Final Report

Existing Ecological Conditions Report: Bannockburn Growth Area (Bruce Creek West)

Prepared for

Victorian Planning Authority

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Ecology and Heritage Partners Pty Ltd

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Ecology and Heritage Partners acknowledge the Traditional Owners of the country we live and work on, and we pay our respect to Elders past, present and emerging.

EXECUTIVE SUMMARY

Introduction

Ecology and Heritage Partners Pty Ltd was engaged by the Victorian Planning Authority to undertake an Existing Ecological Conditions Report for the Bannockburn Growth Area (Bruce Creek West) (the study area).

A detailed Ecological Assessment was undertaken to confirm the condition and extent of native vegetation within the study area, and to determine the requirement for any targeted surveys for significant flora or fauna.

Methods

Ecological Assessment

A field assessment was undertaken on 11 July 2022 to obtain information on flora and fauna values within the study area. The study area was walked, with all commonly observed vascular flora and fauna species recorded, significant records mapped, and the overall condition of vegetation and habitats noted.

Results

Forty-seven flora species (21 indigenous and 26 non-indigenous or introduced) and seven fauna species (six native and one introduced) were recorded within the study area during the ecological assessment.

Detailed vegetation mapping completed across the study area recorded three Ecological Vegetation Classes (EVC) (Plains Grassland (EVC 132), Creekline Grassy Woodland (EVC 68) and Plains Grassy Woodland (EVC 55)) within the study area comprising 14.260 hectares of native vegetation, four Large canopy trees, 21 Large scattered trees and 20 small scattered trees.

The study area supports 5.038 hectares of Plains Grassland. Some of these patches have the potential to constitute the nationally significant Natural Temperate Grassland of the Victorian Volcanic Plain ecological community and/or the State-significant Western Basalt Plains Grassland Community. A Spring survey is required to confirm whether the patches are of sufficient quality to constitute either of these ecological communities.

No nationally-significant or state-significant flora species were identified within the study area during the ecological assessment. However, the study are offers suitable habitat for five nationally-significant species (Spiny Rice-flower, Large-headed Fireweed, Matted Flax-lily, Button Wrinklewort, and Adamson's Blown-grass), and three State-significant species (Cut-leaf Burr Daisy, Small Scurf-pea and Hairy Tails). Targeted surveys are required to confirm their presence/absence.

The study area is known to support one nationally-significant fauna species (Growling Grass Frog *Litoria raniformis*), and offers potential habitat for two other nationally-significant species (Striped Legless Lizard *Delma impar* and Golden Sun Moth *Synemon plana*, the latter of which has been recorded on the east side of Bruce Creek), and one State-significant fauna species, Tussock Skink *Pseudemoia pagenstecheri*). Targeted surveys are required to confirm their presence/absence.

Table S1. Summary of the ecological values that occur within the study area.

Species diversity	Moderate assemblage of plants and animals, with 47 flora species and seven fauna species recorded during the ecological surveys.
Native vegetation	• 7.07 hectares of native vegetation represented by three EVCs: o *Heavier Soils* Plains Grassland (EVC 132_63) 5.038 hectares; o Creekline Grassy Woodland (EVC 68) 1.683 hectares; o Plains Grassy Woodland (EVC 55_61) 0.349 hectares; o Four Large Canopy Trees; and, o 41 Scattered Trees
Wetlands	• The study area is located 30 kilometres to the west of the Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar site.
Significant ecological communities	• Potential for the nationally-significant *Natural Temperate Grassland of the Victorian Volcanic Plain* and the State significant *Western (Basalt) Plains Grassland Community* to be present in the study area
Significant flora species	• Potential for the following nationally-significant flora to be present within the study area: o Spiny Rice-flower, Large-headed Fireweed, Matted Flax-lily, Button Wrinklewort, and Adamson's Blown-grass. • Potential for the following State-significant flora to be present within the study area: o Cut-leaf Burr Daisy, Small Scurf-pea and Hairy Tails.
Significant fauna species	• Known presence of one nationally significant fauna: confirmed habitat for Growling Grass Frog along the Bruce Creek corridor; o Potential habitat for Golden Sun Moth within the study area (parcels along Bruce Creek West). o Potential habitat for Striped Legless Lizard within the study area (parcels along Bruce Creek West). o Potential habitat for one State-significant fauna, Tussock Skink (Endangered under the FFG Act), within the study area.

Legislative and Policy Implications

Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act - Federal)

A confirmed population of Growling Grass Frog exists along Bruce Creek (Ecology and Heritage Partners 2021), and potential habitat exists for several nationally significant flora and fauna (Table 1). If the recommended targeted flora and fauna surveys confirm the presence of any nationally-significant species within the study area, or any nationally-significant ecological communities are recorded during the Spring flora surveys, any future development activity should be assessed against the relevant significant impact guidelines for the relevant species and/or ecological communities recorded within the study area:

A referral to the Commonwealth Environment Minister may be required depending on the outcome of the significant impact assessments undertaken.

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

A confirmed population of Tussock Skink *Pseudemoia pagenstecheri* exists along the eastern banks of Bruce Creek (Ecology and Heritage Partners 2021). Targeted surveys for the species should be conducted concurrently with surveys for Striped Legless Lizard. Areas of Plains Grassland within the study area may correspond to one FFG Act-listed community; Western (Basalt) Plains Grassland. Spring surveys are required to confirm the presence/absence of this community.

Catchment and Land Protection Act 1994 (Victoria)

Weeds listed as noxious under the CaLP Act were recorded during the assessment (Willow *Salix* sp., Chilean Needle-grass *Nasella neesiana*, African Box-thorn *Lycium ferocissimum*, Saffron Thistle *Carthamus lanatus*, Artichoke Thistle *Cynara cardunculus*, Serrated Tussock *Nassella trichotoma*, Sweet Briar *Rosa rubiginosa* and Spiny Rush *Juncus acutus*). Similarly, there is evidence that the study area is currently occupied by several pest fauna species listed under the CaLP Act (Red Fox *Vulpes vulpes* and European Rabbit *Oryctolagus cuniculus*). Weed management and pest fauna management actions are likely to be required to be incorporated into any future Construction Environmental Management Plan (CEMP) as part of any future development of the study area.

Mitigation Measures and Recommendations

Given the biodiversity recorded within these areas as well as those potentially present, it is recommended that these ecological values be retained, enhanced and managed to assist in creating a more diverse, connected and resilient natural environment, particularly those located within the Bruce Creek corridor

It is recommended that a suitably qualified ecologist undertake Spring flora surveys and the targeted surveys for significant flora and fauna species as detailed in sections 3.3 below, to confirm the presence/absence of nationally- and State-significant species and ecological communities within the study area.

CONTENTS

INTRODUCTION

1.1 Background

Ecology and Heritage Partners Pty Ltd was engaged by the Victorian Planning Authority to undertake detailed ecological investigations in order to determine the existing ecological conditions within the Bannockburn Growth Area (Bruce Creek West), located on private property along the western bank of Bruce Creek, south of Willowbrae Way Bannockburn, and extending to the railway easement to the south (Figure 1).

The Victorian Planning Authority has led the development of the Bannockburn Growth Plan to guide the sustainable growth of Bannockburn to the year 2050. The project commenced in early 2020 and has involved close collaboration with Golden Plains Shire Council, as well as state agencies. The Bannockburn Growth Plan identifies future growth areas and associated infrastructure requirements to service the future population at a high level.

Ecology and Heritage Partners Pty Ltd was previously engaged by the Victorian Planning Authority (VPA) to undertake a series of ecological assessments within the south-east section of the Bannockburn Growth Area to inform the preparation of the Bannockburn Growth Plan (Growth Plan) and avoid conflicts between urban development and ecological decisions in the more detailed planning process. An Existing Ecological Conditions Report was prepared for the South East Section in 2021 (Ecology and Heritage Partners Pty Ltd 2021), following further detailed assessments and targeted flora and fauna surveys.

This report documents the Ecological Assessments undertaken within the Bruce Creek West of the Bannockburn Growth Area, recommends further necessary on-ground surveys, addresses any implications under Commonwealth and State environmental legislation and provides information on mitigation measures associated with the proposed development should any national or State-significant species or ecological communities be identified within the study area.

1.2 Scope and Objectives

The objective of this report is to inform decisions regarding the future planning and development of the Bruce Creek West Section of the Bannockburn Growth Area.

Specifically, the Ecological Assessment has sought to:

- Identify, assess, and map areas supporting native vegetation and fauna habitat, and determine the conservation significance of these areas;
- Determine the requirement for any targeted flora and/or fauna surveys;
- Collect and present information about environmental values to allow integration with the planning and potential future development of the area; and,
- Provide management measures that should be implemented to reduce adverse impacts on biodiversity values known to, or likely to occur in the study area.

1.3 Study Area

The study area is located within the Bannockburn Growth area, and forms part of the Growth Investigation Area, which covers approximately 1,000 hectares (Figure 1).

The study area comprises the Bruce Creek West section of the Growth Area, which consists of the Bruce Creek riparian corridor and escarpment immediately west of Bruce Creek, between private properties along Willowbrae Way and Ormond Street to the north/north-west and a railway easement to the south, as shown on Figure 2. The study area excludes any of the adjacent agricultural land further west of Bruce the escarpment, but includes four proposed road locations that are proposed to cross the Creek up to 200 metres outside of the creek corridor (Figure 2).

The study area is zoned Farming Zone (FZ) and is partially affected by the Environmental Significance Overlay – Schedule 2 (ESO2).

According to the Department of Environment, Land, Water and Planning (DELWP) NatureKit Map (DELWP 2022a), the study area is located within the Victorian Volcanic Plain bioregion, Corangamite Catchment Management Authority (CMA) and Golden Plains Shire municipality.

2 METHODS

This chapter details the desk-based and field methods used in surveying the current environment as well as the methods used to assess the likelihood of significant flora and fauna species occurring within the study area. It is noted that the methodology detailed below is in accordance with the standard ecological assessment requirements used to inform the precinct structure planning process.

2.1 Desktop Assessment

Relevant literature, online-resources and databases were reviewed to provide an assessment of flora and fauna values associated with the study area. 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 2022d);
- The Atlas of Living Australia (ALA) (ALA 2022) for assistance with the distribution and identification of flora species;
- Birdlife Australia (2022) for detailed descriptions and distributions of birds (both native and exotic);
- The Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) 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 2022f) to ascertain current zoning and environmental overlays in the study area; and
- Aerial photography of the study area;
- Relevant environmental legislation and policies pertaining to target species including EPBC Act Policy Statements, FFG Act Action Statements, and National Recovery Plans; and,
- Previous ecological assessments relevant to the study area; including;
    - Ecology and Heritage Partners Pty Ltd 2020a. Desktop Assessment: Bannockburn Growth Plan, Bannockburn, Victoria. January 2020.

- Ecology and Heritage Partners Pty Ltd 2020b. Biodiversity Assessment: Bannockburn Growth (Victoria), Bannockburn, Victoria. March 2020.
- Ecology and Heritage Partners Pty Ltd 2021. Existing Ecological Conditions Report: Bannockburn Growth Area (South East Section). September 2021.

2.2 Field Assessment

2.2.1 Ecological Assessment (including habitat hectare assessment)

Detailed ecological assessments were undertaken on 11 July 2022 by botanists accredited by DELWP in the habitat hectare methodology (DSE 2004) to quantify the quality and extent of native vegetation values within the study area, identify flora and fauna habitat values within the study area, and to determine conditions with reference to findings of the desk-based assessment.

The study area was walked, with all commonly observed vascular flora and fauna species recorded, significant records mapped and the overall condition of vegetation and habitats noted. Ecological Vegetation Classes (EVCs) were determined with reference to DELWP pre-1750 and extant EVC mapping (DELWP 2022a) and their published descriptions (DELWP 2022c). Native vegetation in the local area was also investigated to assist in determining the pre-European vegetation within the study area.

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

Where native vegetation was identified a habitat hectare assessment was undertaken following methodology described in the Vegetation Quality Assessment Manual (Department of Sustainability and Environment (DSE) 2004). The habitat hectare results are provided in Appendix 1.2.

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 2017).

In summary, the following tasks were undertaken as part of the field assessments within the study area:

- The identification of flora and fauna habitat values;
- An assessment of all watercourses, wetlands and springs;
- An assessment of all potential native fauna habitat, including habitat corridors, food and water sources, nesting and foraging sites;
- The identification of all native vegetation, including:
  - EVCs; and
  - Scattered trees, with Diameter and Breast Height (DBH) quantified, and trees identified as Large Trees or Small Trees;
- Identify the potential presence of any Matters of National Environmental Significance (NES) listed under the EPBC Act;

- A habitat hectares assessment of the native vegetation within the study area, in accordance with the Vegetation Quality Assessment Manual (DSE 2004); and
- The documentation of site and vegetation information, including:
    - the address of the property;
    - photographs of the native vegetation within the study area.

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

Under the *Planning and Environment Act 1987*, Clause 52.17 of the Planning Schemes requires a planning permit from the relevant local Council to remove, destroy or lop native vegetation. The assessment process for the clearing of vegetation follow the '*Guidelines for the removal, destruction or lopping of native vegetation*' (the Guidelines) (DELWP 2017).

Vegetation Assessment

Native vegetation as defined in the Guidelines (DELWP 2017) (Table 1) 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 field assessments.

In addition, the type and general condition of all vegetation was assessed and a determination made as to whether it qualifies for further consideration under local, State or national legislation and policy.

Table 1. Determination 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 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 remnant patch.	Measured in hectares. Each Large scattered tree is assigned an extent of 0.071 hectares (30m diameter). Each Small scattered tree is assigned a default extent of 0.31 hectares (10 metre diameter)	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'.

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 potential EVCs present within the study area are summarised below (Table 2).

Table 2 Benchmark sizes for large trees within the study area.

EVC	Species	Large Tree (DBH)	Small Tree (DBH)
Creekline Grassy Woodland (EVC 68)	*Eucalyptus* spp.	≥ 80 cm	< 80 cm
Plains Grassy Woodland (EVC 55_61)	*Eucalyptus* spp.	≥ 80 cm	< 80cm

Note. DBH = Diameter at Breast Height (i.e. - 1.3 metres above ground level).

2.3 Likelihood of Occurrence Assessment

Relevant biological databases, literature and expert advice were used to identify all species records of national, State and regional conservation significance within 10 kilometres of the study area. 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 study area) were considered to determine a species' likelihood of occurrence within the study area.

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 Table3 and Table 4 respectively.

The results of the likelihood of occurrence assessment for listed flora and fauna species are provided in Appendices 1.4 and 2.1 respectively.

All significant flora and fauna species considered to have the highest likelihood of occurrence within potential habitats within the study area are discussed in the body of this report.

Table 3. Decision guidelines for determining a flora species likelihood of occurrence within the study area.

Likelihood of occurrence	Ecology and Heritage Partners Decision Criteria
1 – Known occurrence	Recorded within the study area recently (i.e. within ten years).
2 - High	Previous records of the species in the local vicinity; and/or, the study area contains areas of high-quality habitat.
3 – Moderate	Limited previous records of the species in the local vicinity; and/or, the study area 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 suitable habitat and/or outside the species range.

Table 4. Decision guidelines for determining fauna species likelihood of occurrence within the study area.

Likely presence or use of the study area	Ecology and Heritage Partners Decision Criteria
1 – Known occurrence	Recorded within the study area recently (i.e. within ten years).
2 - High	Likely resident in the study area based on database records, or expert advice; and/or, recent records (i.e. within ten years) of the species in the local area; and/or, the study area contains the species' preferred habitat.
3 - Moderate	The species is likely to visit the study area regularly (i.e. at least seasonally); and/or, previous records of the species in the local area; and/or, the study area contains some characteristics of the species' preferred habitat.
4 - Low	The species may visit the study area 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 study area 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 study area when moving between areas of more suitable habitat; and/or, out of the species' range; and/or, no suitable habitat present.

2.4 Assessment Qualifications and Limitations

This report has been written based on the quality and extent of the ecological values and habitat considered to be present or absent at the time of the desktop and/or field assessments being undertaken.

Data and information held within the ecological databases and mapping programs reviewed as part of the desktop assessment (e.g. VBA, PMST, NatureKit Maps etc.) are unlikely to represent all flora and fauna observations within, and surrounding the study area. 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 field assessment was undertaken during a sub-optimal season for the identification of flora and fauna species (i.e. winter). The 'snapshot' nature of a standard biodiversity assessment, along with sub-optimal timing of the survey, 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.

The assessment of likelihood of occurrence is based on survey effort and results, background information and previous records compiled. For cryptic and less abundant species that are known to, or that have the potential to use habitat resources within the study area as a resident or a visitor on a regular or infrequent basis, the precautionary principle has been applied when determining the likelihood of occurrence.

A comprehensive list of all terrestrial flora and fauna present within the study area was not undertaken as this was not the objective of the assessment. Rather a list of commonly observed species was recorded to inform the habitat hectare assessment and assist in determining the broader biodiversity values present within the study area.

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

It should be noted, in some instances where the Diameter at Breast Height (DBH) of trees were unable to be measured (i.e. due to presence within Bruce Creek), the size of the tree (i.e. large or small) was estimated via visual assessment.

The terrestrial flora and fauna data collected during the field assessment and information obtained from relevant desktop sources is considered to adequately inform an accurate assessment of the ecological values present within the study area.

3 EXISTING ENVIRONMENT

The following description of the existing environment is based on the landscape, vegetation, fauna habitats and species identified from the desktop assessment and within the study area during the ecological surveys.

3.1 Ecological Values

Several patches of native vegetation and scattered native trees were recorded within the study area. The remainder of the study area comprised introduced and planted vegetation, present as pasture grass, environmental weeds and shelter belts.

A list of all flora species recorded during the field assessment is provided in Appendix 1.1.

3.1.1 Overview

As was found on the eastern side of Bruce Creek, most of the study area is highly modified due to past and current agricultural practices and is dominated by pasture supporting non-indigenous grasses and weeds. Much of the indigenous vegetation and terrestrial fauna habitat remaining within the study area are confined to the Bruce Creek riparian corridor or modified agricultural areas supporting native pasture. Native vegetation, where present within existing farmland, is highly modified, with vegetation generally lacking structure and exhibiting a low diversity of native species.

Three EVC's were mapped across both study areas: *Heavier Soils* Plains Grassland (EVC_132_61), Creekline Grassy Woodland (EVC 68) and Plains Grassy Woodland (EVC 55_61). This is broadly consistent with extant (2005) DELWP modelled mapping (DELWP 2022a).

The remainder of the study area comprises introduced and planted vegetation, present as pasture and environmental weeds. Specific details relating to observed EVC is provided below.

The results of the habitat hectare assessment are provided in Appendix 1.2.

Specific details relating to observed EVCs are provided below, with a summary of the extent of each vegetation type provided in Table S1.

3.1.2 Patches of Native Vegetation

Plains Grassland (Heavier Soils)

Plains Grassland is characterised by treeless vegetation, mostly less than one metre tall, and dominated largely by graminoid and herb life forms. It typically occurs on fertile cracking basalt soils prone to seasonal waterlogging (DELWP 2022c).

Several patches of Plains Grassland were present within the study area, varying in quality due to weed cover, amount of recruitment area, and species composition. While identification of grasses to species level was hindered at times due to grazing as well as the absence of flowering or seed material, the patches typically contained Kangaroo Grass *Themeda triandra,* Wallaby-grass *Rytidosperma* spp, Rough Spear-grass *Austrostipa scabra* and/or other Spear-grass *Austrostipa* spp. Native herbs such as Crane's-bill *Geranium* sp. were occasionally present.

Plate 1. Kangaroo Grass and Spear-grass in a patch of Plains Grassland within the study area (Ecology and Heritage Partners Pty Ltd 11/07/2022).

Plate 2. Spear-grass in a patch of Plains Grassland within the study area (Ecology and Heritage Partners Pty Ltd 11/07/2022).

Plate 3. Wallaby-grass in a patch of Plains Grassland within the study area (Ecology and Heritage Partners Pty Ltd 11/07/2022).

Plate 4. Spear-grass in a patch of Plains Grassland within the study area (Ecology and Heritage Partners Pty Ltd 11/07/2022).

Creekline Grassy Woodland

Creekline Grassy Woodland (CGW) is typically defined as a Eucalypt-dominated woodland (to 15 metre tall) with occasional scattered shrub layer over a mostly grassy/sedgy to herbaceous ground-layer. Occurs on low-gradient ephemeral to intermittent drainage lines which can include a range of graminoid and herbaceous species tolerant of water-logged soils (DELWP 2022c).

The CGW patches (CGW1-5 within the study area were generally in poor condition and were similar in composition throughout the study area. Of the habitat zones with a canopy layer (CGW1, 3, and 4) River Red-gum *Eucalyptus camaldulensis* was the sole canopy species present. Multiple stags, likely of River Red-gum, were scattered throughout the study area along Bruce Creek (Plate 5). The mid layer largely comprised Hedge Wattle *Acacia paradoxa* and Black Wattle *Acacia mearnsii* was occasionally present (Plate 6). The ground layer contained the highest diversity of native vegetation, predominately containing a mixture of Common Tussock-grass *Poa labillardierei*, Rush *Juncus* sp. Common Reed *Phragmites australis,* Club-rush *Bolboschoenus* sp.

along and immediately adjacent to Bruce Creek (Plate 7). Kangaroo Grass, Spear-grass and Wallaby Grass were occasionally present along the western border of the patches.

Several patches also contained the Weed of National Significance African Box-thorn *Lycium ferocissimum.*

Plate 5. Creekline Grassy Woodland patch along the south-west of Bruce creek. (Ecology and Heritage Partners Pty Ltd 11/07/2022).

Plate 6. Hedge wattle and African Box-thorn dominated mid-layer of Creekline Grassy Woodland patch (CGW 4) (Ecology and Heritage Partners Pty Ltd 11/07/2022).

Plate 7. A patch of treeless Creekline Grassy Woodland along Bruce Creek largely comprising Common Tussock-grass and Sea Rush (Ecology and Heritage Partners Pty Ltd 11/07/2022).

Plains Grassy Woodland

Plains Grassy Woodland is typically defined as an open, eucalypt woodland to 15 metres tall. The understorey consists of a few sparse shrubs over a species-rich grassy and herbaceous ground layer (DELWP 2022c).

Several patches of poor-quality Plains Grassy Woodland were present within the study area and consisted of a sparse canopy of River Red-gum over an understorey of Hedge Wattle, Austral Bracken *Pteridium esculentum* and native grasses such as Kangaroo Grass, Wallaby Grass and Spear-grasses, with scattered Black Wattle (protected under the FFG Act) also present (Plate 8; Plate 9).

Plate 8. Black Wattle with Plains Grassy Woodland patch (Ecology and Heritage Partners Pty Ltd 11/07/2022).

Plate 9. Bracken dominating a Plains Grassy Woodland patch (Ecology and Heritage Partners Pty Ltd 11/07/2022).

3.1.3 Large Trees in Patches

A total of four Large Trees (LTs) in Creekline Grassy Woodland and Plains Grassy Woodland patches were present (Figure 2), all of which were River Red-gums (Plate 10; Plate 11; Appendix 1.3).

Plate 10. Large tree along Bruce Creek (Ecology and Heritage Partners Pty Ltd 11/07/2022).

Plate 11. Large tree along Bruce Creek (Ecology and Heritage Partners Pty Ltd 11/07/2022).

3.1.4 Scattered Trees

A total of 41 scattered trees, were recorded within the study area, which consisted of 21 Large and 20 small scattered trees (Figure 2; Appendix 1.3). All were all River Red-gum, and would have once formed part of the Creekline Grassy Woodland and Plains Grassy Woodland EVCs; however, the understorey vegetation contained predominantly introduced species (mainly exotic pasture grasses) and the trees no longer formed a patch of native vegetation (Plate 12; Plate 13).

Plate 12. Large scattered tree within the study area (Ecology and Heritage Partners Pty Ltd 11/07/2022).

Plate 13. Small scattered tree with nest (Ecology and Heritage Partners Pty Ltd 11/07/2022).

3.1.5 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 dominated by environmental weeds such as Toowoomba Canary-grass *Phalaris aquatica*, Buffalo Grass *Bouteloua dactyloides* Wild Oat, Large Quaking-grass, Yorkshire Fog and Rye-grass. Prevalent herbaceous weeds included Red Sorrel *Acetosella vulgaris,* Plumeless Thistle *Carduus acanthoides* and Cape Weed *Arctotheca calendula.*

Noxious weeds were present throughout the study area, the most prevalent of which were the Weeds of National Significance (WoNS) African Boxthorn *Lycium ferocissimum* (Plate 14), Spiny Rush *Juncus acutus* (Plate 15), Serrated Tussock *Nasella trichotoma* and Chilean Needle-grass *Nasella neesiana.* Scattered occurrences of the noxious Sweet Briar *Rosa rubiginosa,* Saffron Thistle *Carthamus lanatus*, and Artichoke Thistle *Cynara cardunculus* and were also present. Occasional specimens of Willow *Salix* sp. (a WoNS) was also observed to be present along the banks of Bruce Creek.

A windrow of Pines *Pinus radiata* and some planted Blue-gums *Eucalyptus globulus* were present in the north of the site off Ormond Street, and Sugar Gums *Eucalyptus cladocalyx* were also present within the study area.

Plate 14. African Boxthorn within the study area (Ecology and Heritage Partners Pty Ltd 11/07/2022).

Plate 55. Spiny Rush within the study area (Ecology and Heritage Partners Pty Ltd 11/07/2022).

3.2 Fauna Habitat

The areas of Plains Grassy Woodland and Creekline Grassy Woodland provide habitat for a range of fauna, including arboreal species that require trees for nesting/roosting (e.g. possums and bird species), as well as ground-dwelling species reliant on a grassy ground cover for their food or shelter (e.g. lizards). Eucalypt (*Eucalyptus* spp.) and Wattle (*Acacia* spp.) trees will provide foraging habitat for nectarivores (nectar-eating) and frugivorous (fruit-eating) bird species. Many eucalypts are mature, providing an array of small, medium and large hollows, bark fissures and crevices. These are likely to be used for shelter and nesting by a range of hollow-dependent fauna, including parrots, microbats, possums, gliders and owls.

Mature scattered trees are likely to act as 'stepping-stones' for fauna moving through the predominantly agricultural landscape, increasing landscape permeability.

Fauna observed using habitat within the study area included Sulphur-crested Cockatoo *Cacatua galerita*, Superb Fairy-wren *Malurus cyaneus*, Eastern Rosella *Platycercus eximius,* Willie Wagtail *Rhipidura leucophrys,* Galah *Eolophus roseicapilla,* Flame Robin *Petroica phoenicea,* Australian Magpie *Gymnorhina tibicen*, Australian Raven *Corvus coronoides* and a Wedge-tailed Eagle *Aquila audax.*

Areas of emergent vegetation were dispersed throughout Bruce Creek, which can provide important habitat for various frog species, such as the nationally vulnerable Growling Grass Frog *Litoria raniformis* which requires still to slow moving waters with intact emergent vegetation on the margins (DEWHA 2009a), and has been confirmed as present during previous targeted surveys within Bruce Creek (Ecology and Heritage Partners Pty Ltd 2021).

The majority of the study area consists of improved exotic or native pastures, likely to be used as a foraging resource by common generalist bird species which are tolerant of modified open areas. Many European Rabbit *Oryctolagus cuniculus* and warrens were noted within the study area in areas of pasture, and Red Fox *Vulpes vulpes* are highly likely to use the study area.

Furthermore, areas of native grassland can support a diversity of animal species, notably skinks, snakes, birds of prey and ground-dwelling birds (TSSC 2008). The nationally vulnerable Striped Legless Lizard *Delma impar*, a grassland specialist, typically occurs in such areas of native and non-native grassland, as does the FFG-Act

listed Tussock Skink and Golden Sun Moth *Synemon plana* (critically endangered under the EPBC Act), which were both recorded on the eastern side of Bruce Creek during previous ecological investigations (Ecology and Heritage Partners 2021).

3.3 Nationally Significant Values

Matters of National Environmental Significance (NES) are listed and protected under the EPBC Act. Matters of NES relating to biodiversity are discussed below in relation to the entire study area based on the results of the PMST (DCCEEW 2022), desktop review of literature, and the results of ecological surveys.

3.3.1 Flora

The VBA contains records of six nationally significant flora species previously recorded within 10 kilometres of the study area (DELWP 2022d) (Figure 3; Appendix 1.4).

The PMST nominated an additional 13 nationally significant species which have not been recorded in the locality but have the potential to occur (DCCEEW 2022; Appendix 1.4).

While there are multiple records of significant species within 10 kilometres of the study area, there are no recorded occurrences within the study area itself. However, this may not indicate the absence of the listed species but may simply reflect the lack of detailed flora survey in the area.

Given the distribution of records and the habitat encountered during the preliminary biodiversity assessment, five nationally significant species were considered to have a moderate or higher likelihood of occurrence within the study area (Table 6); the same as those identified in the assessment of the eastern side of Bruce Creek.

Table 6. Nationally significant flora with potential habitat in the study area

Species	Suitable habitat within the study area	Closest known records
Spiny Rice-flower	The species has the potential to occur in areas of relatively undisturbed Plains Grassland and Plains Grassy Woodland within the study area.	Approx. 1.7 kilometres north of the study area, within the rail corridor.
Large-headed Fireweed	Suitable habitat for this species exists in areas not subject to historical agricultural disturbance (i.e. cropping and/or other major ground disturbances), such as the intact areas of Plains Grassland and Plains Grassy Woodland.	Approximately 1.1 kilometres from the study area, in the Bannockburn Cemetery.
Matted Flax-lily	Likely habitat for the species is identified within areas of moderate to high quality plains grassland. Areas of embedded rock not supporting native vegetation have a moderate to low likelihood of occurrence.	Approximately 1.1 kilometres from the study area, in the Bannockburn Cemetery.
Button Wrinklewort	Likely habitat for the species is identified within areas of moderate to high quality plains grassland. Areas of embedded rock not supporting native vegetation have a moderate to low likelihood of occurrence.	Approximately 1.7 kilometres north of the study area, within the rail corridor.

Species	Suitable habitat within the study area	Closest known records
Adamson's Blown-grass	Likely habitat for the species is identified within Creekline Grassy Woodland vegetation within the area.	Approximately 12 kilometres east of the study area, within agricultural land.

Spiny Rice-flower

There are numerous records of Spiny Rice-flower recorded in the Victorian Biodiversity Atlas (VBA) within 10 kilometres of the study area (Figure 3), mainly within the rail corridor.

Potential habitat for Spiny Rice-flower was identified during previous ecological assessments undertaken near the study area (Ecology and Heritage Partners 2020b; Ecology and Heritage Partners Pty Ltd 2021). The species was considered to have the potential to occur within patches of native vegetation (i.e. Plains Grassland EVC) and areas supporting embedded rock (Figure 2).

Patches of native grassland suitable to support individuals of Spiny Rice-flower are present within the study area. Targeted surveys for the species are recommended to determine the presence/absence of the species.

Large-headed Fireweed

Potential habitat for Large-headed Fireweed was identified during previous ecological assessments undertaken throughout the study area (Ecology and Heritage Partners 2020b; Ecology and Heritage Partners Pty Ltd 2021). The species was considered to have the potential to occur within patches of relatively undisturbed Plains Grassland with Kangaroo Grass present.

Whilst relatively intact areas of Plains Grassland persisted within the study area, the existing condition of habitat showed signs of historical clearing and/or high weed invasion. Habitat for the species is therefore considered marginal, however targeted surveys are recommended to determine the presence/absence of the species.

Matted Flax-lily

Matted Flax-lily has the potential to persist within areas of Plains Grassland and open woodland habitats recorded within the study area (Figure 2). The species is known from a single occurrence in the Bannockburn Cemetery (Figure 3).

Whilst relatively intact areas of Plains Grassland persisted within the study area, the existing condition of habitat showed signs of historical clearing and/or high weed invasion. Habitat for the species is therefore considered marginal, however targeted surveys are recommended to determine the presence/absence of the species.

Button Wrinklewort

Button Wrinklewort grows in grassland and woodland communities primarily associated with Kangaroo Grass with an open distribution between tussocks (Morgan 1995).

Areas dominated by Kangaroo Grass were present within the study area, and as such, targeted surveys are recommended to determine the presence/absence of the species.

Adamson's Blown Grass

The most recent documented records of Adamson's Blown Grass within the VBA (DELWP 2022d) occurs approximately 12 kilometres east of the study area, within agricultural land (Figure 3). The species has the potential to persist within the riparian zone of Bruce Creek.

Potential habitat within the riparian zone of Bruce Creek was highly modified and dominated by exotic grasses including Toowoomba Canary-grass and Kikuyu *Pennisetum clandestinum.* Given the known threats to the species that are present within the study area, including a high cover of annual and perennial weeds within or adjacent to areas of potential habitat, it is considered that existing habitat quality for the species is marginal. However targeted surveys are recommended to determine the presence/absence of the species.

Other Nationally Significant Flora

Based on the landscape context, highly modified, agricultural nature of the study area and extent of previous vegetation removal, the likelihood of any additional nationally significant flora occurring within the study area is considered low due to the absence of suitable habitat and lack of records in close proximity (Appendix 1.4).

3.3.2 Fauna

The VBA contains records of seven nationally significant fauna species previously recorded within 10 kilometres of the study area (DELWP 2022d) (Appendix 2.1) (Figure 4). The PMST nominated an additional 16 nationally significant species which have not been previously recorded but have the potential to occur in the locality (DCCEEW 2022).

Of the 23 nationally significant fauna species that are known to, or are predicted to occur within the locality, one (Growling Grass Frog) is known to occupy the study area, and two were considered to have a moderate or higher likelihood of occurrence within the study area (Table 7); one being Golden Sun Moth which has been recorded on the east side of Bruce Creek.

Based on the results of the desktop assessment and field assessments, it is considered highly unlikely that any additional nationally significant fauna occur within the study area due to highly modified condition of the understorey and ongoing land use of the site resulting in the absence of suitable habitats likely to support nationally significant species.

The likelihood of occurrence of nationally threatened species within the study area is outlined in Appendix 2.1.

Table 7. Nationally significant fauna with suitable habitat in the study area

Species	Suitable habitat within the study area	Closet known records
Striped Legless Lizard	Areas of suitable tussock structure, cracking soils and embedded rock without major disturbance from ploughing.	No records within 10 kilometres of study area.
Growling Grass Frog	Still or water flowing waterbodies with emergent vegetation	Known to occupy the study area.
Golden Sun Moth	Areas supporting a moderate cover (i.e. 20-40%) of Wallaby-grass, Spear-grass and other native perennial species	Eastern side of Bruce Creek, opposite the study area.

Bruce Creek is known to support a population of Growling Grass Frog, and is considered to be a likely dispersal corridor for the species (Ecology and Heritage Partners 2021).

Striped Legless Lizard

Areas that support native grassland and secondary grasslands with cracking soils, and surface or embedded rock within the study area offer suitable habitat for Striped Legless Lizard. Although some discrete areas of embedded rock are still present, most of the study area has either been cropped or is highly disturbed (i.e. dominated by exotic grasses with an absence of cracking soils).

No Striped Legless Lizards were detected on the eastern side of Bruce Creek during targeted surveys undertaken in 2020 (Ecology and Heritage Partners 2021). However, based on habitat quality, there is a moderate likelihood that the species may occupy the western side of the creekand targeted surveys are recommended to confirm their presence/absence.

Growling Grass Frog

Growling Grass Frog were confirmed to be present within Bruce Creek as part of the previous biodiversity assessment for the eastern side of the creek, and were described as an 'important population' (Ecology and Heritage Partners 2021). As such, further targeted surveys are not necessary.

Golden Sun Moth

Small numbers of Golden Sun Moth were confirmed to be present in suitable habitat on the eastern bank of Bruce Creek as part of the previous biodiversity assessment for the eastern side of the creek (Ecology and Heritage Partners 2021). Patches of moderate quality Plains Grassland within the study area (i.e. the western bank) offer suitable habitat for Golden Sun Moth due to the presence of the species' preferred food plant, Wallaby-grass, in addition to Chilean Needle Grass. As such, targeted surveys are recommended to determine the presence/absence of the species within the study area.

3.3.3 Ecological Communities

Five nationally listed ecological communities have the potential to occur within 10 kilometres of the study area (DCCEEW 2022).

- Grassy Eucalypt Woodland of the Victorian Volcanic Plain;
- Natural Damp Grassland of the Victorian Coastal Plains;
- Natural Temperate Grassland of the Victorian Volcanic Plain;
- Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains; and
- White Box-Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland.

Based on the field assessment undertaken, there is potential for Natural Temperate Grassland of the Victorian Volcanic Plain to occur within the study area, in areas of Plains Grassland vegetation. A more detailed assessment in spring will be required to confirm the presence of this ecological community.

Plains Grassy Woodland patches within the study area did not meet the diagnostic characteristics that define the nationally significant *Grassy Eucalypt Woodland of the Victorian Volcanic Plain* given the dominance of non-native grasses in the understorey, lack of community structure and poor native species diversity.

Although the *Grassy Eucalypt Woodland of the Victorian Volcanic Plain* and *Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains* communities have the potential to occur within the broader

area, the on-ground assessment determined them to be absent within the study area based on a lack of indicator species, structure, species diversity, and/or falling outside of the community's distribution.

3.3.4 *Migratory Species*

Migratory species listed under the EPBC Act are those protected under international agreements to which Australia is a signatory. These include the Japan Australia Migratory Bird Agreement (JAMBA), the China Australia Migratory Bird Agreement (CAMBA), the Republic of Korea Migratory Bird Agreement (ROKAMBA), and the Bonn Convention on the Conservation of Migratory Species of Wild Animals. Migratory species are considered matters of NES under the EPBC Act.

No species of bird recognised under the migratory provisions of the EPBC Act were recorded during ecological surveys.

While migratory species of bird may occasionally inhabit the broader locality, the study area is not considered to 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.

3.3.5 *Others Matters of NES*

The study area does not support any other features corresponding with matters of NES protected under the EPBC Act (i.e. World or National Heritage Areas) (DCCEEW 2022).

3.4 State Significant Values

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

3.4.1 *Flora*

The VBA contains records of 21 State-significant flora species within 10 kilometres of the study area (DELWP 2022d) (Appendix 1.4). The majority of these species are located outside of the study area in relatively high quality, undisturbed reserves such as the Bannockburn Flora and Fauna Reserve, or within rail corridors (Figure 3).

However, there is considered to be a moderate likelihood of occurrence within the study area for the following species (Table 8):

Table 8. State significant flora with moderate to high likelihood of occurrence.

Species	Suitable habitat within the study area	Closet known records
Cut-leaf Burr Daisy	Throughout the parcels adjacent to Bruce Creek	Approx. 1.7 kilometres north of the study area, within the rail corridor.

Species	Suitable habitat within the study area	Closet known records
Small Scurf-pea	Throughout the parcels adjacent to Bruce Creek	Approx. 1.7 kilometres north of the study area, within the rail corridor.
Hairy Tails	Throughout the parcels adjacent to Bruce Creek	Approx. 1.7 kilometres north of the study area, within the rail corridor.

Targeted surveys for the species detailed in Table 8 above should be undertaken concurrently with the targeted surveys for nationally-significant flora.

While a total of seven Melbourne Yellow-gum (listed as threatened under the FFG-Act) were recorded on the eastern side of Bruce Creek during previous assessments (Ecology and Heritage Partners 2021), none were recorded during this assessment of the western side of the creek, and nor were any other state listed species.

Approximately 30 specimens of Black Wattle (protected under the FFG Act) were noted during the site assessment.

The likelihood of any other State significant species occurring within the study area is considered low due to the absence of suitable habitat and/or lack of documented records of these species within close proximity to the study area (Appendix 1.4).

3.4.2 Fauna

The VBA contains records of 19 State-significant fauna species within 10 kilometres of the study area (DELWP 2022d) (Appendix 2.1; Figure 4).

All historical records of state listed fauna species have been observed outside or adjacent to the study area, with notable clusters within Bannockburn Flora and Fauna Reserve and Inverleigh Flora Reserve (Figure 4). Eight individuals of Tussock Skink *Pseudemoia pagenstecheri* (Volcanic Plains), listed as Endangered under the FFG Act, were recorded on the eastern side of Bruce Creek during the Striped Legless Lizard surveys undertaken within the South East section of the growth area (Ecology and Heritage Partners 2021).

There is considered to be a moderate to high likelihood of occurrence within the study area for the following species (Table 9).

Table 9. State significant fauna with moderate to high likelihood of occurrence

Species	Suitable habitat within the study area	Closest known records
Tussock Skink	Plains Grassland/ Plains Grassy Woodland along Bruce Creek	Eastern side of Bruce Creek, opposite the study area.
Brown Treecreeper	Creekline Grassy Woodland/ Plains Grassy Woodland along Bruce Creek	Three kilometres north-west of the study area
Hooded Robin	Creekline Grassy Woodland/ Plains Grassy Woodland along Bruce Creek	Three kilometres north-west of the study area
Diamond Firetail	Creekline Grassy Woodland/ Plains Grassy Woodland along Bruce Creek	Three kilometres north-west of the study area

Habitat for the above State significant species is mainly found in woodland areas within the study area. Areas of Plains Grassy Woodland and Creekline Grassy Woodland within the study area was of low quality and relatively degraded (i.e. understorey dominated by exotic vegetation). While targeted surveys are not required

for State-significant fauna, it is recommended that surveys for Tussock Skink take place concurrently with the targeted surveys for Striped Legless Lizard, as the survey methodology is also suitable for this species.

3.4.3 Ecological Communities

One ecological community listed as threatened under the FFG Act, Western (Basalt) Plains Grassland (DELWP 2019e), has the potential to occur within the study area. A Spring flora survey is recommended to determine the presence/absence of this community.

4 LEGISLATIVE AND POLICY IMPLICATIONS

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

The EPBC Act is administered by the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) and provides a national framework for the protection of heritage and the environment, and the conservation of biodiversity. The Act establishes a Commonwealth process for the assessment of proposed actions that are likely to have a significant impact on matters of National Environmental Significance (MNES), or on Commonwealth land. An action (i.e. - project, development, undertaking, activity, or series of activities), requires approval from the Commonwealth Environment Minister if it is likely to have a significant impact on any MNES, described in Table 10.

Table 10. Potential impacts to matters of National Environmental Significance (NES)

Matter of NES	Potential Impacts
World Heritage properties	The proposed action will not impact any properties listed for World Heritage.
National heritage places	The proposed action will not impact any places listed for national heritage.
Ramsar wetlands of international significance	The study area is located 30 kilometres to the west of the Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar site. Provided management practices and construction techniques are consistent with the Environmental Guidelines for Major Construction Sites (EPA 2020a), and Construction Techniques for Sediment Pollution Control (EPA 2020b), the proposed action is unlikely to impact the ecological character of the Ramsar wetland.
Threatened species and ecological communities	Growling Grass Frog is known to be present within the Bruce Creek riparian corridor, and the population has been defined as an 'important population' (Ecology and Heritage Partners Pty Ltd 2021). Golden Sun Moth was recorded on the eastern side of Bruce Creek, opposite the study area, during previous ecological investigations (Ecology and Heritage Partners Ptd Ltd 2021). Potential habitat exists for two fauna species, for which targeted surveys are recommended: Golden Sun Moth and Striped Legless Lizard. One significant ecological community may be present within the study area: Natural Temperate Grassland of the Victorian Volcanic Plain (NTGVVP). A detailed flora assessment in spring will be required to confirm whether the vegetation meets the conditions thresholds for this ecological community.
Migratory and marine species	While a number of species may occasionally forage or fly over habitat within the study areas it would not be classed as an 'important habitat' as defined under the EPBC Act Policy Statement 1.1 Principal Significant Impact Guidelines (DoE 2013).
Commonwealth marine area	The proposed action will not impact any Commonwealth marine areas.
Nuclear actions (including uranium mining)	The proposed action is not a nuclear action.

Great Barrier Reef Marine Park	The proposed action will not impact the Great Barrier Reef Marine Park.
Water resources impacted by coal seam gas or mining development	The proposed action is not a coal seam gas or mining development.

4.1.1 Assessment of impacts to Matters Of National Environmental Significance

Natural Temperate Grassland of the Victorian Volcanic Plain

There is potential for the nationally significant ecological community Natural Temperate Grassland of the Victorian Volcanic Plain to occur within the study area.

Potential impacts to the NTGVVP community as a result of future development will be assessed against the significant impact thresholds for the community detailed in DoE (2013).

Growling Grass Frog

Targeted surveys conducted as part of the ecological investigations for the Bannockburn Growth Area South East study area confirmed the presence of Growling Grass Frog along Bruce Creek (Ecology and Heritage Partners Pty Ltd 2021).

Given the confirmed presence of a viable population within the study area that is not isolated or fragmented from other habitats, it is considered that this population is an 'important population' as described in the significant impact guidelines for the species (DEWHA 2009a).

Potential impacts to Growling Grass Frog as a result of future development will require assessment against the significant impact thresholds for the species detailed in DEWHA (2009) and provided below (Table 11).

Table 11. Significant impact thresholds for Growling Grass Frog (DEWHA 2009a).

Ecological element affected	Impact Threshold
Habitat degradation in an area supporting an important population	Permanent removal or degradation of terrestrial habitat within 200 metre of a waterbody in temperate regions that results in the loss of dispersal or overwintering opportunities for an important population.
	Alteration of aquatic vegetation, diversity or structure that leads to a decrease in habitat quality.
	Alteration to wetland hydrology, diversity and structure.
	Introduction of predatory fish and/or disease agents.
Isolation and fragmentation of populations	Net reduction in the number and/or diversity of waterbodies available to a population.
	Removal or alteration of available terrestrial or aquatic habitat corridors.
	Construction of physical barriers to movement between waterbodies, such as roads or buildings.

To mitigate against a potential impact to Growling Grass Frog and associated habitats, a buffer of at least 200 metres should be applied from confirmed habitat along each bank of Bruce Creek. Frogs are known to use terrestrial areas for foraging and overwintering.

Indirect impacts to the quality of the species' habitat caused by alterations to the hydrology of Bruce Creek must also be carefully mitigated. Increased or decreased flows into potential habitat may alter the diversity and structure of riparian vegetation (i.e. fringing and emergent vegetation used for foraging and breeding), change the pH of the water, and decrease water quality through increased sedimentation and siltation.

If any of the thresholds detailed in Table 11 are exceeded, then the proposed action may result in a significant impact to Growling Grass Frog.

Golden Sun Moth

Approximately 24 hectares of potential Golden Sun Moth habitat is present within the study area (Figure 2).

If Golden Sun Moth are detected during the recommended targeted surveys, potential impacts to the species as a result of future development will require assessment against the significant impact thresholds for the species (DEWHA 2009b).

4.2 *Environment Effects Act 1978* (Victoria)

The *Environment Effects Act 1978* (EE Act) provides for assessments of proposed actions that are capable of having a significant impact 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.

4.2.1 Implications

Actions undertaken in accordance with a prescribed PSP are exempt from the requirements of the EE Act. Provided a PSP is prepared guiding future development within the Bannockburn Growth Area then a referral under the EE Act is not required.

4.3 *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' listed and/or protected flora species, listed vegetation communities and listed fish species in areas of public land (i.e. within road reserves, drainage lines and public reserves). 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.

4.3.1 Flora and Fauna Guarantee Amendment Act 2019 (the Amendment Act)

Amendments to the Flora and Fauna Guarantee Act 1988 came into effect on 1 June 2020 following the passing of the Flora and Fauna Guarantee Amendment Act 2019 (the Amendment Act) through the Victorian Parliament in 2019. The Amendment Act was introduced to update the approach to conservation and regulation outlined in the original Act, and improve its relevance for protecting Victoria's biodiversity.

The Amendment Act now applies to both Crown land and freehold land that is managed by a public authority. Public authorities are defined as bodies established for a public purpose under any act, including administrative offices, departments, councils, public entities and state-owned enterprises. The amended Act

contains an obligation or duty on public authorities and ministers to consider potential biodiversity impacts when exercising their function.

4.3.2 Implications

The FFG Act listed fauna species Growling Grass Frog was recorded within the study area during the previous ecological assessments of the eastern side of Bruce Creek (Ecology and Heritage Partners Pty Ltd 2021), and the site has the potential to support Golden Sun Moth (which was also recorded on the eastern banks of Bruce Creek [Ecology and Heritage Partners Ptd Ltd 2021]), and Striped Legless Lizard, which are both listed under the FFG Act.

Approximately 30 specimens of Black Wattle, which is protected under the FFG-Act, were recorded within the study area, and there is the potential for *Western (Basalt) Plains Grassland* ecological community to occur within the study area. A permit under the FFG Act will be required where impacts to listed FFG Act matters occur on public land, and public authorities must consider impacts to these biodiversity values when assessing any application for the study area.

4.3.2.1 Implications under the Amendment Act

Actions which require a permit under the Amendment Act remain largely consistent with the original Act. A permit will still be required for impacts to protected or listed species and/or communities and areas of critical habitat on public land. However, under the Amendment Act, a permit will also be required where impacts to listed FFG Act matters occur on any freehold land that is managed by a public authority.

The Amendment Act introduces changes to the categories of protected flora, the way they are regulated, and the penalties associated with their protection. The Amendment Act includes no changes to the threatened communities or threatening processes listed under the FFG Act.

4.4 *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.

Weeds listed as noxious under the CaLP Act were recorded during the assessment (Willow, Chilean Needle-grass, African Boxthorn, Saffron Thistle, Artichoke Thistle, Serrated Tussock, Sweet Briar and Spiny Rush). Similarly, there is evidence that the study area is currently occupied by several pest fauna species listed under the CaLP Act (Red Fox and European Rabbit). Weed management and pest fauna management actions are likely to be required to be incorporated into any future Construction Environmental Management Plan (CEMP) as part of any future development of the study area.

4.5 *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.

4.6 *Water Act 1989* (Victoria)

Five road crossings are currently proposed over Bruce Creek, which forms the eastern boundary of the study area.

A 'works on waterways' permit from the Corangamite CMA is likely to be required where any action impacts on waterways within the study area. Additionally, where structures are installed within or across waterways that potentially interfere with the passage of fish or the quality of aquatic habitat, these activities should be referred to DELWP with the Corangamite CMA included for comment.

5 MITIGATION MEASURES

5.1 Precinct Design Principles

At a broad scale, the following measures should be considered as part of the detailed design process for the future PSPs within the Bannockburn Growth Area:

- Retain areas of high conservation value:
- Large areas of native vegetation should be protected in habitat nodes;
- Provide a variety of flora and fauna habitats to promote and retain biodiversity;
- Undertake habitat creation (i.e. waterways, drainage lines and designated revegetation areas);
- Provide linear corridors of vegetation along walking/cycling tracks;
- Create linear habitat corridors along waterways/drainage lines/tributaries whilst implementing Water Sensitive Urban Design whilst ensuring no off-site impacts;
- Incorporating drainage lines into habitat corridors and open public spaces;
- Interpret/educate residents about values of grasslands through signage;
- Undertaken feral pest animal and plant control;
- Retain native trees in urban active and passive open space areas;
- Feature waterways/landscaping combination of a series of smaller connected basins rather than one large isolated basin.
- Investigate methods to interconnect spaces through Open Space Links to create more complete habitat;
- Rehabilitate and protect significant native vegetation;
- Ensure stormwater treatment is designed to provide habitat(s) for significant flora and fauna species;
- Investigate options to achieve high canopy coverage on public and private land (for example 40-50%); and,
- Connect biodiversity sites with parks/open spaces so they are separated from development.

5.2 Best Practice Mitigation Measures

Recommended measures to mitigate impacts upon terrestrial and aquatic values present within the study area are listed below:

- Control of noxious weeds within the study area should be an immediate priority to reduce further degrading impacts to the existing remnant ecological values present within the study area and surrounds;
- Consideration of Water Sensitive Urban Design techniques such as stormwater treatment wetlands, bio-retention systems, porous paving or swales;
- 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;
- Tree Retention Zones (TRZs) should be implemented to prevent indirect losses of native vegetation during construction activities (DSE 2011). A TRZ applies to a tree and is a specific area above and below the ground, with a radius 12 x the DBH. At a minimum standard a TRZ should consider the following:
    - A TRZ 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 TRZ;
    - Where encroachment exceeds 10% of the total area of the TRZ, the tree should be considered as lost and offset accordingly;
    - Directional drilling may be used for works within the TRZ 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 TRZ has not been met an offset may be required.
- Ensure that best practice sedimentation and pollution control measures are undertaken at all times, in accordance with Environment Protection Agency guidelines (EPA 2020a; EPA 2020b; Victorian Urban 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 and pathogen management measures, etc.;
- Growling Grass Frog Conservation Management Plan (GGFCMP). The GGFCMP should detail how aquatic and terrestrial habitat along Bruce Creek will be protected, and enhanced to ensure any potential impacts to the population are mitigated pre, during and post development; and,
- Conservation Management Plan (CMP). One or more CMP's are likely to be required to detail how areas of retained high value biodiversity are protected, managed and enhanced as part of the PSP process. Any conservation area is likely to contain one or more of Golden Sun Moth and the NTGVVP ecological community. The CMP should specify management actions and timeframes associated with the protection and enhancement of the retained values. Where more than one matter of NES is present within a conservation area, the management actions proposed must be complementary to all relevant matters.

6 RECOMMENDATIONS

Further assessments by a suitably qualified ecologist are required to determine the presence or absence of the significant flora and fauna species detailed in Table 13 below, for which potential habitat exists within the study area. Further assessment of the patches of Plains Grassland in Spring is also required to determine whether they classify as the nationally-significant *Natural Temperate Grassland of the Victorian Volcanic Plain* ecological community and/or the State-significant *Western (Basalt) Plains Grassland* ecological community.

Where feasible, targeted surveys for significant flora species will be conducted simultaneously whereby flowering periods overlap or coincide with one another. Known reference sites of significant flora previously documented within proximity to the study area will be visited prior to conducting the targeted surveys, to determine whether the species is presently flowering. Surveys for State-significant flora (i.e. Cut-leaf Burr Daisy, Small Scurf-pea and Hairy Tails) will be undertaken concurrently with those for the nationally-significant flora.

Similarly, known reference sites of significant fauna previously documented within proximity to the study area will be visited prior to conducting the targeted surveys for significant fauna, to confirm whether the species is active. Surveys for the State-significant Tussock Skink will be undertaken concurrently with those for Striped Legless Lizard.

Table 13. Recommended targeted surveys for species listed under the EPBC Act.

Common Name	Scientific Name	Recommended survey timing
FLORA		
Spiny Rice-flower	*Pimelia spinescens* subsp *spinescens*	April to August (When in flower)
Button Wrinklewort	*Rutidosis leptorhynchoides*	Late Spring to early Summer (Oct – Jan)
Large-headed Fireweed	*Senecio macrocarpus*	August to November
Matted Flax-lily	*Dianella amoena*	Late Spring to early Summer (Nov – Jan)
Adamson's Blown Grass	*Lachnagrostis adamsonii*	November to February
FAUNA		
Golden Sun Moth	*Synemon plana*	Between late October and early January (dependent on local flight season)
Striped Legless Lizard	*Delma impar*	Establish tile grids in July. Undertake tile checks between September to December

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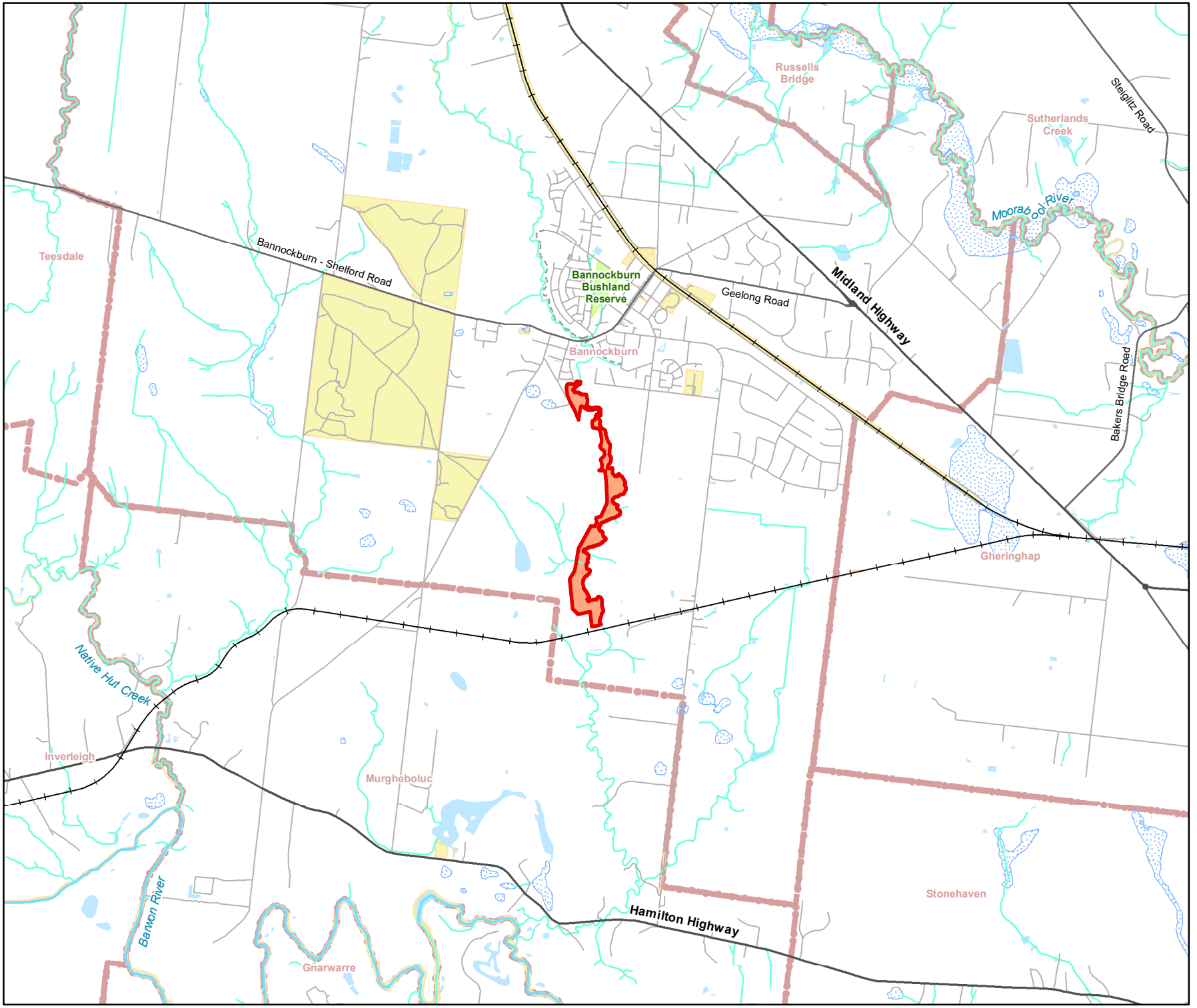


Legend

- Study Area
- Railway
- Major Road
- Collector Road
- Minor Road
- Proposed Road
- Minor Watercourse
- Major Watercourse
- Permanent Waterbody
- Land Subject to Inundation
- Parks and Reserves
- Crown Land
- Localities

Figure 1

Location of the study area

Biodiversity Assessment for Bruce Creek, Bannockburn

N

0 750 1,500

Metres

Map Scale: 1:60,000 @ A4
Coordinate System: GDA 1994 MGA Zone 55

ecology & heritage partners

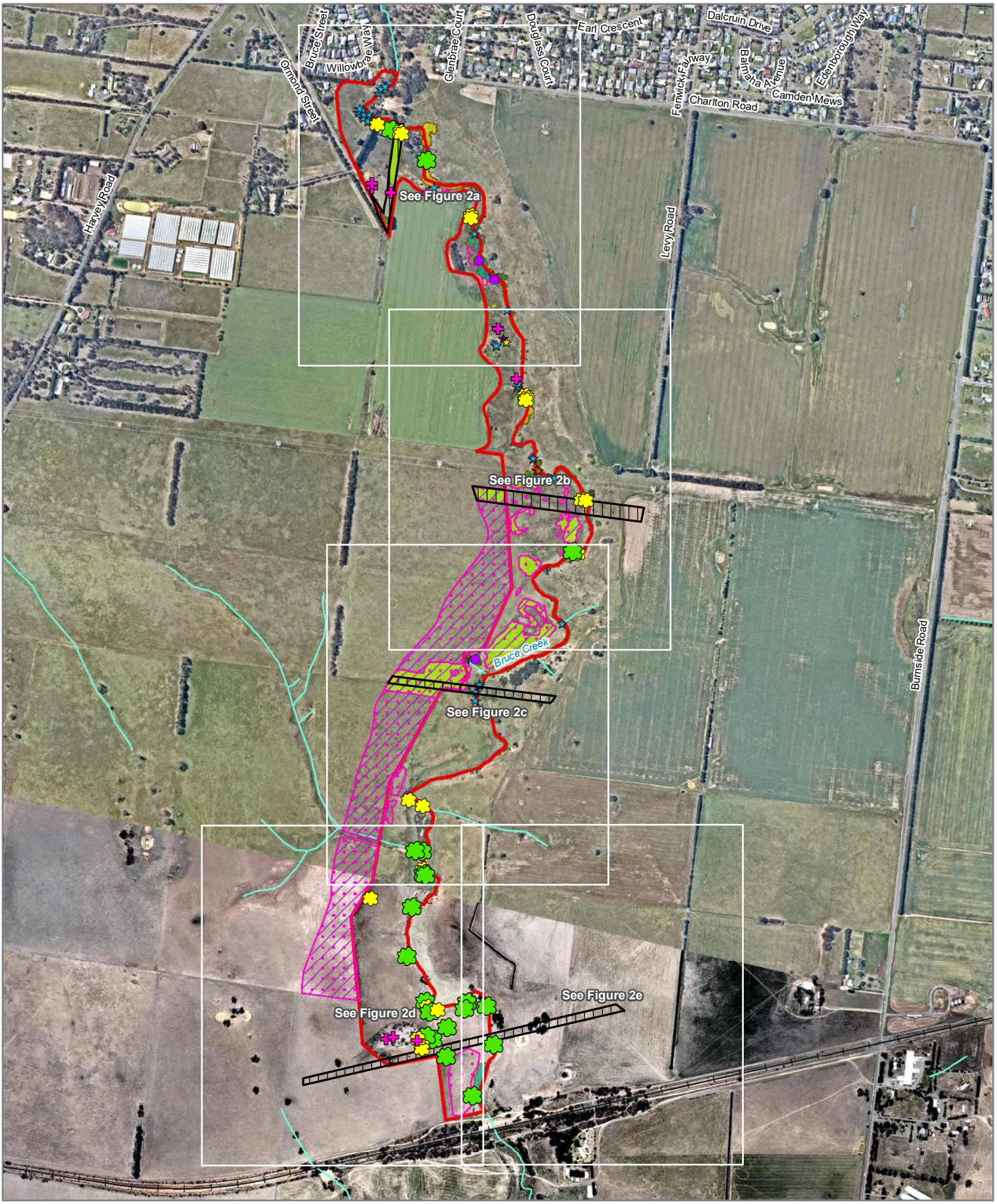


Figure 2 Overview

Ecological features

Biodiversity Assessment for Bruce Creek, Bannockburn

ecology & heritage partners

Legend

- Study Area
- Proposed Roads and Crossings
- Potential Golden Sun Moth habitat
- Scattered Large Tree
- Scattered Small Tree
- Large Tree in patch
- Significant flora (Black wattle)

Ecological Vegetation Classes

- Creekline Grassy Woodland (EVC 68)
- Plains Grassland (EVC 132)
- Plains Grassy Woodland (EVC 55)

EPBC Act vegetation community

- Potential Natural Temperate Grassland of the Victorian Volcanic Plain

Weeds

- Boxthorn
- Pattersons Curse
- Serrated Tussock
- Willow

Native vegetation

- Hedge Wattle

Exotic/planted vegetation

- African Box-thorn

N

0 125 250

Metres

Map Scale: 1:14,000 @ A4
Coordinate System:
GDA 1994 MGA Zone 55

Aerial source: Nearmap 2021

Figure 2a
Ecological features
Biodiversity Assessment for Bruce Creek, Bannockburn

ecology & heritage partners

Legend

- Study Area
- Proposed Roads and Crossings
- Potential Golden Sun Moth habitat
- Scattered Large Tree
- Scattered Small Tree
- Large Tree in patch
- Significant flora (Black wattle)

Ecological Vegetation Classes

- Creekline Grassy Woodland (EVC 68)
- Plains Grassland (EVC 132)
- Plains Grassy Woodland (EVC 55)

Native vegetation

- Hedge Wattle

Weeds

- Boxthorn
- Willow

N

0 25 50
Metres

Map Scale: 1:3,000 @ A4
Coordinate System:
GDA 1994 MGA Zone 55

16294_Fig02_EcoFeat_PMB 10/11/2022 dvaladares

Aerial source: Nearmap 2021

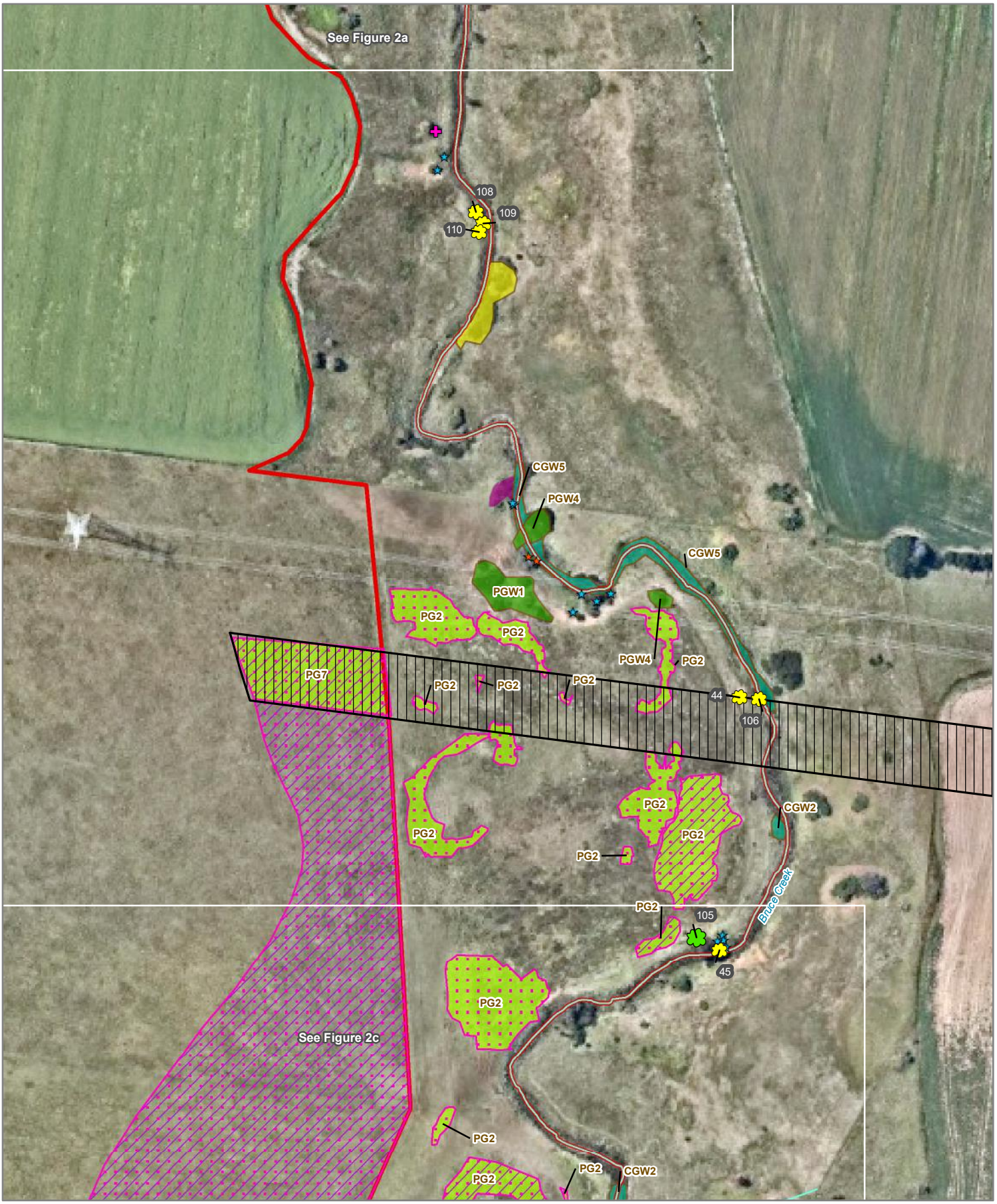


Figure 2b

Ecological features

Biodiversity Assessment for Bruce Creek, Bannockburn

ecology & heritage partners

Legend

- Study Area
- Proposed Roads and Crossings
- Potential Golden Sun Moth habitat
- Scattered Large Tree
- Scattered Small Tree
- Significant flora (Black wattle)

Ecological Vegetation Classes

- Creekline Grassy Woodland (EVC 68)
- Plains Grassland (EVC 132)
- Plains Grassy Woodland (EVC 55)

EPBC Act vegetation community

- Potential Natural Temperate Grassland of the Victorian Volcanic Plain

Weeds

- Boxthorn
- Willow

Native vegetation

- Hedge Wattle

Exotic/planted vegetation

- African Box-thorn

N

0 25 50

Metres

Map Scale: 1:3,000 @ A4
Coordinate System:
GDA 1994 MGA Zone 55

16294_Fig02_EcoFeat_PMB 10/11/2022 dvaladares

Aerial source: Nearmap 2021

Figure 2c

Ecological features

Biodiversity Assessment for Bruce Creek, Bannockburn

ecology & heritage partners

Legend

- Study Area
- Proposed Roads and Crossings
- Potential Golden Sun Moth habitat
- Scattered Small Tree
- Large Tree in patch

Ecological Vegetation Classes

- Creekline Grassy Woodland (EVC 68)
- Plains Grassland (EVC 132)

EPBC Act vegetation community

- Potential Natural Temperate Grassland of the Victorian Volcanic Plain

Weeds

- Boxthorn

N

0 25 50

Metres

Map Scale: 1:3,000 @ A4
Coordinate System:
GDA 1994 MGA Zone 55

16294_Fig02_EcoFeat_PMB 10/11/2022 dvaladares

Aerial source: Nearmap 2021

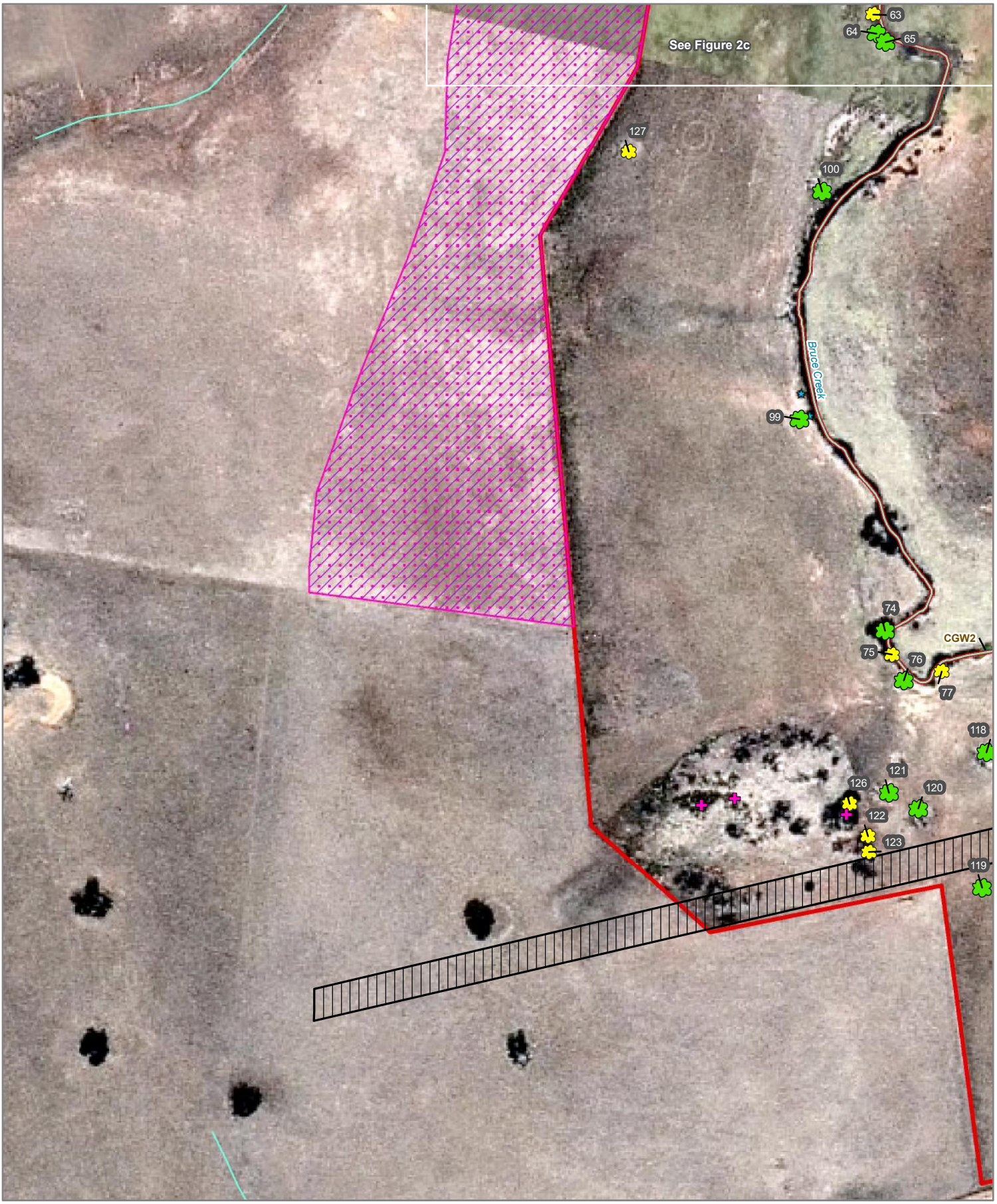


Figure 2d

Ecological features

Biodiversity Assessment for Bruce Creek, Bannockburn

ecology & heritage partners

Legend

- Study Area
- Proposed Roads and Crossings
- Potential Golden Sun Moth habitat
- Scattered Large Tree
- Scattered Small Tree
- Significant flora (Black wattle)

Ecological Vegetation Classes

- Creekline Grassy Woodland (EVC 68)

EPBC Act vegetation community

- Potential Natural Temperate Grassland of the Victorian Volcanic Plain

Weeds

- Boxthorn

N

0 25 50

Metres

Map Scale: 1:3,000 @ A4
Coordinate System:
GDA 1994 MGA Zone 55

16294_Fig02_EcoFeat_PMB 10/11/2022 dvaladares

Aerial source: Nearmap 2021

Figure 2e

Ecological features

Biodiversity Assessment for Bruce Creek, Bannockburn

Legend

Proposed Roads and Crossings

N

0 25 50

Metres

Map Scale: 1:3,000 @ A4
Coordinate System:
GDA 1994 MGA Zone 55

ecology & heritage partners

16294_Fig02_EcoFeat_PMB 10/11/2022 dvaladares

Aerial source: Nearmap 2021

Legend

Study Area

Significant flora

- Bellarine Yellow-gum
- Branching Groundsel
- Button Wrinklewort
- Clover Glycine
- Cut-leaf Burr-daisy
- Derrinallum Billy-buttons
- Fragrant Saltbush
- Giant Honey-myrtle
- Hoary Rapier-sedge
- Large-headed Fireweed
- Matted Flax-lily
- Melbourne Yellow-gum
- Mugga
- Small Scurf-pea
- Snowy Mint-bush
- Spiny Rice-flower
- Spotted Gum

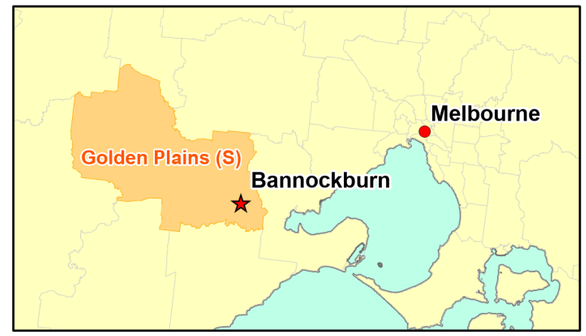


Figure 3

Previously documented significant flora within 5km of the study area

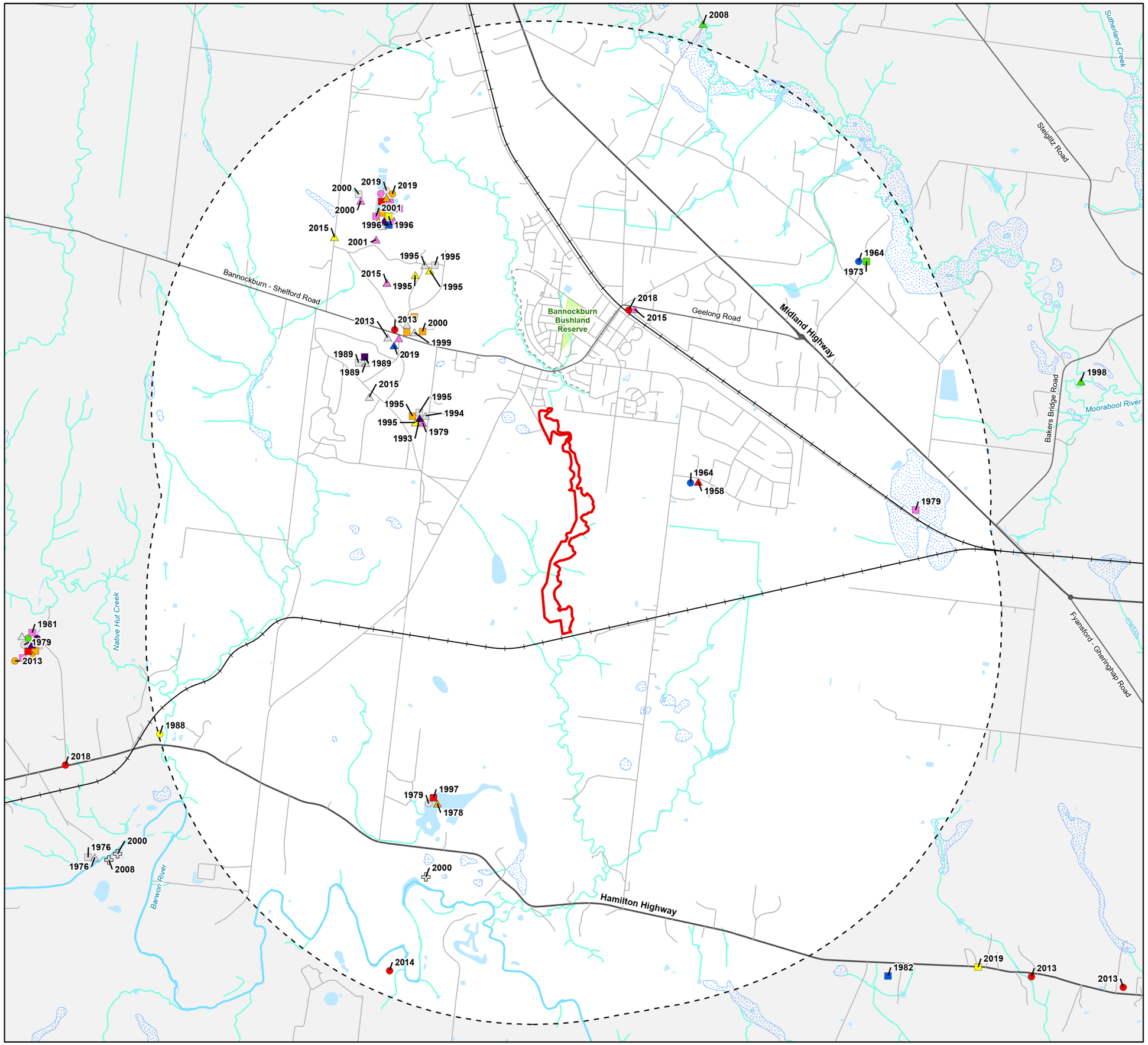
Biodiversity Assessment for Bruce Creek, Bannockburn

0 1 2

Kilometres

Map Scale: 1:47,000 @ A3
Coordinate System: GDA 1994 MGA Zone 55

ecology & heritage partners



Legend

Study Area

Significant fauna

- Australasian Shoveler
- Black Falcon
- Blue-billed Duck
- Brolga
- Caspian Tern
- Common Dunnart
- Common Greenshank
- Curlew Sandpiper
- Diamond Firetail
- Freckled Duck
- Gang-gang Cockatoo
- Grey Goshawk
- Grey-headed Flying-fox
- Growling Grass Frog
- Hardhead
- Hooded Robin
- Little Eagle
- Major Mitchell's Cockatoo
- Musk Duck
- Painted Honeyeater
- Platypus
- Speckled Warbler
- Swift Parrot
- White-throated Needletail
- Yarra Pygmy Perch

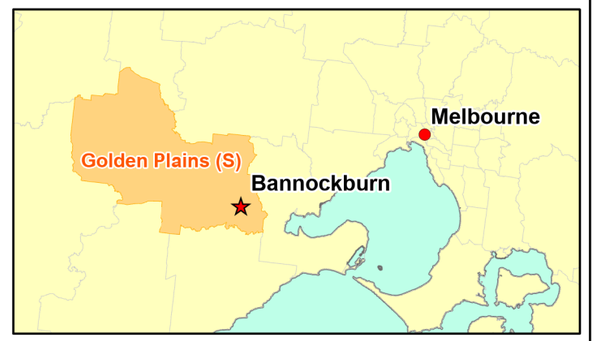


Figure 4

Previously documented significant fauna within 5km of the study area

Biodiversity Assessment for Bruce Creek, Bannockburn

N

0 1 2

Kilometres

Map Scale: 1:47,000 @ A3
Coordinate System: GDA 1994 MGA Zone 55

ecology & heritage partners

APPENDIX 1 FLORA

Appendix 1.1 Flora Results

Legend:

I Protected under the FFG Act (DELWP 2019a);
***** Listed as a noxious weed under the CaLP Act;
w Weed of National Significance;
Planted Victorian and non-Victorian species.

Table A1.1. Flora within the study area.

Scientific Name	Common Name	Notes
INDIGENOUS SPECIES		
Acacia paradoxa	Hedge Wattle	-
Acacia mearnsii	Black Wattle	I
Acaena echinata	Australian Sheep's Burr	-
Anthosachne scabra	Common Wheat-grass	-
Austrostipa bigeniculata	Kneed Spear-grass	-
Austrostipa nodosa	Knotty Spear-grass	-
Austrostipa scabra	Rough Spear-grass	-
Austrostipa sp.	Spear-grass	-
Bolboschoenus sp.	Club sedge	-
Cynodon dactylon	Couch grass	-
Echium plantagineum	Paterson's curse	*
Eucalyptus camaldulensis	River Red-gum	-
Juncus sp.	Rush	-
Microlaena stipoides var. *stipoides*	Weeping Grass	-
Phragmites australis	Common Reed	-
Plantago gaudichaudii	Narrow Plantain	-
Poa labillardierei	Common Tussock-grass	-
Rumex dumosus	Wiry Dock	-
Rytidosperma caespitosum	Common Wallaby-grass	-
Rytidosperma duttoniana	Brown-back Wallaby-grass	-
Rytidosperma spp.	Wallaby-grass	-
Themeda triandra	Kangaroo Grass	-
NON-INDIGENOUS OR INTRODUCED SPECIES		

Scientific Name	Common Name	Notes
Acetosella vulgaris	Red Sorrel	-
Aira sp.	Hair Grass	-
Anthoxanthum odoratum	Sweet Vernal-grass	-
Arctotheca calendula	Cape Weed	-
Avena fatua	Wild Oat	-
Brassica sp.	Turnip	-
Briza maxima	Large Quaking-grass	-
Bromus sp.	Brome	-
Carduus acanthoides	Plumeless Thistle	-
Cenchrus clandestinus	Kikuyu	-
Cynodon dactylon	Couch	-
Disa bracteata	South African Orchid	-
Eucalyptus cladocalyx	Sugar Gum	#
Eucalyptus globulus	Blue-gum	#
Fraxinus sp.	Ash	-
Holcus lanatus	Yorkshire Fog	-
Hypochaeris radicata	Flatweed	-
Juncus acutus subsp. *acutus*	Spiny Rush	*
Lolium sp.	Rye Grass	-
Lycium ferocissimum	African Box-thorn	*w
Nassella neesiana	Chilean Needle-grass	*w
Nassella trichotoma	Serrated Tussock	*w
Pinus radiata	Radiata Pine	#
Phalaris aquatica	Toowoomba Canary-grass	-
Plantago lanceolata	Ribwort	-
Salix sp.	Willow	*w
Sonchus oleraceus	Common Sow-thistle	-
Trifolium sp.	Clover	-

Appendix 1.2 Habitat Hectare Assessment

Table A1.2. Habitat Hectare Assessment Table.

Vegetation Zone		CGW1	CGW2	CGW3	CGW4	CGW5	CGW6	PG2	PG5	PG7	PGW1	PGW2	PGW3	PGW4
Bioregion		VVP	VVP	VVP	VVP	VVP	VVP	VVP	VVP	VVP	VVP	VVP	VVP	VVP
EVC / Tree		CGW	CGW	CGW	CGW	CGW	CGW	PG(HS)	PG(HS)	PG(HS)	PGW	PGW	PGW	PGW
EVC Number		68	68	68	68	68	68	132_61	132_61	132_61	55_61	55_61	55_61	55_61
EVC Conservation Status		En	En	En	En	En	En	En	En	En	En	En	En	En
Patch Condition	Large Old Trees /10	3	0	3	0	0	3	N/A	N/A	N/A	0	9	0	0
	Canopy Cover /5	4	0	2	2	0	2	N/A	N/A	N/A	2	2	2	0
	Under storey /25	5	5	5	5	5	5	5	10	5	5	5	0	5
	Lack of Weeds /15	2	2	2	2	6	2	0	7	4	4	9	4	2
	Recruitment /10	0	0	6	0	1	6	3	3	1	0	0	0	1
	Organic Matter /5	4	4	5	0	0	5	0	5	2	3	5	5	0
	Logs /5	0	0	0	2	0	0	N/A	N/A	N/A	0	0	0	0
	Treeless EVC Multiplier	1.00	1.00	1.00	1.00	1.00	1.00	1.36	1.36	1.36	1.00	1.00	1.00	1.00
	Subtotal =	18	11	23	9	12	23	11	34	16	14	30	11	8
Landscape Value /25		3	3	3	3	3	3	3	3	3	3	3	3	3
Habitat Points /100		21	14	26	12	15	26	14	37	19	17	33	14	11
Habitat Score		0.21	0.14	0.26	0.12	0.15	0.26	0.14	0.37	0.19	0.17	0.33	0.14	0.11

Note: CGW = Creekline Grassy Woodland; PG(HS)= Heavier Soils Plains Grassland; PGW = Plains Grassy Woodland; VVP = Victorian Volcanic Plain; En = Endangered.

Appendix 1.3 Scattered Trees and Large Trees in Patches

Table A1.3. Scattered Trees and Large Trees in Patches.

Tree # (Figure 2)	Species Name	Common Name	DBH (cm)	Size Class	Scattered / Patch
14	*Eucalyptus camaldulensis*	River Red-gum	-	Large	Patch
44	*Eucalyptus camaldulensis*	River Red-gum	-	Small	Scattered
45	*Eucalyptus camaldulensis*	River Red-gum	-	Small	Scattered
61	*Eucalyptus camaldulensis*	River Red-gum	-	Large	Patch
62	-	Stag	-	Large	Scattered
63	*Eucalyptus camaldulensis*	River Red-gum	-	Small	Scattered
64	*Eucalyptus camaldulensis*	River Red-gum	-	Large	Scattered
65	*Eucalyptus camaldulensis*	River Red-gum	-	Large	Scattered
74	*Eucalyptus camaldulensis*	River Red-gum	-	Large	Scattered
75	*Eucalyptus camaldulensis*	River Red-gum	-	Small	Scattered
76	-	Stag	-	Large	Scattered
77	-	Stag	-	Small	Scattered
80	*Eucalyptus camaldulensis*	River Red-gum	-	Large	Scattered
83	*Eucalyptus camaldulensis*	River Red-gum	-	Large	Scattered
88	-	Stag	-	Large	Scattered
91	*Eucalyptus camaldulensis*	River Red-gum	-	Large	Scattered
97	*Eucalyptus camaldulensis*	River Red gum	97	Large	Scattered
98	*Eucalyptus camaldulensis*	River Red gum	95	Large	Scattered
99	-	Stag	88	Large	Scattered
100	-	Stag	88	Large	Scattered
101	-	Stag	96	Large	Scattered
102	-	Stag	52	Small	Scattered
103	-	Stag	68	Small	Scattered
105	*Eucalyptus camaldulensis*	River Red gum	81	Large	Scattered
106	*Eucalyptus camaldulensis*	River Red gum	68	Small	Scattered
108	*Eucalyptus camaldulensis*	River Red gum	16	Small	Scattered
109	*Eucalyptus camaldulensis*	River Red gum	15	Small	Scattered
110	*Eucalyptus camaldulensis*	River Red gum	12	Small	Scattered
111	*Eucalyptus camaldulensis*	River Red gum	82	Large	Patch
112	-	Stag	87	Large	Scattered
113	*Eucalyptus camaldulensis*	River Red gum	105	Large	Scattered
114	*Eucalyptus camaldulensis*	River Red gum	14	Small	Scattered

Tree # (Figure 2)	Species Name	Common Name	DBH (cm)	Size Class	Scattered / Patch
115	*Eucalyptus camaldulensis*	River Red gum	14	Small	Scattered
116	-	Stag	55	Small	Scattered
118	-	Stag	160	Large	Scattered
119	-	Stump	84	Large	Scattered
120	-	Stag	98	Large	Scattered
121	-	Stag	56	Large	Scattered
122	*Eucalyptus camaldulensis*	River Red gum	33	Small	Scattered
123	*Eucalyptus camaldulensis*	River Red gum	44	Small	Scattered
126	*Eucalyptus camaldulensis*	River Red gum	64	Small	Scattered
127	-	Stag	57	Small	Scattered
128	*Eucalyptus camaldulensis*	River Red gum	77	Large	Patch
129	*Eucalyptus camaldulensis*	River Red gum	29	Small	Scattered
130	*Eucalyptus camaldulensis*	River Red gum	24	Small	Scattered

Appendix 1.4 Significant Flora Species

Significant flora within 10 kilometres of the study area 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 Conservation status of each species for each Act. The values in this table correspond to Columns 5 and 6 in Table A1.4.3.

EPBC (*Environment Protection and Biodiversity Conservation Act 1999*):		FFG (*Flora and Fauna Guarantee Act 1988*):	
EX	Extinct	EX	Extinct
CR	Critically endangered	CR	Critically endangered
EN	Endangered	EN	Endangered
VU	Vulnerable	VU	Vulnerable
#	Listed on the Protected Matters Search Tool		

Table A1.4.2 Likelihood of occurrence rankings: Habitat characteristics assessment of significant flora species previously recorded within 10 kilometres of the study area, or that may potentially occur within the study area to determine their likelihood of occurrence. The values in this table correspond to Column 7 in Table A1.4.3.

1	Known Occurrence	• Recorded within the study area recently (i.e. within ten years).
2	High Likelihood	• Previous records of the species in the local vicinity; and/or, • The study area contains areas of high-quality habitat.
3	Moderate Likelihood	• Limited previous records of the species in the local vicinity; and/or • The study area 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 A1.4.3 Significant flora recorded within 10 kilometres of the study area.

Scientific Name	Common Name	Last Documented Record (VBA)	# Records (VBA)	EPBC Act	FFG ACT	Likelihood of occurrence in the study area
NATIONAL SIGNIFICANCE						
Amphibromus fluitans #	River Swamp Wallaby-grass	-	-	VU	-	4
Dianella amoena	Matted Flax-lily	2012	1	EN	cr	2
Dodonaea procumbens #	Trailing Hop-bush	-	-	VU	-	4
Glycine latrobeana	Clover Glycine	2017	7	VU	vu	4
Lachnagrostis adamsonii #	Adamson's Blown-grass	-	-	EN	en	2
Lepidium aschersonii #	Spiny Pepper-cress	-	-	VU	en	4
Lepidium hyssopifolium #	Basalt Pepper-cress	-	-	EN	-	4
Leucochrysum albicans subsp. *tricolor*	White Sunray	2014	14	EN	en	4
Pimelea spinescens subsp. *spinescens*	Spiny Rice-flower	2015	35	CR	cr	2
Prasophyllum spicatum #	Dense Leek-orchid	-	-	VU	cr	4
Prasophyllum validum #	Sturdy Leek-orchid	-	-	VU	-	4
Pterostylis chlorogramma #	Green-striped Greenhood	-	-	VU	en	4
Pterostylis cucullata #	Leafy Greenhood	-	-	VU	-	4
Rutidosis leptorhynchoides	Button Wrinklewort	2011	52	EN	en	2
Senecio macrocarpus	Large-headed Fireweed	2016	54	VU	cr	2
Senecio psilocarpus #	Swamp Fireweed	-	-	VU	-	4
Thelymitra epipactoides #	Metallic Sun-orchid	-	-	EN	en	4
Thelymitra matthewsii #	Spiral Sun-orchid	-	-	VU	en	4
Xerochrysum palustre #	Swamp Everlasting	-	-	VU	cr	5
STATE SIGNIFICANCE						
Acacia aspera subsp. *parviceps*	Rough Wattle	2015	1	-	en	4
Calotis anthemoides	Cut-leaf Burr-daisy	1998	4	-	cr	2
Corymbia maculata	Spotted Gum	2019	2	-	vu	4

Scientific Name	Common Name	Last Documented Record (VBA)	# Records (VBA)	EPBC Act	FFG ACT	Likelihood of occurrence in the study area
Craspedia basaltica	Derrinallum Billy-buttons	1991	2	-	en	4
Cullen parvum	Small Scurf-pea	2007	10	-	en	2
Dianella longifolia var. *grandis* s.l.	Glaucous Flax-lily	1979	1	-	cr	4
Diuris punctata var. *punctata*	Purple Diuris	2005	5	-	en	4
Eucalyptus globulus subsp. *globulus*	Southern Blue-gum	2012	1	-	en	4
Eucalyptus kitsoniana	Bog Gum	2015	1	-	cr	4
Eucalyptus leucoxylon subsp. *bellarinensis*	Bellarine Yellow-gum	2011	1	-	cr	4
Eucalyptus leucoxylon subsp. *connata*	Melbourne Yellow-gum	2019	68	-	en	3
Eucalyptus leucoxylon subsp. *megalocarpa*	Large-fruit Yellow-gum	2015	1	-	cr	4
Eucalyptus sideroxylon subsp. *sideroxylon*	Mugga	2015	6	-	en	4
Lepidosperma canescens	Hoary Rapier-sedge	2007	1	-	en	4
Melaleuca armillaris subsp. *armillaris*	Giant Honey-myrtle	2015	64	-	en	4
Prostanthera nivea var. *nivea*	Snowy Mint-bush	2019	11	-	vu	5
Ptilotus erubescens	Hairy Tails	2008	19	-	cr	2
Pultenaea graveolens	Scented Bush-pea	1989	1	-	en	4
Rhagodia parabolica	Fragrant Saltbush	2019	6	-	vu	4
Senecio cunninghamii var. *cunninghamii*	Branching Groundsel	2005	2	-	en	4
Thelymitra X *macmillanii*	Crimson Sun-orchid	2001	3	-	vu	4

Data source: Victorian Biodiversity Atlas (DELWP 2022d); Protected Matters Search Tool (DCCEEW 2022).

APPENDIX 2 FAUNA

Appendix 2.1 Significant Fauna Species

Significant fauna within 10 kilometres of the study area is provided in the Table A2.1.3 at the end of this section, with Tables A2.1.1 and A2.1.2 below providing the background context for the values in Table 2.1.3.

Table A2.1.1 Conservation status of each species for each Act/Plan. The values in this table correspond to Columns 5 to 7 in Table A2.1.3.

EPBC (*Environment Protection and Biodiversity Conservation Act 1999*):		FFG (*Flora and Fauna Guarantee Act 1988*):	
EX	Extinct	EX	Extinct
CR	Critically endangered	CR	Critically endangered
EN	Endangered	EN	Endangered
VU	Vulnerable	VU	Vulnerable
CD	Conservation dependent	CD	Conservation dependent
#	Listed on the Protected Matters Search Tool		

Table A2.1.2 Likelihood of occurrence rankings: Habitat characteristics assessment of significant fauna species previously recorded within 10 kilometres of the study area, or that may potentially occur within the study area to determine their likelihood of occurrence. The values in this table correspond to Column 7 in Table A2.1.3.

1	High Likelihood	• Known resident in the study area 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 2022d); and/or, • The study area contains the species' preferred habitat.
2	Moderate Likelihood	• The species is likely to visit the study area regularly (i.e. at least seasonally); and/or, • Previous records of the species in the local area (DELWP 2022d); and/or, • The study area contains some characteristics of the species' preferred habitat.
3	Low Likelihood	• The species is likely to visit the study area 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 study area 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 study area when moving between areas of more suitable habitat; and/or,

	• Out of the species' range; and/or, • No suitable habitat present.

Table A2.1.3 Significant fauna recorded within 10 kilometres of the study area.

Scientific Name	Common Name	Last Documented Record (VBA)	# Records (VBA)	EPBC Act	FFG ACT	Likelihood of occurrence in the study area
NATIONAL SIGNIFICANCE						
Botaurus poiciloptilus #	Australasian Bittern	-	-	EN	cr	4
Sternula nereis nereis #	Australian Fairy Tern	-	-	VU	-	4
Prototroctes maraena	Australian Grayling	1987	3	VU	en	3
Rostratula australis #	Australian Painted Snipe	-	-	EN	cr	4
Calidris ferruginea	Curlew Sandpiper	1977	1	CR	cr	4
Numenius madagascariensis #	Eastern Curlew	-	-	CR	cr	4
Galaxiella pusilla #	Eastern Dwarf Galaxias	-	-	VU	en	3
Callocephalon fimbriatum	Gang-gang Cockatoo	2016	22	EN	-	3
Synemon plana #	Golden Sun Moth	-	-	VU	vu	2
Tympanocryptis pinguicolla #	Grassland Earless Dragon	-	-	EN	cr	4
Falco hypoleucos #	Grey Falcon	-	-	VU	vu	3
Pteropus poliocephalus	Grey-headed Flying-fox	1973	1	VU	vu	3
Litoria raniformis	Growling Grass Frog	2010	4	VU	vu	1
Macquaria australasica	Macquarie Perch	1970	1	EN	en	4
Grantiella picta	Painted Honeyeater	2015	19	VU	vu	3
Aprasia parapulchella #	Pink-tailed Worm-lizard	-	-	VU	en	4
Pedionomus torquatus #	Plains-wanderer	-	-	CR	cr	4
Anthochaera phrygia #	Regent Honeyeater	-	-	CR	cr	4
Isoodon obesulus obesulus #	Southern Brown Bandicoot	-	-	EN	en	4
Dasyurus maculatus maculatus #	Spot-tailed Quoll	-	-	EN	-	4

Scientific Name	Common Name	Last Documented Record (VBA)	# Records (VBA)	EPBC Act	FFG ACT	Likelihood of occurrence in the study area
Delma impar #	Striped Legless Lizard	-	-	VU	en	2
Antechinus minimus maritimus #	Swamp Antechinus (mainland)	-	-	VU	vu	4
Lathamus discolor	Swift Parrot	2017	17	CR	cr	4
Hirundapus caudacutus	White-throated Needletail	2016	12	VU	vu	3
Nannoperca obscura	Yarra Pygmy Perch	2008	34	VU	vu	3
Petaurus australis australis #	Yellow-bellied Glider	-	-	VU	-	4
STATE SIGNIFICANCE						
Spatula rhynchotis	Australasian Shoveler	2019	22	-	vu	3
Falco subniger	Black Falcon	2019	15	-	cr	3
Oxyura australis	Blue-billed Duck	2019	29	-	vu	4
Antigone rubicunda	Brolga	1988	1	-	en	4
Hydroprogne caspia	Caspian Tern	1980	5	-	vu	4
Sminthopsis murina murina	Common Dunnart	1964	2	-	vu	4
Tringa nebularia	Common Greenshank	2019	1	-	en	4
Stagonopleura guttata	Diamond Firetail	2013	38	-	vu	3
Stictonetta naevosa	Freckled Duck	2019	6	-	en	4
Accipiter novaehollandiae	Grey Goshawk	2019	8	-	en	3
Aythya australis	Hardhead	2019	48	-	vu	3
Melanodryas cucullata	Hooded Robin	1989	1	-	vu	4
Hieraaetus morphnoides	Little Eagle	2016	57	-	vu	3
Lophochroa leadbeateri	Major Mitchell's Cockatoo	1979	2	-	cr	4
Tyto novaehollandiae	Masked Owl	1994	2	-	cr	4
Biziura lobata	Musk Duck	2019	9	-	vu	4
Ornithorhynchus anatinus	Platypus	2019	11	-	vu	3
Pyrrholaemus sagittatus	Speckled Warbler	2019	2	-	en	3

Scientific Name	Common Name	Last Documented Record (VBA)	# Records (VBA)	EPBC Act	FFG ACT	Likelihood of occurrence in the study area
Pseudemoia pagenstecheri	Tussock Skink	-	-	-	en	2*
Haliaeetus leucogaster	White-bellied Sea-Eagle	2014	1	-	en	4

Data source: Victorian Biodiversity Atlas (DELWP 2022d); Protected Matters Search Tool (DCCEEW 2022). *Due to known occurrence on eastern side of Bruce Creek, as per the report prepared for the South East Section of the Bannockburn Growth Area (Ecology and Heritage Partners 2021).