



# Flora, Fauna and Habitat Hectare Assessment of Ajax Road, Altona

Prepared for Axxcel Management Services

23 November 2012

## Biosis offices

### AUSTRALIAN CAPITAL TERRITORY

#### Canberra

Unit 16 / 2 Yallourn Street  
Fyshwick ACT 2609

Phone: (02) 6228 1599  
Fax: (02) 6280 8752  
Email: [canberra@biosis.com.au](mailto:canberra@biosis.com.au)

### NEW SOUTH WALES

#### Sydney

18–20 Mandible Street  
Alexandria NSW 2015

Phone: (02) 9690 2777  
Fax: (02) 9690 2577  
Email: [sydney@biosis.com.au](mailto:sydney@biosis.com.au)

#### Wollongong

8 Tate Street  
Wollongong NSW 2500

Phone: (02) 4229 5222  
Fax: (02) 4229 5500  
Email: [wollongong@biosis.com.au](mailto:wollongong@biosis.com.au)

### QUEENSLAND

#### Brisbane

Suite 4 First Floor, 72 Wickham Street  
Fortitude Valley QLD 4006

Phone: (07) 3831 7400  
Fax: (07) 3831 7411  
Email: [brisbane@biosis.com.au](mailto:brisbane@biosis.com.au)

### VICTORIA

#### Ballarat

506 Macarthur Street  
Ballarat VIC 3350

Phone: (03) 5331 7000  
Fax: (03) 5331 7033  
Email: [ballarat@biosis.com.au](mailto:ballarat@biosis.com.au)

#### Melbourne (Head Office)

38 Bertie Street  
Port Melbourne VIC 3207

Phone: (03) 9646 9499  
Fax: (03) 9646 9242  
Email: [melbourne@biosis.com.au](mailto:melbourne@biosis.com.au)

#### Wangaratta

26a Reid Street (PO Box 943)  
Wangaratta VIC 3677

Phone: (03) 5721 9453  
Fax: (03) 5721 9454  
Email: [wangaratta@biosis.com.au](mailto:wangaratta@biosis.com.au)

Report to: Axxcel Management Services

Prepared by: Steve Mueck  
Clare McCutcheon  
Sally Koehler

Biosis matter no.: 15746, 12374 & 12238

Version/date	Internal review by	Date sent to client
Draft version 01	MDD	08/03/11
Final version 01	SGM	18/04/11
Final version 02	SGM	29/11/12

File name: 15746.AjaxRoad.FFHHa.DFT.23112012.docx

Citation: Biosis (2012). Ajax Road, Altona: Flora, fauna and habitat hectare assessment. Report for Axxcel Management Services. Authors: S Mueck, C McCutcheon & S Koehler, Biosis Pty Ltd, Melbourne. Project No. 15746.

## Acknowledgements

Biosis Research acknowledges the contribution of the following people and organisations in undertaking this study:

- Axxcel Management Services: Nigel Sharp
- Department of Sustainability & Environment for access to the Victorian Biodiversity Atlas

The following Biosis Research staff were involved in this project:

- Stephen Page & Paul Young for mapping
- Matt Dell for report review

© Biosis Pty Ltd

This document is and shall remain the property of Biosis Pty Ltd. The document may only be used for the purposes for which it was commissioned and in accordance with the Terms of the Engagement for the commission. Unauthorised use of this document in any form whatsoever is prohibited.

Disclaimer:

Biosis Pty Ltd has completed this assessment in accordance with the relevant federal, state and local legislation and current industry best practice. The company accepts no liability for any damages or loss incurred as a result of reliance placed upon the report content or for any purpose other than that for which it was intended.

## Contents

<b>1. Introduction .....</b>	<b>1</b>
1.1 Project background .....	1
1.2 Scope of assessment .....	1
1.3 Location of the study area .....	1
<b>2. Methods .....</b>	<b>2</b>
2.1 Literature and database review.....	2
2.1.1 Definitions of significance .....	2
2.1.2 Likelihood of occurrence .....	2
2.2 Site investigation.....	3
2.2.1 Flora assessment.....	3
2.2.2 Fauna assessment .....	4
2.3 Legislation and policy.....	5
2.4 Victoria's Native Vegetation Management Framework.....	6
2.5 Mapping.....	6
<b>3. Results.....</b>	<b>7</b>
3.1 Site Context.....	7
3.2 Limitations.....	7
3.3 Flora.....	7
3.3.1 Ecological Vegetation Classes .....	8
3.3.2 Species.....	9
3.4 Fauna.....	9
3.4.1 Habitats .....	9
3.4.2 Species.....	13
3.5 Further survey recommendations .....	15
3.6 Summary of biodiversity values of the site.....	15
<b>4. Biodiversity Legislation and Government Policy .....</b>	<b>16</b>
4.1 Commonwealth .....	16
4.1.1 Environment Protection and Biodiversity Conservation Act 1999 .....	16
4.2 State.....	16
4.2.1 Flora and Fauna Guarantee Act 1988 (FFG Act).....	16
4.2.2 Planning and Environment Act 1987 (incl. Planning Schemes).....	17
4.2.3 Native Vegetation Management Framework.....	18
4.2.4 Wildlife Act 1975 and associated Regulations.....	18
4.2.5 Water Act 1989.....	19
4.2.6 Environment Protection Act 1970: State Environmental Protection Policy (Waters of Victoria) 2003..	19
4.2.7 Regional Catchment Strategy and River Health Strategy .....	19

<b>5. Victoria’s Native Vegetation Management Framework (Net Gain)</b> .....	<b>20</b>
5.1 Quantifying native vegetation on site .....	20
5.1.1 Patches of native vegetation.....	20
5.2 Offsets available on site .....	22
5.2.1 Patches of native vegetation.....	22
5.3 Summary of net gain offsets .....	23
<b>6. Recommendations to Minimise Impacts</b> .....	<b>24</b>
<b>Appendices</b> .....	<b>27</b>
A1.1 Species and Communities .....	28
A1.2 Sites.....	29
<b>Appendix 6: DSE Net Gain Calculator Output</b> .....	<b>61</b>
<b>Glossary and Abbreviations</b> .....	<b>67</b>
<b>Figures</b> .....	<b>71</b>

### List of Figures

Figure 1 Location of Lot H, Ajax Road, Altona, Victoria .....	72
Figure 2 Ecological features within Lot H, Ajax Road, Altona.....	73
Figure 3: Golden Sun Moth targeted survey effort, Ajax Road, Altona.....	74

### List of Tables

Table 1: Likelihood for significant species and examples of criteria .....	3
Table 2: Evaluation best/remaining habitat for rare or threatened flora species. ....	11
Table 3: Assessment of the project against the EPBC Act.....	17
Table 4: Quantification and significance of native vegetation patches within the study area.....	21
Table 5: Summary of potential offsets available from south of the Altona railway .....	22

## Summary

Biosis Research Pty. Ltd. was commissioned by Axxcel Management Services to undertake a flora, fauna and habitat hectare assessment of land at Lot H, Ajax Road, Altona. The land is proposed for a future development within this industrial estate.

The site is located approximately 15 km west south west of the Melbourne CBD in Altona, south of the Werribee Rail line. It covers 73.66 ha and includes most of Lot H (78.05 ha) of the Elfield Industrial Estate. It is currently zoned Special Use Zone 4 (SUZ4) which is designated for industrial development.

The site supports substantial areas of remnant native vegetation although areas in close proximity to the existing road network have generally been heavily disturbed and support largely exotic vegetation. The south western corner of the site is subject to inundation and supports brackish wetlands associated with the estuary of Laverton Creek.

### Flora and Ecological Vegetation Classes

The study area includes a matrix of remnant native vegetation and disturbed industrial land dominated by exotic species. The areas of native vegetation are classified into three ecological vegetation classes including Plains Grassland, Plains Grassy Wetland and Brackish Wetland.

A total of 109 indigenous and 80 introduced plant species was recorded from the site. Previous surveys have recorded an additional 29 native and 22 weed species.

Systematic flora surveys of the study area identified 489 individuals of Spiny Rice-flower. This places this population within the largest 10% of known populations for this species. These surveys also identified three individuals of Arching Flax-lily *Dianella* sp. aff. *longifolia* (Benambra) and three populations of Pale Spike-sedge *Eleocharis pallens*.

Two other species of State conservation significance including Creeping Rush *Juncus revolutus* and Salt Lawrenceia *Lawrencia spicata*, are recorded by the existing data from the area of Brackish Wetland in the south west of the study area.

No other significant flora species were detected by the targeted surveys. Other threatened flora may be present although some, like Small Golden Moths *Diuris basaltica*, would probably only be detectable in the first spring after a fire.

### Fauna

The site provides potential habitat for a small number of national and state significant fauna species, the most significant being the EPBC listed Striped Legless Lizard *Delma impar* and Golden Sun Moth *Synemon plana*. There is a record of Golden Sun Moth from within 100 metres of the study area on Ajax Road. Targeted survey between December 2010 and January 2011 did not detect the species; however, a population may still be present.

Habitat for the state significant Altona Skipper Butterfly was identified within the area of Brackish Wetland in the south western corner of Lot H. Marginal habitat for the nationally significant Orange-bellied Parrot was also identified within this area.

Latham's Snipe (listed as migratory under the EPBC Act) was recorded in the study area. Areas of Plains Grassy Wetland and Brackish Wetland within the study area provides potential habitat for this species.

### Vegetation Condition Assessment (Habitat Hectares)

A total of nine habitat zones were identified. Each habitat zone is assigned an overall habitat score, which is multiplied by its area to provide the number of habitat hectares present.

The study area contains a total of 34.9 hectares of native vegetation, which comprises 20.1 habitat hectares (hha). The habitat score for the habitat zones ranges from 0.39 to 0.72. Habitat Zones 9 and 10 represent the most intact areas of native vegetation. The vegetation is predominantly of Very High conservation significance (VHCS) but a small area of High conservation significance (HCS) is also present (HZ 12).

Clearing all of the native vegetation within the study area would result in an offset prescription of over 40 hha, most of which is of VHCS. Retaining all of the native vegetation south of the Altona Railway Line would result in an offset prescription of 15.7 hha, most of which is of VHCS.

### Government Legislation and Policy

See table at end of summary.

### Offset Potential

A total offset of 6.56 hha could be generated through management of vegetation south of the Altona Railway Line and its protection under a Section 173 agreement (under the *Planning and Environment Act 1987* or equivalent). This increases to an offset potential of 7.79 hha if the land was transferred to a conservation reserve managed by a government agency.

Based on the like-for-like requirements of the Framework utilising the offsets available from south of the Altona Railway Line (presuming a transfer to a government authority and management with conservation as one of the management objectives), this reserve would supply an excess gain of 2.67 hha of VHCS Brackish Wetland and have a deficit of 0.04 hha of VHCS Plains Grassy Wetland and 10.58 hha of VHCS Plains Grassland.

The proponent is responsible for protection and the first 10 years of management of offset sites. An Offset Management Plan should be developed for any Net Gain offset sites.

### Summary of legislative requirements for development within the study area

Legislation / Policy	Relevant Ecological Feature on site	Permit / Approval Required	Other Requirements/ Comments
<b>EPBC Act</b>	Threatened species (Spiny Rice-flower, Golden Sun Moth, Latham Snipe) recorded on site.	Referral recommended prior to any development.	Threatened species surveys completed.
	Threatened ecological community (Natural Temperate Grassland of the Victorian Volcanic Plain) present.	Referral recommended prior to any development.	Threatened community surveys completed.
<b>FFG Act</b>		Protected Flora Permit not required	Site is private land.
<b>Planning &amp; Environment Act (Hobsons Bay Council Planning Scheme)</b>	Native vegetation, including patches of native vegetation, present.	Planning permit required, including permission to lop or remove native vegetation.	Comply with 3 step approach to Net Gain. May require external provision of Net Gain offsets.
<b>Victoria's Native Vegetation Management Framework</b>	Site supports 34.9 ha of remnant native vegetation assessable under the Framework. Much of this vegetation is of Very High Conservation Significance	DSE would likely be a referral authority under any development proposal	Threatened species surveys completed.

# 1. Introduction

---

## 1.1 Project background

Biosis Pty Ltd was commissioned by Axxcel Management Services to undertake a flora, fauna and habitat hectare assessment of the majority of Lot H, Ajax Road, Altona. The land is proposed for a future development within this industrial estate.

A due diligence level assessment of the site has previously been conducted for Axxcel Management Services (Biosis Research 2010).

## 1.2 Scope of assessment

The objectives of this investigation are to:

- Undertake a field inspection of the flora and fauna values on site;
- Describe the vascular flora (ferns, conifers, flowering plants) and vertebrate fauna (birds, mammals, reptiles and frogs,);
- Map native vegetation and other relevant habitat features;
- Conduct a vegetation quality assessment (habitat hectare assessment);
- Review the implications of relevant biodiversity legislation and policy, including Net Gain policy; and
- Identify the extent of threatened flora populations within the site through systematic survey.

## 1.3 Location of the study area

The site is located approximately 15 km west south west of the Melbourne CBD in Altona, south of the Werribee Rail line (Figure 1).

The site covers 73.66 ha and includes about 95% of Lot H (78.05 ha) of the Elfield Industrial Estate. It is currently zoned Special Use Zone 4 (SUZ4) which is designated for industrial development.

The site is bounded to the north by the Werribee rail line and is traversed by the Altona rail line. The western boundary of the site abuts Kayes Drain while the eastern boundary includes an unnamed road linking Ajax Road and Slough Road, the southern boundary of Chester Road, and the western boundary of Galvin Street.

The site supports substantial areas of remnant native vegetation although areas in close proximity to the existing road network have generally been heavily disturbed and support largely exotic vegetation. The south western corner of the site is subject to inundation and supports brackish wetlands associated with the estuary of Laverton Creek.

The study area is within the:

- Victorian Volcanic Plain Bioregion
- Werribee River Basin
- Port Phillip and Westernport CMA
- City of Hobsons Bay

## 2. Methods

---

### 2.1 Literature and database review

In order to provide a context for the study site, information about the flora of the local area was obtained from relevant databases. Database searches encompassed an area within 5 kilometres of the study site. Records from the following databases were collated and reviewed:

- Victorian Biodiversity Atlas 'VBA\_FLORA25, FLORA100 & FLORARestricted' August 2010 © The State of Victoria, Department of Sustainability and Environment.
- Victorian Biodiversity Atlas 'VBA\_FAUNA25, FAUNA100 & FAUNARestricted' August 2010 © The State of Victoria, Department of Sustainability and Environment.
- EPBC Act DSEWPC database, accessed using the Protected Matters Search Tool (PMST).

Other sources of biodiversity information:

- DSE Biosites Register.
- DSE Biodiversity Interactive Map 2.0 (Modelled 1750 and 2005 EVCs).
- A Census of the Vascular Plants of Victoria (Walsh and Stajsic, 2007).

The site has been subject to ecological assessments in the past including Frood et al. (1997), Biosis Research (2006) and Biosis Research (2010). Relevant information from these reports was also reviewed and included as appropriate.

#### 2.1.1 Definitions of significance

Significance of a species or community is determined relative to the scale at which it is considered. The sources used to categorise significance of species and communities in this report are summarised in Appendix 1.

#### 2.1.2 Likelihood of occurrence

Database searches provide lists of species from the local area that have potential to occur on the site. Where database records of state and nationally significant species exist from the local area, but these species are not identified during field survey, it is necessary to consider the likelihood that they occur on the site. The DSEWPC PMST may nominate EPBC Act-listed species and communities where the site lies within their broad geographic range.

Likelihood of particular species occurring at a site is determined by assessing factors including the quality of habitat present for the species.

The likelihood of occurrence is a broad categorisation used by Biosis Research to indicate the potential for a species to occur within the site. It is based on expert opinion, using general categories such as those provided in Table 1 below. The determination of likelihood is expressed as negligible, low, medium or high. If the species has been identified on site during our assessment or by other confirmed records then it is documented here as having been 'recorded'. Information relating to these species is presented in the results and discussion section of the report (Section 3.3.2 and Table 2).



**Table 1: Likelihood for significant species and examples of criteria**

Likelihood of occurrence	Potential criteria
<b>Recorded</b>	<ul style="list-style-type: none"> <li>Species recorded on site during current or previous assessment</li> <li>Aquatic species recorded from connected waterbodies in close proximity to the site during current or previous assessment.</li> </ul>
<b>High</b>	<ul style="list-style-type: none"> <li>Sufficient good quality habitat is present on site</li> <li>Sufficient good quality habitat is present in connected waterbodies in close proximity to the site.</li> <li>Site is within species natural distributional range (if known).</li> <li>Species has been recorded within 5 km or from the relevant catchment/basin since 1980.</li> </ul>
<b>Medium</b>	<ul style="list-style-type: none"> <li>Records of terrestrial species within 5 km of the site or of aquatic species in the relevant basin/neighbouring basin but habitat limited in its capacity to support the species due to extent, quality, or isolation.</li> </ul>
<b>Low</b>	<ul style="list-style-type: none"> <li>No records within 5 km of the site or for aquatic species, the relevant basin/neighbouring basin, since 1980.</li> <li>Substantial loss of habitat since any previous record(s).</li> </ul>
<b>Negligible</b>	<ul style="list-style-type: none"> <li>Habitat not present on site</li> <li>Habitat for aquatic species not present in connected waterbodies in close proximity to the site.</li> <li>Habitat present but sufficient targeted survey has been conducted at an optimal time of year and species wasn't recorded.</li> </ul>

## 2.2 Site investigation

The flora and habitat hectare assessments were undertaken on 12 October 2010, 5 January and 2 March 2011.

Targeted species searches were conducted between 11 January and 2 March 2011.

The fauna habitat assessment was undertaken on 31 August 2010. Targeted survey for Golden Sun Moth was conducted between 30 December 2010 and 25 January 2011.

### 2.2.1 Flora assessment

#### Current survey

The properties were traversed on foot and 15 flora species checklists lists were collected to assist in the determination of understorey and weeds components of the habitat scores. These were collated into a single species list of vascular plants for the study area (#T2514100). Additional species noted during targeted searches were also noted and added to the cumulative site list (Appendix 2). Vascular plants include all flowering plants, conifers, ferns and fern allies.

Where some material could not be fully identified in the field, specimens were collected and examined in the laboratory to verify or check determinations made in the field. Keys and descriptions in Walsh and Entwisle (1994, 1996 and 1999) were used in verifying the identification of samples unless more up-to-date published taxonomy was available. Planted species have not been recorded unless they are naturalised.

This data will be submitted to DSE for incorporation into their VBA.

The general condition of native vegetation was observed as well as the effects of current seasonal conditions. Notes were made on specific issues such as noxious weed infestations, evidence of current land-use impacts and the regeneration capacity of the vegetation.

Biosis Research (2010) noted populations of two threatened flora species including Spiny Rice-flower *Pimelea spinescens* subsp. *spinescens* and Arching Flax-lily *Dianella* sp. aff. *longifolia* (Benambra). A total of 32 other species of state and national conservation significance have medium or higher likelihood of occurrence within the site due to the presence of suitable habitat (Biosis Research 2010).

Of these 34 significant species, systematic searches were conducted for nine. The main target species of these searches was Spiny Rice-flower and Arching Flax-lily. However other target species included Small Golden Moths *Diuris basaltica*, Sunshine Diuris *Diuris fragrantissima*, Pale-flower Crane's-bill *Geranium* sp. 3, Small Milkwort *Comesperma polygaloides*, Tough Scurf-pea *Cullen tenax*, Basalt Podolepis *Podolepis* sp. 1 and Rye Beetle-grass *Tripogon loliiformis*.

The limited freshwater wetland habitat present was also examined for evidence of species such as River Swamp Wallaby-grass *Amphibromus fluitans*, Swollen Swamp Wallaby-grass *Amphibromus pithogastrus* and Pale Swamp Everlasting *Coronidium scorpioides* 'aff. *rutidolepis* (Lowland Swamp).

Searches were conducted in the Brackish Wetland in the south western corner of the study area. However the extent of surface water, the dense nature of the vegetation and extent of environmental weeds such as African Boxthorn *Lycium ferocissimum* and Spiny Rush *Juncus acutus* made the survey difficult and a significant portion of this vegetation could not be searched. This community is known to support populations of Creeping Rush *Juncus revolutus* and Salt Lawrenzia *Lawrenzia spicata* to the south of the study area (Biosis Research 2010). Other species such as Salt Fireweed *Senecio halophilus*, Shore Spleenwort *Asplenium obtusatum* subsp. *northlandicum*, Marsh Saltbush *Atriplex paludosa* subsp. *paludosa*, Tiny Arrowgrass *Triglochin minutissima* and Prickly Arrowgrass *Triglochin mucronata* may be present. However given that this area subject to inundation, is unlikely to be developable and the occurrence of any of these species is unlikely to alter the conservation significance of this vegetation, this area was only subject to a general vegetation assessment.

Surveys were conducted under seasonal condition regarded as appropriate for identifying the range of species within this contract area. Spiny Rice-Flower targeted surveys were undertaken while plants were not in flower although the unseasonal wet conditions meant that plants were generally larger and still actively growing, making them stand out more than they otherwise would in a normal dry summer. The main limitation to this survey would be the density of grassland encountered and the impact of this on the overall ability of an observer to detect individual plants.

Data collected included a GPS waypoint for every individual observed.

Targeted surveys were conducted by a minimum of two botanists walking in parallel transect lines approximately 5 m apart. Using this method, approximately 10 ha of habitat was searched per day (each 7.5–8.5 hours). Searches were not undertaken during poor weather conditions (heavy rain or high temperature).

### **Vegetation Quality Assessment for Net Gain**

Native vegetation within the site was mapped and assessed in relation to Net Gain policy according to standard methods provided by DSE (2004). Vegetation quality of identified patches was assessed using the DSE Vegetation Quality Assessment Sheet (DSE 2004). No indigenous canopy trees are present and therefore this component of the vegetation assessment process is not discussed further.

For the purposes of this assessment the limit of the resolution for the habitat hectare assessment process is taken to be 0.01 habitat hectares. That is, if native vegetation is present with sufficient cover but its condition and extent would not result in the identification of at least 0.01 habitat hectares then that vegetation will not be mapped or assessed as a separate habitat zone.

### **2.2.2 Fauna assessment**

The study site was assessed to determine the values of the site for terrestrial fauna. 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. Fauna species were recorded with a view to characterising the values of the site and were not intended to provide a comprehensive survey of all fauna that has potential to utilise the site over time.

Aquatic fauna values were not determined as part of this assessment.

### **Targeted survey for Golden Sun Moth**

Targeted survey was undertaken for Golden Sun Moth on the basis of a record of the species from 2007 and likely presence of the species identified in the due diligence assessment (Biosis Research 2010).

Field surveys were undertaken during the 2010/11 flight season of the Golden Sun Moth. The commencement of the flight season was documented by Biosis Research and other consultants and by the Department of Sustainability and Environment (DSE) by regularly checking sites with known Golden Sun Moth populations. Prior to surveys being conducted at the study area, site/s known to support a population of Golden Sun Moth (with access permitted) were visited to confirm whether the moths were flying on that day. Surveys took place when conditions were suitable for male flight (generally >20°C, bright, clear days, full sun, absence of rain and wind other than a light to moderate breeze) between 10:00 hrs and 15:00 hrs. Four targeted surveys were conducted over five occasions at the site on 30 December 2010 and 4, 16, 20 & 25 January 2011. Survey continued into January as the season was late commencing. Survey to the 31 January was deemed to be appropriate by DSE (Mark Winfield, pers. comm.).

Weather data for the survey days for the Laverton weather station (which is closest to the study area) is shown in Appendix 3. This data is sourced from the Bureau of Meteorology (BOM) [www.bom.gov.au](http://www.bom.gov.au). The reference sites visited were private land on Grieve Parade, Altona (moths confirmed flying there on 30 December), private land at Manor Lakes and near Eynesbury (moths confirmed flying at both sites on 4 January and at Eynesbury on 20 January), private land at Aurora, Epping North (moths confirmed flying there on 16 January) and private land at Donnybrook (moths confirmed flying there on 25 January). Reference sites were visited each morning prior to surveys being undertaken at the Altona study area.

Areas of potential habitat were surveyed by two observers using a transect method, which involved walking parallel transects across the site (spaced at 10-50 m intervals) and recording any individuals observed. Transect information was collected with a hand-held GPS to show coverage. The GPS transect tracks of the GSM observers for the survey days are shown in Figure 3. Appropriately qualified zoologists experienced in Golden Sun Moth identification and survey methods conducted all surveys for the species. Surveys were undertaken in accordance with protocols established by DSEWPC and DSE.

## **2.3 Legislation and policy**

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

- Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act);
- Flora & Fauna Guarantee Act 1988 (FFG Act);
- *Planning and Environment Act 1987* – specifically Clause 52.17, Overlays and Clause 66.02;
- Victoria's Native Vegetation Management Framework (NRE 2002).
- *Wildlife Act 1975* and associated Regulations; and
- *Environment Protection Act 1971*: State Environmental Protection Policy (Waters of Victoria) 2003.

## 2.4 Victoria's Native Vegetation Management Framework

There is a three step process to addressing Victoria's Net Gain policy, outlined in the Framework:

- Step 1 - Avoid the removal of native vegetation, where possible.
- Step 2 - Minimise the removal of native vegetation.
- Step 3 - Appropriately offset the loss of native vegetation, if required.

Addressing the first two steps is an iterative process that is mainly achieved during the design phase of the project. A key input is the assessment and mapping of vegetation and habitats within the site which is provided in this report. The design should incorporate and respond to this information so that impacts to native vegetation and other biodiversity values are minimised. A full description of the steps taken to avoid and minimise impacts needs to be included in the planning permit application.

The third step is addressed in this report and a description of the offsets for vegetation removal as per an assumed design. Net Gain offsets are calculated as per the Framework and the relevant Regional Native Vegetation Plan (PPWCMA 2006). Additional criteria for offsets (like-for-like criteria) are dependent on their conservation significance and are also included in the Framework.

Gains available from protecting and managing areas of native vegetation (offset sites) are calculated as per standard DSE methodology (DSE 2006) and using the on-line DSE Gain Calculator v 1.2: (<http://www.dse.vic.gov.au/DSE/nrence.nsf/LinkView/74DC19C326C445BECA2571AE00037FC0B32D42FB223C7345CA25712B0007130A>).

### Assessment of conservation significance

Conservation significance of areas of native vegetation is calculated as per the Framework (NRE 2002) and incorporates:

- The conservation status of the EVC;
- The quality of the vegetation (habitat score);
- Habitat for threatened species; and
- Other attributes (e.g. Ramsar sites, sites with National Estate values).

The assessment of habitat value for rare and threatened species involves determining if the habitat represents the 'best 50%' or 'remaining 50%' of habitat for each species. The method for this determination is outlined in the DSE referral guide for planning permit applications (DSE 2007b; Table 2).

## 2.5 Mapping

Mapping is conducted using hand-held (uncorrected) GPS units and aerial photo interpretation. The accuracy of this mapping is therefore subject to the accuracy of the GPS units (generally  $\pm 7$  metres) and dependent on the limitations of aerial photo rectification and registration.

Mapping is 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 accurate for detailed design purposes.

## 3. Results

---

### 3.1 Site Context

The site is bounded to the north by the suburban railway (Werribee line), to the south by public land surrounding Truganina Swamp and the Mt. St. Joseph Wetlands, to the west by Kayes Drain and to the east by industrial development around Ajax Road, and factories on Slough Road, Chester road and Galvin Street and Park Parade.

The area of Brackish Wetland in the south east of the study area is part of a broader area of this vegetation associated with the estuary of Laverton Creek. This near coastal environment provides an unusual ecotone between native grasslands and coastal communities. As a result a number of species more typical of saline environments, such as Coast Tussock-grass *Poa poiformis* and Australian Salt-grass *Distichlis distichophylla*, occur in association with typical Plains Grassland flora such as Spiny Rice-flower.

The study area occurs within a broader matrix of industrial and residential land and remnant native vegetation within an urban context.

While the site itself does not support a Biosite, it is surrounded by Biosites to the north (Biosite 3494 of National significance), south (Biosite 4623 for Truganina Swamp which is of State significance) and east (Maidstone Road grassland which is listed as regional significance) (DSE 2005b).

### 3.2 Limitations

Ecological surveys and assessments provide a sampling of the flora and fauna at a given time and season. It is always possible that some species or individuals of a targeted threatened species are not detected during survey. Some plant species are dormant and/or lack flowering or fruiting material at certain times of year (commonly in winter or late summer), making detection and/or identification difficult. Other environmental conditions such as drought, grazing, fire and mowing will also affect the survey results. In many cases these factors do not present a significant limitation to assessing the overall biodiversity values of a site but can limit the detectability of some species.

The current flora and habitat hectare assessments were conducted in late spring and summer, which includes both optimal and suboptimal times for survey. Wetter than average conditions have also extended the ability of observers to more readily detect some species. Older assessments of the site by Biosis Research (now Biosis) provide some indication of other species which probably persist within the study area but can only be detected in more favourable seasonal conditions or after events such as a fire.

The targeted Golden Sun Moth survey was conducted during suitable conditions and at times when Golden Sun Moths were observed flying at various reference sites. However, wetter than average conditions may have influenced the emergence of Golden Sun Moth on this site during this season. For example, Golden Sun Moth were not observed at the reference site closest to the study area on Maidstone Street, Altona North, but were recorded at a site further east on Greive Parade, Altona North in late December 2010 and January 2011.

### 3.3 Flora

The study area includes a matrix of remnant native vegetation and disturbed industrial land dominated by exotic species. Disturbed areas were dominated by bare ground and exotic grasses and other herbs such as Kikuyu *Cenchrus clandestinus*, Galenia *Galenia pubescens*, Bearded Oat *Avena barbata*, Chilean Needle-grass *Nassella neesiana*, Serrated Tussock *Nassella trichotoma*, Toowoomba Canary-grass *Phalaris aquatica*, Barley-grass *Hordeum leporinum* and Wimmera Rye-grass *Lolium rigidum*.

Remnant native grasslands were variously dominated by Kangaroo Grass *Themeda triandra*, spear-grass *Austrostipa* spp. and wallaby-grass *Rytidosperma* spp.

The study area supports three ecological vegetation classes (EVCs) including Plains Grassland (EVC 132), Plains Grassy Wetland (EVC 125) and Brackish Wetland (EVC 656) (Figure 2). DSE's existing and pre-1750 EVC mapping only identifies Plains Grassland and Coastal Saltmarsh (EVC 9) in this location but this mapping, at a scale of 1:100,000, is too coarse to identify these communities at the scale of this assessment. The EVCs on site are discussed in detail below.

### 3.3.1 Ecological Vegetation Classes

Classification of native vegetation in Victoria is based on 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 are provided by DSE: ([www.dse.vic.gov.au/DSE/nrence.nsf/LinkView/DED128E11A362A51CA256FFF001CAB6C544ABC860B2506F7CA257004002550CC](http://www.dse.vic.gov.au/DSE/nrence.nsf/LinkView/DED128E11A362A51CA256FFF001CAB6C544ABC860B2506F7CA257004002550CC)). EVCs identified within the study area are described as follows:

#### Plains Grassland EVC 132

This EVC is dominated by thick swards of Kangaroo Grass *Themeda triandra*. Other common native grasses include wallaby-grasses *Rytidosperma* spp., spear grasses *Austrostipa* spp., Common Wheat-grass *Anthosachne scabra*, Grey Tussock-grass *Poa sieberiana* and Rigid Panic *Walwhalleya prolata*. It contains scattered herbs including Lemon Beauty-heads *Calocephalus citreus*, bindweeds *Convolvulus* spp., Small St John's Wort *Hypericum gramineum*, Grassland Wood-sorrel *Oxalis perennans*, Cotton Fireweed *Senecio quadridentatus* and Yellow Rush-lily *Tricoryne elatior*. An unusual form of Plains Grassland dominated by Coast Tussock-grass *Poa poiformis* and including Australian Salt-grass *Distichlis distichophylla* dominated portions of land south of the Altona railway line. The composition of this grassland appears to be influenced by elevated levels of soil salinity and seasonally wet soil conditions.

#### Plains Grassy Wetland EVC 125

This EVC is dominated by Brown-back Wallaby-grass *Rytidosperma duttonianum*, Common Blown-grass *Lachnagrostis filiformis*, Common Woodruff *Asperula conferta*, Flat Spike-sedge *Eleocharis pallens*, Prickfoot *Eryngium vesiculosum* and Raspwort *Haloragis heterophylla*.

This community is relatively disturbed and when dry is typically dominated by exotic grasses and other herbs such as Ribwort *Plantago lanceolata*, Wimmera Rye-grass *Lolium rigidum*, Squirrel-tail Fescue *Vulpia bromoides* and Hairy Hawkbit *Leontodon taraxacoides* subsp. *taraxacoides*.

#### Brackish Wetland EVC 656

This EVC is dominated by Chaffy Saw-sedge *Gahnia filum*. Other common species include Rounded Noon-flower *Disphyma crassifolium* subsp. *clavellatum*, Australian Salt-grass *Distichlis distichophylla*, Knobby Club-sedge *Ficinia nodosa*, Beaded Glasswort *Sarcocornia quinqueflora*, Small Loosestrife *Lythrum hyssopifolia*, Shiny Bog-sedge *Schoenus nitens* and Creeping Brookweed *Samolus repens*.

The most prominent weeds in this environment include African Box-thorn and Spiny Rush although their cover is relatively low.

### Significant communities

All EVCs within the study area are endangered within the Victorian Volcanic Plain Bioregion. All of the native grasslands present also correspond to the EPBC Act listed Natural Temperate Grassland of the Victorian Volcanic Plain (DEWHA 2008). The occurrences of Plains Grassy Wetland recorded as HZ11 correspond to the EPBC Act listed Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains community.



### 3.3.2 Species

#### Records from the site

A total of 109 indigenous and 80 introduced plant species was recorded from the site (Appendix 2).

#### Frood et al. (1997)

This assessment documents 10 quadrats from within the study area, mainly from south of the Altona Railway. This data records an additional 29 native and 22 weed species, including the rare Creeping Rush *Juncus revolutus* from the area of Brackish Wetland. Many of these species are likely to persist in this environment.

#### Significant species

Existing data identifies one nationally listed species, Spiny Rice-flower, within the study area. This species has been recorded as scattered plants north of the Altona Railway, with most plants in a large population to the south of this railway. Systematic surveys of the study area identified 489 individuals of Spiny Rice-flower within the site (Figure 3). This places this population within the largest 10% of known populations for this species.

Arching Flax-lily, which is vulnerable in Victoria, was recorded from the site by Biosis Research (2010). Systematic surveys identified three individuals of this species within the study area (Figure 3).

Three populations of Pale Spike-sedge, which is poorly known in Victoria, were located during the habitat hectare assessment. This species is restricted to remnants of Plains Grassy Wetland. Estimating the number of individuals present is difficult as this species is rhizomatous and all plants at any one location may be one or multiple individuals.

Two other species of State conservation significance including Creeping Rush *Juncus revolutus* and Salt Lawrenia *Lawrenia spicata*, are recorded by the existing data. Creeping Rush is known from the area of Brackish Wetland within the study area. However, both species are wetland/saltmarsh species and therefore it is reasonable to assume that both occur in the south western corner of the study area within vegetation mapped as Brackish Wetland.

No other significant flora species were detected by the targeted surveys. Other threatened flora may be present although some, like Small Golden Moths, would probably only be detectable in the first spring after a fire.

Consideration of whether habitat represents the 'best or remaining' 50 % of habitat for relevant significant species is included in Section 5.

#### Best or remaining 50% habitat for rare and threatened flora species

Part of the assessment of conservation significance for Net Gain involves consideration of the value of habitat for threatened species. There are 18 flora species threatened in Victoria that have at least medium likelihood of occurrence within the site (Biosis Research 2010). Each of these species is considered in the assessment of conservation significance.

Habitat for each species within each habitat zone is assessed against DSE's criteria (DSE 2007, page 13). The pathway for each decision made (in accordance Table 2 from DSE 2007) is outlined in Table 2.

## 3.4 Fauna

### 3.4.1 Habitats

Fauna habitats that occur within the site can be characterised according to vegetation communities and other features such as waterways, rock outcrops etc.

## Plains grassland

Plains grassland habitat is characterised by native perennial tussock grasses and herbs growing within inter-tussock spaces. Trees and woody shrubs are typically absent. Much of the Plains Grassland habitat on the site contains a combination of loose surface rock and embedded rock. Plains grassland provides habitat for a diverse range of terrestrial fauna, many of which are of national and state significance. There are a number of common bird species that forage within plains grassland habitat, such as Australasian Pipit *Anthus novaeseelandiae*, Stubble Quail *Coturnix pectoralis*, and Willie-wagtail *Rhipidura leucophrys*. Raptors also forage over these open plains grassland areas, with species observed during the present assessment including Black-shouldered Kite *Elanus axillaris* and Brown Goshawk *Accipiter fasciatus*. Dense tussocks and rocky areas provide suitable habitat for a number of reptiles including Common Blue-tongue Lizard *Tiliqua scincoides*, Little Whip-Snake *Suta flagellum*, and the nationally significant Striped Legless Lizard *Delma impar*. Plains grassland habitat within the study area also provides suitable habitat for the nationally significant Golden Sun Moth *Synemon plana*.

## Planted trees and shrubs

A small number of planted trees and shrubs exist within the study area. These are likely to be used by common birds such as the Little Raven *Corvus mellori*, Magpie-lark *Grallina cyanoleuca*, Galah and introduced birds such as Common Starling *Sturnus vulgaris*. Flowering trees and shrubs planted within the site provide additional food resources and habitat for a number of nectar feeding birds such as Red Wattlebird *Anthochaera carunculata* and White-plumed Honeyeater *Lichenostomus penicillatus*. Some older planted trees may also provide foraging resources amongst fallen limbs, bark and leaf litter. These planted trees are unlikely to contain hollows.

## Planted trees and shrubs

A small number of planted trees and shrubs exist within the study area. These are likely to be used by common birds such as the Little Raven *Corvus mellori*, Magpie-lark *Grallina cyanoleuca*, Galah and introduced birds such as Common Starling *Sturnus vulgaris*. Flowering trees and shrubs planted within the site provide additional food resources and habitat for a number of nectar feeding birds such as Red Wattlebird *Anthochaera carunculata* and White-plumed Honeyeater *Lichenostomus penicillatus*. Some older planted trees may also provide foraging resources amongst fallen limbs, bark and leaf litter. These planted trees are unlikely to contain hollows.

## Wetlands

Wetland habitats within the site include a small areas of plains grassy wetland either side of the Altona Railway and an area of brackish wetland in the south-west corner of Lot H that is associated with the Laverton Creek estuary. The areas of plains grassy wetland were dry at the time of assessment, but are prone to inundation during periods of high rainfall. When wet, these areas may provide potential habitat for common bird species such as Masked Lapwing *Vanellus miles* as well as state significant waterbirds such as Eastern Great Egret *Ardea modesta*. The brackish wetland includes a small fringe of saltmarsh vegetation but is otherwise dominated by densely vegetated Chaffy Saw-sedge. The area is contiguous with Truganina Swamp to the south-east, which is listed as a Biosite of State Significance (Biosite 4623). The brackish wetland provides habitat for waterbirds that prefer dense vegetation, such as Baillon's Crake *Porzana pusilla* and Australasian Bittern *Botaurus poiciloptilus*. Chaffy Saw-sedge also provides a food source for the larvae of the state significant Altona Skipper, which is likely to be present within the site.

## Degraded treeless areas

This habitat type is characterised by exotic pasture grasses, weeds and dumped fill and other waste. Due to its highly disturbed and modified nature, this habitat type contains fewer resources for fauna and consequently species diversity is generally poor in these areas. There are large areas of dumped fill and rocky material, which provide refuge for introduced mammals such as Red Fox *Vulpes vulpes* and European Rabbit *Oryctolagus cuniculus*. Degraded treeless vegetation occurs immediately north of the Altona rail line and through much of the centre and south eastern corner of the site (Figure 2).



**Table 2: Evaluation best/remaining habitat for rare or threatened flora species.**

Species	Cons. Status	HZ (Fig 2)	Steps*	Outcome	Con. Sig.#	Notes
<i>Amphibromus pithogastris</i>	Endangered in Victoria	HZ 1, 2 and 11	A; D	NFC	NA	Not recorded by targeted survey
		All others	A; D	NFC	NA	Plains Grassland and Brackish Wetland are not habitat for this species
<i>Dianella sp. aff. longifolia (Benambra)</i>	Vulnerable in Victoria	HZ 6	A; D, F	Best 50% of habitat	Very High	Large area of high quality habitat. Recorded on site.
		All others	A; D	NFC	NA	Current site management not conducive to the expansion of existing populations
<i>Tripogon loliiformis</i>	Rare in Victoria	HZ3, 4, 6 & 9	A; D	NFC	NA	Could be present but is very cryptic
		All others	A; D	NFC	NA	unlikely
<i>Diuris basaltica</i>	Endangered	HZ3, 4, 6 & 9	A; D; F	Best 50% of habitat	Very High	Recorded nearby. Quality of this grassland suggests it could be present. Would only be detectable after the grasslands have been burnt. If not present, it is a good translocation receptor site
		All others	A;D	NFC	NA	Unsuitable habitat or less likely
<i>Podolepis sp. 1</i>	Endangered in Victoria	HZ3, 4, 6 & 9	A; D	NFC	NA	Recorded nearby. Site is a good translocation receptor site
		All others	A;D	NFC	NA	Unsuitable habitat
<i>Pimelea spinescens subsp. spinescens</i>	Critically Endangered	HZ 3,4,6 &9	A; B, C	Best 50% of habitat	NA	Recorded from the site. Noted from south of the Altona line by Frood et al. 1997.
		HZ1,2,10,11	A; D	NFC		Wetlands not suitable habitat
<i>Diuris fragrantissima</i>		HZ3,4,6 &9	A;D	NFC	NA	Could be recorded after a fire
		All others	A;D	NFC	NA	Unsuitable habitat
<i>Cullen tenax</i>	Endangered in Victoria	HZ9	A,D	NFC	NA	Noted in similar environment north of the Werribee line in 1997
		All others	A;D	NFC	NA	

Species	Cons. Status	HZ (Fig 2)	Steps*	Outcome	Con. Sig.#	Notes
<i>Comesperm polygaloides</i>	Vulnerable in Victoria	HZ3,4,6&9	A;D, F	Remaining 50%	NA	Noted in similar environment north of the Werribee line in 1997
		All others	A;D	NFC	NA	Unsuitable habitat
<i>Geranium sp. 3</i>	Rare in Victoria	HZ3,4,6&9	A;D	NFC	NA	No <i>Geranium</i> species recorded
		All others	A;D	NFC	NA	
<i>Saline species</i> <sup>^</sup>	Rare in Victoria	HZ10	A;D-F	Best 50% of habitat	Medium	Brackish Wetland is High quality habitat
		All others	A;D	NFC	NA	

\* Steps taken to determine best or remaining 50 % of habitat. From Table 2 in the Guide for Assessment of Referred Planning Permit Applications (DSE 2007b).

<sup>^</sup>Saline species include *Salsola tragus*, *Atriplex paludosa*, *Senecio halophyllus*, *Triglochin minutissima*, *Triglochin mucronata*, *Juncus revolutus*, *Lawrenca spicata* and *Malva preissiana*.

HZ = Habitat Zone, NFC = No further consideration, NA = Not Applicable

# threatened species rating

### 3.4.2 Species

A total of 28 indigenous and 7 introduced fauna species were recorded from the site during the field assessment (Appendix 3).

#### Significant species

There are 63 species of state and national significance that appear on database records within 5 km of the site (Appendix 3) or have some potential to occur based on distributional range and suitable habitat. Many of these species are coastal or pelagic and are therefore unlikely to occur within the study area.

Twelve fauna species of national or state significance have at least a medium likelihood of occurrence within the study area and are discussed in further detail below.

- **Orange-bellied Parrot *Neophema chrysogaster* (EPBC listed – Nationally significant).** Orange-bellied parrots migrate from Tasmania to mainland Australia during winter, where they feed primarily within coastal saltmarsh. The species have previously been recorded from a small number of locations within the vicinity of the study site. There is potential for Orange-bellied Parrot to occasionally utilise the saltmarsh and sedgeland habitat within the brackish wetland located in the south-west corner of Lot H. This area is not considered to contain high quality or critical habitat for the species, however there is potential for individuals to utilise the site in an unpredictable manner during the cooler months of the year.
- **Striped Legless Lizard *Delma impar* (EPBC listed – Nationally significant).** The Striped Legless Lizard is a cryptic fossorial reptile that inhabits native and modified grasslands, where sufficient cover is available to provide protection from predators. Until recently, suitable habitat was thought to be confined to relatively undisturbed native grassland with good groundcover. However, recent observations have shown that this species also can occur in substantially altered and degraded grassy environments so long as the area retains a suitable tussock grass structure and the soil is of appropriate type, structure, and has not had major disturbances such as ploughing. There are a small number of recent records from the local area, and a known population occurs in the Laverton North Grasslands Reserve located approximately 1.5 kilometres north of the study site. All areas of plains grassland within the site provide potential habitat and there is high likelihood that the species is present within these areas.
- **Golden Sun Moth *Synemon plana* (EPBC listed – Nationally significant).** The Golden Sun Moth is a medium-sized diurnal moth that was formerly thought to be associated with grasslands that have a high cover of native Wallaby grasses (*Rytidosperma* sp). However, recent surveys around Melbourne have found that Golden Sun Moth also inhabit a range of grasslands as well as in areas supporting predominately introduced vegetation. The species is widespread but patchily distributed in remnants of Plains Grassland in Melbourne's west. Golden Sun Moth were recorded immediately adjacent to Ajax Road in 2007 (Figure 3), and there are many more additional records of the species from the surrounding area. Systematic survey for Golden Sun Moth did not detect the species the 2010/11, however, a population may still be present. A second season of survey would provide greater certainty on whether the population has disappeared from the site or could not be detected due to unusually wet conditions (when compared with the past 5 years of Golden Sun Moth surveys around Melbourne).
- **Lewin's Rail *Lewinia pectoralis* and Baillon's Crake *Porzana pusilla* (DSE Advisory List – State Significant).** Lewin's Rail and Baillon's Crake are small waterbirds that occupy a range of wetland habitats with dense fringing and emergent vegetation. Densely vegetated areas within the area of brackish wetland in Lot H provide potential habitat for the species. Reed beds within Kayes Drain and Laverton Creek also provide habitat immediately adjacent to the study site.

- **Royal Spoonbill *Platalea regia*, Little Egret *Egretta garzetta* and Eastern Great Egret *Ardea modesta* (DSE Advisory List – State significant).** These species prefer the shallows of wetlands for foraging activities. Occasionally they will forage in small waterways or wet grassland areas. On occasions, small numbers of some of these species may forage within the area of plains grassy wetland within the study area, the brackish wetland to the south-west of Lot H, and within Kayes Drain and Laverton Creek adjacent to the site.
- **Little Bittern *Ixobrychus minutus* (DSE Advisory List – State significant) and Australasian Bittern *Botaurus poiciloptilus* (EPBC listed – Nationally significant).** Little Bittern and Australasian Bittern are typically found in terrestrial wetlands in temperate regions. These species tend to prefer permanent freshwater wetlands surrounded by vegetation with a tall and dense structure, where individuals will forage within shallow water associated with the edges of pools or waterways. The densely vegetated brackish wetland in the south-west corner of Lot H, which forms the north-western corner of Truganina Swamp, provides potential roosting habitat for these species.
- **Black Falcon *Falco sugnifer* (DSE Advisory List – State significant).** This bird of prey mostly hunts over open plains and undulating land with large tracts of low vegetation, especially in arid and semi-arid zones. Mostly occurs in north, north-west and west of Victoria, although droughts and subsequent food shortages can force individuals into more coastal areas. The Black Falcon is also often associated with wetland areas, including rivers and creeks. In parts of its range the Black Falcon has probably benefited from clearing for pasture and crops, and from the establishment of watering points. Previous records for this species exist from within 5 km of the study area. Plains grassland within the study site provides potentially suitable foraging habitat for Black Falcon.
- **Altona Skipper *Hesperilla flavescens flavescens* (DSE Advisory List – State significant).** The Altona Skipper is a small butterfly that is associated with brackish sedgeland dominated by Chaffy Saw-sedge *Gahnia filum*. Larvae feed almost exclusively on the leaves of *G. filum* plants. The species is only known from a small number of localised sites around Melbourne, including Cherry Lake and Truganina Swamp. The north-western corner of Truganina Swamp extends into the south-western corner of Lot H within the study site. This area is dominated by *G. filum* sedges and it is therefore likely that a population of Altona Skipper is present within the site. Further survey is required to determine the presence and distribution of Altona Skipper within suitable habitat in Lot H.

An additional 5 species listed as near-threatened in Victoria also have potential to occur at the site (Appendix 3). There are no policy implications for these species and they are therefore not discussed any further within this report.

Five Latham's Snipe *Gallinago hardwickii* (listed under the migratory provisions of the EPBC Act) were observed near the study area (vacant land in Ajax Road) during targeted flora surveys in March 2011. There are other areas of habitat for this species in the study area which could support an ecologically significant number of this species as defined under the draft *Significant Impact Guidelines for 36 Migratory Shorebirds* - EPBC Policy Statement 3.21 (Commonwealth of Australia 2009). For Latham's Snipe, important habitat is considered to be sites that:

- *support at least 18 individuals of the species, and*
- *are naturally occurring open freshwater wetland with vegetation cover nearby (for example, tussock grasslands, sedges, lignum or reeds within 100m of the wetland.* (p11 in Commonwealth of Australia 2009).

On this basis, the south-west corner of the study area (Lot H) is of particular importance as potential habitat for Latham's Snipe.

### 3.5 Further survey recommendations

The current flora survey was conducted during optimal seasonal conditions (late spring and summer during above average rainfall conditions). This survey is one of a series of surveys conducted (Biosis Research 2006 & 2010) and therefore it is considered that most plant species present have been identified. However some sections of the study area were examined in mid summer and further spring surveys may identify additional species. No additional flora surveys are proposed as the conservation significance of the site has been comprehensively defined.

### 3.6 Summary of biodiversity values of the site

Key values within the site include:

- The site supports high quality remnants of two nationally significant vegetation communities: Natural Temperate Grassland of the Victorian Volcanic Plain and Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains;
- A large population of one nationally threatened species, Spiny Rice-flower (489 plants);
- Populations of one species listed as vulnerable in Victoria, Arching Flax-lily (three plants) and one listed as poorly known Flat Spike-sedge (three populations), were recorded in the study area;
- There are 34.9 ha of native vegetation including 34.8 ha of Very High conservation significance (VHCS) and 0.1 ha of High conservation significance (HCS) (NRE 2002);
- The site supports 59 plant species considered rare or restricted in the Victorian Volcanic Plain bioregion;
- The native grasslands within the study area provide potential habitat for the nationally significant fauna species; and
- Land to the south is within a Biosite (4623) for Truganina Swamp which is of State significance.
- Habitat for national and state significant fauna species (Orange-bellied Parrot, Striped Legless Lizard, Golden Sun Moth, Lewin's Rail, Baillon's Crake, Royal Spoonbill, Little Egret, Eastern Great Egret, Little Bittern, Australasian Bittern, Black Falcon and Altona Skipper)
- Confirmed record of one insect of national conservation significance (Golden Sun Moth) within 100 m of the study area. Although systematic surveys during the 2010-11 flight season did not detect the species, a population may still be present

## 4. Biodiversity Legislation and Government Policy

---

A guide to the Government legislation, policies and strategies relevant to the species and environments identified during this assessment is provided in Appendix 4.

This section provides an assessment of the project against key biodiversity legislation and government policy.

### 4.1 Commonwealth

#### 4.1.1 Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) applies to developments and associated activities that have the potential to significantly impact on matters protected under the Act.

Any person proposing to take an action that may, or will, have a significant impact on a matter of National Environmental Significance (NES) must refer the action to the Australian Government Minister for the Environment, Heritage and the Arts for a determination of whether the action is a 'controlled action' or not.

Table 3 provides an assessment of the project against the EPBC Act.

#### Implications for the project

The site supports two threatened ecological communities (Natural Temperate Grassland of the Victorian Volcanic Plain and Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains community) and a significant population of at least one listed species (489 Spiny Rice-flower – see Figure 3). A fauna assessment of the site has also identified other matters of NES including the potential presence of an ecologically significant portion of the population of Latham Snipe and a 2007 record of Golden Sun Moth *Synemon plana* adjacent to the study area (on Ajax Road); although targeted survey in December 2010 and January 2011 did not detect the species, a population may still be present. An assessment of the proposed impact could only be defined in response to a finalised development plan for the site.

Given the distribution of matters of NES any development of the site is likely to require a referral under the EPBC Act.

### 4.2 State

#### 4.2.1 Flora and Fauna Guarantee Act 1988 (FFG Act)

The *Flora and Fauna Guarantee Act 1988* (FFG Act) provides for the conservation of threatened species and communities and for the management of potentially threatening processes. A permit is required from DSE to 'take' protected flora species from public land. A permit is generally not required for removal of protected flora from private land.

#### Implications for the project

Native vegetation on site is mostly an FFG listed community (Western (Basalt) Plains Grassland Community) and also supports at least one protected plant taxon.

The land is privately owned and is not declared 'critical habitat'. Therefore a protected flora permit is not required. However the presence of listed threatened flora and habitat for listed 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).

**Table 3: Assessment of the project against the EPBC Act**

Matter of NES	Project issues	Comments
<b>listed threatened species</b>	One listed plant species has been recorded and another 5 have potential habitat or predicted to occur in the project search area (Appendix 2).	A significant population of Spiny Rice-flower is present.
	On listed fauna species, Golden Sun Moth, has an existing record in close proximity to the study area (north of Ajax Road) and broader areas of suitable habitat associated with areas mapped as Plains Grassland	Systematic survey did not detect Golden Sun Moth during the 2010-11 flight season. A population may still be present.
	Grassland habitat suitable for Striped Legless Lizard is present on site. There are recent records of this species from within 5km of the site.	A population of Striped Legless Lizard may be present. Further survey required to determine presence.
	Potentially suitable habitat for Orange-bellied Parrot exists on the fringes of the brackish wetland to the south-west of Lot H.	Species may occasionally utilise habitat within the site, however habitat is marginal and unlikely to contain critical habitat for the species.
<b>ecological communities</b>	The site supported remnants of two listed communities – Natural Temperate Grassland of the Victorian Volcanic Plain and Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains community.	The site has a long history of disturbance but the listed communities still occur within the site.
<b>listed migratory species;</b>	A total of 66 migratory species are predicted to occur within 5 km of the site on the DEWHA database. A number of these species are largely coastal or pelagic species and are highly unlikely to make use the study area. The exception to this is Latham's Snipe which could occur in significant numbers in the south western corner of the site.	The brackish wetland in the south-west of Lot H is densely vegetated and does not contain optimal habitat for any listed migratory species except for Latham's Snipe. Plains Grassy Wetland habitat in the study area also provides smaller areas of habitat for Latham's Snipe.
<b>wetlands of international importance (Ramsar sites).</b>	The DEWHA database identifies the site as being within the catchment of the Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar site.	The Laverton Creek drains directly into Port Phillip Bay, and the site is located close to the Laverton Creek estuary. Subdivision and subsequent development may impact on this listed Ramsar site. Any potential impacts may be reduced by implementation of specific mitigation measures following a more detailed assessment in response to a finalised plan.

#### 4.2.2 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. Standard sections are contained in all planning schemes - the Victoria Planning Provisions (VPP). These State sections include the State Planning Policy Framework (SPPF Clauses 10 to 19), Particular Provisions (Clauses 51 to 56) and General Provisions (Clauses 60 to 67).

Of particular relevance to development proposals are the native vegetation provisions, which are contained in several sections of the State sections of all Planning Schemes, and may also be included in the local section (zoning and overlays). Clause 52.17 requires a planning permit to remove, destroy or lop native vegetation including dead native vegetation, however certain exemptions may apply. Decision guidelines are contained in Clause 52.17-5.



The decision guidelines require the responsible authority to consider a variety of biodiversity and other information including Net Gain policy, biodiversity values and conservation, the land protection role of native vegetation, the quality, condition, location and significance of native vegetation and the impact of vegetation removal. The Planning Scheme defines 'native vegetation' as "Plants that are indigenous to Victoria, including trees, shrubs, herbs and grasses" (Clause 72).

The need for a permit to remove native vegetation may also be triggered by overlays.

### **Implications for the project**

A Planning Permit would be required from the City of Hobson's Bay to remove or clear native vegetation within the site (i.e. scattered occurrences of indigenous plants) as the landholding is greater than 0.4 hectares. Where individual parcels of land support more than 0.5 ha of an endangered community (i.e. Plains Grassland) then DSE would be a compulsory referral authority.

#### **4.2.3 Native Vegetation Management Framework**

*Victoria's Native Vegetation Management – A Framework for Action* (the Framework) provides State Government policy for the protection, enhancement and revegetation of native vegetation in Victoria (NRE 2002) and is an incorporated document in all planning schemes. The primary goal of the Framework is:

*a reversal, across the whole landscape, of the long-term decline in the extent and quality of native vegetation, leading to a Net Gain (NRE 2002).*

Where an application is made to remove native vegetation, a proponent for a development must explain the steps that have been taken to:

- Avoid the removal of native vegetation, where possible.
- Minimise the removal of native vegetation.
- Appropriately offset the loss of native vegetation, if required.

Regional Native Vegetation Plans (e.g. PPWCMA 2006) provide a strategic and co-ordinated approach to the management of native vegetation within a given Catchment Management Authority region, and complement the Native Vegetation Management Framework.

### **Implications for the project**

This report establishes the type, extent and condition of native vegetation within the site. Any proposed development of the site would need to be assessed against the Framework once a development plan has been prepared. A development plan would allow a net gain equation to be defined for the proposed development. As an example for this report it is assumed that development would seek to remove all native vegetation north of the Altona Rail Line and retain and manage all native vegetation to the south of this railway.

#### **4.2.4 Wildlife Act 1975 and associated Regulations**

The *Wildlife Act 1975* is the primary legislation in Victoria providing for protection and management of wildlife.

The Wildlife Regulations 2002 of the Act prescribe penalties for certain activities relevant to wildlife including disturbance of habitat without appropriate authorisation (Section 9).

Authorisation to destroy or possess wildlife may be required (Sections 41– 47) if wildlife needs to be moved or destroyed during development.

### **Implications for the project**

A permit is required to remove native vegetation at the site. 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 vegetation that constitutes habitat for fauna. If construction activities are likely to result in the death of wildlife or the need to remove it, a permit will be required.

#### **4.2.5 Water Act 1989**

The primary purpose of this Act is to provide a framework for the allocation and management of surface water and groundwater throughout Victoria. It provides a principal mechanism for maintenance of ecosystem functions including those of aquatic ecosystems. Any construction or maintenance activity that affects beds and banks of waterways, riparian vegetation, quality or quantity of water, requires a licence, permit or approval from the relevant authority.

The relevant authority for the proposal is Melbourne Water.

#### **Implications for the project**

Any large scale development of the site would incorporate works on waterways associated with stormwater facilities and requires approval from Melbourne Water via an Agreement process set out in their Land Development Manual (<http://ldm.melbournewater.com.au/content/introduction/introduction.asp>).

#### **4.2.6 Environment Protection Act 1970: State Environmental Protection Policy (Waters of Victoria) 2003**

The Environment Protection Act underpins the *State Environmental Protection Policies (SEPP)* which provides a legal framework for the protection and rehabilitation of Victoria's surface water environments. The uses and values of the water environment are known as 'beneficial uses'. Environmental quality objectives and indicators are defined to protect beneficial uses and an attainment program provides guidance on protection of the beneficial uses. The key beneficial use of relevance to biodiversity is 'Aquatic ecosystems'. The Policy requires that aquatic ecosystems be protected.

Impacts to surface water quality must not result in changes that exceed water quality objectives specified to protect beneficial uses. Proponents and land managers need to ensure that direct and indirect (e.g. runoff) impacts to surface water quality do not exceed the water quality objectives.

The SEPP provides recommendations to ensure that beneficial uses are protected.

#### **Implications for the project**

The project may directly and/or indirectly impact upon the Laverton Creek and Truganina Swamp and their associated aquatic ecosystems. Relevant actions identified in the applicable policy clauses have been incorporated into any mitigation measures (Section 6).

#### **4.2.7 Regional Catchment Strategy and River Health Strategy**

State Planning Policy Framework Clause 15.01 (Protection of catchments, waterways and groundwater) states that planning and responsible authorities must have regard for the objectives of the *Port Phillip and Westernport Regional Catchment Strategy* (PPWCMA, 2004). The *Port Phillip and Westernport Regional River Health Strategy* (PPWCMA, Melbourne Water 2007) provides further recommendations on the protection of existing high-value rivers and creeks that are in good condition and strategic improvement of other rivers and creeks

#### **Implications for the project**

The key biodiversity objectives of the above Strategies with respect to the aquatic environment will be met if the mitigation measures outlined in this report are complied with.

Laverton Creek is considered to be of very high regional importance. It is currently in poor condition but is earmarked for a range of management initiatives to improve the condition to moderate.

## 5. Victoria's Native Vegetation Management Framework (Net Gain)

---

### 5.1 Quantifying native vegetation on site

Patches of remnant vegetation were mapped and assessed (Figure 2). Areas of uniform quality for each EVC within the patches are termed 'habitat zones' and each habitat zone is assessed separately.

All remaining areas that are not EVC patches or scattered remnant canopy trees are termed Degraded Treeless Vegetation (DTV; DSE 2007b).

The EVC benchmarks for Plains Grassland, Plains Grassy Wetland and Brackish Wetland are provided in Appendix 5.

#### 5.1.1 Patches of native vegetation

Each habitat zone is assessed in terms of habitat hectares. A total of 9 habitat zones (or polygons) are identified (Figure 2). The results of the vegetation quality assessment are provided in Table 4. Each habitat zone is assigned an overall habitat score, which is multiplied by its area to provide the number of habitat hectares. The conservation significance of each zone is also shown at the bottom of and this is discussed more in the following section.

#### Conservation significance for threatened species

Part of the assessment of conservation significance involves consideration of the value of habitat for threatened species. There are 27 significant species (flora and fauna) that have at least medium likelihood of occurrence within the site and the conservation significance of each habitat zone for each of these species is determined in Sections 3.3.2 and 3.4.2.

The overall threatened species rating for each habitat zone is given by the highest threatened species rating scored for any one species. This result is presented in Table 4.

**Table 4: Quantification and significance of native vegetation patches within the study area.**

Habitat Zone		2	5	6	7	8	9	10	11	12	TOTAL	
Bioregion		Victorian Volcanic Plain										
EVC #: Name		PGWet 125	PG 132	PG 132	PG 132	PG 132	PG 132	BW 656	PGWet 125	PG 132		
EVC Bioregional Conservation Status		Endangered	Endangered	Endangered	Endangered	Endangered	Endangered	Endangered	Endangered.	Endangered		
	<b>Max Score</b>	<b>Score</b>	<b>Score</b>	<b>Score</b>	<b>Score</b>	<b>Score</b>	<b>Score</b>	<b>Score</b>	<b>Score</b>	<b>Score</b>		
Site Condition	Large Old Trees	10	na	na	na	na	na	na	na	na		
	Canopy Cover	5	na	na	na	na	na	na	na	na		
	Lack of Weeds	15	13	2	6	7	4	9	7	7	2	
	Understorey	25	10	15	15	15	15	15	25	10	15	
	Recruitment	10	3	6	6	6	6	6	6	3	6	
	Organic Matter	5	4	3	5	2	5	5	5	5	3	
	Logs	5	na	na	na	na	na	na	na	na	na	
	<b>Total Site Score</b>		30	26	32	30	30	35	43	25	26	
<b>Standardised Site Score (x75/55)</b>		40.91	35.45	43.63	40.91	40.91	47.73	58.64	34.1	35.45		
Landscape Value	Patch Size	10	1	2	1	4	1	6	6	4	1	
	Neighbourhood	10	2	2	4	3	2	4	4	4	0	
	Distance to Core	5	3	3	3	3	3	3	3	3	3	
	<b>Total Landscape Score</b>		<b>6</b>	<b>7</b>	<b>8</b>	<b>10</b>	<b>6</b>	<b>13</b>	<b>13</b>	<b>11</b>	<b>4</b>	
<b>HABITAT SCORE</b>		<b>100</b>	47	42	52	51	47	61	72	45	39	
Habitat points = #/100		<b>1</b>	0.47	0.42	0.56	0.44	0.47	0.61	0.72	0.45	0.39	
Habitat Zone area (ha)			0.20	2.202	3.640	9.673	0.900	10.231	7.485	0.461	0.105	<b>34.897</b>
Habitat Hectares (Hha)			0.090	0.925	1.893	4.933	0.423	6.241	5.389	0.207	0.041	<b>20.142</b>
Conservation Significance	Conservation Status x Hab Score		Very High	Very High	Very High	Very High	Very High	Very High	Very High	Very High	High	
	Threatened Species Rating		High^	High*	Very High*	High*	High*	Very High*	Medium	High^	High	
	Other Site Attribute Rating		Low	Low	Low	Low	Low	Low	Low	Low	Low	
	<b>Overall Conservation Significance (highest rating)</b>		Very High	Very High	Very High	Very High	Very High	Very High	Very High	Very High	High	
<b>Net Gain Offset multiplier</b>			2	2	2	2	2	2	2	2	1.5	
Offset Prescription			0.190	1.850	3.786	9.866	<b>0.846</b>	<b>12.482</b>	<b>10.778</b>	<b>0.414</b>	0.061	<b>40.27 / 15.69**</b>
Number of Spiny Rice-flower present			0	0	8	25	<b>0</b>	<b>456</b>	<b>0</b>	<b>0</b>	0	

\* Spiny Rice-flower # Arching Flax-lily

^ Pale Spike-sedge

\*\* offset prescription for the loss of all patches north of the Altona Railway Line

## Summary

The study area contains a total of 34.61 hectares of native vegetation, which comprises **20.14 habitat hectares**. The habitat score for the habitat zones ranges from 0.39 to 0.72. Habitat Zones 9 and 10 represent the most intact areas of native vegetation. The vegetation is predominantly of Very High conservation significance but a small area of High conservation significance is also present (Table 5).

Clearing all of the native vegetation within the study area would result in an offset prescription of **40.27 hha**, most of which is of VHCS. Retaining all of the native vegetation south of the Altona Railway Line would result in an offset prescription of **25.69 hha** most of which is of VHCS.

## 5.2 Offsets available on site

The proponent intends to develop the site as an industrial subdivision. It is presumed that a potential outcome of the development proposal would be the retention of all native vegetation south of the Altona railway line. This is presumed given the difficulty in providing access via a bridge to this land as it is considered unlikely that a level railway crossing would be approved.

An interim Net Gain offset equation is calculated on the basis of the removal of all native vegetation to the north of the Altona railway and the management of vegetation to the south as a net gain offset site. This area would need to be permanently protected through an appropriate legal mechanism and be actively managed for a 10 year period and subsequently maintained in that improved condition. Two protection options are outlined including the minimum protection option where retained patches are managed under an agreement under Section 173 of the *Planning and Environment Act 1988* and one where land is transferred to a government agency (i.e. City of Hobson's Bay or Melbourne Water) and managed with conservation as one of the objectives of the reserve.

### 5.2.1 Patches of native vegetation

The offset available from retained patches on site is calculated using the DSE Gain Calculator: ([www.dse.vic.gov.au/DSE/nrence.nsf/LinkView/74DC19C326C445BECA2571AE00037FC0B32D42FB223C7345CA25712B0007130A](http://www.dse.vic.gov.au/DSE/nrence.nsf/LinkView/74DC19C326C445BECA2571AE00037FC0B32D42FB223C7345CA25712B0007130A)).

Copies of the DSE Gain Calculator results for each offset quality zone (with the minimum security gain associated with a Section 173 agreement or equivalent) are presented in Appendix 6 and summarised in Table 5.

**Table 5: Summary of potential offsets available from south of the Altona railway**

Offset Habitat Zone	8	9	10	11	Total
EVC	132	132	656	125	
Current habitat score	0.47	0.61	0.71	0.45	
Conservation significance	VH	VH	VH	VH	
Area (ha)	0.90	10.23	7.49	0.46	<b>19.08</b>
Gain Score (173 agreement)	31.50	38.72	29.30	28.45	
Gain Score ( Conservation Reserve)	36.20	44.82	36.40	32.95	
Potential habitat hectares generated as an offset (173 agreement)	0.28	3.96	2.19	0.13	<b>6.56</b>
Potential habitat hectares generated as an offset (Conservation Reserve)	0.33	4.59	2.72	0.15	<b>7.79</b>

### 5.3 Summary of net gain offsets

In summary, a total offset of 6.56 habitat hectares could be generated through management of vegetation on site and protection under a s. 173 agreement (or equivalent). This increases to an offset potential of 7.79 hha if the land was transferred to a conservation reserve.

However the like-for-like requirements indicate that the available offsets cannot be fully utilised to offset the losses associated with this development. While areas of VHCS Brackish Wetland can provide offsets for the loss of HCS Plains Grassland they cannot provide offsets for the loss of VHCS Plains Grassland.

Based on the like-for-like requirements, utilising the offsets available from south of the Altona Railway Line (presuming a transfer to a government authority and management with conservation as one of the management objectives) this reserve would supply an excess gain of **2.67 hha** of VHCS Brackish Wetland and have a deficit of **0.04 hha** of VHCS Plains Grassy Wetland and **10.58 hha** of VHCS Plains Grassland.

The proponent is responsible for protection and the first 10 years of management of offset sites. An Offset Management Plan should be developed for any Net Gain offset sites.

## 6. Recommendations to Minimise Impacts

---

The biodiversity values identified in the flora and fauna assessment should be considered during the design phase of the project.

The primary measure to minimise impacts to biodiversity values on the site is to minimise removal of native vegetation and habitats. To retain these values they need to be avoided in the design process and protected and managed in designated reserves.

Development of the area north of the Altona railway line will result in the loss of Plains Grassland and Plains Grassy Wetland. The offset requirements for these losses are provided in Section 5. Retaining the area south of the railway line and using it as a net gain offset site will protect areas of Brackish Wetland, Plains Grassy Wetland and Plains Grassland. This area also supports a substantial population of Spiny Rice-flower. The area is contiguous with Truganina Swamp to the south-east, which is listed as a Biosite of State Significance (Biosite 4623).

Measures to minimise impacts of development on ecological values of the study area include:

### Design and pre-construction

- Protect all areas to be retained by means of temporary fencing. Fencing must be installed **before** construction work commences.
- Retain fauna habitat linkages within the development and the local area e.g. Laverton Creek/Kayes Drain corridor
- Make allowance within the development footprint for all construction works (including construction vehicle access, road batters, footpaths and all services) so all areas outside the development area (particularly reserves) be treated as no-go zones.
- Incorporate relevant Water Sensitive Urban Design (WSUD) and Water Sensitive Road Design (WSRD) (Wong et al. 2000) elements such as porous pavements, swale drains, buffer strips, flow detention/retention by infiltration and treatment wetlands/ponds, wherever practical/appropriate.
- Minimise the removal of native vegetation within or adjacent to waterbodies and watercourses. Protect waterways by inclusion of appropriate buffers into design.
- Design any stormwater treatment wetlands to provide fauna habitat. Suitable habitat features include shelter and basking sites (i.e. rocks and logs), fringing emergent aquatic vegetation and submerged aquatic vegetation.
- Monitor water quality within any constructed wetlands and within receiving waterways (Laverton Creek and Truganina Swamp) at a number of sites upstream and downstream of the discharge point. This should be conducted as part of an appropriate water quality monitoring program, developed with input from a specialist aquatic ecologist.
- Ensure all environmental constraints are clearly communicated to construction personnel and incorporated into the workforce induction program and a site Construction Management Plan.
- Carefully design any landscape plantings in the vicinity of any conservation reserves. Issues to consider include species' invasiveness, genetic pollution and shading of indigenous grasslands. Landscape plantings that are intended to enhance ecological values must consist of species of local provenance.

## Construction

- Keep the construction footprint to a minimum.
- Protect areas of retained native vegetation and areas of environmental sensitivity. These areas should be fenced and treated as no-go zones.
- Prevent access to no-go zones – including vehicles, construction personnel, equipment and stockpiles.
- The construction zone should incorporate appropriate buffer distances from waterways or associated waterbodies (including floodplains) wherever practicable;
- Install effective sediment control measures to protect waterbodies, retained native vegetation and habitat.
- Manage construction works to minimise discharge of sediments and other pollutants. Suitable measures are provided in *Environmental Guidelines for Major Construction Sites* (EPA 1996, amended) and *Construction Techniques for Sediment Pollution Control* (EPA 1991) and *Guideline for Environmental Management. Doing it right on subdivisions. Temporary environmental protection measures for subdivision construction sites.* (EPA 2004).
- Refuelling of vehicles and storage of chemicals and other equipment should occur on stable surfaces and should not occur within 30-50 m of a waterway or associated waterbodies and should not occur within a floodplain or land subject to inundation;
- All protective fencing must be maintained in good repair throughout construction.
- All sediment control measures must be maintained in good repair and regularly inspected to ensure adequate performance throughout construction.
- Avoid operational discharges to waterways. If such discharges cannot be avoided they should be minimised through water re-use and recycling. Discharges should be monitored to assess the protection of beneficial uses.

## Post-construction

- Develop and implement management plan to retain/enhance biodiversity values of conservation reserves.
- Site rehabilitation/revegetation.

## References

- DEH 2006. EPBC Act Policy Statement 1.1 Significant Impact Guidelines: Matters of National Environmental Significance. Department of Environment and Heritage, Australian Government, Canberra.
- DSE 2004. *Native Vegetation: Sustaining a living landscape. Vegetation Quality Assessment Manual – Guidelines for applying the habitat hectares scoring method. Version 1.3.* Department of Sustainability and Environment, Melbourne.
- DSE 2005. *Biosites Maps and Reports, Port Phillip Region* (CD). Department of Sustainability and Environment, Melbourne.
- DSE 2006b. *Vegetation Gain Approach – Technical basis for calculating gains through improved native vegetation management and revegetation.* Victorian Government, Department of Sustainability and Environment, East Melbourne.
- DSE 2007b. *Native Vegetation - Guide for assessment of referred planning permit applications.* Victorian Government, Department of Sustainability and Environment, East Melbourne.
- EPA, 1991. *Construction Techniques for Sediment Pollution Control.* Publication 275, Environment Protection Authority Victoria, Melbourne.
- EPA, 1996. *Environmental Guidelines for Major Construction Sites.* Publication 480, Environment Protection Authority Victoria, Melbourne.
- EPA 2004. *Publication 960, Guideline for Environmental Management. Doing it right on subdivisions. Temporary environmental protection measures for subdivision construction sites.* Environment Protection Agency, Melbourne.
- Frood, D., Robertson, P. & Ellery W. 1997. *'Burns Road Environs. A Site Assessment for Flora and Fauna.'* Report to the Department of Natural Resources and Environment by Envirosol International Pty Ltd. May 1997.
- IUCN 2001. *IUCN Red List Categories and Criteria: Version 3.1.* IUCN Species Survival Commission, International Union for Conservation of Nature & Natural Resources, Gland, Switzerland and Cambridge, UK.
- NRE 2002. *Victoria's Native Vegetation Management: A Framework for Action.* Department of Natural Resources & Environment, Victoria.
- PPWCMA, 2004. *Port Phillip and Westernport Regional Catchment Strategy.* Port Phillip and Westernport Catchment Management Authority
- PPWCMA 2006. *Port Phillip and Westernport Native Vegetation Plan.* Port Phillip and Westernport Catchment Management Authority, Frankston, Victoria.
- Walsh, N.G. & Stajsic, V. 2007. *A Census of the Vascular Plants of Victoria.* Eighth edition, Royal Botanic Gardens Melbourne.
- Walsh, N.G. & Entwisle, V. 1996. *Flora of Victoria. Volume 3, Dicotyledons, Winteraceae to Myrtaceae.* Inkata Press, Melbourne.
- Walsh, N.G. & Entwisle, V. 1999. *Flora of Victoria. Volume 4, Dicotyledons, Cornaceae to Asteraceae.* Inkata Press, Melbourne.
- Walsh, N.G. & Stajsic, V. 2008. *A Census of the Vascular Plants of Victoria.* Eighth edition, Royal Botanic Gardens Melbourne.



## Appendices

---

## Appendix 1: Sources of Criteria for Significance

The common language meaning of significance is ‘importance; consequence’ (Macquarie Dictionary). While the general meaning of this is clear, the term is further defined in ecological significance assessment.

Following is a list of the information sources used in this report that provide advice on significance of flora and fauna species and communities.

### A1.1 Species and Communities

- A taxon or community has national significance when it is listed as threatened (critically endangered, endangered, vulnerable or conservation dependent) under the ***Environment Protection and Biodiversity Conservation Act 1999***.
- A taxon has national significance when it is listed as rare in Australia (R) in ***A Census of the Vascular Plants of Victoria (Walsh & Stajsic 2008)***.
- A taxon or community has state significance when it is listed as threatened under the ***Flora and Fauna Guarantee Act 1988***.
- A taxon or community has state significance when it is listed as threatened (critically endangered, endangered or vulnerable) or near threatened, rare, data deficient or poorly known in Victoria on a ***DSE Advisory List*** (DSE 2005, 2007a ).
- A taxon or community also has national or state significance when it is considered to be threatened at that level by **Biosis Research** using IUCN criteria (IUCN 2001).
- **Biosis Research** considers flora species to have significance at the bioregional level when they are recorded from a small percentage of records in the bioregion, as follows:

Threshold for bioregional significance	Bioregions	
< 1% of records in the bioregion <b>(bioregions that support more remnant vegetation)</b>	Bridgewater East Gippsland Lowlands East Gippsland Uplands Greater Grampians Highlands – Far East Highlands – Northern Fall	Highlands – Southern Fall Lowan Mallee Otway Ranges Victorian Alps Wilson's Promontory
< 5% of records in the bioregion <b>(bioregions that have been more cleared)</b>	Central Victorian Uplands Dundas Tablelands Gippsland Plain Glenelg Plain Goldfields Monaro Tablelands Murray Fans Murray Mallee Murray Scroll Belt	Northern Inland Slopes Otway Plain Robinvale Plain Strzelecki Ranges Victorian Riverina Victorian Volcanic Plain Warrnambool Plain Wimmera

## A1.2 Sites

- Patches of native vegetation have conservation significance (very high, high, medium or low) according to the criteria for significance in **Victoria's Native Vegetation Management – A Framework for Action** (NRE 2002). This assessment is calculated at the bioregional scale.
- Areas of conservation significance are documented in the **DSE Victorian biosite database**. The database rates sites as significant at national, state and regional levels. These ratings are undertaken at varying geographic scales and are thus not directly comparable to the categories defined by the Framework (NRE 2002).

## Appendix 2: Flora Results

### A2.1 Flora species recorded from study area

#### Australian status:

C Critically endangered (EPBC Act)

#### Victorian status:

e endangered (FIS)

v vulnerable (FIS)

k Poorly known (FIS)

**2010/11:** Species recorded during current survey (FIS Lists T25141)

Species uncommon in the bioregion (recorded from less than 1% of sites) are labelled **R (56 species)**

**Table A2.1. Flora species (109 Native, 81 weeds) recorded from the study area**

Species	Common Name
<b>Rare or Threatened Native Species</b>	
v <i>Dianella</i> sp. aff. <i>longifolia</i> (Benambra)	Arching Flax-lily
k <i>Eleocharis pallens</i>	Pale Spike-sedge
Ce <i>Pimelea spinescens</i> subsp. <i>spinescens</i>	Spiny Rice-flower
<b>Native Species</b>	
<i>Acacia pycnantha</i>	Golden Wattle
<i>Acaena echinata</i>	Sheep's Burr
<b><i>Alisma plantago-aquatica</i></b>	<b>Water Plantain</b>
<b><i>Amphibromus nervosus</i></b>	<b>Common Swamp Wallaby-grass</b>
<i>Anthosachne scabra</i>	Common Wheat-grass
<b><i>Apium annuum</i></b>	<b>Annual Celery</b>
<i>Asperula conferta</i>	Common Woodruff
<i>Atriplex semibaccata</i>	Berry Saltbush
<i>Austrostipa bigeniculata</i>	Kneed Spear-grass
<i>Austrostipa curticoma</i>	Short-crown Spear-grass
<b><i>Austrostipa gibbosa</i></b>	<b>Spurred Spear-grass</b>
<b><i>Austrostipa oligostachya</i></b>	<b>Fine-head Spear-grass</b>
<b><i>Bolboschoenus caldwellii</i></b>	<b>Salt Club-sedge</b>
<b><i>Bothriochloa macra</i></b>	<b>Red-leg Grass</b>
<b><i>Brachyscome dentata</i></b>	<b>Lobe-seed Daisy</b>
<b><i>Caesia calliantha</i></b>	<b>Blue Grass-lily</b>
<i>Calocephalus citreus</i>	Lemon Beauty-heads
<b><i>Calocephalus lacteus</i></b>	<b>Milky Beauty-heads</b>
<b><i>Cassinia arcuata</i></b>	<b>Drooping Cassinia</b>
<b><i>Cheilanthes austrotenuifolia</i></b>	<b>Green Rock-fern</b>
<i>Chloris truncata</i>	Windmill Grass
<i>Convolvulus angustissimus</i> var. <i>omnigracilis</i>	Blushing Bindweed
<b><i>Crassula decumbens</i> var. <i>decumbens</i></b>	<b>Spreading Crassula</b>
<i>Crassula sieberiana</i>	Sieber Crassula
<b><i>Damasonium minus</i></b>	<b>Star Fruit</b>
<b><i>Dianella brevicaulis</i></b>	<b>Small-flower Flax-lily</b>
<i>Dianella revoluta</i> var. <i>revoluta</i>	Black-anther Flax-lily

Species	Common Name
<b>Native Species (cont.)</b>	
<i>Dichelachne crinita</i>	Long-hair Plume-grass
<i>Dichondra repens</i>	Kidney-weed
<b><i>Dillwynia cinerascens</i></b>	<b>Grey Parrot-pea</b>
<b><i>Disphyma crassifolium</i> subsp. <i>clavellatum</i></b>	<b>Rounded Noon-flower</b>
<b><i>Distichlis distichophylla</i></b>	<b>Australian Salt-grass</b>
<b><i>Dodonaea viscosa</i> subsp. <i>spatulata</i></b>	<b>Sticky Hop-bush</b>
<i>Einadia nutans</i> subsp. <i>nutans</i>	Nodding Saltbush
<b><i>Eleocharis pusilla</i></b>	<b>Small Spike-sedge</b>
<b><i>Enchylaena tomentosa</i> var. <i>tomentosa</i></b>	<b>Ruby Saltbush</b>
<b><i>Eriochloa pseudoacrotricha</i></b>	<b>Early Spring-grass</b>
<i>Eryngium ovinum</i>	Blue Devil
<b><i>Eryngium vesiculosum</i></b>	<b>Prickfoot</b>
<b><i>Euchiton collinus</i></b>	<b>Creeping Cudweed</b>
<b><i>Euchiton involucratus</i></b>	<b>Star Cudweed</b>
<b><i>Eutaxia microphylla</i> var. <i>microphylla</i></b>	<b>Common Eutaxia</b>
<b><i>Ficinia nodosa</i></b>	<b>Knobby Club-sedge</b>
<b><i>Gahnia filum</i></b>	<b>Chaffy Saw-sedge</b>
<i>Geranium retrorsum</i>	Grassland Crane's-bill
<b><i>Glycine tabicina</i></b>	<b>Variable Glycine</b>
<b><i>Goodenia pinnatifida</i></b>	<b>Cut-leaf Goodenia</b>
<i>Haloragis heterophylla</i>	Varied Raspwort
<b><i>Halosarcia pergranulata</i></b>	<b>Blackseed Glasswort</b>
<i>Hypericum gramineum</i>	Small St John's Wort
<b><i>Hypoxis glabella</i> var. <i>glabella</i></b>	<b>Tiny Star</b>
<b><i>Isolepis cernua</i> var. <i>cernua</i></b>	<b>Nodding Club-sedge</b>
<b><i>Isolepis cernua</i> var. <i>platycarpa</i></b>	<b>Nodding Club-sedge</b>
<b><i>Isolepis hookeriana</i></b>	<b>Grassy Club-sedge</b>
<b><i>Isolepis victoriensis</i></b>	<b>Victorian Club-sedge</b>
<b><i>Juncus amabilis</i></b>	<b>Hollow Rush</b>
<i>Juncus bufonius</i>	Toad Rush
<b><i>Juncus kraussii</i> subsp. <i>australiensis</i></b>	<b>Sea Rush</b>
<i>Juncus subsecundus</i>	Finger Rush
<b><i>Lachnagrostis aemula</i></b>	<b>Purplish Blown-grass</b>
<i>Lachnagrostis filiformis</i>	Common Blown-grass
<b><i>Linum marginale</i></b>	<b>Native Flax</b>
<b><i>Lobelia irrigua</i></b>	<b>Salt Pratia</b>
<b><i>Lomandra longifolia</i></b>	<b>Spiny-headed Mat-rush</b>
<b><i>Lomandra micrantha</i></b>	<b>Small-flower Mat-rush</b>
<b><i>Lomandra nana</i></b>	<b>Dwarf Mat-rush</b>
<i>Lythrum hyssopifolia</i>	Small Loosestrife
<b><i>Maireana decalvans</i></b>	<b>Black Cotton-bush</b>
<i>Microlaena stipoides</i> var. <i>stipoides</i>	Weeping Grass
<i>Oxalis perennans</i>	Grassland Wood-sorrel
<b><i>Panicum decompositum</i> var. <i>decompositum</i></b>	<b>Native Millet</b>
<b><i>Panicum effusum</i></b>	<b>Hairy Panic</b>
<i>Phragmites australis</i>	Common Reed
<b><i>Pimelea curviflora</i></b>	<b>Curved Rice-flower</b>
<b><i>Pimelea glauca</i></b>	<b>Smooth Rice-flower</b>
<i>Plantago gaudichaudii</i>	Narrow Plantain
<i>Poa labillardierei</i> var. (Volcanic Plains)	Basalt Tussock-grass

Species	Common Name
<b>Native Species (cont.)</b>	
<b><i>Poa poiformis</i></b>	<b>Coast Tussock-grass</b>
<i>Poa sieberiana</i> var. <i>sieberiana</i>	Grey Tussock-grass
<b><i>Pseudognaphalium luteoalbum</i></b>	<b>Jersey Cudweed</b>
<b><i>Ptilotus macrocephalus</i></b>	<b>Feather Heads</b>
<b><i>Rhagodia candolleana</i> subsp. <i>candolleana</i></b>	<b>Seaberry Saltbush</b>
<i>Rumex brownii</i>	Slender Dock
<i>Rumex dumosus</i>	Wiry Dock
<i>Rytidosperma auriculata</i>	Lobed Wallaby-grass
<i>Rytidosperma caespitosa</i>	Common Wallaby-grass
<b><i>Rytidosperma carphoides</i></b>	<b>Short Wallaby-grass</b>
<i>Rytidosperma duttoniana</i>	Brown-back Wallaby-grass
<i>Rytidosperma eriantha</i>	Hill Wallaby-grass
<i>Rytidosperma fulva</i>	Copper-awned Wallaby-grass
<i>Rytidosperma setacea</i>	Bristly Wallaby-grass
<b><i>Samolus repens</i></b>	<b>Creeping Brookweed</b>
<i>Sarcocornia quinqueflora</i>	Beaded Glasswort
<i>Schoenus apogon</i>	Common Bog-sedge
<b><i>Schoenus nitens</i></b>	<b>Shiny Bog-sedge</b>
<b><i>Selliera radicans</i></b>	<b>Shiny Swamp-mat</b>
<i>Senecio quadridentatus</i>	Cotton Fireweed
<i>Solenogyne dominii</i>	Smooth Solenogyne
<b><i>Stackhousia subterranea</i></b>	<b>Plains Stackhousia</b>
<b><i>Suaeda australis</i></b>	<b>Austral Seablite</b>
<i>Themeda triandra</i>	Kangaroo Grass
<i>Tricoryne elatior</i>	Yellow Rush-lily
<b><i>Velleia paradoxa</i></b>	<b>Spur Velleia</b>
<i>Veronica gracilis</i>	Slender Speedwell
<b><i>Wahlenbergia luteola</i></b>	<b>Bronze Bluebell</b>
<i>Walwhalleya proluta</i>	Rigid Panic
<b><i>Wilsonia rotundifolia</i></b>	<b>Round-leaf Wilsonia</b>
<b>Introduced Species</b>	
<i>Acacia</i> spp.	Wattle (naturalised)
<i>Agapanthus praecox</i> subsp. <i>orientalis</i>	Agapanthus
<i>Anthoxanthum odoratum</i>	Sweet Vernal-grass
<i>Arctotheca calendula</i>	Cape Weed
<i>Aster subulatus</i>	Aster-weed
<i>Atriplex prostrata</i>	Hastate Orache
<i>Avena barbata</i>	Bearded Oat
<i>Avena sterilis</i>	Sterile Oat
<i>Berkheya rigida</i>	African Thistle
<i>Brassica fruticulosa</i>	Twiggy Turnip
<i>Briza maxima</i>	Large Quaking-grass
<i>Briza minor</i>	Lesser Quaking-grass
<i>Bromus catharticus</i>	Prairie Grass
<i>Bromus hordeaceus</i> subsp. <i>hordeaceus</i>	Soft Brome
<i>Catapodium rigidum</i>	Fern Grass
<i>Cenchrus clandestinus</i>	Kikuyu
<i>Centaureum erythraea</i>	Common Centaury

Species	Common Name
<b>Introduced Species (cont.)</b>	
<i>Centaurium tenuiflorum</i>	Slender Centaury
<i>Cicendia quadrangularis</i>	Square Cicendia
<i>Cirsium vulgare</i>	Spear Thistle
<i>Conyza bonariensis</i>	Flaxleaf Fleabane
<i>Cortaderia selloana</i>	Pampas Grass
<i>Cynara cardunculus</i>	Artichoke Thistle
<i>Cynodon dactylon</i> var. <i>dactylon</i>	Couch
<i>Cyperus eragrostis</i>	Drain Flat-sedge
<i>Dactylis glomerata</i>	Cocksfoot
<i>Dittrichia graveolens</i>	Stinkwort
<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 malacoides</i>	Oval Heron's-bill
<i>Foeniculum vulgare</i>	Fennel
<i>Galenia pubescens</i> var. <i>pubescens</i>	Galenia
<i>Galium murale</i>	Small Goosegrass
<i>Genista linifolia</i>	Flax-leaf Broom
<i>Gladiolus</i> spp.	Gladiolus
<i>Hedypnois cretica</i>	Cretan Hedypnois
<i>Helminthotheca echioides</i>	Ox-tongue
<i>Hypochoeris radicata</i>	Flatweed
<i>Juncus acutus</i> subsp. <i>acutus</i>	Spiny Rush
<i>Leontodon taraxacoides</i> subsp. <i>taraxacoides</i>	Hairy Hawkbit
<i>Lilaea scilloides</i>	Lilaea
<i>Lolium rigidum</i>	Wimmera Rye-grass
<i>Lotus angustissimus</i>	Slender Bird's-foot Trefoil
<i>Lycium ferocissimum</i>	African Box-thorn
<i>Lysimachia arvensis</i>	Pimpernel
<i>Marrubium vulgare</i>	Horehound
<i>Medicago polymorpha</i>	Burr Medic
<i>Melilotus indicus</i>	Sweet Melilot
<i>Modiola caroliniana</i>	Red-flower Mallow
<i>Moraea setifolia</i>	Thread Iris
<i>Nassella neesiana</i>	Chilean Needle-grass
<i>Nassella trichotoma</i>	Serrated Tussock
<i>Oxalis pes-caprae</i>	Soursob
<i>Paspalum dilatatum</i>	Paspalum
<i>Paspalum distichum</i>	Water Couch
<i>Phalaris aquatica</i>	Toowoomba Canary-grass
<i>Piptatherum miliaceum</i>	Rice Millet
<i>Plantago coronopus</i>	Buck's-horn Plantain
<i>Plantago lanceolata</i>	Ribwort
<i>Polycarpon tetraphyllum</i>	Four-leaved Allseed
<i>Polygonum aviculare</i>	Hogweed
<i>Rapistrum rugosum</i>	Giant Mustard
<i>Romulea minutiflora</i>	Small-flower Onion-grass
<i>Romulea rosea</i>	Onion Grass
<i>Rosa rubiginosa</i>	Sweet Briar
<i>Rumex crispus</i>	Curled Dock

---

Species	Common Name
<b>Introduced Species (cont.)</b>	
<i>Setaria parviflora</i>	Slender Pigeon Grass
<i>Solanum nigrum</i>	Black Nightshade
<i>Sonchus asper</i>	Rough Sow-thistle
<i>Sonchus oleraceus</i>	Common Sow-thistle
<i>Spergularia media</i>	Greater Sea-spurrey
<i>Sporobolus africanus</i>	Rat-tail Grass
<i>Tribolium acutiflorum</i>	Crested Desmazeria
<i>Trifolium angustifolium</i> var. <i>angustifolium</i>	Narrow-leaf Clover
<i>Trifolium campestre</i> var. <i>campestre</i>	Hop Clover
<i>Trifolium dubium</i>	Suckling Clover
<i>Trifolium glomeratum</i>	Cluster Clover
<i>Ulex europaeus</i>	Gorse
<i>Vicia sativa</i>	Common Vetch
<i>Vulpia bromoides</i>	Squirrel-tail Fescue



## A2.2 Additional flora species recorded by Frood et al. 1997

Table A2.2. Additional flora species (29 Native, 22 weeds) recorded from the study area

Species	Common Name
<b>Rare or Threatened Native Species</b>	
r <i>Juncus revolutus</i>	Creeping Rush
k <i>Lachnagrostis filiformis</i> var. 2	Wetland Blown-grass
<b>Native Species</b>	
<i>Acaena ovina</i>	Australian Sheep's Burr
<i>Apium prostratum</i> subsp. <i>prostratum</i>	Sea Celery
<i>Asperula scoparia</i>	Prickly Woodruff
<i>Austrostipa rudis</i>	Veined Spear-grass
<i>Austrostipa setacea</i>	Corkscrew Spear-grass
<i>Carex breviculmis</i>	Common Grass-sedge
<i>Chrysocephalum apiculatum</i> s.l.	Common Everlasting
<i>Cuscuta</i> spp.	Dodder
<i>Eleocharis acuta</i>	Common Spike-sedge
<i>Epilobium billardierianum</i> subsp. <i>billardierianum</i>	Smooth Willow-herb
<i>Epilobium billardierianum</i> subsp. <i>intermedium</i>	Variable Willow-herb
<i>Eragrostis parviflora</i>	Weeping Love-grass
<i>Isolepis marginata</i>	Little Club-sedge
<i>Juncus flavidus</i>	Gold Rush
<i>Juncus holoschoenus</i>	Joint-leaf Rush
<i>Lemna disperma</i>	Common Duckweed
<i>Lepilaena cylindrocarpa</i>	Long-fruit Water-mat
<i>Leptorhynchus squamatus</i>	Scaly Buttons
<i>Lobelia pratioides</i>	Poison Lobelia
<i>Malva</i> aff. <i>preissiana</i> (pink-flowered inland form)	Australian Hollyhock
<i>Myriophyllum</i> spp.	Water-milfoil
<i>Puccinellia stricta</i>	Australian Saltmarsh-grass
<i>Ruppia polycarpa</i>	Many-fruit Tassel
<i>Sebaea albidiflora</i>	White Sebaea
<i>Senecio glomeratus</i>	Annual Fireweed
<i>Sonchus hydrophilus</i>	Native Sow-thistle
<i>Stuckenia pectinata</i>	Fennel Pondweed
<i>Triglochin striata</i>	Streaked Arrowgrass
<i>Vittadinia gracilis</i>	Woolly New Holland Daisy
<i>Wolffia australiana</i>	Tiny Duckweed
<b>Introduced Species</b>	
<i>Aira caryophyllea</i>	Silvery Hair-grass
<i>Avena fatua</i>	Wild Oat
<i>Bromus diandrus</i>	Great Brome
<i>Cotula coronopifolia</i>	Water Buttons
<i>Hordeum leporinum</i>	Barley-grass
<i>Hordeum marinum</i>	Sea Barley-grass
<i>Hypochoeris glabra</i>	Smooth Cat's-ear
<i>Juncus capitatus</i>	Capitate Rush
<i>Lactuca saligna</i>	Willow-leaf Lettuce

---

Species	Common Name
<b>Introduced Species (cont.)</b>	
<i>Lactuca serriola</i>	Prickly Lettuce
<i>Melilotus siculus</i>	Mediterranean Melilot
<i>Parapholis incurva</i>	Coast Barb-grass
<i>Parentucellia latifolia</i>	Red Bartsia
<i>Phalaris paradoxa</i>	Paradoxical Canary-grass
<i>Polypogon monspeliensis</i>	Annual Beard-grass
<i>Puccinellia fasciculata</i>	Borrer's Saltmarsh-grass
<i>Rumex conglomeratus</i>	Clustered Dock
<i>Scorzonera laciniata</i>	Scorzonera
<i>Tragopogon porrifolius</i>	Salsify
<i>Trifolium scabrum</i>	Rough Clover
<i>Trifolium striatum</i>	Knotted Clover
<i>Trifolium subterraneum</i>	Subterranean Clover

## A2.3 Significant flora species

Includes national and state significant species from the following sources:

- DSE Flora Information System 2007 Version
- DEWHA database (PMST accessed on 01.05.10)
- Current survey

Search area is 5 km radius.

### Australian status:

CR	Critically Endangered (EPBC Act)
EN	Endangered (EPBC Act)
VU	Vulnerable (EPBC Act)
R	Rare (Walsh & Stajsic 2007)

### Victorian status:

e	endangered (FIS)
v	vulnerable (FIS)
r	rare (FIS)
L	listed as threatened under FFG Act

### Most recent record:

#	species predicted to occur by the PMST (not recorded on FIS unless dated)
Year	recorded on the FIS
2009	recorded during current survey

**Likelihood of occurrence:** – refer to Section 2.1.2

**Table A2.3 Flora of national or state significance recorded or predicted to occur within 5 km of the study area**

Scientific name	Common name	Aust. status	Vic. status	Most recent record	Likelihood of occurrence in study area
<b>National significance:</b>					
<i>Asperula wimmerana</i>	Wimmera Woodruff	R	r	2009	High
<i>Carex tasmanica</i>	Curly Sedge	VU	v/L	#	Negligible
<i>Diuris basaltica</i>	Small Golden Moths	EN	v/L	1996/#	Medium
<i>Glycine latrobeana</i>	Clover Glycine	VU	v/L	2006/#	Low
<i>Pimelea spinescens</i> subsp. <i>spinescens</i>	Spiny Rice-flower	CR	e	2009/#	Recorded
<i>Prasophyllum frenchii</i>	Maroon Leek-orchid	EN	e/L	#	Negligible
<i>Rutidosia leptorhynchoides</i>	Button Wrinklewort	EN	e/L	#	Negligible
<i>Senecio macrocarpus</i>	Large-fruit Fireweed	VU	e/L	#	Negligible

<b>State significance:</b>					
<i>Acacia rostriformis</i>	Bacchus Marsh Varnish Wattle		v	2010	Negligible
<i>Allocasuarina luehmannii</i>	Buloke		L	2010	Negligible
<i>Alternanthera</i> sp. 1 (Plains)	Plains Joyweed		k	2010	High
<i>Amyema linophylla</i> subsp. <i>orientale</i>	Buloke Mistletoe		v	2010	Negligible
<i>Austrostipa exilis</i>	Heath Spear-grass		r	1995	High
<i>Austrostipa hemipogon</i>	Half-bearded Spear-grass		r	2006	High
<i>Chenopodium desertorum</i> subsp. <i>desertorum</i>	Frosted Goosefoot		r	2008	High
<i>Clematis leptophylla</i>	Skeleton Vine		k	2010	Negligible
<i>Convolvulus angustissimus</i> subsp. <i>omnigracilis</i>	Slender Bindweed		k	2009	Recorded
<i>Cullen parvum</i>	Small Scurf-pea		e/L	2010	High

## Appendix 3: Fauna Results

### A3.1 Fauna species recorded from the study area

#### Australian status:

CR	Critically Endangered (EPBC Act)
E	Endangered (EPBC Act)
V	Vulnerable (EPBC Act)

#### Victorian status:

cr	critically endangered (DSE 2007a)
e	endangered (DSE 2007a)
v	vulnerable (DSE 2007a)
cd	conservation dependent (DSE 2007a)
nt	near threatened (DSE 2007a)
dd	data deficient (DSE 2007a)
L	listed as threatened under FFG Act
*	introduced species

**Table A3.1. Vertebrate fauna recorded from the site during the present assessment (listed in taxonomic order)**

Status	Scientific name	Common name
	<b>Birds</b>	
	<i>Pelecanus conspicillatus</i>	Australian Pelican
	<i>Vanellus miles</i>	Masked Lapwing
	<i>Gallinago hardwickii</i>	Latham's Snipe
	<i>Threskiornis spinicollis</i>	Straw-necked Ibis
	<i>Anas superciliosa</i>	Pacific Black Duck
	<i>Accipiter fasciatus</i>	Brown Goshawk
	<i>Elanus axillaris</i>	Black-shouldered Kite
	<i>Trichoglossus haematodus</i>	Rainbow Lorikeet
	<i>Hirundo neoxena</i>	Welcome Swallow
	<i>Rhipidura leucophrys</i>	Willie Wagtail
	<i>Grallina cyanoleuca</i>	Magpie-lark
	<i>Acanthiza chrysorrhoa</i>	Yellow-rumped Thornbill
	<i>Cincloramphus cruralis</i>	Brown Songlark
	<i>Cisticola exilis</i>	Golden-headed Cisticola
	<i>Malurus cyaneus</i>	Superb Fairy-wren
	<i>Zosterops lateralis</i>	Silvereeye

Status	Scientific name	Common name
	<i>Lichenostomus penicillatus</i>	White-plumed Honeyeater
	<i>Phylidonyris novaehollandiae</i>	New Holland Honeyeater
	<i>Anthochaera carunculata</i>	Red Wattlebird
	<i>Anthus novaeseelandiae</i>	Australasian Pipit
	<i>Gymnorhina tibicen</i>	Australian Magpie
	<i>Corvus mellori</i>	Little Raven
*	<i>Columba livia</i>	Rock Dove
*	<i>Streptopelia chinensis</i>	Spotted Turtle-Dove
*	<i>Turdus merula</i>	Common Blackbird
*	<i>Alauda arvensis</i>	European Skylark
*	<i>Passer domesticus</i>	House Sparrow
*	<i>Acridotheres tristis</i>	Common Myna
*	<i>Sturnus vulgaris</i>	Common Starling
	<b>Mammals</b>	
*	<i>Mus musculus</i>	House Mouse
*	<i>Oryctolagus cuniculus</i>	European Rabbit
*	<i>Lepus europeus</i>	European Hare
*	<i>Vulpes vulpes</i>	Red Fox
	<b>Reptiles</b>	
	<i>Chelodina longicollis</i>	Common Long-necked Turtle
	<i>Tiliqua scincoides</i>	Common Blue-tongued Lizard
	<b>Frogs</b>	
	<i>Crinia signifera</i>	Common Froglet

## A3.2 Significant fauna species

**Includes national and state significant species from the following sources:**

- DSE Victorian Fauna Database 2009 Version
- DEWHA database (PMST accessed on 27.08.10)
- Birds Australia data search
- VAF data search
- MWF data search
- Current survey

Search area is 5 km radius. VAF and MWF search encompassed the Werribee River catchment.

### Australian status:

CR	Critically Endangered (EPBC Act)
E	Endangered (EPBC Act)
V	Vulnerable (EPBC Act)

### Victorian status:

cr	critically endangered (DSE 2007a)
e	endangered (DSE 2007a)
v	vulnerable (DSE 2007a)
cd	conservation dependent (DSE 2007a)
nt	near threatened (DSE 2007a)
dd	data deficient (DSE 2007a)
L	listed as threatened under FFG Act

### Most recent record:

#	species predicted to occur by the PMST (not recorded on other databases unless dated)
##	species predicted to occur based on natural distributional range and suitable habitat despite lack of records in the databases searched
Year	recorded on databases listed above
2010	recorded during fauna assessment

**Likelihood of occurrence:** – refer to Section 2.1.2

**Table A3.2. Fauna of national or state significance recorded, or predicted to occur, within the local area (listed in taxonomic order)**

Scientific Name	Common Name	Aust. status	Vic. status	Most recent record	Likelihood of occurrence in study area
<b>EPBC listed</b>					
<i>Pachyptila turtur</i>	Fairy Prion	VU	vu	1999	Negligible
<i>Thalassarche cauta</i>	Shy Albatross	VU	vu/L	#/1956	Negligible
<i>Rostratula australis</i>	Australian Painted Snipe	VU	cr/L	#/1985	Low
<i>Botaurus poiciloptilus</i>	Australasian Bittern	EN	en/L	1997	Medium
<i>Neophema chrysogaster</i>	Orange-bellied Parrot	CR	cr/L	2004/#	Medium
<i>Lathamus discolor</i>	Swift Parrot	EN	en/L	#	Low
<i>Anthochaera phrygia</i>	Regent Honeyeater	EN	cr/L	#	Negligible

Scientific Name	Common Name	Aust. status	Vic. status	Most recent record	Likelihood of occurrence in study area
<i>Diomedea exulans gibsoni</i>	Gibson's Albatross	VU		#	Negligible
<i>Macronectes giganteus</i>	Southern Giant-Petrel	EN	vu/L	#	Negligible
<i>Diomedea bulleri</i>	Buller's Albatross	VU	L	#	Negligible
<i>Macronectes halli</i>	Northern Giant-Petrel	VU	nt/L	#	Negligible
<i>Dasyurus maculatus</i>	Spot-tailed Quoll	EN	en/L	#	Negligible
<i>Isoodon obesulus obesulus</i>	Southern Brown Bandicoot	EN	nt	#	Negligible
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	VU	vu/L	#	Low
<i>Pseudomys novaehollandiae</i>	New Holland Mouse	VU	vu/L	#	Negligible
<i>Eubalaena australis</i>	Southern Right Whale	EN	cr/L	#	Negligible
<i>Megaptera novaeangliae</i>	Humpback Whale	VU	vu/L	2001/#	Negligible
<i>Arctocephalus tropicalis</i>	Subantarctic Fur Seal	VU		1989	Negligible
<i>Caretta caretta</i>	Loggerhead Turtle	EN		#	Negligible
<i>Dermochelys coriacea</i>	Leathery Turtle	VU	cr/L	#	Negligible
<i>Delma impar</i>	Striped Legless Lizard	VU	en/L	2005/#	High
<i>Tympanocryptis pinguicollis</i>	Grassland Earless Dragon	EN	cr/L	#	Low
<i>Litoria raniformis</i>	Growling Grass Frog	VU	en/L	2006/#	Low
<i>Prototroctes maraena</i>	Australian Grayling	VU	vu/L	#	Not assessed
<i>Galaxiella pusilla</i>	Dwarf Galaxias	VU	vu/L	#	Not assessed
<i>Carcharodon carcharias</i>	Great White Shark	VU	vu/L	#	Negligible
<i>Thalassarche salvini</i>	Salvin's Albatross	VU		#	Negligible
<i>Diomedea sanfordi</i>	Northern Royal Albatross	EN	vu	#	Negligible
<i>Synemon plana</i>	Golden Sun Moth	CR	cr/L	2007	Recorded
<b>State rare or threatened</b>					
<i>Lewinia pectoralis</i>	Lewin's Rail		vu/L	1986	Medium
<i>Porzana pusilla</i>	Baillon's Crake		vu/L	1997	Medium
<i>Sula leucogaster</i>	Brown Booby		en/L	1965	Negligible
<i>Morus serrator</i>	Australasian Gannet		nt/L	2003	Negligible
<i>Gelochelidon nilotica</i>	Gull-billed Tern		en/L	1982	Low
<i>Hydroprogne caspia</i>	Caspian Tern		nt/L	2002	Low
<i>Sternula albifrons</i>	Little Tern		vu/L	2003/#	Negligible



Scientific Name	Common Name	Aust. status	Vic. status	Most recent record	Likelihood of occurrence in study area
<i>Sternula nereis</i>	Fairy Tern		en/L	1996	Negligible
<i>Charadrius mongolus</i>	Lesser Sand Plover		vu	1992	Negligible
<i>Numenius phaeopus</i>	Whimbrel		vu	#/1986	Low
<i>Limosa limosa</i>	Black-tailed Godwit		vu	#/1986	Low
<i>Tringa glareola</i>	Wood Sandpiper		vu	1994/#	Low
<i>Heteroscelus brevipes</i>	Grey-tailed Tattler		cr/L	2006/#	Low
<i>Actitis hypoleucos</i>	Common Sandpiper		vu	2000	Low
<i>Xenus cinereus</i>	Terek Sandpiper		en/L	1997	Low
<i>Calidris tenuirostris</i>	Great Knot		en/L	#/1982	Low
<i>Platalea regia</i>	Royal Spoonbill		vu	2006	Medium
<i>Egretta garzetta</i>	Little Egret		en/L	2006	Medium
<i>Ardea intermedia</i>	Intermediate Egret		cr/L	1999	Low
<i>Ardea modesta</i>	Eastern Great Egret		vu/L	2006/#	Medium
<i>Ixobrychus minutus</i>	Little Bittern		en/L	1980	Medium
<i>Anseranas semipalmata</i>	Magpie Goose		nt/L	2000	Low
<i>Anas rhynchotis</i>	Australasian Shoveler		vu	2003	Low
<i>Stictonetta naevosa</i>	Freckled Duck		en/L	1985	Low
<i>Aythya australis</i>	Hardhead		vu	2003	Low
<i>Oxyura australis</i>	Blue-billed Duck		en/L	2002	Low
<i>Biziura lobata</i>	Musk Duck		vu	2003	Low
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle		vu/L	1993/#	Low
<i>Falco subniger</i>	Black Falcon		vu	1990	Medium
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail Bat		L	1993	Low
<i>Arctocephalus forsteri</i>	New Zealand Fur Seal		vu	#	Negligible
<i>Pseudophryne bibronii</i>	Brown Toadlet		en/L	1871	Low
<i>Bidyanus bidyanus</i>	Silver Perch		cr/L	1992	Not assessed
<i>Hesperilla flavescens flavescens</i>	Altona Skipper		vu/L	1988	High
<b>Other conservation categories</b>					
<i>Coturnix ypsilophora</i>	Brown Quail		nt	2003	High
<i>Phalacrocorax fuscescens</i>	Black-faced Cormorant		nt	2006	Low

Scientific Name	Common Name	Aust. status	Vic. status	Most recent record	Likelihood of occurrence in study area
<i>Phalacrocorax varius</i>	Pied Cormorant		nt	2006	Low
<i>Chlidonias hybridus</i>	Whiskered Tern		nt	2003	Low
<i>Thalaseus bergii</i>	Crested Tern		nt	2006	Negligible
<i>Larus pacificus pacificus</i>	Pacific Gull		nt	2006	Low
<i>Haematopus fuliginosus</i>	Sooty Oystercatcher		nt	2001	Negligible
<i>Pluvialis squatarola</i>	Grey Plover		nt	1992	Low
<i>Pluvialis fulva</i>	Pacific Golden Plover		nt	2006/#	Low
<i>Numenius madagascariensis</i>	Eastern Curlew		nt	1997/#	Low
<i>Calidris canutus</i>	Red Knot		nt	2000/#	Low
<i>Calidris alba</i>	Sanderling		nt	2000	Negligible
<i>Gallinago hardwickii</i>	Latham's Snipe		nt	2011/#	Recorded
<i>Plegadis falcinellus</i>	Glossy Ibis		nt	1996	Medium
<i>Nycticorax caledonicus</i>	Nankeen Night Heron		nt	1996	High
<i>Cereopsis novaehollandiae</i>	Cape Barren Goose		nt	1999	Low
<i>Circus assimilis</i>	Spotted Harrier		nt	1985	Low
<i>Chrysococcyx osculans</i>	Black-eared Cuckoo		nt	1987	Negligible
<i>Calidris melanotos X ferruginea</i>	Cox's Sandpiper		nt	1982	Low
<i>Balaenoptera edeni</i>	Bryde's Whale		dd	#	Negligible
<i>Calidris melanotos</i>	Pectoral Sandpiper		nt	#/1987	Low
<i>Sminthopsis crassicaudata</i>	Fat-tailed Dunnart		nt	2005	High

## A3.3 Migratory species

### Includes records from the following sources:

- DSE Victorian Fauna Database 2007 Version
- DEWHA database (PMST accessed on 27.08.10)
- Birds Australia data search
- Current survey

Search area is 5 km radius.

### Most recent record:

# species predicted to occur by the PMST (not recorded on other databases unless dated)  
 Year recorded on databases listed above  
 2010/2011 recorded during current survey

**Table A3.3. Migratory species recorded, or predicted to occur, within 5 kilometres of the site**

Scientific Name	Common Name	Most recent record
<i>Ardenna tenuirostris</i>	Short-tailed Shearwater	2000
<i>Thalassarche cauta</i>	Shy Albatross	#/1956
<i>Hydroprogne caspia</i>	Caspian Tern	2002
<i>Sternula albifrons</i>	Little Tern	2003/#
<i>Stercorarius parasiticus</i>	Arctic Jaeger	2000
<i>Arenaria interpres</i>	Ruddy Turnstone	2006/#
<i>Pluvialis squatarola</i>	Grey Plover	1992
<i>Pluvialis fulva</i>	Pacific Golden Plover	2006/#
<i>Charadrius mongolus</i>	Lesser Sand Plover	1992
<i>Charadrius bicinctus</i>	Double-banded Plover	2006/#
<i>Numenius madagascariensis</i>	Eastern Curlew	1997/#
<i>Numenius phaeopus</i>	Whimbrel	#/1986
<i>Numenius minutus</i>	Little Curlew	#
<i>Limosa limosa</i>	Black-tailed Godwit	#/1986
<i>Limosa lapponica</i>	Bar-tailed Godwit	1997/#
<i>Tringa glareola</i>	Wood Sandpiper	1994/#
<i>Heteroscelus brevipes</i>	Grey-tailed Tattler	2006/#
<i>Actitis hypoleucos</i>	Common Sandpiper	2000
<i>Tringa nebularia</i>	Common Greenshank	2006
<i>Tringa stagnatilis</i>	Marsh Sandpiper	2006/#
<i>Xenus cinereus</i>	Terek Sandpiper	1997

<i>Calidris ferruginea</i>	Curlew Sandpiper	2006/#
<i>Calidris ruficollis</i>	Red-necked Stint	2006/#
<i>Calidris acuminata</i>	Sharp-tailed Sandpiper	2006/#
<i>Calidris canutus</i>	Red Knot	2000/#
<i>Calidris tenuirostris</i>	Great Knot	#/1982
<i>Calidris alba</i>	Sanderling	2000
<i>Limicola falcinellus</i>	Broad-billed Sandpiper	#/1986
<i>Gallinago hardwickii</i>	Latham's Snipe	2011/#
<i>Rostratula australis</i>	Australian Painted Snipe	#/1985
<i>Plegadis falcinellus</i>	Glossy Ibis	1996
<i>Ardea modesta</i>	Eastern Great Egret	2006/#
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	1993/#
<i>Neophema chrysogaster</i>	Orange-bellied Parrot	2004/#
<i>Merops ornatus</i>	Rainbow Bee-eater	#
<i>Hirundapus caudacutus</i>	White-throated Needletail	2005/#
<i>Apus pacificus</i>	Fork-tailed Swift	#/1977
<i>Rhipidura rufifrons</i>	Rufous Fantail	#
<i>Myiagra cyanoleuca</i>	Satin Flycatcher	#
<i>Acrocephalus stentoreus</i>	Clamorous Reed Warbler	2001
<i>Anthochaera phrygia</i>	Regent Honeyeater	#
<i>Diomedea exulans gibsoni</i>	Gibson's Albatross	#
<i>Tryngites subruficollis</i>	Buff-breasted Sandpiper	1962
<i>Macronectes giganteus</i>	Southern Giant-Petrel	#
<i>Diomedea bulleri</i>	Buller's Albatross	#
<i>Phalaropus lobatus</i>	Red-necked Phalarope	1992
<i>Philomachus pugnax</i>	Ruff	#/1988
<i>Macronectes halli</i>	Northern Giant-Petrel	#
<i>Sterna hirundo</i>	Common Tern	2001
<i>Calidris subminuta</i>	Long-toed Stint	#/1986
<i>Ardea ibis</i>	Cattle Egret	2005/#
<i>Calidris melanotos</i>	Pectoral Sandpiper	#/1987
<i>Eubalaena australis</i>	Southern Right Whale	#

<i>Caperea marginata</i>	Pygmy Right Whale	#
<i>Balaenoptera edeni</i>	Bryde's Whale	#
<i>Megaptera novaeangliae</i>	Humpback Whale	2001/#
<i>Lagenorhynchus obscurus</i>	Dusky Dolphin	#
<i>Tursiops aduncus</i>	Indian Ocean Bottlenose Dolphin	#
<i>Caretta caretta</i>	Loggerhead Turtle	#
<i>Dermochelys coriacea</i>	Leathery Turtle	#
<i>Carcharodon carcharias</i>	Great White Shark	#
<i>Diomedea sanfordi</i>	Northern Royal Albatross	#
<i>Thalassarche salvini</i>	Salvin's Albatross	#
<i>Gallinago megala</i>	Swinhoe's Snipe	#
<i>Gallinago stenura</i>	Pin-tailed Snipe	#
<i>Thalassarche impavida</i>	Campbell Albatross	#

### A3.4 Golden Sun Moth targeted survey results

**Table A3.4a. Results of targeted Golden Sun Moth survey**

Date	Reference site	GSM obs @ ref site	Start time	Finish time	Total survey time	Cloud cover	Wind speed	Temp	Transect width	Survey method	GSM observed
30/12/2010	Grieve Pde	Yes	10:30:00	12:30:00	2:00:00	25-50%	Slight breeze	20-25 C	50m	Walking	No
4/01/2011	Eynesbury & Manor Lakes	Yes	13:30:00	15:00:00	1:30:00	0-25%	Moderate wind	20-25 C	25m	Walking	No
16/01/2011	Aurora	Yes	13:50:00	15:00:00	1:10:00	25-50%	Moderate wind	25-30 C	10m	Walking	No
20/01/2011	Eynesbury	Yes	13:00:00	14:20:00	1:20:00	0-25%	Moderate wind	25-30 C	10m	Walking	No
20/01/2011	Eynesbury	Yes	14:30:00	15:00:00	0:30:00	0-25%	Moderate wind	25-30 C	10m	Walking	No
25/01/2011	Donnybrook	Yes	12:15:00	12:45:00	0:30:00	25-50%	Slight breeze	20-25 C	10m	Walking	No

**Table A3.4b. Weather data from the Bureau of Meteorology**

Data source: Bureau of Meteorology - Laverton weather station 80731

Data is presented in this table for the start and finish times (10:00 & 15:00) and mid-point (12:30) of GSM targeted survey period on each survey day.

Precipitation information is included for the two dates preceding each day of survey.

Date	Time	Precipitation since 9am (mm)	Air Temperature (°C)	Relative humidity (%)	Wind speed (km/h)	Wind direction	Speed of max windgust in last 10 mins (km/h)	Station level pressure (hPa)
28/12/2010	23:30	0						
29/12/2010	23:30	0						
30/12/2010	10:00	0	18.6	62	9	SE	13	1015.4
30/12/2010	12:30	0	20.5	60	13	SE	21	1014.8
30/12/2010	15:00	0	20.6	64	24	S	31	1014.1
2/01/2011	23:30	0						
3/01/2011	23:30	0						
4/01/2011	10:00	0	17.3	60	9	S	15	1010.9
4/01/2011	12:30	0	20	53	21	S	30	1009.7
4/01/2011	15:00	0	19.9	55	24	S	31	1008.6
14/01/2011	23:30	13						
15/01/2011	23:30	0						
16/01/2011	10:00	0	22.9	75	4	SSW	13	1006.4
16/01/2011	12:30	0	23	78	22	S	31	1005.7
16/01/2011	15:00	0	21.5	79	21	S	35	1004.9

Date	Time	Precipitation since 9am (mm)	Air Temperature (°C)	Relative humidity (%)	Wind speed (km/h)	Wind direction	Speed of max windgust in last 10 mins (km/h)	Station level pressure (hPa)
18/01/2011	23:30	0						
19/01/2011	23:30	0						
20/01/2011	10:00	0	20.3	66	5	NW	11	1009.7
20/01/2011	12:30	0	22.8	63	18	S	24	1008.1
20/01/2011	15:00	0	25.3	55	15	SSE	18	1007.1
23/01/2011	23:30	0						
24/01/2011	23:30	0.2						
25/01/2011	10:00	0	19.5	60	9	E	15	1005.6
25/01/2011	12:30	0	23.7	47	8	E	15	1004.7
25/01/2011	15:00	0	24	52	15	SSE	24	1004.4



## Appendix 4: Legislation, Government Policy & Strategies

---

Following is an outline of the Government legislation and policies directly relevant to this assessment.

### Commonwealth

#### Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) applies to developments and associated activities that have the potential to significantly impact on matters protected under the Act.

Under the Act, unless exempt, actions require approval from the Australian Government Minister for Environment, Heritage and the Arts if they are likely to significantly impact on a 'matter of national environmental significance' (NES). Matters of NES are:

- World Heritage properties;
- National Heritage places;
- Listed threatened species and ecological communities;
- Listed migratory species;
- Wetlands of international importance (Ramsar sites);
- The Commonwealth marine environment; and
- Nuclear actions (including uranium mining).

The EPBC Act also applies to the environment in general if actions are taken on Commonwealth land, or if actions that are taken outside Commonwealth land will impact on the environment of Commonwealth land.

Any person proposing to take an action that may, or will, have a significant impact on a matter of NES must refer the action to the Commonwealth Government Minister for Environment, Heritage and the Arts for determination as to whether or not the action is a 'Controlled Action.' 'Significant impacts' are defined in *EPBC Act Policy Statement 1.1 Significant Impact Guidelines: Matters of National Environmental Significance* (DEH 2006).

### State

#### Flora and Fauna Guarantee Act 1988

The primary legislation dealing with biodiversity conservation and sustainable use of native flora and fauna is the *Flora and Fauna Guarantee Act 1988* (FFG Act).

The FFG Act provides for the listing of taxa (genera, species, subspecies, varieties) and communities of flora and fauna which are threatened, and of potentially threatened processes. The Act includes a list of Protected Flora, to which flora taxa and species of listed communities are added. The Act contains powers over the taking, trading and keeping of listed fish.

The protected flora list has three sources:

- plant taxa (species, subspecies or varieties) listed as threatened under the Flora and Fauna Guarantee Act 1988;
- plant taxa belonging to communities listed as threatened under the Flora and Fauna Guarantee Act 1988;
- plant taxa which are not threatened but require protection for other reasons.

Critical Habitat on private land can be declared under the Act for either a species or an ecological community. In areas of Critical Habitat, the Minister for Sustainability and Environment can impose an Interim Conservation Order (ICO). However, there have been no areas of Critical Habitat identified in Victoria, and consequently there are no ICOs.

A permit is required from DSE to 'take' (kill, injure, disturb or collect) protected flora species, including members of listed communities, from public land, or from areas of defined Critical Habitat on private land.

A permit is required from DSE to 'take' listed fish species.

A permit is not required to 'take' listed fauna or members of a listed fauna community under the FFG Act. Controls in relation to protection of fauna are provided under the *Wildlife Act 1975* and the Wildlife Regulations 2002 (see below).

### **Planning and Environment Act 1987**

The *Planning and Environment Act 1987* controls the planning and development of land in Victoria. The Act provides for the development of a planning scheme for all municipalities. Planning schemes follow a standard format and contain state and local components. The Victoria Planning Provisions (VPP) comprise the standard State sections - the State Planning Policy Framework (SPPF Clauses 10 to 19), Particular Provisions (Clauses 51 to 56) and General Provisions (Clauses 60 to 67).

The planning authority provides the local planning policy content, and applies the relevant zones and overlays to particular areas for a particular planning scheme.

Municipal planning schemes include controls over the removal of native vegetation, including permit requirements, as follows:

**Clause 15** contains higher order objectives, strategies and implementation measures for the conservation of the environment, including waterways, flora and fauna. Clause 15.09 states that "*Planning and responsible authorities must have regard to Victoria's Native Vegetation Management – A Framework for Action (Department of Natural Resources and Environment 2002)*).

**Clause 52.17** requires a planning permit to remove, destroy or lop native vegetation including dead native vegetation. This does not apply (to the removal of native vegetation to the minimum extent necessary) if any item in the table of exemptions (Clause 52.17-6) is applicable, or to specific native vegetation or a specific area as specified in a schedule to Clause 52.17, or if clearance is in accordance with a native vegetation precinct plan.

Clause 65.02 requires consideration of native vegetation retention in subdivision applications.

Additional permit requirements may apply under overlays introduced into an individual planning scheme, such as a Vegetation Protection Overlay, or Environmental Significance Overlay.

DSE is a mandatory referral authority in some circumstances involving permit applications for native vegetation removal. Under Clause 66.02, the removal of more than 0.5 hectares of endangered, vulnerable or rare vegetation types or more than 1.0 hectare of a depleted or least concern vegetation type must be referred to the Department. DSE is also a referral authority if the removal of more than 5 trees of greater than 40 cm DBH OR more than 15 trees of less than 40 cm DBH is proposed.

## Native Vegetation Management Framework

The *Native Vegetation Management Framework* (NRE 2002) is State Government policy for the protection, enhancement and revegetation of native vegetation in Victoria. Native vegetation provisions were introduced to all planning schemes in 1989 and the Framework was incorporated into the Victoria Planning Provisions in 2003. The primary goal of the Framework is:

*a reversal, across the whole landscape, of the long-term decline in the extent and quality of native vegetation, leading to a Net Gain* (NRE 2002).

Where an application is made to remove native vegetation, a proponent for a development must explain the steps that have been taken to:

- Avoid the removal of native vegetation, where possible
- Minimise the removal of native vegetation.
- Appropriately offset the loss of native vegetation, if required.

A proponent for a development must demonstrate that the option to avoid and minimise vegetation clearance has been fully explored before considering offsets

An offset may be achieved by improvements in the quality or extent of native vegetation in a selected 'offset area', either within a project area or off-site. An area that is revegetated and protected or set aside for natural regeneration may provide some, or all, of the required offset. The conservation significance of vegetation to be removed is also taken into account when offsets are determined.

## Regional Native Vegetation Plans

Native Vegetation Plans have been prepared to develop a strategic and co-ordinated approach to the management of native vegetation within a given Catchment Management Authority region. The plans are designed to complement the Native Vegetation Management Framework and contains specific information and objectives relating to the region.

The Native Vegetation Plans outline strategic directions including:

- Retaining the quantity of native vegetation by minimising clearing;
- Protecting native vegetation with reservation and management agreements;
- Maintaining and improve the quality of native vegetation; and
- Increasing the quantity of native vegetation.

Responses and offset requirements for clearing native vegetation are outlined. Tree offsets that are not covered by the Framework replacement ratios are calculated using the Regional Native Vegetation Plan where available.

## Wildlife Act 1975 and associated Regulations

The *Wildlife Act 1975* is the primary legislation in Victoria providing for protection and management of wildlife. For the purposes of the Act, wildlife means indigenous vertebrate species (except those declared as pest animals), invertebrate species listed under the FFG Act, and some introduced game species.

The *Wildlife Regulations 2002* of the Act prescribe the penalties for certain activities relevant to wildlife. These include penalties for persons who wilfully damage, disturb or destroy any wildlife habitat without appropriate authorisation (Section 9 of the *Wildlife Regulations 2002*). Authorisation for habitat removal may be obtained under the Wildlife Act; through a licence granted under the *Forests Act 1958*; or under any other Act.

Authorisation to destroy or possess wildlife may be required (Sections 41– 47) if wildlife needs to be moved or destroyed during development.

## Appendix 5: EVC Benchmarks

---

# EVC/Bioregion Benchmark for Vegetation Quality Assessment

## Victorian Volcanic Plain bioregion

### EVC 125: Plains Grassy Wetland

#### Description:

This EVC is usually treeless, but in some instances can include sparse River Red Gum *Eucalyptus camaldulensis* or Swamp Gum *Eucalyptus ovata*. A sparse shrub component may also be present. The characteristic ground cover is dominated by grasses and small sedges and herbs. The vegetation is typically species-rich on the outer verges but is usually species-poor in the wetter central areas.

#### Life Forms:

Life form	#Spp	%Cover	LF code
Large Herb	5	5%	LH
Medium Herb	6	10%	MH
Small or Prostrate Herb	3	10%	SH
Large Tufted Graminoid	3	15%	LTG
Large Non-tufted Graminoid	1	5%	LNG
Medium to Small Tufted Graminoid	8	30%	MTG
Medium to Tiny Non-tufted Graminoid	2	10%	MNG
Bryophytes/Lichens	na	10%	BL

#### LF Code

#### Species typical of at least part of EVC range

#### Common Name

LH	<i>Epilobium billardierianum</i>	Variable Willow-herb
LH	<i>Villarsia reniformis</i>	Running Marsh-flower
LH	<i>Epilobium billardierianum ssp. cinereum</i>	Grey Willow-herb
MH	<i>Potamogeton tricarinatus s.l.</i>	Floating Pondweed
MH	<i>Lilaeopsis polyantha</i>	Australian Lilaeopsis
MH	<i>Utricularia dichotoma s.l.</i>	Fairies' Aprons
SH	<i>Eryngium vesiculosum</i>	Prickfoot
SH	<i>Neopaxia australasica</i>	White Purslane
SH	<i>Lobelia pratioides</i>	Poison Lobelia
LTG	<i>Juncus flavidus</i>	Gold Rush
LTG	<i>Deyeuxia quadriseta</i>	Reed Bent-grass
LTG	<i>Amphibromus nervosus</i>	Common Swamp Wallaby-grass
LTG	<i>Poa labillardierei</i>	Common Tussock-grass
MTG	<i>Triglochin procerum s.l.</i>	Water Ribbons
MTG	<i>Glyceria australls</i>	Australian Sweet-grass
MTG	<i>Juncus holoschoenus</i>	Joint-leaf Rush
MTG	<i>Austrodanthonia duttoniana</i>	Brown-back Wallaby-grass
MNG	<i>Eleocharis acuta</i>	Common Spike-sedge
MNG	<i>Eleocharis pusilla</i>	Small Spike-sedge

#### Recruitment:

Episodic/Flood. Desirable period between disturbances is 5 years.

#### Organic Litter:

20% cover

#### Logs:

5 m/0.1 ha.(where trees are overhanging the wetland)

# EVC 125: Plains Grassy Wetland - Victorian Volcanic Plain bioregion

## Weediness:

LF Code	Typical Weed Species	Common Name	Invasive	Impact
LH	<i>Cirsium vulgare</i>	Spear Thistle	high	high
MH	<i>Leontodon taraxacoides</i> ssp. <i>taraxacoides</i>	Hairy Hawkbit	high	low
MH	<i>Hypochoeris radicata</i>	Cat's Ear	high	low
LTG	<i>Phalaris aquatica</i>	Toowoomba Canary-grass	high	high
LNG	<i>Holcus lanatus</i>	Yorkshire Fog	high	high
MTG	<i>Briza minor</i>	Lesser Quaking-grass	high	low
MTG	<i>Romulea rosea</i>	Onion Grass	high	low
TTG	<i>Cyperus tenellus</i>	Tiny Flat-sedge	high	low

Published by the Victorian Government Department of Sustainability and Environment May 2004

© The State of Victoria Department of Sustainability and Environment 2004

This publication is copyright. Reproduction and the making available of this material for personal, in-house or non-commercial purposes is authorised, on condition that:

- the copyright owner is acknowledged;
- no official connection is claimed;
- the material is made available without charge or at cost; and
- the material is not subject to inaccurate, misleading or derogatory treatment.

Requests for permission to reproduce or communicate this material in any way not permitted by this licence (or by the fair dealing provisions of the *Copyright Act 1968*) should be directed to the Nominated Officer, Copyright, 8 Nicholson Street, East Melbourne, Victoria, 3002.

For more information contact: Customer Service Centre, 136 186

This publication may be of assistance to you but the State of Victoria and its employees do not guarantee that the publication is without flaw of any kind or is wholly appropriate for your particular purposes and therefore disclaims all liability for any error, loss or other consequence which may arise from you relying on any information in this publication.

[www.dse.vic.gov.au](http://www.dse.vic.gov.au)



# EVC/Bioregion Benchmark for Vegetation Quality Assessment

## Victorian Volcanic Plain bioregion

### EVC 132\_61: *Heavier-soils* Plains Grassland

#### Description:

Treeless vegetation mostly less than 1 m tall dominated by largely graminoid and herb life forms. Occupies fertile cracking basalt soils prone to seasonal waterlogging in areas receiving at least 500 mm annual rainfall.

#### Life Forms:

Life form	#Spp	%Cover	LF code
Large Herb	2	5%	LH
Medium Herb	12	20%	MH
Small or Prostrate Herb	4	5%	SH
Large Tufted Graminoid	1	5%	LTG
Medium to Small Tufted Graminoid	13	40%	MTG
Medium to Tiny Non-tufted Graminoid	4	5%	MNG
Bryophytes/Lichens and Soil Crust*	na	20%	BL

\* Note: treat as one life form in this EVC

LF Code	Species typical of at least part of EVC range	Common Name
SS	<i>Pimelea humilis</i>	Common Rice-flower
LH	<i>Rumex dumosus</i>	Wiry Dock
MH	<i>Calocephalus citreus</i>	Lemon Beauty-heads
MH	<i>Acaena echinata</i>	Sheep's Burr
MH	<i>Leptorhynchus squamatus</i>	Scaly Buttons
MH	<i>Eryngium ovinum</i>	Blue Devil
SH	<i>Solenogyne dominii</i>	Smooth Solenogyne
SH	<i>Lobelia pratioides</i>	Poison Lobelia
LTG	<i>Austrostipa bigeniculata</i>	Kneed Spear-grass
LTG	<i>Dichelachne crinita</i>	Long-hair Plume-grass
MTG	<i>Themeda triandra</i>	Kangaroo Grass
MTG	<i>Austrodanthonia caespitosa</i>	Common Wallaby-grass
MTG	<i>Elymus scaber</i> var. <i>scaber</i>	Common Wheat-grass
MTG	<i>Schoenus apogon</i>	Common Bog-sedge
MNG	<i>Microlaena stipoides</i> var. <i>stipoides</i>	Weeping Grass
MNG	<i>Thelymitra pauciflora</i> s.l.	Slender Sun-orchid
MNG	<i>Microtis unifolia</i>	Common Onion-orchid
SC	<i>Convolvulus erubescens</i>	Pink Bindweed

#### Recruitment:

Episodic/Fire or Grazing. Desirable period between disturbances is 5 years.

#### Organic Litter:

10% cover

# EVC 132\_61: *Heavier-soils* Plains Grassland - Victorian Volcanic Plain bioregion

## Weediness:

LF Code	Typical Weed Species	Common Name	Invasive	Impact
LH	<i>Plantago lanceolata</i>	Ribwort	high	low
LH	<i>Cirsium vulgare</i>	Spear Thistle	high	high
LH	<i>Sonchus oleraceus</i>	Common Sow-thistle	high	low
MH	<i>Hypochoeris radicata</i>	Cat's Ear	high	low
MH	<i>Leontodon taraxacoides</i> ssp. <i>taraxacoides</i>	Hairy Hawkbit	high	low
MH	<i>Trifolium subterraneum</i>	Subterranean Clover	high	low
MH	<i>Plantago coronopus</i>	Buck's-horn Plantain	high	low
MH	<i>Trifolium striatum</i>	Knotted Clover	high	low
MH	<i>Trifolium dubium</i>	Suckling Clover	high	low
LTG	<i>Phalaris aquatica</i>	Toowoomba Canary-grass	high	high
LNG	<i>Holcus lanatus</i>	Yorkshire Fog	high	high
MTG	<i>Romulea rosea</i>	Onion Grass	high	low
MTG	<i>Vulpia bromoides</i>	Squirrel-tail Fescue	high	low
MTG	<i>Briza minor</i>	Lesser Quaking-grass	high	low
MTG	<i>Bromus hordeaceus</i> ssp. <i>hordeaceus</i>	Soft Brome	high	low
MTG	<i>Briza maxima</i>	Large Quaking-grass	high	low
MTG	<i>Lolium rigidum</i>	Wimmera Rye-grass	high	low
MTG	<i>Lolium perenne</i>	Perennial Rye-grass	high	low
MTG	<i>Nassella neesiana</i>	Chilean Needle-grass	high	high
MNG	<i>Cynosurus echinatus</i>	Rough Dog's-tail	high	low
MNG	<i>Juncus capitatus</i>	Capitate Rush	high	low

Published by the Victorian Government Department of Sustainability and Environment December 2004

© The State of Victoria Department of Sustainability and Environment 2004

This publication is copyright. Reproduction and the making available of this material for personal, in-house or non-commercial purposes is authorised, on condition that:

- the copyright owner is acknowledged;
- no official connection is claimed;
- the material is made available without charge or at cost; and
- the material is not subject to inaccurate, misleading or derogatory treatment.

Requests for permission to reproduce or communicate this material in any way not permitted by this licence (or by the fair dealing provisions of the *Copyright Act 1968*) should be directed to the Nominated Officer, Copyright, 8 Nicholson Street, East Melbourne, Victoria, 3002.

For more information contact: Customer Service Centre, 136 186

This publication may be of assistance to you but the State of Victoria and its employees do not guarantee that the publication is without flaw of any kind or is wholly appropriate for your particular purposes and therefore disclaims all liability for any error, loss or other consequence which may arise from you relying on any information in this publication.

[www.dse.vic.gov.au](http://www.dse.vic.gov.au)



# EVC/Bioregion Benchmark for Vegetation Quality Assessment

## Victorian Volcanic Plain bioregion

### EVC 132\_63: *Low-rainfall* Plains Grassland

#### Description:

Treeless vegetation mostly < 1 m tall dominated by largely graminoid and herb life forms. Occupies cracking basalt soils prone to seasonal waterlogging in areas receiving < 500 mm annual rainfall.

#### Life forms:

Life form	#Spp	%Cover	LF code
Small Shrub*	1	5%	SS
Prostrate Shrub	1	5%	PS
Large Herb*	2	5%	LH
Medium Herb	8	20%	MH
Small or Prostrate Herb*	3	10%	SH
Large Tufted Graminoid	1	5%	LTG
Medium to Small Tufted Graminoid	10	30%	MTG
Medium to Tiny Non-tufted Graminoid*	2	5%	MNG
Bryophytes/Lichens and Soil Crust**	na	20%	BL

\* Largely seasonal life form

\*\* Note: treat as one life form in this EVC

LF Code	Species typical of at least part of EVC range	Common Name
SS	<i>Pimelea curviflora</i> s.s.	Curved Rice-flower
PS	<i>Atriplex semibaccata</i>	Berry Saltbush
LH	<i>Ptilotus macrocephalus</i>	Feather-heads
MH	<i>Acaena echinata</i>	Sheep's Burr
MH	<i>Plantago gaudichaudii</i>	Narrow Plantain
MH	<i>Maireana enchylaenoides</i>	Wingless Bluebush
MH	<i>Calocephalus citreus</i>	Lemon Beauty-heads
SH	<i>Solenogyne dominii</i>	Smooth Solenogyne
SH	<i>Oxalis perennans</i>	Grassland Wood-sorrel
SH	<i>Chamaesyce drummondii</i>	Flat Spurge
SH	<i>Goodenia pinnatifida</i>	Cut-leaf Goodenia
LTG	<i>Austrostipa bigeniculata</i>	Kneed Spear-grass
MTG	<i>Austrostipa scabra</i>	Rough Spear-grass
MTG	<i>Austrostipa nodosa</i>	Knotty Spear-grass
MTG	<i>Whalleya proluta</i>	Rigid Panic
MTG	<i>Austrodanthonia duttoniana</i>	Brown-back Wallaby-grass
TTG	<i>Centrolepis strigosa</i> ssp. <i>strigosa</i>	Hairy Centrolepis
TTG	<i>Centrolepis aristata</i>	Pointed Centrolepis
SC	<i>Convolvulus erubescens</i> spp. agg.	Pink Bindweed

#### Recruitment:

Episodic/Fire or Grazing. Desirable period between disturbances is 5 years.

#### Organic Litter:

10% cover

# EVC 132\_63: *Low-rainfall* Plains Grassland - Victorian Volcanic Plain bioregion

## Weediness:

LF Code	Typical Weed Species	Common Name	Invasive	Impact
LH	<i>Plantago lanceolata</i>	Ribwort	high	low
LH	<i>Cirsium vulgare</i>	Spear Thistle	high	high
LH	<i>Sonchus oleraceus</i>	Common Sow-thistle	high	low
MH	<i>Hypochoeris radicata</i>	Cat's Ear	high	low
MH	<i>Leontodon taraxacoides</i> ssp. <i>taraxacoides</i>	Hairy Hawkbit	high	low
MH	<i>Trifolium subterraneum</i>	Subterranean Clover	high	low
MH	<i>Plantago coronopus</i>	Buck's-horn Plantain	high	low
MH	<i>Trifolium striatum</i>	Knotted Clover	high	low
MH	<i>Trifolium dubium</i>	Suckling Clover	high	low
MTG	<i>Romulea rosea</i>	Onion Grass	high	low
MTG	<i>Vulpia bromoides</i>	Squirrel-tail Fescue	high	low
MTG	<i>Briza minor</i>	Lesser Quaking-grass	high	low
MTG	<i>Bromus hordeaceus</i> ssp. <i>hordeaceus</i>	Soft Brome	high	low
MTG	<i>Briza maxima</i>	Large Quaking-grass	high	low
MTG	<i>Lolium rigidum</i>	Wimmera Rye-grass	high	low
MTG	<i>Lolium perenne</i>	Perennial Rye-grass	high	low
MTG	<i>Nassella neesiana</i>	Chilean Needle-grass	high	high
MNG	<i>Cynosurus echinatus</i>	Rough Dog's-tail	high	low
MNG	<i>Juncus capitatus</i>	Capitate Rush	high	low

Published by the Victorian Government Department of Sustainability and Environment December 2004

© The State of Victoria Department of Sustainability and Environment 2004

This publication is copyright. Reproduction and the making available of this material for personal, in-house or non-commercial purposes is authorised, on condition that:

- the copyright owner is acknowledged;
- no official connection is claimed;
- the material is made available without charge or at cost; and
- the material is not subject to inaccurate, misleading or derogatory treatment.

Requests for permission to reproduce or communicate this material in any way not permitted by this licence (or by the fair dealing provisions of the *Copyright Act 1968*) should be directed to the Nominated Officer, Copyright, 8 Nicholson Street, East Melbourne, Victoria, 3002.

For more information contact: Customer Service Centre, 136 186

This publication may be of assistance to you but the State of Victoria and its employees do not guarantee that the publication is without flaw of any kind or is wholly appropriate for your particular purposes and therefore disclaims all liability for any error, loss or other consequence which may arise from you relying on any information in this publication.

[www.dse.vic.gov.au](http://www.dse.vic.gov.au)

# EVC/Bioregion Benchmark for Vegetation Quality Assessment

## Victorian Volcanic Plain bioregion

### EVC 656: Brackish Wetland

#### Description:

Treeless EVC dominated by sedges and herbs that are generally indicative of saline conditions. True halophytic species such as samphires, if present, only occur with very low cover. Occurs in estuaries and along poorly defined drainage lines or associated with shorelines of brackish lakes.

#### Life Forms:

Life form	#Spp	%Cover	LF code
Large Herb	1	5%	LH
Medium Herb	3	15%	MH
Small or Prostrate Herb	3	10%	SH
Large Tufted Graminoid	1	10%	LTG
Large Non-tufted Graminoid	2	10%	LNG
Medium to Small Tufted Graminoid	2	5%	MTG
Medium to Tiny Non-tufted Graminoid	3	15%	MNG
Scrambler or Climber	1	1%	SC
Soil Crust	na	10%	S/C
<b>Total understorey projective foliage cover</b>		<b>80%</b>	

LF Code	Species typical of at least part of EVC range	Common Name
LH	<i>Persicaria decipiens</i>	Slender Knotweed
LH	<i>Epilobium billardierianum</i> ssp. <i>billardierianum</i>	Smooth Willow-herb
MH	<i>Sarcocornia quinqueflora</i>	Beaded Glasswort
MH	<i>Samolus repens</i>	Creeping Brookweed
MH	<i>Suaeda australis</i>	Austral Seablite
SH	<i>Selliera radicans</i>	Shiny Swamp-mat
SH	<i>Crassula helmsii</i>	Swamp Crassula
SH	<i>Mimulus repens</i>	Creeping Monkey-flower
LTG	<i>Gahnia filum</i>	Chaffy Saw-sedge
LNG	<i>Juncus kraussii</i> ssp. <i>australiensis</i>	Sea Rush
LNG	<i>Phragmites australis</i>	Common Reed
MTG	<i>Poa poiformis</i>	Coast Tussock-grass
MTG	<i>Lachnagrostis filiformis</i>	Common Blown-grass
MNG	<i>Bolboschoenus caldwellii</i>	Salt Club-sedge
MNG	<i>Distichlis distichophylla</i>	Australian Salt-grass
MNG	<i>Schoenoplectus pungens</i>	Sharp Club-sedge
MNG	<i>Triglochin striatum</i>	Streaked Arrowgrass
SC	<i>Calystegia sepium</i>	Large Bindweed

#### Recruitment:

Episodic/Flood: desirable period of disturbance is every five years

#### Organic Litter:

10% cover

#### Weediness:

There are no consistent weeds in this EVC.

## Appendix 6: DSE Net Gain Calculator Output

---

# DSE Gain Calculator

Version 1.2, October 2008

[About DSE Gain Calculator](#)

**STEP 1** Enter site details

NAME or EOI CODE:   
 SITE CODE (number):   
 SITE LOCATION/ADDRESS:   
 PROPERTY SIZE:

**STEP 2** Habitat zone code (a-z)   
 Zone Type

**STEP 3** Select bioregion

**STEP 4** Select EVC  BCS:   
 If "Other" is selected:  
 - enter EVC & Standardiser:   
 - enter assessed habitat scores manually under STEP 10, based on EVC BCS.

**STEP 5** Enter size of habitat zone, to one decimal place  ha  
 (or revegetation area)

**STEP 6** Select current land tenure

**STEP 7** Select current planning controls

no entitlement to graze with domestic stock  
 no entitlement to remove trees - alive  
 no entitlement to remove trees - dead  
 no entitlement to remove dead vegetation  
 no entitlement to remove fallen timber  
 requirement for regular fuel reduction  
 other - please insert

Enter other:

**STEP 8** Select proposal type

**STEP 9** Select total patch size class - including adjoining zones

**STEP 11** Choose the appropriate management options as required

(a)  Exclude stock and ensure that weed cover does not increase beyond current levels\*  
 (b)  Retain all standing trees - dead or alive  
 (c)  Retain all fallen timber/branches/leaf litter  
 (d)  Eliminate high threat woody weeds & control pest animals  
 (e)  Eliminate all identified high threat weeds & control pest animals  
 (f)  Supplementary planting  
 (g)  
 (h)  Any additional site-specific management actions  
 If (h) is selected, select management actions from below:

Ecological thinning  
 Ecological burning  
 Ecological flooding  
 Other

\*For Grassland type EVC's only  
 Replace management option (a) above with  
  
 \* All grassland management actions must ensure no further weed spread

**STEP 10** Current Habitat Score

Attribute	Max	Default	Assessed	Comments
Large Trees	10	na		
Tree canopy cover	5	na		
Understorey	25	10	15	
Lack of weeds	15	7	4	
Recruitment	10	6		
Organic litter	5	3	5	
Logs	5	na		
Landscape context	25	10	6	
Standardised Habitat Score	100		47	

**STEP 12** Gain Scores for Remnant Management

Attribute	Maintenance Gain/ha		Improvement Gain/ha		Comments
	Calculated	Assessed	Calculated	Assessed	
Large Trees	na		na		
Tree canopy cover	na		na	Enter here:	
Understorey	7.5		1.25	Enter here:	
Lack of weeds	na		1		
Recruitment	3		1		
Organic litter	2.5		0		
Logs	na		na		
Total		13		3.25	

**STEP 13** Choose security arrangement

Standardised Sum Main + Impr Gain/ha	22.10
Prior Mgt Gain/ha	4.7
Security Gain/ha	9.4
<b>Total Gain/ha</b>	<b>36.20</b>

Calculating the total gain  
**Total Gain (HHa) 0.33**

**STEP 14** User details

USER NAME:   
 ORGANISATION:   
 CONTACT TELEPHONE:   
 CONTACT EMAIL:



# DSE Gain Calculator

Version 1.2, October 2008

[About DSE Gain Calculator](#)

**STEP 1** Enter site details

NAME or EOI CODE:   
 SITE CODE (number):   
 SITE LOCATION/ADDRESS:   
 PROPERTY SIZE:

**STEP 2** Habitat zone code (a-z)   
 Zone Type

**STEP 3** Select bioregion

**STEP 4** Select EVC  BCS:   
 If "Other" is selected:  
 - enter EVC & Standardiser:   
 - enter assessed habitat scores manually under STEP 10, based on EVC BCS.

**STEP 5** Enter size of habitat zone, to one decimal place  ha  
 (or revegetation area)

**STEP 6** Select current land tenure

**STEP 7** Select current planning controls

no entitlement to graze with domestic stock  
 no entitlement to remove trees - alive  
 no entitlement to remove trees - dead  
 no entitlement to remove dead vegetation  
 no entitlement to remove fallen timber  
 requirement for regular fuel reduction  
 other - please insert

Enter other:

**STEP 8** Select proposal type

**STEP 9** Select total patch size class - including adjoining zones

**STEP 11** Choose the appropriate management options as required

(a)  Exclude stock and ensure that weed cover does not increase beyond current levels\*  
 (b)  Retain all standing trees - dead or alive  
 (c)  Retain all fallen timber/branches/leaf litter  
 (d)  Eliminate high threat woody weeds & control pest animals  
 (e)  Eliminate all identified high threat weeds & control pest animals  
 (f)  Supplementary planting  
 (g)  
 (h)  Any additional site-specific management actions  
 If (h) is selected, select management actions from below:

Ecological thinning  
 Ecological burning  
 Ecological flooding  
 Other

\*For Grassland type EVC's only  
 Replace management option (a) above with

\* All grassland management actions must ensure no further weed spread

**STEP 10** Current Habitat Score

Attribute	Max	Default	Assessed	Comments
Large Trees	10	na		
Tree canopy cover	5	na		
Understorey	25	10	15	
Lack of weeds	15	7	9	
Recruitment	10	6		
Organic litter	5	3	5	
Logs	5	na		
Landscape context	25	10	13	
Standardised Habitat Score	100		61	

**STEP 12** Gain Scores for Remnant Management

Attribute	Maintenance Gain/ha		Improvement Gain/ha		Comments
	Calculated	Assessed	Calculated	Assessed	
Large Trees	na		na		
Tree canopy cover	na		na	Enter here:	
Understorey	7.5		2.5	Enter here:	
Lack of weeds	na		2		
Recruitment	3		2		
Organic litter	2.5		0		
Logs	na		na		
Total		13		6.5	

**STEP 13** Choose security arrangement

Standardised Sum Main + Impr Gain/ha	26.52
Prior Mgt Gain/ha	6.1
Security Gain/ha	12.2
<b>Total Gain/ha</b>	<b>44.82</b>

Calculating the total gain  
**Total Gain (HHa) 4.59**

**STEP 14** User details

USER NAME:   
 ORGANISATION:   
 CONTACT TELEPHONE:   
 CONTACT EMAIL:



# DSE Gain Calculator

Version 1.2, October 2008

[About DSE Gain Calculator](#)

**STEP 1** Enter site details

NAME or EOI CODE:   
 SITE CODE (number):   
 SITE LOCATION/ADDRESS:   
 PROPERTY SIZE:

**STEP 2** Habitat zone code (a-z)   
 Zone Type

**STEP 3** Select bioregion

**STEP 4** Select EVC  BCS:   
 If "Other" is selected:  
 - enter EVC & Standardiser:   
 - enter assessed habitat scores manually under STEP 10, based on EVC BCS.

**STEP 5** Enter size of habitat zone, to one decimal place  ha  
 (or revegetation area)

**STEP 6** Select current land tenure

**STEP 7** Select current planning controls

no entitlement to graze with domestic stock  
 no entitlement to remove trees - alive  
 no entitlement to remove trees - dead  
 no entitlement to remove dead vegetation  
 no entitlement to remove fallen timber  
 requirement for regular fuel reduction  
 other - please insert

Enter other:

**STEP 8** Select proposal type

**STEP 9** Select total patch size class - including adjoining zones

**STEP 11** Choose the appropriate management options as required

(a)  Exclude stock and ensure that weed cover does not increase beyond current levels\*  
 (b)  Retain all standing trees - dead or alive  
 (c)  Retain all fallen timber/branches/leaf litter  
 (d)  Eliminate high threat woody weeds & control pest animals  
 (e)  Eliminate all identified high threat weeds & control pest animals  
 (f)  Supplementary planting  
 (g)  
 (h)  Any additional site-specific management actions  
 If (h) is selected, select management actions from below:

Ecological thinning  
 Ecological burning  
 Ecological flooding  
 Other

\*For Grassland type EVC's only  
 Replace management option (a) above with  
  
 \* All grassland management actions must ensure no further weed spread

**STEP 10**  
 Current Habitat Score

Attribute	Max	Default	Assessed	Comments
Large Trees	10	na		
Tree canopy cover	5	na		
Understorey	25	10	25	
Lack of weeds	15	7		
Recruitment	10	6		
Organic litter	5	3	5	
Logs	5	na		
Landscape context	25	10	13	
Standardised Habitat Score	100	71		

**STEP 12**  
 Gain Scores for Remnant Management

Attribute	Maintenance Gain/ha		Improvement Gain/ha		Comments
	Calculated	Assessed	Calculated	Assessed	
Large Trees	na		na		
Tree canopy cover	na		na	Enter here:	
Understorey	2.5		0	Enter here:	
Lack of weeds	na		4		
Recruitment	0.6		4		
Organic litter	0		0		
Logs	na		na		
Total	3.1		8		

**STEP 13** Choose security arrangement

Standardised Sum Main + Impr Gain/ha	15.10
Prior Mgt Gain/ha	7.1
Security Gain/ha	14.2
<b>Total Gain/ha</b>	<b>36.40</b>

Calculating the total gain  
**Total Gain (HHa) 2.72**

**STEP 14** User details

USER NAME:   
 ORGANISATION:   
 CONTACT TELEPHONE:   
 CONTACT EMAIL:



# DSE Gain Calculator

Version 1.2, October 2008

[About DSE Gain Calculator](#)

**STEP 1** Enter site details

NAME or EOI CODE:   
 SITE CODE (number):   
 SITE LOCATION/ADDRESS:   
 PROPERTY SIZE:

**STEP 2** Habitat zone code (a-z)   
 Zone Type

**STEP 3** Select bioregion

**STEP 4** Select EVC  BCS:   
 If "Other" is selected: EVC:  Standardiser:   
 - enter EVC & Standardiser  
 - enter assessed habitat scores manually under STEP 10, based on EVC BCS.

**STEP 5** Enter size of habitat zone, to one decimal place  ha  
 (or revegetation area)

**STEP 6** Select current land tenure

**STEP 7** Select current planning controls

no entitlement to graze with domestic stock  
 no entitlement to remove trees - alive  
 no entitlement to remove trees - dead  
 no entitlement to remove dead vegetation  
 no entitlement to remove fallen timber  
 requirement for regular fuel reduction  
 other - please insert

Enter other:

**STEP 8** Select proposal type

**STEP 9** Select total patch size class - including adjoining zones

**STEP 11** Choose the appropriate management options as required

(a)  Exclude stock and ensure that weed cover does not increase beyond current levels\*  
 (b)  Retain all standing trees - dead or alive  
 (c)  Retain all fallen timber/branches/leaf litter  
 (d)  Eliminate high threat woody weeds & control pest animals  
 (e)  Eliminate all identified high threat weeds & control pest animals  
 (f)  Supplementary planting  
 (g)  
 (h)  Any additional site-specific management actions  
 If (h) is selected, select management actions from below:

Ecological thinning  
 Ecological burning  
 Ecological flooding  
 Other

\*For Grassland type EVC's only  
 Replace management option (a) above with

\* All grassland management actions must ensure no further weed spread

**STEP 10**  
**Current Habitat Score**

Attribute	Max	Default	Assessed	Comments
Large Trees	10	na		
Tree canopy cover	5	na		
Understorey	25	10		
Lack of weeds	15	7		
Recruitment	10	6	3	
Organic litter	5	3	5	
Logs	5	na		
Landscape context	25	10	11	
Standardised Habitat Score	100		45	

**STEP 12**  
**Gain Scores for Remnant Management**

Attribute	Maintenance Gain/ha		Improvement Gain/ha		Comments
	Calculated	Assessed	Calculated	Assessed	
Large Trees	na		na		
Tree canopy cover	na		na	Enter here:	
Understorey	1		5	Enter here:	
Lack of weeds	na		4		
Recruitment	0.3		4		
Organic litter	0		0		
Logs	na		na		
Total		1.3		13	

**STEP 13** Choose security arrangement

Standardised Sum Main + Impr Gain/ha	19.45
Prior Mgt Gain/ha	4.5
Security Gain/ha	9.0
<b>Total Gain/ha</b>	<b>32.95</b>

Calculating the total gain  
**Total Gain (HHa) 0.15**

**STEP 14** User details

USER NAME:   
 ORGANISATION:   
 CONTACT TELEPHONE:   
 CONTACT EMAIL:





## Glossary and Abbreviations

---

Items marked with an asterisk (\*) are cited from DSE (2007b).

**AVW** (Atlas of Victorian Wildlife)

State government database containing fauna records.

**BA** (Birds Australia)

Birds Australia is a non-government organisation that maintains an independent database of bird records throughout Australia.

**Benchmark\***

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\***

The variety of all life-forms, the different plants, animals and micro-organisms, the genes they contain, and the ecosystems of which they form a part. The Framework applies this definition to those native species indigenous to or expected to visit the site.

**Bioregion\***

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.

**Bioregional conservation status** (of an EVC)\*

A state-wide classification of the degree of depletion in the extent and/or quality of an Ecological Conservation Class (EVC) within a bioregion in comparison to the State's estimation of its pre-1750 extent and condition. The assessment takes account of how commonly it originally occurred, the current level of depletion

due to clearing, and the level of degradation of condition typical of remaining stands. There are 6 classes: Presumed Extinct, Endangered, Vulnerable, Depleted, Rare and Least Concern as described on page 51 of the Framework (NRE 2002).

**CAMBA** (China – Australia Migratory Bird Agreement)

An international agreement relating to protection of migratory birds that range between China and Australia.

**Conservation status** (see Bioregional conservation status)

**Degraded treeless vegetation\***

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

**DEWHA (Department of the Environment, Water, Heritage and the Arts)**

**Diameter at Breast Height** (DBH)\*

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

**DSE** (Department of Sustainability & Environment)

**Ecological Vegetation Class** (EVC)\*

A type of native vegetation classification that is described through a combination of its floristic, life form and ecological characteristics, and though an inferred fidelity to particular environmental attributes. Each EVC includes a collection of floristic communities (i.e. lower level in the classification that is based solely on groups of the same species) that occur across a biogeographic range, and although differing in species, have similar habitat and ecological processes operating.

**EPBC** (Environment Protection and Biodiversity Conservation Act 1999)

**EVC** (see Ecological vegetation class)\*

**FFG** (Flora and Fauna Guarantee Act 1988 (Vic.))

**FIS (Flora Information System)**

State government database containing flora records.

**Gain\***

An increase in the extent and/or quality of a site either by management or maintenance commitments and actions.

**Gain Target\***

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

**Habitat hectare\***

A site based measure of quality and quantity of native vegetation that is assessed in the context of the relevant native vegetation.

**Habitat score\***

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

**Habitat zone\***

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.

**Improvement gain\***

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.

**Indigenous vegetation\***

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

**IUCN (International Union for Conservation of Nature)****JAMBA (Japan – Australia Migratory Bird Agreement)**

An international agreement relating to protection of migratory birds that range between Japan and Australia.

**Large Old Tree (LOT)\***

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

**Like-for-like\***

These are part of the criteria for determination of an offset and provide a direct link between the loss and the offset gain, in terms of vegetation type or landscape function. There are more specific requirements for higher conservation significance vegetation and more flexible requirements for lower significance.

**Maintenance Gain\***

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.

**Medium Old Tree (MOT)\***

A tree with a DBH equal to or greater than 0.75 of the large tree diameter in the relevant EVC benchmark but less than the DBH for a large old tree.

**Native (indigenous) vegetation\***

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

**Net Gain\***

Where, over a specified area and period of time, losses of native vegetation and habitat, as measured by a combined quality-quantity measure (habitat-hectare), are reduced, minimised and more than balanced by commensurate gains.

**Net outcome\***

The result of applying conservation significance criteria to protection, investment and offset decisions. This results in a range of outcomes from short term losses for Low conservation significance to substantial net gain for Very High conservation significance. For offsets, the Framework (Table 6) specifies a multiplier on the calculated loss (in habitat hectares) to achieve the net outcome. This is graded according to conservation significance.

**Offset Management Plan (OMP)**

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

**Old tree\***

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).

**Offset\***

A native vegetation offset is any works, or other actions to make reparation for the loss of native vegetation arising from the removal or destruction of native vegetation. The gains achieved must be permanent and ongoing, and linked to a specific clearing site. See also on-site offset and third-party offset.

**On-site offset\***

An offset located on the same property as the clearing.

**Third-party offset\***

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

**Patch** (see Remnant Patch)**Prior management gain**

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

**Property Vegetation Plan\***

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.

**Protection (of a tree)\***

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.

**Recruitment\***

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.

**Remnant patch or patch\***

An area of vegetation, with or without trees, where native plants constitute more than 25% of the total understorey plant cover (bare ground is not included); or an area of treed vegetation where the density of the trees is such that canopy tree cover is at least at benchmark canopy cover.

**Remnant vegetation\***

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.

#### **Revegetation\***

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

**ROKAMBA** (Republic of Korea – Australia Migratory Bird Agreement)

An international agreement relating to protection of migratory birds that range between the Republic of Korea and Australia.

#### **Scattered trees\***

Canopy trees within an area where total understorey plant cover comprises at least 75% of weeds or non-native plants and the overall canopy cover for a group (i.e. Three or more trees) is less than 20%.

#### **Section 173 agreements\***

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.

#### **Small tree\***

A tree with a DBH equal to or greater than 0.25 of the large tree diameter in the relevant EVC benchmark but less than the DBH for a medium old tree.

#### **sp.**

Species (one species).

#### **spp.**

Species (more than one species).

#### **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.

#### **Understorey\***

Understorey is all vegetation other than mature 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).

#### **VAF** (Victorian Aquatic Fauna)

State government database containing aquatic fauna records.

#### **Vegetation Quality Assessment**

The standard DSE 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'.

#### **Very Large Old Tree** (VLOT)

A tree with a DBH of at least 1.5 times that of the large tree DBH as specified in the relevant EVC benchmark.

## Figures

---

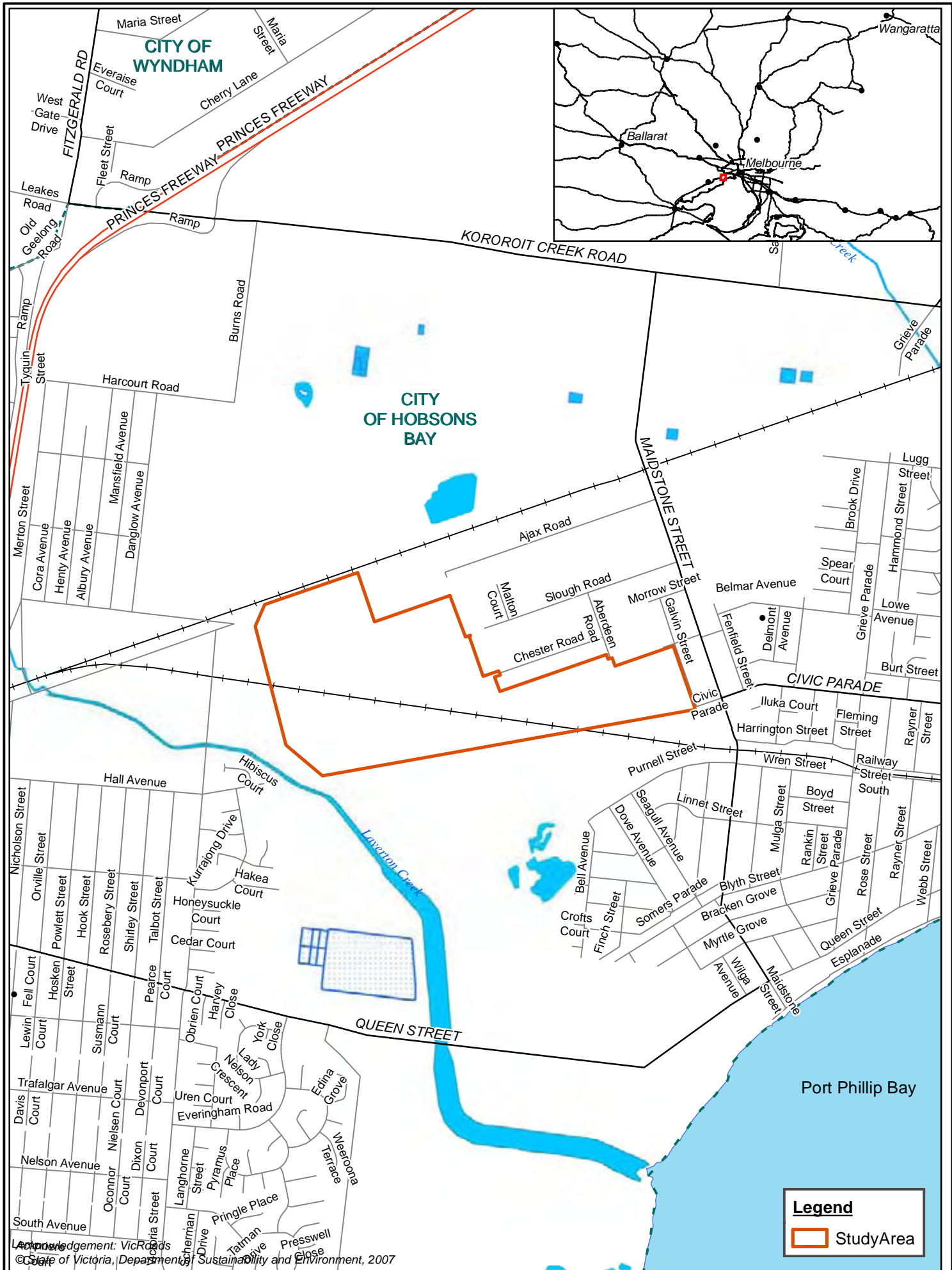
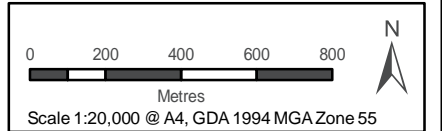


Figure 1: Location of the Study Area - Ajax Road, Altona, Victoria

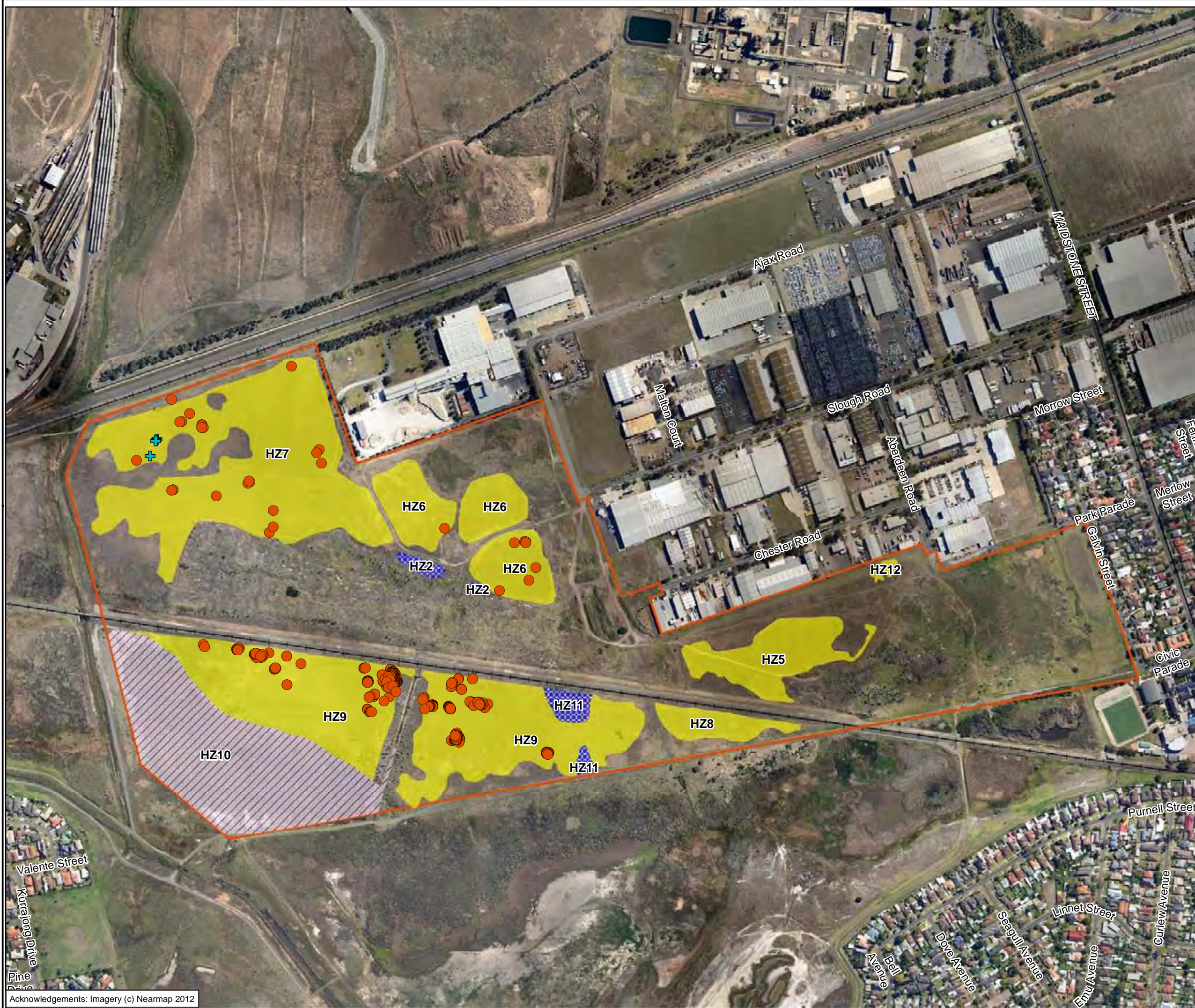


Biosis Pty Ltd  
Ballarat, Brisbane, Canberra, Melbourne,  
Sydney, Wangarratta & Wollongong

Matter: 15746  
Date: 23 November 2012, Checked By: SJM, Drawn By: pangas  
Location: P:\15700s\15746\Mapping\15746\_Fig1.mxd







**Legend**

- Study Area
- Significant Flora**
- + Arching Flax-lily
- Spiny Rice-flower
- Ecological Vegetation Class**
- Brackish Wetland
- Plains Grassy Wetland
- Plains Grassland

**Figure 2: Ecological features within Lot H, Ajax Road properties, Altona, Victoria**

0 75 150 225 300  
 Metres  
 Scale: 1:6,000 @ A3  
 Coordinate System: GDA 1994 MGA Zone 55

**biosis.** N  
 Biosis Pty Ltd  
 Ballarat, Brisbane, Canberra, Melbourne,  
 Sydney, Wangaratta & Wollongong

Matter: 15746  
 Date: 30 November 2012.  
 Checked by: SJM, Drawn by: PMA  
 Location: P:\15700s\15746\mapping\15746\_Fig2\_floora\_fauna\_report

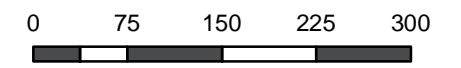




**Legend**

- Study Area
- GSM transects by date**
- 4/01/2011
- 16/01/2011
- 20/01/2011
- 25/01/2011
- EVC patch

**Figure 3: Golden Sun Moth targeted survey effort, Ajax Road, Altona, Victoria**



Metres  
 Scale: 1:6,000 @ A3  
 Coordinate System: GDA 1994 MGA Zone 55

**biosis.**

Biosis Pty Ltd

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

Matter: 15746  
 Date: 30 November 2012  
 Checked by: SJM, Drawn by: PMA / SJP  
 Location: P:\15700s\15746\mapping\15746\_Fig3\_GSM\_targeted