greens Creek Swamp Wildlife Reserve. These records trigger the requirement for a Level 1 Assessment.

2.5.4.1 Level 1 Assessment

Level 1 assessments were undertaken utilising a combination of roaming Brolga surveys and database searches and consultation with local residents and stakeholders.

Desktop Analysis

A detailed desktop assessment was undertaken to identify all known and potential breeding and flocking habitat within the broader locality (i.e. within 10 kilometres of the Project Site). This included interrogation of:

- The Victorian Biodiversity Atlas (DELWP);
- Sheldons Flocking Database (Sheldon 2004); and,
- Birdlife Australia's New Atlas (Birdlife 2020).

Roaming Surveys and Community Consultation

Ecology and Heritage Partners consulted with local landowners (as provided by Umwelt via RES), Birdlife Australia, the local DELWP office (Horsham), and local friends groups to ascertain the historical and current utilisation of habitats within the broader Project Site.

A roaming survey was undertaken between 22 – 26 June 2020 to visit locations within 20 kilometres of the Project Site where the species has previously been recorded, or sites that have the potential to support flocking or breeding habitat (Figure 6). No access into Greens Creek Swamp Wildlife Reserve, located approximately two kilometres north-east of the Project Site, was possible due to it being surrounded by privately owned land. However, potential habitat suitability was observed via high powered binoculars.

The findings of the Level One Assessment were used to decide whether a Level Two Assessment is required using the qualitative risk assessment method detailed in AusWEA (2005).

The results of the Brolga Level 1 assessment is provided in Section 3.7.

2.5.5 Bat Surveys

Bat surveys were undertaken in accordance with the *Survey guidelines for Australia's threatened bats* (DEWHA 2010b). Although no significant bat species have previously been documented within the VBA (DELWP 2021a) within or in close proximity to the Project Site (Figure 9). However, it is understood that a call from within the frequency range of the nationally significant Southern Bent-wing Bat *Miniopterus orianae bassanii* complex was previously recorded in low abundance as part of the microbat surveys undertaken for the Bulgana Windfarm Development (BL&A 2014).

Given that the Southern Bent-wing Bat is likely to be dependant on one of two known maternity caves located near Warrnambool and Naracoote – approximately 145 kilometres and 195 kilometres from the windfarm respectively, the species is highly unlikely to utilise habitat within the Project Site on a regular basis, given that foraging range of the species is known to be up to 70 kilometres on any given night (Swifft 2021a). Therefore, it is likely that the call could be from one of two other species associated with this call complex – Little Forest Bat *Vespadelus vulturnus* or Chocolate Wattled Bat *Chalinolobus morio* (R. Gration *pers comm.)*.

As such, the purpose of the microbat survey was not to undertake targeted surveys for any specific species, but rather, to gain an understanding of the diversity of species that are likely to utilise habitat within and adjacent to the Project Site.

Nine Song Meter SM4 (Wildlife Acoustics™) sound recorders were deployed on 9 April 2020 and retrieved on 6 May 2020 (i.e. left out for 28 days (Figure 3).

The SM4's recorded audible sounds from 10kHz hz-55kHz which is the calling acoustic frequency for microbats. These instruments record the high frequency calls or echolocation, produced by the bats when they are in flight, and save these calls directly to a memory card. Different bat species produce distinguishable calls; therefore, detectors were used to identify the species present in a given area. It is important to note that although detectors may give an index of overall bat activity levels, they cannot be used to determine bat abundance, as the number of individuals making the calls is not known.

As one round of microbat surveys was previously completed by Emerge Associates (2020b) in November – December 2019, Ecology and Heritage Partners undertook a second survey between 9 April and 6 May 2020.

Bat detector locations were chosen based on geography and habitat type to capture a representative sample of the Project Site (Figure 3). Weller and Zabel (2002) found detectors placed at a height of 1.4 metres recorded 30% more calls than those placed on the ground. This method was adopted at all locations within the Project Site.

Call Analysis

Identification of bat calls collected were analysed by Rob Gration from EcoAerial Consulting Services, a recognised expert in bat call analysis. All nights of data were assessed for the calls of all bats, with a particular focus on the detection of significant bats, such as Southern Bent-Wing Bat and/or Yellow-bellied Sheathtail Bat.

If one of the call complex cohorts (Little Forest Bat *Vespadelus vulturnus* or Chocolate Wattled Bat *Chalinolobus morio*) was positively identified it was recorded as present once only. A filter was also run for calls in the frequency range of Yellow-bellied Sheathtail Bat.

Call analysis involved the allocation of every data file to a species, and then counting the number of call records for each species. Results of the Anabat call analysis is provided in Section 3.9 and Appendix 3.

2.6 Likelihood of Occurrence Assessment

Relevant biological databases, literature (listed in Section 2.1) and expert advice were used to identify all species records of national, State and regional conservation significance within 10 kilometres of the Project Site. The proximity, number, dispersion and date of known locality records (assuming over-dispersed and random patterns of locality records being more likely to occur in the Project Site) were considered to determine a species' likelihood of occurrence within the Project Site.

Additional factors also taken into consideration include: the known biogeographical distribution of the species; underlying geology of existing locality records; and, vegetation and habitat associations. The decision guidelines for determining the likelihood of occurrence of flora and fauna species are presented in Table 8 and Table 9 respectively.

The results of the likelihood of occurrence assessment for listed flora and fauna species are provided in Appendices 2.4 and 3.1, respectively.

Table 8. Decision guidelines for determining a flora species likelihood of occurrence within the Project Site.

Likelihood of occurrence	Decision guidelines
1 – Known occurrence	Recorded within the Project Site recently (i.e. within 10 years).
2 – High	Previous records of the species in the local vicinity; and/or, the Project Site contains areas of high-quality habitat.
3 – Moderate	Limited previous records of the species in the local vicinity; and/or, the Project Site contains some characteristics of the species' preferred habitat.
4 – Low	Poor or limited habitat for the species however other evidence (such as a lack of records or environmental factors) indicates there is a low likelihood of presence.
5 – Unlikely	No potential habitat and/or outside the species range.

Table 9. Decision guidelines for determining a fauna species likelihood of occurrence within the Project Site.

Likely presence or use of the Project Site	Decision guidelines
1 – Known occurrence	Recorded within the Project Site recently (i.e. within 10 years).
2 – High	Likely resident in the Project Site based on database records, or expert advice; and/or, recent records (i.e. within 10 years) of the species in the local area; and/or, the Project Site contains the species' preferred habitat.
3 – Moderate	The species is likely to visit the Project Site regularly (i.e. at least seasonally); and/or, previous records of the species in the local area; and/or, the Project Site contains some characteristics of the species' preferred habitat.
4 – Low	The species may visit the Project Site occasionally or opportunistically whilst en route to more suitable sites; and/or, there are only limited or historical records of the species in the local area (i.e. more than 20 years old); and/or, the Project Site contains few or no characteristics of the species' preferred habitat.
5 – Unlikely	No previous records of the species in the local area; and/or, the species may fly over the Project Site when moving between areas of more suitable habitat; and/or, out of the species' range; and/or, no suitable habitat present.

2.7 Assessment Qualifications and Limitations

Data and information held within the ecological databases and mapping programs reviewed in the desktop assessment (ie – VBA, PMST, Nature Kit Maps etc.) are unlikely to represent all flora and fauna observations within, and surrounding, the Project Site. It is therefore important to acknowledge that a lack of documented records does not necessarily indicate that a species or community is absent. Furthermore, a documented record may indicate a species' presence in an area at a given point in time, but it generally does not offer information about how a species is making use of an area (e.g. foraging, nesting, dispersing). This can be important information when determining the potential impact of a proposed action on a threatened species.

The 'snap shot' nature of a biodiversity assessment, meant that migratory, transitory or uncommon fauna species may have been absent from typically occupied habitats at the time of the field assessment. In addition, annual or cryptic flora species such as those that persist via underground tubers may also be absent. Nevertheless, the terrestrial flora and fauna data collected during the field assessment and information obtained from relevant desktop sources is considered adequate to provide an accurate assessment of the ecological values present within the Assessment Area.

Ecological values identified were recorded using a hand-held GPS or tablet with an accuracy of +/-3 metres. This level of accuracy is considered adequate to provide an accurate assessment of the ecological values present within the Assessment Area; however, this data should not be used for detailed surveying purposes.

Generally, the level of risk posed by the limitations described below is considered to be low due to the level of effort and resources used to conduct multiple ecological surveys conducted to date between July 2019 and March 2022 throughout the Project Site. Additional information has been obtained from previous assessment conducted by Emerge Associates (2020a; 2020b). Limitations and assumptions relating to the survey effort for ecological values are detailed below.

2.7.1 Vegetation Surveys

Data and information held within the ecological databases and mapping programs reviewed in the desktop assessment (e.g. VBA, PMST, Nature Kit Maps etc.) are unlikely to represent all flora and fauna observations within, and surrounding, the Project Site. It is therefore important to acknowledge that a lack of documented records does not necessarily indicate that a species or community is absent.

Only the Assessment Area was assessed as part of the habitat hectare assessments and targeted flora surveys.

The field assessments were undertaken over multiple seasons between 2019 and 2022 to maximise the likelihood of detection for patches of native vegetation, and significant flora and fauna species. As such, it is considered that sufficient effort has been employed to determine the likelihood of significant species occurring within the Project Site, and to accurately characterise the flora and faunal values present.

Therefore, it is considered that the terrestrial flora and fauna data collected during the field assessment and information obtained from relevant desktop sources is considered to provide an accurate assessment of the ecological values present within the Project Site.

2.7.2 Swift Parrot Assessment

Much of the eucalypt habitat assessed supported the species' preferred foraging species (i.e. Yellow Gum, Grey Box, Yellow Box and Ironbark). However, few eucalypts were observed to be flowering, which indicates that forging resources were low in the Stawell region at the time of the surveys.

Few lerps were observed, and although some congregations of other nectar-feeding birds were observed, these observations were few.

Given the cryptic nature of the species, and low number of breeding pairs in the wild, it is acknowledged that the likelihood of observing the species during temporarily discrete surveys are low. However, the main purpose of the survey was to determine the quality and extent of habitat suitability within and adjacent to the Project Site, and this was able to be accurately determined.

2.7.3 Bird Utilisation Surveys

The fixed-point bird counts may have suffered from some biases because of the use of estimation in determining the distance of birds from the observer. Horizontal distances became increasingly difficult to judge as the distance between the observer and the bird increased.

Vertical distances were also difficult to judge, depending on structures and other landmarks that could be used as a reference. However, the higher the bird the greater the likelihood of error. In addition, this difficulty was not consistent across species, with small and large species biasing the results in unknown directions.

To attempt to overcome these potential errors, and to calibrate the estimations of the observers, at each point count 200 metres was measured to use as a reference for the estimations that followed. To calibrate height, a landmark of known height (such as wind anemometer tower, power-line poles etc.) was used as a reference point. Whilst these precautions alleviated some of the bias in this process, the height and distance data need to be interpreted in a cautious manner, given the probability of a high degree of error in the data-set.

A further bias in the data-set is the over-representation of large birds. As the distance between the observer and the bird increases, smaller species are increasingly likely to be overlooked. This effect is also likely to be exacerbated by weather conditions with overcast, windy or wet conditions having a negative impact on the detectability of some birds.

2.7.4 General Limitations

General ecological limitations associated with the ecological investigations include:

- The assessment of likelihood of occurrence is based on survey effort and results, background information and previous records compiled;
- Non-vascular flora (i.e. mosses, liverworts) were not recorded, although their presence is noted as part of the cover of native species in the definition of a patch of native vegetation;
- Ecological features identified during field assessments were recorded using a differential GPS (dGPS) with sub-metre accuracy, or a hand-held tablet or GPS with an accuracy of between +/- 3 metres. This level of accuracy is considered adequate to provide an accurate assessment of the ecological features present within the Project Site; however, this data should not be used for detailed surveying purposes; and,
- For cryptic and less abundant species that are known to, or that have the potential to use habitat resources within the Assessment Area as a resident or a visitor on a regular or infrequent basis, the precautionary principle (i.e. the absence of a species during targeted surveys is not used as a reason for assuming the species is not present, or may utilise habitats within the Assessment Area, particularly where the species was/is known to occur within the locality, and the Assessment Area supports suitable habitats) has been applied when determining the likelihood of occurrence.

2.7.5 Updated Development Footprint

RES and Umwelt provided the most recent development plan on 6 June 2022. This updated plan included the re-siting of several turbine locations, as well as alternate alignments for several internal access tracks and reticulation. The location of some re-sited turbines and internal access tracks is outside the Assessment Area that has been subject to on-ground assessment by Ecology and Heritage Partners.

It is intended that these areas will be surveyed to ensure the presence of potential ecological values can be quantified and incorporated into an updated version of this report. However, the updated development plan

is not anticipated to substantially alter the impacts included within this report, specifically the assessment against the EES referral thresholds detailed in Section 6.2.

3 EXISTING ECOLOGICAL CONDITIONS

3.1 Overview

Much of the Project Site is highly modified due to agricultural practices and is dominated by crops (ie – wheat, canola, barley) or pasture supporting non-indigenous grasses and weeds. Additional species (often Australian natives not indigenous to the region) have also been planted along shelterbelts and parcel boundaries.

Native vegetation in the Project Site is representative of seven EVC's: Plains Woodland (EVC 803), Grassy Woodland (EVC 175), *Low Rises* Grassy Woodland (EVC 175_61), Creekline Grassy Woodland (EVC 68), Heathy Woodland (EVC 48), Alluvial Terraces Herb-rich Woodland (EVC 67), and Box Ironbark Forest (EVC 61). The presence of these EVCs is generally consistent with the modelled pre-1750s native vegetation mapping (DELWP 2021b).

A total of 137.131 hectares of native vegetation was recorded within the Assessment Area (Table 10).

Native vegetation, where present, is predominantly present via numerous stands of trees scattered throughout paddocks, within roadside reserves and along creek lines and property boundaries.

A summary of the results of the vegetation assessments are given in Table 10 and Table 11, which outlines the type and extent of each EVC recorded, and scattered native trees (large and small) within the Project Site.

Table 10. Extent of mapped vegetation type (EVC).

EVC	BCS	Extent (hectares)^	# Large Trees in patches
Alluvial Terraces Herb-rich Woodland (EVC 67)	Endangered	3.699	19
Box Ironbark Forest (EVC 61)	Depleted	9.844	38
Creekline Grassy Woodland (EVC 68)	Endangered	16.670	81
Grassy Woodland (EVC 175_61)	Vulnerable	70.689	292
Heathy Woodland (EVC 48)	Depleted	17.556	79
Plains Grassy Wetland (EVC 125)	Endangered	0.083	0
Plains Woodland (EVC 803)	Endangered	18.590	114
Total		**137.131**	**619**

Note: ^ Area in hectares (rounded off to three decimal places); BCS = Bioregional Conservation Significance

The results of the habitat hectare assessment are provided in Appendix 1.3.

A total of 73 flora species were recorded, comprising 47 native and 26 non-native species. A list of all flora species recorded during the field assessment are provided in Appendix 1.1.

A total of 89 fauna species were recorded comprising 84 native and five non-native species. Of these, there were 76 birds (73 native and 3 non-native species); 12 mammals (9 native and 3 non-native) and one invertebrate (native). A list of all fauna species recorded during the field assessment are provided in Appendix 2.2.

3.2 Patches of Native Vegetation

3.2.1 Plains Woodland

Plains Woodland was identified within the impact area and classified into three habitat zones (PW1-PW3; Figure 2) based on habitat quality. The habitat zones remained consistent between both the Wimmera and Goldfields Bioregions, however were represented by different canopy species compositions. Typically, the PW overstory observed within the Goldfields Bioregion was one or a combination of four species; Yellow Box *Eucalyptus melliodora*, River Red Gum *Eucalyptus camaldulensis*, Grey Box *Eucalyptus microcarpa* and the State significant Buloke *Allocasuarina luehmannii.* The EVC within the Wimmera bioregion was similarly represented, however Yellow Gum *Eucalyptus leucoxylon* replaced River Red Gum as a dominant canopy species.

Areas identified as PW1 was a heavily modified, often treeless habitat zone represented by at least 25% native perennial grass cover such as Rough Spear-grass *Austrostipa scabra* as well as intermittent shrubs such as Gold-dust Wattle *Acacia acinacea* and Golden Wattle *Acacia pycnantha*. Weed species typically included pasture grasses such as Yorkshire Fog *Holcus lanatus* and Toowoomba Canary-grass *Phalaris aquatica*, and other exotic herbs such as Stork-bill *Erodium botrys* and Cats Ear *Hypochaeris radicata* (Plate 1).

Areas of PW2 increased in understory diversity, however the habitat structure remained similar to PW1. This habitat zone also supports Large Trees identified above as evidence of woody recruitment. PW3 showed a further increase in species diversity as well as habitat structure supporting additional native species such as Supple Spear grass *Austrostipa mollis*, Common Wallaby Grass *Rytidosperma setaceae,* Cranberry Heath *Astroloma humifusum*, Sheeps Burr *Acaena echinata,* and Black Anther Flax-lily *Dianella admixta* (Plate 2).

Plate 1. Plains Woodland (PW1) recorded within the Project Site (Ecology and Heritage Partners Pty Ltd 07/10/2020).

Plate 2. Plains Woodland (PW2) recorded within the Project Site (Ecology and Heritage Partners Pty Ltd 07/10/2020).

3.2.2 Low Rises Grassy Woodland

Low Rises Grassy Woodland was identified within the impact area and classified into seven habitat quality zones (GW1-GW7; Figure 2) based on habitat quality. The habitat zones quality and understory species were synonymous with the quality and understory composition as identified in areas of Plains Woodland (i.e

PW1=GW1, PW2=GW2 etc.). However, areas of *Low Rises* Grassy Woodland were represented by two canopy species only – Grey Box and Yellow Gum. Within the Goldfields bioregion, this EVC was identified as the *Low Rises* Grassy Woodland which held a similar species composition but was typically found on sedimentary soils on lower slopes at the interface between the plains and the woodlands found on sedimentary hills (Plate 3; Plate 4).

Plate 3. Grassy Woodland (GW3) recorded within the Project Site (Ecology and Heritage Partners Pty Ltd 06/10/2020).

Plate 4. Grassy Woodland (GW2) recorded within the Project Site (Ecology and Heritage Partners Pty Ltd 06/10/2020).

3.2.3 Creekline Grassy Woodland

Creekline Grassy Woodland between the two bioregions occurs on similar substrates within particular geographical features such as river banks and drainage lines on fertile colluvial/alluvial soils, however exhibit distinct differences in canopy species composition. Within the Goldfields Bioregion, Creekline Grassy Woodland is characterised by three canopy species; River Red Gum, Grey Box, and Yellow Box. The Wimmera Bioregion is characterised by a single canopy species: River Red Gum.

Creekline Grassy Woodland was identified within the impact area and classified into two habitat zones based on minor differences in canopy health. Both habitat zones exceeded the large tree benchmark with an understory that lacked habitat structure and native species diversity, with the exception of scattered native grasses such as Rough Spear-grass amongst a predominantly weedy understory consisting of pasture species such as Prairie Grass *Bromus catharticus*, Great Brome *Bromus diandrus* and Barley *Hordeum spp.* (Plate 5; Plate 6).

Plate 5. Creekline Grassy Woodland (CGW1) recorded within the Project Site (Ecology and Heritage Partners Pty Ltd 06/10/2020).

Plate 6. Creekline Grassy Woodland (CGW2) recorded within the Project Site (Ecology and Heritage Partners Pty Ltd 06/10/2020).

3.2.4 Heathy Woodland

Heathy Woodland was identified within the Goldfields Bioregion and represented a highly diverse structure and species composition. Typically, Heathy Woodland is a eucalypt dominated low woodland to 10 metres occurring on nutrient poor soils with a diverse array of narrow or ericoid-leaved shrubs (DELWP 2021b).

Heathy Woodland recorded within the Project Site was classified into three habitat zones based on quality and structure primarily within the understory condition, with HW1 supporting a diverse understory composition and tree layer, HW2 supporting a tree layer, but modified understory, and HW3 supporting both modified tree and understory layers. All zones were represented by a eucalypt canopy represented by two species: Red Box *Eucalyptus polyanthemos* and Bundy *Eucalyptus goniocalyx*.

HW1 exhibited a highly diverse understory with a range of shrubs, orchids, herbs, and grasses observed including but not limited to Purple Beard-orchid *Calochilus robertsonii*, Wax-lip Orchid *Glossodia major*, Twining Fringe Lily *Thysanotus patersonii,* Milkmaids *Burchardia mbellate,* Golden Wattle, Black-anther Flax-lily and Shiny Everlasting *Xerochrysum viscosum* (Plate 7).

HW2 occurred adjacent to HW 1, separated by an arterial road and adjacent to farmland however lacked the understory species diversity. This habitat zone was dominated by exotic pasture species such as Barley and Great Brome with scattered native grasses such as Rough Spear-grass (Plate 8).

Plate 7. Heathy Woodland (HW1) recorded within the Project Site (Ecology and Heritage Partners Pty Ltd 08/10/2020).

Plate 8. Heathy Woodland (HW2) recorded within the Project Site (Ecology and Heritage Partners Pty Ltd 07/10/2020).

3.2.5 Alluvial Terraces Herb-Rich Woodland

Alluvial Terraces Herb-Rich Woodland Heathy Woodland is typically defined as an open woodland to 15 metres found on alluvial plains and ephemeral drainage lines. The EVC is characterised by heavier clay subsoils, and a high species-richness at the ground-layer (DELWP 2021b).

Alluvial Terraces Herb-Rich Woodland recorded within the Project Site was represented by a single habitat zone (ATHRW1, Figure 2). The canopy was represented by two eucalypt species Yellow Gum and Yellow Box which exceeded the Large Tree Benchmark. The understory was poor in native diversity and cover with scattered occurrences of Supple Spear-grass and Rough Spear-grass amongst pasture weeds which dominated the habitat zone (Plate 9; Plate 10).

Plate 9. Alluvial Terraces Herb-rich Woodland (ATHrW1) recorded within the Project Site (Ecology and Heritage Partners Pty Ltd 06/10/2020).

Plate 10. Alluvial Terraces Herb-rich Woodland (ATHrW1) recorded within the Project Site (Ecology and Heritage Partners Pty Ltd 05/10/2020).

3.2.6 *Box Ironbark Forest*

Box Ironbark Forest occurs within areas of low rainfall on infertile often stony soils on gently undulating rises, low hills and paneplains. The overstory is open to 20 metres tall typically with at least one ironbark species with a dense midstory over a sparse to well-developed suite of herbs and grasses in the understory (DELWP 2021b).

Box Ironbark Forest was recorded within the Goldfields Bioregion and represented by a single habitat zone within Joel Joel Nature Conservation Reserve. This habitat zone was represented by a diverse eucalypt canopy including Grey Box, Yellow Gum and Red Box over a midstory of shrubs including Golden Wattle, Spreading Wattle *Acacia genistifolia*, and a diverse ground layer supporting a diverse layer of grasses and herbs such as Common Wallaby grass, Black-anther Flax-lily and Twining Fringe-lily (Plate 11; Plate 12).

This habitat zone was relatively weed free, with common pasture species prevalent adjacent to farmland. Large Quaking Grass *Briza maxima* was commonly observed, however in low densities.

Plate 11. Box Ironbark Forest (BIF1) recorded within the Project Site (Ecology and Heritage Partners Pty Ltd 08/10/2020).

Plate 12. Box Ironbark Forest (BIF1) recorded within the Project Site (Ecology and Heritage Partners Pty Ltd 08/10/2020).

3.2.7 *Plains Grassy Wetland*

Plains Grassy Wetland (EVC 125) is a typically treeless EVC although can include sparse occurrences of River Red Gum in addition to a sparse shrub component. The characteristic ground cover is dominated by grasses, herbs and small sedges often rich in species diversity along the fringes, and species-poor in the wetter central areas (DELWP 2021b).

One small patch of Plains Grassy Wetland was mapped immediately adjacent to Watta Wella Road near the western end of the Wind Farm Development Footprint). Although not modelled as occurring within the assessment area (DELWP 2022a), based on the field surveys, the area is located in a low-lying area that supports an ephemeral wetland and supports a moderate diversity of herbs and native grasses (Plate 13; Plate 14).

Although the EVC was largely free of weedy species, scattered occurrences of Wild Oat *Avena fatua* and Toowoomba Canary Grass were recorded in high densities.

Plate 13. Plains Grassy Wetland (PGWe1) recorded within the Project Site (Ecology and Heritage Partners Pty Ltd 09/10/2020).

Plate 14. Plains Grassy Wetland (PGWe1) recorded within the Project Site (Ecology and Heritage Partners Pty Ltd 09/10/2020).

3.3 Large Trees and Scattered Trees

3.3.1 Large Trees in Patches

A total of 619 Large Trees (LTs) were recorded within patches of native vegetation (Figure 2). The majority of Large Trees comprise Grey Box and Yellow Gum, with River Red-gum, Bundy and Yellow Box also common (Table 11) (Plate 15; Plate 16).

Table 11. Species composition of Large Trees in patches.

Common Name	Species Name	# of specimens
Buloke	*Allocasuarina luehmannii*	1
Grey Box	*Eucalyptus microcarpa*	253
River Red-gum	*Eucalyptus camaldulensis*	79
Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	129
Stag		13
Red Ironbark	*Eucalyptus tricarpa*	6
Yellow Box	*Eucalyptus melliodora*	69
Red Box	*Eucalyptus polyanthemos*	3
Bundy	*Eucalyptus goniocalyx*	66
Total		**619**

Plate 15. Large Tree (Stag) in Plains Woodland (Ecology and Heritage Partners Pty Ltd 06/10/2020).

Plate 16. Large Tree (River Red Gum) in Alluvial Terraces Herb-rich Woodland (Ecology and Heritage Partners Pty Ltd 08/10/2020).

3.3.2 Scattered Trees

A total of 329 scattered trees were recorded within the Project Site, which consisted of 280 Large and 49 Small scattered trees (Figure 2; Table 12). These trees would have once formed part of the EVC's recorded throughout the Project Site; however, the understorey vegetation has been cleared predominantly for farming practices and contained predominantly introduced species (mainly exotic pasture grasses) and the trees no longer formed a patch of native vegetation (Plate 17; Plate 18).

Table 12. Summary of scattered trees within the Project Site.

Common Name	Species Name	Large Tree	Small Tree	Total
Buloke	*Allocasuarina luehmannii*	14	1	**15**
Grey Box	*Eucalyptus microcarpa*	80	15	**95**
River Red-gum	*Eucalyptus camaldulensis*	33	5	**38**
Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	42	7	**49**
Stag		12	11	**23**
Yellow Box	*Eucalyptus melliodora*	50	5	**55**
Red Box	*Eucalyptus polyanthemos*	1	1	**2**
Bundy	*Eucalyptus goniocalyx*	48	4	**52**
Total		**280**	**49**	**329**

Plate 17. Scattered Trees within farmland typical of the Project Site (Ecology and Heritage Partners Pty Ltd 09/10/2021).

Plate 18. Large Scattered Tree within farmland typical of the Project Site (Ecology and Heritage Partners Pty Ltd 24/06/2021).

3.3.3 Introduced and Planted Vegetation

Areas not supporting native vegetation had a high cover (>90%) of exotic grass species, many of which were direct-seeded for use as pasture. Scattered native grasses were generally present in these areas, however they did not have the required 25% relative cover to be considered a patch.

Non-native areas were generally improved pasture dominated by environmental weeds such as Toowoomba Canary-grass, Rye-grass *Lolium* spp., Meadow Fox-tail *Alopecurus pratensis*, Galenia *Galenia pubescens* var. *pubescens*, Ribwort *Plantago lanceolata*, Couch *Cynodon dactylon* var. *dactylon* and Wild Oat *Avena fatua* (Plate 19; Plate 20).

Native trees and shrubs were observed as windrows or as visual screens along fence lines within farmland properties which included general Australian species such as eucalypt varieties and Bottlebrushes (Plate 21; Plate 22).

Plate 19. Improved pasture typical of the Project Site (Ecology and Heritage Partners Pty Ltd 07/10/2020).

Plate 20. Improved pasture typical of the Project Site (Ecology and Heritage Partners Pty Ltd 07/10/2020).

Plate 21. Native planted windrows typical of the Project Site (Ecology and Heritage Partners Pty Ltd 07/10/2020).

Plate 22. Native planted visual screens typical of the Project Site (Ecology and Heritage Partners Pty Ltd 05/10/2020).

3.4 Fauna Habitats

The fauna habitats across the Project Site exhibited evidence of sustained agricultural land-use, with large areas dominated by introduced cropping and pasture species. The majority of moderate to high quality terrestrial fauna habitat is present in the form of canopy vegetation distributed throughout the broader area.

3.4.1 Habitat Connectivity

On a broader landscape scale, there are several habitat features that provide connectivity to and from larger core areas of habitat such as Joel Joel Nature Conservation Reserve, Deep Lead Nature Conservation Reserve Glynwylln State Forest, Watta Wella Bushland Reserve, St Arnaud-Pyrenees State Forest and Ararat Regional Park.

There are several habitat corridors to and from these areas of core habitat. Vegetated road reserves, particularly along Landsborough Road, Joel South Road, Vineyard Road and Stawell-Avoca Road provide good habitat corridors for a variety of woodland dependent species, including woodland birds, arboreal mammals, small ground-dwelling mammals and reptiles. These roadside reserves provide connectivity (via habitat corridors and stepping stones) with large areas of native bushland located within, as well as west, and north of the Project Site.

Scattered trees within paddocks throughout the Project Site act as 'stepping stones' as a means of connection for more mobile fauna, including birds, microbats and arboreal mammals.

There are several other small reserves located throughout the locality, including Kirkella Bushland Reserve, Cocks Farm Bushland Reserve and Malakoff Bushland Reserve. Although these areas are not directly connected to the Project Site, there is a potential for more mobile fauna (e.g. birds and mammals) to move between these consolidated areas of habitat and the Project Site (e.g. through remnant native vegetation along roadsides). While the native vegetation within the Assessment Area largely occurs as isolated patches, some are connected to riparian corridors (e.g. Wimmera River) or vegetation within road reserves (e.g. Landsborough Road, Vineyard Road) or larger areas of forest adjoining the Project Site.

Riparian habitat acts as important dispersal corridors for native flora and fauna, with the Wimmera River extending along the eastern boundary of the Project Site, and Six and Seven Mile Creeks intersecting the Project Site from north to south. Such habitat corridors and associated connectivity is important in a landscape that has largely been cleared for agricultural purposes.

Wildlife corridors and scattered connections of vegetation (stepping stones) have numerous benefits to native fauna populations, particularly in modified landscapes where much of the surrounding vegetation is restricted to linear strips along roadsides or streams. They can, and often do constitute valuable habitat in their own right. Some of the key benefits of wildlife corridors associated with the maintenance of biodiversity on a local, and at a landscape level, include:

- protection and ongoing maintenance of ecosystem functionality through the reduction of threatening processes (erosion, weed spread, hydrological alterations);
- protection for populations of threatened species, or disturbance sensitive species (ie – orchids) that may have been lost from the surrounding landscape;
- provision of habitat (refuge, shelter, breeding opportunities) for a range of fauna either residing within corridors, or moving through the landscape;
- maintenance of species richness and diversity;
- a source of seed dispersal for flora species sensitive to moderate levels of disturbance;
- immigration of animals to supplement declining populations, thus reducing the likelihood of local extinctions;
- availability of habitat for reintroduction following extinction events;
- prevention of demographic changes occurring in populations that may result from prolonged isolation from other populations of the same species by aiding gene flow, thus enhancement of genetic variation and prevention of inbreeding; and
- facilitating fauna movement through modified landscapes to more optimal habitats.

3.4.2 Woodlands

Woodland vegetation varies in quality throughout the Assessment Area. However, in the context of extensive agricultural land use within privately owned land they are, overall, of high habitat value for native fauna. These remnants, particularly areas such as Joel Joel Nature Conservation Reserve and Watta Wella Bushland Reserve, as well as roadside and riparian vegetation are structurally and floristically diverse and the vegetation cover provides habitat niches for a diversity of native fauna and important habitat connectivity in an otherwise highly modified landscape.

A variety of arboreal mammals, microbats, ground-dwelling mammals, woodland birds, reptiles and amphibians are likely to reside in, forage in, rely upon, regularly use and move through woodland vegetation within the Project Site. A high diversity of woodland bird species were observed within this vegetation type during the avian surveys. These areas support occasional hollow-bearing trees, providing habitat for hollow-dependent fauna including possums, gliders, microbats and hollow-nesting birds such as parrots and owls. Additionally, a high degree of canopy connectivity enables arboreal mammals to move easily between trees.

3.4.3 Scattered Trees

The habitat value of scattered trees is dependent on the tree species, maturity and landscape context however, overall, they are of moderate value for native fauna.

Scattered trees in varying densities occur throughout the Assessment Area and provide an important resource for more mobile tree-dependent fauna. Many of the scattered eucalypts are relatively mature, providing an array of small, medium, large and very large hollows, bark fissures and crevices. These are likely to be relied upon for shelter and nesting by a range of hollow-dependent fauna including parrots, microbats, possums, gliders and owls. Scattered Buloke throughout the Assessment Area exhibited fewer signs of hollows, although several dead (Stag) Buloke where being utilised where hollows had formed where limbs had dropped off.

Scattered trees provide foraging habitat for insectivorous and nectivorous birds as well as vantage points and nesting areas for diurnal and nocturnal raptors and other non-hollow dependant species including Australian Magpie *Cracticus tibicen* and Australian Raven *Corvus coronoides*. These trees also provide stepping stones for more mobile fauna moving through the Assessment Area, enhancing landscape permeability for a wide range woodland birds, possums, reptiles, as well as predators such as raptors.

3.4.4 Open Pasture / Crops

The majority of the Project Site consists of paddocks which are either cropped or contain improved exotic pasture. Bird species which are tolerant of modified open areas are likely to use these areas, including foraging nocturnal and diurnal raptors. During the current suite of assessments, Wedge-tailed Eagle *Adua audax*, Brown Falcon *Falco berigora* and Nankeen Kestrel *Falco cenchroides* were observed foraging in these areas. Common opportunist species including Australian Magpie, Australian Raven, Sulphur-crested Cockatoo *Cacatua galerita*, Galah *Eolophus roseicapilla* and Little Corella *Cacatua sanguinea* were also observed utilising this habitat during the field assessments.

3.4.5 Creeklines and artificial waterbodies

Several drainage lines and creeklines, as well as artificially constructed farm dams occur throughout the Assessment Area, providing habitat of varying quality for a range of waterbirds and frog species. Most of the farm dams were in very poor condition, with livestock having unrestricted access. The network of drainage lines and creeklines area spatially well connected. However, during the assessments undertaken in 2020, most were dry and few refuge pools remained, while aquatic vegetation had senesced.

Nonetheless, when inundated and connected, the network of waterbodies is likely to provide dispersal opportunities for fauna, particularly frogs and fish that may be residing, refuging and/or breeding in the dams and creeklines throughout the Assessment Area.

3.5 National Significance Assessment

Matters of National Environmental Significance (NES) are listed and protected under the EPBC Act.

3.5.1 *Flora*

The VBA contains records of three nationally significant species previously recorded within 10 kilometres of the Project Site (DELWP 2021a) (Appendix 1.4; Figure 8). The majority of these records are located in areas of relatively high quality, undisturbed habitat (ie - Joel Joel NCR, Vinelea Bushland Reserve, Watta Wella Bushland Reserve, JJ Kingston Wildflower Sanctuary) or waterways and roadsides (Figure 8).

The PMST nominated an additional 18 nationally significant species which have not been previously recorded but have the potential to occur in the locality (DCCEEW 2022) (Figure 8; Appendix 1.4).

Of the 21 nationally significant flora species that have previously been recorded, or are predicted to occur within the locality, the following two species are considered to have the highest likelihood of occurrence within the Wind Farm Development Footprint (Table 13).

Table 13. Nationally significant flora with the highest likelihood of occurrence.

Species	Suitable habitat within the Project Site	Closest known records
Tawny Spider-orchid	Undisturbed woodland within the infrastructure footprint provide potential habitat for the nationally significant Tawny Spider-orchid. Surveys focussed on undisturbed roadsides, waterways and private land with an intact canopy present and evidence of an undisturbed groundlayer	Approx. 500 metres to the north-west within the Watta Wella I18 Bushland Reserve north near Natimuk.
River Swamp Wallaby-grass	Within swampy / wetland vegetation within the Infrastructure Footprint.	Previously recorded within the Project Site (Emerge Associates 2020b).

Tawny Spider-Orchid

Despite targeted surveys being undertaken in areas of potential habitat within the Assessment Area (i.e.- undisturbed roadsides, creeklines, patches of vegetation with moderate to high quality understory) at an appropriate time of year when the species was known to be flowering, no Tawny Spider-orchids were recorded.

Some areas of high quality Heathy Woodland and Box Ironbark Forest within the broader Project Site provide potential habitat for the species. However, given that most areas within the Infrastructure Footprint exhibit high levels of agricultural disturbance and /or modification, the Infrastructure Footprint generally provides only marginal habitat for the species due to high levels of disturbance in the ground layer.

Based on the results of the targeted surveys, the condition of potential habitats present, and the confirmed presence of the species flowering in the nearby reference site (Watta Wella Bushland I18 Reserve; Plate 23), it is considered highly unlikely that a population of Tawny Spider-orchid is present within the Assessment Area.

River Swamp Wallaby-grass

Initial targeted surveys undertaken in October 2020 and October 2021 where the species had previously been recorded by Emerge Associates (2020b) were not able to confirm the presence of River Swamp Wallaby-grass due to the absence of flowering material (or mature seeds).

Additional surveys for the species undertaken in March 2022 were able to collect mature seed and identified the presence of two *Amphibromus* species (Figure 3). None of the seed collected were able to be confirmed

as River Swamp Wallaby-grass. However, given the previously confirmed presence of the species in this location (Emerge 2020b), it is considered highly likely that the species was present within the broader patch of *Amphibromus* spp. Located in the survey area (Plate 24). As such, a polygon has been provided showing the location of *Amphibromus* spp. Within and immediately adjacent to the infrastructure footprint (Figure 4; Figure 5), although it is unknown how many individuals of River Swamp Wallaby-grass are present.

Plate 23. Tawny Spider-orchid recorded within Watta Wella Bushland Reserve (Ecology and Heritage Partners Pty Ltd 19/10/2021).

Plate 24. River Swamp Wallaby-grass west of Six Mile Creek (Ecology and Heritage Partners Pty Ltd 04/03/2022).

Other Nationally Significant Flora

No other nationally significant flora were recorded as part of the ecological survey program.

Based on the landscape context, highly modified condition of vegetation within the Infrastructure Footprint and extent of previous vegetation removal, the likelihood of any additional nationally significant flora occurring within the Infrastructure Footprint is considered low due to the modification of potential habitats, and lack of records in close proximity (i.e. – outside of the species known range) (Appendix 1.4).

3.5.2 Fauna

The VBA contains records of three nationally significant species previously recorded within 10 kilometres of the Project Site (DELWP 2021a) (Figure 9). The PMST nominated an additional 14 nationally significant species which have not been previously recorded but have the potential to occur in the locality (DCCEEW 2022) (Figure 9; Appendix 2.1).

Of the 17 nationally significant fauna species that have previously been recorded, or are predicted to occur within the locality, the following two species were considered to have the highest likelihood of occurrence within the Project Development Footprint (Table 14).

Table 14. Nationally significant fauna with the highest likelihood of occurrence.

Species	Suitable habitat within the Project Site	Closest known records
Swift Parrot	Box-Ironbark woodland within the Project Site and broader locality. Surveys focussed on woodlands that support preferred foraging habitat for the species with an intact canopy present.	Previous records from within Joel Joel Conservation Reserve.

Golden Sun Moth	Woodland/grassland with a ground layer comprising a cover of at least 20% Wallaby-grass	Previously recorded within the Project Site (Emerge Associates 2020b).

Golden Sun Moth Surveys

Most of the Project Site is highly modified for agriculture purposes and does not provide suitable habitat for Golden Sun Moth due to the low cover of suitable native grass species such as Wallaby-grass, and absence of preferred exotic species such as Chilean Needle-grass.

Targeted surveys focused on areas of potential habitat for Golden Sun Moth identified by Emerge Associates (2020b), as well as additional areas of potential habitat identified during the habitat hectare assessments that are proposed to be directly impacted, or have the potential to be indirectly impacted by the Project infrastructure. These areas were predominantly located within roadside vegetation where there has generally been less disturbance (i.e. grazing, pasture improvement, fertiliser usage), as well as areas of pasture where the cover of Wallaby-grass was at least 20%, which is the generally accepted cover threshold acknowledged to support preferred habitat for the species (DEWHA 2009a). These areas were deemed to contain the highest quality habitat for the species due to the higher abundance of native grasses.

Systematic surveys for Golden Sun Moth identified low numbers of Golden Sun Moth in five discrete areas within, or immediately adjacent to the Assessment Area (Figure 5). The limited dispersal ability of the Golden Sun Moth means that these discrete areas of confirmed habitat where separated by 200 metres or more are effectively isolated and should be considered as separate habitat area (DEWHA 2009b). Further, isolated sites where the species has gone extinct are unlikely to be naturally recolonised (DEWHA 2009a).

Where Golden Sun Moth are present, moderate quality habitat in the form of scattered Wallaby-grass *Rytidosperma* spp., and Spear-grass *Austrostipa* spp., is present. In many cases, a secondary grassland is present where a cover of Wallaby-grass has regrown following past disturbance (i.e. ploughing/scalping)

Despite the presence of Wallaby-grass in some patches or native vegetation, or within pasture, habitat quality was considered sub-optimal for the species due to the relatively low coverage of preferred native grass species and ground cover generally consisting of less than 10% Wallaby-grass. Further, most areas considered as unsuitable habitat showed clear signs of recent agricultural disturbance (i.e. soil ripping/ploughing).

Based on the recorded presence of Golden Sun Moth, a total of 164.53 hectares of confirmed Golden Sun Moth habitat is present (Figure 5).

Swift Parrot

Desktop Assessment

According to the VBA database, Swift Parrot *Lathamus discolor* was recently recorded immediately adjacent to the Project Site in Joel Joel Nature Conservation Reserve (DELWP 2021d). A total of four Swift Parrots were recorded in the reserve in 2019, representing the only species records within 10 kilometres of the Project Site.

An additional nine Swift Parrot records, some containing multiple specimens, are known from the Birdlife Australia New Atlas (Birdlife 2020), with six of these recorded between 1997 and 2019 in Glynwylln State Forest, plus additional records within Morrl Morrl Nature Conservation Reserve (2003), Bolangum Nature Conservation Reserve (2019) and Stawell (2013).

Targeted Survey

Targeted searches for Swift Parrot were undertaken concurrently to the autumn bird utilisation surveys in May 2020, as well as the habitat assessment undertaken in August 2020 in order to coincide with the Swift Parrot over-wintering period on mainland Australia. No Swift Parrots were detected during either survey event in 2020.

Habitat Assessment

The objective of the assessment was to identify the presence of important eucalypt species known to provide a food source for Swift Parrot in Victoria including Yellow Gum, Red Ironbark, Mugga, Yellow Box and Grey Box, as well as determine the potential quality of these sites for foraging.

A total of nine sites that were considered to support potential Swift Parrot foraging habitat were assessed. A summary of site habitat attributes is provided in Table 15.

Table 15. Swift Parrot habitat attributes

Site #	Location	Dominant foraging species	Likelihood of Swift Parrot utilisation
SP1	Glynwylln State Forest	Mature Grey Box, Yellow Gum specimens. Limited evidence of flowering at time of assessment	Likely to be used regularly when Swift Parrot is present in broader locality, and preferred eucalypts are flowering. Several previous records of Swift Parrot in this location. Several large trees in a relatively large remnant.
SP2	Watta Wella Bushland Reserve	Mature Grey Box, Yellow Gum present. Also Yellow Box specimens observed. Limited evidence of flowering at time of assessment.	May occasionally utilise habitat. Several large preferred foraging trees in a relatively large remnant.
SP3	Vineyard Road road reserve – east of Watta Wella Bushland reserve	High number of mature Yellow Box, Yellow Gum and Grey Box present. Limited evidence of flowering at time of assessment.	Likely to occasionally utilise habitat. Narrow, linear corridor subject to ongoing disturbance by vehicles. However, high number of mature eucalypts preferred by species.
SP4	Joel Joel Nature Conservation Reserve	Mature Grey Box, with Red Ironbark and Yellow Gum also present. Limited evidence of flowering at time of assessment.	Likely to be used regularly when Swift Parrot is present in broader locality, and preferred eucalypts are flowering. Several previous records of species in reserve. Large, intact remnant.
SP5	Vances Crossing Road road reserve – east of Joel Joel Nature Conservation Reserve	Mature Grey Box, with Red Ironbark and Yellow Gum also present. Limited evidence of flowering at time of assessment.	Likely to occasionally utilise habitat. Narrow, linear corridor subject to ongoing disturbance by vehicles. However, high number of mature eucalypts preferred by species.
SP6	Deep Lead Nature Conservation Reserve (No. 2)	Mature Grey Box, Red Ironbark and Yellow Gum present. Red Box and Yellow Box also present. Limited evidence of flowering at time of assessment.	Highly likely to be used regularly when Swift Parrot is present in broader locality, and preferred eucalypts are flowering. Several previous records of Swift Parrot in this location. Several large trees in a large, high quality remnant.
SP7	Landsborough Road road reserve – west of	Mature Yellow Gum dominant. River Red-gum and Grey Box also present.	May occasionally utilise habitat. Narrow, linear corridor subject to ongoing disturbance by

Site #	Location	Dominant foraging species	Likelihood of Swift Parrot utilisation
	Joel Joel Nature Conservation Reserve	Limited evidence of flowering at time of assessment.	vehicles. However, high number of mature eucalypts preferred by species.
SP8	Vinelea Bushland Reserve	Mature Yellow Box and Grey Box. Limited evidence of flowering at time of assessment.	Small, discrete remnant that may occasionally be utilised for foraging habitat due to dominance of preferred eucalypt species.
SP9	Watta Wella Road road reserve – extending NE from Watta Wella Bushland Reserve	Mature Grey Box, Yellow Gum present. Also Yellow Box specimens observed. Limited evidence of flowering at time of assessment.	May occasionally utilise habitat. Narrow, linear corridor subject to ongoing disturbance by vehicles. However, high number of mature eucalypts preferred by species.

Of the sites assessed, all have the potential to provide foraging habitat for Swift Parrot. However, site SP1 (Glynwylln State Forest), SP4 (Joel Joel Nature Conservation Reserve) and SP6 (Deep Lead Nature Conservation Reserve [No. 2]) are considered to support the highest quality foraging habitat, where these areas are likely to be regularly utilised for foraging purposes when the species is present within the broader locality, and the eucalypts are flowering.

Based on the current development layout, the turbines in closest proximity to Joel Joel Nature Conservation Reserve are located approximately 275 metres (Figure 2j) and 225 metres (Figure 2n) away from this habitat (SP4) respectively.

Site SP1 is located approximately 7.9 kilometres north-west of the nearest turbine and so the continuation of utilisation of habitat within this site is highly unlikely to be adversely impacted by the proposed wind farm development (Figure 3a).

Site SP6 is located approximately 10.5 kilometres east of the nearest turbine, and so the continuation of utilisation of habitat within this site is highly unlikely to be adversely impacted by the proposed wind farm development (Figure 3a).

Of the other sites assessed, although many supported mature eucalypts that would provide potential foraging habitat for Swift Parrot, due to their small size or discrete nature, and distance from other areas of larger areas of suitable habitat, it is considered that these areas would likely be used on an occasional basis only, and would not be relied upon for foraging purposes given the presence of higher quality, larger areas present within the locality.

Growling Grass Frog eDNA Sampling

No DNA from Growling Grass Frog were detected in any of the samples analysed from the 13 waterbodies.

The sampling was undertaken during early Spring (October) which is within the known active breeding and calling season for Growling Grass Frog (DEWHA 2009c), and is recognised as the optimum time to detect the presence of the species.

In aquatic environments, eDNA generally breaks down in a matter of weeks (Thomsen *et. al.,* 2012; Dejean *et. al.,* 2011), and during this time, can disperse over a kilometre away from its original source.

Given the time of year the sampling was undertaken, and the potential to detect the presence of Growling Grass Frog DNA within the catchment (if present) over a period of multiple weeks during the optimum time of

year, based on the results of the eDNA analysis, it is considered highly unlikely that an extant population of Growling Grass Frog is currently utilising waterbodies within the catchment for breeding purposes.

Further details on the results of the eDNA analysis are provided in Appendix 4.

Migratory Species

Migratory species are protected under the EPBC Act if they are listed under the following agreements:

- Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention);
- China Australia Migratory Bird Agreement (CAMBA);
- Japan Australia Migratory Bird Agreement (JAMBA); or the
- Republic of Korea Australia Migratory Bird Agreement (ROKAMBA).

The VBA (DELWP 2021a) indicates that two migratory bird species (White-throated Needle-tail *Hirundapus caudacutus* and Swift Parrot) have been recorded within the project locality (Appendix 2.1). The Project Site would not be classed as 'important habitat' for Migratory species as defined under the EPBC Act Policy Statement 1.1 Principal Significant Impact Guidelines (DoE 2013). The proposed wind farm is not located between, or in close proximity to, either migratory bird feeding areas, or important, regularly used, feeding and roosting sites, hence the likelihood of migratory birds moving through the Project Site when moving between wetlands in the local area is low.

While it is possible that small numbers of migratory birds could fly over the site during migration, it has been well documented that shorebirds typically fly between 0.5 and six kilometres in elevation during migration, well above the tip of the proposed turbines (Williams *et al.* 1981; Piersma *et al.* 1990; Tulp *et al.* 1994). Owing to these factors, it is considered that the likelihood of migratory bird mortality through turbine collisions is low and that the proposed wind farm is unlikely to have a significant impact on any migratory species.

3.5.3 Ecological Communities

Six nationally listed ecological communities are predicted to occur within 10 kilometres of the Project Site (DCCEEW 2022):

- Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions;
- Grassy Eucalypt Woodland of the Victorian Volcanic Plain;
- Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia;
- Plains Mallee box woodlands of the Murray Darling Depression, Riverina and Naracoorte Coastal Plain Bioregions;
- Natural Grasslands of the Murray Valley Plains; and,
- White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland.

Due to the absence of key eucalypt species dominating (or formerly dominating) the canopy of patches of native vegetation, or the vegetation structure not meeting key thresholds, five of the six nationally significant

ecological communities are assessed as being absent from the Project Site. However, some patches of *Low Rises* Grassy Woodland EVC, Box Ironbark Forest EVC and Plains Woodland EVC meet the thresholds that define the *Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia* (GBGW) ecological community.

Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia

Several patches of *Low Rises* Grassy Woodland, Box Ironbark Forest and Plains Woodland are dominated by Grey Box and were assessed against the condition thresholds that define the nationally significant ecological community Grey Box (*Eucalyptus microcarpa)* Grassy Woodlands and Derived Native Grasslands of South-eastern Australia (GBGW Community).

Based on an assessment against the condition thresholds for the community, some habitat zones of Box Ironbark Forest, Plains Woodland and Grassy Woodland EVCs (BIF1, GW2, GW3, GW4, GW5, GW6, PW2, PW3, PW4) qualify as the GBGW Community (Figure 2). These habitat zones are generally located within or adjacent to the road reserves of Watta Wella Road, Porters Road, Vineyard Road, Landsborough Road [within and adjacent to Joel Joel Nature Conservation Reserve], and Vances Crossing Road (Figure 2). An assessment against the condition thresholds for the Community are given below:

- Is the most common tree species Grey Box? Yes
- Is the patch at least 0.5 hectares in size? Yes
- Do non-grass weeds make up more than 30% of the plant cover in the ground layer? No
- Do trees cover at least 10% of the patch? Yes
- Is the patch bigger than 2 hectares? Yes (some)
- Are there at least eight trees per hectare that either:
    - Contain hollows? No;
        - or
    - Have a diameter >60 cm at 1.3 metres above ground level? No
- Are there at least 20 live trees per hectare with a diameter of 12 cm at 1.3 metres above ground level?

In patches smaller than 2 hectares:

- Are there at least 8 native species in the mid and ground layers? Yes
- Is at least 50% of the plant cover in the ground layer made up of perennial native species? Yes

<u>The listed national ecological community is present.</u>

A total of 85.987 hectares of the GBGW Community is present within the Assessment Area. Of this, a total of 1.671 hectares is proposed to be impacted under the current development footprint (Figure 2).

3.5.4 *Other Matters of NES*

No Ramsar wetlands occur within or surrounding the Project Site. The closest Ramsar wetland is Lake Albacutya, located approximately 100 – 150 kilometres away.

3.6 State Significance Assessment

Biodiversity matters present within the Project Site that are considered of significance to the State of Victoria are outlined below.

3.6.1 *Flora*

The VBA contains records of 21 state significant flora species from within the project locality (DELWP 2021a (Appendix 1.4; Figure 8).

Two State significant flora species; Buloke and Hairy Tails *Ptilotis erebescens* were recorded within the Project Site during the field survey (Figure 3). Emerge Associates also recorded Broad-lip Diuris *Diuris x palochila* and Grassland Bindweed *Convolvulus graminetinus* (2020a; 2020b). However, these species were not observed by Ecology and Heritage Partners. Further, it is understood that the identification of these species based on the collection of seed material and photos was not confirmed by the herbarium at the Royal Botanic Gardens Victoria.

3.6.2 *Fauna*

The VBA contains records of 15 State significant fauna species within the project locality (DELWP 2021a) (Appendix 2.1; Figure 9).

Three State significant fauna: Hardhead *Aythya australis*, Speckled Warbler *Chthonicola sagittate* and Hooded Robin *Melanodryas cucullata cucullata* were recorded during bird utilisation surveys.

Based on habitat present within the Project Site, the landscape context and the proximity of previous records, additional state-significant fauna species are considered unlikely to occur within the site (Appendix 2.1).

Similarly, no evidence of Powerful Owl or Barking Owl roosting or breeding activity was found during surveys, but there is a moderate likelihood that Powerful Owl uses native vegetation within the Project Site for foraging and roosting activities, as there exists a high number of large hollow-bearing trees in the Project Site, and records exist in the Joel Joel Nature Conservation Reserve (Figure 9).

Squirrel Glider (listed as vulnerable under the FFG Act in Victoria) has previously been recorded in the Project Site (DELWP 2021d), most recently in 1988. Squirrel Gliders prefer to feed on flowering eucalypt species and use large hollow-bearing trees for nesting. The Project Site contains suitable habitat for the species, particularly along roadsides and waterbodies. These areas contain large contiguous corridors of remnant vegetation supporting a mix of large hollow-bearing eucalypts as well as younger eucalypts and wattle species also suitable for feeding. This considered, there is a moderate likelihood of the Squirrel Glider occupying the Project Site, however there is no risk of turbine collision due to Squirrel Glider not occupying the RSA. While there may be some Squirrel Glider habitat loss in the Project Site due to vegetation clearing, there is a low overall risk to the species as most critical habitat containing hollow-bearing trees will be retained.

Platypus eDNA Analysis

No DNA from Platypus were detected in any of the samples analysed from the 13 waterbodies (Appendix 4).

Platypus are active throughout the year, predominantly at night, although in winter and early spring, are also more active during the day. The sampling was undertaken during early Spring (October) which is during a period when Platypus is known to be active (day and night).

In aquatic environments, eDNA generally breaks down in a matter of weeks (Thomsen *et. al.,* 2012; Dejean *et. al.,* 2011), and during this time, can disperse over a kilometre away from its original source.

Given the time of year the sampling was undertaken, and the potential to detect the presence of Platypus DNA within the catchment (if present) over a period of multiple weeks during a time of year when the species is known to be active, based on the results of the eDNA analysis, it is considered highly unlikely that an extant population of Platypus is currently utilising waterbodies within the catchment.

3.6.3 Ecological Communities

One State significant ecological community is considered to be present within the Project Site: the Victorian Temperate Woodland Bird Community. The Victorian Temperate Woodland Bird Community has been defined as a suite of bird species, mainly associated with drier woodlands on the slopes and plains north of the Great Dividing Range (DELWP 2022g).

The Project Site is within the geographic range of the community and the assemblage of 24 birds that defines this community, with suitable habitat present along roadside, watercourses, and the Joel Joel Nature Conservation Reserve adjacent to the Project Site. Of the 24 birds, a total of 7 species that comprise the community were recorded within the patches of native vegetation within the Project Site (Table 16), with several additional woodland dependent birds listed in this threatened community likely to use this habitat.

Therefore, it is considered that this community is present within Assessment Area, adjacent to and within the road reserves of Watta Wella Road, Porters Road, Vineyard Road and Vances Crossing Road (Figure 2). Joe Joel Nature Conservation reserve is also considered to support the Community.

A total of 48.23 hectares of the Victorian Temperate Woodland Bird Community has been mapped within the Assessment Area, with 1.32 hectares proposed to be impacted under the current Development Plan.

Table 16. List of bird species associated with the Temperate Woodland Bird Community, their legal status and their status within, and in proximity to, the Project Site.

Common Name	Scientific Name	Legislative Threat Status		Recorded in current survey
		EPBC	FFG	
Apostlebird	*Struthidea cinerea*	-	vu	-
Barking Owl	*Ninox connivens*	-	ce	-
Back-chinned Honeyeater	*Melithripterus gularis gularis*	-	-	-
Brown Treecreeper (south-eastern subspecies)	*Climacteris picumnus victoriae*	-	-	Yes
Brown-headed Honeyeater	*Melithreptus brevirostris*	-	-	Yes
Bush Stone-curlew	*Burhinus grallarius*	-	ce	-

Common Name	Scientific Name	Legislative Threat Status		Recorded in current survey
		EPBC	FFG	
Diamond Firetail	*Stagonopleura guttata*	-	vu	-
Fuscous Honeyeater	*Lichenostomus fuscus*	-	-	Yes
Grey-crowned Babbler	*Pomatostomus temporalis*	-	vu	-
Ground Cuckoo-shrike	*Coracina maxima*	-	e	-
Hooded Robin	*Melanodryas cucullata cucullata*	-	vu	Yes
Jacky Winter	*Microeca fascinans*	-	-	Yes
Little Lorikeet	*Glossopsitta pusilla*	-	-	-
Painted Button-quail	*Turnix varia*	-	-	-
Painted Honeyeater	*Grantiella picta*	-	vu	-
Red-capped Robin	*Petroica goodenovii*	-	-	-
Red-tailed Back-cockatoo	*Calyptorhynchus banksi*	EN	en	-
Speckled Warbler	*Chthonicola sagittata*	-	en	Yes
Superb Parrot	*Polytelis swainsonii*	VU	en	-
Swift Parrot	*Lathamus discolor*	EN	ce	-
Turquoise Parrot	*Neophema splendida*	-	vu	-
Regent Honeyeater	*Anthochaera phrygia*	EN	ce	-
Western Gerygone	*Gerygone fusca*	-	-	-
Yellow-tufted Honeyeater	*Lichenostomus melanops*	-	-	Yes

Note. EPBC Act: E = Endangered; VU = Vulnerable; FFG Act: ce/en/vu critically endangered/endangered/vulnerable in Victoria under the FFG Act (DELWP 2022e).

3.7 Brolga Assessment

3.7.1 Desktop Interrogation

According to the VBA (DELWP 2021d), the Sheldon Flocking Site Database (Sheldon 2004) and an interrogation of the Birdlife New Atlas dataset (Birdlife 2020), there are six known records of Brolga within 20 kilometres of the Project Site (Figure 6). There is one confirmed record of Brolga from 2008 within the Project Site, with additional VBA and Sheldon database records from 1990 and 1997 located approximately two kilometres north-east of the Project Site in Greens Creek Swamp Wildlife Reserve. An additional VBA and Sheldon's record from 1986 are located near Greens Creek Road, approximately seven kilometres north-west of the Project Site.

The Birdlife New Atlas dataset (Birdlife 2021) does not contain any Brolga records within 20 kilometres of the Project Site, and no historical breeding or flocking records are present within 20 kilometres of the Project Site (DELWP 2021a; Sheldon 2004).

The Project Site is located on the mid-northern extent of the Victorian distribution range (as indicated in DSE 2012), limiting the likelihood of Brolgas flying across the site when moving between areas of suitable habitat.

Based on a review of Google Earth and NearMap historical imagery, Greens Creek Swamp Wildlife Reserve was last inundated in 2018. It is noted that when inundated, Greens Creek Swamp Wildlife Reserve may provide potential breeding habitat for Brolga. However, it is noted that there are no historical breeding records within Greens Swamp Wildlife Reserve, or within 20 kilometres of the Project Site.

An assessment of recent aerial photography (NearMap), and a review of the Directory of Important Wetlands database (DAWE 2021) and Current Wetland layer (DELWP 2022b) determined that the local area is highly modified due to agricultural activity and no longer supports any potential breeding or flocking Brolga habitat, or any important wetland habitat.

3.7.2 Landholder Liaison

Ecology and Heritage Partners consulted with a total of 11 local landowners within and adjacent to the vicinity of the Project Site (as provided by Umwelt via RES), as well as other relevant parties including Birdlife Australia, the local DELWP office (Horsham), and local friends groups to ascertain the historical and current utilisation of habitats within the broader locality. Where no response was received by telephone, these groups/individuals were contacted via email.

All landowners indicated that they were not aware of any areas of potential habitat within the local area (aside from Greens Creek Swamp), nor provided information regarding any recent or historical incidental sightings of Brolga occurring within the local area. As such, no site visits to landowner properties were undertaken (aside from those located within the Project Site).

Members of local Landcare groups recalled seeing Brolgas historically in the region but have not sighted any in the past 20 years, with large-scale draining of swamps and significant droughts in recent times speculated to be important factors for the species decline in the region.

3.7.3 Field Assessment

A roaming survey was undertaken between 22 – 26 June 2020 to visit locations within 20 kilometres of the Project Site where the species has previously been recorded, or sites that have the potential to support flocking or breeding habitat (Figure 6). The June 2020 roaming surveys were undertaking during the known flocking season of the Brolga and is considered to be a high period of detectability for the species.

No access into Greens Creek Swamp Wildlife Reserve, located approximately two kilometres north-east of the Project Site, was possible due to it being surrounded by privately owned land. However, potential habitat suitability was assessed via high powered binoculars. Greens Creek Swamp appeared dry during the field assessment, with a large number of dead eucalypt trees and evidence of salinity issues. It did not appear to provide breeding or flocking habitat for Brolga.

All areas assessed for Brolga during the roaming survey were dry or near dry at the time of visit. No habitats within the Project Site or broader locality are considered to support moderate or high-quality breeding or flocking habitat for Brolga. No Brolga were observed during the surveys.

3.7.4 Conclusion

Based on the absence of potential Brolga breeding and flocking habitat, the paucity of recent Brolga records within the locality based on both a detailed desktop database interrogation, and liaison with local landowners,

it is determined that a Level Two Assessment is not required as the risk of impact to Brolga due to the proposed wind farm is low.

3.8 Bird Utilisation Surveys

3.8.1 Overview

Seventy-six (76) bird species were recorded, consisting of 8,788 individuals, during the fixed-point bird counts. One other species was identified to generic level (i.e. Raven species, either Little Raven *Corvus mellori* or Australian Raven *C. coronoides*). Three introduced species were recorded: Common Starling, Eurasian Skylark, and House Sparrow. No nationally significant species were recorded within the Project Site; however, the following species listed as threatened under the FFG Act were recorded (DELWP 2022e):

- Hardhead *Aythya australis* (Vulnerable)
- Hooded Robin *Melanodryas cucullate* (Vulnerable)
- Speckled Warbler *Pyrrholaemus sagittatus* (Endangered).

The most commonly recorded species were Australian Magpie *Gymnorhina tibicen* (recorded during 83% of surveys), Galah *Eolophus roseicapilla* (53%), Long-billed Corella *Cacatua tenuirostris* (44%), Sulphur-crested Cockatoo *Cacatua galerita* (43%), and Red-rumped Parrot *Psephotus haematonotus* (38%).

A total of 91.6% of bird observations made during the point counts were of individuals that were either on the ground or flying below the Rotor Swept Area. A further 6.2% did not have their height recorded as they were obscured from vision, while no birds were recorded flying above the Rotor Swept Area.

Birds observed flying at Rotor Swept Area (2.2%) include Australian Magpie *Cracticus tibicen*, Galah *Eolophus roseicapilla*, Long-billed Corella *Cacatua tenuirostris*, Sulphur-crested Cockatoo *Cacatua galerita*, White-faced Heron *Egretta novaehollandiae*, and Wedge-tailed Eagle *Aquila audax*. All species observed within the Rotor Swept Area were locally common birds and not nationally or State significant.

Four species – Brown Treecreeper, Hardhead, Hooded Robin, and Speckled Warbler – recorded during the bird utilisation surveys are defined as 'species of interest' as outlined in Lumsden *et al.* (2019). However, based on typical flight behaviour none are likely to fly in the Rotor Swept Area.

A variety of other bird species were also recorded (see Appendix 2.2 for full species list), including:

- Generalist bird species common in modified landscapes, such as open paddocks, including Noisy Miner *Manorina melanocephala*, Willie Wagtail *Rhipidura leucophrys* and Little Raven *Corvus mellori*;
- Woodland bird species using larger patches of native and non-native vegetation around the Wimmera River, Seven Mile Creek, Joel Joel NCR, Watta Wella Reserve and other bushland in the Project Site, such as Rufous Whistler *Pachycephala rufiventris*, Red Wattlebird *Anthochaera carunculata*, Rainbow Bee-eater *Merops ornatus*, Weebill *Smicrornis brevirostris* and Dusky Woodswallow *Artamus cyanopterus*;

- Water bird species using dams and streams in the Project Site including Australian Woodduck *Chenonetta jubata*, Australian Shelduck *Tadorna tadornoides*, Straw-necked Ibis *Threskiornis spinicollis* and White-faced Heron *Egretta novaehollandiae*;
- Raptors foraging over paddocks, roadsides and waterbodies, including Black Kite *Milvus migrans*, Wedge-tailed Eagle *Aquila audax*, Collared Sparrowhawk *Accipiter cirrocephalus* and Nankeen Kestrel *Falco cenchroides*; and,
- Parrot species feeding on sowed crops and using large hollow-bearing gums, including Crimson Rosella *Platycercus elegans,* Eastern Rosella *Platycercus eximius*, Musk Lorikeet *Glossopsitta concinna*, and Purple-crowned Lorikeet *Glossopsitta porphyrocephala*.

Incidental observations recorded in the Project Site did not include any additional species to those recorded during point-counts.

3.8.2 Species Richness

The predicted species richness estimate for the point count surveys was 75 species, which converts to a completeness of over 100% and means that an additional 1-2 species were recorded relative to the predicted total number of species likely to occupy the Project Site. A greater number of actual species relative to predicted species is an indication that survey effort was very high and covered a range of conditions and seasons. The study appears to reach asymptote (or plateau) after six months of survey. The results show a clear relationship between effort and the number of species detected.

3.8.3 Flight Heights

The following is based on turbine specifications of a 166 metre hub height with a blade length of 89 metres, resulting in a 255 metre tip height and 76 metre ground clearance. Therefore, the Rotor Swept Area (RSA) is between 77 metres and 255 metres in height.

The majority of bird species observed (92%) during the point counts were either recorded on the ground or flying below the Rotor Swept Area (Table 17). Just over 2% of bird species were in the Rotor Swept Area, consisting primarily of Wedge-tailed Eagle and Long-billed Corella. This percentage is typical of surveys for wind farms located in areas characterised by open pasture. No other raptors were observed in the Rotor Swept Area. Bird point count survey locations were assigned to capture a representative sample of vegetation and habitat type. Given much of the Project Site comprises open paddocks, most bird point count survey locations are situated in these areas. However, several sites were situated to capture any woodland and waterbird habitats in the Project Site.

The most frequently observed species flying in the Rotor Swept Area during point-counts were Long-billed Corella (150 individuals), followed by Wedge-tailed Eagle (24). Wedge-tailed Eagles are likely to fly at and above Rotor Swept Area when foraging, while large parrots, including several recorded in the Rotor Swept Area during surveys such as Galah, Sulphur-crested Cockatoo and Long-billed Corella, tend to fly in the Rotor Swept Area as they move daily between roosts and feeding areas. No significant wetlands are present in or near the Project Site, however one waterbird species recorded during point count surveys – White-faced Heron was observed flying in the Rotor Swept Area, while others such as Straw-necked Ibis may also fly in the

Rotor Swept Area when moving between habitat areas. The Project Site was driven extensively and very few water birds likely to fly in the Rotor Swept Area were identified flying overhead.

Generally, non-passerine birds such as raptors, wetland/waterbirds and parrots have flight characteristics that make them prone to collisions with wind turbines. These species are usually larger, less mobile, occur in flocks (particularly parrots) and forage in more open areas. Some minor changes in local distribution and abundance of these species may be expected as a consequence of ongoing operation of the turbines, and although these impacts are not expected to be significant and minimal in line with the stated AusWEA (2005), collision potential and post construction monitoring should be established to further assess the impact of the project on bird species and populations.

A summary of species recorded during point count surveys and associated flying heights against Rotor Swept Area is provided in Table 18 and Graph 1.

Table 17. Summary of birds recorded at the varying flight heights

Flight Height	# of birds	% of birds
Height not recorded	545	6.2%
Ground (0 metres)	2590	29.5%
Below RSA (1-76m)	5461	62.1%
RSA (77-255m)	192	2.2%
Above RSA (>255m)	0	0.0%

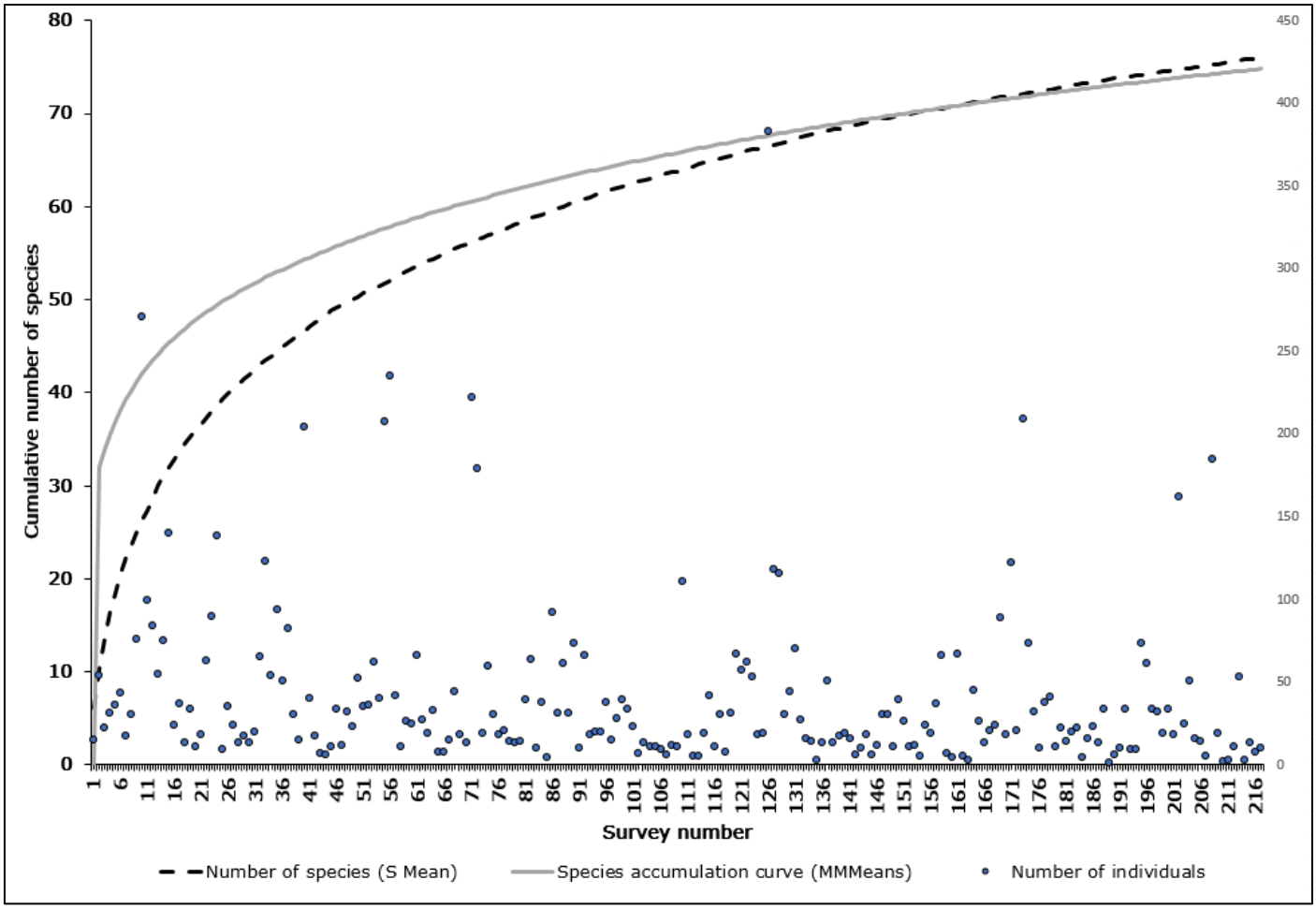
Table 18. Number of instances of bird species recorded in Point Count Surveys classified according the RSA at which they were detected (excluding incidental records).

Species	Height not observed	Ground	Below RSA	RSA	Total
Australasian Pipit	16	26	36	0	**78**
Australian Magpie	62	642	240	3	**947**
Australian Raven	4	148	128	0	**280**
Australian Shelduck	0	16	10	0	**26**
Australian Woodduck	10	128	49	0	**187**
Black Kite	0	0	2	0	**2**
Black-faced Cuckooshrike	1	0	3	0	**4**
Black-shouldered Kite	0	0	1	0	**1**
Brown Falcon	0	0	4	0	**4**
Brown Songlark	1	1	3	0	**5**
Brown Treecreeper	5	2	13	0	**20**
Brown-headed Honeyeater	0	0	6	0	**6**
Buff-rumped Thornbill	0	0	2	0	**2**
Chestnut-rumped Thornbill	2	0	0	0	**2**

Species	Height not observed	Ground	Below RSA	RSA	Total
Collared Sparrowhawk	0	0	1	0	1
Common Bronzewing	0	0	2	0	2
Common Starling	0	10	187	0	197
Crested Pigeon	1	4	11	0	16
Crested Shrike-tit	0	0	3	0	3
Crimson Rosella	5	0	43	0	48
Dusky Woodswallow	0	0	19	0	19
Eastern Rosella	0	0	36	0	36
Eurasian Skylark	6	2	0	0	8
Flame Robin	0	0	4	0	4
Fuscous Honeyeater	0	0	5	0	5
Galah	55	165	371	9	600
Golden-headed Cisticola	0	1	0	0	1
Grey Shrike-thrush	6	1	3	0	10
Hardhead	0	0	1	0	1
Hooded Robin	0	0	1	0	1
House Sparrow	10	4	4	0	18
Jacky Winter	0	0	6	0	6
Laughing Kookaburra	6	0	9	0	15
Little Corella	9	0	67	0	76
Little Raven	22	703	478	0	1203
Little Wattlebird	0	0	2	0	2
Long-billed Corella	74	475	2209	150	2908
Magpie-lark	5	2	11	0	18
Mistletoebird	2	0	1	0	3
Musk Lorikeet	1	0	109	0	110
Nankeen Kestrel	0	1	6	0	7
New-holland Honeyeater	2	0	0	0	2
Noisy Miner	22	8	61	0	91
Pied Currawong	0	0	2	0	2
Purple-crowned Lorikeet	0	0	4	0	4
Rainbow Bee eater	1	0	19	0	20
Rainbow Lorikeet	2	0	0	0	2
Red Wattlebird	27	0	17	0	44

Species	Height not observed	Ground	Below RSA	RSA	Total
Red-rumped Parrot	23	17	292	0	**332**
Restless Flycatcher	1	0	5	0	**6**
Rufous Songlark	1	0	0	0	**1**
Rufous Whistler	6	0	3	0	**9**
Southern Whiteface	3	0	6	0	**9**
Speckled Warbler	2	0	0	0	**2**
Spotted Pardalote	3	0	0	0	**3**
Straw-necked Ibis	0	13	2	0	**15**
Striated Pardalote	22	0	24	0	**46**
Stubble Quail	2	0	0	0	**2**
Sulphur-crested Cockatoo	65	192	491	5	**753**
Superb Fairywren	20	4	34	0	**58**
Tree Martin	0	0	23	0	**23**
Wedge-tailed Eagle	5	0	10	24	**39**
Weebill	6	2	76	0	**84**
Welcome Swallow	2	0	107	0	**109**
White-breasted Woodswallow	0	0	5	0	**5**
White-browed Scrubwren	1	0	2	0	**3**
White-faced Heron	0	0	2	1	**3**
White-fronted Chat	1	5	26	0	**32**
White-plumed Honeyeater	1	0	36	0	**37**
White-throated Treecreeper	1	0	0	0	**1**
White-winged Chough	0	0	3	0	**3**
Willie Wagtail	9	5	45	0	**59**
Yellow Thornbill	0	0	17	0	**17**
Yellow-faced Honeyeater	1	0	3	0	**4**
Yellow-rumped Thornbill	13	13	58	0	**84**
Yellow-tufted Honeyeater	0	0	2	0	**2**

Note. Ground – 0 metres; Below RSA – 1-76 metres; RSA 77-255 metres; Above RSA > 255 metres.



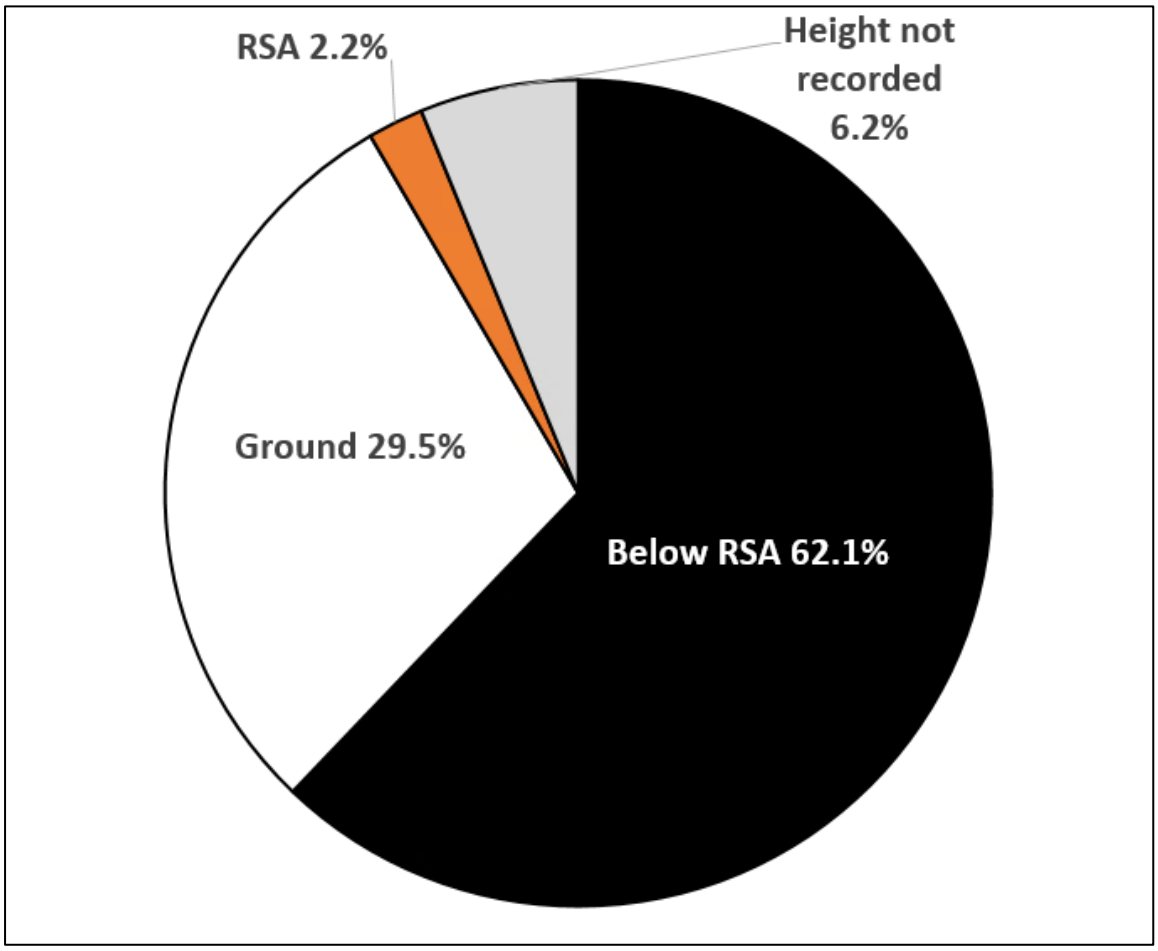
Graph 1. Species accumulation curve across the entire survey period.

Source: Species accumulation curve produced using EstimateS (Colwell 2013)

3.8.4 Raptors

Several Wedge-tailed Eagles were observed flying in the Rotor Swept Area. In addition, several raptors species were observed in or near the Project Site, including Black-shouldered Kite, Black Kite, Brown Falcon, Collared Sparrowhawk, Nankeen Kestrel (Appendix 2.2). Based on the results of the bird utilisation surveys, the proposed wind farm footprint may be located within the territory of at least two pairs of Wedge-tailed Eagles. While 39 individuals Wedge-tailed Eagles were recorded during surveys, most of these records are likely to be the same handful of individuals. Wedge-tailed Eagles are known to occupy a territory of approximately 30-40 square kilometres (Hatton *et al.* 2014). Given the Project Site is approximately 70-80 square kilometres, at least two resident pairs – and several juveniles in spring and summer – are likely to occupy the Project Site.

Raptors in general accounted for a low percentage (<1%) of birds recorded within and adjacent to the wind farm during the bird surveys.



Graph 2. Percentage of birds recorded below (RSA), at rotor swept area (RSA) height (77 – 255 metres), during the survey period. Note no species were recorded above RSA, although several parrot and raptor species are likely to utilise heights within and above RSA.

3.9 Microbat Surveys

3.9.1 Desktop Review

The database search of the VBA (DELWP 2021a) contained records for eight microbat species; including Southern Free-tailed Bat *Ozimops planicepts*, Gould's Wattled Bat *Chalinolobus gouldii*, Chocolate Wattled Bat *Chalinolobus morio*, White-striped Freetail Bat *Tadarida australis*, Lesser Long-eared Bat *Nyctophilus geoffroyi* and Little Forest Bat *Vespadelus vulturnus* within a 20 kilometre radius of the Project Site (Table 19). No significant bat species have previously been recorded within 10 kilometres of the Project Site (DELWP 2021a).

Table 19. Microbat species previously recorded within the wind farm locality (DELWP 2021a).

Microbat species	VBA
White-striped Freetail Bat *Tadarida australis*	✓
Southern Forest Bat *Vespadelus regulus*	✓
Gould's Wattled Bat *Chalinolobus gouldii*	✓

Microbat species	VBA
Chocolate Wattled Bat *Chalinolobus morio*	✓
Little Forest Bat *Vespadelus vulturnus*	✓
Lesser Long-eared Bat *Nyctophilus geoffroyi*	✓
Southern Free-tailed Bat *Ozimops planiceps*	✓
Large Forest Bat *Vespadelus darlingtoni*	✓

3.9.2 Bat Survey Results

A minimum of nine native bat species were detected during the bat surveys, including Southern Free-tailed Bat, White-striped Freetail Bat, Eastern Falsistrelle *Falsistrellus tasmaniensis*, Gould's Wattled Bat, Chocolate Wattled Bat and Little Forest Bat (Table 20). A maximum of up to thirteen native bat species were recorded when calls that could not be identified to species level are considered.

Nocturnal and Bat detector surveys were undertaken across the Project Site over several nights in April 2020. One call complex (Eastern Bent-wing Bat / Large Forest Bat) is the only result that may be attributed to a significant species – the FFG listed Eastern Bent-wing Bat *Miniopterus schreibersii oceanensis*. A number of other calls detected during surveys could not be identified to species level, and were assigned to one of four call complexes: Eastern Bent-wing Bat / Large Forest Bat; Forest Bat spp. *Vespadelus darlingtoni / V. Regulus / V. vulturnus;* Nyctophilus spp. *Nyctophilus geoffroyi / Nyctophilus gouldi*; or Eastern Freetail Bat / Southern Freetail Bat (Table 20).

Eleven of the thirteen possible microbat species recorded within the Project Site are considered to have a moderate to high risk of collision due to their flight behaviour. White-striped Freetail Bat is particularly at risk, having recorded the highest number of collision incidents from a sub-sample of turbines across 15 Victorian Wind Energy Facilities between 2003 and 2018 (ARI 2019). Species recorded that are not a collision risk include Inland Broad-nosed Bat, which is considered very unlikely to fly at Rotor Swept Area height as the species rarely flies above 15 metres or tree canopy height (Churchill 2008). Eastern Bent-wing Bat is a cave dwelling bat that forages at and around canopy height in treed areas, and close to the ground in grassy areas. The species has previously been shown to fly consistently below turbine height, with no collision mortalities published in Victoria (ARI 2019).

All bat species recorded in the Project Site (including call complex level) that have a moderate to high risk of collision are not state or federally listed species, with stable populations and widespread distribution. In this context, turbines are likely to cause low impacts to significant bat populations recorded in the Project Site.

Table 20. Bat species detected across the Project Site during bat surveys.

Site	BS-01	BS-02	BS-03	BS-04	BS-05	BS-06	BS-07	BS-08
Number of Detections	4,386	3,078	5,392	3,617	2,139	3,319	4,213	3,826
Species								
White-striped Freetail Bat *Tadarida australis*	✓	✓	✓	✓	✓	✓	✓	✓
Eastern Falsistrelle *Falsistrellus tasmaniensis*	-	-	✓	✓	✓	✓	✓	✓
Gould's Wattled Bat *Chalinolobus gouldi*	✓	✓	✓	✓	✓	✓	✓	✓

Site	BS-01	BS-02	BS-03	BS-04	BS-05	BS-06	BS-07	BS-08
Inland Broad-nosed Bat *Scotorepens balstoni*	✓	✓	-	✓	-	-	✓	-
Large Forest Bat *Vespadelus darlingtoni*	✓	✓	✓	✓	✓	✓	✓	✓
Southern Freetail Bat *Ozimops planiceps*	✓	✓	✓	✓	✓	✓	✓	✓
Chocolate Wattled Bat *Chalinolobus morio*	✓	-	✓	✓	✓	✓	✓	✓
Little Forest Bat *Vespadelus vulturnus*	✓	-	✓	✓	✓	✓	✓	✓
Not identified to species level								
Eastern Bent-wing Bat / Large Forest Bat	-	-	✓	-	-	-	-	-
Forest Bat spp. *Vespadelus darlingtoni / V. Regulus / V. vulturnus*	✓	✓	✓	✓	✓	✓	✓	✓
Nyctophilus spp. *Nyctophilus geoffroyi / Nyctophilus gouldi*	✓	✓	✓	✓	✓	✓	✓	✓
Eastern Freetail Bat / Southern Freetail Bat	✓	✓	✓	✓	✓	✓	✓	✓

4 REMOVAL, DESTRUCTION OR LOPPING OF NATIVE VEGETATION (THE GUIDELINES)

4.1 Avoid and Minimise Statement

The land within the Project Site has not been subject to any strategic level planning process. However, some discrete areas are affected by an ESO, with one turbine located within this area (Figure 2h).

RES considers that the location selected represents a good balance of grid availability, wind and solar resource availability, and reduced potential environmental impacts relative to comparable sites.

The collective layout and positioning of the components forming the collective Project presented within this report represents an iterative development process with each version of the layout building on the continuation of analysis and data capture within the project site. A design workshop between RES and the technical teams including in-house, and external technical, environmental and planning specialists was undertaken in March 2022 and subsequent significant layout amendments have been adopted by the Project to avoid further native vegetation, threatened species habitat and areas prone to flooding.

Due to the nature of the proposed development, and the objective to maximise the wind, solar and energy storage potential of the site, it is not possible to avoid impacts to native vegetation. However, through the iterative design process, RES have minimised impacts through the re-siting of project infrastructure which has reduced impacts by approximately 43% from 9.511 hectares, including 62 Large Trees in patches, and 83 scattered trees (74 large and 9 small) down to the current proposed impacts detailed in Section 4.

It should be noted that the current impacts are an over-estimate, with further minimisation likely to be achieved through the refinement of buffers, and micro-siting of project infrastructure away from areas of known ecological value.

No feasible opportunities exist to further avoid and minimise impacts on native vegetation without undermining the key objectives of the Project.

4.2 Residual Impacts

The below clearing scenario is based on the extent of the infrastructure footprint and associated buffers as provided by Umwelt on 6 June 2022 and assessed against the extent of native vegetation mapped to date within the Assessment Area.

Specifically, the buffers applied around the infrastructure footprint comprise:

- Reticulation – 3 metres either side (i.e. 6 metres overall)
- Access Tracks – 5.5 metres wide, plus an additional one metre either side (except on existing made roads including Porter Road, Vineyard Road, Vances Crossing Road);
- Other Infrastructure – 5 metre buffer around edge of footprint.

It should be noted that no offsite impacts (i.e. swept paths, transport impacts) have been assumed at this stage.

4.2.1 Vegetation proposed to be removed

The Project Site is within Location 3, with 7.674 hectares of native vegetation proposed to be removed, comprising 5.454 hectares of native vegetation patches, 34 Large Trees in patches, and 37 scattered trees (30 Large and seven Small Trees). As such, the permit application falls under the Detailed assessment pathway (Table 21).

Condition scores for vegetation proposed to be removed are provided in Appendix 1.3.

Table 21. Removal of Native Vegetation (the Guidelines) (DELWP 2017).

Assessment pathway	Detailed
Location Category	3
Total Extent of vegetation (including scattered trees) (ha)	7.674
Extent of proposed removal of patch vegetation (ha)	5.454
Large Trees (scattered and in patches) to be removed (no.)	64
Small scattered trees to be removed (no.)	7
EVC Conservation Status of vegetation to be removed	Endangered (CGW, PW, PGWe, ATHRW) Vulnerable (GW) Depleted (HW)

Note: CGW = Creekline Grassy Woodland, PW = Plains Woodland, PGWe = Plains Grassy Wetland, ATHRW = Alluvial Terraces Herb-rich Woodland, GW = Grassy Woodland, HW = Heathy Woodland.

4.2.2 Offset Targets

The offset requirement for native vegetation removal is 2.373 General Habitat Units and 64 Large Trees.

A summary of proposed vegetation losses and associated offset requirements is presented in Table 22 and the Native Vegetation Removal (NVR) report is presented in Appendix 5.

Table 22. Offset Targets.

General/Species Offsets Required	2.373 General Habitat Units
Large Trees	64
Vicinity (catchment/council)	Wimmera CMA / Northern Grampians Shire
Minimum Strategic Biodiversity Value*	0.271

***The minimum Strategic Biodiversity Value is 80% of the weighted average score across habitat zones where a General offset is required.

4.3 Offset Strategy

According to DELWPs Native Vegetation Offset Register (DELWP 2022g), there are four offset sites within the Wimmera CMA or Northern Grampians Shire region that can be used to satisfy the General Habitat Unit and Large tree offset requirements.

An offset register search statement identifying the relevant offsite sites is provided in Appendix 6.

5 POTENTIAL IMPACTS

The project footprint will be finalised with reference to the findings of this assessment to avoid and minimise impacts on ecological values where possible. Likely impacts associated with the project footprint and operation of the proposed renewable energy project are discussed in the following sections.

5.1 Construction Related Impacts

In the absence of suitable mitigation measures, construction-related impacts are likely to include:

- The introduction and spread of weeds and soil pathogens due to on-site activities;
- Disturbance to wildlife from increased human activity and noise during construction; and,
- Indirect impacts on adjacent areas if construction activities, erosion and drainage are not appropriately managed.

The Project Site is located within a relatively flat farmland landscape with interspersing ephemeral drainage lines which are unlikely to hold water for any length of time. Where possible, access tracks have been located in cleared paddocks or are located along existing roads. There will be some impacts to native vegetation, primarily as a result of the construction of the proposed solar farm, and widening of existing roads to facilitate access and egress. As part of these works, there is anticipated to be impacts to two specimens of the State significant Buloke.

It is understood that all impacts to River Swamp Wallaby-grass have been avoided through micrositing of infrastructure and the inclusion of below ground cable reticulation. Therefore the potential construction related impacts are generally considered to be low provided a Construction Environment Management Plan is prepared to ensure the protection of retained vegetation prior to, and during construction, as well as control the spread of weeds and pathogens.

5.2 Operational Impacts

There are likely to be bird and bat mortalities as a result of turbine collision and barotrauma associated with the operation of the wind farm.

5.2.1 Birds

The primary focus of the impacts of wind farms on birds is related to collision with wind turbines (Kuvlesky *et al.* 2007), although collision with powerlines associated with wind farms has also been recorded (Janss and Ferrer 2000; Kuvlesky *et al.* 2007). However, wind farms have the potential to directly and indirectly impact birds and other taxa in other ways as well. For example, in Europe, displacement through habitat loss is considered the main detrimental effect of wind farms on avian abundance (Kuvlesky *et al.* 2007). This effect has been shown to manifest itself on both grassland birds that use habitat under the wind turbines (Leddy *et al.* 1999) and birds of prey that are frequently encountered within RSA (Farfán *et al.* 2009), although it is likely to affect all bird species to some extent. This effect is likely to occur because of the noise, movement and human disturbance associated with wind turbines (Leddy *et al.* 1999). This type of research has not been

conducted in Australia, therefore the impact that this type of disturbance will have on Australian grassland birds is not well known.

The impact of increased bird mortality as a result of collisions with wind turbines or powerlines will affect different species in different ways. Affected species that are short-lived, with high annual reproduction rates, are likely to be able to absorb this additional mortality with little impact to their overall population size at a regional or national level (Chamberlain *et al.* 2006). By contrast, affected species that are long-lived, slowly reproducing species are more vulnerable to this type of additive mortality and may be less able to maintain viable population sizes when faced by such stresses (Sæther and Bakke 2000).

Given that raptors are long-lived and are a slowly reproducing species, they are distributed in low densities compared to other birds, and are therefore exposed to increased risk of local population declines. The loss of a single breeding individual could potentially adversely impact the local population. However, it is well known based on published literature that certain raptors adapt their behaviour in the presence of wind turbines (Farfán *et al.* 2009), although detailed avoidance rates for most species worldwide is not known (Chamberlain *et al.* 2006). Particular raptor species have been identified as being 'of concern' due to their proneness to collision with operational wind turbines, although these species do appear to become conditioned to the presence of wind turbines after an extended period of time, and adjust their foraging behaviour to avoid wind turbines (i.e. up to 99% avoidance rates for most species).

Less than 1% of observations made during the bird utilisation surveys conducted by Ecology and Heritage partners were of birds within, or above, RSA (Table 18). Further, it cannot be assumed that all the birds observed within the Project Site will collide with the wind turbines, as birds are known to adapt their behaviour in the presence of wind turbines to avoid an obstacle, such as a wind turbine, in their flight path (Farfán *et al.* 2009; A. Organ, pers. comm.).

Overseas studies have shown that even collision-prone bird species avoid collisions with wind generators on most occasions (Winkelman 1992a; 1992b; Still *et al.* 1995). A range of avoidance rates of bird species from overseas studies range from 100% to 98% (Winkelman 1992; Still *et al.* 1995). In Australia, three avoidance rates are commonly used when calculating collision risk of birds at wind farms: 95%, 98% and 99%. Avoidance rates in Australia have previously been recorded at the Codrington Wind Farm in Victoria, where birds have regularly exhibited 100% avoidance of turbines.

Despite the specific composition of the birds observed using RSA, it is likely that other species recorded during both the fixed-point count and incidental surveys will occasionally fly within RSA and a varying degree of mortality is likely to be expected for these species. Of importance with regards to assessing the risk of turbine collision are those birds that are threatened on a regional, state or national level.

However, given the low proportion of bird flights within the RSA (2.2% of bird movements observed during the surveys), the abundance of those species most likely to fly within this area, the high level of avoidance behaviour exhibited by many species of birds, buffers around the limited areas of high quality habitat and the predominantly low quality habitat that comprises the rest of the Project Site it is unlikely that the construction of the proposed wind farm will have a significant impact on the avifauna of the region.

Ongoing monitoring of bird populations and mortalities at the wind farm, once built, would be required to ensure that bird mortality is at a low level. This will take the form of a Bird and Avifauna Management (BAM) Plan (Section 8).

5.2.2 *Forest Owls*

Powerful Owl and Barking Owl

Results of the desktop assessment show that four Powerful Owl individuals were recorded near the Project Site, with all four recorded together on the same visit (DELWP 2021a). The Powerful Owls were recorded over 20 years ago (1999) on the fringe of Joel Joel Nature Conservation Reserve. There are no other Powerful Owl records within 10 kilometres of the Project Site (DELWP 2021a).

There are no records of Barking Owl within 10 kilometres of the Project Site (DELWP 2021a). The closest records are located between 11 and 16 kilometres west of the Project Site near Stawell (Monaghan's Bushland Reserve, Illawarra Nature Conservation Reserve).

Active searching for evidence (i.e. pallets, white-wash, prey remains and/or use of hollows) of significant forest owl species in suitable habitats was undertaken during roaming surveys of suitable habitats within the Project Site. No forest owls were detected.

Although no evidence of Powerful Owl or Barking Owl roosting or breeding activity was found during surveys, there is a moderate likelihood that Powerful Owl uses native vegetation within the Project Site for foraging and roosting activities, as there exists a high number of large hollow-bearing trees in the Project Site.

Barking Owls have been shown to prefer forest edge, wooded creek lines and forest interior (80% of foraging locations) for foraging compared to scattered trees in paddocks and small isolated patches (20%) (Taylor *et al.* 2002). While there exists a high number of large hollow-bearing trees in the project area, areas of the species' preferred foraging habitat within the Project Site are largely proposed to be retained, and given the lack of recent nearby records of Barking Owl, there is a low likelihood that Barking Owl uses native vegetation within the Project Site for foraging and roosting activities.

In relation to wind turbine collision risk, Powerful Owl, Barking Owl (and other Ninox species) are canopy foraging species and rarely ascend beyond canopy height during foraging activities, due primarily to their 'stop start' hunting technique (Carter *et al*. 2019). The species also tends to avoid flying through open areas, preferring to move instead along habitat corridors (i.e. roadside remnant vegetation). In this context, Powerful Owl and Barking Owl are considered to have a very low collision risk.

5.2.3 *Swift Parrot*

Swift Parrot are defined as 'species of interest' as outlined in Lumsden *et al.* (2019), meaning "there is a higher probability that they are of 'concern' or 'extreme concern' from the impacts of wind turbine collisions at the state-wide population level, compared to the other categories of 'minimal' and 'mild' concern".

Based on the desktop and field assessments, it is likely that Swift Parrot use the Project Site on occasion to forage, while passing through during their migratory period. The Project Site contains a high number of Swift Parrot feeding tree species, including Yellow Gum, Yellow Box and Grey Box, while several Red Ironbark trees are also present (Section 3.1). However, only the Joel Joel Conservation Reserve, which is situated beyond the Project Site, contains a small patch of the species preferred habitat (box-ironbark forest). The extant grassy woodland and plains woodland located within the Project Site may, at best, serve as 'rest points' on route to more suitable habitats to the north-east (i.e. Kara Kara National Park and Mount Bolangum Nature Conservation Reserve). Although remnant woodland vegetation within the Project Site contains Grey Box and

Yellow Box canopy, this vegetation is located primarily along ridge lines and gullies. According to current and historical Swift Parrot annual survey results, this is not preferred habitat for Swift Parrot, which are more likely to be found on upper and lower slopes (Ingwersen *et al*. 2021).

While the species is observed to fly at RSA height, often when embarking on longer distance flights, most of the time Swift Parrots tend to only fly at canopy height along foraging grounds (Biosis 2006). A modeling study conducted on the cumulative impacts of wind farms on Swift Parrot found the impacts to be negligible, with approximately one fatality caused every ten years (Biosis 2005). This study modelled the risk to Swift Parrot of 39 wind farm proposals in south-eastern Australia, and while a number of wind farms have been constructed since this study, many of the 39 wind farms did not proceed. As such, the study's modelling is still considered an accurate measure of cumulative risks to Swift Parrot. The same study also documented that only 16% of the total population of this species would be affected by wind farms in Victoria, that risk of collision is higher in close proximity to foraging resources, and that Swift Parrot would, due to their accurate flying ability, show a 95-100% avoidance of turbines (Biosis 2005).

Due to the presence of only marginal Swift Parrot habitat in the Project Site, and the failure to detect the species during targeted surveys, a precautionary and broad scale approach to the management of Swift Parrot within the Project Site would significantly reduce the risk to the species. The low number of species records within 10 kilometres of the Project Site mean turbine collision with Swift Parrot is unlikely but cannot be ruled out.

The risk of collision can be significantly reduced by ensuring turbines are configured to provide a significant buffer between possible Swift Parrot feeding grounds (i.e. large or contiguous patches of remnant eucalypt forests) and active turbines in the Project Site. Based on the current development layout, the turbines in closest proximity to Joel Joel Nature Conservation Reserve (SP4) are located approximately 275 metres (Figure 2j) and 225 metres (Figure 2n) away from this forging habitat respectively.

Given the species' total population is low and in decline, any impacts to Swift Parrot through turbine collision could potentially represent a significant impact to the species. While turbines have been configured to reduce the risk of collision to the species, overall there is a low to moderate risk to the species from turbine collision.

5.3 Potential Impacts on Brolgas

Cranes, both overseas and in Australia, have been identified as being prone to collision with powerlines (Goldstraw and Du Guesclin 1991; Janss and Ferrer 2000; Kuvlesky *et al.* 2007), although this does not specifically relate to turbine collisions. Brolgas, as Australian representatives of the Crane family, are therefore also seen as being potentially significantly impacted by collisions with aerial infrastructure, such as wind turbines. Indeed, the impact of wind farms on Brolgas is one of the key environmental issues facing the industry in south-western Victoria (DSE 2012), given the limited distribution of Brolgas in Victoria.

Wind farms have the potential to impact on the Brolga in the following ways:

- Habitat loss by removal of wetlands and nearby pasture habitats as a result of the construction of wind farm infrastructure;
- Collision with wind turbines, power lines and monitoring equipment;

- Disturbance of birds leading to displacement and exclusion from areas of suitable habitat or changes in behaviour; and
- Creation of barriers to flying birds, interrupting migratory movements between important habitat areas or disrupting local flight paths.

No habitats within the Project Site or broader locality are considered to support moderate or high-quality breeding or flocking habitat for Brolga, and no Brolga were observed during the surveys. The nearest previously recorded flocking site is located near Marnoo, approximately 32 kilometres north of the Project Site. This site was identified by Sheldon (2004).

The Brolga Guidelines (DSE 2012) recommend that a 3.2 km and 5 km radius turbine-free buffer from breeding sites and flock roost sites respectively, will adequately meet the objectives set for these habitats. Given the paucity of breeding or flocking habitat for Brolga, these buffer distances will be achieved, and any potential impact to Brolga is considered to be low to negligible.

5.4 Potential Impacts on Bats

Bats are susceptible to mortality caused by wind turbines (Arnett 2005; Bearwald *et al*. 2008, Kunz *et al*. 2007). In some habitats both a high number of individuals and species are struck by wind turbines, especially those bat species that undertake large scale annual migrations (Kunz *et al*. 2007; Kuvlesky *et al*. 2007; Cryan and Barclay 2009). Furthermore, bats may be attracted to wind turbines following vortices created by the blade tips and have been observed investigating all parts of the turbine (Horn *et al*. 2008; Cryan and Barclay 2009). There is also potential for bats to die as a result of barotrauma caused by changes in pressure produced by the rotating turbines (Bearwald *et al*. 2008, Cryan and Barclay 2009).

To date little scientific data has been published regarding the impact of existing wind farms on Australian bat species. Carcass surveys undertaken as part of the Studland Bay and Bluff Point Wind Farms in Tasmania revealed that the majority of the carcasses were Gould's Wattled Bat (a high-flying, open-air foraging species) with the remaining being *Vespadelus* spp. (Hull and Cawthen 2012). A carcass survey within the small scale (two turbine) Hepburn Wind Farm detected a single White-Striped Freetail Bat mortality (Bennett 2012).

Collisions with turbine blades are understood to be the most frequent interaction causing mortality or injury, although the cause of these collisions is poorly known. General observations to date indicate that bats do not typically collide with turbine towers, transmission structures, guy wires, or meteorological towers (i.e. stationary structures); however current understanding of how and why bats come into contact with turbines is lacking. This is due to the limited ability to observe how bats behave at night around these structures as they move across the landscape between patches of vegetation and during foraging activities (MNR 2007, Horn *et al.* 2008a).

There are four main factors that contribute to bat mortality at wind farm sites:

- Bat species and abundance in the area;
- Season (i.e. time of year) and weather conditions (e.g. clear, warm nights with low wind). Such factors are likely to influence the level of bat activity and thus mortality at wind farms (MNR 2007);

- Habitat/landscape features in the area (e.g. migration routes, forested ridges, and hibernacula/swarming sites may be important features). High levels of bat activity have been documented in forested ridge habitats, and areas where the woodland patches have been cleared for wind turbine placement also offer attractive foraging habitat for some species of bats. Edges of remnant woodlands and scattered remnant trees in paddocks provide favourable foraging areas where bats can easily capture airborne insect prey, creating areas of concentrated bat activity (Barclay 1985; Lumsden and Bennett 2000, 2005; Kunz *et al.* 2007, Horn *et al.* 2008a); and,
- The number of turbines contained within the wind farm.

5.4.1 Bats Species in the Project Site

The majority of species previously recorded or predicted to occur within the Project Site are likely to focus their foraging activities in forested areas, around patches of vegetation and scattered remnant trees, at or below canopy height. The Project Site lacks waterbodies and supports densely vegetated areas, which is likely to limit foraging activity.

Species that use more open areas, such as the Lesser Long-eared Bat *Nyctophilus geoffroyi*, generally fly close to the ground (less than five metres high) when in these areas (Churchill 1998). Bat species that typically fly high are at the highest risk of flying within the RSA and suffering mortality from barotrauma or collision. Of the species likely to occur, the White-striped Freetail Bat is known to fly at height (50 metres or above) (Churchill 1998), and therefore this species is considered to be at highest risk of blade collisions and barotrauma. However, the potential impacts to White-striped Freetail Bat and other bats during operation of the wind farm are expected to be low due to the RSA height (85 metres) and the location of turbines in a cleared landscape, some distance from significant woodland habitats and large trees that would be favoured for foraging by most bat species.

5.5 Cumulative Biodiversity Impacts

The largest impact to biodiversity in the locality and encompassing bioregion is likely to have stemmed from increased European settlement around the 1940s and the subsequent land clearance for agriculture. The Wimmera bioregion is one of Victoria's most cleared bioregions. In 2011, the area of vegetation removed since European settlement within the bioregion was estimated to be 1,671,024 ha (83.1%) (VEAC 2011). Future disturbance associated with human activities in these bioregions is likely to be associated with ongoing agricultural activities and development.

The impacts from the project must be considered together with the biodiversity impacts that have resulted from historic and predicted future human disturbances.

In addition to cumulative impacts associated with construction of the Watta Wella Wind Farm, Solar Farm and Battery Facility, operational activities have the potential to lead to incremental and cumulative impacts (e.g. barrier effects, changes to bird/bat behaviour etc.). Nearby operating wind farms within the vicinity of the Project Site include:

- Bulgana Wind Farm (operating) - 56 turbines located approximately five kilometres south of the Project Site;

- Crowlands Wind Farm (operating) - 39 turbines located approximately 19 kilometres south-east of the Project Site; and,
- Ararat Wind Farm (operating) - 128 turbines located approximately 20 kilometres south of the Project Site.

Although in close proximity to Bulgana, Crowlands and Ararat Wind Farms, operation of the proposed Watta Renewable Energy Project is considered unlikely to significantly increase cumulative pressures within the broader landscape due to the development footprint being located in a setting within a predominantly cleared and uniform landscape, outside the likely common distribution range of key species potentially impacted by wind farm developments (e.g. Brolga, Southern Bent-wing Bat, migratory shorebirds).

Despite this, ongoing monitoring of bird populations following commissioning of the Project will enable the proponent to identify and mitigate cumulative impacts as other renewable energy projects are brought on-line.

5.6 The Impact of Climate Change

Climate change is likely to have an impact on both the flora and fauna of the Project Site. There has been recent speculation about the movement of wetlands south as the interior of Australia becomes increasingly arid. This conjecture is not supported by empirical data and it is likely that changes in Australia's climate will have unpredictable impacts on Australia's biodiversity, including birds (Pittock 2003). Changes that have already occurred as a result of the effect of climate change on birds include changes to distribution, phenology, morphology and physiology, behaviour, and abundance and population dynamics (Chambers *et al.* 2005).

As climate change is better understood it may be that developments such as wind farms need to be mindful of the impacts of this phenomenon, however at present, this is not possible. It should also be noted that wind farms are a 'clean' energy source with relatively very low carbon emissions.

6 LEGISLATIVE AND POLICY IMPLICATIONS

6.1 *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth)

The EPBC Act establishes a Commonwealth process for the assessment of proposed actions (i.e. project, development, undertaking, activity, or series of activities) that are likely to have a significant impact on matters of national environmental significance (NES), or on Commonwealth land. An action, unless otherwise exempt, requires approval from the Commonwealth Environment Minister if it is considered likely to have an impact on any matters of NES. A summary of potential impacts to matter is NES is provided in Table 23

Table 23. Potential impacts to matters of NES.

Matter of NES	Potential Impacts
World Heritage properties	No. The proposed action will not impact any properties listed for World Heritage.
National Heritage places	No. The proposed action will not impact any places listed for national heritage.
Ramsar wetlands of international significance	No. The nearest wetland of international importance is Lake Albacutya, located approximately 150 kilometres upstream of the Project Site. The proposed development will not impact any wetlands of international significance.
Threatened species and ecological communities	One nationally significant flora species (River Swamp Wallaby-grass) and one nationally significant fauna species (Golden Sun Moth) was recorded within the Assessment Area. There is suitable habitat within the Project Site for the Swift Parrot (refer to Section 3.5.2). The GBGW ecological community was recorded within the Assessment Area (Section 3.5.3).
Migratory and marine species	There is no marine habitat within the Project Site and the Project Site would not be classed as an 'important habitat' as defined under the EPBC Act Policy Statement 1.1 Principal Significant Impact Guidelines (DoE 2013), in that it does not contain: • Habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species; • Habitat utilised by a migratory species which is at the limit of the species range; or, • Habitat within an area where the species is declining. It is considered that the likelihood of migratory bird mortality through turbine collisions is low and that the proposed wind farm is unlikely to have a significant impact on any migratory species
Commonwealth marine area	No. The proposed action will not impact any Commonwealth marine areas.
Nuclear actions (including uranium mining)	No. The proposed action is not a nuclear action.
Great Barrier Reef Marine Park	No. The proposed action will not impact the Great Barrier Reef Marine Park.
Water resources impacted by coal seam gas or mining development	No. The proposed action is not a coal seam gas or mining development.

The following implications are based on the current preliminary impact assessment and are considered to be conservative. Further impact minimisation demonstrated via micro siting of infrastructure will be undertaken during the detailed design phase of the project.

6.1.1 Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia

A total of 85.987 hectares of the Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia (GBGW) ecological community is present within the Assessment Area. Based on the Preliminary Impact Assessment, there is a proposed impact to 1.671 hectares of the GBGW ecological community through removal to accommodate project infrastructure.

An assessment of the development footprint against the significant impact guidelines for Endangered ecological communities (DoE 2013) is provided below in Table 24.

Table 24. Assessment against the Significant Impact Guidelines for Endangered or Critically Endangered Ecological Communities: GBGW ecological community.

Significant Impact Guidelines 1.1 – Significant Impact Criteria for Endangered or Critically Endangered Ecological Communities (GBGW)	
Significant impact Criteria	**Comment**
1. Reduce the extent of an ecological community.	The proposed action will result in a reduction in extent of the ecological community, with the proposed removal of a maximum of 1.671 hectares out of more than 100 hectares of the community estimated to occur in the broader locality. The 1.671 hectares is located within road reserves, and is in poor condition relative to the remainder of the community present (i.e. Joel Joel Conservation Nature Reserve) due to its proximity to existing roads. Most of the impacted 1.671 hectares is due to assumed impacts within the buffer areas associated with the construction of access tracks and installation of reticulation. Impacts to the ecological community cannot be entirely avoided due to the requirement to construct infrastructure associated with the Project. Impacts have been reduced from previous versions of the construction footprint to minimise vegetation impacts along the entire alignment, with a particular focus on retaining as much of the GBGW community as practically possible. However, based on the Preliminary Impact Assessment, the extent of the community will be reduced by approximately 1.671 hectares.
2. Fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines.	The overall GBGW community is present within several road reserves, as well as nature reserves, and is surrounded by a modified agricultural landscape. The 1.671 hectares proposed to be removed occurs within road reserves already impacted by the presence of made roadways and agricultural paddocks. Although access roads will be constructed through some road reserves, it is not considered that the community will be fragmented, or result in its ecological function significantly altered as a result of the proposed action. As such, the proposed action will not likely result in increased fragmentation of the ecological community, given that only small, discrete areas of the community in an already fragmented landscape is proposed for removal.
3. Adversely affect habitat critical to the survival of an ecological community.	The proposed action is not likely to adversely affect the long-term survival of the ecological community, given that the majority of the community is being avoided by the proposed action (Figure 2).

Significant Impact Guidelines 1.1 – Significant Impact Criteria for Endangered or Critically Endangered Ecological Communities (GBGW)	
4. Modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns.	The proposed action will result in the removal of surface soil within the development footprint required to construct access and install reticulation. Soil and rock removal will only be taken to the extent necessary to level the ground to facilitate construction works. Soil will not be stockpiled outside of the activity area and will be reinstated as soon as possible. Given the small, localised nature of works within the ecological community and the existing presence of the roads, groundwater levels, water drainage patterns and nutrient loads are unlikely to be affected by the proposed action.
5. Cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting.	The overall functionality of the community will not be affected by the proposed action. This is due to the small, localised nature of the proposed impacts to the community, the existing roads located within and adjacent to the community, as well as the retention of the remainder of the community adjacent to the infrastructure footprint.
6. Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to:	The overall quality of the ecological community is not likely to be affected by the proposed action. The community is present within existing road reserves and nature reserves, and the creation of additional access roads and reticulation resulting in a potential impact to 1.671 hectares of a remnant of the GBGW community that is present immediately adjacent to existing carriageways will not cause a substantial reduction in the quality or integrity of the remaining GBGW community. Appropriate management of the construction process and machinery will be used to ensure that any weed species, pollutants and/or pathogens are not inadvertently spread into areas supporting the ecological community.
a. assisting invasive species, that are harmful to the listed ecological community, to become established or;	
b. causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community.	
7. Interfere with the recovery of an ecological community.	The proposed action is not likely to interfere with the ecological processes or recovery of the ecological community, due to the retention of larger, adjacent patches of the ecological community.

Implications

The proposed action will result in the direct and indirect impact to 1.671 hectares of the GBGW ecological community through removal to accommodate project infrastructure..

Based on a 'self-assessment' against the Commonwealth significant impact guidelines (DoE 2013), it is considered that the proposed action has the potential to result in a significant impact to the GBGW ecological community, given that the removal of 1.671 hectares will result in the reduction in the extent of a Critically Endangered ecological community.

6.1.2 Swift Parrot

An assessment of the potential impacts to Swift Parrot against the *EPBC Significant Impact Guidelines 1.1 – Matters of National Environmental Significance* is included below (Table 25).

An important concept for determining the potential significance of an impact under the EPBC Act is that of 'habitat critical to the survival' of a species. The EPBC Act Significant impact guidelines 1.1 (Commonwealth of Australia 2013) provides the following guidance for determining whether an action may affect habitat critical to the survival of a species:

- Habitat critical to the survival of a species or ecological community' refers to areas that are necessary:
    - for activities such as foraging, breeding, roosting, or dispersal;
    - for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators);
    - to maintain genetic diversity and long term evolutionary development; or,
    - for the reintroduction of populations or recovery of the species or ecological community.

Table 25. Significant Impact Assessment for the Critically Endangered Swift Parrot

Significant Impact Criteria	Comment
An action is likely to have a significant impact on a critically endangered species if there is a real chance or possibility that it will:	
1. Lead to a long term decrease in the size of a population.	The vegetation on site is not identified as priority habitat for the species, unlike many conservation reserves nearby. As such, it is considered unlikely that the proposed vegetation removal, which will be undertaken in a manner that maintains broader connectivity within the landscape, would lead to a long term decrease in the population. Any impacts to Swift Parrot through turbine collision could potentially represent a significant impact to the species due to the ongoing decline in the known population size of Swift Parrot.
2. Reduce the area of occupancy of the species.	Swift Parrot have not been recorded within the Project Site. While the vegetation on site may provide opportunistic foraging habitat, its connectivity will be maintained, so the area of occupancy will not be reduced.
3. Fragment an existing population into two or more populations.	Swift Parrot is a migratory species that breeds in Tasmania and overwinters in Victoria. The proposed action will not fragment an existing population.
4. Adversely affect habitat critical to the survival of a species.	The vegetation within the Project Site is not identified as one of the high priority sites with which Swift Parrot shows a high level of fidelity. While it may provide opportunistic foraging habitat, proposed impacts to habitat are highly unlikely to be habitat critical to the species' survival.
5. Disrupt the breeding cycle of a population.	The entire population of Swift Parrot breeds in Tasmania, so the proposed vegetation removal would not disrupt its breeding cycle.
6. Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	The vegetation on site is considered to be opportunistic foraging habitat, and is close to several areas of key habitat. It's connectivity will be maintained. The removal of some vegetation on site is therefore highly unlikely to cause the species to decline.
7. Result in invasive species that are harmful to an endangered species becoming established in the endangered species' habitat.	The Project Site is within a matrix of highly modified agricultural land already subject to weed and pest invasion. Nevertheless, mitigation measures (see Section 7.1) will be put in place to ensure appropriate pest plant and animal management is in place, including the development of a CEMP. The proposed works are unlikely to assist the establishment of an invasive species that would prevent the use of the site by Swift Parrot.

Significant Impact Criteria	Comment
8. Introduce disease that may cause the species to decline.	While the introduction of disease is unlikely, mitigation measures (see section 7.1) will be put in place to ensure appropriate pathogen management.
9. Interfere substantially with the recovery of the species.	The site has not been identified as priority habitat for Swift Parrot, and given the number of priority sites within close proximity, the removal of vegetation in a way that maintains connectivity is unlikely to interfere with the recovery of the species. However, the species population numbers are known to be in decline, and any impacts to Swift Parrot through turbine collision could potentially represent a significant impact to the species. While turbines have been configured to reduce the risk of collision to the species, overall there is a low to moderate risk that turbine strike may interfere with the recovery of the species population.

Implications

Although not recognised as supporting any high priority sites, the proposed development footprint will impact on potential foraging habitat for Swift Parrot. Any impacts to Swift Parrot through turbine collision could potentially represent a significant impact to the species due to the low numbers and ongoing decline of the existing population. While turbines have been configured to reduce the risk of collision to the species, it is not possible to predict exactly where (direction and height) individuals will fly and therefore, a low to moderate risk to the species from turbine collision remains.

However, it is noted that the risk of turbine collision for Swift Parrot is higher in close proximity to foraging resources, and that Swift Parrot would, due to their accurate flying ability, show a 95-100% avoidance of turbines (Biosis 2005).

6.1.3 Golden Sun Moth

Based on the recorded presence of Golden Sun Moth, a total of 164.53 hectares of confirmed Golden Sun Moth habitat is present (Figure 5). Based on the Preliminary Impact Assessment, there is a proposed impact to 9.75 hectares of confirmed Golden Sun Moth habitat to enable construction and siting of the proposed wind farm, solar farm and associated access tracks and reticulation infrastructure. An assessment of the potential impacts to the vulnerable Golden Sun Moth against the *EPBC Significant Impact Guidelines 1.1 – Matters of National Environmental Significance* is included below (Table 26).

Table 26. Assessment against the Significant Impact Guidelines for the vulnerable Golden Sun Moth (DoE 2013).

Significant Impact Criteria	Comment
An action is likely to have a significant impact on a critically endangered species if there is a real chance or possibility that it will:	
1. Disrupt the breeding cycle of an 'important population',	The Project Site is not considered to support an ' important population' as: - The population is not necessary for the species' long-term survival or recovery; - A key source population for breeding or dispersal is not present; - The population is not considered necessary to maintain genetic diversity; and - The population is not at the limit of the species range (DAWE 2021) Further, given the presence of over 164 hectares of confirmed habitat, the potential impact to 9.75 hectares will not disrupt the breeding cycle.

Significant Impact Criteria	Comment
	Therefore, the breeding and dispersal capabilities of this population are unlikely to be affected or compromised by the proposed development, given the localised of the proposed impacts.
2. Lead to a long-term decrease in the size of an important population of a species	The Project Site is not considered to support an ' important population'. Given the discrete nature of the proposed disturbance (narrow, linear impact areas), it is highly unlikely that the action will lead to a long-term decrease in the size of the population. However, it must be acknowledged that the accidental loss of several larvae may occur during habitat removal.
3. Reduce the area of occupancy of an important population	The Project Site is not considered to support an ' important population'. The 9.75 hectares of impact to confirmed habitat occurs within a modified agricultural landscape. Due to the narrow, linear impact footprint to construct access roads, the proposed action will not form a permanent, long-term barrier to Golden Sun Moth movement between adjacent areas of suitable habitat. However, 9.75 hectares of habitat will be impacted, reducing the overall area of occupancy within the infrastructure footprint.
4. Fragment an existing important population into two or more populations	As the access road footprint will be approximately 7.5 metres wide, inclusive of erosion and sedimentary controls, due to the dispersal capacity of the species being over 200 metres (DSEWPaC 2011), fragmentation of existing populations or habitat will not occur.
5. Adversely affect habitat critical to the survival of a species	The proposed action will not adversely affect habitat critical to the survival of the species. The proposed action will result in the removal of surface soil and known food plants to facilitate the construction of Project infrastructure. Similar or higher quality habitat (approx. 155 hectares of confirmed habitat) for the species is present immediately adjacent to the proposed impact site.
6. Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	Although a maximum of 9.75 hectares of confirmed habitat is proposed to be removed as a result of the proposed action, the extent and overall quality of surrounding areas of Golden Sun Moth habitat is not likely to be affected by the proposed action. Appropriate management during the construction process will ensure weed species, pollutants and/or pathogens are not inadvertently spread into areas supporting known habitat.
7. Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	The proposed action is not likely to interfere with the ecological processes or recovery of areas considered to be habitat for Golden Sun Moth, due to the retention of larger, adjacent areas of suitable habitat. Appropriate management during the construction process will ensure weed species, pollutants and/or pathogens/diseases are not inadvertently spread into areas supporting known habitat.
8. Introduce disease that may cause the species to decline, or	
9. Interfere substantially with the recovery of the species.	

Implications

Based on the recorded presence of Golden Sun Moth, a total of 164.53 hectares of confirmed Golden Sun Moth habitat is present (Figure 5). Based on the Preliminary Impact Assessment, there is a proposed impact to 9.75 hectares of confirmed Golden Sun Moth habitat.

It is considered that the proposed action may result in a significant impact to the vulnerable Golden Sun Moth given that the area of occupancy will be potentially reduced by up to 9.75 hectares. However, the Project Site is not considered to support an ' important population' as:

- The population is not necessary for the species' long-term survival or recovery;
- A key source population for breeding or dispersal is not present;
- The population is not considered necessary for maintain genetic diversity; and,
- The population is not at the limit of the species range (DAWE 2021).

Given the discrete nature of the proposed disturbance (narrow, linear impact areas), it is highly unlikely that the action will lead to a long-term decrease in the size of the population. Therefore, the breeding and dispersal capabilities of this population are unlikely to be affected or compromised by the proposed development, given the localised of the proposed impacts.

6.1.4 Implications

The following implications are based on the current preliminary impact assessment and are considered to be conservative. Further impact minimisation will be demonstrated via micro siting of infrastructure during the detailed design phase of the project.

Based on the Preliminary Impact Assessment, there is a proposed impact to 9.75 hectares of confirmed Golden Sun Moth habitat, and 1.671 hectares of the Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia ecological community.

All impacts to River Swamp Wallaby-grass have been avoided through micro siting of infrastructure and the inclusion of below ground cable reticulation. No Tawny Spider-orchid were recorded within the Assessment Area.

The Project Site also contains suitable foraging habitat for Swift Parrot. Any impacts to Swift Parrot through turbine collision could potentially represent a significant impact to the species. While turbines have been configured to reduce the risk of collision to the species, it is not possible to predict exactly where (direction and height) individuals will fly and therefore a low to moderate risk to the species from turbine collision remains.

The Project is being referred under the EPBC Act for further assessment.

6.2 *Environment Effects Act 1978* (Victoria)

The *Environment Effects Act 1978* (EE Act) provides for assessment of proposed actions that can have a significant effect on the environment via the preparation of an Environment Effects Statement (EES). A project with potential adverse environmental effects that, individually or in combination, could be significant in a regional or State context should be referred. Actions that may be referred for an EES decision are discussed in Table 27.

The following implications are based on the current preliminary impact assessment and are considered to be conservative. Further impact minimisation will be demonstrated via micro siting of infrastructure during the detailed design phase of the project.

Table 27. Referral criteria under the EE Act.

Referral criteria	Potential Impacts
Individual potential environment effects Individual types of potential effects on the environment that might be of regional or State significance, and therefore warrant referral of a project, are:	
Potential clearing of 10 hectares or more of native vegetation from an area that: • is of an EVC identified as endangered by DELWP in accordance with Appendix 2 of Victoria's Native Vegetation Management – A Framework for Action (DSE 2002); • is of Very High conservation significance (as defined in accordance with Appendix 3 of Victoria's Native Vegetation Management – A Framework for Action (DSE 2002); or, • is not authorised under an approved Forest Management Plan or Fire Protection Plan	No. A total area of 5.4536 hectares of native vegetation patches are proposed to be impacted. This comprises: • 1.328 hectares of native vegetation from four endangered EVCs: o 0.1186 hectares of ATHRW; o 0.4476 hectares of CGW; o 0.0147 hectares of PGWe; and, o 0.7471 hectares of PW. • 1.7 hectares of native vegetation of Very High conservation significance EVCs: o 0.375 hectares of GW; o 1.022 hectares of HW; o 0.015 hectares of PGWe; and, o 0.288 hectares of PW.

Referral criteria	Potential Impacts
Potential long-term loss of a significant proportion (1-5 percent depending on the conservation status of the species) of known remaining habitat or population of a threatened species within Victoria	No. Flora: Six individuals of the State significant Buloke are proposed to be impacted, with over 100 individuals mapped within the Assessment Area that will be retained. The loss of these six plants will not exceed 1-5% of the overall population within Victoria. A population of Hairy Tails was mapped within the Assessment Area, with one individual occurring within the proposed impact area. Hairy Tails has a broad range, extending roughly between Geelong, Horsham and Echuca, with numerous individuals mapped within this area (DELWP 2022a). The loss of one individual as a result of the Project will not result in a long-term loss of a significant proportion of the known remaining habitat or population of the species. Four Grassland Bindweed individuals occur within the Project Site (Emerge Associates 2020b). Fauna: A total of 9.75 hectares of confirmed habitat for the Golden Sun Moth is proposed to be impacted. However, the loss of vegetation as part of this proposal will not result in the log-term loss of a significant proportion of the species' habitat (i.e. 1-5%) given the species occupies a large habitat range across much of the Victorian Volcanic Plain north and west of Melbourne. Hardhead, Speckled Warbler and Hooded Robin were recorded during the ecological assessments. Although these species, as well as other State significant fauna are likely to utilise the site (Squirrel Glider, Powerful Owl), these species are highly unlikely to be impacted due to turbine strike, and the construction of the wind farm will not result in the loss of a significant proportion of habitat for these species. Eastern Bent-wing Bat is a cave dwelling bat that forages at and around canopy height in treed areas, and close to the ground in grassy areas. The species has previously been shown to fly consistently below turbine height, with no collision mortalities published in Victoria. Swift Parrot is known to utilise habitat within the locality on a seasonal basis when foraging conditions area optimal. Foraging habitat for the species within Victoria ranges from Horsham (west) to Wodonga (east), as well as habitat located around Greater Melbourne and Orbost to the east (Figure 7). Impacts to 5.8 hectares of foraging habitat will not result in the loss of a significant proportion of foraging habitat for the species.
Potential long-term change to the ecological character of a wetland listed under the Ramsar Convention or in 'A Dictionary of Important Wetlands in Australia'	No. The impact area is not listed under the Ramsar Convention or in 'A Dictionary of Important Wetlands in Australia'.
Potential extensive or major effects on the health or biodiversity of aquatic, estuarine or marine ecosystems, over the long time	Highly unlikely. Although there will be creek crossings constructed, this will not result in adverse impacts of aquatic waterways within the Project Site.
Potential extensive or major effect on the health, safety or well-being of a human community, due to emissions to air or water or chemical hazards or displacement of residents	Unknown. Outside the scope of this report.
Potential greenhouse gas emissions exceeding 200,000 tonnes of carbon dioxide equivalent per annum, directly attributable to the operation of the facility	Unknown. Outside the scope of this report.

Referral criteria	Potential Impacts
A combination of potential environmental effects A combination or two or more of the following types of potential effects on the environment that might be of regional or State significance, and therefore warrant referral of a project, are:	
Potential clearing of 10 hectares or more of native vegetation, unless authorised under an approved Forest Management Act or Fire Protection Plan	No. A total area of 5.4536 hectares of native vegetation is proposed to be removed.
Potential extensive or major effects on landscape values of regional importance, especially where recognised by a planning scheme overlay or within or adjoining land reserved under the *National Parks Act 1975*	Unlikely. The impact footprint is not within or adjoining a National Park. Two turbines are located within an area covered by an Environmental Significance Overlay – Schedule 1 (ESO1). This overlay protects 'significant ridges on the highest land in the municipality' with one of its main objectives being to 'protect significant ridges from development which may accentuate erosion'. It is considered unlikely that two turbines in this location will result in potential extensive or major effects on landscape values of regional importance.
Matters listed under the FFG Act: • Potential loss of a significant area of a listed ecological community; • Potential loss of a genetically important population of an endangered or threatened species; • Potential loss of critical habitat; or, • Potential significant effects on habitat values of a wetland supporting migratory birds.	A total of 1.32 hectares of the Victorian Temperate Woodland Bird ecological community is proposed to be impacted out of a total 48.23 hectares mapped in the Assessment Area. Hardhead, Speckled Warbler and Hooded Robin were recorded during the ecological assessments. Although these species, as well as other State significant fauna are likely to utilise the site (Eastern Bent-wing Bat, Squirrel Glider, Powerful Owl), these species are highly unlikely to be impacted due to turbine strike, and the construction of the wind farm will not result in the loss of a genetically important population of these species. Swift Parrot is known to utilise habitat within the locality on a seasonal basis when foraging conditions area optimal. Foraging habitat for the species within Victoria ranges from Horsham (west) to Wodonga (east), as well as habitat located around Greater Melbourne and Orbost to the east. Impacts to 5.8 hectares of foraging habitat will not result in the loss of a critical habitat for the species. No loss of a genetically important population of an endangered or threatened species, loss of critical habitat or significant effects on habitat values of a wetland supporting migratory birds is likely to occur as a result of the Project.
Potential extensive or major effects on land stability, acid sulphate soils or highly erodible soils over the short of long term	Unknown. Outside the scope of this report.
Potential extensive or major effects on beneficial uses of waterbodies over the long term due to changes in water quality, streamflows or regional groundwater levels	Unknown. Outside the scope of this report.
Potential extensive or major effects on social or economic well-being due to direct or indirect displacement of non-residential land use activities	Unknown. Outside the scope of this report.

Referral criteria	Potential Impacts
Potential for extensive displacement of residences or severance or residential access to community resources due to infrastructure development	Unknown. Outside the scope of this report.
Potential significant effects on the amenity of a substantial number of residents, due to extensive or major, long-term changes in visual, noise and traffic conditions	Unknown. Outside the scope of this report.
Potential exposure of a human community to severe or chronic health or safety hazards over the short or long term, due to emissions to air or water or noise chemical hazards or associated transport	Unknown. Outside the scope of this report.
Potential extensive or major effects on Aboriginal cultural heritage	Unknown. Outside the scope of this report.
Potential extensive or major effects on cultural heritage places listed on the Heritage Register of the Archaeological Inventory under the *Heritage Act 1995*.	Unknown. Outside the scope of this report.

6.2.1 Implications

Based on an assessment of ecological thresholds, an EES is unlikely to be triggered by the Project based on ecological impacts alone as:

- None of the thresholds relating to any of the individual ecological criteria are likely to be exceeded; and,
- None of the thresholds relating to the combination of ecological criteria are likely to be exceeded.

It should be noted that Ecology and Heritage Partners' have not undertaken a detailed assessment of other non-ecological referral criteria detailed in DSE (2006).

6.3 *Flora and Fauna Guarantee Act 1988* (Victoria)

The FFG Act is the primary legislation dealing with biodiversity conservation and sustainable use of native flora and fauna in Victoria. Proponents are required to apply for an FFG Act Permit to 'take' threatened and/or protected flora species, listed vegetation communities and listed fish species in areas of public land (e.g. within road reserves, drainage lines and public reserves/parks). An FFG Act permit is generally not required for removal of species or communities on private land, or for the removal of habitat for a listed terrestrial fauna species. However, the Flora and Fauna Guarantee Amendment Act 2019 came into effect on 1 June 2020 and now applies the FFG Act to Crown land and private/freehold land that is managed by a public authority.

6.3.1 *Implications*

Six individuals of the State significant Buloke, and one Hairy Tails specimen are proposed to be impacted. Four fauna species (Golden Sun Moth, Hardhead, Hooded Robin, and Speckled Warbler), two flora species (Buloke, Hairy Tails) and one ecological community (Victorian Temperate Woodland Bird Community) listed as threatened under the FFG Act were recorded during the field surveys. Where impacts to these species or communities occur on private land, a permit under the FFG Act is not required. Where impacts are proposed on public land (i.e. road reserves), an FFG Act permit will be required.

6.4 *Planning and Environment Act 1987* (Victoria)

The *Planning and Environment Act 1987* outlines the legislative framework for planning in Victoria and for the development and administration of planning schemes. All planning schemes contain native vegetation provisions at Clause 52.17, which requires a planning permit from the relevant local Council to remove, destroy or lop native vegetation, unless an exemption at Clause 52.17-7 of the Victoria Planning Provisions applies.

6.4.1 *Local Planning Scheme*

The Project Site is located within the Northern Grampians Shire, and lies predominantly within the Farming Zone (FZ), with some small pockets of vegetation (mainly along the Wimmera River and Seven Mile Creek, and within some conservation reserves) zoned Public Conservation and Resource Zone (PCRZ) (DELWP 2022d). The following overlays, relevant to ecological values, are summarised below (DELWP 2022d):

Environmental Significance Overlay – Schedule 1 (ESO1) (partial)

Significant Ridge Environs

There are significant ridges on the highest land in the municipality which display erosion characteristics and which are susceptible to further environmental degradation.

A permit is required to remove, destroy or lop native vegetation, including dead vegetation.

A permit is not required for buildings and works if the slope of the land where the buildings and works are to be carried out is less than 10%.

Clause 52.32 – Wind Energy Facility

A permit is required under Clause 52.32 of the Northern Grampians Shire Planning Scheme to use and develop a wind energy facility.

Site and context analysis ecological application requirements in relation to the site:

- Existing vegetation types, condition and coverage (see Section 3.1);
- The landscape of the site (see Section 1.3);
- The impact of the proposal on any species listed under the FFG Act or EPBC Act (see Section 3 and Section 5); and,
- Any other notable features, constraints or other characteristics of the site.

Site and context analysis ecological application requirements in relation to the surrounding area:

- Direction and distances to significant conservation and recreation areas, and water features (see Section 1.3);
- Sites of flora and fauna listed under the FFG Act or EPBC Act, including significant habitat corridors, and movement corridors for these fauna (See Section 3);
- National Parks, State Parks, Coastal Reserves and other land subject to the *National Parks Act 1975* (see Section 1.3);
- Land declared a Ramsar wetland as defined under section 17 of the EPBC Act (see Section 3.5.4); and,
- Bushfire risks.

Design response ecological application requirements:

- A rehabilitation plan for the site;
- A description of how the proposal responds to any significant landscape features for the area identified in the planning scheme;
- An assessment of the impact of the proposal on any species (including birds and bats) listed under the FFG Act or EPBC Act (see Section 5.1 and Section 5.2); and,
- An environmental management plan including any rehabilitation and monitoring requirements;

Clause 53.13 Renewable Energy Facility (Other Than Wind Energy Facility);

This clause applies to an application under any provision of this planning scheme to use or develop land for a renewable energy facility (other than a wind energy facility). A planning permit will be required.

Ecological application requirements:

- The extent of vegetation removal (see Section 3.3.1 - Vegetation proposed to be removed);
- A rehabilitation plan for the site;
- The impact of the proposal on any species listed under the FFG Act or EPBC Act (see Section 3.5 – Significance Assessment); and,
- An environmental management plan including a construction management plan, and any rehabilitation and monitoring.

6.4.2 The Guidelines

The State Planning Policy Framework and the decision guidelines at Clause 52.17 (Native Vegetation) and Clause 12.01 require Planning and Responsible Authorities to have regard for 'Guidelines for the removal, destruction or lopping of native vegetation' (Guidelines) (DELWP 2017b). Where the clearing of native vegetation is permitted, the quantity and type of vegetation to be offset is determined using methodology specified in the Guidelines. The primary objective of the regulations is '*no net loss in the contribution made by native vegetation to Victoria's biodiversity*'.

6.4.3 *Implications*

The Project Site is within Location 3, with 7.674 hectares of native vegetation proposed to be removed, comprising 5.454 hectares of native vegetation patches, 34 Large Trees in patches, and 37 scattered trees (30 Large and seven Small Trees). As such, the permit application falls under the Detailed assessment pathway.

The offset requirement for native vegetation removal is 2.373 General Habitat Units and 64 Large Trees.

A planning permit from the Northern Grampians Shire is required to remove, destroy or lop any native vegetation under Clause 52.17 and Clause 42.01 (ESO1) of the Planning Scheme.

A permit is required under Clause 52.32 of the Planning Scheme to develop and use a Wind energy facility. The ecological application requirements are outlined in Section 6.4.1.

A permit is required under Clause 53.13 of the Planning Scheme to use or develop a renewable energy facility (other than wind energy facility).

A permit will be referred to DELWP as a 'recommending authority' as the applications is being assessed under the Detailed Assessment pathway.

6.5 *Catchment and Land Protection Act 1994* (Victoria)

The *Catchment and Land Protection Act 1994* (CaLP Act) contains provisions relating to catchment planning, land management, noxious weeds and pest animals. Landowners are responsible for the control of any infestation of noxious weeds and pest fauna species to minimise their spread and impact on ecological values.

Ten weed species listed under CaLP act were recorded over the assessments (Emerge Associates 2020a; 2020b).

6.5.1 *Implications*

A Weed and Pest Management Plan will be required to be incorporated in the Environment Management Plan prepared for the project.

6.6 *Wildlife Act 1975* and Wildlife Regulations 2013 (Victoria)

The *Wildlife Act 1975* (and associated Wildlife Regulations 2013) is the primary legislation in Victoria providing for protection and management of wildlife. Authorisation for habitat removal may be obtained under the *Wildlife Act 1975* through a licence granted under the *Forests Act 1958*, or under any other Act such as the *Planning and Environment Act 1987*. Any persons engaged to remove, salvage, hold or relocate native fauna during construction must hold a current Management Authorisation under the *Wildlife Act 1975*, issued by DELWP.

6.7 Policy and Planning Guidelines – Development of Wind Energy Facilities in Victoria

Wind energy facilities should not lead to unacceptable impacts on critical environmental, cultural or landscape values (DELWP 2022f). These values include those protected under Commonwealth and State legislation and those recognised through planning schemes such as the State Planning Policy Framework.

Responsible authorities and applicants must consider a range of environmental values (for example: flora, vegetation and fauna) and risks when identifying suitable sites for wind energy facility development.

6.7.1 Implications

Impacts on flora and fauna species and habitats from wind energy facilities and associated infrastructure can be minimised through facility placement and design measures at the project planning stage. Minimisation of impacts to native vegetation patches, scattered trees, and significant impacts to environmental values at the site can be further achieved by focusing construction and other project activity in agricultural areas.

An Environmental Management Plan (EMP) will be required to detail how the site will be managed throughout the life of the Project, and across all environmental components. The EMP should include a bat and avifauna management plan (DELWP 2017b). The project must consider impacts on birds and bats, which are known to collide with wind turbines. Research by the Arthur Rylah Institute has improved knowledge of wind turbine impact on bats and birds (DELWP 2020b), and DELWP is developing risk assessment and mitigation guidelines specifically for Brolga, Southern Bent-wing Bat, Red-tailed Black Cockatoo, Black Falcon and White-bellied Sea Eagle (DELWP 2020c).

7 MITIGATION MEASURES

7.1 Best Practice Mitigation Measures

Recommended measures to mitigate impacts upon terrestrial and aquatic values present within the Project Site may include:

- Minimise impacts to native vegetation and habitats through construction and micro-siting techniques, including fencing retained areas of native vegetation. If indeed necessary, trees should be lopped or trimmed rather than removed. Similarly, soil disturbance and sedimentation within wetlands should be avoided or kept to a minimum, to avoid, or minimise impacts to fauna habitats;
- All contractors should be aware of ecologically sensitive areas to minimise the likelihood of inadvertent disturbance to areas marked for retention. Native vegetation (areas of sensitivity) should be included as a mapping overlay on any construction plans;
- Tree Protection Zones (TPZs) should be implemented to prevent indirect losses of native vegetation during construction activities (DSE 2011). A TPZ applies to a tree and is a specific area above and below the ground, with a radius 12 x the Diameter at Breast Height (DBH). At a minimum standard a TPZ should consider the following:
    - A TPZ of trees should be a radius no less than two metres or greater than 15 metres;
    - Construction, related activities and encroachment (i.e. earthworks such as trenching that disturb the root zone) should be excluded from the TPZ;
    - Where encroachment is 10% or more of the total area of the TPZ, the tree should be considered as lost and offset accordingly (unless an arboricultural report specifies otherwise);
    - Directional drilling may be used for works within the TPZ without being considered encroachment. The directional bore should be at least 600 millimetres deep;
    - The above guidelines may be varied if a qualified arborist confirms the works will not significantly damage the tree (including stags / dead trees). In this case the tree would be retained, and no offset would be required; and,
    - Where the minimum standard for a TPZ has not been met an offset may be required.
- Removal of any habitat trees or shrubs (particularly hollow-bearing trees or trees/shrubs with nests) should be undertaken between February and September to avoid the breeding season for most fauna species. If any habitat trees or shrubs are proposed to be removed, this should be undertaken under the supervision of an appropriately qualified zoologist to salvage and translocate any displaced fauna. A Fauna Management Plan may be required to guide the salvage and translocation process;
- Where possible, construction stockpiles, machinery, roads, and other infrastructure should be placed away from areas supporting native vegetation, Large Trees and/or wetlands; and,

- Ensure that best practice sedimentation and pollution control measures are undertaken at all times, in accordance with Environment Protection Authority guidelines (EPA 1991; EPA 1996; Victorian Stormwater Committee 1999) to prevent offsite impacts to waterways and wetlands; and,
- As indigenous flora provides valuable habitat for indigenous fauna, it is recommended that any landscape plantings that are undertaken as part of the proposed works are conducted using indigenous species sourced from a local provenance, rather than exotic deciduous trees and shrubs.

In addition to these measures, the following documents should be prepared and implemented prior to any construction activities:

- Construction Environmental Management Plan (CEMP). The CEMP should include specific species/vegetation conservation strategies, daily monitoring, sedimentation management, site specific rehabilitation plans, weed, pest and pathogen management measures, etc.; and,
- Fauna Management Plan. This may be required if habitat for common fauna species is likely to be impacted and salvage and relocation must be undertaken to minimise the risk of injury or death to those species.

8 RECOMMENDATIONS

Based on the quality and extent of ecological values known to, or considered likely to occur, it is recommended that RES:

1. Commission additional ecological assessments to be undertaken in areas where the development footprint is location outside of areas previously assessed to ensure all on-ground ecological values with the potential to be impacted are quantified;
2. Avoid impacts to Buloke and other scattered trees where possible;
3. Avoid and/or minimise impacts to the GBGW Community and Victorian Temperate Woodland Bird Community where possible;
4. Maximise the turbine-free buffer distance around Joel Joel Nature Conservation Reserve to mitigate potential impacts to Swift Parrot;
5. Prior to construction, develop a Construction Environmental Management Plan (CEMP) with specific management actions to mitigate against potential impacts to areas of ecological value;
6. Develop a Weed Management Plan, which should be incorporated into the CEMP;
7. Before commencement of construction, the preparation of a Bat and Avifauna Management Plan to the satisfaction of the Responsible Authority, in consultation with the DELWP. When approved, the BAM Plan must be endorsed by the responsible authority. The BAM Plan must include:
    a) A strategy for managing and mitigating bird and bat strike arising from the wind energy facility operation. The strategy must include procedures for the regular removal of carcasses likely to attract raptors to areas near wind turbines;
    b) A procedure for addressing significant impacts of birds and bat populations caused by the wind farm. This procedure must provide that the operator of the wind energy facility immediately investigates the possible causes of any significant impacts on bird and bat populations, and thereafter designs and implement measures to mitigate those impacts in consultation with the responsible authority and DELWP;
    c) A monitoring period of at least two years to record, by species, any bird and bat strikes; and,
    d) A strategy to manage and/or monitor the wind farm beyond the designated period depending upon the results of the monitoring period referred to above. The strategy must include provisions to take account of any changes to weather patterns during the initial two-year monitoring period.
8. If there are changes to the layout through the process of preparing the final development plans, confirmation of any potential impacts (or lack thereof) to native vegetation and fauna habitat must be undertaken.

9 FURTHER REQUIREMENTS

Further requirements associated with development of the Project Site, as well as additional studies or reporting that may be required, are provided in Table 28.

Table 28. Further requirements associated with development of the Project Site.

Relevant Legislation	Implications	Further Action
Environment Protection and Biodiversity Conservation Act 1999	Based on the Preliminary Impact Assessment, there is a proposed impact 9.75 hectares of confirmed Golden Sun Moth habitat, and 1.671 hectares of the Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia ecological community. All impacts to River Swamp Wallaby-grass have been avoided through micrositing of infrastructure and the inclusion of below ground reticulation. No Tawny Spider-orchid were recorded within the Assessment Area. The Project Site also contains suitable foraging habitat for Swift Parrot. Any impacts to Swift Parrot through turbine collision could potentially represent a significant impact to the species. While turbines have been configured to reduce the risk of collision to the species, overall there is a low to moderate risk to the species from turbine collision.	A referral under the EPBC Act to the Commonwealth Environment Minister is currently in preparation.
Flora and Fauna Guarantee Act 1988	Four fauna species (Golden Sun Moth, Hardhead, Hooded Robin, and Speckled Warbler), two flora species (Buloke, Hairy Tails) and one ecological community (Victorian Temperate Woodland Bird Community) listed as threatened under the FFG Act were recorded during the field surveys. Six Buloke and one Hairy Tails specimen are present within the infrastructure footprint.	Where impacts are proposed on public land (i.e. road reserves), an FFG Act permit will be required.
Environment Effects Act 1978	Based on the current review of ecological impacts associated with the proposed development, it is unlikely that an EES will be triggered based on ecological impacts alone as: - None of the thresholds relating to any of the individual ecological criteria are likely to be exceeded; and, - None of the thresholds relating to the combination of ecological criteria are likely to be exceeded.	Undertake an assessment of non-ecological criteria.
Planning and Environment Act 1987	A planning permit from the Northern Grampians Shire is required to remove, destroy or lop any native vegetation under Clauses 42.01 (ESO1), 52.17, 52.32 and 53.13 of the Planning Scheme.	Prepare and submit a Planning Permit application.
Catchment and Land Protection Act 1994	10 weed species listed under the CaLP Act were recorded within the Project Site.	A Weed and Pest Management Plan will be required to be incorporated in the Environment Management Plan prepared for the project
Wildlife Act 1975	Any persons engaged to conduct salvage and translocation or general handling of terrestrial fauna species must hold a current Management Authorisation.	Ensure wildlife specialists hold a current Management Authorisation.

REFERENCES

ALA 2022. Atlas of Living Australia. URL: https://www.ala.org.au/. Atlas of Living Australia, Canberra, ACT.

ARI 2019. Developing a science-based approach to defining key bird and bats of concern for wind farm development in Victoria. Arthur Rylah Institute for Environmental Research Technical Report Serios No. 301. Department of Environment, Land, Water and Planning, Heidelberg, Victoria.

Arnett, E.B., technical editor. 2005. Relationships between bats and wind turbines in Pennsylvania and West Virginia: an assessment of bat fatality search protocols, patterns of fatality, and behavioural interactions with wind turbines. A final report submitted to the Bats and Wind Energy Cooperative. Bat Conservation International. Austin, Texas, USA.

Backhouse, G., Kosky, B., Rouse, D., and Turner, J. 2016. Bush Gems: A Guide to the Wild Orchids of Victoria, Australia. Orchids of Australia Series. Published in Melbourne, Australia in August 2016 by Gary Backhouse, Bill Kosky, Dean Rouse and James Turner

Bearwald, E.F., D'Amours, G.H., Klug, B.J. and Barclay, R.M.R. 2008. Barotrauma is a significant cause of bat fatalities at wind turbines. Current Biology 18(16):695-696.

Bennett, E. 2012. Hepburn Wind Farm Bird and Bat Mortality Survey Interim Report 11th July 2011 – 9th January 2012. Unpublished report prepared by Elmoby Ecology for Hepburn Wind Farm.

Biosis 2005. Modelled cumulative impacts of wind farms on the Swift Parrot. Report prepared for the Department of Environment and Heritage.

Biosis 2006. Wind Farm Collision Risk for Birds: Cumulative risks for threatened and migratory species. Biosis 2006.

Birdlife Australia 2020. Birds Australia Atlas. New Atlas Data Extraction – July 2020. Birdlife Australia

BL&A 2014. Bulgana Wind Farm Flora and Fauna Assessment. Report prepared for Bulgana Wind Farm Pty Ltd. September 2014.

Brereton, R. N. 1997. Management prescriptions for the swift parrot in production forests. - Tasmanian RFA Environment and Heritage Technical Committee

Brown, P. 1989. The swift parrot Lathamus discolor. A Report on its Ecology, Distribution, and Status, Including Management Considerations. - Department of Lands, Parks and Wildlife, Hobart.

Carter, N. *et al.* 2019. Joining the dots: How does an apex predator move through an urbanizing landscape? Global Ecology and Conservation 17. Melbourne, Australia

Chamberlain, D.E., Rehfisch, M.R., Fox, A.D., Desholm, M, & Anthony, S.J. 2006. Mortality in wind turbine collision risk models The effect of avoidance rates on bird mortality predictions made by wind turbine collision risk models. Ibis 148:198–202.

Churchill, S. 2008. Australian Bats (2nd Edition). Allen and Unwin, Sydney.

Clarke, G.M. & C. O'Dwyer 1999. Further survey in southeastern New South Wales for the endangered golden sun moth, Synemon plana. Pg 77. CSIRO Entomology, Canberra.

Clarke, G.M. & C. O'Dwyer 1999. Further survey in southeastern New South Wales for the endangered golden sun moth, Synemon plana. Pg 77. CSIRO Entomology, Canberra.

Cogger, H.G., Cameron, E.E., Sadlier, R.A. and Eggler, P 1993. *The Action Plan for Australian Reptiles*. Australian Nature conservation Agency, Canberra, ACT.

Colwell, R. K. 2013. EstimateS: Statistical estimation of species richness and shared species from samples. Version 9. User's Guide and application published at: http://purl.oclc.org/estimates.

Colwell, R. K., C. X. Mao, & J. Chang. 2004. Interpolating, extrapolating, and comparing incidence-based species accumulation curves. *Ecology* **85**, 2717-2727

Commonwealth of Australia 2013. Survey Guidelines for Australia's Threatened Orchids. Guidelines for Detecting Orchids Listed as 'Threatened' under the *Environment Protection and Biodiversity Conservation Act 1999.* Commonwealth of Australia. Canberra.

Cryan, P. M. & Barclay, M. R. 2009. Causes of bat fatalities at wind turbines: hypotheses and predictions. Journal of Mammology 90:1330–1340.

DAWE 2021. Conservation Advice for *Synemon plana* Golden Sun Moth. Prepared by the Commonwealth Department of Agriculture, Water and the Environment. Commonwealth of Australia, 2021.

DCCEEW 2022. Protected Matters Search Tool. [www Document] URL: https://www.dcceew.gov.au/environment/epbc/protected-matters-search-tool. Commonwealth Department of Climate Change, Energy, the Environment and Water, Canberra, ACT.

Dejean T, A Valentini, A Duparc, S Pellier-Cult, F Pompanon, P Taberlet and C Miaud, 2011. Persistence of environmental DNA in freshwater ecosystems. PloS One 6(8): e23398

DELWP 2017. *Guidelines for the removal, destruction or lopping of native vegetation*. December 2017. Victorian Department of Environment, Land, Water and Planning, Melbourne, Victoria.

DELWP 2018. *Assessor's handbook: Applications to remove, destroy or lop native vegetation*. October 2018. Victorian Department of Environment, Land, Water and Planning, Melbourne, Victoria.

DELWP 2019a. *Flora and Fauna Guarantee Act 1988* Protected Flora List – November 2019 [www Document]. URL: https://www.environment.vic.gov.au/__data/assets/pdf_file/0011/50420/20191114-FFG-protected-flora-list.pdf. Victorian Department of Environment, Land, Water and Planning, Melbourne, Victoria.

DELWP 2019b. Solar Energy Facilities Design and Development Guidelines. Victorian Department of Environment, Land, Water and Planning, Melbourne, Victoria. August 2019.

DELWP 2020a. Draft Brolga Assessment and Mitigation Standards for Wind Energy Facilities: For wind energy facility permit applications. Victorian Department of Environment, Land, Water and Planning, Melbourne, Victoria.

DELWP 2020b. Improving the regulation of wind farms impacts on birds and bats. [www Document]. URL: https://www.planning.vic.gov.au/__data/assets/pdf_file/0028/435259/Improving-the-regulation-of-wind-farms-impacts-on-birds-and-bats.pdf.

DELWP 2020c. Summary of ARI report species of concern for wind farm development. [www Document]. URL: https://www.planning.vic.gov.au/__data/assets/pdf_file/0021/435261/Summary-of-ARI-report-species-of-concern-for-wind-farm-developments.pdf

DELWP 2021a. Victorian Biodiversity Atlas. Sourced from GIS layers: "VBA_FLORA25", "VBA_FLORA100", "VBA_FAUNA25", "VBA_FAUNA100". August 2021. Victorian Department of Environment, Land, Water and Planning, Melbourne, Victoria.

DELWP 2022a. NatureKit Map [www Document]. URL: https://maps2.biodiversity.vic.gov.au/Html5viewer/index.html?viewer=NatureKit. Victorian Department of Environment, Land, Water and Planning, Melbourne, Victoria.

DELWP 2022b. Native Vegetation Information Management Tool [www Document]. URL: https://nvim.delwp.vic.gov.au. Victorian Department of Environment, Land, Water and Planning, Melbourne, Victoria.

DELWP 2022c. Ecological Vegetation Class (EVC) Benchmarks for each Bioregion [www Document]. URL: https://www.environment.vic.gov.au/biodiversity/bioregions-and-evc-benchmarks. Victorian Department of Environment, Land, Water and Planning, Melbourne, Victoria.

DELWP 2022d. VicPlan Map [www Document]. URL: https://mapshare.maps.vic.gov.au/vicplan/. Victorian Department of Environment, Land, Water and Planning, Melbourne, Victoria.

DELWP 2022e. *Flora and Fauna Guarantee Act 1988* Threatened List – June 2022. Victorian Department of Environment, Land, Water and Planning, Melbourne, Victoria.

DELWP 2022f. Development of Wind Energy Facilities in Victoria: Policy and Planning Guidelines. Victorian Department of Environment, Land, Water and Planning, Melbourne, Victoria. November 2021.

DEWLP 2022g. *Flora and Fauna Guarantee Act 1988* Threatened List. Characteristics of Threatened Communities. [www Document]. URL: https://www.environment.vic.gov.au/conserving-threatened-species?a=50418. Victorian Department of Environment, Land, Water and Planning, Melbourne, Victoria.

DEWHA 2008. Approved Conservation Advice for *Amphibromus fluitans* River Swamp Wallaby-grass. Commonwealth Department of Environment, Water, Heritage and the Arts. March 2008.

DEWHA 2009a. Significant Impact Guidelines for the Critically Endangered Golden Sun Moth (*Synemon plana*). Department of the Environment, Water, Heritage and the Arts, Canberra.

DEWHA 2009b. Background Paper to EPBC Act Policy Statement 3.12 –Nationally Threatened Species and Ecological Communities Significant Impact Guidelines for the Critically Endangered Golden Sun Moth (*Synemon plana*)

DEWHA 2009c. Significant impact guidelines for the vulnerable growling grass frog (*Litoria raniformis*). Nationally threatened species and ecological communities EPBC Act policy statement 3.14. Department of the Environment, Water, Heritage and the Arts, Canberra

DEWHA 2010a. Commonwealth Survey guidelines for Australia's threatened bats. Guidelines for detecting bats listed as threatened under the *Environment Protection and Biodiversity Conservation Act 1999.* Commonwealth of Australia, 2010.

DEWHA 2010b. Commonwealth Survey guidelines for Australia's threatened birds. Guidelines for detecting birds listed as threatened under the *Environment Protection and Biodiversity Conservation Act 1999.* Commonwealth of Australia, 2010.

DoE 2013. *Commonwealth Draft Survey Guidelines for Australia's Threatened Orchids.* Australian Department of the Environment, Canberra.

DSE 2004a. *Vegetation quality assessment manual: Guidelines for applying the habitat hectares scoring method.* Version 1.3. Victorian Department of Sustainability and Environment, Melbourne Victoria.

DSE 2004b. Flora and Fauna Guarantee Act Action Statement: Five threatened Victoria Sun Moths. Department of Sustainability and Environment, East Melbourne, Victoria.

DSE 2006. Ministerial guidelines for assessment of environmental effects under the *Environment Effects Act 1978*. Seventh Edition, 2006. Published by the Victorian Government Department of Sustainability and Environment, Melbourne. June 2006

DSE 2010. *Biodiversity Precinct Structure Planning Kit.* Victorian Department of Sustainability and Environment, Melbourne, Victoria.

DSE 2011. *Native Vegetation Technical information sheet: Defining an acceptable distance for tree retention during construction works*. Victorian Department of Sustainability and Environment, Melbourne, Victoria.

DSE 2012. Interim Guidelines for the Assessment, Avoidance, Mitigation and Offsetting of Potential Wind Farm Impacts on the Victorian Brolga Population 2011. Revision 1, February 2012. Victorian Department of Sustainability and Environment, Melbourne, Victoria.

DSEWPaC 2012. *Environment Protection and Biodiversity Conservation Act 1999* Environmental Offsets Policy (October 2012). Department of Sustainability, Environment, Water, Population and Communities, Canberra.

Duncan, A., Baker, G.B. and Montgomery, N. (Eds) 1999. *The Action Plan for Australian Bats*. Environment Australia, Canberra, ACT.

Emerge Associates 2020a. Phase 1 Ecological Study – Joel Joel Wind and Solar Farm Phase 1. Report prepared for Umwelt Australia

Emerge Associates 2020b. Phase 2 Targeted Ecological Assessments – Joel Joel Wind and Solar Farm. Report prepared for Umwelt Australia

Endersby, I & Koehler, S. 2006. Golden Sun Moth Synemon plana: discovery of new populations around Melbourne. The Victorian Naturalist 123, 362-365

EnviroDNA 2021. Assessing presence of platypuses and growling grass frogs using eDNA. Report prepared for Ecology and Heritage Partners. December 2021.

EPA 1991. *Construction Techniques for Sediment Pollution Control*. Published document prepared by the Victorian Environment Protection Authority, Melbourne, Victoria.

EPA 1996. *Environmental Guidelines for Major Construction Sites*. Published document prepared by the Victorian Environmental Protection Authority, Melbourne, Victoria.

Farfán, M.A., Vargas, J.M., Duarte, J. & Real, R. 2009. What is the impact of wind farms on birds? A case study in southern Spain. Biodiversity Conservation 18:3741–3758.

Garnett, S., Szabo, J. and Dutson, G 2011. *The Action Plan for Australian Birds 2010*. CSIRO Publishing, Melbourne, Victoria.

Gullan, P. 2017. Illustrated Flora Information System of Victoria (IFISV). Viridans Pty Ltd, Victoria.

Hatton F, Olsen J, Gruber B. 2015. Post-fledging spatial use by a juvenile Wedge-tailed tailed Eagle Aquila audax using satellite telemetry. Corella 39, 53–60.

Higgins PJ (ed.). 1999. Handbook of Australian, New Zealand and Antarctic Birds. Oxford University Press, Melbourne.

Horn, J. W., Arnett, E. B. & Kunz, T. H. 2008a. Behavioural Responses of Bats to Operating Wind Turbines. Journal of Wildlife Management. 72:123–132.

Hull, C.L. and Cawthen, L. 2012. Bat fatalities at two wind farms in Tasmania, Australia: bat characteristics, and spatial and temporal patterns. New Zealand Journal of Zoology 40: 5-15.

Ingwersen, D., Timewell, C., Roderick, M., Mowat, E., Peters, K., Meney, B. 2021. Swift Parrot and Regent Honeyeater: Mid-year 2021 monitoring update. Birdlife Australia

Janss, G.F.E. & Ferrer, M. 2000. Rate of bird collision with power lines: effects of conductor-marking and static wiremaking. Journal of Field Ornithology 69:8–17.

Kennedy, S.J., and Tzaros, C.L. 2005. Foraging ecology of the Swift Parrot *Lathamus discolor* in the box-ironbark forests and woodlands of Victoria. Pacific Conservation Biology. 11: 158-173.

Kunz, T.H., E.B. Arnett, W.P. Erickson, A.R. Hoar, G.D. Johnson, R.P. Larkin, M.D. Strickland, R.W. Thresher, and M.D. Tuttle. 2007. Ecological impacts of wind energy development on bats: questions, research needs, and hypotheses. Frontiers in Ecology and the Environment 5:315–324.

Kuvlesky, W.P., Brennan, L.A., Morrison, M.L., Boydston, K.K., Ballard, B.M., & Bryant, F.C. 2007. Wind energy development and wildlife conservations: challenges and opportunities. Journal of Wildlife Management 71:2487–2498.

Leddy, K.L., Higgins, K.F., & Naugle, D.E. 1999. Effects of wind turbines on upland nesting birds in conservation reserve program grasslands. Wilson Bulletin 111:100–104

Ministry of Natural Resources (MNR) Ontario 2007. Guidelines to Assist in the Review of Wind Power Proposals – Potential Impacts to Bats and Bat Habitats. Developmental Working Draft.

Moloney, P.D., Lumsden, L.F. and Smales, I. 2019. Investigation of existing post-construction mortality monitoring at Victorian wind farms to assess its utility in estimating mortality rates. Arthur Rylah

Institute for Environmental Research Technical Report Series No. 302. Department of Environment, Land, Water and Planning, Heidelberg, Victoria

Olah, G., Stojanovic, D., Webb, M.H., Waples, R.S., and Heinsohn, R. 2020. Comparison of three techniques for genetic estimation of effective population size in a critically endangered parrot. Animal Conservation. 24: 3. 491-498.

Piersma, T, Zwarts, L and Buggermann, J. H. 1990. Behaviour aspects of the departure of waders before long distances flights: flocking vocalisation, flight paths and diurnal timing. Ardea 78: 157-184

Raaijmakers, J. G. W. 1987. Statistical analysis of the Michaelis-Menten equation. Biometrics 43, 793-803.

Sæther, B.E. & Bakke, Ø. 2000. Avian life history variation and contribution of demographic traits to the population growth rate. Ecology 81:642–653.

Sands, D.P.A. and New, T.R. 2002. *The Action Plan for Australian Butterflies*. Environment Australia, Canberra, ACT.

Saunders, D.L. and Tzaros, C. l. 2011. *National Recovery Plan for the Swift Parrot Lathamus discolor.* Birds Australia, Melbourne.

Sheldon, R. 2004. Characterisation and modelling of Brolga *Grus rubicunda* flocking habitat in south-west Victoria: relationships between habitat characteristics, Brolga abundance and flocking duration. Honours thesis, School of Science and Engineering, University of Ballarat.

Still, D., Painter, S. Lawrence, E.S. Little, B. and Thomas, M. 1995. Birds, wind farms, Blyth Harbour. Proceedings of the 16th British Wind Energy Association Conference. Pp: 175–181.

Stojanovic, D., Olah, G., Webb, M.H., Waples, R.S., Heinsohn. 2020. Comparison of three techniques for genetic estimation if effective population size in a critically endangered parrot. Animal Conservation 24: 3. 491-498.

Swifft 2021. Southern Bent-wing Bat – National Recovery Team. URL: https://www.swifft.net.au/cb_pages/team_southern_bent-wing_bat_-_recovery_team.php#:~:text=Southern%20Bent%2Dwing%20Bats%20can,in%20just%20a%20few%20hours. State Wide Integrated Flora and Fauna Teams. Federation University Australia.

Taylor, I.R., Kirsten, I.N.D.R.E. and Peake, P., 2002. Habitat, breeding and conservation of the Barking Owl *Ninox connivens* in northeastern Victoria, Australia. Ecology and conservation of owls. Victoria, Australia: CSIRO Publishing, pp.116-124

Thomsen PF, J Kielgast, LL Iversen, PR Møller, M Rasmussen and E Willerslev. 2012. Detection of a diverse marine fish fauna using environmental DNA from seawater samples. PLoS One 7(8): e41732

TSSC 2012. Commonwealth Listing Advice on *Amphibromus fluitans* River Swamp Wallaby-grass. Threatened Scientific Species Committee Established under the *Environment Protection and Biodiversity Conservation Act 1999.*

TSSC 2016. Conservation Advice *Caladenia fulva* Tawny Spider-orchid. Threatened Scientific Species Committee Established under the *Environment Protection and Biodiversity Conservation Act 1999*.

Tulp, I., McChesney, S and De Goeij, P. 1994. Migratory departures of waders from north-western Australia: behaviour, timing and possible migration routes. Ardea 82: 201-221.

Tyler, M.J. 1997. *The Action Plan for Australian Frogs*. Wildlife Australia, Canberra, ACT.

VEAC (Victorian Environmental Assessment Council) 2011. Remnant Native Vegetation Investigation, Final Report. Melbourne, Victoria.

Watson, D.M. 2003. The 'standardized search': An improved way to conduct bird surveys. Austral Ecology 28:515–525.

Weller, T.J. and Zabel, C.J. 2002. Variation in bat detections due to detector orientation in a forest. Wildlife Society Bulletin 30(3): 922-930.

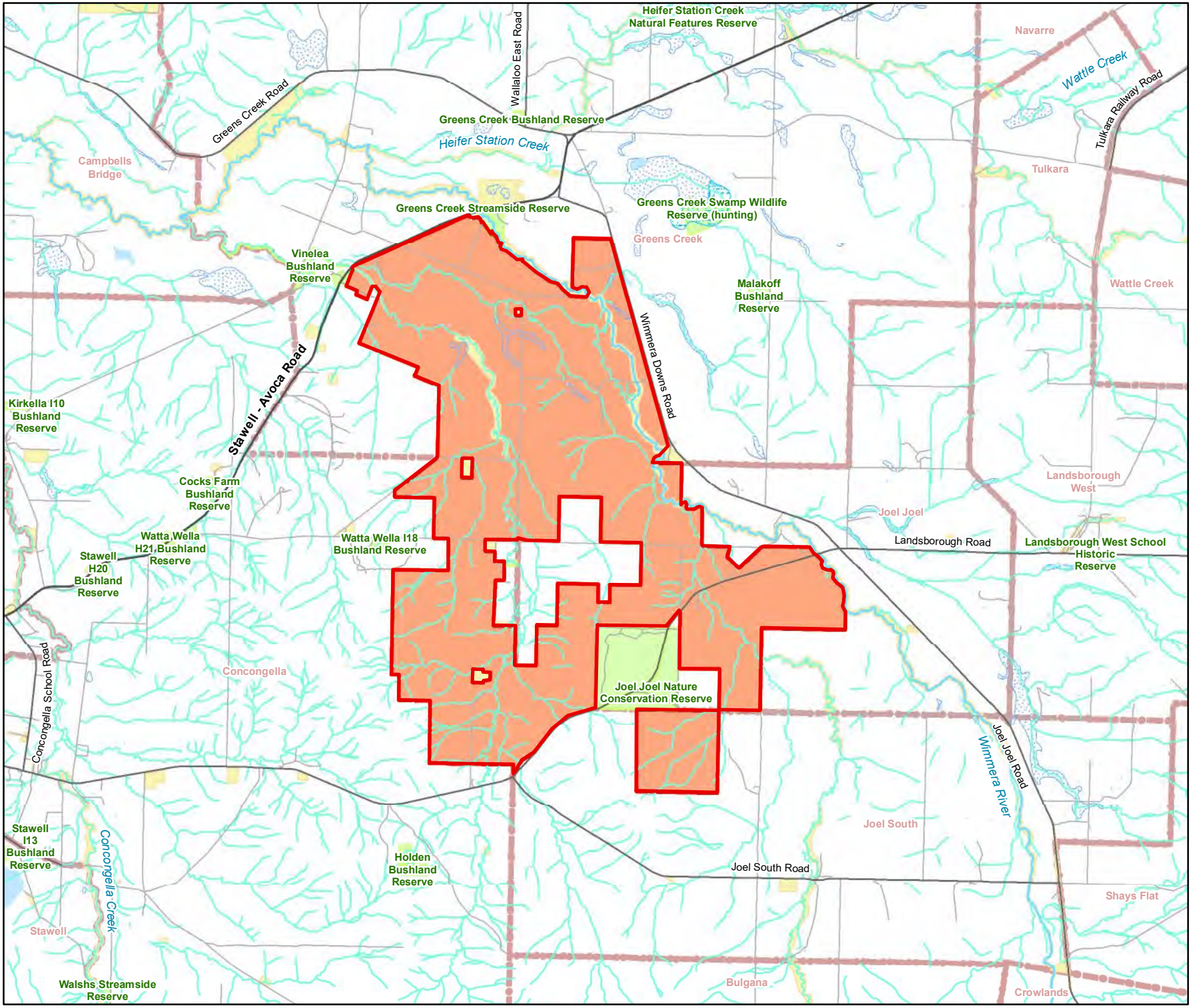
Williams, T. C., Williams, J. M., Ireland, L. C. and Teal, J. M. 1981 Autumnal bird migration over western North Atlantic Ocean. Amer. Birds. 31: 251-267

Winkelman, J.E. 1992a. The impact of the Sep Wind Park near Oosterbierum (Fr.), The Netherlands, on birds. 1. Collision victims. RIN-Rapport 92/2. Rijksinstitut voor Natuurbeheer. Arnhem, The Netherlands.

Winkelman, J.E. 1992b. The impact of the Sep wind Park near Oosterbierum (Fr.), The Netherlands on birds. 2. nocturnal collision victims. RIN-Rapport 92/3. Rijksinstitut voor Natuurbeheer, Arnhem, The Netherlands.

Woinarski, J., Burbidge, A. and Harrison, P. 2014. *The Action Plan for Australian Mammals 2012*. CSIRO Publishing, Melbourne, Victoria.

Yamanaka H., Motozawa H., Tsuji S., Miyazawa R. C., Takahara T. & Minamoto T., 2016. On-site filtration of water samples for environmental DNA analysis to avoid DNA degradation during transportation. Ecol. Res. 31 , 963–967.



Legend

- Wind Farm Development Boundary
- Major Road
- Collector Road
- Minor Road
- Minor Watercourse
- Major Watercourse
- Permanent Waterbody
- Land Subject to Inundation
- Wetland/Swamp
- Parks and Reserves
- Crown Land
- Localities

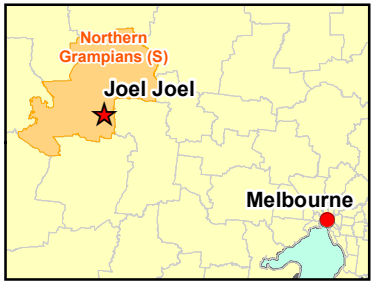


Figure 1

Location of the study area

Watta Wella Wind Farm, Solar Farm and Battery Facility

N

0 1,250 2,500

Metres

Map Scale: 1:100,000 @ A4
Coordinate System: GDA2020 MGA Zone 54

ecology & heritage partners

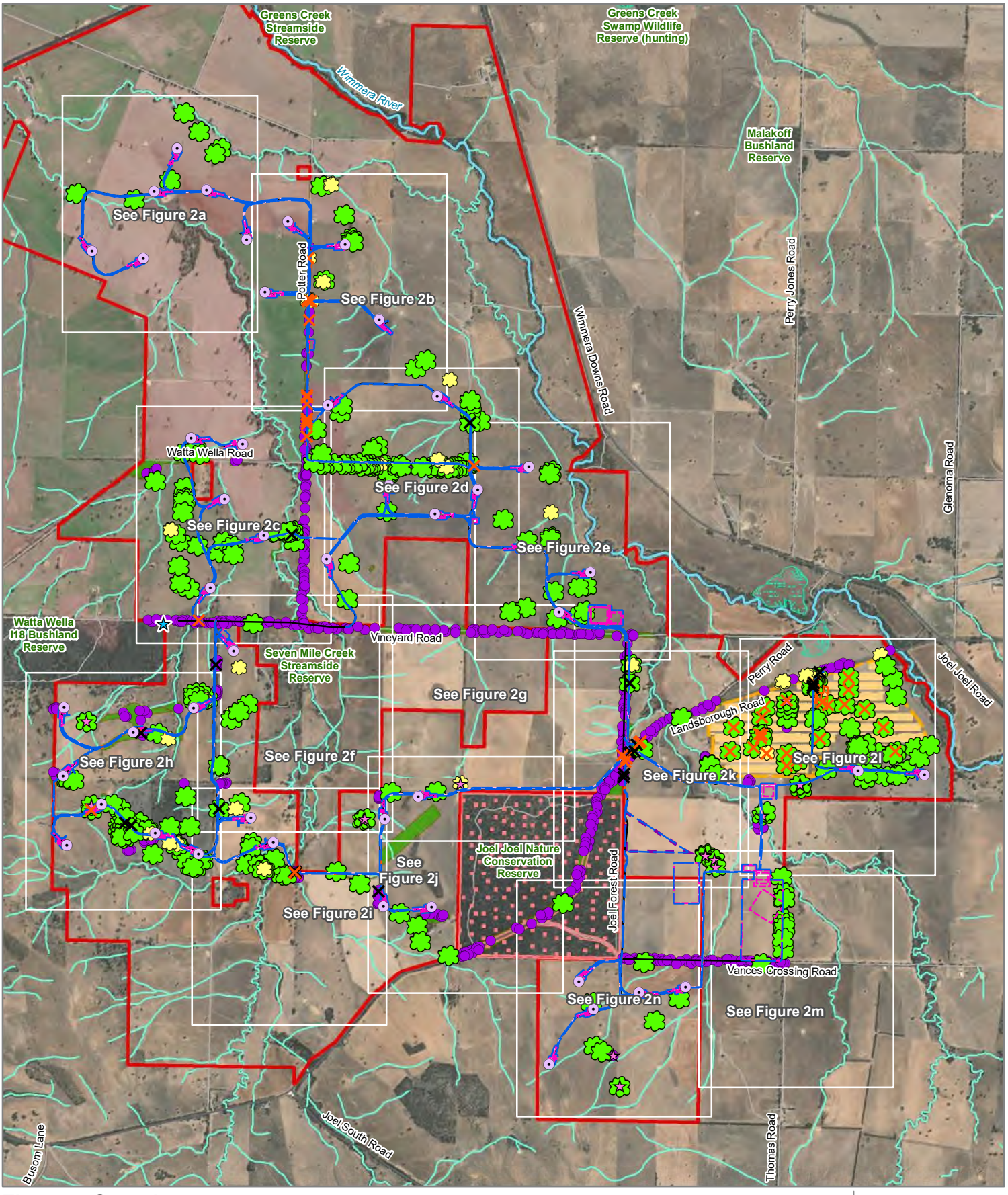


Figure 2 Overview

Ecological features

Watta Wella Wind Farm, Solar Farm and Battery Facility

Legend

- Wind Farm Development Boundary
- Solar Farm boundary
- Solar farm impact footprint
- Wind Farm Infrastructure Footprint
- WTG
- Tracks
- Infrastructure and hardstands
- Reticulation
- BESS Site Boundary
- Current Wetlands
- Large Scattered Tree
- Small Scattered Tree
- Large Tree in patch
- Tree - direct impact
- Tree - TPZ impact >10%
- Native Vegetation
- Impacted vegetation

Significant flora

- Buloke
- Beard orchid

N

0 500 1,000

Metres

Map Scale: 1:51,000 @ A4
Coordinate System:
GDA 1994 MGA Zone 54

ecology & heritage partners

13637_Fig02_EcoFeat_PMB_G94 19/07/2022 psorensen

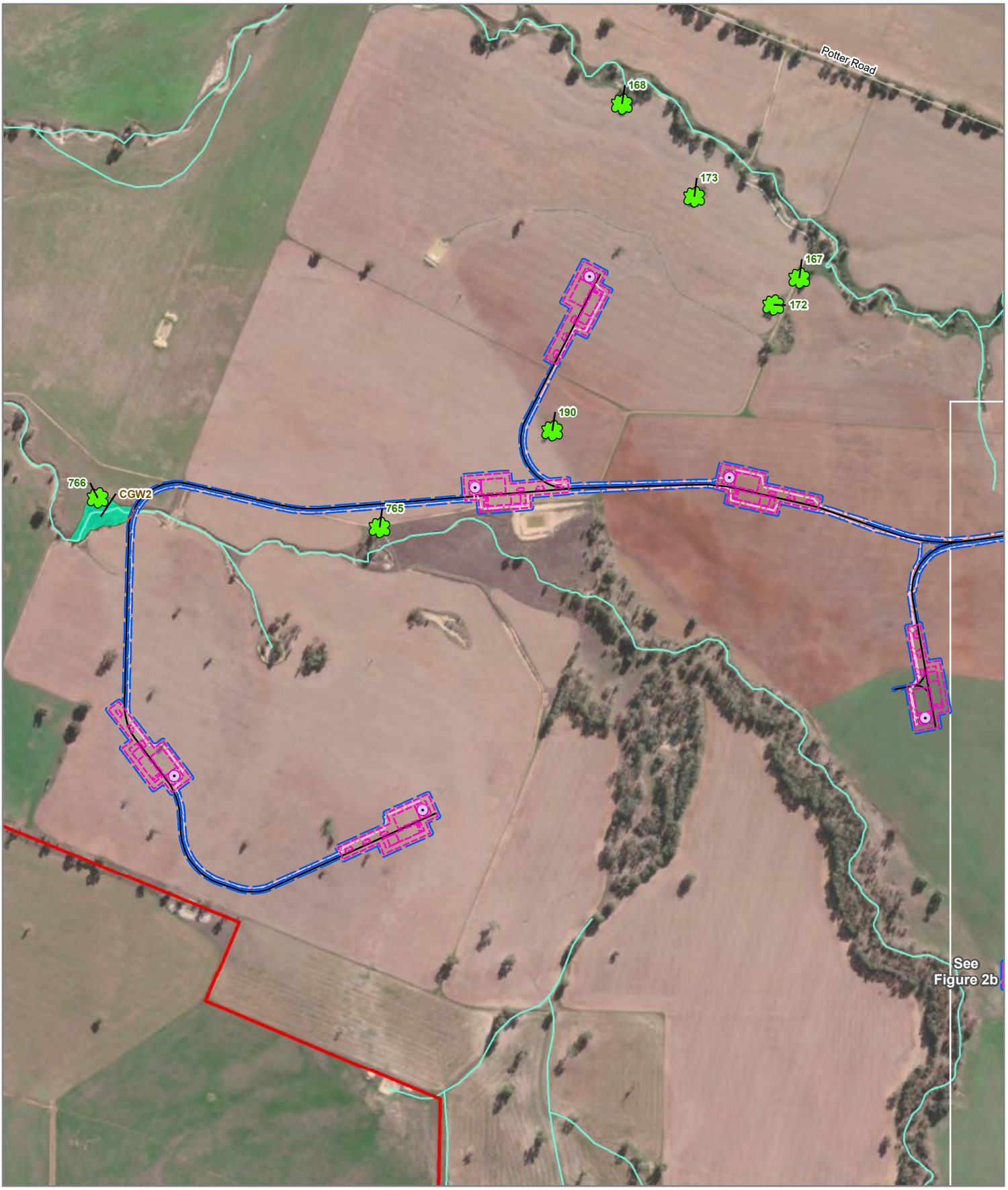


Figure 2a

Ecological features

Watta Wella Wind Farm, Solar Farm and Battery Facility

Legend

- Wind Farm Development Boundary
- Wind Farm Infrastructure Footprint
- WTG
- Tracks
- Infrastructure and hardstands
- Reticulation
- Large Scattered Tree

Ecological Vegetation Class

- Creekline Grassy Woodland
- Impacted vegetation

N

0 100 200

Metres

Map Scale: 1:10,500 @ A4
Coordinate System:
GDA 1994 MGA Zone 54

ecology & heritage partners

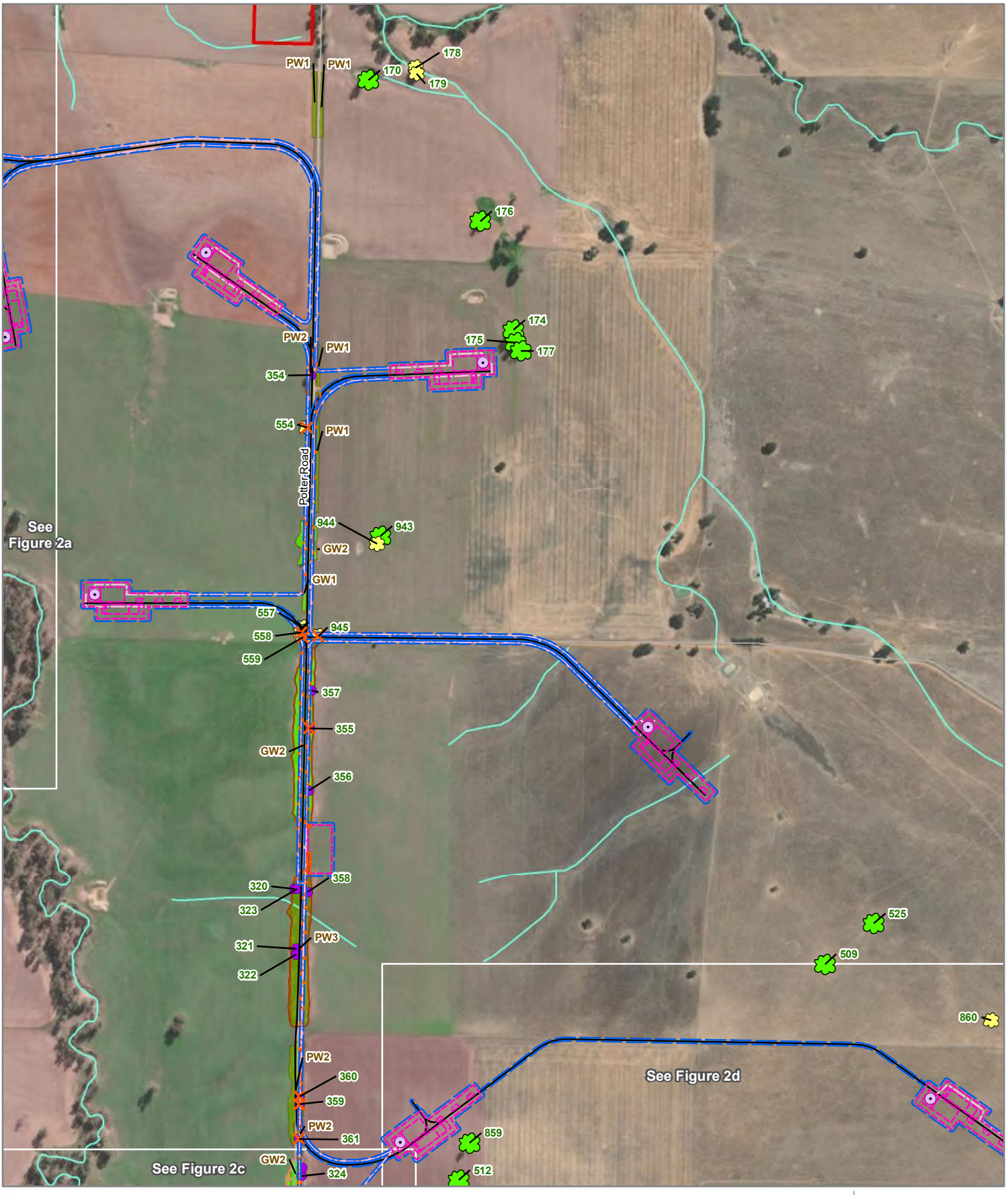


Figure 2b

Ecological features

Watta Wella Wind Farm, Solar Farm and Battery Facility

Legend

- Wind Farm Development Boundary
- Wind Farm Infrastructure Footprint
- WTG
- Tracks
- Infrastructure and hardstands
- Reticulation
- Large Scattered Tree
- Small Scattered Tree
- Large Tree in patch
- Tree - direct impact
- Tree - TPZ impact >10%

Ecological Vegetation Class

- Grassy Woodland
- Plains Woodland
- Impacted vegetation

EPBC Act Community

- Grey Box Grassy Woodland

FFG Act Community

- Victorian Temperate Woodland Bird Community

N

0 100 200

Metres

Map Scale: 1:10,500 @ A4
Coordinate System:
GDA 1994 MGA Zone 54

ecology & heritage partners

13637_Fig02_EcoFeat_PMB_G94 19/07/2022 psorensen

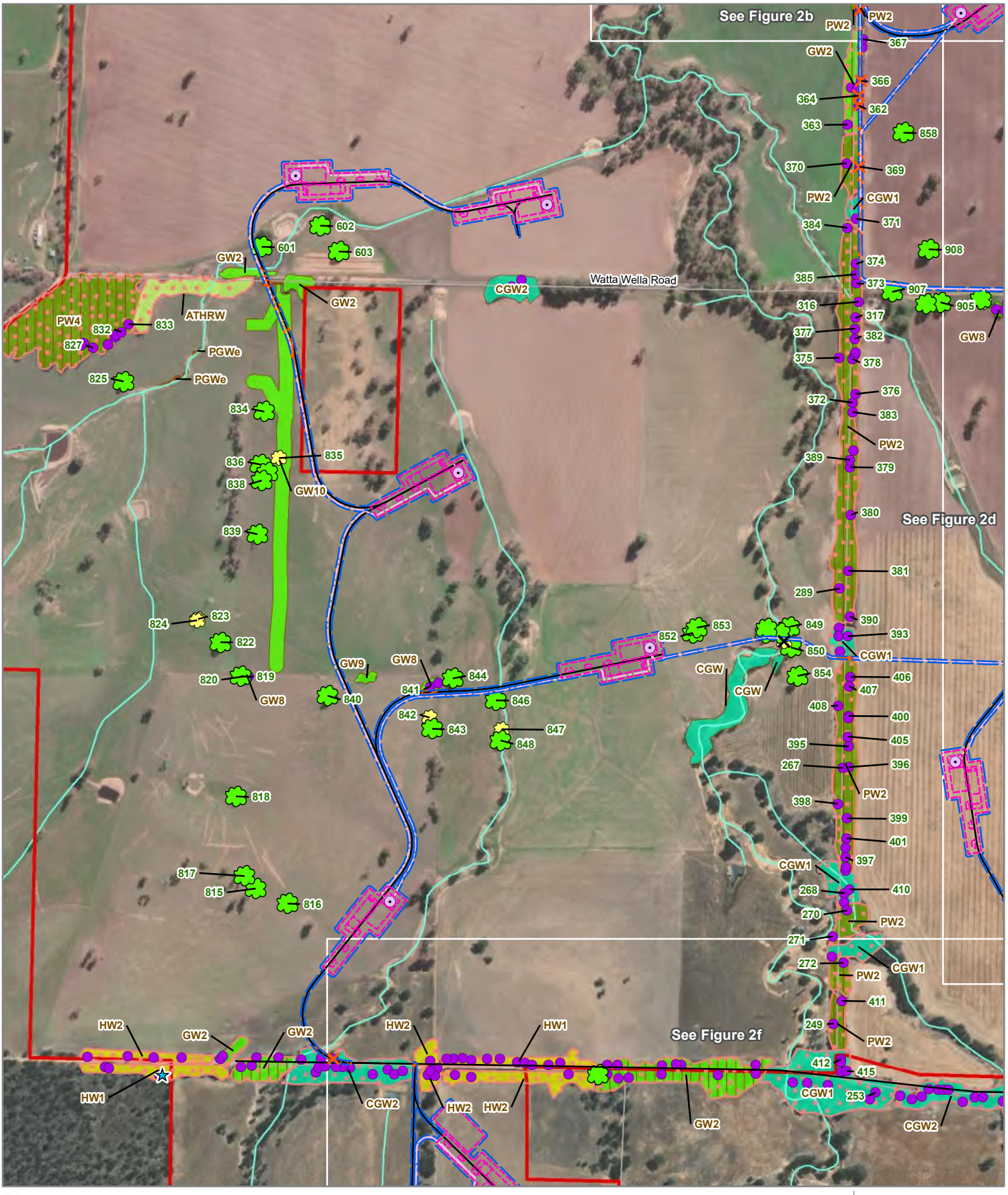


Figure 2c

Ecological features

Watta Wella Wind Farm, Solar Farm and Battery Facility

Legend

- Wind Farm Development Boundary
- Wind Farm Infrastructure Footprint
- WTG
- Tracks
- Infrastructure and hardstands
- Reticulation
- Large Scattered Tree
- Small Scattered Tree
- Large Tree in patch
- Tree - direct impact
- Tree - TPZ impact >10%

Ecological Vegetation Class

- Alluvial Terraces Herb-rich Woodland
- Creekline Grassy Woodland
- Grassy Woodland
- Heathy Woodland
- Plains Grassy Wetland
- Plains Woodland
- Impacted vegetation

N

0 100 200

Metres

Map Scale: 1:10,500 @ A4
Coordinate System:
GDA 1994 MGA Zone 54

ecology & heritage partners

13637_Fig02_EcoFeat_PMB_G94 19/07/2022 psorensen

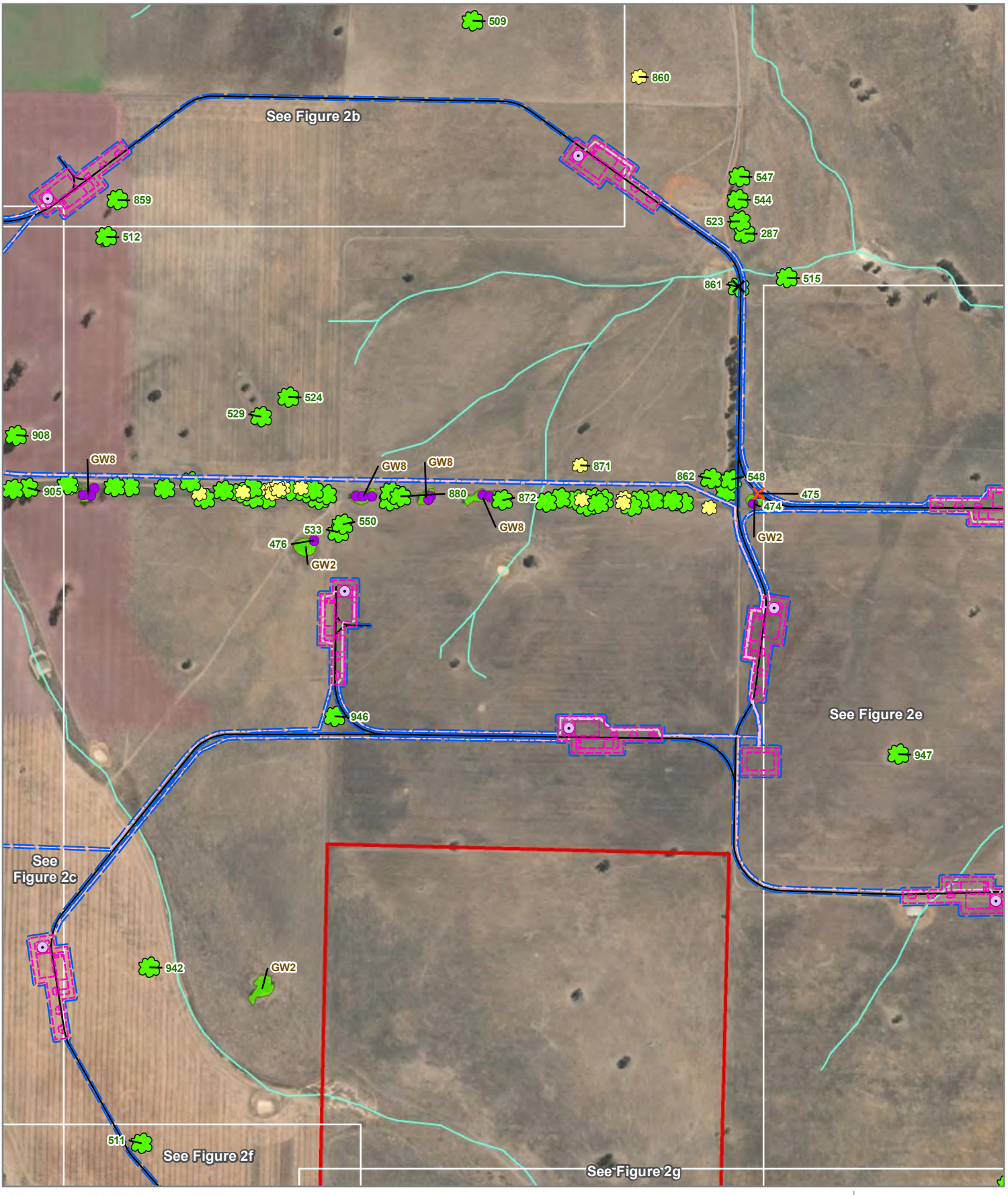


Figure 2d

Ecological features

Watta Wella Wind Farm, Solar Farm and Battery Facility

Legend

- Wind Farm Development Boundary
- Wind Farm Infrastructure Footprint
- WTG
- Tracks
- Infrastructure and hardstands
- Reticulation
- Large Scattered Tree
- Small Scattered Tree
- Large Tree in patch
- Tree - direct impact
- Tree - TPZ impact >10%

Ecological Vegetation Class

- Grassy Woodland
- Impacted vegetation

N

0 100 200

Metres

Map Scale: 1:10,500 @ A4
Coordinate System:
GDA 1994 MGA Zone 54

ecology & heritage partners

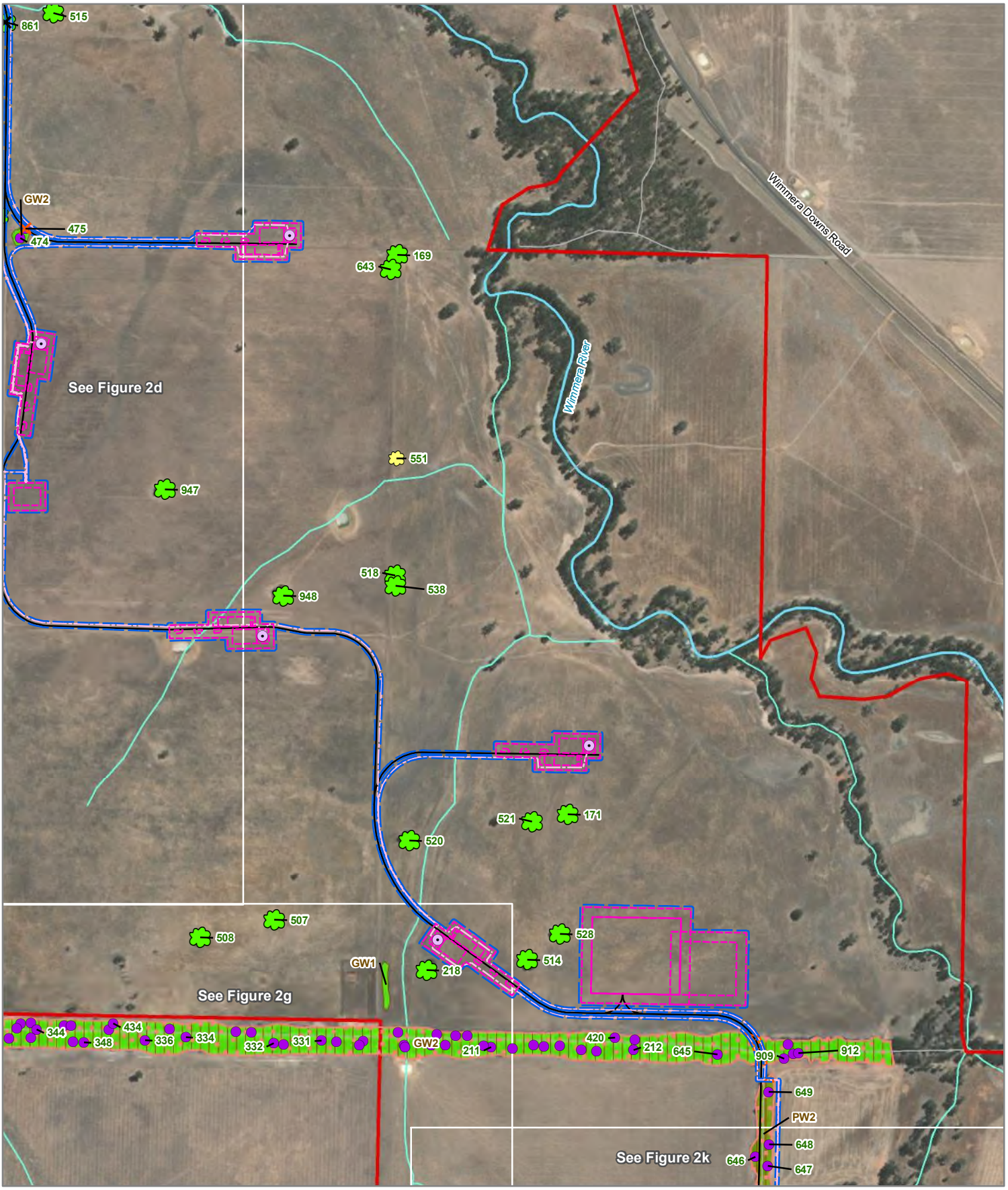


Figure 2e

Ecological features

Watta Wella Wind Farm, Solar Farm and Battery Facility

Legend

- Wind Farm Development Boundary
- Wind Farm Infrastructure Footprint
- WTG
- Tracks
- Infrastructure and hardstands
- Reticulation
- Large Scattered Tree
- Small Scattered Tree
- Large Tree in patch
- Tree - direct impact
- Tree - TPZ impact >10%

Ecological Vegetation Class

- Grassy Woodland
- Plains Woodland
- Impacted vegetation

EPBC Act Community

- Grey Box Grassy Woodland

FFG Act Community

- Victorian Temperate Woodland Bird Community

N

0 100 200

Metres

Map Scale: 1:10,500 @ A4
Coordinate System:
GDA 1994 MGA Zone 54

ecology & heritage partners

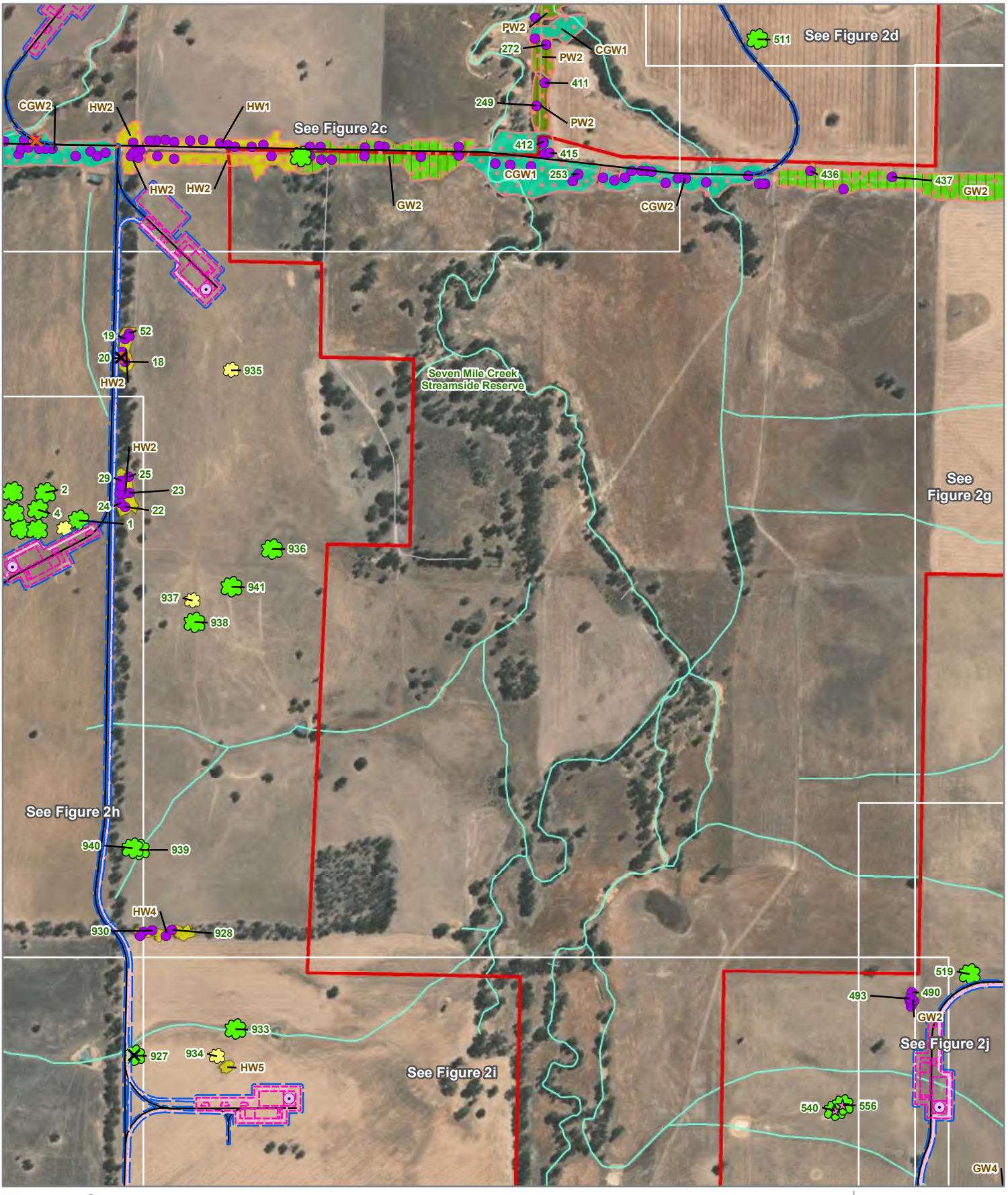


Figure 2f

Ecological features

Watta Wella Wind Farm, Solar Farm and Battery Facility

Legend

- Wind Farm Development Boundary
- Wind Farm Infrastructure Footprint
- WTG
- Tracks
- Infrastructure and hardstands
- Reticulation
- Large Scattered Tree
- Small Scattered Tree
- Large Tree in patch
- Tree - direct impact
- Tree - TPZ impact >10%

Ecological Vegetation Class

- Creekline Grassy Woodland
- Grassy Woodland
- Heathy Woodland
- Plains Woodland
- Impacted vegetation

N

0 100 200

Metres

Map Scale: 1:10,500 @ A4
Coordinate System:
GDA 1994 MGA Zone 54

ecology & heritage partners

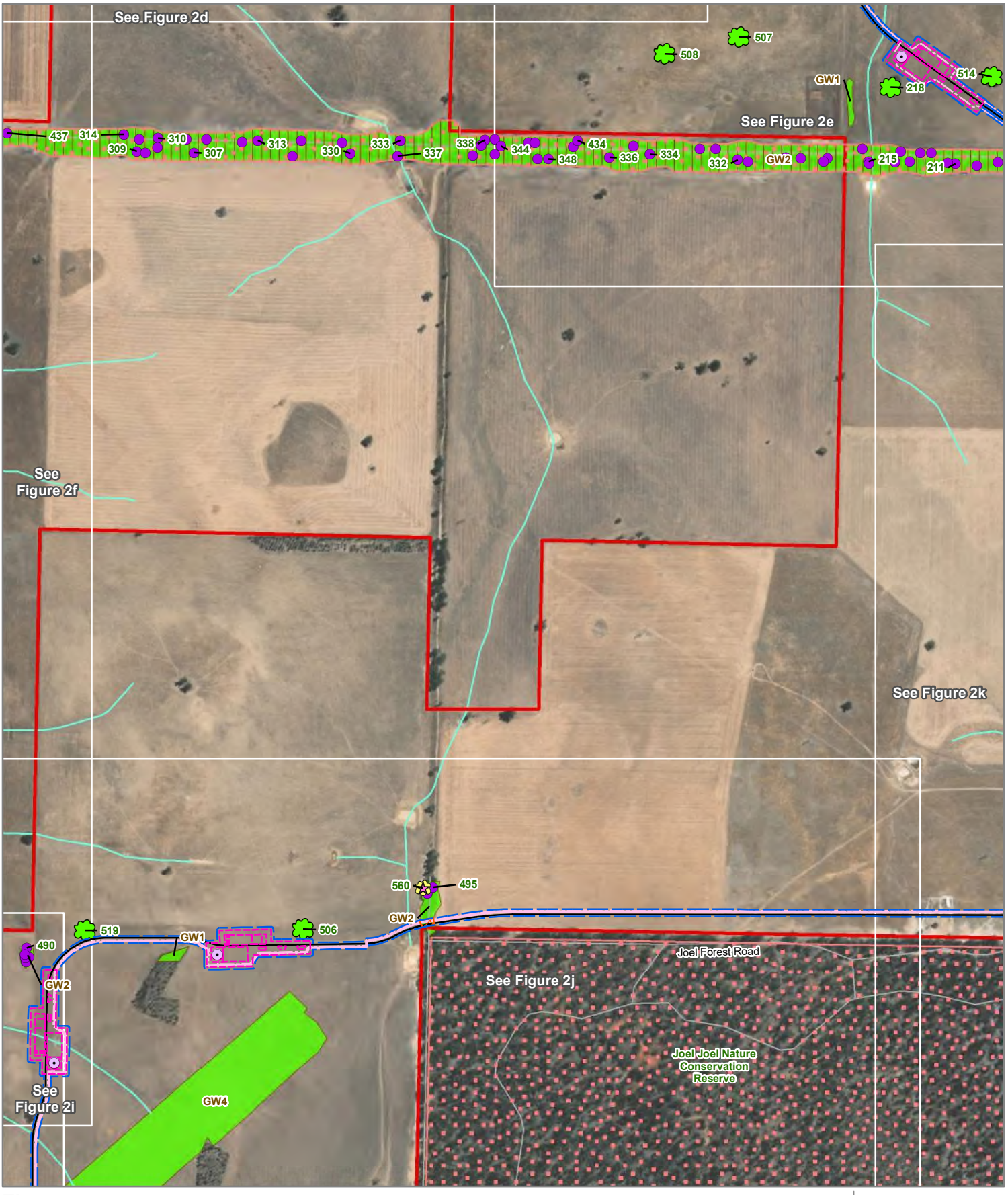


Figure 2g

Ecological features

Watta Wella Wind Farm, Solar Farm and Battery Facility

Legend

- Wind Farm Development Boundary
- Wind Farm Infrastructure Footprint
- WTG
- Tracks
- Infrastructure and hardstands
- Reticulation
- Large Scattered Tree
- Small Scattered Tree
- Large Tree in patch

Ecological Vegetation Class

- Grassy Woodland
- Impacted vegetation

Significant flora

- Buloke

EPBC Act Community

- Grey Box Grassy Woodland

FFG Act Community

- Victorian Temperate Woodland Bird Community

N

0 100 200

Metres

Map Scale: 1:10,500 @ A4
Coordinate System:
GDA 1994 MGA Zone 54

ecology & heritage partners

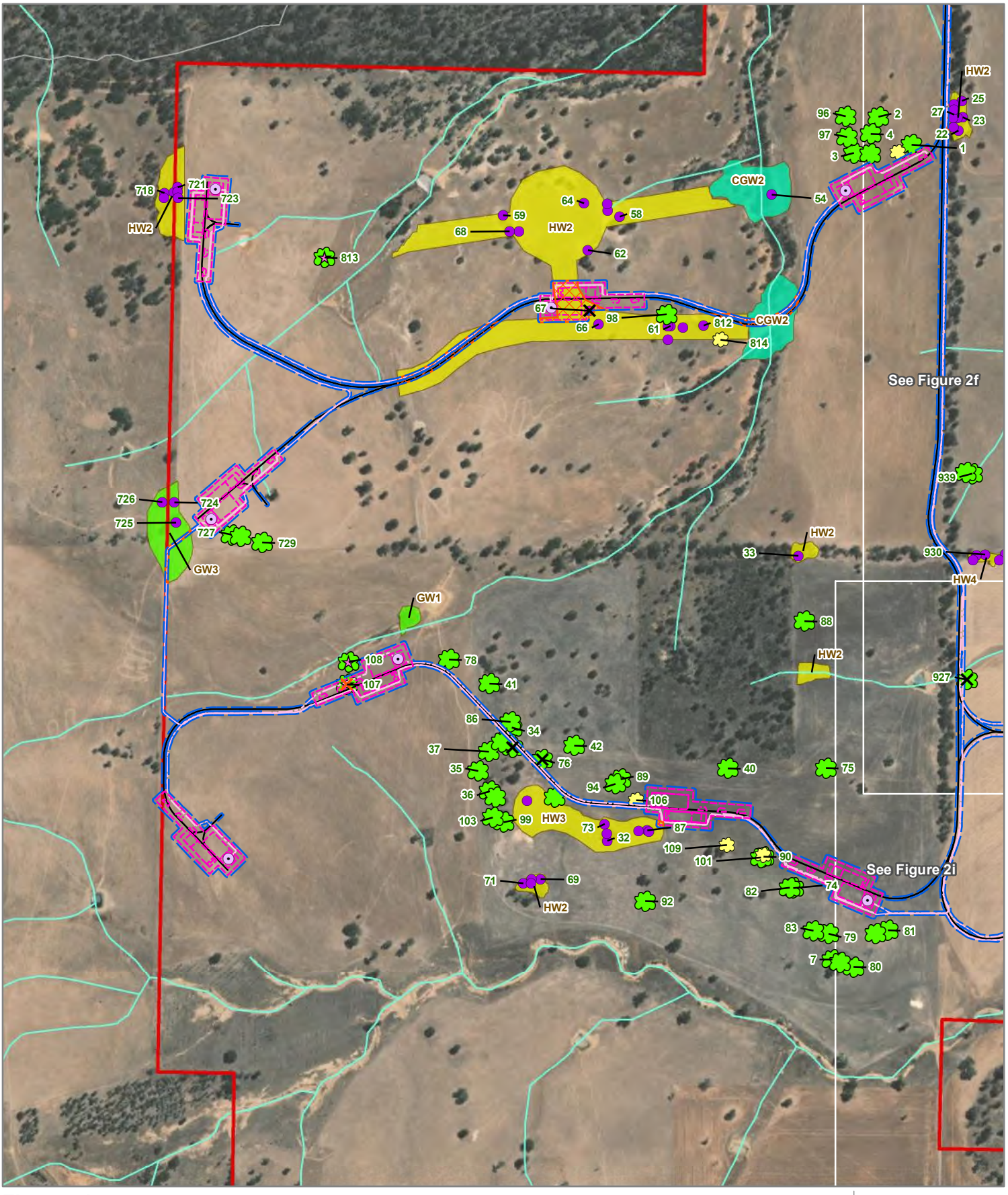


Figure 2h

Ecological features

Watta Wella Wind Farm, Solar Farm and Battery Facility

Legend

- Wind Farm Development Boundary
- Wind Farm Infrastructure Footprint
- WTG
- Tracks
- Infrastructure and hardstands
- Reticulation
- Large Scattered Tree
- Small Scattered Tree
- Large Tree in patch
- Tree - direct impact
- Tree - TPZ impact >10%

Ecological Vegetation Class

- Creekline Grassy Woodland
- Grassy Woodland
- Heathy Woodland
- Impacted vegetation

Significant flora

- Buloke

N

0 100 200

Metres

Map Scale: 1:10,500 @ A4
Coordinate System:
GDA 1994 MGA Zone 54

ecology & heritage partners

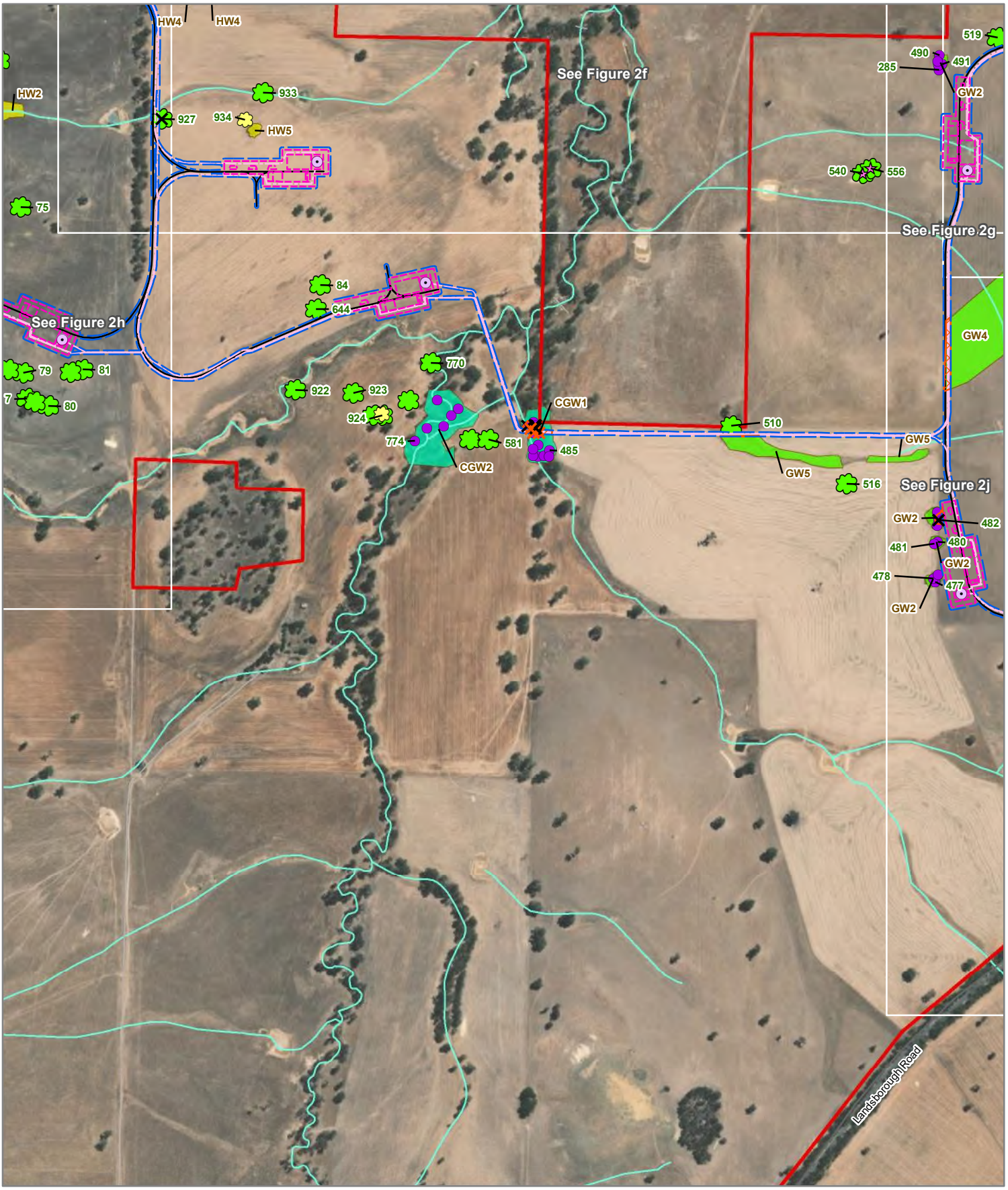


Figure 2i

Ecological features

Watta Wella Wind Farm, Solar Farm and Battery Facility

ecology & heritage partners

13637_Fig02_EcoFeat_PMB_G94 19/07/2022 psorensen

Legend

- Wind Farm Development Boundary
- Wind Farm Infrastructure Footprint
- WTG
- Tracks
- Infrastructure and hardstands
- Reticulation
- Large Scattered Tree
- Small Scattered Tree
- Large Tree in patch
- Tree - direct impact
- Tree - TPZ impact >10%

Ecological Vegetation Class

- Creekline Grassy Woodland
- Grassy Woodland
- Heathy Woodland
- Impacted vegetation

Significant flora

- Buloke

N

0 100 200

Metres

Map Scale: 1:10,500 @ A4
Coordinate System:
GDA 1994 MGA Zone 54

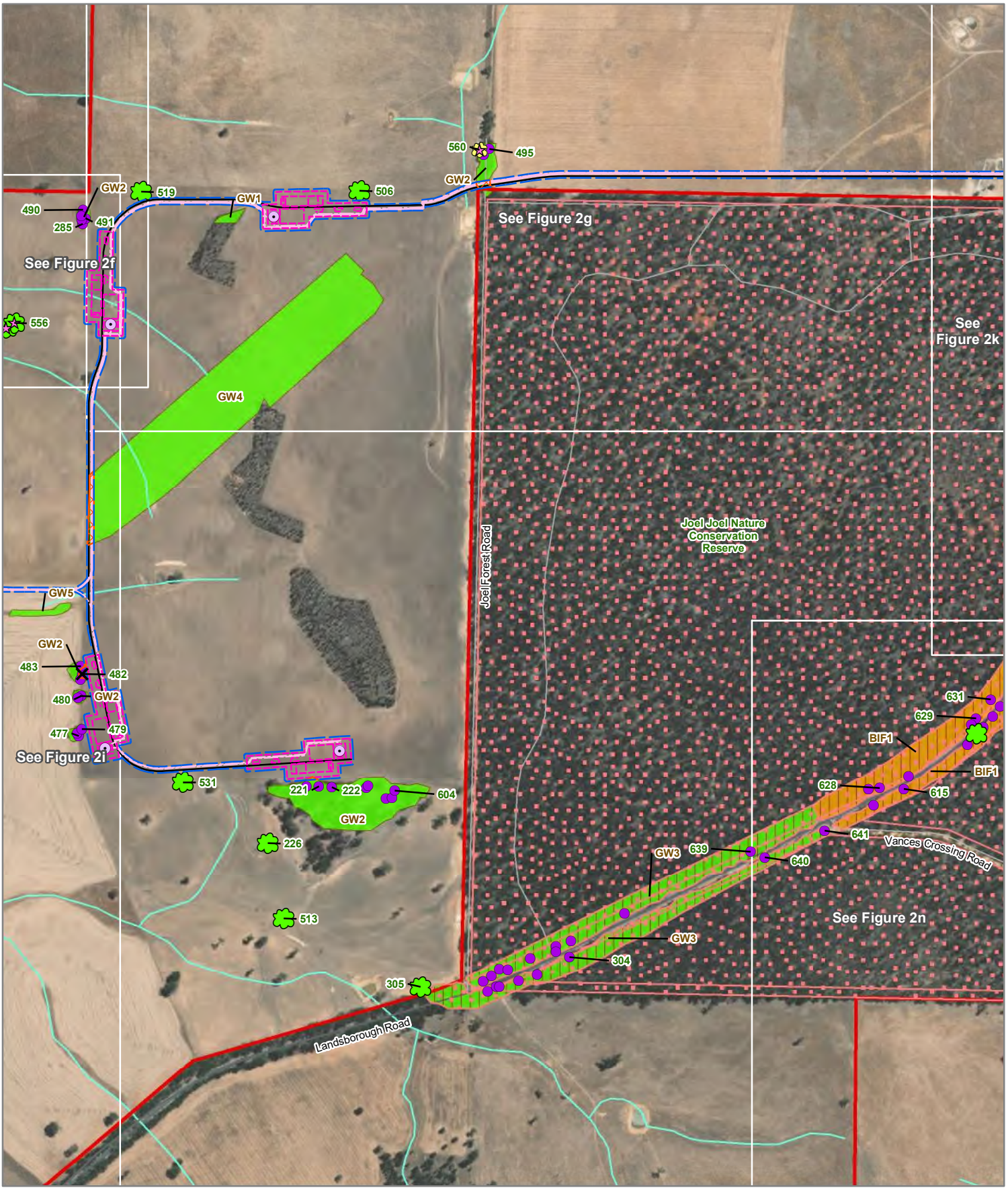


Figure 2j

Ecological features

Watta Wella Wind Farm, Solar Farm and Battery Facility

Legend

- Wind Farm Development Boundary
- Wind Farm Infrastructure Footprint
- WTG
- Tracks
- Infrastructure and hardstands
- Reticulation
- Large Scattered Tree
- Small Scattered Tree
- Large Tree in patch
- Tree - TPZ impact >10%

Ecological Vegetation Class

- Box Ironbark Forest
- Grassy Woodland
- Impacted vegetation

Significant flora

- Buloke

EPBC Act Community

- Grey Box Grassy Woodland

FFG Act Community

- Victorian Temperate Woodland Bird Community

N

0 100 200

Metres

Map Scale: 1:10,500 @ A4
Coordinate System:
GDA 1994 MGA Zone 54

ecology & heritage partners

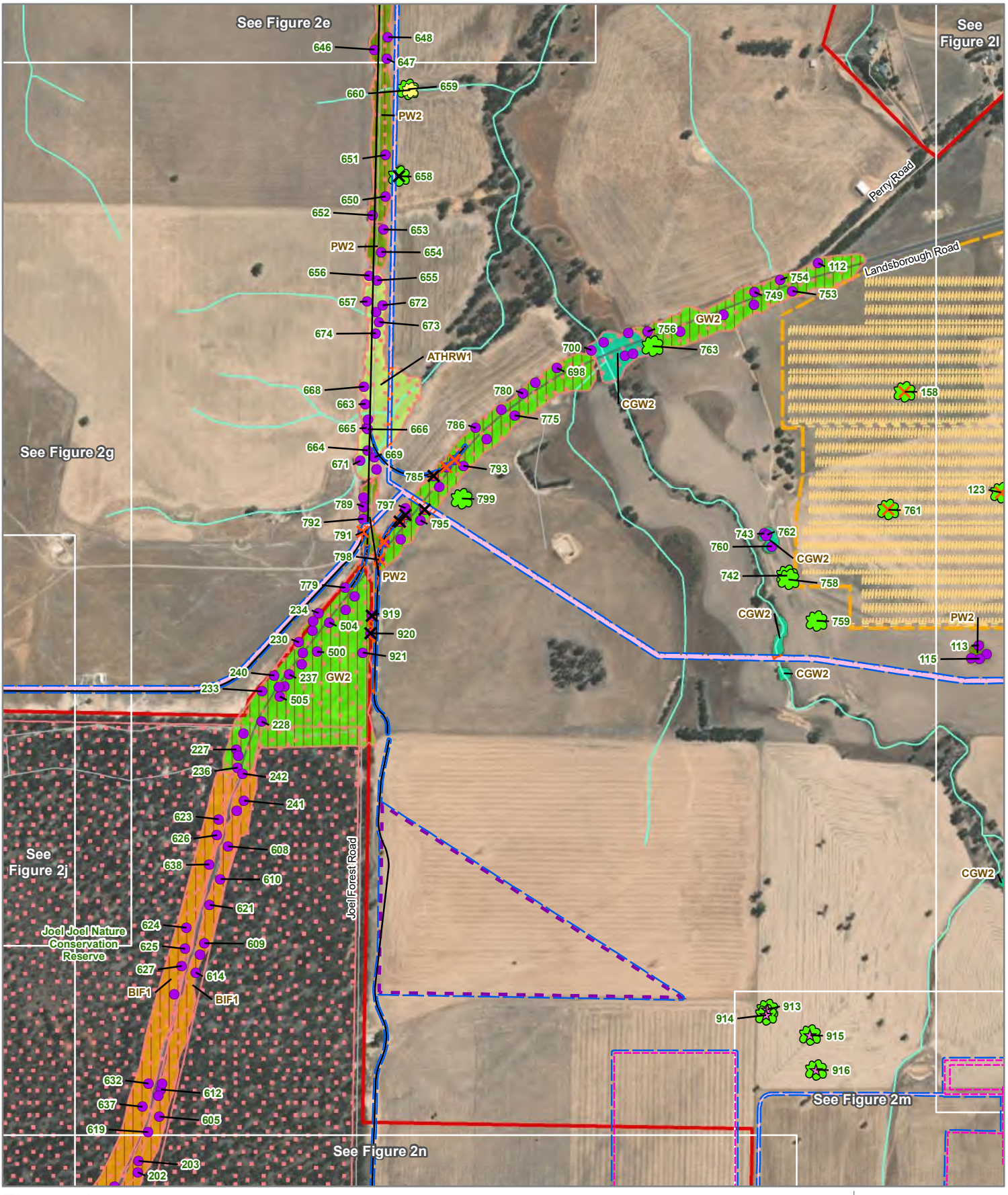


Figure 2k

Ecological features

Watta Wella Wind Farm, Solar Farm and Battery Facility

Legend

- Wind Farm Development Boundary
- Solar Farm boundary
- Solar farm impact footprint
- Wind Farm Infrastructure Footprint
- Tracks
- Infrastructure and hardstands
- Reticulation
- BESS Site Boundary
- Large Scattered Tree
- Small Scattered Tree
- Large Tree in patch
- Tree - direct impact
- Tree - TPZ impact >10%

Ecological Vegetation Class

- Alluvial Terraces Herb-rich Woodland
- Box Ironbark Forest
- Creekline Grassy Woodland
- Grassy Woodland
- Plains Woodland
- Impacted vegetation

N

0 100 200

Metres

Map Scale: 1:10,500 @ A4
Coordinate System:
GDA 1994 MGA Zone 54

ecology & heritage partners

13637_Fig02_EcoFeat_PMB_G94 19/07/2022 psorensen

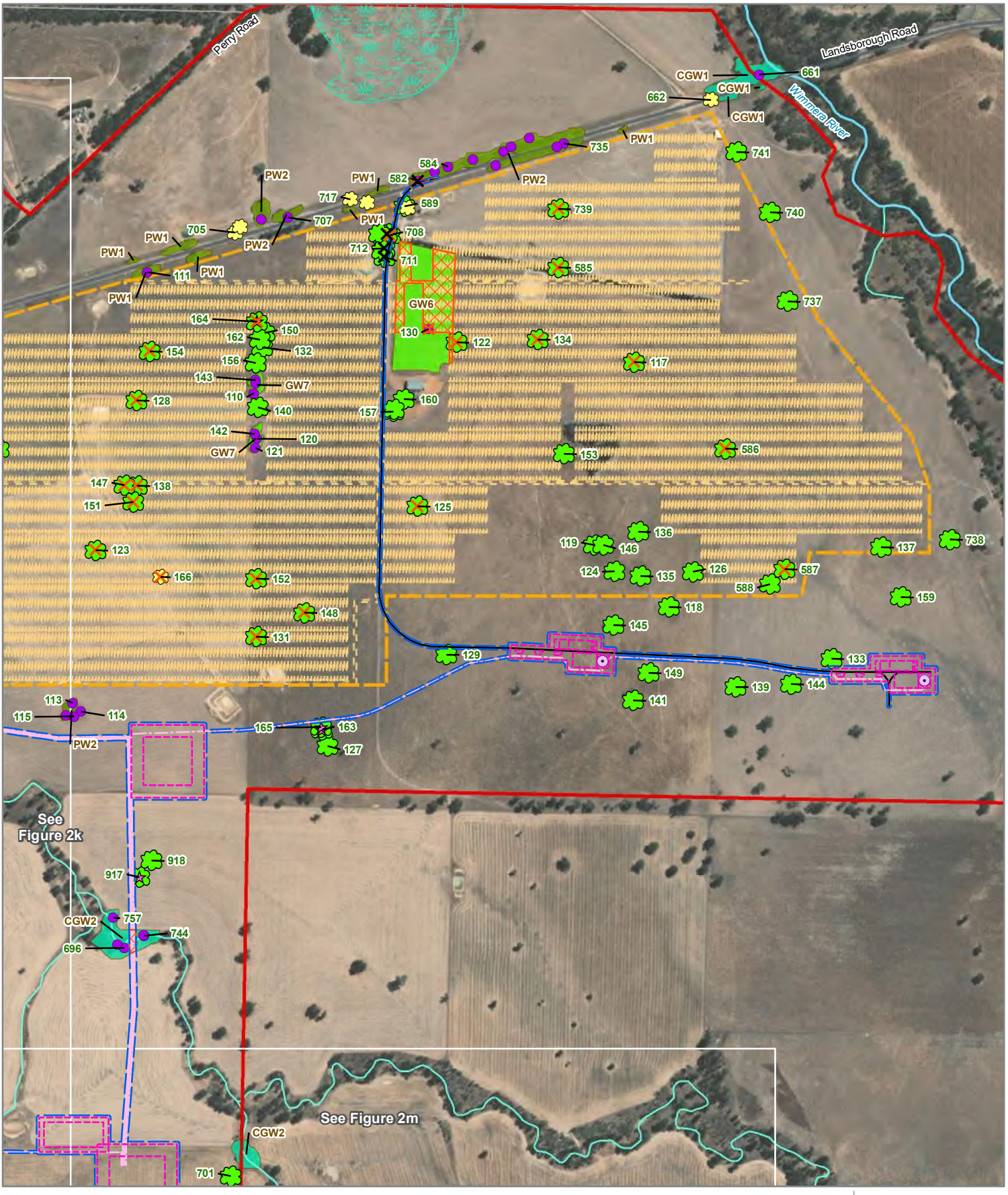


Figure 2l

Ecological features

Watta Wella Wind Farm, Solar Farm and Battery Facility

Legend

- Wind Farm Development Boundary
- Solar Farm boundary
- Solar farm impact footprint
- Wind Farm Infrastructure Footprint
- WTG
- Tracks
- Infrastructure and hardstands
- Reticulation
- Current Wetlands
- Large Scattered Tree
- Small Scattered Tree
- Large Tree in patch
- Tree - direct impact
- Tree - TPZ impact >10%

Ecological Vegetation Class

- Creekline Grassy Woodland
- Grassy Woodland
- Plains Woodland
- Impacted vegetation

Significant flora

- Buloke

N

0 100 200

Metres

Map Scale: 1:10,500 @ A4
Coordinate System:
GDA 1994 MGA Zone 54

ecology & heritage partners

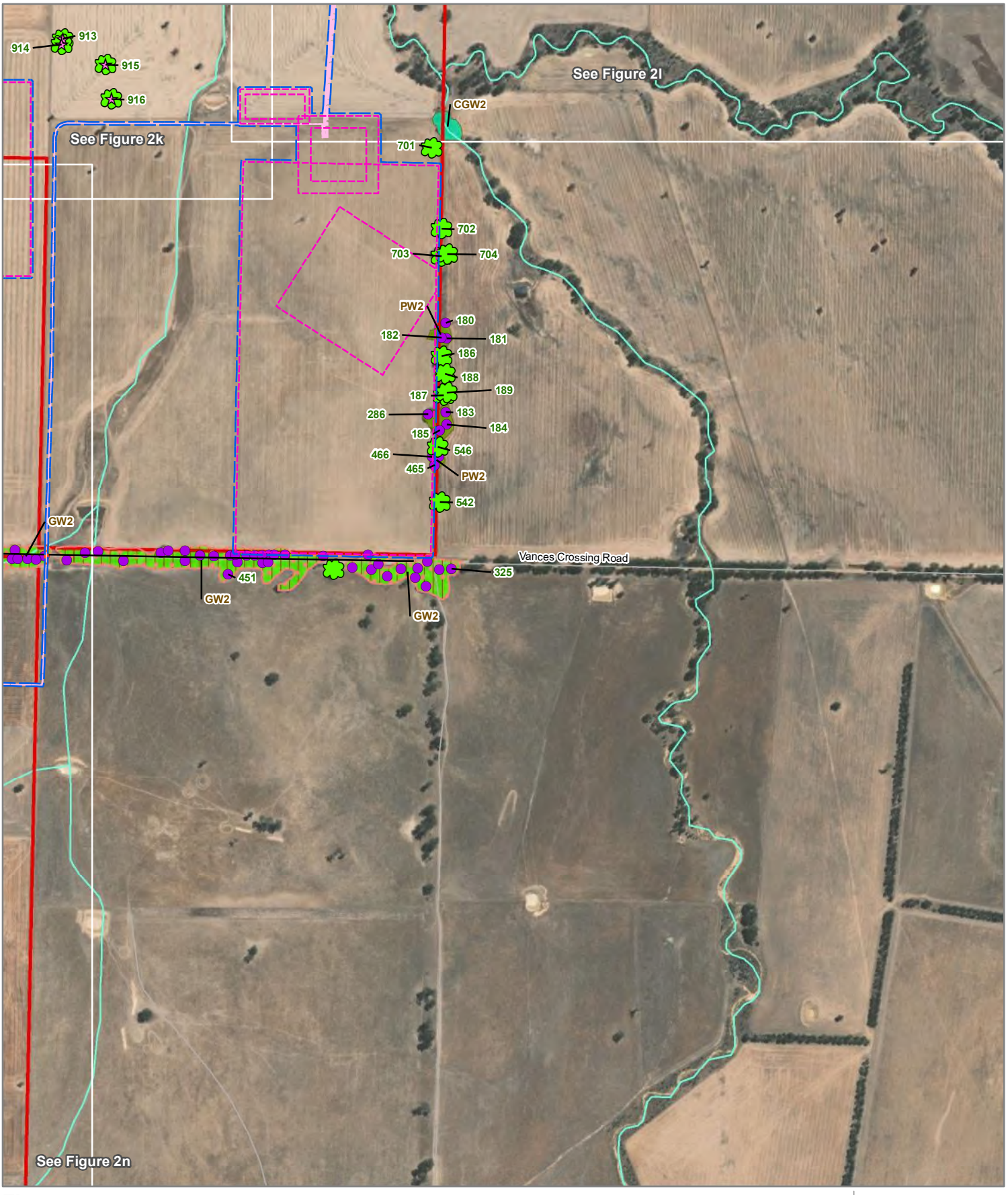


Figure 2m

Ecological features

Watta Wella Wind Farm, Solar Farm and Battery Facility

Legend

- Wind Farm Development Boundary
- Wind Farm Infrastructure Footprint
- Tracks
- Infrastructure and hardstands
- Reticulation
- Large Scattered Tree
- Large Tree in patch

Ecological Vegetation Class

- Creekline Grassy Woodland
- Grassy Woodland
- Plains Woodland
- Impacted vegetation

Significant flora

- Buloke

EPBC Act Community

- Grey Box Grassy Woodland

FFG Act Community

- Victorian Temperate Woodland Bird Community

N

0 100 200

Metres

Map Scale: 1:10,500 @ A4
Coordinate System:
GDA 1994 MGA Zone 54

ecology & heritage partners

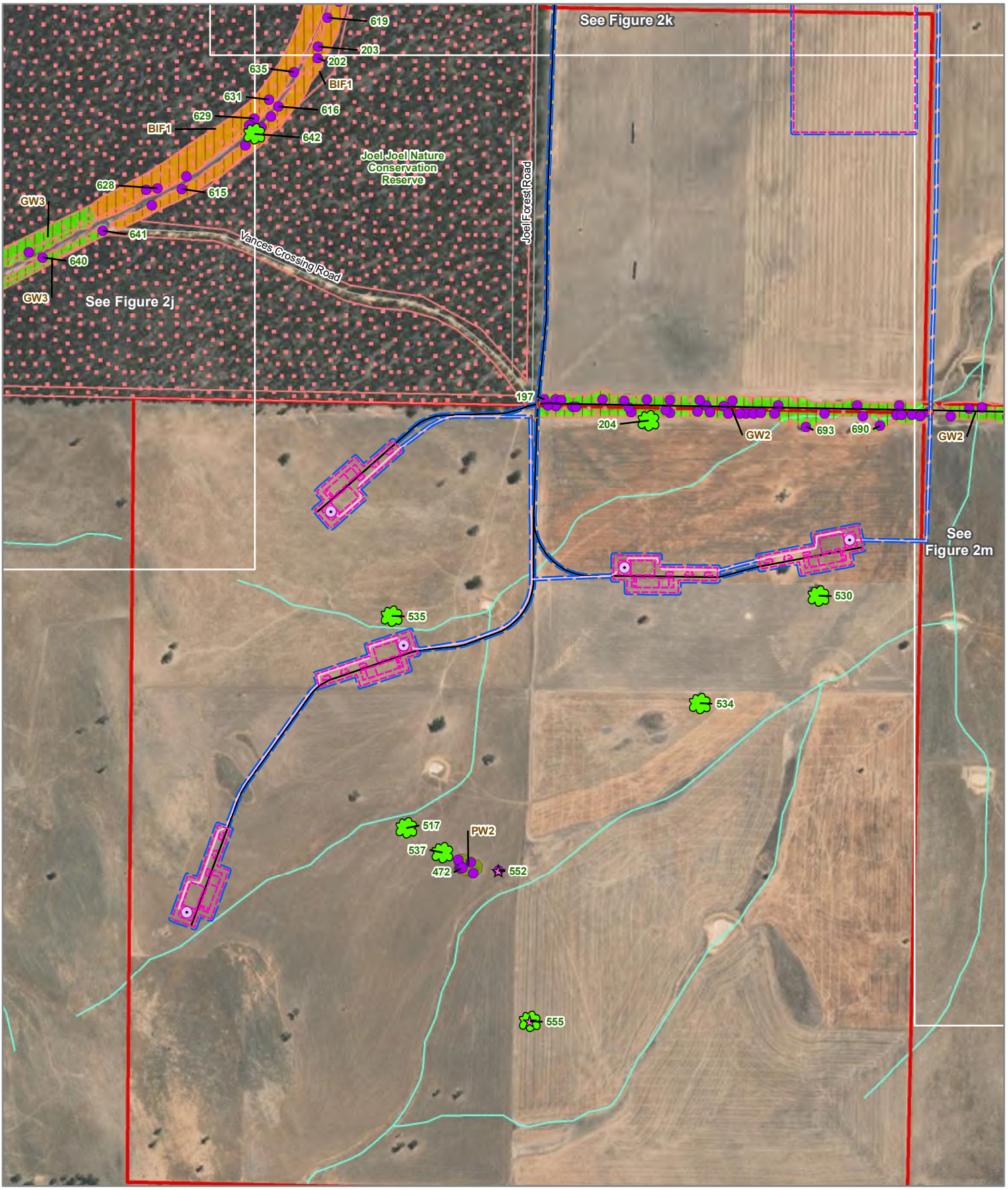


Figure 2n

Ecological features

Watta Wella Wind Farm, Solar Farm and Battery Facility

Legend

- Wind Farm Development Boundary
- Wind Farm Infrastructure Footprint
- WTG
- Tracks
- Infrastructure and hardstands
- Reticulation
- Large Scattered Tree
- Large Tree in patch

Ecological Vegetation Class

- Box Ironbark Forest
- Grassy Woodland
- Plains Woodland
- Impacted vegetation

Significant flora

- Buloke

EPBC Act Community

- Grey Box Grassy Woodland

FFG Act Community

- Victorian Temperate Woodland Bird Community

N

0 100 200

Metres

Map Scale: 1:10,500 @ A4
Coordinate System:
GDA 1994 MGA Zone 54

ecology & heritage partners

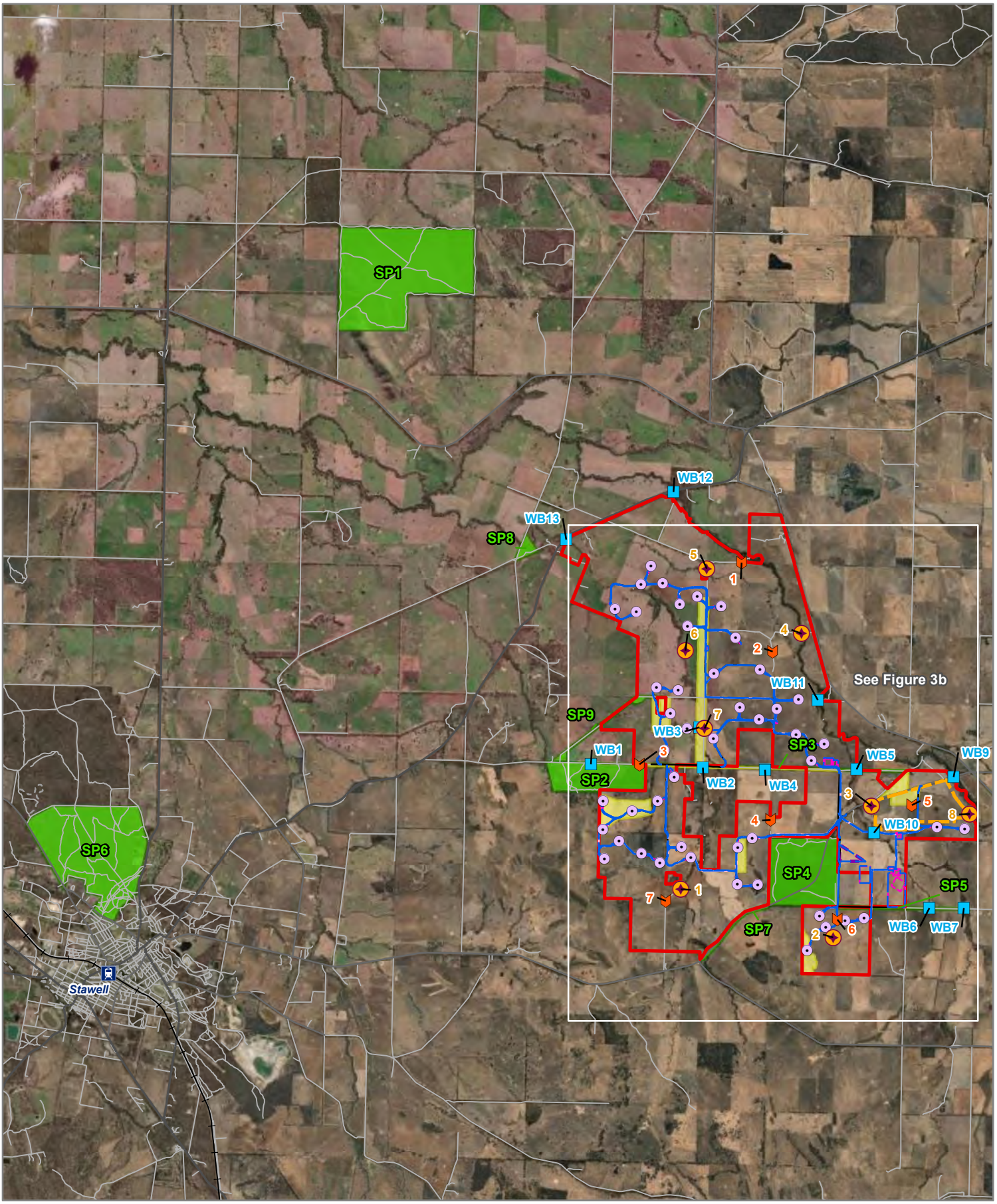


Figure 3a

Fauna survey effort

Watta Wella Wind Farm, Solar Farm and Battery Facility

Legend

- Wind Farm Development Boundary
- Solar Farm boundary
- Wind Farm Infrastructure Footprint
- WTG
- Infrastructure and hardstands
- Reticulation
- Tracks
- BESS Site Boundary
- Golden Sun Moth survey area
- Swift Parrot habitat survey area
- Waterbody survey location
- Bat survey location
- Bird utilisation survey location

N

0 900 1,800

Metres

Map Scale: 1:120,000 @ A4
Coordinate System:
GDA2020 MGA Zone 54

13637_Fig03_FaunaSurvey_PMB_G20 15/06/2022 psorensen

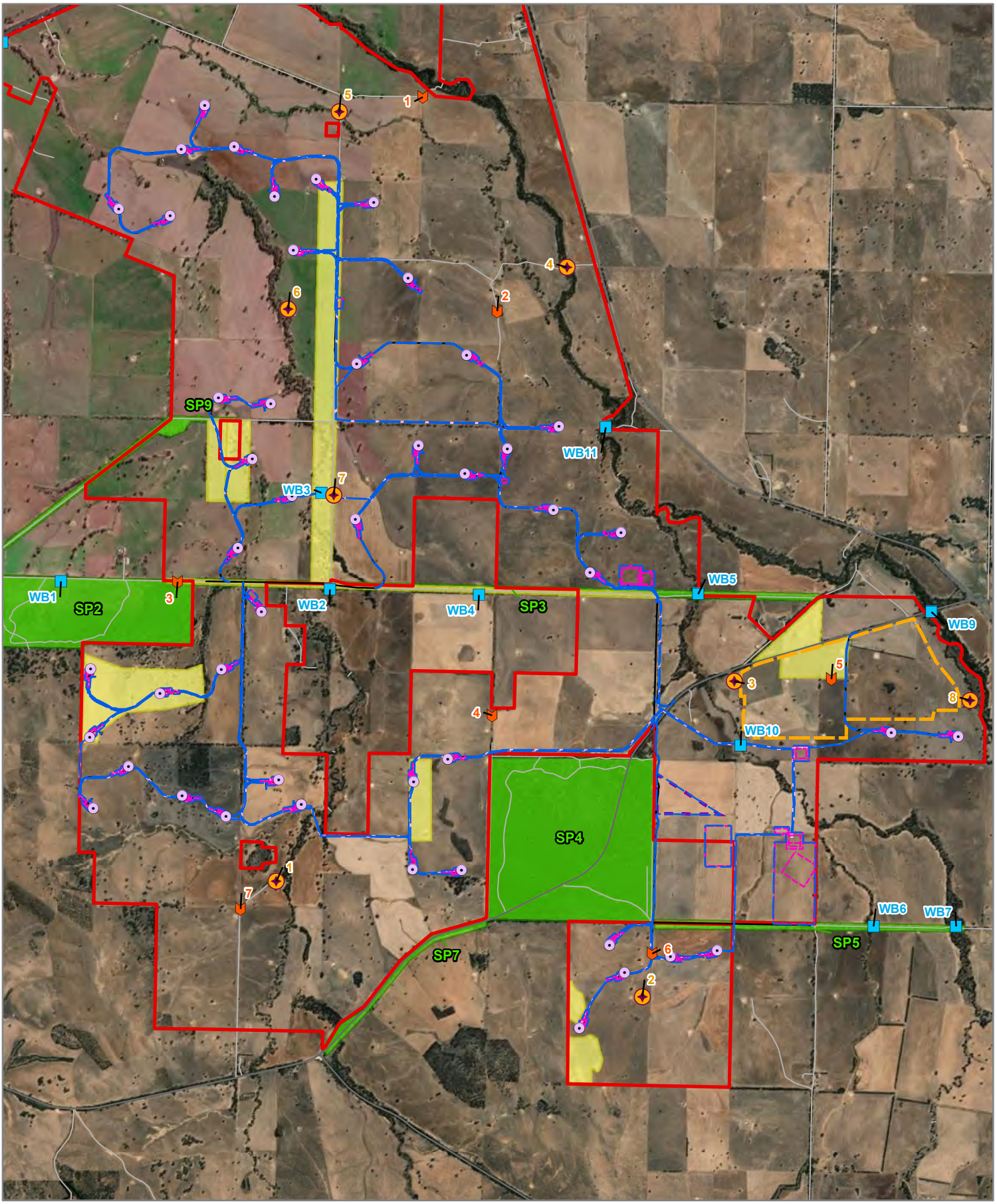


Figure 3b

Fauna survey effort

Watta Wella Wind Farm, Solar Farm and Battery Facility

Legend

- Wind Farm Development Boundary
- Solar Farm boundary
- Wind Farm Infrastructure Footprint
- WTG
- Infrastructure and hardstands
- Reticulation
- Tracks
- BESS Site Boundary
- Golden Sun Moth survey area
- Swift Parrot habitat survey area
- Waterbody survey location
- Bat survey location
- Bird utilisation survey location

Map Scale: 1:50,000 @ A4
Coordinate System: GDA2020 MGA Zone 54

13637_Fig03_FaunaSurvey_PMB_G20 15/06/2022 psorensen

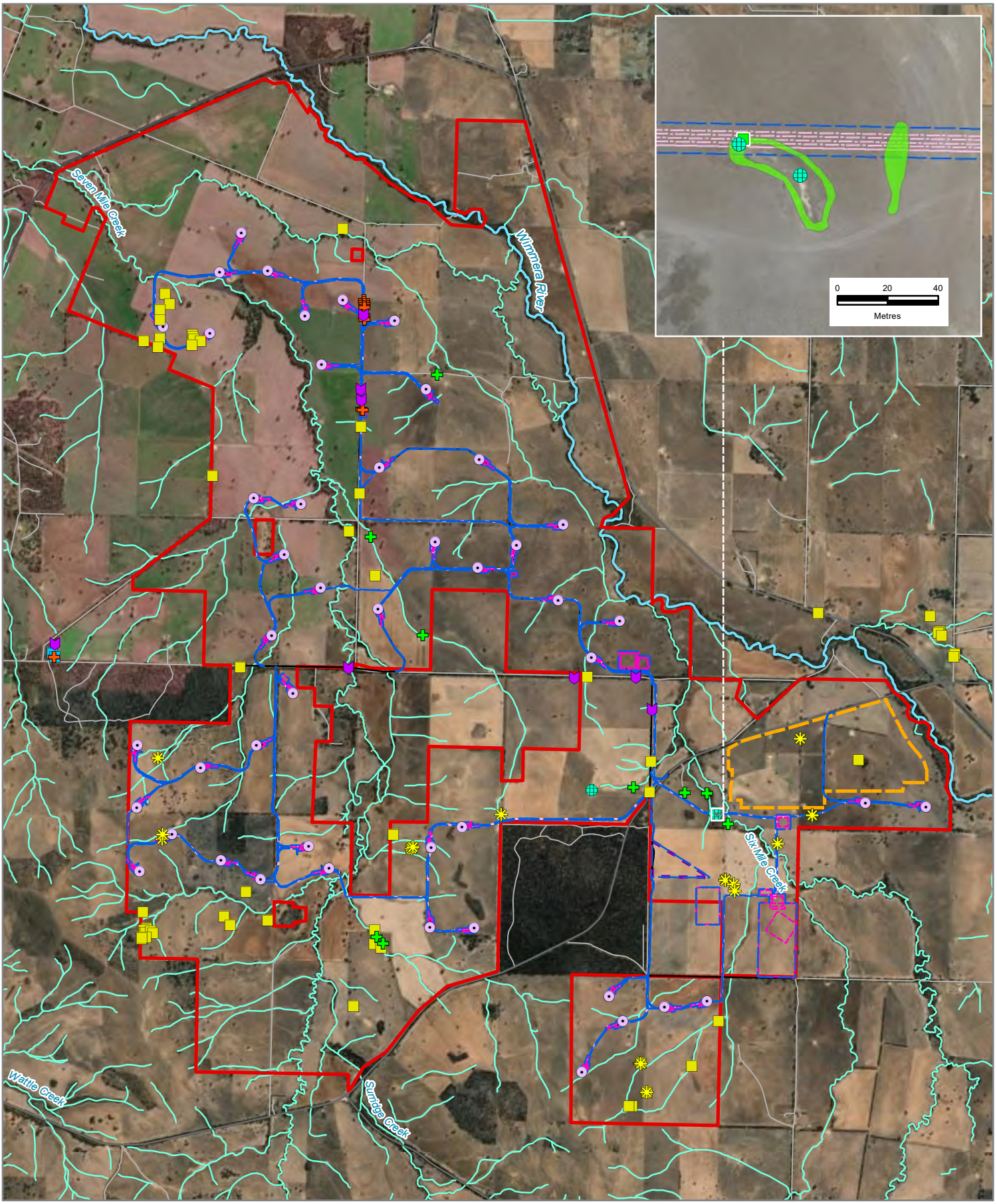


Figure 4
Surveyed Significant Flora
Watta Wella Wind Farm, Solar Farm and Battery Facility

ecology & heritage partners

Legend

- Wind Farm Development Boundary
- Solar Farm boundary
- Wind Farm Infrastructure Footprint
- WTG
- Infrastructure and hardstands
- Reticulation
- Tracks

Significant Flora (EHP 2021)

- Hairy Tails
- Buloke
- Areas of River Swamp Wallaby-grass habitat

Significant Flora (Emerge Associates 2019-2020)

- Grassland Bindweed
- River Swamp Wallaby-grass
- Buloke
- Tawny Spider-orchid
- River Swamp Wallaby (confirmed)

N

0 500 1,000
Metres

Map Scale: 1:55,000 @ A4
Coordinate System:
GDA2020 MGA Zone 54

13637_Fig04_SigFlora_Surveyed_P_G20 10/06/2022 Melsley

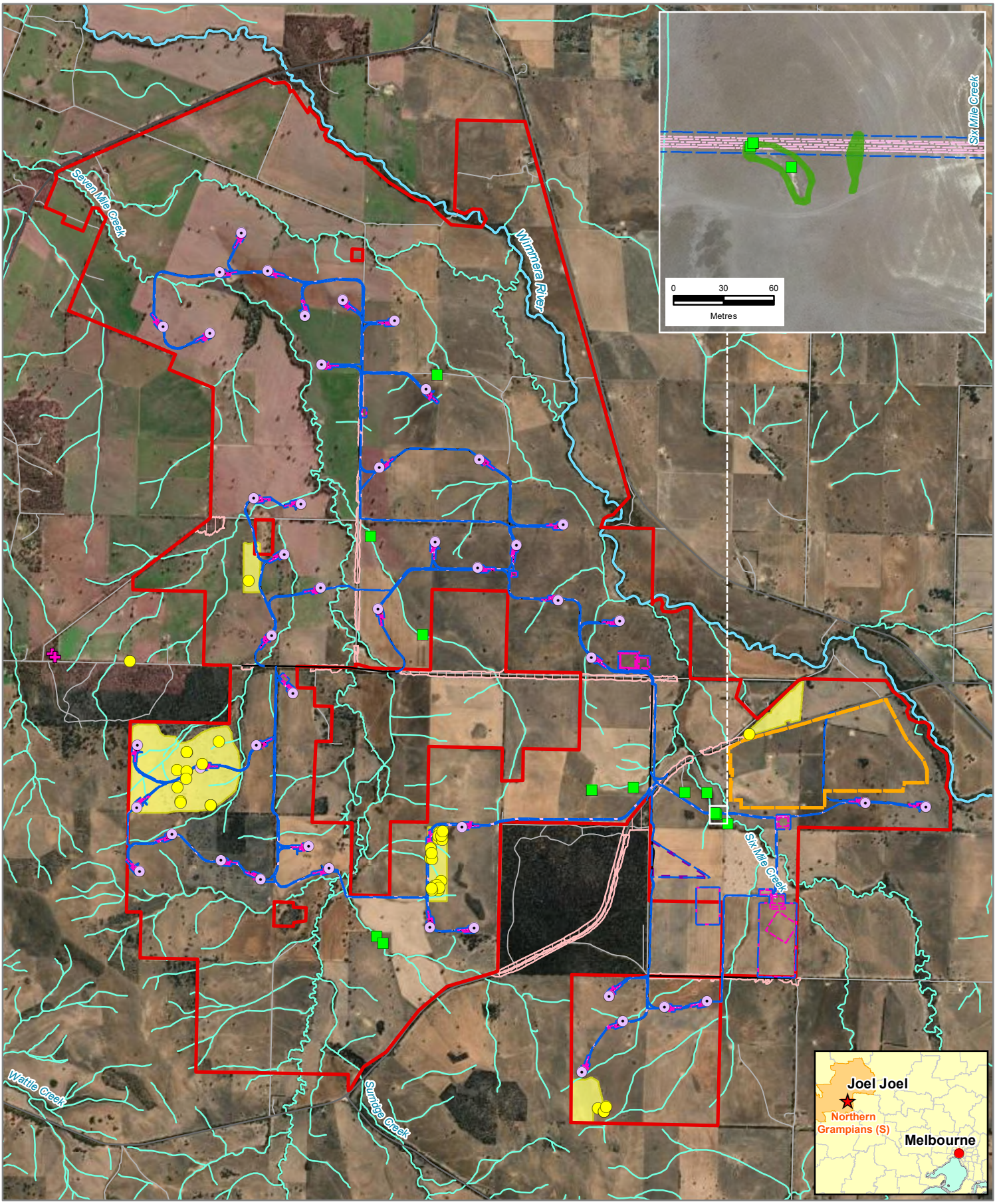


Figure 5

Matters of National Environmental Significance

Watta Wella Wind Farm, Solar Farm and Battery Facility

ecology & heritage partners

Legend

- Wind Farm Development Boundary
- Solar Farm boundary
- Wind Farm Infrastructure Footprint
- WTG
- Tracks
- Infrastructure and hardstands
- Reticulation
- BESS Site Boundary
- Areas of River Swamp Wallaby-grass habitat
- River Swamp Wallaby-grass (Emerge Associates 2019, 2020)
- Tawny Spider-orchid (Ecology and Heritage Partners 2021, VBA)
- Golden Sun Moth (Ecology and Heritage Partners 2021)
- Confirmed Golden Sun Moth habitat

EPBC Act Community

- Grey Box Grassy Woodland

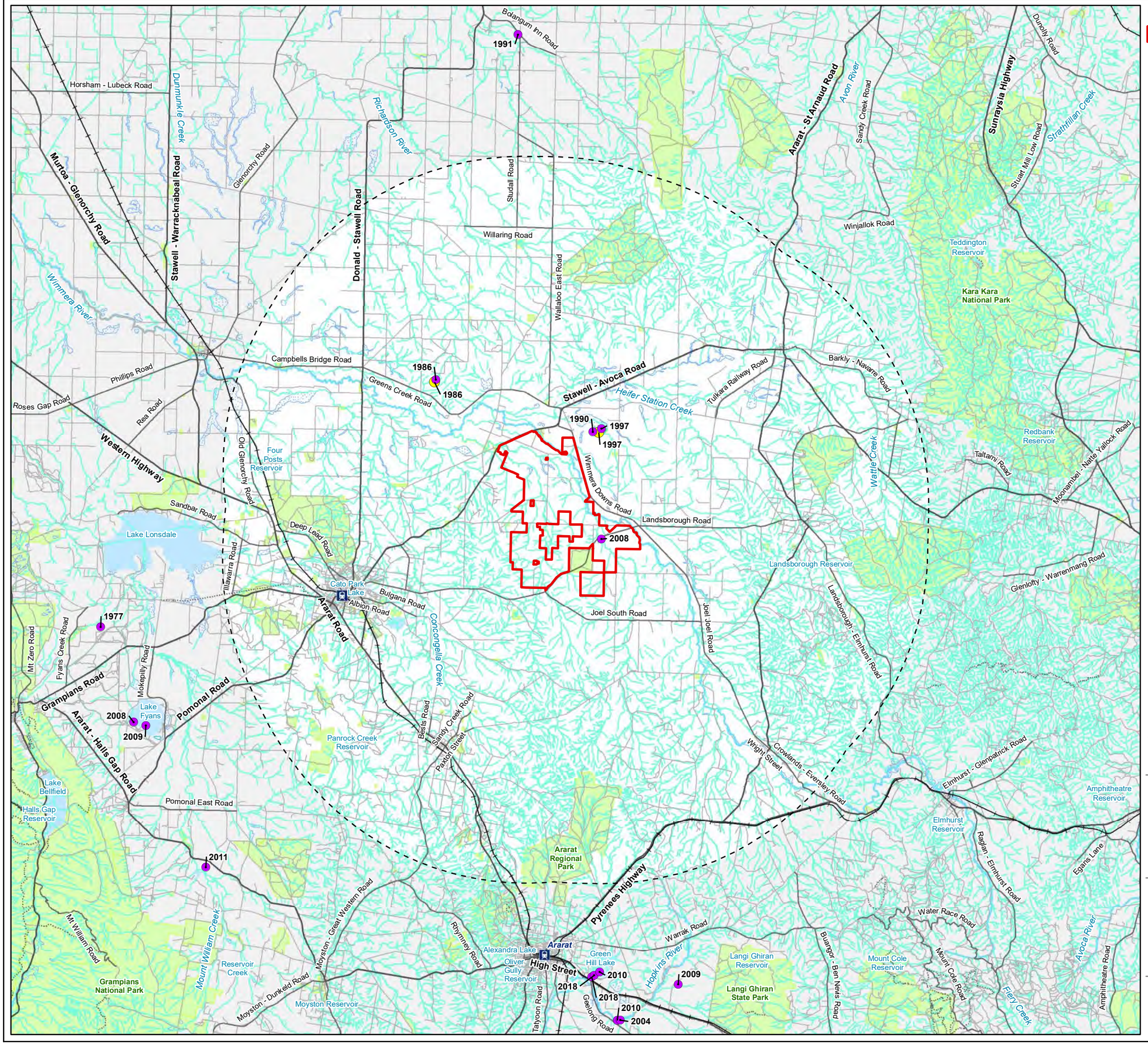
N

0 500 1,000

Metres

Map Scale: 1:55,000 @ A4
Coordinate System: GDA2020 MGA Zone 54

13637_Fig05_MNES_P_G20 30/06/2022 dvaladares



Legend

- Wind Farm Development Boundary
- Brolga (VBA 2021)
- Sheldon Database Flocking Records

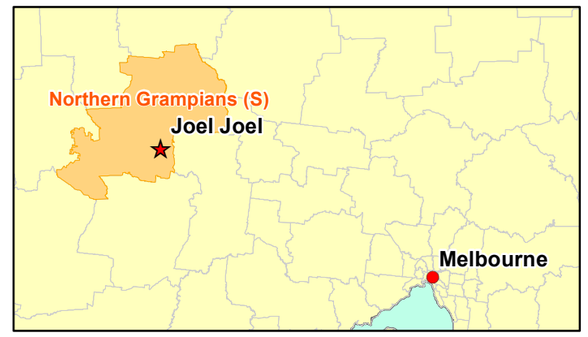


Figure 6

Previously documented Brolga records within 20km of the study area

Watta Wella Wind Farm, Solar Farm and Battery Facility

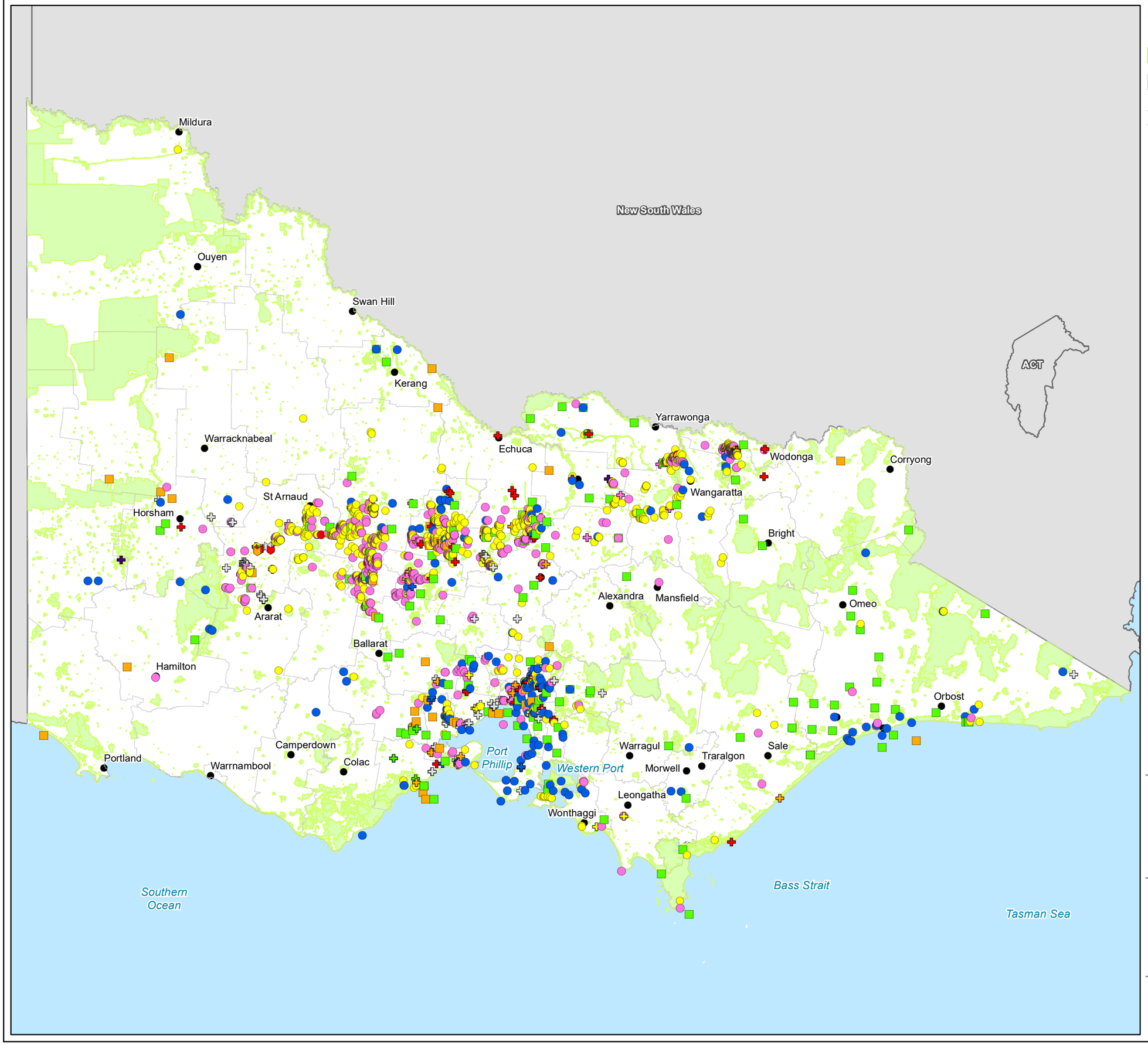
N

0 5 10

Kilometres

Map Scale: 1:250,000 @ A3
Coordinate System: GDA2020 MGA Zone 54

ecology & heritage partners



Legend

- Towns
- Parks and Reserves
- Local Government Areas

Swift Parrot records (VBA 2021)

- 2019
- 2018
- 2017
- 2016
- 2015
- 2014
- 2012
- 2011
- 2010
- 2000s
- 1990s
- 1980s
- 1970s
- < 1970s

Swift Parrot records (Birdlife 2021)

- 2019
- 2003
- 2001
- 2013
- 1997

Figure 7a

Previously documented Swift Parrot records in Victoria

Watta Wella Wind Farm, Solar Farm and Battery Facility

N

0 50 100

Kilometres

Map Scale: 1:2,600,000 @ A3

ecology & heritage partners

Legend

Wind Farm Development Boundary

Swift Parrot records (VBA 2021)

- 2019
- 2018
- 2010
- 2000s
- 1990s
- 1980s
- 1970s
- < 1970s

Swift Parrot records (Birdlife 2021)

- 2019
- 2013
- 2003
- 2001
- 1997

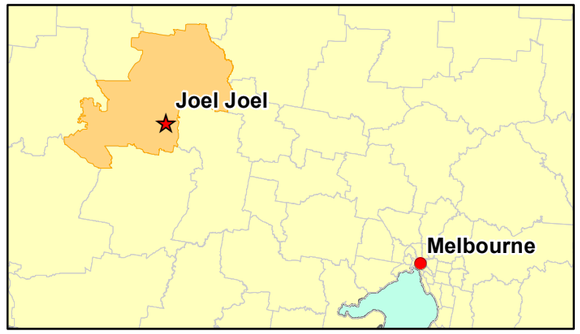


Figure 7a

Previously documented Swift Parrot records within 50km of the study area

Watta Wella Wind Farm, Solar Farm and Battery Facility

0 10 20

Kilometres

Map Scale: 1:400,000 @ A3
Coordinate System: GDA2020 MGA Zone 54

ecology & heritage partners

Legend

Wind Farm Development Boundary

Significant flora

- Blue Mallee
- Broom Bitter-pea
- Buloke
- Clover Glycine
- Common Beard-heath
- Crowded Greenhood
- Flax-lily
- Fringed Sun-orchid
- Golden Cowslips
- Goldfields Grevillea
- Grampians Goodenia
- Hairy Tails
- Pale-flower Crane's-bill
- Rising Star Guinea-flower
- Small Milkwort
- Square Raspwort
- Swamp Diuris
- Tiny Bog-sedge
- Veined Spider-orchid

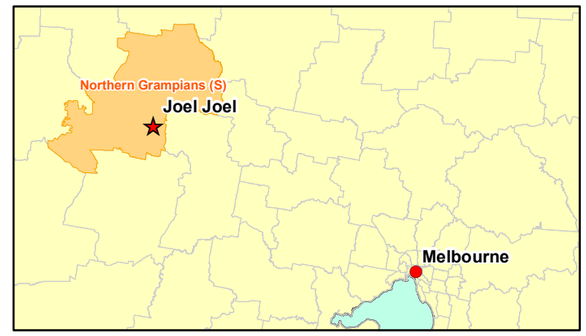


Figure 8

Previously documented significant flora within 10km of the study area

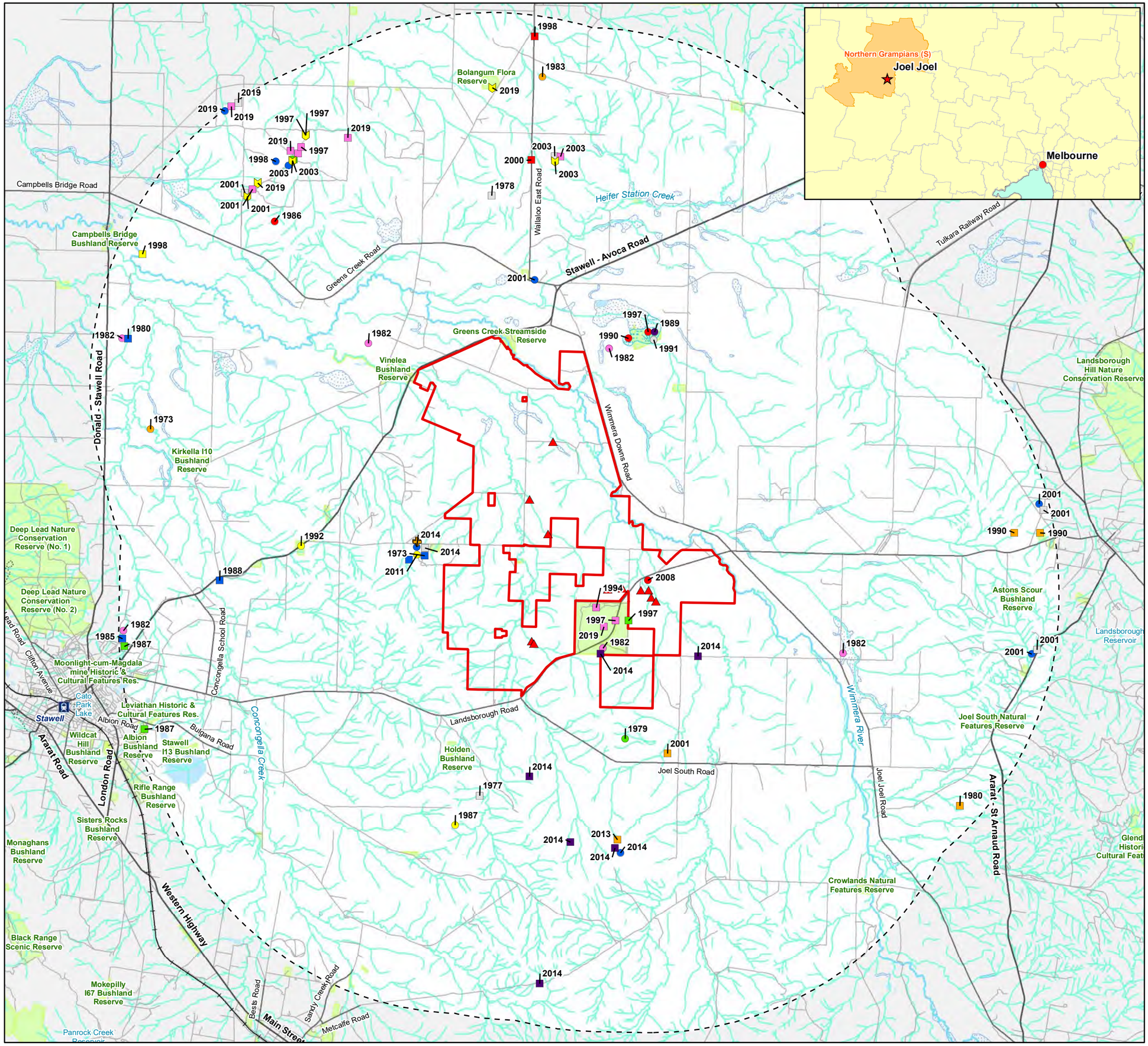
Watta Wella Wind Farm, Solar Farm and Battery Facility

0 3 6

Kilometres

Map Scale: 1:112,000 @ A3
Coordinate System: GDA2020 MGA Zone 54

ecology & heritage partners



Legend

Wind Farm Development Boundary

Significant fauna (VBA 2021)

- Australasian Shoveler
- Brolga
- Brown Toadlet
- Bush Stone-curlew
- Common Dunnart
- Diamond Firetail
- Growling Grass Frog
- Hardhead
- Hooded Robin
- Lace Monitor
- Little Eagle
- Platypus
- Powerful Owl
- Squirrel Glider
- Swift Parrot
- White-throated Needletail

Other significant fauna records

- Swift Parrot (Birdlife 2021)
- River Swamp Wallaby-grass (Emerge Associates 2019, 2020)
- Tawny Spider-orchid (Ecology and Heritage Partners 2021, VBA)

Figure 9

Previously documented significant fauna within 10km of the study area

Watta Wella Wind Farm, Solar Farm and Battery Facility

0 3 6

Kilometres

Map Scale: 1:112,000 @ A3
Coordinate System: GDA2020 MGA Zone 54

ecology & heritage partners

APPENDIX 1 - FLORA

Appendix 1.1 Flora Results

Legend:

EN/VU Listed as Critically Endangered/Endangered/Vulnerable under the EPBC Act;

P Protected under the FFG Act ;

ce/en/vu/r Listed as critically endangered/endangered/vulnerable/ in Victoria under FFG Act (DELWP 2022e);

***** Listed as a noxious weed under the CaLP Act;

^ Recorded outside the Assessment Area (i.e. reference site).

Table A1.1. Flora within the Project Site.

Scientific Name	Common Name	Comments
NATIVE SPECIES		
Acacia acinacea s.l.	Gold-dust Wattle	P
Acacia genistifolia	Spreading Wattle	P
Acacia pycnantha	Golden Wattle	P
Acaena echinata	Sheep's Burr	
Allocasuarina luehmannii	Buloke	ce
Amphibromus fluitans	River Swamp Wallaby-grass	VU
Amphibromus spp.	Swamp Wallaby-grass	
Anthosachne scabra	Common Wheat-grass	
Astroloma humifusum	Cranberry Heath	
Austrostipa scabra	Rough Spear-grass	
Austrostipa spp.	Spear Grass	
Burchardia umbellata	Milkmaids	P; ^
Caladenia fulva	Tawny Spider-orchid	EN; en; ^
Calochilus robertsonii s.l.	Purple Beard-orchid	P
Calytrix tetragona	Common Fringe-myrtle	^
Crassula sieberiana s.l.	Sieber Crassula	
Dianella admixta	Black-anther Flax-lily	
Drosera peltata s.l.	Pale Sundew	
Eucalyptus albens	White Box	
Eucalyptus camaldulensis	River Red-gum	
Eucalyptus goniocalyx s.l.	Bundy	
Eucalyptus leucoxylon subsp. *pruinosa*	Waxy Yellow-gum	
Eucalyptus melliodora	Yellow Box	
Eucalyptus microcarpa	Grey Box	

Scientific Name	Common Name	Comments
Eucalyptus polyanthemos	Red Box	
Eucalyptus tricarpa	Red Ironbark	
Eucalyptus tricarpa	Red Ironbark	
Eutaxia microphylla	Common Eutaxia	^
Glossodia major	Wax-lip Orchid	P
Gonocarpus tetragynus	Common Raspwort	
Goodenia geniculata	Bent Goodenia	^
Hibbertia exutiacies	Spiky Guinea-flower	^
Kennedia prostrata	Running Postman	^
Leptorhynchos squamatus	Scaly Buttons	P; ^
Lomandra filiformis	Wattle Mat-rush	
Lomandra nana	Dwarf Mat-rush	
Microtis spp.	Onion Orchid	P
Millotia tenuifolia var. *tenuifolia*	Soft Millotia	P; ^
Pimelea humilis	Common Rice-flower	^
Ptilotus erubescens	Hairy Tails	ce
Rytidosperma caespitosum	Common Wallaby-grass	
Rytidosperma geniculatum	Kneed Wallaby-grass	
Rytidosperma spp.	Wallaby Grass	
Thysanotus patersonii	Twining Fringe-lily	P
Vittadinia cuneata	Fuzzy New Holland Daisy	P
Xerochrysum viscosum	Shiny Everlasting	P
NON-NATIVE SPECIES		
Aira caryophyllea subsp. *caryophyllea*	Silvery Hair-grass	
Alopecurus pratensis	Meadow Fox-tail	
Arctotheca calendula	Capeweed	
Avena fatua	Wild Oat	
Briza maxima	Large Quaking-grass	
Briza minor	Lesser Quaking-grass	
Bromus catharticus	Prairie Grass	
Bromus diandrus	Great Brome	
Cynodon dactylon var. *dactylon*	Couch	
Ehrharta calycina	Perennial Veldt-grass	
Ehrharta longiflora	Annual Veldt-grass	
Erodium botrys	Big Heron's-bill	
Fumaria bastardii	Bastard's Fumitory	

Scientific Name	Common Name	Comments
Galenia pubescens var. *pubescens*	Galenia	
Holcus lanatus	Yorkshire Fog	
Hordeum (monospecific)	Barley	
Hypochaeris glabra	Smooth Cat's-ear	
Hypochaeris radicata	Flatweed	
Lepidium africanum	Common Peppercress	
Lolium spp.	Rye Grass	
Medicago spp.	Medic	
Phalaris aquatica	Toowoomba Canary-grass	
Plantago lanceolata	Ribwort	
Romulea rosea	Onion Grass	
Sonchus oleraceus	Common Sow-thistle	
Trifolium angustifolium var. *angustifolium*	Narrow-leaf Clover	

Appendix 1.2 Scattered Trees and Large Trees in Patches

Table A1.2. Scattered Trees and Large Trees in Patches.

Tree ID	Common Name	Species Name	DBH	Size Class	Type
1	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	80	Large	Large Scattered Tree
2	Bundy	*Eucalyptus goniocalyx*	66	Large	Large Scattered Tree
3	Bundy	*Eucalyptus goniocalyx*	64	Large	Large Scattered Tree
4	Bundy	*Eucalyptus goniocalyx*	62	Large	Large Scattered Tree
5	Yellow Box	*Eucalyptus melliodora*	45	Small	Small Scattered Tree
6	Bundy	*Eucalyptus goniocalyx*	70	Large	Large Tree in patch
7	Bundy	*Eucalyptus goniocalyx*	65	Large	Large Scattered Tree
8	Bundy	*Eucalyptus goniocalyx*	67	Large	Large Tree in patch
9	Bundy	*Eucalyptus goniocalyx*	112	Large	Large Tree in patch
10	Bundy	*Eucalyptus goniocalyx*	84	Large	Large Tree in patch
11	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	81	Large	Large Tree in patch
12	Bundy	*Eucalyptus goniocalyx*	80	Large	Large Tree in patch
13	Bundy	*Eucalyptus goniocalyx*	69	Large	Large Tree in patch
14	Bundy	*Eucalyptus goniocalyx*	65	Large	Large Tree in patch
15	Bundy	*Eucalyptus goniocalyx*	64	Large	Large Tree in patch
16	Bundy	*Eucalyptus goniocalyx*	63	Large	Large Tree in patch
17	Bundy	*Eucalyptus goniocalyx*	62	Large	Large Tree in patch
18	Bundy	*Eucalyptus goniocalyx*	125	Large	Large Tree in patch
19	Bundy	*Eucalyptus goniocalyx*	71	Large	Large Tree in patch
20	Stag		68	Large	Large Tree in patch
21	Grey Box	*Eucalyptus microcarpa*	68	Large	Large Tree in patch
22	Yellow Box	*Eucalyptus melliodora*	85	Large	Large Tree in patch
23	Bundy	*Eucalyptus goniocalyx*	84	Large	Large Tree in patch
24	Yellow Box	*Eucalyptus melliodora*	84	Large	Large Tree in patch
25	Bundy	*Eucalyptus goniocalyx*	81	Large	Large Tree in patch
26	Bundy	*Eucalyptus goniocalyx*	75	Large	Large Tree in patch
27	Bundy	*Eucalyptus goniocalyx*	73	Large	Large Tree in patch
28	Yellow Box	*Eucalyptus melliodora*	68	Large	Large Tree in patch
29	Bundy	*Eucalyptus goniocalyx*	67	Large	Large Tree in patch
30	Bundy	*Eucalyptus goniocalyx*	64	Large	Large Tree in patch
31	Bundy	*Eucalyptus goniocalyx*	130	Large	Large Tree in patch
32	Bundy	*Eucalyptus goniocalyx*	74	Large	Large Tree in patch
33	Grey Box	*Eucalyptus microcarpa*	87	Large	Large Tree in patch

Tree ID	Common Name	Species Name	DBH	Size Class	Type
34	Bundy	*Eucalyptus goniocalyx*	89	Large	Large Scattered Tree
35	Grey Box	*Eucalyptus microcarpa*	85	Large	Large Scattered Tree
36	Grey Box	*Eucalyptus microcarpa*	75	Large	Large Scattered Tree
37	Grey Box	*Eucalyptus microcarpa*	75	Large	Large Scattered Tree
38	Bundy	*Eucalyptus goniocalyx*	72	Large	Large Scattered Tree
39	Bundy	*Eucalyptus goniocalyx*	71	Large	Large Scattered Tree
40	Bundy	*Eucalyptus goniocalyx*	71	Large	Large Scattered Tree
41	Bundy	*Eucalyptus goniocalyx*	69	Large	Large Scattered Tree
42	Bundy	*Eucalyptus goniocalyx*	69	Large	Large Scattered Tree
43	Bundy	*Eucalyptus goniocalyx*	61	Large	Large Scattered Tree
44	Yellow Box	*Eucalyptus melliodora*	80	Large	Large Tree in patch
45	Bundy	*Eucalyptus goniocalyx*	78	Large	Large Tree in patch
46	Bundy	*Eucalyptus goniocalyx*	69	Large	Large Tree in patch
47	Grey Box	*Eucalyptus microcarpa*	68	Large	Large Tree in patch
48	Bundy	*Eucalyptus goniocalyx*	110	Large	Large Tree in patch
49	Bundy	*Eucalyptus goniocalyx*	79	Large	Large Tree in patch
50	Bundy	*Eucalyptus goniocalyx*	63	Large	Large Tree in patch
51	Bundy	*Eucalyptus goniocalyx*	80	Large	Large Tree in patch
52	Bundy	*Eucalyptus goniocalyx*	89	Large	Large Tree in patch
53	Bundy	*Eucalyptus goniocalyx*	64	Large	Large Tree in patch
54	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	83	Large	Large Tree in patch
55	Bundy	*Eucalyptus goniocalyx*	78	Large	Large Tree in patch
56	Red Box	*Eucalyptus polyanthemos*	71	Large	Large Tree in patch
57	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	68	Large	Large Tree in patch
58	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	68	Large	Large Tree in patch
59	Bundy	*Eucalyptus goniocalyx*	68	Large	Large Tree in patch
60	Bundy	*Eucalyptus goniocalyx*	65	Large	Large Tree in patch
61	Yellow Box	*Eucalyptus melliodora*	65	Large	Large Tree in patch
62	Red Box	*Eucalyptus polyanthemos*	64	Large	Large Tree in patch
63	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	62	Large	Large Tree in patch
64	Red Box	*Eucalyptus polyanthemos*	62	Large	Large Tree in patch
65	Bundy	*Eucalyptus goniocalyx*	60	Large	Large Tree in patch
66	Bundy	*Eucalyptus goniocalyx*	60	Large	Large Tree in patch
67	Bundy	*Eucalyptus goniocalyx*	60	Large	Large Tree in patch
68	Bundy	*Eucalyptus goniocalyx*	60	Large	Large Tree in patch
69	Bundy	*Eucalyptus goniocalyx*	92	Large	Large Tree in patch

Tree ID	Common Name	Species Name	DBH	Size Class	Type
70	Bundy	*Eucalyptus goniocalyx*	82	Large	Large Tree in patch
71	Bundy	*Eucalyptus goniocalyx*	75	Large	Large Tree in patch
72	Bundy	*Eucalyptus goniocalyx*	72	Large	Large Tree in patch
73	Bundy	*Eucalyptus goniocalyx*	156	Large	Large Tree in patch
74	Bundy	*Eucalyptus goniocalyx*	143	Large	Large Scattered Tree
75	Grey Box	*Eucalyptus microcarpa*	135	Large	Large Scattered Tree
76	Bundy	*Eucalyptus goniocalyx*	132	Large	Large Scattered Tree
77	Bundy	*Eucalyptus goniocalyx*	130	Large	Large Tree in patch
78	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	123	Large	Large Scattered Tree
79	Stag		122	Large	Large Scattered Tree
80	Bundy	*Eucalyptus goniocalyx*	112	Large	Large Scattered Tree
81	Bundy	*Eucalyptus goniocalyx*	112	Large	Large Scattered Tree
82	Bundy	*Eucalyptus goniocalyx*	109	Large	Large Scattered Tree
83	Bundy	*Eucalyptus goniocalyx*	105	Large	Large Scattered Tree
84	Bundy	*Eucalyptus goniocalyx*	104	Large	Large Scattered Tree
85	Bundy	*Eucalyptus goniocalyx*	102	Large	Large Scattered Tree
86	Bundy	*Eucalyptus goniocalyx*	102	Large	Large Scattered Tree
87	Bundy	*Eucalyptus goniocalyx*	90	Large	Large Tree in patch
88	Red Box	*Eucalyptus polyanthemos*	87	Large	Large Scattered Tree
89	Bundy	*Eucalyptus goniocalyx*	80	Large	Large Scattered Tree
90	Bundy	*Eucalyptus goniocalyx*	80	Large	Large Scattered Tree
91	Stag		78	Large	Large Scattered Tree
92	Bundy	*Eucalyptus goniocalyx*	78	Large	Large Scattered Tree
93	Bundy	*Eucalyptus goniocalyx*	76	Large	Large Tree in patch
94	Bundy	*Eucalyptus goniocalyx*	75	Large	Large Scattered Tree
95	Grey Box	*Eucalyptus microcarpa*	74	Large	Large Tree in patch
96	Bundy	*Eucalyptus goniocalyx*	70	Large	Large Scattered Tree
97	Bundy	*Eucalyptus goniocalyx*	68	Large	Large Scattered Tree
98	Bundy	*Eucalyptus goniocalyx*	68	Large	Large Scattered Tree
99	Bundy	*Eucalyptus goniocalyx*	65	Large	Large Scattered Tree
100	Bundy	*Eucalyptus goniocalyx*	65	Large	Large Scattered Tree
101	Bundy	*Eucalyptus goniocalyx*	65	Large	Large Scattered Tree
102	Bundy	*Eucalyptus goniocalyx*	62	Large	Large Scattered Tree
103	Bundy	*Eucalyptus goniocalyx*	60	Large	Large Scattered Tree
104	Bundy	*Eucalyptus goniocalyx*	60	Large	Large Scattered Tree
105	Stag		55	Small	Small Scattered Tree

Tree ID	Common Name	Species Name	DBH	Size Class	Type
106	Stag		50	Small	Small Scattered Tree
107	Buloke	*Allocassuarina luehmannii*	46	Large	Large Scattered Tree
108	Buloke	*Allocassuarina luehmannii*	45	Large	Large Scattered Tree
109	Stag		45	Small	Small Scattered Tree
110	Grey Box	*Eucalyptus microcarpa*	107	Large	Large Tree in patch
111	River Red-gum	*Eucalyptus camaldulensis*	84	Large	Large Tree in patch
112	Grey Box	*Eucalyptus microcarpa*	99	Large	Large Tree in patch
113	Grey Box	*Eucalyptus microcarpa*	124	Large	Large Tree in patch
114	Grey Box	*Eucalyptus microcarpa*	101	Large	Large Tree in patch
115	Grey Box	*Eucalyptus microcarpa*	95	Large	Large Tree in patch
116	Grey Box	*Eucalyptus microcarpa*	80	Large	Large Tree in patch
117	River Red-gum	*Eucalyptus camaldulensis*	202	Large	Large Scattered Tree
118	Grey Box	*Eucalyptus microcarpa*	185	Large	Large Scattered Tree
119	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	170	Large	Large Scattered Tree
120	Grey Box	*Eucalyptus microcarpa*	162	Large	Large Tree in patch
121	Grey Box	*Eucalyptus microcarpa*	154	Large	Large Tree in patch
122	Grey Box	*Eucalyptus microcarpa*	150	Large	Large Scattered Tree
123	Grey Box	*Eucalyptus microcarpa*	150	Large	Large Scattered Tree
124	Grey Box	*Eucalyptus microcarpa*	145	Large	Large Scattered Tree
125	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	130	Large	Large Scattered Tree
126	Grey Box	*Eucalyptus microcarpa*	130	Large	Large Scattered Tree
127	Grey Box	*Eucalyptus microcarpa*	125	Large	Large Scattered Tree
128	Grey Box	*Eucalyptus microcarpa*	122	Large	Large Scattered Tree
129	Grey Box	*Eucalyptus microcarpa*	120	Large	Large Scattered Tree
130	Grey Box	*Eucalyptus microcarpa*	120	Large	Large Tree in patch
131	Grey Box	*Eucalyptus microcarpa*	118	Large	Large Scattered Tree
132	Grey Box	*Eucalyptus microcarpa*	118	Large	Large Scattered Tree
133	Grey Box	*Eucalyptus microcarpa*	115	Large	Large Scattered Tree
134	Grey Box	*Eucalyptus microcarpa*	115	Large	Large Scattered Tree
135	Grey Box	*Eucalyptus microcarpa*	115	Large	Large Scattered Tree
136	Grey Box	*Eucalyptus microcarpa*	115	Large	Large Scattered Tree
137	Grey Box	*Eucalyptus microcarpa*	113	Large	Large Scattered Tree
138	Grey Box	*Eucalyptus microcarpa*	113	Large	Large Scattered Tree
139	Grey Box	*Eucalyptus microcarpa*	112	Large	Large Scattered Tree
140	Grey Box	*Eucalyptus microcarpa*	106	Large	Large Scattered Tree
141	Grey Box	*Eucalyptus microcarpa*	105	Large	Large Scattered Tree

Tree ID	Common Name	Species Name	DBH	Size Class	Type
142	Grey Box	*Eucalyptus microcarpa*	105	Large	Large Tree in patch
143	Grey Box	*Eucalyptus microcarpa*	105	Large	Large Tree in patch
144	Grey Box	*Eucalyptus microcarpa*	102	Large	Large Scattered Tree
145	Yellow Box	*Eucalyptus melliodora*	101	Large	Large Scattered Tree
146	Grey Box	*Eucalyptus microcarpa*	100	Large	Large Scattered Tree
147	Grey Box	*Eucalyptus microcarpa*	100	Large	Large Scattered Tree
148	Grey Box	*Eucalyptus microcarpa*	98	Large	Large Scattered Tree
149	Grey Box	*Eucalyptus microcarpa*	95	Large	Large Scattered Tree
150	Grey Box	*Eucalyptus microcarpa*	95	Large	Large Scattered Tree
151	Grey Box	*Eucalyptus microcarpa*	92	Large	Large Scattered Tree
152	Grey Box	*Eucalyptus microcarpa*	91	Large	Large Scattered Tree
153	Grey Box	*Eucalyptus microcarpa*	89	Large	Large Scattered Tree
154	Grey Box	*Eucalyptus microcarpa*	89	Large	Large Scattered Tree
155	Grey Box	*Eucalyptus microcarpa*	89	Large	Large Tree in patch
156	Grey Box	*Eucalyptus microcarpa*	89	Large	Large Scattered Tree
157	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	82	Large	Large Scattered Tree
158	Grey Box	*Eucalyptus microcarpa*	76	Large	Large Scattered Tree
159	Grey Box	*Eucalyptus microcarpa*	75	Large	Large Scattered Tree
160	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	72	Large	Large Scattered Tree
161	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	71	Large	Large Scattered Tree
162	Stag		71	Large	Large Scattered Tree
163	Buloke	*Allocassuarina luehmannii*	65	Large	Large Scattered Tree
164	Buloke	*Allocassuarina luehmannii*	57	Large	Large Scattered Tree
165	Buloke	*Allocassuarina luehmannii*	54	Large	Large Scattered Tree
166	River Red-gum	*Eucalyptus camaldulensis*	50	Small	Small Scattered Tree
167	Yellow Box	*Eucalyptus melliodora*	271	Large	Large Scattered Tree
168	River Red-gum	*Eucalyptus camaldulensis*	102	Large	Large Scattered Tree
169	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	145	Large	Large Scattered Tree
170	River Red-gum	*Eucalyptus camaldulensis*	145	Large	Large Scattered Tree
171	Bundy	*Eucalyptus goniocalyx*	122	Large	Large Scattered Tree
172	River Red-gum	*Eucalyptus camaldulensis*	120	Large	Large Scattered Tree
173	Yellow Box	*Eucalyptus melliodora*	112	Large	Large Scattered Tree
174	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	109	Large	Large Scattered Tree
175	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	96	Large	Large Scattered Tree
176	Yellow Box	*Eucalyptus melliodora*	89	Large	Large Scattered Tree
177	Grey Box	*Eucalyptus microcarpa*	70	Large	Large Scattered Tree

Tree ID	Common Name	Species Name	DBH	Size Class	Type
178	River Red-gum	*Eucalyptus camaldulensis*	45	Small	Small Scattered Tree
179	River Red-gum	*Eucalyptus camaldulensis*	40	Small	Small Scattered Tree
180	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	95	Large	Large Tree in patch
181	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	89	Large	Large Tree in patch
182	Yellow Box	*Eucalyptus melliodora*	89	Large	Large Tree in patch
183	Yellow Box	*Eucalyptus melliodora*	88	Large	Large Tree in patch
184	Grey Box	*Eucalyptus microcarpa*	79	Large	Large Tree in patch
185	Grey Box	*Eucalyptus microcarpa*	70	Large	Large Tree in patch
186	Yellow Box	*Eucalyptus melliodora*	165	Large	Large Scattered Tree
187	Yellow Box	*Eucalyptus melliodora*	102	Large	Large Scattered Tree
188	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	99	Large	Large Scattered Tree
189	Yellow Box	*Eucalyptus melliodora*	96	Large	Large Scattered Tree
190	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	116	Large	Large Scattered Tree
191	Grey Box	*Eucalyptus microcarpa*	96	Large	Large Tree in patch
192	Grey Box	*Eucalyptus microcarpa*	92	Large	Large Tree in patch
193	Grey Box	*Eucalyptus microcarpa*	90	Large	Large Tree in patch
194	Grey Box	*Eucalyptus microcarpa*	89	Large	Large Tree in patch
195	Grey Box	*Eucalyptus microcarpa*	85	Large	Large Tree in patch
196	Grey Box	*Eucalyptus microcarpa*	82	Large	Large Tree in patch
197	Grey Box	*Eucalyptus microcarpa*	75	Large	Large Tree in patch
198	Grey Box	*Eucalyptus microcarpa*	75	Large	Large Tree in patch
199	Grey Box	*Eucalyptus microcarpa*	74	Large	Large Tree in patch
200	Grey Box	*Eucalyptus microcarpa*	71	Large	Large Tree in patch
201	Grey Box	*Eucalyptus microcarpa*	70	Large	Large Tree in patch
202	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	89	Large	Large Tree in patch
203	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	75	Large	Large Tree in patch
204	Grey Box	*Eucalyptus microcarpa*	86	Large	Large Scattered Tree
205	Grey Box	*Eucalyptus microcarpa*	96	Large	Large Tree in patch
206	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	145	Large	Large Tree in patch
207	River Red-gum	*Eucalyptus camaldulensis*	136	Large	Large Tree in patch
208	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	126	Large	Large Tree in patch
209	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	120	Large	Large Tree in patch
210	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	112	Large	Large Tree in patch
211	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	101	Large	Large Tree in patch
212	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	98	Large	Large Tree in patch
213	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	92	Large	Large Tree in patch

Tree ID	Common Name	Species Name	DBH	Size Class	Type
214	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	91	Large	Large Tree in patch
215	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	86	Large	Large Tree in patch
216	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	76	Large	Large Tree in patch
217	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	73	Large	Large Tree in patch
218	Yellow Box	*Eucalyptus melliodora*	85	Large	Large Scattered Tree
219	Yellow Box	*Eucalyptus melliodora*	102	Large	Large Tree in patch
220	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	91	Large	Large Tree in patch
221	Yellow Box	*Eucalyptus melliodora*	90	Large	Large Tree in patch
222	Yellow Box	*Eucalyptus melliodora*	75	Large	Large Tree in patch
223	Grey Box	*Eucalyptus microcarpa*	72	Large	Large Tree in patch
224	Stag		72	Large	Large Tree in patch
225	Yellow Box	*Eucalyptus melliodora*	72	Large	Large Tree in patch
226	Grey Box	*Eucalyptus microcarpa*	98	Large	Large Scattered Tree
227	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	96	Large	Large Tree in patch
228	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	95	Large	Large Tree in patch
229	Grey Box	*Eucalyptus microcarpa*	92	Large	Large Tree in patch
230	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	89	Large	Large Tree in patch
231	Grey Box	*Eucalyptus microcarpa*	89	Large	Large Tree in patch
232	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	86	Large	Large Tree in patch
233	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	85	Large	Large Tree in patch
234	Grey Box	*Eucalyptus microcarpa*	85	Large	Large Tree in patch
235	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	79	Large	Large Tree in patch
236	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	77	Large	Large Tree in patch
237	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	75	Large	Large Tree in patch
238	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	72	Large	Large Tree in patch
239	Grey Box	*Eucalyptus microcarpa*	72	Large	Large Tree in patch
240	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	70	Large	Large Tree in patch
241	Grey Box	*Eucalyptus microcarpa*	74	Large	Large Tree in patch
242	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	70	Large	Large Tree in patch
243	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	108	Large	Large Tree in patch
244	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	105	Large	Large Tree in patch
245	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	95	Large	Large Tree in patch
246	Yellow Box	*Eucalyptus melliodora*	86	Large	Large Tree in patch
247	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	84	Large	Large Tree in patch
248	Grey Box	*Eucalyptus microcarpa*	88	Large	Large Tree in patch
249	Grey Box	*Eucalyptus microcarpa*	105	Large	Large Tree in patch

Tree ID	Common Name	Species Name	DBH	Size Class	Type
250	Yellow Box	*Eucalyptus melliodora*	95	Large	Large Tree in patch
251	River Red-gum	*Eucalyptus camaldulensis*	95	Large	Large Tree in patch
252	Yellow Box	*Eucalyptus melliodora*	95	Large	Large Tree in patch
253	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	95	Large	Large Tree in patch
254	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	80	Large	Large Tree in patch
255	River Red-gum	*Eucalyptus camaldulensis*	198	Large	Large Tree in patch
256	River Red-gum	*Eucalyptus camaldulensis*	172	Large	Large Tree in patch
257	River Red-gum	*Eucalyptus camaldulensis*	135	Large	Large Tree in patch
258	River Red-gum	*Eucalyptus camaldulensis*	125	Large	Large Tree in patch
259	River Red-gum	*Eucalyptus camaldulensis*	112	Large	Large Tree in patch
260	River Red-gum	*Eucalyptus camaldulensis*	105	Large	Large Tree in patch
261	River Red-gum	*Eucalyptus camaldulensis*	97	Large	Large Tree in patch
262	River Red-gum	*Eucalyptus camaldulensis*	94	Large	Large Tree in patch
263	River Red-gum	*Eucalyptus camaldulensis*	85	Large	Large Tree in patch
264	River Red-gum	*Eucalyptus camaldulensis*	82	Large	Large Tree in patch
265	River Red-gum	*Eucalyptus camaldulensis*	80	Large	Large Tree in patch
266	River Red-gum	*Eucalyptus camaldulensis*	80	Large	Large Tree in patch
267	Grey Box	*Eucalyptus microcarpa*	72	Large	Large Tree in patch
268	River Red-gum	*Eucalyptus camaldulensis*	89	Large	Large Tree in patch
269	River Red-gum	*Eucalyptus camaldulensis*	85	Large	Large Tree in patch
270	Grey Box	*Eucalyptus microcarpa*	90	Large	Large Tree in patch
271	Grey Box	*Eucalyptus microcarpa*	80	Large	Large Tree in patch
272	Grey Box	*Eucalyptus microcarpa*	82	Large	Large Tree in patch
273	Grey Box	*Eucalyptus microcarpa*	80	Large	Large Tree in patch
274	Grey Box	*Eucalyptus microcarpa*	95	Large	Large Tree in patch
275	Yellow Box	*Eucalyptus melliodora*	85	Large	Large Tree in patch
276	Grey Box	*Eucalyptus microcarpa*	75	Large	Large Tree in patch
277	River Red-gum	*Eucalyptus camaldulensis*	169	Large	Large Scattered Tree
278	River Red-gum	*Eucalyptus camaldulensis*	120	Large	Large Tree in patch
279	River Red-gum	*Eucalyptus camaldulensis*	115	Large	Large Tree in patch
280	River Red-gum	*Eucalyptus camaldulensis*	102	Large	Large Tree in patch
281	River Red-gum	*Eucalyptus camaldulensis*	91	Large	Large Tree in patch
282	River Red-gum	*Eucalyptus camaldulensis*	88	Large	Large Tree in patch
283	River Red-gum	*Eucalyptus camaldulensis*	87	Large	Large Tree in patch
284	River Red-gum	*Eucalyptus camaldulensis*	80	Large	Large Tree in patch
285	Grey Box	*Eucalyptus microcarpa*	78	Large	Large Tree in patch

Tree ID	Common Name	Species Name	DBH	Size Class	Type
286	Grey Box	*Eucalyptus microcarpa*	76	Large	Large Tree in patch
287	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	146	Large	Large Scattered Tree
288	Grey Box	*Eucalyptus microcarpa*	70	Large	Large Tree in patch
289	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	70	Large	Large Tree in patch
290	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	106	Large	Large Tree in patch
291	Grey Box	*Eucalyptus microcarpa*	89	Large	Large Tree in patch
292	Grey Box	*Eucalyptus microcarpa*	89	Large	Large Tree in patch
293	Grey Box	*Eucalyptus microcarpa*	84	Large	Large Tree in patch
294	Grey Box	*Eucalyptus microcarpa*	79	Large	Large Tree in patch
295	Grey Box	*Eucalyptus microcarpa*	79	Large	Large Tree in patch
296	Grey Box	*Eucalyptus microcarpa*	76	Large	Large Tree in patch
297	Grey Box	*Eucalyptus microcarpa*	76	Large	Large Tree in patch
298	Grey Box	*Eucalyptus microcarpa*	75	Large	Large Tree in patch
299	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	102	Large	Large Tree in patch
300	Grey Box	*Eucalyptus microcarpa*	78	Large	Large Tree in patch
301	Grey Box	*Eucalyptus microcarpa*	75	Large	Large Tree in patch
302	Grey Box	*Eucalyptus microcarpa*	74	Large	Large Tree in patch
303	Grey Box	*Eucalyptus microcarpa*	70	Large	Large Tree in patch
304	Grey Box	*Eucalyptus microcarpa*	70	Large	Large Tree in patch
305	Stag		111	Large	Large Scattered Tree
306	Grey Box	*Eucalyptus microcarpa*	125	Large	Large Tree in patch
307	Grey Box	*Eucalyptus microcarpa*	105	Large	Large Tree in patch
308	Grey Box	*Eucalyptus microcarpa*	100	Large	Large Tree in patch
309	Grey Box	*Eucalyptus microcarpa*	96	Large	Large Tree in patch
310	Grey Box	*Eucalyptus microcarpa*	93	Large	Large Tree in patch
311	Grey Box	*Eucalyptus microcarpa*	92	Large	Large Tree in patch
312	Grey Box	*Eucalyptus microcarpa*	91	Large	Large Tree in patch
313	Grey Box	*Eucalyptus microcarpa*	88	Large	Large Tree in patch
314	Grey Box	*Eucalyptus microcarpa*	83	Large	Large Tree in patch
315	Grey Box	*Eucalyptus microcarpa*	81	Large	Large Tree in patch
316	Grey Box	*Eucalyptus microcarpa*	105	Large	Large Tree in patch
317	Grey Box	*Eucalyptus microcarpa*	100	Large	Large Tree in patch
318	Grey Box	*Eucalyptus microcarpa*	86	Large	Large Scattered Tree
319	Grey Box	*Eucalyptus microcarpa*	65	Small	Small Scattered Tree
320	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	148	Large	Large Tree in patch
321	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	140	Large	Large Tree in patch

Tree ID	Common Name	Species Name	DBH	Size Class	Type
322	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	138	Large	Large Tree in patch
323	Grey Box	*Eucalyptus microcarpa*	75	Large	Large Tree in patch
324	Yellow Box	*Eucalyptus melliodora*	70	Large	Large Tree in patch
325	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	112	Large	Large Tree in patch
326	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	96	Large	Large Scattered Tree
327	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	76	Large	Large Scattered Tree
328	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	72	Large	Large Scattered Tree
329	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	41	Small	Small Scattered Tree
330	Grey Box	*Eucalyptus microcarpa*	122	Large	Large Tree in patch
331	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	121	Large	Large Tree in patch
332	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	112	Large	Large Tree in patch
333	Grey Box	*Eucalyptus microcarpa*	108	Large	Large Tree in patch
334	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	106	Large	Large Tree in patch
335	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	98	Large	Large Tree in patch
336	Grey Box	*Eucalyptus microcarpa*	90	Large	Large Tree in patch
337	Grey Box	*Eucalyptus microcarpa*	87	Large	Large Tree in patch
338	Grey Box	*Eucalyptus microcarpa*	86	Large	Large Tree in patch
339	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	86	Large	Large Tree in patch
340	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	85	Large	Large Tree in patch
341	Grey Box	*Eucalyptus microcarpa*	84	Large	Large Tree in patch
342	Grey Box	*Eucalyptus microcarpa*	82	Large	Large Tree in patch
343	Grey Box	*Eucalyptus microcarpa*	81	Large	Large Tree in patch
344	Grey Box	*Eucalyptus microcarpa*	79	Large	Large Tree in patch
345	Grey Box	*Eucalyptus microcarpa*	78	Large	Large Tree in patch
346	Grey Box	*Eucalyptus microcarpa*	77	Large	Large Tree in patch
347	Grey Box	*Eucalyptus microcarpa*	74	Large	Large Tree in patch
348	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	72	Large	Large Tree in patch
349	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	71	Large	Large Tree in patch
350	Grey Box	*Eucalyptus microcarpa*	89	Large	Large Tree in patch
351	Grey Box	*Eucalyptus microcarpa*	81	Large	Large Tree in patch
352	Grey Box	*Eucalyptus microcarpa*	72	Large	Large Tree in patch
353	Grey Box	*Eucalyptus microcarpa*	71	Large	Large Tree in patch
354	Yellow Box	*Eucalyptus melliodora*	74	Large	Large Tree in patch
355	Grey Box	*Eucalyptus microcarpa*	155	Large	Large Tree in patch
356	Grey Box	*Eucalyptus microcarpa*	118	Large	Large Tree in patch
357	Grey Box	*Eucalyptus microcarpa*	101	Large	Large Tree in patch

Tree ID	Common Name	Species Name	DBH	Size Class	Type
358	Yellow Box	*Eucalyptus melliodora*	112	Large	Large Tree in patch
359	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	80	Large	Large Tree in patch
360	Yellow Box	*Eucalyptus melliodora*	78	Large	Large Tree in patch
361	Yellow Box	*Eucalyptus melliodora*	75	Large	Large Tree in patch
362	Yellow Box	*Eucalyptus melliodora*	165	Large	Large Tree in patch
363	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	110	Large	Large Tree in patch
364	Yellow Box	*Eucalyptus melliodora*	90	Large	Large Tree in patch
365	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	85	Large	Large Tree in patch
366	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	75	Large	Large Tree in patch
367	Yellow Box	*Eucalyptus melliodora*	72	Large	Large Tree in patch
368	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	70	Large	Large Tree in patch
369	Grey Box	*Eucalyptus microcarpa*	132	Large	Large Tree in patch
370	Grey Box	*Eucalyptus microcarpa*	73	Large	Large Tree in patch
371	River Red-gum	*Eucalyptus camaldulensis*	257	Large	Large Tree in patch
372	Grey Box	*Eucalyptus microcarpa*	140	Large	Large Tree in patch
373	Grey Box	*Eucalyptus microcarpa*	120	Large	Large Tree in patch
374	Grey Box	*Eucalyptus microcarpa*	117	Large	Large Tree in patch
375	Grey Box	*Eucalyptus microcarpa*	106	Large	Large Tree in patch
376	Grey Box	*Eucalyptus microcarpa*	103	Large	Large Tree in patch
377	Grey Box	*Eucalyptus microcarpa*	98	Large	Large Tree in patch
378	Grey Box	*Eucalyptus microcarpa*	95	Large	Large Tree in patch
379	Grey Box	*Eucalyptus microcarpa*	95	Large	Large Tree in patch
380	Grey Box	*Eucalyptus microcarpa*	86	Large	Large Tree in patch
381	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	82	Large	Large Tree in patch
382	Grey Box	*Eucalyptus microcarpa*	80	Large	Large Tree in patch
383	Grey Box	*Eucalyptus microcarpa*	80	Large	Large Tree in patch
384	Grey Box	*Eucalyptus microcarpa*	75	Large	Large Tree in patch
385	Grey Box	*Eucalyptus microcarpa*	75	Large	Large Tree in patch
386	Grey Box	*Eucalyptus microcarpa*	75	Large	Large Tree in patch
387	Grey Box	*Eucalyptus microcarpa*	75	Large	Large Tree in patch
388	Grey Box	*Eucalyptus microcarpa*	75	Large	Large Tree in patch
389	Grey Box	*Eucalyptus microcarpa*	70	Large	Large Tree in patch
390	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	70	Large	Large Tree in patch
391	River Red-gum	*Eucalyptus camaldulensis*	180	Large	Large Tree in patch
392	River Red-gum	*Eucalyptus camaldulensis*	177	Large	Large Tree in patch
393	River Red-gum	*Eucalyptus camaldulensis*	85	Large	Large Tree in patch

Tree ID	Common Name	Species Name	DBH	Size Class	Type
394	River Red-gum	*Eucalyptus camaldulensis*	85	Large	Large Tree in patch
395	Grey Box	*Eucalyptus microcarpa*	195	Large	Large Tree in patch
396	Grey Box	*Eucalyptus microcarpa*	125	Large	Large Tree in patch
397	Grey Box	*Eucalyptus microcarpa*	120	Large	Large Tree in patch
398	Grey Box	*Eucalyptus microcarpa*	112	Large	Large Tree in patch
399	Grey Box	*Eucalyptus microcarpa*	110	Large	Large Tree in patch
400	Grey Box	*Eucalyptus microcarpa*	105	Large	Large Tree in patch
401	Grey Box	*Eucalyptus microcarpa*	102	Large	Large Tree in patch
402	Grey Box	*Eucalyptus microcarpa*	100	Large	Large Tree in patch
403	Stag		95	Large	Large Tree in patch
404	Grey Box	*Eucalyptus microcarpa*	92	Large	Large Tree in patch
405	Yellow Box	*Eucalyptus melliodora*	86	Large	Large Tree in patch
406	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	70	Large	Large Tree in patch
407	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	70	Large	Large Tree in patch
408	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	70	Large	Large Tree in patch
409	Grey Box	*Eucalyptus microcarpa*	70	Large	Large Tree in patch
410	River Red-gum	*Eucalyptus camaldulensis*	100	Large	Large Tree in patch
411	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	106	Large	Large Tree in patch
412	River Red-gum	*Eucalyptus camaldulensis*	146	Large	Large Tree in patch
413	River Red-gum	*Eucalyptus camaldulensis*	98	Large	Large Tree in patch
414	River Red-gum	*Eucalyptus camaldulensis*	80	Large	Large Tree in patch
415	River Red-gum	*Eucalyptus camaldulensis*	80	Large	Large Tree in patch
416	River Red-gum	*Eucalyptus camaldulensis*	124	Large	Large Tree in patch
417	River Red-gum	*Eucalyptus camaldulensis*	93	Large	Large Tree in patch
418	River Red-gum	*Eucalyptus camaldulensis*	86	Large	Large Tree in patch
419	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	102	Large	Large Tree in patch
420	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	99	Large	Large Tree in patch
421	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	95	Large	Large Tree in patch
422	Grey Box	*Eucalyptus microcarpa*	90	Large	Large Tree in patch
423	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	89	Large	Large Tree in patch
424	Grey Box	*Eucalyptus microcarpa*	87	Large	Large Tree in patch
425	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	86	Large	Large Tree in patch
426	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	86	Large	Large Tree in patch
427	Grey Box	*Eucalyptus microcarpa*	85	Large	Large Tree in patch
428	Stag		84	Large	Large Tree in patch
429	Grey Box	*Eucalyptus microcarpa*	82	Large	Large Tree in patch

Tree ID	Common Name	Species Name	DBH	Size Class	Type
430	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	82	Large	Large Tree in patch
431	Grey Box	*Eucalyptus microcarpa*	80	Large	Large Tree in patch
432	Grey Box	*Eucalyptus microcarpa*	80	Large	Large Tree in patch
433	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	80	Large	Large Tree in patch
434	Grey Box	*Eucalyptus microcarpa*	76	Large	Large Tree in patch
435	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	72	Large	Large Tree in patch
436	Grey Box	*Eucalyptus microcarpa*	71	Large	Large Tree in patch
437	Grey Box	*Eucalyptus microcarpa*	70	Large	Large Tree in patch
438	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	70	Large	Large Tree in patch
439	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	145	Large	Large Tree in patch
440	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	122	Large	Large Tree in patch
441	Grey Box	*Eucalyptus microcarpa*	101	Large	Large Tree in patch
442	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	95	Large	Large Tree in patch
443	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	71	Large	Large Tree in patch
444	Grey Box	*Eucalyptus microcarpa*	125	Large	Large Tree in patch
445	Yellow Box	*Eucalyptus melliodora*	109	Large	Large Tree in patch
446	Yellow Box	*Eucalyptus melliodora*	105	Large	Large Tree in patch
447	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	101	Large	Large Tree in patch
448	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	89	Large	Large Tree in patch
449	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	82	Large	Large Tree in patch
450	Grey Box	*Eucalyptus microcarpa*	81	Large	Large Tree in patch
451	Grey Box	*Eucalyptus microcarpa*	81	Large	Large Tree in patch
452	Yellow Box	*Eucalyptus melliodora*	78	Large	Large Tree in patch
453	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	78	Large	Large Tree in patch
454	Grey Box	*Eucalyptus microcarpa*	75	Large	Large Tree in patch
455	Yellow Box	*Eucalyptus melliodora*	75	Large	Large Tree in patch
456	Grey Box	*Eucalyptus microcarpa*	73	Large	Large Tree in patch
457	Grey Box	*Eucalyptus microcarpa*	73	Large	Large Tree in patch
458	Grey Box	*Eucalyptus microcarpa*	72	Large	Large Tree in patch
459	Grey Box	*Eucalyptus microcarpa*	72	Large	Large Tree in patch
460	Yellow Box	*Eucalyptus melliodora*	70	Large	Large Tree in patch
461	Grey Box	*Eucalyptus microcarpa*	99	Large	Large Tree in patch
462	Grey Box	*Eucalyptus microcarpa*	86	Large	Large Tree in patch
463	Grey Box	*Eucalyptus microcarpa*	85	Large	Large Tree in patch
464	Grey Box	*Eucalyptus microcarpa*	75	Large	Large Tree in patch
465	Grey Box	*Eucalyptus microcarpa*	77	Large	Large Tree in patch

Tree ID	Common Name	Species Name	DBH	Size Class	Type
466	Grey Box	*Eucalyptus microcarpa*	73	Large	Large Tree in patch
467	Grey Box	*Eucalyptus microcarpa*	72	Large	Large Tree in patch
468	Grey Box	*Eucalyptus microcarpa*	95	Large	Large Tree in patch
469	Grey Box	*Eucalyptus microcarpa*	86	Large	Large Tree in patch
470	Grey Box	*Eucalyptus microcarpa*	81	Large	Large Tree in patch
471	Grey Box	*Eucalyptus microcarpa*	77	Large	Large Tree in patch
472	Grey Box	*Eucalyptus microcarpa*	76	Large	Large Tree in patch
473	Grey Box	*Eucalyptus microcarpa*	72	Large	Large Tree in patch
474	Yellow Box	*Eucalyptus melliodora*	78	Large	Large Tree in patch
475	Grey Box	*Eucalyptus microcarpa*	75	Large	Large Tree in patch
476	Grey Box	*Eucalyptus microcarpa*	83	Large	Large Tree in patch
477	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	99	Large	Large Tree in patch
478	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	85	Large	Large Tree in patch
479	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	81	Large	Large Tree in patch
480	Grey Box	*Eucalyptus microcarpa*	88	Large	Large Tree in patch
481	Grey Box	*Eucalyptus microcarpa*	85	Large	Large Tree in patch
482	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	110	Large	Large Tree in patch
483	Grey Box	*Eucalyptus microcarpa*	87	Large	Large Tree in patch
484	Grey Box	*Eucalyptus microcarpa*	79	Large	Large Tree in patch
485	Grey Box	*Eucalyptus microcarpa*	125	Large	Large Tree in patch
486	River Red-gum	*Eucalyptus camaldulensis*	112	Large	Large Tree in patch
487	River Red-gum	*Eucalyptus camaldulensis*	110	Large	Large Tree in patch
488	River Red-gum	*Eucalyptus camaldulensis*	105	Large	Large Tree in patch
489	River Red-gum	*Eucalyptus camaldulensis*	88	Large	Large Tree in patch
490	Grey Box	*Eucalyptus microcarpa*	105	Large	Large Tree in patch
491	Grey Box	*Eucalyptus microcarpa*	88	Large	Large Tree in patch
492	Grey Box	*Eucalyptus microcarpa*	77	Large	Large Tree in patch
493	Grey Box	*Eucalyptus microcarpa*	70	Large	Large Tree in patch
494	Grey Box	*Eucalyptus microcarpa*	125	Large	Large Tree in patch
495	Grey Box	*Eucalyptus microcarpa*	81	Large	Large Tree in patch
496	River Red-gum	*Eucalyptus camaldulensis*	109	Large	Large Tree in patch
497	River Red-gum	*Eucalyptus camaldulensis*	102	Large	Large Tree in patch
498	River Red-gum	*Eucalyptus camaldulensis*	102	Large	Large Tree in patch
499	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	88	Large	Large Tree in patch
500	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	86	Large	Large Tree in patch
501	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	84	Large	Large Tree in patch

Tree ID	Common Name	Species Name	DBH	Size Class	Type
502	Grey Box	*Eucalyptus microcarpa*	76	Large	Large Tree in patch
503	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	74	Large	Large Tree in patch
504	Stag		74	Large	Large Tree in patch
505	Grey Box	*Eucalyptus microcarpa*	70	Large	Large Tree in patch
506	Grey Box	*Eucalyptus microcarpa*	192	Large	Large Scattered Tree
507	Bundy	*Eucalyptus goniocalyx*	185	Large	Large Scattered Tree
508	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	165	Large	Large Scattered Tree
509	Grey Box	*Eucalyptus microcarpa*	149	Large	Large Scattered Tree
510	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	145	Large	Large Scattered Tree
511	Grey Box	*Eucalyptus microcarpa*	135	Large	Large Scattered Tree
512	Grey Box	*Eucalyptus microcarpa*	122	Large	Large Scattered Tree
513	Grey Box	*Eucalyptus microcarpa*	118	Large	Large Scattered Tree
514	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	112	Large	Large Scattered Tree
515	Yellow Box	*Eucalyptus melliodora*	112	Large	Large Scattered Tree
516	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	110	Large	Large Scattered Tree
517	Grey Box	*Eucalyptus microcarpa*	106	Large	Large Scattered Tree
518	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	106	Large	Large Scattered Tree
519	Yellow Box	*Eucalyptus melliodora*	106	Large	Large Scattered Tree
520	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	105	Large	Large Scattered Tree
521	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	105	Large	Large Scattered Tree
522	Yellow Box	*Eucalyptus melliodora*	101	Large	Large Scattered Tree
523	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	101	Large	Large Scattered Tree
524	Grey Box	*Eucalyptus microcarpa*	101	Large	Large Scattered Tree
525	Grey Box	*Eucalyptus microcarpa*	101	Large	Large Scattered Tree
526	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	99	Large	Large Scattered Tree
527	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	98	Large	Large Scattered Tree
528	Yellow Box	*Eucalyptus melliodora*	96	Large	Large Scattered Tree
529	Grey Box	*Eucalyptus microcarpa*	96	Large	Large Scattered Tree
530	Grey Box	*Eucalyptus microcarpa*	88	Large	Large Scattered Tree
531	Grey Box	*Eucalyptus microcarpa*	88	Large	Large Scattered Tree
532	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	86	Large	Large Scattered Tree
533	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	86	Large	Large Scattered Tree
534	Grey Box	*Eucalyptus microcarpa*	85	Large	Large Scattered Tree
535	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	85	Large	Large Scattered Tree
536	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	85	Large	Large Scattered Tree
537	Grey Box	*Eucalyptus microcarpa*	82	Large	Large Scattered Tree

Tree ID	Common Name	Species Name	DBH	Size Class	Type
538	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	82	Large	Large Scattered Tree
539	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	81	Large	Large Scattered Tree
540	Buloke	*Allocassuarina luehmannii*	81	Large	Large Scattered Tree
541	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	80	Large	Large Scattered Tree
542	Grey Box	*Eucalyptus microcarpa*	79	Large	Large Scattered Tree
543	Grey Box	*Eucalyptus microcarpa*	78	Large	Large Scattered Tree
544	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	78	Large	Large Scattered Tree
545	Grey Box	*Eucalyptus microcarpa*	75	Large	Large Scattered Tree
546	Grey Box	*Eucalyptus microcarpa*	72	Large	Large Scattered Tree
547	Stag		71	Large	Large Scattered Tree
548	Yellow Box	*Eucalyptus melliodora*	70	Large	Large Scattered Tree
549	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	70	Large	Large Scattered Tree
550	Grey Box	*Eucalyptus microcarpa*	70	Large	Large Scattered Tree
551	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	65	Small	Small Scattered Tree
552	Buloke	*Allocassuarina luehmannii*	62	Large	Large Tree in patch
553	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	61	Small	Small Scattered Tree
554	Stag		57	Small	Small Scattered Tree
555	Buloke	*Allocassuarina luehmannii*	56	Large	Large Scattered Tree
556	Buloke	*Allocassuarina luehmannii*	45	Large	Large Scattered Tree
557	Grey Box	*Eucalyptus microcarpa*	38	Small	Small Scattered Tree
558	Grey Box	*Eucalyptus microcarpa*	35	Small	Small Scattered Tree
559	Grey Box	*Eucalyptus microcarpa*	15	Small	Small Scattered Tree
560	Buloke	*Allocassuarina luehmannii*	15	Small	Small Scattered Tree
561	Yellow Box	*Eucalyptus melliodora*	112	Large	Large Tree in patch
562	Yellow Box	*Eucalyptus melliodora*	101	Large	Large Tree in patch
563	Yellow Box	*Eucalyptus melliodora*	100	Large	Large Tree in patch
564	Yellow Box	*Eucalyptus melliodora*	92	Large	Large Tree in patch
565	Yellow Box	*Eucalyptus melliodora*	80	Large	Large Tree in patch
566	Grey Box	*Eucalyptus microcarpa*	112	Large	Large Tree in patch
567	Grey Box	*Eucalyptus microcarpa*	94	Large	Large Tree in patch
568	Grey Box	*Eucalyptus microcarpa*	92	Large	Large Tree in patch
569	Grey Box	*Eucalyptus microcarpa*	84	Large	Large Tree in patch
570	Grey Box	*Eucalyptus microcarpa*	79	Large	Large Tree in patch
571	Grey Box	*Eucalyptus microcarpa*	78	Large	Large Tree in patch
572	Grey Box	*Eucalyptus microcarpa*	72	Large	Large Tree in patch
573	Grey Box	*Eucalyptus microcarpa*	72	Large	Large Tree in patch

Tree ID	Common Name	Species Name	DBH	Size Class	Type
574	Grey Box	*Eucalyptus microcarpa*	70	Large	Large Scattered Tree
575	River Red-gum	*Eucalyptus camaldulensis*	125	Large	Large Tree in patch
576	Grey Box	*Eucalyptus microcarpa*	71	Large	Large Tree in patch
577	Yellow Box	*Eucalyptus melliodora*	108	Large	Large Tree in patch
578	River Red-gum	*Eucalyptus camaldulensis*	99	Large	Large Tree in patch
579	River Red-gum	*Eucalyptus camaldulensis*	85	Large	Large Tree in patch
580	River Red-gum	*Eucalyptus camaldulensis*	80	Large	Large Tree in patch
581	River Red-gum	*Eucalyptus camaldulensis*	165	Large	Large Scattered Tree
582	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	89	Large	Large Tree in patch
583	River Red-gum	*Eucalyptus camaldulensis*	82	Large	Large Tree in patch
584	River Red-gum	*Eucalyptus camaldulensis*	81	Large	Large Tree in patch
585	River Red-gum	*Eucalyptus camaldulensis*	193	Large	Large Scattered Tree
586	Yellow Box	*Eucalyptus melliodora*	138	Large	Large Scattered Tree
587	Stag		110	Large	Large Scattered Tree
588	Grey Box	*Eucalyptus microcarpa*	100	Large	Large Scattered Tree
589	River Red-gum	*Eucalyptus camaldulensis*	84	Large	Large Scattered Tree
590	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	62	Small	Small Scattered Tree
591	Yellow Box	*Eucalyptus melliodora*	87	Large	Large Tree in patch
592	Bundy	*Eucalyptus goniocalyx*	61	Large	Large Tree in patch
593	Bundy	*Eucalyptus goniocalyx*	60	Large	Large Tree in patch
594	Bundy	*Eucalyptus goniocalyx*	78	Large	Large Tree in patch
595	Bundy	*Eucalyptus goniocalyx*	65	Large	Large Tree in patch
596	Grey Box	*Eucalyptus microcarpa*	100	Large	Large Tree in patch
597	Grey Box	*Eucalyptus microcarpa*	70	Large	Large Tree in patch
598	Bundy	*Eucalyptus goniocalyx*	79	Large	Large Tree in patch
599	Bundy	*Eucalyptus goniocalyx*	67	Large	Large Tree in patch
600	River Red-gum	*Eucalyptus camaldulensis*	92	Large	Large Tree in patch
601	Yellow Box	*Eucalyptus melliodora*	195	Large	Large Scattered Tree
602	River Red-gum	*Eucalyptus camaldulensis*	120	Large	Large Scattered Tree
603	River Red-gum	*Eucalyptus camaldulensis*	115	Large	Large Scattered Tree
604	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	120	Large	Large Tree in patch
605	Grey Box	*Eucalyptus microcarpa*	105	Large	Large Tree in patch
606	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	95	Large	Large Tree in patch
607	Grey Box	*Eucalyptus microcarpa*	89	Large	Large Tree in patch
608	Grey Box	*Eucalyptus microcarpa*	89	Large	Large Tree in patch
609	Grey Box	*Eucalyptus microcarpa*	87	Large	Large Tree in patch

Tree ID	Common Name	Species Name	DBH	Size Class	Type
610	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	80	Large	Large Tree in patch
611	Grey Box	*Eucalyptus microcarpa*	79	Large	Large Tree in patch
612	Grey Box	*Eucalyptus microcarpa*	75	Large	Large Tree in patch
613	Grey Box	*Eucalyptus microcarpa*	75	Large	Large Tree in patch
614	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	75	Large	Large Tree in patch
615	Grey Box	*Eucalyptus microcarpa*	72	Large	Large Tree in patch
616	Stag		72	Large	Large Tree in patch
617	Grey Box	*Eucalyptus microcarpa*	70	Large	Large Tree in patch
618	Grey Box	*Eucalyptus microcarpa*	70	Large	Large Tree in patch
619	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	70	Large	Large Tree in patch
620	Grey Box	*Eucalyptus microcarpa*	70	Large	Large Tree in patch
621	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	70	Large	Large Tree in patch
622	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	70	Large	Large Tree in patch
623	Grey Box	*Eucalyptus microcarpa*	96	Large	Large Tree in patch
624	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	95	Large	Large Tree in patch
625	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	92	Large	Large Tree in patch
626	Grey Box	*Eucalyptus microcarpa*	85	Large	Large Tree in patch
627	Grey Box	*Eucalyptus microcarpa*	80	Large	Large Tree in patch
628	Grey Box	*Eucalyptus microcarpa*	79	Large	Large Tree in patch
629	Grey Box	*Eucalyptus microcarpa*	79	Large	Large Tree in patch
630	Grey Box	*Eucalyptus microcarpa*	76	Large	Large Tree in patch
631	Grey Box	*Eucalyptus microcarpa*	75	Large	Large Tree in patch
632	Grey Box	*Eucalyptus microcarpa*	75	Large	Large Tree in patch
633	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	75	Large	Large Tree in patch
634	Grey Box	*Eucalyptus microcarpa*	74	Large	Large Tree in patch
635	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	71	Large	Large Tree in patch
636	Stag		70	Large	Large Tree in patch
637	Grey Box	*Eucalyptus microcarpa*	70	Large	Large Tree in patch
638	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	70	Large	Large Tree in patch
639	Grey Box	*Eucalyptus microcarpa*	71	Large	Large Tree in patch
640	Grey Box	*Eucalyptus microcarpa*	71	Large	Large Tree in patch
641	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	71	Large	Large Tree in patch
642	Stag		80	Large	Large Scattered Tree
643	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	75	Large	Large Scattered Tree
644	Stag		99	Large	Large Scattered Tree
645	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	82	Large	Large Tree in patch

Tree ID	Common Name	Species Name	DBH	Size Class	Type
646	Yellow Box	*Eucalyptus melliodora*	105	Large	Large Tree in patch
647	Yellow Box	*Eucalyptus melliodora*	101	Large	Large Tree in patch
648	Yellow Box	*Eucalyptus melliodora*	82	Large	Large Tree in patch
649	Yellow Box	*Eucalyptus melliodora*	77	Large	Large Tree in patch
650	Yellow Box	*Eucalyptus melliodora*	73	Large	Large Tree in patch
651	Yellow Box	*Eucalyptus melliodora*	72	Large	Large Tree in patch
652	Yellow Box	*Eucalyptus melliodora*	71	Large	Large Tree in patch
653	Yellow Box	*Eucalyptus melliodora*	91	Large	Large Tree in patch
654	Yellow Box	*Eucalyptus melliodora*	71	Large	Large Tree in patch
655	Stag		88	Large	Large Tree in patch
656	Yellow Box	*Eucalyptus melliodora*	82	Large	Large Tree in patch
657	Yellow Box	*Eucalyptus melliodora*	70	Large	Large Tree in patch
658	Yellow Box	*Eucalyptus melliodora*	140	Large	Large Scattered Tree
659	Yellow Box	*Eucalyptus melliodora*	106	Large	Large Scattered Tree
660	Grey Box	*Eucalyptus microcarpa*	50	Small	Small Scattered Tree
661	River Red-gum	*Eucalyptus camaldulensis*	125	Large	Large Tree in patch
662	River Red-gum	*Eucalyptus camaldulensis*	62	Small	Small Scattered Tree
663	Stag		100	Large	Large Tree in patch
664	Yellow Box	*Eucalyptus melliodora*	92	Large	Large Tree in patch
665	Yellow Box	*Eucalyptus melliodora*	90	Large	Large Tree in patch
666	Yellow Box	*Eucalyptus melliodora*	85	Large	Large Tree in patch
667	Yellow Box	*Eucalyptus melliodora*	76	Large	Large Tree in patch
668	Yellow Box	*Eucalyptus melliodora*	106	Large	Large Tree in patch
669	Stag		112	Large	Large Tree in patch
670	Yellow Box	*Eucalyptus melliodora*	101	Large	Large Tree in patch
671	Yellow Box	*Eucalyptus melliodora*	88	Large	Large Tree in patch
672	Yellow Box	*Eucalyptus melliodora*	75	Large	Large Tree in patch
673	Yellow Box	*Eucalyptus melliodora*	72	Large	Large Tree in patch
674	Yellow Box	*Eucalyptus melliodora*	71	Large	Large Tree in patch
675	Grey Box	*Eucalyptus microcarpa*	98	Large	Large Tree in patch
676	Grey Box	*Eucalyptus microcarpa*	85	Large	Large Tree in patch
677	Grey Box	*Eucalyptus microcarpa*	84	Large	Large Tree in patch
678	Grey Box	*Eucalyptus microcarpa*	81	Large	Large Tree in patch
679	Grey Box	*Eucalyptus microcarpa*	78	Large	Large Tree in patch
680	Grey Box	*Eucalyptus microcarpa*	75	Large	Large Tree in patch
681	Grey Box	*Eucalyptus microcarpa*	72	Large	Large Tree in patch

Tree ID	Common Name	Species Name	DBH	Size Class	Type
682	Grey Box	*Eucalyptus microcarpa*	72	Large	Large Tree in patch
683	Grey Box	*Eucalyptus microcarpa*	72	Large	Large Tree in patch
684	Grey Box	*Eucalyptus microcarpa*	72	Large	Large Tree in patch
685	Grey Box	*Eucalyptus microcarpa*	72	Large	Large Tree in patch
686	Grey Box	*Eucalyptus microcarpa*	71	Large	Large Tree in patch
687	Grey Box	*Eucalyptus microcarpa*	71	Large	Large Tree in patch
688	Grey Box	*Eucalyptus microcarpa*	70	Large	Large Tree in patch
689	Grey Box	*Eucalyptus microcarpa*	70	Large	Large Tree in patch
690	Grey Box	*Eucalyptus microcarpa*	70	Large	Large Tree in patch
691	Grey Box	*Eucalyptus microcarpa*	70	Large	Large Tree in patch
692	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	78	Large	Large Tree in patch
693	Grey Box	*Eucalyptus microcarpa*	101	Large	Large Tree in patch
694	Grey Box	*Eucalyptus microcarpa*	80	Large	Large Tree in patch
695	Grey Box	*Eucalyptus microcarpa*	72	Large	Large Tree in patch
696	River Red-gum	*Eucalyptus camaldulensis*	125	Large	Large Tree in patch
697	River Red-gum	*Eucalyptus camaldulensis*	125	Large	Large Tree in patch
698	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	112	Large	Large Tree in patch
699	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	107	Large	Large Tree in patch
700	River Red-gum	*Eucalyptus camaldulensis*	167	Large	Large Tree in patch
701	Yellow Box	*Eucalyptus melliodora*	125	Large	Large Scattered Tree
702	Yellow Box	*Eucalyptus melliodora*	142	Large	Large Scattered Tree
703	Yellow Box	*Eucalyptus melliodora*	101	Large	Large Scattered Tree
704	Yellow Box	*Eucalyptus melliodora*	89	Large	Large Scattered Tree
705	Grey Box	*Eucalyptus microcarpa*	65	Small	Small Scattered Tree
706	Grey Box	*Eucalyptus microcarpa*	75	Large	Large Tree in patch
707	Grey Box	*Eucalyptus microcarpa*	70	Large	Large Tree in patch
708	River Red-gum	*Eucalyptus camaldulensis*	200	Large	Large Scattered Tree
709	River Red-gum	*Eucalyptus camaldulensis*	153	Large	Large Scattered Tree
710	Grey Box	*Eucalyptus microcarpa*	122	Large	Large Scattered Tree
711	River Red-gum	*Eucalyptus camaldulensis*	74	Large	Large Scattered Tree
712	River Red-gum	*Eucalyptus camaldulensis*	72	Large	Large Scattered Tree
713	Grey Box	*Eucalyptus microcarpa*	71	Large	Large Scattered Tree
714	River Red-gum	*Eucalyptus camaldulensis*	70	Large	Large Scattered Tree
715	Grey Box	*Eucalyptus microcarpa*	62	Small	Small Scattered Tree
716	Grey Box	*Eucalyptus microcarpa*	62	Small	Small Scattered Tree
717	Grey Box	*Eucalyptus microcarpa*	32	Small	Small Scattered Tree

Tree ID	Common Name	Species Name	DBH	Size Class	Type
718	Red Ironbark	*Eucalyptus tricarpa*	75	Large	Large Tree in patch
719	Red Ironbark	*Eucalyptus tricarpa*	72	Large	Large Tree in patch
720	Red Ironbark	*Eucalyptus tricarpa*	72	Large	Large Tree in patch
721	Red Ironbark	*Eucalyptus tricarpa*	70	Large	Large Tree in patch
722	Red Ironbark	*Eucalyptus tricarpa*	65	Large	Large Tree in patch
723	Red Ironbark	*Eucalyptus tricarpa*	62	Large	Large Tree in patch
724	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	89	Large	Large Tree in patch
725	Grey Box	*Eucalyptus microcarpa*	75	Large	Large Tree in patch
726	Grey Box	*Eucalyptus microcarpa*	70	Large	Large Tree in patch
727	Grey Box	*Eucalyptus microcarpa*	87	Large	Large Scattered Tree
728	Grey Box	*Eucalyptus microcarpa*	82	Large	Large Scattered Tree
729	Grey Box	*Eucalyptus microcarpa*	69	Large	Large Scattered Tree
730	River Red-gum	*Eucalyptus camaldulensis*	92	Large	Large Tree in patch
731	River Red-gum	*Eucalyptus camaldulensis*	85	Large	Large Tree in patch
732	River Red-gum	*Eucalyptus camaldulensis*	162	Large	Large Tree in patch
733	River Red-gum	*Eucalyptus camaldulensis*	92	Large	Large Tree in patch
734	River Red-gum	*Eucalyptus camaldulensis*	89	Large	Large Tree in patch
735	River Red-gum	*Eucalyptus camaldulensis*	81	Large	Large Tree in patch
736	River Red-gum	*Eucalyptus camaldulensis*	71	Large	Large Tree in patch
737	Yellow Box	*Eucalyptus melliodora*	200	Large	Large Scattered Tree
738	River Red-gum	*Eucalyptus camaldulensis*	180	Large	Large Scattered Tree
739	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	136	Large	Large Scattered Tree
740	Yellow Box	*Eucalyptus melliodora*	105	Large	Large Scattered Tree
741	Yellow Box	*Eucalyptus melliodora*	100	Large	Large Scattered Tree
742	River Red-gum	*Eucalyptus camaldulensis*	150	Large	Large Scattered Tree
743	River Red-gum	*Eucalyptus camaldulensis*	119	Large	Large Tree in patch
744	River Red-gum	*Eucalyptus camaldulensis*	125	Large	Large Tree in patch
745	River Red-gum	*Eucalyptus camaldulensis*	125	Large	Large Tree in patch
746	River Red-gum	*Eucalyptus camaldulensis*	172	Large	Large Tree in patch
747	River Red-gum	*Eucalyptus camaldulensis*	122	Large	Large Tree in patch
748	River Red-gum	*Eucalyptus camaldulensis*	112	Large	Large Tree in patch
749	Grey Box	*Eucalyptus microcarpa*	102	Large	Large Tree in patch
750	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	95	Large	Large Tree in patch
751	Grey Box	*Eucalyptus microcarpa*	70	Large	Large Tree in patch
752	Stag		70	Large	Large Tree in patch
753	Grey Box	*Eucalyptus microcarpa*	85	Large	Large Tree in patch

Tree ID	Common Name	Species Name	DBH	Size Class	Type
754	Grey Box	*Eucalyptus microcarpa*	83	Large	Large Tree in patch
755	River Red-gum	*Eucalyptus camaldulensis*	103	Large	Large Tree in patch
756	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	81	Large	Large Tree in patch
757	River Red-gum	*Eucalyptus camaldulensis*	125	Large	Large Tree in patch
758	River Red-gum	*Eucalyptus camaldulensis*	180	Large	Large Scattered Tree
759	River Red-gum	*Eucalyptus camaldulensis*	159	Large	Large Scattered Tree
760	River Red-gum	*Eucalyptus camaldulensis*	142	Large	Large Tree in patch
761	Grey Box	*Eucalyptus microcarpa*	129	Large	Large Scattered Tree
762	River Red-gum	*Eucalyptus camaldulensis*	120	Large	Large Tree in patch
763	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	79	Large	Large Scattered Tree
764	River Red-gum	*Eucalyptus camaldulensis*	75	Large	Large Tree in patch
765	River Red-gum	*Eucalyptus camaldulensis*	261	Large	Large Scattered Tree
766	River Red-gum	*Eucalyptus camaldulensis*	142	Large	Large Scattered Tree
767	River Red-gum	*Eucalyptus camaldulensis*	108	Large	Large Tree in patch
768	River Red-gum	*Eucalyptus camaldulensis*	102	Large	Large Tree in patch
769	River Red-gum	*Eucalyptus camaldulensis*	86	Large	Large Scattered Tree
770	River Red-gum	*Eucalyptus camaldulensis*	82	Large	Large Scattered Tree
771	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	72	Large	Large Tree in patch
772	Grey Box	*Eucalyptus microcarpa*	74	Large	Large Tree in patch
773	Grey Box	*Eucalyptus microcarpa*	73	Large	Large Tree in patch
774	River Red-gum	*Eucalyptus camaldulensis*	102	Large	Large Tree in patch
775	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	94	Large	Large Tree in patch
776	Grey Box	*Eucalyptus microcarpa*	81	Large	Large Tree in patch
777	Grey Box	*Eucalyptus microcarpa*	81	Large	Large Tree in patch
778	Grey Box	*Eucalyptus microcarpa*	75	Large	Large Tree in patch
779	Grey Box	*Eucalyptus microcarpa*	78	Large	Large Tree in patch
780	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	92	Large	Large Tree in patch
781	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	89	Large	Large Tree in patch
782	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	85	Large	Large Tree in patch
783	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	82	Large	Large Tree in patch
784	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	72	Large	Large Tree in patch
785	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	72	Large	Large Tree in patch
786	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	72	Large	Large Tree in patch
787	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	71	Large	Large Tree in patch
788	Grey Box	*Eucalyptus microcarpa*	82	Large	Large Tree in patch
789	Grey Box	*Eucalyptus microcarpa*	106	Large	Large Tree in patch

Tree ID	Common Name	Species Name	DBH	Size Class	Type
790	Grey Box	*Eucalyptus microcarpa*	95	Large	Large Tree in patch
791	Grey Box	*Eucalyptus microcarpa*	82	Large	Large Tree in patch
792	Grey Box	*Eucalyptus microcarpa*	72	Large	Large Tree in patch
793	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	86	Large	Large Tree in patch
794	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	84	Large	Large Tree in patch
795	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	81	Large	Large Tree in patch
796	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	81	Large	Large Tree in patch
797	Grey Box	*Eucalyptus microcarpa*	79	Large	Large Tree in patch
798	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	78	Large	Large Tree in patch
799	Grey Box	*Eucalyptus microcarpa*	112	Large	Large Scattered Tree
800	Grey Box	*Eucalyptus microcarpa*	98	Large	Large Tree in patch
801	Grey Box	*Eucalyptus microcarpa*	96	Large	Large Tree in patch
802	Grey Box	*Eucalyptus microcarpa*	82	Large	Large Tree in patch
803	Grey Box	*Eucalyptus microcarpa*	81	Large	Large Tree in patch
804	River Red-gum	*Eucalyptus camaldulensis*	102	Large	Large Tree in patch
805	Stag		98	Large	Large Tree in patch
806	Grey Box	*Eucalyptus microcarpa*	89	Large	Large Tree in patch
807	River Red-gum	*Eucalyptus camaldulensis*	85	Large	Large Tree in patch
808	Yellow Box	*Eucalyptus melliodora*	82	Large	Large Tree in patch
809	Yellow Box	*Eucalyptus melliodora*	98	Large	Large Tree in patch
810	Grey Box	*Eucalyptus microcarpa*	93	Large	Large Tree in patch
811	River Red-gum	*Eucalyptus camaldulensis*	118	Large	Large Tree in patch
812	Bundy	*Eucalyptus goniocalyx*	65	Large	Large Tree in patch
813	Buloke	*Allocassuarina luehmannii*	78	Large	Large Scattered Tree
814	Bundy	*Eucalyptus goniocalyx*	62	Small	Small Scattered Tree
815	Grey Box	*Eucalyptus microcarpa*	81	Large	Large Scattered Tree
816	Grey Box	*Eucalyptus microcarpa*	85	Large	Large Scattered Tree
817	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	77	Large	Large Scattered Tree
818	Yellow Box	*Eucalyptus melliodora*	80	Large	Large Scattered Tree
819	Bundy	*Eucalyptus goniocalyx*	92	LOT	Large Scattered Tree
820	Bundy	*Eucalyptus goniocalyx*	108	Large	Large Tree in patch
821	Bundy	*Eucalyptus goniocalyx*	94	Large	Large Tree in patch
822	Yellow Box	*Eucalyptus melliodora*	112	Large	Large Scattered Tree
823	Stag		53	Small	Small Scattered Tree
824	Bundy	*Eucalyptus goniocalyx*	68	Small	Small Scattered Tree
825	Yellow Box	*Eucalyptus melliodora*	93	Large	Large Scattered Tree

Tree ID	Common Name	Species Name	DBH	Size Class	Type
826	Bundy	*Eucalyptus goniocalyx*	112	Large	Large Tree in patch
827	Bundy	*Eucalyptus goniocalyx*	144	Large	Large Tree in patch
828	Bundy	*Eucalyptus goniocalyx*	77	Large	Large Tree in patch
829	Bundy	*Eucalyptus goniocalyx*	76	Large	Large Tree in patch
830	Bundy	*Eucalyptus goniocalyx*	92	Large	Large Tree in patch
831	Bundy	*Eucalyptus goniocalyx*	78	Large	Large Tree in patch
832	Bundy	*Eucalyptus goniocalyx*	70	Large	Large Tree in patch
833	Bundy	*Eucalyptus goniocalyx*	77	Large	Large Tree in patch
834	Bundy	*Eucalyptus goniocalyx*	175	Large	Large Scattered Tree
835	Stag		65	Small	Small Scattered Tree
836	Bundy	*Eucalyptus goniocalyx*	190	Large	Large Scattered Tree
837	Bundy	*Eucalyptus goniocalyx*	185	Large	Large Scattered Tree
838	Stag		77	Large	Large Scattered Tree
839	Bundy	*Eucalyptus goniocalyx*	74	Large	Large Scattered Tree
840	Grey Box	*Eucalyptus microcarpa*	86	Large	Large Scattered Tree
841	Bundy	*Eucalyptus goniocalyx*	85	Large	Large Tree in patch
842	Stag		66	Small	Small Scattered Tree
843	River Red-gum	*Eucalyptus camaldulensis*	80	Large	Large Scattered Tree
844	Bundy	*Eucalyptus goniocalyx*	88	Large	Large Scattered Tree
845	Grey Box	*Eucalyptus microcarpa*	76	Large	Large Tree in patch
846	River Red-gum	*Eucalyptus camaldulensis*	75	Large	Large Scattered Tree
847	River Red-gum	*Eucalyptus camaldulensis*	56	Small	Small Scattered Tree
848	River Red-gum	*Eucalyptus camaldulensis*	70	Large	Large Scattered Tree
849	River Red-gum	*Eucalyptus camaldulensis*	150	Large	Large Scattered Tree
850	River Red-gum	*Eucalyptus camaldulensis*	81	Large	Large Scattered Tree
851	Stag		66	Small	Small Scattered Tree
852	Yellow Box	*Eucalyptus melliodora*	113	Large	Large Scattered Tree
853	Yellow Box	*Eucalyptus melliodora*	96	Large	Large Scattered Tree
854	Bundy	*Eucalyptus goniocalyx*	98	Large	Large Scattered Tree
855	Stag		87	Large	Large Scattered Tree
856	River Red-gum	*Eucalyptus camaldulensis*	88	Large	Large Scattered Tree
857	River Red-gum	*Eucalyptus camaldulensis*	94	Large	Large Scattered Tree
858	Yellow Box	*Eucalyptus melliodora*	112	Large	Large Scattered Tree
859	Yellow Box	*Eucalyptus melliodora*	88	Large	Large Scattered Tree
860	Grey Box	*Eucalyptus microcarpa*	58	Small	Small Scattered Tree
861	Yellow Box	*Eucalyptus melliodora*	99	Large	Large Scattered Tree

Tree ID	Common Name	Species Name	DBH	Size Class	Type
862	Yellow Box	*Eucalyptus melliodora*	86	Large	Large Scattered Tree
863	Stag		55	Small	Small Scattered Tree
864	Yellow Box	*Eucalyptus melliodora*	72	Large	Large Scattered Tree
865	Stag		88	Large	Large Scattered Tree
866	Yellow Box	*Eucalyptus melliodora*	104	Large	Large Scattered Tree
867	Yellow Box	*Eucalyptus melliodora*	77	Large	Large Scattered Tree
868	Grey Box	*Eucalyptus microcarpa*	72	Large	Large Scattered Tree
869	Yellow Box	*Eucalyptus melliodora*	58	Small	Small Scattered Tree
870	Yellow Box	*Eucalyptus melliodora*	56	Small	Small Scattered Tree
871	Yellow Box	*Eucalyptus melliodora*	87	Small	Small Scattered Tree
872	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	86	Large	Large Scattered Tree
873	Yellow Box	*Eucalyptus melliodora*	77	LOT	Large Tree in patch
874	Yellow Box	*Eucalyptus melliodora*	74	LOT	Large Tree in patch
875	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	71	LOT	Large Tree in patch
876	Yellow Box	*Eucalyptus melliodora*	84	LOT	Large Tree in patch
877	Yellow Box	*Eucalyptus melliodora*	72	LOT	Large Tree in patch
878	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	87	Large	Large Scattered Tree
879	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	98	Large	Large Scattered Tree
880	Grey Box	*Eucalyptus microcarpa*	78	Large	Large Scattered Tree
881	Yellow Box	*Eucalyptus melliodora*	85	Large	Large Tree in patch
882	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	72	Large	Large Tree in patch
883	Grey Box	*Eucalyptus microcarpa*	89	Large	Large Scattered Tree
884	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	48	Small	Small Scattered Tree
885	Grey Box	*Eucalyptus microcarpa*	59	Small	Small Scattered Tree
886	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	27	Small	Small Scattered Tree
887	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	38	Small	Small Scattered Tree
888	Grey Box	*Eucalyptus microcarpa*	83	Large	Large Scattered Tree
889	Grey Box	*Eucalyptus microcarpa*	63	Small	Small Scattered Tree
890	Grey Box	*Eucalyptus microcarpa*	75	Large	Large Scattered Tree
891	Grey Box	*Eucalyptus microcarpa*	77	Large	Large Scattered Tree
892	Grey Box	*Eucalyptus microcarpa*	52	Small	Small Scattered Tree
893	Yellow Box	*Eucalyptus melliodora*	87	Large	Large Scattered Tree
894	Yellow Box	*Eucalyptus melliodora*	88	Large	Large Scattered Tree
895	Grey Box	*Eucalyptus microcarpa*	57	Small	Small Scattered Tree
896	Yellow Box	*Eucalyptus melliodora*	70	Large	Large Scattered Tree
897	Yellow Box	*Eucalyptus melliodora*	107	Large	Large Scattered Tree

Tree ID	Common Name	Species Name	DBH	Size Class	Type
898	Stag		74	Large	Large Scattered Tree
899	Grey Box	*Eucalyptus microcarpa*	76	Large	Large Scattered Tree
900	Grey Box	*Eucalyptus microcarpa*	75	LOT	Large Tree in patch
901	Yellow Box	*Eucalyptus melliodora*	70	LOT	Large Tree in patch
902	Yellow Box	*Eucalyptus melliodora*	84	LOT	Large Tree in patch
903	Stag		68	Small	Small Scattered Tree
904	Yellow Box	*Eucalyptus melliodora*	85	Large	Large Scattered Tree
905	Yellow Box	*Eucalyptus melliodora*	94	Large	Large Scattered Tree
906	Yellow Box	*Eucalyptus melliodora*	89	Large	Large Scattered Tree
907	River Red-gum	*Eucalyptus camaldulensis*	216	Large	Large Scattered Tree
908	Grey Box	*Eucalyptus microcarpa*	134	Large	Large Scattered Tree
909	Yellow Box	*Eucalyptus melliodora*	79	LOT	Large Tree in patch
910	Yellow Gum	*Eucalyptus leucoxylon* subsp. *pruinosa*	78	LOT	Large Tree in patch
911	Yellow Box	*Eucalyptus melliodora*	74	LOT	Large Tree in patch
912	Stag		77	LOT	Large Tree in patch
913	Buloke	*Allocassuarina luehmannii*	56	Large	Large Scattered Tree
914	Buloke	*Allocassuarina luehmannii*	58	Large	Large Scattered Tree
915	Buloke	*Allocassuarina luehmannii*	48	Large	Large Scattered Tree
916	Buloke	*Allocassuarina luehmannii*	50	Large	Large Scattered Tree
917	Buloke	*Allocassuarina luehmannii*	55	Large	Large Scattered Tree
918	River Red-gum	*Eucalyptus camaldulensis*	95	Large	Large Scattered Tree
919	Grey Box	*Eucalyptus microcarpa*	93	LOT	Large Tree in patch
920	Grey Box	*Eucalyptus microcarpa*	102	LOT	Large Tree in patch
921	Grey Box	*Eucalyptus microcarpa*	89	LOT	Large Tree in patch
922	Grey Box	*Eucalyptus microcarpa*	148	Large	Large Scattered Tree
923	River Red-gum	*Eucalyptus camaldulensis*	153	Large	Large Scattered Tree
924	Yellow Box	*Eucalyptus melliodora*	121	Large	Large Scattered Tree
925	Yellow Box	*Eucalyptus melliodora*	89	Large	Large Scattered Tree
926	Yellow Box	*Eucalyptus melliodora*	37	Small	Small Scattered Tree
927	Bundy	*Eucalyptus goniocalyx*	91	Large	Large Scattered Tree
928	Bundy	*Eucalyptus goniocalyx*	62	LOT	Large Tree in patch
929	Bundy	*Eucalyptus goniocalyx*	65	LOT	Large Tree in patch
930	Bundy	*Eucalyptus goniocalyx*	96	LOT	Large Tree in patch
931	Bundy	*Eucalyptus goniocalyx*	84	LOT	Large Tree in patch
932	Bundy	*Eucalyptus goniocalyx*	87	LOT	Large Tree in patch
933	Bundy	*Eucalyptus goniocalyx*	81	Large	Large Scattered Tree

Tree ID	Common Name	Species Name	DBH	Size Class	Type
934	Stag		42	Small	Small Scattered Tree
935	Red Box	*Eucalyptus polyanthemos*	56	Small	Small Scattered Tree
936	Bundy	*Eucalyptus goniocalyx*	84	Large	Large Scattered Tree
937	Bundy	*Eucalyptus goniocalyx*	26	Small	Small Scattered Tree
938	Bundy	*Eucalyptus goniocalyx*	63	Large	Large Scattered Tree
939	Yellow Box	*Eucalyptus melliodora*	105	Large	Large Scattered Tree
940	Yellow Box	*Eucalyptus melliodora*	166	Large	Large Scattered Tree
941	Bundy	*Eucalyptus goniocalyx*	84	Large	Large Scattered Tree
942	Bundy	*Eucalyptus goniocalyx*	75	Large	Large Scattered Tree
943	Grey Box	*Eucalyptus microcarpa*	103	Large	Large Scattered Tree
944	Grey Box	*Eucalyptus microcarpa*	66	Small	Small Scattered Tree
945	Bundy	*Eucalyptus goniocalyx*	60	Small	Small Scattered Tree
946	Yellow Box	*Eucalyptus melliodora*	74	Large	Large Scattered Tree
947	Yellow Box	*Eucalyptus melliodora*	134	Large	Large Scattered Tree
948	Yellow Box	*Eucalyptus melliodora*	193	Large	Large Scattered Tree

Appendix 1.3 Habitat Hectare Assessment

Table A1.3.1. Habitat Hectare Assessment Table.

Note: Wim = Wimmera; GF = Goldfields; PW = Plains Woodland; GW = Grassy Woodland; CGW = Creekline Grassy Woodland; HW = Heathy Woodland; GW(LR) = *Low Rises* Grassy Woodland; ATHrW = Alluvial Terraces Herb-rich Woodland; BIF = Box Ironbark Forest; En = Endangered; VU = Vulnerable; D = Depleted.

Vegetation Zone		ATHRW1	BIF1	CGW1	CGW2	GW1	GW2	GW3	GW4	GW5	GW6	GW7	GW8	GW9
Bioregion		GF	GF	GF	GF	GF	GF	GF	GF	GF	GF	GF	GF	GF
EVC / Tree		ATHrW	BIF	CGW	CGW	GW (LR)	GW (LR)	GW (LR)	GW (LR)	GW (LR)	GW (LR)	GW (LR)	GW (LR)	GW (LR)
EVC Number		67	61	68	68	175_61	175_61	175_61	175_61	175_61	175_61	175_61	175_61	175_61
EVC Conservation Status		En	D	En	En	Vu	Vu	Vu	Vu	Vu	Vu	Vu	Vu	Vu
Patch Condition	Large Old Trees /10	10	8	10	10	0	10	6	0	0	2	9	9	0
	Canopy Cover /5	3	5	5	4	0	3	3	0	0	0	5	5	4
	Under storey /25	5	20	5	5	5	5	15	5	5	10	0	5	5
	Lack of Weeds /15	3	11	0	0	4	4	13	4	4	4	4	4	2
	Recruitment /10	5	10	0	0	5	5	5	6	3	6	0	0	0
	Organic Matter /5	4	5	5	5	5	5	5	2	2	5	4	3	3
	Logs /5	0	5	0	0	0	0	0	0	0	0	0	0	0
	Treeless EVC Multiplier	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Subtotal =	30.00	64.00	25.00	24.00	19.00	31.00	47.00	17.00	14.00	27.00	22.00	26.00	14.00
Landscape Value /25		6	7	7	7	6	6	7	6	6	6	6	6	6
Habitat Points /100		36	71	32	31	25	37	54	23	20	33	28	32	20
Habitat Score		**0.36**	**0.71**	**0.32**	**0.31**	**0.25**	**0.37**	**0.54**	**0.23**	**0.20**	**0.33**	**0.28**	**0.32**	**0.20**
Total Area (ha)		3.699	9.844	6.166	10.504	0.455	45.909	6.884	9.934	0.765	3.016	0.264	0.534	0.081
Area (ha) to be removed		0.188	0.000	0.165	0.543	0.032	1.904	0.076	0.163	0.008	3.016	0.264	0.016	0.000
Area (ha) to be retained		2.514	9.844	4.783	9.960	0.423	38.398	6.808	9.771	0.757	0.000	0.000	0.518	0.081

Vegetation Zone		GW10	HW1	HW2	HW3	HW4	HW5	PGWe1	PW1	PW2	PW3	PW4
Bioregion		GF	GF	GF	GF	GF	GF	GF	GF	Wim	GF	GF
EVC / Tree		GW (LR)	HW	HW	HW	HW	HW	PGWe	PW	PW	PW	PW
EVC Number		175_61	48	48	48	48	48	125	803	803	803	803
EVC Conservation Status		Vu	D	D	D	D	D	En	En	En	En	En
Patch Condition	Large Old Trees /10	0	8	8	2	9	0	0	0	10	10	9
	Canopy Cover /5	0	3	3	5	5	0	0	0	3	3	4
	Under storey /25	5	20	5	0	5	5	10	5	5	10	10
	Lack of Weeds /15	4	13	4	4	4	4	13	2	2	4	4
	Recruitment /10	0	10	5	0	3	0	5	5	5	5	5
	Organic Matter /5	2	5	5	2	5	4	0	5	5	5	5
	Logs /5	0	2	0	0	0	0	0	0	0	0	3
	Treeless EVC Multiplier	1.00	1.00	1.00	1.00	1.00	1.00	1.36	1.00	1.00	1.00	1.00
	Subtotal =	11.00	61.00	30.00	13.00	31.00	13.00	38.08	17.00	30.00	37.00	40.00
Landscape Value /25		7	6	6	6	6	6	6	6	6	6	7
Habitat Points /100		18	67	36	19	37	19	44	23	36	43	47
Habitat Score		**0.18**	**0.67**	**0.36**	**0.19**	**0.37**	**0.19**	**0.44**	**0.23**	**0.36**	**0.43**	**0.47**
Total Area (ha)		2.846	1.297	13.969	1.990	0.242	0.059	0.083	0.910	12.572	1.258	3.849
Area (ha) to be removed		1.012	0.000	1.086	0.096	0.000	0.000	0.029	0.043	0.540	0.294	0.035
Area (ha) to be retained		1.834	1.297	12.883	1.894	0.242	0.059	0.054	0.867	12.032	0.964	3.814

Appendix 1.4 Significant Flora Species

Significant flora within 10 kilometres of the Project Site is provided in the Table A1.4.3 at the end of this section, with Tables A1.4.1 and A1.4.2 below providing the background context for the values in Table 1.4.3.

Table A1.4.1 Likelihood of occurrence rankings: Habitat characteristics assessment of significant flora species previously recorded within 10 kilometres of the Project Site, or that may potentially occur within the Project Site to determine their likelihood of occurrence. The values in this table correspond to Column 8 in Table A1.4.3.

1	Known Occurrence	• Recorded within the Project Site recently (i.e. within ten years).
2	High Likelihood	• Previous records of the species in the local vicinity; and/or, • The Project Site contains areas of high-quality habitat.
3	Moderate Likelihood	• Limited previous records of the species in the local vicinity; and/or • The Project Site contains poor or limited habitat.
4	Low Likelihood	• Poor or limited habitat for the species, however other evidence (such as lack of records or environmental factors) indicates there is a very low likelihood of presence.
5	Unlikely	• No suitable habitat and/or outside the species range.

Table A1.4.2 Significant flora recorded within 10 kilometres of the Project Site.

Scientific name	Common name	Total # of documented records	Last documented record	EPBC	FFG	Likely occurrence (pre-survey program)	Likely occurrence (post-survey program)
NATIONAL SIGNIFICANCE							
*Amphibromus fluitans**	River Swamp Wallaby-grass	-	-	VU	-	1	1
*Caladenia audasii **	McIvor Spider-orchid	-	-	EN	EN	3	3
Caladenia fulva	Tawny Spider-orchid	3	2008	EN	EN	2	3
*Caladenia ornata**	Ornate Pink-fingers	-	-	VU	EN	4	3

Scientific name	Common name	Total # of documented records	Last documented record	EPBC	FFG	Likely occurrence (pre-survey program)	Likely occurrence (post-survey program)
*Caladenia tensa**	Greencomb Spider-orchid	-	-	EN	-	4	4
*Caladenia versicolor**	Candy Spider-orchid	-	-	VU	-	3	3
*Dianella amoena**	Matted Flax-lily	-	-	EN	CR	3	3
*Dodonaea procumbens**	Trailing Hop-bush	-	-	VU	-	3	3
Euphrasia collina subsp. *muelleri**	Purple Eyebright	-	-	EN	EN	3	3
Glycine latrobeana	Clover Glycine	1	1992	VU	VU	3	3
Haloragis exalata var. *exalata*	Square Raspwort	1	2008	VU	-	4	4
*Lachnagrostis adamsonii**	Adamson's Blown-grass	-	-	EN	EN	3	3
*Lepidium monoplocoides**	Winged Peppercress	-	-	EN	EN	4	4
Pimelea spinescens subsp. *spinescens**	Spiny Rice-flower	-	-	CR	CR	3	4
*Prasophyllum subbisectum**	Pomonal Leek-orchid	-	-	EN	EN	4	4
*Prasophyllum validum**	Sturdy Leek-orchid	-	-	VU	-	4	4
*Pterostylis cheraphila**	Floodplain Rustyhood	-	-	VU	VU	4	4
*Rutidosis leptorhynchoides**	Button Wrinklewort	-	-	EN	EN	3	4
*Senecio macrocarpus**	Large-headed Fireweed	-	-	VU	CR	3	4
*Thelymitra matthewsii**	Spiral Sun-orchid	-	-	VU	EN	4	4
*Xerochrysum palustre**	Swamp Everlasting	-	-	VU	CR	4	4
STATE SIGNIFICANCE							
Allocasuarina luehmannii	Buloke	8	2013	-	CR	1	1
Caladenia reticulata s.s.	Veined Spider-orchid	1	2020	-	EN	3	3
Comesperma polygaloides	Small Milkwort	2	1998	-	CR	3	2
Convolvulus graminetinus	Grassland Bindweed	1	2020	-	EN	2	2^

Scientific name	Common name	Total # of documented records	Last documented record	EPBC	FFG	Likely occurrence (pre-survey program)	Likely occurrence (post-survey program)
Daviesia genistifolia s.s.	Broom Bitter-pea	1	2012	-	EN	4	3
Dianella longifolia var. grandis	Flax-lily	1	2012	-	CR	2	2
Diuris behrii	Golden Cowslips	1	2013	-	EN	2	2
Diuris palustris	Swamp Diuris	4	1998	-	EN	2	2
Diuris X palachila	Broad-lip Diuris	1	1980	-	EN	2	2^
Eucalyptus polybractea	Blue Mallee	1	1975	-	EN	3	4
Geranium sp. 3	Pale-flower Crane's-bill	1	2005	-	EN	2	3
Goodenia lineata	Grampians Goodenia	1	1996	-	VU	4	4
Grevillea dryophylla	Goldfields Grevillea	1	1992	-	EN	3	3
Hibbertia humifusa subsp. humifusa	Rising Star Guinea-flower	1	2000	-	EN	3	3
Leucopogon virgatus var. brevifolius	Common Beard-heath	3	2005	-	EN	2	3
Marianthus bignoniaceus	Orange Bell-climber	2	1893	-	EN	4	4
Pterostylis diminuta	Crowded Greenhood	1	1992	-	EN	3	3
Ptilotus erubescens	Hairy Tails	1	1995	-	CR	1	1
Schoenus nanus	Tiny Bog-sedge	4	1981	-	EN	3	3
Thelymitra luteocilium	Fringed Sun-orchid	1	1981	-	VU	2	3
Thelymitra X macmillanii	Crimson Sun-orchid	1	1939	-	VU	3	3

Data Sources: Victorian Biodiversity Atlas (DELWP 2021a); Protected Matters Search Tool (DCCEEW 2022)

Notes: **^** Based on records from Emerge Associates (2020a;b).

APPENDIX 2 - FAUNA

Appendix 2.1 Significant Fauna Species

Significant fauna within 10 kilometres of the Project Site is provided in the Table A2.1.2 at the end of this section.

Table A2.1.1 Likelihood of occurrence rankings: Habitat characteristics assessment of significant fauna species previously recorded within 10 kilometres of the Project Site, or that may potentially occur within the Project Site to determine their likelihood of occurrence. The values in this table correspond to Column 9 in Table A2.1.3.

1	High Likelihood	• Known resident in the Project Site based on site observations, database records, or expert advice; and/or, • Recent records (i.e. within five years) of the species in the local area (DELWP 2018); and/or, • The Project Site contains the species' preferred habitat.
2	Moderate Likelihood	• The species is likely to visit the Project Site regularly (i.e. at least seasonally); and/or, • Previous records of the species in the local area (DELWP 2018); and/or, • The Project Site contains some characteristics of the species' preferred habitat.
3	Low Likelihood	• The species is likely to visit the Project Site occasionally or opportunistically whilst en route to more suitable sites; and/or, • There are only limited or historical records of the species in the local area (i.e. more than 20 years old); and/or, • The Project Site contains few or no characteristics of the species' preferred habitat.
4	Unlikely	• No previous records of the species in the local area; and/or, • The species may fly over the Project Site when moving between areas of more suitable habitat; and/or, • Out of the species' range; and/or, • No suitable habitat present.

Table A2.1.2. Significant fauna within 10 kilometres of the Project Site.

Scientific name	Common name	Total # of documented records	Last documented record	EPBC	FFG	Likely occurrence (pre-survey program)	Likely occurrence (post-survey program)
NATIONAL SIGNIFICANCE							
Aprasia parapulchella#	Pink-tailed Worm-lizard	-	-	VU	EN	4	4
Botaurus poiciloptilus#	Australasian Bittern	-	-	EN	CR	4	4
Calidris ferruginea#	Curlew Sandpiper	-	-	CR	CR	4	4
Delma impar#	Striped Legless Lizard	-	-	VU	EN	3	3
Falco hypoleucos#	Grey Falcon	-	-	VU	VU	3	3
Grantiella picta#	Painted Honeyeater	-	-	VU	VU	3	3
Hirundapus caudacutus	White-throated Needletail	6	2014	VU	VU	3	3
Isoodon obesulus obesulus#	Southern Brown Bandicoot	-	-	EN	EN	3	3
Lathamus discolour	Swift Parrot	11	2019	CR	CR	1	1
Leipoa ocellate#	Malleefowl	-	-	VU	VU	3	3
Litoria raniformis	Growling Grass Frog	6	1788	VU	VU	3	3
Maccullochella peelii#	Murray Cod	-	-	VU	EN	3	3
Numenius madagascariensis#	Eastern Curlew	-	-	CR	CR	3	3
Pedionomous torquatus#	Plains-wanderer	-	-	CR	CR	3	4
Potorous tridactylus trisulcatus#	Long-nosed Potoroo	-	-	VU	VU	3	3
Rostratula australis#	Australian Painted-snipe	-	-	EN	CR	3	3
Synemon plana#	Golden Sun Moth	-	-	`CR	VU	1	1
STATE SIGNIFICANCE							
Antigone rubicunda	Brolga	5	2008	-	EN	3	3
Aythya australis	Hardhead	1	1989	-	VU	2	1

Scientific name	Common name	Total # of documented records	Last documented record	EPBC	FFG	Likely occurrence (pre-survey program)	Likely occurrence (post-survey program)
Burhinus grallarius	Bush Stone-curlew	3	2011	-	CR	2	3
Hieraaetus morphnoides	Little Eagle	5	2013	-	VU	2	3
Melanodryas cucullata	Hooded Robin	8	2019	-	VU	2	1
Ninox strenua	Powerful Owl	4	2019	-	VU	2	3
Oreoica gutturalis	Crested Bellbird	1	1894	-	EN	3	3
Ornithorhynchus anatinus	Platypus	1	1998	-	VU	3	3
Petaurus norfolcensis	Squirrel Glider	8	1988	-	VU	2	2
Pogona barbata	Bearded Dragon	4	2013	-	VU	3	3
Pseudophryne bibronii	Brown Toadlet	12	1983	-	EN	2	3
Sminthopsis murina murina	Common Dunnart	1	1979	-	VU	2	3
Spatula rhynchotis	Australasian Shoveler	1	1991	-	VU	3	3
Stagonopleura guttata	Diamond Firetail	10	2019	-	VU	3	3
Varanus varius	Lace Monitor	2	2000	-	EN	2	2

Appendix 2.2 Fauna List

Legend:

VU Listed as Vulnerable under the EPBC Act;

en/vu Listed as endangered/vulnerable/ in Victoria under FFG Act (DELWP 2022e);

***** Non-native species

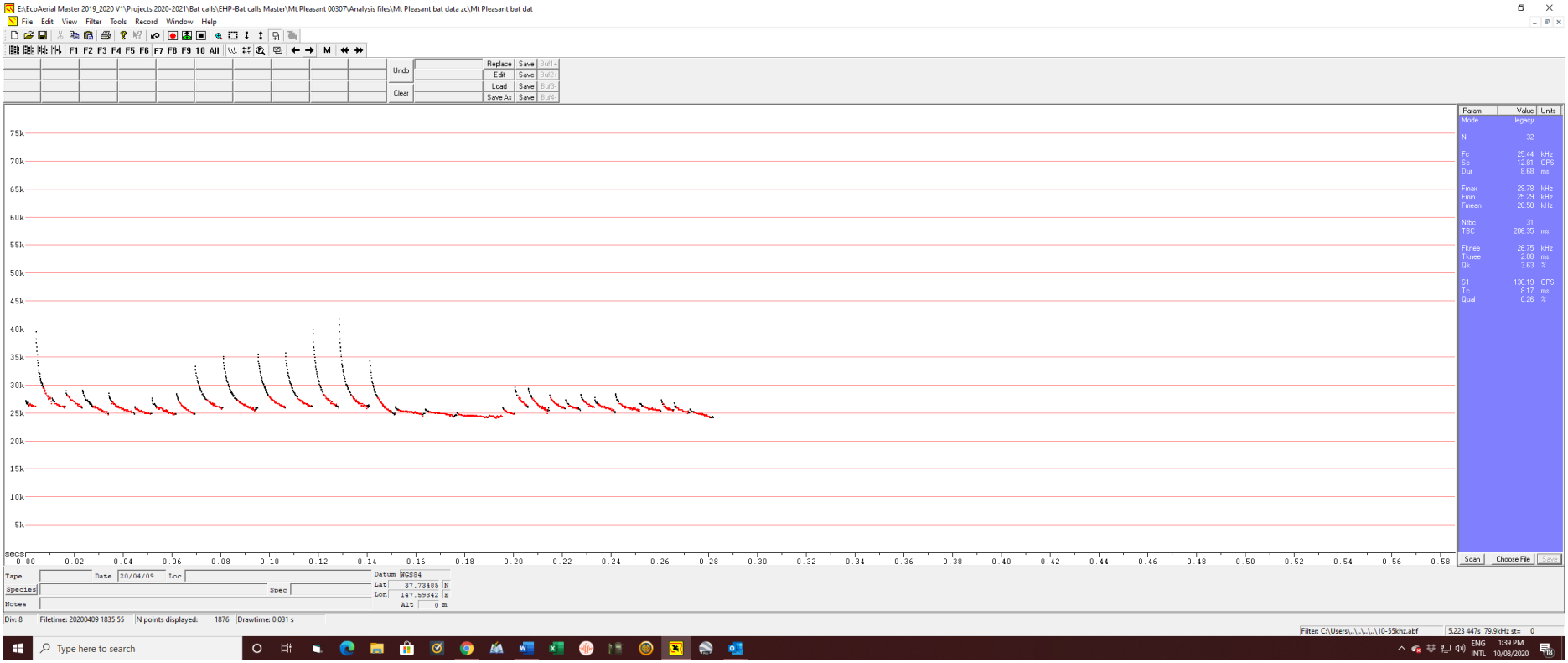
Table A2.2.1. Fauna recorded during the ecological surveys

Common Name	Scientific Name	Comment
BIRDS		
Australasian Pipit	*Anthus novaeseelandiae*	
Australian Magpie	*Gymnorhina tibicen*	
Australian Raven	*Corvus coronoides*	
Australian Shelduck	*Tadorna tadornoides*	
Australian Wood Duck	*Chenonetta jubata*	
Black Kite	*Milvus migrans*	
Black-faced Cuckoo-shrike	*Coracina novaehollandiae*	
Black-shouldered Kite	*Elanus axillaris*	
Brown Falcon	*Falco berigora*	
Brown Songlark	*Cincloramphus cruralis*	
Brown Treecreeper (south-eastern ssp.)	*Climacteris picumnus victoriae*	
Brown-headed Honeyeater	*Melithreptus brevirostris*	
Buff-rumped Thornbill	*Acanthiza reguloides*	
Chestnut-rumped Thornbill	*Acanthiza uropygialis*	
Collared Sparrowhawk	*Accipiter cirrhocephalus*	
Common Bronzewing	*Phaps chalcoptera*	
Common Starling	*Sturnus vulgaris*	*
Crested Pigeon	*Ocyphaps lophotes*	
Crested Shrike-tit	*Falcunculus frontatus*	
Crimson Rosella	*Platycercus elegans*	
Dusky Woodswallow	*Artamus cyanopterus*	
Eastern Rosella	*Platycercus eximius*	
European Skylark	*Alauda arvensis*	*
Flame Robin	*Petroica phoenicea*	
Fuscous Honeyeater	*Lichenostomus fuscus*	
Galah	*Eolophus roseicapilla*	
Golden-headed Cisticola	*Cisticola exilis*	

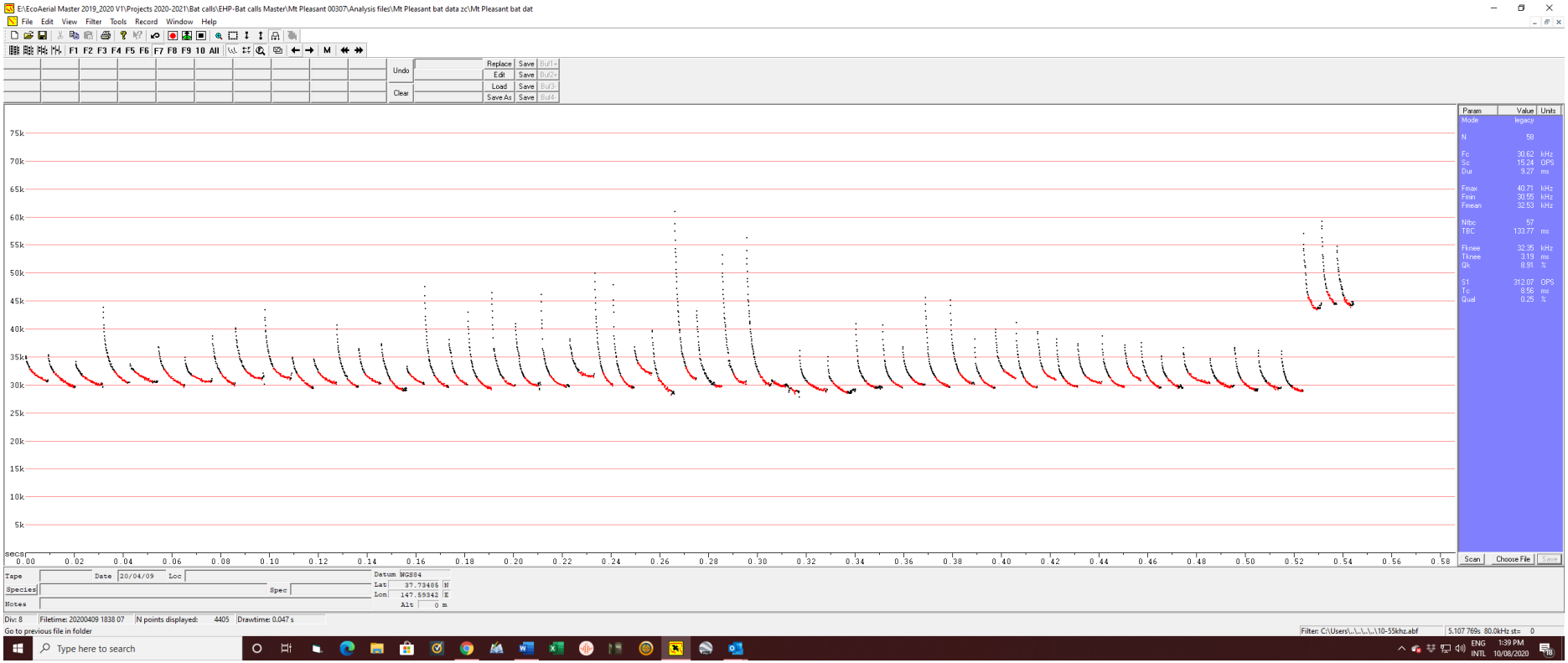
Common Name	Scientific Name	Comment
Grey Shrike-thrush	*Colluricincla harmonica*	
Hardhead	*Aythya australis*	vu
Hooded Robin	*Melanodryas cucullata cucullata*	vu
House Sparrow	*Passer domesticus*	*
Jacky Winter	*Microeca fascinans*	
Laughing Kookaburra	*Dacelo novaeguineae*	
Little Corella	*Cacatua sanguinea*	
Little Raven	*Corvus mellori*	
Little Wattlebird	*Anthochaera chrysoptera*	
Long-billed Corella	*Cacatua tenuirostris*	
Magpie-lark	*Grallina cyanoleuca*	
Mistletoebird	*Dicaeum hirundinaceum*	
Musk Lorikeet	*Glossopsitta concinna*	
Nankeen Kestrel	*Falco cenchroides*	
New Holland Honeyeater	*Phylidonyris novaehollandiae*	
Noisy Miner	*Manorina melanocephala*	
Pied Currawong	*Strepera graculina*	
Purple-crowned Lorikeet	*Glossopsitta porphyrocephala*	
Rainbow Bee-eater	*Merops ornatus*	
Rainbow Lorikeet	*Trichoglossus haematodus*	
Red Wattlebird	*Anthochaera carunculata*	
Red-rumped Parrot	*Psephotus haematonotus*	
Restless Flycatcher	*Myiagra inquieta*	
Rufous Songlark	*Cincloramphus mathewsi*	
Rufous Whistler	*Pachycephala rufiventris*	
Southern Whiteface	*Aphelocephala leucopsis*	
Speckled Warbler	*Chthonicola sagittatus*	en
Spotted Pardalote	*Pardalotus punctatus*	
Straw-necked Ibis	*Threskiornis spinicollis*	
Striated Pardalote	*Pardalotus striatus*	
Stubble Quail	*Coturnix pectoralis*	
Sulphur-crested Cockatoo	*Cacatua galerita*	
Superb Fairy-wren	*Malurus cyaneus*	
Tree Martin	*Petrochelidon nigricans*	
Wedge-tailed Eagle	*Aquila audax*	
Weebill	*Smicrornis brevirostris*	

Common Name	Scientific Name	Comment
Welcome Swallow	*Petrochelidon neoxena*	
White-breasted Woodswallow	*Artamus leucorynchus*	
White-browed Scrubwren	*Sericornis frontalis*	
White-faced Heron	*Egretta novaehollandiae*	
White-fronted Chat	*Epthianura albifrons*	
White-plumed Honeyeater	*Lichenostomus penicillatus*	
White-throated Treecreeper	*Cormobates leucophaeus*	
White-winged Chough	*Corcorax melanorhamphos*	
Willie Wagtail	*Rhipidura leucophrys*	
Yellow Thornbill	*Acanthiza nana*	
Yellow-faced Honeyeater	*Lichenostomus chrysops*	
Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*	
Yellow-tufted Honeyeater	*Lichenostomus melanops*	
MAMMALS		
Black Wallaby	*Wallabia bicolor*	
Chocolate Wattled Bat	*Chalinolobus morio*	
Eastern Falsistrelle	*Falsistrellus tasmaniensis*	
Eastern Grey Kangaroo	*Macropus giganteus*	
European Rabbit	*Oryctolagus cuniculus*	*
Gould's Wattled Bat	*Chalinolobus gouldii*	
Inland Broad-nosed Bat	*Scotorepens balstoni*	
Large Forest Bat	*Vespadelus darlingtoni*	
Little Forest Bat	*Vespadelus vulturnus*	
Red Fox	*Vulpes vulpes*	*
Southern Freetail Bat	*Ozimops planiceps*	
White-striped Freetail Bat	*Tadarida australis*	
INVERTEBRATES		
Golden Sun Moth	*Synemon plana*	VU; vu

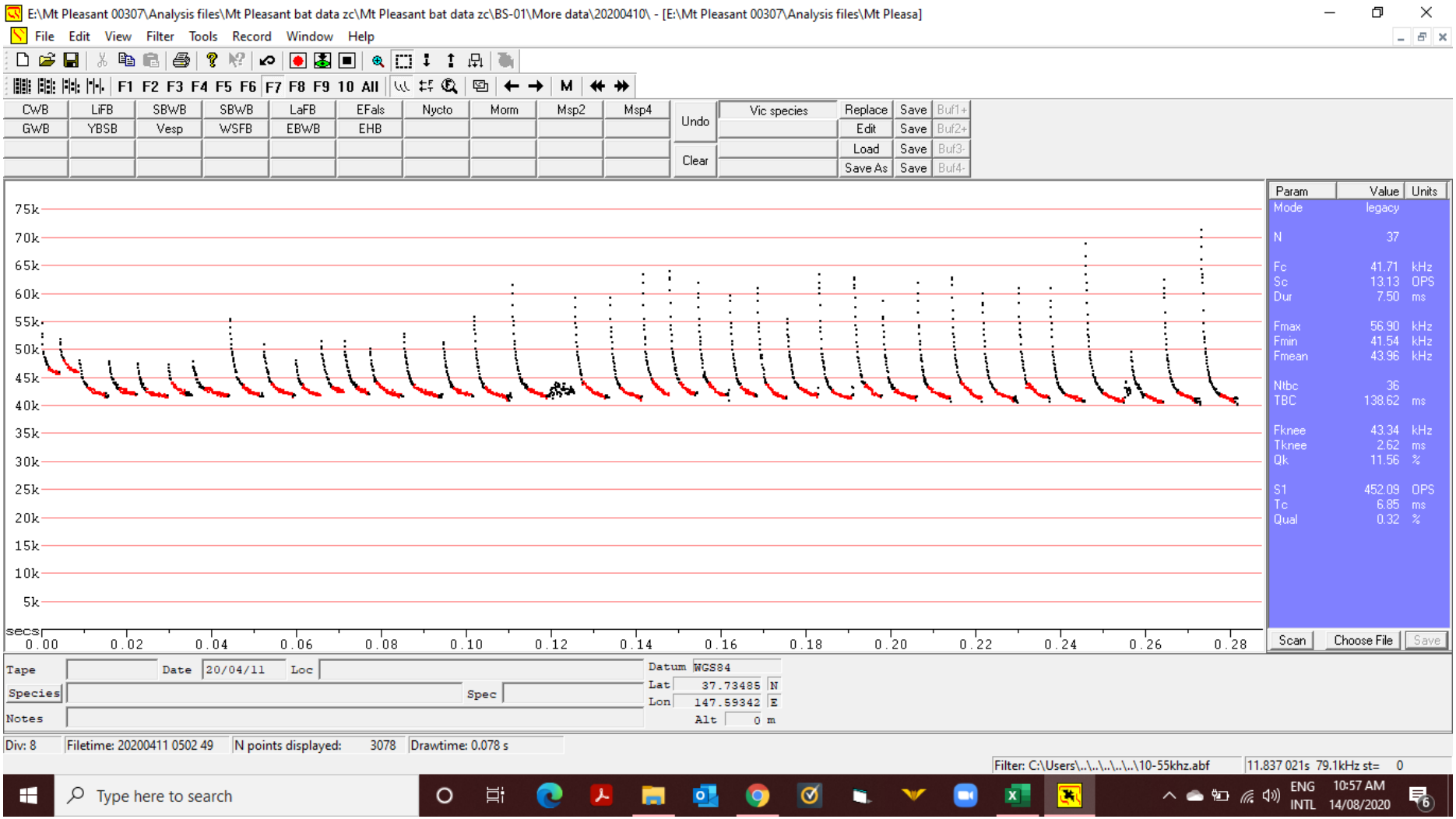
APPENDIX 3 - ANABAT CALL ANALYSIS



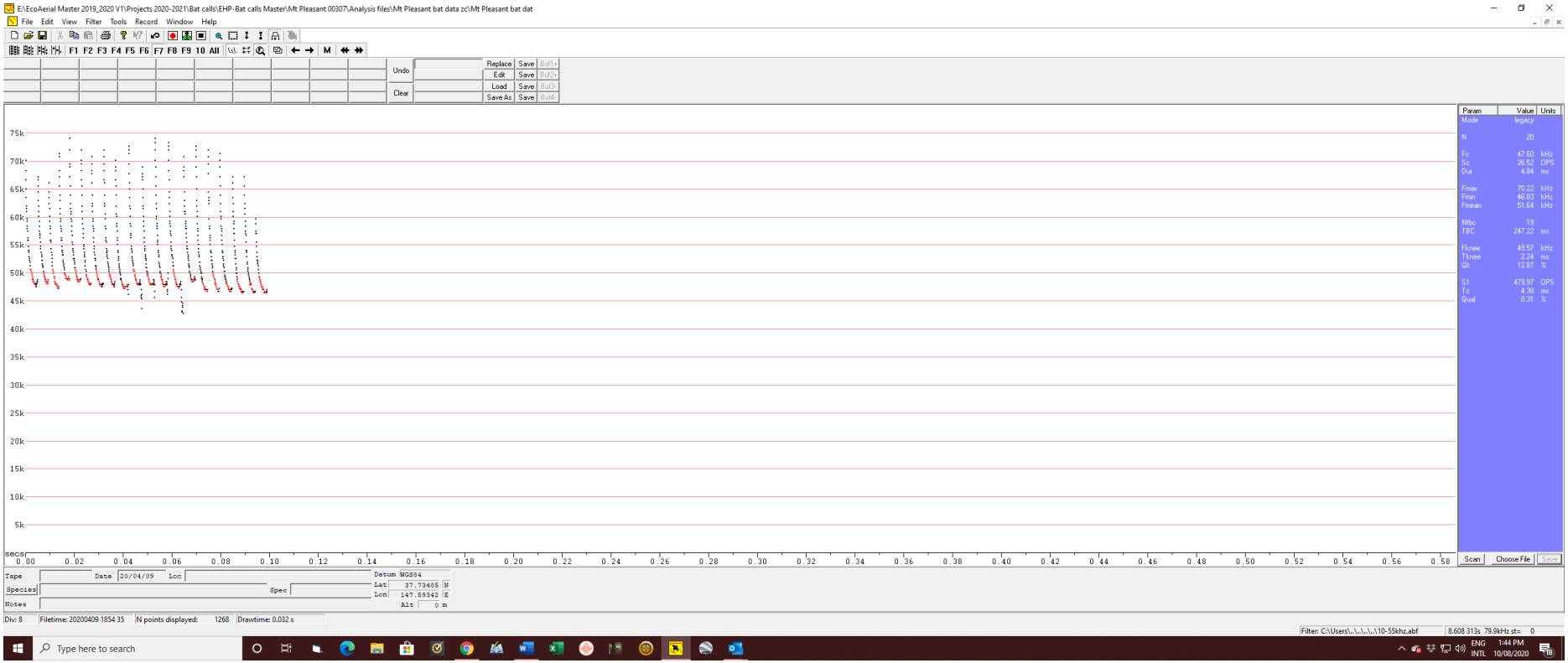
South-eastern Freetail bat



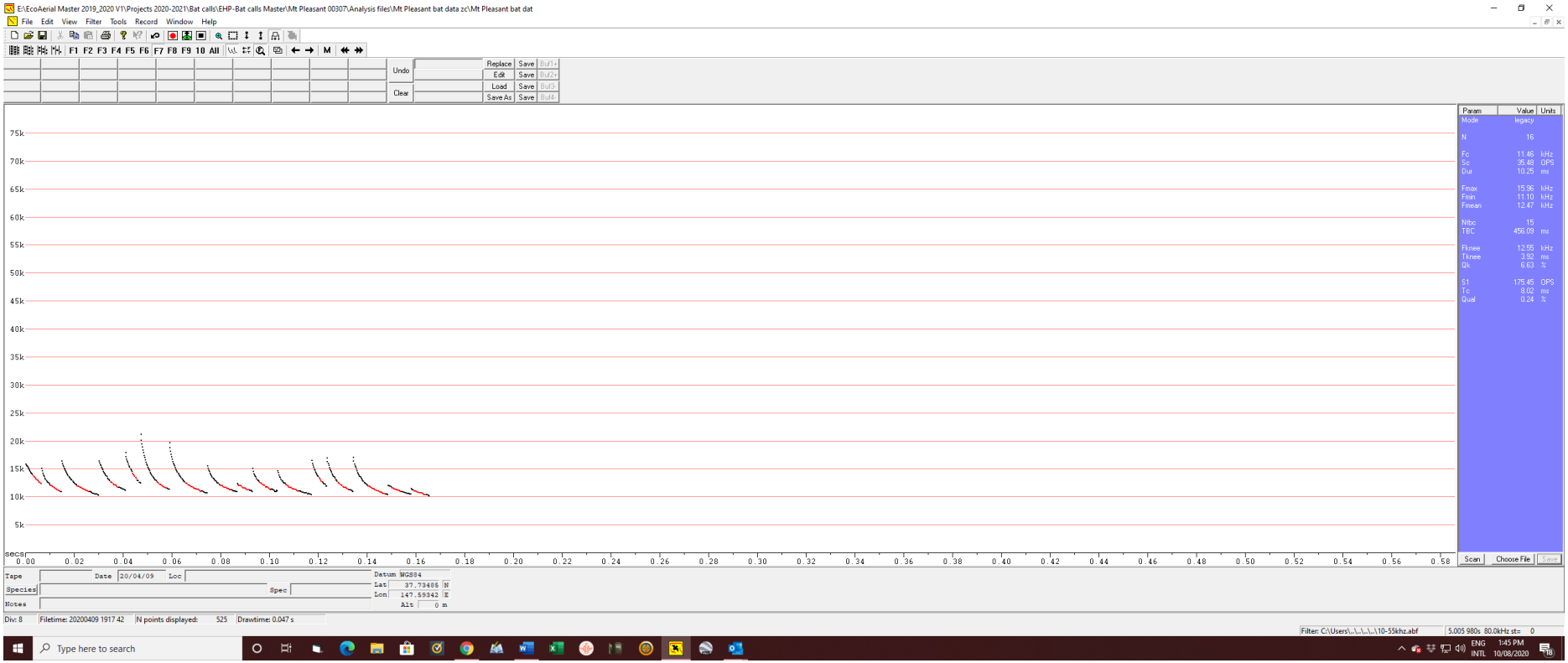
Gould's Wattled bat



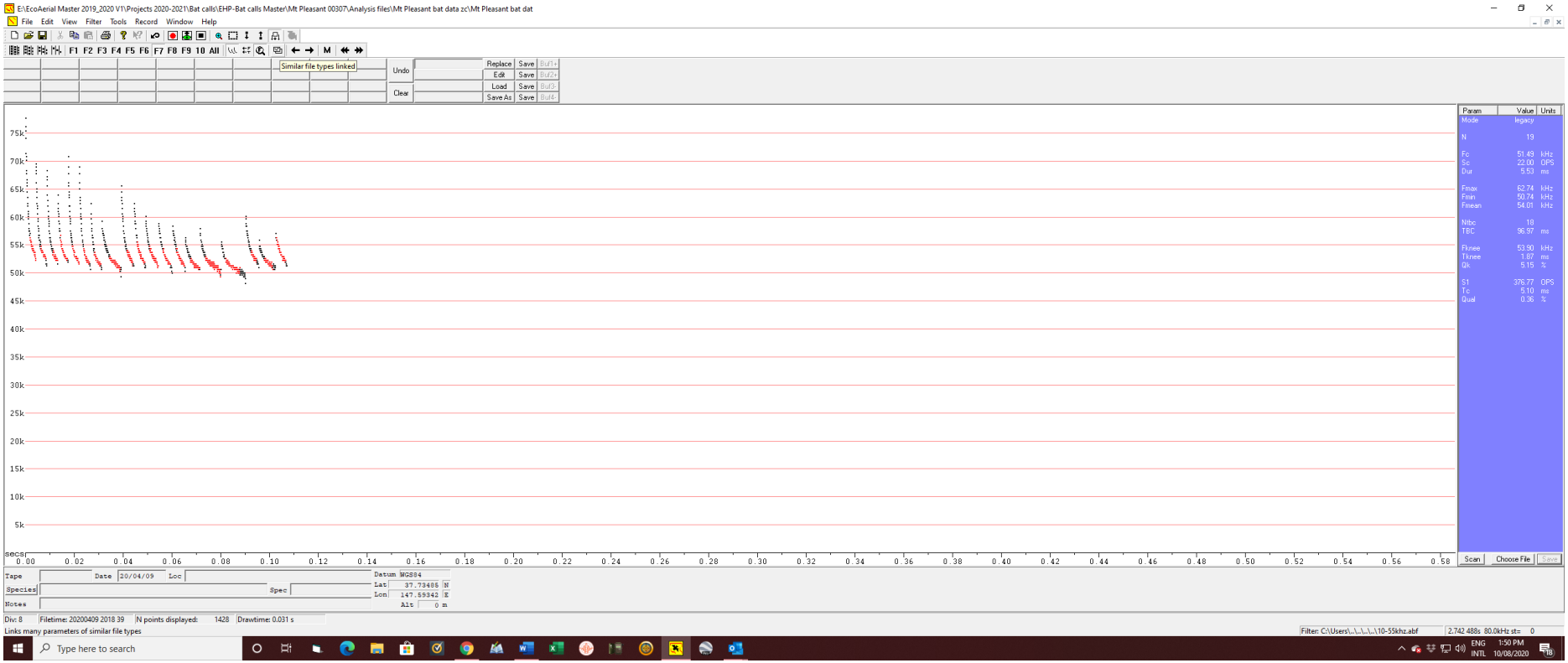
Large Forest Bat



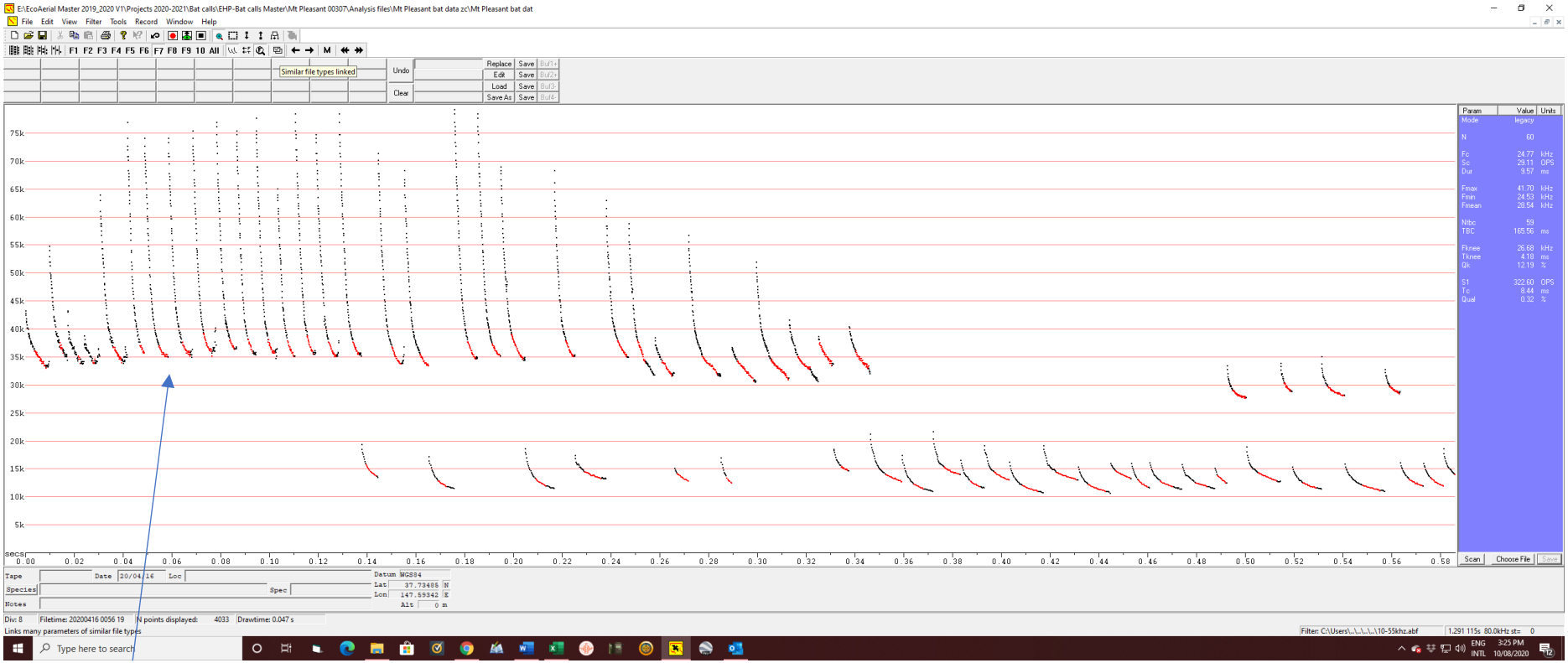
Little Forest Bat



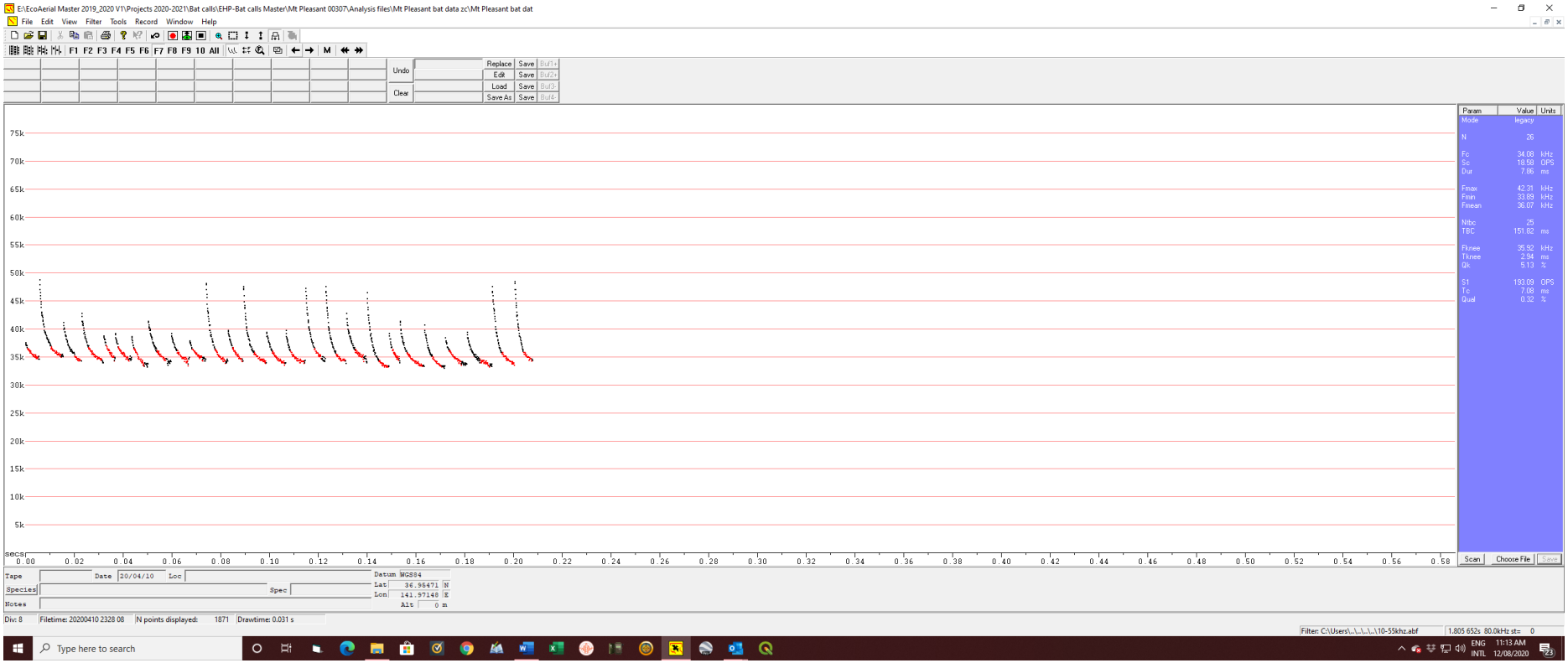
White-striped Freetail Bat



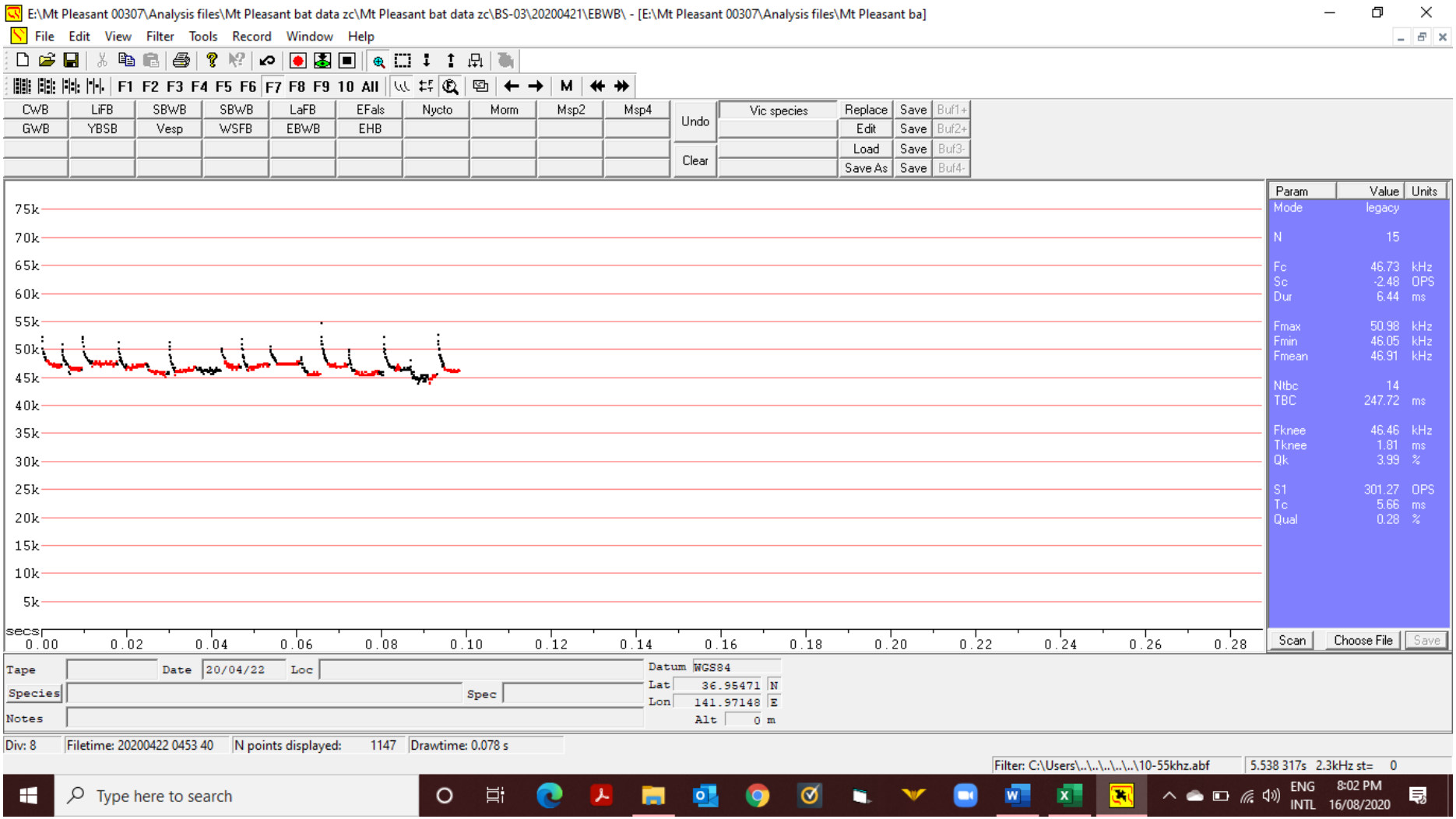
Chocolate Wattled bat



Inland Broad-nosed Bat



Eastern Falsistrelle



Eastern Bent-wing Bat / Large Forest Bat complex- Call characteristics are indicative of 13 EBWB / LFB complex calls recorded. The call frequency and call shape are similar to EBWB but lacks the down turning tail used as a characteristic feature used for a positive identification. The call shape is consistent with LFB but approximately 4-5kHz higher than that used for a positive identification.

APPENDIX 4 – EDNA ANALYSIS

Project number 2132CR1
December 2, 2021

Assessing presence of platypuses and growling grass frogs using eDNA.

Prepared for:
Shannon LeBel

Ecology & Heritage Partners

Prepared by:
Josh Griffiths, Sarah Licul, and Dr Rachael Impey.

EnviroDNA
95 Albert St
Brunswick, VIC 3056
Australia

Disclaimer

The professional analysis and advice in this report has been prepared for the exclusive use of the party or parties to whom it is addressed (the addressee) and for the purposes specified in it. This report is supplied in good faith and reflects the knowledge, expertise and experience of the consultants involved. The report must not be published, quoted or disseminated to any other party without prior written consent from EnviroDNA pty ltd.

EnviroDNA pty ltd accepts no responsibility whatsoever for any loss occasioned by any person acting or refraining from action as a result of reliance on the report. In conducting the analysis in this report EnviroDNA pty ltd has endeavoured to use what it considers is the best information available at the date of publication including information supplied by the addressee. Unless stated otherwise EnviroDNA pty ltd does not warrant the accuracy of any forecast or prediction in this report.

EnviroDNA Pty Ltd
+61 3 9028 8753
envirodna.com

Summary

A key challenge for biodiversity conservation is understanding species occurrence or distribution. Determining the presence or absence of a species is integral to making informed management decisions. Unfortunately, detecting species, particularly in an aquatic environment, can often be difficult, time consuming, expensive, and highly invasive. Analysis of environmental DNA (eDNA) is a relatively new, cheap, quick and non-invasive method for detecting species (Rees *et al.* 2014; McColl-Gausden *et al.* 2019; Thomsen and Willerslev 2015). As the name suggests, eDNA refers to the genetic material that an organism leaves behind in its environment. Quantitative comparisons with traditional sampling methods indicate that eDNA methods can be superior in terms of sensitivity and cost efficiency, particularly for scarce, elusive or cryptic species (Biggs *et al.* 2015; Smart *et al.* 2015; Thomsen *et al.* 2012; Valentini *et al.* 2016; Lugg *et al.* 2018), enabling effective detection of species at low densities.

On 19-20th October 2021, water samples were collected from 13 sites by Ecology & Heritage Partners staff following sampling protocols developed by EnviroDNA. At each site, 2 samples were collected by passing up to 230 mL water (average 96 mL) through a 0.22 μm filter (Sterivex) on site. Filtering on site reduces DNA degradation that may occur during transport of water (Yamanaka *et al.* 2016). A small amount of 100% ethanol was flushed through the filters to minimise sample degradation. Clean sampling protocols were employed to minimise contamination including new sampling equipment at each site, not entering water, and taking care not to transfer soil, water or vegetation between sites. Filters were stored cool, dry, and out of sunlight before being transported to the laboratory for processing.

DNA was extracted from the filters using a commercially available DNA extraction kit (Qiagen DNeasy Blood and Tissue Kit). Real-time quantitative Polymerase Chain Reaction (qPCR) assays were used to amplify the target DNA, using a species-specific probe targeting a small region of the mitochondrial genome of the target species. Assays were performed in triplicate on each sample. Positive and negative controls were included for all assays as well as an Internal Positive Control (IPC) to detect inhibition (Goldberg *et al.* 2016). Two positive PCR's (out of six assays undertaken for each site) were required to classify the sample as positive for the presence of the target species. To minimise false positives, samples were considered equivocal if only 1 assay returned a positive result, indicating very low levels of target DNA. While trace amounts of DNA may indicate the target species is actually present in low abundance, it may also arise from sample contamination through the sampling or laboratory screening process (minimised through strict protocols and negative controls), facilitated movement of DNA between waterbodies (i.e. water birds, recreational anglers, water transfers, predator scats), or dispersal from further upstream in lotic systems. If greater confidence is required, further sampling is recommended at equivocal sites to confirm the presence or absence of the target species. Repeat sampling is also recommended to help determine the tenure of the species at a site (i.e. resident or transient).

Results are summarised in Tables 1-2 below. No DNA from either platypuses or growling grass frog were detected in any of the samples analysed.

EnviroDNA Pty Ltd
+61 3 9028 8753
envirodna.com

Table 1. Results for eDNA screening of water samples for platypuses (*Ornithorhynchus anatinus*).

Site Code	Waterway	Latitude	Longitude	Date sampled	qPCRs +ve	Test Result
WB1		not provided	not provided	19/10/21	0/6	Negative
WB2	7 Mile Ck	not provided	not provided	19/10/21	0/6	Negative
WB3	7 Mile Ck	not provided	not provided	19/10/21	0/6	Negative
WB4		not provided	not provided	19/10/21	0/6	Negative
WB5	6 Mile Ck	not provided	not provided	19/10/21	0/6	Negative
WB6		not provided	not provided	20/10/21	0/6	Negative
WB7		not provided	not provided	20/10/21	0/6	Negative
WB8	Wimmera River	not provided	not provided	20/10/21	0/6	Negative
WB9	Wimmera River	not provided	not provided	20/21/21	0/6	Negative
WB10	6 Mile Ck	not provided	not provided	20/10/21	0/6	Negative
WB11	Wimmera River	not provided	not provided	20/10/21	0/6	Negative
WB12	Wimmera River	not provided	not provided	20/10/21	0/6	Negative
WB13	7 Mile Ck	not provided	not provided	20/10/21	0/6	Negative
negative					0/3	Negative
positive					3/3	Positive

EnviroDNA Pty Ltd
+61 3 9028 8753
envirodna.com

Table 2. Results for eDNA screening of water samples for growling grass frog (*Litoria raniformis*).

Site Code	Waterway	Latitude	Longitude	Date sampled	qPCRs +ve	Test Result
WB1		not provided	not provided	19/10/21	0/6	Negative
WB2	7 Mile Ck	not provided	not provided	19/10/21	0/6	Negative
WB3	7 Mile Ck	not provided	not provided	19/10/21	0/6	Negative
WB4		not provided	not provided	19/10/21	0/6	Negative
WB5	6 Mile Ck	not provided	not provided	19/10/21	0/6	Negative
WB6		not provided	not provided	20/10/21	0/6	Negative
WB7		not provided	not provided	20/10/21	0/6	Negative
WB8	Wimmera River	not provided	not provided	20/10/21	0/6	Negative
WB9	Wimmera River	not provided	not provided	20/21/21	0/6	Negative
WB10	6 Mile Ck	not provided	not provided	20/10/21	0/6	Negative
WB11	Wimmera River	not provided	not provided	20/10/21	0/6	Negative
WB12	Wimmera River	not provided	not provided	20/10/21	0/6	Negative
WB13	7 Mile Ck	not provided	not provided	20/10/21	0/6	Negative
negative					0/3	Negative
positive					3/3	Positive

EnviroDNA Pty Ltd
+61 3 9028 8753
envirodna.com

References

Biggs J., Ewald N., Valentini A. *et al.* (2015) Using eDNA to develop a national citizen science-based monitoring programme for the great crested newt (*Triturus cristatus*). *Biol. Conserv.* doi: 10.1016/j.biocon.2014.11.029. [online].

Goldberg C. S., Turner C. R., Deiner K. *et al.* (2016) Critical considerations for the application of environmental DNA methods to detect aquatic species. *Methods Ecol. Evol.* **7** , 1299–1307.

Lugg W. H., Griffiths J., van Rooyen A. R., Weeks A. R. & Tingley R. (2018) Optimal survey designs for environmental DNA sampling. *Methods Ecol. Evol.* **9** , 1049–1059.

McColl-Gausden E. F., Weeks A. R. & Tingley R. (2019) A field ecologist's guide to environmental DNA sampling in freshwater environments. *Aust. Zool.* doi: 10.7882/az.2019.025.

Rees H. C., Maddison B. C., Middleditch D. J., Patmore J. R. M. & Gough K. C. (2014) REVIEW: The detection of aquatic animal species using environmental DNA – a review of eDNA as a survey tool in ecology. *J. Appl. Ecol.* **51** , 1450–1459. [online].

Smart A. S., Tingley R., Weeks A. R., Van Rooyen A. R. & McCarthy M. A. (2015) Environmental DNA sampling is more sensitive than a traditional survey technique for detecting an aquatic invader. *Ecol. Appl.* **25** , 1944–1952.

Thomsen P. F., Kielgast J., Iversen L. L. *et al.* (2012) Monitoring endangered freshwater biodiversity using environmental DNA. *Mol. Ecol.* **21** , 2565–2573.

Thomsen P. F. & Willerslev E. (2015) Environmental DNA - An emerging tool in conservation for monitoring past and present biodiversity. *Biol. Conserv.* doi: 10.1016/j.biocon.2014.11.019. [online].

Valentini A., Taberlet P., Miaud C. *et al.* (2016) Next-generation monitoring of aquatic biodiversity using environmental DNA metabarcoding. *Mol. Ecol.* **25** , 929–942.

Yamanaka H., Motozawa H., Tsuji S., Miyazawa R. C., Takahara T. & Minamoto T. (2016) On-site filtration of water samples for environmental DNA analysis to avoid DNA degradation during transportation. *Ecol. Res.* **31** , 963–967.

EnviroDNA Pty Ltd
+61 3 9028 8753
envirodna.com

APPENDIX 5 – NATIVE VEGETATION REMOVAL REPORT

Native vegetation removal report

This report provides information to support an application to remove, destroy or lop native vegetation in accordance with the *Guidelines for the removal, destruction or lopping of native vegetation*. The report **is not an assessment by DELWP** of the proposed native vegetation removal. Native vegetation information and offset requirements have been determined using spatial data provided by the applicant or their consultant.

Date of issue: **14/07/2022**
Time of issue: **12:34 am**

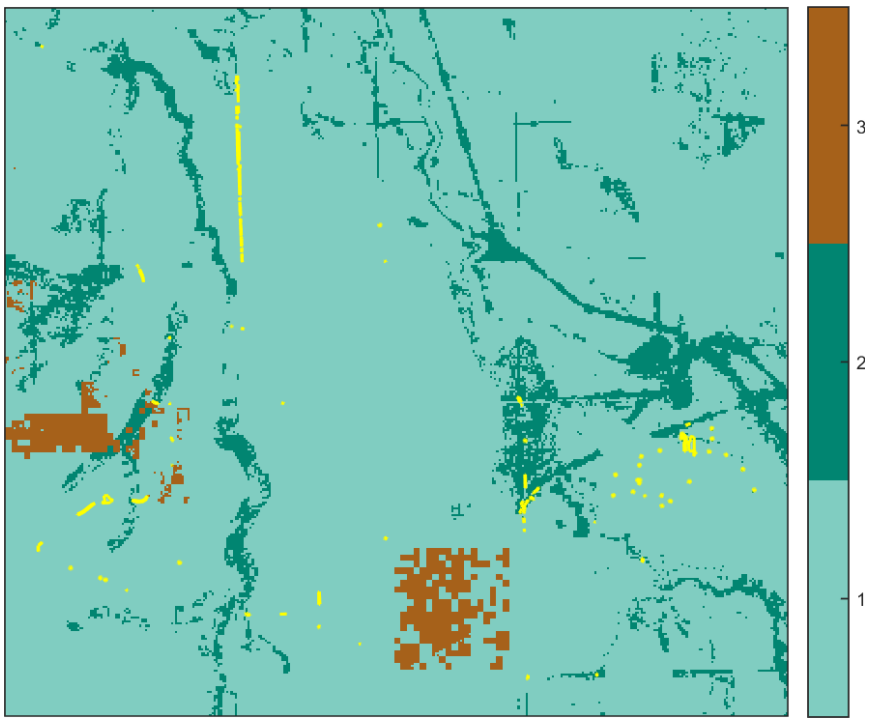
Report ID: EHP_2022_071

Project ID	EHP13637_JoelJoel_VG94

Assessment pathway

Assessment pathway	**Detailed Assessment Pathway**
Extent including past and proposed	7.674 ha
Extent of past removal	0.000 ha
Extent of proposed removal	7.674 ha
No. Large trees proposed to be removed	64
Location category of proposed removal	Location 3 The native vegetation is in an area where the removal of less than 0.5 hectares could have a significant impact on habitat for one or more rare or threatened species.The native vegetation is also in an area mapped as an endangered Ecological Vegetation Class (as per the statewide EVC map).

1. Location map



Offset requirements if a permit is granted

Any approval granted will include a condition to obtain an offset that meets the following requirements:

General offset amount[1]	2.373 general habitat units
Vicinity	Wimmera Catchment Management Authority (CMA) or Northern Grampians Shire Council
Minimum strategic biodiversity value score[2]	0.271
Large trees	64 large trees

NB: values within tables in this document may not add to the totals shown above due to rounding

Appendix 1 includes information about the native vegetation to be removed

Appendix 2 includes information about the rare or threatened species mapped at the site.

Appendix 3 includes maps showing native vegetation to be removed and extracts of relevant species habitat importance maps

1 The general offset amount required is the sum of all general habitat units in Appendix 1.

2 Minimum strategic biodiversity score is 80 per cent of the weighted average score across habitat zones where a general offset is required

Next steps

Any proposal to remove native vegetation must meet the application requirements of the Detailed Assessment Pathway and it will be assessed under the Detailed Assessment Pathway.

If you wish to remove the mapped native vegetation you are required to apply for a permit from your local council. Council will refer your application to DELWP for assessment, as required. **This report is not a referral assessment by DELWP.**

This *Native vegetation removal report* must be submitted with your application for a permit to remove, destroy or lop native vegetation.

Refer to the *Guidelines for the removal, destruction or lopping of native* vegetation (the Guidelines) for a full list of application requirements This report provides information that meets the following application requirements:

- The assessment pathway and reason for the assessment pathway
- A description of the native vegetation to be removed (partly met)
- Maps showing the native vegetation and property (partly met)
- Information about the impacts on rare or threatened species.
- The offset requirements determined in accordance with section 5 of the Guidelines that apply if approval is granted to remove native vegetation.

Additional application requirements must be met including:

- Topographical and land information
- Recent dated photographs
- Details of past native vegetation removal
- An avoid and minimise statement
- A copy of any Property Vegetation Plan that applies
- A defendable space statement as applicable
- A statement about the Native Vegetation Precinct Plan as applicable
- A site assessment report including a habitat hectare assessment of any patches of native vegetation and details of trees
- An offset statement that explains that an offset has been identified and how it will be secured.

Authorised by the Victorian Government, 8 Nicholson Street, East Melbourne.

For more information contact the DELWP Customer Service Centre 136 186

www.delwp.vic.gov.au

Appendix 1: Description of native vegetation to be removed

The species-general offset test was applied to your proposal. This test determines if the proposed removal of native vegetation has a proportional impact on any rare or threatened species habitats above the species offset threshold. The threshold is set at 0.005 per cent of the mapped habitat value for a species. When the proportional impact is above the species offset threshold a species offset is required. This test is done for all species mapped at the site. Multiple species offsets will be required if the species offset threshold is exceeded for multiple species.

Where a zone requires species offset(s), the species habitat units for each species in that zone is calculated by the following equation in accordance with the Guidelines:

Species habitat units = extent x condition x species landscape factor x 2, where the species landscape factor = 0.5 + (habitat importance score/2)

The species offset amount(s) required is the sum of all species habitat units per zone

Where a zone does not require a species offset, the general habitat units in that zone is calculated by the following equation in accordance with the Guidelines:

General habitat units = extent x condition x general landscape factor x 1.5, where the general landscape factor = 0.5 + (strategic biodiversity value score/2)

The general offset amount required is the sum of all general habitat units per zone.

Native vegetation to be removed

Information provided by or on behalf of the applicant in a GIS file							Information calculated by EnSym					
Zone	Type	BioEVC	BioEVC conservation status	Large tree(s)	Partial removal	Condition score	Polygon Extent	Extent without overlap	SBV score	HI score	Habitat units	Offset type
1-PA	Patch	gold0803	Endangered	0	no	0.250	0.012	0.012	0.100		0.002	General
2-GA	Patch	gold0175	Vulnerable	0	no	0.250	0.023	0.023	0.100		0.005	General
3-PC	Patch	gold0803	Endangered	0	no	0.420	0.288	0.288	0.538		0.139	General
4-PB	Patch	gold0803	Endangered	1	no	0.370	0.027	0.027	0.730		0.013	General
5-GB	Patch	gold0175	Vulnerable	3	no	0.370	0.110	0.110	0.651		0.050	General
6-PB	Patch	gold0803	Endangered	1	no	0.370	0.079	0.079	0.540		0.034	General
7-CA	Patch	gold0068	Endangered	0	no	0.320	0.025	0.025	0.671		0.010	General
8-PB	Patch	gold0803	Endangered	0	no	0.370	0.035	0.035	0.680		0.016	General
9-CA	Patch	gold0068	Endangered	0	no	0.320	0.009	0.009	0.310		0.003	General
10-PB	Patch	gold0803	Endangered	0	no	0.370	0.003	0.003	0.310		0.001	General

Information provided by or on behalf of the applicant in a GIS file							Information calculated by EnSym					
Zone	Type	BioEVC	BioEVC conservation status	Large tree(s)	Partial removal	Condition score	Polygon Extent	Extent without overlap	SBV score	HI score	Habitat units	Offset type
11-HB	Patch	gold0048	Depleted	0	no	0.360	0.003	0.003	0.840		0.002	General
12-CB	Patch	gold0068	Endangered	0	no	0.310	0.020	0.020	0.480		0.007	General
13-PB	Patch	gold0803	Endangered	0	no	0.370	0.011	0.011	0.360		0.004	General
14-PB	Patch	gold0803	Endangered	1	no	0.370	0.041	0.041	0.442		0.016	General
19-CB	Patch	gold0068	Endangered	0	no	0.310	0.007	0.007	0.100		0.002	General
20-CB	Patch	gold0068	Endangered	0	no	0.310	0.063	0.063	0.530		0.022	General
21-GB	Patch	gold0175	Vulnerable	1	no	0.370	0.013	0.013	0.310		0.005	General
22-CB	Patch	gold0068	Endangered	0	no	0.310	0.012	0.012	0.480		0.004	General
23-GB	Patch	gold0175	Vulnerable	0	no	0.370	0.017	0.017	0.100		0.005	General
24-PW	Patch	gold0125	Endangered	0	no	0.440	0.015	0.015	0.261		0.006	General
25-GB	Patch	gold0175	Vulnerable	0	no	0.370	0.006	0.006	0.480		0.003	General
26-GB	Patch	gold0175	Vulnerable	1	no	0.370	0.034	0.034	0.300		0.012	General
27-CA	Patch	gold0068	Endangered	8	no	0.320	0.086	0.086	0.350		0.028	General
28-GB	Patch	gold0175	Vulnerable	0	no	0.370	0.040	0.040	0.540		0.017	General
29-GC	Patch	gold0175	Vulnerable	0	no	0.540	0.076	0.076	0.320		0.041	General

Information provided by or on behalf of the applicant in a GIS file							Information calculated by EnSym					
Zone	Type	BioEVC	BioEVC conservation status	Large tree(s)	Partial removal	Condition score	Polygon Extent	Extent without overlap	SBV score	HI score	Habitat units	Offset type
30-GD	Patch	gold0175	Vulnerable	0	no	0.230	0.163	0.163	0.291		0.036	General
31-GE	Patch	gold0175	Vulnerable	0	no	0.200	0.008	0.008	0.320		0.002	General
32-HC	Patch	gold0048	Depleted	0	no	0.190	0.017	0.017	0.520		0.004	General
33-GH	Patch	gold0175	Vulnerable	0	no	0.200	0.016	0.016	0.347		0.003	General
34-GJ	Patch	gold0175	Vulnerable	0	no	0.180	0.136	0.136	0.500		0.028	General
35-GF	Patch	gold0175	Vulnerable	1	no	0.330	1.364	1.364	0.213		0.410	General
36-A	Patch	gold0067	Endangered	0	no	0.360	0.119	0.119	0.637		0.052	General
37-PB	Patch	gold0803	Endangered	0	no	0.370	0.028	0.028	0.100		0.009	General
38-PB	Patch	gold0803	Endangered	0	no	0.370	0.018	0.018	0.100		0.006	General
39-PA	Patch	gold0803	Endangered	0	no	0.250	0.026	0.026	0.100		0.005	General
40-PA	Patch	gold0803	Endangered	0	no	0.250	0.014	0.014	0.100		0.003	General
41-GB	Patch	gold0175	Vulnerable	0	no	0.370	0.051	0.051	0.100		0.016	General
42-GB	Patch	gold0175	Vulnerable	0	no	0.370	0.034	0.034	0.100		0.010	General
43-GB	Patch	gold0175	Vulnerable	1	no	0.370	0.205	0.205	0.289		0.073	General
44-GB	Patch	gold0175	Vulnerable	0	no	0.370	0.244	0.244	0.293		0.088	General

Information provided by or on behalf of the applicant in a GIS file							Information calculated by EnSym					
Zone	Type	BioEVC	BioEVC conservation status	Large tree(s)	Partial removal	Condition score	Polygon Extent	Extent without overlap	SBV score	HI score	Habitat units	Offset type
45-GB	Patch	gold0175	Vulnerable	0	no	0.370	0.000	0.000	0.100		0.000	General
46-PB	Patch	gold0803	Endangered	2	no	0.370	0.077	0.077	0.575		0.034	General
47-PB	Patch	gold0803	Endangered	0	no	0.370	0.018	0.018	0.500		0.007	General
48-CB	Patch	gold0068	Endangered	0	no	0.310	0.002	0.002	0.840		0.001	General
49-CB	Patch	gold0068	Endangered	1	no	0.310	0.060	0.060	0.839		0.026	General
50-GB	Patch	gold0175_61	Vulnerable	0	no	0.370	0.037	0.037	0.541		0.016	General
51-GB	Patch	gold0175_61	Vulnerable	0	no	0.370	0.037	0.037	0.583		0.016	General
52-GB	Patch	gold0175_61	Vulnerable	0	no	0.370	0.042	0.042	0.543		0.018	General
53-PB	Patch	gold0803	Endangered	0	no	0.370	0.016	0.016	0.720		0.008	General
54-PB	Patch	gold0803	Endangered	0	no	0.370	0.004	0.004	0.720		0.002	General
55-PB	Patch	gold0803	Endangered	1	no	0.370	0.050	0.050	0.720		0.024	General
56-GB	Patch	gold0175	Vulnerable	0	no	0.370	0.006	0.006	0.100		0.002	General
57-GB	Patch	gold0175	Vulnerable	2	no	0.370	0.055	0.055	0.100		0.017	General
58-GB	Patch	gold0175	Vulnerable	0	no	0.370	0.000	0.000	0.720		0.000	General
59-GB	Patch	gold0175	Vulnerable	0	no	0.370	0.045	0.045	0.720		0.022	General

Information provided by or on behalf of the applicant in a GIS file							Information calculated by EnSym					
Zone	Type	BioEVC	BioEVC conservation status	Large tree(s)	Partial removal	Condition score	Polygon Extent	Extent without overlap	SBV score	HI score	Habitat units	Offset type
60-GB	Patch	gold0175	Vulnerable	1	no	0.370	0.053	0.053	0.720		0.025	General
61-GB	Patch	gold0175	Vulnerable	3	no	0.370	0.065	0.065	0.720		0.031	General
62-GB	Patch	gold0175	Vulnerable	1	no	0.370	0.075	0.075	0.716		0.036	General
63-GB	Patch	gold0175	Vulnerable	3	no	0.370	0.077	0.077	0.629		0.035	General
67-GB	Patch	gold0175	Vulnerable	0	no	0.370	0.002	0.002	0.490		0.001	General
68-GB	Patch	gold0175	Vulnerable	0	no	0.370	0.023	0.023	0.370		0.009	General
69-GB	Patch	gold0175	Vulnerable	0	no	0.370	0.027	0.027	0.490		0.011	General
70-HB	Patch	gold0048	Depleted	0	no	0.360	0.000	0.000	0.700		0.000	General
71-HB	Patch	gold0048	Depleted	0	no	0.360	0.010	0.010	0.700		0.005	General
72-HB	Patch	gold0048	Depleted	0	no	0.360	0.001	0.001	0.440		0.001	General
73-HB	Patch	gold0048	Depleted	0	no	0.360	0.000	0.000	0.440		0.000	General
74-CB	Patch	gold0068	Endangered	0	no	0.310	0.086	0.086	0.600		0.032	General
75-CB	Patch	gold0068	Endangered	0	no	0.310	0.079	0.079	0.604		0.029	General
76-HB	Patch	gold0048	Depleted	0	no	0.360	0.130	0.130	0.320		0.046	General
77-HB	Patch	gold0048	Depleted	0	no	0.360	0.180	0.180	0.320		0.064	General

Information provided by or on behalf of the applicant in a GIS file							Information calculated by EnSym					
Zone	Type	BioEVC	BioEVC conservation status	Large tree(s)	Partial removal	Condition score	Polygon Extent	Extent without overlap	SBV score	HI score	Habitat units	Offset type
78-HB	Patch	gold0048	Depleted	0	no	0.360	0.055	0.055	0.595		0.024	General
79-HB	Patch	gold0048	Depleted	0	no	0.360	0.026	0.026	0.600		0.011	General
80-HB	Patch	gold0048	Depleted	1	no	0.360	0.590	0.590	0.290		0.206	General
81-HB	Patch	gold0048	Depleted	1	no	0.360	0.027	0.027	0.735		0.013	General
1-ST	Scattered Tree	gold0175	Vulnerable	0	no	0.200	0.031	0.031	0.100		0.005	General
2-ST	Scattered Tree	gold0175	Vulnerable	0	no	0.200	0.031	0.031	0.100		0.005	General
3-ST	Scattered Tree	gold0175	Vulnerable	0	no	0.200	0.031	0.026	0.100		0.004	General
4-ST	Scattered Tree	gold0175	Vulnerable	0	no	0.200	0.031	0.020	0.100		0.003	General
5-ST	Scattered Tree	gold0175	Vulnerable	0	no	0.200	0.031	0.026	0.100		0.004	General
6-ST	Scattered Tree	gold0068	Endangered	0	no	0.200	0.031	0.031	0.310		0.006	General
7-ST	Scattered Tree	gold0175	Vulnerable	0	no	0.200	0.031	0.031	0.100		0.005	General
8-ST	Scattered Tree	gold0048	Depleted	1	no	0.200	0.070	0.070	0.500		0.016	General
9-ST	Scattered Tree	gold0048	Depleted	1	no	0.200	0.070	0.070	0.500		0.016	General
10-ST	Scattered Tree	gold0048	Depleted	1	no	0.200	0.070	0.070	0.310		0.014	General
11-ST	Scattered Tree	gold0175	Vulnerable	1	no	0.200	0.070	0.070	0.100		0.012	General

Information provided by or on behalf of the applicant in a GIS file							Information calculated by EnSym					
Zone	Type	BioEVC	BioEVC conservation status	Large tree(s)	Partial removal	Condition score	Polygon Extent	Extent without overlap	SBV score	HI score	Habitat units	Offset type
12-ST	Scattered Tree	gold0175	Vulnerable	1	no	0.200	0.070	0.059	0.100		0.010	General
13-ST	Scattered Tree	gold0175	Vulnerable	1	no	0.200	0.070	0.070	0.100		0.012	General
14-ST	Scattered Tree	gold0175	Vulnerable	1	no	0.200	0.070	0.070	0.100		0.012	General
15-ST	Scattered Tree	gold0175	Vulnerable	1	no	0.200	0.070	0.070	0.100		0.012	General
16-ST	Scattered Tree	gold0175	Vulnerable	1	no	0.200	0.070	0.070	0.100		0.012	General
17-ST	Scattered Tree	gold0175	Vulnerable	1	no	0.200	0.070	0.070	0.100		0.012	General
18-ST	Scattered Tree	gold0175	Vulnerable	1	no	0.200	0.070	0.068	0.100		0.011	General
19-ST	Scattered Tree	gold0175	Vulnerable	1	no	0.200	0.070	0.068	0.100		0.011	General
20-ST	Scattered Tree	gold0175	Vulnerable	1	no	0.200	0.070	0.070	0.100		0.012	General
21-ST	Scattered Tree	gold0175	Vulnerable	1	no	0.200	0.070	0.070	0.100		0.012	General
22-ST	Scattered Tree	gold0175	Vulnerable	1	no	0.200	0.070	0.070	0.470		0.016	General
23-ST	Scattered Tree	gold0175	Vulnerable	1	no	0.200	0.070	0.070	0.470		0.016	General
24-ST	Scattered Tree	gold0175	Vulnerable	1	no	0.200	0.070	0.070	0.100		0.012	General
25-ST	Scattered Tree	gold0175	Vulnerable	1	no	0.200	0.070	0.070	0.470		0.016	General
28-ST	Scattered Tree	gold0067	Endangered	1	no	0.200	0.070	0.070	0.100		0.012	General

Information provided by or on behalf of the applicant in a GIS file							Information calculated by EnSym					
Zone	Type	BioEVC	BioEVC conservation status	Large tree(s)	Partial removal	Condition score	Polygon Extent	Extent without overlap	SBV score	HI score	Habitat units	Offset type
29-ST	Scattered Tree	gold0067	Endangered	1	no	0.200	0.070	0.070	0.100		0.012	General
30-ST	Scattered Tree	gold0067	Endangered	1	no	0.200	0.070	0.070	0.100		0.012	General
31-ST	Scattered Tree	gold0803	Endangered	1	no	0.200	0.070	0.070	0.387		0.015	General
34-ST	Scattered Tree	gold0803	Endangered	1	no	0.200	0.070	0.045	0.600		0.011	General
35-ST	Scattered Tree	gold0803	Endangered	1	no	0.200	0.070	0.045	0.600		0.011	General
36-ST	Scattered Tree	gold0803	Endangered	1	no	0.200	0.070	0.061	0.600		0.015	General
37-ST	Scattered Tree	gold0803	Endangered	1	no	0.200	0.070	0.061	0.600		0.015	General
38-ST	Scattered Tree	gold0803	Endangered	1	no	0.200	0.070	0.070	0.100		0.012	General
39-ST	Scattered Tree	gold0803	Endangered	1	no	0.200	0.070	0.070	0.100		0.012	General
40-ST	Scattered Tree	gold0175	Vulnerable	1	no	0.200	0.070	0.070	0.100		0.012	General
41-ST	Scattered Tree	gold0048	Depleted	1	no	0.200	0.070	0.070	0.510		0.016	General

Appendix 2: Information about impacts to rare or threatened species' habitats on site

This table lists all rare or threatened species' habitats mapped at the site.

Species common name	Species scientific name	Species number	Conservation status	Group	Habitat impacted	% habitat value affected
Tawny Spider-orchid	*Caladenia fulva*	504498	Endangered	Dispersed	Habitat importance map	0.0018
Elfin Leek-orchid	*Prasophyllum aff. fitzgeraldii B*	507293	Endangered	Highly Localised Habitat	Habitat importance map	0.0018
Stuart Mill Spider-orchid	*Caladenia cretacea*	505592	Endangered	Dispersed	Habitat importance map	0.0011
Rising Star Guinea-flower	*Hibbertia humifusa subsp. humifusa*	505082	Rare	Dispersed	Habitat importance map	0.0003
Large-headed Fireweed	*Senecio macrocarpus*	503116	Endangered	Dispersed	Habitat importance map	0.0003
Striped Legless Lizard	*Delma impar*	12159	Endangered	Dispersed	Habitat importance map	0.0002
Button Wrinklewort	*Rutidosis leptorhynchoides*	502982	Endangered	Dispersed	Habitat importance map	0.0002
McIvor Spider-orchid	*Caladenia audasii*	503664	Endangered	Dispersed	Habitat importance map	0.0002
Woodland Leek-orchid	*Prasophyllum sp. aff. validum A*	505904	Endangered	Dispersed	Habitat importance map	0.0002
Swamp Diuris	*Diuris palustris*	501082	Vulnerable	Dispersed	Habitat importance map	0.0001
Goldfields Grevillea	*Grevillea dryophylla*	501533	Rare	Dispersed	Habitat importance map	0.0001
Purple Eyebright	*Euphrasia collina subsp. muelleri*	504468	Endangered	Dispersed	Habitat importance map	0.0001
Golden Sun Moth	*Synemon plana*	15021	Critically endangered	Dispersed	Habitat importance map	0.0001
Emerald-lip Greenhood	*Pterostylis smaragdyna*	503915	Rare	Dispersed	Habitat importance map	0.0001
Small-leaf Goodenia	*Goodenia benthamiana*	501493	Rare	Dispersed	Habitat importance map	0.0001
Rock Wattle	*Acacia rupicola*	500082	Rare	Dispersed	Habitat importance map	0.0001
Fringed Sun-orchid	*Thelymitra luteocilium*	503375	Rare	Dispersed	Habitat importance map	0.0001
Flat Bluebell	*Wahlenbergia planiflora subsp. planiflora*	504064	Vulnerable	Dispersed	Habitat importance map	0.0001

Spiny Rice-flower	*Pimelea spinescens subsp. spinescens*	504823	Endangered	Dispersed	Habitat importance map	0.0001
Tiny Bog-sedge	*Schoenus nanus*	503050	Rare	Dispersed	Habitat importance map	0.0001
Common Beard-heath	*Leucopogon virgatus var. brevifolius*	504392	Rare	Dispersed	Habitat importance map	0.0001
Bush Stone-curlew	*Burhinus grallarius*	10174	Endangered	Dispersed	Habitat importance map	0.0001
Bearded Dragon	*Pogona barbata*	12177	Vulnerable	Dispersed	Habitat importance map	0.0001
Veined Beard-heath	*Leucopogon neurophyllus*	501986	Rare	Dispersed	Habitat importance map	0.0001
Green Leek-orchid	*Prasophyllum lindleyanum*	502702	Vulnerable	Dispersed	Habitat importance map	0.0001
Small Milkwort	*Comesperma polygaloides*	500798	Vulnerable	Dispersed	Habitat importance map	0.0001
Shiny Tea-tree	*Leptospermum turbinatum*	501963	Rare	Dispersed	Habitat importance map	0.0001
Purple Blown-grass	*Lachnagrostis punicea subsp. punicea*	504206	Rare	Dispersed	Habitat importance map	0.0001
Pale-flower Crane's-bill	*Geranium sp. 3*	505344	Rare	Dispersed	Habitat importance map	0.0000
Black Falcon	*Falco subniger*	10238	Vulnerable	Dispersed	Habitat importance map	0.0000
Slender Club-sedge	*Isolepis congrua*	501773	Vulnerable	Dispersed	Habitat importance map	0.0000
Golden Cowslips	*Diuris behrii*	501061	Vulnerable	Dispersed	Habitat importance map	0.0000
Arching Flax-lily	*Dianella sp. aff. longifolia (Benambra)*	505560	Vulnerable	Dispersed	Habitat importance map	0.0000
Trailing Hop-bush	*Dodonaea procumbens*	501090	Vulnerable	Dispersed	Habitat importance map	0.0000
Rosemary Grevillea	*Grevillea rosmarinifolia subsp. rosmarinifolia*	504066	Rare	Dispersed	Habitat importance map	0.0000
Spear-grass	*Austrostipa trichophylla*	504512	Rare	Dispersed	Habitat importance map	0.0000
Brolga	*Grus rubicunda*	10177	Vulnerable	Dispersed	Habitat importance map	0.0000
Buloke	*Allocasuarina luehmannii*	500678	Endangered	Dispersed	Habitat importance map	0.0000
Clover Glycine	*Glycine latrobeana*	501456	Vulnerable	Dispersed	Habitat importance map	0.0000
Half-bearded Spear-grass	*Austrostipa hemipogon*	503985	Rare	Dispersed	Habitat importance map	0.0000
Hairy Tails	*Ptilotus erubescens*	502825	Vulnerable	Dispersed	Habitat importance map	0.0000

Growling Grass Frog	*Litoria raniformis*	13207	Endangered	Dispersed	Habitat importance map	0.0000
Australasian Shoveler	*Anas rhynchotis*	10212	Vulnerable	Dispersed	Habitat importance map	0.0000
Hardhead	*Aythya australis*	10215	Vulnerable	Dispersed	Habitat importance map	0.0000
Baillon's Crake	*Porzana pusilla palustris*	10050	Vulnerable	Dispersed	Habitat importance map	0.0000
Pale Flax-lily	*Dianella sp. aff. longifolia (Riverina)*	507399	Vulnerable	Dispersed	Habitat importance map	0.0000
Elegant Parrot	*Neophema elegans*	10307	Vulnerable	Dispersed	Habitat importance map	0.0000
Salt Blown-grass	*Lachnagrostis robusta*	504223	Rare	Dispersed	Habitat importance map	0.0000
Swift Parrot	*Lathamus discolor*	10309	Endangered	Dispersed	Habitat importance map	0.0000
Squirrel Glider	*Petaurus norfolcensis*	11137	Endangered	Dispersed	Habitat importance map	0.0000
Spiny Lignum	*Duma horrida subsp. horrida*	502230	Rare	Dispersed	Habitat importance map	0.0000
Speckled Warbler	*Chthonicola sagittatus*	10504	Vulnerable	Dispersed	Habitat importance map	0.0000
Grey-crowned Babbler	*Pomatostomus temporalis temporalis*	10443	Endangered	Dispersed	Habitat importance map	0.0000

Habitat group

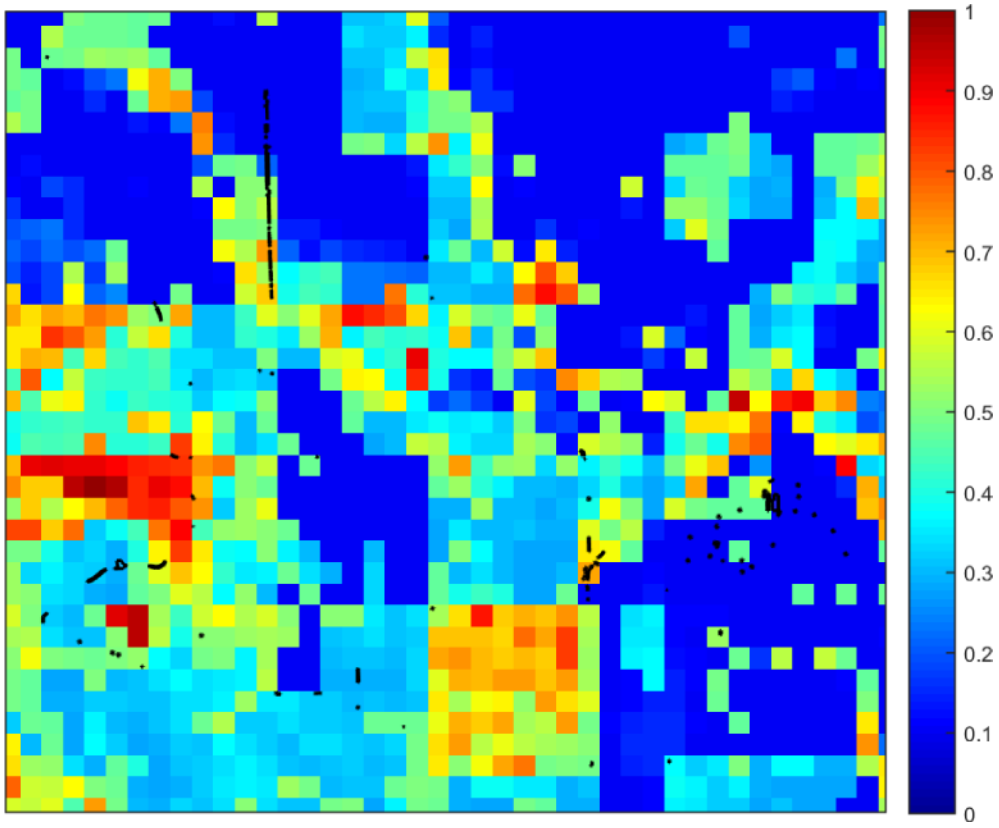
- Highly localised habitat means there is 2000 hectares or less mapped habitat for the species
- Dispersed habitat means there is more than 2000 hectares of mapped habitat for the species

Habitat impacted

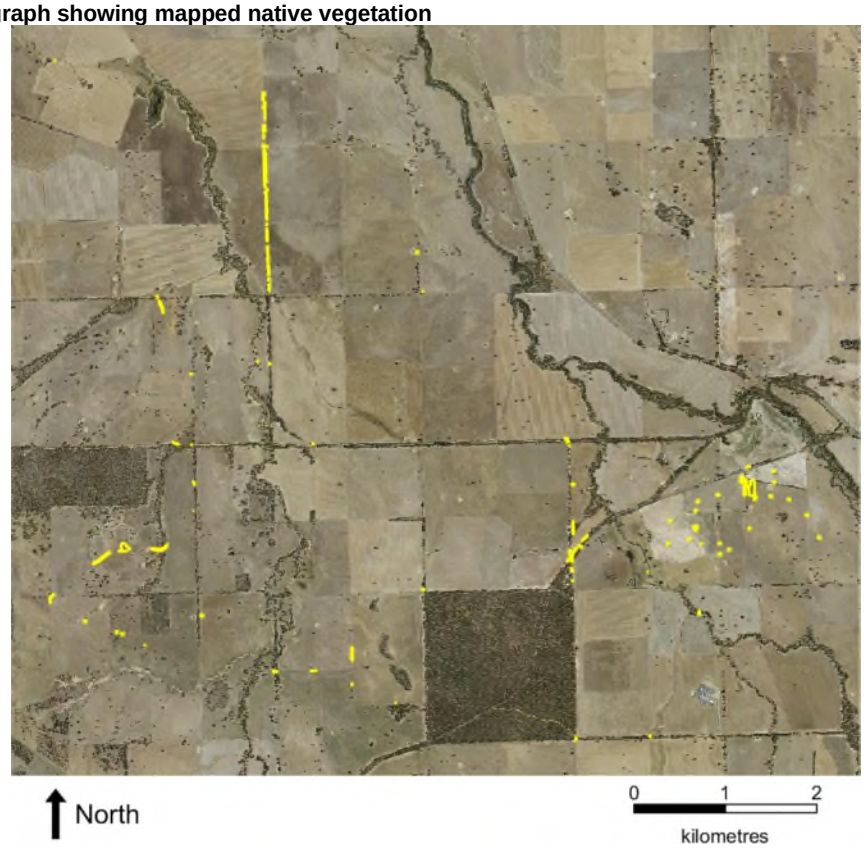
- Habitat importance maps are the maps defined in the Guidelines that include all the mapped habitat for a rare or threatened species
- Top ranking maps are the maps defined in the Guidelines that depict the important areas of a dispersed species habitat, developed from the highest habitat importance scores in dispersed species habitat maps and selected VBA records
- Selected VBA record is an area in Victoria that represents a large population, roosting or breeding site etc.

Appendix 3 – Images of mapped native vegetation

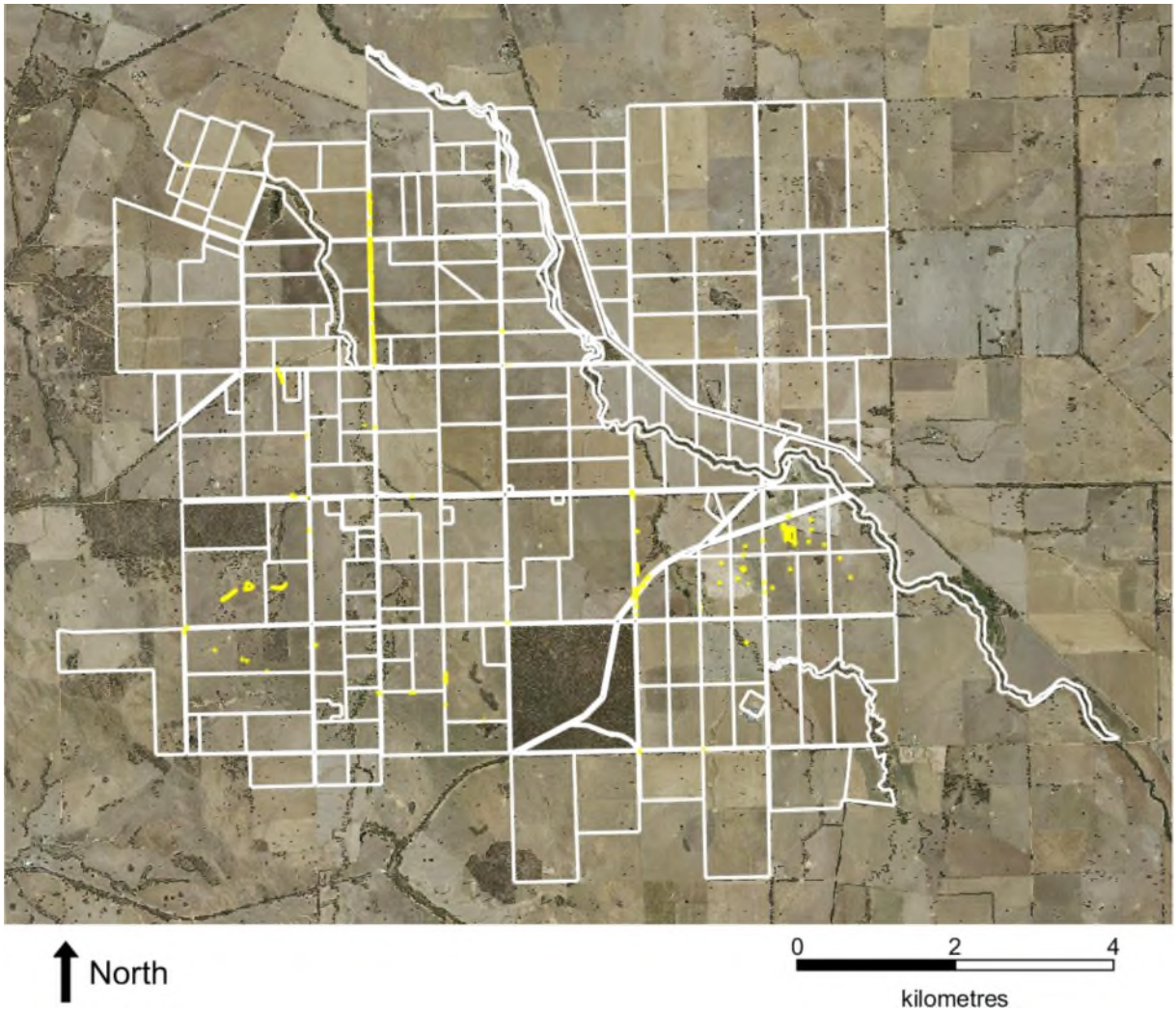
2. Strategic biodiversity values map



3. Aerial photograph showing mapped native vegetation



4. Map of the property in context



Yellow boundaries denote areas of proposed native vegetation removal.

APPENDIX 6 – OFFSET CREDIT STATEMENT

Report of available native vegetation credits

This report lists native vegetation credits available to purchase through the Native Vegetation Credit Register.

This report is **not evidence** that an offset has been secured. An offset is only secured when the units have been purchased and allocated to a permit or other approval and an allocated credit extract is provided by the Native Vegetation Credit Register.

Date and time: 19/07/2022 09:11 **Report ID: 15053**

What was searched for?

General offset

General habitat units	Strategic biodiversity value	Large trees	Vicinity (Catchment Management Authority or Municipal district)	
2.373	0.271	64	CMA	Wimmera
			or LGA	Northern Grampians Shire

Details of available native vegetation credits on 19 July 2022 09:11

These sites meet your requirements for general offsets.

Credit Site ID	GHU	LT	CMA	LGA	Land owner	Trader	Fixed price	Broker(s)
BBA-3052_01	12.555	247	North Central	Northern Grampians Shire	Yes	Yes	No	VegLink
TFN-C2031	18.655	177	Wimmera	Northern Grampians Shire	Yes	Yes	No	Ecocentric, VegLink
VC_CFL-3064_01	52.846	1139	Wimmera	West Wimmera Shire	Yes	Yes	No	Abezco, Bio Offsets, Ethos
VC_CFL-3723_01	52.095	1773	Wimmera	West Wimmera Shire	Yes	Yes	No	VegLink

These sites meet your requirements using alternative arrangements for general offsets.

Credit Site ID	GHU	LT	CMA	LGA	Land owner	Trader	Fixed price	Broker(s)

There are no sites listed in the Native Vegetation Credit Register that meet your offset requirements when applying the alternative arrangements as listed in section 11.2 of the Guidelines for the removal, destruction or lopping of native vegetation.

These potential sites are not yet available, land owners may finalise them once a buyer is confirmed.

Credit Site ID	GHU	LT	CMA	LGA	Land owner	Trader	Fixed price	Broker(s)

There are no potential sites listed in the Native Vegetation Credit Register that meet your offset requirements.

LT - Large Trees *CMA - Catchment Management Authority* *LGA - Municipal District or Local Government Authority*

Next steps

If applying for approval to remove native vegetation
Attach this report to an application to remove native vegetation as evidence that your offset requirement is currently available.

If you have approval to remove native vegetation
Below are the contact details for all brokers. Contact the broker(s) listed for the credit site(s) that meet your offset requirements. These are shown in the above tables. If more than one broker or site is listed, you should get more than one quote before deciding which offset to secure.

Broker contact details

Broker Abbreviation	Broker Name	Phone	Email	Website
Abezco	Abzeco Pty. Ltd.	(03) 9431 5444	offsets@abzeco.com.au	www.abzeco.com.au
Baw Baw SC	Baw Baw Shire Council	(03) 5624 2411	bawbaw@bawbawshire.vic.gov.au	www.bawbawshire.vic.gov.au
Bio Offsets	Biodiversity Offsets Victoria	0452 161 013	info@offsetsvictoria.com.au	www.offsetsvictoria.com.au
Contact NVOR	Native Vegetation Offset Register	136 186	nativevegetation.offsetregister@delwp.vic.gov.au	www.environment.vic.gov.au/native-vegetation
Ecocentric	Ecocentric Environmental Consulting	0410 564 139	ecocentric@me.com	Not avaliable
Ethos	Ethos NRM Pty Ltd	(03) 5153 0037	offsets@ethosnrm.com.au	www.ethosnrm.com.au
Nillumbik SC	Nillumbik Shire Council	(03) 9433 3316	offsets@nillumbik.vic.gov.au	www.nillumbik.vic.gov.au
TFN	Trust for Nature	8631 5888	offsets@tfn.org.au	www.trustfornature.org.au
VegLink	Vegetation Link Pty Ltd	(03) 8578 4250 or 1300 834 546	offsets@vegetationlink.com.au	www.vegetationlink.com.au
Yarra Ranges SC	Yarra Ranges Shire Council	1300 368 333	biodiversityoffsets@yarraranges.vic.gov.au	www.yarraranges.vic.gov.au

For more information contact the DELWP Customer Service Centre 136 186 or the Native Vegetation Credit Register at nativevegetation.offsetregister@delwp.vic.gov.au