Green Fields Station Hydroponics Precinct Project Flora and Fauna Assessment

Prepared for JAC Land Pty Ltd

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Contents

List of Figures

List of Tables

Summary

Biosis Pty Ltd was commissioned by JAC Land Pty Ltd, on behalf of Woodhouse Pastoral Co., to undertake an assessment of the proposed Green Fields Station Hydroponics Precinct Project. The project area is located within the broader Green Fields Station, a 4,698 hectare landholding located approximately 45 km west of Melbourne. The proposal involves the development of land for protected cropping in hydroponic or glasshouse production systems.

The information presented in this report has been prepared to support development approvals for the project including referrals under the Victorian *Environment Effects Act 1978* and Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.

Ecological values

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

- 161.07 ha of native vegetation composed predominantly of Low-rainfall Plains Grassland, with smaller areas of Plains Grassy Wetland, Stony Knoll Shrubland and Plains Woodland.
- Ten scattered trees outside vegetation patches including Buloke *Allocasuarina luehmannii*, River Red Gum *Eucalyptus camaldulensis* and Grey Box *Eucalyptus macrocarpa.*
- *Environment Protection and Biodiversity Conservation* (EPBC) *Act* listed community Natural Temperate Grassland of the Victorian Volcanic Plain.
- *Flora and Fauna Guarantee* (FFG) *Act* communities Western (Basalt)Plains Grassland Community, and Grey Box – Buloke Grassy Woodland Community.
- Populations of EPBC listed flora species Spiny Rice-flower *Pimelea spinescens* and fauna species Golden Sun Moth *Synemon plana.*
- Populations of Department of Environment and Primary Industries (DEPI) Advisory List and FFG Act listed flora: Wimmera Woodruff *Asperula wimmerana*, Arching Flax-lily *Dianella* spp. aff. *longifolia* (Benambra) and Buloke *Allocasuarina luehmannii*
- Modelled habitat for threatened flora and fauna according to DEPI's Habitat Importance Models.
- Vegetation within the project area forms part of a mosaic of fragmented native grasslands in the region and provides habitat linkages between habitat within the broader Green Fields Station landholding and grasslands to the south, including the future Western Grassland Reserves.

Government legislation and policy

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

Legislation / policy	Relevant ecological feature on site	Permit / approval required	Notes
EPBC Act	Listed ecological community Natural Temperate Grassland of the Victorian Volcanic Plain. Listed threatened species: Spiny Rice-flower and Golden Sun Moth found within the project area. Growling Grass Frog located 3 km downstream from the project area. 19 listed migratory species predicted to occur in the project area. Waterways that drain to and become part of the Port Phillip Bay (western shoreline) and Bellarine Peninsula Ramsar Site approximately 21 km downstream of the project area.	Referral recommended.	An EPBC referral is for the project is being prepared.
FFG Act	Two listed communities: Western (Basalt) Plains Grassland Community, and Grey Box-Buloke Grassy Woodland Community. Listed threatened flora and fauna species as recorded in Appendix 1: Flora Appendix 2: Fauna.	Protected Flora Permit required for removal of listed flora on public land including Mount Mary Road and Ballan Road reserves.	Most of the project area is private land and no permit would be required for these areas.
Planning & Environment Act	All indigenous vegetation to be cleared.	Planning permit required, including permission to remove, destroy or lop native vegetation.	Permit application also needs to address provisions of ESO 1 & ESO 5 in the local planning scheme.
Wildlife Act	All wildlife within the project area.	Construction activities are likely to result in the death of wildlife or the need to remove it. A permit will be required.	If permission for removal of vegetation is granted under provisions of other Victorian legislation a separate permit under the *Wildlife Act 1975* is not required for removal of

Legislation / policy	Relevant ecological feature on site	Permit / approval required	Notes
			vegetation that constitutes habitat for fauna.
Environmental Effects Act	Native vegetation and threatened species populations and habitat.	An EES may be required due to the scale of proposed native vegetation removal from an endangered EVC.	A referral is being made to the Minister for Planning for an EES determination.
CaLP Act	Noxious weeds and pest animals as listed in Appendix 1: Flora and Appendix 2: Fauna	N/A	Comply with requirements to control/eradicate.
Water Act	Unnamed tributary of the Werribee River to the north of the project area.	Referral to Melbourne Water/CMA.	A waterway determination will be required.
SEPP	Unnamed tributary of the Werribee River to the north of the project area.	N/A	Consult Melbourne Water and EPA regarding water quality objectives and monitoring requirements.
Regional Catchment Strategy and River Health Strategy	Unnamed tributary of the Werribee River to the north of the project area.	N/A	The key biodiversity objectives of the strategy with respect to the aquatic environment will be met if the mitigation measures outlined in this report are complied with.

Note: Guidance provided in this report does not constitute legal advice.

Proposed clearing and offset requirements

This report has been prepared to support a referral to the Minister for Planning requesting a decision on whether an Environment Effects Statement (EES) is required for the hydroponics precinct project. Currently, the criteria for deciding whether a project should be referred are listed in the Ministerial Guidelines for Assessment of Environmental Effects under the *Environment Effects Act 1978*. For native vegetation impacts, these criteria still reference the former State policy *Victoria's Native Vegetation Management – A Framework for Action 2002*. This policy was replaced by VC105 amendment to the Victoria Planning Provision in December 2013. The contemporary policy 'Permitted clearing of native vegetation: Biodiversity assessment guidelines' (the Guidelines) is now being used to assess native vegetation removal and offsets in Victoria. Given the divergence between the EES Ministerial Guidelines and the new native vegetation policy setting, this report attempts to provide sufficient information to address the implications of the previous and the current native vegetation policies.

Based on the current design, the proposed development will require the removal of 161.07 hectares of native vegetation and ten scattered trees.

Victoria's Permitted Clearing of Native Vegetation – Biodiversity Assessment Guidelines (the Guidelines)

The proposed clearing will occur within location risk A & B. More than one hectare of vegetation is proposed to be cleared from location risk B, therefore, a planning permit application would be assessed on the high risk-based pathway.

Under the Guidelines vegetation losses and offset gains are measured in Biodiversity Equivalence Units (BEUs). Accurate determination of the project's offset requirements can only be obtained by submission of the project data to DEPI. However, we estimate that the project's general offset requirements would be in the order of 65.16 BEUs. This offset requirement does not consider specific offsets for rare or threatened species.

Victoria's Native Vegetation Management – A Framework for Action

Under the Framework all vegetation of Very High conservation significance proposed for clearing requires a gain of twice the number of habitat hectares lost. For the current proposal to remove 86.88 habitat hectares this would total 173.76 habitat hectares. In addition, a total of 10 scattered trees are proposed for clearing which would generate a requirement to protect a total of 15 Very Large Old Trees, 12 Large Old Trees and 8 Medium Old Trees, and 230 new trees would need to be recruited. Alternatively using a 'recruit only' option 1140 trees could be recruited.

Offset Strategy

An area south of Ballan Road has been identified as potentially suitable for providing offsets associated with vegetation losses from the hydroponics project. The area contains a total of 536.76 hectares of native vegetation divided into two main habitat zones: 23A and 23B. By using DEPI's Gain Calculator it has been calculated that the offset site could generate a total gain of 211.69 habitat hectares. We anticipate that this would adequately meet the habitat hectare offset requirements for the project under either the Guidelines (for general BEUs) or the Framework.

If the Framework is to be used to calculate offsets, an additional offset area would need to be obtained to meet the offset requirements for scattered trees. If offsets are provided under the Guidelines, specific offsets may be required for modelled rare and threatened species habitat in the project area. This requirement can be determined following submission of the project data to DEPI.

Recommendations and mitigation measures

Mitigation measures contained in this report can be incorporated into a Construction Environmental Management Plan to provide guidance on the protection of environmental values during construction.

The primary measure for avoiding and minimising impacts to biodiversity within the project area is to minimise the removal of native vegetation. Where native vegetation removal can not be avoided any losses of vegetation or threatened species habitat should be appropriately offset.

The impact of the development can be minimised by ensuring that it does not have a significant impact on adjoining areas. Measures such as provision of buffers to significant environmental values and waterways, and sediment control around waterways are important techniques and have been incorporated into the current design.

1. Introduction

1.1 Project background

Biosis Pty Ltd was commissioned by JAC Land Pty Ltd, on behalf of Woodhouse Pastoral Co., to undertake an assessment of the proposed Green Fields Station Hydroponics Precinct Project. The project area is located within the broader Green Fields Station, a 4,698 hectare landholding located approximately 45 km west of Melbourne. The proposal involves the development of land for protected cropping, which are essentially cropping activities that employ hydroponic or glasshouse production systems and techniques. The project entails the development and operation of a hydroponics precinct comprising 14 glasshouses. The project area, and study area for this report, is 457 ha including all ancillary components such as services and access roads.

The broader Green Fields Station landholding has been subject to extensive ecological survey over the period 2010 – 2014 culminating in the preparation of a comprehensive *Biodiversity Assessment Report* (Biosis 2014), hereafter referred to as 'the BAR'. The BAR provides information collected from surveys conducted from 2010 that is relevant to the proposed project area.

The information presented in this report has been prepared to support development approvals for the project including referrals under the Victorian *Environment Effects Act 1978* and Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.

1.2 Scope of assessment

The objectives of this investigation are to:

- Summarise biodiversity information for the project area from previous surveys detailed in the BAR.
- Conduct additional surveys of biodiversity values where necessary to fully assess the potential impact of the hydroponics project.
- Quantify potential impacts to biodiversity resulting from the hydroponics project.
- Review the implications of relevant biodiversity legislation and policy, including Victoria's Permitted Clearing of Native Vegetation: Biodiversity Assessment Guidelines.
- Quantify any offsets required as a result of proposed vegetation clearance, or clearance of habitat for threatened species.
- Provide recommendations and outline mitigation measures to reduce impacts on biodiversity in the project area.

1.3 Location of the project area

The project area is located approximately 45 km to the west of Melbourne within Green Fields Station (Figure 1). The project area is approximately 457 ha and is bounded to the south by Ballan Road and to the east by Mt Mary Road. This area includes ancillary project components such as service corridors and road access.

The project area is within the:

- Victorian Volcanic Plain Bioregion

- The Werribee and Moorabool River Basins
- Management area of Port Phillip and Westernport Catchment Management Authority (CMA)
- Shire of Wyndham.

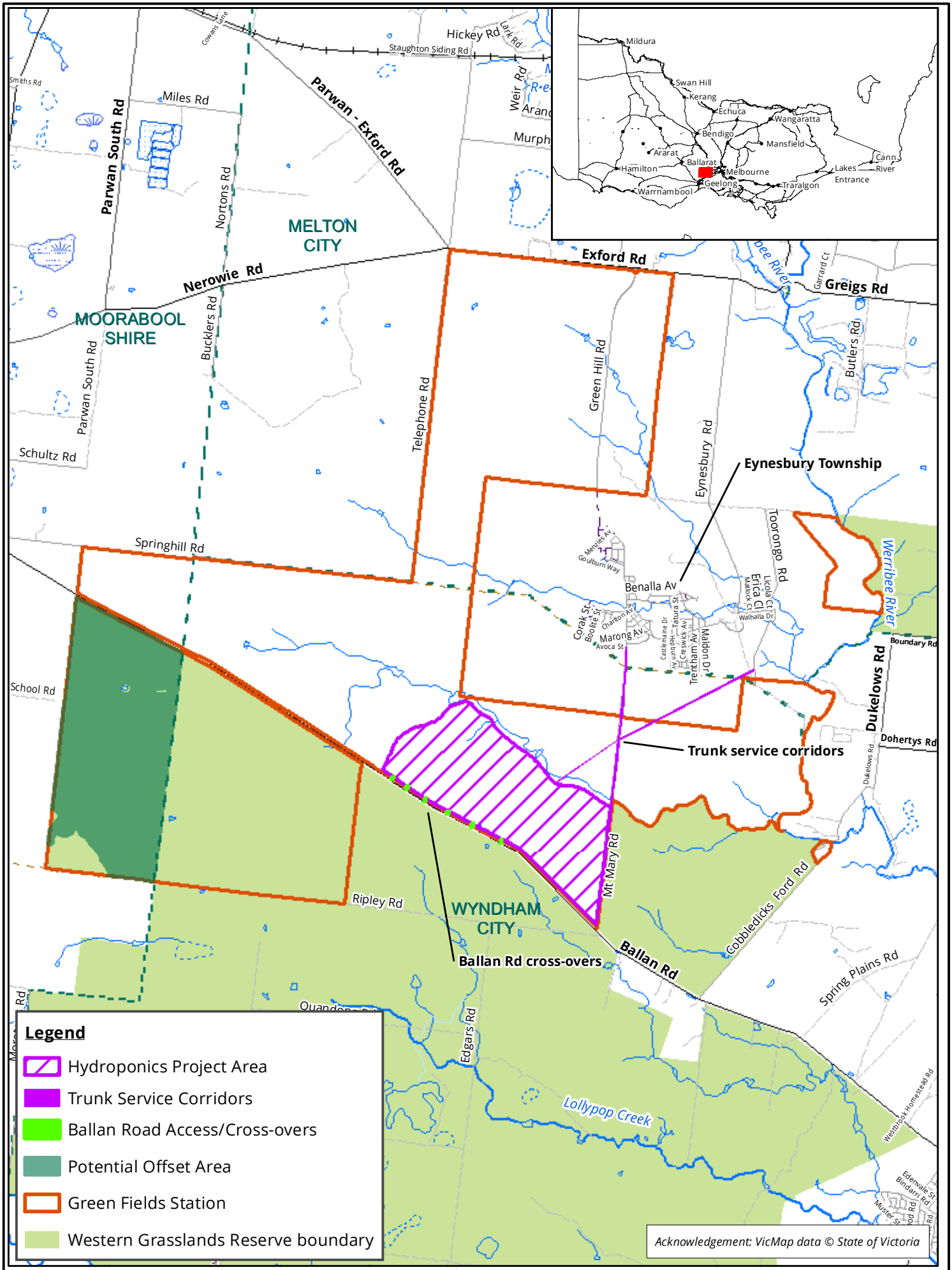

Figure 1: Location of the Green Fields Station Hydroponics Project Area

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Scale 1:70,000 @ A4, GDA 1994 MGA Zone 55

Biosis Pty Ltd
Ballarat, Brisbane, Canberra, Melbourne, Sydney, Wangaratta & Wollongong

2. Methods

2.1 Literature and database review

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

- Flora Information System which includes records from the Victorian Biodiversity Atlas 'VBA_FLORA25, FLORA100 & FLORA Restricted' August 2012 © The State of Victoria, Department of Environment and Primary Industries (DEPI). The contribution of the Royal Botanical Gardens Melbourne to the database is acknowledged.
- Victorian Biodiversity Atlas 'VBA_FAUNA25, FAUNA100 & FAUNA Restricted' August 2012 © The State of Victoria.
- DEPI Biodiversity Interactive Map (BIM) and Native Vegetation Information Management (NVIM).
- BirdLife Australia, the New Atlas of Australian Birds 1998-2012 (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).
- Melbourne Water Fish database (MWF)

The modelled 2005 distribution and 1750 EVCs (DEPI mapping of native vegetation present at these dates) within the project area and their bioregional conservation status was reviewed using Biodiversity Interactive Maps (www.depi.vic.gov.au). Other relevant spatial data on Biodiversity Interactive Maps was reviewed, including the Wetlands Spatial Database.

Other sources of biodiversity information consulted, where relevant, included:

- Actions for Biodiversity Conservation (threatened species)
- EPBC Act Significant Impact Guidelines
- Environmental Reporting Tool (ERT)
- National Recovery Plans
- Conservation Advices
- Species Profiles and Threats Database (SPRAT)
- DEPI Advisory Lists (DSE 2005a, 2009a, 2013)
- Conservation Status of Australian Fishes (ASFB 2010)
- A Census of the Vascular Plants of Victoria (Walsh and Stajsic 2007)
- Aerial photography
- Topographic maps.

In addition, reports relevant to the project area were reviewed, including Biosis Research (2000), Biosis Research (2010), GHD (2009), BL&A (2009) and KBR (2010).

2.2 Habitat Importance Models

As part of *Victoria's Permitted Clearing of Native Vegetation: Biodiversity Assessment Guidelines*, DEPI has produced models for Victoria describing the extent of habitat for each 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 2013).

Under the Guidelines, these models form the basis for determining the impact of potential native vegetation clearing on rare and threatened species. 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.

The full set of habitat importance models provided by DEPI was interrogated as part of this investigation to determine the extent of modelled habitat for rare or threatened species within the project area. Detailed offset calculations related to these models have not been undertaken at this stage of the project planning and will be finalised as part of the project's offset strategy.

2.3 Definitions of significance

2.3.1 Species and ecological communities

The significance of a species or community is determined by its listing as rare or threatened under Commonwealth or State legislation / policy. The sources used to categorise significance of species and communities in this report are summarised below in Table 1.

Table 1: Criteria for determining significance of species & ecological communities

Significance	
National	Listed as threatened (critically endangered, endangered, vulnerable or conservation dependent) under the *Environment Protection and Biodiversity Conservation Act 1999.*
State	Listed as threatened (critically endangered, endangered, vulnerable) or rare for flora species, in Victoria on a DEPI Advisory List (DSE 2005, 2013a) Listed as threatened under the *Flora and Fauna Guarantee Act 1988*.

2.3.2 NaturePrint areas

NaturePrint is an online instrument developed by DEPI that integrates information about biodiversity values, threatening processes and ecosystem function at the landscape scale. This information is analysed to identify areas that contribute most to protecting a range of biodiversity values and determines their relative contribution to biodiversity.

2.4 Likelihood of occurrence

The likelihood of occurrence is a broad categorisation used by Biosis to indicate the potential for a species to occur within the project area. It is based on expert opinion and implies the relative value of a site for a particular species.

Only those species listed under the EPBC Act or listed as threatened under the FFG Act (hereafter referred to as 'listed species') are assessed to determine their likelihood of occurrence. The habitat value for species

listed on the DEPI Advisory Lists is calculated by the Habitat Importance Modelling produced by DEPI (DEPI 2013a). Where DEPI Advisory list species are recorded in the project area this is noted in Appendix 1 (flora) and Appendix 2 (fauna).

The likelihood of listed species occurring within the project area is ranked as negligible, low, medium or high. The rationale for the rank assigned is provided for each species in Appendix 1 (flora) and Appendix 2 (fauna).

Species which have at least medium likelihood of occurrence are given further consideration in this report.

2.5 Field Surveys

2.5.1 General flora assessment

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

Victoria's Permitted Clearing of Native Vegetation: Biodiversity Assessment Guidelines classify native vegetation into two categories (DEPI 2013a):

- 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 cover is native plants.*
  - *An area with three or more indigenous canopy trees where the tree canopy cover is at least 20 percent.*

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 DEPI.

- 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.

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

The bulk of the survey work undertaken for the project was conducted during preparation of the BAR. General flora survey was undertaken on 22 February–19 March 2010, 8–11 March 2011, 10 May 2011 and 8–20 February 2013, and additional surveys were undertaken of the project's ancillary components on 13-14 May 2014. During these surveys the following was undertaken:

- Species lists were collected, including incidental records of threatened species.
- Native vegetation was mapped and a habitat hectare assessment was undertaken as per the DEPI Vegetation Quality Assessment Manual (DSE 2004).
- Locations of scattered trees were mapped.
- Locations of any threatened vegetation communities were mapped.

2.5.2 General fauna survey

The project area was investigated to determine fauna habitat values. These were determined, primarily, on the basis of the types and qualities of habitat(s) present in the project area. All species of fauna observed during the assessment were noted and active searching for fauna was undertaken. This included direct observation, searching under rocks and logs, examination of tracks and scats and identifying calls. Particular attention was given to searching for significant species and their habitats. The habitat values of the broader Green Fields Station were assessed in 2010, which incorporated an assessment of the proposed hydroponics precinct project area.

2.6 Targeted flora and fauna survey

Targeted surveys for significant flora and fauna (rare or threatened species) were tailored to identify significant species and their habitats within the project area. Surveys were conducted in areas of potentially suitable habitat for rare or threatened species recorded from the project area, or for species with records within 5 km that were considered likely to occur within the project area. Surveys were conducted in areas for which there was initially considered to be at least a medium likelihood of occurrence.

2.6.1 Targeted Flora Assessment

Targeted survey was conducted at the time of year when each species is considered to be most conspicuous. For most species this is during their flowering period. Table 2 below summarises the timing of targeted surveys. A full list of species for which targeted survey was conducted is provided in Appendix 1: Flora, Table A1.2.

Table 2: Targeted survey timing and survey type

Survey Dates	Target Species
September 2013 – November 2013	Spring flowering threatened species, Small Golden Moths orchid *Diuris basaltica*
August 2013	Spiny Rice-flower *Pimelea spinescens* subsp. *spinescens*
May 2013 – June 2013	Brittle Greenhood *Pterostylis truncata* survey
December 2010 – February 2011	Spring flowering species, Spiny Rice-flower and Brittle Greenhood

Ecological burns were undertaken in some areas in April 2013 to assist surveys for species such as Small Golden Moths orchid *Diuris basaltica* which rely on fire to stimulate flowering. Survey for Small Golden Moths orchid was conducted after the species was observed to be flowering at a reference sites at Ferrars Road and Clark Road. Targeted survey was conducted by qualified botanists using transects with five meter spacing.

Targeted flora assessment has not been undertaken in the Ballan Road Reserve.

2.6.2 Targeted fauna assessments

Targeted surveys for threatened species identified as having a medium or higher likelihood of occurrence in the project area were undertaken over the period 2013 – 2014. Targeted fauna assessments were not undertaken in the Ballan Road reserve. The following species were targeted:

Golden Sun Moth surveys were undertaken during the 2013 - 2014 flying seasons (December – January). Surveys were undertaken on suitable flying days (generally >20°C, clear, dry and still) where observations of a

reference site indicated that moths were flying in the local area. Surveys were conducted by qualified zoologists using survey transects at 50 m spacing on four separate occasions. Surveys were spaced at least one week apart.

Striped Legless Lizard targeted survey was undertaken by utilising survey grids of artificial shelter in the form of terracotta roof tiles. Roof tiles were deployed in survey grids consisting of five transects of 10 tiles spaced 5 m apart. Roof tile survey grids were established during winter 2013, at least one month prior to the commencement of survey/checks, in order to allow animals to become accustomed to utilising the roof tiles as shelter sites. Each roof tile survey grid was checked a total of nine times between September and December 2013.

Plains-wanderer nocturnal targeted surveys were undertaken in areas of suitable grassland habitat within the project area in 2014. Suitable habitat was identified and was defined using the Plains-wanderer Habitat Management Guide (NPWS 2002). Surveys were carried out under calm conditions and involved spotlighting along transects through areas of potentially suitable habitat. Transects were spaced at approximately 15 m and were carried out on foot by teams of two zoologists. Nocturnal surveys were also trialled using a thermal-imaging camera to detect Plains Wanderer.

2.6.3 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 the Department of Environment and Primary Industries under the *Wildlife Act 1975, Flora and Fauna Guarantee Act 1988* and *National Parks Act 1975* (Permit number 10006240, expiry date 9 May 2015).
- Approvals 04.12 and 14.12 from the Wildlife and Small Institutions Animal Ethics Committee.
- Permit RP1071 issued by the Department of Environment and Primary Industries (Fisheries Victoria) under the *Fisheries Act 1995.*

2.7 Qualifications

Ecological surveys and assessments provide a sampling of the flora and fauna at a given time and season. It is possible, indeed highly probable, that some species are not detected during survey. Some plant species are dormant and/or lack flowering or fruiting material at certain times of year, making detection and/or identification difficult. Some fauna species, particularly reptiles and frogs, are less active during the cooler months. Some species that are more cryptic than others and/or present in very low abundance may be difficult to detect without extensive survey effort over a wider area and longer period of time. In addition, migratory fauna may be seasonally absent.

This is particularly relevant to the grassy ecosystems which can change dramatically from year to year as a result of seasonal conditions or land management influences. In many cases these factors do not present a significant limitation to assessing the overall biodiversity values of a site.

The ecological survey effort has been comprehensive in the Green Fields Station project area over the past three years. Surveys have been undertaken at the times of year that will maximise their effectiveness in detecting target species or communities. Notwithstanding this, there is a low probability that small populations of cryptic flora and fauna may have remained undetected. Overall, the results presented in this report can be relied upon to provide an accurate understanding of the biodiversity values that persist in the project area and that are likely to be impacted by any future development or land use change.

An exception to this is the Ballan Road Reserve. To date a thorough targeted flora and fauna survey has not been undertaken for the Ballan Road Reserve. This area is known to contain a significant population of Spiny Rice-flower (estimated to be over 100 plants) and is likely to contain additional threatened species. Only incidental observations of threatened species have been mapped in the road reserve and it is likely that additional plants exist in the road reserve.

2.8 Legislation and policy

The following key pieces of biodiversity legislation and policy were reviewed and the implications for the project assessed:

- *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)
- *Flora & Fauna Guarantee Act 1988* (FFG Act)
- *Environmental Effects Act 1978*
- *Catchment and Land Protection Act 1994* (CaLP Act)
- *Planning and Environment Act 1987* – specifically Clause 52.17, Overlays and Clause 66.02 of the local planning scheme.
- Permitted clearing of native vegetation: Biodiversity assessment guidelines (DEPI 2013)
- *Wildlife Act 1975* and associated Regulations
- *Water Act 1989*
- *Environment Protection Act 1970*: State Environmental Protection Policy (Waters of Victoria) 2003
- Port Phillip and Westernport Native Vegetation Plan (PPWCMA 2006)
- Port Phillip and Westernport Regional Catchment Strategy (PPWCMA, 2004)
- Port Phillip and Western Port Regional River Health Strategy, Western Port Catchment, Melbourne Water, Melbourne (PPWCMA, Melbourne Water 2007)
- Moorabool, Melton Shire and Wyndham City Local Planning Schemes.

2.9 Mapping

JAC Land supplied Biosis with most recent master plan of the proposed hydroponics precinct and ancillary components (version six [6]). Development impacts on biodiversity values were calculated using the footprint of the latest master plan.

Mapping was conducted using a combination of differential GPS and 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 for hand held units and sub-metre for DGPS) and dependent on the limitations of aerial photo rectification and registration.

Mapping has been produced using a Geographic Information System (GIS).

3. Results

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

Species recorded during the flora and fauna assessment are listed in Appendix 1 (flora) and Appendix 2 (fauna). Unless of particular note, these species are not discussed further.

Those species recorded or predicted to occur in the local area are also provided in those appendices, along with an assessment of the likelihood of the species occurring within the project area.

3.1 Flora

The project area supports large tracts of native grassland vegetation (Figure 2). Extensive areas of Plains Grassland cover much of the site, with smaller scattered stony-knolls, and patches of wetland in the lower lying areas. A number of scattered trees exist outside patches of vegetation.

Sections of the project area have been previously cultivated and areas of remnant grassland vegetation typically exist as discrete patches surrounded by these cultivated areas. Cultivated areas are dominated largely by introduced species, with adventitious native species, interspersed.

The project area has had a long history of grazing, and this has likely led to substantial modification of the vegetation, through selective grazing of palatable species and introductions of weed species.

A list of flora species recorded during surveys of the broader Green Fields Station area is included in Appendix 1: Flora This list may contain species that were not located within the project area.

3.1.1 Ecological vegetation classes

Classification of native vegetation in Victoria is based on EVCs. An EVC contains one or more floristic (plant) communities, and represents a grouping of broadly similar environments. Definitions of EVCs and benchmarks are provided by DEPI: (http://www.depi.vic.gov.au).

The current assessment indicates substantial areas of native vegetation remain within the project area. Based on the current assessment the site supports the following four EVCs (Figure 2):

- *Low-rainfall* Plains Grassland (EVC 132_63)
- Stony Knoll Shrubland (EVC 649)
- Plains Woodland (EVC 803)
- Plains Grassy Wetland (EVC 125).

The following general descriptions for the four EVCs recorded in the project area are based on data collected during this assessment.

***Low-rainfall* Plains Grassland (EVC 132_63)**

A total of 159.38 ha of *Low-rainfall* Plains Grassland occurs within the project area. This EVC occurs on cracking basalt soils in areas that receive less than 500 mm annual rainfall. The vegetation present commonly includes native grass species such as Kneed Spear-grass *Austrostipa bigeniculata*, Rough Spear-grass *Austrostipa scabra*, Bristly Wallaby-grass *Rytidosperma setacea*, Lobed Wallaby-grass *Rytidosperma auriculata*, Brown-back Wallaby-grass *Rytidosperma duttoniana*, Windmill Grass *Chloris truncata* and Kangaroo-grass *Themeda triandra*. Other species present include Blushing Bindweed *Convolvulus angustissimus*, Grassland

Wood-sorrel *Oxalis perennans*, Flat Spurge *Chamaesyce drummondii*, Wingless Blue-bush *Maireana enchylaenoides* and Berry Saltbush *Atriplex semibaccata*.

Introduced weed species commonly found in this EVC include Galenia *Galenia pubescens* var. *pubescens*, Artichoke Thistle *Cynara cardunculus*, Lesser Canary-grass *Phalaris minor*, Sticky Ground-*cherry Physalis viscosa* and scattered infestations of Serrated Tussock *Nassella trichotoma* and Couch *Cynodon dactylon* var. *dactylon*.

Low-rainfall Plains Grassland is Endangered within the Victorian Volcanic Plain bioregion.

Plate 1: Spear-grass dominated *Low-rainfall* Plains Grassland

Stony Knoll Shrubland (EVC 649)

A total of 0.98 ha of Stony Knoll Shrubland occurs within the project area. Stony Knoll Shrubland within the area is associated with rocky rises and typically contains a depleted shrub layer of scattered Hedge Wattle *Acacia paradoxa* and Tree Violet *Melicytus dentatus*. The ground layer includes indigenous grasses and other herbaceous species such as Kangaroo Grass, Weeping Grass *Microlaena stipoides*, Slender Wallaby-grass *Rytidosperma racemosa*, Spear Grass, Wattle Mat-rush *Lomandra filiformis* and Kidney-weed *Dichondra repens*.

Common weed species include African Box-thorn *Lycium ferocissimum*, Horehound *Marrubium vulgare*, Serrated Tussock and Galenia.

Stony Knoll Shrubland is Endangered within the Victorian Volcanic Plain bioregion.

Plains Woodland (EVC 803)

A total of 0.17 ha of Plains Woodland occurs within the project area. Plains Woodland within the project area was typically restricted to remnant patches of Buloke *Allocasuarina luehmannii*. Mistletoes are frequent, including Box Mistletoe *Amyema miquelii*. Nodding Saltbush, Ruby Saltbush *Enchylaena tomentosa* var. *tomentosa*, Clammy Goosefoot *Chenopodium pumilio*, Bristly Wallaby-grass and spear grasses *Austrostipa* spp.

are common elements of the understorey. Less frequently observed species include Knob Sedge *Carex inversa*, Wattle Matt-rush *Lomandra filiformis*, Wingless Bluebush *Maireana enchylaenoides* and Bronze Bluebell *Wahlenbergia luteola*.

Typical weeds include African Box-thorn, Fat Hen *Chenopodium album*, Sowbane *Chenopodium murale*, Galenia and Mallow of Nice *Malva nicaeensis*.

Plains Woodland is Endangered within the Victorian Volcanic Plain bioregion.

Plains Grassy Wetland

A total of 0.54 ha of Plains Grassy Wetland occurs within the project area. This EVC occurs on the heavy black to grey clays found in swampy drainage lines and seasonally waterlogged wet depressions surrounded by Plains Grassland.

The ground cover is dominated by grasses, small sedges and in relatively intact examples, forbs. Plains Grassy Wetland within the project area was typically dry at the time of the current assessment. Indigenous species recorded include Common Nardoo *Marsilea drummondii*, Varied Raspwort, Poison Lobelia *Lobelia pratioides*, Swamp Goodenia *Goodenia humilis*, Lesser Joyweed *Alternanthera denticulata*, Common Swamp Wallaby-grass *Amphibromus nervosus*, Common Woodruff *Asperula conferta*, Pale Spike-sedge *Eleocharis pallens*, Flat Spurge and wallaby-grasses.

Weed species commonly occurring within Plains Grassy Wetland include Spear Thistle *Cirsium vulgare*, Artichoke Thistle and Cane Needle-grass *Nassella hyalina*.

Plains Grassy Wetland is Endangered within the Victorian Volcanic Plain bioregion.

3.1.2 Rare and threatened species

One species of national significance, Spiny Rice-flower *Pimelea spinescens* subsp. *spinescens* was recorded from the project area during the current assessment (Figure 2). Spiny Rice-flower plants were found in two habitat zones adjacent to Ballan Road, within the Mt Mary Road reserve, and a significant population was detected within the Ballan Road Reserve (Figure 2). Note that the Ballan Road reserve has not been extensively surveyed to date and it is likely that more plants exist in this high quality area of grassland than is shown in (Figure 2).

Three state listed species were located within the project area: Wimmera Woodruff *Asperula wimmerana*, Arching Flax-lily *Dianella* spp. aff. *longifolia* (Benambra) and Buloke *Allocasuarina luehmannii*.

DEPI's habitat importance models for the project area show modelled habitat for 18 species listed in Table 3. The areas of modelled habitat are shown in Figure 4.

Table 3: Summary of rare or threatened flora species' habitats modelled in the project area under DEPI's Habitat Importance Models.

Common name	Species name	Typical habitat
Austral Crane's-bill	*Geranium solanderi* var. *solanderi* s.s.	Plains Grassland
Buloke Mistletoe	*Amyema linophylla* subsp. *orientale*	Buloke woodland
Clover Glycine	*Glycine latrobeana*	Plains Grassland
Heath Spear-grass	*Austrostipa exilis*	Plains Grassland
Large-headed Fireweed	*Senecio macrocarpus*	Plains Grassland
Matted Flax-lily	*Dianella amoena*	Plains Grassland / Plains Grassy Woodland
Pale Swamp Everlasting	*Coronidium scorpioides* 'aff. *rutidolepis* (Lowland Swamps)' variant	Plains Grassy Wetland
Purple Blown-grass	*Lachnagrostis punicea* subsp. *punicea*	Plains Grassland
Rosemary Grevillea	*Grevillea rosmarinifolia* subsp. *rosmarinifolia*	Plains Woodland
Rye Beetle-grass	*Tripogon loliiformis*	Plains Grassland
Small Milkwort	*Comesperma polygaloides*	Plains Grassland and Plains Grassy Woodland
Small Scurf-pea	*Cullen parvum*	Plains Grassland / Plains Grassy Woodland
Snowy Mint-bush	*Prostanthera nivea* var. *nivea*	Stony Knoll Shrubland
Spiny Rice-flower	*Pimelea spinescens*	Plains Grassland
Spiny Rice-flower	*Pimelea spinescens* subsp. *spinescens*	Plains Grassland
Sticky Wattle	*Acacia howittii*	Typical moist forest species. Widely planted outside range
Swamp Sheoak	*Casuarina obesa*	Wetland
Tough Scurf-pea	*Cullen tenax*	Plains Grassland / Plains Grassy Wetland

3.1.3 Significant ecological communities

A number of national and state listed threatened ecological communities were identified within the project area. These are described in detail below.

Nationally significant, EPBC listed ecological communities

Natural Temperate Grassland of the Victorian Volcanic Plain

Extensive areas of the Critically Endangered Natural Temperate Grassland of the Victorian Volcanic Plain community were identified within the project area (Figure 2, Plate 2).

The Australian Government Policy Statement 3.8 (DEH 2008) states that the listed ecological community Natural Temperate Grassland of the Victorian Volcanic Plain follows closely the floristics of Plains Grassland (EVC 132). Within the project area, areas of Plains Grassland meeting the criteria of the Natural Temperate Grassland of the Victorian Volcanic Plain community are characterised by a dominance (>50% of the total vegetation cover) of indigenous species, with tussock grasses providing a common element, including wallaby grasses, spear grasses and/or Kangaroo Grass. Weed species provide <50% of the total vegetation cover.

Plate 2: High quality *Natural Temperate Grassland of the Victorian Volcanic Plain*

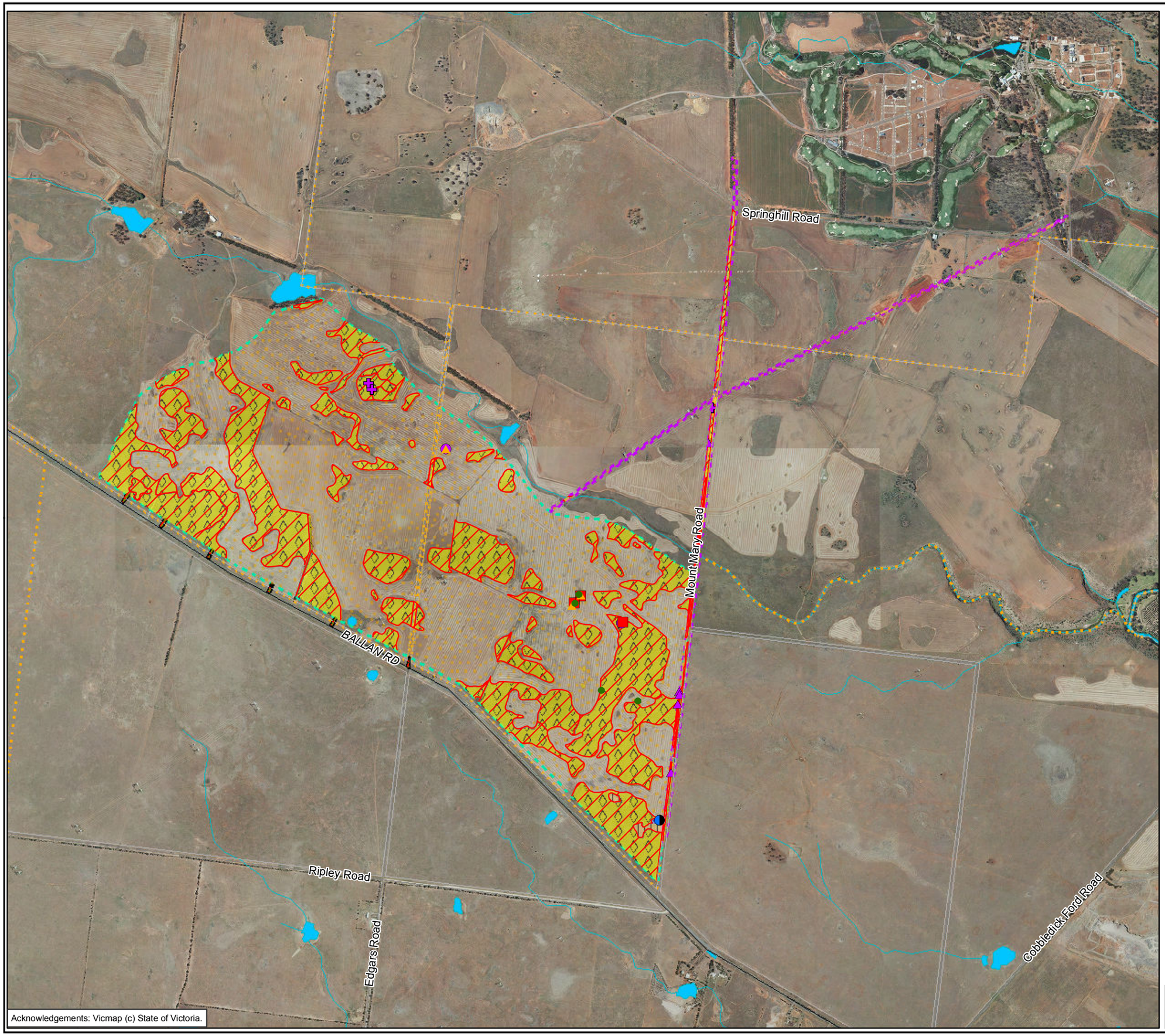
State significant, FFG listed communities

Western (Basalt) Plains Grassland Community

All areas of mapped Plains Grassland (EVC 132_63) also correspond to the state significant FFG listed Western (Basalt) Plains Grassland community (Figure 2). A description of this community (i.e. Plains Grassland) within the project area is provided in Section 3.1.1 above.

Grey Box – Buloke Grassy Woodland Community

All areas of mapped Plains Woodland (EVC 803) also correspond to the state significant FFG listed Grey Box-Buloke Grassy Woodland Community (Figure 2). A description of this community (i.e. Plains Woodland) within the project area is provided in Section 3.1.1 above.



Legend

Green Fields Station

Hydroponics project area

Hydroponics area

Ballan Road Access

Service corridors

National Significance

Spiny Rice-flower

State Significance

Arching Flax-lily

Buloke

Wimmera Woodruff

EPBC listed Ecological Communities

Natural Temperate Grassland of the Victorian Volcanic Plain

Scattered Trees

Very Large Old Tree

Large Old Tree

Medium Old Tree

Ecological Vegetation Classes

125 Plains Grassy Wetland

132_63 Low-rainfall Plains Grassland

649 Stony Knoll Shrubland

803 Plains Woodland

Other Vegetation

Modified Native Vegetation

NB: For clarity only flora values within the impact area are displayed in the map. Flora values exist outside of the displayed project area

Figure 2: Flora values within the study area

0 200 400 600 800 1,000

Metres

Scale: 1:20,000 @ A3

Coordinate System: GDA 1994 MGA Zone 55

Biosis Pty Ltd

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

N

Matter: 16089,
Date: 21 May 2014,
Checked by: MJAL, Drawn by: JMS, Last edited by: jshepherd
Location:P:\16000s\16089 Eynesbury Re-referral T+C\Mapping\16089_F2_PermitArea(flora)_20140521