# 3 PSP42 North

Investigation of the PSP42 North area incorporates:

- Identification of biodiversity values of the potential ephemeral wetland and investigate the future state/use of this water body
- Determine drainage reserve widths
- Solution to integration of Phileo and Stella's properties, and
- Provision of a typical cross section that communicates the shape and indicative dimensions of the conveyance channel, batter slopes, vegetation (species structure) and other assets.

## 3.1 PSP42 North wetland values

The ephemeral wetland located in PSP42 North was mapped as historically supporting Plains Grassy Wetland (EVC 125) in proximity to Cane Grass Wetland (EVC 291).

The field observation identified the wetland could be delineated into two zones; relatively intact Cane Grass Wetland vegetation community to the south and a modified northern zone as presented in Figure 18.

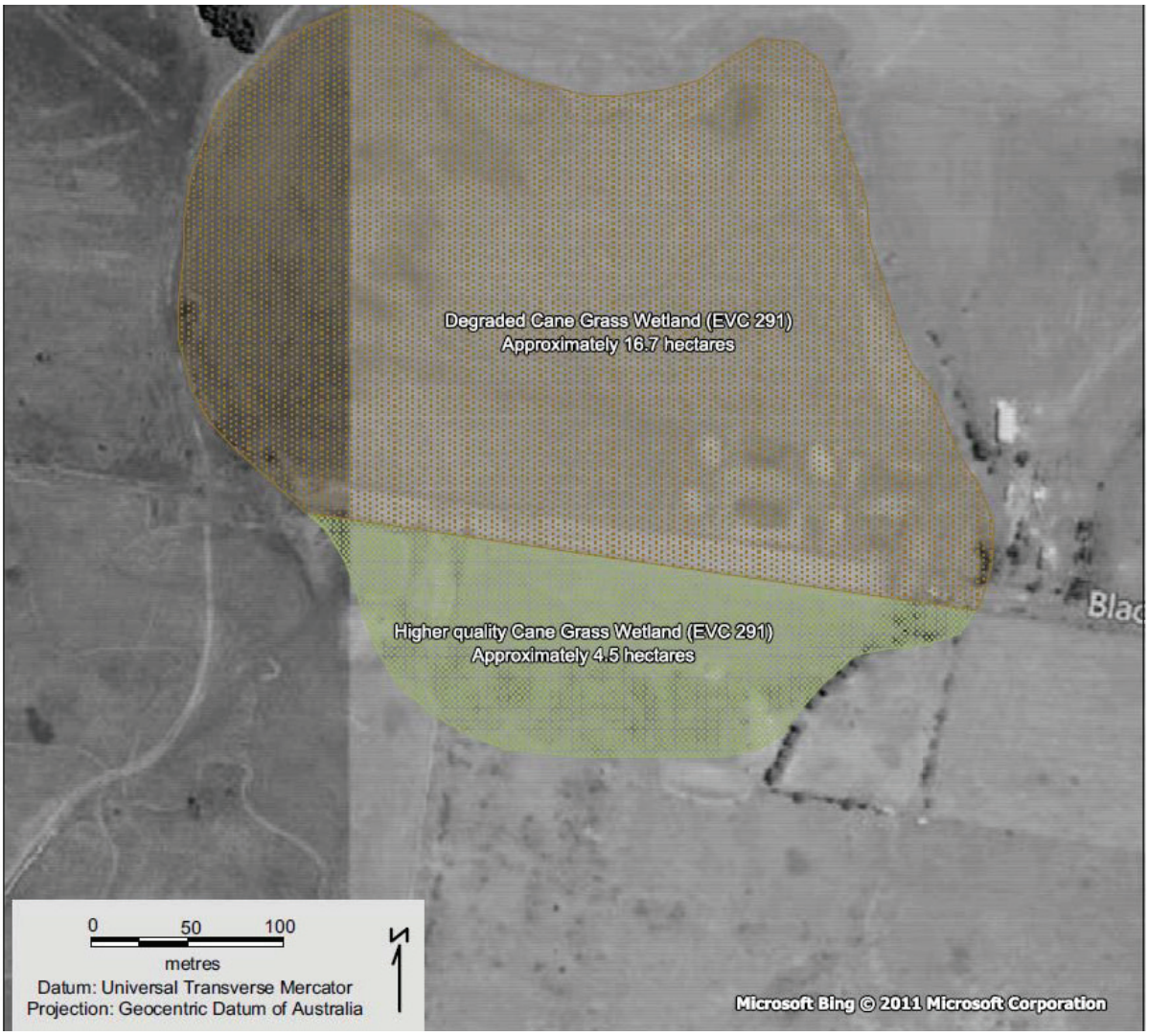



**Figure 18.** *Delineation of high value and low value areas of wetland type.*

The southern zone represented a relatively intact Cane Grass Wetland vegetation community dominated by characteristic Cane Grass Wetland flora species (Figure 18). The high cover of indigenous flora species integral to the structure and function of a Cane Grass Wetland deemed this area a remnant vegetation community of high conservation significance.

Importantly, the disjunct location of this Cane Grass Wetland is of high bioregional conservation significance: to the authors knowledge it represents one of the most south-easterly extents of the known range for this community.

**Figure 19.** *Ephemeral Wetland image (located in PSP42 North)*

The modified northern zone includes; a vehicle track, cropping, construction of a dam and infestations of high-threat weeds. The road easement, which dissected the wetland, was inundated at the time of the site inspection, therefore observation of the ground flora was not possible. However, disturbance of this central fenced area was assumed given the use as a vehicle track and horse paddock. The northern zone has very low to no conservation values.

The presence of the high value Cane Grass area does provide a core area from which the remaining wetland extent could potentially be recolonised if intensive weed management was undertaken. Deconstruction of the existing dam wall and revegetation of disturbed areas is also recommended if there was a desire to enhance the rehabilitation of the wetland overall.

## 3.2 Drainage solution for Phelio and Stella's property

Alluvium was asked to investigate the potential to better manage the treatment of surface water when the Phelio and Stella properties were considered together rather than individual drainage solutions. We discussed the drainage options with Breese Pitt Dixon who are engaged by Stella as the principle development engineers. Both Alluvium and Breeze Pitt Dixon believe the most sensible outcome is to bring all the stormwater into Stella's properly and locate a large regional wetland in the degraded depression. This option has also been discussed with Melbourne Water and it is their preferred option also.

The combined catchment area would result in a wetland approximately 4.2 ha in size and would need to be located in an area of the depression that currently have no environmental values. The wetland design should first and foremost be focused on achieving water quality objectives, but in addition the design should consider how best it could replicate the original EVC (where appropriate) and provide suitable habitat for Growling Grass Frog (where appropriate). Figure 20 provides an overall conceptual layout of the catchment area and location of the wetland.

## 3.3 Specific Setback requirements

There is a small unnamed tributary of Lollypop Creek running through PSP42 North. The tributary has been heavily degraded through agricultural practices, has limited waterway values and has a catchment greater than 60 ha. As such the setback requirement is dictated by the 100 year ARI hydraulic width (approximately 35) and the draft Melbourne Water Setback Guidelines, which stipulates an additional 15 m waterway corridor width that includes a 30 m CRZ and 15 m VB.

The spatial layout of these requirements shown in Figure 20 and the conceptual cross section provided in Figure 21.

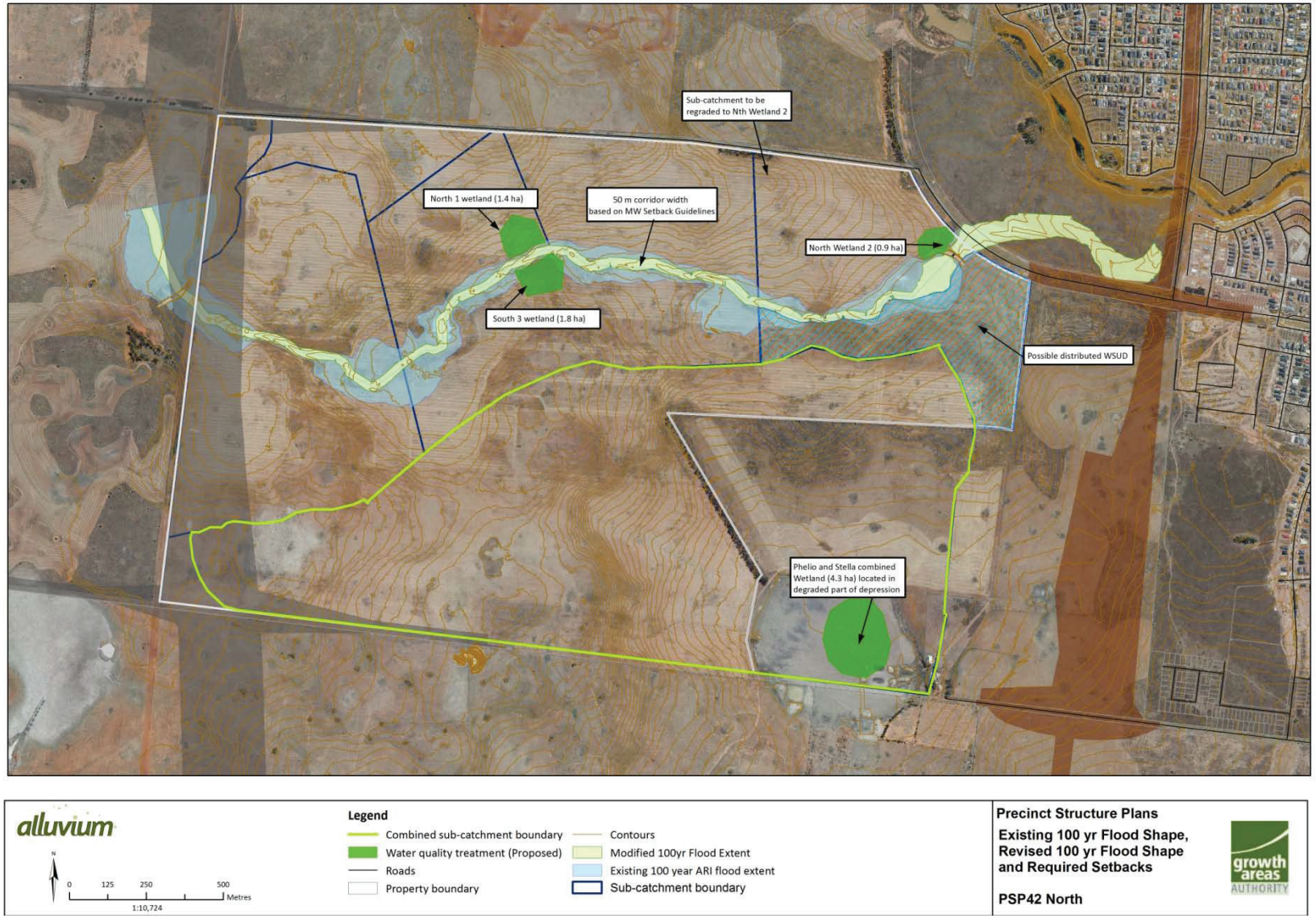



**Figure 20.** *PSP 42 North surface drainage plan*

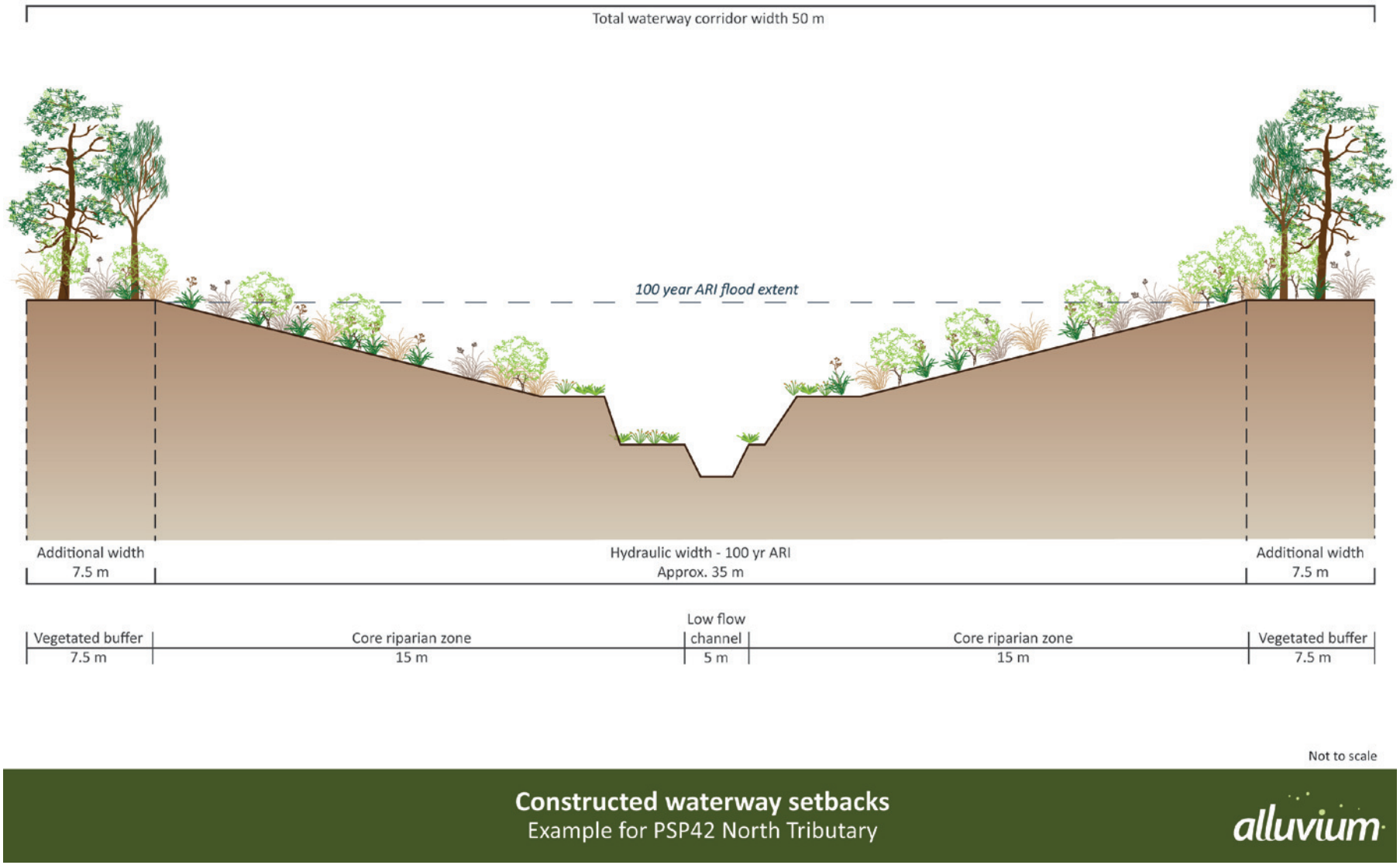



**Figure 21.** *Conceptual cross section for unnamed tributary (PSP42 North)*

AUSTRALIAN ECOSYSTEMS

CONSULTANCY • NURSERY • WETLANDS • REVEGETATION • MANAGEMENT

# Ephemeral Wetland and Riparian Biodiversity Values at Wyndham Vale Precinct

*2nd DRAFT*
November 2011


**Client:**

Kane Travis

Alluvium Consulting

1 John Street

P.O. Box 204

South Melbourne VIC 3205

M 0420 362 714

T 03 9686 3508

kane.travis@alluvium.com.au

**Prepared by:**

Australian Ecosystems Pty Ltd

**Australian Ecosystems Pty Ltd**

PO Box 424

Patterson Lakes VIC 3197

Tel: (03) 9775 0612

Fax: (03) 9775 0614

Hwww.australianecosystems.com.au

## CONTENTS



## APPENDICES



## LIST OF FIGURES

## LIST OF PHOTOGRAPHS



## LIST OF TABLES

# 1.0 INTRODUCTION

## 1.1 Project Context and Objectives

Australian Ecosystems Pty Ltd was engaged by Alluvium Consulting Pty Ltd to provide an ecological assessment of two ephemeral wetlands and a section of remnant riparian vegetation along the Werribee River located within the Wyndham Vale Precinct. The aim of the ecological assessment was to identify biodiversity values – including potential presence of native flora and fauna – to contribute to informing the Growth Areas Authority's planning decisions.

The main objectives of this study were to:

1. Identify extant and future potential biodiversity values of the large ephemeral wetland (here forward referred to as Ephemeral Wetland 1) and the riparian zone of Werribee River located in PSP 40 West;
2. Identify extant and future potential biodiversity values of an ephemeral wetland located in PSP 42 North (here forward referred to as Ephemeral Wetland 2); and
3. Comment on the suitability of a proposed 200 metre wide habitat corridor along the Werribee River, with particular reference to Growling Grass Frog (*Litoria raniformis*).

## 1.2 Study Area

The Wyndham Vale Precinct study areas were situated north-west of Werribee township approximately 38 kilometres south-west of Melbourne CBD. The Precinct falls within the highly modified landscape of the Werribee River catchment.

Ephemeral Wetland 1, approximately 25 hectares, was located adjacent to Westbrook Homestead Road with the Werribee River study area directly north of Ephemeral Wetland 1, extending approximately 3.5 kilometres (Figure 1, page 2). Ephemeral Wetland 2 was approximately 21 hectares, located at the end of Black Forest Road. The study areas lie within the Victorian Volcanic Plain Bioregion, and the Port Phillip and Westernport Catchment Management Authority region.


**Figure 1 Location of Study Areas**

Ephemeral Wetland and Riparian Biodiversity Values of Wyndham Vale Precinct

Map prepared by Australian Ecosystems 10 November 2011



Australian Ecosystems Pty Ltd
CONSULTANCY • NURSERY • WETLANDS • REVEGETATION • MANAGEMENT
ABN: 36 080 253 096

Australian Ecosystems Pty Ltd
PO Box 424 Patterson Lakes VIC 3197

## 2.0 METHODOLOGY

### 2.1 Review of Existing Information

Preliminary to the field survey, to ascertain an overview of the previously recorded biodiversity values of the study area, the following information sources were reviewed:

**Flora and vegetation information sources:**

- DSE (2005) Advisory List of Rare or Threatened Plants in Victoria – 2005. Victorian Department of Sustainability and Environment, East Melbourne, Victoria
- Adair, R., Cheal, D. and White, M. (2008) Advisory List of environmental weeds in the Inland Plains bioregions of Victoria. Victorian Department of Sustainability and Environment, East Melbourne. Victoria
- DSE (2011b) 2005 and pre-1750 (pre European settlement) Ecological Vegetation Class mapping, Biodiversity Interactive Maps Website
- DSE (2010b) *Victorian Flora Database* The State of Victoria, Department of Sustainability and Environment (accessed via the 'Flora Information System', [2011, May] - © Viridans Biological Databases). The contribution of the Royal Botanical Gardens to the database is acknowledged
- DSEWPC (2011) Environment Protection and Biodiversity Conservation Act (1999) Protected Matters Search Tool Website
- DSE (2011a) Ecological Vegetation Classes by Bioregion – Victorian Riverina

**Fauna data sources:**

- DSE (2007) Advisory List of Rare or Threatened Vertebrate Fauna in Victoria - 2007. Victorian Department of Sustainability and Environment, East Melbourne Victoria
- DSE (2010a) *Victorian Fauna Database*, The State of Victoria, Department of Sustainability and Environment (accessed via the 'Atlas of Victorian Wildlife', [2011, May] - © Viridans Biological Databases)
- DSEWPC (2011) Environment Protection and Biodiversity Conservation Act (1999) Protected Matters Search Tool Website

## 2.2 Site Assessment

The study area was traversed on foot, on 11th and 18th October 2011 by experienced ecologists (Dylan Osler, Bryan Mole and Ana Backstrom), to identify extant and potential biodiversity values. Dominant and common flora species, vegetation structure and habitat values were recorded for each study area. This data was used to describe the vegetation communities, and hence habitat, present within the study areas.

## 2.3 Plant Taxonomy

Plant taxonomy in this report follows the Flora Information System (Department of Sustainability and Environment, East Melbourne, Victoria), with consideration to the Census of Victoria Vascular Plants (Walsh and Stajsic, 2007). The biological nomenclature convention adopted in this document follows *Scientific name* Common name for flora species and Common name (*Scientific name*) for fauna species. An asterisk (*) denotes exotic species and hash sign (#) denotes indigenous species occurring outside of their natural range.

## 2.4 Limitations

Ecological projects that address biodiversity conservation are conducted in consideration of the long geological timescale. These projects can be limited by issues with technology and project constraints, such as short timeframes. Information sources including databases and previous survey results are drawn on to provide a greater breadth of information. Albeit the use of extant information sources, it is acknowledged that there will always be information gaps due to the incomplete nature of ecological knowledge – the entire complexity of ecological processes and systems is not known. Given this and the scope of the project, it is highly likely that not all future (or past) scenarios were considered. Therefore, the precautionary approach was adopted – that is, *lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation* (Australian Government Publishing Service, 1992: Section 3, Paragraph 3.5.1).

## 3.0 RESULTS

Two remnant Ecological Vegetation Classes (EVCs) (Floodplain Riparian Woodland (EVC 56) and Cane Grass Wetland (EVC 291)) and 23 indigenous flora species were observed across the study areas (Appendix 1, page 14). The Wyndham Vale Precinct area was mapped as historically supporting five EVCs (Appendix 2, page 17) (DSE, 2011b). Different to both the pre-1750 and 2005 DSE EVC mapping, Ephemeral Wetland 2 was recorded as Cane Grass Wetland (EVC 291). Of the two observed EVCs, Floodplain Riparian Woodland (EVC 56) is listed as endangered whilst Cane Grass Wetland (EVC 291) is not listed, however considered rare or endangered (by the authors) within the Volcanic Plains Bioregion.

### 3.1 Ephemeral Wetland 1 (PSP 40 West)

**Photograph 1 Ephemeral Wetland 1 (PSP 40 West), Wyndham Vale Precinct, October 2011**

No patches of remnant wetland vegetation (where indigenous vegetation comprises greater then 25 percent of the ground cover) were observed within Ephemeral Wetland 1. This observation correlated with 2005 DSE EVC mapping (Appendix 2, page 17) and mapping presented in the *Biodiversity Assessment Report (Native Vegetation) PSP 40: Wyndham*

*Vale* (GAA, 2010). Extensive pugging from cattle was also observed throughout this wetland area.

Ephemeral Wetland 1 supported a highly modified vegetation community comprising 'improved pasture grasses' dominated by **Lolium perenne* Perennial Rye-grass, **Phalaris minor* Lesser Canary-grass and **Hordeum leporinum* Barley-grass. Scattered indigenous grass species included *Amphibromus nervosus* Common Swamp Wallaby-grass in low lying areas and *Chloris truncata* Windmill Grass, *Austrostipa scabra* Spear Grass and *Rytidosperma caespitosum* Common Wallaby-grass on higher ground. Indigenous herbaceous species were again sparsely scattered with *Lythrum hyssopifolium* Small Loosestrife and *Centipedia cunninghamii* Common Sneezeweed the main taxa recorded.

### 3.2 Ephemeral Wetland 2 (PSP 42 North)

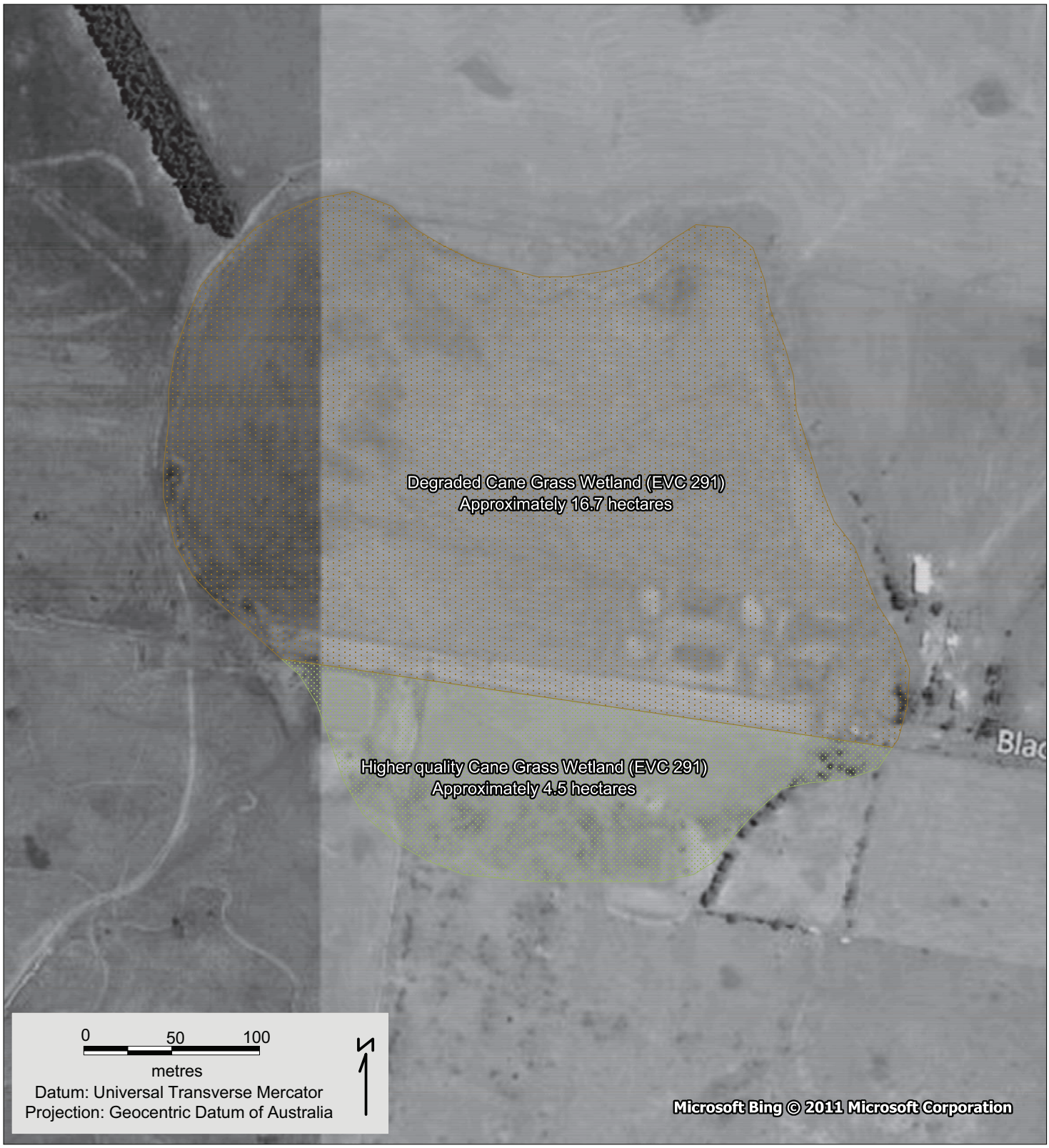
**Photograph 2 Ephemeral Wetland 2 (PSP 42 North), Wyndham Vale Precinct, October 2011**

Ephemeral Wetland 2 (Wyndham Vale Swamp) was mapped as historically supporting Plains Grassy Wetland (EVC 125) in proximity to Cane Grass Wetland (EVC 291) (DSE, 2011b) (Appendix 2, page 17). Although the 2005 Department of Sustainability and Environment (DSE) EVC mapping did not show Ephemeral Wetland 2, it was recorded in the 1994 DSE wetland mapping as Shallow Freshwater Marsh (Appendix 3, page 20).

The field observation showed Ephemeral Wetland 2 could be delineated into two zones; relatively intact Cane-grass Wetland vegetation community to the south and a modified northern zone (Figure 2, page 8). The southern zone was dominated by characteristic Cane-grass Wetland flora species including *Eragrostis infecunda* Southern Cane-grass, *Marsilea drummondii* Common Nardoo, *Rytidosperma duttoniana* Common Wallaby-grass and *Eleocharis acuta* Common Spike-sedge. The high cover of indigenous flora species integral to the structure and function of a Cane Grass Wetland deemed this area a remnant vegetation community of high conservation significance. Importantly, the disjunct location of this Cane Grass Wetland is of high bioregional conservation significance: to the authors knowledge it represents one of the most south-easterly extents of the known range for this wetland type.

Disturbance vectors of the northern wetland zone included; a vehicle track, cropping, construction of a dam and infestations of high-threat weeds such as **Cynara cardunculus* Artichoke Thistle and **Lycium ferocissimum* Box Thorn and **Opuntia* spp. Prickly Pear. The road easement, which dissected the wetland, was inundated at the time of the site inspection, therefore observation of the ground flora was not possible (Photograph 4, below). However, disturbance of this central fenced area was assumed given the use as a vehicle track and horse paddock.

**Photograph 3 Road easement through Ephemeral Wetland 2 (PSP 42 North), with a dam wall (right-hand side of photograph) dominated by high threat exotic species**




Australian Ecosystems Pty Ltd
CONSULTANCY • NURSERY • WETLANDS • REVEGETATION • MANAGEMENT
ABN: 36 080 253 096

Australian Ecosystems Pty Ltd
PO Box 424 Patterson Lakes VIC 3197

**Figure 2 Extent of the Cane Grass Wetland EVC (291), Ephemeral Wetland 2 (Wyndham Vale Swamp)**

Ephemeral Wetland and Riparian Biodiversity Values of Wyndham Vale Precinct

Map prepared by Australian Ecosystems 10 November 2011

### 3.3 Werribee River Riparian Zone (PSP 40 West)

**Photograph 4 Werribee River, Wyndham Vale, October 2011**

Werribee River is the major watercourse of the Werribee River Catchment and as such provides an important link between various remnant wetland and riverine habitats, and numerous terrestrial habitats. These range from Shrubby Foothill Forest and Heathy Dry Forest in the catchment's north to Plains Grassy Woodland, Plains Grassland and Treeless Private Land in the south. Brown (2011: p. 45) states that "riverine and wetland habitats [for frogs in the Werribee River catchment] should not be managed in isolation of each other as they are both likely to contribute substantially to the habitat requirements of frogs in the region". The proposed corridor along the Werribee River would provide connectivity through the landscape and has been identified as a *strategically important habitat area* for Growling Grass Frog (*Litoria raniformis*) (DSE, 2011c).

The importance of connectivity between wetlands in the landscape for movement of Growling Grass Frogs and indeed other species of frogs, and biota in general, is well documented (for example: Brown, 2011; DSE, 2011c; Robertson *et. al*., 2002; Heard *et. al.*, 2010). Heard *et. al.* (2010: p.21) detail a number of methods for reducing the impact of urbanisation on

Growling Grass Frog and consider "the maintenance of significant terrestrial [vegetated] buffer zones around wetlands is an important aspect of habitat management for *Litoria raniformis* in urbanising landscapes."

Further, the federal government's *Draft EPBC Act Policy Statement 3.14: Significant Impact Guidelines for the Vulnerable Growling Grass Frog (Litoria raniformis)* (DEWHA, 2009: p. 10) states that a significant threat to Growling Grass Frog is the "permanent removal or degradation of terrestrial habitat – for example, between ponds, drainage lines or other temporary or permanent habitat – within 200 metres of a water body in temperate regions [such as the Werribee River study area], that results in the loss of dispersal or overwintering opportunities for an important population."

Remnant vegetation of moderate quality, comprising structurally intact Floodplain Riparian Woodland (EVC 56), occupied a riparian zone, ranging between, approximately, 40 and 60 metres-wide. The canopy was dominated by large old and younger mature, healthy *Eucalyptus camaldulensis* River Red Gums. The mid-strata included small trees of *Acacia melanoxylon* Blackwood and *Acacia mearnsii* Black Wattle with scattered *Callistemon sieberi* River Bottlebrush and *Leptospermum lanigerum* Woolly Tea-tree. The fringing ground flora comprised indigenous grass and forb species; including *Poa labillardierei* Common Tussock-grass, *Rhytidospermum caespitosum* Common Wallaby-grass, *Atriplex semibaccata* Berry Saltbush and *Rumex brownii* Slender Dock, interspersed with introduced species such as *Lolium perenne* Perennial Rye-grass, *Galenia pubescens* Galenia and *Nassella neesiana* Chilean Needle-grass. Although a high cover of introduced weed species were present at the site, the overall vegetation structure still provided significant habitat opportunities for a number of native fauna types, from frogs to mammals and birds. At several locations along the river, steep banks gave way to broad benches which would provide opportunity for frog breeding activity in localised pools and depressions after overbank-flows recede.

In-stream habitat was also evident; albeit turbid water conditions at the time of survey. Numerous overhanging limbs and branches with in-stream vegetation, logs and coarse woody debris provided suitable aquatic structure for fish and frog habitat. Fish were reported as commonly caught in this stretch of the river, and Platypus (*Ornithorhynchus anatinus*) have been observed on numerous occasions (Riverbank Stockfeeds Pty Ltd, pers. comm. 18th October, 2011).

The Werribee River study area is considered suitable habitat for Growling Grass Frog, including the provision of dispersal and breeding opportunities (Brown, 2011; DSE, 2011; DSEWPC, 2011). Growling Grass Frog terrestrial habitat includes grasslands, woodlands and areas of improved pasture, comprising vegetation (tussocks and grasses), rocks, logs, soil cracks and other ground debris (Table 1, below) (Brown, 2011; Heard, *et. al.*, 2010). Open terrestrial habitat adjacent to waterbodies and waterways is considered an important habitat requirement for Growling Grass Frog dispersal, foraging, shelter and overwintering (DSE, 2011; Heard, *et. al.*, 2010).

**Table 1 Percentage of Growling Grass Frog (*Litoria raniformis*) records, in each Ecological Vegetation Class (EVC), in the Werribee River Catchment. Records were derived from the Atlas of Victorian Wildlife (DSE) to March 2009. (Extracted from Brown, 2011: p.41)**

| EVC Description | *L. raniformis* records (%) |
|---|---|
| Shrubby Dry Forest | 6.67 |
| Higher Rainfall Plains Grassy Woodland | 6.67 |
| Cleared Severely Disturbed | 6.67 |
| Box-Ironbark Forest | 20 |
| Rocky Chenopod Woodland | 13.33 |
| Grassy Woodland | 6.67 |
| Stream-bank Shrubland | 13.33 |
| Private Land (no tree cover) | 25 |

The recommended 200 metre-wide frog habitat buffer zone of Werribee River is better considered as an unobstructed habitat corridor for the protection and potential enhancement of Growling Grass Frog populations and other frog species. An important function of the habitat corridor is to contribute to the maintenance of water quality through a vegetated riparian buffer. A significant threat to Growling Grass Frog is the deterioration of water quality from fertilizers, pesticides and other urban run-off pollutants (DEWAH, 2009; DSE, 2011; Heard, et. al., 2010).

Following DEWAH (2009: p. 12), it is recommended that the Werribee River 200 metre wide frog habitat corridor comprise:

- A dedicated terrestrial Growling Grass Frog habitat zone adjacent to the waterway – minimum of 100 metres wide from the normal water level – comprising indigenous riparian vegetation, logs, rocks and other coarse woody debris. Recommended habitat management strategies include: protection of extant indigenous vegetation; prevention of further habitat

degradation through, for example, weed management strategies; and enhancement of remnant vegetation through strategic revegetation.

- An adjacent buffer zone (fringing the Growling Grass Frog terrestrial habitat zone) with a minimum width of 100 metres, free of constructed hard surfaces. Landscape features that would enhance the habitat value of this zone include constructed wetlands and wetland features – such as ephemeral depressions – and rehabilitated remnant ephemeral wetlands, for example Ephemeral Wetland 1. The recommended spatial distribution of wetland bodies within the landscape, to optimise the likelihood of supporting Growling Grass Frog, is proximity of between 300 and 500 metres (Ecology Partners, 2010; Heard, *et. al.*, 2004; Robertson, *et. al.,* 2002).

## 4.0 CONCLUSION AND RECOMMENDATIONS

Biodiversity values of high conservation significance were observed at two of the three study areas – Ephemeral Wetland 2 and the Werribee River riparian zone. Summary recommendations are as follows:

### 4.1 Ephemeral Wetland 1 (PSP 40 West)

- No significant indigenous vegetation communities were recorded
- Rehabilitation of this ephemeral wetland would potentially benefit Growling Grass Frog populations

### 4.2 Ephemeral Wetland 2 (PSP 42 North)

- A high conservation significance area of Cane Grass Wetland (EVC 291) was recorded
- A high cover of structurally significant Cane Grass Wetland flora species dominated the southern zone of this wetland, creating a core area from which the remaining wetland extent could potentially be recolonised
- Several high threat weed species were recorded (including **Cynodon dactylon* Couch, **Paspalum distichum* Water Couch and **Cynara cardunculus* Artichoke Thistle) which require intensive weed management to enable the ecological restoration of this wetland
- Deconstruction of the existing dam wall and revegetation of disturbed areas is recommended to enhance the rehabilitation of the wetland

- Re-routing of the proposed extension of Black Forest Road is recommended to prevent fragmentation of a high conservation significance Cane Grass Wetland

### 4.3 Werribee River Riparian Zone (PSP 40 West)

- The riparian zones' Floodplain Riparian Woodland (EVC 56) habitat was a structurally intact, remnant vegetation community of moderate quality.
- Suitable Growling Grass Frog habitat within the Werribee River study area included grassland, woodland and areas of improved pasture; suitable for dispersal, breeding, shelter and overwintering extending over 200 metres from the normal water level
- In-stream habitat included aquatic vegetation, logs, coarse woody debris and litter
- Regular Platypus (*Ornithorhynchus anatinus*) sightings were reported by Riverbank Stockfeed personel (pers. comm. 18th October 2011)
- The recommended riparian zone width – to provide protection to Growling Grass Frogs from significant threats – follows previously reported research, as a minimum of 200 metres. The proposal to reserve a 200 metre wide vegetation buffer represents significant opportunity for minimising the impact of urbanisation on the water quality, landscape values and flora and fauna values of the Werribee River.

## 5.0 REFERENCES

Adair, R., Cheal, D. and White, M. (2008) *Advisory List of environmental weeds of the Inland Plains bioregions of Victoria*. Victorian Department of Sustainability and Environment, East Melbourne. Victoria

Australian Government Publishing Services (1992) *Intergovernmental Agreement on the Environment (IGAE)* Commonwealth of Australia, Canberra http://www.environment.gov.au/about/esd/publications/igae/index.html, Accessed October 2011

Brown, G. (2011) The status of the frog fauna of the Werribee River Catchment, Southern Victoria, with notes on the utility of large databases in such assessments *The Victorian Naturalist* **128** (2): 36 - 47 The Field Naturalists of Club of Victoria, Balckburn

Department of Environment Water Heritage and the Arts (DEWAH) (2009) *Draft EPBC Act Policy Statement 3.14: Significant Impact Guidelines for the Vulnerable Growling Grass Frog* (*Litoria raniformis*) Department of Environment, Water, Heritage and the Arts, Canberra. http://www.environment.gov.au/epbc/publications/litoria-raniformis.html Accessed October 2011

Department of Sustainability, Environment, Water, Populations and Community (DSEWPC) (2011) *Environment Protection and Biodiversity Conservation Act (1999) Protected Matters Search Tool Website:* http://www.environment.gov.au/arcgis-framework/apps/pmst/pmst.jsf, Accessed October 2011

Department of Sustainability and Environment (DSE) (2005) *Advisory List of Rare or Threatened Plants in Victoria - 2005* Victorian Department of Sustainability and Environment, East Melbourne, Victoria

Department of Sustainability and Environment (DSE) (2007) *Advisory List of Rare or Threatened Vertebrate Fauna in Victoria - 2007* Victorian Department of Sustainability and Environment, East Melbourne. Victoria

Department of Sustainability and Environment (DSE) (2010a) *Victorian Fauna State Database*, The State of Victoria, Department of Sustainability and Environment (accessed via the 'Atlas of Victorian Wildlife', [2011, May] - © Viridans Biological Databases)

Department of Sustainability and Environment (DSE) (2010b) *Victorian Flora State Database*, The State of Victoria, Department of Sustainability and Environment (accessed via the 'Flora Information System', [2011, May] - © Viridans Biological Databases). The contribution of the Royal Botanical Gardens to the database is acknowledged

Department of Sustainability and Environment (DSE) (2011a) *Ecological Vegetation Classes by Bioregion – Victorian Riverina Ecological Vegetation Class (EVC) Benchmarks for Each Bioregion Website:* http://www.dse.vic.gov.au/conservation-and-environment/evc-benchmarks-victorian-riverina-bioregion, Accessed October 2011

Department of Sustainability and Environment (DSE) (2011b) *Extant and pre-1750 (pre European settlement) Ecological Vegetation Class mapping*, Biodiversity Interactive Maps Website:http://www.dse.vic.gov.au/DSE/dsencor.nsf/LinkView/836EE128E54D861FCA256DA200208B945FD09CE028D6AA58CA256DAC0029FA1A, Accessed October 2011

Department of Sustainability and Environment (DSE) (2011c) *Sub-regional Species Strategy for the Growling Grass Frog*, Draft for Public Consultation. The State of Victoria, Victorian Department of Sustainability and Environment, East Melbourne. Victoria http://www.dse.vic.gov.au/__data/assets/pdf_file/0003/127758/DRAFT-Growling-Grass-Frog-Strategy_web.pdf, Accessed October 2011

Ecology Partners (2010) *Armstrong Creek North East Industrial Precinct: Growling Grass Frog Conservation Management Plan* Unpublished report prepared by C. G. Foale and A. Hill on behalf of Department of Planning and Community Development and City of Greater http://www.geelongaustralia.com.au/library/docs/c207docs/Armstrong%20Creek%20NEIP%20-%20Growling%20Grass%20Frog%20Conservation%20Management%20Plan.pdf, Accessed October 2011

Growth Areas Authority (2010) *Biodiversity Assessment Report (Native Vegetation): Melton-Wyndham Investigation Area – Section A* Growth Areas Authority Melbourne http://www.gaa.vic.gov.au/Assets/Files/Biodiversity%20Assessment%20report%20%28Native%20Vegetation%29%20PSP%2040%20Wyndham%20Vale.pdf, Accessed October 2011

Heard, G., Scroggie, M., and Clemann, N. (2010) *Guidelines for managing the endangered Growling Grass Frog in urbanising Landscapes.* Arthur Rylah Institute for Environmental Research Technical Report Series No. 208. Department of Sustainability and Environment, Heidelberg, Victoria. http://www.dse.vic.gov.au/__data/assets/pdf_file/0004/128902/ARI-Technical-Series-GGF-guidelines-2010.pdf, Accessed October 2011

Heard, G.W., Robertson, P. and Scroggie, M. (2004) *The ecology and conservation status of the Growling Grass Frog Litoria raniformis within the Merri Creek corridor.* Wildlife Profiles Pty. Ltd. and Arthur Rylah Institute for Environmental Research, Melbourne.

Robertson, P., Heard, G. and Scroggie, M. (2002). *The Ecology and Conservation Status of the Growling Grass Frog (Litoria raniformis) within the Merri Creek corridor. Interim Report: Distribution, Abundance and Habitat Requirements.* Report produced for the Department of Natural Resources and Environment.

**Appendix 1 Flora species recorded at Ephemeral Wetland 1 (PSP 40 West), Ephemeral Wetland 2 (PSP 42 North) and Werribee River (PSP 40 West)**

| ORIGIN | SCIENTIFIC NAME | COMMON NAME | EPBC | FFG | VROTS | IUCN | Ephemeral Wetland 1 (PSP 40 West) | Ephemeral Wetland 2 (PSP 42 West) | Weribee River |
|---|---|---|---|---|---|---|---|---|---|
| | *Acacia mearnsii* | Black Wattle | | | | EN | | | Y |
| | *Acacia melanoxylon* | Blackwood | | | | VU | | | Y |
| * | *Acetosella vulgaris* | Sheep Sorrel | | | | | Y | | |
| * | *Aira elegantissima* | Delicate Hair-grass | | | | | Y | | Y |
| | *Amphibromus nervosus* | Common Swamp Wallaby-grass | | | | EN | Y | | |
| * | *Arctotheca calendula* | Cape Weed | | | | | Y | | Y |
| | *Atriplex semibaccata* | Berry Saltbush | | | | LC | Y | | Y |
| | *Austrostipa aff. scabra subsp. falcata* | Spear Grass | | P | | | Y | | Y |
| * | *Avena fatua* | Wild Oat | | | | | | | Y |
| | *Azolla filiculoides* | Pacific Azolla | | | | | | Y | |
| * | *Bromus diandrus* | Great Brome | | | | | | | Y |
| | *Callistemon sieberi* | River Bottlebrush | | | | EN | | | Y |
| * | *Capsella bursa-pastoris* | Shepherd's Purse | | | | | | Y | |
| | *Centipeda cunninghamii* | Common Sneezeweed | | | | | Y | | |
| | *Chloris truncata* | Windmill Grass | | | | LC | Y | | |
| * | *Cirsium vulgare* | Spear Thistle | | | | | Y | | Y |
| * | *Conyza bonariensis* | Flaxleaf Fleabane | | | | | | | Y |
| | *Cotula australis* | Common Cotula | | | | | Y | | |
| * | *Cynara cardunculus* | Artichoke Thistle | | | | | Y | Y | Y |
| * | *Cynodon dactylon var. dactylon* | Couch | | | | | | Y | Y |
| * | *Dactylis glomerata* | Cocksfoot | | | | | | | Y |
| * | *Echium plantagineum* | Paterson's Curse | | | | | | | Y |
| * | *Ehrharta longiflora* | Annual Veldt-grass | | | | | | | Y |
| | *Eleocharis acuta* | Common Spike-sedge | | | | EN | | Y | |
| | *Eragrostis infecunda* | Southern Cane-grass | | | | LC | | Y | |

| ORIGIN | SCIENTIFIC NAME | COMMON NAME | EPBC | FFG | VROTS | IUCN | Ephemeral Wetland 1 (PSP 40 West) | Ephemeral Wetland 2 (PSP 42 West) | Weribee River |
|---|---|---|---|---|---|---|---|---|---|
| | *Eucalyptus camaldulensis* | River Red-gum | | X | | EN | | | Y |
| * | *Euphorbia lathyris* | Caper Spurge | | | | | | | Y |
| * | *Fumaria bastardii* | Bastard's Fumitory | | | | | | | Y |
| * | *Galenia pubescens var. pubescens* | Galenia | | | | | Y | | Y |
| * | *Helminthotheca echioides* | Ox-tongue | | | | | Y | | |
| * | *Hordeum leporinum* | Barley-grass | | | | | Y | Y | |
| * | *Hypochaeris radicata* | Flatweed | | | | | Y | | Y |
| | *Juncus subsecundus* | Finger Rush | | | | | Y | | Y |
| | *Juncus usitatus* | Billabong Rush | | | | | | | |
| | *Juncus vaginatus* | Clustered Rush | | | | | | | |
| | *Leptospermum lanigerum* | Woolly Tea-tree | | | | CR | | | Y |
| * | *Lolium perenne* | Perennial Rye-grass | | | | | Y | Y | Y |
| * | *Lycium ferocissimum* | African Box-thorn | | | | | Y | Y | Y |
| | *Lythrum hyssopifolia* | Small Loosestrife | | | | | Y | Y | |
| | *Marsilea drummondii* | Common Nardoo | | | | | | Y | |
| * | *Medicago polymorpha* | Burr Medic | | | | | | | Y |
| * | *Nassella neesiana* | Chilean Needle-grass | | | | | | | Y |
| * | *Nassella trichotoma* | Serrated Tussock | | | | | Y | | Y |
| * | *Opuntia spp.* | Prickly Pear | | | | | | | Y |
| * | *Oxalis pes-caprae* | Soursob | | | | | | | Y |
| * | *Paspalum distichum* | Water Couch | | | | | | Y | |
| * | *Petrorhagia dubia* | Velvety Pink | | | | | | | Y |
| * | *Phalaris minor* | Lesser Canary-grass | | | | | Y | | |
| | *Poa labillardierei* | Common Tussock-grass | | | | VU | | | Y |
| * | *Raphanus raphanistrum* | Wild Radish | | | | | Y | | Y |
| * | *Romulea rosea* | Onion Grass | | | | | | | Y |
| | *Rumex brownii* | Slender Dock | | | | LC | | | Y |
| * | *Rumex crispus* | Curled Dock | | | | | Y | | Y |

| ORIGIN | SCIENTIFIC NAME | COMMON NAME | EPBC | FFG | VROTS | IUCN | Ephemeral Wetland 1 (PSP 40 West) | Ephemeral Wetland 2 (PSP 42 West) | Weribee River |
|---|---|---|---|---|---|---|---|---|---|
| | *Rytidosperma caespitosum* | Common Wallaby-grass | | | | LC | Y | | Y |
| | *Rytidosperma duttonianum* | Brown-back Wallaby-grass | | | | EN | | Y | |
| * | *Solanum linnaeanum* | Apple of Sodom | | | | | Y | | Y |
| * | *Sonchus asper s.l.* | Rough Sow-thistle | | | | | Y | | Y |
| * | *Sonchus oleraceus* | Common Sow-thistle | | | | | Y | | Y |
| * | *Trifolium arvense var. arvense* | Hare's-foot Clover | | | | | Y | | Y |
| * | *Ulex europaeus* | Gorse | | | | | | | Y |
| * | *Vulpia bromoides* | Squirrel-tail Fescue | | | | | Y | | Y |
| * | *Xanthium spinosum* | Bathurst Burr | | | | | Y | | |

**Key:**

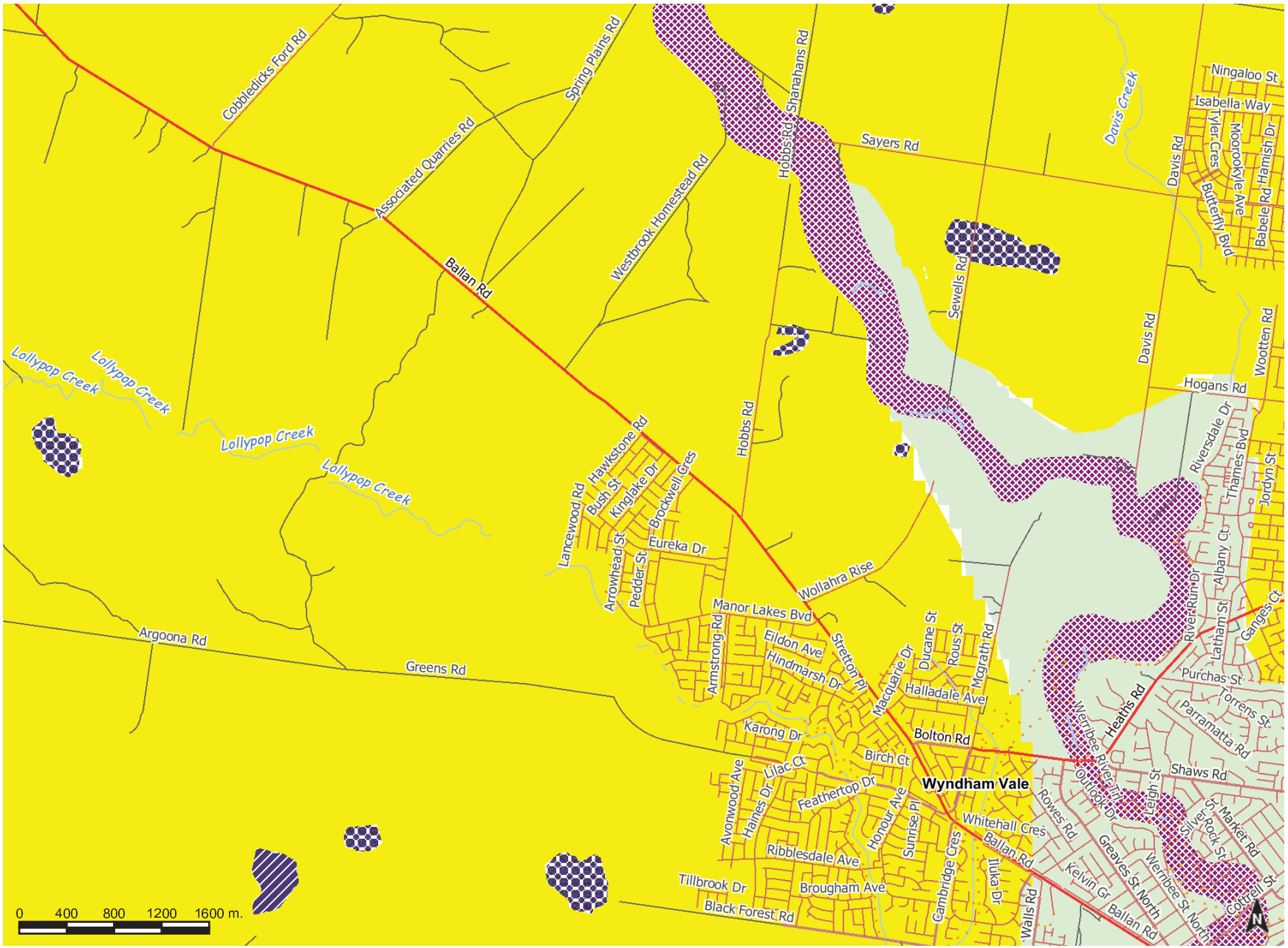
**EPBC** Status under the *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act)
**FFG** Status under the *Flora and Fauna Guarantee Act* 1988 (FFG Act)
**VROT** Conservation Status in Victoria
**IUCN** Status under the International Union for Conservation of Nature Red List of Threatened Species
**P** Provisionally listed
**CR** Critically Endangered
**EN** Endangered
**VU** Vulnerable
**NT** Near Threatened
**LC** Least Concern
***** Exotic flora, naturalised in Victoria (alien plants that reproduce consistently and sustain populations over many lifecycles without direct intervention by humans (Walsh and Stajsic, 2007))

## Appendix 2 Department of Sustainability and Environment Ecological Vegetation Class (EVC) Mapping (pre-1750 and 2005)

This page is intentionally blank.

# Wyndham Vale pre-1750 Ecological Vegetation Classes (EVCs)

Department of Sustainability and Environment




ROADS
- Freeway
- Highway
- Main Road
- Secondary Road
- Local Road
- 2WD (Unsealed)
- 4WD Only
- Walking or Cycle Track

WATERCOURSES
- Major Watercourse
- Minor Watercourse

1750 EVCs
- 56 Floodplain Riparian Woodland
- 291 Cane Grass Wetland
- 125 Plains Grassy Wetland
- 132 Plains Grassland
- 55 Plains Grassy Woodland

WATERBODIES
- Watercourse Area
- Permanent Waterbody
- Wetland Area

BUILT UP AREAS



Map Scale 1:47,040

Biodiversity Interactive Map A4 Landscape



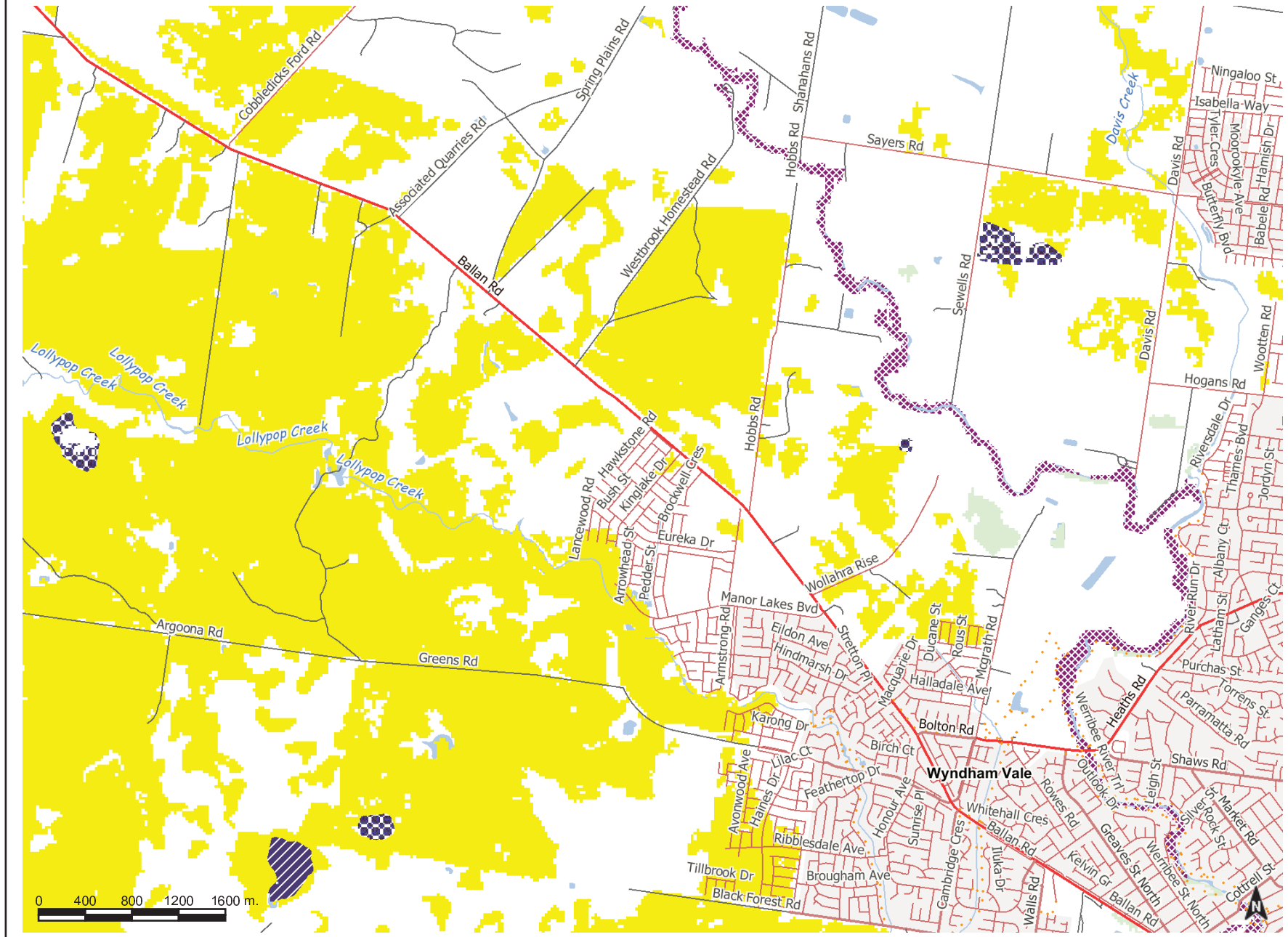
Produced on Sun Nov 13 11:25:19 EST 2011

GDA Vicgrid94

State Government Victoria

# Wyndham Vale 2005 Ecological Vegetation Classes (EVCs)

Department of Sustainability and Environment




ROADS
- Freeway
- Highway
- Main Road
- Secondary Road
- Local Road
- 2WD (Unsealed)
- 4WD Only
- Walking or Cycle Track

WATERCOURSES
- Major Watercourse
- Minor Watercourse

ECOLOGICAL VEGETATION CLASSES
- 56 Floodplain Riparian Woodland
- 291 Cane Grass Wetland
- 125 Plains Grassy Wetland
- 132 Plains Grassland
- 55 Plains Grassy Woodland

WATERBODIES
- Watercourse Area
- Permanent Waterbody
- Wetland Area

BUILT UP AREAS



Map Scale 1:47,040

Biodiversity Interactive Map A4 Landscape



Produced on Sun Nov 13 11:26:35 EST 2011

GDA Vicgrid94

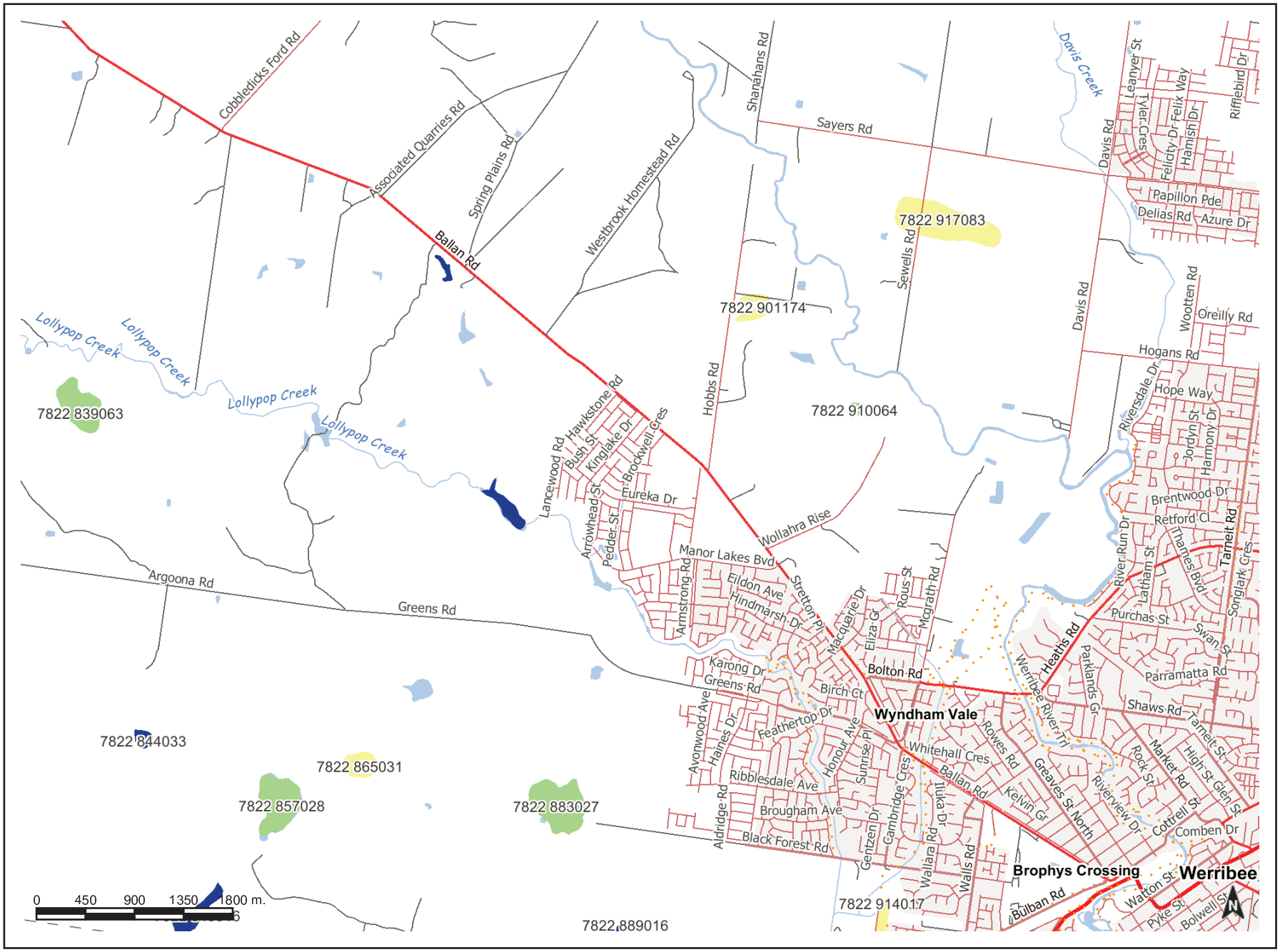
State Government Victoria

## Appendix 3 Department of Sustainability and Environment 1994 Wetland Mapping

This page is intentionally blank.

# Wyndham Vale Department of Sustainability 1994 Wetland Mapping

Department of Sustainability and Environment




ROADS
- Freeway
- Highway
- Main Road
- Secondary Road
- Local Road
- 2WD (Unsealed)
- 4WD Only
- Walking or Cycle Track

WATERCOURSES
- Major Watercourse
- Minor Watercourse

1994 WETLAND CATEGORIES
- Sewage Ponds
- Salt works
- Freshwater Meadow
- Shallow Freshwater Marsh
- Deep Freshwater Marsh
- Permnanent Open Freshwater
- Semi-permanent Saline
- Permanent Saline

WATERBODIES
- Watercourse Area
- Permanent Waterbody
- Wetland Area

BUILT UP AREAS



Map Scale 1:49,505

Biodiversity Interactive Map A4 Landscape



Produced on Sun Nov 13 16:09:02 EST 2011

GDA Vicgrid94

State Government Victoria