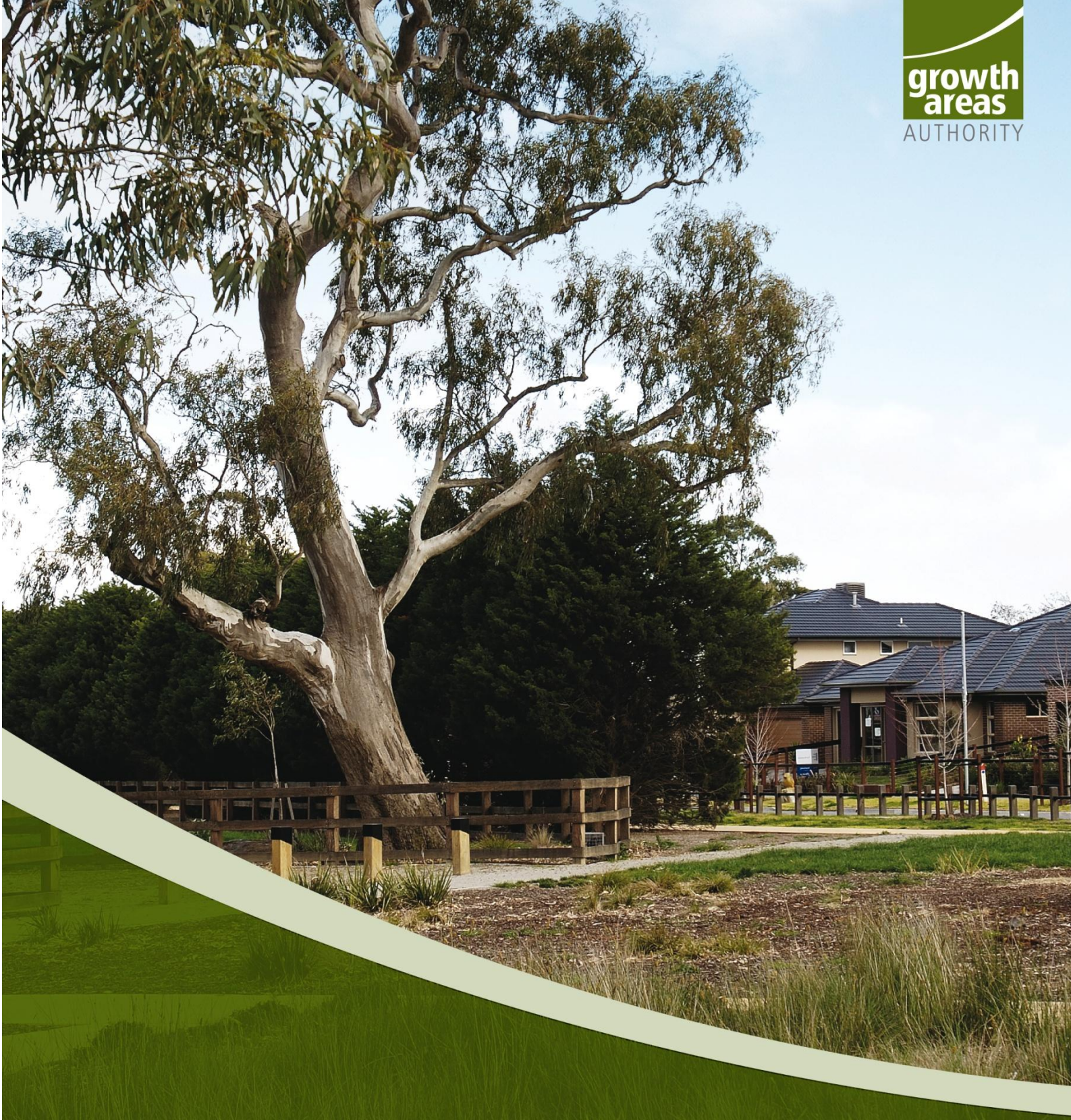

growth areas AUTHORITY

Biodiversity Assessment Report

Contract Area 42 : Casey Central – PSP 1051

August 2012

Citation
Growth Areas Authority (2012), Biodiversity Assessment Report: Contract Area 42 – Casey Central – PSP 1051
Growth Areas Authority, Melbourne
Published by the Growth Areas Authority, Melbourne, August 2012

Authorised by the Growth Areas Authority, Level 29, 35 Collins Street, Melbourne 3000.

ISBN 978-1-921747-75-5 (printed)
ISBN 978-1-921747-76-2 (CD-ROM
ISBN 978-1-921747-77-9 (online)

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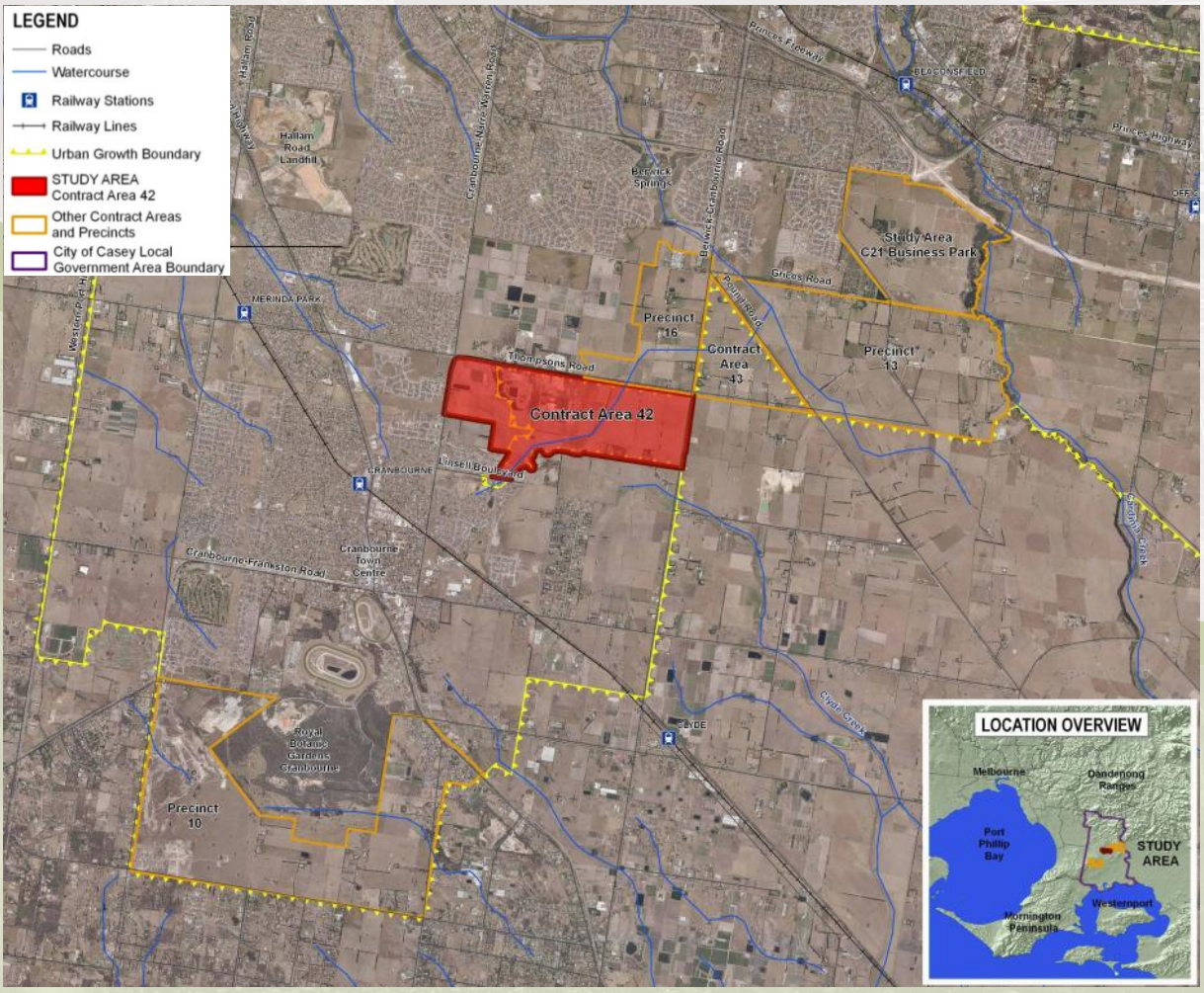
Biodiversity Assessment Report
Contract Area 42: Casey Central – PSP 1051
August 2012



MAP: Contract Area 42 – Casey Central PSP 1051

Biodiversity Mapping Project
Quality Assurance – Verification Sheet
Contract Area 42: Casey Central – PSP 1051

Document Title	Biodiversity Assessment Report		
Precinct (Name and Number)	Contract Area 42 Casey Central PSP 1051		
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ISBN Number	ISBN 978-1-921747-75-5 (printed) ISBN 978-1-921747-76-2 (CD-ROM ISBN 978-1-921747-77-9 (online)		

	Organisation
This document is approved for release	**Growth Areas Authority : Director, Technical Services:** ..... **Date:** 2/8/12
	Department of Sustainability and Environment ..... **Director, Ecosystem Services:** **Date:** 2-8-2012

Biodiversity Assessment Report: Investigation Area 42

4 October 2011

Report by Mark Shepherd, Joanne Henry and David Nance.

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External version control

Version	Date sent to client	Reviewed by:
1	28 April 2010	Biosis Research, DSE
2	21 December 2010, DSE	DSE
3	12 July 2011	DSE/GAA
4	4 October 2011	

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.

Jeremy Neal, Mark Shepherd and Peter Gannon undertook habitat hectare assessments.

Mark Shepherd, Nic McCaffrey, Doug Frood and Gidja Walker undertook targeted and general flora survey.

Annabelle Stewart, Joanne Henry, Zorza Goodman and David Nance undertook targeted and general fauna survey.

Jane Juliff and David Nance provided technical assistance.

Nic McCaffrey assisted with 'likelihood of occurrence' ratings of significant flora and reviewed sections of the draft report.

Mal's Ecological and Environmental Services

Malcolm Legg undertook general fauna survey and targeted survey for threatened fauna, and provided regional significance ratings for threatened fauna.

Rob Gration MWldMgt (Habitat); Certified Wildlife Biologist ® Ecological Consulting Services

Rob Gration identified and analysed microbat calls recorded with AnaBat.

Pathways Bushland and Environment

Doug Frood undertook targeted and general flora survey and assisted with the determination of habitat for some threatened flora species

Ecocentric Environmental Consulting

Peter Gannon undertook habitat hectare assessments and reviewed sections of the draft report.

Department of Sustainability and Environment

Clare White, Biodiversity Precinct Planner, provided project advice relating to the determination of conservation significance of habitat zones within the study area.

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

Sub-Regional Species Surveys

Sub-Regional surveys were conducted for the Growling Grass Frog (GGF), the Golden Sun Moth (GSM), and the Southern Brown Bandicoot (SBB), as part of a separate project to the current Biodiversity Mapping Project 2009 – 2010. The purpose of the work was to inform and provide background information for the development of Sub-Regional strategies for each of these species.

Contractors were required to reference and use the Sub-Regional survey information as part of the preparation of the Biodiversity Assessment Reports. Accordingly, no targeted surveys were carried out for these species as part of the Biodiversity Mapping Project 2009 – 2010.

The Sub-Regional survey information referenced in the Biodiversity Assessment report will be superseded by the Sub-Regional Strategies for the relevant species and ultimately the Biodiversity Conservation Strategy once endorsed by the Federal Government.

EXECUTIVE SUMMARY

Practical Ecology Pty Ltd was commissioned by Growth Areas Authority to undertake a detailed flora, fauna and habitat hectare assessment within Contract Area 42, Cranbourne East, 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 potential preparation of a Precinct Structure Plan for Contract Area 42.

Contract Area 42 is located within the City of Casey in Melbourne's south eastern growth corridor (Figure i). The contract area is approximately 276 hectares in area and is bounded by Thompsons Road to the north, Narre Warren Road to the west, Berwick-Cranbourne Road to the east and residential development to the south (Figure i). The contract area is located within the Gippsland Plain bioregion.

The majority of the contract area is currently being used for grazing livestock and features large open paddocks with some indigenous trees and planted vegetation. A disused quarry and a garden supplies business are situated on the higher elevations in the central sector. The majority of native vegetation and fauna habitat within the contract area occurs within these two properties at 1520 and 1550 Thompsons Road. Native vegetation is also common within roadsides, wetlands and within a large drainage-line transversing the study area from north to south (Figure ii). A Land Subject to Inundation Overlay (LSIO) occupies a significant proportion of the contract area and coincides with the major drainage-line.

The owners of several large properties refused Practical Ecology permission to undertake an ecological assessment (Figure ii).

Flora

Two-hundred and seventy-five flora species were recorded within the contract area, of which 138 are indigenous species. The flora species records within the contract area constitute relatively high floristic diversity when compared to the highly modified and mostly cleared agricultural landscape within which the contract area is situated. Surrounding farmland would typically comprise a small proportion of the floristic diversity found within the quarries at the contract area.

Three significant flora species were recorded within the contract area during the current assessment (Figure iv). All species are listed as *rare or threatened* by the Department of Sustainability and Environment (DSE) and are not listed as threatened under the *Environment Protection Biodiversity Conservation Act* 1999 (EPBC Act) or the Flora and *Fauna Guarantee Act* 1988 (FFG Act). All three species were recorded within 1520 Thompsons Road, a disused quarry. One nationally significant species, River Swamp Wallaby-grass *Amphibromus fluitans* is considered to have a high likelihood of occurrence within the contract area.

Native vegetation within the contract area is confined primarily to 1520 and 1550 Thompsons Road, 2/585 Berwick Cranbourne Road, drainage-lines and roadsides. 22.64 hectares of native vegetation within the contract area meets DSE's native cover threshold and comprises 8.22 habitat hectares. Of the 68 patches of native vegetation recorded within the study area, 39 patches have been assigned very high conservation significance, while the remaining 29 patches have been assigned high conservation significance. Twenty-four scattered trees were recorded within the contract area.

EightEVCs were recorded and mapped within the contract area. Most EVCs recorded within the area have an *endangered* or *vulnerable* conservation status in the Gippsland Plains bioregion.

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 remnants.

Fauna

One hundred and fifteen fauna species were recorded during the current assessment, including 98 indigenous species, one non-indigenous native species and sixteen exotic species (Appendix 11). Three threatened fauna species were recorded during the current assessment (Figure iv). Two of these species are threatened wetland birds, the Royal Spoonbill *Platalea regia* and Australia Shoveller *Anas rhynchotis*. One threatened amphibian; Southern Toadlet *Pseudophryne semimarmorata* was recorded within the contract area. Previous surveys have also recorded the threatened wetland bird, Hardhead *Aythya australis,* which was not recorded during the current assessment. Footprints that bear resemblance to Southern Brown Bandicoot *Isoodon obesulus* were found during the targeted survey for Southern Toadlet, however as a footprint is considered inconclusive, this species is not recorded as being present. It is given a high likelihood of occurrence and it is recommended that all potential habitat is managed for the protection of this species.

This biodiversity assessment did not include targeted surveys for Growling Grass Frog *Litoria ranifomis* and Southern Brown Bandicoot. These species have been assessed as part of Sub Regional Surveys required under the Strategic Assessment Report.

Sixty national and state significant fauna species recorded or predicted to occur within 10 kilometres of the study area are documented on the Atlas of Victorian Wildlife (AVW) (DSE 2009b)and EPBC Protected Matters Search Tool (DEWHA 2010a) (Appendix 15). Eight fauna species detected during AVW and EPBC searches are considered to have a high likelihood of occurrence within the contract area. An additional 19 species are considered to have at least a moderate likelihood of occurrence within the contract area. These are shown in Appendix 16.

Two large woodland areas provide habitat to a number of woodland dependent species, in particular birds. The woodland at 1520 Thompsons Road provides the highest quality habitat within the contract area. 1520 Thompsons Road (Figure 5A ref. P12) had two threatened fauna species records within the property, Royal Spoonbill and Southern Toadlet. There are a number of drainage-lines present which provide habitat for amphibians including Southern Toadlet. Royal Spoonbill *Platalea regia* was also seen wading in the dam at 1520 Thompsons Road. A woodland within 2/585 Berwick-Cranbourne Road is highly modified and in a state of regeneration. However, this woodland occupies a substantial area and is considered habitat for many woodland birds, microbat species and other lifeforms.

Other areas of native (non-indigenous) and exotic (introduced) vegetation, including numerous small patches of regenerating Swamp Scrub and other native vegetation that do not meet the DSE threshold for consideration under Victoria's *Native Vegetation Management Framework*. Some of these areas occur within roadsides and drainage-lines within the contract area. Whilst highly modified or immature, some of these areas comprise relatively complex vegetation structures and floristic diversity and are considered habitat for threatened fauna species, such as threatened wetland birds and amphibians (Figure iv).

The constructed wetlands and the drainage-line along Cornwell Crescent in the south of the contract area provide habitat for wetland birds, fish and amphibians (Figure iii). Dams with fringing native vegetation also offer habitat for wetland birds and amphibians. A pair of Australasian Shovelers, were recorded in a dam in the south-west corner of the property at 1500 Thompsons Road. No access was granted to this property; however the birds were observed from across the fence from the adjacent property 1520 Thompsons Road. Habitat condition within dams and wetlands has the potential to improve as the wetland floristic diversity increases and habitat values develop.

The drainage area running through the contract area from Thompsons Road, connecting with the wetlands in Cornwell Crescent may provide habitat for the Nationally listed Southern Brown Bandicoot and Dwarf Galaxias and the the State significant Southern Toatlet. The drainage lines are in a poor condition with a high cover of exotic species including Blackberry **Rubus fructis*. However, Blackberry is a known habitat component for Southern Brown Bandicoot and should be managed accordingly. These areas should be conserved and enhanced.

Key Biodiversity Issues and Implications

The areas of highest conservation value within the contract area consists of the remnant and regenerating woodlands and wetlands within and surrounding 'the quarries' at 1550 and 1520 Thompsons Road. The mix of woodland and wetland within this site offers a diverse range of habitats supporting a number of the region's significant flora and fauna species in a neighbourhood that is otherwise depauperate of quality habitat.

Despite the widespread clearing of remnant habitat across the contract area there are several other patches of habitat and modified habitat corridors within the contract area. Sites of conservation value include:

- Two quarry sites and the wetland / woodland habitats therein (discussed above).
- A major drainage-line transecting the study area from north to south (with reaches branching west and east through land parcels 626780 and 150452089 respectively).
- A regenerating woodland at 2/585 Berwick-Cranbourne Road.
- Scattered trees, remnant vegetation and exotic vegetation within road reserves, especially within Thompsons Road reserve.

Furthermore, many other roadsides, sections of drainage-line and areas of Degraded Treeless Vegetation contiguous with remnant patches are considered habitat for threatened fauna species within the contract area and generally hold greater conservation value compared to surrounding agricultural land.

The two quarry sites offer a range of quality habitat options for significant flora and fauna. Several significant flora taxa were recorded on site and habitat exists to support woodland dependent fauna, amphibians and wetland birds. Several significant fauna taxa were also found on site, including Southern Toadlet, Royal Spoonbill and Australasian Shoveler, and habitat exists to support Hardhead and potentially other wetland birds. Several Endangered and Vulnerable EVCs, such as Swamp Scrub, Damp Sands Herb-rich Woodland and Swampy Riparian Woodland were also found on site. The paucity of habitat options in the region further contributes to the necessity to conserve the values within the two quarry sites. In short, these sites, specifically those within land parcels 151078259, 636817, 20221531, 203929396, 150452089 and 52925555 should be considered for retention within the precinct and set aside as a conservation reserve for their preservation and the enhancement of their ecological values.

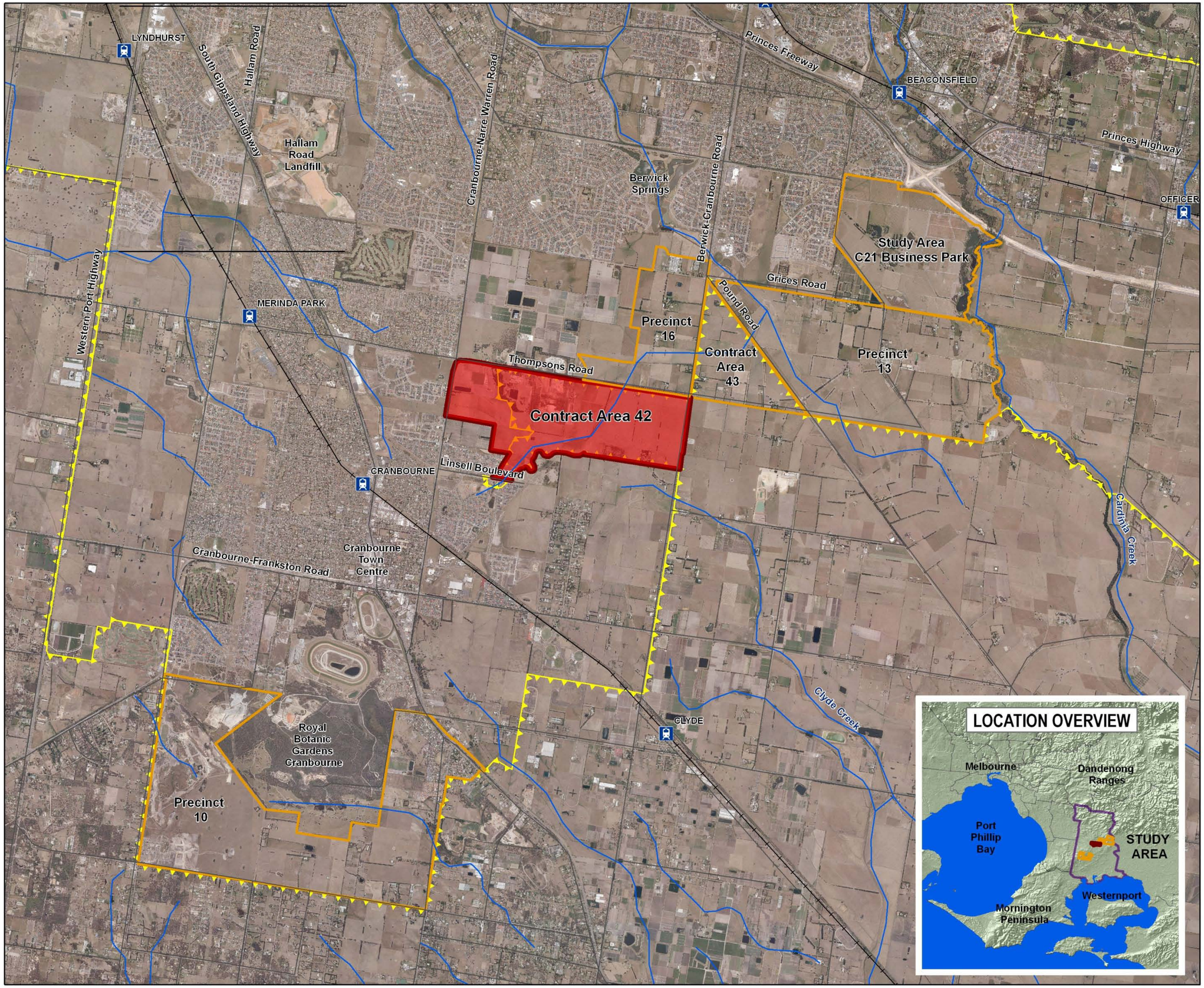
Land-use change within the contract area, such as residential, business or industrial developments have the potential to significantly impact existing native vegetation, ecosystem function, water quality, threatened species habitat, and local and regional biodiversity, primarily through the direct removal of native vegetation and habitat. However, less than 10 percent of the study area comprises indigenous vegetation. This relatively small proportion of the contract area should be retained for conservation and rehabilitation, as required first and foremost by Victoria's *Native Vegetation Management: a Framework for Action* (DNRE 2002).

The following impact minimisation options should be considered for the contract area when a Precinct Structure Plan is being developed:

- The avoidance and therefore retention of native vegetation through careful placement of roads, infrastructure, building lots and open space during the design phase.
- The retention of wetlands including areas of open water and other wetland habitat.
- The development of stormwater retarding basins to reduce additional stormwater runoff entering drainage lines and wetlands.
- The avoidance of removal of existing roadside vegetation through the purchase of adjacent cleared private land when planning for road duplication.
- The retention of scattered trees within the study area.
- The retention of all drainage line habitat and staged removal of weeds (such as blackberry) within these areas, and the addition of indigenous habitat within these areas.
- The adoption of conservation aims in the rezoning and PSP planning process.

Potential improvements to be considered for the protection of biodiversity values include:

- Incorporation of Water Sensitive Urban Design (WSUD) stormwater treatment systems.
- Establishment of additional habitat for the region's significant fauna (with particular emphasis on the provision of habitat for Southern Brown Bandicoot *Isoodon obesulus*, Growling Grass Frog *Litoria raniformis*, Glossy Grass Skink *Pseudemoia rawlinsoni* and Southern Toadlet).
- Establishment of supporting terrestrial habitat on either side of the drainage-lines (with particular emphasis on providing habitat linkages for Southern Brown Bandicoot).
- Establishment of adequate buffer zones to either side of drainage-lines for the purpose of controlling pedestrian access.
- Retention of roadside remnant areas and drainage-lines offering aquatic habitat values to the region's significant fauna.



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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: 02	DATE: 04/10/10

MAP AND SURVEY DETAILS

Mapping by: Staci Timms, 29/04/10
Generated from: Aerial Imagery and GIS base layers supplied by DSE and GAA, additional GIS layers from Geoscience Australia.

For further detail of Contract Area 42, refer to "FIGURE 1: Study Area"

DATUM: GDA 94 VICGRID 94

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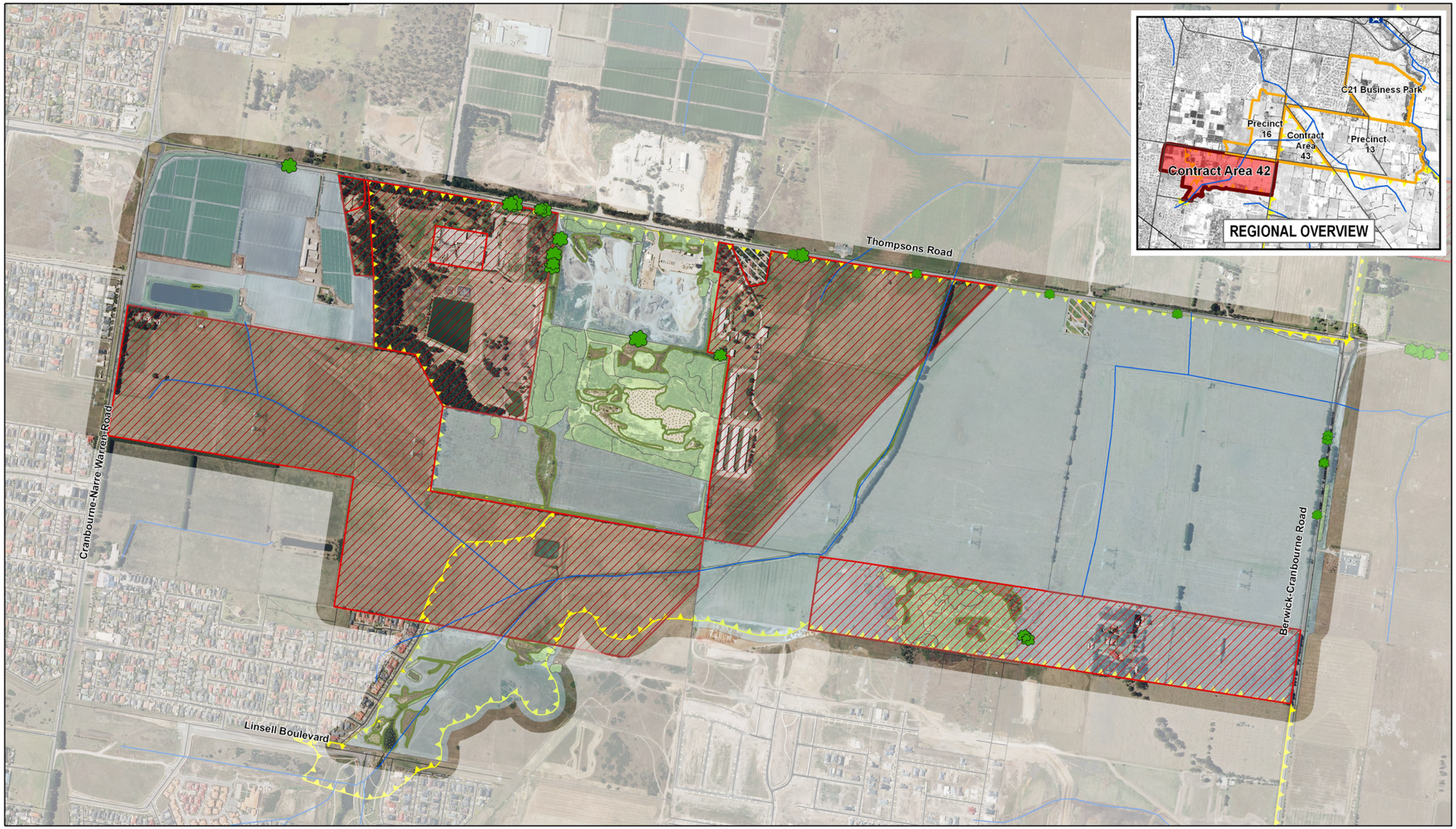
Kilometres

1:50,000 when printed at A3

LEGEND

- Roads
- Watercourse
- Railway Stations
- Railway Lines
- Urban Growth Boundary
- STUDY AREA Contract Area 42
- Other Contract Areas and Precincts
- City of Casey Local Government Area Boundary

FIGURE i
REGIONAL CONTEXT
Contract Area 42
Biodiversity Mapping Project
2009-2011



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DATUM: GDA 94 VICGRID 94

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Metres

1:10,000 when printed at A3

MAP AND SURVEY DETAILS

Surveyed by: Mark Shepherd, Luke Bennet and Peter Gannon, 06Oct09 - 07Feb10

Mapping by: Staci Timms, Mar10

Generated from: Data collected in the field using Juno PDAs and DSE's Habitas Software. Aerial Imagery and GIS base layers supplied by DSE and GAA, additional GIS layers from Geoscience Australia.

For more detailed maps of Access, EVCs and Scattered Trees, refer to Figures 2 and 5.

VERSION: 02	**DATE:** 04/10/10

LEGEND

- Roads
- Watercourse
- Urban Growth Boundary
- Investigation Area 42 Site Boundary
- Other Precincts and Contract Areas

Access*

- Property Access Constraints - Surveys** Not Completed
- No survey necessary -domestic zone only.

* Nature of access constraints detailed in Figure 2

**General flora, targeted flora and/or targeted fauna surveys

Flora

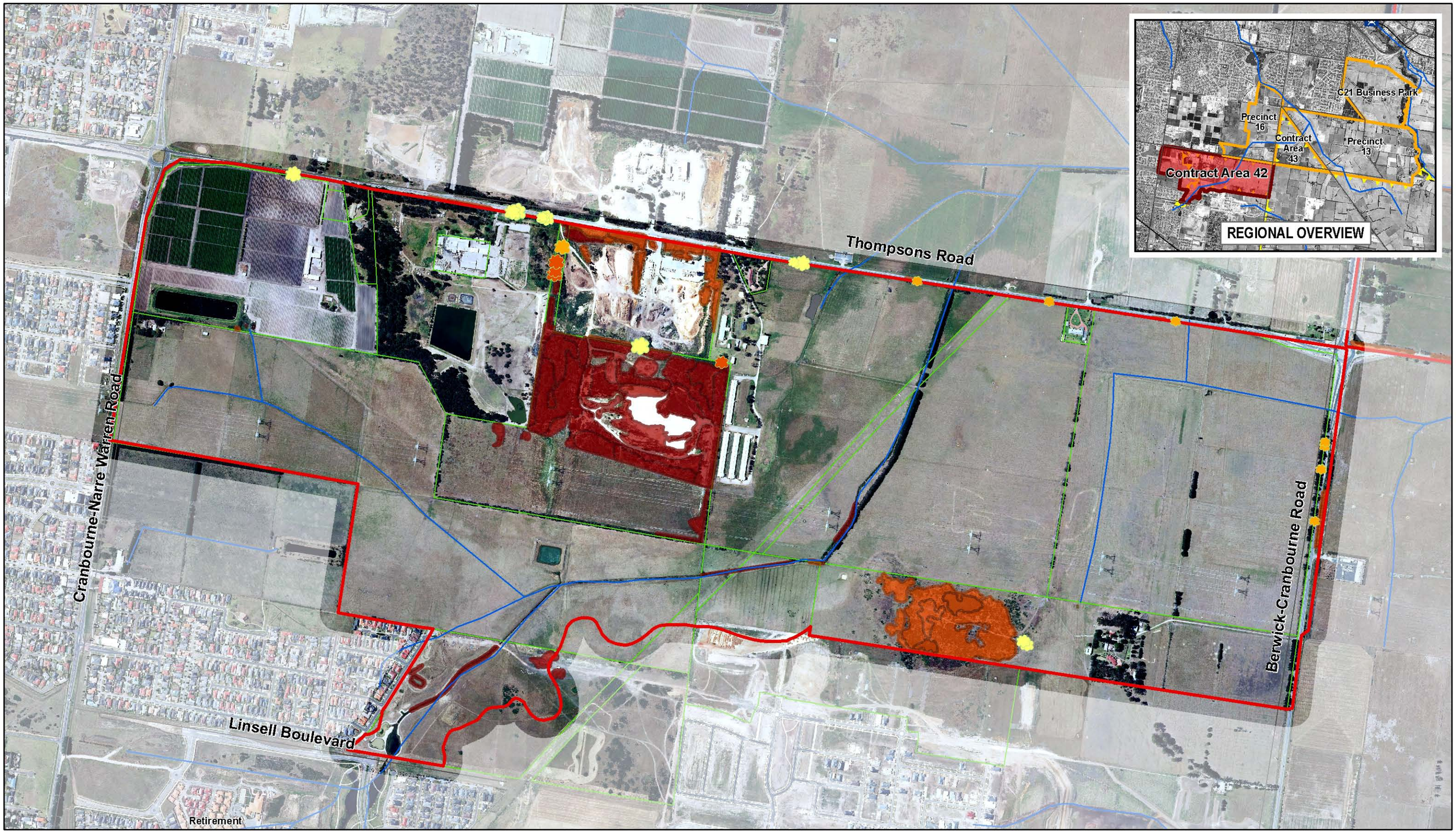
- Scattered Trees
- Degraded Treeless Vegetation
- Remnant Patch
- Non Native Vegetation

FIGURE ii

PROPERTY ACCESS AND FLORA SURVEY RESULTS

Contract Area 42

Biodiversity Mapping Project 2009-2011



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MAP AND SURVEY DETAILS

Surveyed by: Mark Shepherd, Luke Bennett and Peter Gannon, 6 Oct 2009 - 7 Feb 2010

Mapping by: Staci Timms, April 2010

Updated by Colin Broughton, September 2011

Generated from: Data collected in the field using Juno PDAs and DSE's Habitas Software. Aerial Imagery and GIS base layers supplied by DSE and GAA, additional GIS layers from Geoscience Australia.

For more detailed maps of the Conservation Significance of Native Vegetation, refer to Fig. 6

VERSION 02	DATE: 21/09/11

LEGEND

- Watercourse
- Roads
- Urban Growth Boundary
- Contract Area 42 Study Area
- Other Precincts and Contract Areas
- Property Boundary

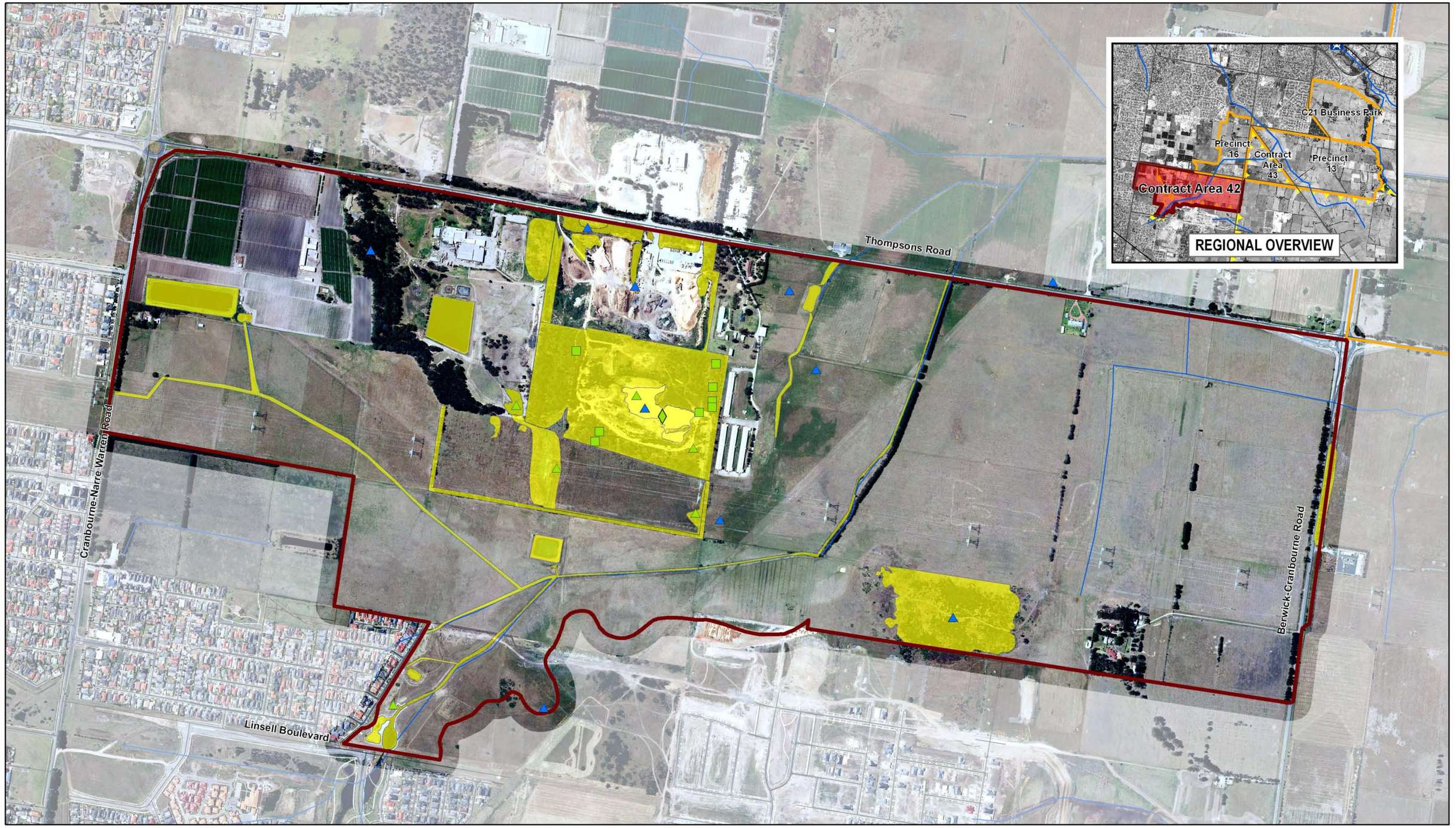
Conservation Status - Scattered Trees

- Low
- Medium
- High

Conservation Status - Habitat Zones

- High
- Very High

FIGURE iii
CONSERVATION SIGNIFICANCE
Contract Area 42
Biodiversity Mapping Project 2009-2011



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MAP AND SURVEY DETAILS

Surveyed by: Mark Shepherd, Luke Bennett, Peter Gannon, Jo Henry, Zorza Goodman, Mal Legg, David Nance and Annabelle Stewart. Oct09 - Apr10
Mapping by: Staci Timms, April 10
Generated from: Aerial Imagery and GIS base layers supplied by DSE and GAA, additional GIS layers from Geoscience Australia.

For detailed Figures of Fauna Habitat and Threatened Flora and Fauna Species Records refer to Figures 5, 6 and 8

VERSION: 02	DATE: 04/10/10

LEGEND

- Roads
- Watercourse
- Urban Growth Boundary
- Contract Area 42 Study Area Boundary
- Other Precincts and Contract Areas
- Fauna Habitat

Threatened Species Records

Flora Records
- Practical Ecology Survey Results

Fauna Records
- Practical Ecology Survey Results
- Database Results

Conservation Significance Level
- State
- Regional

FIGURE iv
THREATENED SPECIES RECORDS AND FAUNA HABITAT
Contract Area 42
Biodiversity Mapping Project 2009-2011

Contents

1. INTRODUCTION

1.1 Project Background

Project Purpose

The role of the Growth Areas Authority (GAA) is to plan for the new suburbs on the periphery of metropolitan Melbourne, to improve planning process and achieve better outcomes for new communities.

The GAA has undertaken detailed scale flora and fauna assessment and mapping to determine biodiversity values within Melbourne's growth areas. This is an essential input into the planning process and informs the environmental outcomes that can be achieved from the process. Assessment and mapping of biodiversity values, as part of Melbourne's planning, has never been undertaken on this scale before.

The project provides biodiversity information which is needed to carry out the detailed planning for future urban precincts. Importantly, this information (which includes determination of 'habitat hectares' of native vegetation in each precinct) will enable the application of the *Victorian Native Vegetation Management Framework* principles of 'avoid, minimise and offset' and the achievement of 'net gain' outcomes.

Planning of new precincts in Melbourne must also meet National objectives for the conservation of matters of National Environmental Significance as described by the Commonwealth Environmental Protection and Biodiversity Conservation Act 1999. The biodiversity reports prepared by the GAA are an important tool in Victoria meeting its obligations under Commonwealth legislation and achieving these national environmental objectives.

The purpose of the GAA Biodiversity Assessment and Mapping Project is to:

- Undertake detailed field surveys of native vegetation and targeted flora and fauna species and to assess and map the ecological significance of these.
- Prepare Biodiversity Reports (covering native vegetation and flora and fauna habitat) 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

- Assist the long term planning of Melbourne's growth areas, including working with infrastructure authorities to ensure their requirements are met over the next 30-50 years;

The project has been undertaken over two consecutive years covering a total of 43,577 hectares, using prescribed survey techniques to map native vegetation, and targeted flora and fauna species. Experienced botanists and zoologists have been contracted by the GAA to undertake field surveys according to standards established by the GAA and the Victorian Department of Sustainability and Environment (DSE).

The total areas surveyed during the first year of the project (2008/2009) was 32,899 hectares of which 6,070 hectares was inside the Urban Growth Boundary; 20,320 hectares was within investigation areas (proposed Urban Growth Boundary); and 6,509 hectares of western grassland areas - resulting in the production and publication of 13 Biodiversity Reports.

The second year of the project (2009/2010) assessed and mapped an additional area of 10,678 hectares of land proposed for future urban development and will result in the preparation of a further 20 Biodiversity Reports.

Biodiversity Reports

These Biodiversity Reports will inform the preparation of precinct structure plans in areas designated for future urban development. In particular, the reports provide data about the quality, type, extent and significance of native vegetation and flora and fauna habitat within each planning precinct. Additionally, the Reports provide data used for preparation of Native Vegetation Precinct Plans and, in some cases, for preparation of Conservation Management Plans.

This process enables the planners and other professionals working on the precinct plan to understand the ecological value of habitat existing within the precinct and to make decisions about the future urban structure and provision of infrastructure within the precinct using the principles contained in *Victoria's Native Vegetation Management Framework* of 'avoid, minimise and offset'.

The State Government's goal for conserving native vegetation 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'. The assessment and mapping of Victoria's biodiversity values make a significant contribution to the State Government's goal in the context of planning for Melbourne's growth areas.

Streamlining Initiative

Detailed assessment and mapping of biodiversity prior to precinct planning is an initiative developed by the GAA to improve and streamline the planning process. It is an innovative approach to structure planning practice and improves both planning and environmental outcomes in Victoria by the following:

- The assessments are carried out early in the planning cycle so that they can inform design and decision making.

- The field work is undertaken at the correct time of the year according to ecological standards and according to survey techniques established and agreed by GAA and DSE.

- Multiple field surveys are conducted concurrently by qualified practitioners, which is a more efficient method of collecting the biodiversity data.

- Economies of scale are achieved by contractors covering large land areas (at the precinct scale), reducing the cost and time required.

- The resulting Biodiversity Reports provide all stakeholders with consistent and reliable information about flora, fauna and habitat values within the precinct to enable better decision making and environmental outcomes to be achieved.

- GAA carrying out this work reduces the burden on local governments and land owners and provides greater certainty for urban development and biodiversity outcomes.

As a streamlining initiative, the project follows GAA principles of carrying out the necessary background research competently and early in the process. By the GAA establishing the survey and reporting standards required up front and by doing the research early in the process, it avoids others having to repeat or rectify the research later in the process. Repeat surveys and inadequate quality of surveys has often occurred in the past and the GAA seeks to avoid this occurring in current planning work.

New Standards of Practice

The GAA Biodiversity Mapping and Assessment Project establishes new standards in the integration of biodiversity conservation in the planning of new suburbs in growth areas by:

- Determining up front with the Department of Sustainability and Environment the prescribed survey techniques to be used by contractors working in the field.

- Establishing up front with the Department of Sustainability and Environment which targeted surveys (for which species of flora and fauna) are required in each precinct according to known or likely habitat.

- Agreements between GAA and DSE mean that a more strategic approach has been taken to surveys for specific species – using either an 'assumed' presence model (e.g. Striped Legless Lizard) and a sub-regional survey approach (for Southern Brown Bandicoot, Growling Grass Frog and Golden Sun Moth).

- Use of hand-held GPS field mapping devices and a common approach to map presentation to provide consistent and quality mapping standards to be achieved.

- All contractors, while being experienced and qualified scientists, were required to undergo three days of compulsory training in habitat hectare assessment techniques and a competency check (managed by DSE) and field based quality checks of their work.

The GAA flora and fauna mapping and assessment project was undertaken in close association with the Department of Sustainability and Environment (DSE) which is the regulator for biodiversity protection and conservation in Victoria. This collaborative and proactive approach by the GAA to work with the DSE has added significant value to the quality and reliability of the project outcomes. The data collected by the project and it assessment and mapping adds to the protection, management and restoration of the environment through the precinct planning process.

The Biodiversity Reports prepared for each planning precinct are a key input into the detailed planning for the precinct. They support the preparation of key documents such as:

- The Biodiversity Plan (setting out the key biodiversity issues and implications) included within the Precinct Structure Plan.

- Native Vegetation Precinct Plan (setting out the native vegetation to be retained, removed and offset within the precinct).

- A Conservation Management Plan if required (which sets out the management prescriptions for matters of national environmental significance).

Collaboration by GAA with the Victorian Department of Sustainability and Environment (DSE) throughout the project has enabled the development of a robust methodology and a biodiversity template for the production of reports.

Quality of Professional Work and Final Product

The GAA approach has established appropriate standards at the outset of the project and ensured that the work is done to meet these standards, to avoid re-work and future delays. Measures have been put in place throughout this project to ensure quality standards are met and reflected in the final reports. These can be summarised as follows:

- A project governance structure has been used by the project from start to finish involving both the GAA (undertaking the project) and DSE (the regulator for biodiversity matters under Victorian legislation) in establishing the project scope and standards to be achieved.

- A project scope was prepared and reflected within the Tender specification used by the GAA to ensure that contractors who were selected by the GAA had the

experience and skill required to carry out the project and meet the required quality standards.

- Contractors working on the project were required to undertake 3 days of compulsory training and to meet a competency check.

- Contractors were required to submit monthly reports of the data collected to GAA and DSE to enable checking of data and mapping integrity. This quality check provided confidence in the information collected and rectification of any deficiencies prior to acceptance of the results.

- Biodiversity Reports which explain and interpret the data collected in the field were prepared by qualified ecologists and are designed to enable planners, engineers, designers and others to understand the information and use it in practical applications.

- Quality assurance of draft reports by another qualified ecological consultant has been used to ensure work is accurate and consistent in meeting project standards. The quality assurance process provides a streamlined approach to checking and amending reports before they are finalised and accepted by GAA and DSE.

1.2 Objectives

Outline the objectives of the report:

1. To identify, assess, and map significant flora, fauna, and habitat in the Precinct area and their level of conservation significance.

2. To collect data at sufficient detail and standard that enables a Precinct structure Plan and Biodiversity Plan to be developed

3. To provide advice on any works or management measures that may reduce adverse impacts of the development on species known or likely to occur in the Precinct.

4. To ensure that development of the precinct is able to comply with Government legislative and policy requirements on the protection of indigenous fauna and flora species and communities.

1.3 Study Area

Investigation Area 42 is located within the suburbs of Cranbourne East and Clyde North, within the City of Casey in Melbourne's south eastern growth corridor (Figure 1). Area 42 is approximately 276 hectares in area and is bounded by Thompsons Road to the north,

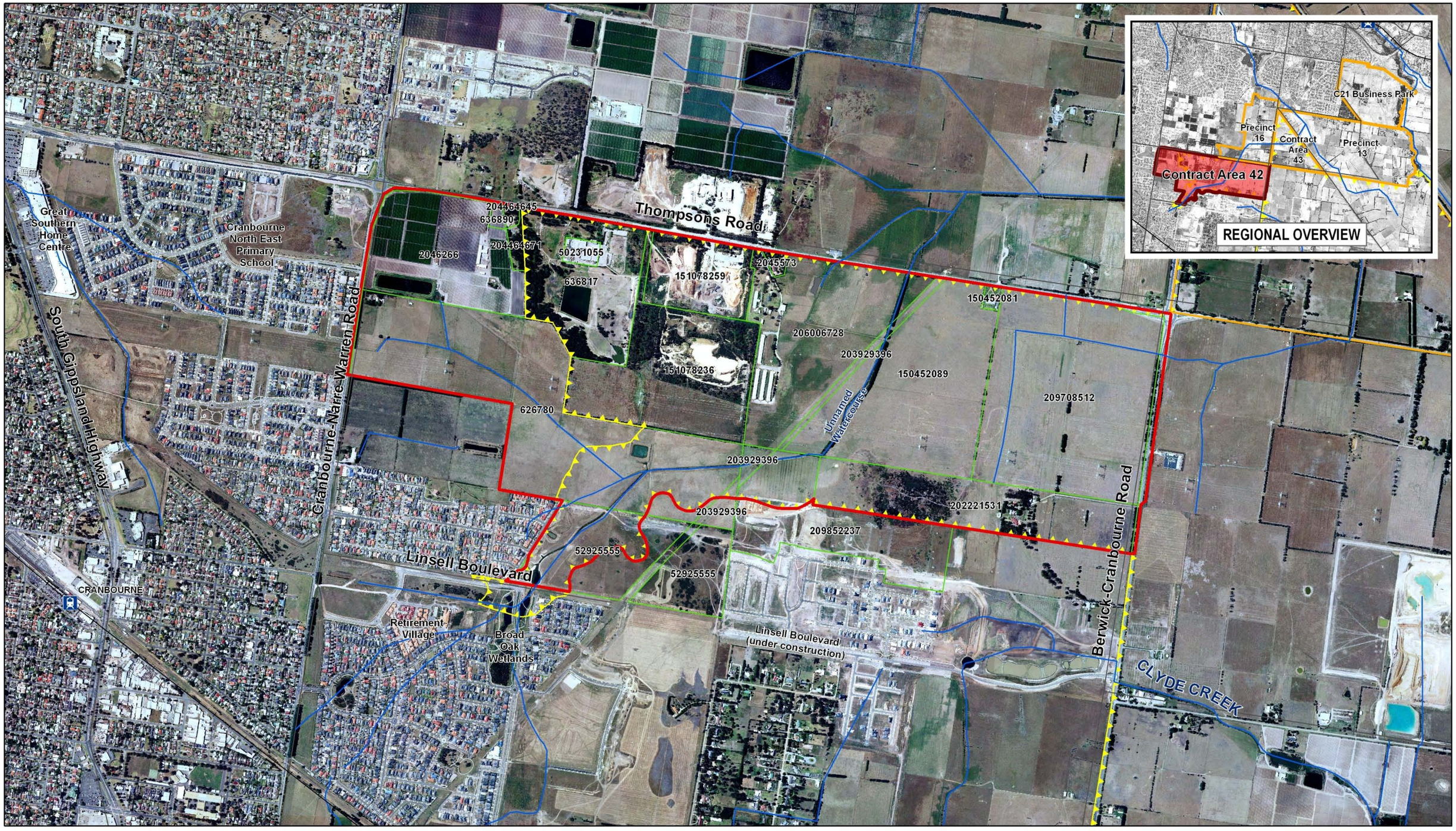
Narre Warren Road to the west, Berwick-Cranbourne Road to the east and residential development to the south. The study area is surrounded predominately by agricultural land to the north and east and by residential areas to the south and east (Figure 1).

The study area consists of approximately 18 privately owned parcels 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 exotic trees in rows. An elevated section in the central-northern sector consists of former quarries and a garden supplies business. Native vegetation is common in roadsides and surrounding the quarries. A large drainage-line transects the study area from north to south and drains into an artificial wetland in the south of the study area. Both the drainage-line and the wetland are dominated by indigenous vegetation in most sections. A market garden and abattoir are located in the north-western sector of the study area.

Sandy soils occur on the higher elevations in the central and northern sectors, of which extensive areas are occupied by Heathy Woodland and Damp Sands Herb-Rich Woodland remnants. Small Swampy Riparian Woodland remnants occur on sedimentary derived soils on the poorly drained lower elevations. In general, grazing is the dominant land use on the lower elevations, while extractive industry dominates the higher elevations.

The majority of Area 42 is zoned *Green Wedge Zone* (GWZ6). Areas of lowest elevation surrounding a major drainage-line are subject to Inundation and are zoned *Urban Floodway Zone* (UFZ). An area buffering the extractive industry in the centre of the study area is zoned *Farm Zone* (FZ2), while a section in the north-west currently occupied by market gardens and farmland is zoned *Residential* (R1Z). No parcels within the Precinct are covered by *Environmental Significance Overlays*. A Large section of low elevation within the centre of the study area is covered by a *Land Subject to Inundation Overlay* (LSIO) (DPCD 2009).

No parts of the study area coincide with a Biosite, as defined by DSE (2005a). and falls within the Gippsland Plains Bioregion (DSE 2010a).



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DATUM: GDA 94 VICGRID 94

N

0 200 400 600 800 1,000

Metres

when printed at A3

MAP AND SURVEY DETAILS

Mapping by: Staci Timms, March 2010

Generated from: Aerial Imagery and GIS base layers supplied by DSE and GAA, additional GIS layers from Geosciences Australia.

VERSION 02 | **DATE: 04/10/10**

LEGEND

- Roads
- Watercourses*
- Railway Line
- Train Station
- Urban Growth Boundary
- Contract Area 42 Site Boundary
- Property Boundary
- **257462** Property PFI

* Mostly unnamed draingaeg lines unless labelled otherwise.

FIGURE 1
STUDY AREA
Contract Area 42
Biodiversity Mapping Project
2009-2011

2. METHODS

2.1 Terminology

Flora taxonomic nomenclature is consistent with the Flora Information System (FIS) database when accessed through Viridans software (DSE 2009a). Taxonomic nomenclature for scientific names is derived from Walsh and Stajsic (Walsh and Stajsic 2007).

Fauna taxonomic nomenclature is consistent with Atlas of Victorian Wildlife database, accessed through Viridian software (DSE 2009b).

2.2 Literature and Database Review

Background information on the study area's bioregion and EVC distribution (pre-1750, and current) and previous threatened flora and fauna data 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.

2.2.1 GIS data

The following GIS mapping layers supplied to Practical Ecology by DSE for use in this project included:

- Cadastre data, identifying individual land parcels, and individual parcel identifiers.
- Pre 1750 EVCs.
- Extant EVCs.
- Biosite25_region mapping layer.
- Geo-referenced and ortho-rectified aerial photographs of the study area.

2.2.2 Victorian Resources

Flora Information System (FIS) and Atlas of Victoria Wildlife (AVW): The Flora Information System (DSE 2009a) and Atlas of Victoria Wildlife (DSE 2009b) databases were queried to a distance of 10 kilometres from the study area boundary. The recorded locations of significant flora and fauna taxa were referred to in the field during the surveys and were

used to assist in the determination of likelihood of occurrence. Flora species record sheets were generated using the FIS (DSE 2009a).

DSE Aquatic Fauna Database. The DSE database of aquatic fauna was reviewed (DSE 2010b), additional records for Dwarf Galaxias were provided by DSE and reviewed.

DSE Advisory Lists. DSE's Advisory Lists of rare and threatened flora and fauna were reviewed (DSE 2005b; 2007a; 2009c).

2.2.3 Commonwealth resources

EPBC Act Protected Matters Search Tool. The *Protected Matters Search Tool* (DEWHA 2010a) was queried for a 10 km buffer from the study area boundary. The search tool provides information on EPBC Act listed species occurring or predicted to occur in the search area: http://www.environment.gov.au/erin/ert/epbc/index.html

EPBC Act Species Profile and Threats Database. EPBC Act listed species profiles were investigated on the DEWHA species profile and threats database (DEWHA 2010c): http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl

Environmental Reporting Tool (ERT) The ERT was consulted for threatened species, important wetlands and heritage sites within the study area (DEWHA 2010d): http://www.environment.gov.au/apps/boobook/mapservlet?app=ert

National Recovery Plans National Recovery Plans for EPBC Act listed flora and fauna were reviewed: http://www.environment.gov.au/biodiversity/threatened/recovery.html (DEWHA 2010b).

2.2.4 Consultant's Reports

A review was conducted of ecological reports, including Strategic Impact Assessments/ Surveys made available to us that were relevant to the study area. This literature assisted the identification of significant sites, species, habitat corridors and other relevant matters.

These reports included:

- Draft sub-regional survey for Growling Grass Frog *Litoria ranifomis* (Renowden et al. 2010)
- Draft sub-regional strategy for Southern Brown Bandicoot *Isoodon obesulus* (O'Malley 2010)
- Dwarf galaxias survey of the Cardinia Creek Retarding Basin and selected locations in the Cardinia Creek catchment (McGuckin 2010).
- Biodiversity Enhancement Strategy – City of Casey (McMillan et al. 2003);

- Flora and Fauna assessment 1520 Thompsons Rd, Clyde North (Fairbridge and Appleby 2009);
- City of Casey Revegetation Strategy (Brett Lane and Associates 2008)
- Sub Regional Survey for Growling Grass Frog (Renowden et al. 2010)
- Sub-regional surveys for Southern Brown Bandicoot *Isoodon obesulus* (Stewart and Shepherd 2010).

Ecology Australia undertook a Sub-regional targeted survey for Growling Grass Frog for Growth Areas Authority within the entire south-east growth corridor, within which the study area is included (Renowden et al. 2010). This report is part of a Strategic Impact Assessment and was completed as part of an arrangement between the Department of Environment, Water, Heritage and the Arts (DEWHA) and Department of Sustainability and Environment (DSE) to address EPBC listed species on a sub-regional scale. Consultation with field naturalists

2.2.5 Consultation with field naturalists

Botanist Doug Frood of *Pathways Bushland and Environment* was engaged to partake in flora survey at 1520 and 1550 Thompsons Road. Doug undertook and assisted with:

- general flora survey;
- targeted searches for threatened flora species;
- the determination of Ecological Vegetation Classes within some sections of the study area;
- the identification and/or confirmation of threatened flora species found within 1520 Thompsons Road; and
- the determination of potential habitat within 1520 Thompsons Road for Floodplain Fire-weed *Senecio campylocarpus*.

Doug also assisted with the identification of flora samples taken from various properties and roadsides within the study area.

Malcolm Legg of Mal's Ecological and Environmental Services assisted with general and targeted fauna survey and identifying potential habitat and sites for targeted surveys.

Rob Gration MWldMgt (Habitat); *Certified Wildlife Biologist ® Ecological Consulting Services* provided advice on methods to target microbats using Anabat and undertook bat call analysis.

2.2.6 Determination of likelihood of occurrence for threatened species

Threatened flora

Likelihood of occurrence for threatened flora species was determined by habitat analysis and proximity to past records (DSE 2009a). All current and past significant flora records within 10 kilometers of the study area were displayed on a working map to aid the determination of likelihood of occurrence.

The Flora of Victoria (Walsh and Entwisle 1994; 1996; 1999) was reviewed and botanical expert Doug Frood was consulted for advice on appropriate habitat within the study area for some threatened flora species.

Threatened Fauna

Likelihood of occurrence for threatened fauna species was determined by habitat analysis and proximity to past records (DSE 2009b). All current and past significant fauna records within 10 kilometres of the study area were displayed on a working map to aid the determination of likelihood of occurrence.

Malcolm Legg provided zoological expertise in potential habitat to target for conservation significant species.

2.3 Field survey techniques

2.3.1 General flora survey

General flora survey was undertaken on foot within all properties for which access had been granted. The majority of survey was undertaken between September 2009 and December 2010.

Particular attention was given to areas of high floristic diversity, including areas of indigenous habitat and drainage-lines during general flora survey. Flora species were recorded on species record sheets generated from the FIS (DSE 2009a). Separate flora species lists were compiled for the following study sites within the study area:

- 1520 Thompsons Road.
- 1550 Thompsons Road.
- The remainder of the study area (all properties and roadsides excluding the above mentioned properties).

Separate flora lists for 1520 and 1550 Thomspons Road were complied in the interests of providing greater floristic detail of the properties within which the highest biodiversity exists within the contract area.

2.3.2 Habitat hectare assessments

Habitat hectare assessments were conducted, on a land parcel by parcel basis, across the contract area. The assessments were conducted in accordance with DSE's *Growth Areas Authority Biodiversity Assessment Project 2009/10: vegetation mapping and condition assessment procedures* (DSE 2009d). 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 Personal Digital Assistant (PDA). The Department of Sustainability and Environment (DSE) developed a software application for ArcPad 7.1.1 for the *Growth Areas Authority Biodiversity Mapping project* 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 by DSE to form a single GIS shapefile, which was exported into excel spreadsheets for presentation in this report.

The site assessments included:

- Mapping the extent of remnant and non-remnant vegetation, including 'degraded treeless 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 determination of size class (small, medium, large and very large) and species of scattered trees and the number of trees per size class within vegetation patches.

Vegetation in the study area was determined as one of four categories:

- Remnant Patch.

- Scattered Trees.
- Degraded Treeless Vegetation.
- Non-native Vegetation.

These categories and their definitions are consistent with relevant policy and legislation, particularly *Victoria's Native Vegetation Management Framework* (DNRE 2002).

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 2004a).

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 *2009/2010 Vegetation Mapping and Condition Assessment Procedures* (DSE 2009d).

The number of Very Large Old Trees (VLOTS), Large Old Trees (LOTS), and Medium Old Trees (MOTS) occurring within a vegetation patch were recorded on the HabitAs shapefile using ArcPad.

Scattered Trees

Scattered Trees point location software (STLocn.shp spatial layer) was used to collect the point location coordinates for all VLOT's, LOT's MOT's and ST's occurring outside of any remnant patches (within non-native and degraded treeless vegetation sites).

The number of small Scattered Trees within a patch could not be recorded using the HabitAs software and was therefore recorded on a PDA based spreadsheet (SmallTreeCount.xls) for submission with the final dataset.

Scattered Tree point locations 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 2004a).

The Genus and species of the scattered tree was recorded on the software.

Degraded Treeless Vegetation

Degraded treeless vegetation was recorded as any contiguous area of remnant vegetation occurring below 25% overall cover, defined at a scale of approximately 1:5000.

Non-Native Vegetation

Non-native vegetation was recorded as any contiguous area of non-native vegetation, including areas of non-indigenous native flora species, defined at a scale of approximately 1:5000.

2.3.3 Targeted Flora survey

Targeted Flora Surveys were conducted for five designated flora species specified in Appendix 6 of the Growth Areas Authority *Biodiversity Mapping Project Request for Tender* document:

- Matted-flax lily
- River Swamp Wallaby-grass
- Swamp Everlasting
- Maroon Leek-orchid
- Grey Billy buttons

An additional nine flora species were targeted during general flora searches:

- Pale Swamp Everlasting
- Veined Spear-grass
- Purple Diuris
- Naked Sun Orchid
- Wine-lipped Spider Orchid
- Frankston Spider Orchid
- Cream Spider Orchid
- Green-stripeed Spider Orchid
- Metallic Sun Orchid

The appropriate season and conditions were chosen for each of the targeted flora species within appropriate habitat at the study area when the timing of access was favorable (refer to Limitations section 2.4.2 for weather information).

Appropriate habitat for threatened flora species within the study area was identified during general flora survey and reconnaissance visits at the beginning of the survey period or shortly after access was granted. Six broad areas of habitat were identified (Figure 2).

Targeted flora surveys were undertaken in six locations in spring (Figure 2; Table 5). Four of the six locations were surveyed again in early summer. One of the remaining two locations was surveyed in late summer, which included targeted survey for Veined Spear-grass *Austrostipa rudis* subsp. *Australis*, for which a positive identification requires the summer maturing seeds.

Targeted searches were undertaken in contiguous patches of appropriate habitat within a defined area of 1 to 4 hectares for at least two hours by 1-2 botanists. Targeted surveys were undertaken in transects. In most cases, searches for targeted species were also carried out during general flora survey and habitat hectare assessments. Areas of highest floristic diversity and potential to harbor threatened species were surveyed multiple times, in some cases, individual sites were surveyed more than four times, including habitat hectare assessments, and targeted and general flora survey.

2.3.4 General Fauna Survey

The study area was surveyed by Malcolm Legg of Mal's Environmental and Ecological Services and by Joanne Henry, Annabelle Stewart, Zorza Goodman and David Nance of Practical Ecology between September 2009 and April 2010

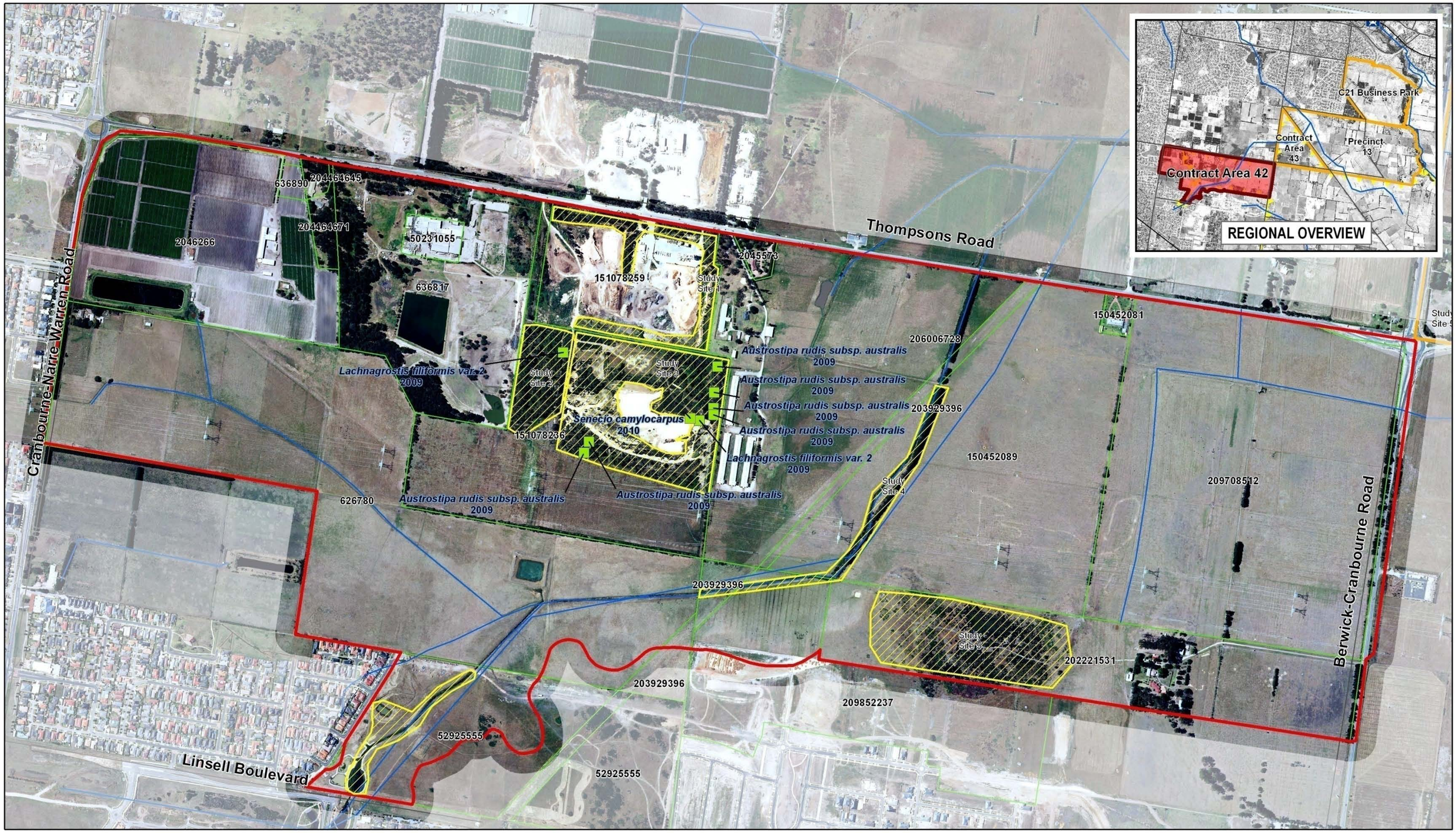
General fauna survey was undertaken throughout potential habitat areas (Figure 6) within the study area (Figure 3). This included observations of habitat and potential habitat, diurnal bird surveys, invertebrate surveys, micro-bat surveys and spotlighting to target nocturnal birds, arboreal and terrestrial mammals (Figure 2). All incidental fauna seen or heard was recorded during targeted surveys.

Bird census was undertaken throughout the Precinct. Incidental records were also compiled for fauna species recorded within this Precinct.

All fauna sampling within the study area was carried out under Research Permit Numbers 10004805 (Practical Ecology) and 10004056 (Mal's Environmental and Ecological Services).

Spotlighting

Spotlighting was undertaken at least 30 minutes after sunset, on foot using 50 watt spotlights. Potential habitat was targeted during the spotlight surveys undertaken on three separate nights. All fauna seen and heard during spotlight walks were recorded. Figure 3 displays the location of spotlighting surveys undertaken within the study area.



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DATUM: GDA 94 VICGRID 94

N

0 100 200 300 400

Metres

1:9,000 when printed at A3

MAP AND SURVEY DETAILS

Surveyed by: Mark Shepherd, Luke Bennett and Peter Gannon,
6 Oct 2009 - 7 Feb 2010
Mapping by: Staci Timms, April 2010
Generated from: Data collected in the field using Juno PDAs and DSE's Habitas Software. Aerial Imagery and GIS base layers supplied by DSE and GAA, additional GIS layers from Geoscience Australia.

VERSION: 02 **DATE:** 04/10/10

LEGEND

- Unnamed Drainage Lines
- Roads
- Urban Growth Boundary
- Contract Area 42 Study Area
- Other Precincts and Contract Areas
- Property Boundary
- 257462 Property PFI
- Targeted Flora Survey Study Sites
- State Significant Species Date of Record
- *Acacia howittii* 11/12/2009 Species Name Date of Record
- Record approximate location only

FIGURE 2
SIGNIFICANT FLORA AND SURVEY EFFORT
Contract Area 42
Biodiversity Mapping Project 2009-2011

Invertebrate Survey

Areas of potential habitat were identified and two invertebrate pitfall transects were deployed (Figure 3). Each transect comprised ten pitfalls located approximately 20 m apart. Pitfall traps were filled with a solution of biodegradable, odourless, chemical free detergent, table salt and water. The detergent serves to break the surface tension of the water while the salt acts as a preservative for short periods. Traps were open for three consecutive nights during warm weather. Invertebrates were collected each day and traps reset.

Active searching was undertaken at each transect site, including log turning, bark removal, pooter collection and the sweeping of areas with a large canvas net. Aquatic invertebrate sampling involved netting and the collection of silt. Other collection of invertebrates took place opportunistically in areas of habitat throughout the precinct. Figure 3 displays the locations of invertebrate pitfalls undertaken within the study area.

Invertebrates were preserved in an ethanol solution and identified and photographed in a laboratory. Classification of invertebrates was undertaken to Order and in some instances Family level.

Micro-bat Surveys

Anabat II and Anabat SD1 were used to detect micro-bat presence within the study area. The Anabat detectors were used passively and actively during the surveys. Passive survey involved leaving the Anabat out unattended during the evening, and active survey involved carrying the Anabat detector whilst surveying with a spotlight. Both techniques are effective for detecting micro-bat species. Figure 3 displays the locations of Anabat surveys undertaken within the study area.

Bird Surveys

Bird Surveys were undertaken at every habitat type twice between dawn and midday and twice preceding sunset. Wetland birds were surveyed during daylight hours. All birds were identified using sight and call vocalisation. All birds seen and heard during other targeted surveys were recorded. Figure 3 displays the locations of bird surveys undertaken within the study area.

General and 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, including wetland birds were identified by sight and vocalisation during daytime and spotlight walks. Woodland birds were surveyed between dawn and midday and two hours preceding nightfall.
- Reptiles were identified by sight, during log and rubbish turning and during general inspection of habitat. Where possible, reptiles were captured by hand to

assist identification. All reptiles were returned to the point of capture after identification.

- Reptiles and small mammals were also surveyed using the Glossy Grass Skink *Pseudemoia rawlinsoni* methods detailed in section 2.3.5 below.
- Mammals were identified by vocalisation, sight and by identifying diggings, scats and footprints.
- Amphibians were identified by vocalisation and sight, including spotlighting and fish trapping (tadpoles were detected using small fish traps and dip netting) within a selection of appropriate amphibian habitat during spotlighting surveys.

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

2.3.5 Targeted Fauna Survey

Targeted searches were commissioned by GAA for four fauna species listed as threatened under State and Federal legislation or as threatened by DSE (DSE 2007a) (Table 1). Targeted searches for any other threatened species were not commissioned by GAA. Please note this biodiversity assessment does not include targeted surveys of Growling Grass Frog and Southern Brown Bandicoot as they are being undertaken in the Sub Regional Surveys required under the Strategic Assessment.

Table 1. Threatened Species Targeted for Fauna Survey

FFG	EPBC	DSE (2007a)	Common name	Scientific name
L	VU	v	Dwarf Galaxias	*Galaxiella pusilla*
		n	Glossy Grass Skink	*Pseudemoia rawlinsoni*
		v	Southern Toadlet	*Pseudophryne semimarmorata*
L		v	Swamp Skink	*Egernia coventryi*

Dwarf Galaxias

Dwarf Galaxias *Galaxiella pusilla* were targeted using rectangular bait traps baited with White Bait and glow sticks placed in appropriate habitat, near reeds and sedges. Bait traps were deployed in potential habitat, the number of traps deployed is shown in Figure 3. Traps were left overnight and checked 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, netting occurred for a minimum of 15 minutes per site. All bait trap and dip net locations are displayed in Figure 3. Dates and climatic conditions are shown in Table 6.

Glossy Grass Skink

Glossy Grass Skink was surveyed by using 30 cm by 30 cm pieces of colour-bond tin placed at 10-20 m intervals within suitable habitat. Habitat included drainage-lines, along

Cardinia Creek, around wetlands and dams throughout the study area. The tin sheets were lifted during the morning prior to 11am and reptiles sheltering under the tin for warmth were caught or observed. Three hundred tin pieces were deployed within the study area and were checked four times each, however a small number of tin was only checked twice due to limited access (refer to section 2.3.6 for access limitations). Surveys were undertaken in all weather throughout the survey period.

Tin locations are displayed in Figure 3.

Southern Toadlet

Areas of potential Southern Toadlet *Pseudophryne semimarmorata* habitat within the study area, including roadsides and drainage-lines were identified. These sites have been traversed on foot to identify Southern Toadlet calls during wet weather. Areas of habitat that have been traversed are displayed in Figure 3.

Swamp Skink

Swamp Skink *Egernia coventryi* was surveyed by using 30 cm by 30 cm pieces of corrugated tin placed at 10-20 m intervals within suitable habitat. Habitat included drainage-lines and around wetlands and dams throughout the precinct. The tin pieces were lifted during the morning prior to 11 am and reptiles sheltering under the tin for warmth were caught or observed. Three hundred tin pieces were deployed and most were checked a total of four times each apart from a small number of tin pieces due to access limitations (section 2.3.6). Surveys were undertaken in all weather throughout the survey period.

Swamp Skinks were also surveyed using Elliot traps. Traps were baited with a mixture of peanut butter, oats, molasses and sardines and were placed in potential habitat throughout the study area. A total of 120 Elliot traps were deployed for four nights, traps were checked each morning. Tin and trap were deployed in areas of potential habitat, locations are displayed in Figure 3.

Thompsons Road

Cranbourne-Narre Warren Road

Berwick-Cranbourne Road

CLYDE CREEK

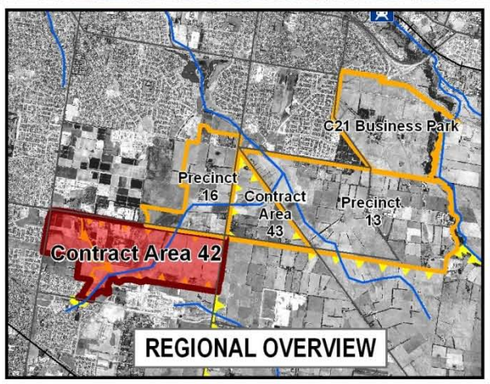
636890 204464645 204464671 2046266 50231055 636817 626780 151078259 151078236 2045573 206006728 203929396 150452089 150452081 208514983 636934 209708512 202221531 209852237 52925555

X30 X30 X3 X10 X10 X10 X10 X100 X16 X10 X10 X15 X15 X15 X10 X10 X10 X3 X3 X100 X20 X20 X16

In addition to the bird survey transects indicated on this map, active searches and incidental bird observations were undertaken throughout all accessed properties.

SURVEY METHOD FOR TARGETED SPECIES

Dwarf Galaxias: Dip Net, Bait Trap
Swamp Skink: Tin, Elliot Trap
Glossy Grass Skink: Tin, Elliot Trap
Southern Toadlet: Frog Transect (vocalisation identification)



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MAP AND SURVEY DETAILS

Surveyed by: Jo Henry, David Nance, Annabelle Stewart and Zorza Goodman
Oct 2009 - April 2010
Mapping by: Staci Timms, April 2010
Generated from: Data collected in the field using Juno PDAs and DSE's Habitas Software. Aerial Imagery and GIS base layers supplied by DSE and GAA, additional GIS layers from Geoscience Australia.

VERSION: 02 **DATE:** 04/10/10

LEGEND

- Watercourse
- Roads
- Study Area Boundary
- Property Boundary
- 257462 Property PFI
- Access Denied, not surveyed
- Fauna survey partially completed

Survey Method*

- Dip Net
- Light Trap (X4) Number of traps
- Elliot Traps (X40) Number of traps
- Tin Tiles (X50) Number of tiles
- Frog Transect
- Invertebrate Pitfall and netting (X10) Number of pitfall traps
- Spotlight (X3) Number of repetitions
- Anabat point ; route (X3) Number of repetitions
- Bird Surveys (X4) Number of repetitions

*Survey locations mapped are general only and do not represent exact spatial location of route taken or position of traps.

FIGURE 3
FAUNA SURVEY EFFORT
Contract Area 42
Biodiversity Mapping Project 2009-2011

2.3.6 Limitations

Site access

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 was 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.

The owners/representatives of six properties refused Practical Ecology permission to access, or were unable to be contacted to request permission to access:

- 1660 Thompsons Road, Cranbourne East (partial access granted).
- 350 Narre Warren Road, Cranbourne East.
- 1460 Thompsons Road, Cranbourne East.
- 1468 Thompsons Road, Cranbourne East.
- 1500 Thompsons Road, Cranbourne East.
- 1580 Thompsons Road, Cranbourne East.

Two small properties were not assessed because a roadside inspection and aerial photograph interpretation revealed that the properties consisted entirely of 'domestic areas', such as driveways, sheds, garden beds and lawn. These properties were:

- 1568 Thompsons Road, Cranbourne East.
- 1670 Thompsons Road, Cranbourne East.

The owner/representative of one property granted access until mid summer, after which a request to undertake a second round of targeted flora survey was refused. This property was:

- 2/585 Berwick-Cranbourne Road Clyde North.

Tin checking as part of a targeted survey for Glossy Grass Skink, Swamp Skink and other reptiles was undertaken only twice within this property. The tin was removed by the land manager after they retracted access. This property had habitat hectare assessments, spring

targeted flora and fauna assessments and general flora and fauna assessments, but a second targeted flora survey and Southern Toadlet survey was unable to be undertaken in early summer.

Property access, land owner contactability and survey completion status are depicted in Figure 4.

Flora survey timing

Due to the timing of access constraints within the study area, flora survey for threatened species was not undertaken in the ideal season for some species. Repeated attempts to contact the owners and seek permission to access the largest and most significant habitat within the study area at 1520 Thompsons Road resulted in permission to access the property on Wednesday 30 September 2009. Flora survey was scheduled soon after, however, some species, including Greenhood *Pterostylis* spp. had finished flowering at the time of survey. Ideally survey at this property would have begun in early spring in order to account for the relatively diverse assemblage of early spring flowering species.

Similarly, repeated attempts to establish the ownership and seek permission to access 2/585 Berwick-Cranbourne Road Clyde North and 1660 Thompsons road, Cranbourne North were not made until late November. However, habitat in these properties was highly modified and not considered highly likely to support threatened flora species.

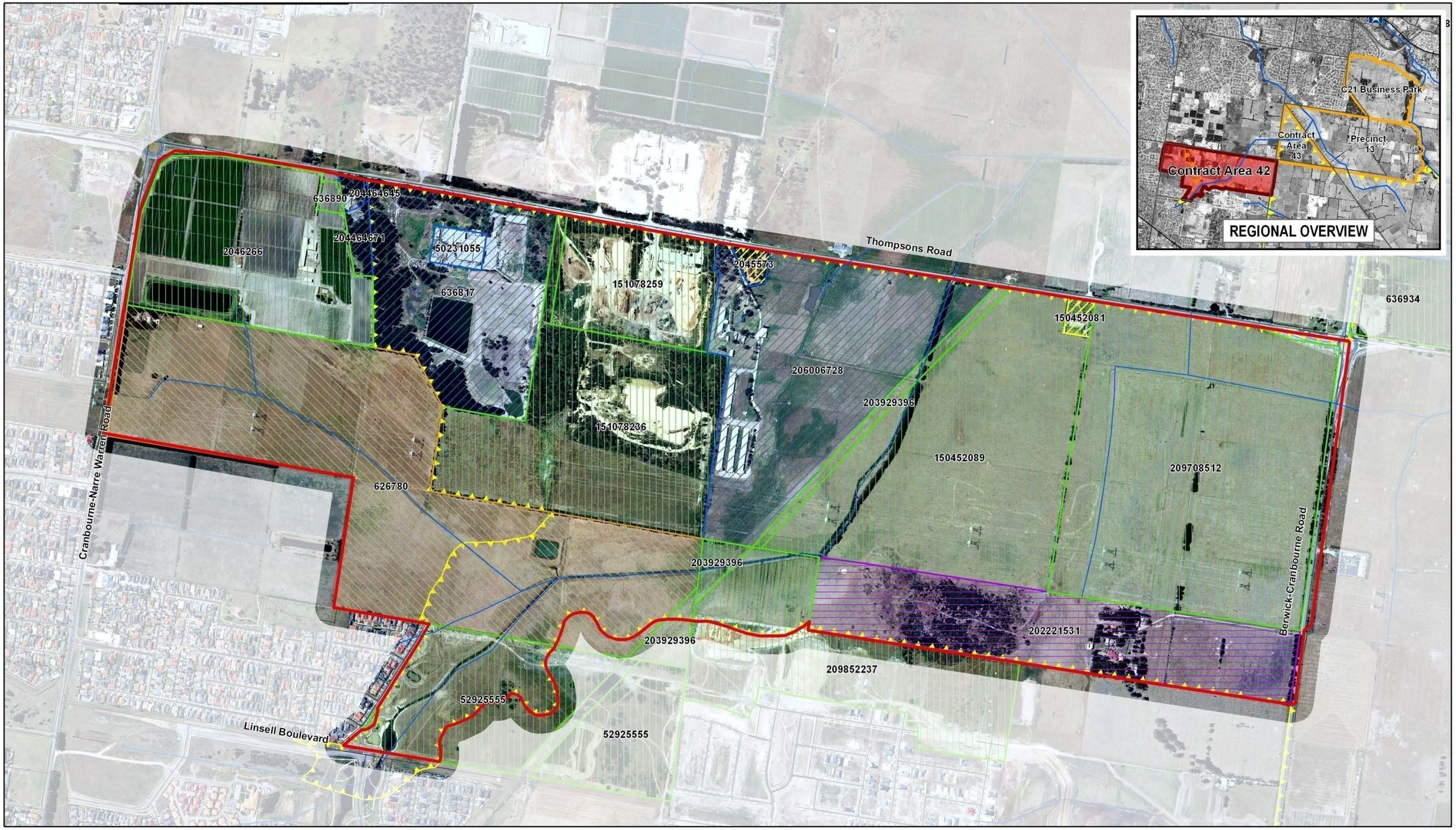
Targeted surveys for threatened flora species are ideally extend over a twelve month period or longer, with extensive survey being conducted during the spring flowering-seed set period. Greater certainty of the presence or absence of threatened flora species would be gained if targeted surveys were undertaken for at least a twelve month period.

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 shapefile in accordance with the GAA *Vegetation Mapping User Guide*. 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*. However, the DBH of small trees is required to calculate tree recruitment offset requirements for small trees using the *Port Phillip and Westernport Native Vegetation Plan*(PPWCMA 2006).

Fauna survey limitations

The optimal time for most fauna sampling is during spring/summer. Different results may have been achieved if surveying was undertaken in different times of the year and over a longer period. An extended survey period would produce more detailed results and a greater certainty of presence or absence of fauna species. Fully comprehensive fauna survey should therefore occur during all seasons over a number of years. This study included four targeted species surveys; Glossy Grass Skink, Swamp Skink, Dwarf Galaxias



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DATUM: GDA 94 VICGRID 94

N

0 100 200 300 400 500

Metres

1:10,000 when printed at A3

MAP AND SURVEY DETAILS

Surveyed by: Mark Shepherd, Luke Bennet and Peter Gannon, 06Oct09 - 07Feb10
Mapping by: Staci Timms, Mar10
Generated from: Data collected in the field using Juno PDAs and DSE's Habitas Software. Aerial Imagery and GIS base layers supplied by DSE and GAA, additional GIS layers from Geoscience Australia.

VERSION: 02 **DATE:** 04/10/10

LEGEND

- Roads
- Watercourse
- Urban Growth Boundary
- Contract Area 42 Site Boundary
- Other Precincts and Contract Areas
- 235479 Parcel PFI

Property Access

- Access granted Flora and Fauna Surveys completed
- Access denied No surveys undertaken onsite
- No survey necessary -site consists of domestic zone only.
- Partial access granted. Surveys incomplete
- Unable to contact landowner. No surveys undertaken onsite

FIGURE 4
PROPERTY ACCESS
Contract Area 42
Biodiversity Mapping Project
2009-2011

and Southern Toadlet. However, other threatened species that have the potential to occur within the contract area were not targeted for survey.

In addition to targeted fauna survey, general fauna survey was also undertaken. Incidental observations were made during all surveys. On the basis of existing information and the new information from this study, it is expected that a reasonable proportion of the species expected to be present within the contract area were detected. While tin trapping, Elliot trapping, AnaBat recording, light trapping, dip netting, frog transects, bird census and spotlighting were undertaken as part of general fauna survey, it is likely that other species would be detected over a longer survey period over different seasons.

While spotlighting is a common and proven survey technique, there are a number of limitations associated with it. While spotlighting took place on warm still nights, bright moonlight may have resulted in some fauna species present within the study site remaining undetected. This is due to increased visibility and hence a higher likelihood of predation leading to spotlight avoidance by fauna, which is a common limitation associated with spotlighting.

Tin, Elliot and bait trapping also come with limitations. No fauna trapping technique will result in conclusive survey results as many individuals and some species are can be 'trap shy'. While traps were placed in areas that were considered optimal habitat, individuals may not necessarily come into contact with the trap.

In addition to these limitations, a number of species may not have been observed due to drought and other environmental conditions.

3. RESULTS

3.1 General flora survey

3.1.1 Flora species recorded

275 flora species were recorded within the contract area (Appendices 1 & 2). 138 (50%) of these species are indigenous. The remaining 137 (50%) were either exotic species or native species occurring outside of their natural range. Separate flora lists were compiled for:

- 1520 Thompsons Road (Appendix 3).
- 1550 Thompsons Road (Appendix 4).
- The remainder of the study area (All properties excluding 1520 and 1550 Thompsons Road (Appendix 5).

General flora survey was undertaken in all areas for which access was granted (as specified in section 2.3.1. The majority of flora species recorded within the study area occur within 'the quarries', which represent the areas of highest biodiversity and conservation significance within the study area.

3.1.2 Threatened flora species recorded within 10 kilometres

Thirty-seven threatened flora species have been recorded within 10 kilometres of the study area (DSE 2009a). These species and their likelihood of occurrence are presented in Appendix 6. Four of these species are considered to have at a high likelihood of occurrence within the study area. A further four species recorded within 10 kilometres are considered to have a moderate likelihood of occurrence within the study area.

Nine threatened flora species are predicted to occur by the EPBC Protected Matters Search Tool (DEWHA 2010a). Four of these species have also been recorded within 10 kilometres (DSE 2009a) One of these species; River Swamp Wallaby-grass *Amphibromus fluitans* has been assigned a high likelihood of occurrence due to the presence of potentially suitable wetland habitat within drainage-lines and within 1520 Thompsons Road (Appendix 6).

A description of habitat requirements for threatened flora species recorded within 10 kilometres and species predicted to occur by DEWHA (2010c) is presented in Appendix 6. Appendix 6 also includes an explanation of likelihood of occurrence for each threatened flora species.

3.1.3 Threatened flora species recorded within the study area

Three significant flora species were recorded within the study area (Table 2). All species are listed as *rare or threatened* by DSE (2005b) and are not listed as threatened under the EPBC Act or FFG Act. All three species were recorded within 1520 Thompsons Road (the quarry), within buffer zones of the now disused quarry (Figure 2).

Table 2. Threatened flora species recorded within the study area.

Life Form	Scientific Name	Common Name	EPBC	FFG	VROTS
Herbs	*Senecio campylocarpus*	Floodplain Fireweed			rare
Graminoids	*Austrostipa rudis* subsp. *australis*	Veined Spear-grass			rare
	Lachnagrostis filiformis var. *2*	Wetland Blown-grass			k (status unknown)

Floodplain Fireweed *Senecio campylocarpus* was recorded in a drainage-line in the eastern section of the quarry at 1520 Thompsons Road (Figure 2). The record is an approximate location only.

Floodplain Fireweed is a small shrub or herb to ~1.5 metres high, which appears similar to Cotton Fireweed *S. quadridentatus* but differs by its sparsely haired to glabrous leaves and stems, broader leaves tapering distinctly to each end, broader involucral bracts reflexed rather than spreading at maturity (Thompson 2004). Many sections of drainage-line throughout the quarries are considered potential habitat for the species, which prefers seasonally damp or wet soils. Floodplain Fireweed can persist in modified habitats, such as those found within the extraction site at 1520 Thompsons Road (Doug Frood pers comm. 2009).

Veined Spear-grass *Austrostipa rudis* subsp. *australis* was recorded at numerous locations within the quarry's vegetated buffer zones at 1520 Thompsons Road (Figure 2). Veined Spear-grass is uncommon in open forest, sandy or sand-stone derived soils (Walsh and Entwisle 1994). The species has tall culms to 1.3m and is distinguished from other *Austrostipa rudis* subspecies by the presence of awns greater than 65mm, in addition to other morphological differences (Walsh and Entwisle 1994).

Veined Spear-grass was recorded in colonies of more than 100 and up to 10m wide in a variety of habitats within the quarry, including a highly modified constructed embankment near the western boundary (Figure 2).

Wetland Blown-grass *Lachnagrostis filiformis* Var 2 was recorded near the waters edge in a drainage-line leading to the main wetland at the quarry (1520 Thompsons Road). Wetland Blown-grass occurs within wetland margins in wet or damp soils. Many sections within 1520 and 1550 Thompsons Road are considered suitable habitat for the species. The closely related *Lachnagrostis filiformis* var 1 was recorded in many parts of the study area, especially within the quarries, which demonstrates that suitable habitat for var 2 is widespread throughout the study area.

3.1.4 Best or Remaining 50% habitat for rare or threatened flora species

Best or remaining 50% habitat determinations for individual habitat zones were influenced only by the presence of threatened flora species within the study area, or for species with a high likelihood of occurrence, including River Swamp Wallaby-grass *Amphibromus fluitans*. All other threatened species recorded within 10km or predicted to occur by DEWHA (2010a) were granted a likelihood of occurrence no greater than *moderate*, based on an evaluation of habitat suitability within the study area and proximity to records. It was therefore determined that, based on the moderate likelihood of occurrence rating 'no further consideration is required for those species' when addressing Question D in Table 2 of DSE's *Guide for Assessment of Referred Planning Permit Applications* (DSE 2006)(Appendix 9).

Ten habitat zones within the study area were assigned high conservation significance due to the presence of Wetland Blown-grass *Lachnagrostis filiformis* Var 2, or the presence of suitable habitat for Wetland Blown-grass. These ten habitat zones were considered 'remaining 50% habitat' for Wetland Blown-grass in the bioregion given the relatively low site condition and landscape context scores attained (Appendix 8). Wetland Blown-grass *Lachnagrostis filiformis* Var 2 is considered 'poorly known' (k) by DSE (2005b). The conservation status of species is more accurately classified as 'Vulnerable', as opposed to 'Rare', since its population decline in the region is attributable to wetland habitat loss rather than it being a naturally restricted species. Wetland Blown-grass is therefore considered 'threatened' rather than 'rare' when determining the conservation significance of habitat zones.

Thirty-two habitat zones within the study area were assigned medium conservation significance due to the presence of a rare species, the presence of 'remaining 50% habitat for rare species', or 'best 50% habitat for regionally significant species'. Habitat zones were considered remaining 50% habitat for rare species due to the relatively low site condition and landscape context scores attained (Appendix 9).

3.1.5 Vegetation

Approximately 23 hectares of the 276 hectare study area (8%) comprises native vegetation classified as Habitat Zones (Figure 5).

Vegetation type and distribution within the study area is influenced by primarily by geology, land use and drainage. Vegetation within the study area has been highly modified since European settlement, which is due primarily to:

- the clearing of vegetation for agriculture, including grazing and crops;
- the deepening and straightening of former waterways and wetlands to form distinct drainage-lines and channels; and
- the clearing of vegetation and the removal of soil during the operation of sand mines.

Eight EVCs were identified and mapped within the study area. Table 3 summarises EVCs recorded within the study area.

Table 3. Summary of EVCs recorded within the study area.

EVC Name	EVC Number	EVC cons status	Area (ha)
Damp Sands Herb-rich Woodland	GipP0003	Vulnerable	10.92
Grassy Woodland	GipP0175	Endangered	0.01
Heathy Woodland	GipP0048	Least Concern	8.26
Plains Grassy Woodland	GipP0055	Endangered	0.27
Swamp Scrub	GipP0053	Endangered	0.90
Swampy Riparian Woodland	GipP0083	Endangered	0.78
Sedge Wetland	GipP0136	Vulnerable	1.25
Tall Marsh	GipP0821	Endangered	0.25
		Total	**22.64**

A significant proportion of the native vegetation occurring within the study area has recolonised following disturbance. In general, wetland vegetation, Swamp Scrub and native vegetation within drainage-lines has recolonised following the creation of dams, drainage channels and depressions. Similarly, native vegetation within the extraction zones at 1520 Thompsons Road has recolonised following the removal of top-soil. Other areas of native vegetation, such as within the former quarry buffer zones at 1520 Thompsons Road, are considered remnant.

The following EVC descriptions are based on the condition of Habitat Zones found on site, and include more general descriptions referenced from Oates and Taranto (Oates and Taranto 2001) and from EVC benchmarks available on-line (DSE 2010a).

Damp Sands Herb-rich Woodland

Damp Sands Herb-rich Woodland typically consists of a grassy or bracken-dominated understorey and a ground layer rich in herbs and orchids. The EVC occurs predominately on flat or undulating areas on moderately fertile, relatively well-drained, deep sandy or loamy topsoils over heavier subsoils. A component of wattles and heathy shrubs may be present (Oates and Taranto 2001).

The overstorey is variously dominated by Coast Manna Gum *Eucalyptus viminalis* subsp. *pryoriana*, Narrow-leaf Peppermint *Eucalyptus radiata* and occasionally Messmate *Eucalyptus obliqua.* Other woody species may include Black Wattle *Acacia mearnsii,* Coast Banksia *Banksia integrifolia* var. *integrifolia,* Silver Banksia *Banksia marginata,* and Prickly Tea-tree *Leptospermum continentale* (Oates and Taranto 2001).

Damp Sands herb-rich Woodland was recorded within the quarry buffer zones at 1520 Thompsons Road and was ecotonal with Heathy Woodland within this property. The overstorey was dominated by a mature stand of Coast Manna Gum *Eucalyptus viminalis* subsp. *pryoriana*. Other woody species present included Wedding Bush *Rycinocarpus pinifolius* and various Wattles. Most Damp Sands Herb-rich Woodland within the study area is considered remnant vegetation that has not recolonised following disturbance, based on the relatively old age of Eucalypts and the relatively diverse species composition in many areas.

The ground story was dominated by a thick layer of Austral Bracken *Pteridium esculentum* in many areas. Blackberry **Rubus fruticosus* spp agg was common in areas closest to adjacent farmland. Grass species included Wallaby grass *Austrodanthonia* spp. and Veined Spear-grass *Austrostipa rudis* subsp *australis*. Spiny-headed Mat-rush *Lomandra longifolia* subsp. *longifolia* tussocks were common.

Oates and Taranto (2001) note that Damp Sands Herb-rich Woodland can resemble degraded Heathy Woodland and is often found in association with this EVC. Damp Sands Herb-rich woodland was certainly ecotonal with adjacent Heathy Woodland and shared many of the characteristics of this vegetation. However, Damp Sands Herb-rich Woodland occurred on the lower elevations, while Heathy Woodland occurred on the sandier more elevated soils, within, and adjacent to the quarry.

Damp Sands Herb-rich Woodland has a 'Vulnerable' conservation status within the Gippsland Plain Bioregion.

Plate 1. Damp sands herb-rich woodland

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 2010d). 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 and Taranto 2001).

This EVC was designated to one small area of regenerating native vegetation within the study area, consisting mostly of Wattles *Acacia* spp. This habitat zone scored 8 out of a possible 75 for site condition and is not consistent with the Grassy Woodland benchmark, other than through the presence of indigenous wattles. This EVC designation and habitat zone determination is an arbitrary classification made through the necessity to determine any area of native vegetation greater than 25% indigenous cover and greater than ~25m^2 (1:5000) as a vegetation patch. This vegetation patch is generally consistent with what DSE has previously determined as Degraded Treeless Vegetation and may be determined as such.

Grassy Woodland has an 'Endangered' conservation status within the Gippsland Plain bioregion.

Heathy Woodland (EVC 48)

Heathy Woodland is usually associated with nutrient poor, sandy soils in areas of low to moderate rainfall. The EVC is a low (to 10m tall), Eucalypt-dominated woodland and generally supports a diverse array of narrow-leaved shrubs (except where frequent fire has reduced these to a dense cover of bracken) (Oates and Taranto 2001). Geophytes and annuals can be quite common but the ground cover is normally fairly sparse (DSE 2010d).

The overstorey typically consists of Messmate *Eucalyptus obliqua,* Narrow-leaf Peppermint *Eucalyptus radiata*, Shining Peppermint *Eucalyptus willisii* and Coast Manna Gum *Eucalyptus viminalis* subsp. *pryoriana*. The shrub layer may typically include species such as *Leptospermum myrsinoides*, Prickly Tea-tree *Leptospermum continentale* and Common Heath *Epacris impressa*. Understorey species may include Wattle Mat-rush *Lomandra filiformis*, Common Raspwort *Gonocarpus tetragynus*, and Tall Sundew *Drosera peltata* subsp. *auriculata* (Oates and Taranto 2001).

Little remains of this EVC within the Cranbourne region with much of its former extent cleared for agricultural use (particularly market gardening) and quarrying. This EVC would once have occupied most of the areas dominated by sandy soils within the elevated sections of the study area. Heathy Woodland has been removed in some sectors of the study area due to the construction of quarries and clearing for market gardens. However, relatively large areas of this EVC remain in this precinct, especially within and surrounding quarries at 1550 and 1520 Thompsons Road.

Heathy Woodland occurs within the former buffer zones at the 1550 Thompsons Road quarry. Heathy Woodland in the eastern sector of this property appears remnant, based on the size and age of the Eucalypts and a lack of any evidence of soil removal or deposition. Heathy Woodland within the western sector of 1550 Thompsons Road appears to have colonised earth barriers possibly constructed several decades ago. Heathy Woodland in the unmodified eastern sector is generally of a higher quality, and more closely resembles the

benchmark definition of the EVC. A dense cover of Austral Bracken dominates some areas within this sector. Graminoids such as Spear grasses *Austrostipa* spp. and Mat-rush *Lomandra* spp. occur in the understorey, while shrubs such as Common Correa and wattles occur in the middle storey. The overstorey is dominated Coast Manna-gum *Eucalyptus viminalis* subsp *pryoriana*.

Large areas of vegetation within the extraction zone at 1520 Thompsons Road were assigned Heathy Woodland EVC, due to the sandy soil and many heath species recorded. However, most of these areas lacked a mature Eucalypt canopy and did not clearly display the characteristics of the Heathy Woodland EVC benchmark due to the area's highly modified nature. Areas subject to recent disturbance in the north of the extraction site were generally lacking floristic diversity. However, some areas in the south of the extraction site were relatively high in floristic diversity, presumably due to the longer time since disturbance. Vegetation within the extraction site is currently in the process of regeneration. The floristic composition and structure within the extraction site will presumably become more diverse and complex over the coming decades and generally displayed excellent potential for rehabilitation.

Plate 2. Regenerating heath within extraction site at 1520 Thompsons Road

Plate 3. Regenerating heath within extraction site at 1520 Thompsons Road

Heathy Woodland has a 'Least Concern' Conservation Status within the Gippsland Plains bioregion (DSE 2010d). This conservation status is a reflection of the relatively common occurrence within the entire Gippsland Plain bioregion. However, Heathy Woodland distribution within the local area is threatened and is restricted to small remnants (DSE 2009a).

Plains Grassy Woodland (EVC 55)

Plains Grassy Woodland typically occupies poorly drained, fertile soils on flat or gently undulating plains at low elevations. Scattered River Red Gums *Eucalyptus camaldulensis* would have dominated the upper canopy, with an understorey consisting of a few sparse shrubs over a species-rich grassy and herbaceous ground layer. It is likely that this EVC would have been ecotonal with the Grassy Woodland and Heathy Woodland EVCs within the region.

Plains Grassy Woodland within the study area is represented by a several highly modified Habitat Zones within 1550 and 1520 Thompsons Road. The majority of Plains Grassy Woodland within the study area consists of revegetation and does not clearly display the characteristics of the Plains Grassy Woodland EVC benchmark. The EVC determination was made primarily due to the presence of a planted River Red-gum canopy.

It appears that Plains Grassy Woodland was planted over ten years ago on a constructed dirt mound, adjacent to Thompsons Road, and includes non-indigenous native flora species, such as Spotted Gum *Corymbia maculata*. It appears as though some indigenous species have colonised the revegetated areas, as native flora species diversity is greater than what would typically be expected in revegetation.

The understorey includes many weed species, such as Panic Veldt-grass *Ehrharta erecta* and Sweet Pittosporum *Pittosporum undulatum*.

This EVC has an 'Endangered' Conservation Status within the Gippsland Plains bioregion (DSE 2010d).

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 and Taranto 2001).

Eleven mostly small patches of Swamp Scrub were recorded within the study area on low-lying, damp reaches of roadside verge and drainage-line. These patches are generally the result of natural recolonisation of this EVC within damp, marshy sites that have been left relatively undisturbed. Swamp Scrub of low-moderate quality were recorded mostly within the quarry properties at 1520 and 1550 Thompsons Road.

The Swamp Scrub canopy within the study area is typically dominated by a closed cover of Swamp Paperbark *Melaleuca ericifolia* over an understorey of low-moderate diversity. Swamp Scrub patches generally show good signs of regeneration and colonisation suggesting that this EVC would continue to colonise damp sites and flood zones if left un-disturbed. 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 2010d).

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 2010d).

Within the study area, this EVC was found fringing dams and within constructed drainage-lines and was generally the result of natural colonisation. In general, floristic diversity within this EVC was low, as can be expected of colonising aquatic vegetation in dams and drainage-lines. Species and structural diversity was highest within 1520 and 1550 Thompsons Road where small depressions and dams have been colonised by aquatic and semi-aquatic vegetation.

This EVC has a 'Vulnerable' Conservation Status within the Gippsland Plains bioregion (DSE 2010d).

Plate 4. Inundated area occupied by sedges and aquatic species, 1550 Thompsons Road

Swampy Riparian Woodland (EVC 83)

Swampy Riparian Woodland was once common along broad drainage-lines and on levees near streams in the Gippsland Plains Bioregion (Oates and Taranto 2001). The EVC is typically dominated by Swamp Gum *Eucalyptus ovata* with the middle and understorey dominated by Swamp Paperbark *Melaleuca ericifolia*, Wooly Tea-tree *Leptospermum lanigerum* and Common Reed *Phragmites australis* (Oates and Taranto 2001).

Swampy Riparian Woodland was recorded within the north-east of 1520 Thompsons Road in a damp area subject to reduced surface drainage, as a result of the construction of dirt mounds adjacent to the vegetation. The vegetation is probably the result of natural colonisation following the increased moisture.

This EVC held a poor representation of indigenous floristic diversity within the study area and was highly modified, due to the impacts of weed invasion, most notably Blackberry **Rubus fruticosus* Spp. Agg. The overstorey was dominated by an immature Swamp Gum canopy, while the understorey was dominated mostly by introduced grasses and woody weeds.

This EVC has an 'Endangered' Conservation Status within the Gippsland Plains bioregion (DSE 2010d).

1520 and 1550 Thompsons Road

Vegetation within 1520 Thompsons Road, in combination with adjoining vegetation within 1550 Thompsons Road, represents the largest and most floristically diverse native vegetation within the study area. Regenerating vegetation within the extraction site at 1520 Thompsons Road is generally highly modified due to the activities undertaken during the operation of a now disused quarry. Some sections of native vegetation within the extraction site were removed using heavy machinery as recently as October 2008, as depicted in plate 5 below (Fairbridge and Appleby 2009).

Plate 5. Removal of recolonising native vegetation at extraction site October 2008.

Whilst highly modified, this vegetation is floristically diverse, when considered within the context of the study area and the surrounding agricultural landscape. The high floristic diversity of many sections of recolonising vegetation within the extraction site at 1520 Thompsons Road is presumably due in part to the abundance of indigenous seed input into the site and the favourable conditions due to the to the low soil fertility following removal of top-soil. It appears as though the extraction site has been modified by heavy machinery at different stages, given the different ages of recolonising vegetation. Recolonising vegetation appears oldest and most floristically diverse in the southern sector, where a variety of lifeforms, including orchids, mosses, grasses, lilies, shrubs and herbs occur.

The majority of the buffer zones surrounding the extraction sites in both 1520 and 1550 Thompsons Road comprise Damp Sands herb-rich Woodland and Heathy Woodland. The

buffer zones in the south and east of 1520 Thompsons Road appear not to have been modified by heavy machinery in recent times, and have not had soil removed or disturbed. Similarly, the buffer zones in the north-east sector of 1550 Thompsons Road have remained mostly undisturbed.

3.2 Habitat hectare and scattered tree assessments

Habitat hectare and scattered tree assessments were undertaken within the study area between 6 October 2009 and 7 February 2010 within all properties for which landholder permission was granted (Table 4).

Table 4. Habitat hectare and Scattered Tree assessments within the study area

Month	Survey date	Property Address	Property PFI
September	n/a	n/a	n/a
October	6/10/2009	1550 Thompsons Rd	151078259
	7/10/2009	1520 Thompsons Rd	151078236
	21/10/2009	60S Cornwell Cres	52925555
	22/10/2009	1450 Thompsons Rd	2046266
	22/10/2009	1450 Thompsons Rd	636890
	27/10/2009	1520 Thompsons Rd	151078236
	28/10/2009	1550 Thompsons Rd	151078259
November	3/11/2009	1520 Thompsons Rd	151078236
	4/11/2009	1520 Thompsons Rd	151078236
	10/11/2009	585 Berwick-Cranbourne Rd	209708512
	17/11/2009	1550 Thompsons Rd	151078259
	17/11/2009	1520 Thompsons Rd	151078236
	24/11/2009	2/585 Berwick-Cranbourne Rd	202221531
	24/11/2009	1660 Thompsons Rd	150452089
	24/11/2009	Butterfield Place	203929396
	24/11/2009	545 Berwick-Cranbourne Rd	209852234
December	3/12/2009	1520 Thompsons Rd	151078236
	9/12/2009	1520 Thompsons Rd	151078236
	14/12/2009	2/585 Berwick-Cranbourne Rd (Roadside reserve)	R202221531
	14/12/2009	1450 Thompsons Rd (Roadside reserve)	R636890
	15/12/2009	1450 Thompsons Rd (Roadside reserve)	R636890
	15/12/2009	1460 Thompsons Rd (Roadside reserve)	R204464645
	15/12/2009	1468 Thompsons Rd (Roadside reserve)	R204464671
	15/12/2009	1500 Thompsons Rd (Roadside reserve)	R50230155
	15/12/2009	1520 Thompsons Rd (Roadside reserve)	R151078236
	15/12/2009	1550 Thompsons Rd (Roadside reserve)	R151078259
	15/12/2009	1580 Thompsons Rd (Roadside reserve)	R206006728
	15/12/2009	1568 Thompsons Rd (Roadside reserve)	R2045573
	15/12/2009	Butterfield Place (Roadside reserve)	R203929396
	15/12/2009	1660 Thompsons Rd (Roadside reserve)	R150452089
	15/12/2009	1670 Thompsons Rd (Roadside reserve)	R150452081
	15/12/2009	585 Berwick-Cranbourne Rd (Roadside reserve)	R209708512
January	n/a	n/a	n/a
February	7/2/2009	585 Berwick-Cranbourne Rd (opposite Roadside)	Unknown

3.2.1 Scattered trees

Twenty-four 'scattered trees', as defined by DSE (2007b) occur within the study area (Appendix 7). Scattered trees constitute important habitat for the region's indigenous fauna and in many cases are the only source of tree hollows and canopy nectar in an otherwise highly modified environments (Figure 5).

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

- below average rainfall in recent years;
- cattle pugging and soil compaction at the base of the trees;
- tree trunk damage due to stock rubbing against trees; and
- 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*. Scattered Trees occurred mostly within roadsides on the northern and eastern boundaries, and within the quarries. Fourteen Coast Manna Gum *Eucalyptus viminalis* subsp. *pryoriana* occur on higher elevations on sandy soils within the study area and are remnants of Heathy Woodland. The remaining ten Scattered Trees are mostly Swamp Gum *Eucalyptus ovata* subsp *ovata* which occur in low lying and poorly drained areas, and are remnants of Swampy Riparian Woodland. Appendix 7 lists scattered trees recorded within the study area.

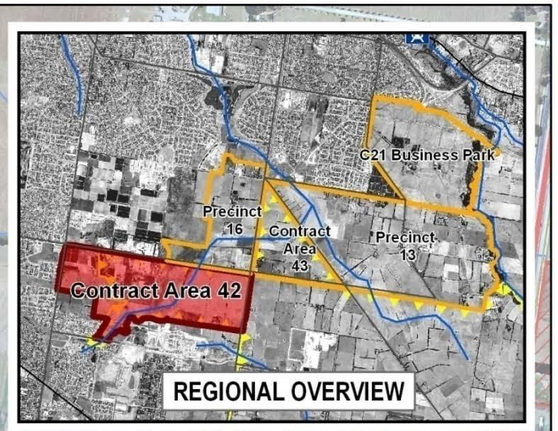
3.2.2 Conservation significance of scattered trees

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

- EVC conservation status (assigned the lowest conservation significance which applies to the original EVC which they belonged);
- if the tree species is or provides habitat for a threatened species; and
- 'other site attributes'.

All EVCs, except Heathy Woodland assigned to scattered trees within the study area are classified as 'Endangered' EVC within the Gippsland Bioregion (DSE 2010d). The remaining

Refer to the Appendices, Figure 5A-5D for further detail



Thompsons Road

Cranbourne-Narre Warren Road

Berwick-Cranbourne Road

Linsell Boulevard

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DATUM: GDA 94 VICGRID 94

N

0 100 200 300 400

Metres

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MAP AND SURVEY DETAILS

Surveyed by: Mark Shepherd, Luke Bennett and Peter Gannon, 6 Oct 2009 - 7 Feb 2010
Mapping by: Staci Timms, April 2010
Generated from: Data collected in the field using Juno PDAs and DSE's Habitas Software. Aerial Imagery and GIS base layers supplied by DSE and GAA, additional GIS layers from Geoscience Australia.

For further detail of EVCs and Scattered Trees refer to Figures 5A-5D

VERSION 02 **DATE:** 04/10/10

LEGEND

- Watercourse
- Roads
- Study Area Boundary
- Property Boundary
- 257462 Property PFI
- Flora Surveys Not Complete

Modelled Vegetation

- Highly likely native vegetation - woody
- Possibly native vegetation
- Wetland habitat
- Non Native Vegetation
- Degraded Treeless Vegetation

Ecological Vegetation Class

- EVC 3: Damp Sands Herb-rich Woodland
- EVC 48: Heathy Woodland
- EVC 53: Swamp Scrub
- EVC 55: Plains Grassy Woodland
- EVC 83: Swampy Riparian Woodland
- EVC 136: Sedge Wetland
- EVC 175: Grassy Woodland
- EVC 821: Tall Marsh

Scattered Trees

- Small Tree
- Medium Old Tree
- Large Old Tree
- Very Large Old Tree
- E.vi Coast Manna Gum *Eucalyptus viminalis* ssp. *pryoriana*
- E.ov Swamp Gum *Eucalyptus ovata* ssp. *ovata*
- E.ce Mealy Stringbark *Eucalyptus cephalocarpa*

FIGURE 5
ECOLOGICAL VEGETATION CLASSES AND SCATTERED TREES
Contract Area 42
Biodiversity Mapping Project 2009-2011

Heathy Woodland EVC scattered tree zones are classified as 'Least Concern' within the Gippsland Bioregion (DSE 2010d).

The conservation significance of scattered trees is Low within the study area. 'Other site attributes' have not influenced the overall conservation significance of any scattered trees, (Appendix 7).

3.2.3 Habitat zones

A total of **22.64 hectares** of native vegetation comprising **8.22 habitat hectares** was defined as meeting DSE's (2004b) native vegetation cover thresholds within the survey period.

Vegetation patches within the study area that constitute Habitat Zones, in accordance with Victoria's *Native Vegetation Management Framework* policy (DNRE 2002), vary between 0.003 and 3.93 hectares and are generally less than 0.5 hectares per patch. Furthermore, many patches of native vegetation are modified and not contiguous with other native vegetation. This was reflected in the relatively low-moderate habitat scores, which were generally less than 0.45. The scores are a reflection of the modified agricultural landscape within which the study area occurs and vegetation modification associated with the operation of quarries at the centre of the study area. 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.
- Introduction of grassy weeds, pasture grasses and high nutrient levels.
- General absence of regeneration of woody species (due to grazing and rabbits) and subsequently a declining canopy coverage.
- Losses of middle and ground-storey native vegetation resulting in a depauperate native vegetative understorey cover scores.
- Vegetation disturbance as a result of the operation of an extractive industry, including surface scraping and elevated dust levels.
- Inappropriate fire regimes.

Patches of native vegetation within the quarries were significantly larger in size and scored relatively highly, compared to the majority of patches throughout the study area. These patches are predominately Heathy Woodland and Damp Sands Herb-rich Woodland. Although generally low in quality, drainage-lines within the study area held native vegetation in many sections and were also large in area.

3.2.4 Conservation significance of habitat zones

Of the 68 patches of native vegetation recorded within the study area, 39 patches have been assigned **very high** conservation significance, as per Appendix 3 of Victoria's *Native Vegetation Framework* (DNRE 2002) (Appendix 8). The remaining 29 patches have been assigned **high** conservation significance (Appendix 8: Figure 6).

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 flora and fauna within actual habitat zones or similar habitats within the study area. 'Other site attributes' have not influenced the overall conservation significance of any habitat zones (Appendix 8).

3.2.5 Vegetation quality (habitat hectares)

Vegetation quality in terms of habitat scores varies between 0.11 and 0.54 (Appendix 8). The average habitat score is 0.29 within the study area.

The relatively low habitat 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.

Appendix 8 presents all habitat hectare scores recorded within the study area during the current assessment.

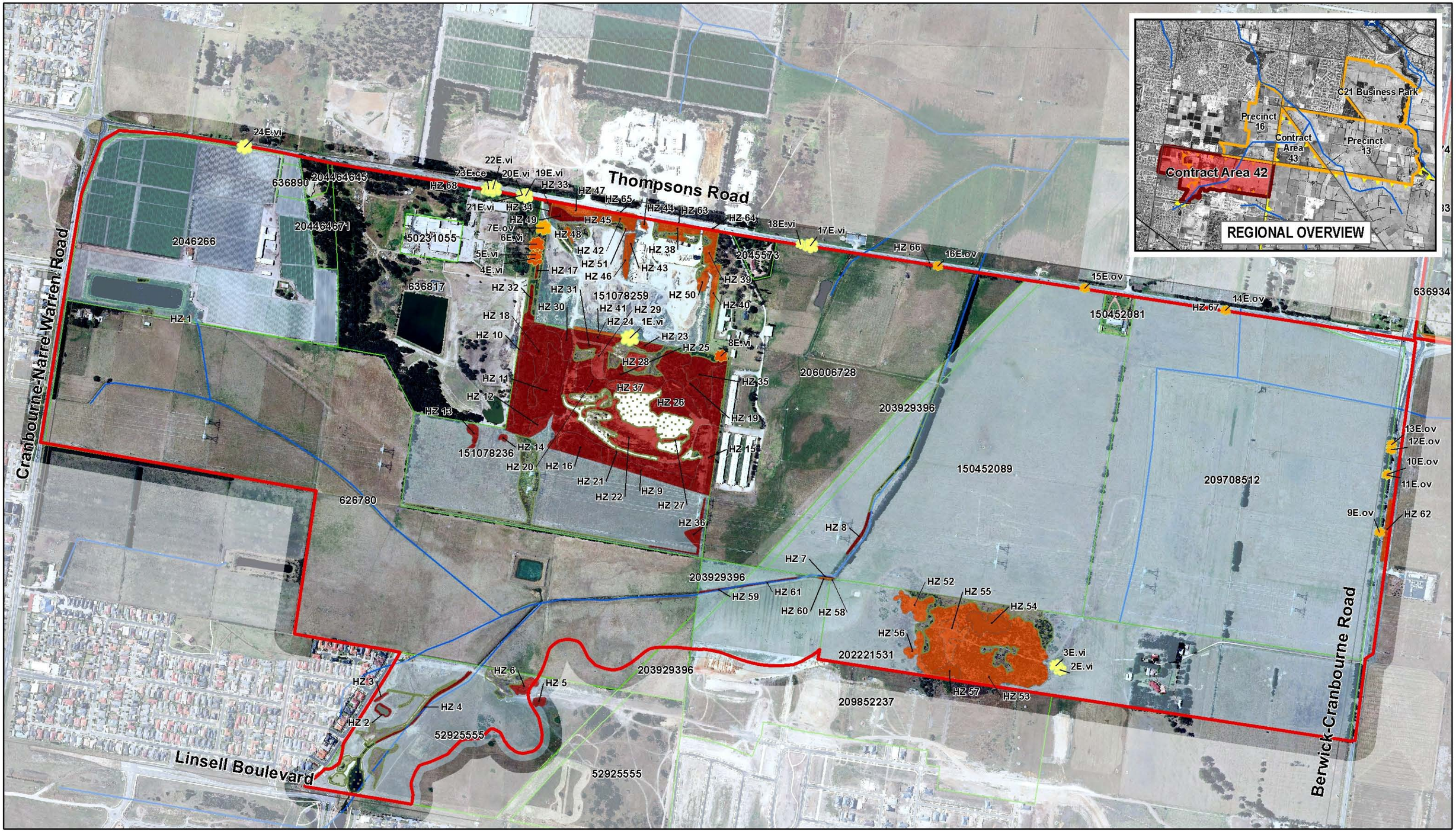
3.2.6 Degraded treeless and non-native vegetation

The majority of the study area is dominated by Non-Native Vegetation (NNV), in the form of grazing and cropping land. The majority of this land occurs on the lower elevations consisting of sedimentary derived soils in the south, east, and west of the study area (Figure 2). NNV within the study area typically comprises exotic pasture grasses, such as Rye grasses *Lolium* spp with occasional introduced crop weeds such as Thistles and other broadleaf weeds.

Degraded Treeless Vegetation (DTV) is mostly contiguous with native vegetation patches within the study area (Figure 2). Some recently disturbed sections within the quarries comprise DTV of relatively high indigenous floristic diversity. While these areas cannot be classified as vegetation patches under *Victoria's Native Vegetation Management: a Framework for Action* (DNRE 2002), they are in a state of regeneration, and may develop indigenous cover at or beyond the thresholds defined by *the Framework* in coming years.

Many areas of DTV within the study area are associated with drainage-lines. These areas comprise indigenous graminoids in combination with a range of exotic graminoids, such as Drain Sedge *Cyperus eragrostis*.

DTV within the study area generally comprises greater floristic diversity compared to the surrounding agricultural land and is habitat for native fauna, such as birds, reptiles and amphibians.



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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.

DATUM: GDA 94 VICGRID 94

N

0 100 200 300 400
Metres

1:9,000 when printed at A3

MAP AND SURVEY DETAILS

Surveyed by: Mark Shepherd, Luke Bennett and Peter Gannon,
6 Oct 2009 - 7 Feb 2010
Mapping by: Staci Timms, April 2010
Updated by Colin Broughton, September 2011
Generated from: Data collected in the field using Juno PDAs and DSE's Habitas Software. Aerial Imagery and GIS base layers supplied by DSE and GAA, additional GIS layers from Geoscience Australia.

VERSION 03 | DATE: 21/09/11

LEGEND

- Watercourse
- Roads
- Study Area Boundary
- Property Boundary
- 257462 Property PFI
- Non-Native Vegetation

Conservation Status - Scattered Trees

- Low
- Medium
- High

Conservation Status - Habitat Zones

- High
- Very High

FIGURE 6
CONSERVATION SIGNIFICANCE
Contract Area 42
Biodiversity Mapping Project 2009-2011

3.3 Targeted flora

Targeted surveys for threatened flora were undertaken in six areas of habitat (Figure 2) for species nominated by DSE (Table 5).

The six areas of habitat identified for targeted searches within the study area comprised two broad habitat types:

- Remnant and regenerating woodlands and other vegetation types, surrounding the quarries and within 2/585 Cranbourne-Berwick Road.
- A large drainage-line transecting the study area from north to south (Figure 2).

Three flora species listed by DSE as rare (r), or suspected of being rare or threatened (k), were recorded within the study area (Table 2). These species are:

- Floodplain Fireweed *Senecio campylocarpus.*
- Veined Spear-grass *Austrostipa rudis* subsp. *australis*.

Wetland Blown-grass *Lachnagrostis filiformis* var. 2.

Table 5. Targeted flora survey effort

Month	Site No	Property Address	Assessor	Survey date	Duration of survey (hrs)	Temperature range(°C)	Species Surveyed*
September	**1**	1550 Thompsons Rd	Mark Shepherd, Nic McCaffrey	23/9/2009	8	11.0-17.0	MFL, RSWG, SE, MLO, GBB, PSE, VSG, PD, NSO, WSO, FSO, CSO, GSO, MSO.
October	**3**	1520 Thompsons Rd	Mark Shepherd, Doug Frood	7/10/2009	6	5.9-13.3	MFL, RSWG, SE, MLO, GBB, PSE, VSG, PD, NSO, WSO, FSO, CSO, GSO, MSO.
	6	60s Cornwall Crs	Mark Shepherd	21/10/2009	2	11.6-18.0	MFL, RSWG, SE, MLO, GBB, PSE, VSG, PD, NSO, WSO, FSO, CSO, GSO, MSO.
November	**1**	1550 Thompsons Rd	Mark Shepherd, Gidja Walker	18/11/2009	1	9.5-~	MFL, RSWG, SE, MLO, GBB, PSE, VSG, PD, NSO, WSO, FSO, CSO, GSO, MSO.
	2	1520 Thompsons Rd	Mark Shepherd, Gidja Walker	18/11/2009	2	9.5-~	MFL, RSWG, SE, MLO, GBB, PSE, VSG, PD, NSO, WSO, FSO, CSO, GSO, MSO.
	3	1520 Thompsons Rd	Mark Shepherd, Gidja Walker	18/11/2009	1	9.5-~	MFL, RSWG, SE, MLO, GBB, PSE, VSG, PD, NSO, WSO, FSO, CSO, GSO, MSO.
	4	1660 Thompsons Rd/545 Berwick Rd	Mark Shepherd	24/11/2009	2	9.0-23.3	MFL, RSWG, SE, MLO, GBB, PSE, VSG, PD, NSO, WSO, FSO, CSO, GSO, MSO.
	5	2/585 Berwick-Cranbourne Rd	Mark Shepherd	24/11/2009	2	9.0-23.3	MFL, RSWG, SE, MLO, GBB, PSE, VSG, PD, NSO, WSO, FSO, CSO, GSO, MSO.
December	**2**	1520 Thompsons Rd	Mark Shepherd	3/12/2009	2	11.2-30.5	MFL, RSWG, SE, MLO, GBB, PSE, VSG, PD, NSO, WSO, FSO, CSO, GSO, MSO.
	3	1520 Thompsons Rd	Mark Shepherd	9/12/2009	2	8.1-24.0	MFL, RSWG, SE, MLO, GBB, PSE, VSG, PD, NSO, WSO, FSO, CSO, GSO, MSO.
January							
February	**6**	60s Cornwall Crs	Mark Shepherd	7/2/2010	2	15.5-30.5	MFL, RSWG, SE, MLO, GBB, PSE, VSG, PD, NSO, WSO, FSO, CSO, GSO, MSO.

*

MFL	Matted Flax-lily
RSWG	River Swamp Wallaby-grass
SE	Swamp Everlasting
MLO	Maroon Leek-orchid
GBB	Grey Billy buttons
PSE	Pale Swamp Everlasting
VSG	Veined Spear-grass
PD	Purple Diuris
NSO	Naked Sun Orchid
WSO	Wine-lipped Spider Orchid
FSO	Frankston Spider Orchid
CSO	Cream Spider Orchid
GSO	Green-striped Spider Orchid
MSO	Metallic Sun Orchid

^ BOM (2010)

~ Missing Data from BOM (2010)

3.4 Fauna survey results

3.4.1 Fauna habitats

Much of the study area has been highly modified by grazing, cropping and more recently urbanisation. Large open paddocks lined with planted exotic vegetation dominate the precinct. However, native vegetation is present in roadsides, and in particular within the disused quarry site at 1520 Thompsons Road (Figure 7). Surrounding properties also have some native vegetation present. There is also a large patch of regenerating heathy woodland present on the property at 2/585 Berwick-Cranbourne Road, however this patch of vegetation is still grazed by cattle and therefore the ground storey is heavily degraded.

While many of the trees within the study area are too young to have formed hollows, some hollow bearing trees may be present and would support a suite of hollow dependant species such as parrots, rosellas, lorikeets, owls, arboreal mammals and microbats.

There is also a main drainage-line crossing diagonally through the investigation area, ending in a wetland at 60S Cornwell Crescent. This drainage-line and wetland is providing critical habitat for fish, amphibians and wetland birds.

A number of wetlands are also present within the investigation area. The wetland in Cornwell Crescent and the disused quarry site has old quarry excavations which have since filled with water and are acting as a wetland. There are also a number of farm dams throughout the area.

The general fauna habitats have been classed into woodland, drainage-lines, wetlands, farmland and exotic vegetation. To follow are descriptions of these habitats.

Woodlands

Remnant woodlands are important habitat for a number of fauna species. Within the study area, these isolated patches are particularly critical for the presence of a suite of woodland dependant species including woodland dependent birds, arboreal & terrestrial mammals, reptiles, invertebrates, microbats and some amphibians. The woodlands within the study area are dominated by Heathy Woodland (EVC 48) and Damp Sands Herb Rich Woodland (EVC 3).

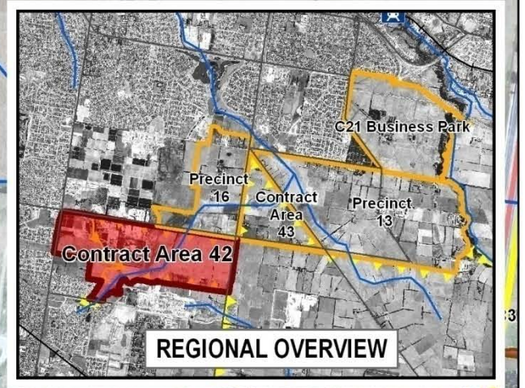
Some trees within these woodland remnants may have hollows present that are suitable for hollow-dependant fauna such as birds, arboreal mammals and bats. The woodland patches have a number of habitat niches present. Fallen timber provides habitat for small mammals, skinks and invertebrates. Fallen timber is also important for many bird species from which they perch or hunt. Other important resources provided by woodlands include nectar, sap, bark, organic litter and nesting sites

Most of the woodland habitat within the investigation area is confined to the property at 1520 Thompsons Road but also extends into bordering properties. There is also a patch of regenerating heathy woodland at 2/585 Berwick-Cranbourne Road (Figure 7).

Fence-lines and property boundaries have remnant woodland trees or scattered trees present with both indigenous and non-indigenous trees and shrubs. Many of these plantings include non-indigenous Eucalypts, *Cypress* spp, *Pinus* spp and other exotic trees. While the structure and floristic diversity of these fence-line plantings are not as complex as that of remnant woodland patches, they still provide opportunities for woodland birds and arboreal mammals to move through a landscape and to forage, nest and roost (Bennett, Kimber and Ryan 2000).

Woodland
High Likelihood
Rufous Fantail
Southern Brown Bandicoot

Moderate Likelihood
Chestnut-rumped Heathwren
Grey Headed Flying Fox
Powerful Owl
Satin Flycatcher



Thompsons Road

Cranbourne-Narre Warren Road

Berwick-Cranbourne Road

Linsell Boulevard

636890
204464645
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636817
151078259
2045573
151078236
206006728
203929396
150452081
150452089
626780
209708512
202221531
209852237
52925555
636934

WETLANDS
High Likelihood
Australian Shoveler*
Hardhead*
Royal Spoonbill*

Moderate Likelihood
Blue-billed Duck
Pied Cormorant
Cape Barren Goose
Eastern Egret
Dwarf Galaxias
Freckled Duck
Growling Grass Frog

*Recorded on site

Farmland
Moderate Likelihood
Black Falcon
Brown Quail
Spotted Harrier

Overhead/Air Space
Entire Site
Moderate Likelihood
Fork Tailed Swift
White Throated Needletail

Drainage Lines
High Likelihood
Southern Toadlet*
Southern Brown Bandicoot

Moderate Likelihood
Dwarf Galaxias
Swamp Skink

* Recorded on site

Moderate Likelihood
Baillon's Crake

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MAP AND SURVEY DETAILS

Surveyed by: Jo Henry, Annabelle Stewart, David Nance, Zorza Goodman and Mal Legg Oct 2009 - Apr 2010
Mapping by: Staci Timms, April 2010
Generated from: Data collected in the field using IPAQ PDAs. Aerial Imagery and GIS base layers supplied by DSE and GAA, additional GIS layers from Geoscience Australia.

VERSION: 02 **DATE:** 04/10/10

LEGEND

- Watercourse
- Roads
- Study Area Boundary
- Property Boundary
- 257462 Property PFI
- Drainage line
- Non-indigenous Eucalypt Woodland
- Remnant Woodland
- Swamp Scrub
- Wetland

FIGURE 7
FAUNA HABITAT
Contract Area 42
Biodiversity Mapping Project
2009-2011


Plates 6 & 7. Regenerating heathy woodland at 2/585 Berwick-Cranbourne Rd. photos taken by M. Shepherd


Plates 8 & 9. These two photos show the remnant patch of woodland present at 1520 Thompsons Road, note the large nest in the photo on the left. Photos taken by M. Shepherd.

Wetlands (including surrounding vegetation)

A number of dams are located throughout the investigation area (Figure 7). These habitats offer valuable resources for many fauna. Although the quality of the wetlands varies, it is well documented that these environments are critical habitat for birds and amphibians (Hero, Littlejohn and Marantelli 1991; Pizzey and Knight 2007). There are a number of dams within the study are that have little fringing vegetation due to previous and current land management practices; however, these areas provide potential habitat for many birds, amphibians, reptiles and insects. They also provide a valuable watering source for many

fauna species including mammals. Two wetlands of particular note are the wetland in the disused quarry at 1520 Thompsons Road and the wetland at 60S Cromwell Crescent.

The wetland at 1520 Thompsons Rd is the result of large areas of earth excavated during the time when the quarry was active, which has subsequently filled with water. The water quality and fringing vegetation at 1520 Thompsons Rd are not of high quality, however a number of threatened species have been recorded within this site. The Royal Spoonbill, which is listed as vulnerable in Victoria (DSE 2009b), was seen feeding in the wetland during this assessment. In in a previous study undertaken at this site the Australasian Shoveler *Anas rhynchotis* and the Hardhead *Aythya australis* (Fairbridge and Appleby 2009) both listed as vulnerable in Victoria (DSE 2007a) were seen foraging in the wetland. The only fish recorded in the wetland are Common Goldfish *Carassius auratus* and Short-finned Eel *Anguilla australis*. This is most likely a result of the wetland being quite recent and isolated from other wetlands, and given time the aquatic fauna would most likely increase.

The wetland at Cromwell Crescent is connected to the main drainage-line present in the study area. As such this wetland offers potential habitat for the nationally threatened Dwarf Galaxias. The wetland has been recently revegetated with fringing vegetation and is home to a number of amphibians and also the Common Galaxias *Galaxias maculatus*. Also heard at this site was the regionally significant Clamorous Reed-Warbler *Acrocephalus australis*. As the revegetation develops with time, the structural diversity will increase and provide habitat to additional fauna.

Plates 10 & 11. Photographs showing wetland habitats in the investigation area, the photograph on the left is taken at Cromwell Crescent and the right was taken at 1520 Thompsons Rd. Photos by M. Shepherd.

Drainage-lines

Drainage-lines within the precinct are dominated by a Sedge Wetland EVC (Figure 7). These drainage-lines provide habitat to a number of amphibians such as conservation significant species including Growling Grass Frogs and birds such as reed-warblers, cisticolas and wrens aswell as providing shelter and connectivity for mammals such as Southern Brown Bandicoot. Species such as the state significant Southern Toadlet, and the regionally significant Australian Reed-Warbler *Acrocephalus australis*, were recorded within this habitat type during the current assessment. Drainage-lines may also serve as migratory routes and spawning habitat for the threatened Dwarf Galaxias during times of flood. A

constructed wetland in the south of the precinct is of particular interest because it provides valuable habitat, and habitat links, in a largely urbanised area.

Farmland and exotic vegetation

Areas of farmland and exotic vegetation serve a less important role as habitat for most native species. A number of the more generalist bird species and raptors were recorded throughout farmland within the study area. Open farmland areas and open areas with fringing vegetation are important hunting grounds for raptors such as Brown Falcon *Falco subniger,* Brown Goshawk *Accipiter* fasciatus, Black-shouldered Kite *Elanus axillaris*, Whistling Kite *Haliastur sphenurus* and Nankeen Kestrel *Falco cenchroides.*

3.4.2 Fauna species

Fauna species recorded

One hundred and fifteen fauna species were recorded during the current assessment, including 98 indigenous species, one non-indigenous native species, the Eastern Dwarf Tree Frog *Litoria fallax*, and sixteen exotic species (Appendix 11& 12). Of the native species recorded, there were nine amphibians (including the non-indigenous native), 72 Bird species, seven reptiles and ten mammals (plus four mammals that were not identified to species level) and one native fish, Common Gallaxias.

Three threatened fauna species were recorded during the current assessment (Figure 8). Two of these species are threatened wetland birds, the Royal Spoonbill *Platalea regia* and Australia Shoveller *Anas rhynchotis*. One threatened amphibian; Southern Toadlet *Pseudophryne semimarmorata* was recorded within the contract area. Previous surveys have also recorded the threatened wetland bird, Hardhead *Aythya australis,* which was not recorded during the current assessment. Footprints that bear resemblance to Southern Brown Bandicoot *Isoodon obesulus* were found during the targeted survey for Southern Toadlet, however as a footprint is considered inconclusive, this species is not recorded as being present. It is given a high likelihood of occurrence and it is recommended that all potential habitat is managed for the protection of this species.

A list of all native species recorded within the study area is provided in Appendix 11. Of the exotic species recorded there were nine birds, two fish and five mammals recorded. A list of exotic fauna recorded within the study area is provided in Appendix 12. Bat records within the study area were determined using Anabat time versus frequency graphs. A time versus frequency graph for each species recorded within the study area is presented in Appendix 17.

One hundred and sixty-one invertebrate species, totalling 627 individuals were identified during invertebrate surveys within the study area (Appendix 14). Many invertebrates could not be identified beyond order, however most have been recorded photographically and are have been can be provided on a CD upon request.

Database records and previous surveys

A total of 302 species are documented on DSE's AVW (DSE 2009b) from within 10 km of the study area boundary. Sixty national and state significant fauna species are recorded or predicted to occur within 10 km of the study area are documented on the VFD (DSE 2009b) and EPBC Protected Matters Search Tool (Appendix 16).

In determining the '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, eight species recorded on AVW and EPBC searches are considered to have a high likelihood of occurrence within the study area. A further 19 species are considered to have at least a moderate likelihood of occurrence within the study area (Appendix 16). The habitat requirements for significant species detected on AVW and EPBC searches are detailed in Appendix 16.

Threatened fauna species

Three threatened fauna species were detected during the survey (Figure 8). However, one mammal, the Southern Brown Bandicoot, which is listed as Endangered under the EPBC Act, invalid or ineligible under the FFG Act and as Near Threatened in the State of Victoria is thought to occur within the area (DSE 2007a). Footprints were seen along the drainage line that runs through the study area, however, this presence is considered unconfirmed, we have assigned this species a *high* likelihood of occurrence within the contract area throughout suitable habitat patches.

Plates 12 & 13. Photographs showing potential bandicoot footprints taken along the drainage line within property pfi 150452089 Photos by D. Nance.

Two threatened wetland birds were detected during the current assessment, the Australasian Shoveler and the Royal Spoonbill which are both listed as vulnerable in Victoria (DSE 2007a). One amphibian species was detected during targeted surveys, the Southern Toadlet which is listed as Vulnerable in Victoria (DSE 2007a). All threatened fauna are shown on Figure 8 and are listed in Appendix 11. The Growling Grass Frog is also considered to have a high likelihood of occurrence, although no frogs were seen or heard during the surveys, potential habitat was identified during the current assessment and habitat was also identified in the Draft Sub-regional surveys for Growling Grass Frog (Renowden et al. 2010).

Best or remaining 50% habitat for rare and threatened fauna species

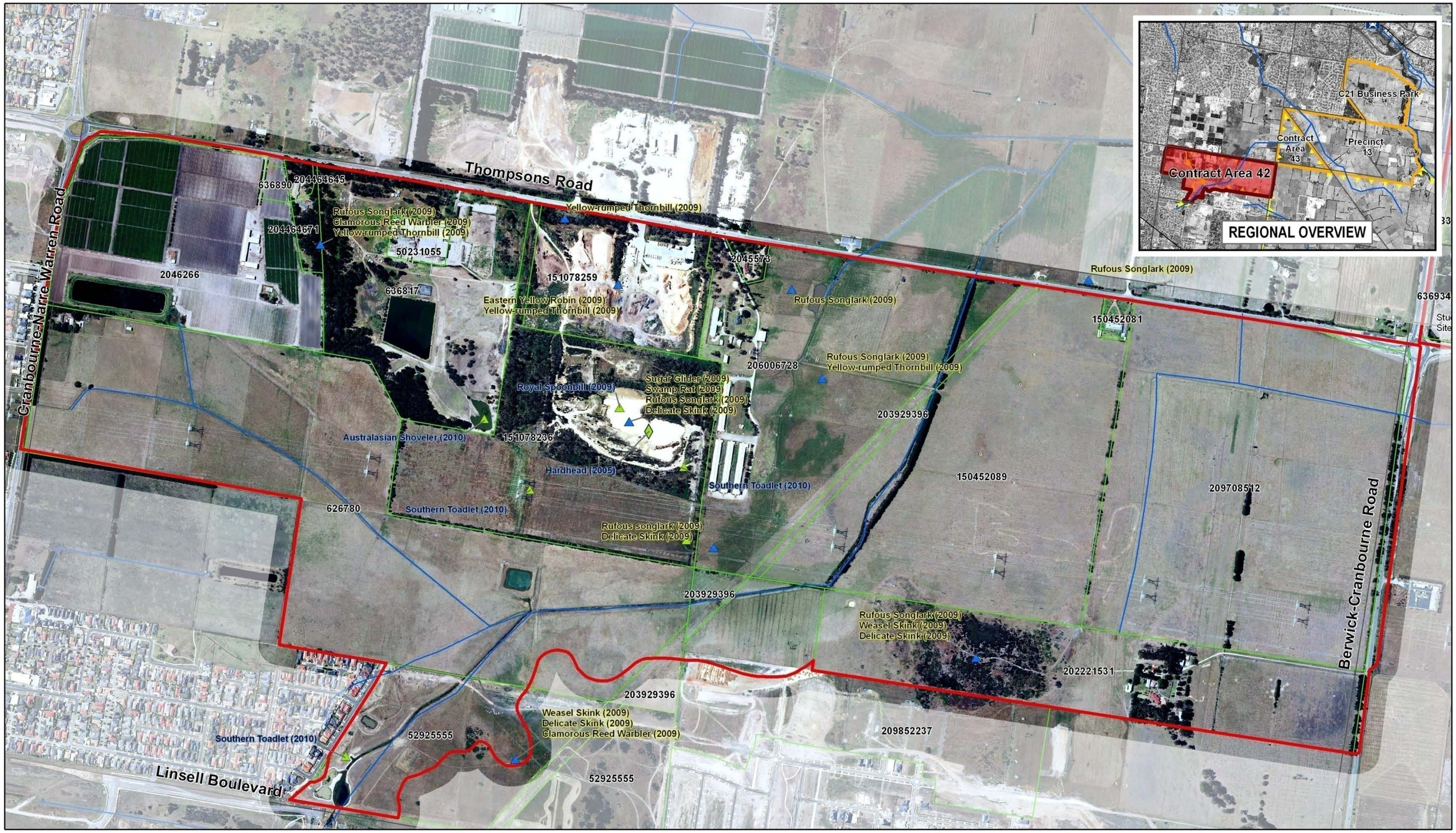
Habitat zones have been assessed as to whether they are best or remaining 50% habitat for all threatened species that were detected through database searches and recorded during the survey. However, the site at 1520 Thompsons Road is considered best 50% of habitat for woodland birds, the Southern Toadlet and some wetland birds. This site has critical habitat within the investigation area, and many 'environmental indicator' species are present within this habitat.

There is also much enhancement potential for the wetlands throughout the site, and for weed removal within the heathy woodland. Another site of particular importance within the study area is 2/585 Berwick-Cranbourne Road. Although the woodland does not offer the same quality as that found in 1520, it does provide habitat to many bird and microbat species, and the potential for improvement is great.

The drainage-lines throughout the study area are considered best 50% habitat for Southern Toadlet. This species has been recorded within the main drainage-lines and in small seeps throughout the study area.

3.4.3 Targeted fauna

One species listed as vulnerable within Victoria (DSE 2009b) was detected during targeted surveys (Figure 8). This was the Southern Toadlet. The Southern Toadlet was detected at 60S Cornwell Crescent and 1520 Thompsons Road. No other targeted species were detected within the study area.Please note this biodiversity assessment does not include targeted surveys of Growling Grass Frog and Southern Brown Bandicoot as they are being undertaken in the Sub Regional Surveys required under the Strategic Assessment. The Sub Regional Survey for Southern Brown Bandicoot identifies that there is potential habitat for the species in the precinct. Refer to the Sub Regional Survey for Southen Brown Bandicoot (Stewart and Shepherd 2010).



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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.

DATUM: GDA 94 VICGRID 94

N

0 100 200 300 400

Metres

1:8,838 when printed at A3

MAP AND SURVEY DETAILS

Surveyed by: Jo Henry, Annabelle Stewart, David Nance, Zorza Goodman and Mal Legg Oct 2009 - Apr 2010
Mapping by: Staci Timms, April 2010
Generated from: Data collected in the field using IPAQ PDAs. Aerial Imagery and GIS base layers supplied by DSE and GAA, additional GIS layers from Geoscience Australia.

VERSION: 02 **DATE:** 04/10/10

LEGEND

- Watercourse
- Roads
- Study Area Boundary
- Property Boundary
- 257462 Property PFI

Significant Species Records

- Blue-billed Duck (1998) — Practical Ecology Survey Results State Significant Species and Date of Record
- Blue-billed Duck (1998) — Practical Ecology Survey Results Regionally Significant Species and Date of Record
- Blue-billed Duck (1998) — Database Results State Significant Species and Date of Record

FIGURE 8
SIGNIFICANT FAUNA RECORDS
Contract Area 42
Biodiversity Mapping Project 2009-2011

Table 6. Targeted fauna surveys undertaken

Month	Survey Date	Property Address	Survey Type	Species targeted		Mean Temperature range (°C)
				Common Name	Scientific name	
November	7/11/2009	Pound Road	Tin	Glossy Grass Skink	*Pseudemoia rawlinsoni*	11.0–30.1
	7/11/2009	Pound Road	Tin	Swamp Skink	*Egernia coventryi*	11.0–30.1
	10/11/2009–14/11/2009	Pound Road	Elliots	Glossy Grass Skink	*Pseudemoia rawlinsoni*	14.0–29.5
	10/11/2009–14/11/2009	Pound Road	Elliots	Swamp Skink	*Egernia coventryi*	14.0–29.5
	10/11/2009–14/11/2009	Thompsons Road	Elliots	Glossy Grass Skink	*Pseudemoia rawlinsoni*	14.0–29.5
	10/11/2009–14/11/2009	Thompsons Road	Elliots	Swamp Skink	*Egernia coventryi*	14.0–29.5
	14/11/2009	1100 Pound Road	Tin	Glossy Grass Skink	*Pseudemoia rawlinsoni*	13.0–29.4
	14/11/2009	1100 Pound Road	Tin	Swamp Skink	*Egernia coventryi*	13.0–29.4
	14/11/2009	Thompsons Road	Tin	Glossy Grass Skink	*Pseudemoia rawlinsoni*	13.0–29.4
	14/11/2009	Thompsons Road	Tin	Swamp Skink	*Egernia coventryi*	13.0–29.4
	15/11/2009	Pound Road	Tin	Glossy Grass Skink	*Pseudemoia rawlinsoni*	9.9–24.8
	15/11/2009	Pound Road	Tin	Swamp Skink	*Egernia coventryi*	9.9–24.8
	15/11/2009	1100 Pound Road	Tin	Glossy Grass Skink	*Pseudemoia rawlinsoni*	9.9–24.8
	15/11/2009	1100 Pound Road	Tin	Swamp Skink	*Egernia coventryi*	9.9–24.8
	27/11/2009	Pound Road	Dip Net	Dwarf Galaxias	*Galaxiella pusilla*	13.5–26.5
	27/11/2009	Pound Road	Bait Trap	Dwarf Galaxias	*Galaxiella pusilla*	13.5–26.5
	27/11/2009	1100 Pound Road	Dip Net	Dwarf Galaxias	*Galaxiella pusilla*	13.5–26.5
	27/11/2009	1100 Pound Road	Bait Trap	Dwarf Galaxias	*Galaxiella pusilla*	13.5–26.5
	27/11/2009	Berwick–Cranbourne Road	Dip Net	Dwarf Galaxias	*Galaxiella pusilla*	13.5–26.5
	27/11/2009	Berwick–Cranbourne Road	Bait Trap	Dwarf Galaxias	*Galaxiella pusilla*	13.5–26.5
December	4/12/2009	Thompsons Road	Dip Net	Dwarf Galaxias	*Galaxiella pusilla*	10.0–20.5
	4/12/2009	Thompsons Road	Bait Trap	Dwarf Galaxias	*Galaxiella pusilla*	10.0–20.5
	4/12/2009	Thompsons Road	Tin	Glossy Grass Skink	*Pseudemoia rawlinsoni*	10.0–20.5
	4/12/2009	Thompsons Road	Tin	Swamp Skink	*Egernia coventryi*	10.0–20.5
	4/12/2009	Pound Road	Tin	Glossy Grass Skink	*Pseudemoia rawlinsoni*	10.0–20.5
	4/12/2009	Pound Road	Tin	Swamp Skink	*Egernia coventryi*	10.0–20.5
	4/12/2009	Berwick–Cranbourne Road	Tin	Glossy Grass Skink	*Pseudemoia rawlinsoni*	10.0–20.5

Month	Survey Date	Property Address	Survey Type	Species targeted		Mean Temperature range (°C)
				Common Name	Scientific name	
	4/12/2009	Berwick-Cranbourne Road	Tin	Swamp Skink	*Egernia coventryi*	10.0-20.5
	4/12/2009	1100 Pound Road	Tin	Glossy Grass Skink	*Pseudemoia rawlinsoni*	10.0-20.5
	4/12/2009	1100 Pound Road	Tin	Swamp Skink	*Egernia coventryi*	10.0-20.5
	9/12/2009	Pound Road	Tin	Glossy Grass Skink	*Pseudemoia rawlinsoni*	8.1-24.0
	9/12/2009	Pound Road	Tin	Swamp Skink	*Egernia coventryi*	8.1-24.0
	11/12/2009	Berwick-Cranbourne Road	Tin	Glossy Grass Skink	*Pseudemoia rawlinsoni*	10.9-19.0
	11/12/2009	Berwick-Cranbourne Road	Tin	Swamp Skink	*Egernia coventryi*	10.9-19.0
	11/12/2009	Pound Road	Tin	Glossy Grass Skink	*Pseudemoia rawlinsoni*	10.9-19.0
	11/12/2009	Pound Road	Tin	Swamp Skink	*Egernia coventryi*	10.9-19.0
	11/12/2009	Thompsons Road	Tin	Glossy Grass Skink	*Pseudemoia rawlinsoni*	10.9-19.0
	11/12/2009	Thompsons Road	Tin	Swamp Skink	*Egernia coventryi*	10.9-19.0
	11/12/2009	1100 Pound Road	Tin	Glossy Grass Skink	*Pseudemoia rawlinsoni*	10.9-19.0
	11/12/2009	1100 Pound Road	Tin	Swamp Skink	*Egernia coventryi*	10.9-19.0
	15/12/2009	Thompsons Road	Tin	Glossy Grass Skink	*Pseudemoia rawlinsoni*	8.5-27.1
	15/12/2009	Thompsons Road	Tin	Swamp Skink	*Egernia coventryi*	8.5-27.1
January	27/01/2010	Pound Road	Tin	Glossy Grass Skink	*Pseudemoia rawlinsoni*	14.5-20.8
	27/01/2010	Pound Road	Tin	Swamp Skink	*Egernia coventryi*	14.5-20.8
	27/01/2010-01/02/2010	1100 Pound Road	Elliots	Glossy Grass Skink	*Pseudemoia rawlinsoni*	14.4-26.8
	27/01/2010-01/02/2010	1100 Pound Road	Elliots	Swamp Skink	*Egernia coventryi*	14.4-26.8
April	8/04/2010	1100 Pound Road	Vocalisation Id	Southern Toadlet	*Psuedophryne semimarmorata*	16.0-21.3
	9/04/2010	Pound Road	Vocalisation Id	Southern Toadlet	*Psuedophryne semimarmorata*	12.6-21.3
	9/04/2010	1100 Pound Road	Vocalisation Id	Southern Toadlet	*Psuedophryne semimarmorata*	12.6-21.3
	13/04/2010	Berwick-Cranbourne Road	Vocalisation Id	Southern Toadlet	*Psuedophryne semimarmorata*	11.5-16.6
	13/04/2010	1100 Pound Road	Vocalisation Id	Southern Toadlet	*Psuedophryne semimarmorata*	11.5-16.6
	13/04/2010	Thompsons Road	Vocalisation Id	Southern Toadlet	*Psuedophryne semimarmorata*	11.5-16.6
	22/04/2010	1100 Pound Road	Vocalisation Id	Southern Toadlet	*Psuedophryne semimarmorata*	13.3-27.2
	22/04/2010	1825 Thompsons Road	Vocalisation Id	Southern Toadlet	*Psuedophryne semimarmorata*	13.3-27.2

4. RELEVANT POLICY AND LEGISLATION

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

4.1 Commonwealth policy and legislation

4.1.1 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* (NES). Numerous threatened species and communities listed under the EPBC Act have been recorded, or have the potential to occur in the Casey-Cardinia Growth Area, within which the study area is situated. The development of the Casey-Cardinia growth area has the potential to have a significant impact on matters of NES, including impacts on threatened fauna species (DSE 2007a).

Under the EPBC Act 1999, a 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.

Two EPBC listed fauna species; Growling Grass Frog and Southern Brown Bandicoot *Isoodon obesulus* for which potential habitat was identified within the study area, are included and addressed in the Casey-Cardinia Growth Area SIA (DSE 2009e). These species have not been surveyed through this assessment as they are covered by the Sub Regional Surveys required under the Strategic Assessment.

The SIA notes that:

> *Extending the urban area to the south-east will further compromise ecological processes persisting in those areas. In the south-east, some road reserves and minor drainage-lines are known to afford narrow avenues of connected habitat for the Southern Brown-bandicoot, albeit tenuous ones* (Gannon 2009). *This connectivity within the south-east will more than likely be removed as a result of urban development. The mitigation emphasis will be on maintaining and restoring connectivity at a sub-regional level, focusing on larger areas of habitat and major strategic linkages. The challenge for monitoring will be finding practical ways to assess the degree of ecological function remaining in this part of the landscape, and identifying how urban development and the mitigation strategies influence the net result.*

Source: (DSE 2009e).

The SIA states that habitat corridors and indirect impacts to Southern Brown Bandicoot are likely to be the greatest impacts.

The SIA lists mitigation objectives, including:

- Exclude major areas of suitable habitat from development.
- Retain, upgrade and connect existing habitats within proposed precincts and outside the Urban Growth Boundary, including the important population at the Royal Botanic Gardens Cranbourne.
- Secure and manage retained habitat and linkages to conserve Southern Brown Bandicoot.
- Monitor retained and new habitat and adjust management accordingly.
- Carefully plan and construct urban development within precincts to minimise impacts on species (such as employing road design and other techniques that facilitate road crossings, and restricting cat, dog and human access in particular areas).

The SIA outlines the greatest threats to Growling Grass Frog due to the expansion of the urban growth boundary include:

- Loss of terrestrial habitat surrounding waterbodies
- Altered hydrology and/or altered wetland vegetation
- Loss of connectivity and increased fragmentation within a landscape
- Introduction of predatory fish

Mitigation objectives for Growling Grass Frog include:

- Identify and monitor key populations within the south east growth area
- Retain, upgrade, connect and enhance or buffer existing habitat
- Create new habitat within precincts
- Carefully manage hydrology to exclude predatory fish from entering new areas
- Monitor new habitat and adapt management as required

To meet these objectives a number of strategies are outlined in the SIA. These include managing and creating new wetlands within the south eastern growth area. Water quality and hydrology will be carefully managed to increase quality and connectivity for the

Growling Grass Frog. All areas of habitat will be monitored and management techniques adapted according to monitoring results.

The SIA also outlines the objectives of a Sub-regional Strategy and Conservation Management Plan for each PSP area.

Other EPBC Act listed threatened and/or migratory fauna species with *at least* a moderate likelihood of occurrence that are not addressed in the SIA, may also need to be addressed in a referral to DEWHA. These species include:

- Dwarf Galaxias *Galaxiella pusilla*
- Fork-tailed Swift *Apus pacificus*
- Grey-headed Flying Fox *Pteropus poliocephalus*
- Latham's Snipe *Gallinago hardwickii*
- Rufous Fantail *Rhipidura rufifrons*
- Satin Flycatcher *Myiagra cyanoleuca*
- White-throated Needletail *Hirundapus caudacutus*

No EPBC Act listed flora species were recorded within the study area. One EPBC listed flora species is considered to have at a high likelihood of occurrence within the study area; River Swamp Wallaby-grass *Amphibromus fluitans*. One other EPBC listed species, Matted Flax-lily *Dianella amoena*, is considered to have a moderate likelihood of occurrence within the study area

4.1.2 Ramsar – The Convention on Wetlands of International Importance 1971

There are no Ramsar wetlands within the study area The Ramsar *Handbook 16: Managing Wetlands* suggest that all wetlands require a dynamic management plan that sets out key objectives (Ramsar Convention Secretariat 2007). A risk assessment can also be carried out and wetlands should have ongoing monitoring to identify and manage hazards.

The drainage from the contract area may flow into Western Port Bay which is listed as a wetland of international importantance under the Ramsar convention. All hydrology within the contract area should be managed to reduce pollutants and volumes of stormwater run-off through the construction of retarding wetlands. Western Port Bay should not be adversely impacted by the potential development if such measures are enacted to a high standard.

4.1.3 Recovery plans

Recovery plans address research priorities and management strategies to halt decline and conserve threatened species listed under the EPBC Act. Recovery plans aim to provide a framework by which relevant stakeholders can optimise the long-term survival of threatened species and ecosystems in-situ. A number of Recovery Plans may be relevant to threatened species that have been recorded or have the potential to occur within the study area.

The relevant Recovery Plans and basic objectives are listed below.

The National Recovery Plan for the Dwarf Galaxias *Galaxiella pusilla* (Saddlier, Jackson and Hammer 2010)

Management actions to ensure the National Recovery Plan for the Dwarf Galaxias objectives are met are as follows:

- *No direct loss of habitat through wetland drainage on either public or private land.*
- *No physical alteration to Dwarf Galaxias habitat as a consequence of incidental works on land adjoining Dwarf Galaxias habitat.*
- *Applications for water abstraction or dam construction do not compromise flow regimes for Dwarf Galaxias.*
- *Habitat and adjoining riparian habitat are fenced off to stock access.*
- *Off-stream watering points are provided for stock.*
- *No further damage to riparian vegetation.*
- *Damaged or depleted riparian vegetation is protected and (if necessary) supplemented by active revegetation works.*
- *Plans to clear vegetation lying adjacent to Dwarf Galaxias habitat will not impact upon water quality (no increase in sedimentation/nutrient levels/pesticides/herbicides etc).*
- *Plans to revegetate with plantation timber/crops will not impact upon overall water yield (and subsequently flow regime of Dwarf Galaxias habitat).*
- *Proposals to translocate aquatic species into Dwarf Galaxias habitat are subject to relevant risk management processes according to relevant national and State guidelines.*

Source: (Saddlier, Jackson and Hammer 2010)

Dwarf Galaxias were not recorded within the study area. However, there are records for this species within 10km search area bounding the study area which includes catchment areas. Therefore, the above guidelines should be incorporated into the precinct structure planning of the study area.

There is a National Recovery Plan being prepared for the Southern Brown Bandicoot which may impact any clearing of potential Southern Brown Bandicoot habitat within the study area. A National Recovery Plan is in preparation for the Growling Grass Frog which may have recommendations for the management of the wetlands within the study area (DEWHA 2010c).

4.1.4 Conservation advices

Conservation advices provide information to various stakeholders on implementing on-ground actions for identifying threats to communities or species of concern and on developing management plans to control those threats.

There are 12 conservation advices for the Port Phillip and Westernport Area. These include:

- Alpine *Sphagnum* Bogs and Associated Fens.
- *Amphibromus fluitans* (River Swamp Wallaby Grass).
- Gippsland Red Gum (*Eucalyptus tereticornis subsp. Mediana*) Grassy Woodland and Associated Native Grassland.
- Grey Box (*Eucalyptus macrocarpa*) Grassy Woodlands and Derived Native Grasslands of Southern-eastern Australia.
- Natural Temperate Grassland of the Victorian Volcanic Plain.
- *Neophema chrysogaster* (Orange Bellied Parrot).
- *Prasophyllum colemaniae* (Swamp Fireweed, Smooth-fruited Groundsel).
- *Thalassarche chrysostoma* (Grey-headed Albatross).
- *Thalassarche melanophris* (Black-browed Albatross).
- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland.

Source (DEWHA 2010c)

4.1.5 Threat abatement plans

Threat abatement plans are created to address key threatening processes outlined for threatened species under the EPBC Act 1999. Threat abatement plans aim to provide a national framework by which coordinated and integrated management of key threatening processes are undertaken.

Threat Abatement Plans that may be implemented within the study area are:

- Threat abatement plan for competition and land degradation by rabbits 2008.
- Threat abatement plan for Dieback caused by the root-rot fungus Phytophthora cinnamomi.
- Threat abatement plan for infection of amphibians with chytrid fungus resulting in chytridiomycosis.
- Threat abatement plan for predation by the European red fox 2008.
- Threat abatement plan for predation by feral cats 2008.

Source (DEWHA 2010b)

These threat abatement plans set out objectives for each threat management and provide actions on how to achieve set objectives.

4.2 State policy and legislation

4.2.1 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.

4.2.2 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.

All flora species listed as threatened under the FFG Act are considered to have a low likelihood of occurrence within the study area (Appendix 6).

Protected Flora are species classified 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). A number of species found throughout the study area are listed under the FFG Act 1988 as Protected Flora. These species are listed in Appendix 2.

There were no FFG listed fauna species recorded within the study area. One FFG listed fauna species is assessed as having a high likelihood of occurrence and an additional ten fauna species are assessed as having a moderate likelihood of occurrence within the study area.

FFG listed species thought to have a high likelihood of occurrence:

- Eastern Great Egret *Ardea modesta*

FFG listed species thought to have a moderate likelihood of occurrence:

- Ballion's Crake *Porzana pusilla*
- Blue Billed Duck *Oxyura australis*
- Chestnut rumped Heathwren *Calamanthus pyrrhopygius*
- Dwarf Galaxias *Galaxiella pusilla*
- Freckled Duck *Stictonetta naevosa*
- Grey-headed Flying Fox *Pteropus poliocephalus*
- Growling Grass Frog *Litoria raniformis*
- Powerful Owl *Ninox strenua*
- Swamp Skink *Egernia coventryi*
- Southern Brown Bandicoot *Isoodon obesulus*

A permit is required if proposed works may kill, injure or disturb any listed protected flora species on public land.

4.2.3 Environment Effects Act 1978

The Environment Effects Acts 1978 only relates to public works deemed so by Order of the Minister and stated in the Government Gazette. If this is the case then the Act states that:

> "*Before commencing any public works to which this Act applies, the proponent must cause an Environment Effects Statement to be prepared and submit it to the Minister for the Minister's assessment of the environmental effects of the works.* [and] *A copy of the statement shall be submitted to the relevant Minister by the proponent.* [and] *A statement under this Act shall be prepared and submitted at the expense of the proponent of the works.*"
>
> Source: State of Victoria 2010 (Victorian Consolidated Acts)

An Environmental Effects Statement is prepared prior to development to identify potential environmental impacts and indicate ways in which environmental damage is mitigated or risks reduced.

4.2.4 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.

4.2.5 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 (R) – 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 supports 15 regionally controlled and restricted noxious weeds listed by DPI (2010c) (Appendix 2). 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 (DPI 2010).

4.2.6 Victoria's Native Vegetation Management Framework: A Framework for Action

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 DNRE (2002, p. 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.

The Precinct development is in the early phases of structure planning that will determine future land use. The Native Vegetation Framework requires that the avoidance of native

vegetation is a priority. When vegetation cannot be avoided, vegetation loss and other detrimental impacts must be minimised.

Relatively little of this site's remnant vegetation remains within the study area. This presents an opportunity, through appropriate (re)zoning, to protect what little remains and avoid future impacts to native vegetation through the integration of a precinct reserve system within the Planning Scheme.

Figure 2 displays the location of native vegetation, including scattered trees within the study area. Section 5.1 discusses the Net Gain three step process and opportunities to avoid and minimise native vegetation loss during the rezoning and design stages.

4.2.7 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 (PPWCMA 2006). Table 3.4C of the *Native Vegetation Plan* sets out the offset requirements for the loss of trees of various ages and sizes.

4.2.8 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.

4.2.9 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.

4.2.10 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 integrate 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, and integration of surface and subsurface flow management, to promote conservation and environmental enhancement and provide for the protection of catchment conditions.

4.2.11 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 natural assets are related, 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.

4.2.12 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.

4.2.13 Victoria's Biodiversity Strategy

Victoria's Biodiversity Strategy set out guidelines for achieving broad biodiversity objectives as set out below:

- *There is a reversal, across the entire landscape, of the long-term decline in the extent and quality of native vegetation, leading to a net gain with the first target being no net loss by the year 2001.*

- *The ecological processes and the biodiversity dependent upon terrestrial, freshwater and marine environments are maintained and, where necessary, restored.*

- *The present diversity of species and ecological communities and their viability is maintained or improved across each bioregion.*

- *There is no further preventable decline in the viability of any rare species or of any rare ecological community.*

- *There is an increase in the viability of threatened species and in the extent and quality of threatened ecological communities.*

Victoria's Biodiversity Strategy is achieved through adherence to the Acts and policy guidelines aforementioned.

4.3 Local policy and legislation

4.3.1 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.

Clause 52.16 applies to land where a native vegetation precinct plan (NVPP), corresponding to that land, is incorporated into this scheme. Where an NVPP applies, a permit is required to remove destroy or lop native vegetation, except where it is in accordance with that NVPP and Clause 52.16. Though an NVPP can stand alone, it may form part of a more general strategic or precinct structure plan. The purpose of an NVPP is to protect and conserve

native vegetation to reduce the impact of land and water degradation and provide habitat for plants and animals, and to enable other areas of native vegetation to be removed in accordance with the NVPP. The NVPP may require specified works to be provided or specified payments to be made to offset the removal, destruction or lopping of native vegetation. No permit is required under clause 52.17 where an NVPP is incorporated and listed in the schedule to clause 52.16 Native Vegetation Precinct Plan. A permit to remove, destroy or lop vegetation may still be required under an applicable overlay, depending on the requirements of the schedule to that overlay. However, it is often that case that such overlays are removed during the precinct planning process.

Much of the Investigation Area is covered by a Green Wedge Zone, and a Land Subject to Inundation Overlay runs diagonally through the area following the main drainage-line ending in the wetlands along Cornwell Crescent. There is some land covered under Farm Zone and Residential Zone.

4.3.2 Local Planning Policies/Strategies

The City of Casey has published at least two strategy statements relevant to biodiversity conservation in the Casey municipality which aim to identify biodiversity assets and outline conservation measures:

- *City of Casey Biodiversity Strategy*. Report prepared for the City of Casey by Ecology Australia, Fairfield, Victoria (McMillan et al. 2003).
- *Casey Revegetation Strategy*. Report for the City of Casey by Brett Lane and Associates, North Carlton, Victoria (Brett Lane and Associates 2008).

5. KEY BIODIVERSITY ISSUES AND IMPLICATIONS

It is estimated that only 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 and should be prioritised for retention and on-going ecological management as part of the *Investigation Area 42* rezoning and any future development.

Roadsides within the City of Casey are often the only remaining indigenous habitat within an area and are therefore important as habitat corridors for fauna throughout the municipality (Brett Lane and Associates 2008). 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. All roadsides, regardless of native vegetative cover, are important habitat within the study area, given the potential occurrence of threatened species, including Southern Toadlet and Glossy Grass Skink, in these areas.

Careful consideration should be given to wetlands and drainage-lines within the study area and the potential for the development to alter hydrology. Any rezoning and subsequent precinct design should therefore avoid impacts to wetland areas and drainage-lines. Water-sensitive urban design principles should be considered when designing the new precinct, in particular the incorporation of wetlands along the main drainage-line to provide critical habitat for wetland birds, amphibians and fish. Incorporating islands and artificial roosting and nesting sites into wetland design may increase wetland functionality and breeding success for birds.

The areas of highest conservation value within the study area consists of the remnant and regenerating woodlands and wetlands within and surrounding 'the quarries' at 1550 and 1520 Thompsons Road. Other areas of conservation value include:

- A major drainage-line transecting the study area from north to south.
- A regenerating woodland at 2/585 Berwick-Cranbourne Road.
- Scattered trees, remnant vegetation and exotic vegetation within road reserves, especially within Thompsons Road reserve.

Furthermore, many other roadsides, sections of drainage-line and areas of DTV contiguous with remnant patches are considered habitat for threatened fauna species within the contract area and generally hold greater conservation value compared to surrounding agricultural land.

Land-use change within the contract area, such as residential, business or industrial developments have the potential to significantly impact existing native vegetation, ecosystem function, water quality, threatened species habitat, and local and regional biodiversity, primarily through the direct removal of native vegetation and habitat. However, less than 10 percent of the study area comprises indigenous vegetation. This relatively small proportion of the study area should be retained for conservation and rehabilitation, as required first and foremost by Victoria's *Native Vegetation Management: a Framework for Action* (DNRE 2002). Furthermore, most areas of existing or potential habitat for threatened species coincide with native vegetation patches within the study area.

5.1 Opportunities to reduce potential impacts

The following impact minimisation options should be considered for the contract area:

- The avoidance and therefore retention of native vegetation through careful placement of roads, infrastructure, building lots and open space during the design phase.
- The retention of wetlands including areas of open water and other wetland habitat detailed in section 5.1.3.
- The avoidance of existing roadside vegetation through the purchase of adjacent cleared private land when planning for road duplication.
- The retention of scattered trees within the study area.
- Retention and minimisation of direct and indirect disturbance to drainage line habitat and connectivity with other waterways.
- The staged removal of drainage-line habitat at the construction phase when unavoidable habitat losses are incurred.
- The minimisation of alterations to hydrological regime and runoff water quality via use of water sensitive designs
- The salvage and re-location of Southern Toadlet during breeding season prior to the construction phase if unavoidable drainage-line habitat losses are incurred.
- The adoption of conservation aims in the rezoning and PSP planning process.

There is potential within the Precinct Structure Planning process to provide for the best possible ecological outcomes during and after the rezoning and subsequent development of the study area.

Creation of habitat within constructed wetlands

Drainage-lines and farm dams within the contract area currently support threatened species, and hold greater floristic diversity and habitat value compared to surrounding grazing land. Drainage-line modification may need to be undertaken to provide for increased stormwater run-off as a result of possible development of the study area. Unavoidable loss of aquatic habitat may result after existing drainage-lines will be widened and deepened to create wetlands and retarding basins. In order to mitigate this potential habitat loss, it may be appropriate to consider staging the removal of habitat and/or creating constructed wetlands adjacent to drainage-lines and allowing the drainage-lines to remain in place.

If newly constructed wetlands are to be created, significant opportunities exist for the addition of aquatic habitat. Constructed wetlands could be planted with a variety of indigenous aquatic and semi-aquatic vegetation, such as sedges, rushes and herbs, to create habitat for many types of fauna including amphibians, reptiles and birds. An appropriately qualified ecologist should be engaged to create a plant species schedule for revegetation which is appropriate to soil type, hydrology, and other site conditions. Appropriate management should be undertaken to maintain the planting, and control weeds, especially in the formative years.

Islands could be considered for incorporation into the constructed wetland design within Contract Area 42 in order to provide predator-free habitat for threatened species. Islands create a higher ephemeral zone to open water ratio, by increasing the lineal shore-line distance which provides additional shore-line habitat. Islands can buffer winds and reduce wave action, thereby improving water quality by reducing erosion of revegetated banks. Constructed islands can also play a role in fluid dynamics by reducing and dispersing input flows, thereby allowing sediments to settle (Wong et al. 1999). Revegetation may be difficult to establish and maintain on islands due to the impacts of high density bird populations. Artificial nest-boxes and perches could therefore be considered to allow vegetation to establish and persist on constructed islands.

5.1.1 Domestic animals and feral predators

The development of the study area may also result in the need for designated passive recreation areas. Wetland habitats and associated passive recreation areas, including public open space, should be designed to exclude domestic pets, especially cats and dogs, which have the potential to become predators of native birds and bird's eggs, and disrupt their breeding, foraging and nesting patterns.

Significant numbers of Foxes have been recorded within the study area and may increase in numbers after development due to the increase in available food and shelter resources. Fox and cat control within the study area should be undertaken as a regionally coordinated program in order to protect and enhance biodiversity values, including habitat values for threatened wetland birds.

Fox scats were recorded in abundance within the quarries. The abundance of foxes may be due to the abundance of prey species and chicken remains which exist within the garden supplies operation at 1550 Thompsons Road. An opportunity exists for fox control to be undertaken prior this food resource being removed. This may help reduce increased predation on native fauna once the food source has been removed.

5.1.2 Protection and enhancement of existing biodiversity assets

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). Native vegetation within Contract Area 42 is therefore an important biodiversity asset given the little native vegetation that remains within the region.

As described in section 3.2, 1520 Thompsons Road is dominated by native vegetation, in the elevated northern sector of the property, which comprises a disused quarry and associated buffer zones. The adjacent 1550 Thompsons Road is dominated by native vegetation in buffer zones within the eastern sector. Other areas of habitat occur in roadsides, drainage-lines and within 2/585 Berwick-Cranbourne Road.

The management of retained vegetation and habitat should aim to control threatening processes currently underway with the study area, including:

- weed invasion;
- inappropriate fire regimes;
- access to native vegetation by stock;
- lack of habitat connectivity; and
- feral animal predation on, and displacement of native fauna.

A detailed ecological management plan prepared by an appropriately qualified ecologist, prescribing management for a >10 year period, is needed to guide appropriate ecological restoration works within the study area. The following paragraphs summarise the primary threatening processes occurring within the study area and make suggestions for remedial actions.

Woody weed control

Many woody weed species occur at significant densities within 1520 Thompsons Road, including:

- Radiata Pine *Pinus radiata;*
- Coast Wattle *Acacia longifolia* subsp. *sophorae*;;

- Sweet Pittosporum *Pittosporum undulatum*; and
- Blackberry *Rubus fruticosus* spp. agg.

Most woody weeds could be relatively easily controlled using a 'cut and paint' method. However, Blackberry dominates the understory in the damp areas of the quarries such as the Swampy Riparian Woodland understorey and would be difficult to eliminate due to the large area infested. Strategic control of Blackberry on the infestation's margins and within areas of highest vegetation quality would allow native species to re-establish.

However, many weed species provide habitat to fauna, and widespread weed removal may reduce available habitat for fauna. A program of staged weed removal in conjunction with revegetation of appropriate native vegetation to provide habitat should be considered.

Ecological burns

Areas of Heathy Woodland and Damp Sands Herb-rich Woodland are dominated by a thick cover of Austral Bracken *Pteridium esculentum* in most sections where topsoil has not been removed. Austral Bracken can dominate if unsuitable burning regimes eliminate the shrub layer (Oates and Taranto 2001). A schedule for ecological burns undertaken in a mosaic pattern and at suitable intervals should be considered for the remnant vegetation at the quarries in order to promote and enhance floristic diversity.

Rehabilitation and conservation

There is potential to improve the habitat values through implementation of rehabilitation and conservation programs, and through improved land and water use practices that promote natural regeneration of the site's woodland and wetland EVCs. The area surrounding the dams within 1520 Thompsons road has been significantly disturbed in the recent past, however colonising species are already returning and opportunity exists to enhance this natural regeneration through revegetation and stock exclusion. Cattle are currently accessing native vegetation within 1520 Thompsons Road, especially within the western sector and throughout the regeneration woodland in 2/585 Berwick-Cranbourne Road. Post and wire fencing would prevent stock accessing remnant vegetation and therefore prevent compaction, erosion and weed seed introduction.

Non-indigenous, plantation vegetation is scattered throughout the site, including along the fence line at 1520 Cranbourne Road and along the driveway at 2/585 Berwick-Cranbourne Road. These areas are the result of revegetation efforts. While the areas do not qualify as Habitat Zones, they offer a range of habitat values to regional fauna, such as roosting and foraging sites. These areas of plantings offer the chance for ecological enhancement through introduction of indigenous understorey by supplementary planting with appropriate species.

The woodland patches within 1520 and 1550 Thompsons Road and 2/585 Berwick-Cranbourne Road are considered critical habitat within the study area. The presence of numerous honeyeaters and species such as Eastern Yellow Robin *Eopsaltria australis*, Dusky

Woodswallows *Artamus cyanopterus,* Tawny Frogmouth *Podargus strigoides* and Sugar Glider *Petarus breviceps*, demonstrates the high level of biodiversity and shows that these areas are functioning woodlands.

The retention of these habitats will determine the ongoing persistence of woodland dependent species within the study area. However the impacts of urbanisation may reduce the ability of these species to exist within the landscape. Therefore, buffers surrounding these areas and increased connectivity within the landscape may help mitigate some impacts associated with urbanisation.

The main drainage-line that runs north south diagonally through the investigation area is covered by a land subject to indundation overlay (LSIO). The presence of a drainage-line and LSIO indicates the area floods periodically. This sporadic flooding provides important habitat and resources for wetland birds, amphibians and other species such as Dwarf Galaxias for feeding, moving through the landscape and breeding.

There is an opportunity to keep this important habitat and even the potentiality to improve this habitat through water-sensitive urban design (WSUD) principles. The drainage-line could be widened into a series of ephemeral wetlands. Through recolonisation and revegetation of indigenous aquatic, semi-aquatic and terrestrial vegetation, the habitat may increase for amphibians and wetland birds and may also offer resources for a number of species. However, WSUD may result in detrimental impacts on Dwarf Galaxias. Such habitats can reduce movement opportunities and harbour introduced fish species, such as Eastern Gambusia that pose a threat. These habitats would need to be created in a way that is sensitive to the requirements of Dwarf Galaxias and does not provide favourable habitat for introduced fish species (Unmack & Paras 1995).

5.1.3 Buffer zones and habitat links

While the majority of native vegetation within the study area occurs with the quarries, several other smaller areas of native vegetation occur within the study area, such as:

- regenerating Heathy Woodland within 2/585 Cranbourne-Berwick Road;
- the north-south drainage-line; and
- roadsides, particularly Thompsons Road.

These remnants constitute habitat for a range of indigenous fauna including regional and state significant species. There is potential to increase the viability of existing habitat within the study area by linking the above mentioned habitat with the 'core habitat' at the quarries, through the creation of revegetated habitat links. Habitat links could be incorporated with the potential network of constructed wetlands described in section 4.1.1. Revegetated habitat links would probably not need to exceed 250 m in length, given the current distribution of the habitat within the study area.

Habitat links should also be designed with the aim of linking areas of existing or potential habitat beyond the study area, such as the Langwarrin Flora and Fauna Reserve, the foothills of the Great Dividing Range and Western Port Bay. A recent study commissioned by DSE explores existing and potential habitat connectivity and associated issues in the south-eastern region of Melbourne (McCaffrey and Henry 2010) and should be referred to when designing habitat links within the study area.

A reserve system design should consider to the following principles:

- the retention and conservation of all areas of remnant (and regenerating) vegetation patches;
- the retention of all areas of habitat for threatened fauna species (including areas dominated by exotic or non-indigenous flora);
- the establishment of habitat links between remnant vegetation and habitat;
- buffers surrounding important habitat to reduce disturbance to fauna;
- the rehabilitation of existing highly modified habitat to link areas of existing higher quality habitat within the study area; and
- the establishment of habitat links which integrate habitat within this study area to habitat within neighbouring precincts and beyond.

Areas of non-indigenous vegetation defined as public open space within the potential PSP area, should be incorporated into buffer zones to protect and enhance areas of fauna habitat. There is also potential to utilise roads and footpaths wherever possible to separate reserves from developable areas.

6. CONCLUSION

A large amount of the contract area is dominated by pasture and used for grazing livestock. One large property grows market produce. This provides an opportunity to develop a large portion of the area without removing native vegetation.

The majority of native vegetation and fauna habitat within the study area is located in the quarry sites located at 1520 and 1550 Thompsons Road and 2/585 Berwick-Cranbourne Road. These areas of woodland have the largest amount of floristic and structural diversity and the highest numbers of fauna species. The woodland areas are critical habitat within the study area for a number of woodland dependent fauna. The other main habitat types within the investigation area include drainage-lines and wetlands.

There is a major drainage-line, which runs north south, diagonally through the investigation area, ending in a wetland at Cornwell Crescent. This drainage-line offers important habitat for amphibians, fish and may also offer critical habitat for the Southern Brown Bandicoot. It is also a vital habitat link through the site. The state significant Southern Toadlet was recorded within this drainage-line. The wetlands within the contract area comprise vegetated farm dams, an excavation site that has filled with water and constructed wetlands. All of these are valuable habitat for amphibians and wetland birds. Two state significant wetland birds and one state significant amphibian were seen utilising these habitat types.

Large trees containing hollows and canopy habitat are present as scattered indigenous trees and as planted exotic and non-indigenous Eucalypts along fence-lines and roadsides. Established trees, especially Eucalypts should be retained for their value as habitat for threatened woodland birds and microbats. All other areas of habitat, both indigenous and non-indigenous, including roadsides, wetlands, drainage-lines and areas of woodland should also be considered for retention.

Ninety-eight indigenous fauna species were recorded during the current assessment, comprising eight amphibians, 72 birds, seven reptiles and ten mammals. Three species are listed as threatened under state legislation, two wetland birds and one amphibian. One hundred and sixty-one invertebrate species were recorded during the current assessment.

- The Australasian Shoveler *Anas rhynchotis*, is listed as vulnerable in Victoria (DSE 2007a).
- The Royal Spoonbill *Platalea regia* is listed as vulnerable in Victoria (DSE 2007a).
- One amphibian, Southern Toadlet *Pseudophryne semimarmorata*, was recorded within the study area and is listed as vulnerable in Victoria (DSE 2007a).

Sixty national and state significant fauna species are recorded or predicted to occur within ten kilometres of the contract area and are documented on the Victorian Fauna Database (DSE 2009b) and EPBC Protected Matters Search Tool. Eight species recorded on AVW and

EPBC searches are considered to have a high likelihood of occurrence within the contract area and a further 19 species are considered to have a moderate likelihood of occurrence within the contract area (Appendix 16).

Two-hundred and seventy-five flora species were recorded within the contract area, of which 138 are indigenous species. The flora species records within the area constitute relatively high floristic diversity when compared to the highly modified and mostly cleared agricultural landscape within which the contract area is situated. Surrounding farmland would typically comprise a small proportion of the floristic diversity found within the quarries in the contract area.

Thirty-seven threatened flora species were recorded within 10 kilometres of the contract area (DSE 2009a). These species and their likelihood of occurrence are presented in Appendix 6. Four of these species are considered to have a high likelihood of occurrence within the area. A further four species recorded within 10 kilometres are considered to have a moderate likelihood of occurrence within the contract area.

A reserve system, combining biolinks, public open space, buffer zones, revegetation areas and existing habitat managed for conservation, should be incorporated into the rezoning process. Priority should therefore be given to:

- the retention and conservation of all areas of remnant EVC habitat
- the retention of all areas of habitat for threatened fauna species (including areas dominated by exotic or non-indigenous flora)
- the establishment of habitat corridors between remnant vegetation
- the rehabilitation of highly modified habitat linking remnant vegetation
- the establishment of habitat corridors which integrate this study area with habitat values within neighbouring precincts and beyond.

Areas of non-indigenous vegetation defined as public open space within the Precinct development, should also be incorporated into buffer zones to protect and enhance areas of fauna habitat. There is also potential to utilise roads and footpaths wherever possible to separate reserves from development areas.

7. REFERENCES

Allen, G. R., Midgley, S. H. & Allen, M. (2002) *Field Guide to the Freshwater Fishes of Australia.* Western Australian Museum, Perth.

Belcher, C., Burnett, S. & Jones, M. (2008) *Spotted-tailed Quoll Dasyurus maculatus*. IN Van Dyck, S. & Strahan, R. *The Mammals of Australia.* 3rd edn. Reed New Holland, Sydney.

Bennett, A. F., Kimber, S. L. & Ryan, P. A. (2000) *Revegetation and wildlife: enhancing Revegetated habitats for wildlife conservation in Rural Environment*. Bushcare – National Projects Research and Development Program, Environment Australia, Canberra, ACT.

BOM (2010) *Bureau of Meteorology*. Australian Government. Accessed 2 Sept 2010 via: http://www.bom.gov.au/

Braby, M. (2004) *The Complete Guide to Butterflies of Australia.* CSIRO Australia.

Brett Lane and Associates (2008) *Casey Revegetation Strategy*. Prepared for City of Casey by Brett Lane and Associates Pty Ltd, North Carlton.

Brett Lane and Associates (2008) *Casey Revegetation Strategy*. Report for City of Casey by Brett Lane and Associates Pty Ltd, North Carlton.

Densley, C. (2001) *Growing Australian*. Australian Plants Society, Victoria.

Department of Primary Industries (2006) *Australian grayling Prototroctes maraena: primefacts*. Department of Primary Industries, Nelson Bay, New South Wales.

DEWHA (2010a) *Protected Matters Search Tool*. Department of Sustainability, Environment, Water, Population and Communities. Accessed via: http://www.environment.gov.au/erin/ert/epbc/index.html

DEWHA (2010b) *Threatened species & ecological communities: Recovery Plans*. Department of Sustainability, Environment, Water, Population and Communities. Accessed via: http://www.environment.gov.au/biodiversity/threatened/recovery.html

DEWHA (2010c) *Species Profile and Threats Database*. Department of Sustainability, Environment, Water, Population and Communities. Accessed via: http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl

DEWHA (2010d) *Environmental Reporting Tool*. Department of the Environment, Water, Heritage and the Arts. Accessed via: http://www.environment.gov.au/apps/boobook/mapservlet?app=ert

DNRE (2002) *Victoria's Native Vegetation Management – A Framework for Action*. The State of Victoria; Department of Natural Resources and Environment, Melbourne.

DPCD (2009) *Planning Schemes Online*. Department of Planning and Community Development. Accessed via: http://www.dse.vic.gov.au/planningschemes/

DPI (2010) *Victorian Resources Online: Invasive Plants – Noxious Weeds Listing* Department of Primary Industries. Accessed via: http://www.dpi.vic.gov.au/dpi/vro/vrosite.nsf/pages/weeds_noxious

DSE (2004a) *Vegetation Quality Assessment Manual – Guidelines for applying the habitat hectares scoring method Version 1.3*. Department of Sustainability and Environment, Victoria, East Melbourne.

DSE (2004b) *Vegetation Quality Assessment Manual – Guidelines for applying the habitat hectares scoring method, Version 1.3*. Department of Sustainability and Environment, East Melbourne, Victoria.

DSE (2005a) *BioSite maps and reports: Port Phillip region [CD-ROM]*. Department of Sustainability and Environment, East Melbourne, Victoria.

DSE (2005b) *Advisory list of rare or threatened plants in Victoria*. Department of Sustainability and Environment, East Melbourne, Victoria.

DSE (2006) *Native Vegetation Guide for Assessment of referred planning permit applications*. Victorian Government Department of Sustainability and Environment, Melbourne.

DSE (2007a) *Advisory list of threatened vertebrate fauna in Victoria – 2007*. Department of Environment and Sustainability, East Melbourne, Victoria.

DSE (2007b) *Native Vegetation: Guide for assessment of referred planning permit applications*. Department of Sustainibility and Environment, East Melbourne, Victoria.

DSE (2009a) *Victorian Flora Site Database: Flora Information System (FIS)*, Viridans Biological Databases. Department of Sustainability and Environment, East Melbourne, Victoria.

DSE (2009b) *Atlas of Victorian Wildlife (accessed via the Victorian Fauna Database (VFD) August 2009, Viridans Biological Databases)*, Viridans Biological Databases. Department of Sustainability and Environment, East Melbourne, Victoria.

DSE (2009c) *Advisory list of threatened invertebrate fauna in Victoria – 2009*. Department of Sustainability and Environment, East Melbourne, Victoria.

DSE (2009d) *Growth Areas Authority Biodiversity Assessment Project 2009/10: Vegetation mapping and condition assessment procedures v1.4*. Department of Sustainability and Environment, East Melbourne, Victoria.

DSE (2009e) *Strategic impact assessment report for Environment Protection and Biodiversity Conservation Act 1999*. Department of Sustainability and Environment, East Melbourne, Victoria.

DSE (2010a) *Biodiversity Interactive Maps*. Department of Sustainability and Environment. Accessed via: http://mapshare2.dse.vic.gov.au/MapShare2EXT/imf.jsp?site=bim

DSE (2010b) *Aquatic Fauna Database*. Department of Sustainability. Accessed via:

DSE (2010c) *Flora and Fauna Guarantee Act 1988 - Protected Flora List*. Department of Sustainability and Environment, East Melbourne, Victoria.

DSE (2010d) *EVC Benchmark - Gippsland Plain Bioregion*. Department of Sustainability and Environment. Accessed March 2010 via: http://www.dse.vic.gov.au/dse/nrence.nsf/LinkView/023BED87C3F957D6CA256F1F0023074B8062D358172E420C4A256DEA0012F71C

Earl, G. & Barlow, T. (2004) *Action Statement No. 200. Purple Diuris: Diuris punctata var. punctata*. Department of Sustainability and Environment, East Melbourne, Victoria.

Fairbridge, D. & Appleby, G. (2009) *Flora and Fauna Assessment and Net Gain Analysis, 1520 Thompsons Road, Cranbourne East. Version 2.* Practical Ecology, Preston, Victoria.

Ford, F. (2008) *Smoky Mouse Pseudomys fumeus.* IN Van Dyck, S. & Strahan, R. *The mammals of Australia.* 3rd edn. Reed New Holland, Sydney.

Gannon, P. (2009) *Background Technical Report 2A - Biodiversity Assessment of the Investigation Area in Melbournes South East*. Practical Ecology.

Halse, S. A., Pearson, G. B., Hassell, C., Collins, P., Scanlon, M. D. & Minton, C. D. T. (2005) Mandora Marsh, north-western Australia, an arid-zone wetland maintaining continental populations of waterbirds. *Emu,* 105**,** pp. 115-125.

Hamer, A. & Organ, A. (2006) *Distribution, Habitat Use and Movement Patterns of the Growling Grass Frog Litoria raniformis throughout the Packenham Area, Victoria*. Report for Department of Sustainability and Environment by Ecology Partners Pty Ltd, Brunswick, Victoria.

Heard, G., Robertson, P. & Moysey, E. (2004) *Management Plan for the Growling Grass Frog Litoria raniformis within the Fairway Waters development, Pakenham, Victoria*. Report to Westmont Holdings Pty Ltd and Simons Builders Pty Ltd by Wildlife Profiles Pty Ltd and Ecology Australia Pty Ltd, Melbourne, Victoria.

Hero, J.-M., Littlejohn, M. & Marantelli, G. (1991) *Frogwatch Field Guide to Victorian Frogs.* Department of Conservation and Environment, Melbourne.

Higgins, P. J. & Davies, S. J. J. F. (eds.) (1996) *Handbook of Australian, New Zealand and Antartic: Birds Snipe to Pigeons*. Oxford University Press, Melbourne.

Higgins, P. J. (ed.) (1999) *Handbook of Australian, New Zealand and Antarctic Birds: Parrots to Dollarbird*. Oxford University Press, South Melbourne, Victoria.

Higgins, P. J., Peter, J. M. & Steele, W. K. (eds.) (2001) *Handbook of Australian, New Zealand and Antarctic Birds: Tyrant-flycatchers to Chats*. Oxford University Press, South Melbourne, Victoria.

Higgins, P. J. & Peter, J. M. (eds.) (2002) *Handbook of Australian, New Zealand and Antarctic Birds: Pardalotes to shrike-thrushes*. Oxford University Press, Melbourne.

Higgins, P. J., Peter, J. M. & Cowling, S. J. (eds.) (2006) *Handbook of Australian, New Zealand and Antarctic Birds: Boatbill to Starlings*. Oxford University Press, Melbourne.

Jeanes, J. A. & Backhouse, G. N. (2006) *Wild orchids of Victoria, Australia.* Aquatic Photographics, Seaford.

Johnston, P. G. (2008) *Long-nosed Potoroo Potorous tridactylus*. IN Van Dyck, S. & Strahan, R. *The Mammals of Australia.* 3rd edn. Reed New Holland, Sydney, pp. 302-4.

Kemper, C. & Wilson, B. A. (2008) *New Holland Mouse Pseudomys novaehollandiae*. IN Van Dyck, S. & Strahan, R. *The Mammals of Australia*. Reed New Holland, Sydney, pp. 643-44.

Marchant, S. & Higgins, P. J. (1990) *Handbook of Australian, New Zealand and Antarctic birds - Volume 1 Ratites to Ducks.* Oxford University Press, Melbourne.

Marchant, S. & Higgins, P. J. (1993) *Handbook of Australian, New Zealand and Antarctic Birds - Volume 2 Raptors to Lapwings.* Oxford University Press, Melbourne.

McCaffrey, N. & Henry, J. (2010) *Ecological Connectivity Plan for the South-east region of Melbourne*. Practical Ecology Pty Ltd, Preston, Victoria.

McGuckin, J. (2010) *Dwarf galaxias survey of the Cardinia Creek Retarding Basin and selected locations in the Cardinia Creek catchment*. Streamline Research Pty. Ltd., Eltham, Victoria.

McMillan, S. E., Way, S., Carr, G. W. & McMahon, A. R. G. (2003) *Biodiversity Enhancement Strategy - City of Casey*. Ecology Australia Pty Ltd, Fairfield, Victoria.

Menkhorst, P. & Knight, F. (2001) *A Field Guide to the Mammals of Australia.* 1st edn. Oxford University Press, Melbourne.

O'Dwyer, C. & Attiwill, P. M. (2000) Restoration of a Native Grassland as Habitat for the Golden Sun Moth *Synemon plana* Walker (Lepidoptera; Castniidae) at Mount Piper, Australia. *Restor Ecology,* 8**,** pp. 170-174.

O'Malley, A. (2010) *Southern Brown Bandicoot Sub-regional Strategy (in prep)*. Report for Department of Sustainability and Environment by Practical Ecology Pty Ltd, Preston, Victoria.

Oates, A. & Taranto, M. (2001) *Vegetation Mapping of the Port Phillip & Western Port Region*. Arthur Rylah Institute for Environmental Research, Department of Sustainability and Environment, Melbourne.

Paull, D. J. (2008) *Southern Brown Bandicoot Isoodon obesulus.* IN Dyck, V. & Strahan, R. *The Mammals of Australia.* 3rd edn. Reed New Holland, Sydney.

Pizzey, G. & Knight, F. (2007) *The Field Guide to the Birds of Australia.* 8th edn. Harper Collins Publishers, Sydney.

PPWCMA (2006) *Port Phillip and Westernport Native Vegetation Plan*. Port Phillip and Westernport Catchment Management Authority, Frankston.

Radford, J. Q. & Bennett, A. F. (2005) Terrestrial avifauna of the Gippsland Plain and Strzelecki Ranges, Victoria, Australia: insights from Atlas data. *Wildlife Research,* 32**,** pp. 531-555.

Ramsar Convention Secretariat (2007) *Managing wetlands: Frameworks for managing Wetlands of International Importance and other wetland sites.* 3rd edn. Ramsar Convention Secretariat, Gland, Switzerland

Renowden, C., Marr, R. M., Schmidt, B., Quin, D. G. & McMahon, J. M. (2010) *Sub-regional surveys for the Growling Grass Frog*. Fairfield, Victoria.

Richards, G. C. (1983) *Grey-headed Flying Fox*. IN Strahan, R. *Complete Book of Australian Mammals.* Cornstalk Publishing, North Ryde, NSW.

Rogers, D. I. (1990) *Platalea regia Royal Spoonbill*. IN Marchant, S. & Higgins, P. J. *Handbook of Australian, New Zealand & Antarctic Birds: Ratites to Ducks.* Oxford University Press, Melbourne.

Saddlier, S., Jackson, J. & Hammer, M. (2010) *National Recovery Plan for the Dwarf Galaxias Galaxiella pusilla*. Environment, D. o. S. a., East Melbourne.

Stewart, A. & Shepherd, M. (2010) *GAA Sub-regional Survey; Southern Brown Bandicoot*. Practical Ecology, Preston, Victoria.

Thompson, I. R. (2004) Taxonomic studies of Australian *Senecio* (Asteraceae): 1. The disciform species. *Muelleria,* 19**,** pp. 101-214.

Walsh, N. G. & Entwisle, T. J. (1994) *Flora of Victoria: Ferns and Allied Plants, Conifers and Monocotyledons.* Inkata Press, Melbourne.

Walsh, N. G. & Entwisle, T. J. (1996) *Flora of Victoria: Dicotyledons Winteraceae to Myrtaceae.* Inkata Press, Melbourne.

Walsh, N. G. & Entwisle, T. J. (1999) *Flora of Victoria: Dicotyledons Cornaceae to Asteraceae.* Inkata Press.

Walsh, N. G. & Stajsic, V. (2007) *A Census of the Vascular Plants of Victoria*.

Wilson, S. & Swan, G. (2008) *A Complete Guide to Reptiles of Australia - Second Edition.* Reed New Holland, Sydney.

Wong, T., Breen, P., Somes, N. & Lloyd, S. (1999) *Managing Urban Stormwater Using Constructed Wetlands*. Department of Civil Engineering, Monash University, Clayton, Victoria.

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Appendix 1. Indigenous Flora Species Recorded within the Study Area

Life Form	Scientific Name	Common Name	EPBC	FFG	VROTS	Regional
Trees	**Mimosaceae**					
	Acacia dealbata	Silver Wattle				Reg
	Acacia mearnsii	Black Wattle		P		
	Acacia melanoxylon	Blackwood				
	Casuarinaceae					
	Allocasuarina littoralis	Black Sheoak				
	Myrtaceae					
	Eucalyptus camaldulensis	River Red-gum				Reg
	Eucalyptus ovata	Swamp Gum				Reg
	Eucalyptus radiata	Narrow-leaf Peppermint				Reg
	Eucalyptus viminalis subsp. pryoriana	Coast Manna-gum				
	Eucalyptus cephalocarpa	Mealy Stringybark				Reg
	Santalaceae					
	Exocarpos cupressiformis	Cherry Ballart				
Shrubs	**Asteraceae**					
	Olearia ramulosa	Twiggy Daisy-bush				Reg
	Ozothamnus ferrugineus	Tree Everlasting				
	Euphorbiaceae					
	Amperea xiphoclada var. xiphoclada	Broom Spurge				
	Ricinocarpos pinifolius	Wedding Bush				Reg
	Fabaceae					
	Viminaria juncea	Golden Spray				Reg
	Geraniaceae					
	Pelargonium australe	Austral Stork's-bill				Reg
	Mimosaceae					
	Acacia genistifolia	Spreading Wattle		P		Reg
	Acacia oxycedrus	Spike Wattle		P		
	Acacia paradoxa	Hedge Wattle				
	Acacia verticillata	Prickly Moses		P		Reg
	Myrtaceae					
	Leptospermum continentale	Prickly Tea-tree				
	Leptospermum myrsinoides	Heath Tea-tree				
	Leptospermum scoparium	Manuka				Reg
	Melaleuca ericifolia	Swamp Paperbark				
	Melaleuca squarrosa	Scented Paperbark				
	Proteaceae					
	Persoonia spp.	Geebung				Reg
	Rutaceae					
	Correa reflexa var. reflexa	Common Correa		P		Reg
	Solanaceae					
	Solanum laciniatum	Large Kangaroo Apple				Reg
Herbs	**Alismataceae**					
	Alisma plantago-aquatica	Water Plantain				

Life Form	Scientific Name	Common Name	EPBC	FFG	VROTS	Regional
	Apiaceae					
	Centella cordifolia	Centella				
	Trachymene composita	Parsnip Trachymene				Reg
	Asteraceae					
	Cassinia aculeata	Common Cassinia		P		
	Cassinia arcuata	Drooping Cassinia		P		
	Cassinia longifolia	Shiny Cassinia		P		Reg
	Cotula australis	Common Cotula		P		
	Euchiton spp.	Cudweed		P		
	Lagenophora gracilis	Slender Bottle-daisy		P		Reg
	Lagenophora stipitata	Common Bottle-daisy		P		Reg
	Pseudognaphalium luteoalbum	Jersey Cudweed		P		Reg
	Senecio campylocarpus	Floodplain Fireweed		P	r	Reg
	Senecio glomeratus	Annual Fireweed		P		
	Senecio hispidulus s.l.	Rough Fireweed		P		Reg
	Senecio hispidulus s.s.	Rough Fireweed		P		Reg
	Senecio minimus	Shrubby Fireweed		P		Reg
	Senecio quadridentatus	Cotton Fireweed		P		Reg
	Brassicaceae					
	Brassicaceae spp.	Crucifer				
	Caryophyllaceae					
	Spergularia spp.	Sand Spurrey				Reg
	Stellaria pungens	Prickly Starwort				Reg
	Clusiaceae					
	Hypericum gramineum	Small St John's Wort				
	Hypericum japonicum	Matted St John's Wort				Reg
	Convolvulaceae					
	Dichondra repens	Kidney-weed				
	Crassulaceae					
	Crassula decumbens var. decumbens	Spreading Crassula				
	Crassula helmsii	Swamp Crassula				
	Crassula sieberiana s.l.	Sieber Crassula				
	Droseraceae					
	Drosera peltata subsp. auriculata	Tall Sundew				Reg
	Drosera peltata subsp. peltata	Pale Sundew				Reg
	Epacridaceae					
	Epacris impressa	Common Heath		P		Reg
	Euphorbiaceae					
	Poranthera microphylla s.l.	Small Poranthera				
	Fabaceae					
	Aotus ericoides	Common Aotus				Reg
	Bossiaea cinerea	Showy Bossiaea				Reg
	Daviesia latifolia	Hop Bitter-pea				Reg
	Hardenbergia violacea	Purple Coral-pea				Reg
	Kennedia prostrata	Running Postman				
	Haloragaceae					
	Gonocarpus humilis	Shade Raspwort				Reg
	Gonocarpus tetragynus	Common Raspwort				
	Lauraceae					
	Cassytha glabella	Slender Dodder-laurel				Reg
	Lemnaceae					

Life Form	Scientific Name	Common Name	EPBC	FFG	VROTS	Regional
	Lemna disperma	Common Duckweed				
	Lythraceae					
	Lythrum hyssopifolia	Small Loosestrife				
	Onagraceae					
	Epilobium billardierianum subsp. billardierianum	Smooth Willow-herb				
	Epilobium hirtigerum	Hairy Willow-herb				
	Oxalidaceae					
	Oxalis exilis	Shady Wood-sorrel				Reg
	Oxalis perennans	Grassland Wood-sorrel				Reg
	Pittosporaceae					
	Billardiera scandens s.l.	Common Apple-berry				Reg
	Polygalaceae					
	Comesperma volubile	Love Creeper				
	Persicaria decipiens	Slender Knotweed				
	Persicaria prostrata	Creeping Knotweed				Reg
	Rumex spp.	Dock				
	Portulacaceae					
	Portulaca oleracea	Common Purslane				
	Potamogetonaceae					
	Potamogeton ochreatus	Blunt Pondweed				Reg
	Potamogeton spp.	Pondweed				
	Ranunculaceae					
	Ranunculus pumilio	Ferny Small-flower Buttercup				Reg
	Ranunculus spp.	Buttercup				
	Rubiaceae					
	Opercularia varia	Variable Stinkweed				
	Stackhousiaceae					
	Stackhousia monogyna	Creamy Stackhousia				Reg
	Veronicaceae					
	Veronica plebeia	Trailing Speedwell				Reg
	Violaceae					
	Viola hederacea sensu Willis (1972)	Ivy-leaf Violet				Reg
Graminoids (grass-like plants)	**Anthericaceae**					
	Thysanotus patersonii	Twining Fringe-lily				Reg
	Cyperaceae					
	Baumea tetragona	Square Twig-sedge				Reg
	Bolboschoenus caldwellii	Salt Club-sedge				
	Carex appressa	Tall Sedge				
	Carex breviculmis	Common Grass-sedge				
	Eleocharis acuta	Common Spike-sedge				
	Gahnia radula	Thatch Saw-sedge				
	Isolepis cernua var. platycarpa	Broad-fruit Club-sedge				
	Isolepis inundata	Swamp Club-sedge				
	Isolepis marginata	Little Club-sedge				
	Lepidosperma concavum	Sandhill Sword-sedge				
	Lepidosperma laterale	Variable Sword-sedge				Reg
	Lepidosperma longitudinale	Pithy Sword-sedge				Reg
	Schoenoplectus tabernaemontani	River Club-sedge				
	Schoenus apogon	Common Bog-sedge				
	Hemerocallidaceae					

Life Form	Scientific Name	Common Name	EPBC	FFG	VROTS	Regional
	Dianella longifolia s.l.	Pale Flax-lily				Reg
	Tricoryne elatior	Yellow Rush-lily				
	Juncaceae					
	Juncus amabilis	Hollow Rush				
	Juncus bufonius	Toad Rush				
	Juncus pallidus	Pale Rush				
	Juncus planifolius	Broad-leaf Rush				
	Juncus spp.	Rush				
	Luzula meridionalis var. meridionalis	Common Woodrush				Reg
	Juncaginaceae					
	Triglochin procera s.l.	Water Ribbons				
	Orchidaceae					
	Microtis spp.	Onion Orchid		P		Reg
	Pterostylis spp.	Greenhood		P		Reg
	Thelymitra pauciflora s.l.	Slender Sun-orchid		P		Reg
	Thelymitra spp.	Sun Orchid		P		Reg
	Poaceae					
	Amphibromus nervosus	Common Swamp Wallaby-grass				Reg
	Austrodanthonia fulva	Copper-awned Wallaby-grass				Reg
	Austrodanthonia setacea	Bristly Wallaby-grass				
	Austrostipa mollis	Supple Spear-grass				Reg
	Austrostipa rudis subsp. australis	Veined Spear-grass			r	Reg
	Austrostipa spp.	Spear Grass				
	Deyeuxia quadriseta	Reed Bent-grass				
	Eragrostis brownii	Common Love-grass				Reg
	Hemarthria uncinata var. uncinata	Mat Grass				Reg
	Lachnagrostis filiformis var. 1	Common Blown-grass				
	Lachnagrostis filiformis var. 2	Wetland Blown-grass			k	Reg
	Microlaena stipoides var. stipoides	Weeping Grass				
	Phragmites australis	Common Reed				
	Poa clelandii	Noah's Ark				Reg
	Poa morrisii	Soft Tussock-grass				
	Restionaceae					
	Lepyrodia muelleri	Common Scale-rush				Reg
	Typhaceae					
	Typha domingensis	Narrow-leaf Cumbungi				
	Xanthorrhoeaceae					
	Lomandra filiformis subsp. coriacea	Wattle Mat-rush				Reg
	Lomandra filiformis subsp. filiformis	Wattle Mat-rush				Reg
	Lomandra longifolia	Spiny-headed Mat-rush				
	Lomandra nana	Dwarf Mat-rush				Reg
	Xanthorrhoea minor subsp. lutea	Small Grass-tree		P		
Scramblers/Climbers	**Fabaceae**					
	Glycine clandestina	Twining Glycine				Reg
Ferns	**Dennstaedtiaceae**					
	Pteridium esculentum	Austral Bracken				

Life Form	Scientific Name	Common Name	EPBC	FFG	VROTS	Regional
	Azollaceae					
	Azolla filiculoides	Pacific Azolla		P		

Appendix 2. Exotic Flora Species recorded within the Study Area

Life Form	Origin	Scientific Name	Common Name	CaLP Act listing
NON-INDIGENOUS NATIVE SPECIES				
Trees		**Myrtaceae**		
	#	*Corymbia maculata*	Spotted Gum	
	#	*Eucalyptus botryoides*	Southern Mahogany	
Shrubs		**Mimosaceae**		
	#	*Acacia floribunda*	White Sallow-wattle	
	#	*Acacia longifolia subsp. longifolia*	Sallow Wattle	
	#	*Acacia longifolia subsp. sophorae*	Coast Wattle	
		Myrtaceae		
	#	*Leptospermum laevigatum*	Coast Tea-tree	
		Pittosporaceae		
	#	*Pittosporum undulatum*	Sweet Pittosporum	
EXOTIC SPECIES				
Trees		**Oleaceae**		
	*	*Fraxinus angustifolia*	Desert Ash	
		Pinaceae		
	*	*Pinus radiata*	Radiata Pine	
Shrubs		**Ericaceae**		
	*	*Erica arborea*	Tree Heath	
	*	*Erica lusitanica*	Spanish Heath	
		Fabaceae		
	*	*Chamaecytisus palmensis*	Tree Lucerne	
	*	*Genista linifolia*	Flax-leaf Broom	C
	*	*Genista monspessulana*	Montpellier Broom	C
	*	*Psoralea pinnata*	Blue Psoralea	
	*	*Ulex europaeus*	Gorse	C
		Mimosaceae		
	*	*Paraserianthes lophantha subsp. lophantha*	Cape Wattle	
		Phytolaccaceae		
	*	*Phytolacca octandra*	Red-ink Weed	
		Rosaceae		
	*	*Cotoneaster pannosus*	Velvet Cotoneaster	
	*	*Rosa rubiginosa*	Sweet Briar	C
		Rubiaceae		
	*	*Coprosma repens*	Mirror Bush	

Life Form	Origin	Scientific Name	Common Name	CaLP Act listing
		Salicaceae		
	*	*Salix cinerea*	Grey Sallow	R
		Veronicaceae		
	*	*Callitriche stagnalis*	Common Water-starwort	
Herbs		**Alismataceae**		
	*	*Alisma lanceolata*	Water Plantain	
		Apiaceae		
	*	*Daucus carota*	Carrot	
	*	*Foeniculum vulgare*	Fennel	R
		Asteraceae		
	*	*Arctotheca calendula*	Cape Weed	
	*	*Aster subulatus*	Aster-weed	
	*	*Cirsium vulgare*	Spear Thistle	C
	*	*Conyza spp.*	Fleabane	
	*	*Cotula coronopifolia*	Water Buttons	
	*	*Dittrichia graveolens*	Stinkwort	C
	*	*Helminthotheca echioides*	Ox-tongue	
	*	*Hypochoeris radicata*	Flatweed	
	*	*Lactuca serriola*	Prickly Lettuce	
	*	*Leontodon taraxacoides subsp. taraxacoides*	Hairy Hawkbit	
	*	*Soliva sessilis*	Jo Jo	
	*	*Sonchus asper s.l.*	Rough Sow-thistle	
	*	*Sonchus asper subsp. glaucescens*	Blue Sow-thistle	
	*	*Sonchus oleraceus*	Common Sow-thistle	
	*	*Taraxacum officinale spp. agg.*	Garden Dandelion	
	*	*Vellereophyton dealbatum*	White Cudweed	
		Boraginaceae		
	*	*Myosotis discolor*	Yellow-and-blue Forget-me-not	
	*	*Brassica fruticulosa*	Twiggy Turnip	
		Brassicaceae		
	*	*Lepidium africanum*	Common Peppercress	
	*	*Nasturtium officinale*	Watercress	
	*	*Raphanus raphanistrum*	Wild Radish	
	*	*Sisymbrium officinale*	Hedge Mustard	
		Caryophyllaceae		
	*	*Cerastium glomeratum s.l.*	Common Mouse-ear Chickweed	
	*	*Stellaria media*	Chickweed	
		Crassulaceae		
	*	*Crassula natans var. minus*	Water Crassula	
	*	*Crassula tetragona subsp. robusta*	Shrubby Crassula	
		Fabaceae		
	*	*Lotus spp. (naturalised)*	Trefoil	

Life Form	Origin	Scientific Name	Common Name	CaLP Act listing
	*	*Medicago polymorpha*	Burr Medic	
	*	*Melilotus indicus*	Sweet Melilot	
	*	*Ornithopus compressus*	Yellow Serradella	
	*	*Trifolium arvense var. arvense*	Hare's-foot Clover	
	*	*Trifolium glomeratum*	Cluster Clover	
	*	*Trifolium repens var. repens*	White Clover	
	*	*Trifolium spp.*	Clover	
	*	*Vicia hirsuta*	Tiny Vetch	
	*	*Vicia sativa*	Common Vetch	
	*	*Vicia sativa subsp. nigra*	Narrow-leaf Vetch	
	*	*Vicia sativa subsp. sativa*	Common Vetch	
	*	*Vicia spp.*	Vetch	
		Fumariaceae		
	*	*Fumaria bastardii*	Bastard's Fumitory	
	*	*Fumaria capreolata*	White Fumitory	
	*	*Fumaria spp.*	Fumitory	
		Gentianaceae		
	*	*Centaurium erythraea*	Common Centaury	
		Geraniaceae		
	*	*Erodium moschatum*	Musky Heron's-bill	
	*	*Geranium dissectum*	Cut-leaf Crane's-bill	
		Iridaceae		
	*	*Sisyrinchium iridifolium*	Striped Rush-leaf	
		Malvaceae		
	*	*Modiola caroliniana*	Red-flower Mallow	
		Oxalidaceae		
	*	*Oxalis incarnata*	Pale Wood-sorrel	
	*	*Oxalis pes-caprae*	Soursob	R
		Polygonaceae		
	*	*Acetosella vulgaris*	Sheep Sorrel	
	*	*Polygonum aviculare s.l.*	Prostrate Knotweed	
	*	*Polygonum aviculare s.s.*	Hogweed	
	*	*Rumex conglomeratus*	Clustered Dock	
	*	*Rumex crispus*	Curled Dock	
		Primulaceae		
	*	*Anagallis arvensis*	Pimpernel	
		Rosaceae		
	*	*Crataegus monogyna*	Hawthorn	C
		Rubiaceae		
	*	*Galium aparine*	Cleavers	
		Solanaceae		
	*	*Solanum americanum*	Glossy Nightshade	
	*	*Solanum nigrum sensu Willis (1972)*	Black Nightshade	

Life Form	Origin	Scientific Name	Common Name	CaLP Act listing
	*	*Solanum spp.*	Nightshade	
		Urticaceae		
	*	*Urtica urens*	Small Nettle	
		Veronicaceae		
	*	*Plantago coronopus*	Buck's-horn Plantain	
	*	*Plantago lanceolata*	Ribwort	
	*	*Plantago major*	Greater Plantain	
Graminoids (grass like plants)		**Alliaceae**		
	*	*Allium triquetrum*	Angled Onion	R
		Araceae		
	*	*Zantedeschia aethiopica*	White Arum-lily	
		Cyperaceae		
	*	*Cyperus eragrostis*	Drain Flat-sedge	
		Iridaceae		
	*	*Crocosmia X crocosmiiflora*	Montbretia	
	*	*Freesia spp.*	Freesia	
	*	*Gladiolus spp.*	Gladiolus	
	*	*Romulea rosea*	Onion Grass	
		Juncaceae		
	*	*Juncus acutus subsp. acutus*	Spiny Rush	C
	*	*Juncus articulatus*	Jointed Rush	
	*	*Juncus microcephalus*	Tiny-headed Rush	
		Poaceae		
	*	*Agrostis capillaris var. capillaris*	Brown-top Bent	
	*	*Agrostis stolonifera*	Creeping Bent	
	*	*Aira caryophyllea*	Silvery Hair-grass	
	*	*Aira elegantissima*	Delicate Hair-grass	
	*	*Anthoxanthum odoratum*	Sweet Vernal-grass	
	*	*Avena spp.*	Oat	
	*	*Briza maxima*	Large Quaking-grass	
	*	*Briza minor*	Lesser Quaking-grass	
	*	*Bromus catharticus*	Prairie Grass	
	*	*Bromus diandrus*	Great Brome	
	*	*Bromus hordeaceus subsp. hordeaceus*	Soft Brome	
	*	*Cortaderia selloana*	Pampas Grass	
	*	*Cortaderia spp.*	Pampas Grass	
	*	*Cynodon dactylon var. dactylon*	Couch	
	*	*Dactylis glomerata*	Cocksfoot	
	*	*Ehrharta erecta var. erecta*	Panic Veldt-grass	
	*	*Ehrharta longiflora*	Annual Veldt-grass	
	*	*Festuca arundinacea*	Tall Fescue	
	*	*Glyceria maxima*	Reed Sweet-grass	

Life Form	Origin	Scientific Name	Common Name	CaLP Act listing
	*	*Holcus lanatus*	Yorkshire Fog	
	*	*Lolium perenne*	Perennial Rye-grass	
	*	*Paspalum dilatatum*	Paspalum	
	*	*Paspalum distichum*	Water Couch	
	*	*Pennisetum clandestinum*	Kikuyu	
	*	*Phalaris aquatica*	Toowoomba Canary-grass	
	*	*Poa annua*	Annual Meadow-grass	
	*	*Polypogon monspeliensis*	Annual Beard-grass	
	*	*Sporobolus africanus*	Rat-tail Grass	
	*	*Tribolium acutiflorum s.s.*	Crested Desmazeria	
	*	*Vulpia myuros*	Rat's-tail Fescue	
	*	*Vulpia myuros f. megalura*	Fox-tail Fescue	
	*	*Vulpia spp.*	Fescue	
Scramblers/Climbers		**Apocynaceae**		
	*	*Vinca major*	Blue Periwinkle	
		Rosaceae		
	*	*Rubus anglocandicans*	Blackberry	C
	*	*Rubus fruticosus spp. agg.*	Blackberry	C
		Asteraceae		
	*	*Delairea odorata*	Cape Ivy	
Ferns		**Asparagaceae**		
	*	*Asparagus asparagoides*	Bridal Creeper	R

Appendix 3. Flora records within 1520 Thompsons Road

FFG	EPBC	VROTS	Origin	Scientific Name	Common Name
			#	*Acacia floribunda*	White Sallow-wattle
			#	*Acacia longifolia subsp. longifolia*	Sallow Wattle
				Acacia mearnsii	Black Wattle
				Acacia paradoxa	Hedge Wattle
			*	*Acetosa sagittata*	Rambling Dock
			*	*Acetosella vulgaris*	Sheep Sorrel
			*	*Agrostis capillaris*	Brown-top Bent
			*	*Aira caryophyllea*	Silvery Hair-grass
			*	*Aira elegantissima*	Delicate Hair-grass
			*	*Allium triquetrum*	Angled Onion
				Allocasuarina littoralis	Black Sheoak
				Amphibromus nervosus	Common Swamp Wallaby-grass
			*	*Anagallis arvensis*	Pimpernel
			*	*Anthoxanthum odoratum*	Sweet Vernal-grass
			*	*Arctotheca calendula*	Cape Weed
			*	*Asparagus asparagoides*	Bridal Creeper
			*	*Aster subulatus*	Aster-weed
				Austrodanthonia fulva	Copper-awned Wallaby-grass
				Austrodanthonia setacea	Bristly Wallaby-grass
		r		*Austrostipa rudis subsp. australis*	Veined Spear-grass
				Azolla filiculoides	Pacific Azolla
				Billardiera scandens s.l.	Common Apple-berry
				Bossiaea cinerea	Showy Bossiaea
			*	*Brassica fruticulosa*	Twiggy Turnip
			*	*Briza maxima*	Large Quaking-grass
			*	*Briza minor*	Lesser Quaking-grass
			*	*Bromus catharticus*	Prairie Grass
			*	*Bromus diandrus*	Great Brome
			*	*Bromus hordeaceus subsp. hordeaceus*	Soft Brome
			*	*Callitriche stagnalis*	Common Water-starwort
				Carex breviculmis	Common Grass-sedge
				Cassinia arcuata	Drooping Cassinia
				Cassinia longifolia	Shiny Cassinia
			*	*Centaurium erythraea*	Common Centaury
				Centella cordifolia	Centella
			*	*Cerastium glomeratum s.l.*	Common Mouse-ear Chickweed
			*	*Cirsium vulgare*	Spear Thistle
				Comesperma volubile	Love Creeper
				Cotula australis	Common Cotula
			*	*Cotula coronopifolia*	Water Buttons
				Crassula decumbens var. decumbens	Spreading Crassula
			*	*Crassula natans var. minus*	Water Crassula
				Crassula sieberiana s.l.	Sieber Crassula
			*	*Crataegus monogyna*	Hawthorn
			*	*Crocosmia X crocosmiiflora*	Montbretia
			*	*Cynodon dactylon var. dactylon*	Couch
			*	*Cyperus eragrostis*	Drain Flat-sedge
			*	*Daucus carota*	Carrot
				Daviesia latifolia	Hop Bitter-pea
			*	*Delairea odorata*	Cape Ivy
				Deyeuxia quadriseta	Reed Bent-grass
				Dianella longifolia s.l.	Pale Flax-lily
				Dichondra repens	Kidney-weed

FFG	EPBC	VROTS	Origin	Scientific Name	Common Name
			*	*Dittrichia graveolens*	Stinkwort
				Drosera peltata subsp. auriculata	Tall Sundew
				Drosera peltata subsp. peltata	Pale Sundew
			*	*Ehrharta erecta var. erecta*	Panic Veldt-grass
			*	*Ehrharta longiflora*	Annual Veldt-grass
				Eleocharis acuta	Common Spike-sedge
				Epacris impressa	Common Heath
				Epilobium billardierianum subsp. billardierianum	Smooth Willow-herb
				Epilobium hirtigerum	Hairy Willow-herb
				Eragrostis brownii	Common Love-grass
			*	*Erica arborea*	Tree Heath
			*	*Erica lusitanica*	Spanish Heath
				Eucalyptus camaldulensis	River Red-gum
				Eucalyptus ovata	Swamp Gum
				Eucalyptus radiata	Narrow-leaf Peppermint
				Eucalyptus viminalis subsp. pryoriana	Coast Manna-gum
				Euchiton spp.	Cudweed
				Exocarpos cupressiformis	Cherry Ballart
			*	*Fumaria bastardii*	Bastard's Fumitory
				Gahnia radula	Thatch Saw-sedge
			*	*Galium aparine*	Cleavers
			*	*Genista linifolia*	Flax-leaf Broom
			*	*Genista monspessulana*	Montpellier Broom
			*	*Geranium dissectum*	Cut-leaf Crane's-bill
			*	*Gladiolus spp.*	Gladiolus
			*	*Glyceria maxima*	Reed Sweet-grass
				Glycine clandestina	Twining Glycine
				Gonocarpus humilis	Shade Raspwort
				Hardenbergia violacea	Purple Coral-pea
			*	*Holcus lanatus*	Yorkshire Fog
				Hypericum japonicum	Matted St John's Wort
			*	*Hypochoeris radicata*	Flatweed
				Isolepis cernua var. platycarpa	Broad-fruit Club-sedge
				Isolepis inundata	Swamp Club-sedge
				Isolepis marginata	Little Club-sedge
				Juncus amabilis	Hollow Rush
			*	*Juncus articulatus*	Jointed Rush
				Juncus bufonius	Toad Rush
			*	*Juncus microcephalus*	Tiny-headed Rush
				Juncus pallidus	Pale Rush
				Lachnagrostis filiformis var. 1	Common Blown-grass
		k		*Lachnagrostis filiformis var. 2*	Wetland Blown-grass
			*	*Lactuca serriola*	Prickly Lettuce
				Lagenophora stipitata	Common Bottle-daisy
				Lemna disperma	Common Duckweed
			*	*Leontodon taraxacoides subsp. taraxacoides*	Hairy Hawkbit
			*	*Lepidium africanum*	Common Peppercress
				Lepidosperma concavum	Sandhill Sword-sedge
				Lepidosperma laterale	Variable Sword-sedge
				Lepidosperma longitudinale	Pithy Sword-sedge
				Leptospermum continentale	Prickly Tea-tree
			#	*Leptospermum laevigatum*	Coast Tea-tree
				Leptospermum myrsinoides	Heath Tea-tree
				Leptospermum scoparium	Manuka
				Lepyrodia muelleri	Common Scale-rush
			*	*Lolium perenne*	Perennial Rye-grass
				Lomandra filiformis subsp. coriacea	Wattle Mat-rush
				Lomandra filiformis subsp. filiformis	Wattle Mat-rush

FFG	EPBC	VROTS	Origin	Scientific Name	Common Name
				Lomandra longifolia	Spiny-headed Mat-rush
				Lomandra nana	Dwarf Mat-rush
			*	*Lotus spp. (naturalised)*	Trefoil
				Luzula meridionalis var. meridionalis	Common Woodrush
				Lythrum hyssopifolia	Small Loosestrife
				Melaleuca ericifolia	Swamp Paperbark
				Microlaena stipoides var. stipoides	Weeping Grass
				Microtis spp.	Onion Orchid
			*	*Myosotis discolor*	Yellow-and-blue Forget-me-not
				Opercularia varia	Variable Stinkweed
			*	*Ornithopus spp.*	Bird's Foot
				Oxalis exilis	Shady Wood-sorrel
			*	*Oxalis pes-caprae*	Soursob
				Ozothamnus ferrugineus	Tree Everlasting
			*	*Paspalum dilatatum*	Paspalum
			*	*Paspalum distichum*	Water Couch
			*	*Pennisetum clandestinum*	Kikuyu
				Persicaria decipiens	Slender Knotweed
				Persicaria prostrata	Creeping Knotweed
			*	*Phytolacca octandra*	Red-ink Weed
			*	*Pinus radiata*	Radiata Pine
			#	*Pittosporum undulatum*	Sweet Pittosporum
			*	*Plantago coronopus*	Buck's-horn Plantain
			*	*Plantago lanceolata*	Ribwort
			*	*Poa annua*	Annual Meadow-grass
				Poa clelandii	Noah's Ark
				Poa morrisii	Soft Tussock-grass
			*	*Polygonum aviculare s.l.*	Prostrate Knotweed
			*	*Polypogon monspeliensis*	Annual Beard-grass
				Poranthera microphylla s.l.	Small Poranthera
				Portulaca oleracea	Common Purslane
				Potamogeton ochreatus	Blunt Pondweed
				Pseudognaphalium luteoalbum	Jersey Cudweed
				Pteridium esculentum	Austral Bracken
				Ranunculus pumilio	Ferny Small-flower Buttercup
				Ranunculus spp.	Buttercup
				Ricinocarpos pinifolius	Wedding Bush
			*	*Romulea rosea*	Onion Grass
			*	*Rubus anglocandicans*	Blackberry
			*	*Rumex conglomeratus*	Clustered Dock
			*	*Rumex crispus*	Curled Dock
			*	*Salix cinerea*	Grey Sallow
				Schoenus apogon	Common Bog-sedge
		r		*Senecio campylocarpus*	Floodplain Fireweed
				Senecio glomeratus	Annual Fireweed
				Senecio hispidulus s.s.	Rough Fireweed
				Senecio minimus	Shrubby Fireweed
				Senecio quadridentatus	Cotton Fireweed
			*	*Sisymbrium officinale*	Hedge Mustard
			*	*Sisyrinchium iridifolium*	Striped Rush-leaf
				Solanum laciniatum	Large Kangaroo Apple
			*	*Solanum nigrum sensu Willis (1972)*	Black Nightshade
			*	*Soliva sessilis*	Jo Jo
			*	*Sonchus asper s.l.*	Rough Sow-thistle
			*	*Sonchus asper subsp. glaucescens*	Blue Sow-thistle
			*	*Sonchus oleraceus*	Common Sow-thistle
				Spergularia spp.	Sand Spurrey
			*	*Stellaria media*	Chickweed

FFG	EPBC	VROTS	Origin	Scientific Name	Common Name
				Stellaria pungens	Prickly Starwort
				Thelymitra pauciflora s.l.	Slender Sun-orchid
				Thelymitra spp.	Sun Orchid
				Thysanotus patersonii	Twining Fringe-lily
				Trachymene composita	Parsnip Trachymene
				Tricoryne elatior	Yellow Rush-lily
			*	*Trifolium glomeratum*	Cluster Clover
				Typha domingensis	Narrow-leaf Cumbungi
			*	*Ulex europaeus*	Gorse
			*	*Vellereophyton dealbatum*	White Cudweed
			*	*Vicia spp.*	Vetch
				Viminaria juncea	Golden Spray
			*	*Vulpia myuros*	Rat's-tail Fescue
			*	*Vulpia myuros f. megalura*	Fox-tail Fescue

Appendix 4. Flora records within 1550 Thompsons Road

FFG	EPBC	VROTS	Origin	Scientific Name	Common Name
				Acacia genistifolia	Spreading Wattle
			#	*Acacia longifolia subsp. longifolia*	Sallow Wattle
			#	*Acacia longifolia subsp. sophorae*	Coast Wattle
				Acacia mearnsii	Black Wattle
				Acacia melanoxylon	Blackwood
				Acacia oxycedrus	Spike Wattle
				Acacia paradoxa	Hedge Wattle
				Acacia verticillata	Prickly Moses
			*	*Acetosella vulgaris*	Sheep Sorrel
			*	*Agrostis capillaris*	Brown-top Bent
			*	*Agrostis stolonifera*	Creeping Bent
			*	*Allium triquetrum*	Angled Onion
				Allocasuarina littoralis	Black Sheoak
				Amperea xiphoclada var. xiphoclada	Broom Spurge
			*	*Anthoxanthum odoratum*	Sweet Vernal-grass
				Aotus ericoides	Common Aotus
			*	*Arctotheca calendula*	Cape Weed
			*	*Asparagus asparagoides*	Bridal Creeper
			*	*Aster subulatus*	Aster-weed
				Austrodanthonia setacea	Bristly Wallaby-grass
				Austrostipa mollis	Supple Spear-grass
				Austrostipa spp.	Spear Grass
				Azolla filiculoides	Pacific Azolla
				Baumea tetragona	Square Twig-sedge
				Billardiera scandens s.l.	Common Apple-berry
				Bossiaea cinerea	Showy Bossiaea
			*	*Brassica fruticulosa*	Twiggy Turnip
			*	*Bromus catharticus*	Prairie Grass
			*	*Bromus diandrus*	Great Brome
				Carex appressa	Tall Sedge
				Cassinia aculeata	Common Cassinia
				Cassinia arcuata	Drooping Cassinia
				Cassytha glabella	Slender Dodder-laurel
			*	*Cerastium glomeratum s.l.*	Common Mouse-ear Chickweed
			*	*Chamaecytisus palmensis*	Tree Lucerne
			*	*Cirsium vulgare*	Spear Thistle
				Comesperma volubile	Love Creeper
			*	*Conyza spp.*	Fleabane
			*	*Coprosma repens*	Mirror Bush
				Correa reflexa var. reflexa	Common Correa
			*	*Cortaderia selloana*	Pampas Grass
		v	#	*Corymbia maculata*	Spotted Gum
			*	*Cotoneaster pannosus*	Velvet Cotoneaster
				Cotula australis	Common Cotula
				Crassula decumbens var. decumbens	Spreading Crassula
			*	*Cynodon dactylon var. dactylon*	Couch
			*	*Dactylis glomerata*	Cocksfoot
				Dianella longifolia s.l.	Pale Flax-lily
				Dichondra repens	Kidney-weed
			*	*Ehrharta erecta var. erecta*	Panic Veldt-grass
			*	*Ehrharta longiflora*	Annual Veldt-grass
				Eleocharis acuta	Common Spike-sedge
			*	*Erodium moschatum*	Musky Heron's-bill
			#	*Eucalyptus botryoides*	Southern Mahogany
				Eucalyptus viminalis subsp. pryoriana	Coast Manna-gum

FFG	EPBC	VROTS	Origin	Scientific Name	Common Name
				Exocarpos cupressiformis	Cherry Ballart
			*	*Foeniculum vulgare*	Fennel
			*	*Freesia spp.*	Freesia
			*	*Fumaria bastardii*	Bastard's Fumitory
			*	*Fumaria capreolata*	White Fumitory
				Gahnia radula	Thatch Saw-sedge
			*	*Galium aparine*	Cleavers
			*	*Genista linifolia*	Flax-leaf Broom
			*	*Genista monspessulana*	Montpellier Broom
			*	*Geranium dissectum*	Cut-leaf Crane's-bill
			*	*Gladiolus spp.*	Gladiolus
				Gonocarpus humilis	Shade Raspwort
				Gonocarpus tetragynus	Common Raspwort
			*	*Helminthotheca echioides*	Ox-tongue
				Hemarthria uncinata var. uncinata	Mat Grass
				Hypericum gramineum	Small St John's Wort
			*	*Hypochoeris radicata*	Flatweed
				Isolepis inundata	Swamp Club-sedge
				Isolepis marginata	Little Club-sedge
				Juncus pallidus	Pale Rush
				Juncus planifolius	Broad-leaf Rush
				Juncus spp.	Rush
				Kennedia prostrata	Running Postman
				Lagenophora gracilis	Slender Bottle-daisy
				Lemna disperma	Common Duckweed
				Leptospermum continentale	Prickly Tea-tree
			#	*Leptospermum laevigatum*	Coast Tea-tree
				Leptospermum myrsinoides	Heath Tea-tree
				Lepyrodia muelleri	Common Scale-rush
			*	*Lolium perenne*	Perennial Rye-grass
				Lomandra longifolia	Spiny-headed Mat-rush
				Malva spp.	Mallow
			*	*Medicago polymorpha*	Burr Medic
				Melaleuca ericifolia	Swamp Paperbark
				Melaleuca squarrosa	Scented Paperbark
			*	*Melilotus indicus*	Sweet Melilot
				Microlaena stipoides var. stipoides	Weeping Grass
			*	*Modiola caroliniana*	Red-flower Mallow
				Olearia ramulosa	Twiggy Daisy-bush
				Opercularia varia	Variable Stinkweed
			*	*Ornithopus compressus*	Yellow Serradella
			*	*Ornithopus pinnatus*	Sand Bird's-foot
			*	*Oxalis incarnata*	Pale Wood-sorrel
				Oxalis perennans	Grassland Wood-sorrel
			*	*Oxalis pes-caprae*	Soursob
				Ozothamnus ferrugineus	Tree Everlasting
			*	*Paraserianthes lophantha subsp. lophantha*	Cape Wattle
			*	*Pennisetum clandestinum*	Kikuyu
				Persicaria decipiens	Slender Knotweed
				Persoonia spp.	Geebung
			*	*Phytolacca octandra*	Red-ink Weed
			*	*Pinus radiata*	Radiata Pine
			#	*Pittosporum undulatum*	Sweet Pittosporum
			*	*Plantago lanceolata*	Ribwort
			*	*Plantago major*	Greater Plantain
			*	*Poa annua*	Annual Meadow-grass
				Poa clelandii	Noah's Ark
			*	*Polygonum aviculare s.s.*	Hogweed

FFG	EPBC	VROTS	Origin	Scientific Name	Common Name
			*	*Polypogon monspeliensis*	Annual Beard-grass
			*	*Psoralea pinnata*	Blue Psoralea
				Pteridium esculentum	Austral Bracken
				Pterostylis spp.	Greenhood
			*	*Raphanus raphanistrum*	Wild Radish
				Ricinocarpos pinifolius	Wedding Bush
			*	*Romulea rosea*	Onion Grass
			*	*Rubus fruticosus spp. agg.*	Blackberry
			*	*Rumex conglomeratus*	Clustered Dock
			*	*Rumex crispus*	Curled Dock
				Rumex spp.	Dock
				Schoenus apogon	Common Bog-sedge
				Senecio glomeratus	Annual Fireweed
				Senecio hispidulus s.l.	Rough Fireweed
				Senecio minimus	Shrubby Fireweed
				Senecio quadridentatus	Cotton Fireweed
			*	*Sisymbrium officinale*	Hedge Mustard
			*	*Solanum americanum*	Glossy Nightshade
				Solanum laciniatum	Large Kangaroo Apple
			*	*Solanum nigrum sensu Willis (1972)*	Black Nightshade
			*	*Sonchus oleraceus*	Common Sow-thistle
			*	*Sporobolus africanus*	Rat-tail Grass
				Stackhousia monogyna	Creamy Stackhousia
			*	*Stellaria media*	Chickweed
			*	*Taraxacum officinale spp. agg.*	Garden Dandelion
				Thysanotus patersonii	Twining Fringe-lily
				Trachymene composita	Parsnip Trachymene
			*	*Tribolium acutiflorum s.s.*	Crested Desmazeria
			*	*Trifolium spp.*	Clover
				Typha domingensis	Narrow-leaf Cumbungi
			*	*Ulex europaeus*	Gorse
			*	*Urtica urens*	Small Nettle
				Veronica plebeia	Trailing Speedwell
			*	*Vicia hirsuta*	Tiny Vetch
			*	*Vicia sativa*	Common Vetch
			*	*Vinca major*	Blue Periwinkle
				Viola hederacea sensu Willis (1972)	Ivy-leaf Violet
			*	*Vulpia spp.*	Fescue
				Westringia spp.	Westringia
				Xanthorrhoea minor subsp. lutea	Small Grass-tree
			*	*Zantedeschia aethiopica*	White Arum-lily

Appendix 5. Flora records within remainder of study area (Excluding 1520 and 1550 Thompsons Road)

FFG	EPBC	VROTS	Origin	Scientific Name	Common Name
				Acacia dealbata	Silver Wattle
			#	*Acacia longifolia subsp. longifolia*	Sallow Wattle
				Acacia melanoxylon	Blackwood
			*	*Acetosella vulgaris*	Sheep Sorrel
			*	*Agrostis capillaris var. capillaris*	Brown-top Bent
			*	*Alisma lanceolata*	Water Plantain
			*	*Anagallis arvensis*	Pimpernel
			*	*Anthoxanthum odoratum*	Sweet Vernal-grass
			*	*Arctotheca calendula*	Cape Weed
			*	*Aster subulatus*	Aster-weed
			*	*Avena spp.*	Oat
				Bolboschoenus caldwellii	Salt Club-sedge
				Brassicaceae spp.	Crucifer
			*	*Briza minor*	Lesser Quaking-grass
			*	*Bromus catharticus*	Prairie Grass
			*	*Bromus diandrus*	Great Brome
				Carex appressa	Tall Sedge
				Cassinia arcuata	Drooping Cassinia
			*	*Centaurium erythraea*	Common Centaury
			*	*Cirsium vulgare*	Spear Thistle
			*	*Conyza spp.*	Fleabane
			*	*Coprosma repens*	Mirror Bush
			*	*Cortaderia spp.*	Pampas Grass
				Cotula australis	Common Cotula
				Crassula helmsii	Swamp Crassula
			*	*Crassula tetragona subsp. robusta*	Shrubby Crassula
			*	*Cynodon dactylon var. dactylon*	Couch
			*	*Cyperus eragrostis*	Drain Flat-sedge
			*	*Dactylis glomerata*	Cocksfoot
				Eleocharis acuta	Common Spike-sedge
				Epilobium billardierianum subsp. billardierianum	Smooth Willow-herb
			#	*Eucalyptus botryoides*	Southern Mahogany
			*	*Festuca arundinacea*	Tall Fescue
			*	*Fraxinus angustifolia*	Desert Ash
			*	*Fumaria spp.*	Fumitory
			*	*Galium aparine*	Cleavers
			*	*Geranium dissectum*	Cut-leaf Crane's-bill
			*	*Helminthotheca echioides*	Ox-tongue
				Hemarthria uncinata var. uncinata	Mat Grass
			*	*Hypochoeris radicata*	Flatweed
			*	*Juncus acutus subsp. acutus*	Spiny Rush
				Juncus amabilis	Hollow Rush
			*	*Juncus articulatus*	Jointed Rush
				Juncus bufonius	Toad Rush
				Juncus pallidus	Pale Rush
			*	*Lactuca serriola*	Prickly Lettuce
			*	*Lolium perenne*	Perennial Rye-grass
				Lotus spp.	Trefoil
				Lythrum hyssopifolia	Small Loosestrife
				Melaleuca ericifolia	Swamp Paperbark
			*	*Nasturtium officinale*	Watercress
				Oxalis exilis	Shady Wood-sorrel

FFG	EPBC	VROTS	Origin	Scientific Name	Common Name
				Ozothamnus ferrugineus	Tree Everlasting
			*	*Paspalum distichum*	Water Couch
				Pelargonium australe	Austral Stork's-bill
			*	*Pennisetum clandestinum*	Kikuyu
				Persicaria decipiens	Slender Knotweed
			*	*Phalaris aquatica*	Toowoomba Canary-grass
				Phragmites australis	Common Reed
			*	*Plantago coronopus*	Buck's-horn Plantain
			*	*Plantago lanceolata*	Ribwort
			*	*Polypogon monspeliensis*	Annual Beard-grass
				Potamogeton spp.	Pondweed
			*	*Raphanus raphanistrum*	Wild Radish
			*	*Romulea rosea*	Onion Grass
			*	*Rosa rubiginosa*	Sweet Briar
			*	*Rubus fruticosus spp. agg.*	Blackberry
			*	*Rumex conglomeratus*	Clustered Dock
				Schoenoplectus tabernaemontani	River Club-sedge
				Solanum spp.	Nightshade
			*	*Sonchus asper s.l.*	Rough Sow-thistle
			*	*Sonchus oleraceus*	Common Sow-thistle
			*	*Taraxacum officinale spp. agg.*	Garden Dandelion
			*	*Trifolium arvense var. arvense*	Hare's-foot Clover
			*	*Trifolium repens var. repens*	White Clover
			*	*Trifolium spp.*	Clover
				Triglochin procera s.l.	Water Ribbons
				Typha domingensis	Narrow-leaf Cumbungi
			*	*Ulex europaeus*	Gorse
			*	*Vicia sativa subsp. nigra*	Narrow-leaf Vetch
			*	*Vicia sativa subsp. sativa*	Common Vetch

Appendix 6. Threatened flora species within 10km

Life Form	Scientific Name	Family Name	Common Name	EPBC	FFG	DSE	Database	Other Sources	Current Survey Record	Number of Records within 10km (DSE 2009a)	Likelihood of Occurrence*	Likelihood Reasoning	Habitat Description
Graminoid	*Amphibromus fluitans*	Poaceae	River Swamp Wallaby-grass	VU			EPBC/FIS			5	High	Nearest records from Lynbrook and close to Royal Botanic Gardens Cranbourne (RBGC). Many inundated areas within the study area, especially within the quarries.	Mostly confined to the north-central Victorian reach of the Murray River and is uncommon in southern Victoria. Occurs in natural and constructed wetlands such as farm dams, lagoons and swamp margins (DEWHA 2010c; Walsh and Entwisle 1994).
Graminoid	*Austrostipa rudis subsp. australis*	Poaceae	Veined Spear-grass			r	FIS		Yes	5	High	Has been recorded at numerous locations within the study area. Potential habitat exists in other areas of the study area.	Dry open forest, grassy low open forest on sandy soils. Uncommon with scattered populations across southern victoria (Walsh and Entwisle 1994).
Graminoid	*Burnettia cuneata*	Orchidaceae	Lizard Orchid			r				1	Low	One record at Guys Hill (Foothills of the Great Dividing Range) ~10km away. No suitable habitat within the study area (No *M. squarrosa*)	Usually found in acidic, low-nutrient soils which are frequently waterlogged and dominated by *Melaleuca squarrosa* (DSE 2009a).
Graminoid	*Caladenia aurantiaca*	Orchidaceae	Orange-tip Finger-orchid			r	FIS			2	Low	1 record from 1971. Other most recent rec 1999 from RBGC. Low-moderate likelihood of occurrence within 1520 Thompsons Road.	Southern Victoria, east of Melbourne in open forests, heathlands and heathy woodlands (Walsh and Entwisle 1994).
Graminoid	*Caladenia fragrantissima subsp. Orientalis*	Orchidaceae	Cream Spider-orchid	EN	L	e	EPBC			0	Low	No records within 10km. No high quality suitable habitat within the study area. Extremely rare plant.	Referred to in the Census of the Vascular Plants of Victoria (Walsh and Stajsic 2007) as *Caladenia orientalis*. Occurs in Heath and Heathy Woodland in coastal areas between Mornington Peninsula to Wilsons Promontory. Extremly rare plant (Jeanes and Backhouse 2006).
Graminoid	*Caladenia oenochila*	Orchidaceae	Wine-lipped Spider-orchid	VU	L	v	FIS			1	Low	Unlikely - record from 1939 - north of Pakenham bypass. Now extremely rare in the Melbourne area.	Uncommon populations across southern Victoria. Occurs in Foothill and heathy Forests in low hill areas (Jeanes and Backhouse 2006).
Graminoid	*Caladenia robinsonii*	Orchidaceae	Frankston Spider-orchid	EN	L	e	EPBC			0	Low	No records within 10km. No high quality suitable habitat within the study area. Extremely rare plant.	Known only from coastal heathland near Rosebud. An extremely rare plant (Jeanes and Backhouse 2006).
Herb	*Cardamine paucijuga s.s.*	Brassicaceae	Annual Bitter-cress			v	FIS			1	Low	Unlikely - limited habitat in the study area. Occurs in high quality habitats	Scatterd populations, primarily in southern Victoria including Portland, Grampions and Wilsons Promontory (Walsh and Entwisle 1996). Occurs in riparian and swamp scrub in rich soil in dry or moist conditions (Densley 2001).
Herb	*Cardamine tenuifolia*	Brassicaceae	Slender Bitter-cress			k	FIS			1	Low	One record north of the Pakenham bypass adjacent to Cardinia Creek	Swamp margins, plains grassland, valley sclerophyll forest in populations scattered across southern Victoria (Walsh and Entwisle 1996).
Graminoid	*Chorizandra australis*	Cyperaceae	Southern Bristle-sedge			k	FIS			1	Low	Found in remnant Riparian Scrub along Boggy Creek Langwarrin. No Riparian Scrub or similar intact habitats within the study area.	Widespread, infrequent populations accros soputhern Victoria. Lowland swamps and waterholes of low-nutrient soils (Walsh and Entwisle 1994).
Shrub	*Correa reflexa var. lobata*	Rutaceae	Powelltown Correa			r	FIS			1	Moderate	Records from RBGC - could possible in Heathy Woodlands and Damp Sand Herb-rich Woodlands in quarries	Locally common in areas south-east of Melbourne. Moist, open forests, often heathy. Also heathy woodlands (Walsh and Entwisle 1999).

Life Form	Scientific Name	Family Name	Common Name	EPBC	FFG	DSE	Database	Other Sources	Current Survey Record	Number of Records within 10km (DSE 2009a)	Likelihood of Occurrence*	Likelihood Reasoning	Habitat Description
Graminoid	*Corybas aconitiflorus*	Orchidaceae	Spurred Helmet-orchid			r	FIS			1	Low	North of Beaconsfield Nature Conservation Reserve along Cardinia Creek. Possible within 1520 Thompsons Road within the study area but unlikely.	Localized and uncommon colonies in the south-east of Victoria. Prefering sheltered, damp positions in shrubby vegetation (Walsh & Entwistle 1994).
Hern	*Craspedia canens*	Asteraceae	Grey Billy-buttons		L	e	FIS			7	Low	Unlikely - 3 records from intact wetland north of cranbourne in 1993	Few populations in south-east Victoria between Cranbourne and Traralgon. Grasslands, often around margins of swamps (Walsh & Entwistle 1999).
Graminoid	*Dianella amoena*	Hemerocallidaceae	Matted Flax-lily	EN		e	FIS/EPBC			10	Moderate	Records on former South Gippsland Hwy and in Officer, both >5kms away. But could be in study area as undetected plants.	Confined to southern Victoria in vegetation types such as lowland grasslands, grassy woodlands and grassy wetlands. The species can tolerate well drained to seasonally wet soils (DEWHA 2010a).
Graminoid	*Diuris punctata var. punctata*	Orchidaceae	Purple Diuris		L	v	FIS			15	Low	Nearest records from early 1980's, east of Cardinia Creek approximately 5km away. Not usually found in sandy soils such as at the quarries.	Distributed widely across lowland areas of Victoria. Occurs 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 (Earl and Barlow 2004).
Graminoid	*Eleocharis macbarronii*	Cyperaceae	Grey Spike-sedge			k	FIS			2	Low	Last records from Mid-90s in Lyndhurst. Unlikely.	Infrequent populations in areas of western and northern victoria. Found in heavy soils in waterlogged areas around wetlands and drainage-lines (Walsh and Entwisle 1994).
Graminoid	*Entolasia stricta*	Poaceae	Upright Panic			k	FIS			1	Moderate	Recorded close to Botanic Drv in RBGC	Sandy soils in grassy low open forests. Distribution uncertain however recorded east of Bairnsdale and near Frankston and Stradbroke (Walsh and Entwisle 1994).
Tree	*Eucalyptus fulgens*	Myrtaceae	Green Scentbark			r	FIS			7	Low	Most records from southern highlands fall bioregion, occasional plants on the plains	Open forest areas, tolerating damp conditions. Found in areas east of Healseville and Woori Yallock to the Latrobe Valley (Walsh and Entwisle 1996).
Tree	*Eucalyptus X studleyensis*	Myrtaceae	Studley Park Gum			e	FIS			3	Moderate	3 records within 10km. Recent record in 2007 >5kms away.	Considered a hybrid between Swamp Gum (*E. ovata*) and River Red-gum (*E. camaldulensis*). Plains on lower elevations.
Tree	*Eucalyptus yarraensis*	Myrtaceae	Yarra Gum			r	FIS			1	Low	1 record near Carrum Downs from 2005.	Open forest areas, from Traralgon to north west Victoria, near Ararat (Walsh and Entwisle 1996).
Scrambler/climber	*Glycine latrobeana*	Fabaceae	Clover Glycine	VU	L	v	EPBC			0	Low	No records within 10km. No ideally suitable habitat within the study area.	Mostly Grassland and Grassy Woodland. Widespread distribution but uncommon (Walsh and Entwisle 1996).
Herb	*Helichrysum aff. rutidolepis (Lowland Swamps)*	Asteraceae	Pale Swamp Everlasting			v	FIS			5	Low	Unlikely - no suitable habitat. Records from intact wetland at Lynbrook and former south-Gippsland Railway	Moist well drained sites in open grassy forest or woodland. Frequent, widespread populations across much of Victoria, excluding the north-west (Walsh and Entwisle 1999).
Graminoid	*Lachnagrostis filiformis var. 2*	Poaceae	Wetland Blown-grass			k	FIS		Yes	2	High	Recorded within 1520 Thompsons Road. Other potential habitat exists within the study area.	Grows on the edges of wetlands.
Graminoid	*Lachnagrostis punicea subsp. filifolia*	Poaceae	Purple Blown-grass		f	r	FIS			7	Low	Unlikely - records from intact wetland at Lynbrook and from former South-Gippsland Railway	Scattered populations across the Victorian Volcanic plains in wet depressions, marshes and slightly saline swamps.
Shrub	*Leionema bilobum*	Rutaceae	Notched Leionema			r	FIS			1	Low	Unlikely. 1 record from foothills of the Great Divide ~10km away.	Wet and damp forests (Walsh and Entwisle 1999).

Life Form	Scientific Name	Family Name	Common Name	EPBC	FFG	DSE	Database	Other Sources	Current Survey Record	Number of Records within 10km (DSE 2009a)	Likelihood of Occurrence*	Likelihood Reasoning	Habitat Description
Herb	*Microseris sp. 1*	Asteraceae	Plains Yam-daisy			v	FIS			3	Low	Unlikely - no suitable habitat. Records from remnant near Lynbrook and former South-Gippsland Railway.	Rare in Plains Grassland and Woodlands in damp depressions mostly in the Basalt soils of Victorias Western Plains (Walsh and Entwisle 1999).
Shrub	*Olearia asterotricha*	Asteraceae	Rough Daisy-bush			r	FIS			1	Low	1 record near Fountain Gate from 1914. No suitable habitat within the study area.	Moist forest and swampy heathland. Scattered distibution in southern victoria. Uncommon (Walsh and Entwisle 1999).
Herb	*Potamogeton perfoliatus s.l.*	Potamogetonaceae	Perfoliate Pondweed			k	FIS			1	Low	Recorded in 2005 in Cardinia Creek. It is a wetland plant which could disperse easliy through water. However, waterways highly modified within study area.	Flowing or still, fresh or brackish, creeks and rivers. On Sandy, stoney or muddy substrates (Walsh and Entwisle 1994).
Graminoid	*Prasophyllum frenchii*	Orchidaceae	Maroon Leek-orchid	EN	L	e	FIS/EPBC			12	Low	Recent records (1985) <5km away in former South Gippsland rainlway. Unlikely to occur due to lack of suitable habitat.	Infrequent, widespread populations in south western Victoria. Grasslands heathlands and grassy woodlands on moist well drained soils, including roadsides or rail reserves (Jeanes and Backhouse 2006).
Graminoid	*Prasophyllum pyriforme s.s.*	Orchidaceae	Silurian Leek-orchid			e	FIS			1	Low	Last record from 1932. Lack of suitable habitat.	Few known populations, occuring to the north-east of Melbourne in dry open forest with shrubby understory (Jeanes and Backhouse 2006).
Graminoid	*Pterostylis grandiflora*	Orchidaceae	Cobra Greenhood			r	FIS			1	Low	Last record from 1940. Lack of suitable habitat.	Few widely distributed populations in Eastern Victoria. Moist shady slopes in heath and grassy open forests (Jeanes and Backhouse 2006).
Graminoid	*Pterostylis X ingens*	Orchidaceae	Sharp Greenhood			r	FIS			1	Low	Last record from 1940's. Lack of suitable habitat and lack of parent plants.	Infrequent, widespread colonies accros Victoria. Occuring in areas of moist open forest (Walsh and Entwisle 1994).
Herb	*Senecio campylocarpus*	Asteraceae	Floodplain Fireweed			r			Yes	1	High	Recorded within 1520 Thompsons Rd. Other areas of similar habitat exists within the study area.	Occurs in drainage-lines or waterlogged areas, often in modified habitas such as 1520 Thompsons Road (Doug Frood pers comm).
Shrub	*Tetratheca stenocarpa*	Elaeocarpaceae	Long Pink-bells			r	FIS			1	Low	Last record in 1935	Tall open forest areas with populations limited to the Healesville area, the Pyrete Ranges and French Island (Walsh and Entwisle 1999).
Graminoid	*Thelymitra circumsepta*	Orchidaceae	Naked Sun-orchid			v	FIS/EPBC			4	Low	1999 was the last record on FIS, there is a stable pop at RBGC. Unlikely to occue due to very specific habitat requirements.	Found around the margins of swamps, along sub-alpine streams and sphagnum bogs. Often in disturbed areas and exposed positions in woodlands, open forests and wet heathlands (Jeanes and Backhouse 2006).
Graminoid	*Thelymitra epipactoides*	Orchidaceae	Metallic Sun-orchid	EN	L	e	EPBC			0	Low	No records within 10 kms. Very rare plant. No high quality habitat within the study area.	Heath, grassland and woodland. Flowering enhanced by summer fires. Higly endangered (Jeanes and Backhouse 2006).
Herb	*Xerochrysum palustre*	Asteraceae	Swamp Everlasting	VU	L	v	EPBC			3	Low	3 records. Nearest record in Lyndhurst. Others on railway. Lack of suitable habitat in the study area	Occurs in swamps usually found on basalt derived soils

***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.

Appendix 7. Scattered trees

ID	Scientific Name	Common Name	Tree Size	EVC	EVC Conservation Status	Other Attributes	Conservation Significance	Latitude	Longitude	Location ref. (Maps 5 A-D)
1	*Eucalyptus viminalis subsp pryoriana*	Coast Manna Gum	VLOT	Heathy Woodland	Least Concern	Low	Low	-38.08935959190	145.31064409500	Q9
2	*Eucalyptus viminalis subsp pryoriana*	Coast Manna Gum	MOT	Heathy Woodland	Least Concern	Low	Low	-38.09673365810	145.32281272900	L9
3	*Eucalyptus viminalis subsp pryoriana*	Coast Manna Gum	MOT	Heathy Woodland	Least Concern	Low	Low	-38.09664244040	145.32269357400	L9
4	*Eucalyptus viminalis subsp pryoriana*	Coast Manna Gum	LOT	Heathy Woodland	Least Concern	Low	Low	-38.08758636580	145.30794895700	N7
5	*Eucalyptus viminalis subsp pryoriana*	Coast Manna Gum	MOT	Heathy Woodland	Least Concern	Low	Low	-38.08751191490	145.30797714100	N7
6	*Eucalyptus viminalis subsp pryoriana*	Coast Manna Gum	LOT	Heathy Woodland	Least Concern	Low	Low	-38.08727726470	145.30800121200	N6
7	*Eucalyptus ovata subsp ovata*	Swamp Gum	LOT	Swampy Riparian Woodland	Endangered	Low	Low	-38.08690341730	145.30819804900	N6
8	*Eucalyptus viminalis subsp pryoriana*	Coast Manna Gum	MOT	Heathy Woodland	Least Concern	Low	Low	-38.08975603410	145.31320364200	S10
9	*Eucalyptus ovata subsp ovata*	Swamp Gum	Small	Swampy Riparian Woodland	Endangered	Low	Low	-38.09363916100	145.33181784200	R14
10	*Eucalyptus ovata subsp ovata*	Swamp Gum	Small	Swampy Riparian Woodland	Endangered	Low	Low	-38.09234099220	145.33203020000	R12
11	*Eucalyptus ovata subsp ovata*	Swamp Gum	Small	Swampy Riparian Woodland	Endangered	Low	Low	-38.09235976690	145.33202429400	R12
12	*Eucalyptus ovata subsp ovata*	Swamp Gum	Small	Swampy Riparian Woodland	Endangered	Low	Low	-38.09179060810	145.33212880500	R11
13	*Eucalyptus ovata subsp ovata*	Swamp Gum	Small	Swampy Riparian Woodland	Endangered	Low	Low	-38.09168523970	145.33214572200	R11
14	*Eucalyptus ovata subsp ovata*	Swamp Gum	Small	Swampy Riparian Woodland	Endangered	Low	Low	-38.08870096920	145.32744571700	N7
15	*Eucalyptus ovata subsp ovata*	Swamp Gum	Small	Swampy Riparian Woodland	Endangered	Low	Low	-38.08821777540	145.32346564900	K6
16	*Eucalyptus ovata subsp ovata*	Swamp Gum	Small	Swampy Riparian Woodland	Endangered	Low	Low	-38.08772740430	145.31932451800	G5
17	*Eucalyptus viminalis subsp pryoriana*	Coast Manna Gum	LOT	Heathy Woodland	Least Concern	Low	Low	-38.08728861160	145.31572195500	D5
18	*Eucalyptus viminalis subsp pryoriana*	Coast Manna Gum	Small	Heathy Woodland	Least Concern	Low	Low	-38.08726002190	145.31544573400	D5
19	*Eucalyptus viminalis subsp pryoriana*	Coast Manna Gum	LOT	Heathy Woodland	Least Concern	Low	Low	-38.08619256370	145.30768875600	N5
20	*Eucalyptus viminalis subsp pryoriana*	Coast Manna Gum	MOT	Heathy Woodland	Least Concern	Low	Low	-38.08617165290	145.30759002100	N5
21	*Eucalyptus viminalis subsp pryoriana*	Coast Manna Gum	Small	Heathy Woodland	Least Concern	Low	Low	-38.08616999140	145.30756118900	N5
22	*Eucalyptus viminalis subsp pryoriana*	Coast Manna Gum	VLOT	Heathy Woodland	Least Concern	Low	Low	-38.08603820120	145.30675107500	M4
23	*Eucalyptus cephalocarpa*	Mealy Stringybark	LOT	Heathy Woodland	Least Concern	Low	Low	-38.08604193990	145.30663292200	M4
24	*Eucalyptus viminalis subsp pryoriana*	Coast Manna Gum	LOT	Heathy Woodland	Least Concern	Low	Low	-38.08511999420	145.29974215700	G3

Appendix 8. Habitat hectare results

Habitat Zone			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
PFI			2046266	52925555	52925555	52925555	52925555	52925555	150452089	150452089	151078236	151078236	151078236	151078236	151078236	151078236	151078236	151078236	151078236
Site ID			1	1	2	9	6	7	2	1	1	1	1	1	7	8	1	1	4
Habitat Zone ID			A	A	A	A	A	A	A	A	S	O	N	P	A	A	F	R	A
EVC Name (Initials)			GW	SW	SW	SW	TM	TM	SS	SW	DSHW	DSHW	DSHW	DSHW	DSHW	DSHW	DSHW	DSHW	DSHW
EVC Number			GipP0175	GipP0136	GipP0136	GipP0136	GipP0821	GipP0821	GipP0053_61	GipP0136	GipP0003	GipP0003	GipP0003	GipP0003	GipP0003	GipP0003	GipP0003	GipP0003	GipP0003
Total Area of Habitat Zone (ha)		**(#.#)**	0.01	0.06	0.03	0.25	0.07	0.18	0.02	0.09	0.70	0.37	1.82	0.19	0.12	0.03	0.81	0.55	0.04
		Max 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	0	0	0	0	0	5	0	0	0	0	0	7	0	0
	Canopy Cover	**5**	0	0	0	0	0	0	0	0	4	0	4	0	0	0	2	4	2
	Lack of Weeds	**15**	0	11	7	4	2	2	4	0	4	0	4	0	0	0	0	6	9
	Understorey	**25**	5	15	5	15	5	15	5	5	20	5	20	5	5	5	15	15	5
	Recruitment	**10**	1	6	3	10	0	0	0	0	3	5	6	1	0	0	10	10	10
	Organic Matter	**5**	2	5	3	0	5	5	3	0	5	4	4	4	4	4	4	4	3
	Logs	**5**	0	0	0	0	0	0	0	0	5	0	2	2	0	0	5	2	0
	Total Score	**75**	8	50	24	39	16	30	15	7	46	14	40	12	9	9	43	41	29
Landscape Score		**25**	4	4	4	2	4	4	2	4	3	5	5	4	4	4	4	2	2
Habitat Score#		**100**	12	54	28	41	20	34	17	11	49	19	45	16	13	13	47	43	31
Habitat Score as above = #/100		**0.##**	0.12	0.54	0.28	0.41	0.20	0.34	0.17	0.11	0.49	0.19	0.45	0.16	0.13	0.13	0.47	0.43	0.31
Habitat Hectares		**(#.#)**	**0.001**	**0.03**	**0.01**	**0.10**	**0.01**	**0.06**	**0.003**	**0.01**	**0.34**	**0.07**	**0.82**	**0.03**	**0.02**	**0.004**	**0.38**	**0.24**	**0.01**
Bioregion			GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP
EVC Conservation Status			E	V	V	V	E	E	E	V	V	V	V	V	V	V	V	V	V
Conservation Significance	**Conservation Status x Habitat Score**		High	Very High	Medium	High	High	High	High	Medium	High	Medium	High	Medium	Medium	Medium	High	High	High
	Threatened Species Rating flora		Low	Low	Low	Low	Medium	Medium	Low	Low	Medium	Medium	Medium	Medium	Low	Low	Medium	Medium	Low
	Threatened Species Rating fauna		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
	Other Site Attribute Rating																		
	Overall Conservation Significance (highest rating)		**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**
Trees within patches	**VLOT**																2		
	LOT										6						9		
	MOT										22			2			6	5	

Habitat Zone		18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
PFI		151078236	151078236	151078236	151078236	151078236	151078236	151078236	151078236	151078236	151078236	151078236	151078236	151078236	151078236	151078236	151078236	151078236
Site ID		1	1	1	1	1	1	1	1	1	1	2	1	1	1	3	5	5
Habitat Zone ID		M	D	K	Q	T	A	B	H	G	U	A	J	L	C	A	B	A
EVC Name (Initials)		DSHW	HW	HW	HW	HW	HW	HW	HW	HW	HW	HW	HW	SS	SS	SS	SS	PGW
EVC Number		GipP0003	GipP0048	GipP0048	GipP0048	GipP0048	GipP0048	GipP0048	GipP0048	GipP0048	GipP0048	GipP0048	GipP0048	GipP0053_61	GipP0053_61	GipP0053_61	GipP0053_61	GipP0055
Total Area of Habitat Zone (ha)	**(#.#)**	0.82	1.24	0.50	1.06	1.78	0.18	0.27	0.46	0.73	0.07	0.24	0.31	0.25	0.11	0.08	0.02	0.02
		Max 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	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
	Canopy Cover	**5**	5	4	3	2	0	1	2	2	0	0	0	0	0	0	0	0	4
	Lack of Weeds	**15**	4	0	6	9	9	0	0	0	4	9	2	2	0	4	15	7	4
	Understorey	**25**	20	15	15	20	15	5	15	15	5	15	15	15	15	5	5	15	15
	Recruitment	**10**	6	1	10	10	10	1	3	5	1	10	5	5	0	0	0	0	6
	Organic Matter	**5**	4	2	5	3	3	4	5	5	5	3	4	4	4	5	0	3	3
	Logs	**5**	2	2	2	5	2	0	4	2	0	4	0	0	0	0	0	0	5
	Total Score	**75**	41	26	41	51	39	11	29	29	15	41	26	26	24	18	25	31	37
Landscape Score		**25**	6	4	2	4	4	4	4	2	4	2	4	4	5	2	4	4	4
Habitat Score#		**100**	47	31	43	46	41	16	24	34	20	41	20	20	35	24	40	18	36
Habitat Score as above = #/100		**0.##**	0.47	0.31	0.43	0.46	0.41	0.16	0.24	0.34	0.20	0.41	0.20	0.20	0.35	0.24	0.40	0.18	0.36
Habitat Hectares		**(#.#)**	**0.39**	**0.38**	**0.22**	**0.49**	**0.73**	**0.03**	**0.06**	**0.16**	**0.15**	**0.03**	**0.05**	**0.06**	**0.09**	**0.03**	**0.03**	**0.004**	**0.01**
Bioregion			GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP
EVC Conservation Status			V	LC	LC	LC	LC	LC	LC	LC	LC	LC	LC	LC	E	E	E	E	E
Conservation Significance	**Conservation Status x Habitat Score**		High	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	High	High	High	High	Very High
	Threatened Species Rating flora		Medium	Medium	High	Medium	High	Medium	High	High	High	High	Medium	High	Medium	Medium	Medium	Low	Medium
	Threatened Species Rating fauna		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	High
	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**
Trees within patches	**VLOT**					1													
	LOT			5															
	MOT			20												1		3	

Habitat Zone			35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51
PFI			151078236	151078236	151078236	151078259	151078259	151078259	151078259	151078259	151078259	151078259	151078259	151078259	151078259	151078259	151078259	151078259	151078259
Site ID			1	6	1	1	2	2	7	3	5	6	3	5	3	4	3	2	3
Habitat Zone ID			E	A	I	A	B	E	A	B	B	A	E	A	A	A	F	D	C
EVC Name (Initials)			SRW	SW	SW	HW	HW	HW	HW	HW	HW	HW	SS	SS	SS	PGW	PGW	SW	SW
EVC Number			GipP0083	GipP0136	GipP0136	GipP0048	GipP0048	GipP0048	GipP0048	GipP0048	GipP0048	GipP0048	GipP0053_61	GipP0053_61	GipP0053_61	GipP0055	GipP0055	GipP0136	GipP0136
Total Area of Habitat Zone (ha)		**(#.#)**	0.58	0.25	0.31	0.31	0.33	0.14	0.08	0.25	0.08	0.03	0.06	0.12	0.21	0.06	0.19	0.11	0.02
		Max 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	9	9	0	0	0	0	9	0	0	0	0	0	0	0
	Canopy Cover	**5**	2	0	0	2	4	0	0	4	4	4	0	0	1	0	4	0	0
	Lack of Weeds	**15**	0	0	6	4	0	0	0	4	4	0	7	7	7	7	4	4	9
	Understorey	**25**	10	15	15	15	15	5	15	15	15	5	15	5	15	5	15	15	15
	Recruitment	**10**	1	10	10	5	5	5	1	10	6	5	0	0	0	5	6	3	3
	Organic Matter	**5**	4	4	5	4	4	4	5	5	5	4	0	2	3	2	3	4	2
	Logs	**5**	2	0	0	4	4	4	0	4	4	0	0	0	0	0	5	0	0
	Total Score	**75**	19	39	49	43	41	18	21	42	38	27	28	18	33	19	37	35	39
Landscape Score		**25**	4	4	2	4	4	2	4	3	4	2	4	4	4	1	4	2	4
Habitat Score#		**100**	23	43	51	47	45	20	25	45	42	29	32	22	37	20	41	37	43
Habitat Score as above = #/100		**0.##**	0.23	0.43	0.51	0.47	0.45	0.20	0.25	0.45	0.42	0.29	0.32	0.22	0.37	0.20	0.41	0.37	0.43
Habitat Hectares		**(#.#)**	**0.13**	**0.11**	**0.16**	**0.15**	**0.15**	**0.03**	**0.02**	**0.11**	**0.03**	**0.01**	**0.02**	**0.03**	**0.08**	**0.01**	**0.08**	**0.04**	**0.01**
Bioregion			GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP
EVC Conservation Status			E	V	V	LC	LC	LC	LC	LC	LC	LC	E	E	E	E	E	V	V
Conservation Significance	**Conservation Status x Habitat Score**		High	High	Very High	Low	Low	Low	Low	Low	Low	Low	High	High	High	High	Very High	High	High
	Threatened Species Rating flora		Low	High	Medium	Medium	Medium	Medium	Low	Medium	Medium	Medium	Medium	Medium	Low	Low	Medium	High	High
	Threatened Species Rating fauna		Very High	Very High	Very High	High	High	High	High	High	High	High	High	High	High	High	High	High	High
	Other Site Attribute Rating																		
	Overall Conservation Significance (highest rating)		**Very High**	**Very High**	**Very High**	**High**	**High**	**High**	**High**	**High**	**High**	**High**	**High**	**High**	**High**	**High**	**Very High**	**High**	**High**
Trees within patches	**VLOT**					2	1												
	LOT					5	4					1			3				
	MOT		3			4	12			11	1	1			7		3		

Habitat Zone			52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68
PFI			202221531	202221531	202221531	202221531	202221531	202221531	202221531	203929396	209852237	209852237	BERW CRAN	R151078259	R151078259	R151078259	R206006728	R209708512	R636817
Site ID			2	3	3	3	1	3	4	1	2	1	1	1	2	3	1	1	1
Habitat Zone ID			A	A	B	D	A	C	A	A	A	A	A	A	A	A	A	A	A
EVC Name (Initials)			DSHW	DSHW	DSHW	DSHW	DSHW	DSHW	SS	SW	SS	SW	SRW	HW	HW	HW	SRW	SS	HW
EVC Number			GipP0003	GipP0003	GipP0003	GipP0003	GipP0003	GipP0003	GipP0053_61	GipP0136	GipP0053_61	GipP0136	GipP0083	GipP0048	GipP0048	GipP0048	GipP0083	GipP0053_61	GipP0048
Total Area of Habitat Zone (ha)		**(#.#)**	0.38	3.93	0.41	0.35	0.25	0.15	0.003	0.05	0.01	0.08	0.18	0.04	0.02	0.05	0.02	0.02	0.09
		Max 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	2	0	0	0	0	0	0	0	0	0	0	9	0	0	0	0
	Canopy Cover	**5**	0	2	0	0	0	0	0	0	0	0	4	0	4	4	4	0	0
	Lack of Weeds	**15**	0	7	13	0	0	13	4	4	4	4	0	0	4	4	0	0	7
	Understorey	**25**	5	15	5	5	5	5	5	15	5	15	5	15	5	5	5	10	5
	Recruitment	**10**	5	5	5	5	5	5	0	10	0	10	3	5	0	5	0	0	0
	Organic Matter	**5**	2	5	3	4	2	3	3	0	3	0	4	2	5	5	4	4	5
	Logs	**5**	0	2	0	0	0	0	0	0	0	0	4	0	0	0	0	0	2
	Total Score	**75**	12	38	26	14	12	26	15	39	15	39	20	22	27	23	13	18	19
Landscape Score		**25**	2	2	2	2	2	2	2	2	2	2	2	4	4	4	2	2	4
Habitat Score#		**100**	14	40	28	16	14	28	17	41	17	41	22	26	31	27	15	20	23
Habitat Score as above = #/100		**0.##**	0.14	0.40	0.28	0.16	0.14	0.28	0.17	0.41	0.17	0.41	0.22	0.26	0.31	0.27	0.15	0.20	0.23
Habitat Hectares		**(#.#)**	**0.05**	**1.57**	**0.11**	**0.06**	**0.04**	**0.04**	**0.001**	**0.02**	**0.002**	**0.03**	**0.04**	**0.01**	**0.01**	**0.01**	**0.003**	**0.004**	**0.02**
Bioregion			GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP
EVC Conservation Status			V	V	V	V	V	V	E	V	E	V	E	LC	LC	LC	E	E	LC
Conservation Significance	**Conservation Status x Habitat Score**		Medium	High	Medium	Medium	Medium	Medium	High	High	High	High	High	Low	Low	Low	High	High	Low
	Threatened Species Rating flora		Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Medium	Medium	Medium	Low	Low	Low
	Threatened Species Rating fauna		High	High	High	High	High	High	High	Very High	High	Very High	High	High	High	High	High	High	High
	Other Site Attribute Rating																		
	Overall Conservation Significance (highest rating)		**High**	**High**	**High**	**High**	**High**	**High**	**High**	**Very High**	**High**	**Very High**	**High**	**High**	**High**	**High**	**High**	**High**	**High**
Trees within patches	**VLOT**																		
	LOT														1				
	MOT																		

Appendix 9. Reasoning for 50% best or remaining habitat for threatened flora species

Rare or Threatened Flora species	EPBC	VROT status (DSE, 2005a)	Recorded in present study?	Best or remaining 50% of habitat	A. Is the species, or has the species been recorded as 'resident' on site? *Yes - go to B. No - go to D.*	B. Is it possible to discriminate between the importance of different populations of the species? For example, can numbers be reasonably estimated and is there available knowledge on what are typical populations sizes? *Yes - go to C. No - go to E.*	C. Does the site contain a populations that is above average size or importance for the bioregion? *Yes - Best 50% of habitat. No - remaining 50% of habitat.*	D. Does the habitat on site clearly meet one or more of the habitat requirements of the species? Is it resonable to expect that the species is present or would make significant use of the site in the medium term (eg within the next 10 years) *Yes to both - go to F. No to either - no further consideration required for that species.*	E. Has some form of habitat modelling been undertaken for the species in the bioregion? *Yes - use information to determine Best 50% of habitat or Remaining 50% of habitat. No - go to F.*	F. Does the site represent above-average condition and landscape context for the relevant EVC or habitat type in the region? *Yes - best 50% of habitat. No - remaining 50% of habitat.*
Veined spear-grass *Austrostipa rudis* subsp *australis*		r	Yes	Remaining	Yes, HZs 16, 19 go to B. No go to D	Not possible to discriminate between importance of populations - go to E		Yes, habitat meets requirements, or it is reasonable to expect that the species would occur make reasonable use of HZs 9-12, 15, 16, 18-31, 34, 38-40, 42, 44, 49, 63-65 - Go to F	No - habitat modelling has not been undertaken (to the best of our knowledge).	No to all - remaining 50% habitat.
Floodplain fireweed *Senecio Campylocarpus*		r	Yes	Remaining	Yes, HZ 22 - go to B. No - go to D	Not possible to discriminate between importance of populations - go to E		Yes, habitat meets requirements or it is reasonable to expect that the species would occur make reasonable use of HZs 19-22, 24-27, 29-31, 37, 45, 46, 50, 51 - Go to F	No - habitat modelling has not been undertaken (to the best of our knowledge).	No to all - remaining 50% habitat.
Wetland Blown-grass *Lachnagrostis filiformis* Var 2		k	Yes	Remaining	Yes, HZ 22 - go to B. No go to D	Not possible to discriminate between importance of populations - go to E		Yes, habitat meets requirements, or it is reasonable to expect that the species would occur make reasonable use of HZs 20, 22, 24-27, 29, 36, 50, 51 - go to F.	No - habitat modelling has not been undertaken (to the best of our knowledge).	No to all - remaining 50% habitat.
River Swamp Wallaby-grass *Amphibromus fluitans*	VU		No	Remaining	No - go to D			Yes, habitat meets requirements, or it is reasonable to expect that the species would occur make reasonable use of HZs 20, 22, 24-27, 29, 36, 50, 51 - go to F.	No - habitat modelling has not been undertaken (to the best of our knowledge).	No to all - remaining 50% habitat.

Appendix 10. Methodology for defining faunal 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.

Last rec.	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	
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 2007a)*		
	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* – (DSE 2007a).
	R1	Regional	Regional according to Table 4. *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 2007a). 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* (DSE 2007a).
Regional Significance	Species listed as data deficient or near threatened in Victoria *Advisory List of Threatened Vertebrate Fauna in Victoria* – (DSE 2007a). 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.

Appendix 11. Indigenous fauna records: general & targeted surveys

Investigation Area 42 assessment period: September 2009 to April 2010. Fauna taxa recorded incidentally and during general and targeted searches for threatened fauna from within the study area. Assessment undertaken by Malcolm Legg of Mal's Ecological and Environmental Services and Joanne Henry, Annabelle Stewart, Zorza Goodman and David Nance of Practical Ecology.

		Conservation Status					
Scientific Name	**Common Name**	**EPBC**	**FFG**	**DSE (2007)**	**Regional**	**Type of record**	**Comments**
AMPHIBIANS							
Crinia signifera	Common Froglet					General observations/Spotlighting	Found in dams, drainage-lines and woodland. Also wet areas along roadsides.
Litoria fallax	Eastern Dwarf Tree Frog					Spotlighting/Incidental	Found in a small dam and wet areas. Found near gate.
Litoria peronii	Peron's Tree Frog					General observation	
Litoria ewingii	Southern Brown Tree Frog					General observation/Spotlighting/Incidental	Found in dams, drainage-lines and woodland. Also wet areas along roadsides.
Limnodynastes dumerilii	Southern Bullfrog					General observation/Spotlighting/Incidental	Found in dams, drainage-lines and wet areas of woodland.
Limnodynastes tasmaniensis	Spotted Marsh Frog					General observation/Spotlighting/Incidental/Tin census	Found in dams and drainage-lines. Also wet areas along roadsides.
Limnodynastes peroni	Striped Marsh Frog					General observation/Spotlighting/Incidental/Tin census	Generally found in wet areas and in dams and drainage-lines.
Litoria verreauxii	Verreaux's Tree Frog					Spotlighting/Incidental	Generally found in wet areas and in dams.
Pseudophryne semimarmorata	Southern Toadlet			v		Transects	found in drainage-lines throughout study area
REPTILES							
Tiliqua nigrolutea	Blotched Blue-tongued Lizard					Incidental/active searching	Under rubble.
Tiliqua scincoides	Common Blue-tongued Lizard					Incidental/active searching	Under tin.
Lampropholis delicata	Delicate Skink					Incidental/Tin census	Also recorded under rubbish.
Bassiana duperreyi	Eastern Three-lined Skink					Tin census	
Lampropholis guichenoti	Garden Skink					Incidental/Tin census	Also recorded under rubbish.
Austrelaps superbus	Lowland Copperhead					Previous report	Elliot trap
Saproscincus mustelinus	Weasel Skink					Incidental/Tin census	Also recorded under rubbish.
BIRDS							
Tachybaptus novaehollandiae	Australasian Grebe					Timed bird census/Incidental	Found in dams and pastured habitat.
Gymnorhina tibicen	Australian Magpie					General observations/Timed bird census	Found throughout in heath, woodland and pastured habitat. Found in market garden.
Pelecanus conspicillatus	Australian Pelican					General observations/Timed bird census/Incidental	Found near dams and wetland.
Corvus coronoides	Australian Raven					Timed bird census	Found in pastured habitat.
Anas rhynchotis	Australasian Shoveler			v		General observations	Farm dam in south west corner of 1500 Thompsons Road
Threskiornis molucca	Australian White Ibis					General observations/Timed bird census	Found in wet areas in pastured and woodland habitat.
Chenonetta jubata	Australian Wood Duck					Incidental/Timed bird census	Mostly found in dams and in pastured habitat.
Cygnus atratus	Black Swan					Incidental/Timed bird census	Found in dams.
Coracina novaehollandiae	Black-faced Cuckoo-shrike					Timed bird census	Found in heath and woodland habitats.
Elseyorinis melanops	Black-fronted Dotterel					Timed bird census	Found in dams.
Elanus axillaris	Black-shouldered Kite					Timed bird census	Found over woodland and pastured habitat.
Falco berigora	Brown Falcon					Timed bird census	
Acanthiza pusilla	Brown Thornbill					Timed bird census	Mostly found in woodland habitat but also found in heath and along roadsides.
Anas castanea	Chestnut Teal					General observations	
Acrocephalus stentoreus	Clamorous Reed Warbler					General observations/Timed bird census	Found in dams and along drainage-lines in tall grass.
Phaps chalcoptera	Common Bronzewing					General observations/Timed bird census	Found in woodlands.
Ocyphaps lophotes	Crested Pigeon				R1	General observations/Timed bird census	Mainly in woodlands. Also found in heath and the market gardens.
Gallinula tenebrosa	Dusky Moorhen					Incidental/Timed bird census	Found in dams and wet pastured areas.
Artamus cyanopterus	Dusky Woodswallow					Timed bird census	Found flying over water bodies and woodland habitat.
Platycercus eximius	Eastern Rosella					Timed bird census	Found mainly in woodland and occasional heath habitat.
Eopsaltria australis	Eastern Yellow Robin					Timed bird census	Found in woodlands.
Fulica atra	Eurasian Coot					General observations/Timed bird census	Found near dams.
Hirundo ariel	Fairy Martin					Timed bird census	Found flying over water bodies and woodland habitat.
Cacomantis flabelliformis	Fan-tailed Cuckoo					General observations/Timed bird census	Found in woodlands.
Eolophus roseicapillus	Galah					Timed bird census	
Pachycephala pectoralis	Golden Whistler					Timed bird census	Found in woodland habitat.
Cisticola exilis	Golden-headed Cisticola					Timed bird census	Found in tall grass in pastured habitat.
Cracticus torquatus	Grey Butcherbird					Timed bird census	Found in woodland habitat.
Rhipidura fuliginosa	Grey Fantail					Timed bird census	Found in heath and woodland habitats.
Colluricincla harmonica	Grey Shrike-thrush					Timed bird census	Found in woodland habitat.
Anas gracilis	Grey Teal					Previous report	
Aythya australis	Hardhead					Previous report	
Chrysococcyx basalis	Horsfield's Bronze-Cuckoo					Timed bird census	Found in woodland habitat.

		Conservation Status					
Scientific Name	**Common Name**	**EPBC**	**FFG**	**DSE (2007)**	**Regional**	**Type of record**	**Comments**
Cacatua sanguinea	Little Corella					Timed bird census	Found in heath and woodland habitat.
Megalurus gramineus	Little Grassbird					General observations/Timed bird census	Found near dams, in tall grass and in pastured habitat.
Phalacrocorax melanoleucos	Little Pied Cormorant					Timed bird census	Found near a dam.
Corvus mellori	Little Raven					General observations/Timed bird census	Found throughout in pastured, heath and woodland habitat. Found at the market garden.
Grallina cyanoleura	Magpie-lark					General observations/Timed bird census	Found throughout in pastured, heath and woodland habitat. Found in open areas and at the
Vanellus miles	Masked Lapwing					Timed bird census	Found in pastured habitat.
Dicaeum hirundinaceum	Mistletoebird					Previous report	
Falco cenchroides	Nankeen Kestrel					General observations/Timed bird census	Found over pastured habitat.
Phylidonyris novaehollandiae	New Holland Honeyeater					Timed bird census	Found in woodland habitat.
Manorina melanocephala	Noisy Miner					General observations/Timed bird census	Found in heath and woodland habitat.
Oriolus sagittatus	Olive-backed Oriole					Previous report	
Anas supoerciliosa	Pacific Black Duck					Incidental/General observations/Timed bird census	Found in wet pastured habitat and in dams.
Cuculus pallidus	Pallid Cuckoo					Timed bird census	Found in woodland habitat.
Falco peregrinus	Peregrine Falcon					General observations	
Porphyrio porphyrio	Purple Swamphen					Incidental/General observations/Timed bird census	Found in pastured habitat and in dams.
Trichoglossus haematodus	Rainbow Lorikeet					Timed bird census	Found in pastured and woodland habitat.
Anthochaera carunculata	Red Wattlebird					Timed bird census	Found in heath and woodland habitat. Also found along roadsides.
Neochmia temporalis	Red-browed Finch					General observations/Timed bird census	Found bathing near heath.
Platalea regia	Royal Spoonbill			v		General observations/Timed bird census	Seen wading in old quarry dam.
Cincloramphus mathewsi	Rufous songlark				R1	General observations/Timed bird census	Found in woodland habitat and along roadsides.
Pachycephala rufiventris	Rufous Whistler					Timed bird census	Found in woodland habitat.
Chrysococcyx lucidus	Shining Bronze-Cuckoo					Previous report	
Zosterops lateralis	Silvereye					Timed bird census	Found in heath and woodland habitat.
Pardalotus punctatus	Spotted Pardalote					Previous report	
Threskiornis spinicollis	Straw-necked Ibis					Incidental/General observations/Timed bird census	Mostly in pastured habitat and in open areas.
Coturnix pectoralis	Stubble Quail					Timed bird census	Flushed.
Cacatua galerita	Sulphur-crested Cockatoo					Timed bird census	
Malurus cyaneus	Superb Fairy-wren					General observations/Timed bird census	Found in heath and woodland habitat. Also found using Gorse.
Podargus strigoides	Tawny Frogmouth					Spotlighting	Found in heath and woodland habitat.
Hirundo nigricans	Tree Martin					Previous report	
Hirundo neoxena	Welcome Swallow					Timed bird census	Mostly in woodland habitat. Also in heath habitat.
Haliastur sphenurus	Whistling Kite					Timed bird census	Found flying and in Eucalypts.
Sericornis frontalis	White-browed Scrubwren					Timed bird census	Found in heath and woodland habitat.
Egretta novaehollandiae	White-faced Heron					General observations/Timed bird census	Found near water and in dams. Also found in woodland habitat.
Ardea pacifica	White-necked Heron					General observations/Timed bird census	Found in pastured habitat and near water.
Lichenostomus penicillatus	White-plumed Honeyeater					Timed bird census	Found in woodland habitat.
Rhipidura leucophrys	Willie Wagtail					General observations/Timed bird census	Found in pastured, heath and woodland habitat.
Acanthiza chrysorrhoa	Yellow-rumped Thornbill					General observations/Timed bird census	Found in heath and woodland habitat. Also found using Gorse.
Calyptorhynchus funereus	Yellow-tailed Black-Cockatoo					General observations/Timed bird census	Found in heath and woodland habitat. Found in Eucalypts.
FISH							
Galaxias maculatus	Common Galaxias					Light trap	In drainage-line and wetland
MAMMALS							
Chalinolobus morio	Chocolate Wattled Bat					Bat detector	
Trichosurus vulpecula	Common Brushtail Possum					Spotlighting	Found in woodland habitat.
Pseudocheirus peregrinus	Common Ringtail Possum					General observations/Spotlighting	Found in woodland habitat. Dreys seen in trees.
Vespadelus sp	Forest Bat sp					Bat detector	Identified to call complex
Chalinolobus gouldii	Gould's Wattled Bat					Bat detector	
Vespadelus darlingtoni	Large Forest Bat					Bat detector	
Nyctophilus sp	Long-eared Bat					Bat detector	Identified to call complex
Vespadelus vulturnus	Little Forest Bat					Bat detector	
Mormopterus	Mormopterus spp					Bat detector	Identified to call complex
Mormopterus sp4	Southern Freetail bat					Bat detector	
Petaurus breviceps	Sugar Glider					Spotlighting	Found in woodland habitat.
Rattus lutreolus ssp. Lutreolus	Swamp Rat					Incidental	Runways and mounds.
Unidentified bat	Unidentified bat					Incidental/Spotlighting	Found throughout in heath and woodland habitat. Also flying over water.
Tadarida australis	White-striped Freetail Bat					Bat detector/Spotlighting	Found throughout in heath and woodland habitat. Also flying over water.

Appendix 12. Exotic fauna species recorded: general and targeted surveys

Investigation Area 42 assessment period: September 2009 to April 2010. Fauna taxa recorded incidentally and during general and targeted searches for threatened fauna from within the study area. Assessment undertaken by Malcolm Legg of Mal's Ecological and Environmental Services and Joanne Henry, Annabelle Stewart, Zorza Goodman and David Nance of Practical Ecology.

Scientific Name	Common Name	Type of record	Comments
BIRDS			
**Turdus merula*	Common Blackbird	General observations/Timed bird census	Found throughout in heath, woodland and open areas. Found in market garden.
**Acridotheres tristis*	Common Myna	General observations/Timed bird census	Found throughout the site in heath, woodland, open areas and pastured habitat. Found in market garden.
**Sturnus vulgaris*	Common Starling	General observations/Timed bird census	Found throughout the site in heath, woodland, open areas and pastured habitat. Found in market garden.
**Carduelis carduelis*	European Goldfinch	General observations/Timed bird census	Found in heath, woodland and pastured habitat. Also along roadsides.
**Carduelis chloris*	European greenfinch	Timed bird census	
**Alaudia arvensis*	European Skylark	General observations/Timed bird census	Found in pastured habitat.
**Passer domesticus*	House Sparrow	Timed bird census	Found in market garden
**Columba livia*	Rock Dove	General observations/Timed bird census	Found in woodlands
**Streptopelia chinensis*	Spotted Turtle-Dove	General observations/Timed bird census	Found throughout the site in heath, woodland and pastured habitat.Found in market garden.
FISH			
**Gambusia holbrooki*	Eastern Gambusia	Fish survey/Baited fish trap	
**Carassius auratus*	Goldfish	Baited light traps	
MAMMALS			
**Rattus rattus*	Black Rat	Elliott trap	
**Felis catus*	Cat	Spotlighting/Incidental	Scats found throughout the site. Observed in heath, woodland and pasture habitats.
**Oryctolagus cunniculus*	European Rabbit	Spotlighting/Incidental	Scats found throughout the site. Observed in heath, woodland and pasture habitats.
**Mus musculus*	House Mouse	Elliott trap/Tin census	
**Vulpes vulpes*	Red Fox	Observation/Spotlighting	Scats and tracks found throughout the site. Observed in heath, woodland and pasture habitats.

Appendix 13. Fauna recorded during targeted and general fauna survey within each property

Investigation Area 42 assessment period: September 2009 to April 2010. Fauna taxa recorded incidentally and during general and targeted searches for threatened fauna from within the study area. Assessment undertaken by Malcolm Legg of Mal's Ecological and Environmental Services and Joanne Henry, Annabelle Stewart, Zorza Goodman and David Nance of Practical Ecology.

Site 1 - 1450 Thompsons Road	
Common Name	**Scientific Name**
BIRDS	
Australian Magpie	*Gymnorhina tibicen*
Common Myna	**Acridotheres tristis*
Common Starling	**Sturnus vulgaris*
Crested Pigeon	*Ocyphaps lophotes*
House Sparrow	**Passer domesticus*
Little Raven	*Corvus mellori*
Magpie-lark	*Grallina cyanoleura*
Spotted Turtle-Dove	**Streptopelia chinensis*
Straw-necked Ibis	*Threskiornis spinicollis*

Site 2 - 1468 Thompsons Rd	
Common Name	**Scientific Name**
AMPHIBIANS	
Common Froglet	*Crinia signifera*
Spotted Marsh Frog	*Limnodynastes tasmaniensis*
BIRDS	
Australasian Grebe	*Tachybaptus novaehollandiae*
Australian Magpie	*Gymnorhina tibicen*
Australian Pelican	*Pelecanus conspicillatus*
Australian Raven	*Corvus coronoides*
Australian Wood Duck	*Chenonetta jubata*
Brown Falcon	*Falco berigora*
Brown Thornbill	*Acanthiza pusilla*
Clamorous Reed Warbler	*Acrocephalus stentoreus*
Common Blackbird	**Turdus merula*
Common Bronzewing	*Phaps chalcoptera*
Common Myna	**Acridotheres tristis*
Common Starling	**Sturnus vulgaris*
Crested Pigeon	*Ocyphaps lophotes*
Dusky Moorhen	*Gallinula tenebrosa*
Eurasian Coot	*Fulica atra*
European Skylark	**Alauda arvensis*
Fairy Martin	*Hirundo ariel*
Golden-headed Cisticola	*Cisticola exilis*
Grey Fantail	*Rhipidura fuliginosa*
Little Grassbird	*Megalurus gramineus*
Little Raven	*Corvus mellori*
Magpie-lark	*Grallina cyanoleura*
Noisy Miner	*Manorina melanocephala*
Pacific Black Duck	*Anas superciliosa*
Purple Swamphen	*Porphyrio porphyrio*

Rainbow Lorikeet	*Trichoglossus haematodus*
Site 2 - 1468 Thompsons Rd	
Common Name	**Scientific Name**
Red Wattlebird	*Anthochaera carunculata*
Rufous songlark	*Cincloramphus mathewsi*
Spotted Turtle-Dove	**Streptopelia chinensis*
Straw-necked Ibis	*Threskiornis spinicollis*
Superb Fairy-wren	*Malurus cyaneus*
Welcome Swallow	*Hirundo neoxena*
Whistling Kite	*Haliastur sphenurus*
White-faced Heron	*Egretta novaehollandiae*
White-necked heron	*Ardea pacifica*
White-plumed Honeyeater	*Lichenostomus penicillatus*
Willie Wagtail	*Rhipidura leucophrys*
Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*
Yellow-tailed Black-Cockatoo	*Calyptorhynchus funereus*
MAMMALS	
INTRODUCED MAMMALS	
Red Fox	**Vulpes vulpes*

Site 3 - 1520 Thompsons Road, Cranbourne East	
Common Name	**Scientific Name**
AMPHIBIANS	
Common Froglet	*Crinia signifera*
Eastern Dwarf Tree Frog#	*Litoria fallax*
Peron's Tree Frog	*Litoria peronii*
Southern Brown Tree Frog	*Litoria ewingii*
Southern Bullfrog	*Limnodynastes dumerilii*
Spotted Marsh Frog	*Limnodynastes tasmaniensis*
Striped Marsh Frog	*Limnodynastes peronii*
Verreaux's Tree Frog	*Litoria verreauxii*
Southern Toadlet	*Psuedophryne semimarmorata*
REPTILES	
Blotched Blue-tongued Lizard	*Tiliqua nigrulutea*
Common Blue-tongued Lizard	*Tiliqua scincoides*
Delicate Skink	*Lampropholis delicata*
Eastern Three-lined Skink	*Bassiana duperreyi*
Garden Skink	*Lampropholis guichenoti*
Lowland Copperhead	*Austrelpas superbus*
BIRDS	
Australasian Grebe	*Tachybaptus novaehollandiae*
Australian Magpie	*Gymnorhina tibicen*
Australian Raven	*Corvus coronoides*
Australasian Shoveler	*Anas rhynchotis*
Australian White Ibis	*Threskiornis molucca*
Australian Wood Duck	*Chenonetta jubata*
Black-shouldered Kite	*Elanus axillaris*
Brown Thornbill	*Acanthiza pusilla*
Chestnut teal	*Anas castanea*
Common Blackbird	**Turdus merula*
Common Bronzewing	*Phaps chalcoptera*
Common Myna	**Acridotheres tristis*
Common Starling	**Sturnus vulgaris*
Crested Pigeon	*Ocyphaps lophotes*

Dusky Woodswallow	*Artamus cyanopterus*
Eastern Rosella	*Platycercus eximius*
Site 3 - 1520 Thompsons Road, Cranbourne East	
Common Name	**Scientific Name**
Eastern Yellow Robin	*Eopsaltria australis*
Eurasian Coot	*Fulica atra*
European Skylark	**Alauda arvensis*
Fairy Martin	*Hirundo ariel*
Fan-tailed Cuckoo	*Cacomantis flabelliformis*
Golden Whistler	*Pachycephala pectoralis*
Grey Butcherbird	*Cracticus torquatus*
Grey fantail	*Rhipidura albiscarpa*
Grey Shrike-thrush	*Colluricincla harmonica*
Horsfield's Bronze-Cuckoo	*Chrysococcyx basalis*
Little Raven	*Corvus mellori*
Magpie-lark	*Grallina cyanoleura*
Masked Lapwing	*Vanellus miles*
Nankeen Kestrel	*Falco cenchroides*
New Holland Honeyeater	*Phylidonyris novaehollandiae*
Noisy Miner	*Manorina melanocephala*
Pacific Black Duck	*Anas supoerciliosa*
Pallid Cuckoo	*Cuculus pallidus*
Peregrine Falcon	*Falco peregrinus*
Purple Swamphen	*Porphyrio porphyrio*
Red Wattlebird	*Anthochaera carunculata*
Red-browed Finch	*Neochmia temporalis*
Rock Dove	**Columba livia*
Royal Spoonbill	*Platalea regia*
Rufous Whistler	*Pachycephala rufiventris*
Silvereye	*Zosterops lateralis*
Spotted Turtle-Dove	**Streptopelia chinensis*
Straw-necked Ibis	*Threskiornis spinicollis*
Stubble Quail	*Coturnix pectoralis*
Superb Fairy-wren	*Malurus cyaneus*
Tawny Frogmouth	*Podargus strigoides*
Welcome Swallow	*Hirundo neoxena*
Whistling Kite	*Haliastur sphenurus*
White-browed Scrubwren	*Sericornis frontalis*
White-faced heron	*Egretta novaehollandiae*
White-necked heron	*Ardea pacifica*
White-plumed Honeyeater	*Lichenostomus penicillatus*
Willie wagtail	*Rhipidura leucophrys*
Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*
Yellow-tailed Black-Cockatoo	*Calyptorhynchus funereus*
FISH	
Goldfish	**Carassius auratus*
MAMMALS	
Chocolate Wattled Bat	*Chalinolobus morio*
Common Brushtail Possum	*Trichosurus vulpecula*
Common Ringtail Possum	*Pseudocheirus peregrinus*
Gould's Wattled Bat	*Chalinolobus gouldii*
Large Forest Bat	*Vespadelus darlingtoni*
Long-eared Bat	*Nyctophilus sp*
Little Forest Bat	*Vespadelus vulturnus*
Sugar Glider	*Petaurus breviceps*

Swamp Rat	*Rattus lutreolus*
Unidentified Bat	*Chalinolobus gouldi/Mormopterus sp2* or *sp4*
Unidentified Bat	*Mormopterus sp2* or *sp4*

Site 3 - 1520 Thompsons Road, Cranbourne East	
Common Name	**Scientific Name**
Unidentified Bat	*Vespadelus darlingtoni/V. Regulus/V. vulturnus*
White-striped Freetail Bat	*Tadarida australis*
INTRODUCED MAMMALS	
Black Rat	**Rattus rattus*
Cat	**Felis catus*
European Rabbit	**Oryctolagus cunniculus*
House Mouse	**Mus musculus*
Red Fox	**Vulpes vulpes*

Site 4 - 1550 Thompsons Road	
Common Name	**Scientific Name**
AMPHIBIANS	
Common Froglet	*Crinia signifera*
Spotted Marsh Frog	*Limnodynastes tasmaniensis*
BIRDS	
Brown Thornbill	*Acanthiza pusilla*
Common Blackbird	**Turdus merula*
Common Myna	**Acridotheres tristis*
Common Starling	**Sturnus vulgaris*
Dusky Moorhen	*Gallinula tenebrosa*
Eastern Rosella	*Platycercus eximius*
Eastern Yellow Robin	*Eopsaltria australis*
Little Raven	*Corvus mellori*
Magpie-lark	*Grallina cyanoleura*
New Holland Honeyeater	*Phylidonyris novaehollandiae*
Red Wattlebird	*Anthochaera carunculata*
Silvereye	*Zosterops lateralis*
Spotted Turtle-Dove	**Streptopelia chinensis*
Straw-necked Ibis	*Threskiornis spinicollis*
Superb Fairy-wren	*Malurus cyaneus*
White-browed Scrubwren	*Sericornis frontalis*
White-plumed Honeyeater	*Lichenostomus penicillatus*
Willie wagtail	*Rhipidura leucophrys*
Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*
INTRODUCED MAMMALS	
Red Fox	**Vulpes vulpes*

Site 5 - 1568 Thompsons Rd Cranbourne East	
Common Name	**Scientific Name**
AMPHIBIANS	
Common Froglet	*Crinia signifera*
Southern Brown Tree Frog	*Litoria ewingii*
Spotted Marsh Frog	*Limnodynastes tasmaniensis*
BIRDS	
Common Blackbird	**Turdus merula*
Common Myna	**Acridotheres tristis*
Common Starling	**Sturnus vulgaris*
European Skylark	**Alauda arvensis*
Grey Butcherbird	*Cracticus torquatus*

Little Raven	*Corvus mellori*
Magpie-lark	*Grallina cyanoleura*
Pacific Black Duck	*Anas supoerciliosa*
Red Wattlebird	*Anthochaera carunculata*

Site 5 - 1568 Thompsons Rd Cranbourne East	
Common Name	**Scientific Name**
Rufous Songlark	*Cincloramphus mathewsi*
Spotted Turtle-Dove	**Streptopelia chinensis*
Straw-necked Ibis	*Threskiornis spinicollis*
Willie Wagtail	*Rhipidura leucophrys*

Site 6 - 1580 Thompsons Road	
Common Name	**Scientific Name**
AMPHIBIANS	
Common Froglet	*Crinia signifera*
Southern Brown Treefrog	*Litoria ewingii*
Spotted Marsh Frog	*Limnodynastes tasmaniensis*
Striped Marsh Frog	*Limnodynastes peronii*
BIRDS	
Australian Magpie	*Gymnorhina tibicen*
Australian White Ibis	*Threskiornis molucca*
Australian Wood Duck	*Chenonetta jubata*
Black-shouldered Kite	*Elanus axillaris*
Brown Thornbill	*Acanthiza pusilla*
Common Myna	**Acridotheres tristis*
Common Starling	**Sturnus vulgaris*
European Goldfinch	**Carduelis carduelis*
European Skylark	**Alauda arvensis*
Little Grassbird	*Megalurus gramineus*
Little Raven	*Corvus mellori*
Magpie-lark	*Grallina cyanoleura*
Nankeen Kestrel	*Falco cenchroides*
Pacific Black Duck	*Anas supoerciliosa*
Red Wattlebird	*Anthochaera carunculata*
Rufous songlark	*Cincloramphus mathewsi*
Spotted Turtle-Dove	**Streptopelia chinensis*
Straw-necked Ibis	*Threskiornis spinicollis*
Welcome Swallow	*Hirundo neoxena*
Whistling Kite	*Haliastur sphenurus*
White-faced heron	*Egretta novaehollandiae*
Yellow-rumped thornbill	*Acanthiza chrysorrhoa*
Yellow-tailed Black-Cockatoo	*Calyptorhynchus funereus*
INTRODUCED MAMMALS	
Red Fox	**Vulpes vulpes*

Site 7 - 1660 Thompson Rd, Cranbourne East	
Common Name	**Scientific Name**
AMPHIBIANS	
Common Froglet	*Crinia signifera*
Spotted Marsh Frog	*Limnodynastes tasmaniensis*
BIRDS	
Australian Magpie	*Gymnorhina tibicen*

Common Myna	**Acridotheres tristis*
Common Starling	**Sturnus vulgaris*
European Goldfinch	**Carduelis carduelis*
European Greenfinch	**Carduelis chloris*
European Skylark	**Alauda arvensis*
Site 7 - 1660 Thompson Rd, Cranbourne East	
Common Name	**Scientific Name**
Grey Butcherbird	*Cracticus torquatus*
Little Raven	*Corvus mellori*
Magpie-lark	*Grallina cyanoleura*
Rufous Songlark	*Cincloramphus mathewsi*
Straw-necked Ibis	*Threskiornis spinicollis*
Willie Wagtail	*Rhipidura leucophrys*
MAMMALS	
Common Ringtail Possum	*Pseudocheirus peregrinus*
Site 8 - 2/585 Berwick-Cranbourne Road	
Common Name	**Scientific Name**
REPTILES	
Blotched Blue-tongued Lizard	*Tiliqua nigrolutea*
BIRDS	
Australian Magpie	*Gymnorhina tibicen*
Australian White Ibis	*Threskiornis molucca*
Black-faced Cuckoo-shrike	*Coracina novaehollandiae*
Brown Thornbill	*Acanthiza pusilla*
Common Blackbird	**Turdus merula*
Common Bronzewing	*Phaps chalcoptera*
Common Myna	**Acridotheres tristis*
Common Starling	**Sturnus vulgaris*
Crested Pigeon	*Ocyphaps lophotes*
Eastern Rosella	*Platycercus eximius*
European Goldfinch	**Carduelis carduelis*
European Skylark	**Alauda arvensis*
Fan-tailed Cuckoo	*Cacomantis flabelliformis*
Grey fantail	*Rhipidura albiscarpa*
Little Corella	*Cacatua sanguinea*
Little Raven	*Corvus mellori*
Magpie-lark	*Grallina cyanoleura*
Masked Lapwing	*Vanellus miles*
Nankeen Kestrel	*Falco cenchroides*
Noisy Miner	*Manorina melanocephala*
Red Wattlebird	*Anthochaera carunculata*
Rock Dove	**Columba livia*
Rufous songlark	*Cincloramphus mathewsi*
Silvereye	*Zosterops lateralis*
Spotted Turtle-Dove	**Streptopelia chinensis*
Straw-necked Ibis	*Threskiornis spinicollis*
Superb Fairy-wren	*Malurus cyaneus*
Tawny Frogmouth	*Podargus strigoides*
Welcome Swallow	*Hirundo neoxena*
White-browed Scrubwren	*Sericornis frontalis*
Willie Wagtail	*Rhipidura leucophrys*
Yellow-rumped thornbill	*Acanthiza chrysorrhoa*
Yellow-tailed Black-Cockatoo	*Calyptorhynchus funereus*

MAMMALS	
Gould's Wattled Bat	*Chalinolobus gouldii*
Little Forest Bat	*Vespadelus vulturnus*
Southern Freetail bat	*Mormopterus sp4*
Unidentified Bat	*Chalinolobus gouldi/Mormopterus sp2* or *sp4*
Unidentified Bat	*Vespadelus vulturnus/Chalinolobus morio*

Site 8 - 2/585 Berwick-Cranbourne Road	
Common Name	**Scientific Name**
Unidentified Bat	*Vespadelus darlingtoni/V. Regulus/V. vulturnus*
INTRODUCED MAMMALS	
Cat	**Felis catus*
European Rabbit	**Oryctolagus cunniculus*
House Mouse	**Mus musculus*
Red Fox	**Vulpes vulpes*

Site 9 - 350 Narre Warren Road	
Common Name	**Scientific Name**
AMPHIBIANS	
Common Froglet	*Crinia signifera*
Southern Brown Tree Frog	*Litoria ewingii*
Spotted Marsh Frog	*Limnodynastes tasmaniensis*
BIRDS	
Australian Magpie	*Gymnorhina tibicen*
Black-shouldered Kite	*Elanus axillaris*
Common Myna	**Acridotheres tristis*
Common Starling	**Sturnus vulgaris*
European Goldfinch	**Carduelis carduelis*
European Skylark	**Alauda arvensis*
Galah	*Eolophus roseicapillus*
Grey Butcherbird	*Cracticus torquatus*
Little Corella	*Cacatua sanguinea*
Little Raven	*Corvus mellori*
Magpie-lark	*Grallina cyanoleura*
Rainbow Lorikeet	*Trichoglossus haematodus*
Red Wattlebird	*Anthochaera carunculata*
Spotted Turtle-Dove	**Streptopelia chinensis*
Straw-necked Ibis	*Threskiornis spinicollis*
Sulphur-crested Cockatoo	*Cacatua galerita*
White-necked heron	*Ardea pacifica*
MAMMALS	
INTRODUCED MAMMALS	
Red Fox	**Vulpes vulpes*

Site 10 - 545 Berwick-Cranbourne Road	
Common Name	**Scientific Name**
BIRDS	
Australian Magpie	*Gymnorhina tibicen*
Australian White Ibis	*Threskiornis molucca*
Common Myna	**Acridotheres tristis*
Common Starling	**Sturnus vulgaris*
European Skylark	**Alauda arvensis*
Little Raven	*Corvus mellori*
Magpie-lark	*Grallina cyanoleura*

Nankeen Kestrel	*Falco cenchroides*
Rainbow Lorikeet	*Trichoglossus haematodus*
Straw-necked Ibis	*Threskiornis spinicollis*

Site 11 - 60S Cornwell Cres Common Name	Scientific Name
AMPHIBIANS	
Common Froglet	*Crinia signifera*
Southern Brown Tree Frog	*Litoria ewingii*
Southern Bullfrog	*Limnodynastes dumerilii*
Spotted Marsh Frog	*Limnodynastes tasmaniensis*
Striped Marsh Frog	*Limnodynastes peronii*
REPTILES	
Delicate Skink	*Lampropholis delicata*
Garden Skink	*Lampropholis guichenoti*
Weasel Skink	*Saproscincus mustelinus*
BIRDS	
Australasian Grebe	*Tachybaptus novaehollandiae*
Australian Magpie	*Gymnorhina tibicen*
Australian Pelican	*Pelecanus conspicillatus*
Australian Raven	*Corvus coronoides*
Australian White Ibis	*Threskiornis molucca*
Australian Wood Duck	*Chenonetta jubata*
Black Swan	*Cygnus atratus*
Black-fronted Dotterel	*Elseyornis melanops*
Chestnut teal	*Anas castanea*
Clamorous Reed Warbler	*Acrocephalus stentoreus*
Common Myna	**Acridotheres tristis*
Common Starling	**Sturnus vulgaris*
Dusky Moorhen	*Gallinula tenebrosa*
Eurasian Coot	*Fulica atra*
European Skylark	**Alauda arvensis*
Fairy Martin	*Hirundo ariel*
Golden-headed Cisticola	*Cisticola exilis*
Little Grassbird	*Megalurus gramineus*
Little Pied Cormorant	*Microcarbo melanoleucos*
Little Raven	*Corvus mellori*
Magpie-lark	*Grallina cyanoleura*
Nankeen Kestrel	*Falco cenchroides*
Pacific Black Duck	*Anas superciliosa*
Purple Swamphen	*Porphyrio porphyrio*
Rainbow Lorikeet	*Trichoglossus haematodus*
Spotted Turtle-Dove	**Streptopelia chinensis*
Straw-necked Ibis	*Threskiornis spinicollis*
Superb Fairy-wren	*Malurus cyaneus*
Welcome Swallow	*Hirundo neoxena*
White-faced Heron	*Egretta novaehollandiae*
Willie Wagtail	*Rhipidura leucophrys*
Yellow-rumped thornbill	*Acanthiza chrysorrhoa*
FISH	
Common Galaxias	*Galaxias maculatus*
Eastern Gambusia	**Gambusia holbrooki*

MAMMALS	
Gould's Wattled Bat	*Chalinolobus gouldii*
Unidentified Bat	*Chalinolobus gouldi/Mormopterus sp2* or *sp4*
Unidentified Bat	*Mormopterus sp2* or *sp4*
Unidentified Bat	*Vespadelus darlingtoni/V. Regulus/V. vulturnus*
White-striped Freetail Bat	*Tadarida australis*
INTRODUCED MAMMALS	
Cat	**Felis catus*
European Rabbit	**Oryctolagus cunniculus*
House Mouse	**Mus musculus*
Red Fox	**Vulpes vulpes*

Site 12 - Thompsons Rd (near quarry)	
Common Name	**Scientific Name**
AMPHIBIANS	
Peron's Tree Frog	*Litoria peronii*
Southern Bullfrog	*Limnodynastes dumerilii*
Striped marsh frog	*Limnodynastes peronii*
REPTILES	
Garden Skink	*Lampropholis guichenoti*
BIRDS	
Australian Magpie	*Gymnorhina tibicen*
Common Blackbird	**Turdus merula*
Common Myna	**Acridotheres tristis*
Common Starling	**Sturnus vulgaris*
Magpie-lark	*Grallina cyanoleura*
Rufous songlark	*Cincloramphus mathewsi*
Straw-necked Ibis	*Threskiornis spinicollis*
White-faced heron	*Egretta novaehollandiae*
White-plumed Honeyeater	*Lichenostomus penicillatus*
Willie wagtail	*Rhipidura leucophrys*

Site 12 - Thompsons Rd (near quarry)	
Common Name	**Scientific Name**
BIRDS	
Australian magpie	*Gymnorhina tibicen*
Common blackbird	*Turdus merula*
Common myna	*Acridotheres tristis*
Common starling	*Sturnus vulgaris*
Crested Pigeon	*Ocyphaps lophotes*
House Sparrow	*Passer domesticus*
Little Raven	*Corvus mellori*
Magpie-lark	*Grallina cyanoleuca*
Spotted Turtle-dove	*Streptopelia chinensis*
Straw-necked Ibis	*Threskiornis spinicollis*

*Denotes introduced species

# Denotes non-indigenous native

Appendix 14. Invertebrate species recorded: general and targeted surveys

Invertebrate species recorded during the current assessment, surveys carried out between November 2009 and January 2010. Field work and identification undertaken by Zorza Goodman.

CLASS	ORDER	COMMON NAME	FAMILY or SPECIES	Number of Individuals
Insecta	Blattodea	Cockroach 1	Unknown	1
Arachnida	Araneae	Spider 13	Lycosidae	19
Arachnida	Araneae	Spider 14	Thomisidae	1
Arachnida	Araneae	Spider 15	Unknownn	1
Arachnida	Araneae	Spider 16	Unknownn	1
Arachnida	Araneae	Spider 17	Unknownn	2
Arachnida	Araneae	Spider 18	Tetragnathidae	2
Arachnida	Araneae	Spider 19	Miturgidae	1
Arachnida	Araneae	Spider 20	Unknownn	1
Arachnida	Araneae	Spider 21	Unknownn	1
Arachnida	Araneae	Spider 22	Aranenae	2
Arachnida	Araneae	Spider 23	Unknownn	1
Arachnida	Araneae	Spider 24	Salticidae	1
Arachnida	Araneae	Spider 25	Unknownn	1
Arachnida	Araneae	Spider 26	Unknownn	1
Arachnida	Araneae	Spider 27	Aranenae	1
Arachnida	Araneae	Spider 28	Unknownn	1
Arachnida	Araneae	Spider 29	Unknownn	1
Arachnida	Araneae	Spider 31	Sparassidae	1
Insecta	Coleoptera	Weevil 1	Superfamily Curculionidea	1
Insecta	Coleoptera	Weevil 2	Superfamily Curculionidea	2
Insecta	Coleoptera	Weevil 3	Superfamily Curculionidea	1
Insecta	Coleoptera	Weevil 4	Superfamily Curculionidea	3
Insecta	Coleoptera	Weevil 5	Superfamily Curculionidea	1
Insecta	Coleoptera	Ladybug 4	Superfamily Coccinellidae	1
Insecta	Coleoptera	Beetle 1	Unknown	4
Insecta	Coleoptera	Beetle 4	Unknown	4
Insecta	Coleoptera	Beetle 7	Unknown	2
Insecta	Coleoptera	Beetle 8	Unknown	1
Insecta	Coleoptera	Beetle 9	Unknown	1
Insecta	Coleoptera	Beetle 10	Unknown	1
Insecta	Coleoptera	Beetle 11	Unknown	2
Insecta	Coleoptera	Beetle 12	Unknown	1
Insecta	Coleoptera	Beetle 13	Unknown	1
Insecta	Coleoptera	Beetle 14	Unknown	3
Insecta	Coleoptera	Beetle 16	Unknown	1
Insecta	Coleoptera	Beetle 17	Unknown	2
Insecta	Coleoptera	Beetle 18	Unknown	1
Insecta	Coleoptera	Beetle 20	Unknown	1
Insecta	Coleoptera	Beetle 21	Unknown	1
Insecta	Coleoptera	Beetle 22	Unknown	1
Insecta	Coleoptera	Beetle 23	Unknown	2
Insecta	Coleoptera	Beetle 24	Corixidae	4
Insecta	Coleoptera	Beetle 25	Sp. Onychohydrus suteueris	1
Insecta	Coleoptera	Beetle 26	Dytiscidae	2
Insecta	Coleoptera	Beetle 27	Unknown	1
Insecta	Dermaptera	Earwig 1	Unknown	1
Insecta	Diptera	Mosquito 4	Unknown	1
Insecta	Diptera	Fly 1	Unknown	9
Insecta	Diptera	Fly 4	Unknown	1
Insecta	Diptera	Fly 7	Unknown	1

CLASS	ORDER	COMMON NAME	FAMILY or SPECIES	Number of Individuals
Insecta	Diptera	Fly 9	Unknown	21
Insecta	Diptera	Fly 12	Unknown	1
Insecta	Diptera	Fly 15	Unknown	40
Insecta	Diptera	Fly 22	Unknown	2
Insecta	Diptera	Fly 23	Unknown	1
Insecta	Diptera	Fly 24	Unknown	1
Insecta	Diptera	Fly 25	Unknown	1
Insecta	Diptera	Fly 26	Unknown	1
Insecta	Diptera	Fly 27	Unknown	1
Insecta	Diptera	Fly 28	Unknown	1
Insecta	Diptera	Fly 29	Unknown	2
Insecta	Diptera	Fly 30	Unknown	1
Insecta	Diptera	Fly 36	Unknown	1
Insecta	Diptera	Fly 37	Unknown	1
Insecta	Diptera	Fly 38	Unknown	1
Insecta	Diptera	Fly 39	Unknown	1
Insecta	Diptera	Fly 40	Unknown	3
Insecta	Diptera	Fly 41	Unknown	2
Insecta	Diptera	Fly 42	Unknown	1
Insecta	Diptera	Fly 43	Unknown	11
Insecta	Diptera	Fly 44	Unknown	1
Insecta	Diptera	Fly 45	Unknown	1
Insecta	Diptera	Fly 46	Unknown	1
Insecta	Diptera	Fly 47	Unknown	1
Insecta	Diptera	Fly 48	Unknown	2
Insecta	Diptera	Fly 49	Unknown	1
Insecta	Diptera	Fly 50	Unknown	2
Insecta	Diptera	Fly 51	Unknown	1
Insecta	Diptera	Fly 52	Unknown	1
Insecta	Diptera	Fly 53	Unknown	2
Insecta	Diptera	Fly 54	Unknown	1
Insecta	Hemiptera	Cicada 1	Unknown	1
Insecta	Hemiptera	Sheildbug 1	Unknown	1
Insecta	Hemiptera	Sheildbug 2	Unknown	1
Insecta	Hemiptera	Sheildbug 4	Unknown	1
Insecta	Hemiptera	Sheildbug 5	Unknown	3
Insecta	Hemiptera	Sheildbug 6	Unknown	1
Insecta	Hemiptera	Sheildbug 7	Unknown	1
Insecta	Hemiptera	Aphid 1	Unknown	1
Insecta	Hemiptera	Sucker 5	Unknown	1
Insecta	Hemiptera	Sucker 6	Unknown	4
Insecta	Hemiptera	Sucker 8	Unknown	1
Insecta	Hemiptera	Sucker 9	Unknown	1
Insecta	Hemiptera	Sucker 10	Unknown	6
Insecta	Hemiptera	Sucker 11	Unknown	1
Insecta	Hemiptera	Sucker 12	Unknown	7
Insecta	Hemiptera	Sucker 13	Unknown	16
Insecta	Hemiptera	Sucker 14	Unknown	1
Insecta	Hemiptera	Sucker 15	Unknown	6
Insecta	Hemiptera	Sucker 16	Unknown	3
Insecta	Hymenoptera	Ant 4	Unknown	2
Insecta	Hymenoptera	Ant 6	Unknown	nest
Insecta	Hymenoptera	Ant 7	Unknown	nest
Insecta	Hymenoptera	Wasp 1	Unknown	1
Insecta	Hymenoptera	Wasp 5	Unknown	1
Insecta	Hymenoptera	Wasp 6	Unknown	1
Insecta	Hymenoptera	Wasp 7	Unknown	1
Insecta	Hymenoptera	Wasp 12	Unknown	1
Insecta	Hymenoptera	Wasp 14	Unknown	1
Insecta	Hymenoptera	Wasp 16	Unknown	1

CLASS	ORDER	COMMON NAME	FAMILY or SPECIES	Number of Individuals
Insecta	Hymenoptera	Wasp 17	Unknown	1
Insecta	Hymenoptera	Wasp 18	Unknown	1
Insecta	Hymenoptera	Wasp 19	Unknown	1
Insecta	Hymenoptera	Wasp 20	Unknown	1
Insecta	Hymenoptera	Wasp 21	Unknown	1
Insecta	Hymenoptera	Wasp 22	Unknown	2
Insecta	Hymenoptera	Wasp 23	Unknown	1
Insecta	Hymenoptera	Wasp 24	Unknown	1
Insecta	Hymenoptera	Wasp 25	Unknown	1
Insecta	Hymenoptera	Wasp 27	Unknown	1
Insecta	Hymenoptera	Wasp 28	Unknown	1
Insecta	Hymenoptera	Wasp 30	Unknown	2
Insecta	Hymenoptera	Wasp 31	Unknown	1
Insecta	Hymenoptera	Wasp 32	Unknown	1
Insecta	Hymenoptera	Wasp 33	Unknown	1
Insecta	Hymenoptera	Wasp 34	Unknown	1
Insecta	Hymenoptera	Bee 4	Unknown	1
Insecta	Hymenoptera	Bee 5	Unknown	1
Insecta	Hymenoptera	Bee 6	Unknown	1
Malacostraca	Isopoda	Slater 1	Unknown	4
Malacostraca	Isopoda	Slater 2	Unknown	2
Insecta	Lepidoptera	Moth 2	Unknown	1
Insecta	Lepidoptera	Moth 4	Unknown	
Insecta	Lepidoptera	Moth 6	Unknown	1
Insecta	Lepidoptera	Butterfly 2	Pieridae	16
Insecta	Lepidoptera	Butterfly 4	Lycaenidae	22
Insecta	Lepidoptera	Butterfly 5	Hesperiidae	18
Insecta	Lepidoptera	Caterpillar 3	Unknown	1
Insecta	Lepidoptera	Caterpillar 4	Unknown	7
Insecta	Lepidoptera	Caterpillar 5	Unknown	2
Insecta	Lepidoptera	Caterpillar 6	Unknown	1
Insecta	Lepidoptera	Caterpillar 7	Unknown	50
Insecta	Lepidoptera	Caterpillar 8	Unknown	1
Insecta	Lepidoptera	Caterpillar 9	Unknown	134
Insecta	Neuroptera	Lacewing 2	Unknown	9
Insecta	Neuroptera	Lacewing 3	Unknown	1
Insecta	Neuroptera	Lacewing 4	Unknown	8
Insecta	Odonata	Dragonfly 2	Unknown	5
Insecta	Odonata	Dragonfly 4	Unknown	22
Insecta	Odonata	Dragonfly 5	Unknown	1
Insecta	Odonata	Dragonfly 6	Unknown	1
Insecta	Odonata	Dragonfly 7	Unknown	1
Insecta	Odonata	Dragonfly 8	Unknown	1
Insecta	Orthoptera	Cricket 1	Unknown	6
Arachnida sub. Acarina	Superorder Parasitiformes	Mite 1	Unknown	1
Gastropoda	Stylommatophora	Snail 1	Unknown	3
Gastropoda	Stylommatophora	Snail 2	Unknown	
Gastropoda	Stylommatophora	Snail 3	Unknown	6
Unknown	Unknown	Scale 1	Uknown	3
Diplopoda	Unknown	Larvae 1	Unknown	1
		Larvae 2	Unknown	3
Entognatha	Unknowns	Unknowns	Unknown	1
			TOTAL	627

Appendix 15. Threatened fauna species recorded and/or predicted to occur within a radius of 10km of the study area

Threatened fauna species recorded during the current assessment and those detected within ten kilometres of the study area boundary on DSE's Atlas of Victorian Wildlife (AVW) (DSE 2009b). Species listed on EPBC Protected Matters Search Tool also included, except for Listed Marine Species (not relevant). A likelihood of occurrence is given to each species based on year of last record, number of records and habitat requirements.

Scientific Name	Family Name	Common Name	Conservation Status				Database	Current Survey	Habitat Notes	No. of Records (AVW)	Likelihood of Occurrence	Likelihood Reasoning
			FFG	EPBC	DSE	Regional Signficance						
Anas rhynchotis	Anatidae	Australasian Shoveler			v		AVW	Present	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. This species nest in grass nests on the ground, usually in dense cover and near water. (Marchant and Higgins 1990; Pizzey and Knight 2007).	13	High	Was seen in present survey and habitat is present within precinct
Prototroctes maraena	Retropinnidae	Australian Grayling		VU	v		EPBC/AVW		This species only spends part of its life in freshwater streams, Australian Graylings migrate between freshwater streams and the ocean. Streams where this species occur tend to be clear with gravel bottoms and a variety of instream habitat such as pools and riffles. The upstream migration of this species has been effectively terminated in some rivers by dams (Allen, Midgley and Allen 2002; Department of Primary Industries 2006).	2	Low	Last seen in 1985, preferred habitat not present
Porzana pusilla	Rallidae	Baillon's Crake	L		v		AVW		This species returns to northern Victoria in spring, but few details on migration. It inhabits freshwater wetlands and floodwaters usually containing floating plants or tall emergent vegetation. The Baillon's Crake feeds in shallow water, mud and emergent aquatic plants. It has been found to nest in clumps or tussocks of vegetation surrounded by water (Marchant and Higgins 1993; Pizzey and Knight 2007).	3	Moderate	Was last recorded in 2002, there is some habitat present however not optimal.
Falco subniger	Falconidae	Black Falcon			v	R1	AVW		The Black Falcon has a stronghold in inland Australia. Most Victorian records come from the lowlands and only occasionally from the foothills. It occurs mainly over croplands, grasslands and wooded farmlands. To catch flushed prey, they sweep low over croplands and grasslands and are often attracted by smoke from grassfires and late-summer burning off. This species nests in trees in old stick-nests of other birds (Marchant and Higgins 1993; Pizzey and Knight 2007).	1	Moderate	Was last recorded in 1999, habitat is present within precinct.
Monarcha melanopsis	Dicruridae	Black-faced Monarch		m			EPBC		Black-faced Monarch is a summer migrant to the south-east coastal areas. It is found mainly in rainforest, often in wet sclerophyll forests, and occasionally in mangroves. Sometimes in dry sclerophyll forests or woodlands, especially if they are open and near rainforests (Higgins, Peter and Cowling 2006; Pizzey and Knight 2007).		Low	It hasn't been recorded in AVW and habitat is not present
Oxyura australis	Anatidae	Blue-billed Duck	L		e		AVW		This species inhabits deep, permanent, well-vegetated swamps, but at times (especially in winter) may occur in large numbers on large open wetlands. 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 (Marchant and Higgins 1990; Pizzey and Knight 2007).	11	Moderate	Was last recorded in 2002. There is habitat within the precinct however it isn't optimal.
Coturnix ypsilophora	Phasianidae	Brown Quail			n	R1	AVW		The Brown Quail is widespread in Victoria, however suitable habitats are quite localised. It occupies mainly well watered areas and it has been reported from grass and sedge flats, often adjacent to rivers and swamps. Along major rivers in northern Victoria they occur in grassy River Red Gum forests and in eastern Victoria they inhabit wet woodlands and forests containing grasses, sword-sedges and gahnias. It has also been observed in bracken, lucerne pastures, and	8	Moderate	Was last recorded in 2000. May still occur within the precinct.

Scientific Name	Family Name	Common Name	Conservation Status				Database	Current Survey	Habitat Notes	No. of Records (AVW)	Likelihood of Occurrence	Likelihood Reasoning
			FFG	EPBC	DSE	Regional Signficance						
									potato crops. It feeds and nests on the ground (Marchant and Higgins 1993)			
Climacteris picumnus victoriae	Climacteridae	Brown Treecreeper (south-eastern ssp.)			n	R3	AVW		Occurs in eucalypt woodlands, particularly open woodland lacking a dense understorey. It is sedentary and nests in tree hollows within permanent territories, breeding in pairs or communally in small groups. Birds forage on tree trunks and on the ground amongst leaf litter and on fallen logs for ants, beetles and larvae (Higgins, Peter and Steele 2001).	1	Low	Was last recorded in 2000. Very little habitat is present, the record is at the outer edge of the 10km search.
Cereopsis novaehollandiae	Anatidae	Cape Barren Goose			n	R2,R3	AVW		The Cape Barren Goose occurs on coastal islands or on open wetlands and pastures on the mainland. Although some breeding birds remain throughout the year on islands off Wilsons Promonitory (where they nest on the ground in tussock grsslands), young geese move away after the breeding seasons due to diminished food supply. These usually form feeeding flocks in improved pastures on the neighbouring mainland but some individuals may move farther afield (Marchant and Higgins 1990).	3	Moderate	Was last recorded in 1999. Some potential habitat is present.
Ardea ibis	Ardeidae	Cattle Egret		m			EPBC		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 . 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. The species nests colonially, often with other waterbirds. Egrets are threatened due to restricted nesting sites (Marchant and Higgins 1990; Pizzey and Knight 2007).		Low	Hasn't been recorded however some potential habitat within the precinct.
Calamanthus pyrrhopygius	Pardalotidae	Chestnut-rumped Heathwren	L		v	R1	AVW		This species mainly inhabit heathy woodlands, or wet heaths and scrubs with emergent eucalypts or banksias in the lowlands and foothills. It isoccasionally seen in samphire shrublands with adjacent eucalyptus woodlands. May also occur locally in box-ironbark, stringybark and peppermint forests, where there is scattered shrubs and sparse tree cover. Occasionally recorded in peppermint forests and Snow Gum woodlands at high elevations but do not generally occur in treeless heaths or dense forests. They feed on bare ground, in low shrubs and occasionally low trees, especially where abundant fallen branches or rocks are present. Their nests are built near the ground in shrubs or grass tussocks (Marchant and Higgins 1993).	3	Moderate	Was last recorded in 1999. Potenital habitat occurs within the precinct.
Galaxiella pusilla	Galaxiidae	Dwarf Galaxias	L	VU	v		EPBC/AVW		Occurs in vegetated margins of slow-flowing coastal creek backwaters, drains and swamps, often with dense aquatic macrophytes. Ephemeral sites require seasonal flooding and linkages to other more permanent populations for population replenishment, therefore wetland connectivity may be critical to survival. Rare in Victoria, however more abundant in the south-east of the state in Mornington Pennisula & Western Port areas (Allen, Midgley and Allen 2002).	11	Moderate	Was last recorded in 2010 There is habitat present within the precinct.
Numenius madagascariensis	Scolopacidae	Eastern Curlew		m	n	R3	AVW		This species is a summer migrant to Victoria, from Siberian breeding grounds. Small numbers will over winter in coastal areas. During summer they occur regularly on tidal mudflats in Corner Inlet, Western Port and Port Phillip Bay. Small numbers occur elsewhere on coastal mudflats and, rarely, birds appear on muddy edges of inland saline lakes.	2	Low	Was last recorded in 1909. Preferred habitat not present within the precinct.

Scientific Name	Family Name	Common Name	Conservation Status				Database	Current Survey	Habitat Notes	No. of Records (AVW)	Likelihood of Occurrence	Likelihood Reasoning
			FFG	EPBC	DSE	Regional Signficance						
									They feed by probing in mudlfats, in rock pools and among seagrass and roost on spits, islets or in saltmarshes (Higgins and Davies 1996; Pizzey and Knight 2007).			
Ardea modesta	Ardeidae	Eastern Great Egret	L	m	v		AVW/EPBC		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 2010c).	7	High	Was last recorded in 2001. Has been seen in nearby precinct and habitat is present within precinct.
Apus pacificus	Apodidae	Fork-tailed Swift		m			EPBC		The Fork-tailed Swift is a migratory species occurring throughout Australia. This insectivorous species is almost entirely aerial. Occur over inland plains, often over cliffs or beaches, also over settled areas. They feed aerially, and probably also roost aerially, although rarely seen to land (Higgins 1999; Pizzey and Knight 2007).		Moderate	Since it is entirely aerial potential habitat is present, however it has not been recorded previously.
Stictonetta naevosa	Anatidae	Freckled Duck	L		e		AVW		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, which always occurs over water and usually with easy access from the water amongst shelter. This species is a specialist filter feeder, limiting foraging to aquatic habitats (Marchant and Higgins 1990).	1	Moderate	Was last recorded in 2002. Some potential habitat present within study site.
Plegadis falcinellus	Threskiornithidae	Glossy Ibis		m	n	R3	AVW		This species is a partial summer migrants to Victoria from northern Australia. They inhabit vegetated or muddy margins of freshwater wetlands and nearby grasslands and pastures. They forage in shallow water or mud on the margins of wetlands and occasionally from low vegetation and nest colonially, usually with other ibises. They build stick-nests in trees and shrubs low over water, in reedbeds or on islands (Marchant and Higgins 1990; Pizzey and Knight 2007).	1	Low	Last recorded in 1976. Potential habitat present however not seen in over 30 years.
Synemon plana	Castniidae	Golden Sun Moth	L	CR	c		EPBC/AVW		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).	1	Low	Potential habitat not present on site.
Accipiter novaehollandiae	Accipitridae	Grey Goshawk	L		v	R1	AVW		The Grey Goshawk has a stronghold in Victoria, particularly the white form, in the Otway Ranges, where wet forests and gullies containing Mountain Grey Gum adjoin partly cleared farmlands. They occur in lower densities in similar habitats in the Strzelecki Ranges, Gippsland Plains and Otway Plains. Elsewhere in the State they are occasionally seen in woodlands, dry forests, suburban parks and wooded farmlands (Marchant and Higgins 1993).	4	Low	Last recorded in 1990. Potential to utlise some areas within study site however not been recorded in 20 years.
Pteropus poliocephalus	Pteropodidae	Grey-headed Flying-fox	L	VU	v		EPBC/AVW		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).	1	Moderate	This species was last recorded in 2003. There is the potential for vagrants to visit the area when eucalypts are flowering.

Scientific Name	Family Name	Common Name	Conservation Status				Database	Current Survey	Habitat Notes	No. of Records (AVW)	Likelihood of Occurrence	Likelihood Reasoning
			FFG	EPBC	DSE	Regional Signficance						
Pomatostomus temporalis	Pomatostomidae	Grey-crowned Babbler	L		e		AVW		This species inhabit dry forests and open woodlands, roadside trees, and wooded farmlands and can be associated with river floodplains. 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 (Higgins and Peter 2002; Pizzey and Knight 2007).	1	Low	Last recorded in 1988, only sub-optimal habitat present.
Litoria raniformis	Hylidae	Growling Grass Frog	L	V	e		EPBC/AVW		The species often inhabitant water bodies with a diverse assemblage of aquatic vegetation, including emergents such as sedges, submergent species such as curly pondweed, floating species such as water ribbon and filamentous algae . The aquatic vegetation provides sites for male frogs to call from, sites for eggs to be deposited and for relatively safe development, food and shelter for tadpoles. Dense submergent vegetation is especially important to protect eggs and tadpoles from predation (Hamer and Organ 2006; Heard, Robertson and Moysey 2004).	47	Moderate	Last recorded in 2006, however has been recorded within 10km by another consultancy during this spring/summer. Potential habitat present.
Aythya australis	Anatidae	Hardhead			v		AVW		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 (Halse et al. 2005; Rogers 1990). 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).	23	High	Last recorded in 2005 (AVW) and recorded on site in 2008 (Fairbridge and Appleby 2009), habitat present within study area.
Lichenostomus melanops cassidix	Meliphagidae	Helmeted Honeyeater	L	E/m	c		EPBC/AVW		Inhabits open Eucalypt forest or woodland, Subspecies *cassidix* confined to Yellingbo area of Yarra Ranges. Nest in colonies along creeks and nests built in low shrubs (Higgins, Peter and Steele 2001).	1	Low	Last recorded in 1915. Not present within the study area.
Melanodryas cucullata	Petroicidae	Hooded Robin	L		n	R3	AVW		Highest density in semi-arid nw. Victoria where they inhabit mallee scrubs, cypress pine woodlands, mallee heaths with scattered trees and box-ironbarks forests. Uncommon in s. Vic where they occur in a range of lightly timbered habitats containing tall shrubs. These include Box woodlands, coastal heaths and heathy woodlands. Forage on bare ground, using vantage points such as dead limbs or fence posts to detect prey (Marchant and Higgins 1993; Pizzey and Knight 2007).	1	Low	Last recorded in 1981. Habitat not present within the study area.
Ardea intermedia	Ardeidae	Intermediate Egret	L		c		EPBC/AVW		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).	1	Low	Very little foraging habitat is present within the study area. Only one record.
Acrodipsas brisbanensis	Lycaenidae	Large Ant Blue	L		e		AVW		The caterpillar of this species appears to spend its 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 2004). They are mostly found around coastal areas.	1	Low	Last record in 1941. Low likelihood of occurrence within the study area.

Scientific Name	Family Name	Common Name	Conservation Status				Database	Current Survey	Habitat Notes	No. of Records (AVW)	Likelihood of Occurrence	Likelihood Reasoning
			FFG	EPBC	DSE	Regional Signficance						
Gallinago hardwickii	Scolopacidae	Latham's Snipe		m	n	R3	EPBC/AVW		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).	15	Moderate	Last recorded in 2005. There is potential habitat within the study area.
Lewinia pectoralis	Rallidae	Lewin's Rail	L		v		AVW		The Lewin's Rail is secretive, and inhabits areas of heavily vegetated swamps, such as coastal saltmarshes, rushy ditches and swampy streams, it occasionally ventures quite far from water. It feeds from the surface of wet mud, usually among dense woody-stemmed vegetation. Nests are generally found near the ground in dense cover (Marchant and Higgins 1993).	1	Low	No optimal habitat in study area. Last record was in 1997.
Ixobrychus minutus	Ardeidae	Little Bittern	L		e		AVW		This species occurs mainly in northern Victoria in wetlands and floodplains along the Murray River. It tends to inhabit emergent vegetation and reedbeds. It also utilises floating masses of aquatic vegetation in freshwater wetlands. This species is rarely seen due to it using dense vegetation as preferred habtiat. The Little Bittern will feed in shallow water in dense vegetation and their platform nests are built in low dense swampy vegetation (Marchant and Higgins 1990).	2	Low	This species is generally recorded in northern Victoria, however some potential habitat present, last recorded in 2002.
Egretta garzetta	Ardeidae	Little Egret	L		e		AVW		Inhabit terrestrial wetlands and shallow margins of tidal estuaries and inland lakes and rivers. Feed in shallow water and nest colonially, often with other waterbirds. Stick-nests are usually built in trees over water, although occasionally in reedbeds (Marchant and Higgins 1990).	1	Low	Potential habitat is present one record from 2000.
Potorous tridactylus tridactylus	Potoroidae	Long-nosed Potoroo (SE mainland)	L	VU	e		EPBC		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. Preferred habitat has an understorey that may feature grass-trees, sedges, ferns or heath, or low shrubs of tea-trees or melaleucas (Johnston 2008).		Low	No optimal habitat in study area, no records within 10kms of study area.
Anseranas semipalmata	Anseranatidae	Magpie Goose	L		n	R3	AVW		Most of the populations of this species have been re-introduced. They breed colonially and build platform nests over water, usually among tall rushes or reedbeds. The Magpie Goose feeds by digging in mud or by up-ending in shallow water, they have also been see grazing and digging well away from water (Marchant and Higgins 1990).	1	Low	Some potential habitat, however was last recorded in 1987.
Biziura lobata	Anatidae	Musk Duck			v		AVW		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 (Marchant and Higgins 1990; Pizzey and Knight 2007).	3	Moderate	Some potential habitat is present. This species was last recorded in 1992, however it was seen during this study in a neighboring precinct.
Pseudomys novaehollandiae	Muridae	New Holland Mouse	L		v		AVW		The New Holland Mouse is found in dry heath and open forest where the understorey is low growing and leaf-litter sparse They are nocturnal, gregarious, and shelters in burrow systems up to several metres long (Kemper and Wilson 2008).	2	Low	Was last seen in 1976. Thought to be extinct in the area.
Neophema chrysogaster	Psittacidae	Orange-bellied Parrot	L	CR/m	cr		EPBC		Breed in south-west Tasmania and are winter migrants to Victoria where they are are usually present from late March to early Nov, inhabiting coastal habitats such as bays and estuaries in saltmarshes, herbland or low shrublands. Much of their winter habitat has been altered and saltmarshes in		Low	No habitat present within the study area and has not been recorded previously.

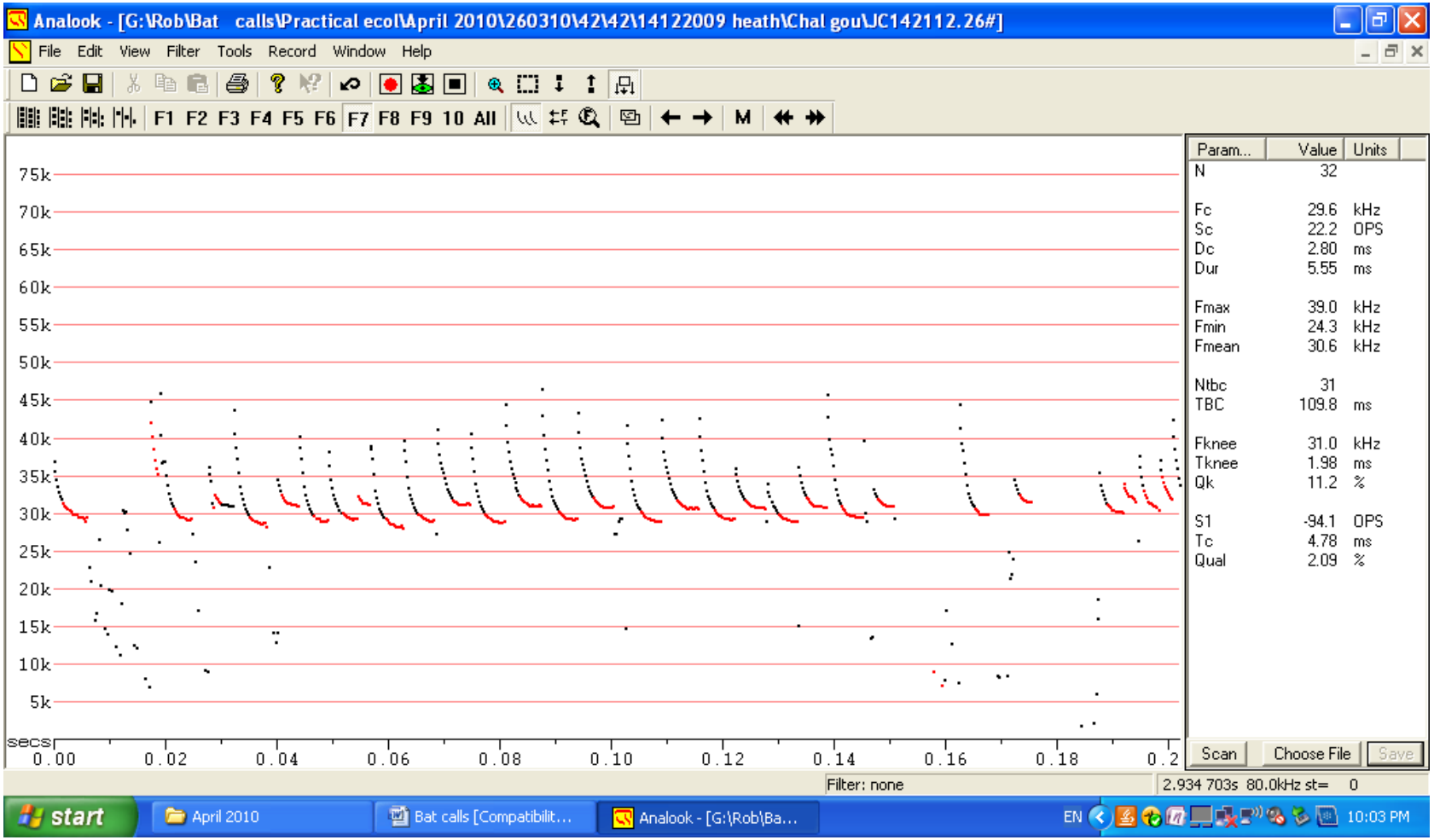
Scientific Name	Family Name	Common Name	Conservation Status				Database	Current Survey	Habitat Notes	No. of Records (AVW)	Likelihood of Occurrence	Likelihood Reasoning
			FFG	EPBC	DSE	Regional Signficance						
									low low rainfall areas have been developed for uses such as salt extraction. Illlegal trapping has also reduced numbers (Higgins 1999).			
Larus pacificus pacificus	Laridae	Pacific Gull			n	R3	AVW		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).	54	High	This species has a high likelihood of occurrence due to the number of records, it was last recorded in 2006.
Grantiella picta	Meliphagidae	Painted Honeyeater	L		v		AVW		The Painted Honeyeater is a summer migrants to Victoria. They are generally found to inhabit box-ironbark, Broad-leaved Peppermint and Red Stringybark forests and box-buloke woodlands in the northern foothills of the great Divide. May also occur in Red Ironbark and Red Box forests in southern Victoria. They are occasionally found along the Murray River valley to Hattah-Kulkyne NP where they inhabit Black Box woodlands. This species is usually found in open stands of old eucalypts that are infested with mistletoes (Higgins, Peter and Steele 2001).	1	Low	There is not optimal habitat present and it was last recorded in 1981.
Rostratula benghalensis s. lat.	Rostratulidae	Australian Painted Snipe	L	VU/m	c		EPBC/AVW		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. They do not form flocks but loose groups are sometimes seen, either alone or with Latham's Snipe. 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 (Marchant and Higgins 1993; Pizzey and Knight 2007).	1	Low	Some potential habitat is present however there is only one record from 1989.
Phalacrocorax varius	Phalacrocoracidae	Pied Cormorant			n	R3	AVW		This species is most often found along the coast, however they 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 (Marchant and Higgins 1990; Pizzey and Knight 2007).	5	Moderate	Although this species was last recorded in 1997, it has been seen in nearby precincts during this study.
Ninox strenua	Strigidae	Powerful Owl	L		v	R1	AVW		The Powerful Owl is widespread in foothill and coastal forests where they tend to favour gullies with peppermint and manna gum forests. They are occasionally seen in wetter mountain forests, drier box-ironbark forests, open woodlands, and softwood plantations. This species requires very large hollows for breeding (Higgins 1999).	2	Moderate	Some potential habitat is present, along with prey species. Last recorded in 2003.
Merops ornatus	Meropidae	Rainbow Bee-eater		m			EPBC		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	Potential habitat is present, however this species has not been recorded within 10km of the study area.
Anthochaera phrygia	Meliphagidae	Regent Honeyeater	L	EN /m	c		EPBC		Occurs mainly in box-ironbark forests and woodlands north of the Great Divide. This species is highly nomadic and their movements are determined by the flowering of eucalypts (Higgins 1999; Pizzey and Knight 2007).		Low	No optimal habitat present, not been recorded within 10km of the study area,
Platalea regia	Threskiornithidae	Royal Spoonbill			v		AVW	Present	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,	10	high	Last recorded in 2005 however seen in 2009 during this assessment.

Scientific Name	Family Name	Common Name	Conservation Status				Database	Current Survey	Habitat Notes	No. of Records (AVW)	Likelihood of Occurrence	Likelihood Reasoning
			FFG	EPBC	DSE	Regional Signficance						
									singly or in loose colonies and are often seen with other species (Rogers 1990).			
Rhipidura rufifrons	Dicruridae	Rufous Fantail		m		R2	EPBC		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 (Higgins, Peter and Cowling 2006).	7	High	Habitat is present within study area, was last recorded in 2000. Has been seen in nearby precincts during this study.
Myiagra cyanoleuca	Dicruridae	Satin Flycatcher		m		R2	EPBC		The Satin Flycatcher is a migrant to southern parts of Victoria during the spring/summer months. It is generally found in many habitat types including wet schlerophyl and woodland particularly along watercourses (Higgins, Peter and Cowling 2006).	11	Moderate	Last recorded in 2000. Most likely to be on-passage to other breeding sites.
Pseudomys fumeus	Muridae	Smoky Mouse	L	EN	c		EPBC		The Smoky Mouse occurs mainly in in dry sclerophyll forest on ridges with heath and tussock-grass understorey, coastal heath and subalpine heath. It shelters communally in a nest on the surface of the ground. Its preferred haibtat is dense heath, and its diet consists of fungi, seeds and flowers. It has a patchy distribution and may have a successional pattern of occurence relating to time since fire (Ford 2008; Menkhorst and Knight 2001).		Low	Very little potential habitat on site and has not been previously recorded.
Isoodon obesulus obesulus	Peramelidae	Southern Brown Bandicoot	L	E	n	R3	EPBC/AVW		The Southern Brown Bandicoot is both active during the day and night. It is found in forest, heath and shrub communities. It shelters in a nest of vegetation beneath dense cover, it eats fungi, tubers and arthropods (Menkhorst and Knight 2001; Paull 2008).	34	Moderate	Some potential habitat is present, was last recorded in 2005. Most records come from the Cranbourne Botanic Gardens. Was not detected during this survey.
Tyto tenebricosa	Tytonidae	Sooty Owl	L		v		AVW		Inhabit mainly old growth forests including gullies and escarpments, rainforests and Mountain Ash forests in large areas of continuous forest. They are absent or rare in some areas where the habitat seems suitable such as Otway Ranges, Wilsons Promontory and Strzelecki Ranges. This may be because the forests are too small or fragmented. They catch prey from branches of trees and shrubs or from the ground. They nest and roost in large holes in eucalypts; occasionally they also roost on low tree branches or tops of tree-ferns. These owls are sedentary and territorial (Marchant and Higgins 1990).	1	Low	Last seen in 1992, optimal habitat not present.
Pseudophryne semimarmorata	Myobatrachidae	Southern Toadlet			v		AVW	Present	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, Littlejohn and Marantelli 1991).	55	High	Species was detected during this assessment.
Dasyurus maculatus maculatus (SE mainland population)	Dasyuridae	Spot-tailed Quoll	L	EN	e		EPBC		The Spot-tailed quoll is a carnivorous marsupial found in many different treed habitats including rainforest, wet and dry sclerophyll forest and woodland. In parts of Tasmania it is also found in coastal heath and scrub (Belcher, Burnett and Jones 2008; Menkhorst and Knight 2001).		Low	Never been recorded in the area.
Circus assimilis	Accipitridae	Spotted Harrier			n	R3	AVW		This species occurs in open grasslands, open shrublands, saltbush, open woodlands, crops and similar low vegetation that allow hunting. Their stick nests are built in low trees (Pizzey and Knight 2007).	3	Moderate	Potential foraging habitat is present and was last recorded in 2004.
Egernia coventryi	Scincidae	Swamp Skink	L		v		AVW		The Swamp Skink can be found in cool temperate, low-lying wetlands including swamp margins, tea-tree thickets and tidal salt-marshes. This species is secretive, and often found in dense low vegetation. It shelters in burrows (Wilson and Swan 2008).	11	Moderate	There is potential habitat present within the study area, however it was last recorded in 1997. This study failed to detect it.

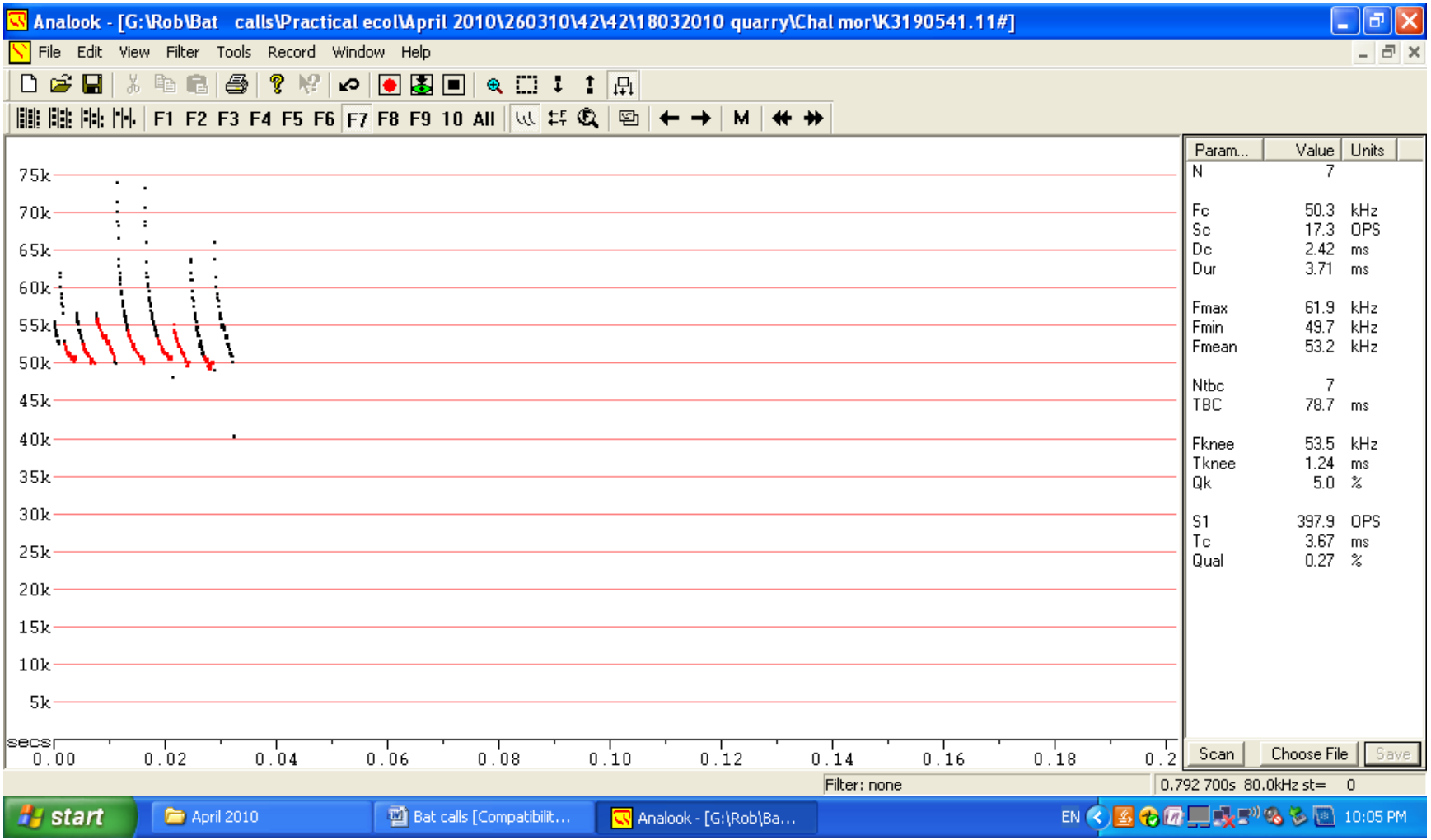
Scientific Name	Family Name	Common Name	Conservation Status				Database	Current Survey	Habitat Notes	No. of Records (AVW)	Likelihood of Occurrence	Likelihood Reasoning
			FFG	EPBC	DSE	Regional Signficance						
Polytelis swainsonii	Psittacidae	Superb Parrot	L	VU	e		EPBC/AVW		This species is generally 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. Their nests are 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. They forage in their nesting forests and may also forage on the ground, in eucalypts and in mistletoes (Higgins 1999; Pizzey and Knight 2007).	1	Low	This species is generally recorded in northern parts of Victoria, very little potential habitat present.
Lathamus discolor	Psittacidae	Swift Parrot	L	E	e	R1	EPBC/AVW		The Swift Parrot is a winter migrant to Victoria, arriving from their breeding areas in Tasmania; however small numbers of non-breeding birds may remain here during summer. They are nomadic, and follow the flowering trees and psyllid infestations. They are often seen in box-ironbark forests, and can be seen in urban parks and occur sporadically elsewhere in forests and woodlands but are rarely seen in treeless areas, rainforests or wet forests (Higgins 1999; Pizzey and Knight 2007).	2	Low	There is some potential habitat present, however the last record was in 1989.
Chlidonias hybridus	Laridae	Whiskered Tern			n	R3	AVW		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 areas with emergent vegetation. The Whiskered Tern build nests on the water in colonies among flooded or emergent vegetation (Pizzey and Knight 2007).	2	Low	Little potential habitat present even though the last record was in 2004.
Haliaeetus leucogaster	Accipitridae	White-bellied Sea-Eagle	L	m	v		EPBC/AVW		The White-bellied Sea-eagle mainly occurs along the coast, but may travel along some inland rivers and lakes (Pizzey and Knight 2007).	6	Low	No potential habitat, last record in 1997.
Hirundapus caudacutus	Apodidae	White-throated Needletail		m			EPBC		White Throated Needletail is a migratory species. It is almost entirely aerial and occurs over many types of habitat (Pizzey and Knight 2007).		high	Potential habitat is present as it is almost entirely aerial.
Nannoperca obscura	Percichthyidae	Yarra Pygmy Perch	L	VU	n		EPBC		The Yarra Pygmy Perch occurs in slow moving or still water bodies with abundant cover of aquatic vegetation and many logs, snags and rocks (Allen, Midgley and Allen 2002).		Low	Not previously recorded, however has been recorded near the Dandenong/Eumemmerring creeks. However high quality habitat not present.

Appendix 17. Time v. frequency graphs for bats identified with bat detector

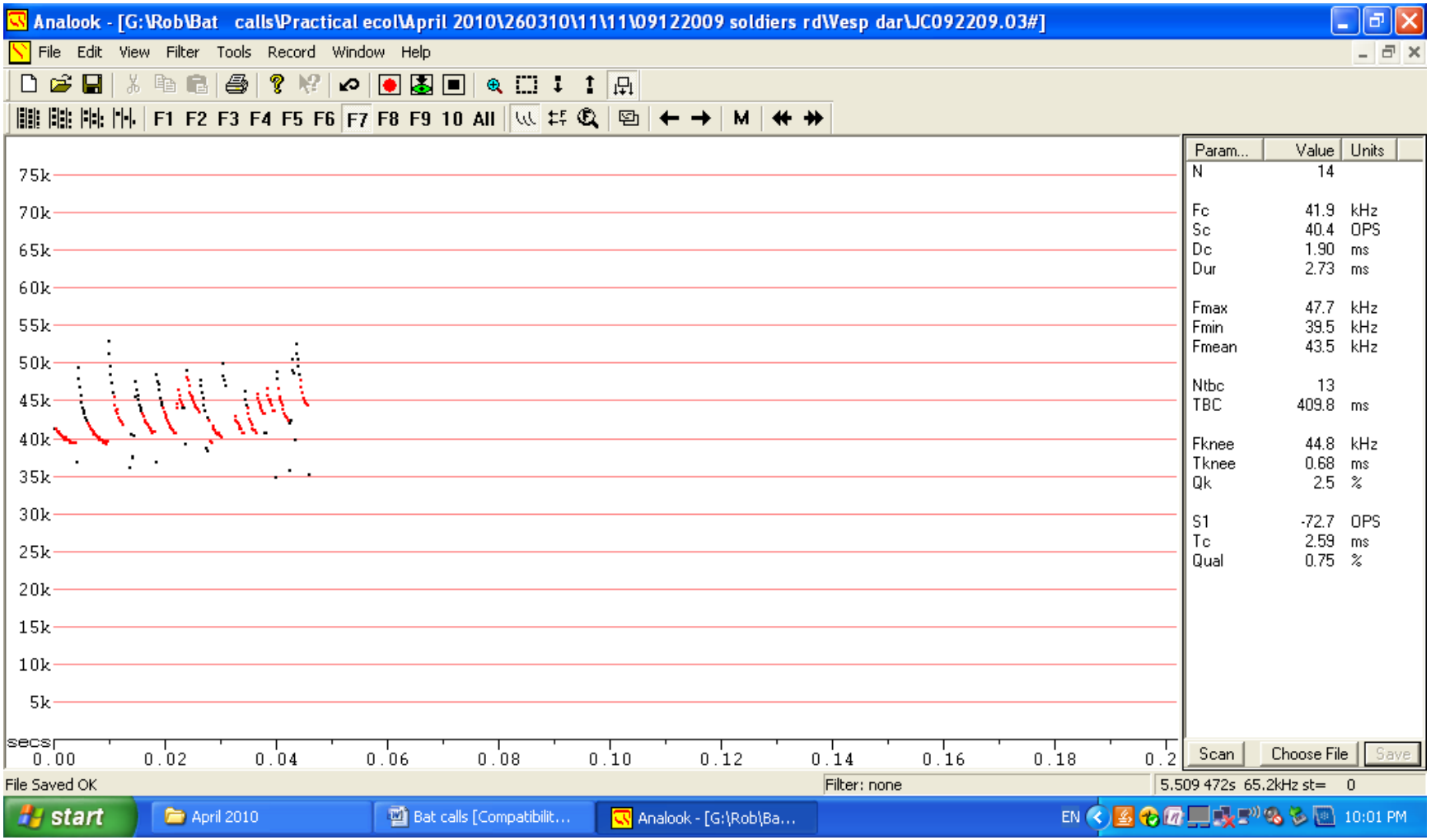
These graphs are a visual display of the frequency of microbat calls (k) on the *y* axis and the time (seconds) the call occur over on the *x* axis. These graphs can enable identification of microbats to species or genus. As per the Australasian Bat Society standards for surveying microbats, the graphs are displayed with the results.



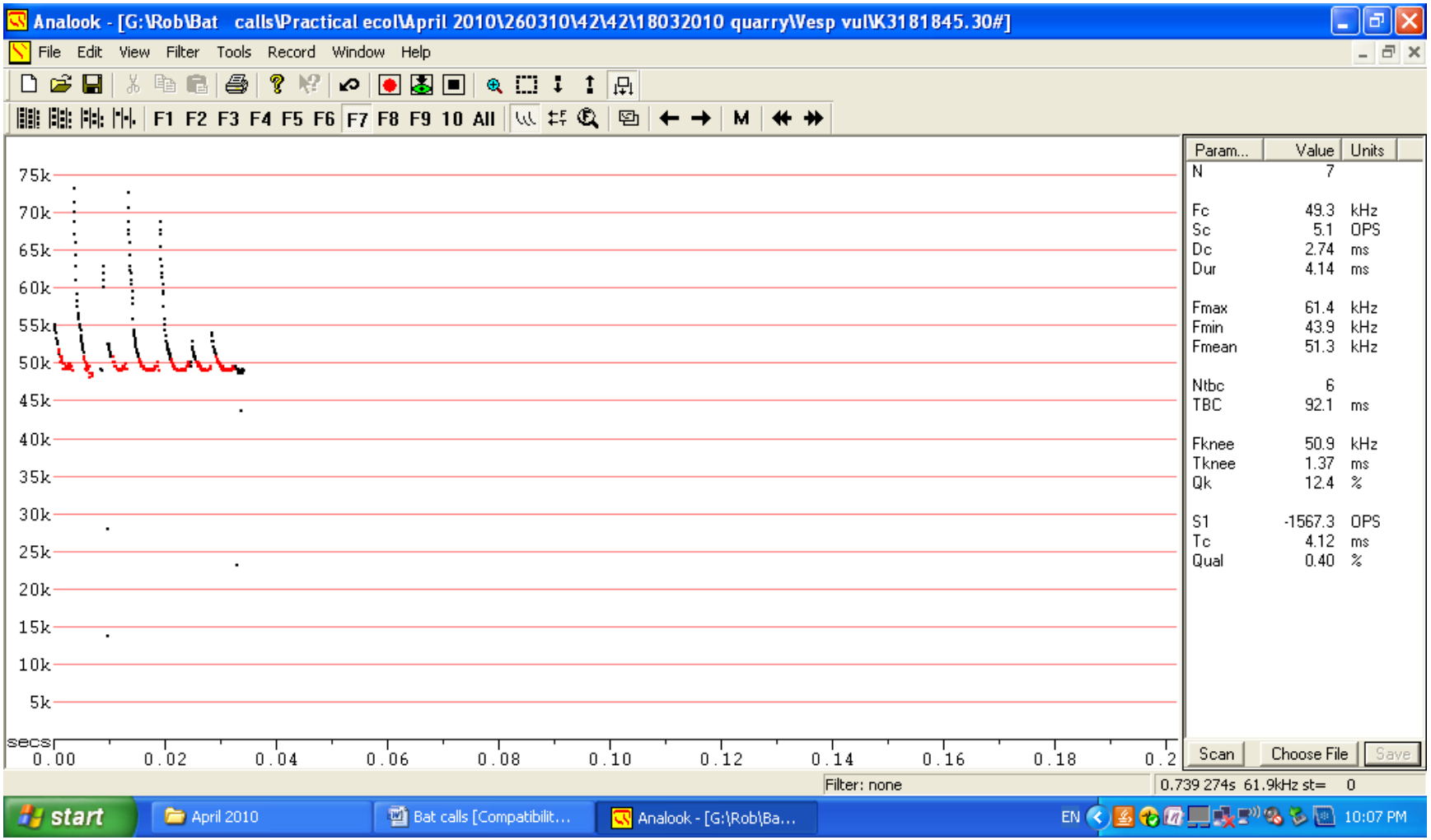
Gould's Wattled Bat



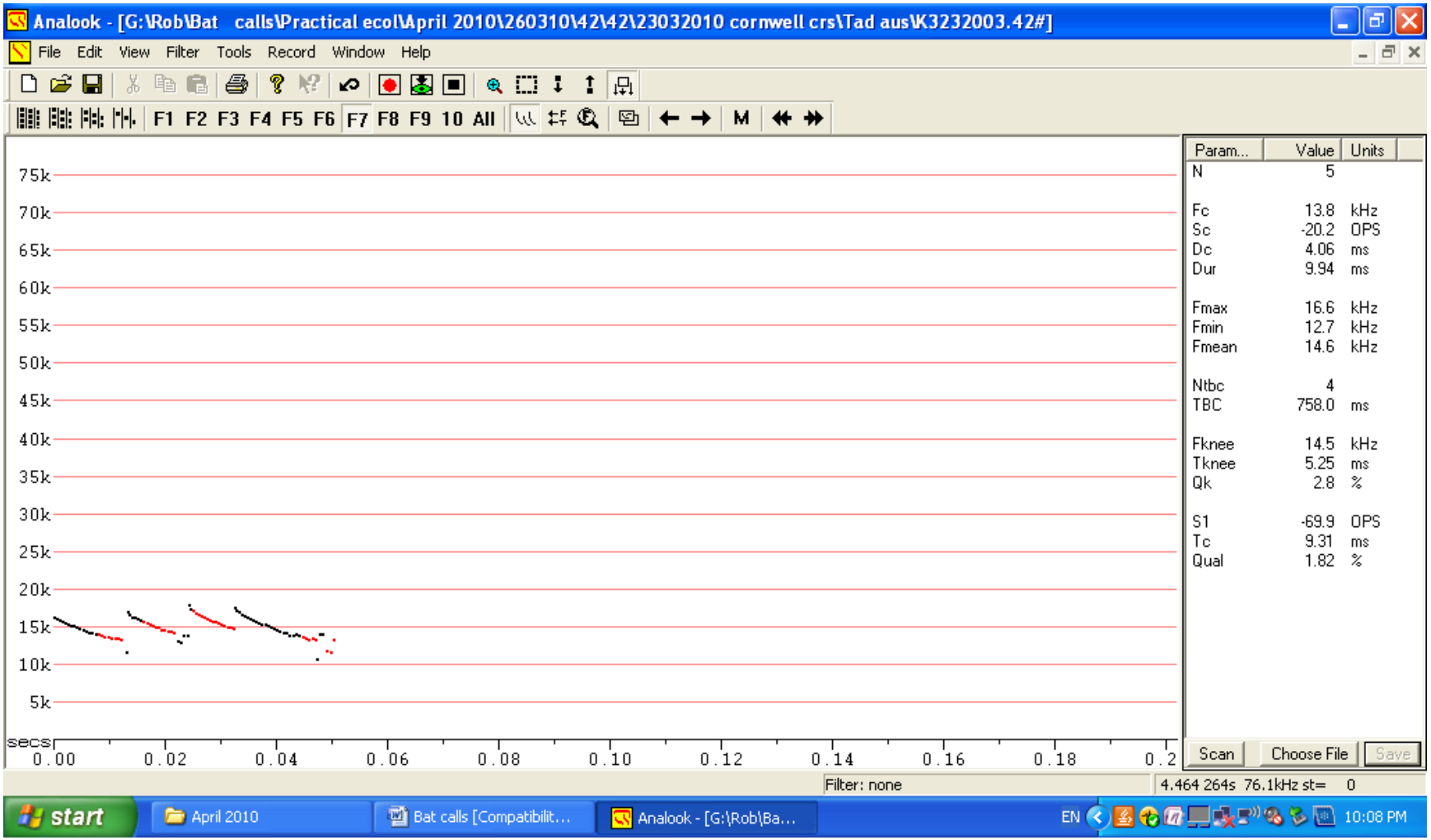
Chocolate Wattled Bat



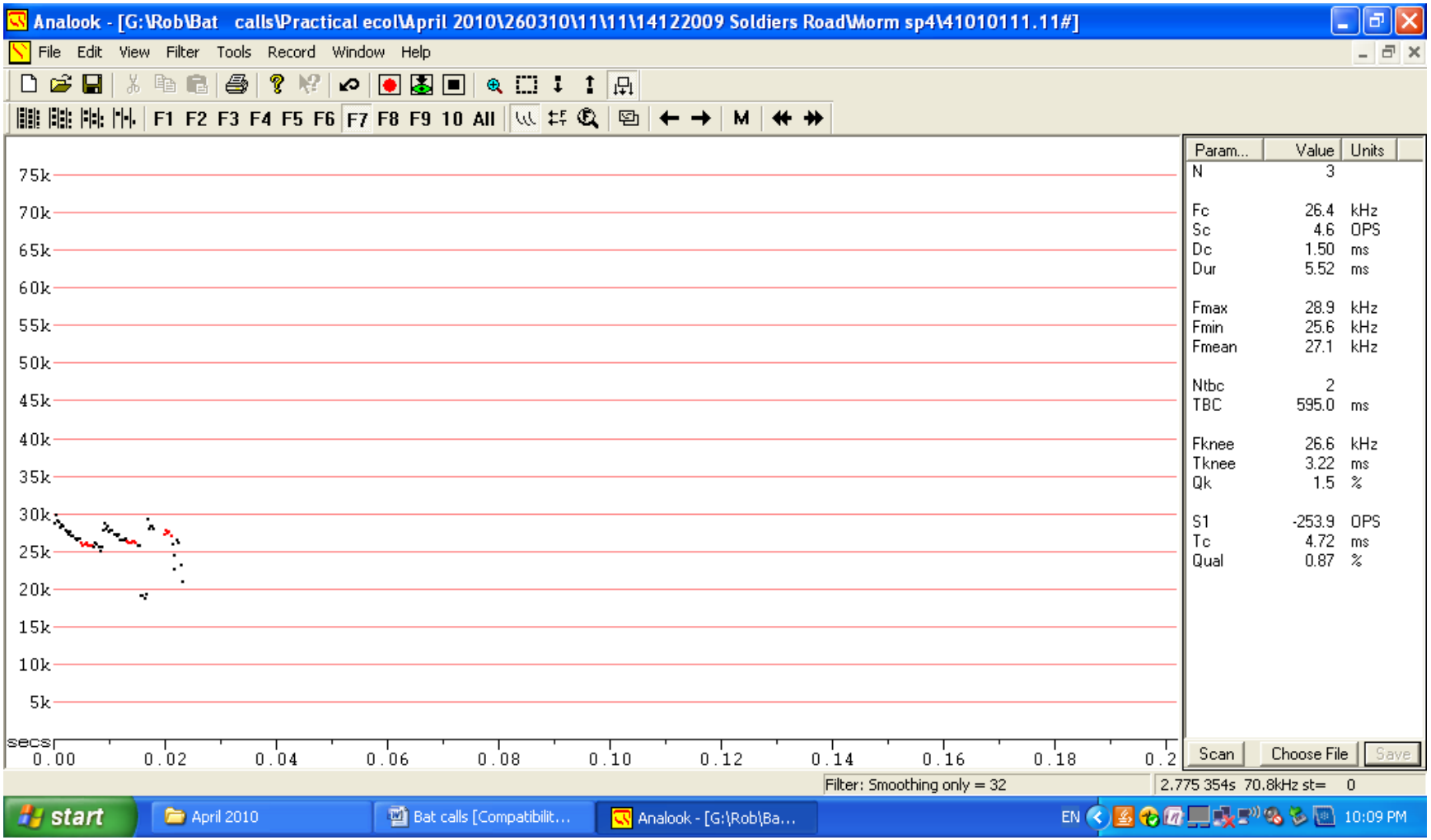
Large Forest Bat



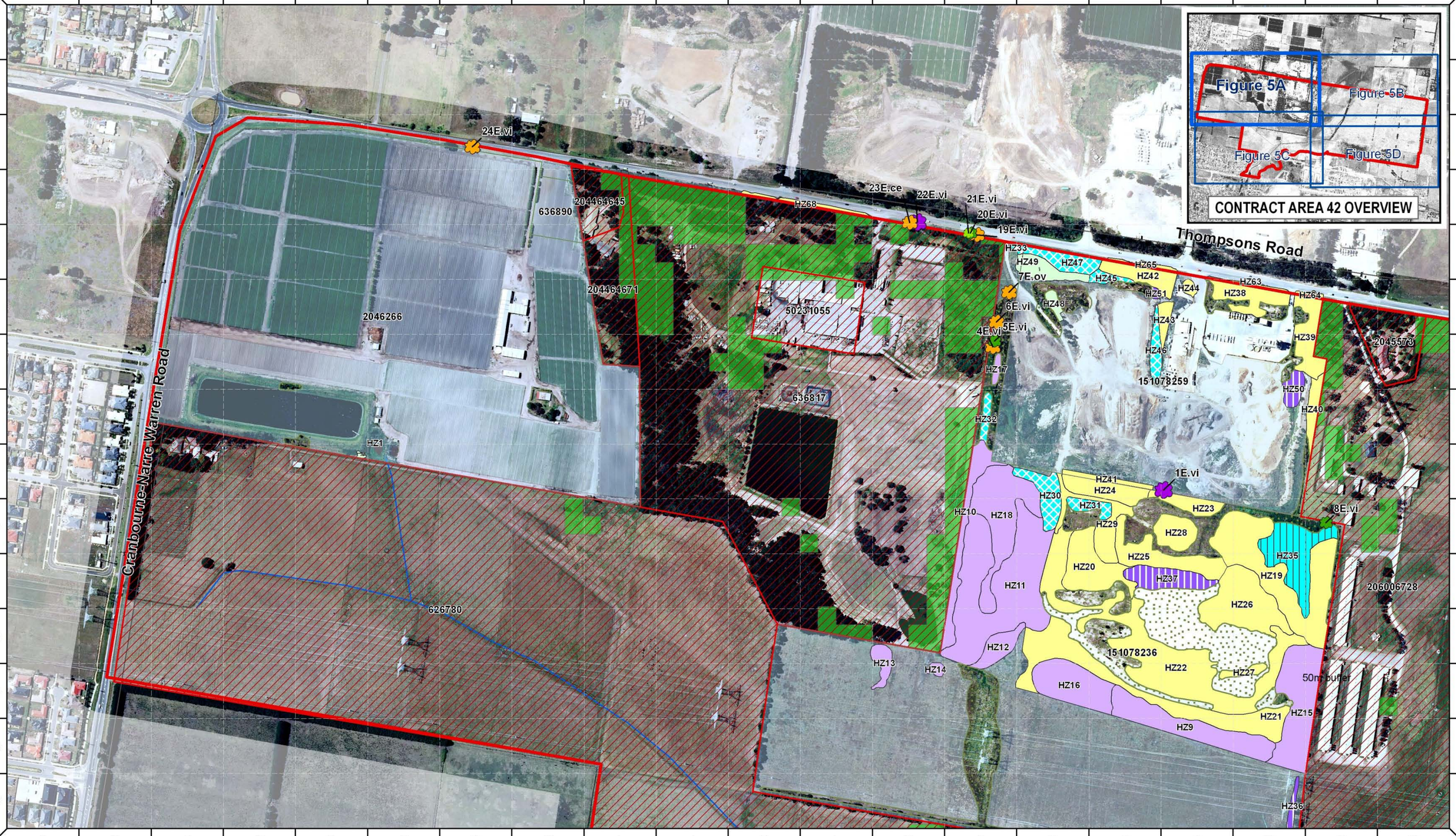
Little Forest Bat



White-striped Freetail Bat



Southern Freetail Bat



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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.

DATUM: GDA 94 VICGRID 94

N

0 50 100 150 200

Metres

1:5,000 when printed at A3

MAP AND SURVEY DETAILS

Surveyed by: Mark Shepherd, Luke Bennett and Peter Gannon,
6 Oct 2009 - 7 Feb 2010
Mapping by: Staci Timms, April 2010
Generated from: Data collected in the field using Juno PDAs and DSE's Habitas Software. Aerial Imagery and GIS base layers supplied by DSE and GAA, additional GIS layers from Geoscience Australia.

VERSION: 02 **DATE:** 04/10/10

LEGEND

- Watercourse
- Roads
- Study Area Boundary
- Property Boundary
- 257462 Property PFI
- Flora Surveys Not Complete

Modelled Vegetation

- Highly likely native vegetation - woody
- Non Native Vegetation
- Degraded Treeless Vegetation

Ecological Vegetation Class

- EVC 3: Damp Sands Herb-rich Woodland
- EVC 48: Heathy Woodland
- EVC 53: Swamp Scrub
- EVC 55: Plains Grassy Woodland
- EVC 83: Swampy Riparian Woodland
- EVC 136: Sedge Wetland
- EVC 175: Grassy Woodland
- EVC 821: Tall Marsh

Scattered Trees

- Small Tree
- Medium Old Tree
- Large Old Tree
- Very Large Old Tree
- E.vi Coast Manna Gum *Eucalyptus viminalis* ssp. *pryoriana*
- E.ov Swamp Gum *Eucalyptus ovata* ssp. *ovata*
- E.ce Mealy Stringbark *Eucalyptus cephalocarpa*

FIGURE 5A
ECOLOGICAL VEGETATION CLASSES AND SCATTERED TREES
Contract Area 42
Biodiversity Mapping Project 2009-2011

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Contracting and Consulting in Environmental Planning and Ecological Restoration
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DATUM: GDA 94 VICGRID 94

N

0 50 100 150 200

Metres

1:5,000 when printed at A3

MAP AND SURVEY DETAILS

Surveyed by: Mark Shepherd, Luke Bennett and Peter Gannon,
6 Oct 2009 - 7 Feb 2010
Mapping by: Staci Timms, April 2010
Generated from: Data collected in the field using Juno PDAs and DSE's Habitas Software. Aerial Imagery and GIS base layers supplied by DSE and GAA, additional GIS layers from Geoscience Australia.

VERSION 02 **DATE:** 04/10/10

LEGEND

- Watercourse
- Roads
- Study Area Boundary
- Property Boundary
- 257462 Property PFI
- Flora Surveys Not Complete

Modelled Vegetation

- Highly likely native vegetation - woody
- Non Native Vegetation
- Degraded Treeless Vegetation

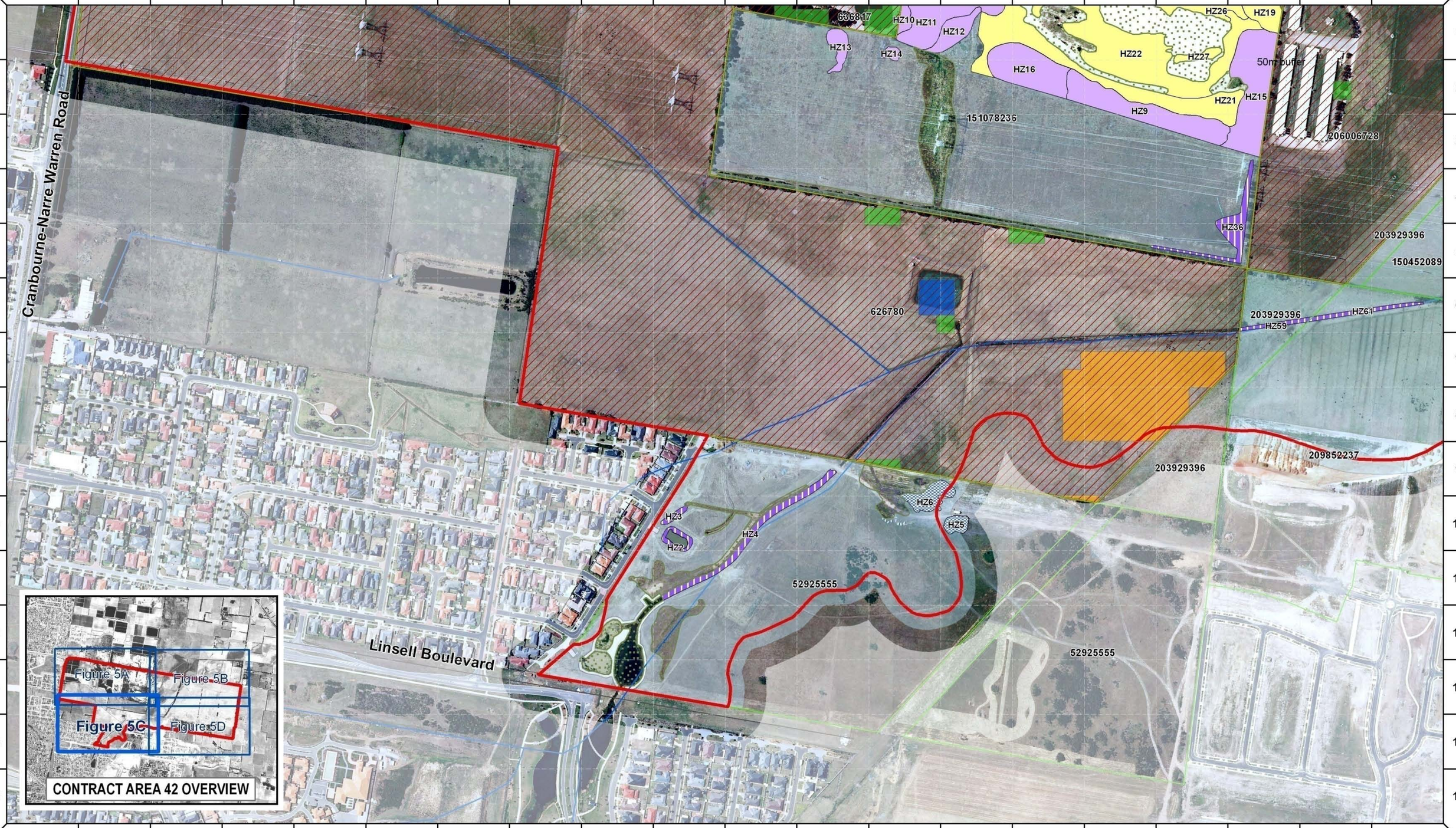
Ecological Vegetation Class

- EVC 3: Damp Sands Herb-rich Woodland
- EVC 48: Heathy Woodland
- EVC 53: Swamp Scrub
- EVC 55: Plains Grassy Woodland
- EVC 83: Swampy Riparian Woodland
- EVC 136: Sedge Wetland
- EVC 175: Grassy Woodland
- EVC 821: Tall Marsh

Scattered Trees

- Small Tree
- Medium Old Tree
- Large Old Tree
- E.vi Coast Manna Gum *Eucalyptus viminalis* ssp. *pryoriana*
- E.ov Swamp Gum *Eucalyptus ovata* ssp. *ovata*
- E.ce Mealy Stringbark *Eucalyptus cephalocarpa*

FIGURE 5B
ECOLOGICAL VEGETATION CLASSES AND SCATTERED TREES
Contract Area 42
Biodiversity Mapping Project 2009-2011



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VERSION: 02 **DATE:** 04/10/10

LEGEND

- Watercourse
- Roads
- Study Area Boundary
- Property Boundary
- 257462 Property PFI
- Flora Surveys Not Complete
- Non Native Vegetation
- Degraded Treeless Vegetation

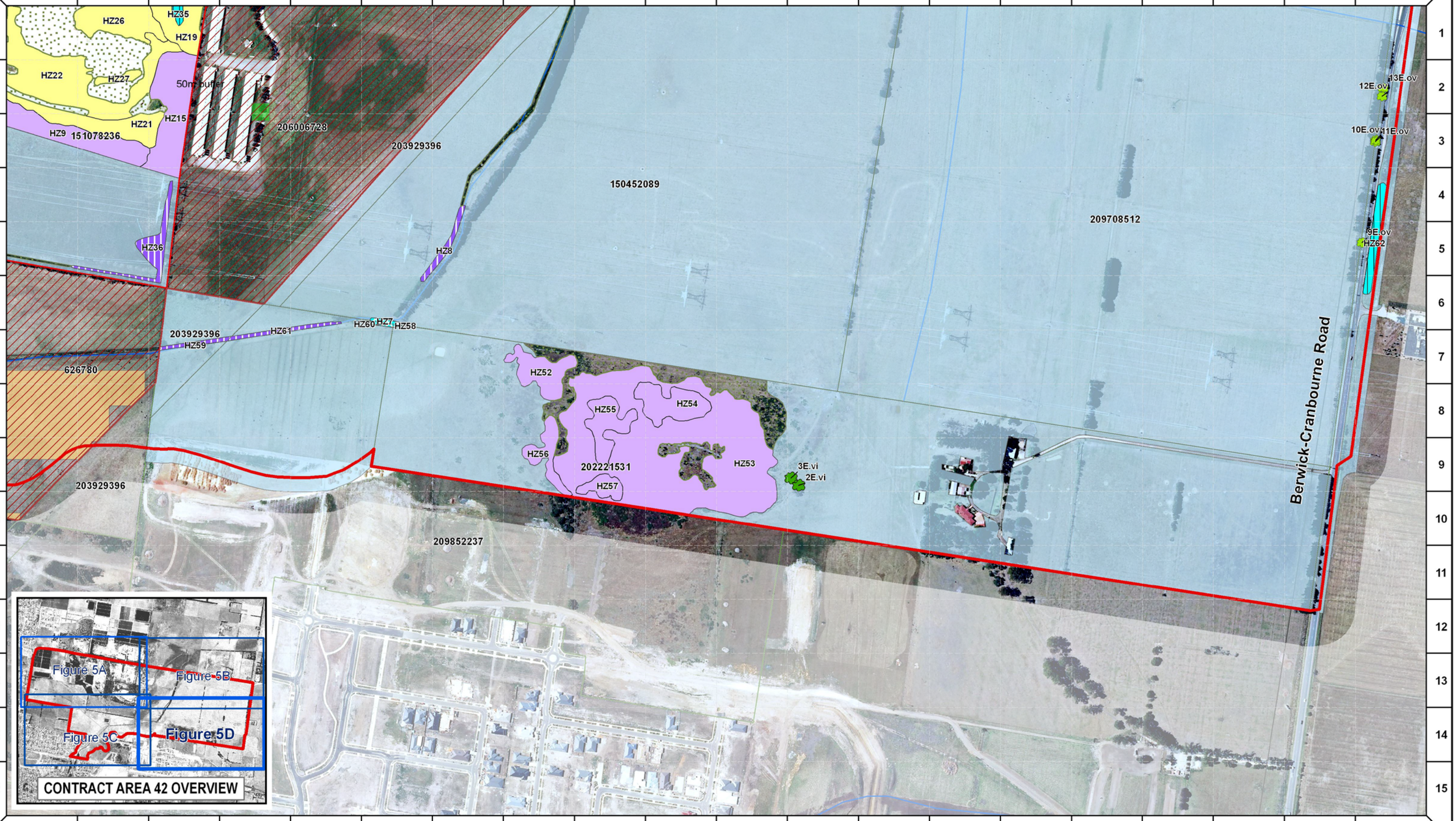
Modelled Vegetation

- Highly likely native vegetation - woody
- Possible native vegetation
- Wetland Habitat

Ecological Vegetation Class

- EVC 3: Damp Sands Herb-rich Woodland
- EVC 48: Heathy Woodland
- EVC 53: Swamp Scrub
- EVC 55: Plains Grassy Woodland
- EVC 83: Swampy Riparian Woodland
- EVC 136: Sedge Wetland
- EVC 175: Grassy Woodland
- EVC 821: Tall Marsh

FIGURE 5C
ECOLOGICAL VEGETATION CLASSES AND SCATTERED TREES
Contract Area 42
Biodiversity Mapping Project 2009-2011



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- Study Area Boundary
- Property Boundary
- 257462 Property PFI
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Modelled Vegetation

- Highly likely native vegetation - woody
- Possibly native vegetation
- Non Native Vegetation
- Degraded Treeless Vegetation

Ecological Vegetation Class

- EVC 3: Damp Sands Herb-rich Woodland
- EVC 48: Heathy Woodland
- EVC 53: Swamp Scrub
- EVC 55: Plains Grassy Woodland
- EVC 83: Swampy Riparian Woodland
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FIGURE 5D
ECOLOGICAL VEGETATION CLASSES AND SCATTERED TREES
Contract Area 42
Biodiversity Mapping Project 2009-2011

ISBN 978-1-921747-75-5 (printed)
ISBN 978-1-921747-76-2 (CD-ROM
ISBN 978-1-921747-77-9 (online)

www.gaa.vic.gov.au