growth areas AUTHORITY

Biodiversity Assessment Report (Native Vegetation)
PSP 13: Clyde North

September 2010

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www.gaa.vic.gov.au

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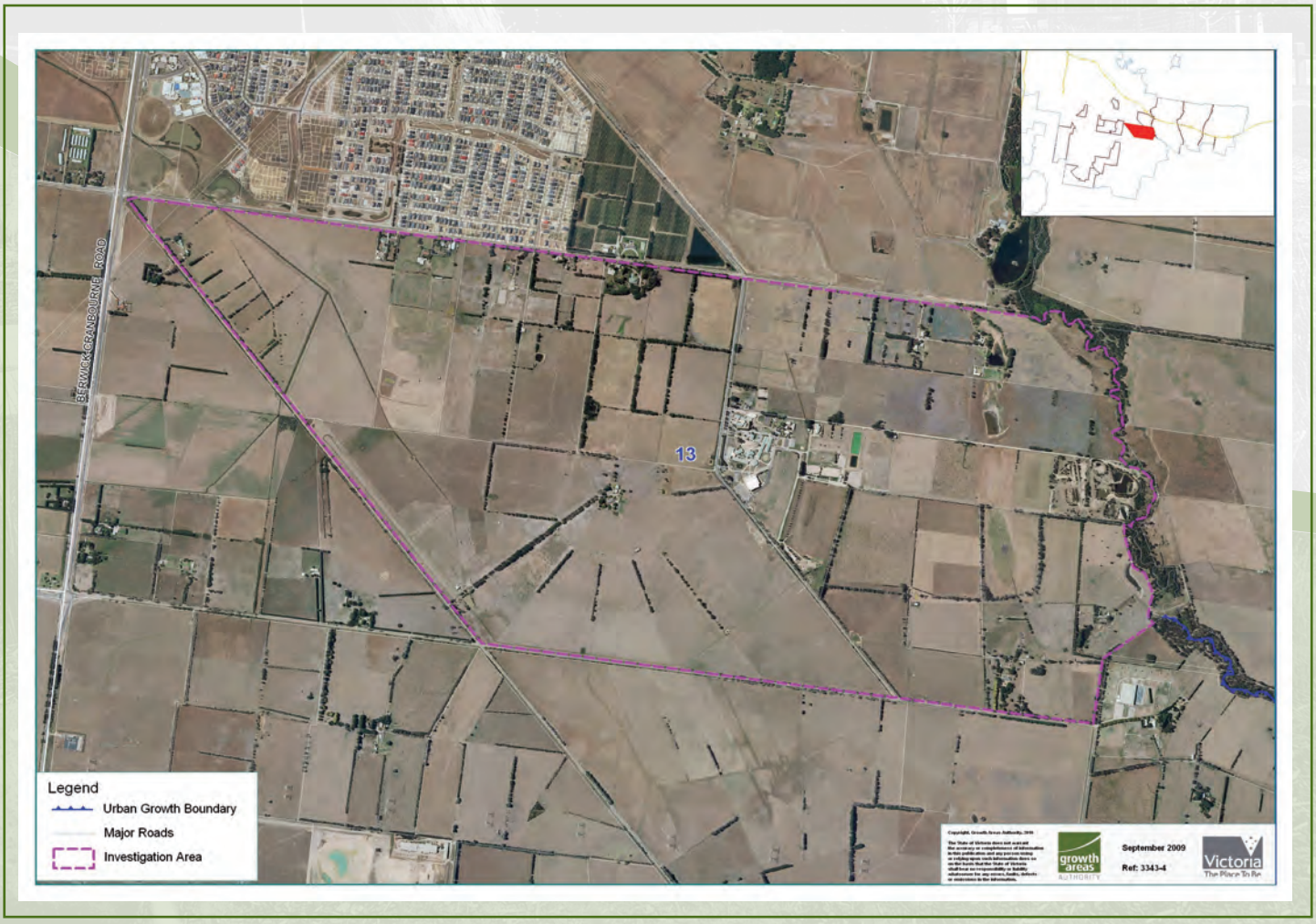

MAP: PSP 13 - Clyde North

Biodiversity Assessment Project (Native Vegetation)
Quality Assurance - Verification Sheet
PSP 13: Clyde North

Document Title	Biodiversity Assessment Report		
Precinct (Name and Number)	PSP 13: Clyde North		
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ISBN Number	978-1-921747-42-7		

This document is approved for release	**Organisation**
	Growth Areas Authority : Director, Policy and Strategy: ..... **Date: .....3.... / ...09.../ ...2010...**
	Department of Sustainability and Environment ..... **Director, Ecosystem Services:** **Date: ...3.... / ...09.../ ...2010...**

Quality Control: Report Verification Checklist			
Name of Company		**Practical Ecology**	
		Date	**Verifier**
Contract Signed		August 2008	Bill Vasiliadis
Habitat Hectare Competency Training Completed		August 2008	Mark Shepherd
Survey Period	**Start**	September 2008	Mark Shepherd
	Completed	January 2009	Mark Shepherd
Vegetation Assessment Surveys completed in accordance with DSE's Vegetation Quality Assessment Manual Version 1.3 (2004)		January 2009	Mark Shepherd
Mapping completed to agreed standards		December 2009	Mark Shepherd
Data authenticated by DSE		June 2009	Simon Denby
Habitat Hectare Assessment completed using 'Habitat Hectares for ArcPad' in accordance with agreed DSE approved methodology		January 2009	Mark Shepherd
Targeted Fauna surveys completed in accordance with agreed DSE's Vegetation Quality Assessment Manual Version 1.3 (2004)		-	-
Survey Results not included with this Report		General fauna survey for species not listed as state or nationally significant	N/A
Internal Quality Control completed		December 2009	Mark Shepherd
Final Report completed		December 2009	Mark Shepherd

Biodiversity Assessment Report: Flora and Fauna Assessment and Mapping Precinct 13, Clyde North

10 December 2009

Part 1 (Background and Purpose) by Growth Areas Authority.
Part 2 (Flora) and Part 3 (Fauna) by Mark Shepherd, Joanne Henry, Joanne North & Peter Gannon.

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Prepared for:	Growth Areas Authority	PE project number:	GAA 1047
Contact:	Bill Vasiliadis	PE file location:	R:\AAAA Major Clients - Projects\GAA\Biodiversity Reports\combined reports\Precinct 13 DRAFT\Final Draft\PSP_13_F+F_FINAL_10Dec09.doc

External version control

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1	15 June 2009	Tim Peggie, Bill Vasiliadis, Lyndal McDonald (GAA), Clare White (DSE)
2	10 December 2009	
3		

Internal review and auditing of this report for quality control was conducted by Peter Gannon.

Acknowledgments

The following people and organisations contributed to the report, provided advice, information or provided technical support during the preparation of this report:

Practical Ecology

Staci Timms undertook GIS data processing and created maps for the report.

Joy MacDonald, Jeremy Neal, Greg James and David Fairbridge undertook habitat hectare assessments.

Joanne North, Joanne Henry and Michael Reynolds undertook targeted survey for Growling Grass Frog.

Lincoln Kern provided project support and guidance.

Greg James contributed to descriptions of EVCs occurring within the study area.

Jane Juliff and Michael Reynolds provided technical assistance.

Nic McCaffrey assisted with 'likelihood of occurrence' ratings of significant flora.

Mal's Ecological and Environmental Services

Malcolm Legg undertook targeted survey for threatened fauna and reviewed sections of Part 3.

Ecocentric Environmental Consulting

Peter Gannon undertook habitat hectare assessments.

Growth Areas Authority

Yong Zhou provided *Land Subject to Inundation Overlay* and *Precinct Structure Plan* areas as GIS layers.

Department of Sustainability and Environment

Biodiversity Information Group provided access to their ecological databases; Victorian Flora Site Database (VFSD) and Atlas of Victorian Wildlife (AVW).

EXECUTIVE SUMMARY

Practical Ecology Pty Ltd was commissioned by Growth Areas Authority to undertake a targeted flora and fauna survey, and habitat hectare assessment within Precinct Structure Plan (PSP) area 13; *Clyde North*, Victoria. The purpose of this report is to provide information on the flora and fauna species, Ecological Vegetation Classes (EVCs), and fauna habitats occurring or predicted to occur within the precinct, as background information to assist the preparation of a Precinct Structure Plan for the *Clyde North* PSP area 13.

PSP area 13 is located in the suburb of Clyde North, within the City of Casey in Melbourne's south eastern growth corridor (Figure i). Clyde North is approximately 533 ha and is surrounded predominately by agricultural land to the north, south and west and by creek-line vegetation to the east (Figure i). The study area consists of approximately 15 privately owned properties and includes adjacent road reserves. The majority of the study area is currently being used for grazing livestock and features large open paddocks with some indigenous trees and planted vegetation. Native vegetation is common in roadsides and adjacent to wetlands and waterways. The Cardinia creek bounding the east of the study area is dominated by significant areas of indigenous and non-indigenous woodland, scrub and planted exotic vegetation.

A floodplain adjacent to Cardinia Creek and a major drainage line within the study area are covered by a 'Land Subject to Inundation Overlay' (LSIO) (DPCD 2009). The LSIO occupies 178 hectares of the study area. Part of the study area, adjacent to Cardinia Creek is included in Regional Biosite #6888 *Cardinia Creek (lower)* (DSE 2005b).

Flora

Native vegetation within the Clyde North Precinct is confined primarily to roadsides, drainage-lines, wetlands, and the Cardinia Creek riparian zone. Of this vegetation, **9.13 hectares** of native vegetation meets DSE's native cover threshold and comprises **2.09 habitat hectares.** Eight EVCs were recorded and mapped within the study area. Most EVCs occurring within the study area have an *endangered* conservation status in the Gippsland Plains bioregion. Sixty-five scattered trees were recorded within the study area. Many of these trees are River Red-gum *Eucalyptus camaldulensis* that occur on the drier plains within the study area.

Habitat Zones within the study area include:

- patches of Swamp Scrub along roadsides, within the Cardinia Creek riparian corridor and floodplain, and within drainage lines
- Swampy Riparian Woodland and wetland EVC mosaics in significant stands along the Cardinia Creek riparian corridor

- indigenous wetland vegetation in wetlands and drainage lines
- Plains Grassy Woodland within roadsides and farm paddocks.

Non-indigenous vegetation comprises planted non-indigenous Eucalypts and other established trees along fence-lines and roadsides. Drainage lines, wetlands and roadsides include areas of modified native vegetation that comprise the floristic components of Swamp Scrub and other EVCs, but do not meet DSE's cover thresholds. Large areas of agricultural land dominate the study area and comprise little native vegetation, with the exception of scattered tress and small woodland remnants. Degraded Treeless Vegetation (DTV) totals **528 hectares** within the study area.

No flora species of national or state significance were recorded within the study area, during the current assessment. Sixteen flora species of national or state significance have been recorded within a 5km radius of the study area or have been predicted to occur within 5km by DEWHA (2009a). At least two threatened flora species; Matted Flax-lily *Dianella amoena* and Purple Diuris *Diuris punctata* var. *Punctata;* are considered to have a moderate likelihood of occurrence within the study area, although were not recorded during the current assessment. Further survey at appropriate times of the year would provide a greater understanding of the likelihood of occurrence of those species within the study area.

Fauna

Targeted surveys were undertaken for the following state and nationally listed threatened fauna species:

- Australian Grayling *Prototroctes maraena*
- Dwarf Galaxias *Galaxiella pusilla*
- Glossy Grass Skink *Pseudemoia rawlinsoni*
- Growling Grass Frog *Litoria raniformis*
- Southern Brown Bandicoot *Isoodon obesulus obesulus*
- Southern Toadlet *Pseudophryne semimarmorata*
- Swamp Skink *Egernia coventryi*

A total of **87** fauna species were recorded within the study area, comprising seven amphibians, three reptiles, 61 birds, five invertebrates, two fish and nine mammals. Seventy-five species (86%) are native, while 12 species (14%) are introduced. Three fauna species of state significance were recorded during the current assessment; Glossy Grass Skink *Pseudemoia rawlinsoni*, Southern Toadlet *Pseudophryne semimarmorata*, and Hardhead *Aythya australis*. Two fauna species were recorded during targeted searches for

threatened species, while the remaining 85 species were recorded incidentally within the study area.

Surveys for other state and nationally threatened species were not commissioned by Growth Areas Authority. These include Swift Parrot *Lathamus discolor* and a suite of other threatened woodland and wetland birds, some of which have a high likelihood of occurrence within the study area. Furthermore, general surveys for species not listed as state or nationally significant were not commissioned by Growth Areas Authority. Further survey at appropriate times would better determine the likelihood of occurrence of threatened fauna within the study area.

Thirty-three fauna species of national, state or regional significance have been recorded within a 5km radius of the study area (DSE 2005c) or have been predicted to occur within 5km by DEWHA (2009a). Nineteen of these species are considered likely to have at least a low to medium likelihood of utilising the study area or of finding critical habitat within the study area. Many of these 19 species are wetland birds that are likely to utilise the many wetlands and marshy pastures within the study area.

Drainage-lines, wetlands and roadsides that do not meet the DNRE (2002) threshold for native vegetation comprise remnant or regenerating indigenous vegetation, such as Swamp Paperbark *Melaleuca ericifolia* and Common Reed *Phragmites australis* in many parts of the study area. These areas and many other areas dominated by introduced flora in drainage-lines, wetlands and roadsides are generally considered habitat for some threatened fauna species.

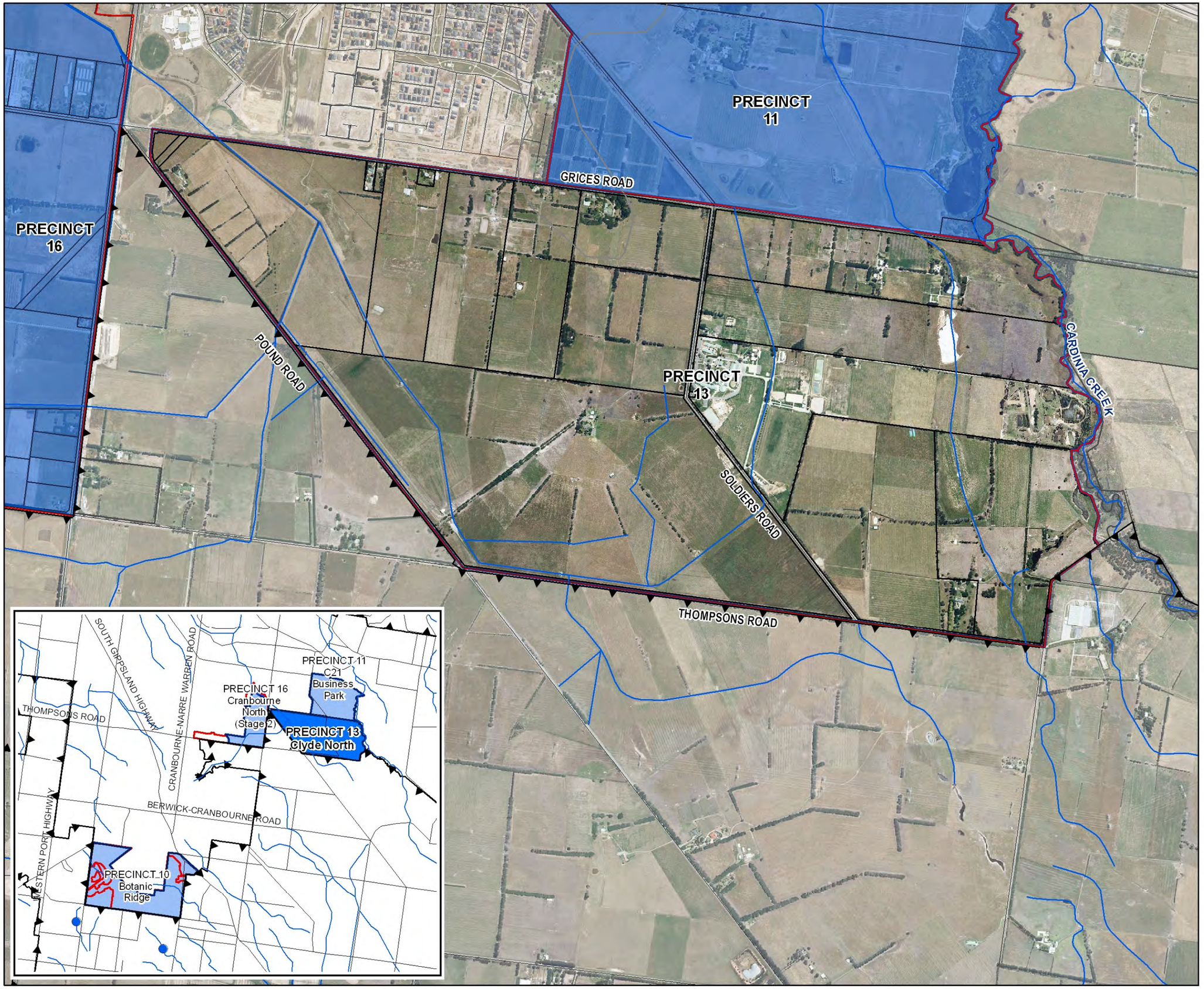
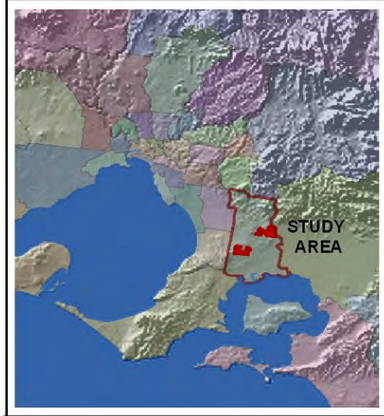


FIGURE i

Context Map of PSP Areas
Biodiversity Assessment Report
Flora Assessment and Mapping
Clyde North
Growth Areas Authority

LEGEND

- Roads
- Watercourses
- Urban Growth Boundary
- Property Boundary
- Study Area Boundary
- Precinct Boundary



MAP AND SURVEY DETAILS
Mapping by: Staci Timms, May '09
Generated from: GIS layers and Aerial Photography, supplied by DSE, GAA, ESRI and Geosciences Australia.

DATUM: GDA 94 MGA Zone 55

N

NOTES:
Practical Ecology bears no responsibility for the accuracy and completeness of this information and any decisions or actions taken on the basis of the map. While information appears accurate at publication, nature and circumstances are constantly changing.

VERSION	01	DATE	11/06/09

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Part 1

Background and Purpose

Precinct Structure Plan area 13;

Clyde North

1. BACKGROUND AND PURPOSE

1.1 Study Area

Precinct Structure Plan (PSP) area 13; *Clyde North*, is located within the suburb of Clyde North, within the City of Casey in Melbourne's south eastern growth corridor (Figure 1). Clyde North referred to hereafter as *Precinct 13*, is approximately 533 hectares in area and is bounded by Grices road to the north, Cardinia Creek to the east, Thompsons road to the south and by Pound road to the west. The study area is surrounded predominately by agricultural land to the north, south and west and by creek-line vegetation to the east (Figure 1).

The study area consists of approximately 15 privately owned properties and includes adjacent road reserves. The majority of the study area is currently being used for grazing stock and features large open paddocks with some indigenous trees and planted vegetation. Native vegetation is common in roadsides and adjacent to wetlands and waterways. The Cardinia creek and its floodplain to the east of the study area is dominated by significant areas of indigenous and non-indigenous woodland, scrub and planted exotic vegetation.

The Cardinia Creek floodplain and an area surrounding a major drainage line within the study area are covered by a 'Land Subject to Inundation Overlay' (LSIO) (DPCD 2009). Part of the study area, adjacent to Cardinia Creek is included in Regional Biosite #6888 *Cardinia Creek (lower)* (DSE 2005b).

The study area falls within the Gippsland Plains Bioregion (DSE 2009a).

1.2 Project Scope

The Growth Area Authority (GAA) engaged contractors during 2008 / 2009 to map and assess native vegetation and fauna habitat in designated Precinct Structure Plan areas surrounding Melbourne. The scope and design of this project was developed jointly with the Department of Sustainability and Environment (DSE). The purpose of this mapping and assessment process was to:

- Prepare biodiversity reports as essential background input into precinct structure planning at an early stage in the planning process;

- Inform the preparation of precinct structure plans in areas designated for future urban development (in most cases this will also include preparation of a Native Vegetation Precinct Plan)

- Identify priorities for protection and enhancement of biodiversity including potential reserve areas, biodiversity corridors and areas with potential to provide offsets for vegetation lost as a result of urban development;

- Assist long term planning related to infrastructure including liaison with relevant service authorities to ensure their requirements are met over the next 30-50 years;

This new approach focuses on achieving the objectives of the Victorian Native Vegetation Framework and planning development within the Urban Growth Zone at a regional level. This approach will improve the clarity and flexibility of native vegetation management, reduce the administrative burden on local government, provide greater certainty for urban development and improve biodiversity outcomes.

The mapping and assessment undertaken as part of this project has been undertaken in sufficient detail and of a sufficient standard to be used for the preparation of Native Vegetation Precinct Plans and Precinct Structure Plans.

The contractors assessed and mapped vegetation within existing precinct planning areas inside the Urban Growth Boundary (UGB). Contractors were required to submit a GIS data layer of all site assessments, together with other site information and observations on a monthly basis. The site assessments included:The extent of native and non-native vegetation
Mapped polygons of sites / zones
Confirmation of the native vegetation type (EVC)
Native vegetation condition assessment (Habitat Hectares site and landscape context score) and other site attributes including land use, dominant weeds etc.
The genera, size (small, medium, large and very large) and location of all remnant indigenous scattered trees

The number and size (small, medium, large and very large) of trees within vegetation patches that meet DSE's benchmark definition of a canopy species
The location of all observed rare or threatened plants or observed native flora
The location of all observed rare or threatened native fauna or habitat and land use features for fauna

The outputs of the Vegetation and Fauna Assessment and Mapping project will include two parts:

PART A: Vegetation condition, Rare or Threatened Flora species, Habitat and Land Use Features.

PART B: Fauna Surveys.

After consideration of the maps, information and records collected in Part A above and - existing data and fauna and mapping provided by DSE - GAA in consultation with DSE proposed to identify Study Sites for a general assessment of fauna and habitats.

This original approach to Fauna surveys was amended through negotiation with, and agreement of, the DSE to a targeted approach to survey for significant species. The specifications for these surveys are outlined in Appendix 1 of this report.

The priority for 2008 / 2009 was to assess areas for the next group of precinct structure plans, including PSP numbers 10, 13, 16, 23, 25, 26, 37, & 40 (total area 6796 hectares).

1.3 Amended Project Scope

The GAA became aware that the State Government was preparing to commission other major transport infrastructure projects and to plan for the future growth of Melbourne. These proposed projects, all of which were within, or in close proximity to, the GAA study areas, required assessment and mapping of vegetation and fauna. GAA staff negotiated with the Department's responsible for these projects for them to use the established GAA contract and project arrangements to obtain the vegetation and fauna information for their projects.

Additional PSP areas (PSP areas 11 and 4) were contracted to Practical Ecology to be assessed in 2008 for the extent and quality of native vegetation. PSP 4 was later withdrawn (late Nov 2008) as the surveys had been commissioned by City of Cardinia.

The outputs of the Vegetation and Fauna Assessment and Mapping project will also provide some of the vegetation and fauna data for four key Government projects:

1. Investigation to plan for the future growth of Melbourne
2. Regional Rail Link between West Werribee and Southern Cross via Tarneit and Sunshine
3. Outer Metropolitan Ring Transport Corridor Reservation Project
4. Ensuring critical grasslands are protected. The State Government is committed to the creation of two large areas as grassland protected areas.

Only Project No. 2 (above) directly involved existing PSP areas. The results for these projects will be reported in separate reports being prepared for each Project.

2. PROJECT SPECIFICATIONS AND MANAGEMENT ARRANGEMENTS

2.1 Tenders and Selection of Contractors

The Request for Tender was prepared by Growth Areas Authority jointly with the Department of Sustainability and Environment to ensure that the survey methodologies and all data collected and recorded as part of the project complied with Departmental standards. The Request for Tender was advertised in the Herald Sun and on the VicTender web site on the 23rd July 2008.

The Tenders were assessed against the Evaluation Criteria and 4 Contracts were awarded on the 26th August 2008 for Part A (Vegetation condition/Rare or Threatened Flora species/Habitat attributes and Land Use Features). Two Contracts were also awarded for Part B (Fauna Surveys).

Vegetation Condition Assessment and Mapping

Each contractor identified Habitat Zones (as per the method described in Vegetation Quality Assessment Manual Version 1.3, DSE 2004) within the assigned study sites. Habitat Zones and conducted a habitat hectare assessment using 'Habitat Hectares for Arc Pad'. Each contractor recorded land use, other habitat features, and dominant weed species at each zone. DSE supplied each contractor with 'Habitat Hectares for Arc Pad' which was used when mapping and undertaking habitat hectare assessments.

Contractors undertook a 30 minute assessment to identify and (using a GPS) record (i) all Victorian rare or threatened species (VROTS) and; (ii) any habitat features for native fauna. A count or estimate of the number of individual VROTS was provided at each recorded point location. DSE provided an assessment sheet for recording habitat and land use features for fauna likely to be present in the study area including hollow logs, tree hollows, litter, rocks and rock walls. This assessment sheet was also made available to load onto PDAs and these land use and habitat attributes were recorded for all properties that have been assessed and mapped.

For scattered trees, contractors identified and recorded the location of all individual indigenous trees encountered within any Habitat Zone, including the genera, diameter at breast height and assessment to determine ecological/ habitat significance.

Targeted Fauna Surveys

Appendix 1 outlines the agreed approach to surveys for significant fauna species throughout these investigation areas.

2.2 Training of Contractors

The GAA and DSE provided a mandatory (3 day) training course in the assessment methods and tools. The dates for this training course were 27, 28 &, 29 August 2008. This training included habitat-hectare assessments and mapping (to ensure the method is being applied in a consistent manner), use of the Habitat Hectares for Arc Pad software, other data collection requirements, OH&S and landholder engagement.

Staffs of contractors were trained in field situations in Native Vegetation assessment by DSE using the habitat hectare assessment methodology and the use of hand held GPS devices loaded with Arc View software provided by DSE.

2.3 Access to Properties and Communication with Landholders

GAA, in consultation with contractors, developed procedures for access to properties and protocols for contact with landholders. Contractors were provided with GAA authorised identification documentation to be carried by all staff whilst undertaking field surveys. The GAA assisted in the engagement of landholders in the process and facilitated access to properties to undertake site assessments.

A letter explaining the mapping project and requesting access to properties was sent to each landholder and occupier. Fact Sheets explaining precinct structure planning and the vegetation mapping project were also forwarded with the letter to landholders. Land owners were given the choice to make contact with the respective contractor to arrange access to their property. Contractors also spent considerable resources making contact with land owners and arranging site visits. A small number of landholders refused to provide access to their properties and in some cases the land owner data base did not lead to any contact being made with the land owner or occupier. Contractors provided regular updates as to which landowners had denied the contractor access to their property to conduct a survey.

In cases where access to a property has not been possible, mapping in this report will show the DSE modelled data layer of information and the contractors confirmation of this by a 'drive by' assessment. While this is not ground survey results it provides an indication of likely vegetation and habitat. In some cases, finalisation of the precinct structure plan and /or native vegetation precinct plan will require additional on ground assessment surveys to be undertaken at these properties.

2.4 Access to Existing Reports and Databases

In some parts of the precinct planning areas flora and/or fauna surveys had been previously arranged by landholders, councils or property developers. GAA, where possible, sought access to these reports and provided a copy to the relevant contractor. DSE staff also provided copies of reports that they knew existed for some of these areas.

Contractors were provided with a copy of, or access to, the DSE corporate flora and fauna databases, including the Atlas of Victorian Wildlife, Flora Information System and Aerial photography. Access to landholder and property information was arranged through DSE and in some cases a contractor was engage to compile a telephone contact database to enable contractors to contact property owners.

2.5 DSE Quality Assurance Arrangements

Field surveys were undertaken by qualified and experienced botanists and ecologists who had participated in the training provided by the DSE as part of this project.

DSE also undertook quality assurance site visits with the contractors to ensure that the assessment methodology was being applied in a consistent manner.

Contractors provided monthly reports to the GAA contract manager including an account of hectares assessed and the data collected. GAA undertook a check of GIS integrity and then arranged for DSE to check the data for its consistency with the *Vegetation Quality Assessment Manual* Version 1.3 (DSE 2004).

Audits of the data files were conducted by DSE to ensure that the records conformed to DSE standards and that all attributes had been recorded accurately.

Any deficiencies were reported to each contractor for correction and improvement prior to acceptance of the results and finalisation of payments.

2.6 Project Governance

A Native Vegetation Project Control Group was established by GAA, which initially included GAA and DSE representatives only. Representatives of VicRoads and Department of Transport were later invited to join the Project Control Group when it was decided that GAA's contractors would be used to undertake the assessment and data gathering for VicRoads and Department of Transport's road and rail project. The Department of Transport also arranged for their project manager (Maunsell) to attend the meetings. The Project Control Group has met regularly since the project commenced.

2.7 Monthly Reporting

Monthly updates and data files were provided on the progress of the assessments along with the contractor's updated project plan to ensure completion of the planned extent of assessment/mapping within the time period provided for the assessment. Initially the assessments were to be completed by the end of December 2008 but the GAA negotiated

with contractors to extend the survey deadline into early 2009 to maximise the areas assessed and mapped.

BACKGROUND & PURPOSE APPENDIX 1. TARGETED FAUNA SURVEYS – Specifications for Casey- Cardinia Area

Includes Precincts: Botanic Ridge PSP area 10, Clyde North PSP area 13, Cranbourne North (Stage 2) PSP area 16.

In addition to the targeted survey guidance as outlined in Appendix 2 of DSE's *Draft Flora, Fauna, and Habitat Hectare Assessment Model* please see comments below.

Fauna Species discussed at site visit:

- **Growling Grass Frogs** – ideal time for nocturnal surveying is October to December for calling males – particularly after rain. Survey can be extended until February for nocturnal spotlighting and diurnal surveys. Survey all drainage lines, dams, water bodies, streams, rivers, areas where there is water in all three precincts etc.

- **Dwarf Galaxias, Australasian Grayling** – ideal time is spring when there is permanent water. Survey all areas where there is water.

- **Southern Brown Bandicoots** – survey should occur in winter when the species are active and digging. Survey in areas of potential habitat (where vegetation or habitat structure is appropriate – including patches of weeds) in Botanic Ridge and other precincts with suitable habitat.

  Survey to include:

  - Daytime searches of at least two hours for each site of suitable habitat resources, such as areas with a dense understorey and thick ground cover, perhaps focussing on areas where fire has produced a mosaic of habitat that vary according to time since burning.

  - Daytime searches for signs of activity, including tracks, scats, nests and conical foraging holes. Usually undertaken concurrently with habitat resource searches and recommended survey effort is therefore the same.

  - Collection and analysis of predator scats, owl casts or remains, targeting predatory bird/mammal nests/dens.

  - Multiple spotlight surveys of transects at least 100 m apart in all areas of likely habitat to maximise area surveyed with total transect length of at least 1000m; repeat over two nights and across all seasons if possible to reduce influence of climatic conditions on survey outcome

  - Additional cage (3 nights in a row) and camera surveys in areas of likely habitat.

DSE has provided information of landholders with records and updated AVW records.

- **Swamp Skink, Glossy Grass Skink** –
    - Likely to be present in Botanic Ridge precinct and other precincts if suitable habitat.
    - Pit fall traps/ tiles /metal sheets over summer period in selected areas of potential habitat
    - If Elliot traps used they should be triggered for the lightest weight possible
    - They are cryptic species and often missed in targeted survey so very important for ecological assessment of site and potential and likely habitat to be mapped. Often in disturbed areas.
- **Southern Toadlet**
    - Survey in autumn
- **White Footed Dunnart**
    - If there are records around Clyde North then targeted survey in likely habitat.

Part 2

Habitat Hectare Assessment and Targeted Flora Survey

Precinct Structure Plan area 13;

Clyde North

3. FLORA INTRODUCTION

Practical Ecology Pty Ltd was commissioned by Growth Areas Authority (GAA) to undertake a habitat hectare, threatened flora survey and site condition assessment of Precinct Structure Plan area 13; referred to hereafter as *Precinct 13*, in Clyde North, Victoria. The primary objectives of this study are to establish the distribution, abundance and significance of remnant EVC Habitat Zones, threatened flora and significant habitat within the study area and to present the information within the context of relevant legislation and policy.

This report provides information on significant flora and habitat-hectare values within Precinct 13 by:

- identifying the study area's known habitat-hectare values and the conservation status therein
- documenting significant flora species that occur or have potential to occur within the study area
- assessing all fieldwork data and information from relevant literature and databases against relevant policy and legislation

This information will be utilised by GAA to inform:

- the preparation of a Precinct Structure Plans
- the identification of priorities for protection and enhancement of biodiversity including potential reserve areas, biodiversity corridors and areas with potential to provide offsets for vegetation lost as a result of urban development
- long term planning related to infrastructure including liaison with relevant service authorities to ensure their requirements are met over the next 30-50 years.

4. FLORA METHODS

Flora taxonomy is consistent with the Flora Information System (FIS) database when accessed through Viridans software (DSE 2007a). Taxonomic nomenclature for scientific names is derived from Walsh and Stajsic (2008).

4.1 Literature review and desktop assessment

Background information on the study area's bioregion and EVC distribution (pre-1750, and current) was gathered by literature review prior to site surveys. Planning reports and land management documents were also reviewed. Several GIS mapping layers were provided to Practical Ecology by GAA and DSE and these were incorporated into a GIS. Mapping layers and data sources are detailed below.

Cadastre data and parcel identifiers: the cadastre data, identifying individual land parcels, along with individual parcel identifiers were supplied by GAA/DSE for this project and incorporated into Practical Ecology's GIS.

Bioregion: determined by referring to DSE's *Biodiversity Interactive Map* (DSE 2009a).

Pre 1750 EVCs: determined by referring to DSE's pre-1750 EVC distribution maps (DSE 2009a).

Extant EVCs: the extant EVC GIS mapping layer was supplied by DSE for this project and geo-rectified with the aerials for this study.

Modeled Native Vegetation Extent and Quality: determined by referring to DSE on-line maps and confirmed on site (DSE 2009a).

Biosites: the Biosite25_region mapping layer was not supplied by DSE for this project but was hand digitised using DSE's Biosite cd (DSE 2005b).

Significant attribute waypoints: the Fauna100_point, Flora100_point and lfw100_point waypoint attribute layers were supplied by DSE for this project and integrated into our GIS of the study area.

Flora Information System (FIS) and Atlas of Victoria Wildlife (AVW): The Flora Information System(DSE 2007a) and Atlas of Victoria Wildlife (DSE 2005c) databases were queried for the study area. The record locations of significant flora and fauna taxa were referred to in the field during the habitat-hectare surveys.

Management reports: A review was conducted of management reports available to us from the region to assist in the pre-survey identification of significant sites and habitat corridors. These reports included McMillan et al (2003), Fairbridge & Appleby (2009), Lane & Associates (2008) and Costello et al (2003).

Site aerials: the study area was previewed prior to site assessment using both Google Earth and aerials supplied by DSE to identify patches of vegetation. Google Earth aerials were also streamed live to a laptop during the site surveys for site identification, and for comparison with more up-to-date DSE aerials for the study area.

Fieldwork: Field survey was undertaken on foot. The majority of survey was undertaken between October and November 2008. However, access to individual properties was dependent on correct landholder contact details and the contactability of landholders, the lack of which prevented contact via telephone in some cases. Certain landholders were therefore contacted in person through 'door knocking'. Furthermore, in some instances, permission was granted on the condition that the landholder to be present during the survey, which required arrangements to be made for meeting the landholder at a mutually agreeable time. Circumstances such as these contributed to delays in property access in some cases and resulted in some surveys being undertaken in January. Survey was therefore disjointed and extended over a period of several months. Weather conditions during the survey were therefore varied due to the extended period over which survey was undertaken.

4.2 Flora

Habitat hectare assessments were conducted, on a land parcel by parcel basis, across the study area. The assessments were conducted in accordance with DSE's *Vegetation Quality Assessment Manual* (DSE 2004), *User Guide Habitat Hectares Assessment Sheet for ArcPad 7.1.1 – Version 6* (DSE 2008a) and *GAA Native Vegetation Mapping Project Field Assessment Methodology – Quick Reference Guide* (DSE 2008b). Training was provided by DSE in a three day session at the project's inception. Auditing was undertaken by DSE throughout the fieldwork stage.

Flora data was collected in the field using a hand held Person Digital Assistant (PDA). The Department of Sustainability and Environment (DSE) developed a software application for ArcPad 7.1.1 for the *Growth Areas Authority Native Vegetation and Mapping project* (DSE 2008a) in order to enable the collection of data in the field. DSE's software application enabled the collection of data as outlined in the sections below. The resulting ESRI shapefiles were processed using ArcView V.9 software to re-edit and refine of polygon boundaries, based on hardcopy mapping.

GIS data was submitted to GAA and DSE for monthly review throughout the project. Requested edits were completed and data was resubmitted. At the conclusion of the fieldwork, the monthly data was merged to form a single GIS file, which was exported to into excel spreadsheets for presentation in this report.

The site assessments included:

- mapping the extent of remnant and non-remnant vegetation

- mapping polygons of Habitat Zones, as defined below and in accordance with Victoria's *Native Vegetation Management Framework* (DNRE 2002)
- determination of Ecological Vegetation Classes (EVC)
- native vegetation condition assessment (Habitat Hectares site and landscape context score) and assessment of other site attributes including land-use, habitat attributes and high threat environmental weeds
- the size (small, medium, large and very large) and genera of trees (either as patches or individual trees when scattered in the landscape)
- the location of observed rare or threatened plant species
- the location of incidentally recorded threatened fauna species.

Vegetation in the study area was categorised into different types. These categories and their definitions are consistent with policy and legislation, particularly *Victoria's Native Vegetation Management Framework* (DNRE 2002), and assists in identifying where such policies come into effect.

The following categories were applied.

4.2.1 Remnant Vegetation Patch

- EVCs and Habitat Zones were identified within each patch in accordance with Section 5 of DSE's *Vegetation Quality Assessment Manual Version 1.3* (DSE 2004).
- For each Habitat Zone the Zone Overview data was recorded using DSE's Site Assessment Checklist. Details on the type of information collected is provided in the GAA Vegetation Mapping User Guide, Section 2 – *Collecting Zone Overview data.*
- Each Habitat Zone was mapped and a Habitat Hectares Assessment using DSE's PDA based 'Habitat Hectares for ArcPad' software was conducted in accordance with the GAA Vegetation Mapping User Guide, Section 5 – *Completing a Habitat Hectares Assessment.*
- The number of Very Large Old Trees (VLOTS), Large Old Trees (LOTS), Medium Old Trees (MOTS) and Small Trees (STs) were recorded in the Tree Count Tab of DSE's PDA based 'Habitat Hectares for ArcPad' software (refer to Section 5.6.5 of the GAA Vegetation Mapping User Guide for more information).
- The number of STs cannot be recorded via the Scattered Tree software and was therefore recorded manually and transferred to the Habitas.dbf file (refer to Section 5.6.5 of the GAA Vegetation Mapping User Guide for more information).

- The location of any observed VROT flora was recorded using DSE's PDA based 'tflora_template' shapefile (refer to Section 10 of the GAA Vegetation Mapping User Guide – *Mapping the Location & Number of all Observed Rare or Threatened Flora* for more information).

- The location of any observed VROT fauna was recorded using DSE's PDA based 'tfauna_template' shapefile (refer to Section 11 of the GAA Vegetation Mapping User Guide, Section 11 – *Mapping the Location & Number of all Observed Rare or Threatened Fauna* for more information).

4.2.2 Scattered Trees

- Scattered tree polygons were assigned in the field and a scattered tree EVC was assigned in accordance with Section 5 of DSE's *Vegetation Quality Assessment Manual Version 1.3* (DSE 2004).

- Scattered tree Zone Overview data was recorded for each scattered tree 'zone' using DSE's Site Assessment Checklist. Details on the type of information collected is provided in the GAA Vegetation Mapping User Guide, Section 2 – *Collecting Zone Overview data.*

- For each Zone map the complete boundary of each Habitat Zone was mapped and a Scattered Trees Assessment was conducted using DSE's PDA based 'Scattered Tree Assessment for ArcPad software in accordance with the GAA Vegetation Mapping User Guide, Section 6 – *Completing a Scattered Tree Assessment.*

- The number of VLOT, LOT, MOT and ST was recorded for each scattered tree zone using DSE's PDA based STLocn_template shapefile in accordance with the GAA Vegetation Mapping User Guide, Section 6 – *Completing a Scattered Tree Assessment*.

- The location of any observed VROT flora was recorded using DSE's PDA based 'tflora_template' shapefile (refer to Section 10 of the GAA Vegetation Mapping User Guide – *Mapping the Location & Number of all Observed Rare or Threatened Flora* for more information).

- The location of any observed VROT fauna was recorded using DSE's PDA based 'tfauna_template' shapefile (refer to Section 11 of the GAA Vegetation Mapping User Guide, Section 11 – *Mapping the Location & Number of all Observed Rare or Threatened Fauna* for more information).

4.2.3 Degraded Treeless Vegetation

Degraded Treeless Vegetation Overview data was recorded for each site using DSE's Site Assessment Checklist. Details on the type of information collected is provided in the GAA Vegetation Mapping User Guide, Section 2 – *Collecting Zone Overview data.*

The complete boundaries of each site was mapped the relevant data was recorded using DSE's PDA based 'Habitat Hectares for ArcPad' software in accordance with the GAA Vegetation Mapping User Guide, Section 9 – *Completing a Degraded Treeless Vegetation Assessment*.

The location of any observed VROT flora was recorded using DSE's PDA based 'tflora_template' shapefile (refer to Section 10 of the GAA Vegetation Mapping User Guide – *Mapping the Location & Number of all Observed Rare or Threatened Flora* for more information).

The location of any observed VROT fauna was recorded using DSE's PDA based 'tfauna_template' shapefile (refer to Section 11 of the GAA Vegetation Mapping User Guide, Section 11 – *Mapping the Location & Number of all Observed Rare or Threatened Fauna* for more information).

5. FLORA LIMITATIONS

5.1 Flora survey and ecological assessment

Flora lists for each property and for the entire precinct were not commissioned by GAA and were not compiled by Practical Ecology for the study area. No incidental records, flora quadrat or transect analyses were undertaken. Lists of weed species were recorded during habitat hectare assessments and are included as part of the GIS files created during the project. However, these lists were undertaken for the purposes of habitat hectare assessments and were selected from a 'drop-down' list of common weed species. The lists are therefore not exhaustive or necessarily complete records of weed species recorded within the study area, and are therefore not included in this report.

No data other than habitat hectare assessments and site condition checklists was collected during site visits, as per the project brief. Practical Ecology was not commissioned to undertake biodiversity reporting for the study area at the time of the field assessment. Information relating to the general site condition contained within this report is therefore a product of assessor recollection of the study area. Photographs and hard copy mapping of the ecological attributes of the site was not undertaken.

Unseasonably dry and hot conditions during the survey of certain properties in summer presents as a limitation, and may have a minor influence over the results of habitat hectare assessment results.

5.2 Site Access

There were several properties within the study area which did not respond to the GAA's initial contact queries. These properties were later canvassed on foot and permission was sought for access and the conduct of site surveys. This time consuming process contributed to delays in the survey process, and subsequently, resulted in a 'temporally and geographically disjointed' assessment across the study area. However, all properties within the study area were accessed for flora assessment during the current assessment.

5.3 Flora survey for threatened species

The study area was not considered highly likely habitat for threatened flora species, due to the highly modified nature of the agricultural landscape within which it is situated. Three threatened flora species that have been recorded within five kilometres (DSE 2007a) or predicted to occur by DEWHA (2009a) have been assigned a medium likelihood of occurrence. These three threatened species are spring flowering species. Targeted searches for threatened flora were undertaken in spring, therefore the timing and temporal

extent of threatened flora surveys was not considered a significant limitation for these threatened flora species.

5.4 Scattered Trees

The number of Very Large Old Trees (VLOTs), Large Old Trees (LOTs), Medium Old Trees (MOTs) and Small Trees (STs) were recorded for each scattered tree zone using DSE's PDA based STLocn_template shapefile in accordance with the GAA *Vegetation Mapping User Guide*, Section 6 – *Completing a Scattered Tree Assessment*. Size classifications were based on the trunk diameter at breast height (DBH), as measured at 1.3 metres from ground level. Records of actual DBH measurements of individual trees were not kept, in accordance with the project brief and the *User Guide*. The DBH of small trees is however, required to calculate tree recruitment offset requirements for small trees using the *Port Phillip and Westernport Native Vegetation Plan* (PPWPCMA 2008). Hypothetical offset requirements for small trees in accordance the relevant EVC benchmark (DSE 2009b) and discussed in section 4.2, were therefore calculated using the maximum small tree DBH as the default DBH.

6. FLORA RESULTS

6.1 Remnant Patches

Vegetation patches within the study area that constitute Habitat Zones, in accordance with Victoria's *Native Vegetation Management Framework* policy (DSE 2004), are generally small in area (generally less than 0.3 hectares per patch). Furthermore, patches of native vegetation are generally modified and not contiguous with other Habitat Zones. This was reflected in the relatively low habitat hectare assessment scores, which were generally between 0.15 and 0.35. The scores are a reflection of the highly modified agricultural landscape within which the study area occurs. Low habitat hectare scores can be attributed to, but not necessarily limited to:

- pugging (due to hard hooves) by livestock, particularly within damper soils in the gullies and around marshy areas
- soil disturbance, such as gully erosion, tracks through remnants and areas of exposed soil with little to no vegetative cover
- introduction of grassy weeds, pasture grasses and high nutrient levels
- cropping of tussock grasses and the ground storey vegetation in general
- general absence of regeneration of woody species (due to grazing and rabbits) and subsequently a declining canopy coverage
- loss of middle and ground-storey vegetation resulting in a depauperate native vegetative understorey cover.

6.1.1 Ecological Vegetation Classes

Eight EVCs were identified and mapped within the study area. Table 1 summarises EVCs, EVC Conservation Status (DSE 2009b), EVC area and habitat-hectares recorded within the study area.

Table 1. Summary of EVCs recorded within the study area.

EVC Name	EVC Number	EVC cons status	Conservation significance	Area (ha)	Habitat Hectares
Grassy Woodland	GipP0175	Endangered	Very High	0.360	0.054
Plains Grassy Woodland	GipP0055	Endangered	High	1.110	0.298
Swampy Riparian Complex	GipP0126	Endangered	Very High	0.060	0.003
Swampy Riparian Woodland	GipP0083	Endangered	Very High	0.760	0.235
Swamp Scrub	GipP0053	Endangered	Very High	1.930	0.326
Sedge Wetland	GipP0136	Vulnerable	Very High	0.290	0.104
Tall Marsh	GipP0821	Endangered	Very High	4.280	0.971
Wetland Formation	GipP0074	Endangered	Very High	0.340	0.103
		Totals		**9.130**	**2.093**

The following EVC descriptions are based on the condition of Habitat Zones found on site, and include more general descriptions referenced from EVC benchmarks available on-line (DSE 2009b) and from Oates and Taranto (2001).

Grassy Woodland (EVC 175)

In remnant unmodified condition, Grassy Woodland EVC is a variable, open eucalypt woodland (to 15m tall) with a diverse ground layer of grasses and herbs and a sparse shrub component. It occurs on sites with moderate fertility on gentle slopes or undulating hills on a range of geologies (DSE 2009b). The Grassy Woodland canopy can comprise various Eucalypt species, such as Narrow-leaf Peppermint *Eucalyptus radiata,* Coast Manna Gum *Eucalyptus viminalis* subsp. *pryoriana,* Snow Gum *Eucalyptus pauciflora* or Sheoaks; Drooping Sheoak *Allocasuarina verticillata* and Black Sheoak *Allocasuarina littoralis* (Oates & Taranto 2001).

This EVC is represented as two small, isolated patches within the study area (Figure 2). The patches are suffering from edge effects due to their small size and the surrounded farmland. Weed invasion is prolific in the understory with native herbs and grasses being effectively absent, which is reflected in the low habitat hectare scores. The canopy comprises Eucalypt species and is in poor to moderate health, presumably due to the extended period of below average rainfall and edge effects including increased insect attack and increased exposure to winds.

This EVC has an 'Endangered' Conservation Status within the Gippsland Plains bioregion (DSE 2009b).

Plains Grassy Woodland (EVC 55)

Plains Grassy Woodland EVC most likely once occupied the majority of the drier, elevated plains west of the Cardinia Creek floodplain prior to European settlement (DSE 2009b). This EVC is effectively all but absent from the precinct, attributable to land clearance and long-term grazing. Some small remnants persist, mostly within road reserves (Figure 2). Scattered River Red Gums *Eucalyptus camaldulensis* throughout the study area also indicate that the EVC once dominated the drier plains (Figure 2).

Plains Grassy Woodland would have once been ecotonal with Plains Grassland within the study area (DSE 2009b). The EVC would likely have presented as an open, eucalypt woodland (to 15m tall) dominated by River Red Gums *Eucalyptus camaldulensis*, with a diverse, grassy and herbaceous understorey and a sparse cover of shrubs.

Plains Grassy Woodland within the study area is mostly highly modified and suffering from the impacts of weed invasion and other disturbance related to the surrounding agricultural landscape. Mature Red gums were mostly absent from patches and native understory diversity was generally low. All patches scored below 0.30.

This EVC has an 'Endangered' Conservation Status within the Gippsland Plains bioregion (DSE 2009b).

Swampy Riparian Complex (EVC 126)

Swampy Riparian Complex is a mapping unit that includes a range of EVCs that cannot be resolved at the scale of mapping. The EVC is therefore variable but is representative of vegetation typical of swampy or waterlogged, low gradient drainage-lines. The EVC may include components of Creekline Herb-rich Woodland, Gully Woodland, Shrubby Gully Forest, Fern Swamp, Swampy Riparian Woodland, Swampy Woodland and Swamp Scrub. Swampy Riparian Complex is typically a woodland to 15 m tall or forest to 20 m tall (DSE 2009).

Swampy Riparian Complex within the study area is limited to a single habitat zone and scored poorly for all site conditions criteria. The EVC is highly modified within the study area.

This EVC has an 'Endangered' Conservation Status within the Gippsland Plains bioregion (DSE 2009b).

Swampy Riparian Woodland (EVC 83)

Swampy Riparian Woodland was once common along broad drainage lines and on levees near streams and may once have dominated the Cardinia Creek riparian corridor (Oates & Taranto 2001). The EVC is typically dominated by Swamp Gum *Eucalyptus ovata* with the

middle and under story dominated by Swamp Paperbark *Melaleuca ericifolia*, Wooly Tea-tree *Leptospermum lanigerum* and Common Reed *Phragmites australis* (Oates & Taranto 2001).

This EVC is now isolated to small patches within the study area where Swamp Gum canopy has been retained. Swampy Riparian Woodland remnants on site were generally ecotonal with Swamp Scrub patches with an understorey that was generally dominated by emergent Swamp Paperbark over a diverse range of graminoids and herbs.

This EVC held a moderate representation of indigenous middle-storey diversity within the study area, including shrubs such as Sweet Bursaria *Bursaria spinosa* and Hemp Bush *Gynatrix pulchella* . Understorey diversity was generally low.

This EVC has an 'Endangered' Conservation Status within the Gippsland Plains bioregion (DSE 2009b).

Swamp Scrub (EVC 53)

Swamp Scrub is dominated by Swamp Paperbark *Melaleuca ericifolia* or sometimes Woolly Tea-tree *Leptospermum lanigerum* which forms a dense closed canopy. The EVC forms on poorly drained sites or on alluvial deposits along streams. Swamp Paperbark typically out-competes Eucalypt species, although emergent Swamp Gum *Eucalyptus ovata* may occur. Shrubs are usually absent; while a herbaceous and grassy understorey may be present depending on light availability (Oates & Taranto 2001).

Patches of Swamp Scrub were recorded throughout the study area within low-lying, damp reaches of roadside verge, un-grazed drainage ditches, and interspersed within woodland remnants at swampy / marshy sites. Much of the Cardinia Creek riparian corridor has also been classified as Swamp Scrub. Swampy Riparian Woodland may have once dominated the riparian corridor (Oates and Taranto 2001), however Eucalypts were most likely removed, allowing for the colonisation of Swamp Scrub within this area. The swamp scrub canopy is dominated by a closed cover of Swamp Paperbark over a surprisingly diverse ground cover of graminoids, herbs and mosses.

Swamp Scrub patches generally show good signs of regeneration and colonisation suggesting that this EVC would naturally colonise damp sites and flood zones if left un-grazed and un-slashed. Small patches with an immature canopy cover were common within the study area.

This EVC has an 'Endangered' Conservation Status within the Gippsland Plains bioregion (DSE 2009b).

Sedge Wetland (EVC 136)

Sedge Wetland more typically occupies in low-lying areas where landforms such as billabongs, lakes, swamps or depressions occur. Vegetation is generally treeless, however shrubs may be present at the fringes and occasionally scattered throughout the EVC.

Vegetation is dominated by sedges, rushes and reeds and tends to be low in diversity in central areas with more variety towards the fringes (DSE 2009b).

Within the study area, this EVC was found fringing dams and was generally the result of natural colonisation and was probably not remnant vegetation. Dams that were subject to frequent access by stock or with a fluctuating water level were less likely to have a colonising aquatic margin. On the whole, floristic diversity within this EVC was low, as can be expected of colonising aquatic vegetation in farm dams.

This EVC has a 'Vulnerable' Conservation Status within the Gippsland Plains bioregion (DSE 2009b).

Tall Marsh (EVC 821)

Tall Marsh more generally occurs on Quaternary sedimentary geology of mainly estuarine sands, where soils are peaty, silty clays, and average annual rainfall is approximately 600 mm. It requires shallow water (to 1 m deep) and low current-scour, and can only tolerate very low levels of salinity (DSE 2009b).

Tall Marsh was found fringing a number of farm dams and constructed drainage-lines within the study area and was generally the result of natural colonisation. Within the study area this EVC preferred dams with a shallow aquatic margin and a relatively non-fluctuating water level. These sites were generally dominated by Cumbungi *Typha* spp. with Common Reed *Phragmites australis* and Club-sedge *Schoenoplectus* spp often present.

This EVC has an 'Endangered' Conservation Status within the Gippsland Plains bioregion (DSE 2009b).

Wetland Formation (EVC 74)

Wetland formation is a broad EVC that is similar in structure and species composition to Sedge Wetland. The EVC is considered an EVC aggregate that incorporates a range of freshwater wetland EVCs. Wetland Formation occurs in depressions associated with standing water and ephemeral water bodies. The EVC can have herbland, sedgeland and rushland elements and is characterised by the lack of woody plants (shrubs and trees), however, it can be ecotonal with Swamp Scrub (DSE 2009b).

Wetland Formation within the study area was found fringing a number of dams and was generally the result of natural colonisation. Within the study area this EVC preferred dams with a shallow aquatic margin and a relatively non-fluctuating water level.

This EVC has an 'Endangered' Conservation Status within the Gippsland Plains bioregion (DSE 2009b).

6.1.2 Conservation Significance

Of the 46 patches of vegetation recorded in the study area, 37 patches have been assigned **very high** conservation significance, as per Appendix 3 of Victoria's *Native Vegetation Framework* DNRE (2002) (Appendix 2). The remaining nine patches have been assigned **high** conservation significance (Appendix 2).

The high and very high conservation significance determinations within the study area are due primarily to the endangered conservation status of the majority of EVCs and the recorded presence of threatened fauna within actual Habitat Zones or similar habitats within the study area. While 'other site attributes' have not influenced the overall conservation significance of any patches, certain patches fall within Biosite 6888 (DSE 2007a) or have been identified by McMillan et al (2003) as significant roadside vegetation in the City of Casey (Appendix 4).

6.1.3 Vegetation Quality (habitat hectares)

Vegetation quality in terms of habitat hectare scores varies between 0.05 and 0.44 (Appendix 2). The average habitat hectare score is 0.25 within the study area.

The relatively low habitat hectare scores are a reflection of the highly modified nature of the agricultural landscape within which the study area is situated. Landscape scores are ≤ 5, which is a reflection of a lack of surrounding native vegetation and large conservation reserves within 5km of the study area boundary.

Table 1 presents a summary of habitat hectares assigned to each EVC, while Appendix 2 presents all habitat hectare scores recorded within the study area during the current assessment.

6.1.4 Key Biodiversity Issues and Implications

Approximately nine hectares of the 533 hectare study area (less than 2%) comprises native vegetation classified as Habitat Zones (Figure 2). Native vegetation occurs primarily within the Cardinia Creek Riparian corridor, roadsides, drainage-lines and wetlands (Figure 2).

Roadsides, fence-lines and drainage lines dominated by exotic vegetation displayed in Part 3 Figure 3 are considered habitat for threatened fauna species within the study area.

The Cardinia Creek floodplain extends up to 600 metres west of the creek centreline into the study area and is encumbered with a *Land Subject to Inundation Overlay* (LSIO). Similarly, a major drainage-line intersecting the east of the study area is encumbered with a LSIO several hundred metres wide (DPCD 2009). This 178 hectare area represents potential habitat for wetland birds during times of flood. In addition areas of exotic vegetation surrounding wetland complexes within the LSIO are especially important due to the

movement of fauna between water-bodies and the utilisation of pasture near water-bodies by certain wetland birds (Pizzey & Knight 2007) (Part 3 Appendix 2).

6.2 Scattered Trees

Sixty-five 'scattered trees', as defined by DSE (2007b) occur within **25** scattered tree zones defined within the study area, including six scattered trees found within roadside reserves (Appendix 3). Scattered Tree zones total **1.53 hectares** within Precinct 13. Scattered trees constitute important habitat for the region's indigenous fauna (Part 3 Figure 3).

In general, scattered trees displayed poorer than expected canopy health, most likely due to:

- Below average rainfall in recent years
- higher than expected mistletoe infestations
- cattle pugging and soil compaction at the base of the trees
- tree trunk damage due to stock rubbing against trees
- general impacts associated with agricultural use of the land such as
    - removal of supporting ground and middle-storey vegetation,
    - soil cultivation,
    - introduction of fertilizers and nutrients and
    - changes to the surface and sub-surface hydrology.

All scattered trees found within the study area belong to the genus *Eucalyptus*. Table 3 below summarises scattered tree size classes and EVCs found within the study area.

Table 2. Scattered tree summary

	Swamp Scrub	Plains Grassy Woodland	Swampy Riparian Woodland	Grassy Woodland	Totals
EVC Number	GipP0053	GipP0055	GipP0083	GipP0175	
EVC Conservation Status	Endangered	Endangered	Endangered	Endangered	
Very Large Old Trees	0	6	1	0	7
Large Old Trees	0	13	1	0	14
Medium Old Trees	0	4	0	1	5
Small Trees	2	31	1	5	39
Totals	**2**	**54**	**3**	**6**	**65**

6.2.1 Ecological Vegetation Classes

Four EVCs have been assigned to scattered tree zones within the study area (Table 3; Appendix 3; Figure 2). The majority of scattered trees are River Red Gum *Eucalyptus camaldulensis* occurring within Plains Grassy Woodland EVC, however, the recording of scattered tree taxa was limited to genera as per the project brief. Tree species records for individual scattered trees are therefore not included within this report (refer to Section 3.4 for more detail).

6.2.2 Conservation Significance of Scattered Trees

The Conservation Significance of Scattered Trees is determined by a combination of:

- EVC conservation status
- the presence of threatened species and
- 'other site attributes'.

All EVCs assigned to scattered tree zones within the study area are classed as 'Endangered' within the Gippsland Bioregion (DSE 2009b). In addition, all scattered trees were considered 'remaining 50%' habitat for several threatened species that occur within 5km on the AVW database (DSE 2005c) or are predicted to occur by DEWHA (2009a) (Table 4). All scattered trees have therefore been assigned **high** conservation significance. While 'other site attributes' have not influenced the overall conservation significance of any scattered trees, the location of certain scattered trees within the study area are consistent with areas identified by McMillan et al (2003) as significant roadside vegetation within the City of Casey (Appendix 3).

6.2.3 Key Biodiversity Issues and Implications

All indigenous scattered trees and areas of native woodland displayed in Part 3 Figure 3 are considered 'remaining 50% of habitat' for certain threatened fauna species likely to occur within the study area (Appendix 3).

6.3 Degraded Treeless Vegetation

6.3.1 Description

Degraded Treeless Vegetation (DTV) dominates the study area in the form of grazing land (Figure 2). DTV within the study area typically comprises exotic pasture grasses, such as Rye grasses *Hordeum* spp with occasional introduced crop weeds such as Thistles and other

broadleaf weeds. Residential areas (including gardens), windbreaks and other areas vegetated with non-indigenous flora have been included within DTV at the study area.

6.3.2 Hectares present

Degraded Treeless Vegetation occupies **528 hectares** within the study area (Figure 2).

6.4 Significant Flora Species and Ecological Communities

6.4.1 Listed Ecological Communities

No Listed Ecological Communities listed under the EPBC Act 1999 and the FFG Act 1988 were recorded within the study area.

6.4.2 Nationally Significant Flora Species

Recorded during the current assessment

No nationally significant flora species listed under the EPBC Act 1999 were recorded during the current assessment.

Recorded in 5 km database searches

Six nationally significant flora species listed under the EPBC Act 1999 were predicted to occur by the DEWHA Protected Matters Search Tool within 5km of the study area boundary (DEWHA 2009) (Appendix 1). Two nationally significant species; River Swamp Wallaby-grass *Amphibromus fluitans* and Matted Flax-lily *Dianella amoena* was assigned a medium likelihood of occurrence rating based on the identification of potentially suitable habitat within the study area, and numerous other records within the region.

River Swamp Wallaby-grass *Amphibromus fluitans*

River Swamp Wallaby-grass is listed as *Vulnerable* under the EPBC Act 1999 and is mostly confined to the north-central Victorian reach of the Murray River and is uncommon in southern Victoria. The species is known to occur in a variety of natural and constructed wetlands such as farm dams, lagoons and swamp margins (DEWHA 2009b; Walsh & Entwistle 1994).

River Swamp Wallaby-grass has been recorded in wetlands in Lyndbrook and near the Royal Botanic Gardens Cranbourne (DSE 2007a). Potential habitat exists at wetland sites, including farm dams within the study area.

Matted Flax-lily Dianella amoena

Matted Flax-lily is confined to southern Victoria and is now considered extinct in Tasmania. This plant has been recorded in a variety of vegetation types characterised by fertile soils and dominated by grasses in the understory, such as lowland grasslands, grassy woodlands and grassy wetlands. The species can tolerate well drained to seasonally wet soils (DEWHA 2009c).

All records within the vicinity of the study area are west of the Cardinia Creek (DSE 2007a). Suitable habitat may exist in the study area, due to small patches of Plains Grassy Woodland and Grassy Woodland, especially within roadsides.

6.4.3 State Significant Flora Species

No State significant flora species listed under the FFG Act 1988 or listed under DSE's Advisory list of rare or threatened plants in Victoria (DSE 2005a) were recorded during the current assessment.

Recorded in 5 km database searches

Twelve state significance species listed under the FFG Act 1988 have been recorded within 5km of the study area according to DSE's Flora Information System (DSE 2005) (Appendix 1). Two of these species, Purple Diuris *Diuris punctata* var. *punctata* and Matted Flax-lily *Dianella amoena* have been assigned a medium likelihood of occurrence within the study area, based on the identification of potential suitable habitat and numerous other records within the region. Matted Flax-lily habitat requirements and previous records are discussed in the previous section. Purple Diuris is discussed below.

Purple Diuris *Diuris punctata* var. *punctata*

Purple Diuris is distributed widely across lowland areas of Victoria including the Greater Grampians, Goldfields, Victorian Volcanic Plain, Gippsland Plain, Victorian Riverina, Northern Inland Slopes, East Gippsland Uplands and East Gippsland Lowlands bioregions. Sixty-seven extant populations have been recorded within Victoria.

Purple Diuris occurs principally in grassy and heathy vegetation types such as lowland native grasslands, grassy woodlands, heathy woodlands and open heath-lands, usually on fertile, loamy soils. The species can tolerate periodic inundation (DSE 2009).

Purple Diuris has not been recorded since the early 1980's within the vicinity of study area (DSE 2007a), however, the species may persist in roadside and creek-line woodland and grass dominated remnants within the study area.

7. FLORA LEGISLATIVE REQUIREMENTS

The following section outlines the implications of legislation, treaties, plans, or policies, for habitat-hectare, flora and fauna values found on site.

7.1 Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Act 1999* (EPBC Act 1999) applies to sites where proposed developments or projects may have a *significant impact* on *matters of National environmental significance*.

Under the EPBC Act 1999, the proponent must refer proposed actions that may require approval, to the Commonwealth Environment Minister. The Minister then decides which assessment and reporting option is applied. The Minister may approve a 'controlled action' allowing the development to proceed provided conditions are applied to mitigate significant impacts protected by this act.

Using the Department of Environment, Water, Heritage and the Arts (DEWHA's) Protected Matters Search Tool (DEWHA 2009) six threatened flora species of national significance were predicted to occur within 5km of the study area boundary. Two EPBC listed flora species; Maroon Leek-orchid and Matted Flax-lily have been recorded within 5km of the study area(DSE 2007a). No listed threatened species or communities were recorded during this survey. Two EPBC-listed flora species Matted Flax-lily and River Swamp Wallaby-grass are assessed as having a moderate likelihood of occurrence in the study area (Section 4.4). Appendix 1 lists all relevant flora species detected using the EPBC Protected Matters Search Tool (DEWHA 2009a). Further surveys during optimal survey conditions may better refine the likelihood of occurrence, however the type and extent of proposed development will determine if further surveys are required.

7.2 Flora and Fauna Guarantee Act 1988

The *Flora and Fauna Guarantee Act 1988* (FFG Act 1988) was legislated to ensure the continued survival of all Victorian species of flora and fauna and all Victorian communities of plants and animals. A key component of the FFG Act 1988 is to ensure the sustainable use of flora and fauna resources whether they are threatened or not.

The FFG Act 1988 lists:

- threatened species of flora and fauna
- threatened communities of flora and fauna

- protected flora
- potentially threatening processes

There were no threatened flora species listed under the FFG Act 1988 recorded during this survey within the study area. There are also no listed threatened communities known to occur within the study area. One FFG-listed species; Purple Diuris *Diuris punctata* var. *punctata* was assessed as having a moderate likelihood of occurrence in the study area (Section 4.4).

Protected Flora are species are listed as protected to regulate exploitation including removal from the wild for cultivation and the cut-flower industry. Among others the list includes all members of the Asteraceae (daisies) family, all members of Epacridaceae (heaths), all members of Orchidaceae (orchids) and all Acacias (excluding Silver Wattle, Early Black Wattle, Lightwood, Blackwood and Hedge Wattles). While flora species lists were not compiled for the study area, it is highly likely that a number of species found throughout the study area are listed under the FFG Act 1988 as Protected Flora.

A permit is required if proposed works may kill, injure or disturb listed flora species.

7.3 Planning and Environment Act 1987

The purpose of the *Planning and Environment Act 1987* is to establish a framework for planning the use, development and protection of land in Victoria in the present and long-term interests of all Victorians.

Under the Act a Planning Permit is required for development within Victoria which may have significant effects on the environment, or which the responsible authority considers the environment may have on the use or development. The objectives of planning and the planning framework include (among others):

- To provide for the protection of natural and man-made resources and the maintenance of ecological processes and genetic diversity.
- To establish a system of planning schemes based on municipal districts to be the principal way of setting out objectives, policies and controls for the use, development and protection of land.
- To ensure that the effects on the environment are considered and provide for explicit consideration of social and economic effects when decisions are made about the use and development of land.
- To facilitate development which achieves the objectives of planning in Victoria and planning objectives set up in planning schemes.

Clause 52.17 of the Planning Scheme is the principle action of the Planning and Environment Act within the Scheme relating to native vegetation impacts, unless:

- The application is exempt under the Table of Exemptions 52.17-6 within the Clause.
- A Native Vegetation Precinct Plan applies.

Victoria's *Native Vegetation Management framework* can be triggered by Clause 52.17 and is discussed below.

7.4 Native Vegetation Management Framework

A principle tenet of Victoria's *Native Vegetation Management Framework* is the objective of retention and management of native vegetation (DNRE 2002). According to the DSE (2002:14) the goal of native vegetation management in Victoria is to achieve:

> *A reversal, across the entire landscape, of the long-term decline in the extent and quality of native vegetation, leading to a Net Gain.*

Four individual actions to achieve the above goal are outlined in the DNRE's (2002) Framework. These are:

- active improvement of the quality of existing vegetation
- avoidance or minimisation of further permanent losses through clearing
- strategic increase in the cover of native vegetation through biodiverse revegetation
- the flexibility that is required to support landholders as they move towards more sustainable land use

To achieve the most strategic outcome for native vegetation across Victoria the *Native Vegetation Management Framework* embraces a system of classification determining both the land protection and conservation significance of any given site. The Net Gain methodology is intended to provide a systematic approach that ensures the conservation of the majority of remnant vegetation across Victoria. DNRE (2002) has established a three step approach to use when applying the Net Gain process. These steps are:

- To avoid adverse impacts, particularly through vegetation clearance.
- If impacts cannot be avoided, to minimise impacts through appropriate consideration in planning processes and expert input to project design or management.

- Identify appropriate offset options.

The outcome of the Net Gain process is intended to ensure that the most significant vegetation incurs no losses (exceptions may apply) and less significant vegetation is adequately managed through commensurate offsets based on the level of significance. During the planning process, it must be ensured that every effort has been made to avoid clearing remnant vegetation at the outset and, if clearance is unavoidable, impacts have been minimised. Preference must also be given to the avoidance of damage or loss of the most significant vegetation and reduce the amount of overall vegetation cleared.

7.5 Port Phillip and Westernport CMA Native Vegetation Plan

Victoria's *Native Vegetation Management Framework* states that regional vegetation plans will provide regional guidelines for responsible authorities in determining permit applications to remove, destroy or lop native vegetation. The *Port Phillip and Westernport Native Vegetation Plan* (PPWCMA 2006) is to be used as a reference document for the conservation status of native vegetation communities in the region. The *Native Vegetation Plan* represents the minimum requirement for offsets and:

- Describes the overall policy response to clearing applications.
- Describes the requirements for offsetting the loss of remnant but relatively intact areas of native vegetation.
- Describes the requirements for offsetting the loss of scattered, individual trees of various ages, sizes and growth rates.
- Describes the requirements for offsetting the loss of scattered trees smaller than medium old trees and slow-growing tree species.
- Describes the requirements for offsetting grass trees and tree ferns.
- Describes the requirements for offsetting harvesting of timber from naturally established native forest on private land.

The *Native Vegetation Plan* applies where *parcels of land greater than 4ha with less than 8 scattered trees per hectare* or where *parcels of land less then 4ha with any number of scattered old trees per hectare* (DNRE 2002). This applies to very large, large and medium old trees and any trees less than medium trees.

Appendix 3.4 of the *Native Vegetation Plan* states that "where protection and recruitment is not required by Victoria's *Native Vegetation Management Framework* and there is no practical way to achieve protection, a *recruitment only offset* may be applied" (PPWCMA 2006). However, it is part of DSE Port Phillip Region's focus to require the *protection and recruitment* prescription in most planning applications (DSE 2007a). Table 3.4C of the

Native Vegetation Plan sets out the offset requirements for the loss of trees of various ages and sizes.

7.6 Wildlife Act 1975 and associated regulations

The purpose of the *Wildlife Act 1975* is to establish procedures in order to promote the protection and conservation of wildlife, prevent wildlife from becoming extinct, and to prohibit and regulate the conduct of persons engaged in activities concerning or related to wildlife. The Act requires people engaged in wildlife research (such as fauna surveys, salvage or translocation activities) to obtain a permit in order to ensure that these activities are undertaken with appropriate conservation and protection measures.

Furthermore, the Act requires that a permit is obtained for the management of wildlife where:

- Wildlife is damaging any building, vineyard, orchard, crop, tree, pasture, habitat or other property.
- For the purposes of the management, conservation, protection or control of wildlife or for the purposes of education about wildlife, research into wildlife or scientific or other study of wildlife.
- For aboriginal cultural purposes.
- For the purposes of enabling the care, treatment or rehabilitation of sick, injured or orphaned wildlife.
- For the purposes of ensuring the health or safety of any person or class of persons.
- To support a recognised wildlife management plan.
- To make provision for the custody, care and management of wildlife, held under another authorisation or a license which has been suspended, during the period of that suspension.

Under the *Wildlife Act 1975* land can also be designated as State Game Reserves, State Game Refuges, State Faunal Reserves, Game Management Stations, or other classifications as specified, for the preservation and conservation of wildlife. A plan of management is to be developed as soon as practicable for each reserve once gazetted.

7.6.1 Wildlife Regulations 2002

The objectives of the *Wildlife Regulations 2002* are:

- To make further provision in relation to the licensing system established by section 22 of the Wildlife Act 1975.

- To prescribe fees, offences, royalties and various other matters for the purposes of the Wildlife Act 1975.
- To provide for exemptions from certain provisions of the Wildlife Act 1975.

Under *Wildlife Regulations 2002* a person, unless licensed, permitted or authorised to do so under the Act:

- Must not willfully damage, disturb or destroy any wildlife habitat.
- Must not use a bait, lure, poison, decoy, or live animal to attract wildlife for the purpose of taking that wildlife.
- Must not use a firearm from an aircraft, motor vehicle, boat, or any other vehicle to take wildlife.
- Must not use an artificial light, electronic device, or recorded sound to hunt or take wildlife.
- Must not use a gun, bow or other weapon, trap, or any other equipment or substance for the purpose of taking wildlife.

Authorisation to conduct wildlife research or wildlife management can be obtained under the Act, and is subject to any conditions, limitations or restrictions placed on that authorisation. Proponents must allow inspection by an authorised officer, at any reasonable time, for the purpose of monitoring compliance with this Act.

7.7 Water Act 1989

The *Water Act 1989* provides the framework for allocating surface-water and groundwater throughout Victoria. The Act allows authorities and individuals, via various entitlement mechanisms, to use water for commercial or irrigation purposes. Some licenses enable withdrawals of water directly from streams, others from groundwater. The *Water Act 1989* also defines water that is set aside for the environment under the Environmental Water Reserve.

The purpose of the Act is to integrated management of all elements of the terrestrial phase of the water cycle. This includes promotion of orderly, equitable and efficient water use, greater community involvement, integration of surface and subsurface flow management, to promote conservation and environmental enhancement and provide for the protection of catchment conditions.

7.8 Environment Protection Act 1970: State Environmental Protection Policy (Waters of Victoria) 2003

State Environment Protection Policies (SEPPs) express, in law, the Victorian community's expectations, needs and priorities for protecting and sustainably using the environment, and the social and economic values that depend on it. Made under the *Environment Protection Act 1970*, SEPPs are a means of setting agreed outcomes against which we can measure progress and coordinate environment protection throughout Victoria.

The SEPP Waters of Victoria then sets the framework for government agencies, businesses and the community to work together, to protect and rehabilitate Victoria's surface water environments. The Waters of Victoria SEPP details the uses and values of our water environments (beneficial uses), sets measurements and indicators so we know how well they are being protected (environmental quality objectives) and outlines what needs to be done to protect them (attainment program).

The result is a 'blueprint' for achieving agreed environmental outcomes and strategic directions for protecting Victoria's water. More detailed management frameworks and tools are provided through statewide strategies (e.g. the Victorian River Health Strategy) and more detailed actions are provided in regional plans developed by catchment, coastal and water management bodies.

The *Environment Protection Act 1970* also adopts as a principle tenet the Precautionary Principle where, in the threat of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.

7.9 Port Phillip and Western Port Regional Catchment Strategy

A primary function of the Port Phillip and Westernport Catchment Management Authority is to prepare a catchment management strategy for its region and coordinate and monitor its implementation. The *Port Phillip and Western Port Regional Catchment Strategy* describes the natural assets of the region, how these are interrelated, and provides a management framework for their conservation and sustainable use. The *Regional Catchment Strategy* focuses on four main groups of catchment assets – water resources (sustainable water use and healthy waterways), land (appropriate land management and sustainable productivity), biodiversity (healthy, diverse and enduring ecosystems) and the people of the region (community participation working to achieve sustainability).

The *Regional Catchment Strategy* is an important planning and working document for all organisations and people involved in natural resource management in the region, including government agencies and councils, water authorities and Landcare and community groups. It provides a framework for effort, an investment guide, a means of integrating policy, and an action plan for catchment works. It allocates tasks and defines roles for many

stakeholders in the delivery of environmental programs across the region. It is also a regional investment guide, informing the allocation of Victorian and Australian Government investment in natural resource management in the region.

7.10 Port Phillip and Western Port Regional River Health Strategy

The *Port Phillip and Westernport Regional River Health Strategy* was developed by Melbourne Water in consultation with the Port Phillip and Westernport Catchment Management Authority, their local community and key stakeholders. The *River Health Strategy* provides a five year blueprint for the stakeholders to work together to improve our rivers and creeks. It identifies waterway values (catchment based), threats to waterway values, and actions to address these threats. The Strategy identifies river health related objectives, activities and targets for rivers located within the Maribyrnong, Werribee, Bunyip and Yarra river basins.

The *Port Phillip and Westernport Regional River Health Strategy* also covers drainages within the Westernport, Werribee and Maribyrnong catchments which, until now, had no designated regional management authority. Under the new arrangements, Melbourne Water is now the regional drainage, waterways and floodplain manager for the entire region, and is responsible for river health, management and maintenance of regional drains as well as identifying and maintaining areas subject to flooding. This arrangement will also provide more consistent and coordinated delivery of waterway health and improvement programs.

7.11 Local Government Planning Schemes

Local Government Planning Schemes set out policies and provisions for the use, development and protection of land for municipalities in Victoria. These are legal documents prepared by the local council or the Minister for Planning, and approved by the Minister.

The development of the Planning Schemes is based on a comprehensive set of planning provisions for Victoria outlined in the Victorian Planning Provisions (VPPs). VPPs were introduced as part of a planning reform process in 1996 to simplify and standardise the planning process.

Provision 52.17 of the VPP outlines objectives for the protection and conservation of native vegetation. The purpose of 52.17 is to protect and conserve native vegetation, to reduce the impact of land and water degradation and provide habitat for plants and animals, to avoid, minimise or Offset vegetation loss, and to manage vegetation near buildings to reduce the threat to life and property from wildfire.

Before deciding on an application, in addition to the decision guidelines in Clause 65, the responsible authority must consider, as appropriate:

- Victoria's Native Vegetation Management – A Framework for Action (DNRE 2002).
- Whether the proposed development can be located and designed to avoid the removal of native vegetation.
- Whether the proposed development is located and designed to minimise the removal of native vegetation.
- The need to offset the loss of native vegetation having regard to the conservation significance of the vegetation.
- The conservation and enhancement of the area.
- The preservation of and impact on the natural environment or landscape values.
- Any relevant approved Regional Vegetation Plan.
- Whether the proposed development is in accordance with any property vegetation plan that applies to the site.
- The cumulative impact of native vegetation removal on biodiversity conservation and management.

Exemptions apply in certain circumstances, as outlined in Clause 52.17-6, Table of exemptions.

7.12 Catchment and Land Protection Act 1994

The *Catchment and Land Protection Act 1994* (CaLP Act 1994) contains provisions relating to the integrated management and protection of catchments, encourages community participation in the management of land and water resources, and sets up a system of controls for the management of noxious weeds and pest animals. This Act also provides a legislative framework for the integrated and coordinated management of private and public land at a catchment level which:

- Focuses on long-term land productivity while also conserving the environment.
- Ensures that the quality of the State's land and water resources and their associated plant and animal life are maintained and enhanced.
- Establishes processes that can be used to assess the condition of the State's land and water resources and the effectiveness of land protection measures.
- Establish processes to encourage and support participation of land holders, resource managers and other members of the community in catchment management and land protection.

- Establishes and supports the operation of the Victorian Catchment Management Council and the Catchment Management Authorities.

- To provide for the control of noxious weeds and pest animals.

The study site supports a number of weeds that are declared noxious under the CaLP Act 1994. Plants occurring on this list are known, or have the potential to, result in detrimental environmental or economic impact.

Under the CaLP Act 1994 declared noxious weeds are categorised into four groups depending on their known and potential impact and specific circumstances for each region. These categories include:

- State Prohibited Weeds (S) are either currently absent in Victoria or are restricted enough to be eradicated. The Victorian Government is responsible for their control.

- Regionally Prohibited Weeds (P) in the Port Phillip Catchment Management Authority area are not necessarily widespread but have the potential to become widespread. It is expected that weeds that meet this criteria can be eradicated from the region. For weeds considered to be Regionally Prohibited it is the responsibility of the land owner to control these weeds on their land but not on adjacent roadside reserves.

- Regionally Controlled Weeds (C) are usually widespread but it is important to prevent further spread. It is the responsibility of the landowner to control these weeds on their property and on adjacent roadside reserves.

- Restricted occur in other states and are considered to be a serious threat to primary production, Crown land, the environment and/or community health if they were traded in Victoria. No weeds are currently listed as Restricted Weeds.

The study area may support regionally controlled noxious weeds listed by DPI (2006). The control of these weeds on private land and adjacent roadsides is the responsibility of the landholder. The landholder must take all reasonable measures to prevent their spread and control these weed species.

8. FLORA CONCLUSION

Native vegetation assessed as Habitat Zones within the Clyde North Precinct are confined primarily to roadsides, drainage-lines, wetlands, and the Cardinia Creek riparian zone. Habitat Zones within the study area include patches of Swamp Scrub (found on roadsides and drainage lines, and within the Cardinia Creek floodplain and riparian corridor), Swampy Riparian Woodland (along the Cardinia Creek riparian corridor), wetland EVCs (in natural and constructed wetlands within the Cardinia Creek floodplain and along some drainage lines), and small patches of Grassy Woodland (at scattered sites within farm paddocks) (Figure 2).

In addition there are areas of native (non-indigenous) and exotic (introduced) vegetation, including areas of regenerating Swamp Scrub that do not meet the DNRE (2002) threshold for consideration under Victoria's *Native Vegetation Management Framework*. Many of these sites, whilst highly modified or immature, comprise relatively complex vegetation structures and floristic diversity and are considered habitat for threatened fauna species (Part 2 Figure 3).

Non-indigenous habitat comprises planted Eucalypts and other established tree species along fence-lines and roadsides, as well as established trees within gardens and plantation areas (Part 2 Figure 3). In addition, some drainage lines and roadsides are dominated by exotic vegetation and woody weed thickets which offer habitat for ground fauna. Areas dominated by grassy weed and drainage lines vegetated with semi-aquatic exotics (in particular Drain Flat-sedge **Cyperus eragrostis*) also offer modified habitat for threatened wetland birds and amphibians (Part 2 Figure 3).

The remainder of the study area comprises large areas of agricultural land with little or no native vegetation cover.

Habitat Zones within the study area include patches of Swamp Scrub on roadsides, Cardinia Creek and drainage lines, wetland vegetation in wetlands and drainage lines and small amounts of woodland within farm paddocks (Figure 2). Non-indigenous habitat comprises planted non-indigenous Eucalypts and other established tree species along fence-lines and roadsides (Part 2 Figure 3). In addition, some drainage lines and roadsides are dominated by exotic vegetation which serves as habitat, including habitat for threatened wetland birds and amphibians (Part 2 Figure 3).

It is estimated that about 7% of former native vegetation remains within the City of Casey, of which a significant proportion has been highly modified (McMillan et al. 2003). Patterns of vegetation clearance within the study area are consistent with those undertaken historically throughout the City of Casey, whereby, the majority of the study area has been cleared for agriculture, and remaining native vegetation has been modified to varying degrees. All remnant vegetation and all remaining habitat, both indigenous and non-indigenous, is therefore significant as a local source of biodiversity.

Roadsides within the City of Casey are often the only remaining indigenous habitat within an area and are critically important as habitat corridors for fauna throughout the municipality (Lane 2008). Within the study area, threatened species, including Southern Toadlet and Glossy Grass Skink were found in these areas. Native vegetation distribution within the study area is consistent with general patterns of vegetation distribution within the City of Casey, in that roadsides comprise greater biodiversity compared to surrounding agricultural land.

Large trees containing hollows and canopy habitat are common as scattered indigenous trees and as planted exotic and non-indigenous Eucalypts along fence-lines and roadsides. Established trees, especially Eucalypts are particularly valuable as habitat for threatened woodland birds.

Wetlands and wetland vegetation within the study area are particularly important areas of faunal habitat, including habitat for threatened wetland birds.

At least two threatened flora species; Matted Flax-lily and Purple Diuris are considered to have a moderate likelihood of occurrence within the study area.

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Flora Appendix 1. Flora Species recorded on databases

Flora species detected within a five kilometre radius from the study area boundary on DSE's *Flora Information System* (DSE 2009d). Relevant species listed on EPBC Protected Matters Search Tool (DEWHA 2009a) also included.

Likelihood of Occurrence:
Low: Few aspects of habitat requirements are met on site.
Moderate: Some aspects of habitat requirements are met on site.
High: Optimal habitat present.

Conservation Status Codes (EPBC and FFG Acts):

EN – Endangered under the National EPBC Act (very high risk of extinction in the wild)

VU – Vulnerable under the National EPBC Act (high risk of extinction in the wild)

f–Listed as threatened under the Flora and Fauna Guarantee Act

Victorian Conservation Status Codes(DSE 2005a):
e – Endangered (at risk of becoming extinct);
v – Vulnerable (at risk of becoming endangered);
r –Rare (rare but not considered otherwise threatened);
k –poorly known (accurate distribution information is inadequate to allocate to one of the conservation status categories);

FFG	EPBC	DSE	Common Name	Scientific Name	Family Name	Likelihood of Occurrence	Database	Freq (FIS only)	NumSite (FIS only)	Likelihood Reasoning	Habitat
		r	Cobra Greenhood	*Pterostylis grandiflora*	Orchidaceae	Low	FIS	0.33%	1	last rec from 1940	Populations limited to a small area of coastal far western Victoria and Southern G ippsland. Found in heathlands and heathy woodlands on sandy soils
	EN		Cream Spider-orchid	*Caladenia fragrantissima subsp. orientalis*	Orchidaceae	Low	EPBC			nearestr rec south Gipp	Found in heathlands and heathy woodlands on sandy soils
		r	Green Scentbark	*Eucalyptus fulgens*	Myrtaceae	Low	FIS	1%	3	All recs from shf bioregion, occasional plants on the plains	Open forest areas, tollerating damp conditions
		r	Long Pink-bells	*Tetratheca stenocarpa*	Elaeocarpaceae	Low	FIS	0.33%	1	last rec 1935	Tall open forest areas
f	EN	e	Maroon Leek-orchid	*Prasophyllum frenchii*	Orchidaceae	Low	FIS/EPBC	2%	6	Recent records (within the last 20 years) >5km away in Clyde railway	Grasslands heathlands and grassy woodlands on sandy and black loams.
	EN	e	Matted Flax-lily	*Dianella amoena*	Hemerocallidaceae	Med	FIS/EPBC	2%	6	All recs east of Cardinia Crk but could be in study area as undetected plants	Found in grassland and grassy woodlnds on fertile soils.
	EN		Metallic Sun-orchid	*Thelymitra epipactoides*	Orchidaceae	Low	EPBC			Nearest rec near Dandenong in 1980, nearest recent rec in West Gipp	Grows in coastal heathlands, grasslands and woodlands.
		k	Perfoliate Pondweed	*Potamogeton perfoliatus s.l.*	Potamogetonaceae	Low	FIS	0.33%	1	Possible as it has been recorded in 2005 north of study area in Cardinia Creek. It is a wetland plant which could spread through water.	Flowing or still, fresh or brackish, creeks and rivers. On Sandy, stoney or muddy substrates
f		v	Purple Diuris	*Diuris punctata var. punctata*	Orchidaceae	Med	FIS	4.01%	12	Recs from early 1980's, but may still be present in grassland remnants	Moist areas in box, red gum and sclerophyll woodlands, grassy low open forest
	VU		River Swamp Wallaby-grass	*Amphibromus fluitans*	Poaceae	Med	EPBC			Possible - found in wetland at Lynbrook and near RBGC	Found in riparian scrub and grassy low open forests
		r	Sharp Greenhood	*Pterostylis X ingens*	Orchidaceae	Low	FIS	0.33%	1	last rec from likely 1940s	Valley sclerophyll forest
		e	Silurian Leek-orchid	*Prasophyllum pyriforme s.s.*	Orchidaceae	Low	FIS	0.33%	1	last rec from 1932	Valley sclerophyll forest
		k	Slender Bitter-cress	*Cardamine tenuifolia*	Brassicaceae	Low	FIS	0.33%	1	One rec from north of bypass along Cardinia Creek	Swamp margins, plains grassland, valley sclerophyll forest
	VU		Swamp Everlasting	*Xerochrysum palustre*	Asteraceae	Low	EPBC				Occurs in swamps usually found on basalt derived soils
		r	Veined Spear-grass	*Austrostipa rudis subsp. australis*	Poaceae	Low	FIS	1.67%	5	Possible along remnants on Cradinia Crk	Dry sclerophyll forest, grassy low open forest
		v	Wine-lipped Spider-orchid	*Caladenia oenochila*	Orchidaceae	Low	FIS	0.33%	1	unlikely - rec from 1939, north of bypass	Damp and valley sclerophyll forests

Flora Appendix 2. Habitat Hectare Results

Precinct			13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13
PFI			630167	630176	633477	633477	633477	633478	633478	633478	633479	633479	633479	633479	633479	633479	633479	633479	633479	633479	633479	633479	633479	633479
Site ID			2	1	1	1	2	1	2	3	1	1	1	1	2	3	4	5	6	7	7	8	9	10
Habitat Zone			A	A	A	B	A	A	A	A	A	B	C	D	A	A	A	A	A	A	A	A	A	A
EVC Name (Initials)			TM	TM	SS	SRW	SS	SRW	WF	GW	SRW	SRW	SRW	SRW	TM	TM	TM	TM	TM	SRC	WF	SW	GW	SRW
EVC Number			GipP0821	GipP0821	GipP0053	GipP0083	GipP0053	GipP0083	GipP0074	GipP0175	GipP0083	GipP0083	GipP0083	GipP0083	GipP0821	GipP0821	GipP0821	GipP0821	GipP0821	GipP0126	GipP0074	GipP0136	GipP0175	GipP0083
Total Area of Habitat Zone (ha)		**(#.#)**	0.05	3.43	0.84	0.14	0.13	0.21	0.09	0.22	0.04	0.02	0.02	0.02	0.21	0.24	0.16	0.09	0.10	0.06	0.07	0.29	0.14	0.05
		Max Score	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**
Site Condition	**Large Old Trees**	**10**	0	0	0	8	0	10	0	9	5	5	9	9	0	0	0	0	0	0	0	0	0	9
	Canopy Cover	**5**	0	0	5	0	5	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	3	3
	Lack of Weeds	**15**	11	7	0	0	0	4	7	0	0	0	0	0	9	7	6	0	7	0	7	11	0	0
	Understorey	**25**	5	5	5	5	5	15	0	0	15	15	5	5	5	5	5	15	5	5	25	5	0	5
	Recruitment	**10**	0	0	0	0	0	6	0	0	5	5	5	5	0	1	1	1	1	0	0	10	0	5
	Organic Matter	**5**	5	5	2	4	5	3	3	4	5	5	5	5	5	5	5	5	5	0	3	5	2	5
	Logs	**5**	0	0	0	0	0	0	0	0	2	2	5	5	0	0	0	4	0	0	0	0	0	0
	Total Score	**75**	**21**	**23.12**	**12**	**17**	**15**	**38**	**10**	**13**	**32**	**32**	**31**	**31**	**19**	**18**	**17**	**25**	**18**	**5**	**35**	**31**	**5**	**27**
Landscape Score		**25**	1	0	5	5	0	5	5	5	3	3	3	3	2	2	2	2	2	0	5	5	5	5
Habitat Score#		**100**	22	23.12	17	22	15	43	15	18	35	35	34	34	21	20	19	27	20	5	40	36	10	32
Habitat Score as above=#/100		**0.##**	0.22	0.23	0.17	0.22	0.15	0.43	0.15	0.18	0.35	0.35	0.34	0.34	0.21	0.20	0.19	0.27	0.20	0.05	0.40	0.36	0.10	0.32
Habitat Hectares		**(#.#)**	**0.011**	**0.793**	**0.143**	**0.031**	**0.020**	**0.090**	**0.014**	**0.040**	**0.014**	**0.007**	**0.007**	**0.007**	**0.044**	**0.048**	**0.030**	**0.024**	**0.020**	**0.003**	**0.028**	**0.104**	**0.014**	**0.016**
Bioregion			GipP E	GipP E	GipP E	GipP E	GipP E	GipP E	GipP E	GipP E	GipP E	GipP E	GipP E	GipP E	GipP E	GipP E	GipP E	GipP E	GipP E	GipP E	GipP E	GipP V	GipP E	GipP E
EVC Conservation Status			High	High	High	High	High	Very High	High	High	High	High	High	High	High	High	High	High	High	High	Very High	High	High	High
Conservation Significance	**Conservation Status x Habitat Score**		Very High	Very High	Very High	Very High	Very High	Very High	Very High	Very High	Very High	Very High	Very High	Very High	Very High	Very High	Very High	Very High	Very High	Very High	Very High	Very High	Very High	Very High
	Threatened Species Rating				Medium	Medium	Medium	Medium																
	Other Site Attribute Rating																							
	Overall Conservation Significance (highest rating)		**Very High**	**Very High**	**Very High**	**Very High**	**Very High**	**Very High**	**Very High**	**Very High**	**Very High**	**Very High**	**Very High**	**Very High**	**Very High**	**Very High**	**Very High**	**Very High**	**Very High**	**Very High**	**Very High**	**Very High**	**Very High**	**Very High**

Precinct			13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13
PFI			52906085	52906086	205798195	205798226	205798226	R536842	R536842	R536842	R536843	R536843	R536843	R536843	R536843	R536899	R536899	R536899	R536899	R536899	R536899
Site ID			1	1	1	1	2	1	2	3	1	3	4	5	6	2	3	5	7	8	10	11
Habitat Zone			B	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
EVC Name (Initials)			SRW	WF	SRW	WF	WF	PGW	SS	PGW	PGW	SS	SS	SS	PGW	PGW	PGW	PGW	SRW	SRW	SRW	SRW
EVC Number			GipP0083	GipP0074	GipP0083	GipP0074	GipP0074	GipP0055	GipP0053	GipP0055	GipP0055	GipP0053	GipP0053	GipP0053	GipP0055	GipP0055	GipP0055	GipP0055	GipP0083	GipP0083	GipP0083	GipP0083
Total Area of Habitat Zone (ha)		**(#.#)**	0.02	0.07	0.09	0.02	0.09	0.45	0.51	0.18	0.05	0.33	0.01	0.05	0.19	0.04	0.03	0.02	0.02	0.05	0.02	0.01
		Max Score	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**
Site Condition	**Large Old Trees**	**10**	10	0	0	0	0	9	0	0	0	0	0	0	0	0	0	0	0	9	0	0
	Canopy Cover	**5**	0	0	2	0	0	2	0	2	0	0	5	0	0	3	0	0	3	3	0	0
	Lack of Weeds	**15**	4	11	0	7	11	0	0	0	7	0	4	4	4	0	0	0	0	0	0	0
	Understorey	**25**	15	5	5	25	25	5	5	5	5	5	5	5	15	5	5	5	5	5	5	0
	Recruitment	**10**	6	3	5	0	0	5	5	5	3	5	3	3	3	0	1	3	1	5	1	0
	Organic Matter	**5**	3	0	5	0	3	3	5	5	5	5	5	5	3	5	4	5	5	5	2	3
	Logs	**5**	0	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	4	0	0	0
	Total Score	**75**	**38**	**19**	**19**	**32**	**39**	**26**	**15**	**17**	**20**	**15**	**22**	**17**	**25**	**13**	**10**	**13**	**18**	**27**	**8**	**3**
Landscape Score		**25**	5	1	5	5	5	1	1	1	1	1	1	1	1	5	5	5	5	5	5	5
Habitat Score#		**100**	43	20	24	37	44	27	16	22	21	16	23	18	26	18	15	18	23	32	13	8
Habitat Score as above=#/100		**0.##**	0.43	0.20	0.24	0.37	0.44	0.27	0.16	0.22	0.21	0.16	0.23	0.18	0.26	0.18	0.15	0.18	0.23	0.32	0.13	0.08
Habitat Hectares		**(#.#)**	**0.009**	**0.014**	**0.022**	**0.007**	**0.040**	**0.122**	**0.082**	**0.040**	**0.011**	**0.053**	**0.002**	**0.009**	**0.049**	**0.007**	**0.005**	**0.004**	**0.005**	**0.016**	**0.003**	**0.001**
Bioregion			GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP
EVC Conservation Status			E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Conservation Significance	**Conservation Status x Habitat Score**		Very High	High	High	High	Very High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High
	Threatened Species Rating		Very High	Very High	Very High	Very High	Very High	High	Very High	High	High	Very High	Very High	Very High	High	High	High	High	Very High	Very High	Very High	Very High
	Other Site Attribute Rating							Medium	Medium	Medium						Medium		Medium	Medium	Medium	Medium	Medium
	Overall Conservation Significance (highest rating)		**Very High**	**Very High**	**Very High**	**Very High**	**Very High**	**High**	**Very High**	**High**	**High**	**Very High**	**Very High**	**Very High**	**High**	**High**	**High**	**High**	**Very High**	**Very High**	**Very High**	**Very High**

Precinct			13	13	13	13
PFI			R536899	R536899	R539084	R539084
Site ID			12	13	2	2
Habitat Zone			A	A	A	B
EVC Name (Initials)			SRW	PGW	PGW	SS
EVC Number			GipP0083	GipP0055	GipP0055	GipP0053
Total Area of Habitat Zone (ha)		**(#.#)**	0.05	0.01	0.14	0.06
		Max Score	**Score**	**Score**	**Score**	**Score**
Site Condition	**Large Old Trees**	**10**	0	0	10	0
	Canopy Cover	**5**	0	2	3	5
	Lack of Weeds	**15**	4	0	7	0
	Understorey	**25**	5	5	15	15
	Recruitment	**10**	1	0	0	3
	Organic Matter	**5**	3	5	3	3
	Logs	**5**	0	0	0	0
	Total Score	**75**	**13**	**12**	**38**	**26**
Landscape Score		**25**	5	5	5	4
Habitat Score#		**100**	18	17	43	30
Habitat Score as above=#/100		**0.##**	0.18	0.17	0.43	0.30
Habitat Hectares		**(#.#)**	**0.009**	**0.002**	**0.060**	**0.018**
Bioregion			GipP	GipP	GipP	GipP
EVC Conservation Status			E	E	E	E
Conservation Significance	**Conservation Status x Habitat Score**		High	High	Very High	High
	Threatened Species Rating		Very High	High	High	Very High
	Other Site Attribute Rating		Medium			
	Overall Conservation Significance (highest rating)		**Very High**	**High**	**High**	**Very High**

Flora Appendix 3. Scattered Trees

Precinct		13	13	13	13	13	13	13	13	13	13	13	13	13
PFI		R536843	536843	615733	630176	633477	633479	52740865	52740865	52740865	52740865	52740865	52740866	52740866
Scattered Tree Site		8	2	3	2	4	11	1	2	3	6	7	1	2
Scattered Tree Zone		A	A	A	A	A	A	A	A	A	A	A	A	A
Bioregion		GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP
EVC Name (Initials)		SS	PGW	PGW	PGW	PGW	PGW	PGW	PGW	PGW	PGW	PGW	PGW	PGW
EVC Number		GipP0053	GipP0055	GipP0055	GipP0055	GipP0055	GipP0055	GipP0055	GipP0055	GipP0055	GipP0055	GipP0055	GipP0055	GipP0055
EVC Conservation Status		E	E	E	E	E	E	E	E	E	E	E	E	E
Scattered Tree Size Category	**Very Large Old Trees**	0	0	0	0	4	1	0	0	0	0	0	0	0
	Large Old Trees	0	0	1	0	3	0	1	1	1	1	0	3	1
	Medium Old Trees	0	1	0	0	0	0	0	0	0	1	0	0	0
	Small Trees	2	8	0	4	0	0	0	0	0	0	0	17	0
Total Number of Scattered Trees		2	9	1	4	7	1	1	1	1	2	0	20	1
Total Area of Scattered Tree Zone (ha)	**(#.#)**	0.005	0.200	0.012	0.018	0.648	0.115	0.008	0.035	0.003	0.036	0.016	0.186	0.052
Conservation Significance	**Conservation Status x Habitat Score**	High	High	High	High	High	High	High	High	High	High	High	High	High
	Threatened Species Rating	High	High	High	High	High	High	High	High	High	High	High	High	High
	Other Site Attribute Rating													
	Overall Conservation Significance (highest rating)	**High**	**High**	**High**	**High**	**High**	**High**	**High**	**High**	**High**	**High**	**High**	**High**	**High**
Threatened Species (remaining 50% habitat)		Spotted Harrier Swift parrot Grey-headed Flying-fox	Spotted Harrier Swift parrot Grey-headed Flying-fox	Spotted Harrier Swift parrot Grey-headed Flying-fox	Spotted Harrier Swift parrot Grey-headed Flying-fox	Spotted Harrier Swift parrot Grey-headed Flying-fox	Spotted Harrier Swift parrot Grey-headed Flying-fox	Spotted Harrier Swift parrot Grey-headed Flying-fox	Spotted Harrier Swift parrot Grey-headed Flying-fox	Spotted Harrier Swift parrot Grey-headed Flying-fox	Spotted Harrier Swift parrot Grey-headed Flying-fox	Spotted Harrier Swift parrot Grey-headed Flying-fox	Spotted Harrier Swift parrot Grey-headed Flying-fox	Spotted Harrier Swift parrot Grey-headed Flying-fox
Tree protection offset requirements for Scattered Old Trees	**Very large old trees**	0	0	0	0	20	5	0	0	0	0	0	0	0
	Large old trees	0	0	4	0	12	0	4	4	4	4	0	12	4
	Medium old trees	0	2	0	0	0	0	0	0	0	2	0	0	0
Recruitment offset requirement (small trees =75% benchmark DBH by default)		60	260	20	120	180	30	20	20	20	40	0	570	20
Other Site Atribute Rating	**City of Casey Biodiversity Emhancement Strategy Area of Regional Significance**													

Precinct		13	13	13	13	13	13	13	13	13	13	13	13
PFI		52740965	57240865	R536899	R536899	R536899	R536898	633479	R536899	R536899	615731	615731	633479
Scattered Tree Site		5	4	4	6	14	1	13	9	1	1	2	12
Scattered Tree Zone		A	A	A	A	A	A	A	A	A	A	A	A
Bioregion		GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP
EVC Name (Initials)		PGW	PGW	PGW	PGW	PGW	PGW	SRW	SRW	SRW	GW	GW	GW
EVC Number		GipP0055	GipP0055	GipP0055	GipP0055	GipP0055	GipP0055	GipP0083	GipP0083	GipP0083	GipP0175	GipP0175	GipP0175
EVC Conservation Status		E	E	E	E	E	E	E	E	E	E	E	E
Scattered Tree Size Category	**Very Large Old Trees**	0	1	0	0	0	0	1	0	0	0	0	0
	Large Old Trees	1	0	0	0	0	0	0	1	0	0	0	0
	Medium Old Trees	0	0	0	1	1	0	0	0	0	1	0	0
	Small Trees	0	0	1	0	0	1	0	0	1	0	1	4
Total Number of Scattered Trees		1	1	1	1	1	1	1	1	1	1	1	4
Total Area of Scattered Tree Zone (ha)	**(#.#)**	0.024	0.032	0.007	0.010	0.010	0.015	0.017	0.009	0.010	0.026	0.014	0.021
Conservation Significance	**Conservation Status x Habitat Score**	High	High	High	High	High	High	High	High	High	High	High	High
	Threatened Species Rating	High	High	High	High	High	High	High	High	High	High	High	High
	Other Site Attribute Rating												
	Overall Conservation Significance (highest rating)	**High**	**High**	**High**	**High**	**High**	**High**	**High**	**High**	**High**	**High**	**High**	**High**
Threatened Species (remaining 50% habitat)		Spotted Harrier Swift parrot Grey-headed Flying-fox	Spotted Harrier Swift parrot Grey-headed Flying-fox	Spotted Harrier Swift parrot Grey-headed Flying-fox	Spotted Harrier Swift parrot Grey-headed Flying-fox	Spotted Harrier Swift parrot Grey-headed Flying-fox	Spotted Harrier Swift parrot Grey-headed Flying-fox	Spotted Harrier Swift parrot Grey-headed Flying-fox	Spotted Harrier Swift parrot Grey-headed Flying-fox	Spotted Harrier Swift parrot Grey-headed Flying-fox	Spotted Harrier Swift parrot Grey-headed Flying-fox	Spotted Harrier Swift parrot Grey-headed Flying-fox	Spotted Harrier Swift parrot Grey-headed Flying-fox
Tree protection offset requirements for Scattered Old Trees	**Very large old trees**	0	5	0	0	0	0	5	0	0	0	0	0
	Large old trees	4	0	0	0	0	0	0	4	0	0	0	0
	Medium old trees	0	0	0	2	2	0	0	0	0	2	0	0
Recruitment offset requirement (small trees =75% benchmark DBH by default)		20	30	30	20	20	30	30	20	30	20	30	120
Other Site Atribute Rating	**City of Casey Biodiversity Emhancement Strategy Area of Regional Significance**			yes						yes			

Flora Appendix 4. Conservation Significance Ratings decisions

Precinct		13	13	13	13	13	13	13	13	13	13	13	13	13	13
PFI		630167	630176	633477	633477	633477	633478	633478	633478	633479	633479	633479	633479	633479	633479
Site ID		2	1	1	1	2	1	2	3	1	1	1	1	2	3
Habitat Zone		A	A	A	B	A	A	A	A	A	B	C	D	A	A
EVC Name (Initials)		TM	TM	SS	SRW	SS	SRW	WF	GW	SRW	SRW	SRW	SRW	TM	TM
EVC Conservation Status		E	E	E	E	E	E	E	E	E	E	E	E	E	E
Conservation Significance	**Conservation Status x Habitat Score**	High	High	High	High	High	Very High	High	High	High	High	High	High	High	High
	Threatened Species Rating	Very High	Very High	Very High	Very High	Very High	Very High	Very High	Very High	Very High	Very High	Very High	Very High	Very High	Very High
	Other Site Attribute Rating			Medium	Medium	Medium	Medium								
	Overall Conservation Significance (highest rating)	**Very High**	**Very High**	**Very High**	**Very High**	**Very High**	**Very High**	**Very High**	**Very High**	**Very High**	**Very High**	**Very High**	**Very High**	**Very High**	**Very High**
Threatened Species Rating	**Presence of threatened/rare flora species.** **Bold Text:** Best 50% of habitat Standard Text: Remaining 50% of habitat	River Swamp Wallaby-grass	River Swamp Wallaby-grass	River Swamp Wallaby-grass	Matted Flax-lily, Purple Diuris, River Swamp Wallaby-grass	River Swamp Wallaby-grass	Matted Flax-lily, Purple Diuris, River Swamp Wallaby-grass	River Swamp Wallaby-grass	Matted Flax-lily, Purple Diuris	Matted Flax-lily, Purple Diuris, River Swamp Wallaby-grass	Matted Flax-lily, Purple Diuris, River Swamp Wallaby-grass	Matted Flax-lily, Purple Diuris, River Swamp Wallaby-grass	Matted Flax-lily, Purple Diuris, River Swamp Wallaby-grass	River Swamp Wallaby-grass	River Swamp Wallaby-grass
	Status (highest status of likley spp.)	Vulnerable	Vulnerable	Vulnerable	Endangered	Vulnerable	Endangered	Vulnerable	Endangered	Endangered	Endangered	Endangered	Endangered	Vulnerable	Vulnerable
	Presence of threatened/rare fauna species. **Bold Text:** Best 50% of habitat Standard Text: Remaining 50% of habitat	**Southern Toadlet, Glossy Grass Skink, Swamp Skink, Australian Shoveler, Eastern Great Egret, Hardhead, Royal Spoonbill,** Growling Grass Frog, Blue-billed Duck, Freckled Duck, Intermediate Egret, Lantham's Snipe, Musk Duck, Pied Cormorant	**Southern Toadlet, Glossy Grass Skink, Swamp Skink, Australian Shoveler, Eastern Great Egret, Hardhead, Royal Spoonbill,** Growling Grass Frog, Blue-billed Duck, Freckled Duck, Intermediate Egret, Lantham's Snipe, Musk Duck, Pied Cormorant	**Swamp Skink, Glossy Grass Skink, Southern Toadlet**	**Swamp Skink, Glossy Grass Skink, Southern Toadlet,** Swift Parrot	**Swamp Skink, Glossy Grass Skink, Southern Toadlet**	**Swamp Skink, Glossy Grass Skink, Southern Toadlet,** Swift Parrot	**Australian Shoveler, Eastern Great Egret, Hardhead, Royal Spoonbill,** Growling Grass Frog, Blue-billed Duck, Freckled Duck, Intermediate Egret, Lantham's Snipe, Musk Duck, Pied Cormorant	**Swift Parrot**	**Swamp Skink, Glossy Grass Skink, Southern Toadlet,** Swift Parrot	**Swamp Skink, Glossy Grass Skink, Southern Toadlet,** Swift Parrot	**Swamp Skink, Glossy Grass Skink, Southern Toadlet,** Swift Parrot	**Swamp Skink, Glossy Grass Skink, Southern Toadlet,** Swift Parrot	**Southern Toadlet, Glossy Grass Skink, Swamp Skink, Australian Shoveler, Eastern Great Egret, Hardhead, Royal Spoonbill,** Growling Grass Frog, Blue-billed Duck, Freckled Duck, Intermediate Egret, Lantham's Snipe, Musk Duck, Pied Cormorant	**Southern Toadlet, Glossy Grass Skink, Swamp Skink, Australian Shoveler, Eastern Great Egret, Hardhead, Royal Spoonbill,** Growling Grass Frog, Blue-billed Duck, Freckled Duck, Intermediate Egret, Lantham's Snipe, Musk Duck, Pied Cormorant
	Status (highest status of likley spp.)	Critically Endangered	Critically Endangered	Endangered	Endangered	Endangered	Endangered	Critically Endangered	Endangered	Endangered	Endangered	Endangered	Endangered	Critically Endangered	Critically Endangered
Other Site Atribute Rating	**Which biosite, if any, does the site cover?**			6888	6888	6888	6888								
	If the site falls within a biosite, are the biosite flora and fauna values present? Or potentially present?			Yes	Yes	Yes	yes								
	City of Casey Biodiversity Emhancement Strategy Area of Regional Significance														

Precinct		13	13	13	13	13	13	13	13	13	13	13	13	13	13
PFI		633479	633479	633479	633479	633479	633479	633479	633479	52906085	52906086	205798195	205798226	205798226	R536842
Site ID		4	5	6	7	7	8	9	10	1	1	1	1	2	1
Habitat Zone		A	A	A	A	A	A	A	A	B	A	A	A	A	A
EVC Name (Initials)		TM	TM	TM	SRC	WF	SW	GW	SRW	SRW	WF	SRW	WF	WF	PGW
EVC Conservation Status		E	E	E	E	E	V	E	E	E	E	E	E	E	E
Conservation Significance	**Conservation Status x Habitat Score**	High	High	High	High	Very High	High	High	High	Very High	High	High	High	Very High	High
	Threatened Species Rating	Very High	Very High	Very High	Very High	Very High	Very High	Very High	Very High	Very High	Very High	Very High	Very High	Very High	High
	Other Site Attribute Rating														Medium
	Overall Conservation Significance (highest rating)	**Very High**	**Very High**	**Very High**	**Very High**	**Very High**	**Very High**	**Very High**	**Very High**	**Very High**	**Very High**	**Very High**	**Very High**	**Very High**	**High**
Threatened Species Rating	**Presence of threatened/rare flora species.** **Bold Text:** Best 50% of habitat Standard Text: Remaining 50% of habitat	River Swamp Wallaby-grass	River Swamp Wallaby-grass	River Swamp Wallaby-grass	Matted Flax-lily, Purple Diuris	River Swamp Wallaby-grass	River Swamp Wallaby-grass	Matted Flax-lily, Purple Diuris	Matted Flax-lily, Purple Diuris, River Swamp Wallaby-grass	Matted Flax-lily, Purple Diuris, River Swamp Wallaby-grass	River Swamp Wallaby-grass	Matted Flax-lily, Purple Diuris, River Swamp Wallaby-grass	River Swamp Wallaby-grass	River Swamp Wallaby-grass	Matted Flax-lily, Purple Diuris
	Status (highest status of likley spp.)	Vulnerable	Vulnerable	Vulnerable	Endangered	Vulnerable	Vulnerable	Endangered	Endangered	Endangered	Vulnerable	Endangered	Vulnerable	Vulnerable	Endangered
	Presence of threatened/rare fauna species. **Bold Text:** Best 50% of habitat Standard Text: Remaining 50% of habitat	**Southern Toadlet, Glossy Grass Skink, Swamp Skink, Australian Shoveler, Eastern Great Egret, Hardhead, Royal Spoonbill,** Growling Grass Frog, Blue-billed Duck, Freckled Duck, Intermediate Egret, Lantham's Snipe, Musk Duck, Pied Cormorant	**Southern Toadlet, Glossy Grass Skink, Swamp Skink, Australian Shoveler, Eastern Great Egret, Hardhead, Royal Spoonbill,** Growling Grass Frog, Blue-billed Duck, Freckled Duck, Intermediate Egret, Lantham's Snipe, Musk Duck, Pied Cormorant	**Southern Toadlet, Glossy Grass Skink, Swamp Skink, Australian Shoveler, Eastern Great Egret, Hardhead, Royal Spoonbill,** Growling Grass Frog, Blue-billed Duck, Freckled Duck, Intermediate Egret, Lantham's Snipe, Musk Duck, Pied Cormorant	**Swamp Skink, Glossy Grass Skink, Southern Toadlet,** Swift Parrot	**Australian Shoveler, Eastern Great Egret, Hardhead, Royal Spoonbill,** Growling Grass Frog, Blue-billed Duck, Freckled Duck, Intermediate Egret, Lantham's Snipe, Musk Duck, Pied Cormorant	**Australian Shoveler, Eastern Great Egret, Hardhead, Royal Spoonbill,** Growling Grass Frog, Blue-billed Duck, Freckled Duck, Intermediate Egret, Lantham's Snipe, Musk Duck, Pied Cormorant	**Swift Parrot**,	**Swamp Skink, Glossy Grass Skink, Southern Toadlet,** Swift Parrot	**Swamp Skink, Glossy Grass Skink, Southern Toadlet,** Swift Parrot	**Australian Shoveler, Eastern Great Egret, Hardhead, Royal Spoonbill,** Growling Grass Frog, Blue-billed Duck, Freckled Duck, Intermediate Egret, Lantham's Snipe, Musk Duck, Pied Cormorant	**Swamp Skink, Glossy Grass Skink, Southern Toadlet,** Swift Parrot	**Australian Shoveler, Eastern Great Egret, Hardhead, Royal Spoonbill,** Growling Grass Frog, Blue-billed Duck, Freckled Duck, Intermediate Egret, Lantham's Snipe, Musk Duck, Pied Cormorant	**Australian Shoveler, Eastern Great Egret, Hardhead, Royal Spoonbill,** Growling Grass Frog, Blue-billed Duck, Freckled Duck, Intermediate Egret, Lantham's Snipe, Musk Duck, Pied Cormorant	Swift Parrot
	Status (highest status of likley spp.)	Critically Endangered	Critically Endangered	Critically Endangered	Endangered	Critically Endangered	Critically Endangered	Endangered	Endangered	Endangered	Critically Endangered	Endangered	Critically Endangered	Critically Endangered	Endangered
Other Site Atribute Rating	**Which biosite, if any, does the site cover?**														
	If the site falls within a biosite, are the biosite flora and fauna values present? Or potentially present?														
	City of Casey Biodiversity Emhancement Strategy Area of Regional Significance														Yes

Precinct		13	13	13	13	13	13	13	13	13	13	13	13	13	13
PFI		R536842	R536842	R536843	R536843	R536843	R536843	R536843	R536899	R536899	R536899	R536899	R536899	R536899	R536899
Site ID		2	3	1	3	4	5	6	2	3	5	7	8	10	11
Habitat Zone		A	A	A	A	A	A	A	A	A	A	A	A	A	A
EVC Name (Initials)		SS	PGW	PGW	SS	SS	SS	PGW	PGW	PGW	PGW	SRW	SRW	SRW	SRW
EVC Conservation Status		E	E	E	E	E	E	E	E	E	E	E	E	E	E
Conservation Significance	**Conservation Status x Habitat Score**	High	High	High	High	High	High	High	High	High	High	High	High	High	High
	Threatened Species Rating	Very High	High	High	Very High	Very High	Very High	High	High	High	High	Very High	Very High	Very High	Very High
	Other Site Attribute Rating	Medium	Medium						Medium		Medium	Medium	Medium	Medium	Medium
	Overall Conservation Significance (highest rating)	**Very High**	**High**	**High**	**Very High**	**Very High**	**Very High**	**High**	**High**	**High**	**High**	**Very High**	**Very High**	**Very High**	**Very High**
Threatened Species Rating	**Presence of threatened/rare flora species.** **Bold Text:** Best 50% of habitat Standard Text: Remaining 50% of habitat	River Swamp Wallaby-grass	Matted Flax-lily, Purple Diuris	Matted Flax-lily, Purple Diuris	River Swamp Wallaby-grass	River Swamp Wallaby-grass	River Swamp Wallaby-grass	Matted Flax-lily, Purple Diuris	Matted Flax-lily, Purple Diuris	Matted Flax-lily, Purple Diuris	Matted Flax-lily, Purple Diuris	Matted Flax-lily, Purple Diuris, River Swamp Wallaby-grass	Matted Flax-lily, Purple Diuris, River Swamp Wallaby-grass	Matted Flax-lily, Purple Diuris, River Swamp Wallaby-grass	Matted Flax-lily, Purple Diuris, River Swamp Wallaby-grass
	Status (highest status of likley spp.)	Vulnerable	Endangered	Endangered	Vulnerable	Vulnerable	Vulnerable	Endangered	Endangered	Endangered	Endangered	Endangered	Endangered	Endangered	Endangered
	Presence of threatened/rare fauna species. **Bold Text:** Best 50% of habitat Standard Text: Remaining 50% of habitat	**Swamp Skink, Glossy Grass Skink, Southern Toadlet**	Swift Parrot	Swift Parrot	**Swamp Skink, Glossy Grass Skink, Southern Toadlet**	**Swamp Skink, Glossy Grass Skink, Southern Toadlet**	**Swamp Skink, Glossy Grass Skink, Southern Toadlet**	Swift Parrot	Swift Parrot	Swift Parrot	Swift Parrot	**Swamp Skink, Glossy Grass Skink, Southern Toadlet,** Swift Parrot	**Swamp Skink, Glossy Grass Skink, Southern Toadlet,** Swift Parrot	**Swamp Skink, Glossy Grass Skink, Southern Toadlet,** Swift Parrot	**Swamp Skink, Glossy Grass Skink, Southern Toadlet,** Swift Parrot
	Status (highest status of likley spp.)	Endangered	Endangered	Endangered	Endangered	Endangered	Endangered	Endangered	Endangered	Endangered	Endangered	Endangered	Endangered	Endangered	Endangered
Other Site Atribute Rating	**Which biosite, if any, does the site cover?**														
	If the site falls within a biosite, are the biosite flora and fauna values present? Or potentially present?														
	City of Casey Biodiversity Emhancement Strategy Area of Regional Significance	Yes	Yes						Yes		Yes	Yes	Yes	Yes	Yes

Precinct		13	13	13	13
PFI		R536899	R536899	R539084	R539084
Site ID		12	13	2	2
Habitat Zone		A	A	A	B
EVC Name (Initials)		SRW	PGW	PGW	SS
EVC Conservation Status		E	E	E	E
Conservation Significance	**Conservation Status x Habitat Score**	High	High	Very High	High
	Threatened Species Rating	Very High	High	High	Very High
	Other Site Attribute Rating	Medium			
	Overall Conservation Significance (highest rating)	**Very High**	**High**	**High**	**Very High**
Threatened Species Rating	**Presence of threatened/rare flora species.** **Bold Text:** Best 50% of habitat Standard Text: Remaining 50% of habitat	Matted Flax-lily, Purple Diuris, River Swamp Wallaby-grass	Matted Flax-lily, Purple Diuris	Matted Flax-lily, Purple Diuris	River Swamp Wallaby-grass
	Status (highest status of likley spp.)	Endangered	Endangered	Endangered	Vulnerable
	Presence of threatened/rare fauna species. **Bold Text:** Best 50% of habitat Standard Text: Remaining 50% of habitat	**Swamp Skink, Glossy Grass Skink, Southern Toadlet,** Swift Parrot	Swift Parrot	Swift Parrot	**Swamp Skink, Glossy Grass Skink, Southern Toadlet**
	Status (highest status of likley spp.)	Endangered	Endangered	Endangered	Endangered
Other Site Atribute Rating	**Which biosite, if any, does the site cover?**				
	If the site falls within a biosite, are the biosite flora and fauna values present? Or potentially present?				
	City of Casey Biodiversity Emhancement Strategy Area of Regional Significance	Yes			

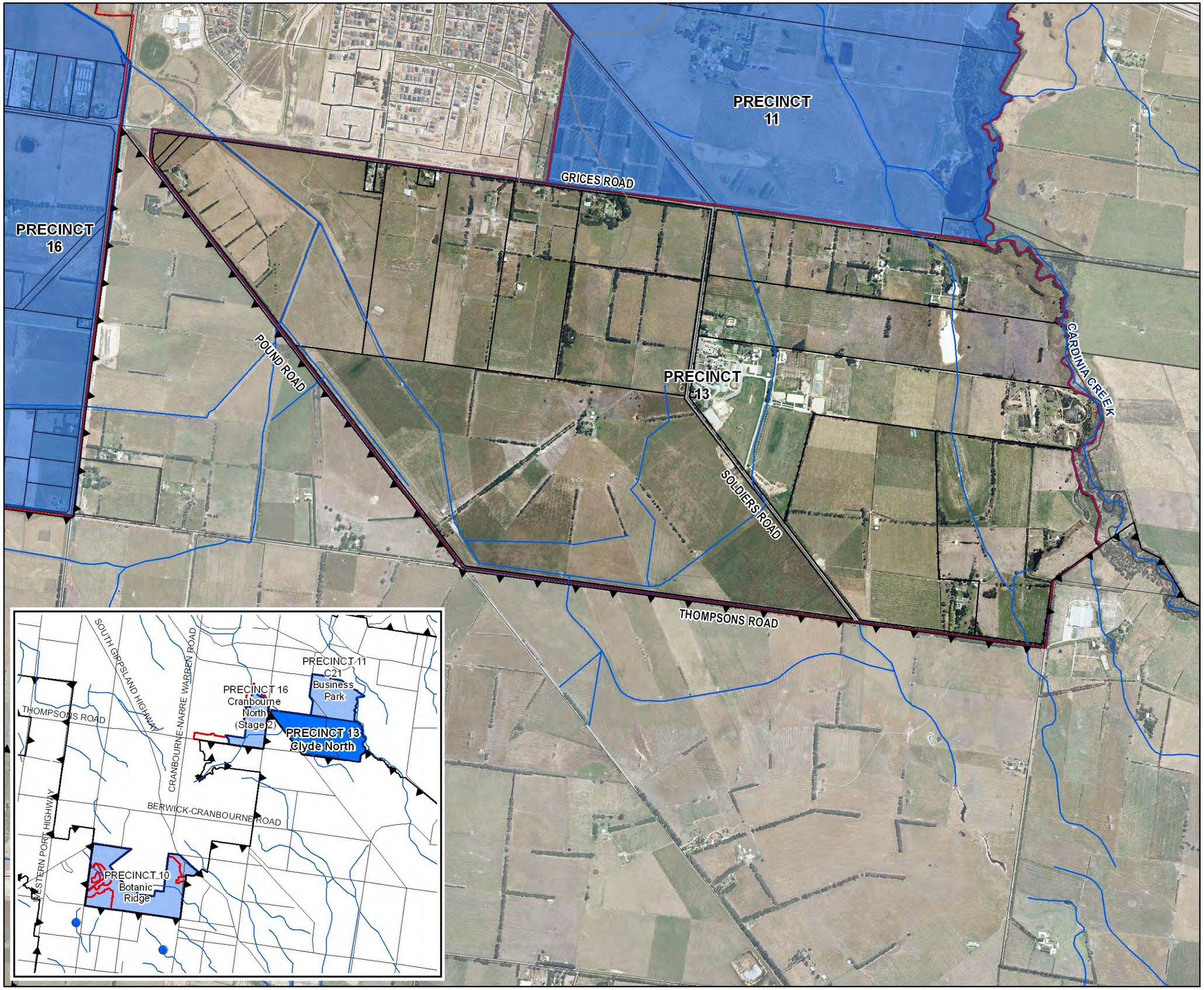
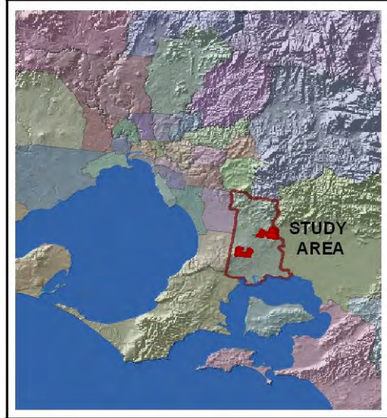


FIGURE 1
Context Map of PSP Areas
Biodiversity Assessment Report
Flora Assessment and Mapping
Clyde North
Growth Areas Authority

LEGEND

- Roads
- Watercourses
- Urban Growth Boundary
- Property Boundary
- Study Area Boundary
- Precinct Boundary



MAP AND SURVEY DETAILS
Mapping by: Staci Timms, May '09
Generated from: GIS layers and Aerial Photography, supplied by DSE, GAA, ESRI and Geosciences Australia.

DATUM: GDA 94 MGA Zone 55

N

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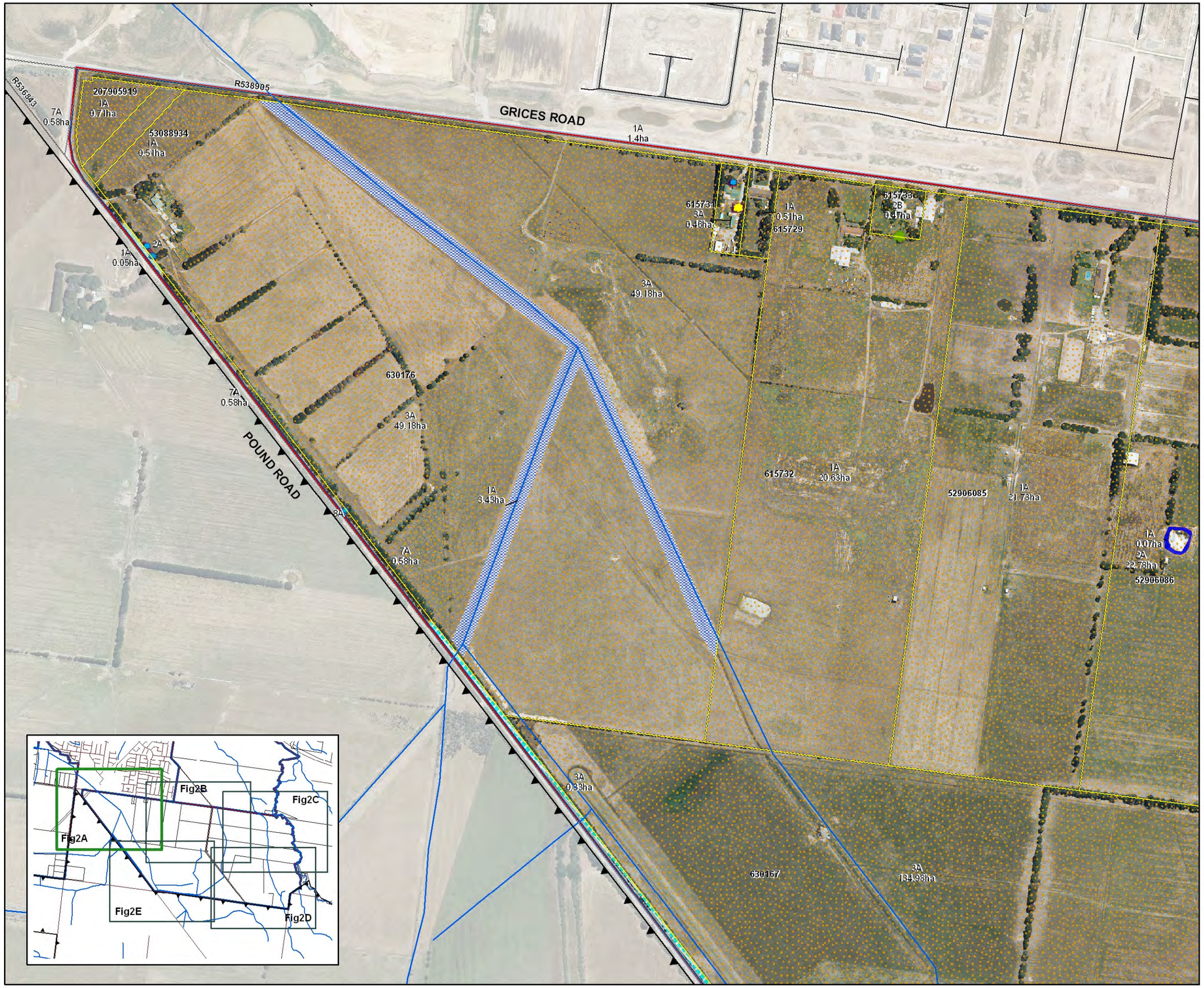

FIGURE 2A
Native Vegetation Within Precinct 13 Study Area
Biodiversity Assessment Report
Flora Assessment and Mapping
Clyde North
Growth Areas Authority

LEGEND

- Roads
- Watercourses
- Study Area Boundary
- Property Boundary
- Precinct Boundary
- Urban Growth Boundary

Scattered Tree Locations

- Small Tree
- Medium Old Tree
- Large Old Tree
- Very Large Old Tree
- Scattered Tree Zones
- Degraded Treeless Vegetation

Habitat Zone EVCs

- EVC 48: Heathy Woodland
- EVC 53: Swamp Scrub
- EVC 55: Plains Grassy Woodland
- EVC 74: Wetland Formation
- EVC 83: Swampy Riparian Woodland
- EVC 126: Swampy Riparian Complex
- EVC 136: Sedge Wetland
- EVC 175: Grassy Woodland
- EVC 653: Aquatic Herbland
- EVC 793: Damp Heathy Woodland
- EVC 821: Tall Marsh
- EVC 937: Swampy Woodland

MAP AND SURVEY DETAILS
Surveyed by: Joy MacDonald, Mark Shepherd, Peter Gannon, Greg James and David Fairbridge, Oct '08-May'09
Mapping by: Staci Timms and Jo Henry, May '09
Generated from: data collected in the field using Trimble and IPAQ PDAs and aerial photograph interpretation. GIS layers and Aerial Photography supplied by DSE and GAA.

DATUM: GDA 94 MGA Zone 55

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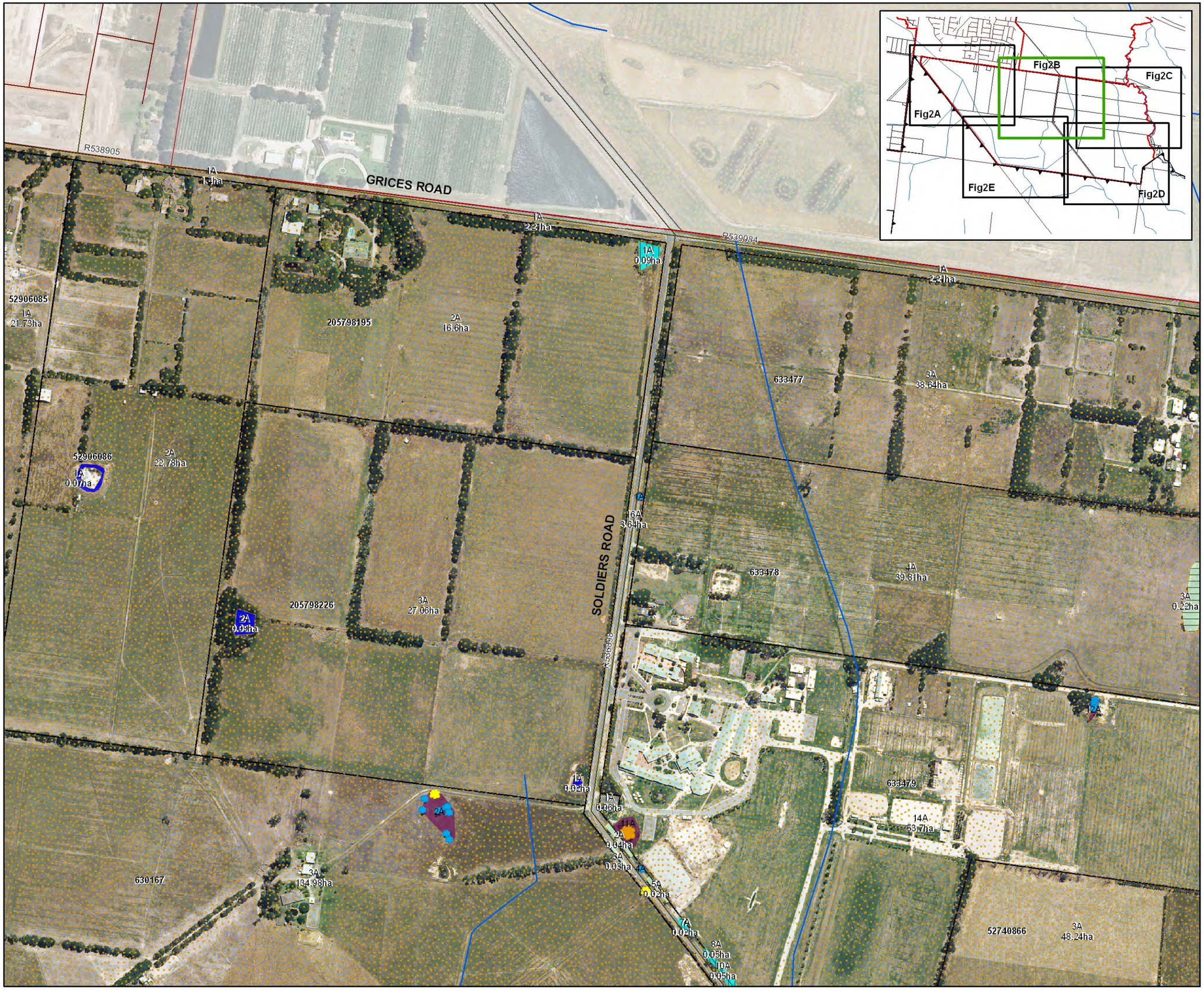

FIGURE 2B
Native Vegetation Within Precinct 13 Study Area
Biodiversity Assessment Report
Flora Assessment and Mapping
Clyde North
Growth Areas Authority

LEGEND

- Roads
- Watercourses
- Urban Growth Boundary
- Property Boundary
- Study Area Boundary

Scattered Tree Locations

- Small Tree
- Large Old Tree
- Scattered Tree Zones
- Medium Old Tree
- Very Large Old Tree
- Degraded Treeless Vegetation

Habitat Zone EVCs

- EVC 48: Heathy Woodland
- EVC 53: Swamp Scrub
- EVC 55: Plains Grassy Woodland
- EVC 74: Wetland Formation
- EVC 83: Swampy Riparian Woodland
- EVC 126: Swampy Riparian Complex
- EVC 136: Sedge Wetland
- EVC 175: Grassy Woodland
- EVC 653: Aquatic Herbland
- EVC 793: Damp Heathy Woodland
- EVC 821: Tall Marsh
- EVC 937: Swampy Woodland

MAP AND SURVEY DETAILS
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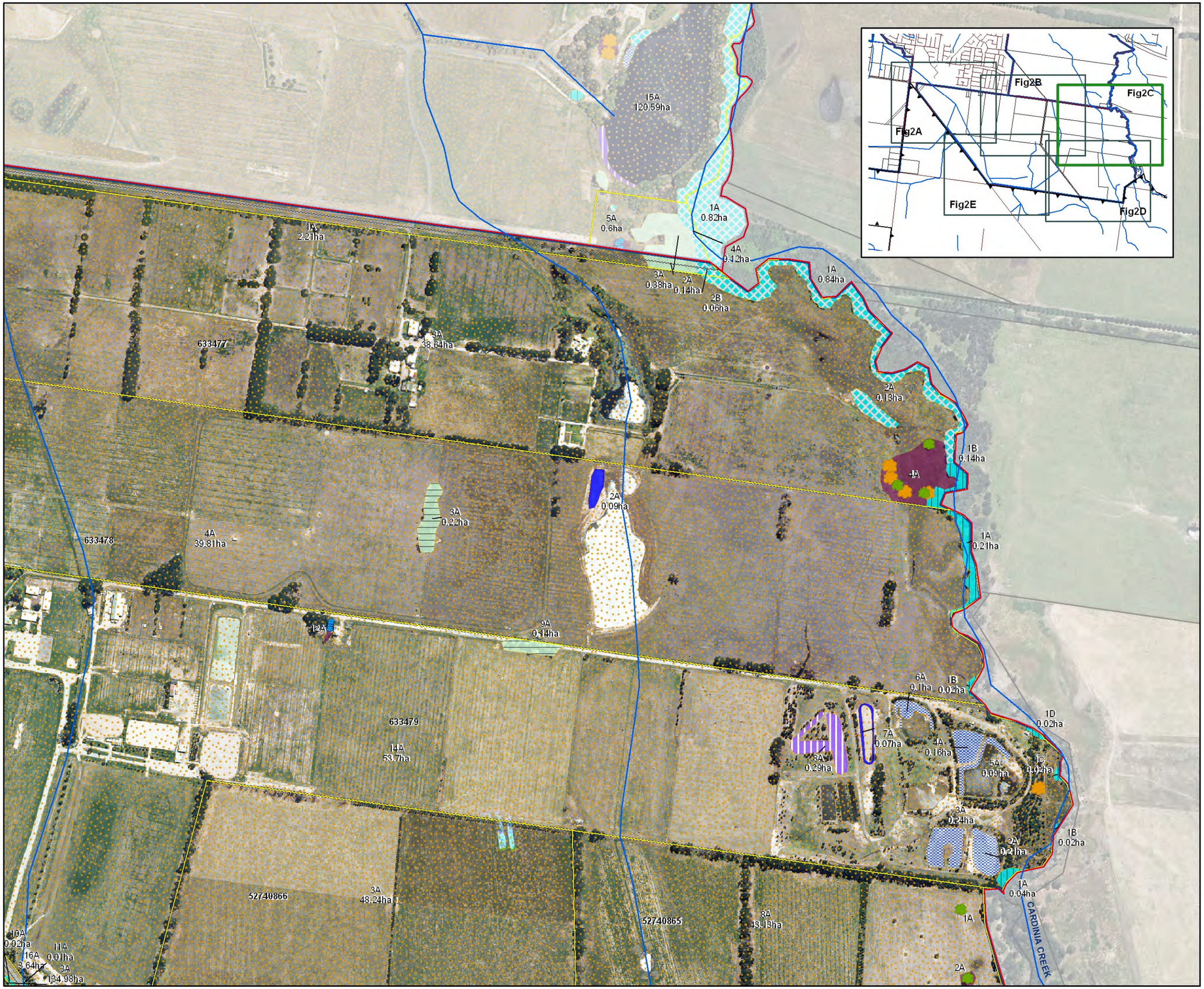

FIGURE 2C
Native Vegetation Within Precinct 13 Study Area
Biodiversity Assessment Report
Flora Assessment and Mapping
Clyde North
Growth Areas Authority

LEGEND

- Roads
- Watercourses
- Study Area Boundary
- Property Boundary
- Precinct Boundary
- Urban Growth Boundary

Scattered Tree Locations

- Small Tree
- Medium Old Tree
- Large Old Tree
- Very Large Old Tree
- Scattered Tree Zones
- Degraded Treeless Vegetation

Habitat Zone EVCs

- EVC 48: Heathy Woodland
- EVC 53: Swamp Scrub
- EVC 55: Plains Grassy Woodland
- EVC 74: Wetland Formation
- EVC 83: Swampy Riparian Woodland
- EVC 126: Swampy Riparian Complex
- EVC 136: Sedge Wetland
- EVC 175: Grassy Woodland
- EVC 653: Aquatic Herbland
- EVC 793: Damp Heathy Woodland
- EVC 821: Tall Marsh
- EVC 937: Swampy Woodland

MAP AND SURVEY DETAILS
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FIGURE 2D
Native Vegetation Within Precinct 13 Study Area
Biodiversity Assessment Report
Flora Assessment and Mapping
Clyde North
Growth Areas Authority

LEGEND

- Roads
- Watercourses
- Study Area Boundary
- Property Boundary
- Precinct Boundary
- Urban Growth Boundary

Scattered Tree Locations

- Small Tree
- Medium Old Tree
- Large Old Tree
- Very Large Old Tree
- Scattered Tree Zones
- Degraded Treeless Vegetation

Habitat Zone EVCs

- EVC 48: Heathy Woodland
- EVC 53: Swamp Scrub
- EVC 55: Plains Grassy Woodland
- EVC 74: Wetland Formation
- EVC 83: Swampy Riparian Woodland
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- EVC 821: Tall Marsh
- EVC 937: Swampy Woodland

MAP AND SURVEY DETAILS
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FIGURE 2E
Native Vegetation Within Precinct 13 Study Area

Biodiversity Assessment Report
Flora Assessment and Mapping
Clyde North
Growth Areas Authority

LEGEND

- Roads
- Watercourses
- Study Area Boundary
- Property Boundary
- Precinct Boundary
- Urban Growth Boundary

Scattered Tree Locations

- Small Tree
- Medium Old Tree
- Large Old Tree
- Very Large Old Tree
- Scattered Tree Zones
- Degraded Treeless Vegetation

Habitat Zone EVCs

- EVC 48: Heathy Woodland
- EVC 53: Swamp Scrub
- EVC 55: Plains Grassy Woodland
- EVC 74: Wetland Formation
- EVC 83: Swampy Riparian Woodland
- EVC 126: Swampy Riparian Complex
- EVC 136: Sedge Wetland
- EVC 175: Grassy Woodland
- EVC 653: Aquatic Herbland
- EVC 793: Damp Heathy Woodland
- EVC 821: Tall Marsh
- EVC 937: Swampy Woodland

MAP AND SURVEY DETAILS

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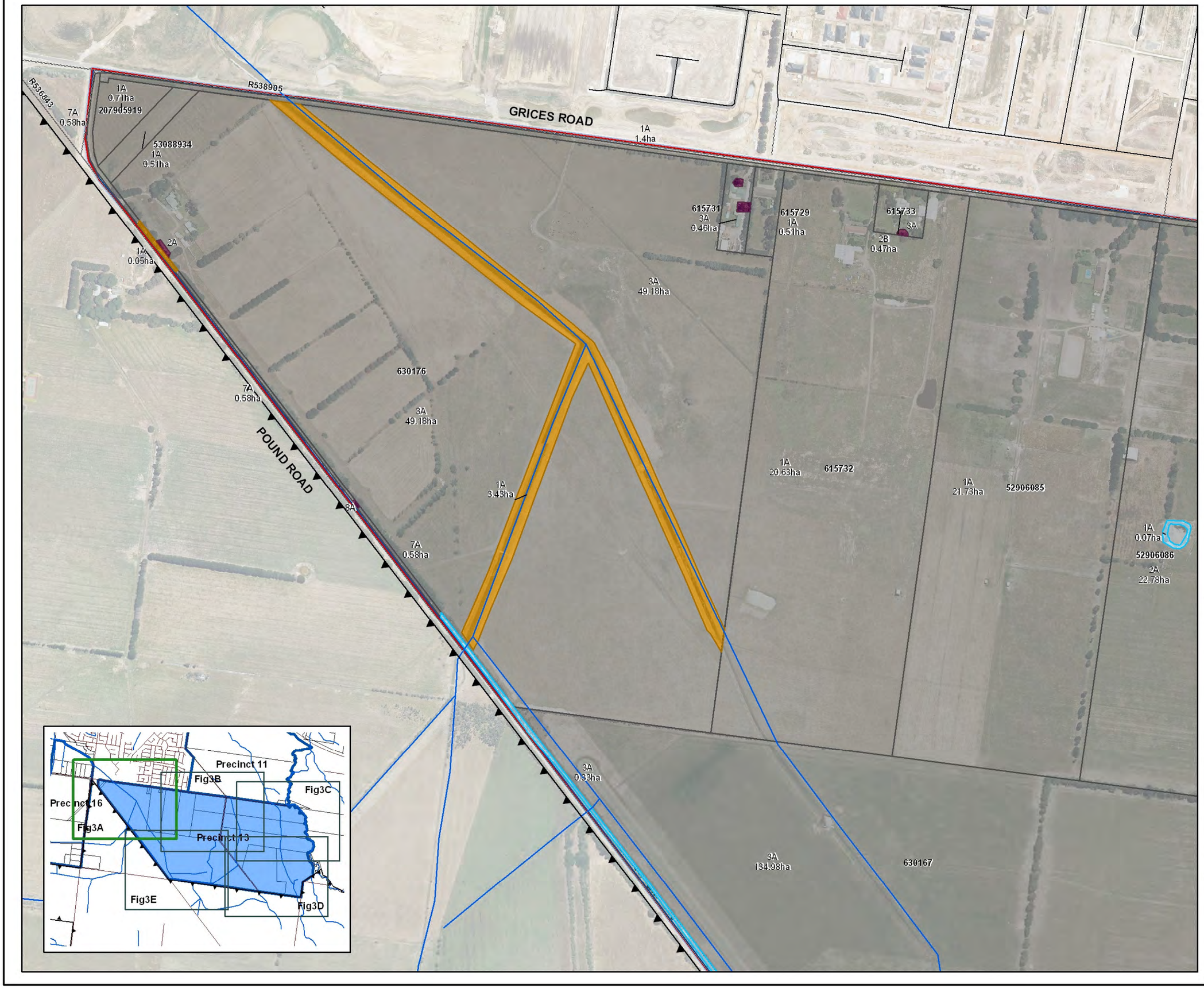

FIGURE 3A
Vegetation Quality of Habitat Zones Within Precinct 13 Study Area
Biodiversity Assessment Report
Flora Assessment and Mapping
Clyde North
Growth Areas Authority

LEGEND

- Roads
- Watercourses
- Study Area Boundary
- Precinct Boundary
- Urban Growth Boundary
- Scattered Tree Zones

Vegetation Quality of Habitat Zones

Site Condition Scores

- 0
- 1 - 19.99
- 20 - 29.99
- 30 - 100

MAP AND SURVEY DETAILS

Surveyed by: Joy MacDonald, Mark Shepherd, Peter Gannon, Greg James and David Fairbridge, Oct '08-May'09

Mapping by: Staci Timms and Jo Henry, May '09

Generated from: data collected in the field using Trimble and IPAQ PDAs and aerial photograph interpretation. GIS layers and Aerial Photography supplied by DSE and GAA.

DATUM: GDA 94 MGA Zone 55

N

0 50 100 150 200 250
Metres

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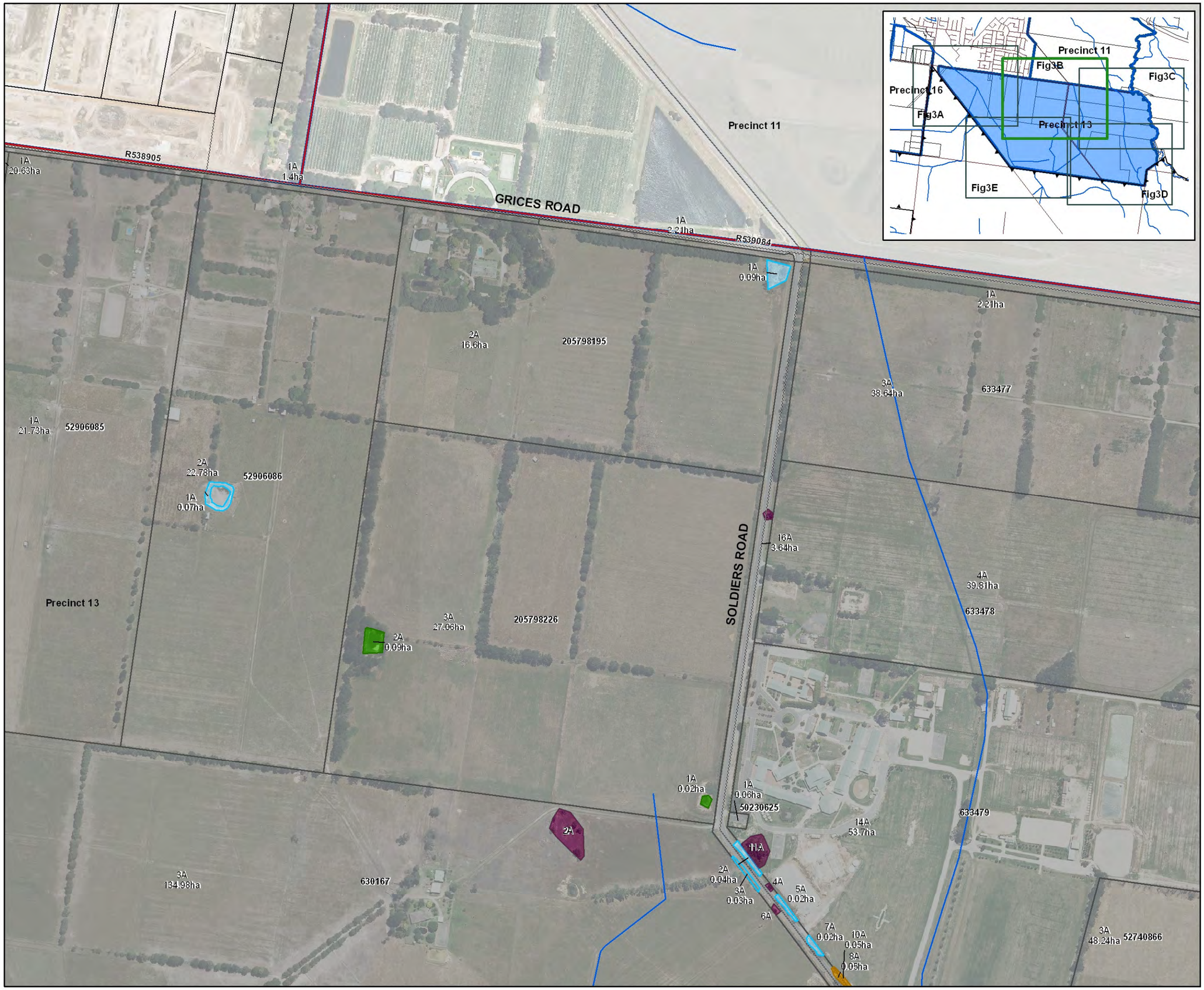

FIGURE 3B

Vegetation Quality of Habitat Zones Within Precinct 13 Study Area

Biodiversity Assessment Report
Flora Assessment and Mapping
Clyde North
Growth Areas Authority

LEGEND

- Roads
- Watercourses
- Study Area Boundary
- Precinct Boundary
- Urban Growth Boundary
- Scattered Tree Zones

Vegetation Quality of Habitat Zones

Site Condition Scores

- 0
- 1 - 19.99
- 20 - 29.99
- 30 - 100

MAP AND SURVEY DETAILS

Surveyed by: Joy MacDonald, Mark Shepherd, Peter Gannon, Greg James and David Fairbridge, Oct '08-May'09

Mapping by: Staci Timms and Jo Henry, May '09

Generated from: data collected in the field using Trimble and IPAQ PDAs and aerial photograph interpretation. GIS layers and Aerial Photography supplied by DSE and GAA.

DATUM: GDA 94 MGA Zone 55

N

0 50 100 150 200 250

Metres

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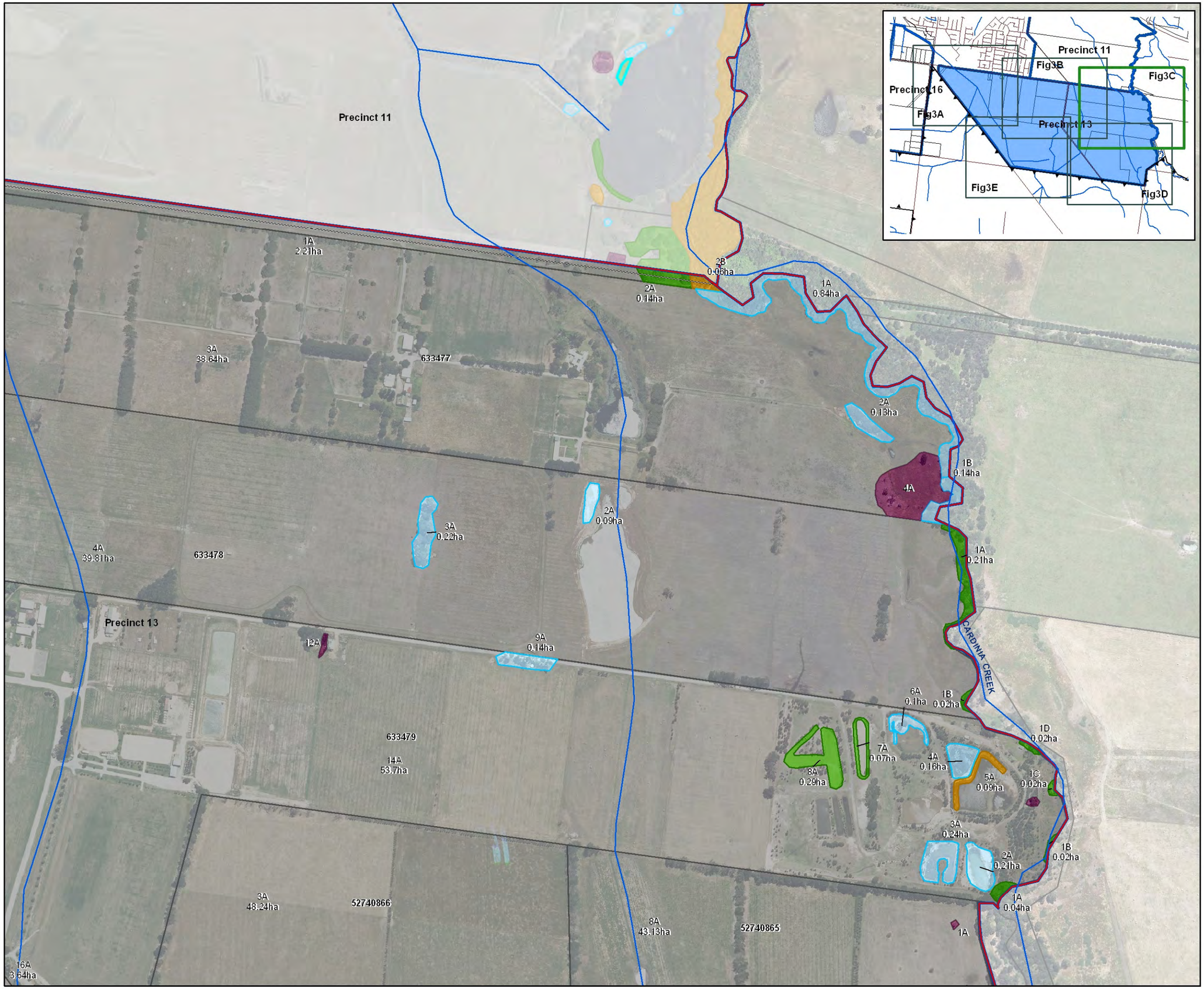

FIGURE 3C
Vegetation Quality of Habitat Zones Within Precinct 13 Study Area
Biodiversity Assessment Report
Flora Assessment and Mapping
Clyde North
Growth Areas Authority

LEGEND

- Roads
- Watercourses
- Study Area Boundary
- Precinct Boundary
- Urban Growth Boundary
- Scattered Tree Zones

Vegetation Quality of Habitat Zones

Site Condition Scores

- 0
- 1 - 19.99
- 20 - 29.99
- 30 - 100

MAP AND SURVEY DETAILS

Surveyed by: Joy MacDonald, Mark Shepherd, Peter Gannon, Greg James and David Fairbridge, Oct '08-May '09

Mapping by: Staci Timms and Jo Henry, May '09

Generated from: data collected in the field using Trimble and IPAQ PDAs and aerial photograph interpretation. GIS layers and Aerial Photography supplied by DSE and GAA.

DATUM: GDA 94 MGA Zone 55

N

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Metres

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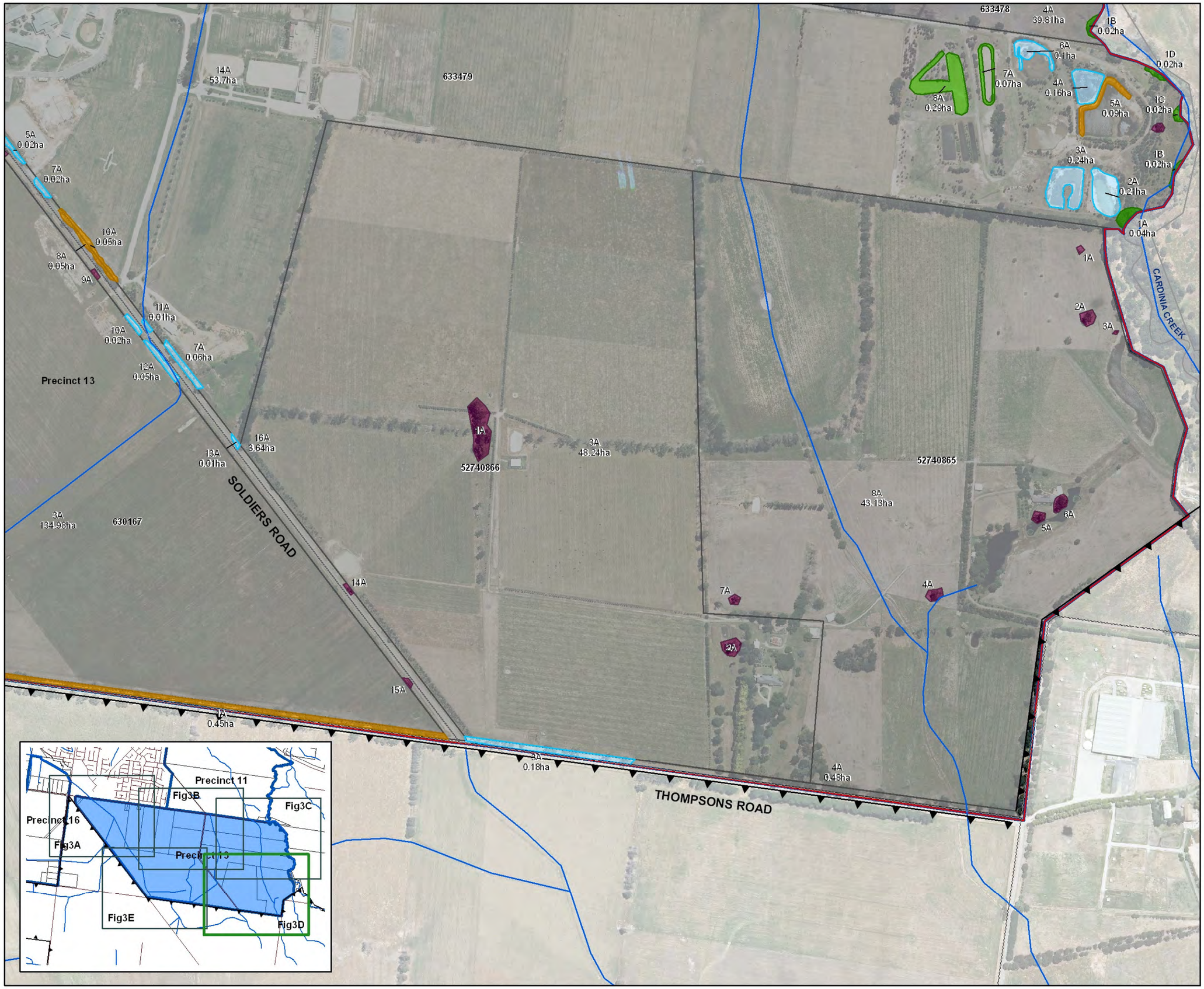

FIGURE 3D

Vegetation Quality of Habitat Zones Within Precinct 13 Study Area

Biodiversity Assessment Report
Flora Assessment and Mapping
Clyde North
Growth Areas Authority

LEGEND

- Roads
- Watercourses
- Study Area Boundary
- Precinct Boundary
- Urban Growth Boundary
- Scattered Tree Zones

Vegetation Quality of Habitat Zones

Site Condition Scores

- 0
- 1 - 19.99
- 20 - 29.99
- 30 - 100

MAP AND SURVEY DETAILS

Surveyed by: Joy MacDonald, Mark Shepherd, Peter Gannon, Greg James and David Fairbridge, Oct '08-May '09

Mapping by: Staci Timms and Jo Henry, May '09

Generated from: data collected in the field using Trimble and IPAQ PDAs and aerial photograph interpretation. GIS layers and Aerial Photography supplied by DSE and GAA.

DATUM: GDA 94 MGA Zone 55

N

0 50 100 150 200 250

Metres

1:5,000

NOTES:

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VERSION	01	DATE	05/06/09

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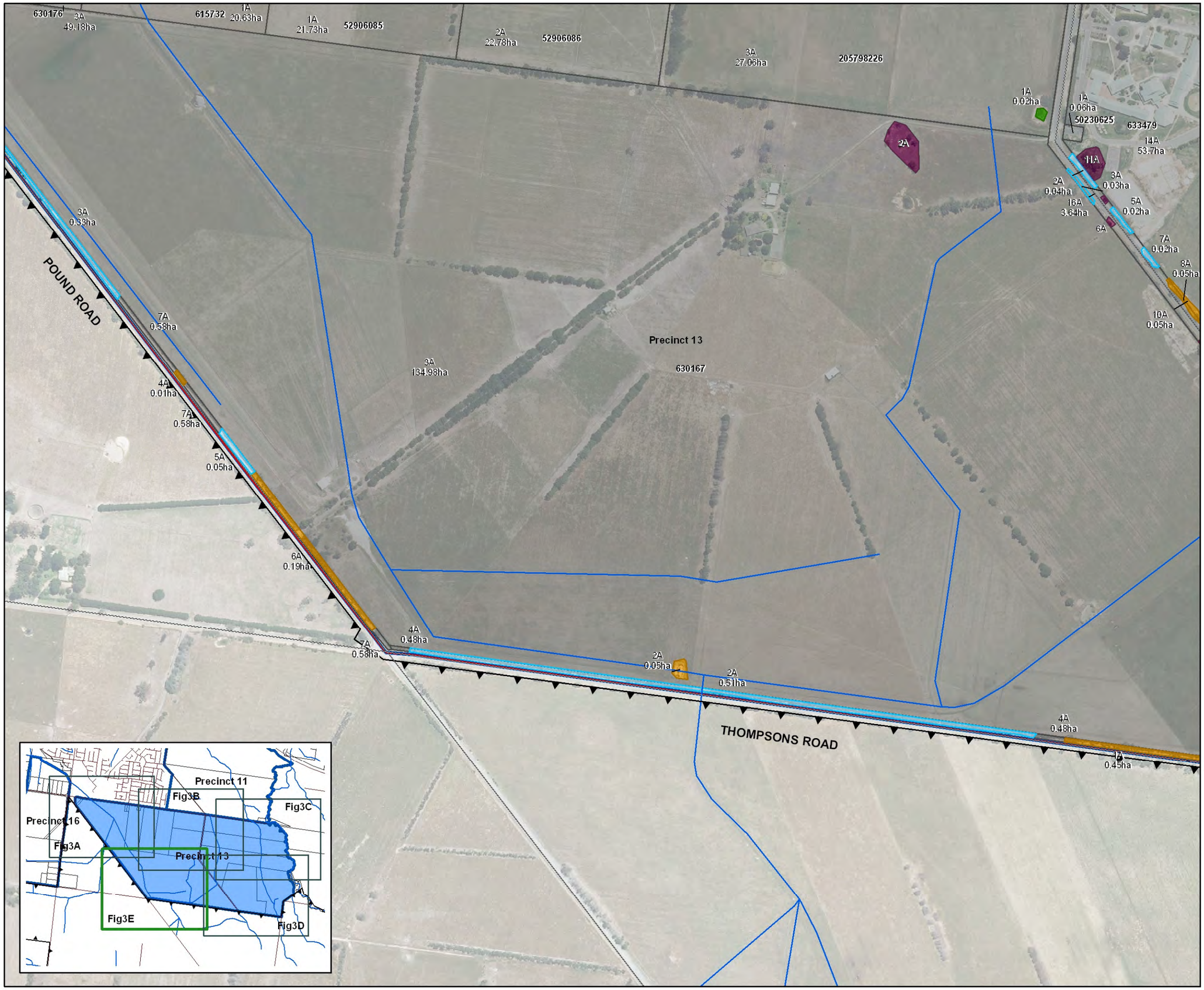
FIGURE 3E
Vegetation Quality of Habitat Zones Within Precinct 13 Study Area

Biodiversity Assessment Report
Flora Assessment and Mapping
Clyde North
Growth Areas Authority



LEGEND

- Roads
- Watercourses
- Study Area Boundary
- Precinct Boundary
- Urban Growth Boundary
- Scattered Tree Zones

Vegetation Quality of Habitat Zones

Site Condition Scores

- 0
- 1 - 19.99
- 20 - 29.99
- 30 - 100

MAP AND SURVEY DETAILS

Surveyed by: Joy MacDonald, Mark Shepherd, Peter Gannon, Greg James and David Fairbridge, Oct '08-May'09

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N

0 50 100 150 200 250
Metres

1:5,000

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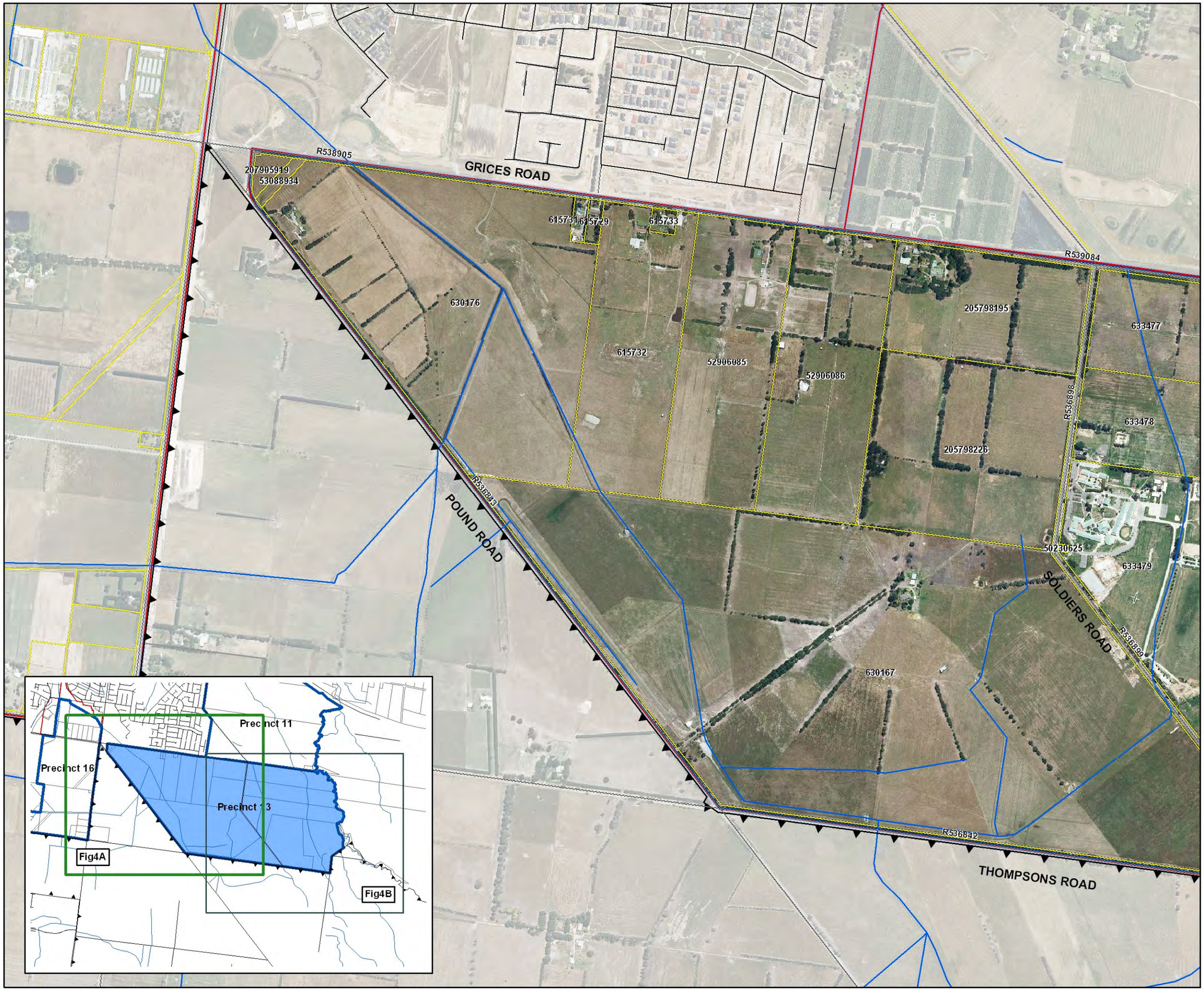
FIGURE 4A
Significant Species Distribution
Precinct 13 Study Area
Biodiversity Assessment Report
Flora Assessment and Mapping
Clyde North
Growth Areas Authority



LEGEND

- Roads
- Watercourses
- Property Boundary
- Study Area Boundary
- Precinct Boundary
- Urban Growth Boundary
- 633479 Parcel PFI
- R539084 Road PFI
- *Thelymitra circumsepta* (1998) State Significant Species and Date of Record
- *Dianella amoena* (2004) Nationally Significant Species and Date of Record

Significant Flora Species

- Database Records of Species of National Significance
- Database Records of Species of State Significance
- Surveyed Records of Species of National Significance
- Surveyed Records of Species of State Significance

MAP AND SURVEY DETAILS
Surveyed by: Joy MacDonald, Mark Shepherd, Peter Gannon, Greg James and David Fairbridge, Oct '08-May '09
Mapping by: Staci Timms and Jo Henry, May '09
Generated from: data collected in the field using Trimble and IPAQ PDAs and aerial photograph interpretation. GIS layers and Aerial Photography supplied by DSE and GAA.

DATUM: GDA 94 MGA Zone 55

N

0 100 200 300 400 500
Metres

1:10,000

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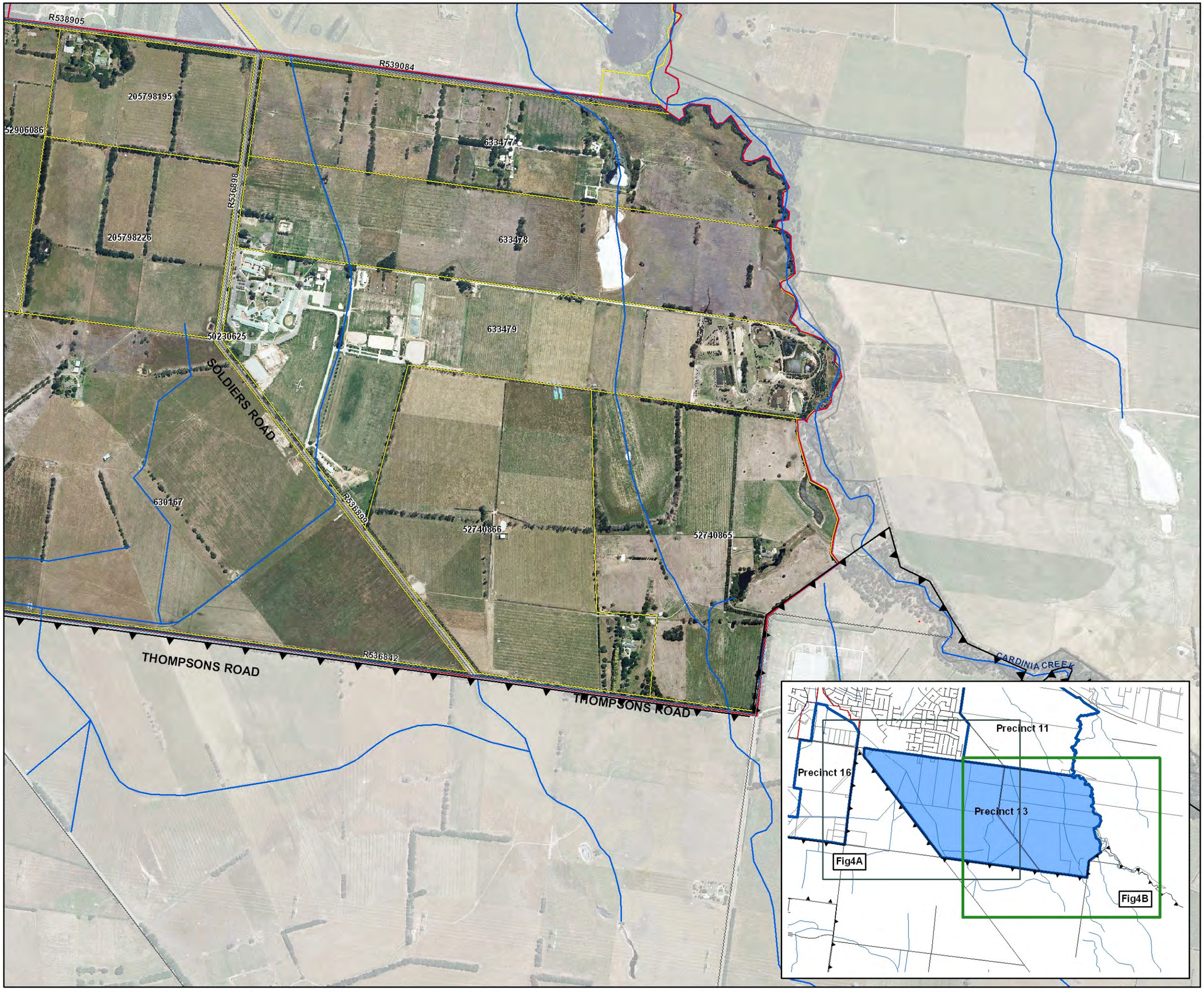

FIGURE 4B
Significant Species Distribution
Precinct 13 Study Area
Biodiversity Assessment Report
Flora Assessment and Mapping
Clyde North
Growth Areas Authority

LEGEND

- Roads
- Watercourses
- Property Boundary
- Study Area Boundary
- Precinct Boundary
- Urban Growth Boundary
- 633479 Parcel PFI
- R539084 Road PFI
- *Thalymitra circumsepta* (1998) State Significant Species and Date of Record
- *Dianella amoena* (2004) Nationally Significant Species and Date of Record

Significant Flora Species

- Database Records of Species of National Significance
- Database Records of Species of State Significance
- Surveyed Records of Species of National Significance
- Surveyed Records of Species of State Significance

MAP AND SURVEY DETAILS
Surveyed by: Joy MacDonald, Mark Shepherd, Peter Gannon, Greg James and David Fairbridge, Oct '08-May '09
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N

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Metres

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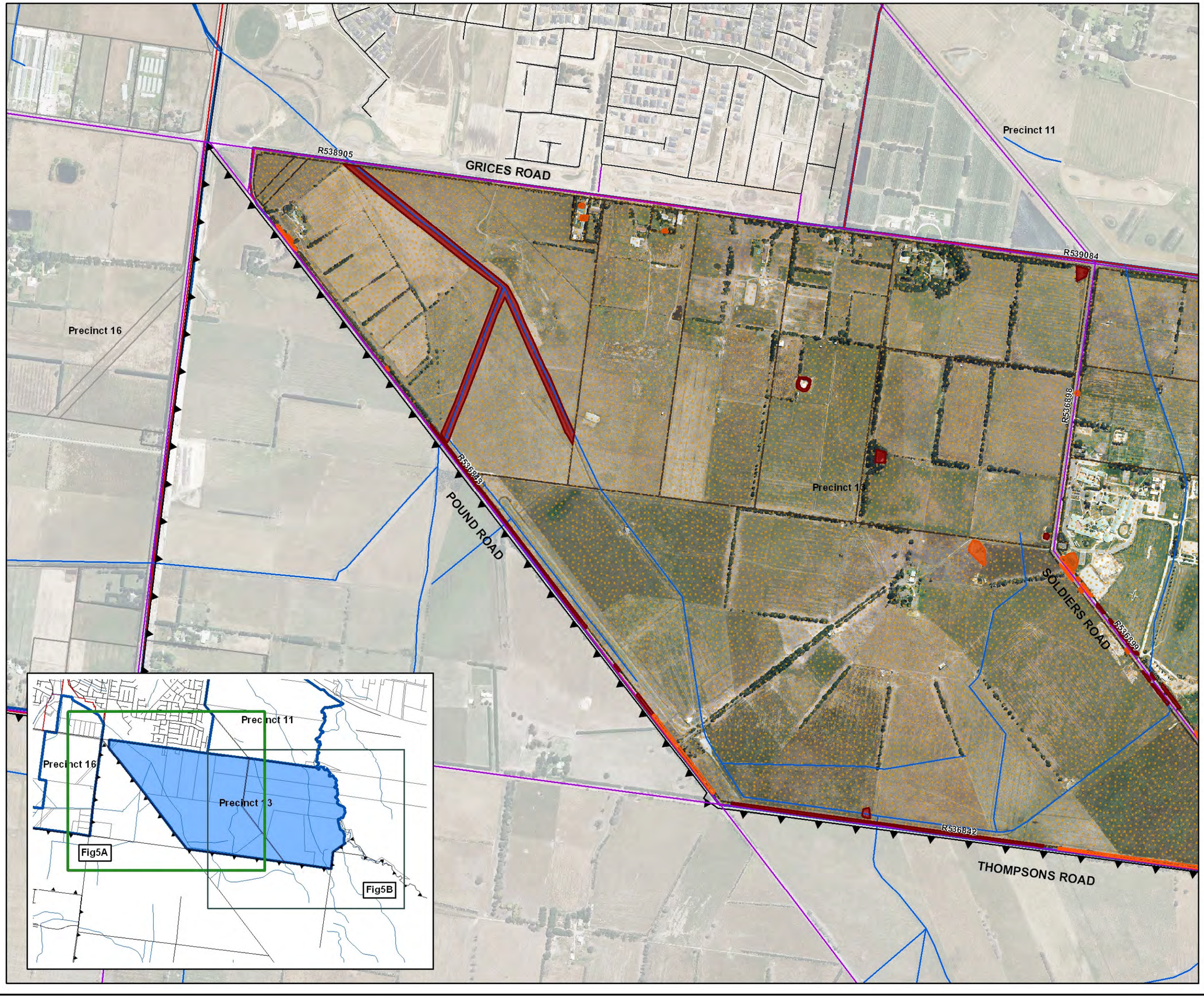

FIGURE 5A
Conservation Significance
Precinct 13 Study Area
Biodiversity Assessment Report
Flora Assessment and Mapping
Clyde North
Growth Areas Authority

LEGEND

- Roads
- Watercourses
- Property Boundary
- Study Area Boundary
- Precinct Boundary
- Urban Growth Boundary
- 633479 Parcel PFI
- R539084 Road PFI
- Degraded Treeless Vegetation

Conservation Significance

- Very High
- High
- Medium
- Low

MAP AND SURVEY DETAILS
Surveyed by: Joy MacDonald, Mark Shepherd, Peter Gannon, Greg James and David Fairbridge, Oct '08-May'09
Mapping by: Staci Timms and Jo Henry, May '09
Generated from: data collected in the field using Trimble and IPAQ PDAs and aerial photograph interpretation. GIS layers and Aerial Photography supplied by DSE and GAA.

DATUM: GDA 94 MGA Zone 55

N

0 100 200 300 400 500
Metres

1:10,000

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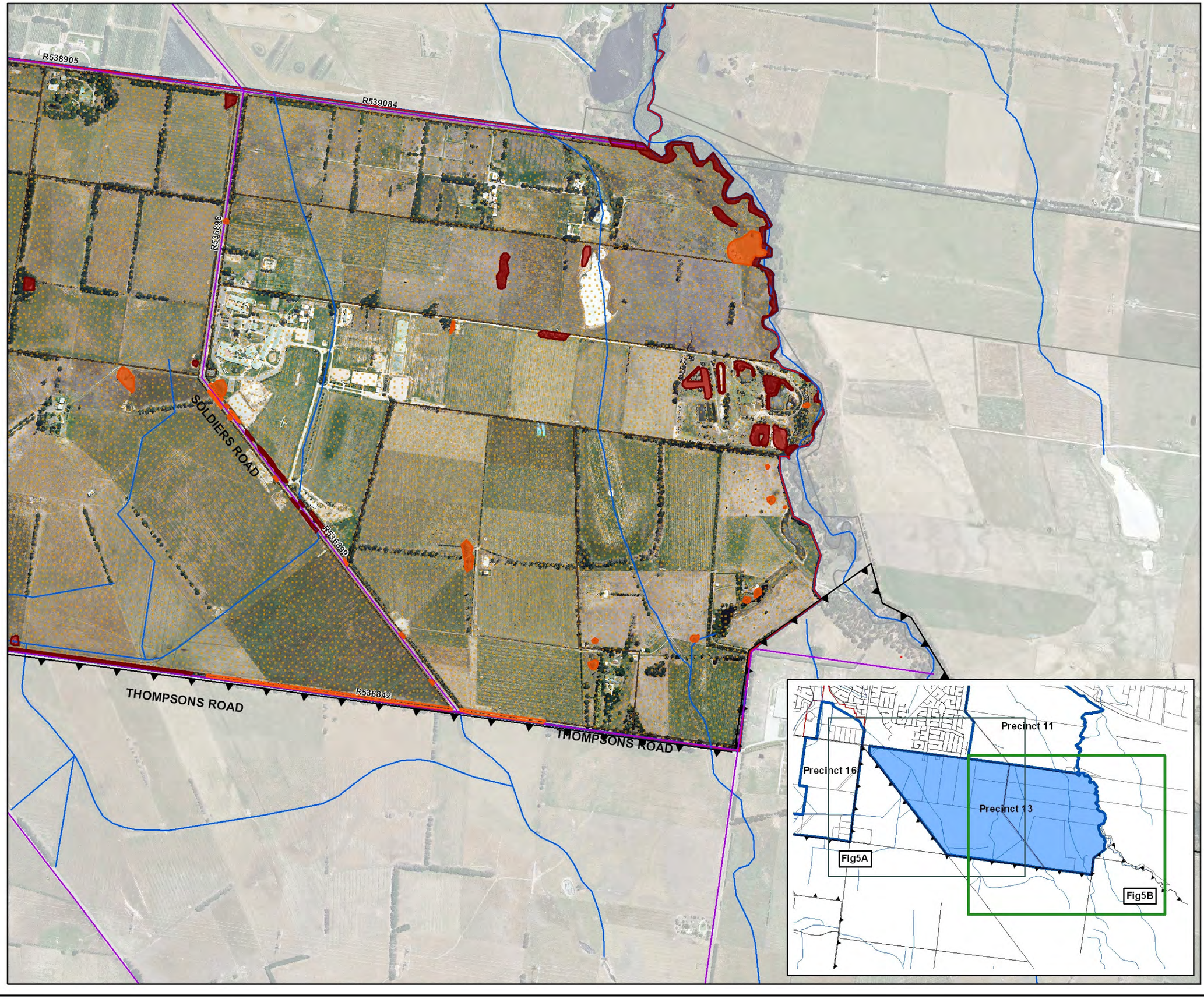

FIGURE 5B
Conservation Significance
Precinct 13 Study Area
Biodiversity Assessment Report
Flora Assessment and Mapping
Clyde North
Growth Areas Authority

LEGEND

- Roads
- Watercourses
- Property Boundary
- Study Area Boundary
- Precinct Boundary
- Urban Growth Boundary
- 633479 Parcel PFI
- R539084 Road PFI
- Degraded Treeless Vegetation

Conservation Significance

- Very High
- High
- Medium
- Low

MAP AND SURVEY DETAILS
Surveyed by: Joy MacDonald, Mark Shepherd, Peter Gannon, Greg James and David Fairbridge, Oct '08-May'09
Mapping by: Staci Timms and Jo Henry, May '09
Generated from: data collected in the field using Trimble and IPAQ PDAs and aerial photograph interpretation. GIS layers and Aerial Photography supplied by DSE and GAA.

DATUM: GDA 94 MGA Zone 55

N

0 100 200 300 400 500
Metres

1:10,000

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Part 3

Targeted Fauna Survey

Precinct Structure Plan Area 13;

Clyde North

10. FAUNA INTRODUCTION

Practical Ecology Pty Ltd was commissioned by Growth Areas Authority to undertake a targeted fauna survey and fauna habitat assessment of Precinct Structure Plan are 13; *Clyde North*, referred to hereafter as *Precinct 13*, in Clyde North, Victoria. The primary objectives of this study are to establish the distribution, abundance and significance of fauna and fauna habitats within the study area and to present the information within the context of relevant legislation and policy.

This report provides information on the fauna and fauna habitat within Precinct 13 by:

- establishing the study area's known biological values with regard to fauna
- documenting significant fauna species that occur or have potential to occur within the study area
- assessing all fieldwork data and information from relevant literature and databases against relevant policy and legislation
- providing recommendations to ensure the study area's significant values are maintained within the context of the proposed future land use.

11. FAUNA METHODS

Fauna taxonomy is consistent with the Victorian Wildlife Atlas database (also called Victorian Fauna Database (VFD), when accessed through Viridans software (DSE 2007a).

11.1.1 Existing Information

Previous studies including Costello et al. (2001), Fairbridge & Appleby (2009) and McMillan et al. (2003) were reviewed. Existing information on the DSE's Victorian Fauna Database (VFD) July 2005 edition for a five kilometre radius around the study area was retrieved. In addition, a report was generated from the Department of Environment, Water Heritage and the Art's (DEWHA) *Protected Matters Search Tool* for a five kilometre radius from the study area boundary (DEWHA 2009). The *Protected Matters Search Tool* uses habitat modelling to predict the presence of nationally significant species within five kilometres of the study area.

11.1.2 New Information

The study area was surveyed by Malcolm Legg of Mal's Environmental and Ecological Services between 20 February and 30 April 2009 and by Joanne North, Joanne Henry, and Michael Reynolds of Practical Ecology 25–26 February and 12–13 March 2009. Targeted searches were undertaken for seven species, listed as threatened under State and Federal legislation (Table 1).

Table 3. Threatened Species Targeted for Fauna Survey

FFG	EPBC	DSE (2007)	Common name	Scientific name
L	VU	v	Australian Grayling	*Prototroctes maraena*
L	VU	v	Dwarf Galaxias	*Galaxiella pusilla*
		n	Glossy Grass Skink	*Pseudemoia rawlinsoni*
L	VU	e	Growling Grass Frog	*Litoria raniformis*
I	EN	n	Southern Brown Bandicoot	*Isoodon obesulus obesulus*
		v	Southern Toadlet	*Pseudophryne semimarmorata*
L		v	Swamp Skink	*Egernia coventryi*

Australian Grayling and Dwarf Galaxias

Australian Grayling *Prototroctes maraena* and Dwarf Galaxias *Galaxiella pusilla* were targeted using rectangular bait traps baited with White Bait placed in appropriate habitat, near reeds and sedges. Two traps were deployed at each survey location. Traps were checked two–three times before midnight, after which they were left overnight and re-checked again the following morning. Dip-nets were also used near the banks of waterways in and around reeds and sedges in random searches at each survey location.

Glossy Grass Skink

Glossy Grass Skink *Pseudemoia rawlinsoni* was surveyed by using 30cm by 30cm pieces of colour-bond tin placed at 20 meter intervals along six transects, within suitable habitat. Habitat included roadsides, drainage lines and Cardinia Creek. The tin pieces were lifted the following morning prior to 11am and reptiles sheltering under the tin for warmth were caught or observed. Surveys were undertaken in all weather.

Growling Grass Frog

Potential Growling Grass Frog *Litoria raniformis* habitat was identified using aerial photography followed by habitat assessment in the field. Habitat attributes, according to Tyler (1989); Cogger (2000) and Clemann & Gillespie (2004) were assessed, including:

- Wetland type and permanency (ephemeral farm dam, permanent / semi-permanent creek line or quarry lagoon).
- The presence of emergent, submergent and floating vegetation (for male calling platforms, sheltering and tadpole protection)
- The presence of rocks and fallen timber (for basking and sheltering) within and adjacent to potential sites.
- The presence of soil cracking and fringing vegetation (for refuge and foraging).
- Distance of survey sites to the nearest suitable water body. Note; this species is highly mobile and can move up to one kilometre within 24 hours (DEWHA 2009; Clemann & Gillespie 2004).

Areas determined as potential habitat were scanned using two 50-watt spotlights to search for frogs on the banks, on floating vegetation and in areas of emergent vegetation. The surrounding terrestrial habitat within 10 metres of the water-body was also searched. The time spent at each sub-site was determined by size and habitat complexity.

Growling Grass Frog was targeted during searches within the wetland complex and farm dams at Hillcrest Christian College (PFI: 633479) and 1/335 Grices Road (PFI: 633477) and Cardinia Creek from Grices Road at the northern boundary of the precinct to the southern boundary of Hillcrest Christian College. Nine fish traps were deployed to detect the presence of tadpoles at nine wetlands within the two properties, and the Cardinia Creek. Traps were placed in appropriate habitat, along with glow sticks to attract tadpoles. Active searching for metamorphs was also conducted during nocturnal surveys at sites where suitable aquatic habitat occurred. Tadpole identification was confirmed by Anstis (2002). Successful recruitment was recorded at a water body if metamorphosing tadpoles or recently metamorphosed froglets were observed.

'Call-playback' methodology was not used during the survey due to inappropriate survey timing (see Limitations, Section 3). However, listening for male calls was undertaken throughout the survey regardless.

Temperature and general weather conditions were recorded at the commencement and conclusion of each survey. All sites within Precinct 13 were surveyed twice during warm and still weather conditions (minimum temperature recorded was 17 °C). All other incidental frog and other fauna species were recorded during the surveys. Field surveys were conducted on 25th – 26th February and 12th – 13th March 2009 within Precinct 13.

Southern Brown Bandicoot

Potential Southern Brown Bandicoot *Isoodon obesulus obesulus* habitat was traversed on foot for signs of Bandicoot diggings and scats. Eleven individual property parcels, including roadsides were searched. When diggings were located, infra red cameras were deployed for seven days and nights during the full or new moon cycles. Infrared cameras are triggered by an infrared sensor that detects the movement of heat. The cameras record 30 seconds of motion using Infrared light at night. The cameras record 30 seconds of standard colour video during the day.

10 hair tubes were deployed at two suitable Bandicoot habitat sites for seven days and nights. Cameras were deployed at five suitable sites. Peanut butter, oats and honey was used as an attractant to the hair tubes and cameras.

Southern Toadlet

Six areas of potential Southern Toadlet *Pseudophryne semimarmorata* habitat within the study area, including roadsides, drainage lines and Cardinia Creek were traversed on foot to identify Southern Toadlet calls during wet weather. When, calls were identified, Southern Toadlet was caught for positive identification. Six transects were searched for Southern Toadlet.

Swamp Skink

Swamp Skink *Egernia coventryi* was surveyed using 15 Elliot traps, which were deployed along seven transects within suitable habitat, including roadsides, drainage lines and Cardinia Creek. Peanut butter, oats and honey were used as bait. Traps were left out two nights during mild-warm weather and were checked each morning. Swamp Skink also had the potential to be detected during targeted survey for Glossy Grass Skink.

Incidental Survey

Non-target amphibians, reptiles, birds and mammals were subject to incidental survey during targeted searches undertaken with a particular emphasis placed on threatened species using the following methods:

- Birds were identified by sight and vocalisation. Wetland birds were surveyed throughout the day. Woodland birds were surveyed between dawn and midday and in the hour preceding nightfall.
- Reptiles were identified by sight during general inspection of habitat.

- Reptiles and small mammals, including White-footed Dunnart *Sminthopsis leucopus* can be detected using the Glossy Grass Skink methods detailed above.
- Mammals were identified by sight.
- Amphibians were identified by vocalisation and sight, including spotlighting and fish trapping within a selection of appropriate amphibian habitat during Growling Grass Frog surveys.

A fauna species list (or defined area list) for the entire study area was compiled for each property and for the entire study area. This included species recorded in the study area and those flying over or heard close to the study area.

Assessments of fauna habitat were made by direct observation during the assessment.

11.1.3 Research permit

All fauna sampling within the study area was carried out under Research Permit Numbers 10002918 (Practical Ecology) and 10004056 (Mal's Environmental and Ecological Services).

11.2 Data Handling and Storage

11.2.1 Database Entry, Validation and Submission

All species of fauna recorded are coded using the DSE Biodiversity Information Group standards as part of Practical Ecology's data-sharing agreement with DSE. Lists of all fauna taxa detected throughout the survey within the study area were submitted to DSE as a contribution to the Atlas of Victoria Wildlife for future reference. These records are submitted in the standardised spreadsheet provided by DSE Biodiversity Information Group.

11.3 Mapping

Geographic data collection in the field for the purposes of map display was carried out with a handheld GPS for recording significant fauna species locations. Determination of habitat boundaries in Figure 3 was undertaken by a combination of ground-truthing and aerial photography interpretation. All maps were produced using ArcView ArcGIS V.9.

12. FAUNA LIMITATIONS

Fauna surveys were undertaken only for targeted species listed in table 5 and only within properties for which permission to access was granted to Practical Ecology by landholders (Figure 3). A sample approach to fauna survey was undertaken and therefore not all properties that had granted Practical Ecology permission to access were surveyed. No targeted fauna survey was commissioned by Growth Areas Authority for other threatened species which have potential to occur within the study area, including Swift Parrot *Lathamus discolor* and a suite of other threatened woodland and wetland birds.

No general fauna survey for non-threatened species was commissioned by Growth Areas Authority, including trapping, spotlighting, bat detection, frog and owl call-back detection. Non-target fauna and some threatened fauna were not adequately surveyed during the current assessment.

Practical Ecology was not commissioned by Growth Areas Authority to map potential habitat for fauna species known or expected to occur within the study area. In addition, at the time of fauna survey, Practical Ecology had not been commissioned to prepare biodiversity reports, and were therefore not required at the time to consider fauna habitat or record the likelihood of occurrence for threatened species. Areas of high faunal habitat significance shown in Figure 3 were determined by a combination of our recollection of the sites assessed, arborist data and aerial photography interpretation. No habitat mapping using hand-held GPS was undertaken in the field. Furthermore, Habitat Zones described in Part 2 of this report do not constitute all fauna habitat within the study area. Practical Ecology was not engaged at the time of our field assessments to map non-indigenous habitat, within which many fauna species occur.

The timing of the survey was less than optimal for most of the targeted threatened species. Detailed surveying to determine the likely presence or absence of species is best undertaken throughout all seasons of a typical year. While the primary Growling Grass Frog breeding season is from August to April, the optimal male calling period is from September to December, and calling is usually stimulated by rain events (DEWHA 2009). Unseasonal weather conditions, including temperatures over 45^{0}C, and recent dry conditions made 'call play-back' an inappropriate survey method during the survey period. In addition, following a period of rain and weather unsuitable for survey, the survey was resumed when weather conditions were considerably cooler. Call playback during these conditions was also considered an inappropriate survey method. Increasingly cool weather eventually prevented the continuation of Growling Grass Frog survey. However, Growling Grass Frog was targeted during searches within the wetland complex and farm dams at Hillcrest Christian College (PFI: 633479) and 1/335 Grices Road (PFI: 633477) and Cardinia Creek from Grices Road at the northern boundary of the precinct to the southern boundary of Hillcrest Christian College.

One property owner refused permission for Practical Ecology to access their properties for the fauna survey (Figure 3). This property comprised two property parcels (Persistent

Feature Identifier (PFI): 205798195 and 205798226) at 211 Grices road, Clyde North. Figure 3 displays properties that were not accessed for fauna survey.

13. FAUNA RESULTS

13.1 Fauna records from the current assessment

A total of 87 fauna species were recorded within the study area during the current assessment, comprising seven amphibians, three reptiles, 61 birds, five invertebrates, two fish and nine mammals. Seventy-five species (86%) are native, while 12 species (14%) are introduced. Fauna records from the current assessment are provided in Appendices 2, 3 and 4).

13.1.1 Significant species recorded during the current assessment

Three state significant species; Southern Toadlet *Pseudophryne semimarmorata*, Glossy Grass Skink *Pseudemoia rawlinsoni* and Hardhead *Aythya australis* were recorded during the current assessment (Figure 2 Table 2). A further eight species recorded within the current assessment are considered to be of regional significance (Table 2). Methods for defining conservation significance are described in Appendix 1. Significant fauna records are displayed in more detail in Appendix 2.

One additional record of Southern Toadlet was located within 100 metres of the study area (Figure 2).

Table 4. Significant native fauna recorded during the current assessment

Scientific Name	Common Name	Conservation Significance			
		EPBC	FFG	DSE (2007)	Regional Conservation Status
AMPHIBIANS					
Southern Toadlet	*Pseudophryne semimarmorata*			v	Regional
REPTILES					
Glossy Grass Skink	*Pseudemoia rawlinsoni*			n	Regional
BIRDS					
Black-fronted Dotterel	*Elseyorinis melanops*				Regional
Black-winged Stilt	*Himantopus himantopus*				Regional
Eastern Yellow Robin	*Eopsaltria australis*				Regional
Flame Robin	*Petroica phoenicea*				Regional
Hardhead	*Aythya australis*			v	Regional
Musk Lorikeet	*Glossopsitta concinna*				Regional
MAMMALS					
Short-beaked Echidna	*Tachyglossus aculeatus*				Regional
Swamp Rat	*Rattus lutreolus ssp. Lutreolus*				Regional

Codes for status within Victoria:

- v vulnerable in Victoria (DSE 2007)
- e endangered in Victoria (DSE 2007) or Australia (EPBC Act)
- n near threatened in Victoria (DSE 2007)
- L listed as threatened under FFG Act 1988
- I Invalid or ineligible under FFG Act 1988

State significant species recorded within the study area are discussed in section 4.4. Areas of habitat within the study areas for national and state significant species found in the study area are shown in Figure 3 and discussed in section 4.4.

13.1.2 Incidental species recorded during the current assessment

Incidental records compiled during site visits resulted in 85 fauna species, including one state significant and eight regionally significant species discussed in section 4.1.1 above. Incidental records comprised six amphibians, two reptiles, 61 birds, five invertebrates, two fish and nine mammals. Incidental fauna records for the study area and their conservation status are presented in Appendix 3. Fauna recorded within each property is listed in Appendix 4.

13.2 Database Records and Previous Surveys

A total of 210 fauna species are documented on DSE's VFD (DSE 2007a) from within 5 km of the study area boundary. These records comprise 191 (91%) indigenous species and 19 (9%) introduced species. Thirty-three national and state significant fauna species recorded or predicted to occur within five kilometres of the study area are documented on the Victorian Fauna Database(DSE 2007a) and EPBC Protected Matters Search Tool (Appendix 5).

In determining this 'likelihood of occurrence' and utilisation of the study site by national or state significant fauna, the following factors were considered.

- The conservation status of the species and its distribution.
- Previous recordings of species in the local area.
- The quality, distribution and availability of suitable habitat for individual species.
- The generally fragmented and highly modified nature of fauna habitat surrounding the study area.

Based on the review criteria detailed above, six species recorded on AVW and EPBC searches are considered to have a high likelihood of occurrence within the study area. A further 14 species are considered to have at least a low-medium likelihood of occurrence within the study area (Appendix 5). The habitat requirements for significant species detected on AVW and EPBC searches are discussed in Appendix 5. A summary of nationally and state listed threatened species with at least a low-medium likelihood of occurrence is presented in table 3 below.

Table 5. Nationally or state listed threatened species with at least low-medium likelihood of occurrence recorded or predicted to occur within 5km

FFG	EPBC	DSE (2007)	Migratory	Regional Significance	Common Name	Scientific Name	Family Name	Likelihood of Occurrence	Database	Freq (AVW only)	No. Site (AVW only)	No. of Recs (DSE 2007a)	Last Record (DSE 2007a)
		v		S, R2	Australasian Shoveler	*Anas rhynchotis*	Anatidae	High	AVW	2.41%	9	19	2005
f		e		S, R2	Blue-billed Duck	*Oxyura australis*	Anatidae	Med	AVW	2.68%	10	20	2002
	m		J, C	R2, R3	Cattle Egret	*Ardea ibis*	Ardeidae	Med-high	EPBC				
f		v	J, C	S, R2, R3	Eastern Great Egret	*Ardea modesta*	Ardeidae	High	AVW	0.53%	2	6	1985
f		e		S, R2	Freckled Duck	*Stictonetta naevosa*	Anatidae	Med	AVW	0.26%	1	2	2002
f	CR	e		N, S, R2	Golden Sun Moth	*Synemon plana*	Castniidae	Low-med	EPBC				
f	V	e		N, S, R2	Growling Grass Frog	*Litoria raniformis*	Hylidae	Med	EPBC/AVW	12.33 %	46	11	2005
	VU			N, S, R2	Grey-headed Flying-fox	*Pteropus poliocephalus*	Pteropodidae	Low-med	EPBC				
		v		S, R2	Hardhead	*Aythya australis*	Anatidae	High	AVW	2.94%	11	23	2005
f	EN	c		N, S, R2	Helmeted Honeyeater	*Lichenostomus melanops cassidix*	Meliphagidae	Low-med	AVW	0.26%	1	6	1932
f		c		S, R2	Intermediate Egret	*Ardea intermedia*	Ardeidae	Med	EPBC				
		n		S, R2	Latham's Snipe	*Gallinago hardwickii*	Scolopacidae	Med	AVW	2.68%	10	11	2004
		v		S, R2	Musk Duck	*Biziura lobata*	Anatidae	Med	AVW	0.53%	2	3	1992
		n		S, R2	Pied Cormorant	*Phalacrocorax varius*	Phalacrocoracidae	High	AVW	0.53%	2	2	1997
		v		S, R2	Royal Spoonbill	*Platalea regia*	Threskiornithidae	Med-high	AVW	0.80%	3	6	2001
		v		S, R2	Southern Toadlet	*Pseudophryne semimarmorata*	Myobatrachidae	High	AVW	13.67 %	51	2	1965
	m	n		S, R2, R3	Spotted Harrier	*Circus assimilis*	Accipitridae	Med	AVW	0.26%	1	2	2004
f	E	e		N, S, R1, R2	Swift Parrot	*Lathamus discolor*	Psittacidae	Med	EPBC/AVW	0.26%	1	3	1989
	m		J, R, C	R2, R3	White-throated Needletail	*Hirundapus caudacutus*	Apodidae	High	EPBC				

See appendix 2 key for conservation status and significance definitions

13.3 Fauna habitats

The majority of the study area has been highly modified by grazing, urbanisation and the construction of a school. Large open paddocks lined with planted exotic vegetation dominate the precinct. However, native vegetation is common in roadsides, along Cardinia Creek and in wetlands associated with the Cardinia Creek flood plain (Figure 3). While most of the trees within the study area are too young to have formed hollows, some hollow bearing trees may support a suite of hollow dependant species such as parrots, rosellas, lorikeets, owls, arboreal mammals and microbats.

Areas of regenerating and remnant Swamp Scrub EVC and exotic vegetation with Swamp Scrub components found within roadsides and Cardinia Creek are excellent habitat for amphibians, reptiles, birds, mammals and invertebrates, including threatened species (Figure 3). Habitat dominated by non-indigenous vegetation also occurs in roadsides and fence-lines as exotic trees and shrubs and supports many animals, including woodland birds, Swamp rat *Rattus lutreolus* and potentially arboreal mammals. Drainage lines dominated by introduced flora are likely to be habitat for native amphibians (figure 3).

Wetlands, drainage lines and seasonally wet areas within the study area hold particular habitat value for wetland birds, including migratory and threatened species. A significant drainage line in the north-west of the study area includes over one lineal kilometre of Tall Marsh EVC and is potential habitat for a suite of amphibians, birds and reptiles (Figure 3).

The determination of areas classified as having high faunal habitat values is based on all or any of the following factors.

- The area is a representative or remnant vegetation community.
- The area constitutes a wildlife corridor.
- The area contains important breeding sites.
- The area has high floristic diversity.

The study area has been divided up into five habitat types. An evaluation of each of the habitat types is described below.

Woodlands

Remnant woodlands are highly restricted within the study area and occur only as several small remnant patches in the east of the study area at 490 Soldiers road and the Hillcrest Christian College. Emergent Eucalypts occur within Swamp Scrub in many sections of Cardinia Creek riparian corridor (Part 2, section 4).

Some of the trees within woodlands at the study area have hollows suitable for hollow-dependent fauna such as arboreal mammals, bats and birds. There are some logs present

from fallen branches and trees, which provide habitat for skinks, invertebrates and small mammals. However, large logs are noticeably absent in areas of woodland, as evident in many of the habitat hectare scores (Part 2 Appendix 2).

Many fence-lines and private roadsides within the study area are lined with planted trees and shrubs, including non-indigenous Eucalypts, **Cypress* spp, **Pinus* spp and European trees. While these areas do not hold the floristic diversity of remnant woodlands, they may offer food and shelter resources for fauna, including woodland birds and arboreal mammals (Bennett et al 2000).

Woodlands in the study area provide minimal but potential habitat for a number of threatened birds including Swift Parrot *Lathamus discolour* and Grey-headed Flying-fox *Pteropus poliocephalus.*

Wetlands (including surrounding vegetation)

The Cardinia Creek floodplain supports a number of wetland complexes in the east of the study area (Figure 3). Of these, the Hillcrest Christian College constructed wetlands, whilst offering good habitat values, are highly modified due to stock access, inappropriate rehabilitation efforts and water extraction for irrigation. Other wetlands, especially within 490 Soldiers road and 1/335 Grices road systems offer excellent indigenous habitat for wading birds, such as Black-winged Stilt *Himantopus himantopus*, due to their gently sloping banks. Other wetland birds including Little Pied Cormorant *Phalacrocorax melanoleucos*, Pacific Black Duck *Anas superciliosa* and Chestnut Teal *Anas castanea* were observed incidentally during threatened fauna searches within the wetland complexes (Appendix 4).

Farm dams throughout the study area also offer habitat of varying quality for significant fauna (Figure 3). Dams with fringing native vegetation offer high quality habitat for wetland birds and amphibians (Pizzey & Knight 2007; Hero et al 1991). Some dams hold little fringing vegetation due to impacts by stock and are therefore less valuable. However, these dams may also be utilised by wetland birds, including threatened species. All wetlands in the study area are potential habitat for birds, amphibians, reptiles and insects.

Dwarf Galaxias can populate wetlands such as those on the Cardinia Creek floodplain after flood events. The Cardinia Creek and the wetlands within the study area provide potential habitat for the species.

Drainage lines

An extensive network of drainage lines in the north-west of the study area are dominated by Tall Marsh EVC and provide excellent potential habitat for Glossy Grass Skink *Pseudemoia rawlinsoni*, Swamp Skink *Egernia coventryi* and a range of other reptiles, birds, amphibians and invertebrates. Southern Toadlet *Pseudophryne semimarmorata* was recorded within this drainage network. Drainage lines may also serve as migratory routes for Dwarf Galaxias.

Swamp Scrub

Remnant and regenerating Swamp Scrub within roadsides (Part 2 Figure 2) provides fauna habitat in many sections of the study area. Many roadsides are highly modified and do not meet DSE native vegetation cover thresholds in order to be determined to be a 'patch' of native vegetation (DSE 2004). Many of these roadside areas constitute a modified version of Swamp Scrub which is potential fauna habitat in many parts of the study area.

Roadsides of particular habitat significance within the study area include the southern section of Soldiers road, Pound road, Thompsons road and the western section of Grices road (Figure 3). All of these roadsides are potential habitat for Swamp Skink, Glossy Grass Skink and Southern Toadlet, in addition to a suite of other reptiles, amphibians, mammals, invertebrates and birds.

Other patches of roadside vegetation are dominated by exotic plantings and introduced shrubs such as Boxthorn **Lycium ferocissimum*. Exotic plantings and weed infestations such as Boxthorn thickets provide potential habitat for woodland birds and other ground dwelling and arboreal mammals.

Other roadsides in the study area are dominated by exotic grasses with occasional trees. These areas may support retiles and ground-dwelling mammals and are potentially important dispersal routes for fauna. Roadside drains are important for threatened species such Glossy Grass Skink, Southern Toadlet and Swamp Skink.

Farmland and exotic vegetation

Areas of farmland and exotic vegetation serve a less important role as habitat for most native species. However, Great Egret *Ardea alba* and Cape Barron Goose *Cereopsis novaehollandiae* were observed within the neighbouring *Precinct 16 – Cranbourne North (Stage 2)* in such habitats. These species were recorded in seasonally wet open fields, near drainage lines and in wetlands in the north of Precinct 16. A number of the more generalist bird species and raptors were recorded throughout farmland within the study area. Open farmland areas and open areas fringing vegetation are important hunting grounds for raptors such as Black-shouldered Kite *Elanus axillaris*, Whistling Kite *Haliastur sphenurus* and Nankeen Kestrel *Falco cenchroides* (Pizzey and Knight 2007).

The Southern Brown Bandicoot is also known to utilise areas of exotic vegetation on farms and within roadsides for feeding. Nesting sites of the Southern Brown Bandicoot have been observed under rubbish and material dumps in Cranbourne Botanic Gardens (McCaffrey & Legg 2007) and these types of habitats exist within the Precinct 13 study area. However, Southern Brown Bandicoot has a low likelihood of occurrence within the study area, due primarily to the limited occurrence of suitable habitat such as Heathy Woodland and Grassy Woodland EVCs, the distance from known populations, and the high incidence of Red Fox *Vulpes vulpes* within the study area.

There appears to be a high-presence of rabbits and foxes throughout this habitat, based on the amount of fresh scats.

13.3.1 Habitat Corridors

All of the Habitat Zones mapped in the study area achieved a score of ≤5 out of a possible 25 in the landscape component of the habitat hectare assessments. This low score range indicates that Habitat Zones within the study area are small in area and are distanced from surrounding native vegetation. The closest areas of significant remnant native vegetation are on the Cardinia Creek; listed as regional Biosite #6888 *Cardinia Creek (lower)* by DSE (2005b) and within the Officer Precinct to the north. The Cranbourne Botanic Gardens is approximately 7km to the south west and is also a listed Biosite (DSE 2005b).

While the study area has been substantially modified, sections continue to provide a useful connection to the surrounding areas such as the Cardinia Creek corridor to the north and south. Threatened species records located within lineal roadsides and drainage lines demonstrate that these species can persist and disperse through narrow and modified corridors. Habitat corridors such as these are therefore highly important for fauna within the study area.

13.4 Threatened species occurring or likely to occur

13.4.1 Threatened species recorded during the current assessment

Three state significant species; Glossy Grass Skink *Pseudemoia rawlinsoni*, Hardhead *Aythya australis* and Southern Toadlet *Pseudophryne semimarmorata*, were recorded within the study area during the current assessment (table 8). The significance of these records within the study area and species' habitat requirements are discussed below. A summary of threatened species recorded within the study area is presented in table 8.

Table 6. Threatened species recorded within the study area

Common Name	Scientific Name	Area Observed	Conservation Status			No. of individuals	Date
			EPBC	FFG	DSE (2007)		
Southern Toadlet	*Pseudophryne semimarmorata*	Thompson Road at western end (outside study area)			v	2	20/04/09
Glossy Grass Skink	*Pseudemoia rawlinsoni*	Soldiers Road at southern end			n	1	20/04/09
Glossy Grass Skink	*Pseudemoia rawlinsoni*	Grices Road at western end			n	2	22/04/09
Southern Toadlet	*Pseudophryne semimarmorata*	Pound Road along roadside in Swamp paperbark.			v	3	22/04/09
Southern Toadlet	*Pseudophryne semimarmorata*	1/335 Grices Road in drainage line			v	4	23/04/09
Hardhead	*Aythya australis*	Large dam on corner of Grices Road and Soldiers Road.(outside study area)			v	2	20/04/09
Hardhead	*Aythya australis*	Large dam on 490 Soldiers Rd			v	4	20/04/09

Codes for status within Victoria:

- v vulnerable in Victoria (DSE 2007)
- e endangered in Victoria (DSE 2007) or Australia (EPBC Act)
- n near threatened in Victoria (DSE 2007)
- L listed as threatened under FFG Act 1988
- I Invalid or ineligible under FFG Act 1988

Glossy Grass Skink

Glossy Grass Skink *Pseudemoia rawlinsoni is* listed as near threatened in DSE's *Advisory List of Threatened Vertebrate Fauna in Victoria* (DSE 2007). This species was recorded during targeted searches within the southern section of the Soldiers road reserve and the western section of the Grices road reserve (Figure 2). There is extensive habitat within many other drainage-lines and roadsides within the study area (Figure 3).

Glossy Grass Skink exists as a number of disjunct populations along the southern Australian coastline from south eastern South Australia to south eastern Victoria (Wilson and Swan 2003), including populations in the highlands of Victoria and south eastern New South Wales. Populations also exist on off shore islands and the north eastern coast of Tasmania (DPIWE 2002, Wilson and Swan 2003).

Glossy Grass Skink is a smooth scaled skink, it is a very shiny olive-green colour with two prominent cream dorsolateral stripes; males are approximately 50mm long and females reach up to 63mm (not including tail length) (DPIWE 2002; Wilson and Swan 2003). Glossy Grass Skink is found in wetlands and swampy habitats such as lake edges, salt-marsh and boggy creeks and is always associated with dense vegetation cover (DPIWE 2002, Wilson and Swan 2003).

Hardhead

Hardhead *Aythya australis* is listed as vulnerable in DSE's *Advisory List of Threatened Vertebrate Fauna in Victoria* (DSE 2007). Hardhead was recorded incidentally during targeted searches for threatened species by Practical Ecology within a large farm dam at 490 Soldiers road (Figure 2). Hardhead was also recorded within 25 metres of the study area in a large dam north of the study area, near the corner of Grices and Soldiers Roads, during the current assessment.

Wetlands and farm dams, especially those in the east of the study, offer excellent habitat for Hardhead. Any areas of open water area provide potential habitat (Figure 3). Hardhead was also recorded by Practical Ecology in 2008 during a separate ecological investigation within four kilometres west of the Precinct 13 study area, in wetlands near Thompsons road, Cranbourne East (Fairbridge & Appleby 2009).

Hardhead inhabits deep to shallow wetlands with open water and fringing emergent vegetation (Pizzey and Knight 2007). The species feeds by diving in deep water and occasionally by dabbling just under the water surface (Rogers 1990). Nests are built in thick vegetation such as reeds, lignum and cumbungi, usually over water (Rogers 1990; Halse et al. 2005). These birds are most common in the wetland systems of inland Australia (Halse et al. 2005). Birds visit Victoria from these areas in spring and summer, returning as the northern wetlands are replenished by rain (Halse et al. 2005). However, some birds are present in Victoria all year round depending on the suitability of wetland habitats (Pizzey and Knight 2007).

Southern Toadlet

Southern Toadlet *Pseudophryne semimarmorata* is listed as vulnerable in DSE's *Advisory List of Threatened Vertebrate Fauna in Victoria* (DSE 2007). Southern Toadlet was seen and heard during fauna survey for targeted species within the eastern section of Grices Road reserve and the central section of Pound road reserve by Malcolm Legg (Figure 2). Southern Toadlet was also recorded outside the study area approximately 100 metres south of Grices road reserve. Extensive habitat for this species is also found within drainage lines throughout the study area (Figure 3).

Southern Toadlet is a small frog of 22-32mm. The species has bright orange/yellow colouration on its throat, hind limbs and lower belly, and has a distinct band of black and white marbling on the belly. It occurs throughout southern Victoria, extending into South Australia and Tasmania (Wiltshire and Bull 1977, Hero et al. 1991). Southern Toadlet is found in a variety of habitats including grassland, shrubland, dry forest, woodland and heaths, it is a ground dwelling frog often found under leaf litter (Wiltshire and Bull 1977, Hero et al. 1991).

The Southern Toadlet is an autumn breeder and will spawn eggs into ponds, moist soaks or water-filled depressions (Hero et al. 1991). Tadpoles are aquatic and are found in ponds, flooded grasslands and areas where there is pooled water (Hero et al. 1991).

13.4.2 Significant fauna likely to occur within the study area

Thirty-three species of national, state or regional significance have been recorded within the local area (5km radius from the middle of the study area) or have been predicted to occur by DEWHA (2009a) (Appendix 5). Nineteen of these species are considered likely to have at least a low-medium likelihood to utilise the study area or find critical habitat within the study area. Species considered to have at least a medium likelihood of occurrence within the study area are discussed below. All species occurring or predicted to occur within 5km are briefly discussed in Appendix 5.

Swamp Skink *Egernia coventryi* was not recorded within 5km or predicted to occur by DEWHA (2009a), however, this species was targeted for survey during the current assessment due to the identification of suitable habitat within the study area. Swamp Skink is therefore included in the discussion of habitat requirements and past records for threatened species in section below.

Australasian Shoveler *Anas rhynchotis*

Australasian Shoveler occurs mainly on large well vegetated wetlands and lakes, occasionally including areas with saline waters. Populations are found in higher numbers on permanent, well-vegetated freshwater swamps with areas of open water (Rogers 1990). This species nest in grass nests on the ground, usually in dense cover and near water (Pizzey and Knight 2007).

Australian Shoveler has been assigned a high likelihood of occurrence within the study area. The species has been recorded 19 times from within five kilometres of the study area and was last recorded in 2005 according to the DSE's AVW (DSE 2007a). In addition, Australian Shoveler was recorded by Practical Ecology in 2008 during a separate ecological investigation within four kilometres west of the Precinct 13 study area, in wetlands near Thompsons road, Cranbourne East (Fairbridge & Appleby (2009).

Blue-billed Duck *Oxyura australis*

This species inhabits deep, permanent, well-vegetated swamps, but at times (especially in winter) may occur in large numbers on large open wetlands (Pizzey and Knight 2007). The Blue-billed Duck catches food while diving or occasionally by feeding from the water surface. Their nests are built on trampled swamp vegetation around the base of established stands of reeds and rushes, often over water or on small islands (Rogers 1990).

Blue-billed Duck has been assigned a medium likelihood of occurrence within the study area. The species has been recorded 20 times within five kilometres of the study area and of which the most recent was in 2002(DSE 2007a).

Cattle Egret *Ardea ibis*

Cattle Egret is a migratory species. Cattle Egret occurs in many types of wetlands; from tidal flats in estuaries and bays to the margins of inland lakes, swamps and rivers (Pizzey and Knight 2007). They also use farm dams, mangroves, flooded areas, and artificial wetlands created by irrigation. Cattle Egret are often seen foraging away from water in

crops and pasture, they build stick-nests in trees, usually surrounded by water or dense treed cover, or occasionally in reed-beds (O'Brien 1990). The species nests colonially, often with other waterbirds. Egrets have become threatened due to development and removal habitat used for nesting sites.

Cattle Egret has been assigned a medium-high likelihood of occurrence within the study area. A number of wetlands throughout the study area offer suitable habitat for Cattle Egret. This species was predicted to occur on DEWHA's *Protected Matters Search Tool* (DEWHA 2009).

Dwarf Galaxias *Galaxiella pusilla*

Dwarf Galaxias is a small (3-4cm) transparent fish with longitudinal stripes. The species is associated with sand, gravel and alluvium deposits and is typically found in shallow (less than 30cm deep) and still waters such as swamps, drains, and slow flowing sections of creeks and streams. The species is most often collected near the edge of pools, where aquatic vegetation is abundant (DEWHA 2009b).

Dwarf Galaxias can be found in seasonal water-bodies that may dry up partially or completely during summer which are replenished by rainfall or floodwaters from watercourses during the wetter months (DEWHA 2009b).

Dwarf Galaxias was last recorded within the study area in 1936 within Cardinia Creek. Dwarf Galaxias has been recorded at eleven locations within five kilometres north of the study area in the Cardinia Creek and associated wetlands on the Cardinia Creek floodplain (VAFD 2009). Ten of these records are unverified records of which nine records are located immediately north of the Pakenham bypass within two kilometres upstream of the study area. The nine unverified records are recent records recorded between 2003 and 2008.

Dwarf Galaxias has been assigned a medium likelihood of occurrence within the Cardinia Creek and associated wetlands within the study area.

Eastern Great Egret *Ardea modesta*

Eastern Great Egret is widespread in Australia and has been observed in a wide range of wetland habitats including swamps and marshes, margins of rivers and lakes, damp or flooded grasslands, pastures or agricultural lands, reservoirs, sewage treatment ponds, drainage channels, salt pans and salt lakes, salt marshes, estuarine mudflats, tidal streams, mangrove swamps, coastal lagoons and offshore reefs (DEWHA 2009).

Eastern Great Egret has been assigned a high likelihood of occurrence within the study area. The species has been recorded six times within five kilometres of the study area, of which the most recent was in 1985(DSE 2007a).

Freckled Duck *Stictonetta naevosa*

This species can occur on fresh water swamps, creeks, ponds, dams, reservoirs, sewage ponds and other ephemeral wetlands. It needs a thick cover of vegetation such as bulrush, lignum or tea-tree for nesting (Rogers 1990).

Freckled Duck has been assigned a medium likelihood of occurrence within the study area. The species has been recorded twice within five kilometres of the study area, of which the most recent was in 1985 (DSE 2005a).

Growling Grass Frog *Litoria raniformis*

This species often inhabits water bodies with a diverse assemblage of aquatic vegetation, including emergent species such as sedges *Gahnia* spp., submergent species such as curly pondweed *Potamageton* spp., floating species such as water ribbon *Triglochin* spp. and filamentous algae (Hamer and Organ 2006, Heard et al. 2004a). Aquatic vegetation provides sites for male frogs to call from, sites for eggs to be deposited and remain relatively safe during development, and for food and shelter for tadpoles. Dense submergent vegetation is especially important to protect eggs and tadpoles from predation (Heard et al. 2004).

Growling Grass Frog was targeted during searches within the wetland complex and farm dams at Hillcrest Christian College (PFI: 633479) and 1/335 Grices Road (PFI: 633477) and Cardinia Creek from Grices Road at the northern boundary of the precinct to the southern boundary of Hillcrest Christian College.

The wetlands at Hillcrest Christian College and slow flowing sections of the Cardinia Creek represent the moderate quality habitat within the study area. The Hillcrest Christian College wetlands closest to Cardinia Creek comprise some areas of submerged and emergent aquatic vegetation and represent moderate quality habitat compared to wetlands furthest from the Creek which are highly modified and lower habitat quality. Wetlands within Hillcrest Christian College are accessible to horses, which has restricted colonisation by indigenous aquatic and terrestrial flora which has therefore restricted the establishment of Growling Grass Frog habitat.

Other wetlands and waterways are mostly devoid of indigenous vegetation and generally not suitable for Growling Grass Frog. Farm dams in 2175 Smiths Lane (PFI: 52740865) and 490 Soldiers Road (PFI: 633478) are considered low quality habitat due to the absence of appropriate aquatic vegetation. All other farm dams within the study area are considered highly unlikely to support the species due to their habitat characteristics and distance from Cardinia Creek.

Growling Grass Frog has been assigned medium likelihood of occurrence within the study area and has been recorded 11 times within 5km of the study area, of which the most recent was 2005 (DSE 2005a). Growling Grass Frog habitat is considered to be of moderate quality within sections of the Cardinia Creek, within 5km of the study area (Costello et al 2003). This species is also predicted to occur by DEWHA (2009a).

Hardhead *Aythya australis*

Hardheads inhabit deep to shallow wetlands with open water and fringing emergent vegetation (Pizzey and Knight 2007). The species feeds by diving in deep water and occasionally by dabbling just under the water surface (Rogers 1990). Nests are built in thick vegetation such as reeds, Lignum and Cumbungi, usually over water (Rogers 1990; Halse et

al. 2005). These birds are most common in the wetland systems of inland Australia (Halse et al. 2005). Birds visit Victoria from these areas in spring and summer, returning as the northern wetlands are replenished by rain (Halse et al. 2005). However, some birds are present in Victoria all year round depending on the suitability of wetland habitats (Pizzey and Knight 2007).

Hardhead was recorded in a farm dam in the east of the study area during the current assessment (Figure 2). Hardhead was also recorded outside the study area in a large wetland within 100 meters of the study area, near the corner of Grices and Soldiers roads (Figure 2). Hardhead was recorded in 1965, 2004 and 2005 in the east of the study area (Figure 2).

Intermediate Egret *Ardea intermedia*

The Intermediate Egret occurs in the shallows of mainly grassy inland wetlands, flooded pastures or grasslands. They only occasionally visit coastal wetlands and are generally rare in Victoria. They are sometimes seen foraging in pastures with grazing cattle. This species builds platform nests which are built in trees in riverine forest, swamp woodland and mangroves (Pizzey and Knight 2007).

Intermediate Egret has been assigned a medium likelihood of occurrence within the study area. No records are listed on DSE's AVW within five kilometers (DSE 2005a). This species is predicted to occur by DEWHA (2009a).

Latham's Snipe *Gallinago hardwickii*

Latham's Snipe is a migratory species. The species migrates to Victoria from breeding grounds in Japan. In Victoria this species is widely distributed in a range of habits including heavily vegetated freshwater swamps, and pools or ditches in heaths or subalpine herblands (Pizzey and Knight 2007). Lathams's Snipe also occurs in small ephemeral wetlands such as wet depressions after floods recede. They generally roost in thick vegetation during the day, sometimes under shrubs away from wetlands, and will feed in swamps at night. They are occasionally seen feeding during the day. This species feeds by probing in soft mud and rarely moves far from concealing vegetation (Higgins and Davies 1996).

Latham's Snipe has been assigned a medium likelihood of occurrence within the study area. The species has been recorded 11 times within five kilometres of the study area, of which the most recent was in 2004 (DSE 2005a).

Musk Duck *Biziura lobata*

Musk Duck is usually seen in small numbers on the deep waters of well vegetated fresh to saline lakes, swamps and occasionally shallow inlets and bays. Nests are formed in low vegetation in areas sheltered by surrounding vegetation (Pizzey and Knight 2007).

Musk Duck has been assigned a medium likelihood of occurrence within the study area. The species has been recorded three times within five kilometres of the study area, of which the most recent was in 1992 (DSE 2005a).

Pied Cormorant *Phalacrocorax varius*

This species is most often found along the coast, however Pied Cormorant are also known to use inland wetlands including billabongs, deep and open swamps and rivers (large freshwater and saline wetlands). They nest in colonies, building platforms nests in mangroves or other trees (Pizzey and Knight 2007).

Pied Cormorant has been assigned a high likelihood of occurrence within the study area. The species has been recorded twice within five kilometres of the study area, of which the most recent was in 1997, including one record of within 100 meters (DSE 2005a).

Royal Spoonbill *Platalea regia*

The Royal Spoonbill inhabits the shallow parts of fresh and saline wetlands; these birds are gregarious and are often found in small flocks. They are mostly common on intertidal mudflats in coastal bays. Their stick-nests are built in reeds, shrubs or trees, singly or in loose colonies and are often seen with other species (Rogers 1990).

Royal Spoonbill was recorded within the study area in 1997 (DSE 2005a). Royal spoonbill has been assigned a medium-high likelihood of occurrence within the study area. The species has been recorded six times within five kilometres of the study area, of which the most recent was in 2001 (DSE 2005a).

Southern Toadlet *Pseudophryne semimarmorata*

The Southern Toadlet can be found in dry forest, woodland, shrubland, grassland and heaths. It shelters under leaf litter and other debris in moist soaks and depressions. Their eggs are spawned in shallow burrows under organic litter in low areas close to water (Hero et al. 1991).

Southern Toadlet was recorded within the study area during the current assessment. The species was also recorded within the study area in 1965. The species has been recorded six times within five kilometres of the study area, of which the most recent was in 2001 (DSE 2005a).

Spotted Harrier *Circus assimilis*

Spotted Harrier occurs in open grasslands, open shrublands, saltbush, open woodlands, crops and similar low vegetation that allows for hunting. Their stick nests are built in low trees (Pizzey and Knight 2007).

Spotted Harrier has been assigned a medium likelihood of occurrence within the study area. The species has been recorded twice within five kilometres of the study area, of which the most recent was in 2004 (DSE 2005a).

Swamp Skink *Egernia coventryi*

Swamp Skink is found along the southern coastline from south eastern South Australia to south eastern Victoria (Wilson and Swan 2003). Swamp Skink is a smooth scaled skink, it is very shiny, with highly variable markings; the skinks reach up to 100mm (not including tail

length) (Wilson and Swan 2003). The Swamp Skink is found in wetlands and swampy habitats such as tea-tree thickets and tidal salt marsh; it is always associated with dense vegetation cover (Wilson and Swan 2003). It lives in burrows and is a secretive species (Wilson and Swan 2003).

A recent study undertaken by Homan (2006) has recorded Swamp Skinks in weed-infested, non-swampy habitats, which suggest many areas of roadside and modified drainage-lines including roadside gutters within the study area are potential habitat for the species, providing that core habitat, such as Swamp Scrub EVC or Riparian Scrub EVC is located nearby (Homan 2006).

Swamp Skink has been assigned a low-medium likelihood of occurrence within the study area. The species has not been recorded within five kilometres by DSE (2005a) and has not been predicted to occur by DEWHA (2009a).

Swift Parrot *Lathamus discolor*

Swift Parrot is a winter migrant to Victoria (Swift Parrot Recovery Team 2001) from their breeding areas in Tasmania, however small numbers of non-breeding birds may remain here during summer (Higgins 1999, Swift Parrot Recovery Team 2001). They are nomadic, and follow the flowering of trees and psyllid infestations. In Victoria their distribution is centred on box-ironbark forests, but they are often seen in town parks and occur sporadically elsewhere in dry forests, dry woodlands and wooded farmlands but are seldom seen in treeless areas, rainforests or wet forests (Higgins 1999, Pizzey and Knight 2007). They feed mainly in winter-flowering plants in Victoria, especially Red Ironbarks and ornamental trees and shrubs (Higgins 1999, Swift Parrot Recovery Team 2001). 'Non-indigenous Eucalypts have been defined as "Woodland Habitat for threatened species' in Fauna Figure 3 in recognition of the potential for Swift Parrot to utilise this habitat within the study area.

Swift Parrot has been assigned a medium likelihood of occurrence within the study area. The species has been recorded three times within five kilometres of the study area, of which the most recent was in 1989 (DSE 2005a). This species is also predicted to occur by DEWHA (2009a).

White-throated Needletail *Hirundapus caudacutus*

White Throated Needletail is a migratory species. It is almost entirely aerial and occurs over many types of habitat (Pizzey and Knight 2007).

White-throated Needletail has been assigned a high likelihood of occurrence within the study area. No records are listed on DSE's AVW within five kilometers (DSE 2005a). The species is however, predicted to occur by DEWHA (2009a).

13.5 Relevant Policy and Legislation

The following section explores the two primary *Acts* pertaining to native fauna from national level and state jurisdictions.

Environment Protection and Biodiversity Conservation Act 1999

The *EPBC Act 1999* applies to sites where proposed developments or projects may have a *significant impact* on *matters of National environmental significance*.

Under the EPBC Act, the proponent must refer proposed actions that may require approval, to the Commonwealth Environment Minister. The Minister then decides which assessment and reporting option is applied. The Minister may approve a 'controlled action' allowing the development to proceed provided conditions are applied to mitigate significant impacts protected by this act.

Using the DEWHA's *Protected Matters Search Tool* (DEWHA 2009), 12 threatened species of national significance were predicted to occur within a 5km radius from the centre of the study area (Table 3). Seven EPBC listed species were recorded within 5km of the study area on DSE's AVW (DSE 2007). No listed threatened species or communities were recorded during this survey. Three threatened species; listed under the EPBC Act 1999 have been recorded within five kilometres of the study area (Table 3).

Nine species listed as either migratory or threatened under the *EPBC Act 1999* were assessed as having at least low-medium likelihood of occurrence within the study area (Section 4.2).

Any proposals for rezoning (or associated development) of the precinct need consider the potential impact on nationally significant fauna predicted to have at least a low-medium likelihood of occurrence, and those that have been recorded within five kilometres of the study area. Given that there are five EPBC listed species with at least medium likelihood of occurrence of five EPBC listed species to utilise the study area, proposed rezoning would likely trigger a referral to DEWHA under the EPBC Act 1999.

Flora and Fauna Guarantee Act 1988

The *FFG Act 1988* was legislated to ensure the continued survival of all Victorian species of flora and fauna and all Victorian communities of plants and animals. A key component of the FFG Act is to ensure the sustainable use of flora and fauna resources whether they are threatened or not.

The FFG Act lists:

- threatened species of flora and fauna
- threatened communities of flora and fauna

- protected flora
- potentially threatening processes.

No species listed under the *FFG Act 1988* were recorded during the current assessment. There are also no listed threatened communities known to occur within the study area. One species, Blue-billed Duck *Oxyura australis* was recorded within the study area in 1998 (DSE 2005a).

Nine FFG listed species were assessed as having at least low-medium likelihood of occurrence within the study area (Section 4.4) (Appendix 5). One species, Eastern Great Egret *Ardea modesta* is considered to have a high likelihood of occurrence. Five of the nine FFG species likely to occur are also EPBC-listed (Appendix 5).

14. FAUNA CONCLUSION

Clyde North currently supports at least three threatened fauna species and has the potential to support numerous other threatened species, including a suite of threatened wetland birds. Further survey at appropriate times of the year would provide a better understanding of threatened species presence within the study area.

Habitat for threatened species is confined primarily to roadsides, wetlands, drainage lines and the Cardinia Creek riparian corridor within the study area. Large areas of agricultural land within the study area have limited habitat value for fauna, with the exception of pasture near existing drainage lines and wetlands, which may serve as foraging grounds for wetland birds (Marchant and Higgins 1990).

It is estimated that about 7% of former native vegetation remains within the City of Casey, of which a significant proportion has been highly modified (McMillan et al. 2003). Patterns of vegetation clearance within the study area are consistent with those undertaken historically throughout the City of Casey, whereby, the majority of the study area has been cleared and remaining native vegetation has been modified to varying degrees. All remnant vegetation and all remaining habitat, both indigenous and non-indigenous, is therefore significant as a local source of biodiversity.

Indigenous habitat within the study area comprises Swamp Scrub (found on roadsides and drainage lines, and within the Cardinia Creek floodplain and riparian corridor), Swampy Riparian Woodland (along the Cardinia Creek riparian corridor), wetland EVCs (in natural and constructed wetlands within the Cardinia Creek floodplain and along some drainage lines), and small patches of Grassy Woodland (at scattered sites within farm paddocks) (Figure 3).

Non-indigenous habitat comprises planted non-indigenous Eucalypts and other established tree species along fence-lines and roadsides (Figure 3). In addition, some drainage lines and roadsides are dominated by exotic vegetation which serves as habitat, including habitat for threatened wetland birds and amphibians (Figure 3). Established trees, especially Eucalypts should be retained for their value as habitat for threatened woodland birds. All other areas of habitat, both indigenous and non-indigenous should also be retained.

Wetlands within the study area are particularly important areas of faunal habitat, including habitat for threatened wetland birds.

Roadsides are also particularly important high priority retention areas, given the occurrence of Southern Toadlet and Glossy Grass Skink within roadside habitats, including within sites not mapped as meeting DSE (2004) cover thresholds for native vegetation. Given the occurrence of threatened species within these highly modified habitats, and the frequent occurrence of similar habitats throughout roadsides in the study area, roadsides are highly likely to be serving as dispersal corridors for a range of species, including threatened species that occur within the study area.

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Fauna Appendix 1. Methodology for Defining Significance

This section outlines the assessment methods or criteria used to determine the significance of species, plant communities, fauna habitats and sites. Criteria are consistent with government policies, legislation and publications.

Fauna

The level of significance for fauna species is determined according to the definitions below:

International Significance	Migratory species protected under international treaties (JAMBA, CAMBA, ROKAMBA and Bonn) or listed on the IUCN Red Data List 2006 as threatened
National Significance	Species listed under the *Environment Protection and Biodiversity Conservation Act 1999* as extinct, extinct in the wild, critically endangered, endangered or vulnerable.
State Significance	Species listed as Threatened under Schedule 2 of Victoria's *Flora and Fauna Guarantee Act 1988* Species listed as extinct, critically endangered, endangered, vulnerable in Victoria *Advisory List of Threatened Vertebrate Fauna in Victoria – 2007* (DSE 2007)
Regional Significance	Species listed as data deficient or near threatened in Victoria *Advisory List of Threatened Vertebrate Fauna in Victoria – 2007* (DSE 2007)
Local Significance	Species considered rare, threatened or uncommon within the local area (5km radius from the study area) by the authors with consideration given to previous studies. Many native species are considered to be locally significant within urban areas due to typically high levels of habitat alteration.

Fauna Appendix 2. Threatened species recorded during the current assessment

Clyde North study area assessment period: 20/2/2009 to 30/4/2009. Fauna taxa recorded within the study area during this survey by Malcolm Legg of Mal's Ecological and Environmental Services and Joanne North, Joanne henry and Michael Reynolds of Practical Ecology.

Common Name	Scientific Name	Area Observed	Conservation Status			Number of individuals	Date	Time	Weather Conditions	GPS coordinates	Type of record
			EPBC	FFG	DSE (2007)						
Southern Toadlet	*Pseudophryne semimarmorata*	Thompson Road at western end (outside study area)			v	2	20/04/09	10.11am	Sunny around 24'C	38*05'34.590"S 145*21'246.500"E	Seen/heard
Glossy Grass Skink	*Pseudemoia rawlinsoni*	Soldiers Road at southern end			n	1	20/04/09	10.56am	Sunny around 24'C	38*05'31.140"S 145*22'06.852"E	Trapped/ handheld
Glossy Grass Skink	*Pseudemoia rawlinsoni*	Grices Road at western end			n	2	22/04/09	09.22am	Sunny around 22'C	38*04'30.816"S 145*20'28.500"E	Trapped/ handheld
Southern Toadlet	*Pseudophryne semimarmorata*	Pound Road along roadside in Swamp paperbark.			v	3	22/04/09	10.45am	Sunny around 22'C	38*04'55.758"S 145*20'33.936"E	Seen/heard
Southern Toadlet	*Pseudophryne semimarmorata*	1/335 Grices Road in drainage line			v	4	23/04/09	11.46am	Sunny around 23'C	30*04'45.246"S 145*22'24.192"E	Seen/heard
Hardhead	*Aythya australis*	Large dam on corner of Grices Road and Soldiers Road.			v	2	20/04/09	10.34am	Sunny 19'C	38*04'39.438"S 145* 21'40.638"E	Seen/heard
Hardhead	*Aythya australis*	Large dam on 490 Soldiers Rd			v	4	21/4/2009	9.56 am	Overcast 15*C	38 04 57.100 S 145 22 16.100 E	Seen/heard

Codes for DSE (2007) Conservation Status

- v vulnerable in Victoria (DSE 2007)
- e endangered in Victoria (DSE 2007) or Australia (EPBC Act)
- n near threatened in Victoria (DSE 2007)

Fauna Appendix 3. Fauna recorded during the current assessment

Clyde North study area assessment period: 20/2/2009 to 30/4/2009. Fauna taxa recorded incidentally and during targeted searches for threatened searches from within the study area during this survey by Malcolm Legg of Mal's Ecological and Environmental Services and Joanne North, Joanne henry and Michael Reynolds of Practical Ecology.

Common Name	Scientific Name	Conservation Status			
		EPBC	FFG	DSE (2007)	Conservation significance
AMPHIBIANS					
Banjo Frog	*Limnodynastes dumerilii*				Local
Common Froglet	*Crinia signifera*				Local
Southern Brown Tree Frog	*Litoria ewingii*				Local
Southern Toadlet	*Pseudophryne semimarmorata*			v	State
Spotted Marsh Frog	*Limnodynastes tasmaniensis*				Local
Striped Marsh Frog	*Limnodynastes peroni*				Local
Whistling Treefrog	*Litoria verreauxii*				Local
REPTILES					
Common Long-necked Tortoise	*Chelodina longicollis*				Local
Glossy Grass Skink	*Pseudemoia rawlinsoni*			n	State
Lowland Copperhead	*Austrelaps superbus*				Local
BIRDS					
Australasian Grebe	*Tachybaptus novaehollandiae*				Local
Australian Magpie	*Gymnorhina tibicen*				Local
Australian Raven	*Corvus coronoides*				Local
Australian Wood Duck	*Chenonetta jubata*				Local
Black Swan	*Cygnus atratus*				Local
Black-fronted Dotterel	*Elseyorinis melanops*				Regional
Black-winged Stilt	*Himantopus himantopus*				Regional
Brown Falcon	*Falco berigora*				Local
Brown Goshawk	*Accipiter fasciatus*				Local
Brown Thornbill	*Acanthiza pusilla*				Local
Chestnut Teal	*Anas castanea*				Local
Common Blackbird	**Turdus merula*				
Common Myna	**Acridotheres tristis*				
Common Starling	**Sturnus vulgaris*				
Crested Pigeon	*Ocyphaps lophotes*				Local
Dusky Moorhen	*Gallinula tenebrosa*				Local
Eastern Rosella	*Platycercus eximius*				Local
Eastern Spinebill	*Acanthorhynchus tenuirostris*				Local
Eastern Yellow Robin	*Eopsaltria australis*				Regional
Eurasian Coot	*Fulica atra*				Local
European Goldfinch	**Carduelis carduelis*				
Flame Robin	*Petroica phoenicea*				Regional
Galah	*Eolophus roseicapillus*				Local
Golden Whistler	*Pachycephala pectoralis*				Local
Grey Butcherbird	*Cracticus torquatus*				Local
Grey Fantail	*Rhipidura fuliginosa*				Local
Grey Shrike Thrush	*Colluricincla harmonica*				Local
Hardhead	*Aythya australis*			v	State
Laughing Kookaburra	*Dacelo novaehollandiae*				Local
Little Corella	*Cacatua sanguinea*				Local
Little Pied Cormorant	*Phalacrocorax melanoleucos*				Local
Little Raven	*Corvus mellori*				Local
Magpie-lark	*Grallina cyanoleura*				Local
Masked Lapwing	*Vanellus miles*				Local
Musk Lorikeet	*Glossopsitta concinna*				Regional
Musk Lorikeet	*Glossopsitta concinnia*				Local
Nankeen Kestrel	*Falco cenchroides*				Local

Common Name	Scientific Name	Conservation Status EPBC	FFG	DSE (2007)	Conservation significance
New Holland Honeyeater	*Phylidonyris novaehollandiae*				Local
Noisy Miner	*Manorina melanocephala*				Local
Pacific Black Duck	*Anas supoerciliosa*				Local
Rainbow Lorikeet	*Trichoglossus haematodus*				Local
Red Wattlebird	*Anthochaera carunculata*				Local
Red-browed Finch	*Neochmia temporalis*				Local
Rock Dove	**Columba livia*				
Rufous Whistler	*Pachycephala rufiventris*				Local
Silvereye	*Zosterops lateralis*				Local
Skylark	**Alauda arvensis*				
Spotted Pardalote	*Pardalotus punctatus*				Local
Spotted Turtle-Dove	**Streptopelia chinensis*				
Straw-necked Ibis	*Threskiornis spinicollis*				Local
Sulphur-crested Cockatoo	*Cacatua galerita*				Local
Superb Fairy-wren	*Malurus cyaneus*				Local
Tawny Frogmouth	*Podargus strigoides*				Local
Wedge-tailed Eagle	*Aquila audax*				Local
Welcome Swallow	*Hirundo neoxena*				Local
White-browed Scrubwren	*Sericornis frontalis*				Local
White-faced Heron	*Egretta novaehollandiae*				Local
White-napped Honeyeater	*Melithreptus lunatus*				Local
White-necked Heron	*Ardea pacifica*				Local
Willy Wagtail	*Rhipidura leucophrys*				Local
Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*				Local
INVERTEBRATES					
Backswimmers	Order Hemiptera > Sub Order Heteroptera				Local
Aquatic beetle	Order Coleoptera				Local
Aquatic stick insect	Order Phasmatodea				Local
Dragonfly	Order > Odonata Sub Order > Anisoptera				Local
Mayfly	Order Ephemeroptera				Local
FISH					
Common Galaxias	*Galaxias maculatus*				Local
Mosquito Fish	*Gambusia holbrooki				
MAMMALS					
Brushtail Possum	*Trichosurus vulpecula*				Local
Common Ringtail Possum	*Pseudocheirus peregrinus*				Local
European Rabbit	**Oryctolagus cunniculus*				
Feral Cat	**Felis catus*				
House Mouse	**Mus musculus*				
Red Fox	**Vulpes vulpes*				
Short-beaked Echidna	*Tachyglossus aculeatus*				Regional
Swamp Rat	*Rattus lutreolus ssp. Lutreolus*				Regional
White-striped Freetail Bat	*Tadarida australis*				Local

Table key:

Conservation status

- v vulnerable in Victoria (DSE 2007) and Australia (EPBC Act)
- e endangered in Victoria (DSE 2007) and Australia (EPBC Act)
- n near threatened in Victoria (DSE 2007)
- L listed as threatened under FFG Act 1988
- I Invalid or ineligible under FFG Act 1988
- * introduced species

Fauna Appendix 4. Fauna records during the current assessment: Property Records

Clyde North study area assessment period: 20/2/2009 to 30/4/2009. Fauna taxa recorded incidentally and during targeted searches for threatened searches from within the study area during this survey by Malcolm Legg of Mal's Ecological and Environmental Services and Joanne North, Joanne henry and Michael Reynolds of Practical Ecology.

This Appendix presents records for individual properties within the study area.

Site 1- Thompson Road-Road Reserve

Site 1- Thompson Road-Road Reserve

Common Name	Scientific Name	Conservation status within site.
AMPHIBIANS		
Common Froglet	*Crinia signifera*	Uncommon
Southern Toadlet	*Pseudophryne semimarmorata*	Rare
BIRDS		
Australian Magpie	*Gymnorhina tibicen*	Uncommon
Australian Raven	*Corvus coronoides*	Common
Brown Thornbill	*Acanthiza pusilla*	Common
Common Blackbird	**Turdus merula*	Common
Common Myna	**Acridotheres tristis*	Common
Common Starling	**Sturnus vulgaris*	Common
Eastern Rosella	*Platycercus eximius*	Common
European Goldfinch	**Carduelis carduelis*	Uncommon
Galah	*Eolophus roseicapillus*	Uncommon
Grey Butcherbird	*Cracticus torquatus*	Uncommon
Laughing Kookaburra	*Dacelo novaehollandiae*	Uncommon
Little Raven	*Corvus mellori*	Uncommon
Magpie-lark	*Grallina cyanoleura*	Common
Masked Lapwing	*Vanellus miles*	Uncommon
Nankeen Kestrel	*Falco cenchroides*	Rare
Noisy Miner	*Manorina melanocephala*	Common
Pacific Black Duck	*Anas supoerciliosa*	Uncommon
Rainbow Lorikeet	*Trichoglossus haematodus*	Common
Red Wattlebird	*Anthochaera carunculata*	Common
Skylark	**Alauda arvensis*	Uncommon
Spotted Pardalote	*Pardalotus punctatus*	Uncommon
Spotted Turtle-Dove	**Streptopelia chinensis*	Common
Straw-necked Ibis	*Threskiornis spinicollis*	Uncommon
Sulphur-crested Cockatoo	*Cacatua galerita*	Common
Superb Fairy-wren	*Malurus cyaneus*	Common
Welcome Swallow	*Hirundo neoxena*	Uncommon
White-browed Scrubwren	*Sericornis frontalis*	Common
Willy Wagtail	*Rhipidura leucophrys*	Uncommon
Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*	Common
MAMMALS		
Common Ringtail Possum	*Pseudocheirus peregrinus*	Uncommon
Swamp Rat	*Rattus lutreolus ssp. Lutreolus*	Rare
INTRODUCED MAMMALS		
Red Fox	**Vulpes vulpes*	Common

Site 2- Pound Road-Road Reserve

Common Name	Scientific Name	Conservation status within site.
AMPHIBIANS		
Southern Toadlet	*Pseudophryne semimarmorata*	Rare
BIRDS		
Australian Magpie	*Gymnorhina tibicen*	Common
Australian Raven	*Corvus coronoides*	Common

Brown Falcon	*Falco berigora*	Rare
Brown Thornbill	*Acanthiza pusilla*	Common
Common Blackbird	**Turdus merula*	Common
Common Myna	**Acridotheres tristis*	Common
Common Starling	**Sturnus vulgaris*	Common
Eastern Rosella	*Platycercus eximius*	uncommon
Galah	*Eolophus roseicapillus*	Uncommon
Grey Butcherbird	*Cracticus torquatus*	Uncommon
Grey Fantail	*Rhipidura fuliginosa*	Common at times
Little Raven	*Corvus mellori*	Uncommon
Magpie-lark	*Grallina cyanoleura*	Common
Masked Lapwing	*Vanellus miles*	Uncommon
Noisy Miner	*Manorina melanocephala*	Common
Rainbow Lorikeet	*Trichoglossus haematodus*	Uncommon
Red Wattlebird	*Anthochaera carunculata*	Uncommon
Silvereye	*Zosterops lateralis*	Uncommon
Spotted Turtle-Dove	**Streptopelia chinensis*	Common
Sulphur-crested Cockatoo	*Cacatua galerita*	Uncommon
Superb Fairy-wren	*Malurus cyaneus*	Common
Welcome Swallow	*Hirundo neoxena*	Uncommon
White-browed Scrubwren	*Sericornis frontalis*	Common
Willy Wagtail	*Rhipidura leucophrys*	Uncommon
Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*	Uncommon
MAMMALS		
Swamp Rat	*Rattus lutreolus ssp. Lutreolus*	Uncommon
INTRODUCED MAMMALS		
Red Fox	**Vulpes vulpes*	Common
Feral Cat	**Felis catus*	Uncommon
European Rabbit	**Oryctolagus cunniculus*	Uncommon

Site 3- 1/1275 – Pound Road

Common Name	Scientific Name	Conservation status within site.
AMPHIBIANS		
Common Froglet	*Crinia signifera*	Uncommon
BIRDS		
Australian Magpie	*Gymnorhina tibicen*	Common
Australian Raven	*Corvus coronoides*	Common
Brown Thornbill	*Acanthiza pusilla*	Uncommon
Common Blackbird	**Turdus merula*	Uncommon
Common Myna	**Acridotheres tristis*	Common
Common Starling	**Sturnus vulgaris*	Common
Eastern Rosella	*Platycercus eximius*	Uncommon
European Goldfinch	**Carduelis carduelis*	Uncommon
Galah	*Eolophus roseicapillus*	Uncommon
Grey Butcherbird	*Cracticus torquatus*	Uncommon
Laughing Kookaburra	*Dacelo novaehollandiae*	Uncommon
Magpie-lark	*Grallina cyanoleura*	Common
Masked Lapwing	*Vanellus miles*	Uncommon
Nankeen Kestrel	*Falco cenchroides*	Rare
Noisy Miner	*Manorina melanocephala*	Common
Pacific Black Duck	*Anas supoerciliosa*	Uncommon
Rainbow Lorikeet	*Trichoglossus haematodus*	Uncommon
Red Wattlebird	*Anthochaera carunculata*	Uncommon
Skylark	**Alauda arvensis*	Uncommon
Spotted Pardalote	*Pardalotus punctatus*	Uncommon
Spotted Turtle-Dove	**Streptopelia chinensis*	Common
Straw-necked Ibis	*Threskiornis spinicollis*	Uncommon
Sulphur-crested Cockatoo	*Cacatua galerita*	Uncommon
Superb Fairy-wren	*Malurus cyaneus*	Uncommon
Welcome Swallow	*Hirundo neoxena*	Common
White-browed Scrubwren	*Sericornis frontalis*	Uncommon

Willy Wagtail	*Rhipidura leucophrys*	Uncommon
Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*	Uncommon
MAMMALS		
Common Ringtail Possum	*Pseudocheirus peregrinus*	Uncommon
INTRODUCED MAMMALS		
Red Fox	**Vulpes vulpes*	Uncommon

Site 4- Soldiers Road- Road Reserve.

Common Name	Scientific Name	Conservation status within site.
AMPHIBIANS		
Common Froglet	*Crinia signifera*	Uncommon
REPTILES		
Glossy Grass Skink	*Pseudemoia rawlinsoni*	Rare
BIRDS		
Australian Magpie	*Gymnorhina tibicen*	Common
Australian Raven	*Corvus coronoides*	Uncommon
Common Blackbird	**Turdus merula*	Uncommon
Common Myna	**Acridotheres tristis*	Common
Common Starling	**Sturnus vulgaris*	Common
Crested Pigeon	*Ocyphaps lophotes*	Uncommon
Eastern Rosella	*Platycercus eximius*	Uncommon
Galah	*Eolophus roseicapillus*	Uncommon
Grey Butcherbird	*Cracticus torquatus*	Uncommon
Little Raven	*Corvus mellori*	Uncommon
Magpie-lark	*Grallina cyanoleura*	Common
Noisy Miner	*Manorina melanocephala*	Uncommon
Pacific Black Duck	*Anas supoerciliosa*	Uncommon
Rainbow Lorikeet	*Trichoglossus haematodus*	Uncommon
Spotted Pardalote	*Pardalotus punctatus*	Uncommon
Spotted Turtle-Dove	**Streptopelia chinensis*	Uncommon
Sulphur-crested Cockatoo	*Cacatua galerita*	Uncommon
Welcome Swallow	*Hirundo neoxena*	Uncommon
Willy Wagtail	*Rhipidura leucophrys*	Uncommon
Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*	Uncommon
INTRODUCED MAMMALS		
Red Fox	**Vulpes vulpes*	Common
Feral Cat	**Felis catus*	Common

Site 5- Hillcrest Christian College Soldiers Road

Common Name	Scientific Name	Conservation status within site.
AMPHIBIANS		
Banjo Frog	*Limnodynastes dumerilii*	
Common Froglet	*Crinia signifera*	Common
Southern Brown Tree Frog	*Litoria ewingii*	Uncommon
Spotted Marsh Frog	*Limnodynastes tasmaniensis*	
Striped Marsh Frog	*Limnodynastes peroni*	
REPTILES		
Common Long-necked Tortoise	*Chelodina longicollis*	Rare
Lowland Copperhead	*Austrelaps superbus*	Rare
BIRDS		
Australasian Grebe	*Tachybaptus novaehollandiae*	Uncommon
Australian Magpie	*Gymnorhina tibicen*	Common
Australian Raven	*Corvus coronoides*	Common
Australian Wood Duck	*Chenonetta jubata*	Common
Black-winged Stilt	*Himantopus himantopus*	Rare
Brown Thornbill	*Acanthiza pusilla*	Common
Chestnut Teal	*Anas castanea*	Uncommon
Common Blackbird	**Turdus merula*	Common
Common Myna	**Acridotheres tristis*	Common
Common Starling	**Sturnus vulgaris*	Common

Crested Pigeon	*Ocyphaps lophotes*	Uncommon
Dusky Moorhen	*Gallinula tenebrosa*	Uncommon
Eastern Rosella	*Platycercus eximius*	Uncommon
Eastern Spinebill	*Acanthorhynchus tenuirostris*	Uncommon
Galah	*Eolophus roseicapillus*	Uncommon
Golden Whistler	*Pachycephala pectoralis*	Uncommon
Grey Butcherbird	*Cracticus torquatus*	Uncommon
Grey Fantail	*Rhipidura fuliginosa*	Common at times
Grey Shrike Thrush	*Colluricincla harmonica*	Rare
Laughing Kookaburra	*Dacelo novaehollandiae*	Uncommon
Little Corella	*Cacatua sanguinea*	
Little Pied Cormorant	*Phalacrocorax melanoleucos*	Rare
Little Raven	*Corvus mellori*	Uncommon
Magpie Lark	*Grallina cyanoleuca*	
Magpie-lark	*Grallina cyanoleura*	Common
Masked Lapwing	*Vanellus miles*	Uncommon
New Holland Honeyeater	*Phylidonyris novaehollandiae*	Uncommon
Noisy Miner	*Manorina melanocephala*	Common
Pacific Black Duck	*Anas supoerciliosa*	Uncommon
Rainbow Lorikeet	*Trichoglossus haematodus*	Uncommon
Red Wattlebird	*Anthochaera carunculata*	Common
Rock Dove	*Columba livia*	
Silvereye	*Zosterops lateralis*	Uncommon
Spotted Turtle-Dove	**Streptopelia chinensis*	Common
Straw-necked Ibis	*Threskiornis spinicollis*	Uncommon
Sulphur-crested Cockatoo	*Cacatua galerita*	Uncommon
Superb Fairy-wren	*Malurus cyaneus*	Uncommon
Welcome Swallow	*Hirundo neoxena*	Common
White-browed Scrubwren	*Sericornis frontalis*	Uncommon
Willy Wagtail	*Rhipidura leucophrys*	Uncommon
Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*	
INVERTEBRATES		
Backswimmers	Order Hemiptera > Sub Order Heteroptera	
Mayfly	Order Ephemeroptera	
Aquatic beetle	Order Coleoptera	
Dragonfly	Order > Odonata Sub Order > Anisoptera	
Aquatic stick insect	Order Phasmatodea	
FISH		
Common Galaxias	*Galaxias maculatus*	
*Mosquito Fish	*Gambusia holbrooki*	
MAMMALS		
Brushtail Possum	*Trichosurus vulpecula*	
Common Ringtail Possum	*Pseudocheirus peregrinus*	Uncommon
House Mouse	*Mus musculus*	
Short-beaked Echidna	*Tachyglossus aculeatus*	Rare
Swamp Rat	*Rattus lutreolus ssp. Lutreolus*	Uncommon
White-striped Freetail Bat	*Tadarida australis*	
INTRODUCED MAMMALS		
Red Fox	**Vulpes vulpes*	Common
Feral Cat	**Felis catus*	Uncommon
European Rabbit	**Oryctolagus cunniculus*	Uncommon

Site 6- 490 Soldiers Road

Common Name	Scientific Name	Conservation status within site.
AMPHIBIANS		
Common Froglet	*Crinia signifera*	Common
Southern Brown Treefrog	*Litoria ewingii*	
Southern Toadlet	*Pseudophryne semimarmorata*	Rare
Whistling Treefrog	*Litoria verreauxii*	

REPTILES		
Common Long-necked Tortoise	*Chelodina longicollis*	Uncommon
BIRDS		
Australasian Grebe	*Tachybaptus novaehollandiae*	Uncommon
Australian Magpie	*Gymnorhina tibicen*	Common
Australian Raven	*Corvus coronoides*	Common
Australian Wood Duck	*Chenonetta jubata*	Common
Black-winged Stilt	*Himantopus himantopus*	Rare
Brown Thornbill	*Acanthiza pusilla*	Uncommon
Chestnut Teal	*Anas castanea*	Uncommon
Common Blackbird	**Turdus merula*	Common
Common Myna	**Acridotheres tristis*	Common
Common Starling	**Sturnus vulgaris*	Common
Crested Pigeon	*Ocyphaps lophotes*	Uncommon
Eastern Rosella	*Platycercus eximius*	Uncommon
Eurasian Coot	*Fulica atra*	Uncommon
Galah	*Eolophus roseicapillus*	Uncommon
Grey Butcherbird	*Cracticus torquatus*	Uncommon
Grey Fantail	*Rhipidura fuliginosa*	Common at times
Laughing Kookaburra	*Dacelo novaehollandiae*	Uncommon
Little Pied Cormorant	*Phalacrocorax melanoleucos*	Rare
Magpie-lark	*Grallina cyanoleura*	Common
Masked Lapwing	*Vanellus miles*	Uncommon
Noisy Miner	*Manorina melanocephala*	Common
Pacific Black Duck	*Anas supoerciliosa*	Uncommon
Rainbow Lorikeet	*Trichoglossus haematodus*	Uncommon
Red Wattlebird	*Anthochaera carunculata*	Uncommon
Spotted Pardalote	*Pardalotus punctatus*	Uncommon
Spotted Turtle-Dove	**Streptopelia chinensis*	Common
Sulphur-crested Cockatoo	*Cacatua galerita*	Uncommon
Superb Fairy-wren	*Malurus cyaneus*	Uncommon
Tawny Frogmouth	*Podargus strigoides*	
Welcome Swallow	*Hirundo neoxena*	Uncommon
Wedge-tailed Eagle	*Aquila audax*	
White-browed Scrubwren	*Sericornis frontalis*	Uncommon
Willy Wagtail	*Rhipidura leucophrys*	Uncommon
MAMMALS		
Short-beaked Echidna	*Tachyglossus aculeatus*	Rare
Common Ringtail Possum	*Pseudocheirus peregrinus*	Uncommon
Swamp Rat	*Rattus lutreolus ssp. Lutreolus*	Rare
INTRODUCED MAMMALS		
Red Fox	**Vulpes vulpes*	Common
Feral Cat	**Felis catus*	Common
European Rabbit	**Oryctolagus cunniculus*	Uncommon

Site 7- Grices Road-Road Reserve

Common Name	Scientific Name	Conservation status within site.
AMPHIBIANS		
Common Froglet	*Crinia signifera*	Uncommon
Southern Brown Tree Frog	*Litoria ewingii*	Uncommon
REPTILES		
Common Long-necked Tortoise	*Chelodina longicollis*	Uncommon
Glossy Grass Skink	*Pseudemoia rawlinsoni*	Rare
BIRDS		
Australasian Grebe	*Tachybaptus novaehollandiae*	Uncommon
Australian Magpie	*Gymnorhina tibicen*	Common
Australian Raven	*Corvus coronoides*	Common
Australian Wood Duck	*Chenonetta jubata*	Uncommon
Black Swan	*Cygnus atratus*	Rare
Black-fronted Dotterel	*Elseyorinis melanops*	Uncommon

Brown Thornbill	*Acanthiza pusilla*	Common
Chestnut Teal	*Anas castanea*	Uncommon
Common Blackbird	**Turdus merula*	Common
Common Myna	**Acridotheres tristis*	Common
Common Starling	**Sturnus vulgaris*	Common
Eastern Rosella	*Platycercus eximius*	Uncommon
Eastern Yellow Robin	*Eopsaltria australis*	Rare
Eurasian Coot	*Fulica atra*	Uncommon
European Goldfinch	**Carduelis carduelis*	Uncommon
Flame Robin	*Petroica phoenicea*	Uncommon
Galah	*Eolophus roseicapillus*	Uncommon
Golden Whistler	*Pachycephala pectoralis*	Rare
Grey Butcherbird	*Cracticus torquatus*	Uncommon
Grey Fantail	*Rhipidura fuliginosa*	Common at times
Hardhead	*Aythya australis*	Rare
Little Pied Cormorant	*Phalacrocorax melanoleucos*	Rare
Laughing Kookaburra	*Dacelo novaehollandiae*	Uncommon
Magpie-lark	*Grallina cyanoleura*	Common
Masked Lapwing	*Vanellus miles*	Uncommon
Musk Lorikeet	*Glossopsitta concinnia*	Uncommon
New Holland Honeyeater	*Phylidonyris novaehollandiae*	Uncommon
Noisy Miner	*Manorina melanocephala*	Common
Pacific Black Duck	*Anas supoerciliosa*	Uncommon
Rainbow Lorikeet	*Trichoglossus haematodus*	Common
Red Wattlebird	*Anthochaera carunculata*	Common
Red-browed Finch	*Neochmia temporalis*	Uncommon
Rufous Whistler	*Pachycephala rufiventris*	Rare
Silvereye	*Zosterops lateralis*	Uncommon
Spotted Pardalote	*Pardalotus punctatus*	Common
Spotted Turtle-Dove	**Streptopelia chinensis*	Common
Sulphur-crested Cockatoo	*Cacatua galerita*	Uncommon
Superb Fairy-wren	*Malurus cyaneus*	Common
Welcome Swallow	*Hirundo neoxena*	Uncommon
White-browed Scrubwren	*Sericornis frontalis*	Common
White-faced Heron	*Egretta novaehollandiae*	Rare
White-napped Honeyeater	*Melithreptus lunatus*	Uncommon
White-necked Heron	*Ardea pacifica*	Rare
Willy Wagtail	*Rhipidura leucophrys*	Uncommon
MAMMALS		
Common Ringtail Possum	*Pseudocheirus peregrinus*	Uncommon
Short-beaked Echidna	*Tachyglossus aculeatus*	Uncommon
Swamp Rat	*Rattus lutreolus ssp. Lutreolus*	Uncommon
INTRODUCED MAMMALS		
Red Fox	**Vulpes vulpes*	Common
Feral Cat	**Felis catus*	Common
European Rabbit	**Oryctolagus cunniculus*	Common

Site 8- 121 Grices Road

Common Name	Scientific Name	Conservation status within site.
AMPHIBIANS		
Common Froglet	*Crinia signifera*	Common
Southern Brown Tree Frog	*Litoria ewingii*	Uncommon
BIRDS		
Australasian Grebe	*Tachybaptus novaehollandiae*	Uncommon
Australian Magpie	*Gymnorhina tibicen*	Common
Australian Raven	*Corvus coronoides*	Common
Australian Wood Duck	*Chenonetta jubata*	Uncommon
Brown Thornbill	*Acanthiza pusilla*	Common
Chestnut Teal	*Anas castanea*	Uncommon
Common Blackbird	**Turdus merula*	Common
Common Myna	**Acridotheres tristis*	Common

Common Starling	**Sturnus vulgaris*	Common
Crested Pigeon	*Ocyphaps lophotes*	Uncommon
Eastern Rosella	*Platycercus eximius*	Uncommon
Eurasian Coot	*Fulica atra*	Uncommon
Galah	*Eolophus roseicapillus*	Uncommon
Grey Butcherbird	*Cracticus torquatus*	Uncommon
Laughing Kookaburra	*Dacelo novaehollandiae*	Uncommon
Little Pied Cormorant	*Phalacrocorax melanoleucos*	Rare
Magpie-lark	*Grallina cyanoleura*	Common
Masked Lapwing	*Vanellus miles*	Uncommon
Noisy Miner	*Manorina melanocephala*	Common
Pacific Black Duck	*Anas supoerciliosa*	Uncommon
Rainbow Lorikeet	*Trichoglossus haematodus*	Uncommon
Red Wattlebird	*Anthochaera carunculata*	Uncommon
Skylark	**Alauda arvensis*	Uncommon
Spotted Turtle-Dove	**Streptopelia chinensis*	Common
Straw-necked Ibis	*Threskiornis spinicollis*	Uncommon
Sulphur-crested Cockatoo	*Cacatua galerita*	Uncommon
Welcome Swallow	*Hirundo neoxena*	Uncommon
White-necked Heron	*Ardea pacifica*	Rare
Willy Wagtail	*Rhipidura leucophrys*	Uncommon
MAMMALS		
Common Brushtail Possum	*Trichosurus vulpecula*	Uncommon
Common Ringtail Possum	*Pseudocheirus peregrinus*	Uncommon
INTRODUCED MAMMALS		
Red Fox	**Vulpes vulpes*	Common
Feral Cat	**Felis catus*	Common

Site 9- 125 Grices Road

Common Name	Scientific Name	Conservation status within site.
BIRDS		
Australian Magpie	*Gymnorhina tibicen*	Common
Australian Raven	*Corvus coronoides*	Common
Common Blackbird	**Turdus merula*	Common
Common Myna	**Acridotheres tristis*	Common
Common Starling	**Sturnus vulgaris*	Common
Crested Pigeon	*Ocyphaps lophotes*	Uncommon
Eastern Rosella	*Platycercus eximius*	Uncommon
Galah	*Eolophus roseicapillus*	Uncommon
Grey Butcherbird	*Cracticus torquatus*	Uncommon
Magpie-lark	*Grallina cyanoleura*	Common
Masked Lapwing	*Vanellus miles*	Uncommon
Noisy Miner	*Manorina melanocephala*	Common
Rainbow Lorikeet	*Trichoglossus haematodus*	Common
Red Wattlebird	*Anthochaera carunculata*	Uncommon
Spotted Turtle-Dove	**Streptopelia chinensis*	Common
Sulphur-crested Cockatoo	*Cacatua galerita*	Uncommon
MAMMALS		
Common Brushtail Possum	*Trichosurus vulpecula*	Uncommon
INTRODUCED MAMMALS		
Red Fox	**Vulpes vulpes*	Common

Site 10- 161 Grices Road

Common Name	Scientific Name	Conservation status within site.
BIRDS		
Australian Magpie	*Gymnorhina tibicen*	Common
Australian Raven	*Corvus coronoides*	Common
Common Blackbird	**Turdus merula*	Common
Common Myna	**Acridotheres tristis*	Common

Common Starling	**Sturnus vulgaris*	Common
Crested Pigeon	*Ocyphaps lophotes*	Uncommon
Eastern Rosella	*Platycercus eximius*	Uncommon
Galah	*Eolophus roseicapillus*	Uncommon
Grey Butcherbird	*Cracticus torquatus*	Uncommon
Masked Lapwing	*Vanellus miles*	Uncommon
Magpie-lark	*Grallina cyanoleura*	Common
Noisy Miner	*Manorina melanocephala*	Common
Rainbow Lorikeet	*Trichoglossus haematodus*	Common
Red Wattlebird	*Anthochaera carunculata*	Uncommon
Spotted Turtle-Dove	**Streptopelia chinensis*	Common
Sulphur-crested Cockatoo	*Cacatua galerita*	Uncommon
MAMMALS		
Common Brushtail Possum	*Trichosurus vulpecula*	Uncommon
INTRODUCED MAMMALS		
Red Fox	**Vulpes vulpes*	Common
Feral Cat	**Felis catus*	Common

Site 11- 181 Grices Road

Common Name	Scientific Name	Conservation status within site.
BIRDS		
Australian Magpie	*Gymnorhina tibicen*	Common
Australian Raven	*Corvus coronoides*	Common
Common Blackbird	**Turdus merula*	Common
Common Myna	**Acridotheres tristis*	Common
Common Starling	**Sturnus vulgaris*	Common
Crested Pigeon	*Ocyphaps lophotes*	Uncommon
Eastern Rosella	*Platycercus eximius*	Uncommon
Galah	*Eolophus roseicapillus*	Uncommon
Grey Butcherbird	*Cracticus torquatus*	Uncommon
Magpie-lark	*Grallina cyanoleura*	Common
Masked Lapwing	*Vanellus miles*	Uncommon
Noisy Miner	*Manorina melanocephala*	Common
Rainbow Lorikeet	*Trichoglossus haematodus*	Common
Red Wattlebird	*Anthochaera carunculata*	Uncommon
Spotted Turtle-Dove	**Streptopelia chinensis*	Common
Sulphur-crested Cockatoo	*Cacatua galerita*	Uncommon

Site 13- 1/335 Grices Road

Common Name	Scientific Name	Conservation status within site.
AMPHIBIANS		
Common Toadlet	*Crinia signifera*	Common
Southern Toadlet	*Pseudophryne semimarmorata*	Rare
Southern Brown tree Frog	*Litoria ewingii*	Common
REPTILES		
Common Long-necked Tortoise	*Chelodina longicollis*	Uncommon
FISH		
Mosquito Fish	**Gambusia holbrooki*	
BIRDS		
Australasian Grebe	*Tachybaptus novaehollandiae*	Uncommon
Australian Magpie	*Gymnorhina tibicen*	Common
Magpie Lark	*Grallina cyanoleuca*	
Australian Raven	*Corvus coronoides*	Common
Australian Wood Duck	*Chenonetta jubata*	Uncommon
Black-winged Stilt	*Himantopus himantopus*	Rare
Brown Goshawk	*Accipiter fasciatus*	Uncommon
Brown Thornbill	*Acanthiza pusilla*	Uncommon
Chestnut Teal	*Anas castanea*	Uncommon
Common Blackbird	**Turdus merula*	Common
Common Myna	**Acridotheres tristis*	Common

Common Starling	**Sturnus vulgaris*	Common
Eastern Rosella	*Platycercus eximius*	Uncommon
European Goldfinch	**Carduelis carduelis*	Uncommon
Flame Robin	*Petroica phoenicea*	Uncommon
Galah	*Eolophus roseicapillus*	Uncommon
Grey Butcherbird	*Cracticus torquatus*	Uncommon
Grey Fantail	*Rhipidura fuliginosa*	Uncommon
Laughing Kookaburra	*Dacelo novaehollandiae*	Uncommon
Little Pied Cormorant	*Phalacrocorax melanoleucos*	Rare
Magpie-lark	*Grallina cyanoleura*	Common
Masked Lapwing	*Vanellus miles*	Uncommon
Musk Lorikeet	*Glossopsitta concinna*	Uncommon
Noisy Miner	*Manorina melanocephala*	Common
Pacific Black Duck	*Anas supoerciliosa*	Uncommon
Rainbow Lorikeet	*Trichoglossus haematodus*	Uncommon
Red Wattlebird	*Anthochaera carunculata*	Uncommon
Silvereye	*Zosterops lateralis*	Uncommon
Skylark	**Alauda arvensis*	Uncommon
Spotted Pardalote	*Pardalotus punctatus*	Uncommon
Spotted Turtle-Dove	**Streptopelia chinensis*	Common
Straw-necked Ibis	*Threskiornis spinicollis*	Uncommon
Sulphur-crested Cockatoo	*Cacatua galerita*	Uncommon
Superb Fairy-wren	*Malurus cyaneus*	Uncommon
Welcome Swallow	*Hirundo neoxena*	Common
White-browed Scrubwren	*Sericornis frontalis*	Uncommon
Willy Wagtail	*Rhipidura leucophrys*	Uncommon
MAMMALS		
Common Ringtail Possum	*Pseudocheirus peregrinus*	Uncommon
Short-beaked Echidna	*Tachyglossus aculeatus*	Uncommon
Swamp Rat	*Rattus lutreolus ssp. Lutreolus*	Uncommon
INTRODUCED MAMMALS		
Red Fox	**Vulpes vulpes*	Common
Feral Cat	**Felis catus*	Uncommon
European Rabbit	**Oryctolagus cunniculus*	Uncommon

Fauna Appendix 5. Significant Fauna Species in VFD and EPBC Databases

Fauna species detected within five kilometres of the study area boundary on DSE's Victorian Fauna Database (VFD) (DSE 2005a). Species listed on EPBC Protected Matters Search Tool also included, except for Listed Marine Species (not relevant). Habitat/Comments column also gives indication of location and year of records lodged with VFD.

EPBC	DSE	Mig.	Regional Significance	Common Name	Scientific Name	Family Name	Habitat Notes	Likelihood of Occurrence	Database	Freq (AVW only)	NumSite (AVW only)	Number of Records	Last Record
	v		S, R2	Australasian Shoveler	*Anas rhynchotis*	Anatidae	The Australasian Shoveler occurs mainly on large well vegetated wetlands and lakes, occasionally including areas with saline waters. Populations are found in higher numbers on permanent, well-vegetated freshwater swamps with areas of open water (Rogers 1990). This species nest in grass nests on the ground, usually in dense cover and near water. (Pizzey and Knight 2007).	high	AVW	2.41%	9	19	2005
VU			N, R2	Australian Grayling	*Prototroctes maraena*	Retropinnidae	Australian Graylings migrate between freshwater streams, estuaries and the ocean (DSE 2008). Therefore it relies on free access between these environments. However, it spends most of its life cycle in freshwater streams (DSE 2008). Environments where this species occur tend to be clear with gravel bottoms and a variety of instream habitat such as pools and riffles (DSE 2008).	low	EPBC/AVW	0.53%	2	1	1985
VU, m		C	S R2, R3	Australian Painted Snipe	*Rostratula australis*	Rostratulidae	Hbe listed as vulnerable under the EPBC Act. This species is migratory. They usually occur in the lowlands on shallow freshwater swamps with emergent vegetation, and flooded saltmarshes (Pizzey and Knight 2007). They do not form flocks but loose groups are sometimes seen, either alone or with Latham's Snipe (Marchant and Higgins 1993). Painted Snipe forage on mud among dense swamp vegetation. Their nests are depressions or well made nest of twigs and reeds surrounded by shallow water and dense vegetation (Pizzey and Knight 2007).	low	EPBC				
			R1, R2, R3	Black-faced Monarch	*Monarcha melanopsis*	Dicruridae	Black-faced Monarch is a summer migrant to the south-east coastal areas (Pizzeya nd Knight 2007. It is found in the understorey of rainforest, densley wooded areas, mangroves and areas with a dense canopy (Pizzey and Knight 2007).	low	EPBC				
	e		S, R2	Blue-billed Duck	*Oxyura australis*	Anatidae	This species inhabits deep, permanent, well-vegetated swamps, but as times (especially in winter) may occur in large numbers on large open wetlands(Pizzey and Knight 2007). The Blue-billed Duck catches food while diving or occasionally by feeding from the water surface. Their nests are built on trampled swamp vegetation around the base of established stands of reeds/rushes, often over water or on small islands (Rogers 1990).	med	AVW	2.68%	10	20	2002
m		J, C	R2, R3	Cattle Egret	*Ardea ibis*	Ardeidae	Cattle Egret is a migratory species. The species has a high likelihood of occurrence within the study area. Cattle Egret occurs in many types of wetlands; from tidal flats in estuaries and bays to the margins of inland lakes, swamps and rivers (Pizzey and Knight 2007). They also use farm dams, mangroves, flooded areas, and artificial wetlands created by irrigation. Cattle Egret are often seen foraging away from water in crops and pasture, they build stick-nests in trees, usually surrounded by water or dense treed cover, or occasionally in reed-beds (O'Brien 1990). The species nests colonially, often with other waterbirds. Egrets are threatened due to restricted nesting sites.	med - high	EPBC				
VU	v		S, N, R2	Dwarf Galaxias	*Galaxiella pusilla*	Galaxiidae	Occurs in vegetated margins of slow-flowing coastal creeks, drains and swamps. Rare in Victoria, however more abundant in the south-east of the state in Mornington Pennisula & Western Port areas (Museum Victoria 2006).	low	AVW	0.26%	1		

EPBC	DSE	Mig.	Regional Significance	Common Name	Scientific Name	Family Name	Habitat Notes	Likelihood of Occurrence	Database	Freq (AVW only)	NumSite (AVW only)	Number of Records	Last Record
m	v	J, C	S, R2, R3	Eastern Great Egret	*Ardea modesta, Ardea alba*	Ardeidae	Eastern Great Egret is widespread in Australia and has been observed in a wide range of wetland habitats including swamps and marshes; margins of rivers and lakes; damp or flooded grasslands, pastures or agricultural lands; reservoirs; sewage treatment ponds; drainage channels; salt pans and salt lakes; salt marshes; estuarine mudflats, tidal streams; mangrove swamps; coastal lagoons; and offshore reefs (DEWHA 2009, Pizzey and Knight 2007, Marchant and Higgins 1990).	high	AVW	0.53%	2	6	1985
m		J, C, R	R1, R2, R3	Fork-tailed Swift	*Apus pacificus*	Apodidae	The Fork-tailed Swift is a migratory species occurring throughout Australia. This species is almost entirely aerial, however it is known to roost on cliffs or in very large trees (Pizzey and Knight 2007).	low	EPBC				
	e		S, R2	Freckled Duck	*Stictonetta naevosa*	Anatidae	This species can occur on fresh water swamps, creeks, ponds, dams, reservoirs, sewage ponds and other ephemeral wetlands. It needs a thick cover of vegetation such as bulrush, lignum or tea-tree for nesting (Rogers 1990).	med	AVW	0.26%	1	2	2002
CR	e		N, S, R2	Golden Sun Moth	*Synemon plana*	Castniidae	It is generally found in temperate grasslands and open grassy woodlands where the ground layer is dominated by native Wallaby Grass. Optimal habitat is dominated by wallaby grasses Austrodanthonia spp with an open tussock structure (O'Dwyer and Attiwill 2000). It has also been recorded in grasslands dominated by Kangaroo Grass Themeda triandra and exotic dominated grasslands (ie Chilean Needlegrass) (pers. obs. Henry).	low-med	EPBC				
	e		S, R2	Grey-crowned Babbler	*Pomatostomus temporalis*	Pomatostomidae	This species inhabit dry forests and woodlands, roadside trees, and wooded farmlands usually associated with river floodplains (Pizzey and Knight 2007). The Grey-crowned babbler feed in leaf and branch litter, bark and branch crevices and from foliage of shrubs and trees. They live in groups and build a series of large domed nests in shrubs or small trees (Pizzey and Knight 2007).	low	AVW	0.26%	1	1	1988
VU	v		N, S, R2	Grey-headed Flying-fox	*Pteropus poliocephalus*	Pteropodidae	The Grey-headed Flying-fox occurs in various forest habitats in close proximity to plentiful supplies of nectar producing flowers and fleshy fruit. Large camps can be found roosting in the branches of tall trees in a range of vegetation, including rainforest patches, Melaleuca stands, mangroves, riparian woodland and modified vegetation in urban areas (Richards 1983).	low-med	EPBC				
V	e		N, S, R2	Growling Grass Frog	*Litoria raniformis*	Hylidae	TThe species often inhabitant water bodies with a diverse assemblage of aquatic vegetation, including emergent species such as sedges (Gahnia spp.), submergent species such as curly pondweed (Potamageton spp.), floating species such as water ribbon (Triglochin spp.) and filamentous algae (Hamer and Organ 2006, Heard et al. 2004). The aquatic vegetation provides sites for male frogs to call from, sites for eggs to be deposited and relatively safe development, and food and shelter for tadpoles. Dense submergent vegetation is especially important to protect eggs and tadpoles from predation (Heard et al. 2004).	med	EPBC/AVW	12.33%	46	11	2005

EPBC	DSE	Mig.	Regional Significance	Common Name	Scientific Name	Family Name	Habitat Notes	Likelihood of Occurrence	Database	Freq (AVW only)	NumSite (AVW only)	Number of Records	Last Record
	v		S, R2	Hardhead	*Aythya australis*	Anatidae	Hardheads inhabit deep to shallow wetlands with open water and fringing emergent vegetation (Pizzey and Knight 2007). The species feeds by diving in deep water and occasionally by dabbling just under the water surface (Rogers 1990). Nests are built in thick vegetation (e.g. reeds, lignum, cumbungi), usually over water (Rogers 1990, Halse et al. 2005). These birds are most common in the wetland systems of inland Australia (Halse et al. 2005). Birds do visit Victoria from these areas in spring and summer, returning as the northern wetlands is replenished by rain (Halse et al. 2005). However, some birds are present in Victoria all year round depending on the suitability of the wetland (Pizzey and Knight 2007).	high	AVW	2.94%	11	23	2005
EN	c		N, S, R2	Helmeted Honeyeater	*Lichenostomus melanops cassidix*	Meliphagidae	The Helmeted Honey-eater inhabits Eucalyptus forests over dense shrubby Tea-tree understorey, usually along streams (Pizzey and Knight 2007). They nest in colonies along creeks and their nests are built in low shrubs (Higgins *et al.* 2001). This species is restricted to forest remnants (Higgins et al. 2001).	low-med	AVW	0.26%	1	6	1932
	c		S, R2	Intermediate Egret	*Ardea intermedia*	Ardeidae	The Intermediate Egret occurs in the shallows of mainly grassy inland wetlands, flooded pastures or grasslands. They only occasionally visit coastal wetlands and are generally rare in Victoria. They are sometimes seen foraging in pastures with grazing cattle. This species builds platform nests which are built in trees in riverine forest, swamp woodland and mangroves (Pizzey and Knight 2007).	med	EPBC				
	r		S, R2	Large Ant Blue	*Acrodipsas brisbanensis*	Lycaenidae	The caterpillar of this species appears to spend it's enitre life within an ant nest and is suspected of being carniverous, eating the ants. Adult butterflies tend to fly high near the tops of trees (Braby, 2000) . They are mostly found around coastal areas.	Low	AVW	0.26%	1		
	n		S, R2	Latham's Snipe	*Gallinago hardwickii*	Scolopacidae	Latham's Snipe is a migratory species. The species migrates to Victoria from breeding grounds in Japan. In Victoria this species is widely distributed in a range of habits including heavily vegetated freshwater swamps, and pools or ditches in heaths or subalpine herblands (Pizzey and Knight 2007). Also occurs in small ephemeral wetlands such as wet depressions after floods recede. Generally roosts in thick vegetation during the day, sometimes under shrubs away from wetlands, and will feed in swamps at night. They are occasionally seen feeding during the day. This species feeds by probing in soft mud and rarely moves far from concealing vegetation (Higgins and Davies 1996).	med	AVW	2.68%	10	11	2004
VU			N, R2	Long-nosed Potoroo (SE mainland)	*Potorous tridactylus tridactylus*	Potoroidae	The Long-nosed Potoroo is most commonly found in heathy coastal vegetation, dry and wet sclerophyll forests with a dense understorey with a sandy loamy soil. Their habitat tends to have some open areas with a grassy understorey for foraging (Johnson 1995). Preferred habitat has an understorey that may feature grass-trees, sedges, ferns or heath, or low shrubs of tea-trees or melaleucas (Johnson, 1995).	low	EPBC				
	v		S, R2	Musk Duck	*Biziura lobata*	Anatidae	Usually seen in small numbers on the deep waters of well vegetated fresh to saline lakes, swamps and occasionally shallow inlets and bays. Nests formed in low vegetation in areas sheltered by surrounding vegetation(Pizzey and Knight 2007).	med	AVW	0.53%	2	3	1992

EPBC	DSE	Mig.	Regional Significance	Common Name	Scientific Name	Family Name	Habitat Notes	Likelihood of Occurrence	Database	Freq (AVW only)	NumSite (AVW only)	Number of Records	Last Record
	n		S, R2	Pacific Gull	*Larus pacificus pacificus*	Laridae	The Pacific Gull is one of the largest gulls within the Australian and New Zealand territories, confined to the coast where flocks occur on intertidal mudflats and nearby rubbish tips in Port Phillip Bay, Western Port and Corner Inlet, with smaller numbers elsewhere on estuaries, along beaches and on other intertidal habtiats (Higgins and Davies 1996). This species breeds mainly on islands in Bass Strait and off Tasmania. Some smaller numbers breed on islands off Wilsons Promontory. Their nests are built on the ground on the tops of steep-sided islands (Higgins and Davies 1996).	low	AVW	0.26%	1	1	2006
	n		S, R2	Pied Cormorant	*Phalacrocorax varius*	Phalacrocoracidae	This species is most often found along the coast, however are known to use inland wetlands including billabongs, deep and open swamps and rivers (large freshwater and saline wetlands). They nest in colonies, building platforms nests in mangroves or other trees (Pizzey and Knight 2007).	high	AVW	0.53%	2	2	1997
m		J	R1, R2, R3	Rainbow Bee-eater	*Merops ornatus*	Meropidae	The Rainbow Bee-eater is a migratory species. It occurs in many types of habitat including woodland, shrubland, semi-cleared land and farmland, however it mainly occurs where eucalyptus species are dominant (Higgins 1999). It is almost entirely insectivirous and mostly occurs near to permanent water (Higgins 1999).	low	EPBC				
EN m		J	N, R2, R3	Regent Honeyeater	*Anthochaera phrygia*	Meliphagidae	Occurs mainly in box-ironbark forests and woodlands north of the Great Divide (Pizzey and Knight 2007). This species is highly nomadic, their movements are determined by the flowering of eucalypts (Pizzey and Knight 2007).	low	EPBC				
	v		S, R2	Royal Spoonbill	*Platalea regia*	Threskiornithidae	The Royal Spoonbill inhabits the shallow parts of fresh and saline wetlands; these birds are gregarious in small flocks. They are mostly common on intertidal mudflats in coastal bays. Their stick-nests are built in reeds, shrubs or trees, singly or in loose colonies and are often seen with other species (Rogers 1990).	med-high	AVW	0.80%	3	6	2001
m			R2, R3	Rufous Fantail	*Rhipidura rufifrons*	Dicruridae	The Rufous Fantail is migratory and can be found in a variety of habitats including swampy woodland, rainforest, mangrove, dense wet forests. It is generally found where there is dense shande and thick understorey shrubs and bushes and is often seen close to the ground. , It can be found in less dense habitats during migration and has been seen in many urban sites (Australian Museum 2008).	low	EPBC				
m			R2, R3	Satin Flycatcher	*Myiagra cyanoleuca*	Dicruridae	The Satin Flycatcher is a migratory bird and occurs in Victoria during the spring/summer months. It is generally found in wet dense forests and gullies (Australian Museum 2008).	low	EPBC				
EN			N, R2	Smoky Mouse	*Pseudomys fumeus*	Muridae	The Smoky Mouse occurs mainly in in dry sclerophyll forest on ridges with heath and tussock-grass understorey, coastal heath and subalpine heath (Menkhorst and Knight 2001). It shelters communally in a nest on the surface of the ground (Menkhorst and Knight 2001, Ford et al. 2003). It's preferred haibtat is dense heath, and it's diet consists of fungi, seeds and flowers (Ford et al. 2003). It has a patchy distribution and may have a successional pattern of occurence relating to time since fire .	low	EPBC				
E	n		N, S, R2	Southern Brown Bandicoot	*Isoodon obesulus obesulus*	Peramelidae	The Southern Brown Bandicoot is found in heathy forest, heath and coastal scrub. It shelters in a nest of vegetation beneath dense cover, it eats fungi, tubers and arthropods (Menkhorst and Knight 2001).	low	EPBC/AVW	0.53%	2		
	v		S, R2	Southern Toadlet	*Pseudophryne semimarmorata*	Myobatrachidae	The Southern Toadlet can be found in dry forest, woodland, shrubland, grassland and heaths. It shelters under leaf litter and other debris in moist soaks and depressions. Their eggs are spawned in shallow burrows under organic litter in low areas close to water (Hero et al. 1991).	high	AVW	13.67%	51	2	1965

EPBC	DSE	Mig.	Regional Significance	Common Name	Scientific Name	Family Name	Habitat Notes	Likelihood of Occurrence	Database	Freq (AVW only)	NumSite (AVW only)	Number of Records	Last Record
EN			N, R2	Spot-tailed Quoll	*Dasyurus maculatus maculatus (SE mainland population)*	Dasyuridae	The Spot-tailed quoll is found in many habitats including rainforest, wet and dry sclerophyll forest, coastal heath and scrub (Menkhorst and Knight 2001).	low	EPBC				
m	n		S, R2, R3	Spotted Harrier	*Circus assimilis*	Accipitridae	This species occurs in open grasslands, open shrublands, saltbush, open woodlands, crops and similar low vegetation that allows hunting. Their stick nests are built in low trees (Pizzey and Knight 2007)..	med	AVW	0.26%	1	2	2004
VU	e		N, S, R2	Superb Parrot	*Polytelis swainsonii*	Psittacidae	This species is generally only found in the Upper Murray Valley, mainly in the riverine forests and woodlands of Barmah Forest in Victoria. All other sightings have been made along or within 10 km of the Murray, Ovens and Goulburn Rivers (Higgins 1999). Their nests located in hollows of very large riparian trees in River Red Gum forests. They feed mainly in Black Box, Grey Box, Yellow Box woodlands and sometimes in open woodland (Pizzey and Knight 2007). They forage in their nesting forests and may also forage on the ground, in eucalypts and in mistletoes (Higgins 1999).	low	AVW	0.26%	1		
E	e		N, S, R1, R2	Swift Parrot	*Lathamus discolor*	Psittacidae	The Swift Parrot is a winter migrant to Victoria (Swift Parrot Recovery Team 2001). Arriving from their breeding areas in Tasmania, however small numbers of non-breeding birds may remain here during summer (Higgins 1999, Swift Parrot Recovery Team 2001). They are nomadic, and follow the flowering of trees and psyllid infestations. In Victoria their distribution is centred on box-ironbark forests, but they are often seen in town parks and occur sporadically elsewhere in dry forests, dry woodlands and wooded farmlands but are seldom seen in treeless areas, rainforests or wet forests(Higgins 1999, Pizzey and Knight 2007). Feed mainly in winter-flowering plants, especially Red Ironbarks and ornamental trees and shrubs (Higgins 1999, Swift Parrot Recovery Team 2001).	med	EPBC/AVW	0.26%	1	3	1989
	n		S, R2	Whiskered Tern	*Chlidonias hybridus*	Laridae	This is mainly a summer migrant to Victoria, although some remain here over winter. They inhabit shallow freshwater swamps and fresh or brackish lakes, favouring ares with emergent vegetation (Pizzey and Knight 2007). The Whiskered Tern build nests on the water in colonies among flooded or emergent vegetation (Pizzey and Knight 2007).	low	AVW	0.26%	1	2	2004
m	v	C	S, R2, R3	White-bellied Sea-Eagle	*Haliaeetus leucogaster*	Accipitridae	The White-bellied Sea-eagle mainly occurs along the coast, but may travel along some inland rivers and lakes (Pizzey and Knight 2007).	low	AVW	0.26%	1		
m		J, R, C	R2, R3	White-throated Needletail	*Hirundapus caudacutus*	Apodidae	White Throated Needletail is a migratory species. It is almost entirely aerial and occurs over many types of habitat (Pizzey and Knight 2007).	high	EPBC				

Likelihood of Occurrence:

Low: Few aspects of habitat requirements are met on site.

Moderate: Some aspects of habitat requirements are met on site.

High: Optimal habitat present and/or recently (last 5-10 years) recorded in or near study area.

VFD: Victorian Fauna Database

EPBC: EPBC Protected Matters Search Tool

Freq: The frequency of records within the 5km search area in comparison with all records found in the search area. Only available for VFD data.

Table Key

Last record. Year fauna taxa was last recorded.

No. recs Number of sites in which the species is recorded in

EPBC Species listed as threatened in Australia under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC)

EX	Extinct
CR	Critically Endangered
EN	Endangered
VU	Vulnerable
CD	Conservation Dependent
m	Migratory species

Mig. Birds listed under bilateral migratory bird agreements listed below:

J	JAMBA (Japan-Australia Migratory Bird Agreement 1974)
C	CAMBA (China-Australia Migratory Bird Agreement 1986)
R	ROKAMBA (Republic of Korea-Australia Migratory Bird Agreement 2006)
CMS	Convention on Migratory Species or Bonn Convention. Birds listed under the Agreement on the Conservation of Albatrosses and Petrels (ACAP) 2006

Vic. cons. status Conservation status under DSE's *Advisory List Of Threatened Vertebrate Fauna in Victoria 2007* (DSE 2007)

ex	Extinct
r	Regionally Extinct
w	Extinct in the Wild
c	Critically Endangered
e	Endangered
v	Vulnerable
n	Near Threatened
d	Data Deficient
*	introduced species. Not listed in the advisory list above.

FFG Status under the Flora and Fauna Guarantee Act 1988 (FFG)

L	species listed as threatened
N	species nominated for listing as threatened but has not yet completed the listing process
I	Invalid or ineligible listing

Sig. Biological Significance

This is a rating of the contribution that biological assets of a site or species make towards the conservation of Australia's native biodiversity.

N	National	Species listed under the *Environment Protection and Biodiversity Conservation Act 1999* as extinct, extinct in the wild, critically endangered, endangered or vulnerable.
S1	State	Species listed as Threatened under Schedule 2 of Victoria's *Flora and Fauna Guarantee Act 1988* Species listed as extinct, critically endangered, endangered, vulnerable in Victoria *Advisory List of Threatened Vertebrate Fauna in Victoria - 2007* (DSE 2007)
R1	Regional	Regional according to Table 3. *Rare and restricted species in the greater Gippsland Plains* in Radford and Bennett (2005) – birds only.
R2	Regional	Regional according to Malcolm Legg (pers. comm.). Region is defined as the Mornington Peninsula and surrounding Western Port area.
R3	Regional	Species listed as data deficient or near threatened in Victoria *Advisory List of Threatened Vertebrate Fauna in Victoria - 2007* (DSE 2007) Birds listed under migratory bird agreements Species not listed in the above categories that have a limited range in a bioregion
L	Local	Local. All other native species are considered at least local significance due to the level of habitat depletion in the City of Casey.

Common Name According to Atlas of Victorian Wildlife

Scientific Name According to Atlas of Victorian Wildlife

International Significance	Migratory species protected under international treaties (JAMBA, CAMBA, ROKAMBA and Bonn) or listed on the IUCN Red Data List 2006 as threatened
National Significance	Species listed under the *Environment Protection and Biodiversity Conservation Act 1999* as extinct, extinct in the wild, critically endangered, endangered or vulnerable.
State Significance	Species listed as Threatened under Schedule 2 of Victoria's *Flora and Fauna Guarantee Act 1988* Species listed as extinct, critically endangered, endangered, vulnerable in Victoria *Advisory List of Threatened Vertebrate Fauna in Victoria - 2007* (DSE 2007)

Regional Significance	Species listed as data deficient or near threatened in Victoria *Advisory List of Threatened Vertebrate Fauna in Victoria - 2007* (DSE 2007)
	Species not listed in the above categories that have a limited range in a bioregion
Local Significance	Species considered rare, threatened or uncommon within the local area (5km radius from the study area) by the authors with consideration given to previous studies. Many native species are considered to be locally significant within urban areas due to typically high levels of habitat alteration.

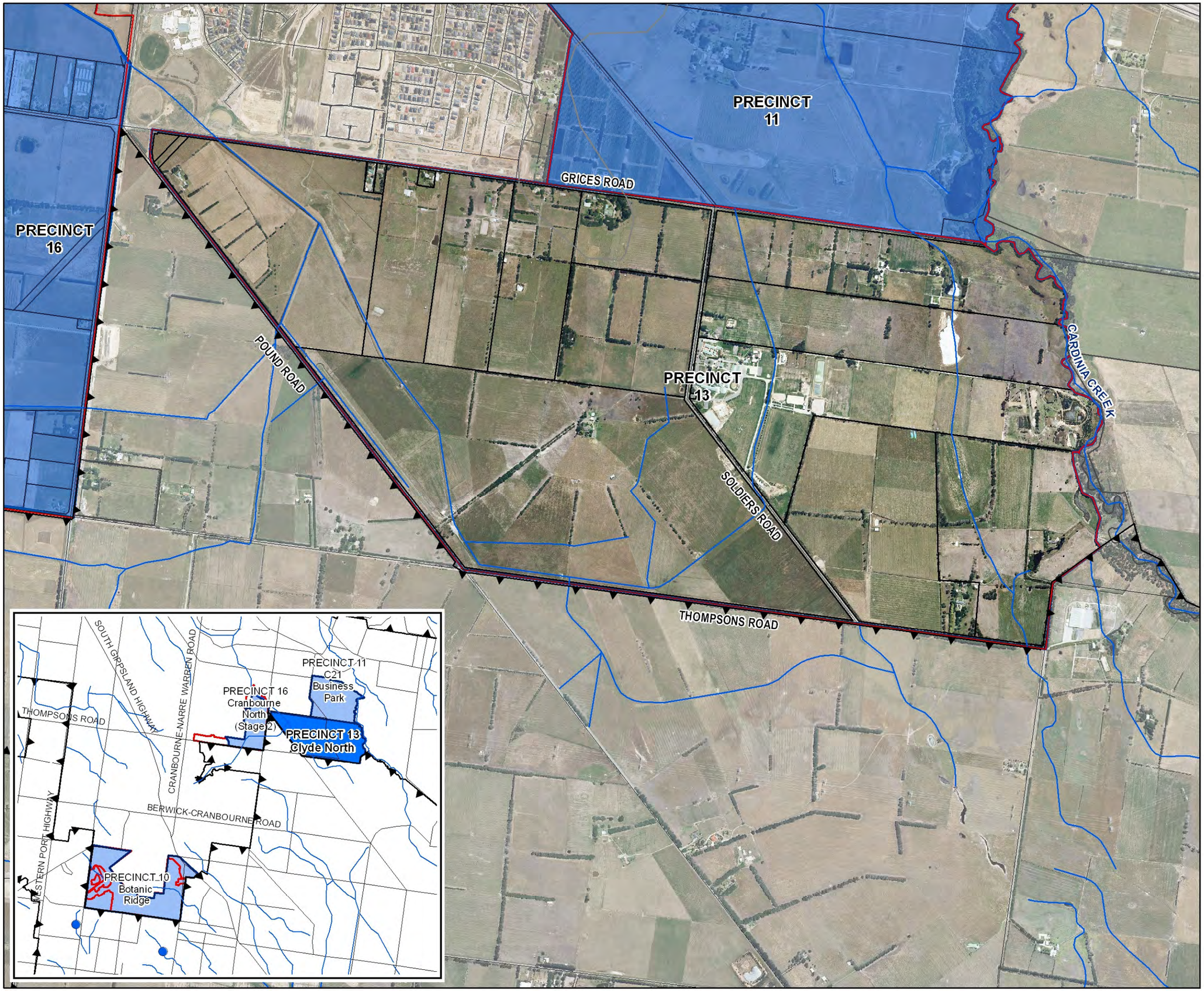
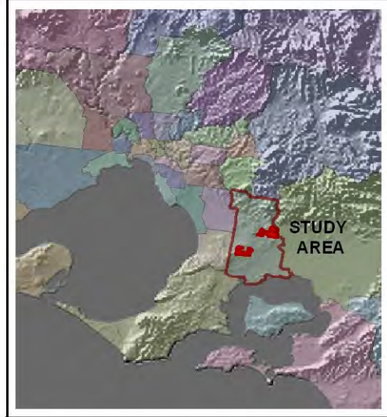


FIGURE 1
Context Map of PSP Areas
Biodiversity Assessment Report
Fauna Assessment and Mapping
Clyde North
Growth Areas Authority

LEGEND

- Roads
- Watercourses
- Urban Growth Boundary
- Property Boundary
- Study Area Boundary
- Precinct Boundary



MAP AND SURVEY DETAILS
Mapping by: Staci Timms, May '09
Generated from: GIS layers and Aerial Photography, supplied by DSE, GAA, ESRI and Geosciences Australia.

DATUM: GDA 94 MGA Zone 55

N

NOTES:
Practical Ecology bears no responsibility for the accuracy and completeness of this information and any decisions or actions taken on the basis of the map. While information appears accurate at publication, nature and circumstances are constantly changing.

VERSION	01	DATE	11/06/09

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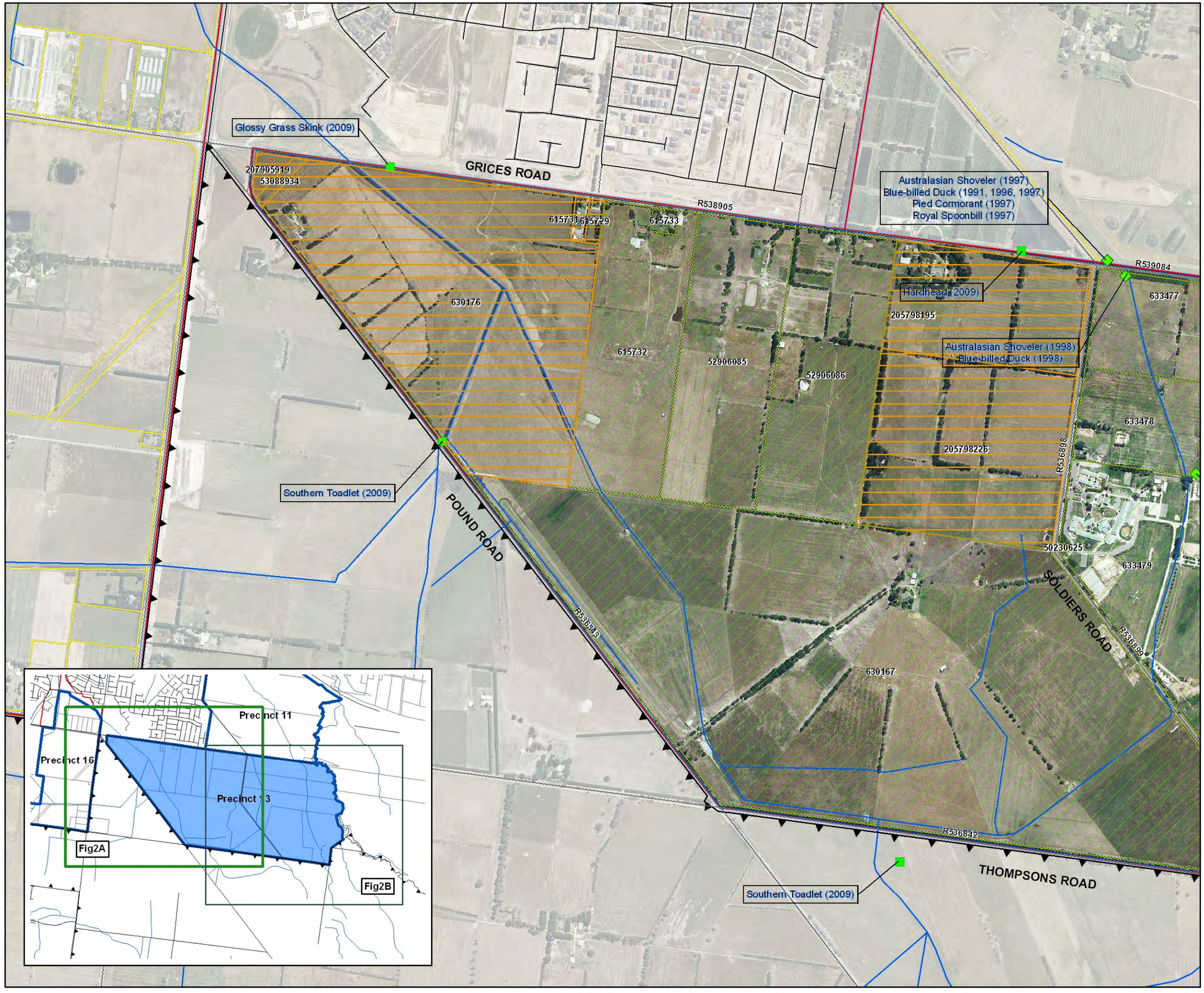

FIGURE 2A
Significant Species Distribution
Precinct 13 Study Area
Biodiversity Assessment Report
Fauna Assessment and Mapping
Clyde North
Growth Areas Authority

LEGEND

- Roads
- Watercourses
- Study Area Boundary
- Property Boundary
- Precinct Boundary
- Urban Growth Boundary
- Property accessed for fauna surveys
- Property not accessed for fauna surveys
- 633479 Parcel PFI
- R539084 Road PFI
- Blue-billed Duck (1998) — State Significant Species and Date of Record
- Growling Grass Frog (2004) — Nationally Significant Species and Date of Record

Significant Species

- Database Records of Species of National Significance
- Database Records of Species of State Significance
- Surveyed Records of Species of National Significance
- Surveyed Records of Species of State Significance

MAP AND SURVEY DETAILS
Surveyed by: Joy MacDonald, Mark Shepherd, Peter Gannon, Greg James and David Fairbridge,
Oct '08-May '09
Mapping by: Staci Timms and Jo Henry, May '09
Generated from: data collected in the field using Trimble and IPAQ PDAs and aerial photograph interpretation. GIS layers and Aerial Photography supplied by DSE and GAA.

DATUM: GDA 94 MGA Zone 55

N

0 100 200 300 400 500
Metres

1:10,000

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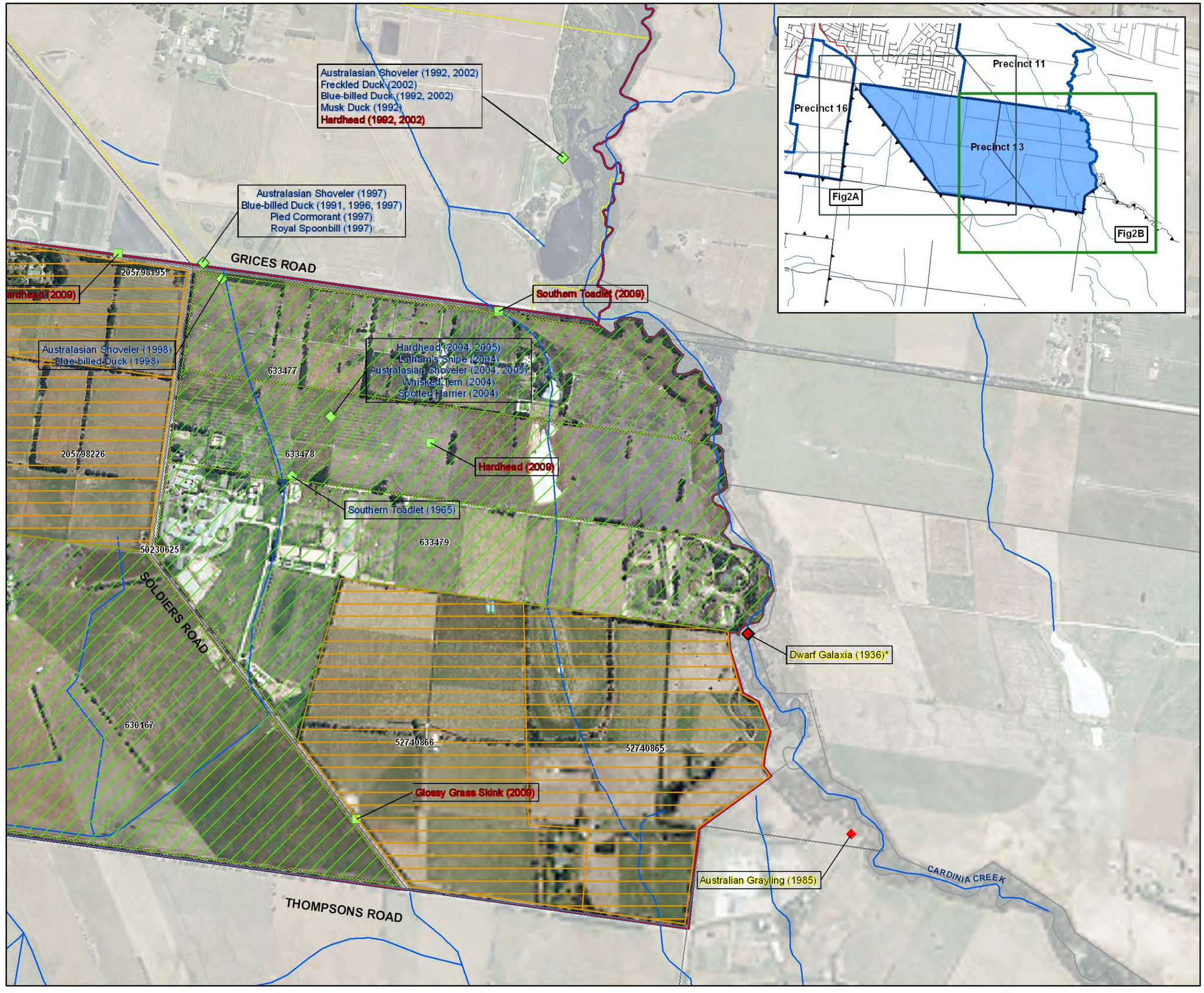

FIGURE 2B

Significant Species Distribution
Precinct 13 Study Area
Biodiversity Assessment Report
Fauna Assessment and Mapping
Clyde North
Growth Areas Authority

LEGEND

- Roads
- Property Boundary
- Watercourses
- Precinct Boundary
- Study Area Boundary
- Urban Growth Boundary
- Property accessed for fauna surveys
- Property not accessed for fauna surveys
- 633479 Parcel PFI
- R539084 Road PFI
- Blue-billed Duck (1998) — State Significant Species and Date from Database Records
- Growling Grass Frog (2004) — Nationally Significant Species and Date from Database Records
- Blue-billed Duck (2009) — State Significant Species and Date from Surveyed Records

Significant Species

- Database Records of Species of National Significance
- Database Records of Species of State Significance
- Surveyed Records of Species of National Significance
- Surveyed Records of Species of State Significance

*Asterix labels denotes record is from the Victorain Aquatic Fauna Database. All other database records are from the Atlas of Victorian Wildlife database.

MAP AND SURVEY DETAILS
Surveyed by: Joy MacDonald, Mark Shepherd, Peter Gannon, Greg James and David Fairbridge, Oct '08-May'09
Mapping by: Staci Timms and Jo Henry, May '09
Generated from: data collected in the field using Trimble and IPAQ PDAs and aerial photograph interpretation. GIS layers and Aerial Photography supplied by DSE and GAA.

DATUM: GDA 94 MGA Zone 55

N

0 100 200 300 400 500
Metres

1:10,000

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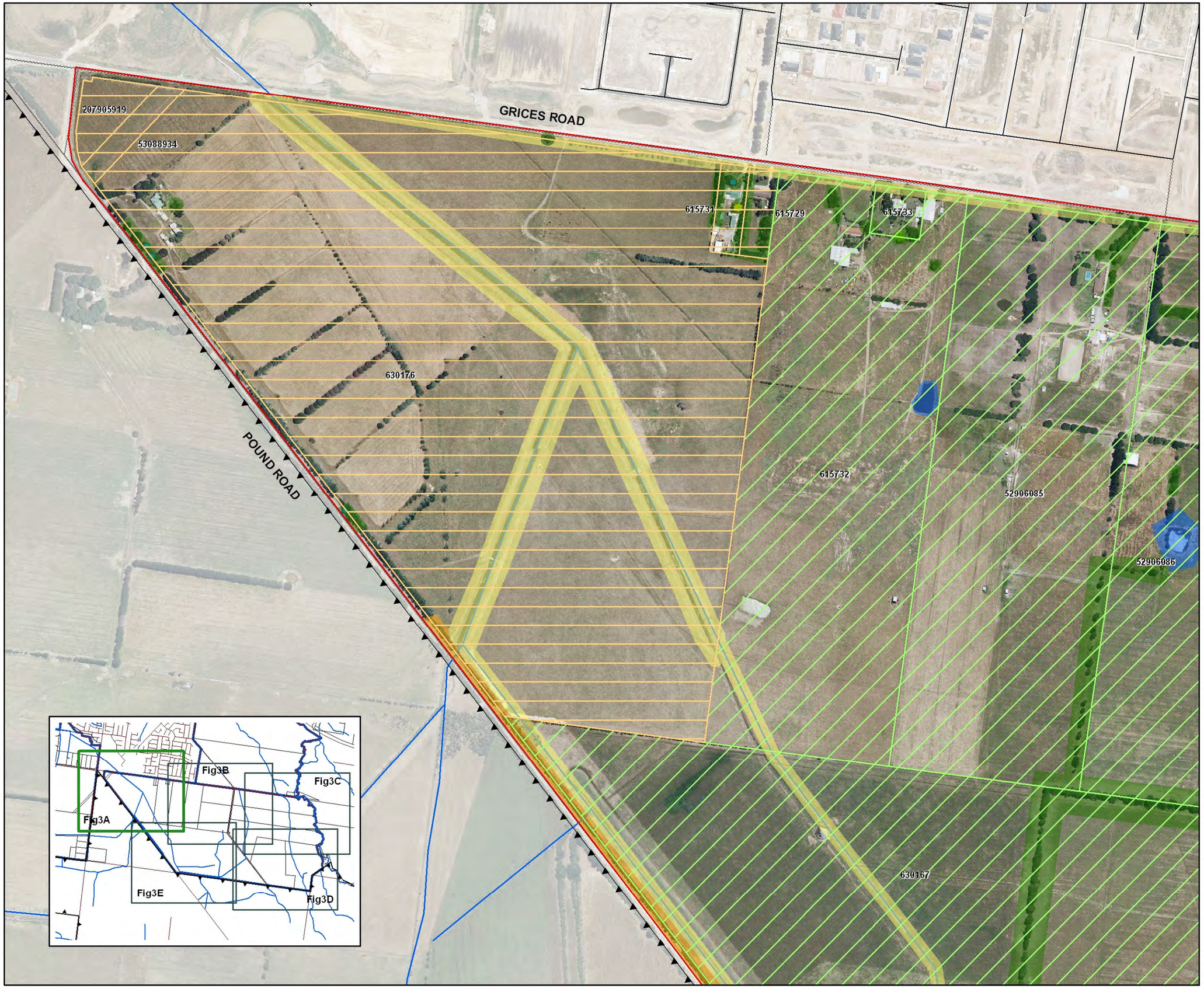

FIGURE 3A

Areas of High Fauna Habitat Value for Significant Species
Precinct 13 Study Area
Biodiversity Assessment Report
Fauna Assessment and Mapping
Clyde North
Growth Areas Authority

LEGEND

- Roads
- Watercourses
- Study Area Boundary
- Property Boundary
- Precinct Boundary
- Urban Growth Boundary
- Properties assessed
- Properties not assessed

Scattered Tree Locations

- Small Tree
- Medium Old Tree
- Large Old Tree
- Very Large Old Tree

Areas of High Faunal Habitat Value for Significant Species*

- Drainage Lines
- Swamp Scrub
- Wetland
- Woodland#

* derived from existing information; flora mapping and aerial photography
# Woodland indicated are those that are defined by the presence of indigenous and non-indigenous flowering Eucalypts.

MAP AND SURVEY DETAILS
Surveyed by: Joy MacDonald, Mark Shepherd, Peter Gannon, Greg James and David Fairbridge, Oct'08-May'09
Mapping by: Staci Timms and Jo Henry, May '09
Generated from: data collected in the field using Trimble and IPAQ PDAs and aerial photograph interpretation. GIS layers and Aerial Photography supplied by DSE and GAA. Woodland Habitat defined by Arborist Reports from Treelogic conducted in 2004 and 2008

DATUM: GDA 94 MGA Zone 55

N

0 50 100 150 200 250

Metres

1:5,000

NOTES:
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VERSION	03	DATE	19/11/09

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FIGURE 3B

Areas of High Fauna Habitat Value for Significant Species
Precinct 13 Study Area
Biodiversity Assessment Report
Fauna Assessment and Mapping
Clyde North
Growth Areas Authority

LEGEND

- Roads
- Watercourses
- Study Area Boundary
- Property Boundary
- Precinct Boundary
- Urban Growth Boundary
- Properties assessed
- Properties not assessed

Scattered Tree Locations

- Small Tree
- Medium Old Tree
- Large Old Tree
- Very Large Old Tree

Areas of High Faunal Habitat Value for Significant Species*

- Drainage Lines
- Swamp Scrub
- Wetland
- Indigenous Woodland#

* derived from existing information; flora mapping and aerial photography
# Woodland indicated are those that are defined by the presence of indigenous and non-indigenous flowering Eucalypts.

MAP AND SURVEY DETAILS
Surveyed by: Joy MacDonald, Mark Shepherd, Peter Gannon, Greg James and David Fairbridge, Oct '08-May'09
Mapping by: Staci Timms and Jo Henry, May '09
Generated from: data collected in the field using Trimble and IPAQ PDAs and aerial photograph interpretation. GIS layers and Aerial Photography supplied by DSE and GAA. Woodland Habitat defined by Arborist Reports from Treelogic conducted in 2004 and 2008

DATUM: GDA 94 MGA Zone 55

N

0 50 100 150 200 250
Metres

1:5,000

NOTES:
Practical Ecology bears no responsibility for the accuracy and completeness of this information and any decisions or actions taken on the basis of the map. While information appears accurate at publication, nature and circumstances are constantly changing.

VERSION	03	DATE	19/11/09

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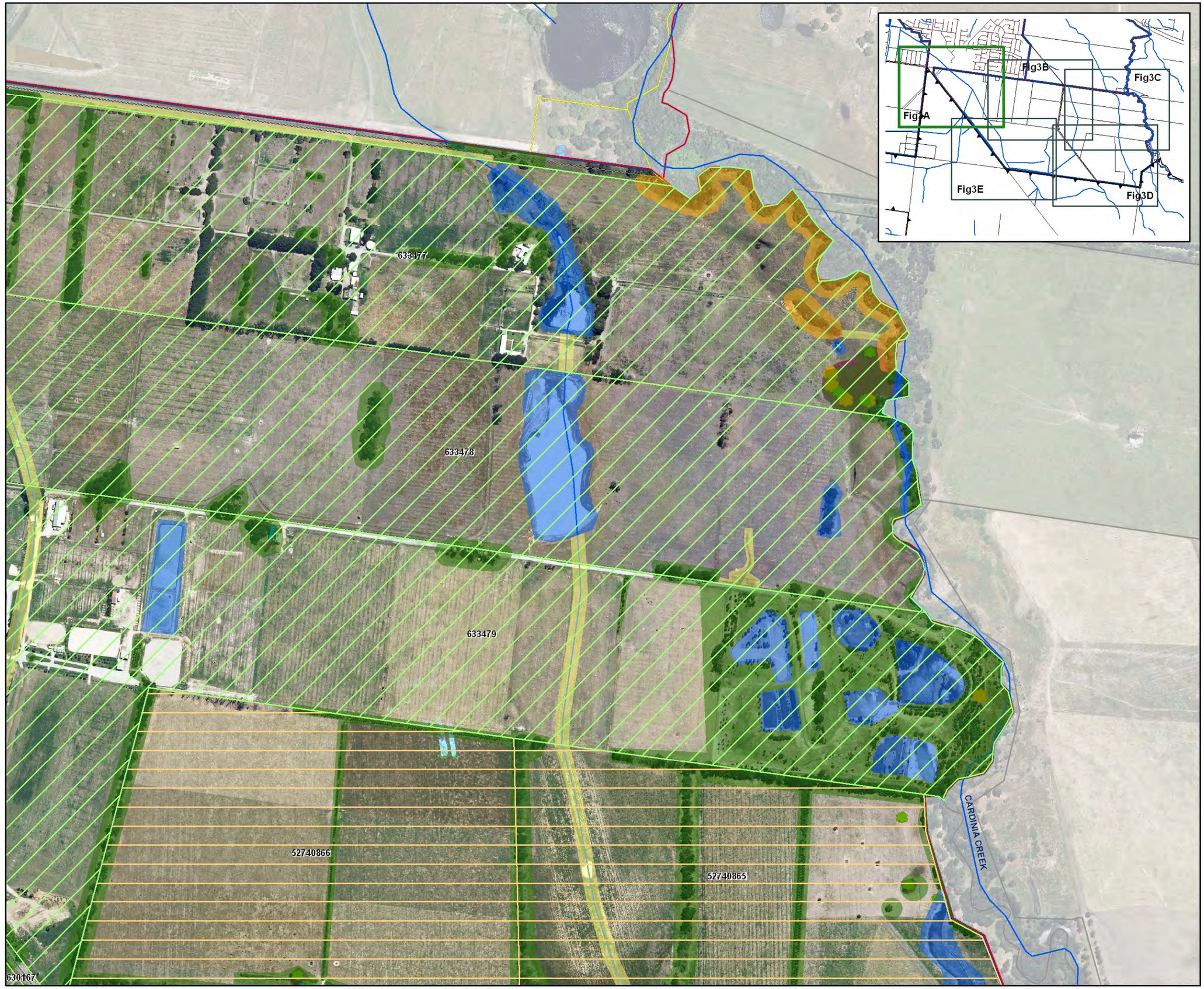

FIGURE 3C
Areas of High Fauna Habitat Value for Significant Species
Precinct 13 Study Area
Biodiversity Assessment Report
Fauna Assessment and Mapping
Clyde North
Growth Areas Authority

LEGEND

- Roads
- Watercourses
- Study Area Boundary
- Property Boundary
- Precinct Boundary
- Urban Growth Boundary
- Properties assessed
- Properties not assessed

Scattered Tree Locations

- Small Tree
- Medium Old Tree
- Large Old Tree
- Very Large Old Tree

Areas of High Faunal Habitat Value for Significant Species*

- Drainage Lines
- Swamp Scrub
- Wetland
- Indigenous Woodland#

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FIGURE 3D

Areas of High Fauna Habitat Value for Significant Species
Precinct 13 Study Area
Biodiversity Assessment Report
Fauna Assessment and Mapping
Clyde North
Growth Areas Authority

LEGEND

- Roads
- Watercourses
- Study Area Boundary
- Properties assessed
- Property Boundary
- Precinct Boundary
- Urban Growth Boundary
- Properties not assessed

Scattered Tree Locations

- Small Tree
- Medium Old Tree
- Large Old Tree
- Very Large Old Tree

Areas of High Faunal Habitat Value for Significant Species*

- Drainage Lines
- Swamp Scrub
- Wetland
- Woodland

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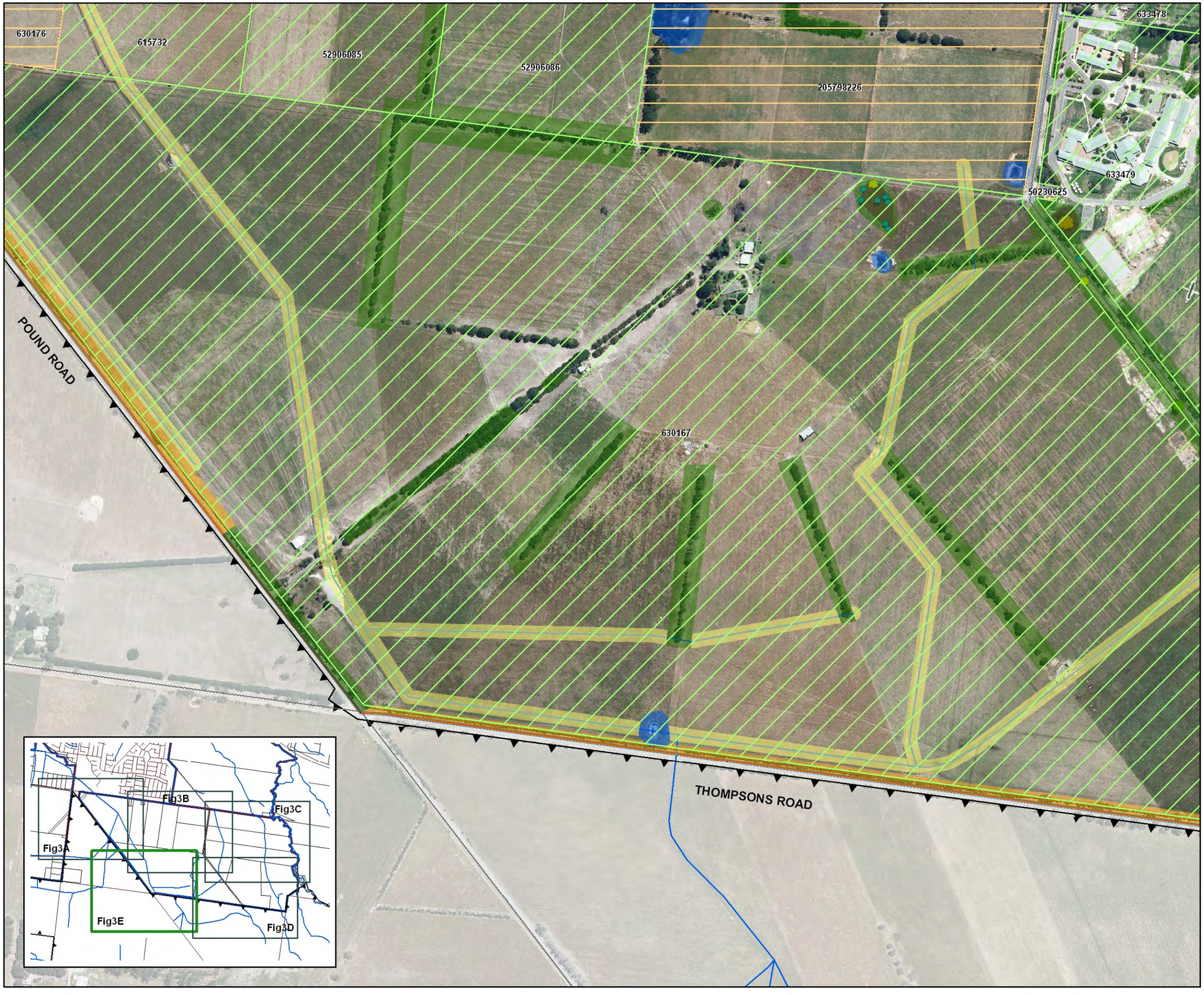

FIGURE 3E
Areas of High Fauna Habitat Value for Significant Species Precinct 13 Study Area

Biodiversity Assessment Report
Fauna Assessment and Mapping
Clyde North
Growth Areas Authority

LEGEND

- Roads
- Watercourses
- Study Area Boundary
- Property Boundary
- Precinct Boundary
- Urban Growth Boundary
- Properties assessed
- Properties not assessed

Scattered Tree Locations

- Small Tree
- Medium Old Tree
- Large Old Tree
- Very Large Old Tree

Areas of High Faunal Habitat Value for Significant Species*

- Drainage Lines
- Swamp Scrub
- Wetland
- Indigenous Woodland#

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