
Report 12.5 – Solomon Heights Biodiversity Project – Draft Report

Directorate	City Development
Director	Stuart Menzies
Policy	<i>Planning and Environment Act 1987, Commonwealth Environment Protection and Biodiversity Conservation Act 1999, Brimbank Planning Scheme, Council Plan 2013-2017 (Updated 2016)</i>
Attachment(s)	<ol style="list-style-type: none">1. Solomon Heights Biodiversity Project – Draft Report2. Assessment area map3. Survey results4. Recommended conservation area5. Solomon Heights Biodiversity Study Overview

Purpose

For Council to consider endorsing the Solomon Heights Biodiversity Project - Draft Report (draft Report), at **Attachment 1**, and making the report publicly available on Council's website.

Report

1. Background

Solomon Heights comprises 32.8 hectares of industrially zoned land in Sunshine North, located on the east side of the Melbourne to Sydney freight line, adjacent to the Sunshine North Industrial Precinct and River Valley Estate. Created in the 1920s, the land was subdivided and sold to owners without roads and services. Today it comprises 465 lots with approximately 120 owners, and remains undeveloped.

Solomon Heights supports a range of significant flora and fauna that is protected under the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)*, State Government legislation and local planning policy. In order for a site with these values to be developed, an ecological investigation across the broader site is required. This work identifies the biodiversity assets and demonstrates how to minimise the impact on biodiversity and compensate for any biodiversity losses.

A biodiversity assessment was commissioned in 2016 on the undeveloped land in Sunshine North (Assessment Area). The Assessment Area includes Solomon Heights, and adjoining river valley and escarpment area inclusive of Cooks Land and the River Valley Estate (at **Attachment 2**). The key objectives of the biodiversity assessment were to:

- Identify the biodiversity values present
- Identify significant areas that require protection, in the form of a permanent conservation area
- Outline options to secure and manage a conservation area.

The Assessment Area is part of the Maribyrnong River Valley, which forms part of a remnant corridor of undeveloped native and introduced vegetation that extends from the inner city through to the Macedon Ranges. This land has remained unmanaged and undeveloped for almost 100 years due to a range of constraints, and is known as a local and regional biodiversity hotspot.

Report 12.5 – Solomon Heights Biodiversity Project – Draft Report (continued)

The biodiversity assessment included a 'broad study area' which identified biodiversity values and habitat connectivity opportunities. Within a 'detailed study area' (Solomon Heights and a section of the adjoining Cooks Land) a more intensive biodiversity study was undertaken, including targeted species surveys.

The Assessment Area has been subject to a number of previous ecological assessments. Data from these prior assessments was incorporated into the draft Report, and new flora and fauna surveys were conducted where there was insufficient data.

2. Consultation

The biodiversity assessment and draft Report were commissioned with the support of the Solomon Heights landowner group, which represents the majority of landholders in the Assessment Area.

3. Analysis

The biodiversity assessment identified significant communities that support flora and fauna, as well as significant individual species. **Attachment 3** provides maps of the Assessment Area and the results of the biodiversity assessment.

The Assessment Area supports a range of ecological features including areas of native grassland, scattered trees, rocky escarpments and riparian woodlands.

A total of 436 individual instances of the critically endangered Spiny Rice Flower were surveyed within the Solomon Heights area, which is a very significant population. Viable populations of Striped Legless Lizard and Golden Sun Moth were also recorded in an earlier survey.

The Assessment Area is the only known site within Brimbank that contains 'The Big 5'. The Big 5 are five highlighted Matters of National Environmental Significance that are protected under the *EPBC Act*. They are:

- Natural Temperate Grassland of Victorian Volcanic Plain – Critically Endangered
- Striped Legless Lizard (*Delma impar*) - Vulnerable
- Spiny Rice Flower (*Pimelea spinescens*) – Critically Endangered
- Golden Sun Moth (*Synemon plana*) – Critically Endangered
- Growling Grass Frog (*Litoria raniformis*) - Vulnerable (found in the broader study area).

Numerous other species of significance were surveyed, including the Matted Flax-lily, Pale Swamp Everlasting, Arching Flax-lily, Fragrant Saltbush and Austral Tobacco.

The biodiversity assessment notes the Assessment Area, including those sites with lower quality vegetation, provide high quality habitat for some species, and are critical corridors for flora and fauna species. Corridors are critical to reduce risk of species inbreeding into extinction, which occurs where populations of plants and animals are fragmented.

A full fauna study was not conducted, however the Assessment Area is known to contain a number of mammals, birds (including migratory birds), reptiles, amphibians and insects, some of State and National Significance. The Assessment Area is within the last remaining corridor in Brimbank for the broader movement of large mammals such as Eastern Grey Kangaroos.

Report 12.5 – Solomon Heights Biodiversity Project – Draft Report (continued)

Ecological recommendations

The key recommendations for the continued persistence of biodiversity assets in the Assessment Area include:

- Securing and protecting areas of native vegetation identified as core biodiversity conservation assets, especially grassland areas of Solomon Heights. **Attachment 4** highlights a proposed conservation area that includes the highest conservation values
- The proposed conservation area has significant potential to provide an offset site for both State and Federal legislative requirements
- Areas of grassland surrounding this core conservation asset contain ecological values and should be treated as ecologically sensitive areas
- The Assessment Area should be given first option for securing the offset requirements for any development at Sunshine North and within Brimbank, to ensure these biodiversity values are retained within the municipality
- Areas of open space between the proposed conservation area and the Maribyrnong River should be retained and managed in the long term for their habitat corridor values. This is the only remaining corridor in Brimbank for the broader movement of large mammals such as Eastern Grey Kangaroos (refer to **Attachment 4**).

Attachment 5 provides an overview of the Biodiversity Assessment (Study) to accompany the draft Report.

4. Resource Implications

There are no direct resource implications as a result of the draft Report. Resources may be required in the future to pursue strategic planning or biodiversity management work in the Assessment Area, and would be referred to Council's Annual Budget process for consideration.

5. Policy/Legislation

This report has been prepared in accordance with *Planning and Environment Act 1987*, *Commonwealth Environment Protection and Biodiversity Conservation Act 1999*, Brimbank Planning Scheme and the Council Plan 2013-2017 (Updated 2016).

Conflict of Interest Declaration

The *Local Government Act 1989* requires Council officers, and anyone engaged under contract, providing advice to Council to disclose any conflict of interest in a matter to which the advice relates. Council officers contributing to the preparation and approval of this report, have no conflicts of interests to declare.

6. Officer Recommendation

That Council:

- Endorses the Solomon Heights Biodiversity Project – Draft Report, at Attachment 1 to this report.**
- Makes the Solomon Heights Biodiversity Project – Report and Solomon Heights Biodiversity Study Overview publicly available on Council's website.**



Solomon Heights Biodiversity Project

REPORT

Prepared for Brimbank City Council

21 December 2016

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- Department of Environment for access to the Protected Matters Search Tool
- BirdLife Australia for access to the New Atlas of Australian Birds 1998–2013

Biosis staff involved in this project were:

- Dan Lim, Karina Salmon & Katrina Sofo (assistance in the field)
- Lachlan Milne (mapping)

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Summary

Biosis Pty Ltd was commissioned by Brimbank City Council to undertake a biodiversity assessment of an area of undeveloped land in Sunshine North known locally as the Solomon Heights / Baldwin Avenue grasslands. This information will be incorporated into a strategic planning assessment of the site.

The study area is located on the western bank of the Maribyrnong River approximately 12.5 km north west of the Melbourne central business district.

Ecological values

Key ecological values identified within the study area are as follows:

- 25.09 ha of native vegetation in the detailed study area and 31.951 ha in the broader study area, including good quality areas of Plains Grassland and Escarpment Shrubland.
- Small numbers of remnant indigenous trees including two large old trees.
- Areas of grassland which correspond to the critically endangered community Natural Temperate Grassland of the Victorian Volcanic Plain (NTGVVP).
- A large population of Spiny Rice-flower *Pimelea spinescens* subsp. *spinescens* (436 individuals) and four individuals of Matted Flax-lily *Dianella amoena*.
- Scattered individuals of other state listed rare or threatened species including Pale Swamp Everlasting *Coronidium gunnianum*, Arching Flax-lily *Dianella* sp. aff. *longifolia* (Benambra), Fragrant Saltbush *Rhagodia parabolica*, Austral Tobacco *Nicotiana suaveolens*, Tough Scurf Pea *Cullen tenax* and Pale-flower Crane's-bill *Geranium* sp. 3.
- Habitat for Striped Legless Lizard *Delma impar* and Golden Sun Moth *Synemon plana*.
- The site contributes to surrounding ecological values, including by providing habitat connectivity.

Government legislation and policy

An assessment of the project in relation to key biodiversity legislation and policy is summarised below.

Legislation / policy	Relevant ecological feature on site	Permit / approval required	Notes
EPBC Act	Threatened species and communities present	Referral required	Significant impact likely to be associated with any viable level of development
FFG Act	Listed species and communities present	Protected Flora Permit not required on private land	Site is largely private land. Development of existing road reserves would require a permit if these are public land
Planning & Environment Act	Indigenous vegetation would be cleared in association with likely development scenario.	Planning permit required, including permission to remove, lop or destroy native vegetation	Permit application needs to address provisions of ESO
CaLP Act	Noxious weeds and pest animals present	Not applicable	Comply with general requirements to control/eradicate

Potential clearing of native vegetation: Biodiversity assessment guidelines (the Guidelines)

Based on a potential planning outcome provided, the potential development of the site would require the removal of 8.691 hectares of native vegetation from within location risk A. Therefore any planning permit application considering the broader development of the site would be assessed on the moderate risk-based pathway. The strategic biodiversity score of the native vegetation identified as potentially to be removed is 0.198.

If a permit(s) is granted, the offset requirements for the planning outcome identified would be 1.006 general biodiversity equivalence units (note that this may be divided between a number of developments).

The general offset must be within the Port Phillip and Westernport Catchment Management Authority area or the Brimbank municipal district, and must have a minimum strategic biodiversity score of 0.158.

It is likely that the required general offsets would be purchased as 'third party' offset credits via an accredited trading scheme.

Development of the identified planning outcome would also attract offsets under the EPBC Act. Estimated offsets associated with an approval under this legislation amount to the protection and management of at least:

- 400 Spiny Rice-flower plants
- 29.5 ha of NTGVP
- 31.9 ha of habitat for Striped Legless Lizard
- 82.6 ha of habitat for Golden Sun Moth

Recommendations

The areas of native vegetation identified as core biodiversity conservation assets need to be managed to maintain their ecological values. However, areas of grassland surrounding this core conservation asset still retain significant ecological values.

In the longer term areas to be managed for conservation could have ownership transferred to a government authority such as council or Parks Victoria, to allow for the ongoing ecological management of this conservation resource. However, other ownership options, such as Trust for Nature or covenanted private ownership also provide opportunities for conservation management.

The area of native vegetation and habitat identified as a priority for conservation has a significant potential to provide an offset for the development of the balance of the Solomon Heights subdivision area and should provide a first option for securing the offset requirements identified for both state and federal legislative requirements.

Areas of open space between the proposed conservation reserve and the Maribyrnong River should be retained for their habitat corridor values. These areas provide for the broader movement of fauna along the Maribyrnong River corridor.

1. Introduction

1.1 Project background

Biosis Pty Ltd was commissioned by Brimbank City Council to undertake a biodiversity assessment of an area of undeveloped land in Sunshine North, known locally as the Solomon Heights / Baldwin Avenue grasslands. This information will be incorporated into planning advice to provide strategic options for future management of the site.

The assessment includes a broader study area on the western bank of the Maribyrnong River and a detailed study area to be subject to more intensive biodiversity assessments (Figure 1).

The site has been subject to a number of previous ecological assessments and development proposals. Development proposals have typically not considered the significant ecological values of the site and Brimbank City Council has decided to collate all the relevant site information and prepare a strategic plan to direct the future land use of this area.

1.2 Scope of assessment

The objectives of this investigation are to:

- Review the existing biodiversity reports relating to the study area.
- Describe the vascular flora (ferns, conifers, flowering plants) and vertebrate fauna (mammals, birds, reptiles, frogs, fishes).
- Map native vegetation and other habitat features (incorporating other assessments as appropriate).
- Conduct a vegetation quality assessment.
- Undertake targeted survey for threatened species.
- Review the implications of relevant biodiversity legislation and policy, including Victoria's Permitted clearing of native vegetation: Biodiversity assessment guidelines ('the Guidelines').
- Identify potential implications of development within the study area and provide recommendations to assist with the development of a strategic planning strategy for the site.

The project brief is provided in Appendix 1.

1.3 Location of the study area

The broad study area is bounded by the Maribyrnong River to the east and north, the Western Ring Road, industrial and residential development to the west and St Andrews Drive to the South and is about 12.5 km north west of the Melbourne central business district (Figure 1). The brief seeks information on the flora, fauna and habitat connectivity values/opportunities within this area with specific regard to the detailed study area.

The more detailed study area is known as the Solomon Heights / Baldwin Avenue grassland area and includes connected grassland on adjoining properties (Figure 1). This area was the focus of more detailed biodiversity study, including surveys. It is an irregular shape and encompasses the Solomon Heights subdivision area, then follows the top of the Maribyrnong River escarpment to the north and north-west to include the connected grassland areas above the river valley.

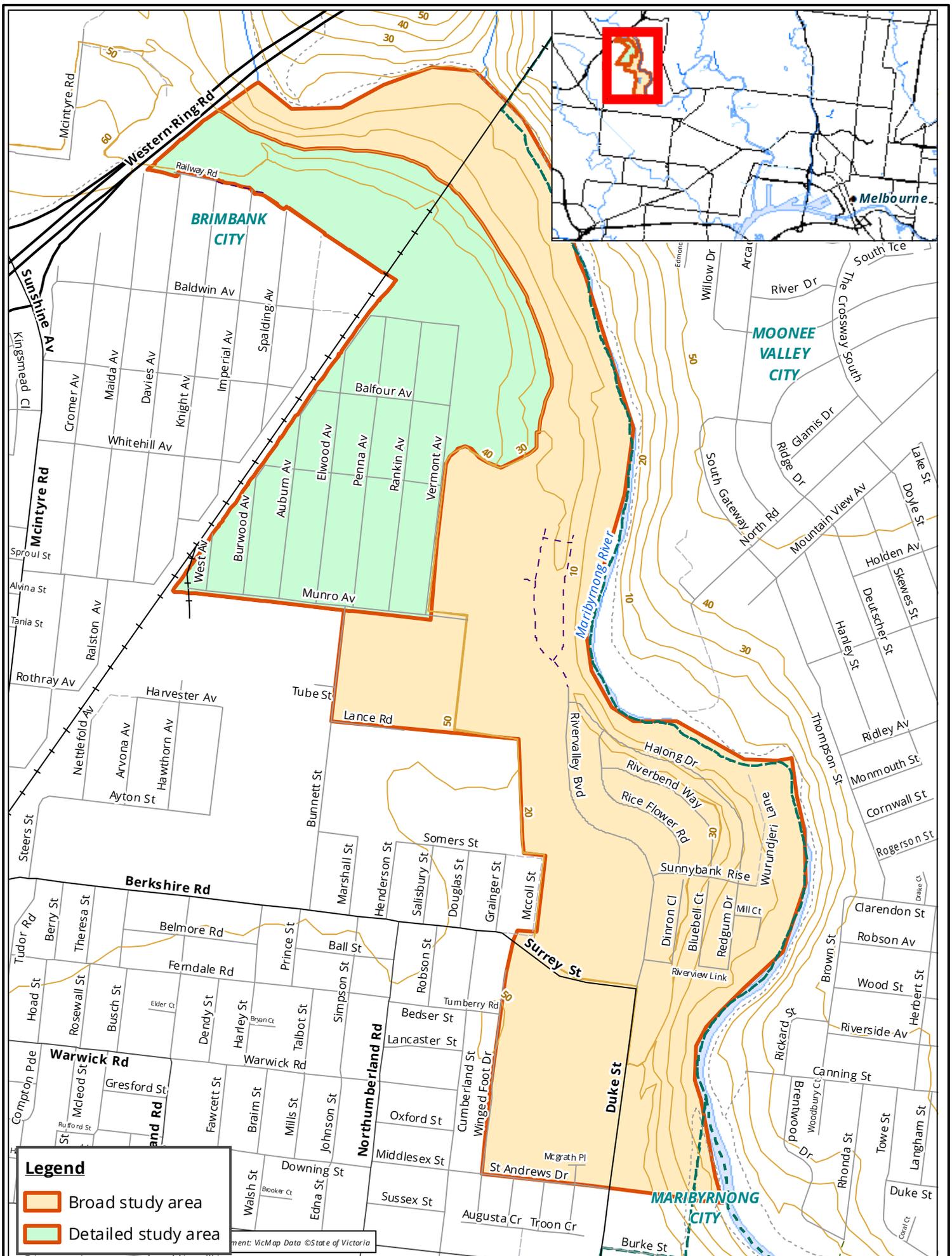
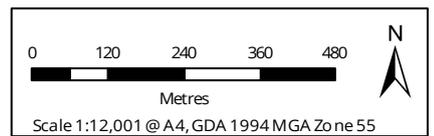


Figure 1: Location of the study area



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 Date: 23 August 2016,
 Checked by: KLS Drawn by: JMS. Last edited by: Imilee
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It comprises numerous land titles and road reserves, and is bounded by:

- Munroe Avenue and to the south
- Maribyrnong River to the north and west
- VicTrack rail corridor (freight) to the north and east.

The brief seeks detailed information, including surveys and recommendations for land use within the detailed study area. It is currently zoned Industrial 3 Zone (IN3Z).

The study area is within the:

- Victorian Volcanic Plain Bioregion
- Maribyrnong River Basin (Maribyrnong catchment)
- Management area of Melbourne Water and/or the Port Phillip and Westernport Catchment Management Authority (CMA)
- City of Brimbank.

2. Methods

2.1 Database review

In order to provide a context for the detailed study area, information about flora and fauna from within 5 km of the study area (the 'local area') was obtained from relevant biodiversity databases. Records from the following databases were collated and reviewed:

- Flora Information System (FIS) which includes records from the Victorian Biodiversity Atlas 'VBA_FLORA25, FLORA100 & FLORA Restricted' August 2015 © The State of Victoria, Department of Environment, Land, Water and Planning (DELWP)
- Victorian Biodiversity Atlas 'VBA_FAUNA25, FAUNA100 & FAUNA Restricted' August 2015 © The State of Victoria
- DELWP Biodiversity Interactive Map (BIM)
- DELWP Habitat Importance Models
- BirdLife Australia Atlas of Australian Birds (BA)
- Protected Matters Search Tool of the Australian Government Department of the Environment for matters protected by the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Other sources of biodiversity information were examined including:

- ABZECO 2011. Flora & Fauna report on Baldwin Avenue / Solomon Heights Grassland. Report for Brimbank City Council. Authors Pegg, J., Just, K. and Francis R. ABZECO Eltham. Report 0943.
- ABZECO 2016. Targeted surveys undertaken for the Striped Legless Lizard *Delma impar* at Solomon Heights, Sunshine North, Victoria. Report for Brimbank City Council. Author De Angelis, D. ABZECO Eltham. Report 0943.2 Version 1.1.
- Biosis Research 1997. Flora and Fauna of River Valley Estates, Maribyrnong River, Sunshine North. Report for Lain Walters Pty Ltd. Authors Meredith C., Costello, C., Larwill S., and Yugovic, J. Biosis Research Melbourne. Project No. 184.
- Biosis Research 2002. Flora and Fauna of the River Valley Estate Property, Sunshine. Report for Atlantic Link Pty Ltd. Authors Costello, C., Gilmore D., Venosta M. and Meredith C. Biosis Research Melbourne. Project No. 1551.
- BL&A 2014. Figure 1: Study area and native vegetation (River Valley Estate). Report for Hermal Mortin Group c/o Lain Watters Pty Ltd. Brett Lane & Associates, Camberwell. Project No. 8135.
- Brett Lane & Associates 2016. *River Valley Estate, Sunshine North: Overview biodiversity assessment of Stages 7, 8 & 9*. Report for Atlantic Link. BL&A Hawthorn.
- Data on the location of Spiny Rice-flower provided as part of Referral 2016/7688 lodged under the (EPBC Act).
- DCE 1990. Remnant Native Grasslands and Grassy Woodlands of the Melbourne Area: An Action Plan for Conservation Based on Biological Values. Department of Conservation and Environment, Melbourne.
- DELWP Native Vegetation Information Management (NVIM) and EnSymNVR tool which generates a Biodiversity Assessment Report (BAR) for proposed losses of native vegetation.

- DELWP NaturePrint; accessed through the Biodiversity Interactive Map.
- EHP 2016a. Ecological assessment, Solomon Heights (Munro Avenue to Whitehill Avenue), Sunshine North, Victoria. Report for Glen Ora Estate Pty Ltd. Author LeBel, S. Ecology & Heritage Partners, Ascot Vale. Project No. 7375.
- EHP 2016b. Targeted Surveys for Matted Flax-lily and Golden Sun Moth, Solomon Heights, Sunshine North, Victoria. Report for Glen Ora Estate Pty Ltd. Author LeBel, S. Ecology & Heritage Partners, Ascot Vale. Project No. 7375.
- McDougall, K. 1987. Sites of Botanical Significance in the Western Region of Melbourne. Department of Conservation, Forests and Lands, Melbourne.

2.2 Definitions of significance

The significance of a species or ecological community is determined by its listing status under Commonwealth or State legislation / policy (Table 1).

Table 1 Criteria for determining significance of species & ecological communities

Significance	
National	Listed as critically endangered, endangered or vulnerable under the EPBC Act
State	Listed as critically endangered, endangered, vulnerable or rare in Victoria on a DELWP Advisory List (DSE 2009, DSE 2013a; DEPI 2014a) Listed as threatened under the <i>Flora & Fauna Guarantee Act 1988</i> (FFG Act)

Lists of significant species generated from the databases are provided in Appendix 2 (flora) and Appendix 3 (fauna). The species have been assessed to determine their likelihood of occurrence based on the process outlined below. These species are not discussed further in this report unless they:

- have a medium or greater likelihood of occurrence
- are flora species listed as threatened under the FFG Act with a medium or greater likelihood of occurrence
- are identified as having habitat on the site by the Habitat Importance Modelling by DELWP.

2.3 Determining likelihood of occurrence of significant species

Likelihood of occurrence indicates the potential for a species or ecological community to occur regularly within the study area. It is based on expert opinion, information in relevant biodiversity databases and reports, and an assessment of the habitats on site. Likelihood of occurrence is ranked as negligible, low, medium, high or recorded. Those species for which there is little or no suitable habitat within the study area are assigned a likelihood of low or negligible and are not considered further.

Species which have at least medium likelihood of occurrence are given further consideration in this report. The need for targeted survey for these species is also considered.

2.4 Site investigation

2.4.1 Flora assessment

The flora assessment was undertaken on 28–29 June and 6, 14, 15 & 18 July 2016 and a list of flora species was collected (# T2560600). This list will be submitted to DELWP for incorporation into the Victorian Biodiversity Atlas. Planted species were not recorded unless they were naturalised.

Native vegetation is defined in the Victoria Planning Provisions as 'plants that are indigenous to Victoria, including trees, shrubs, herbs and grasses' (Clause 72).

The Guidelines classify native vegetation into two categories (DEPI 2013):

- A **remnant patch** of native vegetation (measured in hectares) is either:
 - An area of native vegetation, with or without trees, where at least 25 percent of the total perennial understorey plant cover is native.
 - An area with three or more indigenous canopy trees where the canopy foliage cover is at least 20 per cent of the area.

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

- A **scattered tree** is defined as (extent measured by number of trees):
 - An indigenous canopy tree that does not form part of a remnant patch of native vegetation.

A canopy tree is a mature tree that is greater than three metres in height and is normally found in the upper layer of a vegetation type. Ecological vegetation class descriptions provide a list of the typical canopy species. A condition score and extent is applied to each scattered tree based on information provided by DELWP's NVIM.

A Vegetation Quality Assessment was undertaken for all remnant patch native vegetation identified in the study area. This assessment is consistent with DELWP's habitat hectare method (DSE 2004) and the Guidelines (DEPI 2013a). For the purposes of this assessment the limit of the resolution for the habitat hectare assessment process is taken to be 0.001 habitat hectares (Hha). That is, if native vegetation is present with sufficient cover but its condition and extent would not result in the identification of at least 0.001 Hha then that vegetation will not be mapped or assessed as a separate habitat zone.

Where relevant, notes were made on specific issues such as noxious weed infestations, evidence of management works, current grazing impacts and the regeneration capacity of the vegetation.

Species nomenclature for flora follows the Flora Information System (FIS 2015).

2.4.2 Fauna assessment

No formal fauna assessment was conducted. Threatened fauna, including Striped Legless Lizard *Delma impar* and Golden Sun Moth *Synemon plana*, are known from the site as a result of previous surveys. Much of the detailed study area is considered occupied habitat for these species.

Fauna habitat values and the site's value as a habitat corridor are assessed based on existing knowledge of the site and local area, as well as a site inspection by a zoologist on 15 July 2016.

2.4.3 Targeted searches

Targeted searches for threatened flora were conducted over all of the relatively flat grassy areas of Solomon Heights, excluding areas clearly unlikely to support any threatened species (i.e. areas which have been graded, covered with fill or other debris or are otherwise dominated (>80%) by introduced species).

The primary target of these surveys was Spiny Rice-flower *Pimelea spinescens* subsp. *spinescens*. Locations for other threatened flora were also noted including Matted Flax-lily *Dianella amoena*, Pale Swamp Everlasting *Coronidium gunnianum*, Arching Flax-lily *Dianella* spp. aff. *longifolia* (Benambra), Tough Scurf-pea *Cullen tenax* and Austral Tobacco *Nicotiana suaveolens*.

Targeted surveys were conducted in a manner consistent with the requirements of the Biodiversity Precinct Structure Planning Kit (DSE 2010) for Spiny Rice-flower (i.e. a systematic survey using transects separated by approximately five metres).

2.4.4 Permits

Biosis undertakes flora and fauna assessments under the following permits and approvals:

- Research Permit/Management Authorisation and Permit to Take Protected Flora & Protected Fish issued by DELWP under the *Wildlife Act 1975*, *Flora and Fauna Guarantee Act 1988* and *National Parks Act 1975* (Permit number 10007569).
- Approvals 07.15 and 14.12 from the Wildlife and Small Institutions Animal Ethics Committee.

2.5 Qualifications

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

The current biodiversity assessment was conducted in winter which is not an optimal time for the survey of many species except for Spiny Rice-flower (which was in flower at the time of the assessment). However, a number of other assessments conducted over a range of seasons and seasonal conditions, also provided information relevant to this assessment. Overall therefore there are no seasonal or other external factors which limit the results of this assessment.

Areas of vegetation mapping along the Maribyrnong River and within quarried areas associated with the River Valley Estate were sourced from BL&A (2016). This mapping is therefore dependant on the results of that assessment and Biosis has replicated that mapping based on information supplied by Brett Lane & Associates. Biosis has altered that information as deemed appropriate and otherwise justified in this report.

Biodiversity Assessment Reports (BAR) and Biodiversity Impact Offset Requirement (BIOR) reports are prepared through DELWP's NVIM system or requested through DELWP's Native Vegetation Transitional Guidance team. Biosis supplies relevant site-based spatial information as inputs to DELWP and we are entirely reliant on DELWP's output reports for moderate and high risk pathway applications. Biosis makes every effort to ensure site and spatial information entered into the NVIM, or supplied to DELWP, is an accurate reflection of any potential native vegetation removal.

2.6 Legislation and policy

The implications for the project were assessed in relation to key biodiversity legislation and policy including:

- Matters listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), associated policy statements, significant impacts guidelines, listing advice and key threatening processes
- Threatened taxa, communities and threatening processes listed under Section 10 of the *Flora & Fauna Guarantee Act 1988* (FFG Act); associated action statements and listing advice
- Permitted Clearing of native vegetation: Biodiversity assessment guidelines (DEPI 2013a)
- *Planning and Environment Act 1987* – including the State and Local Planning Policy Framework, Zones and Overlays in the Brimbank Planning Scheme
- Noxious weeds and pest animals lists under the *Catchment and Land Protection Act 1994* (CaLP Act)
- *Environment Effects Act 1978*

2.7 Mapping

Detailed aerial photography was sourced from Nearmap. The extent of the detailed assessment area was provided by Brimbank Council.

Mapping and threatened species surveys were conducted using hand-held (uncorrected) GPS units (WGS84) and aerial photo interpretation. The accuracy of this mapping is therefore subject to the accuracy of the GPS units (generally ± 7 metres) and dependent on the limitations of aerial photo rectification and registration.

The locations of many threatened species and/or areas of ecological sensitivity were recorded using a Topcon GRS-1 DGPS and post-processed to sub 1 metre accuracy.

Mapping has been produced using a Geographic Information System (GIS). Electronic GIS files which contain our flora and fauna spatial data are available to incorporate into design concept plans. However this mapping may not be sufficiently precise for detailed design purposes.

Mapping within the River Valley Estate was provided by Brett Lane & Associates upon request from the City of Brimbank. Some of this mapping was accepted as provided although Biosis reviewed the allocation of both scores and EVC labels.

3. Results

The ecological features of the study area are described below and mapped in Figure 2.

Species recorded during the flora assessment (91 native and 77 introduced species) are listed in Appendix 2 with significant fauna records from the local area listed in Appendix 3 (fauna). Unless of particular note, these species are not discussed further. Two additional rare or threatened flora species, Tough Scurf-pea *Cullen tenax* and Rye Beetle-grass *Tripogon loliiformis*, were noted by previous assessments but were not observed during the current assessment. These cryptic species are typically very difficult to observe during winter and are still likely to be present.

Species predicted to occur in the local area are also listed in the appendices, along with an assessment of the likelihood of each species occurring within the study area.

3.1 Vegetation & fauna habitat

The study area has been extensively modified due to past quarry activities, grazing, slashing, weed invasion, attempts at subdivision and the illegal dumping of rubbish and fill. Significant portions of the study area have been degraded and support predominantly introduced vegetation that is of reduced value for native fauna.

Notwithstanding the above, the detailed study area also supports a range of ecological features including areas of native grassland, scattered trees and rocky escarpments (note that different habitats, such as the riparian woodlands of the river corridor, are also present within the broader study area but are not described here). These features are described further in Table 2 and mapped in Figure 2. Photos of different habitat values are provided in Appendix 4.

3.2 Landscape context

The study area is part of the Maribyrnong River Valley within metropolitan Melbourne. It is therefore part of a remnant corridor of undeveloped native and introduced vegetation extending from the inner city environs to broader areas of agricultural land beyond Melbourne Airport.

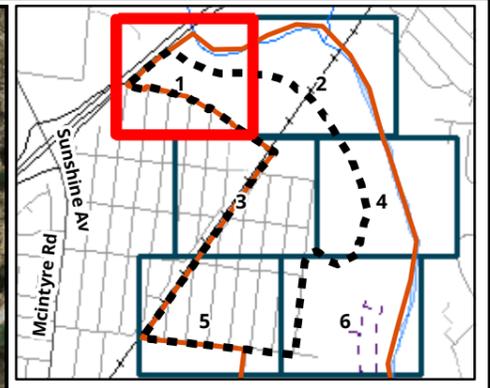
The site contributes to one of the broader nodes of undeveloped land along this corridor and includes relatively diverse landscape features including undeveloped sections of volcanic plain, sections of the Maribyrnong River escarpment, the river floodplain and the remnant ribbon of riparian vegetation along the river.

Remnant grasslands on the plateau represents one of the larger remnants of this community in Melbourne, while the broader remnants of riparian vegetation provide a long, relatively narrow core area of remnant native vegetation. The rocky cliffs and water filled bases of abandoned quarries along the eastern margin of the site also add to the habitat diversity of the broader study area.

3.3 Significant species and ecological communities

3.3.1 EPBC Act and FFG Act listed species

Lists of EPBC Act and FFG Act listed species recorded or predicted to occur within 5 km of the study area or from the relevant catchment (aquatic species) are provided in Appendix 2 (flora) and Appendix 3 (fauna). An assessment of the likelihood of these species occurring in the study area and an indication of where within the site (i.e. which habitats or features of relevance to the species) is included. A summary of those species recorded or with a medium or higher likelihood of occurring in the study area is provided in Table 3.



- Legend**
- Broad Study Area
 - Study Area detail
 - High fauna corridor values
- Scattered trees**
- ◆ *Eucalyptus camaldulensis*
 - ◆ *Eucalyptus leucoxyton*
- Threatened flora**
- + *Nicotiana suaveolens*
 - + *Dianella aff. longifolia (Benambra)*
- Habitat zone**
- 17

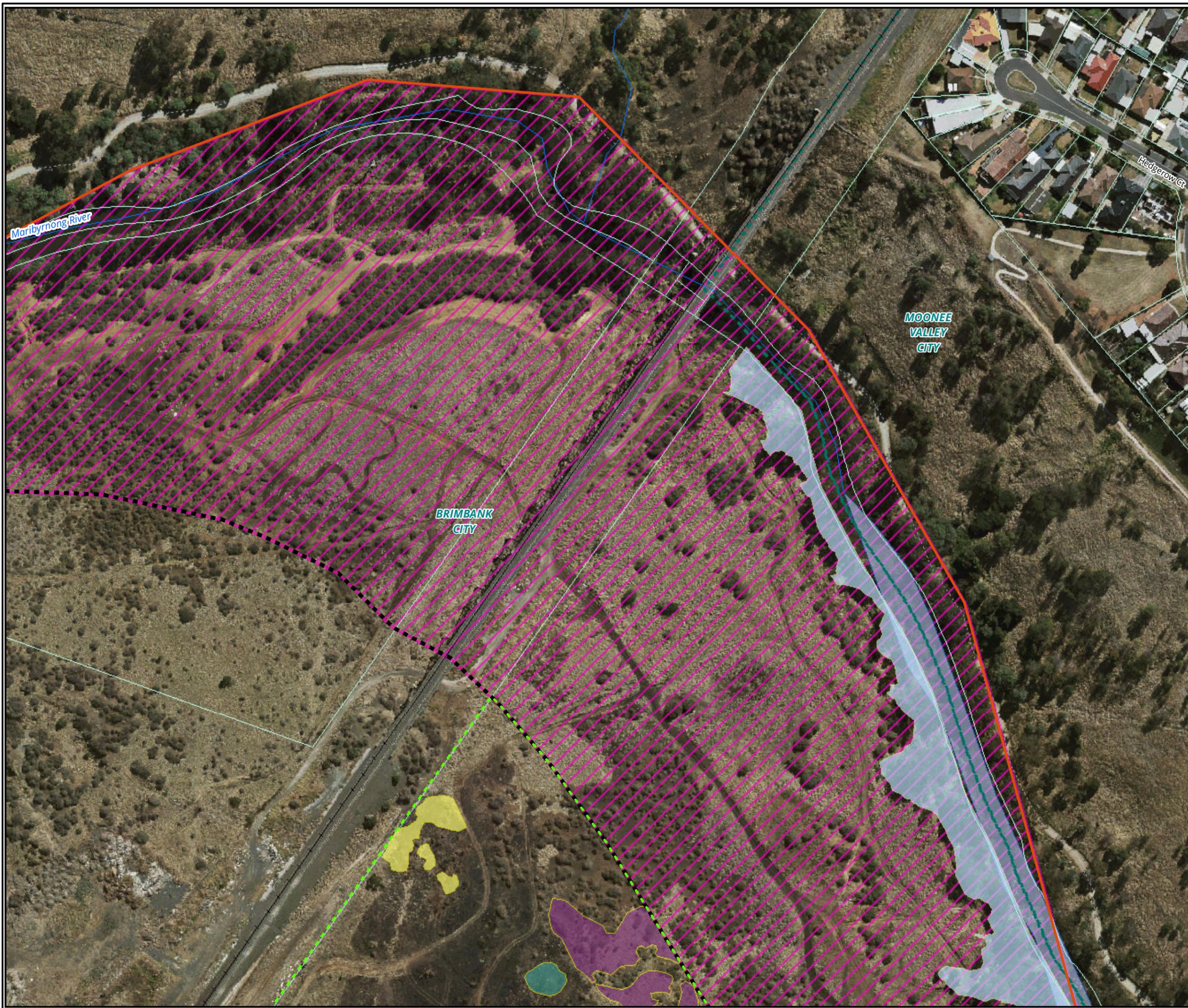
Figure 2.1 Ecological features of the study area



Metres
 Scale: 1:1,700 @ A3
 Coordinate System: GDA 1994 MGA Zone 55



Matter: 22444,
 Date: 27 October 2016,
 Checked by: SGM, Drawn by: LDM, Last edited by: smitchell
 Location: P:\22400s\22444\Mapping\22444_F2_EcoFeatures.mxd



Legend

- Broad Study Area
- Study Area detail
- Conservation Reserve
- High fauna corridor values

Habitat zone

- 14
- 15
- 16
- 18

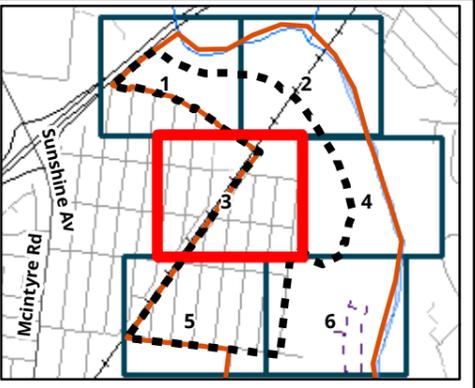
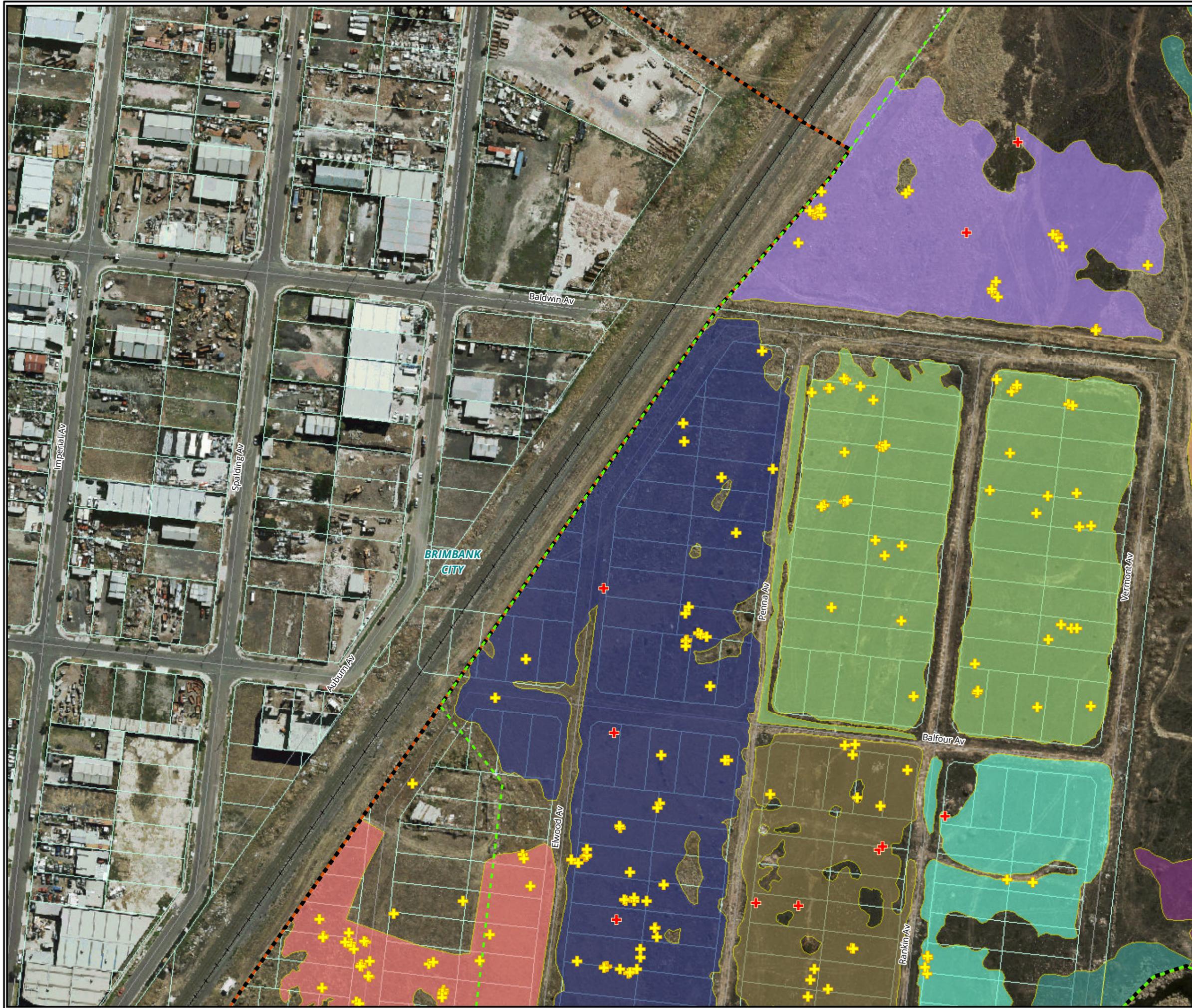
Figure 2.2 Ecological features of the study area

0 25 50 75 100
Metres
Scale: 1:1,800 @ A3
Coordinate System: GDA 1994 MGA Zone 55

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Date: 27 October 2016,
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Location: P:\22400s\22444\Mapping\22444_F2_EcoFeatures.mxd



- Legend**
- Broad Study Area
 - Study Area detail
 - Conservation Reserve
- Fauna survey records**
- + Striped Legless Lizard, ABZECO 2016
 - + *Pimelea spinescens* subsp. *spinescens*
- Threatened flora**
- + *Dianella* aff. *longifolia* (*Benambra*)
 - + *Pimelea spinescens* subsp. *spinescens*
- Habitat zone**
- 7
 - 8
 - 9
 - 10
 - 11
 - 12
 - 13
 - 14
 - 15

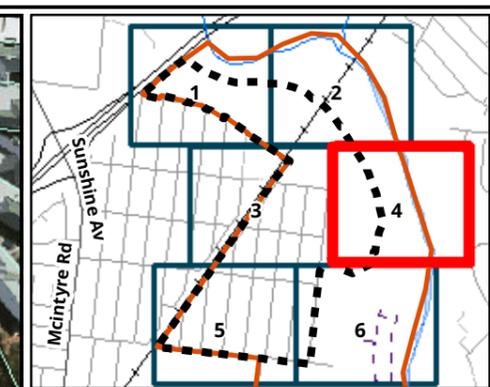
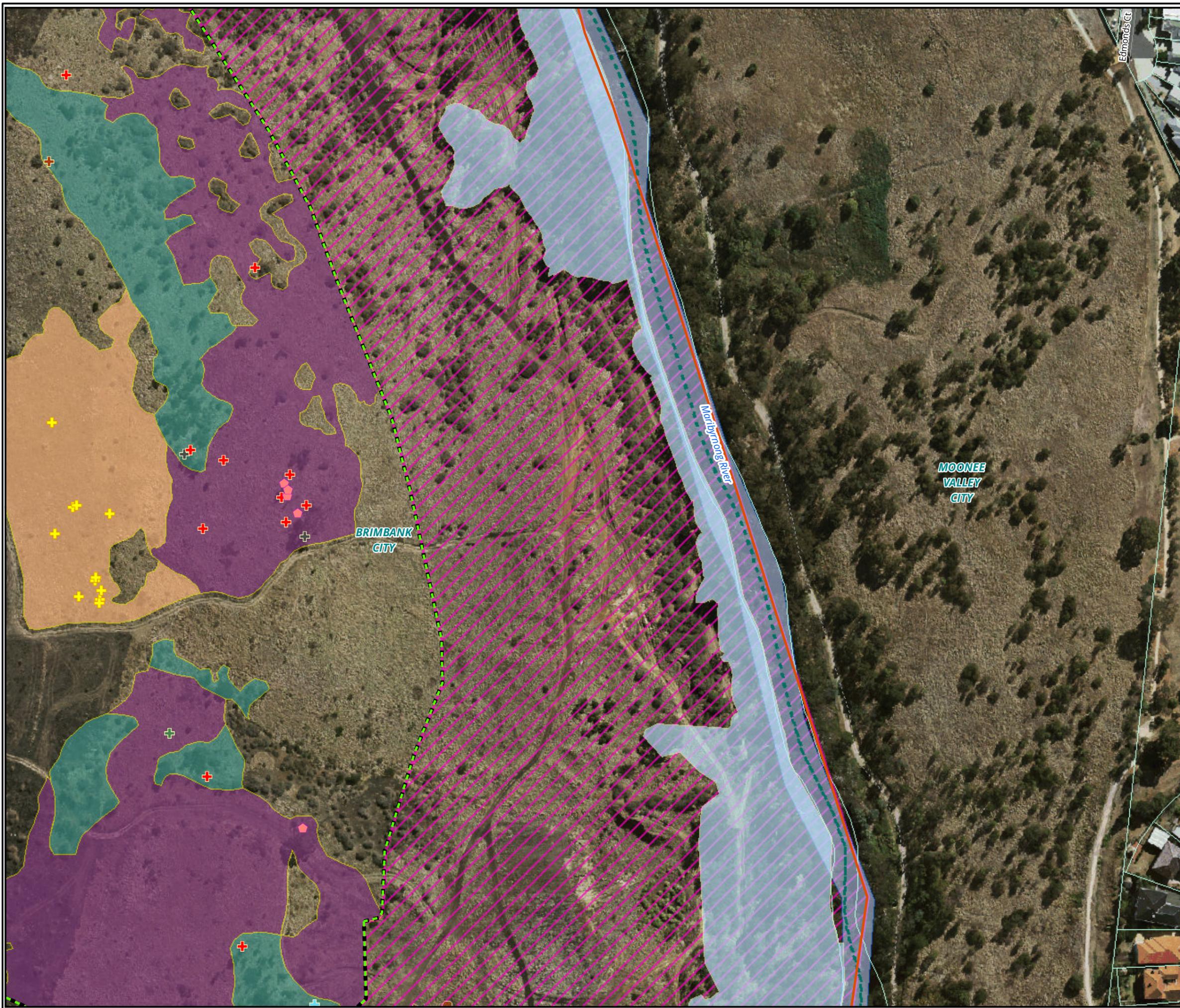
Figure 2.3 Ecological features of the study area



Metres
 Scale: 1:1,800 @ A3
 Coordinate System: GDA 1994 MGA Zone 55



Matter: 22444,
 Date: 27 October 2016,
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 Location: P:\22400s\22444\Mapping\22444_F2_EcoFeatures.mxd



- Legend**
- Broad Study Area
 - Study Area detail
 - Conservation Reserve
 - High fauna corridor values
- Scattered trees**
- ◆ *Eucalyptus camaldulensis*
- Threatened flora**
- + *Cullen tenax*
 - + *Dianella aff. longifolia (Benambra)*
 - + *Dianella amoena*
 - + *Geranium sp. 3*
 - + *Pimelea spinescens subsp. spinescens*
 - + *Rhagodia parabolica*
- Habitat zone**
- 13
 - 14
 - 15
 - 18
 - 19

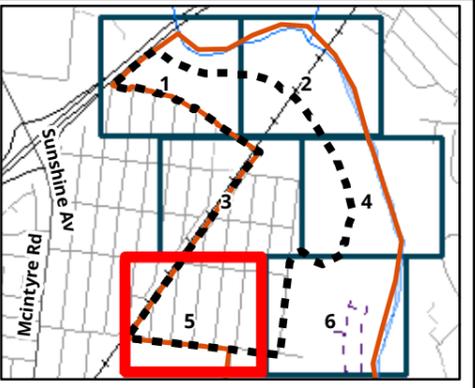
Figure 2.4 Ecological features of the study area



Metres
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 Coordinate System: GDA 1994 MGA Zone 55



Matter: 22444,
 Date: 27 October 2016,
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 Location: P:\22400s\22444\Mapping\22444_F2_EcoFeatures.mxd



Legend

- Broad Study Area
- Study Area detail
- Conservation Reserve

Fauna survey records

- + Golden Sun Moth, Ecology and heritage partners 2016
- ▲ Striped Legless Lizard, ABZECO 2016
- ▲ Striped Legless Lizard, Ecology and heritage partners 2016

Threatened flora

- + *Coronidium gannianum*
- + *Pimelea spinescens* subsp. *spinescens*

Habitat zone

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9

Figure 2.5 Ecological features of the study area

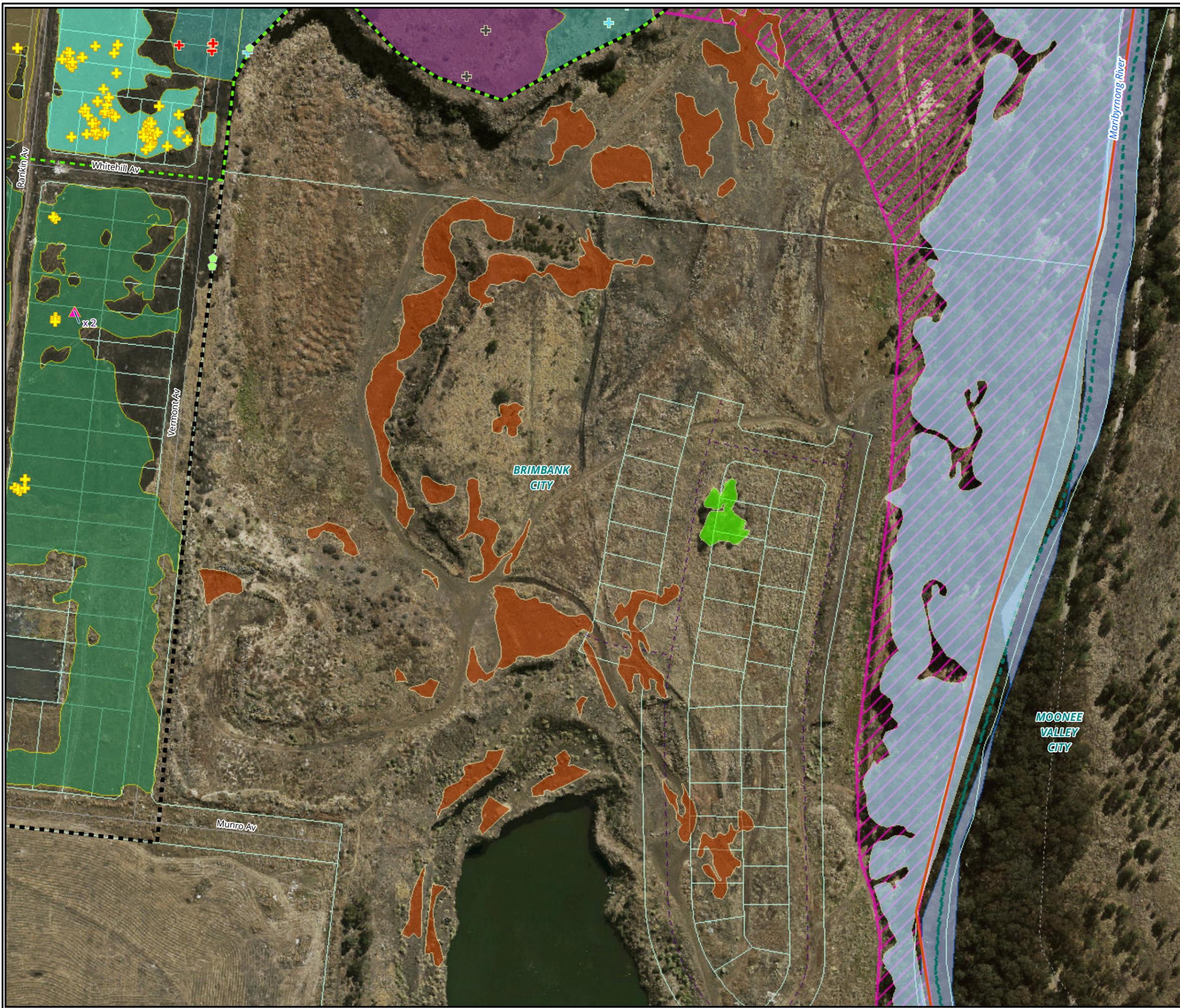
0 25 50 75 100
Metres

Scale: 1:1,700 @ A3
Coordinate System: GDA 1994 MGA Zone 55

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Location: P:\22400s\22444\Mapping\22444_F2_EcoFeatures.mxd



- Legend**
- Broad Study Area
 - Study Area detail
 - Conservation Reserve
 - High fauna corridor values
- Fauna survey records**
- ▲ Striped Legless Lizard, ABZECO 2016
- Scattered trees**
- ◆ *Eucalyptus leucoxylon*
- Threatened flora**
- + *Cullen tenax*
 - + *Dianella aff. longifolia (Benambra)*
 - + *Dianella amoena*
 - + *Pimelea spinescens subsp. spinescens*
- Habitat zone**
- 6
 - 9
 - 10
 - 14
 - 15
 - 18
 - 19
 - 20

Figure 2.6 Ecological features of the study area

0 25 50 75 100
Metres
Scale: 1:1,800 @ A3
Coordinate System: GDA 1994 MGA Zone 55

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Date: 27 October 2016,
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Location: P:\22400s\22444\Mapping\22444_F2_EcoFeatures.mxd

Table 2 Summary of vegetation and habitat types within the study area

Vegetation or habitat type	Description	Location	Significant values
Plains Grassland (EVC 132)	<p>Characterised by spear-grasses <i>Austrostipa</i> spp., wallaby-grasses <i>Rytidosperma</i> spp. and Kangaroo Grass <i>Themeda triandra</i> with occasional forbs in the ground layer. Trees area absent and shrubs are sparse. Degraded remnants have a high cover of weedy perennial grasses such as Serrated Tussock and Chilean Needle-grass.</p> <p>Represented by Habitat Zones 1 to 14 and 19.</p>	The plain and rocky slopes above the Maribyrnong River	<p>Corresponds to Natural Temperate Grassland of the Victorian Volcanic Plain community (NTGVVP - EPBC Act) and Western (Basalt) Plains Grassland Community (FFG Act). Includes a significant population of Spiny Rice-flower and populations of Golden Sun Moth and Striped Legless Lizard. Other populations of rare and threatened species present and numerous species considered rare or restricted in western Melbourne.</p>
Escarpment Shrubland (EVC 895)	<p>Occurs on the rocky slopes of the Maribyrnong River escarpment. The scattered canopy layer includes the occasional River Red-gum <i>Eucalyptus camaldulensis</i> or Yellow-gum <i>Eucalyptus leucoxylon</i>. Otherwise this community is dominated by a sparse to open cover of Lightwood <i>Acacia implexa</i>, Drooping Sheoak <i>Allocasuarina verticillata</i> and Sweet Bursaria <i>Bursaria spinosa</i>. The ground cover is dominated by grasses and herbs including Kangaroo Grass, spear-grasses, wallaby-grasses, and a variety of herbs and forbs.</p> <p>Prominent weeds include African Boxthorn <i>Lycium ferocissimum</i> and Serrated Tussock <i>Nassella trichotoma</i>.</p> <p>Represented by Habitat Zone 15 to 17 and 20.</p>	Escarpment of the Maribyrnong River in the east of the study area.	<p>The escarpment shrublands are unlikely to represent habitat for significant fauna. This vegetation includes populations of or habitat for Matted Flax-lily, Austral Tobacco, Arching Flax-lily, and Fragrant Saltbush <i>Rhagodia parabolica</i>.</p> <p>This community is endangered within the bioregion.</p>
Scattered trees	<p>Scattered remnant trees within the study area (Plate X) provide a foraging resource for mobile fauna species. Some of the trees contain hollows.</p>	Scattered throughout the study area.	Eucalypts in these areas offer possible foraging habitat for a range of common birds.

Vegetation or habitat type	Description	Location	Significant values
Predominantly introduced vegetation	<p>Substantial portions of the study area supports degraded vegetation. This includes areas variously dominated by Chilean Needle Grass <i>Nassella neesiana</i>, Serrated Tussock and African Boxthorn.</p> <p>Other weed species are both broadly and locally common.</p>	Large portions of the study area (see Figure 2).	<p>Areas of native grassland infested with, or areas dominated by Chilean Needle-grass, are potential habitat for Golden Sun Moth.</p> <p>Tussock-forming grasses, such as Serrated Tussock are potential habitat for Striped Legless Lizard.</p>
Quarry waterbodies	<p>Abandoned quarry hole can provide perennial waterbodies. While artificial these waterbodies nonetheless provide habitat for waterbirds and amphibian species.</p> <p>At least one smaller, water-filled, artificial depression was located on the escarpment above the main quarry holes. This area supported some aquatic vegetation but is likely to be ephemeral.</p>	South eastern edge of the broader study area	<p>Artificial water bodies within the study area contribute to habitat diversity and provide resources for species including birds and amphibians. The water bodies may provide habitat for Growling Grass Frog.</p> <p>Both water-filled quarry holes will be used occasionally by significant waterbirds (e.g. Hardhead and Musk Duck) but do not offer important or limiting resources to any such species.</p> <p>The two larger water-filled quarry holes in the south east of the study area offer some potential habitat for Growling Grass Frog with the species recorded on site between these quarries and the Maribyrnong River in 2002.</p>
Quarry Cliffs	Steep or shear rocky cliffs on the western edge of the abandoned quarries.	Associated with abandoned quarries	Provides habitat for reptiles and roosting and nesting habitat for specialist raptors such as Peregrine Falcon.
Floodplain Riparian Woodland	Woodland dominated by River Red-gum along the Maribyrnong River (mapped and assessed by BL&A 2016).	Adjacent to the Maribyrnong River	Provides a habitat corridor for mobile fauna. Habitat for arboreal mammals, birds and bats.

Table 3 Summary of EPBC and FFG Act listed species most likely to occur in the study area

Species name	Listing status	Area of value within the study area
Spiny Rice-flower	Critically Endangered under EPBC Act Listed under FFG Act	Plains Grassland, the location of records of this species are provided in Figure 2.
Striped Legless Lizard	Vulnerable under EPBC Act Listed under FFG Act	Plains Grassland, past records shown in Figure 2
Golden Sun Moth	Critically Endangered under EPBC Act Listed under FFG Act	Plains Grassland, past records shown in Figure 2
Growling Grass Frog	Vulnerable under EPBC Act Listed under FFG Act	Recorded from the Maribyrnong River environs. May utilise water filled abandoned quarries
Matted Flax-lily	Endangered under EPBC Act Listed under FFG Act	Recorded from escarpment grasslands but any areas of native grassland provide potential habitat
Small Golden Moths	Endangered under EPBC Act Listed under FFG Act	Recorded from escarpment grasslands but any areas of native grassland provide potential habitat
Tough Scurf-pea	Listed under FFG Act	Recorded from escarpment grasslands but any areas of native grassland provide potential habitat
Little Egret	Listed under FFG Act	Maribyrnong River environs and water filled abandoned quarries
Intermediate Egret	Listed under FFG Act	Maribyrnong River environs and water filled abandoned quarries
Eastern Great Egret	Listed under FFG Act	Maribyrnong River environs and water filled abandoned quarries
Yellow-bellied Sheathtail Bat	Listed under FFG Act	Air space over study area and environs of Maribyrnong River

The targeted survey for Spiny Rice-flower identified a total of 436 individuals (Figure 2). Surveys also identified:

- 4 mats of Matted Flax-lily
- 1 mat of Pale Swamp Everlasting
- 29 individuals of Arching Flax-lily
- 1 individual of Fragrant Saltbush
- 5 individuals of Austral Tobacco.

Previous surveys also identified 3 individuals of Tough Scurf Pea, records of Rye Beetle-grass within areas of Escarpment Shrubland (where it is likely to be common) and various occurrences of Geranium sp. 3 (likely to be common in grassland areas of the site) (Figure 2).

The distribution of Spiny Rice-flower is largely consistent with the distribution of this species noted by four previous surveys (Biosis Research 2002, ABZECO 2011, BL&A 2014, EHP 2016). While this survey could not find Spiny Rice-flower in some locations identified by other surveys or the number of individuals at a specific location identified by other surveys, it generally found the individuals recorded by past searches, even though

searches conducted by ABZECO 2011, BL&A 2014 and EHP 2016 often had a similar total number of plants but in different locations.

Areas of greatest value for significant species within the study area include:

- Plains Grassland: known to support populations of Spiny Rice-flower, Matted Flax-lily, Pale Swamp Everlasting, Arching Flax-lily, Golden Sun Moth and Striped Legless Lizard.
- Escarpment Shrubland: known to support populations of Tough Scurf-pea, Arching Flax-lily and Austral Tobacco, while also providing potential habitat for Matted Flax-lily.
- Quarry wetlands: provide potential habitat for Growling Grass Frog.

3.3.2 DELWP advisory list of rare and threatened species

To support decision making under the Guidelines, DELWP has produced models for Victoria describing the extent of habitat for most listed rare or threatened species. These models are called 'habitat importance models' and they assign a 'habitat importance score' to a location based on the importance of that location in the landscape as habitat for a particular rare or threatened species, in relation to other suitable habitat for that species (DEPI 2013a).

Under the Guidelines, these models form the basis for determining the impact of potential native vegetation clearing on rare and threatened species. The models only apply where a clearing proposal is considered on the moderate or high risk-based application pathways. The habitat importance scores are used to calculate the type and extent of biodiversity offsets required for native vegetation removal that impacts on individual rare or threatened species habitat for moderate or high risk application pathways.

Species for which habitat is modelled in the study area and are likely to suffer a significant impact from the potential clearing identified by this report are outlined in Appendix 4. These data were provided by DELWP Native Vegetation Transitional Support team and a full output report from DELWP is provided in Appendix 4.

Determination of the requirement for a specific offset based on the extent of impact on one or more rare or threatened species is addressed in Section 5.

3.3.3 Significant ecological communities

Areas of Plains Grassland (EVC 132) identified within this assessment are consistent with the Western (Basalt) Plains Grassland community listed under the FFG Act and Natural Temperate Grassland of the Victorian Volcanic Plains (NTGVPP) Community listed under the EPBC Act.

Escarpment Shrubland is endangered within the Victorian Volcanic Plains bioregion.

3.4 Other ecological values

The plains and rocky slopes of the Maribyrnong River escarpment are mapped by DELWP as Plains Grassland (EVC 132) with the floodplain of the Maribyrnong River mapped as Floodplain Riparian Woodland (EVC 56). Remnants of Escarpment Shrubland are only mapped on the eastern side of the river.

DELWP's Natureprint mapping identifies most of the study area as providing high contribution of natural values including most of the plain and escarpment areas. However DELWP also indicates that much of the site has a low strategic biodiversity score (less than 0.2) although smaller sections of the site do have a moderate to high strategic biodiversity score (0.2 to 0.8).

Although the site is known as a significant grassland, DELWP have identified the entire study area, including the broader study area, as Location A.

The study area also contributes to a broader habitat corridor. The riparian vegetation (EVC 56) provides foraging, roosting and nesting resources for a diversity of birds, reptiles and mammals. The instream habitat also supports species of fish and frogs. It facilitates the movement of fauna from beyond the Melbourne metropolitan area along the Maribyrnong River. While the habitat on the western side of the Maribyrnong only forms part of the broader corridor (i.e. there are also areas with corridor values on the eastern side of the river) it provides important resources for local fauna within a highly altered and urbanised landscape.

3.5 Previous Assessments

The first documented assessment of part of the study area was by McDougall (1987). The site was identified as the Baldwin Avenue Grassland (Site S1) and was identified as being of State conservation significance (on a scale of four levels of significance: national, state, regional and local) although it was acknowledged that additional surveys could identify additional ecological values which the potential to elevate this rating. The rating was based on the known presence of endangered species (Tough Scurf-pea *Cullen tenax*) and the endangered ecological community Plains Grassland (now known as ecological vegetation class 132) (DCE 1990).

A survey over three days in mid-spring 1992 was conducted by Biosis Research (1992) which surveyed areas in the broader study area of this assessment (excluding the Solomon Heights Grassland), identified areas of Plains Grassland (EVC 132) in the north of the site (north of the line of old quarries), smaller remnants of Escarpment Shrubland (EVC 895) and remnants of Riparian Woodland (now known as Floodplain Riparian Woodland EVC 56) along the Maribyrnong River.

Biosis Research (1992) mapped approximately 6 ha of Plains Grassland and Escarpment Shrubland.

Biosis Research (1992) described the vegetation as being in generally poor condition with areas of remnant native vegetation being relatively species poor and under significant threat from weed invasion. The remnant native vegetation was identified as being of High Regional conservation significance with the potential to support the endangered Tough Scurf-pea and a population of Striped Legless Lizard *Delma impar*. The report notes that if these species were recorded the site would be elevated to State conservation significance. The report did note the presence of Plains Rice-flower *Pimelea spinescens* (now known as Spiny Rice-flower *Pimelea spinescens* subsp. *spinescens*), but at the time this species was only rated as rare in Victoria rather than its current status of critically endangered in Australia.

Subsequently Biosis Research (2002) conducted more detailed assessments of the flora and fauna of the River Valley Estate. Surveys were conducted in May and November 2001 and January, February, March and December 2002. Separate targeted surveys were conducted for Spiny Rice-flower in late September 2002, for Tough Scurf-pea in January and February 2002 and for Flax-lily species in March 2002.

Biosis Research (2002) mapped approximately 15 ha of native vegetation identified as Plains Grassland and Escarpment Shrubland. It also recorded two individuals of Matted Flax-lily *Dianella amoena*, 15 Spiny Rice-flower, 47 Tough Scurf-pea, 25 Arching Flax-lily *Dianella* sp. aff. *longifolia* (Benambra) and other species considered rare at the time of the assessment. Of these, Pale-flower Crane's-bill *Geranium* sp. 3 is still considered rare in Victoria.

The fauna surveys conducted by Biosis Research (2002) recorded one significant species, Growling Grass Frog *Litoria raniformis*, noted from the central portion of the study area about 100 m west of the Maribyrnong River.

More recently, development proposals associated with the Solomon Heights grasslands have prompted surveys by ABZECO 2011, Brett Lane & Associates (BL&A 2014) and Ecology and Heritage Partners (EHP 2016

a & b). These assessments included vegetation mapping and targeted searches for threatened flora and fauna including Striped Legless Lizard, Golden Sun Moth *Synemon plana*, Spiny Rice-flower.

Of these assessments, BL&A (2014) covered the broadest study area as it covered all of the detailed study area of this current assessment to the east of the railway. Note, however, only Figure 1 of BL&A (2014) was available to this review.

EH&P (2016) was the most constrained as they only assessed areas between Whitehill Avenue (unmade) and Munro Avenue (unmade), while ABZECO examined all of the existing industrial subdivision between Munro Avenue and Baldwin Avenue.

Information on more recent targeted surveys for Spiny Rice-flower associated with the referral 2016/7677 (and others) under the EPBC Act was also provided to Biosis by a representative of the developer, Ron Silverstein.

All of these recent assessments identified a large (200+ plants) population of Spiny Rice-flower and varying amounts of Plains Grassland.

As noted by Council in the project brief, the majority of the site provides habitat for Striped Legless Lizard and Golden Sun Moth which have been recorded from the site (EHP 2016 a & b). This assessment concurs with that assessment.

None of the targeted surveys conducted have been able to record any individuals of Matted Flax-lily within the Solomon Heights grassland. Biosis Research (2002) recorded two Matted Flax-lily north of the disused quarries, BL&A (2014) appears to have relocated one of these while EH&P (2016) recorded the southern most plant noted by Biosis Research (2002) and an additional plant on the boundary of the Solomon Heights grassland. ABZECO did not record any Matted Flax-lily as their assessment was restricted to the Solomon Heights grassland.

The condition of remnant grassland and escarpment shrublands were not assessed by Biosis Research (2002) as the habitat hectare assessment protocols (DSE 2004) were not implemented by consultants at that time. If habitat hectare data was collected by BL&A (2014) that data was not available to this assessment.

Vegetation mapping by EH&P (2016) covered a subset of the area mapped by ABZECO (2011). However the extent of native vegetation identified by these two consultants is significantly different. The environmental significance overlay (ESO3) identified under the Brimbank Planning Scheme appears to reflect most of the ABZECO (2011) mapping of Plains Grassland although Habitat Zones 17 and 18 of their mapping appears to have been excluded from the ESO.

The habitat hectare scores provided by both ABZECO and EH&P (2016) have some inconsistencies. EHP (2016) appears to utilise the BIM landscape score and almost universally apply a total landscape score of 8/25 for vegetation zones they identify as PG1 to 5 with PG6 allocated a landscape score of 6/25. This is inconsistent with the requirements of DSE (2004) and is not an approved method of providing a habitat hectare assessment.

ABZECO (2011) have correctly allocated a patch size score to broader areas identified as habitat patches. However the Neighbourhood scores allocated to the larger Habitat Zones are not correct (uniformly allocated a score of 0 when some areas clearly score a 1 out of 10) and the Distance to Core score is uniformly allocated a score of 0/5 when this assessment considers the score allocated must be 3/5.

A core area is identified as an area of native vegetation greater than 50 ha regardless of type, quality or tenure, with that area defined as significantly disturbed according to an accepted definition, but typically all areas of native vegetation are considered significantly disturbed unless they effectively qualify as wilderness. The extent of native vegetation in the local area (i.e. within 5 km) is typically beyond any assessment and is

otherwise dependent on mapping provided by the BIM. Examination of the BIM identified a broad band of native vegetation covering more than 50 ha along the Maribyrnong River within a kilometre of the areas of mapped vegetation. Such vegetation must be assigned a Distance to Core Area score of 3/5 as a significantly disturbed core area is present within one kilometre of the vegetation subject to the habitat hectare assessment.

Otherwise the habitat hectare assessments conducted by ABZECO (2011) and EH&P (2016) are relatively consistent apart from mapping quite different areas.

ABZECO (2011) claims to have mapped areas of native vegetation as small as 1000 square metres (0.1 ha or about 32 m by 32 m), while EH&P (2016) appear to have mapped areas as small as 10 m by 10 m. In this assessment Biosis utilised high resolution aerial photography (Nearmap) to provide preliminary mapping of the extent of native vegetation which was then subject to extensive ground inspection and confirmation. This is considered more accurate than defining the extent of vegetation from a ground inspection only.

Other minor issues associated with the ABZECO (2011) and EH&P (2016) reports include the identification of some species. Both consultants record Trailing Speedwell *Veronica plebeia* and have not recorded Slender Speedwell *Veronica gracilis* which is common over the Solomon Heights Grassland, occurring in extensive mats often to ten metres in diameter. This is presumably a misidentification.

Similarly ABZECO (2011) records Button Everlasting *Helichrysum scorpioides* and Pale Flax-lily *Dianella longifolia* var *grandis*. However, we have recorded these species as Pale Swamp Everlasting *Coronidium gunnianum* (syn. *Helichrysum* sp. aff. *rutidolepis* (Lowland Swamps)) and Arching Flax-lily *Dianella* sp. aff. *longifolia* (Benambra). This reflects a poor understanding of the grassland flora as both species were well known entities at the time of the ABZECO survey. This is unusual as ABZECO uses the name *Dianella admixa* for Black-anther Flax-lily which is relatively contemporary taxonomy. Both of these misnamed species are listed as vulnerable in Victoria and were noted as threatened at the time of the ABZECO survey but were not allocated a threatened status in their report.

Other unusual omissions in the various lists of flora provided include Red-legged Grass *Bothriochloa macra*, which is common over the site but was not recorded by ABZECO (2011) and Cranesbill *Geranium* spp. which was noted as a common herb but was not recorded by EH&P (2016a). When utilising benchmarks where a relatively small number of lifeforms can influence the understorey score allocated to a patch of Plains Grassland, these apparent oversights cast a level doubt on the overall assessment conducted by each consultant.

BL&A (2016) conducted a biodiversity assessment of Stages 7, 8 and 9 of the River Valley Estate, which in-part overlaps with the detailed study area assessed by this report. In general mapping of the extent of native vegetation within the area these two assessments overlap was relatively consistent. While BL&A (2016) identify more native vegetation in some areas and less in others, the total area is basically equal. However BL&A identify all of the vegetation on the slope leading down to the Maribyrnong River as Escarpment Shrubland (EVC 895) even though DELWP identify this vegetation as Plains Grassland (EVC 132) and much of this area supports no indigenous shrub cover. In that context this assessment has classified the grassy rocky slopes as Plains Grassland (consistent with its existing condition and DELWP mapping) rather than Escarpment Shrubland. Only areas with dense to scattered shrub cover were classified and assessed as Escarpment Shrubland.

The report also classifies grassy vegetation which has recolonised excavated areas of the abandoned quarry as Escarpment Shrubland. This is inconsistent with the habitat hectare assessment protocols and the biodiversity assessment handbook (DELWP 2015). Their report also indicates that the grasses dominating this secondary grassland is generally dominated by Silky Blue-grass *Dichanthium sericeum*, wallaby-grasses, spear-

grasses and Blackheads. Blackheads is the common name for *Enneapogon nigricans*, although this species is not recorded in BL&A (2016) species list. This is a likely addition to the plant list for the study area.

Additional areas of native vegetation identified by BL&A (2016) outside the detailed study area for this assessment were incorporated into this report. However the EVC allocated to these patches was reassigned to Plains Grassland as considered appropriate and the habitat scores adjusted accordingly. This decision was based on the pre-1750 DELWP mapping of this area as Plains Grassland and the structure of the vegetation present.

Similarly where the allocated score for any component of the habitat score was considered inaccurate, that score was also adjusted.

Where the two assessments overlap, the mapping of vegetation extent, the allocated EVC and the habitat hectare assessment conducted by this assessment was used and that conducted by BL&A (2016) was discarded.

Additional species recorded by BL&A (2016) were added to Appendix 2. Instances where BL&A (2016) recorded species using outdated taxonomy were corrected (i.e. *Dianella longifolia* var. *grandis* s.l. is likely synonymous with *Dianella* sp. aff. *longifolia* (Benambra) and *Austrodanthonia setacea* is recorded as *Rytidosperma setaceum*), while other ambiguous records (i.e. *Galium* spp. identified as an indigenous species) were ignored.

4. Biodiversity legislation and government policy

This section provides an assessment of the project in relation to key biodiversity legislation and government policy. This section does not describe the legislation and policy in detail. Where available, links to further information are provided.

4.1 Commonwealth

4.1.1 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act applies to developments and associated activities that have the potential to significantly impact on Matters of National Environmental Significance (MNES) protected under the Act (DoE 2013).

Link for further information including a guide to the referral process is available at: <http://www.environment.gov.au/epbc/index.html>

Matters of National Environmental Significance relevant to the project are summarised in Table 4. It includes an assessment against the EPBC Act policy statements published by the Australian Government which provide guidance on the practical application of EPBC Act.

Table 4 Assessment of potential development within the site in relation to the EPBC Act

Matter of NES	Project specifics	Assessment against significant impact guidelines
Threatened species and ecological communities	25 listed species have been recorded or predicted to occur in the project search area. The likelihood of these species occurring in the study area is assessed in Appendix 2 (flora) and Appendix 3 (fauna). Five threatened ecological communities have been predicted to occur within the study area.	Significant species (Spiny Rice-flower, Matted Flax-lily, Golden Sun Moth and Striped Legless Lizard) have been recorded on site. One significant community (NTGWVP) is widespread within the study area. Development of the site would likely constitute a significant impact.
Migratory species	Nine migratory species have been recorded or predicted to occur in the project search area (Appendix 3).	While some of these species would be expected to use the study area on occasions, and some of them may do so regularly or may be resident, it does not provide important habitat for an ecologically significant proportion of any of these species.
Wetlands of international importance (Ramsar sites).	The study area is not identified as being within the catchment of a Ramsar site.	The study area does not drain directly into a Ramsar site and the development is not likely to result in a significant impact.

On the basis of criteria outlined in the relevant *Significant Impact Guidelines* (DEWHA 2009a&b, DSEWPaC 2011a&b, DoE 2013) it is considered likely that a significant impact on a MNES would result from development associated with this site. A proponent should therefore refer any proposed development of the site to the Commonwealth Minister for the Environment.

4.2 State

4.2.1 Flora and Fauna Guarantee Act 1988 (FFG Act)

The FFG Act is the key piece of Victorian legislation for the conservation of threatened species and communities and for the management of potentially threatening processes. Under the FFG Act a permit is required from DELWP to 'take' protected flora species from public land. A permit is generally not required for removal of protected flora from private land. Authorisation under the FFG Act is required to collect, kill, injure or disturb listed fish.

Link for further information: <http://www.depi.vic.gov.au/environment-and-wildlife/threatened-species-and-communities/flora-and-fauna-guarantee-act-1988>

Native vegetation on the site is a listed community, and contains listed and protected flora and fauna species, or habitat for them (Appendix 2 and 3).

The land is privately owned, is not declared 'critical habitat' for the purposes of the FFG Act and the flora species are not being taken for the purpose of commercial sale. Therefore a protected flora permit is not required, however the presence of rare or threatened flora and habitat for threatened fauna will be considered by the Responsible Authority in determining its response to an application for vegetation clearance under Clause 52.17 (see below).

Sections of the study area are potentially on public land (i.e. road reserves). Sections of these areas support protected flora species and a listed flora community or its constituent species (Appendix 2). Therefore a protected flora permit from DELWP may be required if any of these species will be affected by a development proposal.

4.2.2 Catchment and Land Protection Act 1994 (CaLP Act)

The CaLP Act identifies and classifies certain species as noxious weeds or pest animals, and provides a system of controls on noxious species.

Declared noxious weeds identified in the study area are listed in Appendix 2 and established pest animals are known from the site (rabbit and fox).

The proponent/land owner must take all reasonable steps to eradicate regionally prohibited weeds, prevent the growth and spread of regionally controlled weeds, and prevent the spread of and as far as possible eradicate established pest animals. The State is responsible for eradicating State prohibited weeds from all land in Victoria.

Link for further information: <http://www.depi.vic.gov.au/agriculture-and-food/pests-diseases-and-weeds/protecting-victoria-from-pest-animals-and-weeds/legislation-policy-and-permits/legislation>

4.2.3 Planning and Environment Act 1987 (incl. Planning Schemes)

The *Planning and Environment Act 1987* controls the planning and development of land in Victoria, and provides for the development of planning schemes for all municipalities.

Reforms to the native vegetation permitted clearing regulations were gazetted on 20 December 2013 through planning scheme amendment VC105. The reforms made changes to the Victoria Planning Provisions including the State Planning Policy Framework (SPPF), Clause 52.16 and 52.17 of all planning scheme within Victoria and introduced the Permitted clearing of native vegetation: Biodiversity Assessment Guidelines (DEPI 2013a).

Of particular relevance to any proposed development within the Study Area are controls relating to the removal, destruction or lopping of native vegetation contained within the Brimbank Planning Scheme (the

Scheme), including permit requirements. The Scheme (Clause 72) defines 'native vegetation' as 'Plants that are indigenous to Victoria, including trees, shrubs, herbs and grasses'. It is an objective of Clause 12.01-2 (Native vegetation management) of the SPPF that permitted clearing of native vegetation results in no net loss in the contribution made by native vegetation to Victoria's biodiversity. For more information on these reforms refer to <http://www.depi.vic.gov.au/environment-and-wildlife/biodiversity/native-vegetation>.

Clause 52.17 (Native Vegetation) requires a planning permit to remove, destroy or lop native vegetation including some dead native vegetation. Decision guidelines are contained in Clause 52.17-5. It should be noted that where native vegetation does not meet the definition of a remnant patch or scattered trees, as described in Section 3.1, the Guidelines do not apply. However, a permit may still be required to remove, destroy or lop native vegetation under the provisions of the Scheme.

Clause 65.02 (Approval of an application to subdivide land) requires consideration of native vegetation retention in a subdivision application and siting of open space areas.

Under Clause 66.02 (Use and development referrals) a permit application to remove, destroy or lop native vegetation is required to be referred to DELWP as a recommending referral authority if any of the following apply:

- the area of native vegetation to be removed is greater than 0.5 hectares
- the class of application is on the high risk-based pathway
- a property vegetation precinct plan applies to the site or
- the native vegetation is on Crown land occupied or managed by the Responsible Authority.

The need for a permit to remove native vegetation is also triggered by the Schedule 3 to the Environmental Significance Overlay (ESO3) that applies to a portion of the Study Area. This provisions and permit requirements of the ESO3 are discussed further in Section 10.3.3 of this report.

Victoria's Biodiversity Assessment Guidelines

The Guidelines are incorporated into the Victoria Planning Provisions and all planning schemes in Victoria (DEPI 2013a). The Guidelines replace Victoria's Native Vegetation Management – A Framework for Action.

The purpose of the Guidelines is to guide how impacts to biodiversity should be considered when assessing a permit application to remove, destroy or lop native vegetation. The objective for permitted clearing of native vegetation in Victoria is 'No net loss in the contribution made by native vegetation to Victoria's biodiversity'.

A detailed assessment of the implications for a project development scenario under the Guidelines is provided in Section 5 of this report. Under the Guidelines, there are three risk-based pathways for assessing an application for a permit to remove native vegetation: low, moderate and high.

A detailed determination of the risk-based pathway for the planning application scenario proposed is provided in Section 5.1.3. In summary, any such a planning application for removal of native vegetation must meet the requirements of, and be assessed in, the moderate risk-based pathway.

4.2.4 Environment Effects Act 1978

The *Environment Effects Act 1978* establishes a process to assess the environmental impacts of a project. If applicable, the Act requires that an Environment Effects Statement (EES) be prepared by the proponent. The EES is submitted to the Minister for Planning and enables them to assess the potential environmental effects of the proposed development.

The general objective of the assessment process is *to provide for the transparent, integrated and timely assessment of the environmental effects of projects capable of having a significant effect on the environment* (DSE 2006).

The 'Ministerial Guidelines for Assessment of Environmental Effects under the Environment Effects Act 1978' (DSE 2006) provide a range of criteria that can be used to determine whether an EES may be required for a project. These criteria relate to individual potential environmental effects and a combination of (two or more) potential environmental effects.

A preliminary self-assessment of the project against the individual and combined criteria was undertaken and concluded that a proposal to develop the southern portion of the subdivision area within the Study Area is unlikely to require referral under the *Environmental Effects Act 1978*, so long as the removal of native vegetation remains below 10 ha.

However, the Guidelines are not binding, and the decision as to whether an EES is required is ultimately at the discretion of the Minister for Planning.

5. Potential Impacts and offsets

5.1 Victoria's biodiversity assessment guidelines

The Guidelines were introduced in December 2013, and they describe the following objective for permitted clearing of native vegetation in Victoria:

"No net loss in the contribution made by native vegetation to Victoria's biodiversity"

This objective is to be achieved through Victoria's planning system using a risk-based approach that relies on strategic planning and the permit and offset system. The key strategies for achieving no net loss at the permit level are:

- avoiding the removal of native vegetation that makes a significant contribution to Victoria's biodiversity
- minimising impacts to Victoria's biodiversity from the removal of native vegetation
- where native vegetation is permitted to be removed, ensuring it is offset in a manner that makes a contribution to Victoria's biodiversity that is equivalent to the contribution made by the native vegetation to be removed.

The steps that have been taken during the design of the development to ensure that impacts on biodiversity from the removal of native vegetation have been minimised include:

- Locating the proposed building in existing disturbed land
- Designing the access road to avoid scattered trees

DELWP has provided biodiversity information tools to assist with determining the risk associated with permitted clearing and the contribution that native vegetation within the study area makes to Victoria's biodiversity.

All planning permit applications to remove native vegetation are assigned to a risk-based pathway determined by the extent and location of proposed clearing. The risk-based pathway determines the information to be provided in a planning permit application and the decision guidelines the responsible authority (e.g. Council) and/or DELWP as a referral authority will use to assess the permit application.

The biodiversity information tools have two components:

Site-based information

The site-based information is observable at a particular site. Biosis has collected the requisite site-based information for the assessment against the Guidelines.

Landscape scale information

Landscape scale information requires consideration of information beyond the site. This information is managed by DELWP and can be accessed via the NVIM. Biosis has submitted the site-based data and location information for the nominated development scenario to DELWP and a Biodiversity Information and Offset Requirements (BIOR) report has been prepared to accompany the main development planning scenario identified.

The following section summarises the results of the site-based assessment and the outputs generated by the BIOR report. The BIOR report identifies the risk-based pathway on which the example planning application would be assessed.

5.1.1 Extent of native vegetation

The extent of native vegetation patches and scattered trees were mapped within the study area (Figure 2) and the condition was assessed in relation to standard methods provided by DSE (2004). The condition of native vegetation was assessed using the DSE Vegetation Quality Assessment Sheet (DSE 2004) and pre-determined EVC benchmarks: <http://www.dse.vic.gov.au/conservation-and-environment/ecological-vegetation-class-evc-benchmarks-by-bioregion>.

Patches of native vegetation identified and assessed by BL&A (2016) outside the study area were included in this assessment. However, adjustments to the EVC classification and subsequent adjustments to the habitat scores were made (see Section 3.5).

The potential removal of native vegetation was assessed in accordance with the area nominated for development as the most likely development planning scenario (Figure 3). The habitat hectare (Hha) scores for native vegetation identified within the study area is outlined in Appendix 5. Spatial data (shapefiles) for the nominated area for vegetation removal were submitted to DELWP's native vegetation support team, who provided a BIOR report for the project. This is provided in Appendix 6 and summarised in the following sections.

5.1.2 Habitat hectares

Areas of uniform quality for each EVC within the patches are termed 'habitat zones' and are assessed separately. The condition score of the habitat zone is multiplied by the extent of the zone to give a value in habitat hectares (Hha).

A total of 20 habitat zones covering 31.951 ha were identified as supporting 15.032 hha. The results of the condition assessment are provided in Appendix 5, with the number of habitat hectares calculated for each habitat zone.

There are also 22 scattered remnant trees within the study area (note that other trees within patches are also present) (six recorded by this assessment and 16 along the Maribyrnong River recorded by BL&A 2016). These trees equate to 0.312 habitat hectares (Table 5). The trees recorded within the study area are identified in Figure 2.

Table 5 Habitat hectare conversion for scattered remnant canopy trees within the study area

Number of scattered trees	Weighted average condition multiplier*	Standard extent (ha)	Habitat hectares (Hha)
22	0.2	0.071	0.312

*From DELWP NVIM

Summary of Habitat hectares within the broad study area

In summary, the study area supports a total of 15.344 hha.

5.1.3 Determining the risk-based pathway

To determine the risk based pathway for any proposed clearing of native vegetation, two factors are considered: **location risk** and **extent risk**.

Legend

- Subject site
 - Parcel boundary
 - Proposed conservation area
 - Species connectivity along river corridor
- Ecological vegetation class**
- Escarpment Grassland
 - Escarpment Shrubland
 - Native grasses
 - Themeda

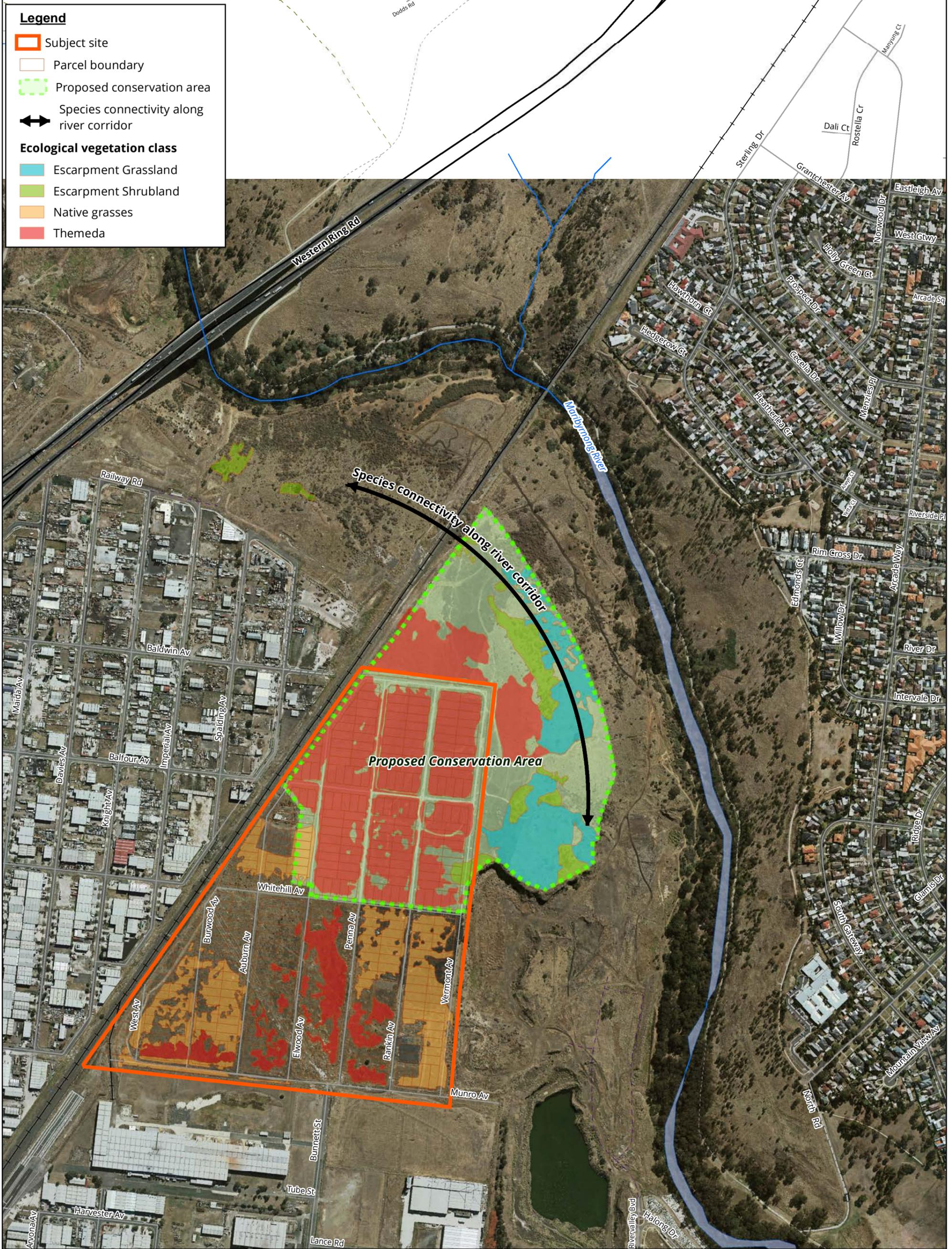


Figure 3 Proposed Conservation Area



Ballarat, Brisbane, Canberra, Hobart, Melbourne, Newcastle, Sydney, Wangaratta & Wollongong

Acknowledgements: Vicmap ©State of Victoria, Nearmap 2016

Matter: MSS,
Date: 04 October 2016,
Checked by: LDM, Drawn by: 22444, Last edited by: Imline
Location: U:\My Documents\ArcGIS\22444_F6_ProposedConsArea



Metres
Scale 1:6,043 @ A3
Coordinate System: GDA 1994 MGA Zone 55



Location risk has been pre-determined by DELWP for all locations in Victoria. The location of a particular site is determined using the *Native vegetation location risk map* available in the Native Vegetation Information Management (NVIM) system (<http://nvim.depi.vic.gov.au>).

The extent risk is based on the extent of native vegetation proposed to be removed. Extent risk is determined with reference to the:

- area of any remnant patches of native vegetation proposed to be removed
- number of any scattered trees proposed to be removed.

In line with a potential planning outcome outlined by Biosis (2016) for future development at Solomon Heights, development would likely result in the loss of 8.691 ha of native vegetation all of which is classified as Plains Grassland and 7.445 ha as NTGVVP. This amounts to an impact of 3.734 hha from within an area classified entirely as Location A. Therefore any such application for removal of this native vegetation must meet the requirements of, and be assessed in, the moderate risk-based pathway. This report provides the relevant information required to be submitted to DELWP to quantify the offset requirements associated with any potential development footprint for Solomon Heights.

5.1.4 Potential state offsets

In order to ensure a gain to Victoria's biodiversity that is equivalent to the loss resulting from permitted clearing of native vegetation, compensatory offsets are required. Losses and gains are measured in biodiversity equivalence scores or units.

For a moderate risk-based pathway application, the specific-general offset test will determine if a general offset, specific offset or combination of both is required.

The offset requirements for the proposed planning outcome are provided in Appendix 6 and summarised in Table 6. The results of the specific-general offset test are also provided in Appendix 6.

Note: a glossary of terms used in relation to the Guidelines and habitat hectares assessments is provided in Appendix 7.

5.2 Potential EPBC Act offsets

Any potential development of the study area would require a referral under the EPBC Act and is likely to be considered a controlled action.

Indicative offsets using the EPBC Act offset calculator and a series of assumptions imbedded within that calculator are provided in Appendix 6. Separate offsets would be required for each MNES to be impacted. This would include impacts to Spiny Rice-flower and NTGVVP as well as Striped Legless Lizard and Golden Sun Moth which have been detected by previous assessments. Note that the habitat requirements for both Striped Legless Lizard and Golden Sun Moth are not restricted to native vegetation.

The potential EPBC Act offset requirements for each MNES associated with the areas identified for development planning approval is as follows:

- Spiny Rice-flower: Protect and manage a population of at least 400 plants
- NTGVVP: Protect and manage 29.5 ha of the community
- Striped Legless Lizard: Protect and manage 31.9 ha of habitat
- Golden Sun Moth: Protect and manage 82.6 ha of habitat

Table 6 Summary of DELWP Biodiversity Impacts and Offset Requirements report

Attribute	Outcome	Notes
Location risk	A	Entire site is identified as Location A
Native vegetation removal extent	8.687 ha	Proposed planning outcome as opposed to a planning permit application (8.687 ha of patch vegetation)
Risk-based pathway	Moderate	
Habitat hectares to be removed	3.732	No scattered trees lost
Strategic Biodiversity Score	0.198	
Modelled habitat for rare or threatened species	Modelled habitat present	The proposed impact does not exceed the threshold for any species
Specific-general offset test result	General offset only	
General/Specific Biodiversity Equivalence Scores	0 – 0.125	
Offset type	General	
Offset risk factor	1.5	
Offset amount: General Biodiversity Equivalence Units	1.006	
Offset habitat for species	Not Applicable	
Offset Vicinity	Port Phillip And Westernport CMA or Brimbank City Council	
Offset minimum Strategic Biodiversity Score	0.158	

5.3 Offset strategy

5.3.1 The Guidelines

A third-party offset site would be required as part of any development proposal. The proponent would need to make an agreement with a landholder for the landholder to retain and manage the defined area of native vegetation as a third party offset site.

The offset site providing the general offset is expected to be on freehold land located in the City of Brimbank or the Port Phillip and Westernport catchment management area. The offset site would also require a minimum strategic biodiversity score of 0.146.

Any development would be required to provide evidence of the availability of the prescribed offset in the form of a quotation from a registered broker as part of any permit application under the moderate risk pathway.

5.3.2 The EPBC Act

Offsets under the EPBC Act are unlikely to be available in the same offset site selected to provide the prescribed GBEUs unless the area identified as a priority conservation area by this assessment is utilised as the primary source of both state and federal offset requirements. The protection and management of this area would readily provide the GBEUs required for the development area.

EPBC Act offset requirements indicate a need for a site within the Victorian Volcanic Plain bioregion which supports 82.6 ha of habitat for Golden Sun Moth, a minimum of 29.5 ha of NTGVVP, confirmed records of Striped Legless Lizard and a population of at least 400 Spiny Rice-flower plants. If this is not possible additional offset areas would need to be secured until the offsets for each MNES are secured.

The balance of the study area supports 15.713 ha of Plains Grassland which equates to NTGVVP and would also provide both Striped Legless Lizard and Golden Sun Moth habitat. This area also supports a known population of 298 Spiny Rice-flower plants, the protection of which would otherwise significantly reduce the estimated offset requirement for this species.

6. Key ecological values and recommendations

This section identifies the key ecological features of the study area, provides an outline of potential implications of proposed development on those values and includes recommendations to assist Brimbank Council to design a planning outcome to minimise impacts on biodiversity.

The primary measure to reduce impacts to biodiversity values within the study area is to minimise removal of native vegetation and terrestrial habitat. It is critical that this be considered during the planning phase for the site, when key decisions are made about planning zones, the location of roads and services, parks and housing areas. The results of this assessment should therefore be incorporated into any project design, by adding the flora and fauna mapping information into the planning maps and investigating options to retain as much of the mapped vegetation/habitats as possible. Priority should be given to highest value areas and retaining larger areas in preference to numerous smaller ones.

The planning phase is also the time during which future requirements for infrastructure and services must be forecast and allowance made outside any nominated reserves for all construction works, such as road batters, footpaths, drainage and services (including optic fibre). All areas of vegetation/habitat nominated in the design plan as 'retained' are to be treated as no-go zones and are not to be encroached upon as development progresses.

A summary of potential implications of development within the study area is provided in Table 7.

Table 7 Summary of key ecological values, potential implications of developing the study area.

Ecological feature	Existing values	Implications of development
Native vegetation	31.951 ha of native vegetation including 1.985 ha of Escarpment Shrubland, 5.612 ha of Floodplain Riparian Woodland and 24.352 ha of Plains Grassland.	<p>Loss of 8.687 ha of Plains Grassland</p> <p>The application will be assessed on the moderate risk-based pathway</p> <p>Proportional impacts to native vegetation below the specific offset threshold for rare and threatened species with modelled habitat covering the site.</p> <p>The Guidelines require an offset of GBEU.</p>
Threatened Species and communities	Habitat for significant species including: a large population of Spiny Rice-flower (436), Matted Flax-lily, Golden Sun Moth, Striped Legless Lizard and other state significant flora.	<p>Significant impacts to MNES including the loss of 138 Spiny Rice-flower (32% of the known population of 436 plants), 7.445 ha of NTGWVP and an estimated 15 ha of habitat for both Striped Legless Lizard and Golden Sun Moth.</p> <p>Referral under the EPBC Act required.</p> <p>Significant offsets relating to each MNES likely to be required.</p>
Other values	Site contributes to an existing fauna movement corridor	Habitat continuity on the western side of the Maribyrnong River should be maintained.

In the longer term areas to be managed for conservation could have ownership transferred to a government authority such as council or Parks Victoria, to allow for the ongoing ecological management of this conservation resource. However, other ownership options, such as Trust for Nature or covenanted private ownership also provide opportunities for conservation management.

The area of native vegetation and habitat identified as a priority for conservation in this report has a significant potential to provide an offset for the development of the balance of Solomon Heights and should provide a first option for securing the required offset requirements identified for both state and federal legislative requirements. However surrounding areas still support significant conservation values and should be considered for retention where possible.

Areas of native and non-native vegetation within and adjacent to the study area contribute to a habitat corridor along the Maribyrnong River. This corridor provides habitat in its own right and also permits movement of fauna species such as Eastern Grey Kangaroos and a variety of birds that range quite widely in response to availability of resources and to variable environmental conditions such as rainfall. Connectivity along this corridor also provides an important function to more sedentary fauna and to flora by preventing isolation of fragmentary small populations that may then be subject to loss of genetic diversity. Retention of a continuous corridor along the riparian zone of Maribyrnong River adjacent to the study area will be important for maintenance of these ecological functions.

The existing habitat corridor on the western side of the Maribyrnong River has already been compromised to some extent by existing development associated with residential subdivision in the south of the broader study area and the existing abandoned quarry holes. However the corridor will continue to function as long as fauna have access to both sides of the Maribyrnong River in the north and north central portions of the broader study area. This would involve the protection of land in the north east of the detailed study area between the proposed conservation area and the Maribyrnong River (Figure 2).

7. Biodiversity conservation and urban design

7.1 Requirement to set aside land for conservation purposes

The detailed assessment of the broader site identified four Matters of National Environmental Significance (MNES) under the EPBC Act including a large population (436 plants) of Spiny Rice-flower, 23.158 ha of Natural Temperate Grasslands of the Victorian Volcanic Plain (NTGVVP), and about 35 ha of habitat suitable for Striped Legless Lizard and Golden Sun Moth.

Based on our experience it is our understanding that any development scenario which would impact on these MNES would be declared a 'controlled action' under the EPBC Act and that complete development of the site would result in an impact on these MNES which would likely not be acceptable to the Commonwealth Department of Environment and Energy (DEE). Even if development of the entire site were to be approved, the offset prescription likely to be applied under the EPBC Act would be very difficult if not impossible to secure given the limited extent of these values in the broader landscape.

As such an area of approximately 12ha of land north of Whitehill Avenue within the site boundaries is recommended to be set aside as part of a larger conservation area that extends beyond the site to the east and north within which urban development is prohibited, with the remaining 21ha south of Whitehill Avenue made available for development (Figure 4). About 174 individual parcels of land within the site boundaries would be directly affected by this conservation area. The conservation area would include a large population (298 plants or 68% of the known population) of Spiny Rice-flower, 15.713 ha of Natural Temperate Grasslands of the Victorian Volcanic Plain (NTGVVP), and about 20 ha of habitat suitable for Striped Legless Lizard and Golden Sun Moth.

The balance of the site unaffected by the nominated conservation area and potentially made available for development represents a development footprint with potential to be approved under the EPBC Act and which would result in achievable offset prescriptions. The area of the site identified as the conservation area contains the necessary offsets required under the P&E Act and EPBC Act for native vegetation and habitat to be cleared as part of development of the southern half of the site.

The boundary of the conservation area has been defined according to the following objectives:

- Protect areas of the highest quality vegetation and habitat for MNES
- Protect a high proportion of the Spiny Rice-flower population
- Avoid the fenced off area containing the dilapidated building structure adjacent to the railway line
- Minimise land-take as far as practicable to maximise development potential of the site
- Allow development to occur on those areas that would most likely gain the necessary approvals under State and Commonwealth biodiversity legislation
- Apply best practice biodiversity principles for the protection of the grasslands.

It is acknowledged that the setting aside of land for conservation purposes limits completely the ability for those lots affected by the proposed conservation area to be developed. This raises fundamental issues of fairness and equity for the affected landowners, which must be addressed as part of the overall solution for the site. A number of options to secure the land for biodiversity conservation purposes which acknowledge these issues are documented by Biosis (2016).

References

- ABZECO 2011. *Flora & Fauna report on Baldwin Avenue / Solomon Heights Grassland*. Report for Brimbank City Council. Authors Pegg, J., Just, K. and Francis R. ABZECO Eltham. Report 0943.
- ABZECO 2016. *Targeted surveys undertaken for the Striped Legless Lizard *Delma impar* at Solomon Heights, Sunshine North, Victoria*. Report for Brimbank City Council. Author De Angelis, D. ABZECO Eltham. Report 0943.2 Version 1.1.
- BCC 2012b. *Brimbank Biodiversity Strategy*. Brimbank City Council.
- Biosis 2016. *Solomon Heights Urban Design Project*. Report for Brimbank Council. Author Stafford, M. Biosis Melbourne. Project No. 22444.
- Biosis Research 1997. *Flora and Fauna of River Valley Estates, Maribyrnong River, Sunshine North*. Report for Lain Walters Pty Ltd. Authors Meredith C., Costello, C., Larwill S., and Yugovic, J. Biosis Research Melbourne. Project No. 184.
- Biosis Research 2002. *Flora and Fauna of the River Valley Estate Property, Sunshine*. Report for Atlantic Link Pty Ltd. Authors Costello, C., Gilmore D., Venosta M. and Meredith C. Biosis Research Melbourne. Project No. 1551.
- BL&A 2012. *Solomon Heights, Sunshine North: feasibility of use as a native vegetation offset & framework for implementation*. Brett Lane & Associates.
- BL&A 2014. Figure 1: *Study area and native vegetation (River Valley Estate)*. Report for Hermal Mortin Group c/o Lain Watters Pty Ltd. Brett Lane & Associates, Camberwell. Project No. 8135.
- DCE 1990. *Remnant Native Grasslands and Grassy Woodlands of the Melbourne Area: An Action Plan for Conservation Based on Biological Values*. Department of Conservation and Environment, Melbourne.
- DEPI 2013. *Permitted clearing of native vegetation - Biodiversity assessment guidelines*. Victorian Government Department of Environment and Primary Industries, Melbourne (September 2013).
- DEPI 2014a. *Advisory List of Rare or Threatened Plants in Victoria – 2014*. Victorian Government Department of Environment & Primary Industries, East Melbourne.
- DEPI 2014b. *Permitted clearing of native vegetation – Biodiversity assessment handbook*. Version 0.2. Victorian Government Department of Environment and Primary Industries, Melbourne (January 2014).
- DEWHA 2009a. *Significant impact guidelines for the critically endangered spiny rice-flower (*Pimelea spinescens* subsp. *spinescens*)*. Nationally threatened species and ecological communities EPBC policy statement 3.11. Australian Government Department of the Environment, Water, Heritage & the Arts', Canberra.
- DEWHA 2009b. *Significant impact guidelines for the critically endangered golden sun moth (*Synemon plana*)*. Nationally threatened species and ecological communities EPBC Act policy statement 3.12, Department of the Environment, Water, Heritage & the Arts. Australian Government, Canberra.
- DoE 2013. Matters of National Environmental Significance. Significant impact guidelines 1.1. *Environment Protection and Biodiversity Conservation Act 1999*. Australian Government Department of the Environment, Canberra.

DSE 2004. *Native Vegetation: Sustaining a living landscape. Vegetation Quality Assessment Manual – Guidelines for applying the Habitat hectares scoring method. Version 1.3.* Victorian Government Department of Sustainability and Environment, Melbourne.

DSE 2006. *Ministerial Guidelines for Assessment of Environmental Effects under the Environment Effects Act 1978.* Victorian Government Department of Sustainability and Environment, Melbourne.

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

DSE 2013. *Advisory List of Threatened Vertebrate Fauna in Victoria – 2013.* Victorian Government Department of Environment & Primary Industries, Melbourne.

DSE 2015. Victorian Biodiversity Atlas 'VBA_FAUNA25, FAUNA100 & FAUNARestricted, FLORA25, FLORA100 & FLORARestricted' August 2015 © The State of Victoria. Victorian Government Department of Sustainability & Environment, Melbourne.

DSEWPaC 2011a. *Environment Protection and Biodiversity Conservation Act 1999 referral guidelines for the vulnerable striped legless lizard* *Delma impar*. Australian Government Department of Sustainability, Environment, Water, Population & Communities. Canberra.

DSEWPaC 2011b. *Nationally Threatened Ecological Communities of the Victorian Volcanic Plain: Natural Temperate Grassland & Grassy Eucalypt Woodland A guide to the identification, assessment and management of nationally threatened ecological communities.* Australian Government Department of Sustainability, Environment, Water, Population & Communities, Canberra.

EHP 2016a. *Ecological assessment, Solomon Heights (Munro Avenue to Whitehill Avenue), Sunshine North, Victoria.* Report for Glen Ora Estate Pty Ltd. Author LeBel, S. Ecology & Heritage Partners, Ascot Vale. Project No. 7375.

EHP 2016b. *Targeted Surveys for Matted Flax-lily and Golden Sun Moth, Solomon Heights, Sunshine North, Victoria.* Report for Glen Ora Estate Pty Ltd. Author LeBel, S. Ecology & Heritage Partners, Ascot Vale. Project No. 7375.

McDougall, K. 1987. *Sites of Botanical Significance in the Western Region of Melbourne.* Department of Conservation, Forests and Lands, Melbourne.

VNPA 2013. *Start with Grasslands: design guidelines to support native grasslands in urban areas.* Victorian National Parks Association.

8. Appendices

Appendix 1 Project brief

Figure 1: Solomon Heights/Baldwin Avenue section

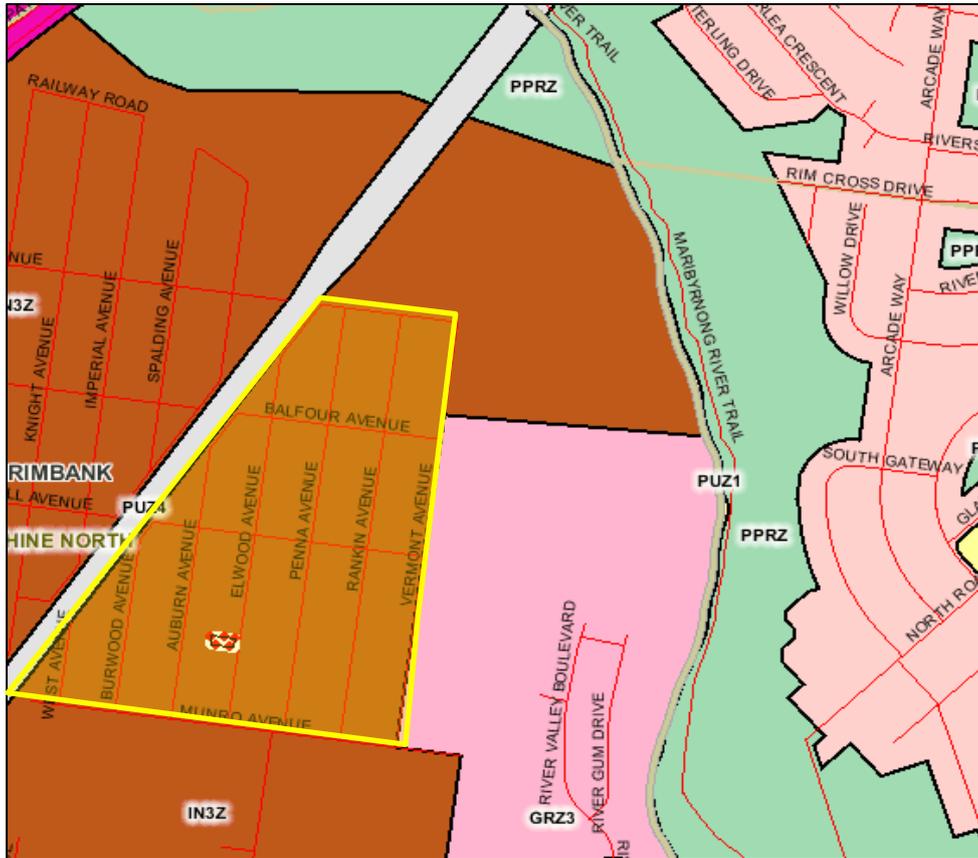


Figure 2: Broad study area



Appendix 2 Flora

Notes to tables:

EPBC Act: C - Critically Endangered EN - Endangered VU - Vulnerable PMST – Protected Matters Search Tool	DEPI 2014a: e - endangered v - vulnerable r - rare
FFG Act: L - listed as threatened under FFG Act P - protected under the FFG Act (public land only)	
Noxious weed status: SP - State prohibited species RP - Regionally prohibited species RC - Regionally controlled species RR - Regionally restricted species	# - Native species outside natural range

A2.1 Flora species (125 native, 103 weeds) recorded from the study area

Table A2.1. Flora species recorded from the study area.

Status	Scientific name	Common name	Other reports
Rare or threatened species:			
k	<i>Convolvulus angustissimus</i> subsp. <i>omnigracilis</i>	Slender Bindweed	
v	<i>Coronidium gunnianum</i>	Pale Swamp Everlasting	
e,f	<i>Cullen tenax</i>	Tough Scurf-pea	Biosis 2002
Ee,f	<i>Dianella amoena</i>	Matted Flax-lily	
v	<i>Dianella</i> sp. aff. <i>longifolia</i> (Benambra)	Arching Flax-lily	
r	<i>Geranium</i> sp. 3	Pale-flower Crane's-bill	
r	<i>Nicotiana suaveolens</i>	Austral Tobacco	
Ce,f	<i>Pimelea spinescens</i> subsp. <i>spinescens</i>	Spiny Rice-flower	
r#	<i>Rhagodia parabolica</i>	Fragrant Saltbush	
r	<i>Tripogon loliiformis</i>	Rye Beetle-grass	ABZECO 2011
Indigenous species:			
	<i>Acacia longifolia</i> var. <i>sophorae</i>	Coast Wattle	BL&A 2016
	<i>Acacia implexa</i>	Lightwood	

Status	Scientific name	Common name	Other reports
	<i>Acacia dealbata</i>	Silver Wattle	BL&A 2016
	<i>Acacia mearnsii</i>	Black Wattle	BL&A 2016
	<i>Acacia melanoxylon</i>	Blackwood	
	<i>Acacia paradoxa</i>	Hedge Wattle	
	<i>Acacia retinoides</i> s.l.	Wirilda	BL&A 2016
	<i>Acaena echinata</i>	Sheep's Burr	
	<i>Allocasuarina verticillata</i>	Drooping Sheoak	
	<i>Alternanthera denticulata</i> s.s.	Lesser Joyweed	
	<i>Amyema</i> spp.	Mistletoe	BL&A 2016
	<i>Anthosachne scabra</i> s.s.	Common Wheat-grass	
	<i>Arthropodium minus</i>	Small Vanilla-lily	
	<i>Asperula conferta</i>	Common Woodruff	
	<i>Atriplex semibaccata</i>	Berry Saltbush	
	<i>Austrostipa bigeniculata</i>	Kneed Spear-grass	
	<i>Austrostipa elegantissima</i>	Feather Spear-grass	
	<i>Austrostipa rudis</i>	Veined Spear-grass	BL&A 2016
	<i>Austrostipa scabra</i> subsp. <i>falcata</i>	Rough Spear-grass	
	<i>Bothriochloa macra</i>	Red-leg Grass	
	<i>Brachyscome basaltica</i> var. <i>gracilis</i>	Woodland Swamp-daisy	
	<i>Brachyscome dentata</i>	Lobe-seed Daisy	
	<i>Bursaria spinosa</i>	Sweet Bursaria	
	<i>Caesia calliantha</i>	Blue Grass-lily	
	<i>Callistemon sieberi</i>	River Bottlebrush	BL&A 2016
	<i>Calocephalus citreus</i>	Lemon Beauty-heads	
	<i>Calystegia sepium</i>	Large Bindweed	BL&A 2016
	<i>Carex bichenoviana</i>	Plains Sedge	BL&A 2016
	<i>Carex breviculmis</i>	Common Grass-sedge	
	<i>Carex inversa</i>	Knob Sedge	
	<i>Carex tereticaulis</i>	Poongort	BL&A 2016
	<i>Carpobrotus rossii</i>	Karkalla	
	<i>Cassinia arcuata</i>	Drooping Cassinia	
	<i>Cheilanthes austrotenuifolia</i>	Green Rock-fern	
	<i>Cheilanthes sieberi</i>	Narrow Rock-fern	BL&A 2016

Status	Scientific name	Common name	Other reports
	<i>Chloris truncata</i>	Windmill Grass	
	<i>Chrysocephalum</i> sp. 1	Plains Everlasting	
	<i>Clematis microphylla</i> s.s.	Small-leaved Clematis	
	<i>Convolvulus angustissimus</i> subsp. <i>angustissimus</i>	Blushing Bindweed	
	<i>Crassula decumbens</i> var. <i>decumbens</i>	Spreading Crassula	
	<i>Crassula sieberiana</i> s.s.	Sieber Crassula	
	<i>Cymbanotus preissianus</i>	Austral Bear's-ear	BL&A 2016
	<i>Desmodium gunnii</i>	Southern Tick-trefoil	
	<i>Dianella admixta</i>	Black-anther Flax-lily	
#	<i>Dichanthium sericeum</i> subsp. <i>sericeum</i>	Silky Blue-grass	
	<i>Dichelachne crinita</i>	Long-hair Plume-grass	
	<i>Dichondra repens</i>	Kidney-weed	
	<i>Duma florulenta</i>	Tangled Lignum	BL&A 2016
	<i>Drosera aberrans</i>	Scented Sundew	BL&A 2016
	<i>Einadia nutans</i>	Nodding Saltbush	
	<i>Eleocharis acuta</i>	Common Spike-sedge	
	<i>Enchylaena tomentosa</i> var. <i>tomentosa</i>	Ruby Saltbush	
	<i>Epilobium billardierianum</i>	Variable Willow-herb	
	<i>Eryngium ovinum</i>	Blue Devil	
	<i>Eucalyptus leucoxylon</i> subsp. <i>leucoxylon</i>	Yellow Gum	
#	<i>Euphorbia drummondii</i>	Flat Spurge	
	<i>Geranium retrorsum</i> s.s.	Grassland Crane's-bill	
	<i>Glycine tabacina</i>	Variable Glycine	
	<i>Goodenia pinnatifida</i>	Cut-leaf Goodenia	
	<i>Haloragis heterophylla</i>	Varied Raspwort	
	<i>Juncus australis</i>	Austral Rush	BL&A 2016
	<i>Hydrocotyle laxiflora</i>	Stinking Pennywort	BL&A 2016
	<i>Hypoxis glabella</i>	Tiny Star	BL&A 2016
	<i>Juncus pallidus</i>	Pale Rush	BL&A 2016
	<i>Juncus subsecundus</i>	Finger Rush	
	<i>Lachnagrostis filiformis</i>	Common Blown-grass	
	<i>Leptospermum lanigerum</i>	Wooly Tea-tree	BL&A 2016
	<i>Linum marginale</i>	Native Flax	

Status	Scientific name	Common name	Other reports
	<i>Lobelia pratoides</i>	Poison Lobelia	
	<i>Lomandra filiformis</i>	Wattle Mat-rush	
	<i>Lomandra micrantha</i>	Small-flower Mat-rush	
	<i>Lomandra nana</i>	Dwarf Mat-rush	BL&A 2016
	<i>Lythrum hyssopifolia</i>	Common loosestrife	BL&A 2016
	<i>Maireana decalvans</i>	Black Cotton-bush	
	<i>Maireana enchylaenoides</i>	Wingless Bluebush	
	<i>Melicytus dentatus</i>	Tree Violet	
	<i>Microlaena stipoides</i> var. <i>stipoides</i>	Weeping Grass	
	<i>Minuria leptophylla</i>	Minnie Daisy	
	<i>Muellerina eucalyptoides</i>	Creeping Mistletoe	
	<i>Oxalis perennans</i>	Grassland Wood-sorrel	
	<i>Panicum effusum</i>	Hairy Panic	
	<i>Phragmites australis</i>	Common Reed	BL&A 2016
	<i>Pimelea glauca</i>	Smooth Rice-flower	
	<i>Pimelea humilis</i>	Common Rice-flower	BL&A 2016
	<i>Plantago gaudichaudii</i>	Narrow Plantain	
	<i>Poa labillardierei</i>	Common Tussock-grass	
	<i>Poa morrisii</i>	Soft Tussock-grass	BL&A 2016
	<i>Poa sieberiana</i> var. <i>sieberiana</i>	Grey Tussock-grass	
	<i>Pycnosorus chrysanthes</i>	Golden Billy-buttons	BL&A 2016
	<i>Rubus parvifolius</i>	Small-leaf Bramble	
	<i>Rumex bidens</i>	Mud Dock	BL&A 2016
	<i>Rumex brownii</i>	Slender Dock	
	<i>Rumes dumosus</i>	Wiry Dock	BL&A 2016
	<i>Rytidosperma caespitosum</i>	Common Wallaby-grass	
	<i>Rytidosperma duttonianum</i>	Brown-back Wallaby-grass	
	<i>Rytidosperma fulvum</i>	Copper-awned Wallaby-grass	
	<i>Rytidosperma geniculatum</i>	Kneed Wallaby-grass	
	<i>Rytidosperma racemosum</i> var. <i>racemosum</i>	Slender Wallaby-grass	
	<i>Rytidosperma setaceum</i>	Bristly Wallaby-grass	
	<i>Rytidosperma</i> spp.	Wallaby Grass	
	<i>Salsola tragus</i>	Prickly Saltwort	

Status	Scientific name	Common name	Other reports
	<i>Schoenus apogon</i>	Common Bog-sedge	BL&A 2016
	<i>Schoenoplectus tabernaemontani</i>	River Club-sedge	BL&A 2016
	<i>Senecio quadridentatus</i>	Cotton Fireweed	
	<i>Senecio tenuiflorus</i> spp. agg.	Slender Fireweed	
	<i>Solenogyne dominii</i>	Smooth Solenogyne	BL&A 2016
	<i>Solanum laciniatum</i>	Large Kangaroo Apple	BL&A 2016
	<i>Themeda triandra</i>	Kangaroo Grass	
	<i>Tricoryne elatior</i>	Yellow Rush-lily	
	<i>Typha orientalis</i>	Broad-leaf Cumbungi	
	<i>Velleia paradoxa</i>	Spur Velleia	
	<i>Veronica gracilis</i>	Slender Speedwell	
	<i>Veronica plebia</i>	Trailing Speedwell	BL&A 2016
	<i>Wahlenbergia communis</i>	Tufted Bluebell	
	<i>Wahlenbergia luteola</i>	Bronze Bluebell	
	<i>Walwhalleya proluta</i>	Rigid Panic	

Introduced species:

	<i>Acacia baileyana</i>	Cootamundra Wattle	
	<i>Acacia saligna</i>	Golden Wreath Wattle	
	<i>Agapanthus praecox</i> subsp. <i>orientalis</i>	Agapanthus	
	<i>Agrostis capillaris</i>	Brown-top Bent	BL&A 2016
	<i>Aloe arborescens</i>	Tree Aloe	BL&A 2016
	<i>Amaranthus albus</i>	Stiff Tumbleweed	
	<i>Anthoxanthum odouratum</i>	Sweet Vernal Grass	BL&A 2016
	<i>Araujia sericifera</i>	White Bladder-flower	
	<i>Arctotheca calendula</i>	Cape weed	
	<i>Aster subulatus</i>	Aster-weed	
	<i>Avena barbata</i>	Bearded Oat	
	<i>Avena fatua</i>	Wild Oat	BL&A 2016
	<i>Berkheya rigida</i>	African Thistle	
	<i>Brassica fruticulosa</i>	Twiggy Turnip	
	<i>Briza maxima</i>	Large Quaking-grass	
	<i>Bromus alopecuroides</i>	Mediterranean Brome	BL&A 2016
	<i>Bromus catharticus</i>	Prairie Grass	

Status	Scientific name	Common name	Other reports
	<i>Bromus diandrus</i>	Great Brome	BL&A 2016
	<i>Bromus hordeaceus</i>	Soft Brome	BL&A 2016
	<i>Carduus tenuiflorus</i>	Winged Slender-thistle	BL&A 2016
	<i>Cenchrus clandestinus</i>	Kikuyu	
	<i>Centaureum erythraea</i>	Common Centaury	
	<i>Cerastium glomeratum</i> s.s.	Sticky Mouse-ear Chickweed	
	<i>Chenopodium murale</i>	Sowbane	
RC	<i>Chrysanthemoides monilifera</i>	Boneseed	
RC	<i>Cirsium vulgare</i>	Spear Thistle	
	<i>Conyza bonariensis</i>	Flaxleaf Fleabane	
	<i>Cortaderia selloana</i>	Pampas Grass	
	<i>Crateagus monogynus</i>	Hawthorn	BL&A 2016
RC	<i>Cynara cardunculus</i> subsp. <i>flavescens</i>	Artichoke Thistle	
	<i>Cynodon dactylon</i> var. <i>dactylon</i>	Couch	
	<i>Cyperus eragrostis</i>	Drain Flat-sedge	
	<i>Dactylis glomerata</i>	Cocksfoot	
RC	<i>Dittrichia graveolens</i>	Stinkwort	
RC	<i>Echium plantagineum</i>	Paterson's Curse	
	<i>Ehrharta erecta</i> var. <i>erecta</i>	Panic Veldt-grass	
	<i>Ehrharta longiflora</i>	Annual Veldt-grass	
	<i>Erodium botrys</i>	Big Heron's-bill	
	<i>Erodium moschatum</i>	Musky Heron's-bill	
	<i>Eucalyptus cladocalyx</i>	Sugar Gum	BL&A 2016
Rr	<i>Foeniculum vulgare</i>	Fennel	
	<i>Fraxinus angustifolia</i>	Desert Ash	
	<i>Fumaria muralis</i>	Wall Fumitory	BL&A 2016
	<i>Galenia pubescens</i> var. <i>pubescens</i>	Galenia	
	<i>Galium aparine</i>	Cleavers	
	<i>Galium murale</i>	Small Goosegrass	
RC	<i>Genista linifolia</i>	Flax-leaf Broom	
RC	<i>Genista monspessulana</i>	Montpellier Broom	
	<i>Helminthotheca echioides</i>	Ox-tongue	
	<i>Holcus lanatus</i>	Yorkshire Fog	BL&A 2016

Status	Scientific name	Common name	Other reports
	<i>Hordeum hystrix</i>	Barley-grass	BL&A 2016
	<i>Hordeum leporinum</i>	Barley-grass	
	<i>Hypochaeris glabra</i>	Smooth Cats-ear	BL&A 2016
	<i>Hypochaeris radicata</i>	Flatweed	
	<i>Juncus acutus</i>	Spiny Rush	BL&A 2016
	<i>Largus ovatus</i>	Hare's-tail Grass	BL&A 2016
	<i>Leontodon taraxacoides</i> subsp. <i>taraxacoides</i>	Hairy Hawkbit	
	<i>Lepidium africanum</i>	Common Peppercross	
	<i>Lolium rigidum</i>	Wimmera Rye-grass	
RC	<i>Lycium ferocissimum</i>	African Box-thorn	
	<i>Lysimachia arvensis</i>	Pimpernel	
	<i>Malva nicaeensis</i>	Mallow of Nice	
	<i>Marrubium vulgare</i>	Horehound	BL&A 2016
	<i>Modiola caroliniana</i>	Red-flower Mallow	
	<i>Nassella hyalina</i>	Cane Needle-grass	
RR	<i>Nassella neesiana</i>	Chilean Needle-grass	
RC	<i>Nassella trichotoma</i>	Serrated Tussock	
RC	<i>Opuntia</i> spp.	Prickly pear	
RR	<i>Oxalis pes-caprae</i>	Soursob	
	<i>Paspalum dilatatum</i>	Paspalum	
	<i>Paspalum distichum</i>	Water Couch	
	<i>Pittosporum undulatum</i>	Sweet Pittosporum	BL&A 2016
	<i>Petrorhagia nanteuillii</i>	Childling Pink	
	<i>Phalaris aquatica</i>	Toowoomba Canary-grass	
	<i>Plantago coronopus</i>	Buck's-horn Plantain	
	<i>Plantago lanceolata</i>	Ribwort	
	<i>Poa annua</i>	Annual Meadow-grass	
	<i>Polycarpon tetraphyllum</i>	Four-leaved Allseed	
	<i>Rapistrum rugosum</i>	Giant Mustard	
	<i>Romulea minutiflora</i>	Small-flower Onion Grass	BL&A 2016
	<i>Romulea rosea</i>	Onion Grass	
RC	<i>Rosa rubiginosa</i>	Sweet Briar	
RC	<i>Rubus fruticosus</i> spp. agg.	Blackberry	

Status	Scientific name	Common name	Other reports
	<i>Rumex crispus</i>	Curled Dock	
	<i>Rumex conglomeratus</i>	Clustered Dock	BL&A 2016
	<i>Salvia verbenaca</i>	Wild Sage	
	<i>Schinus molle</i>	Pepper Tree	
	<i>Sherardia arvensis</i>	Field Madder	
	<i>Solanum nigrum</i>	Black Nightshade	
	<i>Solanum pseudocapsicum</i>	Madeira Winter-cherry	BL&A 2016
	<i>Sonchus asper</i>	Rough Sow-thistle	BL&A 2016
	<i>Sonchus oleraceus</i>	Common Sow-thistle	
	<i>Sporobolus africanus</i>	Rat-tail Grass	
	<i>Stellaria media</i>	Chickweed	
	<i>Tradescantia fluminalis</i>	Wandering Jew	BL&A 2016
	<i>Trifolium angustifolium</i> var. <i>angustifolium</i>	Narrow-leaf Clover	
	<i>Trifolium</i> spp.	Clover	
RC	<i>Ulex europaeus</i>	Gorse	
	<i>Verbena bonariensis</i>	Purple-top	BL&A 2016
	<i>Vicia sativa</i> subsp. <i>sativa</i>	Common Vetch	
	<i>Vinca major</i>	Blue Periwinkle	
	<i>Vulpia</i> spp.	Fescue	BL&A 2016
RC	<i>Watsonia meriana</i> var. <i>bulbillifera</i>	Bulbil Watsonia	

A2.2 Listed flora species

Table A2.2. Listed flora species recorded / predicted to occur within 5 km of the study area.

The following table includes the listed flora species that have potential to occur within the study area. The list of species is sourced from the Victorian Flora Information System and the Protected Matters Search Tool (DoE; accessed on 28.06.2016).

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in study area	Rationale for likelihood ranking
		EPBC	VIC	FFG					
National significance									
<i>Amphibromus fluitans</i>	River Swamp Wallaby-grass	VU			-	PMST	Swampy areas, mainly along the Murray River between Wodonga and Echuca with scattered records from southern Victoria.	Negligible	No suitable habitat
<i>Dianella amoena</i>	Matted Flax-lily	EN	e	L	2001	PMST	Lowland grassland and grassy woodland, on well-drained to seasonally waterlogged fertile sandy loam soils to heavy cracking clays.	Recorded	One large mat recorded
<i>Diuris basaltica</i>	Small Golden Moths	EN	e	L	1962		Plains Grassland dominated by tussock-forming perennial grasses (including Kangaroo Grass); often with embedded surface basalt.	Medium	Past land-use may have resulted in local extinction
<i>Diuris fragrantissima</i>	Sunshine Diuris	EN	e	L	2006	PMST	Grassland dominated by <i>Themeda trianda</i> , on plains with heavy basalt soils and embedded boulders; only known naturally occurring population is in Sunshine.	Low	Past land-use likely to have resulted in local extinction
<i>Glycine latrobeana</i>	Clover Glycine	VU	v	L	-	PMST	Grasslands and grassy woodlands, particularly those dominated by Kangaroo Grass.	Low	Species likely to have been recorded by past surveys
<i>Leucochrysum albicans</i> var. <i>tricolor</i>	White Sunray	EN	e	L	-	PMST	Grasslands of the Victorian Volcanic Plains, primarily on acidic clay soils derived from basalt, with occasional occurrences on adjacent sedimentary, sandy-clay soils.	Low	Species likely to have been recorded by past surveys

<i>Pimelea spinescens</i> subsp. <i>spinescens</i>	Spiny Rice-flower	CR	e	L	2009	PMST	Primarily grasslands featuring a moderate diversity of other native species and inter-tussock spaces, although also recorded in grassland dominated by introduced perennial grasses.	Recorded	Large population present
<i>Prasophyllum frenchii</i>	Maroon Leek-orchid	EN	e	L	-	PMST	Grassland and grassy woodland environments on sandy or black clay loam soils that are generally damp but well drained.	Low	Species likely to have been recorded by past surveys
<i>Prasophyllum suaveolens</i>	Fragrant Leek-orchid	EN	e	L	1962		Open, species rich grasslands dominated by <i>Themeda triandra</i> on poorly draining red-brown soils in western Victoria.	Low	Species likely to have been recorded by past surveys
<i>Pterostylis cucullata</i>	Leafy Greenhood	VU	v	L	-	PMST	Coastal and inland subspecies have differing habitat characteristics.	Negligible	No suitable habitat
<i>Rutidosis leptorrhynchoides</i>	Button Wrinklewort	EN	e	L	-	PMST	Higher quality Plains Grassland and Grassy Woodland in Western Victoria, particularly those with fertile soil and light timber cover.	Low	Species likely to have been recorded by past surveys
<i>Senecio macrocarpus</i>	Large-headed Fireweed	VU	e	L	1900	PMST	Grassland, shrubland and woodland habitats on heavy soils subject to waterlogging and/or drought conditions in summer.	Low	Species likely to have been recorded by past surveys
<i>Thesium australe</i>	Austral Toad-flax	VU	v	L	1904		Most commonly in damp grassland and woodland, including subalpine grassy heathlands.	Low	Species likely to have been recorded by past surveys
State significance									
<i>Acacia howittii</i>	Sticky Wattle		r		1996		Moist forest. Natural occurrences are confined to South Gippsland and Central Highlands.	Low	Non-indigenous native
<i>Callitriche palustris</i> var. <i>palustris</i>	Swamp Water-starwort		k		1945		Shallow, still water and on mud.	Low	Species likely to have been recorded by past surveys

<i>Comesperma polygaloides</i>	Small Milkwort	v	L	2001		Grasslands on the western basalt plains; less commonly in grassy woodlands between Bendigo and the Wimmera.	Low	Species likely to have been recorded by past surveys
<i>Coronidium gunnianum</i>	Pale Swamp Everlasting	v		2009		Widespread and sometimes locally common, particularly in high-rainfall areas of Victoria; often in moist sites in open forests and woodlands.	Recorded	Recorded by Biosis 2016
<i>Cullen tenax</i>	Tough Scurf-pea	e	L	2010		Lowland grasslands, including pastures and occasionally in otherwise disturbed grassy areas.	Recorded	Recorded by Biosis Research 2002
<i>Desmodium varians</i>	Slender Tick-trefoil	k		2001		Broad range of vegetation types but generally associated with rocky outcrops and escarpments.	Recorded	Recorded by Biosis Research 2002
<i>Dianella</i> sp. aff. <i>longifolia</i> (Benambra)	Arching Flax-lily	v		2010		The habitat requirements of this species are poorly known.	Recorded	Small population present (this survey)
<i>Diuris palustris</i>	Swamp Diuris	v	L	1934		Grasslands and open woodlands, often in swampy depressions; confined to the west of the State.	Negligible	No suitable habitat
<i>Diuris X fastidiosa</i>	Proud Diuris	e		1926		Restricted to two sites on the basalt plains west of Melbourne, and one record near Tower Hill in western Victoria.	Low	Past land-use likely to have resulted in local extinction
<i>Eucalyptus leucoxylon</i> subsp. <i>megalocarpa</i>	Large-fruit Yellow-gum	e	L	1996		Coastal, near Nelson.	Low	Species recorded but not this subspecies.
<i>Geranium</i> sp. 3	Pale-flower Crane's-bill	r		2006		Grasslands and dry woodlands.	Recorded	Current survey
<i>Heterozostera tasmanica</i>	Tasman Grass-wrack	r		2007		Locally common in shallow waters to a depth of c. 8m in sandy soil	Negligible	No suitable habitat
<i>Lepidium pseudohyssopifolium</i>	Native Peppergrass	k		1945		Dry woodlands and open-forest; scattered occurrences in Plains Grassland west of Melbourne.	Low	Would have been observed by the many surveys conducted

<i>Melaleuca armillaris</i> subsp. <i>armillaris</i>	Giant Honey-myrtle		r		1987		Near coastal heath/scrub, rocky coast and foothill outcrops.	Low	Non-indigenous native
<i>Nicotiana suaveolens</i>	Austral Tobacco		r		1989		Areas of sandy or gravelly soil, typically associated with streams, gullies and other drainage lines; also grasslands and escarpment shrublands.	Recorded	Current survey
<i>Pterostylis pedoglossa</i>	Prawn Greenhood		v		1932		Heath and heathy woodland near the coast.	Negligible	No suitable habitat
<i>Pterostylis truncata</i>	Brittle Greenhood		e	L	1928		Grassland and grassy woodland habitats, largely to the west of Melbourne.	Low	Potential habitat present but site supports unfavourable land-use
<i>Rhagodia parabolica</i>	Fragrant Saltbush		r		2016		Escarpments within the volcanic plain	Recorded	Single individual observed. May be the result of dispersal from landscape plantings
<i>Rytidosperma setaceum</i> var. <i>brevisetum</i>	Short-bristle Wallaby-grass		r		1996		The habitat requirements of this species are poorly known.	Medium	Species recorded but not the subspecies
<i>Sclerolaena muricata</i> var. <i>muricata</i>	Black Roly-poly		k		1974		Grassland habitats in the plains to the north and west of Melbourne. In the north of the State records are from along the Murray River and associated lakes and floodplains.	Low	Perennial species which would have been observed by the many surveys conducted
<i>Thelymitra gregaria</i>	Basalt Sun-orchid		e	L	1929		Open, species-rich grassland dominated by <i>Themeda triandra</i> on poorly draining soils of the volcanic plains.	Medium	Potential habitat present. Cryptic species requiring specific survey time.
<i>Tripogon loliiformis</i>	Rye Beetle-grass		r		1992		Dry sites in association with escarpments and rocky outcrops.	Recorded	Small population noted by ABZECO

Appendix 3 Fauna

Notes to tables:

<p>EPBC Act:</p> <p>EX - Extinct CR - Critically Endangered EN - Endangered VU - Vulnerable CD - Conservation dependent</p>	<p>DSE 2013:</p> <p>ex - extinct cr - critically endangered en - endangered vu - vulnerable nt - near threatened dd - data deficient rx - regionally extinct</p>
<p>FFG Act:</p> <p>L - listed as threatened under FFG Act N - nominated for listing as threatened I - determined ineligible for listing</p>	
<p>PS - pest species listed under the CaLP Act</p>	<p>* - introduced species</p>
<p>Most recent database records are from the Victorian Biodiversity Atlas unless otherwise specified as follows</p> <p># – Protected Matters Search Tool</p> <p>BA – Birds Australia</p>	

Fauna species in these tables are listed in alphabetical order within their taxonomic group.

A3.1 Listed fauna species

The following table includes a list of the listed fauna species that have potential to occur within the study area. The list of species is sourced from the Victorian Biodiversity Atlas and the Protected Matters Search Tool (DoE; accessed on 28.06.2016).

Table A3.1. Listed fauna species recorded, or predicted to occur, within 5 km of the detailed study area.

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in study area	Rationale for likelihood ranking
		EPBC	VIC	FFG					
National significance									
<i>Pedionomus torquatus</i>	Plains-wanderer	CR	cr	L	1869	PMST	Native grassland with a sparse, open structure.	Low	Locally extinct
<i>Rostratula australis</i>	Australian Painted Snipe	EN	cr	L	-	PMST	Shallows of well-vegetated freshwater wetlands.	Negligible	No habitat present.
<i>Botaurus poiciloptilus</i>	Australasian Bittern	EN	en	L	-	PMST	Shallow freshwater and brackish wetlands with abundant emergent aquatic vegetation.	Negligible	No habitat present.
<i>Lathamus discolor</i>	Swift Parrot	EN	en	L	2000	PMST	A range of forests and woodlands, especially those supporting nectar-producing tree species. Also well-treed urban areas.	Low	Limited foraging resources
<i>Grantiella picta</i>	Painted Honeyeater	VU	vu	L	-	PMST	Dry open woodlands and forests. Typically forages for fruit and nectar in mistletoes and in tree canopies.	Negligible	No habitat present.
<i>Anthochaera phrygia</i>	Regent Honeyeater	CR	cr	L	-	PMST	A range of dry woodlands and forests dominated by nectar-producing tree species.	Negligible	No habitat present.
<i>Petauroides volans</i>	Greater Glider	VU	vu		-	PMST	Wet and damp sclerophyll forest with large hollow-bearing trees.	Negligible	No habitat present.
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	VU	vu	L	-	PMST	Rainforest, wet and dry sclerophyll forest, woodland and urban areas.	Negligible	No habitat present.

<i>Delma impar</i>	Striped Legless Lizard	VU	en	L	2011	PMST	Natural temperate grassland, grassy woodland and exotic grassland.	Recorded	Recent site records (EHP 2016b)
<i>Tympanocryptis pinguicollis</i>	Grassland Earless Dragon	EN	cr	L	-	PMST	Natural temperate grassland.	Negligible	Locally extinct
<i>Litoria raniformis</i>	Growling Grass Frog	VU	en	L	2009	PMST	Still or slow-flowing waterbodies and surrounding terrestrial vegetation.	Medium	Recorded from Maribyrnong River environs. May utilise quarry wetlands.
<i>Prototroctes maraena</i>	Australian Grayling	VU	vu	L	1982	PMST	Adults inhabit cool, clear, freshwater streams	Negligible	No habitat present.
<i>Galaxiella pusilla</i>	Dwarf Galaxias	VU	vu	L	-	PMST	Slow-flowing or still freshwater wetlands such as swamps, drains and backwaters of streams.	Negligible	No habitat present.
<i>Maccullochella macquariensis</i>	Bluenose Cod	EN	cr	L	1908		Streams characterised by a high abundance of large woody debris.	Negligible	No habitat present.
<i>Maccullochella peelii peelii</i>	Murray Cod	VU	en	L	-	PMST	A diverse range of stream habitats in the Murray-Darling basin; principally the main channels of rivers and their major tributaries.	Negligible	No habitat present.
<i>Macquaria australasica</i>	Macquarie Perch	EN	en	L	1970		Streams with clear water and deep, rocky holes with abundant cover.	Negligible	No habitat present.
<i>Synemon plana</i>	Golden Sun Moth	CR	cr	L	1906	PMST	Natural temperate grassland, grassy woodland and pasture supporting spear grasses and wallaby grasses and exotic grassland dominated by Chilean needle grass.	Recorded	Recent site records (EHP 2016b)
State significance									
<i>Lewinia pectoralis</i>	Lewin's Rail		vu	L	1989		Swamps, dense riparian vegetation and saltmarsh.	Negligible	No habitat present.
<i>Porzana pusilla</i>	Baillon's Crane		vu	L	2011		Well-vegetated permanent and temporary fresh and brackish wetlands.	Negligible	No habitat present.

<i>Hydroprogne caspia</i>	Caspian Tern		nt	L	1988		Estuaries, inlets, bays, lagoons, inland lakes, flooded pasture, sewage ponds,	Low	Preferred habitat not present.
<i>Egretta garzetta</i>	Little Egret		en	L	2001		Swamps, billabongs, floodplain pools, mudflats, mangroves and channels; breeds in trees standing in water.	Medium	May utilise the Maribyrnong River and quarry wetlands
<i>Ardea intermedia</i>	Intermediate Egret		cr	L	1982		Densely-vegetated freshwater wetlands including lakes, swamps and billabongs. Breeds in trees standing in water.	Medium	May utilise the Maribyrnong River and quarry wetlands
<i>Ardea modesta</i>	Eastern Great Egret		vu	L	2014		Flooded crops, pasture, swamps, lagoons, saltmarsh, sewage ponds, estuaries, dams, roadside ditches.	Medium	May utilise the Maribyrnong River and quarry wetlands
<i>Ixobrychus minutus dubius</i>	Little Bittern		en	L	1986		Freshwater swamps, lakes and rivers with dense reed-beds, saltmarsh and coastal lagoons.	Negligible	No habitat present.
<i>Aythya australis</i>	Hardhead		vu		2015		A mainly aquatic species preferring large, deep freshwater environments with abundant aquatic vegetation, including slow moving areas of rivers.	Medium	May utilise large quarry wetlands
<i>Biziura lobata</i>	Musk Duck		vu		2007		A largely aquatic species preferring deep water on large, permanent swamps, lakes and estuaries with abundant aquatic vegetation.	Medium	May utilise large quarry wetlands
<i>Accipiter novaehollandiae</i>	Grey Goshawk		vu	L	2000		Rainforest, gallery forest, tall wet forest and woodland. Also partially cleared agricultural land.	Low	May fly over or utilise habitat along Maribyrnong River
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle		vu	L	2009		Coastal areas such as beaches and estuaries, inland wetlands and major inland streams.	Low	May fly over study area
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheathtail Bat			L	2000		A variety of habitats, ranging from wet forests to desert.	High	May utilise the airspace above the study area

<i>Pseudophryne bibronii</i>	Brown Toadlet		en	L	1989		A wide variety of woodland, forest and grassland habitats.	Low	Suitable habitat present but a series of surveys have not detected this species
<i>Neochanna cleaveri</i>	Australian Mudfish		cr	L	2008		Freshwater habitats with abundant aquatic vegetation such as streams, backwaters, billabongs and floodplain wetlands.	Negligible	No habitat present.
<i>Tandanus tandanus</i>	Freshwater Catfish		en	L	1997		Rivers, creeks and billabongs of the Murray-Darling river system.	Negligible	No habitat present.
<i>Paralucia pyrodiscus lucida</i>	Eltham Copper		en	L	1920		Drier sclerophyll forests and woodlands supporting Sweet Bursaria, especially along ridgelines.	Low	Small areas of potential habitat present.

A3.2 Migratory species (EPBC Act listed)

Table A3.2. Migratory fauna species recorded or predicted to occur within 5 km of the study area.

Scientific name	Common name	Most recent record
<i>Lewinia pectoralis</i>	Lewin's Rail	1989
<i>Hydroprogne caspia</i>	Caspian Tern	1988
<i>Actitis hypoleucos</i>	Common Sandpiper	1980
<i>Tringa nebularia</i>	Common Greenshank	-
<i>Gallinago hardwickii</i>	Latham's Snipe	2012
<i>Plegadis falcinellus</i>	Glossy Ibis	2011
<i>Ardea modesta</i>	Eastern Great Egret	2014
<i>Pandion cristatus</i>	Eastern Osprey	-
<i>Merops ornatus</i>	Rainbow Bee-eater	1988
<i>Hirundapus caudacutus</i>	White-throated Needletail	1996
<i>Apus pacificus</i>	Fork-tailed Swift	-
<i>Rhipidura rufifrons</i>	Rufous Fantail	2005
<i>Myiagra cyanoleuca</i>	Satin Flycatcher	-
<i>Monarcha melanopsis</i>	Black-faced Monarch	-
<i>Acrocephalus stentoreus</i>	Clamorous Reed Warbler	2007
<i>Motacilla flava</i>	Yellow Wagtail	-
<i>Sterna hirundo</i>	Common Tern	2006
<i>Ardea ibis</i>	Cattle Egret	2014

Appendix 4 Photos of the study area



Plate 1: Overlooking HZ3 south into HZ2 in the south western corner of the study area.



Plate 2: Ground cover of HZ3 showing predominance of Spear-grass and Wallaby-grass.



Plate 3: Herbaceous species such as Narrow Plantain and Common Woodruff are locally abundant.



Plate 4: Scattered Yellow Gum grow on the margins of the eastern quarry.



Plate 5: Broader areas of grassland support scattered infestations of African Boxthorn and Artichoke Thistle and clusters of threatened Spiny Rice-flower (marked by wooden stakes).



Plate 6: The site supports a large population of Spiny Rice-flower.



Plate 7: The slopes leading down to the Maribyrnong River support areas dominated by rocky platforms.



Plate 8: Large areas of the slopes leading down to the Maribyrnong River are dominated by African Boxthorn.



Plate 9: The floodplain of the Maribyrnong River supports little indigenous ground cover flora.



Plate 10: The rock slopes leading down to the river support grassland, shrubland and scattered trees (HZ 14).



Plate 11: Recently burnt grassland in the north of the study area (HZ 11) supports numerous patches of Black-anther Flax-lily.



Plate 12: Areas of escarpment shrubland are variously dominated by wattles, Sweet Bursaria and Tree Violet (HZ 15).



Plate 13: The broader assessment area supports three exhausted quarry holes two of which support permanent water.



Plate 14: The Maribyrnong River is lined with River Red-gums with a largely introduced understorey.

Appendix 5 Vegetation assessment results

A5.1: The habitat scores and the number of Spiny Rice-flower for each habitat zone (Figure 2) and areas within the proposed development zone likely to be cleared.

Habitat Zone ID		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20		
EVC: Name / #		PG 132- 61	ES 895	ES 895	ES 895	56	PG 132- 61	ES 895															
Max Score		Score	Score	Score	Score	Score	Score	Score	Total														
Site Condition	Large Old Trees	10	NA	NA	NA	NA	5	NA	NA														
	Canopy Cover	5	NA	NA	NA	NA	5	NA	4														
	Lack of Weeds	15	0	4	4	0	4	7	0	4	7	4	7	4	7	4	4	4	4	0	4	0	
	Understorey	25	15	15	10	10	15	15	15	15	15	15	15	15	15	15	15	5	5	15	5	5	
	Recruitment	10	6	6	10	3	6	10	5	5	10	10	10	5	6	6	6	5	5	6	3	5	
	Organic Matter	5	3	3	5	5	5	5	3	3	3	5	5	3	3	3	3	5	5	3	5	3	
	Logs	5	NA	NA	NA	NA	NA	4	NA	NA													
	Total Site Score		24	28	29	18	30	37	23	27	35	34	37	27	31	28	28	19	19	38	17	17	
Standardised Score		32.73	38.18	39.55	24.55	40.91	50.45	31.36	36.82	47.73	46.36	50.45	36.82	42.27	38.18	38.18	25.91	25.91	38	23.18	21.25		
Landscape Value	Patch Size	10	2	2	2	1	1	2	4	4	4	4	4	1	2	2	2	1	1	8	1	1	
	Neighbourhood	10	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	0	0	2	0	0	
	Distance to Core	5	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
	Total Landscape Score		5	5	5	4	4	5	8	8	8	8	8	5	6	6	6	4	4	13	4	4	
HABITAT SCORE	100	37.73	43.18	44.55	28.55	44.91	55.45	39.36	44.82	55.73	54.36	58.45	41.82	48.27	44.18	44.18	29.91	29.91	51	27	25		
Habitat points = #/100	1	0.38	0.43	0.45	0.29	0.45	0.55	0.39	0.45	0.56	0.54	0.58	0.42	0.48	0.44	0.44	0.30	0.30	0.51	0.27	0.25		
Habitat Zone area (ha)		0.326	0.418	1.680	0.946	0.956	2.612	0.796	3.509	1.396	1.135	2.890	1.694	0.983	3.819	1.526	0.073	0.336	5.612	1.194	0.050	31.951	
Habitat Hectares (Hha)		0.123	0.181	0.748	0.270	0.429	1.448	0.313	1.573	0.778	0.617	1.689	0.708	0.475	1.687	0.674	0.022	0.100	2.862	0.322	0.013	15.032	
HZ (ha) Development Zone		0.326	0.418	1.680	0.946	0.956	2.612	0.509	0	0	0	0	0	0	0	0	0	0	0	1.194	0.050	8.691	
Development Zone (Hha)		0.123	0.181	0.748	0.270	0.429	1.448	0.200	0	0	0	0	0	0	0	0	0	0	0	0.322	0.013	3.734	
Number of Spiny Rice Flower		4	0	35	12	5	20	30/4*	73	44	84	48	30	12	0	0	0	0	0	0	0	371	

Notes to table: NA = Not Applicable, PG = Plains Grassland, ES = Escarpment Shrubland

* Spiny Rice-flower in / out of the identified development zone. 32 Spiny Rice-flower occur in the development zone but are not in a Habitat Zone while 3 are out of the development zone but not in a Habitat Zone. The total number of Spiny Rice-flower plants is therefore 436.

Appendix 6 Potential offset requirements

6.1: BIOR report (Ensym scenario test)

Testing Clearing proposal

This report provides offset requirements for proposed clearing. It **DOES NOT represent a Biodiversity Impact and Offset Requirements report** required to support applications for permits to remove native vegetation under clause 52.16 or 52.17 of planning schemes in Victoria. It can be used for internal testing of different clearing proposals. Final clearing shapefiles must be submitted to DELWP for processing.

Date of issue: 02/11/2016
Time of issue: 9:56 am

Ref: Scenario Testing

Project ID	P22444_Veg_Clearing
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Summary of marked native vegetation

Risk-based pathway	Moderate
Total extent	8.687 ha
Remnant patches	8.687 ha
Scattered trees	0 trees
Location risk	A

Strategic biodiversity score of all marked native vegetation	0.198
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Offset requirements

If the marked vegetation was cleared the following offsets would be applicable.

Offset type	General offset
General offset amount (general biodiversity equivalence units)	1.006 general units
General offset attributes	
Vicinity	Port Phillip and Westernport Catchment Management Authority (CMA) or Brimbank City Council
Minimum strategic biodiversity score	0.158 ¹

NB: values presented in tables throughout this document may not add to totals due to rounding.

¹ Minimum strategic biodiversity score is 80 per cent of the weighted average score across habitat zones where a general offset is required

Testing Clearing proposal

Next steps

Any proposal to remove native vegetation must meet the application requirements of the moderate risk-based pathway and it will be assessed under the moderate risk-based pathway.

If you wish to remove the marked native vegetation you must submit the related shapefiles to the Department of Environment, Land, Water and Planning (DELWP) for processing, by email to nativevegetation.support@delwp.vic.gov.au. DELWP will provide a Biodiversity impact and offset requirements report that is required to meet the permit application requirements.

Biodiversity impact of removal of native vegetation

Habitat hectares

Habitat hectares are calculated for each habitat zone within your proposal using the extent and condition scores in the GIS data you provided.

Habitat zone	Site assessed condition score	Extent (ha)	Habitat hectares
1-4-1	0.290	0.016	0.005
2-4-2	0.290	0.036	0.011
3-4-3	0.290	0.007	0.002
4-4-4	0.290	0.002	0.001
5-4-5	0.290	0.007	0.002
6-2-1	0.430	0.199	0.085
7-5-1	0.450	0.045	0.020
8-2-2	0.430	0.220	0.094
9-5-2	0.450	0.054	0.024
10-4-6	0.290	0.017	0.005
11-4-7	0.290	0.038	0.011
12-5-3	0.450	0.007	0.003
13-5-4	0.450	0.032	0.015
14-5-5	0.450	0.022	0.010
15-4-8	0.290	0.214	0.062
16-4-9	0.290	0.122	0.035
17-3-3	0.450	0.004	0.002
18-3-4	0.450	0.005	0.002
19-3-5	0.450	0.019	0.009
20-3-6	0.450	0.007	0.003
21-3-7	0.450	0.022	0.010
22-3-8	0.450	0.003	0.001
23-1-2	0.380	0.033	0.013
24-3-9	0.450	0.005	0.002

Testing Clearing proposal

Habitat zone	Site assessed condition score	Extent (ha)	Habitat hectares
25-3-10	0.450	0.008	0.003
26-3-11	0.450	0.010	0.004
27-3-12	0.450	0.006	0.003
28-3-13	0.450	0.030	0.014
29-1-3	0.380	0.066	0.025
30-4-10	0.290	0.018	0.005
31-4-11	0.290	0.011	0.003
32-5-6	0.450	0.038	0.017
33-4-12	0.290	0.025	0.007
34-5-7	0.450	0.201	0.091
35-5-8	0.450	0.018	0.008
36-4-13	0.290	0.005	0.002
37-4-14	0.290	0.174	0.050
38-5-9	0.450	0.005	0.002
39-1-4	0.380	0.062	0.023
40-5-10	0.450	0.009	0.004
41-3-14	0.450	0.027	0.012
42-3-15	0.450	0.060	0.027
43-4-15	0.290	0.254	0.074
44-1-1	0.380	0.165	0.063
45-3-16	0.450	0.632	0.284
46-3-2	0.450	0.795	0.358
47-7-2	0.390	0.509	0.198
48-6-1	0.550	0.872	0.480
49-6-2	0.550	1.739	0.957
50-3-1	0.450	0.045	0.020
51-5-11	0.450	0.526	0.237
52-20-1	0.250	0.050	0.012
53-19-1	0.270	0.046	0.012
54-19-2	0.270	0.055	0.015
55-19-3	0.270	0.057	0.015
56-19-4	0.270	0.005	0.001
57-19-5	0.270	0.130	0.035

Testing Clearing proposal

Habitat zone	Site assessed condition score	Extent (ha)	Habitat hectares
58-19-6	0.270	0.211	0.057
59-19-7	0.270	0.017	0.005
60-19-8	0.270	0.018	0.005
61-19-9	0.270	0.051	0.014
62-19-10	0.270	0.131	0.035
63-19-11	0.270	0.065	0.018
64-19-12	0.270	0.105	0.028
65-19-13	0.270	0.021	0.006
66-19-14	0.270	0.046	0.013
67-19-15	0.270	0.017	0.004
68-19-16	0.270	0.026	0.007
69-19-17	0.270	0.001	0.000
70-19-18	0.270	0.001	0.000
71-19-19	0.270	0.008	0.002
72-19-20	0.270	0.003	0.001
73-19-21	0.270	0.013	0.004
74-19-22	0.270	0.003	0.001
75-19-23	0.270	0.026	0.007
76-19-24	0.270	0.015	0.004
77-19-25	0.270	0.032	0.009
78-19-26	0.270	0.020	0.005
79-19-27	0.270	0.018	0.005
80-19-28	0.270	0.052	0.014
TOTAL			3.732

Impacts on rare or threatened species habitat above specific offset threshold

The specific-general offset test was applied to your proposal. The test determines if the proposed removal of native vegetation has a proportional impact on any rare or threatened species habitats above the specific offset threshold. The threshold is set at 0.005 per cent of the total habitat for a species. When the proportional impact is above the specific offset threshold a specific offset for that species' habitat is required.

The specific-general offset test found your proposal does not have a proportional impact on any rare or threatened species' habitats above the specific offset threshold. No specific offsets are required. A general offset is required as set out below.

Clearing site biodiversity equivalence score(s)

The general biodiversity equivalence score for the habitat zone(s) is calculated by multiplying the habitat hectares by the strategic biodiversity score.

Testing Clearing proposal

Habitat zone	Habitat hectares	Proportion of habitat zone with general offset	Strategic biodiversity score	General biodiversity equivalence score (GBES)
1-4-1	0.005	100.000 %	0.100	0.000
2-4-2	0.011	100.000 %	0.100	0.001
3-4-3	0.002	100.000 %	0.626	0.001
4-4-4	0.001	100.000 %	0.626	0.000
5-4-5	0.002	100.000 %	0.626	0.001
6-2-1	0.085	100.000 %	0.259	0.022
7-5-1	0.020	100.000 %	0.100	0.002
8-2-2	0.094	100.000 %	0.555	0.052
9-5-2	0.024	100.000 %	0.100	0.002
10-4-6	0.005	100.000 %	0.100	0.001
11-4-7	0.011	100.000 %	0.100	0.001
12-5-3	0.003	100.000 %	0.100	0.000
13-5-4	0.015	100.000 %	0.100	0.001
14-5-5	0.010	100.000 %	0.100	0.001
15-4-8	0.062	100.000 %	0.302	0.019
16-4-9	0.035	100.000 %	0.100	0.004
17-3-3	0.002	100.000 %	0.100	0.000
18-3-4	0.002	100.000 %	0.100	0.000
19-3-5	0.009	100.000 %	0.100	0.001
20-3-6	0.003	100.000 %	0.145	0.000
21-3-7	0.010	100.000 %	0.100	0.001
22-3-8	0.001	100.000 %	0.605	0.001
23-1-2	0.013	100.000 %	0.625	0.008
24-3-9	0.002	100.000 %	0.100	0.000
25-3-10	0.003	100.000 %	0.100	0.000
26-3-11	0.004	100.000 %	0.100	0.000
27-3-12	0.003	100.000 %	0.100	0.000
28-3-13	0.014	100.000 %	0.100	0.001
29-1-3	0.025	100.000 %	0.612	0.015
30-4-10	0.005	100.000 %	0.100	0.001
31-4-11	0.003	100.000 %	0.100	0.000
32-5-6	0.017	100.000 %	0.100	0.002
33-4-12	0.007	100.000 %	0.100	0.001

Testing Clearing proposal

Habitat zone	Habitat hectares	Proportion of habitat zone with general offset	Strategic biodiversity score	General biodiversity equivalence score (GBES)
34-5-7	0.091	100.000 %	0.100	0.009
35-5-8	0.008	100.000 %	0.100	0.001
36-4-13	0.002	100.000 %	0.561	0.001
37-4-14	0.050	100.000 %	0.608	0.031
38-5-9	0.002	100.000 %	0.100	0.000
39-1-4	0.023	100.000 %	0.267	0.006
40-5-10	0.004	100.000 %	0.100	0.000
41-3-14	0.012	100.000 %	0.100	0.001
42-3-15	0.027	100.000 %	0.100	0.003
43-4-15	0.074	100.000 %	0.486	0.036
44-1-1	0.063	100.000 %	0.297	0.019
45-3-16	0.284	100.000 %	0.100	0.028
46-3-2	0.358	100.000 %	0.154	0.055
47-7-2	0.198	100.000 %	0.100	0.020
48-6-1	0.480	100.000 %	0.100	0.048
49-6-2	0.957	100.000 %	0.131	0.125
50-3-1	0.020	100.000 %	0.291	0.006
51-5-11	0.237	100.000 %	0.178	0.042
52-20-1	0.012	100.000 %	0.298	0.004
53-19-1	0.012	100.000 %	0.369	0.005
54-19-2	0.015	100.000 %	0.377	0.006
55-19-3	0.015	100.000 %	0.318	0.005
56-19-4	0.001	100.000 %	0.311	0.000
57-19-5	0.035	100.000 %	0.321	0.011
58-19-6	0.057	100.000 %	0.233	0.013
59-19-7	0.005	100.000 %	0.210	0.001
60-19-8	0.005	100.000 %	0.224	0.001
61-19-9	0.014	100.000 %	0.218	0.003
62-19-10	0.035	100.000 %	0.292	0.010
63-19-11	0.018	100.000 %	0.358	0.006
64-19-12	0.028	100.000 %	0.341	0.010
65-19-13	0.006	100.000 %	0.292	0.002
66-19-14	0.013	100.000 %	0.308	0.004

Testing Clearing proposal

Habitat zone	Habitat hectares	Proportion of habitat zone with general offset	Strategic biodiversity score	General biodiversity equivalence score (GBES)
67-19-15	0.004	100.000 %	0.100	0.000
68-19-16	0.007	100.000 %	0.100	0.001
69-19-17	0.000	100.000 %	0.210	0.000
70-19-18	0.000	100.000 %	0.210	0.000
71-19-19	0.002	100.000 %	0.222	0.000
72-19-20	0.001	100.000 %	0.222	0.000
73-19-21	0.004	100.000 %	0.360	0.001
74-19-22	0.001	100.000 %	0.360	0.000
75-19-23	0.007	100.000 %	0.222	0.002
76-19-24	0.004	100.000 %	0.297	0.001
77-19-25	0.009	100.000 %	0.297	0.003
78-19-26	0.005	100.000 %	0.354	0.002
79-19-27	0.005	100.000 %	0.360	0.002
80-19-28	0.014	100.000 %	0.271	0.004

Mapped rare or threatened species' habitats on site

This table sets out the list of rare or threatened species' habitats mapped at the site beyond those species for which the impact is above the specific offset threshold. These species habitats do not require a specific offset according to the specific-general offset test.

Species number	Species common name	Species scientific name
10050	Baillon's Crake	<i>Porzana pusilla palustris</i>
10195	Australian Little Bittern	<i>Ixobrychus minutus dubius</i>
10215	Hardhead	<i>Aythya australis</i>
10220	Grey Goshawk	<i>Accipiter novaehollandiae novaehollandiae</i>
10230	Square-tailed Kite	<i>Lophoictinia isura</i>
10238	Black Falcon	<i>Falco subniger</i>
10246	Barking Owl	<i>Ninox connivens connivens</i>
10498	Chestnut-rumped Heathwren	<i>Calamanthus pyrrhopygius</i>
10504	Speckled Warbler	<i>Chthonicola sagittatus</i>
10598	Painted Honeyeater	<i>Grantiella picta</i>
10603	Regent Honeyeater	<i>Anthochaera phrygia</i>
12159	Striped Legless Lizard	<i>Delma impar</i>

Testing Clearing proposal

Species number	Species common name	Species scientific name
12283	Lace Monitor	Varanus varius
13117	Brown Toadlet	Pseudophryne bibronii
13207	Growing Grass Frog	Litoria raniformis
15021	Golden Sun Moth	Synemon plana
501456	Clover Glycine	Glycine latrobeana
502746	Snowy Mint-bush	Prostanthera nivea var. nivea
503455	Rye Beetle-grass	Tripogon loliiformis
504655	Pale Swamp Everlasting	Coronidium scorpioides 'aff. rutidolepis (Lowland Swamps)' variant
505337	Austral Crane's-bill	Geranium solanderi var. solanderi s.s.

Offset requirements

If a permit is granted to remove the marked native vegetation the permit condition will include the requirement to obtain a native vegetation offset.

To calculate the required offset amount required the biodiversity equivalence scores are aggregated to the proposal level and multiplied by the relevant risk multiplier.

Offsets also have required attributes:

- General offsets must be located in the same Catchment Management Authority (CMA) boundary or Local Municipal District (local council) as the clearing and must have a minimum strategic biodiversity score of 80 per cent of the clearing.²

The offset requirements for your proposal are as follows:

Offset type	Clearing site biodiversity equivalence score	Risk multiplier	Offset requirements	
			Offset amount (biodiversity equivalence units)	Offset attributes
General	0.670 GBES	1.5	1.006 general units	Offset must be within Port Phillip And Westernport CMA or Brimbank City Council Offset must have a minimum strategic biodiversity score of 0.158

² Strategic biodiversity score is a weighted average across habitat zones where a general offset is required

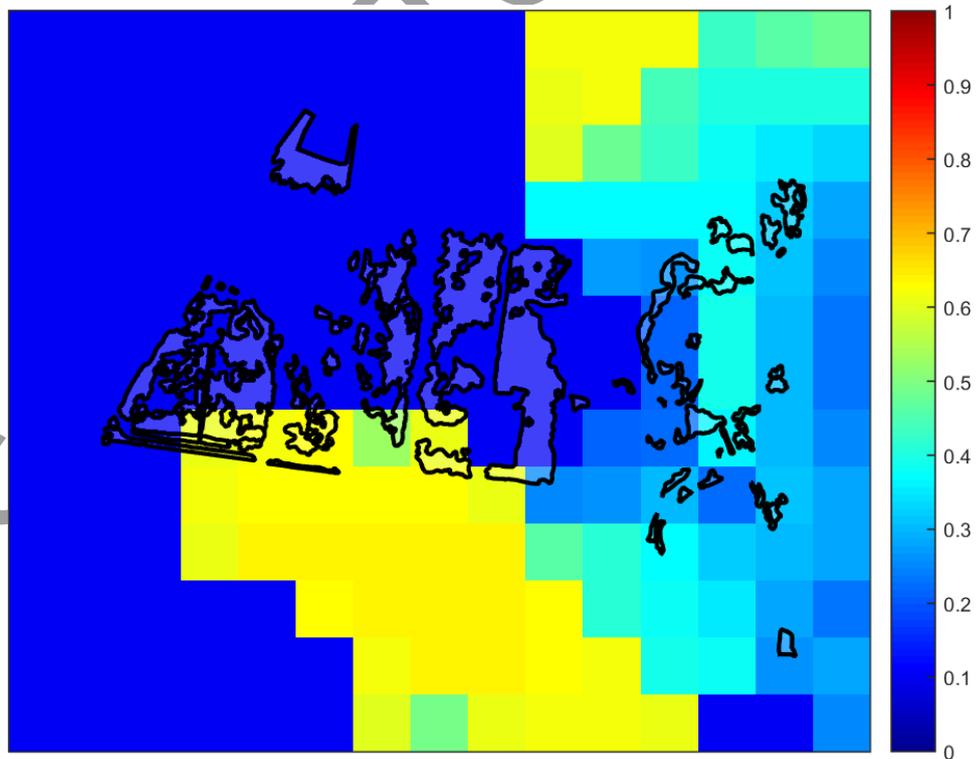
Testing Clearing proposal

Images of marked native vegetation

1. Native vegetation location risk map



2. Strategic biodiversity score map



Testing Clearing proposal

Glossary

Condition score This is the site-assessed condition score for the native vegetation. Each habitat zone in the clearing proposal is assigned a condition score according to the habitat hectare assessment method. This information has been provided by or on behalf of the applicant in the GIS file.

Dispersed habitat A dispersed species habitat is a habitat for a rare or threatened species whose habitat is spread over a relatively broad geographic area greater than 2,000 hectares.

General biodiversity equivalence score The general biodiversity equivalence score quantifies the relative overall contribution that the native vegetation to be removed makes to Victoria's biodiversity. The general biodiversity equivalence score is calculated as follows:

$$\begin{aligned} \text{General biodiversity equivalence score} \\ = \text{habitat hectares} \times \text{strategic biodiversity score} \end{aligned}$$

General offset amount This is calculated by multiplying the general biodiversity equivalence score of the native vegetation to be removed by the risk factor for general offsets. This number is expressed in general biodiversity equivalence units and is the amount of offset that is required to be provided should the application be approved. This offset requirement will be a condition to the permit for the removal of native vegetation.

$$\begin{aligned} \text{Risk adjusted general biodiversity equivalence score} \\ = \text{general biodiversity equivalence score clearing} \times 1.5 \end{aligned}$$

General offset attributes General offset must be located in the same Catchment Management Authority boundary or Municipal District (local council) as the clearing site. They must also have a strategic biodiversity score that is at least 80 per cent of the score of the clearing site.

Habitat hectares Habitat hectares is a site-based measure that combines extent and condition of native vegetation. The habitat hectares of native vegetation is equal to the current condition of the vegetation (condition score) multiplied by the extent of native vegetation. Habitat hectares can be calculated for a remnant patch or for scattered trees or a combination of these two vegetation types. This value is calculated for each habitat zone using the following formula:

$$\text{Habitat hectares} = \text{total extent (hectares)} \times \text{condition score}$$

Habitat importance score The habitat importance score is a measure of the importance of the habitat located on a site for a particular rare or threatened species. The habitat importance score for a species is a weighted average value calculated from the habitat importance map for that species. The habitat importance score is calculated for each habitat zone where the habitat importance map indicates that species habitat occurs.

Testing Clearing proposal

Habitat zone

Habitat zone is a discrete contiguous area of native vegetation that:

- is of a single Ecological Vegetation Class
- has the same measured condition.

Highly localised habitat

A highly localised habitat is habitat for a rare or threatened species that is spread across a very restricted area (less than 2,000 hectares). This can also be applied to a similarly limited sub-habitat that is disproportionately important for a wide-ranging rare or threatened species. Highly localised habitats have the highest habitat importance score (1) for all locations where they are present.

Minimum strategic biodiversity score

The minimum strategic biodiversity score is an attribute for a general offset.

The strategic biodiversity score of the offset site must be at least 80 per cent of the strategic biodiversity score of the native vegetation to be removed. This is to ensure offsets are located in areas with a strategic value that is comparable to, or better than, the native vegetation to be removed. Where a specific and general offset is required, the minimum strategic biodiversity score relates only to the habitat zones that require the general offset.

Offset risk factor

There is a risk that the gain from undertaking the offset will not adequately compensate for the loss from the removal of native vegetation. If this were to occur, despite obtaining an offset, the overall impact from removing native vegetation would result in a loss in the contribution that native vegetation makes to Victoria's biodiversity.

To address the risk of offsets failing, an offset risk factor is applied to the calculated loss to biodiversity value from removing native vegetation.

Risk factor for general offsets = 1.5

Risk factor for specific offset = 2

Offset type

The specific-general offset test determines the offset type required.

When the specific-general offset test determines that the native vegetation removal will have an impact on one or more rare or threatened species habitat above the set threshold of 0.005 per cent, a specific offset is required. This test is done at the permit application level.

A general offset is required when a proposal to remove native vegetation is not deemed, by application of the specific-general offset test, to have an impact on any habitat for any rare or threatened species above the set threshold of 0.005 per cent. All habitat zones that do not require a specific offset will require a general offset.

Proportional impact on species

This is the outcome of the specific-general offset test. The specific-general offset test is calculated across the entire proposal for each species on the native vegetation permitted clearing species list. If the proportional impact on a species is above the set threshold of 0.005 per cent then a specific offset is required for that species.

Testing Clearing proposal

Specific offset amount The specific offset amount is calculated by multiplying the specific biodiversity equivalence score of the native vegetation to be removed by the risk factor for specific offsets. This number is expressed in specific biodiversity equivalence units and is the amount of offset that is required to be provided should the application be approved. This offset requirement will be a condition to the permit for the removal of native vegetation.

$$\begin{aligned} & \text{Risk adjusted specific biodiversity equivalence score} \\ & = \text{specific biodiversity equivalence score clearing} \times 2 \end{aligned}$$

Specific offset attributes Specific offsets must be located in the modelled habitat for the species that has triggered the specific offset requirement.

Specific biodiversity equivalence score The specific biodiversity equivalence score quantifies the relative overall contribution that the native vegetation to be removed makes to the habitat of the relevant rare or threatened species. It is calculated for each habitat zone where one or more species habitats require a specific offset as a result of the specific-general offset test as follows:

$$\begin{aligned} & \text{Specific biodiversity equivalence score} \\ & = \text{habitat hectares} \times \text{habitat importance score} \end{aligned}$$

Strategic biodiversity score This is the weighted average strategic biodiversity score of the marked native vegetation. The strategic biodiversity score has been calculated from the *Strategic biodiversity map* for each habitat zone.

The strategic biodiversity score of native vegetation is a measure of the native vegetation's importance for Victoria's biodiversity, relative to other locations across the landscape. The *Strategic biodiversity map* is a modelled layer that prioritises locations on the basis of rarity and level of depletion of the types of vegetation, species habitats, and condition and connectivity of native vegetation.

Total extent (hectares) for calculating habitat hectares This is the total area of the marked native vegetation in hectares.

The total extent of native vegetation is an input to calculating the habitat hectares of a site and in calculating the general biodiversity equivalence score. Where the marked native vegetation includes scattered trees, each tree is converted to hectares using a standard area calculation of 0.071 hectares per tree. This information has been provided by or on behalf of the applicant in the GIS file.

Vicinity The vicinity is an attribute for a general offset.

The offset site must be located within the same Catchment Management Authority boundary or Local Municipal District as the native vegetation to be removed.

6.2: EPBC Act offset calculator output for MNES

Offsets Assessment Guide

For use in determining offsets under the Environment Protection and Biodiversity Conservation Act 1999
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Golden Sun Moth
EPBC Act status	Critically Endangered
Annual probability of extinction Based on IUCN category definitions	6.8%

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator						
Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
<i>Ecological communities</i>						
Area of community	No		Area			
			Quality			
			Total quantum of impact	0.00		
<i>Threatened species habitat</i>						
Area of habitat	Yes	15 ha of a roughly 50 ha site	Area	15	Hectares	Survey and on site assessment
			Quality	7	Scale 0-10	
			Total quantum of impact	10.50	Adjusted hectares	
Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
<i>Threatened species</i>						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g. Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator																										
Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)	Start area and quality	Future area and quality without offset	Future area and quality with offset	Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)	% of impact offset	Minimum (90%) direct offset requirement met?	Cost (\$ total)	Information source										
<i>Ecological Communities</i>																										
Area of community	No				Risk-related time horizon (max. 20 years)	Start area (hectares)	Risk of loss (%) without offset	Risk of loss (%) with offset																		
					Time until ecological benefit	Start quality (scale of 0-10)	Future area without offset (adjusted hectares)	0.0	Future area with offset (adjusted hectares)	0.0																
							Future quality without offset (scale of 0-10)		Future quality with offset (scale of 0-10)																	
<i>Threatened species habitat</i>																										
Area of habitat	Yes	10.50	Adjusted hectares	82.6	Time over which loss is averted (max. 20 years)	20	Start area (hectares)	82.6	Risk of loss (%) without offset	40%	Risk of loss (%) with offset	5%	Raw gain	28.91	Confidence in result (%)	80%	Adjusted gain	23.13	Net present value (adjusted hectares)	6.20	% of impact offset	100.04%	Minimum (90%) direct offset requirement met?	Yes		
					Time until ecological benefit	10	Start quality (scale of 0-10)	6	Future area without offset (adjusted hectares)	49.6	Future area with offset (adjusted hectares)	78.5	Raw gain	3.00	Confidence in result (%)	80%	Adjusted gain	2.40	Net present value (adjusted hectares)	1.24						
							Future quality without offset (scale of 0-10)	4	Future quality with offset (scale of 0-10)	7																
Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)	Start value	Future value without offset	Future value with offset	Raw gain	Confidence in result (%)	Adjusted gain	Net present value	% of impact offset	Minimum (90%) direct offset requirement met?	Cost (\$ total)	Information source										
Number of features e.g. Nest hollows, habitat trees	No																									
Condition of habitat Change in habitat condition, but no change in extent	No																									
<i>Threatened species</i>																										
Birth rate e.g. Change in nest success	No																									
Mortality rate e.g. Change in number of road kills per year	No																									
Number of individuals e.g. Individual plants/animals	No																									

Summary							
Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost (\$)		
					Direct offset (\$)	Other compensatory measures (\$)	Total (\$)
Birth rate	0				\$0.00		\$0.00
Mortality rate	0				\$0.00		\$0.00
Number of individuals	0				\$0.00		\$0.00
Number of features	0				\$0.00		\$0.00
Condition of habitat	0				\$0.00		\$0.00
Area of habitat	10.5	10.50	100.04%	Yes	\$0.00	N/A	\$0.00
Area of community	0				\$0.00		\$0.00
					\$0.00	\$0.00	\$0.00

Offsets Assessment Guide

For use in determining offsets under the Environment Protection and Biodiversity Conservation Act 1999
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Natural Temperate Grassland
EPBC Act status	Critically Endangered
Annual probability of extinction Based on IUCN category definitions	6.8%

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator						
Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
<i>Ecological communities</i>						
Area of community	Yes	Habitat Zone 4	Area	0.946	Hectares	report Biosis 2016
			Quality	3	Scale 0-10	
			Total quantum of impact	0.28	Adjusted hectares	
<i>Threatened species habitat</i>						
Area of habitat	No		Area			
			Quality			
			Total quantum of impact	0.00		
Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
<i>Threatened species</i>						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g. Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator																			
Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)	Start area and quality	Future area and quality without offset	Future area and quality with offset	Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)	% of impact offset	Minimum (90%) direct offset requirement met?	Cost (\$ total)	Information source			
<i>Ecological Communities</i>																			
Area of community	Yes	0.28	Adjusted hectares	2.4	Risk-related time horizon (max. 20 years)	20	Start area (hectares)	2.4	Risk of loss (%) without offset	50%	Risk of loss (%) with offset	5%	1.08	80%	0.86	0.23	0.29	101.57%	Yes
					Future area without offset (adjusted hectares)	1.2	Future area with offset (adjusted hectares)	2.3											
					Time until ecological benefit	10	Start quality (scale of 0-10)	5	Future quality without offset (scale of 0-10)	3	Future quality with offset (scale of 0-10)	6							
<i>Threatened species habitat</i>																			
Area of habitat	No				Time over which loss is averted (max. 20 years)		Start area (hectares)		Risk of loss (%) without offset		Risk of loss (%) with offset								
					Future area without offset (adjusted hectares)	0.0	Future area with offset (adjusted hectares)	0.0											
					Time until ecological benefit		Start quality (scale of 0-10)		Future quality without offset (scale of 0-10)		Future quality with offset (scale of 0-10)								
Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)	Start value	Future value without offset	Future value with offset	Raw gain	Confidence in result (%)	Adjusted gain	Net present value	% of impact offset	Minimum (90%) direct offset requirement met?	Cost (\$ total)	Information source			
Number of features e.g. Nest hollows, habitat trees	No																		
Condition of habitat Change in habitat condition, but no change in extent	No																		
<i>Threatened species</i>																			
Birth rate e.g. Change in nest success	No																		
Mortality rate e.g. Change in number of road kills per year	No																		
Number of individuals e.g. Individual plants/animals	No																		

Summary							
Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost (\$)		
					Direct offset (\$)	Other compensatory measures (\$)	Total (\$)
Birth rate	0				\$0.00		\$0.00
Mortality rate	0				\$0.00		\$0.00
Number of individuals	0				\$0.00		\$0.00
Number of features	0				\$0.00		\$0.00
Condition of habitat	0				\$0.00		\$0.00
Area of habitat	0				\$0.00		\$0.00
Area of community	0.2838	0.29	101.57%	Yes	\$0.00	N/A	\$0.00
					\$0.00	\$0.00	\$0.00

Offsets Assessment Guide

For use in determining offsets under the Environment Protection and Biodiversity Conservation Act 1999
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Spiny Rice-flower
EPBC Act status	Critically Endangered
Annual probability of extinction Based on IUCN category definitions	6.8%

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator					
Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact	Units	Information source
<i>Ecological communities</i>					
Area of community	No		Area		
			Quality		
			Total quantum of impact	0.00	
<i>Threatened species habitat</i>					
Area of habitat	No		Area		
			Quality		
			Total quantum of impact	0.00	
<i>Threatened species</i>					
<i>Threatened species</i>					
Birth rate e.g. Change in nest success	No				
Mortality rate e.g. Change in number of road kills per year	No				
Number of individuals e.g. Individual plants/animals	Yes	Broader population of 436	138	Count	site survey and census

Offset calculator																
Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)	Start area and quality	Future area and quality without offset	Future area and quality with offset	Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)	% of impact offset	Minimum (90%) direct offset requirement met?	Cost (\$ total)	Information source
<i>Ecological Communities</i>																
Area of community	No				Risk-related time horizon (max. 20 years)	Start area (hectares)	Risk of loss (%) without offset	Risk of loss (%) with offset	0.0							
							Future area without offset (adjusted hectares)	Future area with offset (adjusted hectares)								
							Time until ecological benefit	Start quality (scale of 0-10)								
<i>Threatened species habitat</i>																
Area of habitat	No				Time over which loss is averted (max. 20 years)	Start area (hectares)	Risk of loss (%) without offset	Risk of loss (%) with offset	0.0							
							Future area without offset (adjusted hectares)	Future area with offset (adjusted hectares)								
							Time until ecological benefit	Start quality (scale of 0-10)								
<i>Threatened species</i>																
<i>Threatened species</i>																
Birth rate e.g. Change in nest success	No															
Mortality rate e.g. Change in number of road kills per year	No															
Number of individuals e.g. Individual plants/animals	Yes	138	Count	400	10	400	200	600	400	70%	280.00	145.03	105.09%	Yes		

Summary							
Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost (\$)		
					Direct offset (\$)	Other compensatory measures (\$)	Total (\$)
Birth rate	0				\$0.00		\$0.00
Mortality rate	0				\$0.00		\$0.00
Number of individuals	138	145.03	105.09%	Yes	\$0.00	N/A	\$0.00
Number of features	0				\$0.00		\$0.00
Condition of habitat	0				\$0.00		\$0.00
Area of habitat	0				\$0.00		\$0.00
Area of community	0				\$0.00		\$0.00
					\$0.00	\$0.00	\$0.00

Offsets Assessment Guide

For use in determining offsets under the Environment Protection and Biodiversity Conservation Act 1999
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Striped Legless Lizard
EPBC Act status	Vulnerable
Annual probability of extinction Based on IUCN category definitions	0.2%

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator						
Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
<i>Ecological communities</i>						
Area of community	No		Area			
			Quality			
			Total quantum of impact	0.00		
<i>Threatened species habitat</i>						
Area of habitat	Yes	15 ha of a roughly 50 ha site	Area	15	Hectares	Survey and on site assessment
			Quality	7	Scale 0-10	
			Total quantum of impact	10.50	Adjusted hectares	
<i>Threatened species</i>						
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Birth rate e.g. Change in nest success	No					
Mortality rate e.g. Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator																				
Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)	Start area and quality	Future area and quality without offset	Future area and quality with offset	Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)	% of impact offset	Minimum (90%) direct offset requirement met?	Cost (\$ total)	Information source				
<i>Ecological Communities</i>																				
Area of community	No				Risk-related time horizon (max. 20 years)	Start area (hectares)	Risk of loss (%) without offset	0.0	Risk of loss (%) with offset	0.0										
					Future area without offset (adjusted hectares)		Future area with offset (adjusted hectares)													
					Time until ecological benefit	Start quality (scale of 0-10)	Future quality without offset (scale of 0-10)	Future quality with offset (scale of 0-10)												
<i>Threatened species habitat</i>																				
Area of habitat	Yes	10.50	Adjusted hectares	31.9	Time over which loss is averted (max. 20 years)	20	Start area (hectares)	31.9	Risk of loss (%) without offset	40%	Risk of loss (%) with offset	5%	11.17	80%	8.93	8.58	10.51	100.10%	Yes	
					Future area without offset (adjusted hectares)	19.1	Future area with offset (adjusted hectares)	30.3												
					Time until ecological benefit	10	Start quality (scale of 0-10)	6	Future quality without offset (scale of 0-10)	4	Future quality with offset (scale of 0-10)	7	3.00	80%	2.40	2.35				
<i>Threatened species</i>																				
Number of features e.g. Nest hollows, habitat trees	No																			
Condition of habitat Change in habitat condition, but no change in extent	No																			
Birth rate e.g. Change in nest success	No																			
Mortality rate e.g. Change in number of road kills per year	No																			
Number of individuals e.g. Individual plants/animals	No																			

Summary							
Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost (\$)		
					Direct offset (\$)	Other compensatory measures (\$)	Total (\$)
Birth rate	0				\$0.00		\$0.00
Mortality rate	0				\$0.00		\$0.00
Number of individuals	0				\$0.00		\$0.00
Number of features	0				\$0.00		\$0.00
Condition of habitat	0				\$0.00		\$0.00
Area of habitat	10.5	10.51	100.10%	Yes	\$0.00	N/A	\$0.00
Area of community	0				\$0.00		\$0.00
					\$0.00	\$0.00	\$0.00

Appendix 7 Glossary – Biodiversity assessment guidelines

Items marked with 'A' are cited from DEPI (2013a) ; items marked with 'B' are cited from DSE (2007b) and items marked with a 'C' are cited from DEPI (2014b).

Avoid^A

Avoiding removing any native vegetation when undertaking a use or development. This can be either by not permitting or not going ahead with the use or development, or locating it elsewhere so that removing native vegetation is not required.

Benchmark^B

A standard vegetation –quality reference point, dependent on vegetation type, which is applied in Habitat hectare assessments. Represents the average characteristics of a mature and apparently long undisturbed state of the same vegetation type.

Biodiversity^A

The variety of all life forms, the different plants, animals and microorganisms, the genes they contain, and the ecosystems of which they form a part.

Biodiversity Interactive Map (BIM)

Web based interactive map available on the DSE website that provides information on the biodiversity of Victoria and displays flora and fauna data from the Victorian Biodiversity Atlas.

Bioregion^B

Biogeographic areas that capture the patterns of ecological characteristics in the landscape or seascape, providing a natural framework for recognising and responding to biodiversity values. A landscape based approach to classifying the land surface using a range of environmental attributes such as climate, geomorphology, lithology and vegetation.

BushBroker^A

A program coordinated by DELWP to match parties that require native vegetation offsets with third party suppliers of native vegetation offsets.

Canopy Tree^C

Is a mature tree greater than 3 m in height and is normally found in the upper layer of a vegetation type. Immature trees that are not yet able to flower and are less than three metres in height are considered part of the understorey (see definition of understorey).

Condition score

The score assigned to a habitat zone that indicates the quality of the vegetation relative to the ecological vegetation class benchmark, usually expressed as a percentage or on a scale of 0 to 1.

Degraded treeless vegetation^B

Vegetation that is neither a wetland, a remnant patch nor scattered tree(s).

DBH (Diameter at Breast Height)^B

The diameter of the main trunk of a tree measured 1.3 m above ground level.

Dispersed habitat^A

Habitat for a rare or threatened species whose habitat is spread over a relatively broad geographic area.

Ecological vegetation class (EVC)^A

A native vegetation type classified on the basis of a combination of its floristic, life form, environmental and ecological characteristics.

EVC (see Ecological vegetation class)^B

Extent risk^A

The level of risk to biodiversity from the removal of native vegetation based on the area and/or number of scattered trees to be removed.

Forb

A herbaceous flowering plant that is not a graminoid (grass, sedge or rush).

Gain^A

Predicted improvement in the contribution to Victoria's biodiversity achieved from an offset, calculated by combining site gain with the strategic biodiversity score or habitat importance score of the site. Gain is measured with biodiversity equivalence scores or units.

Gain Target^B

The amount of gain that needs to be achieved to offset a loss measured in Habitat hectares.

General biodiversity equivalence score / units^A

Score or units used to quantify the relative overall contribution of a site to Victoria's biodiversity.

General offset^A

An offset that is required when a proposal to remove native vegetation is not deemed, by application of the specific-general offset test, to have a significant impact on habitat for any rare or threatened species.

General provisions^A

Operational requirements in planning schemes which are consistent across the state, relating to matters such as administrative provisions, ancillary activities and referral of applications.

Habitat hectares^A

Combined measure of condition and extent of native vegetation. This measure is obtained by multiplying the site's condition score (measured between 0 and 1) with the area of the site (in hectares).

Habitat hectares benchmark^A

A reference point for each vegetation type that represents the average condition of mature stands that are likely to reflect pre-settlement circumstances.

Habitat hectares site assessment^A

A site-based measure of the condition of native vegetation with reference to the benchmark for the same type of native vegetation. The assessment generates a condition score of between 0 and 1.

Habitat importance map^A

A map that indicates the importance of locations as habitat for a particular rare or threatened species. This map is based on modelled data.

Habitat importance score^A

Measure of the importance of the habitat located on a site for a particular rare or threatened species.

Habitat zone^B

A discrete area of native vegetation consisting of a single vegetation type (EVC) within an assumed similar quality. This is the base spatial unit for conducting a Habitat hectare assessment. Separate *Vegetation Quality Assessments* (or Habitat hectare assessments) are conducted for each habitat zone within the designated assessment area.

Highly localised habitat^A

Habitat for rare or threatened species whose habitat is spread over a very restricted area (i.e. less than 2,000

Highly localised habitat^A (cont.)

ha). This can also be applied to a similarly limited sub-habitat that is disproportionately important for a wide-ranging rare or threatened species.

Improvement gain^B

This is gain resulting from management commitments beyond existing obligations under legislation to improve the current vegetation quality. Achieving improvement gain is predicated on maintenance commitments being already in place. For example, control of any threats such as grazing that could otherwise damage the native vegetation must already be agreed. Typical actions leading to an improvement gain include reducing or eliminating environmental weeds, enhancement planting or revegetation over a 10-year management period. If the vegetation is to be used as an offset, a commitment to maintain the improvement gain (i.e. no subsequent decline in quality) will be required in perpetuity.

Incorporated document^A

A document that is included in the list of incorporated documents in a planning scheme. These documents affect the operation of the planning scheme.

Indigenous vegetation^B

The type of native vegetation that would have normally been expected to occur on the site prior to European settlement.

Landholder^A

An owner, occupier, proprietor or holder of land.

Landowner^A

Owner of land.

Landscape scale information^A

Mapped or modelled information based on data collected across the landscape rather than just on a particular site.

Large Old Tree (LOT)^B

A tree with a DBH equal to or greater than the large tree diameter as specified in the relevant EVC benchmark.

Listed species

A flora or fauna species listed under the Commonwealth *Environment Protection and Biodiversity Act 1999* or listed as threatened under the Victorian *Flora and Fauna Guarantee Act 1988*.

Local Planning Policy Framework^A

Framework outlining a Municipal Strategic Statement and the Local Planning Policies that apply to the local government area.

Location risk^A

The risk that removing native vegetation in a particular location will have an impact on the persistence of a rare or threatened species.

Loss^A

Loss in the contribution to Victoria's biodiversity when native vegetation is fully or partially removed, as measured in biodiversity equivalence scores or units.

Maintenance Gain^B

This is gain from commitments that contribute to the maintenance of the current vegetation quality over time (i.e. avoiding any decline). Includes foregoing certain entitled activities that could otherwise damage or remove native vegetation, such as grazing or firewood collection. Also typically requires a commitment to ensure no further spread of environmental weeds that may otherwise result in the loss of vegetation quality over time. If the vegetation is to be used as an offset, a commitment to maintain the vegetation quality will be required in perpetuity.

Minimise^A

Locating, designing or managing a use or development to reduce the impacts on biodiversity from the removal of native vegetation.

Native (indigenous) vegetation^B

Native vegetation is plants that are indigenous to Victoria, including trees, shrubs, herbs and grasses (as defined in Clause 72 of the planning scheme).

Native vegetation credit^A

Gains in the contribution that native vegetation makes to Victoria's biodiversity that are registered on the native vegetation credit register. Native vegetation credits are offered for sale to parties who are required to offset the removal of native vegetation.

Native vegetation credit register^A

A statewide register of native vegetation credits that meet minimum standards for security and management of sites. The register is administered by the Department of Environment and Primary Industries, and records the creation, trade and allocation of credits to meet specific offset requirements.

Native vegetation extent^A

Area of land covered by native vegetation or the number of scattered trees.

Native Vegetation Information Management (NVIM) system^A

An online tool used to access information about Victoria's native vegetation.

Native vegetation particular provision^A

Clause 52.17 in the Victoria Planning Provisions that relates to the removing, destroying or lopping of native vegetation.

No net loss^A

An outcome where a particular gain in the contribution to Victoria's biodiversity is equivalent to an associated loss in the contribution to Victoria's biodiversity from permitted clearing.

Offset^A

Protection and management (including revegetation) of native vegetation at a site to generate a gain in the contribution that native vegetation makes to Victoria's biodiversity. An offset is used to compensate for the loss to Victoria's biodiversity from the removal of native vegetation.

Offset Management Plan (OMP)

A document which sets out the requirements for establishment, protection and management of an offset site.

Offset market^A

A system which facilitates trade of native vegetation credits between parties requiring offsets and third party suppliers of offsets.

Old tree^B

A tree with a DBH equal to or greater than 0.75 of the large tree diameter as specified in the relevant EVC benchmark. Includes medium old trees and large old trees (see separate definitions). Some Regional Native Vegetation Plans additionally define very large old trees (1.5 times large tree diameter).

On-site offset^B

An offset located on the same property as the clearing.

Particular Provisions^A

Provisions in the Victoria Planning Provisions that relate to specific activities (for example, native vegetation is a Particular Provision).

Patch (see Remnant Patch)

Permit^A

A legal document that gives permission for a use or development on a particular piece of land.

Perennial^A

A plant that lives for more than two years. Perennials include species that are always visible e.g. shrubs and trees, but also include species that are not always visible above ground.

Permitted clearing^A

Removal of native vegetation for which a planning permit has been granted to remove native vegetation.

Permitted clearing regulations^A

The rules in the planning system that regulate permits for the removal of native vegetation.

Planning provisions – See Victoria Planning Provisions.

Prior management gain

This gain acknowledges actions to manage vegetation since State-wide planning permit controls for native vegetation removal were introduced in 1989.

Planning scheme^A

Policies and provisions for the use, development and protection of land in a local government area.

Planning system^A

Victoria's land-use planning system that includes the Victoria Planning Provisions and each local government's planning scheme.

Property Vegetation Plan^B

A plan which relates to the management of native vegetation within a property, and which is contained within an agreement made pursuant to section 69 of the Conservation, Forests and Lands Act 1987.

Protected species

A flora species protected under the *Victorian Flora and Fauna Guarantee Act 1988*.

Protection (of a tree)^B

An area with twice the canopy diameter of the tree(s) fenced and protected from adverse impacts: grazing, burning and soil disturbance not permitted, fallen timber retained, weeds controlled, and other intervention and/or management if necessary to ensure adequate natural regeneration or planting can occur.

Rare or threatened species^A

A species that is listed in:

- DELWP's Advisory List of Rare or Threatened Plants in Victoria as 'endangered', 'vulnerable', or 'rare', but does not include the 'poorly known' category
- DELWP's Advisory List of Threatened Vertebrate Fauna in Victoria as 'critically endangered', 'endangered' or 'vulnerable', but does not include 'near threatened' or 'data deficient' categories
- DELWP's Advisory List of Threatened Invertebrate Fauna in Victoria as 'critically endangered', 'endangered' or 'vulnerable', but does not include 'near threatened' or 'data deficient' categories.

Recruitment^B

The production of new generations of plants, either by allowing natural ecological processes to occur (regeneration etc), by facilitating such processes such as regeneration to occur, or by actively revegetating (replanting, reseeding). See Revegetation.

Referral authority^A

An authority that a permit application is referred to for decision under Section 55 of the Planning and Environment Act 1987. All referral requirements are specified in Clause 66 of planning schemes.

Remnant patch of native vegetation^A

Either:

- an area of native vegetation, with or without trees, where at least 25 per cent of the total perennial understorey plant cover is native plants.
- an area with three or more indigenous canopy trees where the tree canopy cover is at least 20 per cent.

Remnant vegetation^B

Native vegetation that is established or has regenerated on a largely natural landform. The species present are those normally expected in that vegetation community. Largely natural landforms may have been subject to some past surface disturbance such as some clearing or cultivation (or even the activities of the nineteenth century gold rushes) but do not include man-made structures such as dam walls and quarry floors.

Responsible authority^A

The authority charged with the responsibility for administering and enforcing particular aspects of a planning scheme.

Revegetation^B

Establishment of native vegetation to a minimum standard in formerly cleared areas, outside of a remnant patch.

Scattered tree^C

An indigenous canopy tree that does not form part of a remnant patch of native vegetation (see definition of remnant patch of native vegetation).

Section 173 agreements^B

A management agreement primarily between a landowner and the responsible authority according to section 173 of the Planning and Environment Act 1987.

Security Gain

This is gain from actions to enhance security of the on-going management and protection of native vegetation at the offset site, either by entering into an on-title agreement (for example under Section 173 of the *Planning and Environment Act 1987*), or by locating the offset on land that has greater security than the clearing site, or by transferring private land to a secure public conservation reserve.

Site^A

An area of land that contains contiguous patches of native vegetation or scattered trees, within the same ownership.

Site-based information^A

Information that is collected at a site.

Site gain^A

Predicted improvement in the condition, or the condition and extent, of native vegetation at a site (measured in Habitat hectares) generated by the landowner committing to active management and increased security.

Site loss^A

Loss in the condition, or condition and extent, of native vegetation when native vegetation is fully or partially removed, measured in Habitat hectares.

sp.

Species (one species).

spp.

Species (more than one species).

Species persistence^A

The continued existence of a species into the future.

Specific biodiversity equivalence score / units^A

With reference to a specific species, a score or units used to quantify the relative contribution of a site to Victoria's biodiversity.

Specific-general offset test^A

A test used to determine whether a general or specific offset is required based on the impact of native vegetation removal on the habitat for rare or threatened species.

Specific offset^A

An offset that is targeted to a particular species (or multiple species) impacted by the removal of native vegetation.

State Planning Policy Framework^A

A collection of clauses in the Victoria Planning Provisions that inform planning authorities and responsible authorities of those aspects of state planning policy which they are to take into account and give effect to in planning and administering their respective areas.

Strategic biodiversity map^A

A map that shows the relative value of a location in the landscape with regard to its condition, extent, connectivity and the support function it plays for species. The map is based on modelled data.

Strategic biodiversity score^A

A score that quantifies the relative value of a location in the landscape with regard to its condition, extent, connectivity and the support function it plays for species.

Strategic planning^A

A coordinated approach to planning where areas for conservation and areas which can be cleared are strategically identified.

Supplementary planting

Establishment of overstorey and/or understorey plants within a remnant patch. Typically includes the planting or direct-seeding of understorey life forms.

Taxon (plural taxa)

A term used to describe any taxonomic unit. This term is typically used when referring broadly to any scientifically recognised species, subspecies or variety.

Third-party offset ^B

An offset located on a property owned by a person other than the landowner who incurs the native vegetation loss being offset.

Understorey

Understorey is all vegetation other than mature canopy trees – includes immature trees, shrubs, grasses, herbs, mosses, lichens and soil crust. It does not include dead plant material that is not attached to a living plant. More information on understorey life forms is set out in the Vegetation Quality Assessment Manual (DSE 2004).

Vegetation Quality Assessment

The standard DELWP method for assessing remnant patches of vegetation. Details of the method are outlined in the Vegetation Quality Assessment Method (DSE 2004). The results of the assessment are expressed in Habitat hectares. Also referred to as a 'Habitat hectare assessment'

Victoria Planning Provisions ^A

A list of planning provisions that provides a standard template for individual planning schemes.

Zone ^A

A zone in the Victoria Planning Provisions is a set of permitted uses of land which are defined spatially

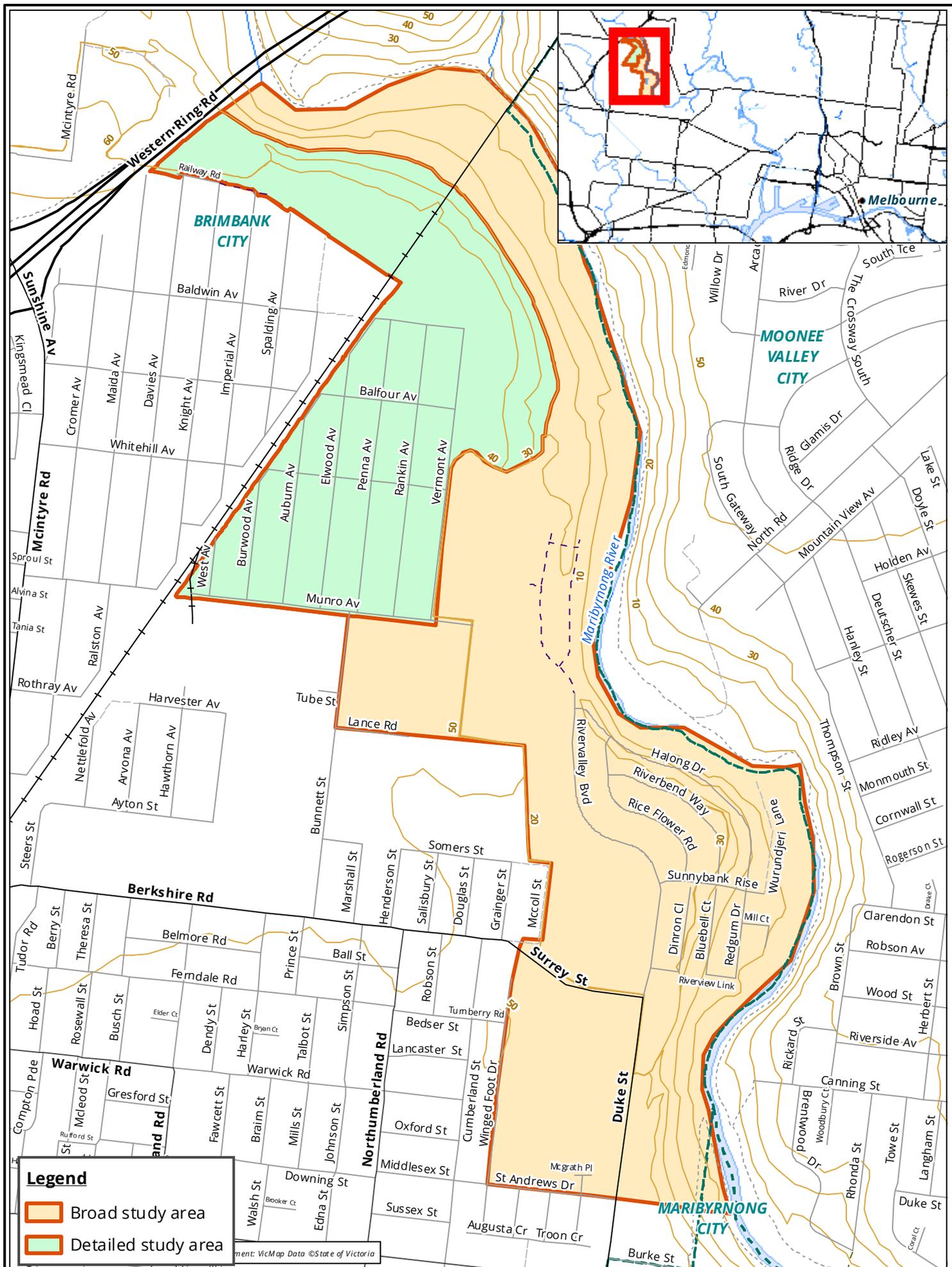
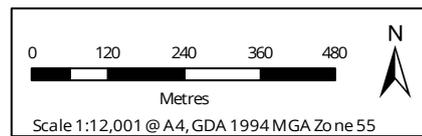


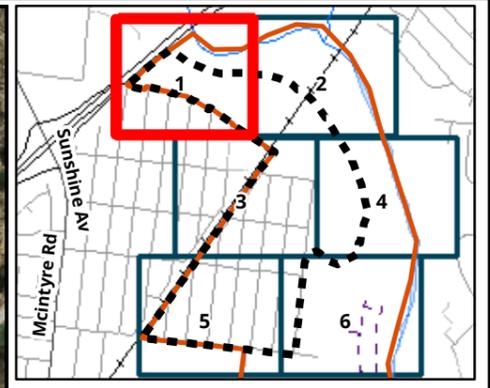
Figure 1: Location of the study area



Biosis Pty Ltd
 Ballarat, Brisbane, Canberra, Hobart, Melbourne,
 Newcastle, Sydney, Warragatta & Wollongong

Matter: 22444,
 Date: 23 August 2016,
 Checked by: KLS Drawn by: JMS. Last edited by: Imilee
 Location: P:\224005\22444\Mapping\22444_F1_BroadStudyArea





- Legend**
- Broad Study Area
 - Study Area detail
 - High fauna corridor values
- Scattered trees**
- ◆ *Eucalyptus camaldulensis*
 - ◆ *Eucalyptus leucoxyton*
- Threatened flora**
- + *Nicotiana suaveolens*
 - + *Dianella aff. longifolia (Benambra)*
- Habitat zone**
- 17

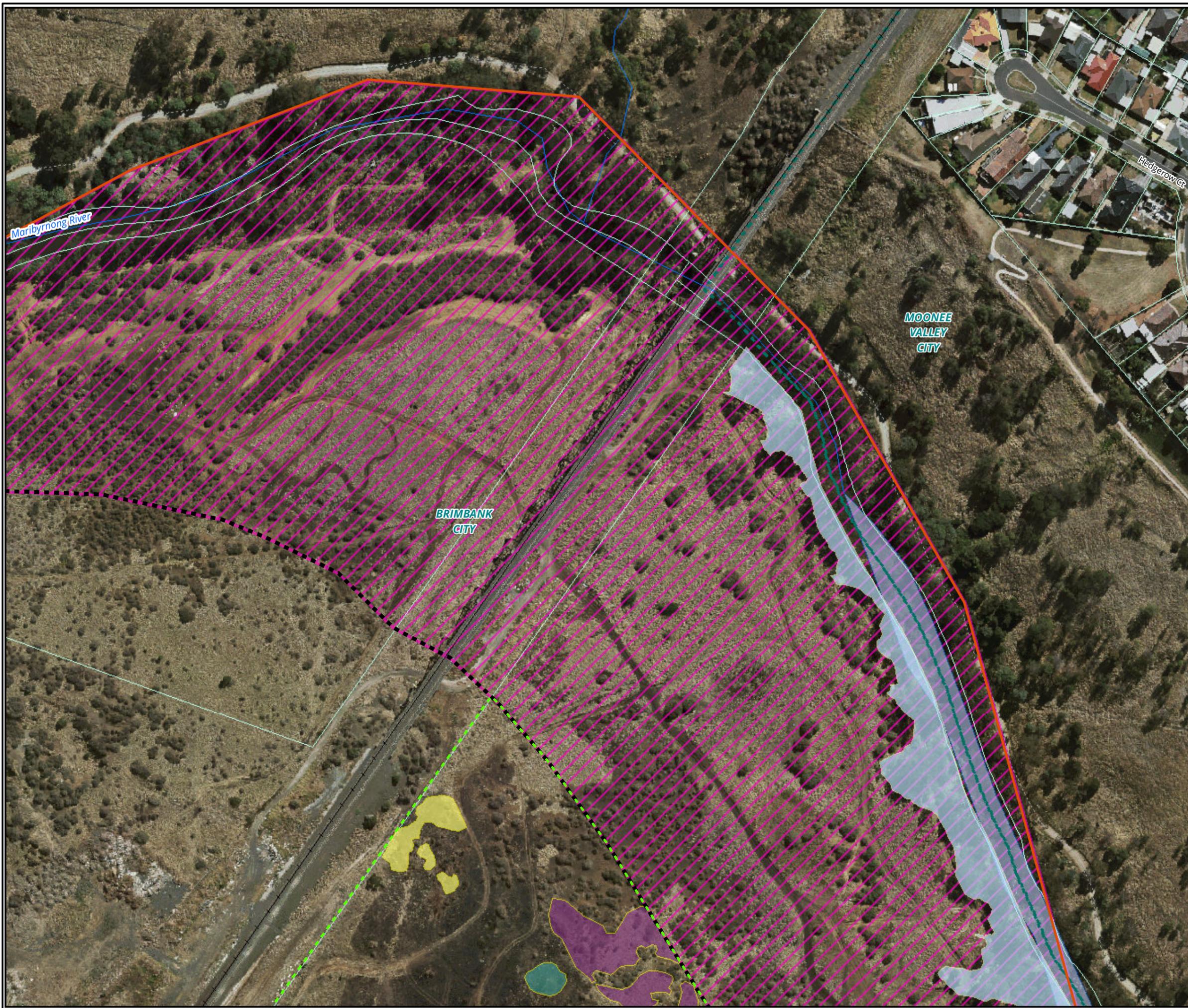
Figure 2.1 Ecological features of the study area



Metres
 Scale: 1:1,700 @ A3
 Coordinate System: GDA 1994 MGA Zone 55

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Matter: 22444,
 Date: 27 October 2016,
 Checked by: SGM, Drawn by: LDM, Last edited by: smitchell
 Location: P:\22400s\22444\Mapping\22444_F2_EcoFeatures.mxd



- Legend**
- Broad Study Area
 - Study Area detail
 - Conservation Reserve
 - High fauna corridor values
- Habitat zone**
- 14
 - 15
 - 16
 - 18

Figure 2.2 Ecological features of the study area

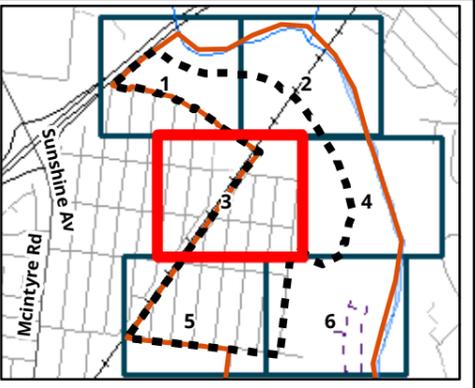
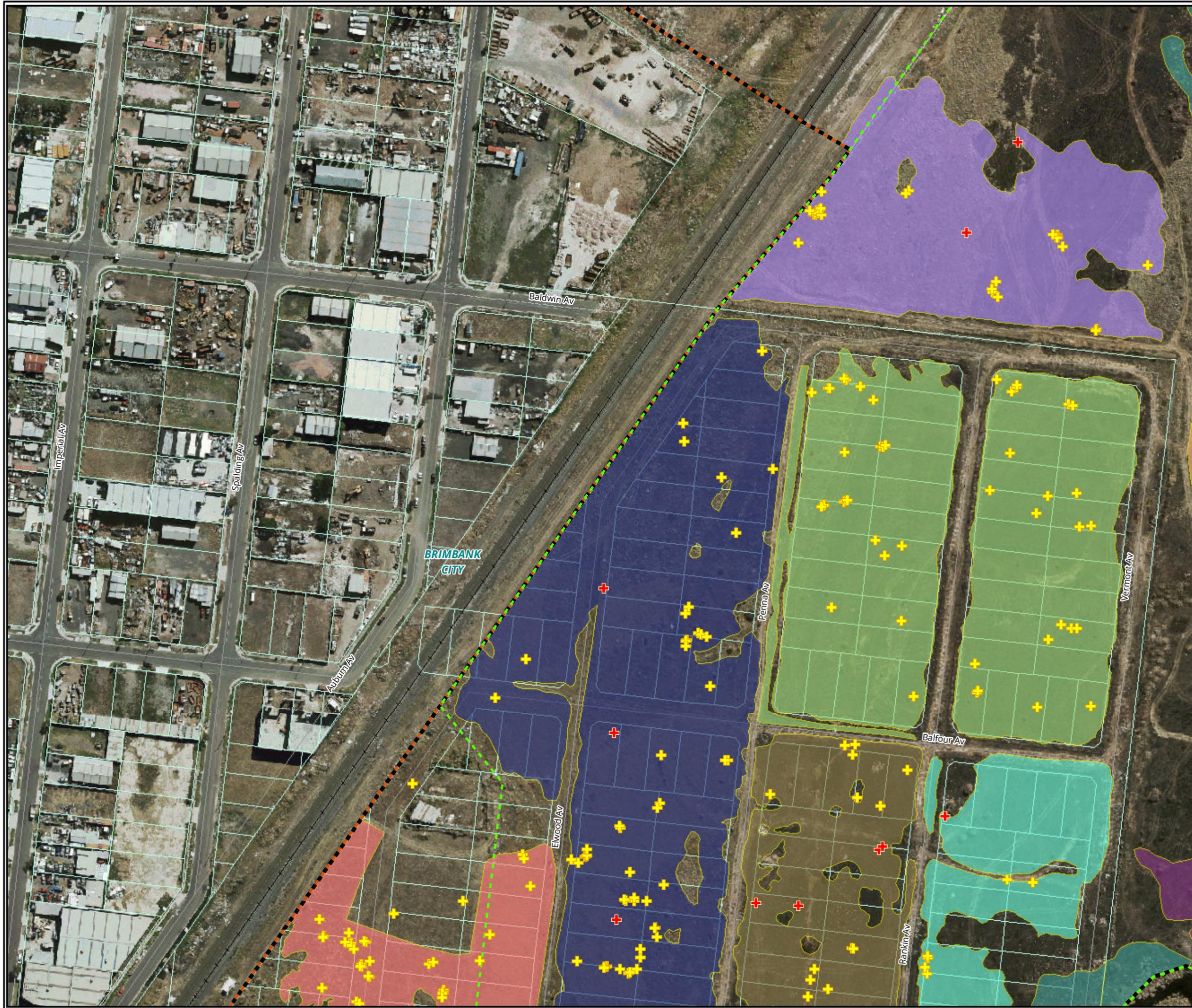


Metres
 Scale: 1:1,800 @ A3
 Coordinate System: GDA 1994 MGA Zone 55

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 Date: 27 October 2016,
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 Location: P:\22400s\22444\Mapping\22444_F2_EcoFeatures.mxd



Legend

- Broad Study Area
- Study Area detail
- Conservation Reserve

Fauna survey records

- + Striped Legless Lizard, ABZECO 2016
- + *Pimelea spinescens* subsp. *spinescens*

Threatened flora

- + *Dianella* aff. *longifolia* (*Benambra*)
- + *Pimelea spinescens* subsp. *spinescens*

Habitat zone

- 7
- 8
- 9
- 10
- 11
- 12
- 13
- 14
- 15

Figure 2.3 Ecological features of the study area

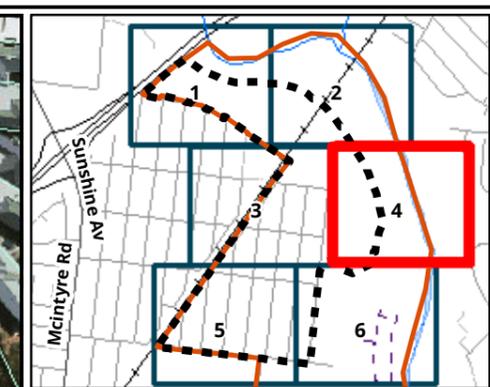
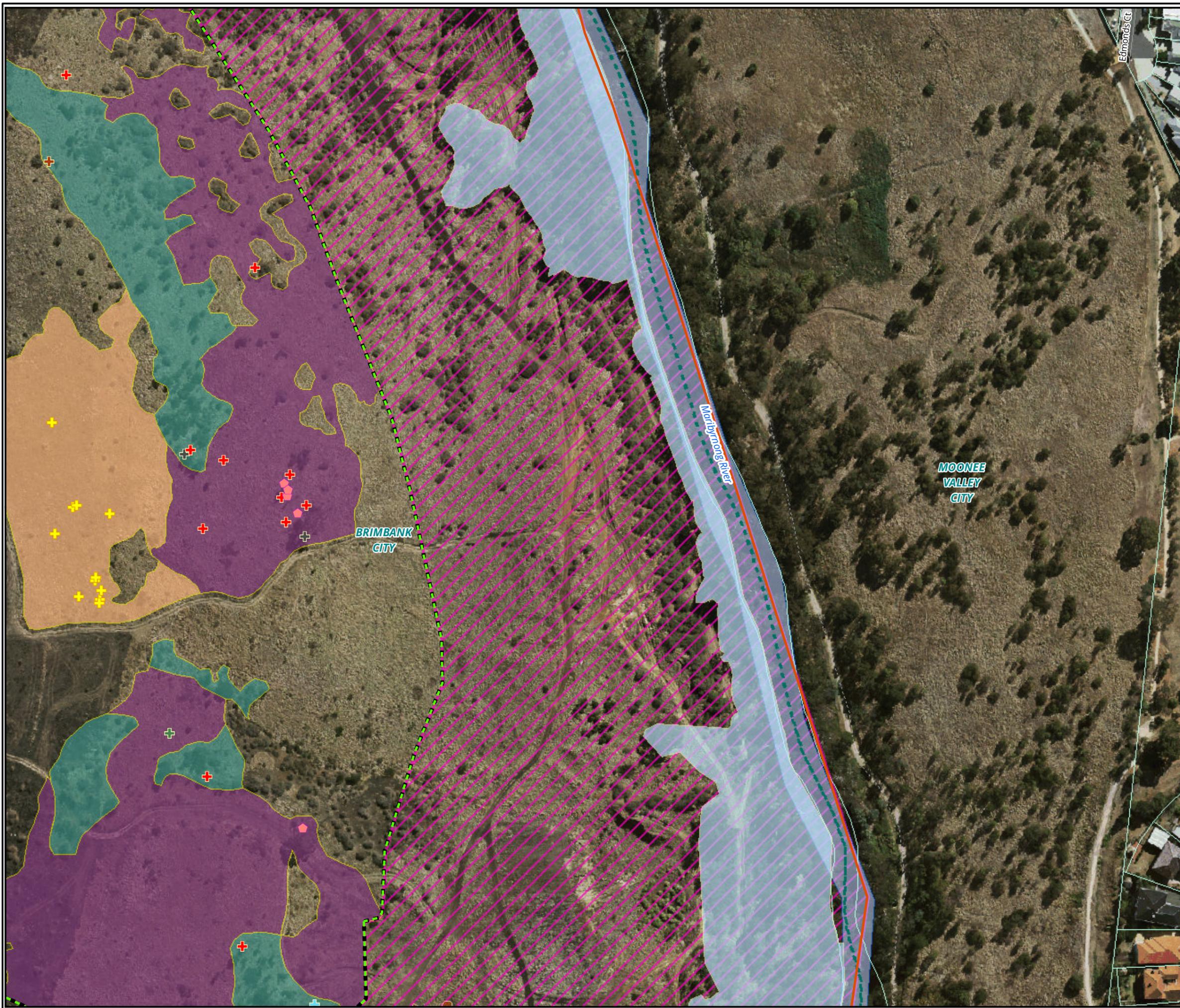
0 25 50 75 100
Metres

Scale: 1:1,800 @ A3
Coordinate System: GDA 1994 MGA Zone 55

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Matter: 22444,
Date: 27 October 2016,
Checked by: SGM, Drawn by: LDM, Last edited by: smitchell
Location: P:\22400s\22444\Mapping\22444_F2_EcoFeatures.mxd



- Legend**
- Broad Study Area
 - Study Area detail
 - Conservation Reserve
 - High fauna corridor values
- Scattered trees**
- ◆ *Eucalyptus camaldulensis*
- Threatened flora**
- + *Cullen tenax*
 - + *Dianella aff. longifolia (Benambra)*
 - + *Dianella amoena*
 - + *Geranium sp. 3*
 - + *Pimelea spinescens subsp. spinescens*
 - + *Rhagodia parabolica*
- Habitat zone**
- 13
 - 14
 - 15
 - 18
 - 19

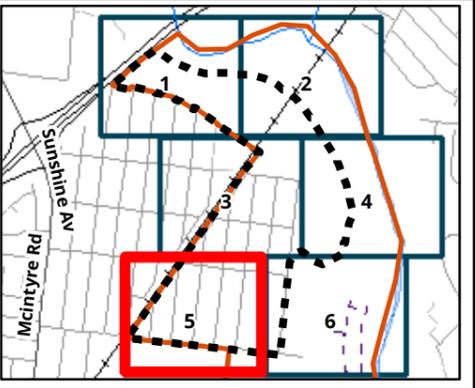
Figure 2.4 Ecological features of the study area



Metres
 Scale: 1:1,700 @ A3
 Coordinate System: GDA 1994 MGA Zone 55



Matter: 22444,
 Date: 27 October 2016,
 Checked by: SGM, Drawn by: LDM, Last edited by: smitchell
 Location: P:\22400s\22444\Mapping\22444_F2_EcoFeatures.mxd



Legend

- Broad Study Area
- Study Area detail
- Conservation Reserve

Fauna survey records

- + Golden Sun Moth, Ecology and heritage partners 2016
- ▲ Striped Legless Lizard, ABZECO 2016
- ▲ Striped Legless Lizard, Ecology and heritage partners 2016

Threatened flora

- + *Coronidium gannianum*
- + *Pimelea spinescens* subsp. *spinescens*

Habitat zone

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9

Figure 2.5 Ecological features of the study area

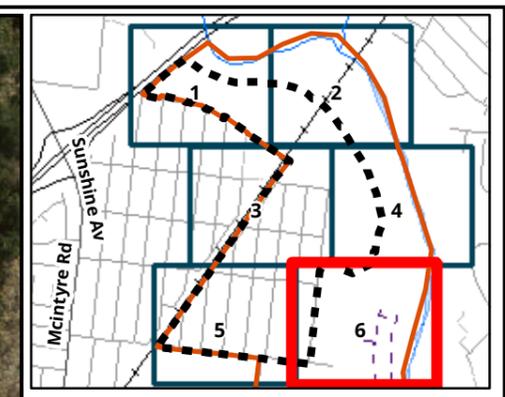
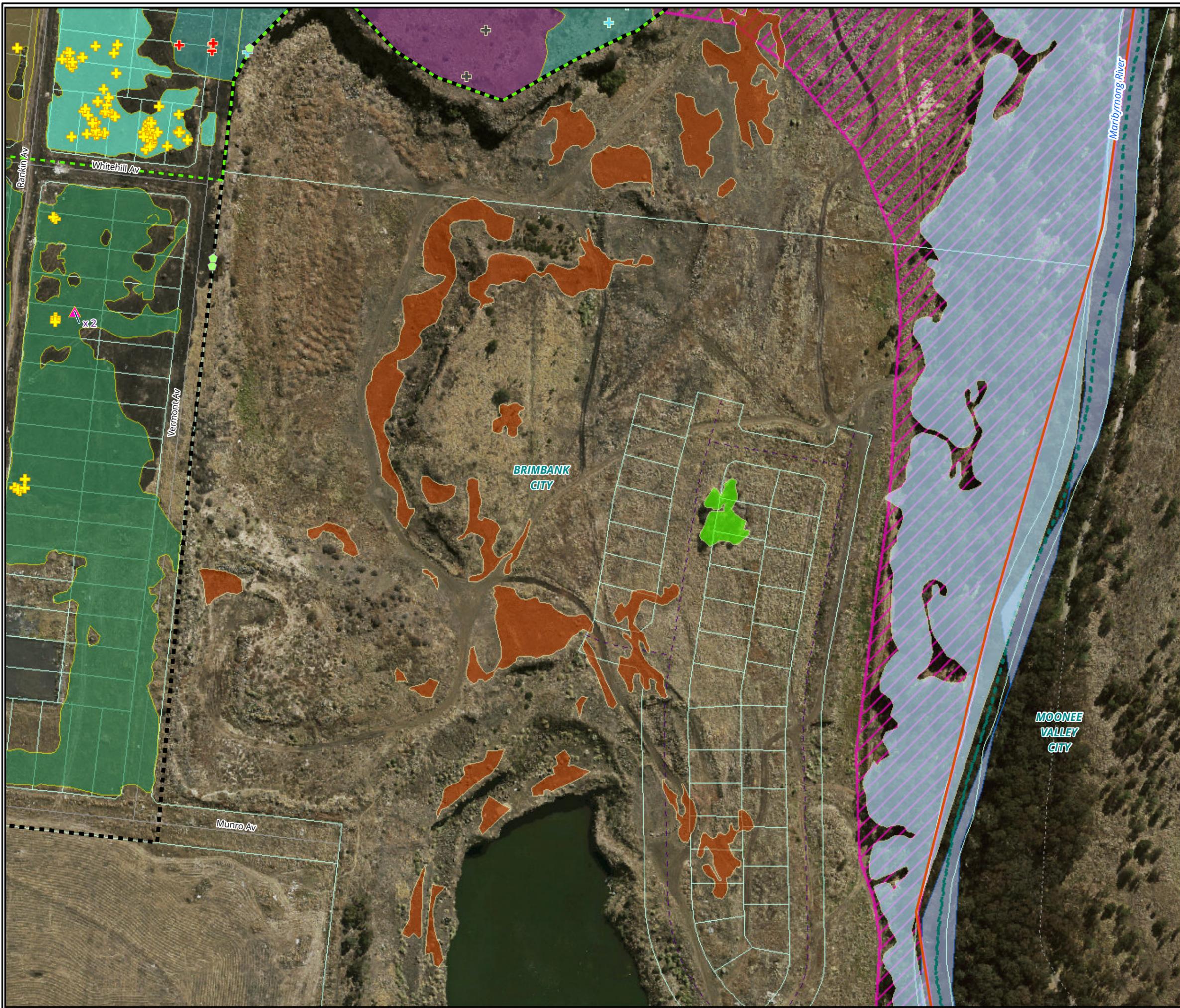
0 25 50 75 100
Metres

Scale: 1:1,700 @ A3
Coordinate System: GDA 1994 MGA Zone 55

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Date: 27 October 2016,
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Location: P:\22400s\22444\Mapping\22444_F2_EcoFeatures.mxd



- Legend**
- Broad Study Area
 - Study Area detail
 - Conservation Reserve
 - High fauna corridor values
- Fauna survey records**
- ▲ Striped Legless Lizard, ABZECO 2016
- Scattered trees**
- ◆ *Eucalyptus leucoxylon*
- Threatened flora**
- + *Cullen tenax*
 - + *Dianella aff. longifolia* (Benambra)
 - + *Dianella amoena*
 - + *Pimelea spinescens* subsp. *spinescens*
- Habitat zone**
- 6
 - 9
 - 10
 - 14
 - 15
 - 18
 - 19
 - 20

Figure 2.6 Ecological features of the study area

0 25 50 75 100
Metres
Scale: 1:1,800 @ A3
Coordinate System: GDA 1994 MGA Zone 55

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Solomon Heights Biodiversity Study Overview

Brimbank City Council recently finalised a biodiversity report detailing the ecological values across an area of mostly undeveloped land in Sunshine North. The area is a stretch of the Maribyrnong Valley corridor including Solomon Heights, Baldwin Avenue grasslands, River Valley and further Maribyrnong River corridor and associated escarpments. Figure 1 shows the study which includes a broad study area (the whole site) and a detailed study area (Baldwin Avenue grassland area).

The key objectives of the biodiversity study are to:

- identify the biodiversity values present
- identify significant areas that require protection, in the form of a permanent conservation area
- outline options to secure and manage a conservation area.

The report was completed by Council's appointed consultants and included information from previous ecological studies at the site. The consultants undertook new flora surveys where required to fill some knowledge gaps of the site. Additional specific surveys were undertaken in the detailed study area.

The key ecological values identified include:

- 25.09 ha of native vegetation in the detailed study area and 31.951 ha in the broader study area
- Good quality areas of Plains Grassland and Escarpment Shrubland
- A strong population of endangered Striped Legless Lizard and Golden Sun Moth
- Areas of grassland which correspond to the critically endangered community Natural Temperate Grassland of the Victorian Volcanic Plain
- A large population of Spiny Rice-flower (436 individuals) and a number of Matted Flax-lilies
- Scattered individuals of other state listed rare or threatened species including Pale Swamp Everlasting, Arching Flax-lily, Fragrant Saltbush, Austral Tobacco, Tough Scurf Pea and Crane's-bill Geranium
- Critical habitat corridors along the Maribyrnong Valley that contribute to surrounding ecological values, including habitat connectivity
- Small numbers of remnant indigenous trees including two large old trees.

The locations of values on the site were mapped, including patches of vegetation, individual threatened species and important habitat corridors.

Figure 2 outlines a proposed conservation area. This area was based on the values on the site that are protected by local, State and Federal legislation. Legislative requirements mean that development approval within this proposed conservation area would be extremely difficult to obtain due to the loss of rare biodiversity values. The proposed conservation area is also likely to provide a valuable site for biodiversity and native vegetation offsets.

The values and the identified potential conservation area will be taken into consideration in strategic planning work currently being undertaken by Brimbank City Council in Sunshine North.

