

Officer Precinct Structure Plan: Conservation Management Plan (excluding Cardinia Creek)

ON BEHALF OF:

Growth Areas Authority

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Ecology Partners Pty Ltd

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EXECUTIVE SUMMARY

Ecology Partners Pty Ltd was commissioned by the Growth Areas Authority (GAA) to prepare a Conservation Management Plan (CMP) for significant species that have been recorded or have a likelihood of occurrence within the Officer Precinct. This document will be used to inform the future management requirements for the various significant flora and fauna species within Officer Precinct Structure Plan (Officer PSP), hereafter called ‘the study area’.

Study Area

The study area is approximately 50 kilometres south-east of the Melbourne CBD. It encompasses the area bounded by Brown Road to the north, Cardinia Creek and the suburb of Beaconsfield to the west, Gum Scrub Creek to the east and Pakenham Bypass to the south, (Figure 1a). The study area, to the north and south of the Princes Highway, consists of predominantly privately owned agricultural land, homesteads, and low density residential blocks.

This CMP covers all of the Officer PSP area except for land within the rail reserve and Cardinia Creek and its eastern floodplain. A separate CMP has been prepared for Cardinia Creek and the eastern flood plain (Figure 1a). Another separate CMP has been prepared specific to the Growling Grass Frog, which exists within VicUrban property in the south-east of the study area (Figure 1a).

Objective

The purpose of this CMP is to provide management protocol for the design, staging, construction, mitigation and monitoring during the implementation of the Officer PSP to protect, enhance and mitigate impacts to significant species and their habitats which exist within the study area. Construction of the study area is expected to occur over several years, with multiple stages of construction likely to occur within the study area at any one time.

This document outlines actions such as salvage and translocation protocol for significant flora and fauna species prior to and during construction, along with general measures to avoid and mitigate impacts to these species and their associated habitats within the six management areas.

The CMP was prepared to meet requirements under Melbourne’s Strategic Assessment and to satisfy the relevant regulatory authority, the Department of Suitability and Environment (DSE).

The implementation of the plan will require the commitment of the future public land managers (including Cardinia Shire Council and Melbourne Water), the collaboration of all relevant stakeholders and ongoing reviews by DSE (and Department of Sustainability, Environment, Water, Population and Communities if required) to ensure intended management outcomes are being achieved.

Conservation Management Plan – Phase One

Six separate areas have been outlined as requiring management actions based on key site features, location of significant species, vegetation condition and ecological attributes. These include: Roadside Reserves; Drainage Lines, the Gilbert Property, the Leber Property, Private Property and Gum Scrub Creek. In most instances, these zones are further broken down into particular management areas. Specific information regarding location, significance, potential impacts and mitigation measures for each of these management areas are provided.

The plan must be carried out in accordance with the specific actions outlined in this plan for the duration of Phase One, being from the date of approval of the CMP until a period of ten years after the completion of the construction. Ongoing monitoring and management reports/statements will be completed at the end of Phase One and are to be reviewed by DSE.

Conservation Management Plan – Phase Two

After the completion of Phase One under this CMP (which occurs 10 years after completion of construction works), Phase Two will be implemented in perpetuity. Relevant land owners will be responsible for undertaking and funding Phase Two of the CMP.

Phase Two will require the ongoing implementation of the following:

- Maintenance of waterway corridors by Melbourne Water and Cardinia Shire Council in accordance with the Memorandum of Understanding between the organisations and reflecting each organisation's standard maintenance policies and programs.
- Maintenance of retained vegetation in the Gilbert and Leber properties by Cardinia Shire Council.
- Any ongoing monitoring and/or management of Matted Flax-lily retained in Roadside Reserves by Cardinia Shire Council.
- Any monitoring and/or management of translocated Matted Flax-lily specimens by the person/organisation responsible for development works that necessitated the translocation.
- The local connector road in the middle of the Gilbert Property must provide a minimum width with no on-street parking on either side of the road (see Figure 7). “No Standing Anytime” parking restrictions and signage must be installed, maintained, and enforced by Cardinia Shire Council, to the satisfaction of DSE and Department of Transport .

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1 INTRODUCTION

1.1 Project information

Ecology Partners Pty Ltd was commissioned by the Growth Areas Authority (GAA) to prepare a Conservation Management Plan (CMP) for significant species that have been recorded or have a likelihood of occurrence within the Officer Precinct Structure Plan (PSP) area (excluding Cardinia Creek and adjacent floodplain). This document outlines the future management requirements for the various significant flora and fauna species within this area, hereafter called ‘the study area’.

The study area is designated for urban development under A Plan for Melbourne’s Growth Areas (2006). A PSP has been prepared for Officer to facilitate its development from rural to an urban area. This will result in the removal of various vegetation patches which is likely to displace or disturb some significant flora and fauna species.

Previous assessments have recorded the existence of four significant flora species within the Precinct (Matted Flax-lily *Dianella amoena*, Arching Flax-lily *Dianella* sp. aff. *longifolia* (Benambra), Green Scentbark *Eucalyptus fulgens* and Veined Spear-grass *Austrostipa rudis* var. *australis*) (Biosis Research Pty Ltd 2004, 2006; Ecology Partners Pty Ltd 2010a). The Flora Information System (FIS 2009) also has records of two additional species (Maroon Leek-orchid *Prasophyllum frenchii* and Purple Diuris *Diuris punctata* var. *punctata*) within the Precinct. Previous targeted surveys by both Biosis Research (2004, 2006) and Ecology Partners (2010a) failed to locate these two species.

There are also several significant fauna species which may reside within the Precinct, including state significant species; Swamp Skink *Egernia coventryi*, Glossy Grass Skink *Pseudemoia rawlinsoni* and Southern Toadlet *Pseudophryne semimarmorata*, and two nationally significant species Southern Brown Bandicoot *Isodon obesulus obesulus* and Growling Grass Frog *Litoria raniformis*. Recent targeted surveys throughout the Precinct failed to record these species, although there is suitable habitat present for these species.

This CMP will cover the protection, management, and actions required for removal of suitable habitat areas for the other species listed above and the management actions required for the removal of habitat for Growling Grass Frog. It is noted that large areas of suitable habitat throughout the precinct are approved to be removed with protection and consolidation of habitat for the species along Gum Scrub Creek (south of the Princess Highway) and in the Cardinia Creek Conservation Area. Protection and enhancement actions for the Growling Grass Frog are outlined in a separate CMP prepared by Biosis Research Pty Ltd.

1.2 Study Area

The Officer Precinct is approximately 50 kilometres south-east of the Melbourne CBD. It encompasses the area bounded by Brown Road to the north, Cardinia Creek and the suburb of Beaconsfield to the west, Gum Scrub Creek to the east and Pakenham Bypass to the south, (Figure 1a).

The study area, to the north and south of the Princes Highway, consists of predominantly privately owned agricultural land, homesteads, and low density residential blocks.

It must be noted that the scope of this CMP does not include the Cardinia Creek Corridor, with a separate CMP for this area prepared (Ecology Australia 2010a). This CMP also does not include land within the rail reserve. This CMP does not include protection and management actions for Growling Grass Frog and Matted Flax-lily on the VicUrban properties as a separate CMP and approval under the EPBC Act exists for these matters as outlined in the Biosis Research.

While most of the Precinct is relatively flat, it gently slopes from north to south. There are more than 30 dams, multiple drainage lines (which are mostly ephemeral), as well as Cardinia and Gum Scrub Creeks.

The study area is divided between two bioregions (DSE 2010b). The flats within the Precinct are within the Gippsland Plain bioregion, which extends from Port Phillip Bay in the west, to Bairnsdale in the east, between the southern slopes of the Great Dividing Range and Wilsons Promontory, excluding the Strzelecki Ranges. The hills within the Precinct, which rise to the north of the study area, are within the Highlands – Southern Fall bioregion which includes the mountain ranges and associated foothills on the southern aspect of the Great Dividing Range and extends from Melbourne in the west to close to the NSW border in the east.

1.3 Terminology

This CMP describes in detail the mitigation measures which will be undertaken throughout the pre-construction and construction stages of the development of the Officer precinct. This CMP also outlines on-going management and monitoring responsibilities.

- *Pre-construction:* This is the period prior to development occurring within the Precinct, i.e. prior to any permits being issued and acted upon for subdivision, buildings and any other works that are associated with the implementation of the PSP. Where a superlot or subdivision is undertaken, this phase may continue to apply until such a time that subsequent permits are issued for works on the superlot. During this stage, detailed planning and design will be undertaken for the Precinct.

- *Construction:* This is when works occur to implement the Officer PSP. It is characterised by the commencement of initial disturbance (i.e. earthworks, existing building demolition, vegetation removal), up until the completion of development of individual properties or the completion of infrastructure projects such as new or upgraded roads and drainage works.
- *On-going Management and Monitoring:* This occurs in some instances immediately following approval of the CMP, whilst other management *and monitoring* actions occur *post-construction* (immediately following completion of construction works).

This CMP outlines actions for two operational phases:

- Phase One of the CMP includes requirements from the date of CMP approval until 10 years after completion of construction works; and,
- Phase Two of the CMP includes the actions to be undertaken in perpetuity for maintenance of habitat, which will commence at the completion of Phase One.

Throughout the following document, references to actions that “will” or “must” happen are required by the Conservation Management Plan and the approval under the Melbourne’s Strategic Assessment (MSA). Actions that are recommendations or “should” happen are not required to be undertaken under the approval of the Conservation Management Plan under the MSA, but are guidelines and/or recommended directions for future actions.

1.4 Background Information and Survey Methodology

Background information on threatened flora and fauna species including their appearance, habitat requirements, occurrence within the precinct, distribution within the surround area and threatening processes are outlined Appendix 1 and 2.

2 CONSERVATION MANAGEMENT PLAN – PHASE ONE

2.1 Objectives

The purpose of this CMP is to provide management protocol for the design, staging, construction, mitigation and monitoring during the implementation of the Officer PSP to protect, enhance and mitigate impacts to significant species and their habitats which exist within the study area (DSE 2010a). Construction within the study area is expected to occur over several years, with multiple stages of construction are likely to occur at any one time. The CMP outlines management actions for the following species:

Flora

- Matted Flax-lily *Dianella amoena*
- Arching Flax-lily *Dianella sp. aff. longifolia* (Benambra)
- Green Scentbark *Eucalyptus fulgens*
- Veined Spear-grass *Austrostipa rudis* subsp. *australis*
- Maroon Leek Orchid *Prasophyllum frenchii*
- Purple Diuris *Diuris punctata* var. *punctata*

Fauna

- Southern Brown Bandicoot *Isoodon obesulus obesulus*
- Swamp Skink *Egernia coventryi*
- Glossy Grass Skink *Pseudemoia rawlinsoni*
- Southern Toadlet *Pseudophryne semimarmorata*
- Growling Grass Frog *Litoria raniformis*

Further information relating to the appearance, habitat requirements, legislation, occurrences of each species within the study area and surrounds as well as their threatening processes are provided below (Appendix 1 and 2).

Large areas of suitable habitat for Growling Grass Frog have been approved to be removed with salvage and translocation requirements with the protection, consolidation and enhancement of habitat for the species occurring along Gum Scrub Creek and Cardinia Creek.

Potential habitat for Southern Brown Bandicoot is being protected in the North West Corner of the precinct through the Native Vegetation Precinct Plan.

Dispersal corridors for the species, as identified in the Sub Regional Strategy for Southern Brown Bandicoot, are being enhanced along Gum Scrub Creek and Cardinia Creek through vegetation improvements as part of upgrading these creek lines.

Threatened flora species are being protected in situ where possible and translocated or seed collected where they are approved to be removed.

The CMP includes mitigation measures for removal of potential habitat for Swamp Skink, Glossy Grass Skink and Southern Toadlet.

The CMP outlines actions such as salvage and translocation protocol for significant flora and fauna species prior to and during construction (Appendix 4 and 5), along with general measures to avoid and mitigate impacts to these species and their associated habitats within the six management areas.

The CMP was prepared to meet requirements under the MSA and to satisfy the relevant regulatory authority, the Department of Suitability and Environment (DSE). The implementation of the plan will require the commitment of the future public land managers (i.e. Cardinia Shire Council and Melbourne Water), the collaboration of all relevant stakeholders and ongoing reviews by DSE [and Department of Sustainability, Environment, Water, Population and Communities (SEWPaC) if required] to ensure intended management outcomes are being achieved.

The overall objectives of this CMP are to:

1. Identify all areas of potential habitat for populations of significant flora and fauna species;
2. Ensure the Officer PSP has a negligible impact on populations of significant flora and fauna species, along with general environment values within the study area;
3. Prescribe measures to improve the long-term viability of populations of significant flora and fauna species by augmenting and extending areas of suitable habitat; and,
4. Ensure that the ongoing survival of flora and fauna populations within the study area is perpetuated into the future.

More specifically, the goals for success pertaining to each significant species in this CMP are listed in Appendix 3.

2.2 Compliance with Legislation

2.2.1 State

The Victorian *Flora and Fauna Guarantee Act 1988* (FFG Act) aims to protect threatened flora and fauna and sets out a number of conservation and management objectives:

- To guarantee that all taxa of Victoria's flora and fauna can survive, flourish and retain their potential for evolutionary development in the wild;
- To conserve Victoria's communities of flora and fauna;
- To manage potentially threatening processes;
- To ensure that any use of flora or fauna by humans is sustainable;
- To ensure that the genetic diversity of flora and fauna is maintained; and
- To encourage the conserving of flora and fauna through co-operative community endeavours.

The following species that are listed for protection under the Flora and Fauna Guarantee Act 1988 that have been identified within the study area or have had suitable habitat identified within the precinct:

- Growling Grass Frog
- Dwarf Galaxias
- Australian Grayling
- Southern Brown Bandicoot
- Swamp Skink
- Matted Flax-lily
- Maroon Leak Orchid

A number of species listed above including Dwarf Galaxias and Australian Grayling have been recorded or have had suitable habitat identified within the Cardinia Creek Corridor which is not included in the scope of this CMP. This CMP therefore does not address management for these species – this is outlined in a separate CMP prepared by Ecology Australia. This CMP also does not include protection and management for existing Growling Grass Frog populations and suitable habitat on VicUrban land within the south-east of the Officer PSP area – this is outlined in a CMP prepared by Biosis Research.

This CMP does address mitigation and management for Southern Brown Bandicoot, Swamp Skink, Matted Flax-lily and Maroon Leak Orchid as these species have been recorded or habitat for these species has been identified to occur in the Officer PSP area (outside of the Cardinia Creek corridor). This CMP also includes salvage and translocation requirements for removal of suitable habitat for Growling Grass Frog on properties other than covered in the VicUrban EPBC Act approval.

Permits and or authorisations may be required for impacts approved under this CMP in relation to protected flora and fish under this Act.

The *Wildlife Act 1975* aims to promote the protection and conservation of Victoria's wildlife with the purposes of:

- Establishing procedures in order to promote the protection and conservation of wildlife;
- Prevention of taxa of wildlife from becoming extinct;
- Sustainable use of and access to wildlife; and
- Prohibit and regulate the conduct of persons engaged in activities concerning or related to wildlife.

The Wildlife Regulations 2002 of the Act prescribe penalties for the purposes of the *Wildlife Act 1975*. These include penalties for persons who wilfully damage, disturb or destroy any wildlife habitat without appropriate authorisation (Section 9 of the Wildlife Regulations 2002). Authorisation and/or permits may be required under the Act for impacts on wildlife referred to in this CMP.

2.2.2 Commonwealth

The Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) requires approval from SEWPaC for any proposal to undertake actions that could have a significant impact on matters of National Environmental Significance (NES). Matters of NES include listed threatened species and ecological communities.

The following species are listed for protection under the EPBC Act and have been identified within the study area or have suitable habitat identified within the study area:

- Growling Grass Frog
- Southern Brown Bandicoot
- Matted Flax-lily
- Maroon Leak Orchid

Under Part 9 (Approval of Actions) of the EPBC Act, individual land owners are required to refer any actions that are likely to have significant impacts on any of these species to the Commonwealth Minister. In this case, however, the study area of this CMP is included in the approvals available under Melbourne's Strategic Assessment which is effectively approval for all development within the study area under Part 10 of the EPBC Act. However, an existing Part 9 approval applies to impacts on Growling Grass Frog habitat on the VicUrban land identified on Figure 1a and therefore this CMP applies to the VicUrban land for all species and communities other than Growling Grass Frog.

2.2.2.1 Melbourne Strategic Assessment under Section 146 of the EPBC Act

An agreement under the Strategic Assessment provision of the EPBC Act [Section 146(1) Agreement, Part 10 Strategic Assessment (EPBC Act)] was made between the Commonwealth of Australia and the State of Victoria on 16th June 2009. This agreement outlines that the State will undertake a Strategic Assessment to assess requirements under the EPBC Act.

As part of this agreement, the Victorian Government has sought approval from the Commonwealth Government for activities that will impact on Matters of NES as a result of a defined Program. The Program is set out in Delivering Melbourne's Newest Sustainable Communities: Program Report (DPCD, December 2009) and applies to:

- Areas inside the existing Urban Growth Boundary (UGB) at 7 August 2010 that are to be subject to the Victorian Government's Precinct Structure Planning process and are exhibited after 26 May 2009 (28 precincts in total).
- The designation of areas for future urban development within an expanded UGB (as approved by Amendment VC68 to the Victorian Planning Provisions on 6/8/2010)
- The proposed Outer Metropolitan Ring / E6 Transport Corridor
- The Tarneit section of the proposed Regional Rail Link project (West Werribee to Deer Park).

Commonwealth approval of all actions associated with urban development within the 28 precincts inside the urban growth area boundary at 7 August 2010 was granted on 8 July 2010, this includes the Officer PSP. The approval has effect for wetlands of international importance, listed threatened species and communities and listed migratory species.

The approval of actions requires urban development to be undertaken in accordance with the approved program approved by the Commonwealth Minister. As part of the approved program, prescriptions have been developed by Victoria for managing several matters of NES which are likely to be impacted as a result of the Program.

These prescriptions have been approved by the Commonwealth and identify decision guidelines on what habitat must be retained and what can be cleared.

They also identify how impacts are to be mitigated, including through the provision of appropriate offsets or strategic planning initiatives.

The approved Prescription for Growling Grass Frog and Southern Brown Bandicoot require:

- Protection and management for the species and their habitat in accordance with the Sub-regional Strategies; and
- A Conservation Management Plan to be prepared to the satisfaction of Department of Sustainability and Environment.

The Draft Sub-regional Strategy for the Southern Brown Bandicoot identifies Gum Scrub Creek in the Officer PSP area as a 'long distance dispersal corridor'.

The approved Prescription for the Matted Flax-lily requires:

- A Conservation Management Plan to be prepared to the satisfaction of Department of Sustainability and Environment.

Existing habitat for the Growling Grass Frog and Southern Brown Bandicoot within the larger Officer study area is proposed to be removed for development under the Officer PSP (shown in Figure 3b). As such, the Officer PSP Cardinia Creek CMP (Ecology Australia Pty Ltd 2010a) and this Officer PSP CMP, allows for the removal of these habitats to be offset through the creation of consolidated habitat corridors and provision for augmenting habitat along waterways (e.g. Cardinia Creek and Gum Scrub Creek).

Through the application of the Strategic Assessment process, this CMP outlines the obligations for landowners and/or developers within the Precinct. The application of the CMP will mean that referrals under the EPBC Act on a property-by-property basis will not be required.

When this CMP is approved by the Department of Sustainability and Environment, urban development may proceed provided the requirements of this CMP are adhered to, subject to obtaining any relevant approvals required under the Cardinia Planning Scheme and other relevant local and state laws.

2.3 Implementation, Timeframes and Review

2.3.1 Management Responsibilities and Funding

Management responsibilities and the source of funding for these actions are outlined in the ‘Mitigation Actions’ and ‘Ongoing Management and Monitoring Actions’ tables provided for each management area (eg. Roadside Reserves, Drainage Lines, Gilbert Property etc). In general terms, if actions outlined by this CMP are considered to be standard obligations of public land managers, then the action is nominated to be funded by the relevant land manager.

In regard to actions nominated to be funded by the ‘Officer DCP’ this refers to projects that have been costed in the Officer Development Contributions Plan.

Any actions to be undertaken by VicRoads is subject to the timing of State Government allocation of the required funds.

2.3.2 Timeframes

The commencement of the CMP will be the approval date of the CMP by DSE. Phase One of the CMP will commence from approval of the CMP until ten years after completion of construction. As the study area may not be fully developed for 20 or more years, the ‘completion of construction’ will occur in different parts of the study area at different times, staggered over an extended timeframe. The ‘completion of construction’ is therefore defined by the date that each subdivision, road upgrade or other associated construction works are completed.

Phase Two of the CMP will commence on completion of Phase One and will be implemented in perpetuity.

2.3.3 Reporting and Review

Management recommendations may need to be amended if management actions are considered inappropriate or inadequate for the long-term persistence of significant species within the study area. New information may become available through ongoing monitoring procedures (i.e. through weed control measures), or following review of ongoing reporting submitted to DSE.

An annual summary statement or report will be prepared for each management area (eg. Roadside Reserves, Drainage Lines, Gilbert Property) to inform DSE of relevant ecological issues, milestones and threats.

This statement/report will include:

- The progress of development within the management area;
- Any measures implemented in accordance with this CMP;
- Any incidents which may have impacted any matters of NES;
- Any mitigation measures implemented;
- Progress of management actions (e.g. weed removal, salvage and translocation works);
- Any significant findings resulting from monitoring activities; and,
- Any requested CMP amendments that may have been made during the course of the year.

The person or organisation responsible for preparing and submitting the annual statement/report is outlined in the ‘Ongoing Management and Monitoring Actions’ table for each management area in the CMP.

An in-depth review of the CMP will be undertaken every five years following its approval as well as at the completion of Phase One. The review will be undertaken by DSE in consultation with all relevant land managers and land owners to address and rectify any issues that may have arisen during the implementation of the CMP.

In the event that through the above review process, it is proposed to extend the requirements outlined in this CMP, including changes to the current scope of proposed works, management actions and monitoring requirements, these must be determined by consultation and agreement between DSE and relevant land managers and land owners.

3 MANAGEMENT AREAS

Six separate areas have been outlined as requiring management actions during Phase One of the CMP based on key site features, location of significant species, vegetation condition and ecological attributes. These include: Roadside Reserves; Drainage Lines, the Gilbert Property, the Leber Property, Private Property and Gum Scrub Creek (Figure 1b).

3.1 Roadside Reserves

3.1.1 Location and Significance

The roadside reserves that contain significant flora species and habitat for significant fauna species are shown in Figure 1b.

3.1.2 Proposed Development

The proposed development will remove significant flora species and habitat for significant fauna species for the upgrade of roads. Significant flora species which have been approved to be removed and which must be retained and protected are shown in Figures 2a-2d and 4a-4d.

3.1.3 Potential Impacts

A summary of potential development impacts is provided in Appendix 6.

3.1.4 Mitigation Actions

Table 1. Summary of detailed actions required for the implementation of the CMP within Roadside Reserves.

Action	Timing	Responsible Agent	Funding Source	Measurable Outcome
Pre-Construction				
Translocation or seed collection of any significant flora species which are proposed to be removed from roadside reserves as outlined in this CMP (See Figures 2a-2d and 4a-4d). This should be done as per Appendix 4 'Salvage and Translocation Protocol – Flora	Seed collection should be undertaken in Nov and Dec for Veined Spear Grass prior to development. Translocation of Matted Flax-lily and Arching Flax-lily should be undertaken during the winter prior to construction commencing	Any person/organisation responsible for undertaking works that will impact on threatened species in road reserves	Officer DCP/Land owner or developer	Translocated Matted Flax-lilies to have a 70% survival rate, with the Survival of transplants and/or propagates to a reproductive stage (producing flowers and fruit)
The Construction Environment Management Plan (CEMP) that is required for works will include temporary protection of species to be retained fenced off as 'No Go' zones with appropriate signage until the construction phase is complete. This should be undertaken by suitable personnel.	To be developed and accepted in the pre-construction phase, and implemented in the construction phase	Any person/organisation responsible for undertaking works that will impact on threatened species in road reserves	Cardinia Shire Council/Land owner or developer	Ensure that the accepted CEMP is undertaken in relation to threatened species and follows all management actions that are recommended for threatened species
Construction				
Ecological Consultant to undertake pre-clearance surveys (active searching) for the Maroon Leek-orchid in the vicinity of the corner (south-east) of Browns and Starling Road prior to construction (Figure 2a-2d and 4a-4d).	Surveys to be undertake October before construction.	Any person/organisation responsible for undertaking works that will impact on threatened species in road reserves	Officer DCP/Land owner or developer	If no Maroon Leek-orchid individuals are found then construction activities can commence. If Maroon Leek-orchid individuals are found then further consultation with DSE is required and this would be considered a contingency action (Section 4).

Action	Timing	Responsible Agent	Funding Source	Measurable Outcome
All contractors to undertake a pre-construction induction for significant flora and fauna species (as per Appendix 1 and 2). An ecological consultant/site supervisor to carry out the induction prior to working on site or during tool-box meetings. If species found during construction, Salvage and Translocation plan to be enacted as per Appendix 4 and 5.	Immediately before construction commences	Any person/organisation responsible for undertaking works that will impact on threatened species in road reserves	Officer DCP/VicRoads /Land owner of developer	Information regarding significant species along roadsides is effectively conveyed to contractors working on-site
Prior to any earth works on land with suitable habitat for Growling Grass Frog as identified on Figure 3b are to undertake Salvage and Translocation for Growling Grass Frog as per protocol in Appendix 5 – Salvage and Translocation Protocol – Fauna. An ecological consultant is to be contracted to undertake the salvage requirements.	Immediately before construction commences	Any person/organisation responsible for undertaking works that will impact on threatened species in road reserves	Officer DCP/VicRoads /Land owner of developer	Salvage and Translocation completed as per protocol.
Salvage and Translocation of previously unidentified significant flora and fauna species found during construction. The method of implementation to be in accordance with the flora and fauna contingency plans as well as the 'Salvage and Translocation Protocols (Appendix 4 and 5)	During Construction	Any person/organisation responsible for undertaking works that will impact on threatened species in road reserves	Land owner	Successful salvage and/or translocation of flora and fauna species into secure protected sites in consultation with DSE
Permanent fencing (eg. 1.0m high post and wire fence) and appropriate signage to be constructed around Matted Flax-lily retained in situ in Rix Road to help increase awareness and reduce disturbance. This should be done by suitable personnel.	During Construction	Any person/organisation responsible for undertaking works that will impact on threatened species in road reserves	Officer DCP/Land owner or developer	To a satisfactory standard by a suitable personnel.

Action	Timing	Responsible Agent	Funding Source	Measurable Outcome
<p>When undertaking road works in areas of potential habitat shown in Figure 3a, ensure that the revegetation includes species that provide some habitat for Swamp Skink, Glossy Grass Skink and Southern Toadlet.</p>	<p>During construction</p>	<p>Any person/organisation responsible for undertaking works that will impact on threatened species in road reserves</p>	<p>Council / VicRoads / Land owner or developer</p>	<p>Provide planting of over and understorey species that provide suitable cover for Swamp Skink, Glossy Grass Skink and Southern Toadlet.</p>

3.1.5 Ongoing Management and Monitoring Actions

Table 2. Implementation of Phase One of the CMP within Roadside Reserves as part of the Officer Precinct development.

Action	Timing	Responsible Agent	Funding Source	Measurable Outcome	Adaptive Management
Qualified personnel to document the health of Matted Flax-lily populations retained in-situ within Road Reserves and undertake appropriate management techniques (i.e. watering/weeding) to ensure survival. Undertake weed control within a five metre radius of Matted Flax-lily populations and maintain fencing. Monitoring of the effectiveness will be conducted concurrently with Council weed control program. Methods to consider include slashing, spraying and burning. See Appendix 4 for detailed information.	Annually for the first ten years of the CMP	Cardinia Shire Council	Cardinia Shire Council	A reduction in exotic biomass to help reduce competition and create open space for Matted Flax-lily populations to survive and reproduce	If exotic biomass is not successfully reduced then a more rigorous and frequent regime is required.
Qualified personnel to document the health of Matted Flax-lily populations which are translocated to a pre-determined site and conduct appropriate management techniques (i.e. watering/weeding). See Appendix 4 for detailed information	For first 10 years of CMP	Any person/organisation responsible for undertaking works that will impact on Matted Flax-lily populations in road reserves	Council / VicRoads / Land owner or developer	Plants are not drought stressed with adequate survival of plants recorded (90% of direct translocation)	Significant proportion (i.e. 20%) of the initial population must be sent and propagated at a nearby local nursery. If less than 90% of translocated plants survive, then replacement propagated plants are to replace failed translocated specimens.
Ensure rubbish or litter in and around retained Matted Flax-lily populations is appropriately managed within Roadside Reserves	As needed for the first ten years of the CMP	Cardinia Shire Council	Cardinia Shire Council	Rubbish and litter appropriately managed to ensure species survival	Clean up as required

Action	Timing	Responsible Agent	Funding Source	Measurable Outcome	Adaptive Management
Ongoing protection of significant flora (other than Matted Flax-lily) retained in-situ within Roadside Reserves (see Figure 2a-2d and 4a-4d).	Ongoing	Cardinia Shire Council	Cardinia Shire Council	Ongoing protection of significant flora.	No ongoing monitoring is required
A progress statement should be written on the implementation of Stage One of the CMP for Matted Flax-lily retained in situ in Roadside Reserves and Matted Flax-lily translocated from Roadside Reserves, documenting key issues and management responses. An individual statement is required from each persons/organisation that have responsibility for retention or translocation of MFL	Statement should be written at the end of Phase One	Matted Flax-lily retained in Rix Road: Cardinia Shire Council Translocated Matted Flax-lily: Person/organisation responsible for works that necessitated translocation	Council / VicRoads / Land owner or developer	All recommendations outlined in the CMP have been effectively followed	Statement submitted to DSE.

3.2 Drainage Lines

There are a number of small drainage lines which are likely to be affected by development in the study area (Figure 1b). As no significant flora species were recorded within drainage lines throughout the Precinct, this section specifically relates to the management requirements to mitigate potential impacts on significant fauna during various stages of the project.

3.2.1 Locations and Significance

Within the study area there are two drainage lines that provide potential habitat for threatened fauna (Figure 3a). The drainage lines are:

- The drainage line that runs south from the Princes Highway (east of Station Street) and connects to Station Street.
- The drainage line that runs from the southern end of the Gilbert property and connects to Officer South Road.

Please note that drainage lines also exist along road sides in the study area and through the Gilbert property, however these are covered by the Roadside Reserves and Gilbert Property sections of this CMP.

3.2.2 Proposed Development

The proposed development of drainage lines within the study area has not yet been finalised and will change depending on discussions with relevant authorities. The drainage line works will however impact on the threatened fauna habitat shown in Figure 3a.

3.2.3 Potential Impacts

A summary of potential development impacts is provided in Appendix 6.

3.2.4 Mitigation Actions

Table 3. Summary of detailed actions for the implementation of the CMP within Drainage Lines.

Action	Timing	Responsible Agent	Funding Source	Measurable Outcome
Construction				
All contractors to undertake a pre-construction induction for significant flora and fauna species (as per Appendix 1 and 2). An ecological consultant/site supervisor to carry out the induction prior to working on site or during tool-box meetings. If species found during construction, Salvage and Translocation plan to be enacted as per Appendix 4 and 5.	Immediately before construction commences	Melbourne Water/Land owner (depending on which agency is responsible for undertaking works)	Melbourne Water Development Services Scheme	Information regarding significant species along drainage lines is effectively conveyed to contractors working on-site
Prior to earth works on and with suitable habitat for Growling Grass Frog as identified on Figure 3b are to undertake Salvage and Translocation for Growling Grass Frog as per protocol in Appendix 5 – Salvage and Translocation Protocol – Fauna. An ecological consultant is to be contracted to undertake the salvage requirements.	Immediately before construction commences	Melbourne Water/Land owner (depending on which agency is responsible for undertaking works)	Melbourne Water Development Services Scheme	Salvage and Translocation completed as per protocol.
Salvage and Translocation of previously unidentified significant flora and fauna species found during construction. The method of implementation to be in accordance with the flora and fauna contingency plans as well as the 'Salvage and Translocation Protocols (Appendix 4 and 5)	During Construction	Melbourne Water/ Land Owner (depending on which agency is responsible for undertaking works)	Melbourne Water Development Services Scheme	Successful salvage and/or translocation of flora and fauna species into secure protected sites in consultation with DSE

Action	Timing	Responsible Agent	Funding Source	Measurable Outcome
<p>When undertaking drainage works in areas of potential habitat shown in Figure 3a, ensure that the revegetation includes species that provide some habitat for Swamp Skink, Glossy Grass Skink and Southern Toadlet.</p>	<p>During construction</p>	<p>Melbourne Water/ Land Owner (depending on which agency is responsible for undertaking works)</p>	<p>Melbourne Water Development Services Scheme</p>	<p>Provide planting of over and understorey species that provide suitable cover for Swamp Skink, Glossy Grass Skink and Southern Toadlet.</p>

3.2.5 Ongoing Management and Monitoring Actions

No ongoing monitoring or management actions are required by this CMP. In the unexpected event that matters of NES are recorded into the future, then the appropriate contingency actions need to be employed as outlined in Section 4.

3.3 Gilbert Property

3.3.1 Locations and Significance

The Gilbert property is located at 340 Princes Highway, Officer (Figure 1b). The site is bordered by the Princes Highway and commercially-owned land to the north, private farmland to the west, the Pakenham rail-line to the south and private dwellings to the east (refer Figures 2d, 3a and 4d). In total, the property is 21.1 hectares in size, of which 14.84 hectares is made up of remnant native vegetation. The property is owned by VicUrban. The required road design for the local connector road through the middle of the property is outlined in Figure 7.

3.3.2 Proposed Development

The proposed developments that will remove threatened flora species and habitat for threatened fauna species in the Gilbert property are:

- A new arterial road along the western side of the property connecting the Princes Highway with the Princes Freeway.
- A local connector road through the middle of the property that will connect the future residential area to the west with the major activity centre and existing train station to the east.
- Upgrade to the drainage function of the property.

Threatened flora species that have been approved to be removed and which must be retained and protected are shown in Figures 2a-2d and 4a-4d.

In this CMP, the area that will not be impacted by the future road and drainage works in the Gilbert property and which will be protected and retained is referred to as the ‘Gilbert Conservation Reserve’.

Any Offset Management Plan applying to the Gilbert property must be consistent with this CMP and must be approved by any relevant public land managers or service authorities assuming responsibility for works or actions under this CMP.

3.3.3 Potential Impacts

A summary of potential development impacts is provided in Appendix 6.

3.3.4 Mitigation Actions

Table 4. Summary of detailed actions for the implementation of the CMP within the Gilbert Property.

Action	Timing	Responsible Agent	Funding Source	Measurable Standard
Pre-Construction				
Detailed Design Plans must be prepared for the two roads, drainage requirements, recreation and any other construction works in the Gilbert property. The plans are to be prepared by Melbourne Water, Cardinia Shire Council, VicRoads and Department of Transport to clearly delineate areas of vegetation to be removed and vegetation to be retained and management actions for the Gilbert Conservation Reserve. These Detailed Plans must be to the satisfaction of DSE prior to any works being undertaken on the property. The east west connector through the Gilbert property is to be designed in accordance with Figure 7.	Prior to construction works	Melbourne Water/Cardinia Shire Council/VicRoads/Department of Transport	Melbourne Water Development Services Scheme/Officer DCP/VicRoads (Depending on nature of works undertaken)	Plans approved to DSE satisfaction in regard to vegetation to be removed and management of vegetation to be retained.
The Construction Environment Management Plan (CEMP) that is required for works will include temporary protection of vegetation to be retained fenced off as 'No Go' zones with appropriate signage until the construction phase is complete. This should be undertaken by suitable personnel.	To be developed and accepted in the pre-construction phase, and implemented in the construction phase	Melbourne Water/Cardinia Shire Council/VicRoads/Land owner (depending on which agency is responsible for undertaking works)	Melbourne Water Development Services Scheme/Officer DCP/VicRoads (Depending on nature of works undertaken)	Ensure that the accepted CEMP is undertaken in relation to threatened species and vegetation communities and follows all management actions that are recommended.
Translocation or seed collection of any significant flora species which are proposed to be removed from Gilbert property as outlined in this CMP (See Figures 2a-2d and 4a-4d). This should be done as per Appendix 4 'Salvage and Translocation Protocol – Flora	Seed collection should be undertaken in Nov and Dec for Veined Spear Grass prior to development.	Melbourne Water/Cardinia Shire Council/VicRoads/Land owner (depending on which agency is responsible for undertaking works)	Melbourne Water Development Services Scheme/Officer DCP/VicRoads (Depending on nature of works undertaken)	Compliance with CMP Translocation Protocol.
Construction				

Action	Timing	Responsible Agent	Funding Source	Measurable Standard
<p>All contractors to undertake a pre-construction induction for significant flora and fauna species (as per Appendix 1 and 2). An ecological consultant/site supervisor to carry out the induction prior to working on site or during tool-box meetings If species found during construction, Salvage and Translocation plan to be enacted as per Appendix 4 and 5.</p>	Immediately before construction commences	Melbourne Water/Cardinia Shire Council/VicRoads/Land owner (depending on which agency is responsible for undertaking works)	Melbourne Water Development Services Scheme/Officer DCP/VicRoads (Depending on nature of works undertaken)	Ecological values within the Gilbert Property are effectively conveyed to contractors working on-site
<p>Prior to any earth works on land with suitable habitat for Growling Grass Frog as identified on Figure 3b are to undertake Salvage and Translocation for Growling Grass Frog as per protocol in Appendix 5 – Salvage and Translocation Protocol – Fauna. An ecological consultant is to be contracted to undertake the salvage requirements.</p>	Immediately before construction commences	Melbourne Water/Cardinia Shire Council/VicRoads/Land owner (depending on which agency is responsible for undertaking works)	Melbourne Water Development Services Scheme/Officer DCP/VicRoads (Depending on nature of works undertaken)	Salvage and Translocation completed as per protocol.
<p>Salvage and Translocation of previously unidentified significant flora and fauna species found during construction. The method of implementation to be in accordance with the flora and fauna contingency plans as well as the 'Salvage and Translocation Protocols (Appendix 4 and 5)</p>	During construction	Melbourne Water/Cardinia Shire Council/VicRoads/Land Owner (depending on which agency is responsible for undertaking works)	Melbourne Water Development Services Scheme/Officer DCP/VicRoads (Depending on nature of works undertaken)	Successful salvage and/or translocation of flora and fauna species into secure protected sites in consultation with DSE
<p>Prevent uncontrolled public access to protect native vegetation communities and threatened flora species to be retained in the future Gilbert Conservation Reserve. Install signage to communicate native vegetation values and manage public access. Signage will detail the cost of fines for any detrimental impact on the native vegetation and threatened species present.</p>	During Construction	Land owner (unless transferred to a public authority through a legally binding agreement with funds provided)	Land owner	Access to the property is adequately controlled.
<p>“No Standing Anytime” signage is to be installed on both sides of the local connector road through middle of the Gilbert property to discourage illegal parking.</p>	During Construction	Cardinia Shire Council	Officer DCP	No Standing signage installed to satisfaction of DSE and Department of Transport.

3.3.5 Ongoing Management and Monitoring Actions

Table 5. Implementation of Phase One of the CMP within the Gilbert Property as part of the Officer Precinct development.

Action	Timing	Responsible Agent	Funding Source	Measurable Outcome	Adaptive Management
Maintain any fences and signs to appropriately manage public access to protect native vegetation communities and threatened flora species to be retained in the future Gilbert Conservation Reserve.	Ongoing for the first ten years of the CMP	Land owner (unless transferred to a public authority through a legally binding agreement with funds provided)	Land owner	No deterioration of infrastructure to manage public access.	Rectify any damaged infrastructure that manages public access.
Manage weeds to ensure survival of vegetation communities and threatened flora species to be retained including management of the level of exotic biomass within the site (especially around Matted Flax-lily).	Ongoing	Land owner (unless transferred to a public authority through a legally binding agreement with funds provided)	Land owner	Keep biomass of exotic flora species to a manageable level in order to reduce competition against native species.	If exotic biomass is not successfully reduced then a more rigorous and frequent regime is required.
Qualified personnel to document the health of Matted Flax-lily populations retained in-situ within Gilbert Conservation Reserve and undertake appropriate management techniques (i.e. watering/weeding) to ensure survival. Undertake weed control within a five metre radius of Matted Flax-lily populations. Methods to consider include slashing, spraying and burning. See Appendix 4 for detailed information.	Annually for the first ten years of the CMP	Land owner	Land owner	A reduction in exotic biomass to help reduce competition and create open space for Matted Flax-lily populations to survive and reproduce	If exotic biomass is not successfully reduced then a more rigorous and frequent regime is required.
Native Shrub Invasion must be controlled through weed control, physical removal and burning regimes to reduce the intrusion of Swamp Paperbark in the Gilbert Conservation Reserve.	Ongoing for the first ten years of the CMP	Land owner (unless transferred to a public authority through a legally binding agreement with funds provided)	Land owner	Swamp Paperbark only growing in appropriate EVCs, i.e. Swamp Scrub	If Swamp Scrub and other shrubs increase in cover then a more rigorous and frequent regime is required

Action	Timing	Responsible Agent	Funding Source	Measurable Outcome	Adaptive Management
Ensure hard rubbish or litter within the Gilbert Conservation Reserve is appropriately managed	Ongoing	Land owner (Unless transferred to a public authority through a legally binding agreement with funds provided)	Land owner	Rubbish and litter appropriately managed to ensure species survival	Clean up as required
"No Standing Anytime" parking restrictions and signage are to be maintained and enforced on both sides of the local connector road through the middle of the Gilbert property (see Figure 7).	Ongoing	Cardinia Shire Council	Cardinia Shire Council	No Standing parking restriction effectively managed to the satisfactory of DSE and Department of Transport	Enforcement action and/or additional signage as needed.
A progress statement should be written on the implementation of Stage One of the CMP for the Gilbert Property, documenting key issues and management responses	Statement should be written at the end of Phase One	Land owner (Unless transferred to a public authority through a legally binding agreement with funds provided)	Land owner	All recommendations outlined in the CMP have been effectively followed	Statement submitted to DSE.

3.4 Leber Property

3.4.1 Locations and Significance

The Leber property is located on Station Street, Officer (see Figure 1b). The site is bordered to the south by the Pakenham Rail-line, to the west by Station Street, to the east by private farmland (Mastrommano Block) and to the north by private dwellings (Gumleaf Lane). In total, the block is 7.91 hectares in size and is currently owned by VicUrban.

3.4.2 Proposed Development

The proposed development will remove significant flora species and habitat for significant fauna species in the Leber Property. Significant flora species which have been approved to be removed and which must be retained and protected are shown in Figures 2a-2d and 4a-4d.

Any Offset Management Plan applying to the Leber property must be consistent with this CMP and must be approved by any relevant public land managers or service authorities assuming responsibility for works or actions under this CMP.

3.4.3 Potential Impacts

A summary of potential development impacts is provided in Appendix 6.

3.4.4 Mitigation Actions

Table 6. Summary of detailed actions for the implementation of the CMP within Leber property.

Action	Timing	Responsible Agent	Funding Source	Measurable Standard
Pre-Construction				
Detailed plans for recreation use in relation to impact on retained native vegetation in the Leber Parkland are to be prepared by land owner and approved by Council and Melbourne Water.	Prior to construction works	Land owner	Land owner	Plans approved to DSE satisfaction in regard to vegetation to be removed and retained
Seed collection of any significant flora species which are proposed to be removed from the Leber Property as part of the Officer PSP. This should be done as per Appendix 4 'Salvage and Translocation Protocol – Flora'.	Prior to construction works	Land owner	Land owner	Compliance with CMP Translocation Protocol.
Construction				
All contractors to undertake a pre-construction induction for significant flora and fauna species (as per Appendix 1 and 2). An ecological consultant/site supervisor to carry out the induction prior to working on site or during toolbox meetings. If species found during construction, Salvage and Translocation plan to be enacted as per Appendix 4 and 5.	Immediately before construction commences	Land owner	Land owner	Ecological values within the Leber Property are effectively conveyed to contractors working on-site
Prior to any earth works on land with suitable habitat for Growling Grass Frog as identified on Figure 3b are to undertake Salvage and Translocation for Growling Grass Frog as per protocol in Appendix 5 – Salvage and Translocation Protocol – Fauna. An ecological consultant is to be contracted to undertake the salvage requirements.	Immediately before construction commences	Land owner	Land owner	Salvage and Translocation completed as per protocol.

Action	Timing	Responsible Agent	Funding Source	Measurable Standard
Salvage and Translocation of previously unidentified significant flora and fauna species found during construction. The method of implementation to be in accordance with the flora and fauna contingency plans as well as the 'Salvage and Translocation Protocols' (Appendix 4 and 5)	During construction	Land owner	Land owner	Successful salvage and/or translocation of flora and fauna species into secure protected sites in consultation with DSE

3.4.5 Ongoing Management and Monitoring Actions

No ongoing monitoring or management actions are required by this CMP. In the unexpected event that matters of NES are recorded into the future, then the appropriate contingency actions need to be employed as outlined in Section 4.

3.5 Private Properties

3.5.1 Location and Significance

Two significant species have been recorded in private property throughout the Precinct; Green Scentbark and Veined Spear-grass. The majority of these records are located to the north of the Princes Highway (see Figure 1b). There is suitable habitat for Growling Grass Frogs on private properties throughout the study area that is approved to be removed in accordance with the Officer PSP. There is also potential habitat for significant fauna species within areas of private property throughout the Precinct, just west of the Gilbert Property (Figure 3a). The actions outlined in this section of the CMP only apply to those private properties containing significant flora species or potential fauna habitat with the exception of the Gilbert and Leber properties that are outlined in Sections 3.3 and 3.4 and actions for Growling Grass Frog and Matted Flax-lily on VicUrban Properties as per their existing EPBC Act approval (2006/3001).

3.5.2 Proposed Development

The majority of land within the study area is under private ownership and over time will make way for residential subdivisions and other developments such as roads and activity centres. The significant flora species which have been approved to be removed and which must be retained and protected are shown in Figures 2a-2d and 4a-4d.

3.5.3 Potential Impacts

A summary of potential development impacts is provided in Appendix 6.

3.5.4 Mitigation Actions

Table 7. Summary of detailed actions for the implementation of the CMP within Private Property.

Action	Timing	Responsible Agent	Funding Source	Measurable Outcome
Pre-Construction				
Seed collection of any significant flora species which are proposed to be removed from Private Property as outlined in this CMP (See Figures 2a-2d and 4a-4d). This should be done as per Appendix 4 'Salvage and Translocation Protocol - Flora	Seed collection should be undertaken in Nov and Dec for Veined Spear Grass, and during June-July for Green Scent Bark prior to construction commencing	Land owner	Land owner	Compliance with CMP Translocation Protocol.
Salvage and Translocation Plan is required for properties with suitable habitat for the Growling Grass Frog that are not included in the VicUrban EPBC Act approval. Salvage and Translocation Plan is to be prepared and implemented in accordance with protocol outlined in Appendix 5 'Salvage and Translocation Protocol – Fauna' to the satisfaction of DSE.	Prior to construction	Land owner	Land owner	Salvage and Translocation Plan prepared and implemented to the satisfaction of DSE.
Construction				
All contractors to undertake a pre-construction induction for significant flora and fauna species (as per Appendix 1 and 2). An ecological consultant/site supervisor to carry out the induction prior to working on site or during tool-box meetings. If species found during construction, Salvage and Translocation plan to be enacted as per Appendix 4 and 5.	Immediately before construction commences	Land owner	Land owner	Information regarding significant species within Private Property is effectively conveyed to contractors working on-site

Action	Timing	Responsible Agent	Funding Source	Measurable Outcome
Prior to any earth works on land with suitable habitat for Growling Grass Frog as identified on Figure 3b are to undertake Salvage and Translocation for Growling Grass Frog as per protocol in Appendix 5 – Salvage and Translocation Protocol – Fauna. An ecological consultant is to be contracted to undertake the salvage requirements.	Immediately before construction commences	Land owner	Land owner	Salvage and Translocation completed as per protocol.
Salvage and Translocation of previously unidentified significant flora and fauna species found during construction. The method of implementation to be in accordance with the flora and fauna contingency plans as well as the 'Salvage and Translocation Protocols' (Appendix 4 and 5)	During Construction	Land owner	Land owner	Successful salvage and/or translocation of flora and fauna species into secure protected sites in consultation with DSE

3.5.5 Ongoing Management and Monitoring Actions

No ongoing monitoring or management actions are required by this CMP. In the unexpected event that matters of NES are recorded into the future, then the appropriate contingency actions need to be employed as outlined in Section 4.

3.6 Gum Scrub Creek

Based on the study area design, Gum Scrub Creek (Figure 1b) will be enhanced through improvements in habitat quality through revegetation and ongoing management from Browns Road to Princes Freeway (Figure 3a). This section specifically relates to the protection and enhancement of potential Southern Brown Bandicoot and Growling Grass Frog habitat throughout Gum Scrub Creek corridor during various stages of the project to ensure the long term viability of these significant species, and other flora and fauna within the study area.

It is important to note that this CMP does not outline required Growling Grass Frog habitat improvement works along Gum Scrub Creek. This CMP outlines works approved under the EPBC Act along Gum Scrub Creek for the Southern Brown Bandicoot only. The Growling Grass Frog works along Gum Scrub Creek approved under the EPBC Act are outlined in a separate CMP prepared for VicUrban by Biosis Research. The works described in this CMP that relate to the Growling Grass Frog are indicative only and are provided to demonstrate how the habitat requirements for the Southern Brown Bandicoot can be provided in conjunction with those for the Growling Grass Frog along the Gum Scrub Creek corridor.

3.6.1 Location and Significance

Gum Scrub Creek is located on the eastern boundary of the study area and is likely to act as an important habitat and dispersal corridor for a range of fauna species within the local area. This section of the study area is also interlinked with several drainage lines adjoining the Princes Highway (2b, 2d, 3a, 4b and 4d). This CMP applies to the creekline and a 50m buffer on the western side of the creek into the Officer Precinct.

A Strategic Management Plan for Southern Brown Bandicoot in the former Koo Wee Rup Swamp area has recently been prepared (Ecology Australia 2008). Results from this Plan outlined the importance of habitat patches located within Lower Gum Scrub Creek for Southern Brown Bandicoot. Although there have been no records within the study area for this species, the retention, and ongoing management and improvement of habitat patches in areas such as Gum Scrub Creek are likely to be important for the ongoing survival of any extant population of this species (Ecology Australia 2009a).

In addition, Growling Grass Frog is known to occur within the south-eastern section of the Precinct with suitable habitat for the species throughout the Precinct. For example, there have recently been a large number of targeted Growling Grass Frog surveys undertaken throughout the Pakenham area, primarily as part of the proposed Pakenham Bypass project (Timewell 2003; Organ 2004, 2005; Hamer and Organ 2008) and other proposed developments in the area (Brett Lane and Associates Pty Ltd 2004, 2005; Norris 2004).

These surveys have revealed that Growling Grass Frogs are widely distributed throughout the Pakenham areas, with a number of relatively large populations present (principally in farm dams) (A. Organ pers. obs.). Extant populations of the frog throughout this area are important for the long-term persistence of the species in the wild, and are likely to be of national conservation significance for the species.

There is suitable habitat for Growling Grass Frog throughout the study area (see Figure 3b). This suitable habitat is approved to be removed with the exceptions of Gum Scrub Creek and Cardinia Creek Corridors where habitat is to be protected, consolidated, enhanced, managed and monitored. The requirements for Gum Scrub Creek in relation to Growling Grass Frog (i.e. habitat creation, management and future monitoring) are outlined in the Biosis Research Pty Ltd CMP for Vic Urban.

The Growling Grass Frog works approved under the EPBC Act are outlined in the Biosis Research CMP, and not in this CMP. This CMP does however consider habitat and management requirements for the Growling Grass Frog to demonstrate how the requirements of this species as well as those of the Southern Brown Bandicoot can be met along Gum Scrub Creek.

3.6.2 Potential Impacts

A summary of potential development impacts is provided in Appendix 6.

3.6.3 Mitigation Measures – Southern Brown Bandicoot habitat provisions

The main habitat requirements for Southern Brown Bandicoot to be considered in the detailed design of Gum Scrub Creek as outlined in Ecology Australia (2010b), include:

- Development Buffer – 30 metres on both sides of Gum Scrub Creek between developments and habitat.
- Movement Corridors – A corridor of greater than 50 metres, for distances up to 1.1 kilometres, which consists of native vegetation with an understorey structure of 50 - 80% foliage density in the 0.2 – 1 metre height range; of which, a core habitat of up to 45 metres is recommended along the creek (subject to areas of public open space) (DEWHA 2010). In areas of public open space a minimum of 30 metres should be applied.

As outlined by DEWHA (2010) the core buffers along the creek should be as wide as possible, to maximise the potential of the area to be used by Southern Brown Bandicoot. Based on ongoing discussions with relevant authorities, landowners and ecological consultants, a core habitat of ‘up to 40 metres’ will apply as this will allow a 30 metre buffer to development on both sides within the 100 metre creek corridor.

In addition, 20-30 metre gaps in Southern Brown Bandicoot habitat along the creek corridor can be provided where considered appropriate to provide breaks in the shrub layer to allow views of the creek.

Revegetation along the creek should aim to create a continuous corridor of habitat for a wide range of terrestrial and aquatic species (including Southern Brown Bandicoot). Accordingly, vegetation enhancements should be positioned at appropriate densities (DEWHA 2010). This should comprise both online creek vegetation and shrubs layers to act as Southern Brown Bandicoot habitat for foraging, shelter and movement purposes, unless inundated. Additionally, the shrub layers positioned higher on the slope could be considered as a refuge for Southern Brown Bandicoot (i.e. during a flooding event).

The above considerations have been incorporated into an Indicative Landscape Concept Design (Appendix 8). This plan shows how a combination of both shrub (large and medium shrubs), and understorey layers along the creek line may be applied. It is recommended that over storey species be planted at sufficient distances away from the creek (≥ 20 metres) so that their growth does not obstruct the development of the understorey. This plan also indicates how Growling Grass Frog habitat works could be incorporated in conjunction with Southern Brown Bandicoot habitat in the Gum Scrub Creek corridor. For Growling Grass Frog habitat requirements refer to Biosis Research CMP prepared for VicUrban (Biosis Research Pty Ltd 2008).

The following plant species should be used to revegetate the Gum Scrub Creek (Table 8) as these plant species are consistent with EVCs within the local area (e.g. Swampy Riparian Woodland, Swamp Scrub). Establishing these plant species along the creek would provide suitable fauna habitat for a wide range of locally abundant and significant fauna species including the Southern Brown Bandicoot.

Table 8: Recommended planting list for Gum Scrub Creek, Officer, Victoria.

Life Form	Species Name	Common Name
Over storey Layer	<i>Eucalyptus viminalis</i> ssp. <i>viminalis</i>	Manna Gum
	<i>Eucalyptus ovata</i>	Swamp Gum
	<i>Eucalyptus radiata</i>	Narrow-leaf Peppermint
Shrub Layer (Large and Medium)	<i>Melaleuca ericifolia</i>	Swamp Paperbark
	<i>Leptospermum lanigerum</i>	Woolly Tea-tree
	<i>Acacia verticillata</i>	Prickly Moses
	<i>Coprosma quadrifida</i>	Prickly Currant-bush
	<i>Leptospermum continentale</i>	Prickly Tea-tree
Graminoids (Under storey)	<i>Lomandra longifolia</i>	Wattle Matt-rush
	<i>Juncus procerus</i>	Tall Rush
	<i>Poa labillardierei</i>	Common Tussock-grass
	<i>Gahnia radula</i>	Thatch Saw-sedge
	<i>Poa siebriana</i>	Grey Tussock-grass
	<i>Phragmites australis</i>	Common Reed

3.6.4 Mitigation Actions

Note: These actions do not include actions required for Growling Grass Frog including salvage and translocation, protection, monitoring and habitat enhancement works along Gum Scrub Creek within VicUrban properties. For these actions please refer to the Biosis Research CMP (Biosis Research Pty Ltd 2008).

Table 9. Summary of detailed actions for the implementation of the CMP within Gum Scrub Creek.

Action	Timing	Responsible Agent	Funding Source	Measurable Outcome
Pre-Construction				
Prior to any works undertaken in Gum Scrub Creek Corridor (50m from creekline), a detailed Design and Management Plan for Gum Scrub Creek must be prepared by the land owner, Melbourne Water, and/or Cardinia Shire Council and is to be approved by DSE. The Design and Management Plan to outline how the requirements for Growling Grass Frog and Southern Brown Bandicoot have been incorporated into the design of the corridor with detailed dimensions and site plans.	Prior to construction works	Land owner	Melbourne Water Development Services Scheme/Land owner	Plans approved to DSE satisfaction in regard to habitat enhancements for Growling Grass Frog (as outlined in the Biosis Research CMP 2008) and Southern Brown Bandicoot (as outlined in this CMP) within Gum Scrub Creek corridor.
The Construction Environment Management Plan (CEMP) that is required for works will include temporary protection of any Growling Grass Frog ponds fenced off as 'No Go' zones with appropriate signage until the construction phase is complete. This should be undertaken by suitable personnel.	To be developed and accepted in the pre-construction phase, and implemented in the construction phase	Land owner	Melbourne Water Development Services Scheme	Ensure that the accepted CEMP is undertaken in relation to protection of Growling Grass Frog ponds

Construction				
All contractors to undertake a pre-construction induction for significant flora and fauna species (as per Appendix 1 and 2). An ecological consultant/site supervisor to carry out the induction prior to working on site or during tool-box meetings. If species found during construction, Salvage and Translocation plan to be enacted as per Appendix 4 and 5.	Immediately before construction commences	Melbourne Water/Cardinia Shire Council/ Land Owner (depending on which agency is responsible for undertaking works)	Melbourne Water Development Services Scheme/Officer DCP	Information regarding significant species along Gum Scrub Creek is effectively conveyed to contractors working on-site
Prior to any earth works on land with suitable habitat for Growling Grass Frog as identified on Figure 3b are to undertake Salvage and Translocation for Growling Grass Frog as per protocol in Appendix 5 – Salvage and Translocation Protocol – Fauna. An ecological consultant is to be contracted to undertake the salvage requirements.	Immediately before construction commences	Melbourne Water/Cardinia Shire Council/ Land Owner (depending on which agency is responsible for undertaking works)	Melbourne Water Development Services Scheme/Officer DCP	Salvage and Translocation completed as per protocol.
Salvage and Translocation of previously unidentified significant flora and fauna species found during construction. The method of implementation to be in accordance with the flora and fauna contingency plans as well as the 'Salvage and Translocation Protocols' (Appendix 4 and 5)	During Construction	Land owner	Melbourne Water Development Services Scheme	Successful salvage and/or translocation of flora and fauna species into secure protected sites in consultation with DSE
Implement Southern Brown Bandicoot habitat enhancement works along Gum Scrub Creek as outlined in the detailed Design and Management Plan approved by DSE.	During Construction	Land owner	Melbourne Water Development Services Scheme	Creation of habitat as outlined in this CMP and in detailed plans approved by DSE. At completion of construction DSE to certify completed works have satisfactorily completed.

Construction				
When undertaking drainage works in areas of potential habitat shown in Figure 3a, ensure that the revegetation includes species that provide some habitat for Swamp Skink, Glossy Grass Skink and Southern Toadlet.	During construction	Melbourne Water/Cardinia Shire Council/ Land Owner (depending on which agency is responsible for undertaking works)	Melbourne Water Development Services Scheme/Officer DCP	Provide planting of over and understorey species that provide suitable cover for Skink, Glossy Grass Skink and Southern Toadlet.
Provide signage to inform the community of the habitat provided for the Southern Brown Bandicoot and other fauna species along Gum Scrub Creek. Signage will outline habitat areas as 'No Go' areas and will detail the cost of fines for any detrimental impact on fauna habitat and/or species.	Construction	Land owner	Land owner	Information is appropriately communicated

3.6.5 Ongoing Management and Monitoring Actions

Table 10. Implementation of Phase One of the CMP within Gum Scrub Creek as part of the Officer Precinct development.

Action	Timing	Responsible Agent	Funding Source	Measurable Outcome	Adaptive Management
A progress statement must be written on the implementation of Phase One of the CMP for Gum Scrub Creek, documenting success of SBB habitat establishment, key issues and management responses	Statement must be written at the end of Phase One	Melbourne Water	Melbourne Water	All recommendations outlined in the CMP have been effectively followed	Statement submitted to DSE.
Maintain vegetation that forms habitat for Southern Brown Bandicoot in accordance with habitat requirements outlined in Section 3.6.3.	Ongoing	Melbourne Water	Melbourne Water	Suitable habitat for Southern Brown Bandicoot is maintained in an ongoing manner.	Replant species lost/damaged, weed removal.

4 CONTINGENCY ACTIONS

This CMP outlines a range of actions to be undertaken in response to existing information about threatened flora and fauna species in the study area.

Management issues may arise during the implementation of the CMP which are not foreseen or quantified by the CMP, such as the discovery of significant flora and fauna species not previously recorded in the study area. If such management issues occur, the responsibility for undertaking and funding the appropriate management response (as determined by DSE) will be the responsibility of the relevant land owner.

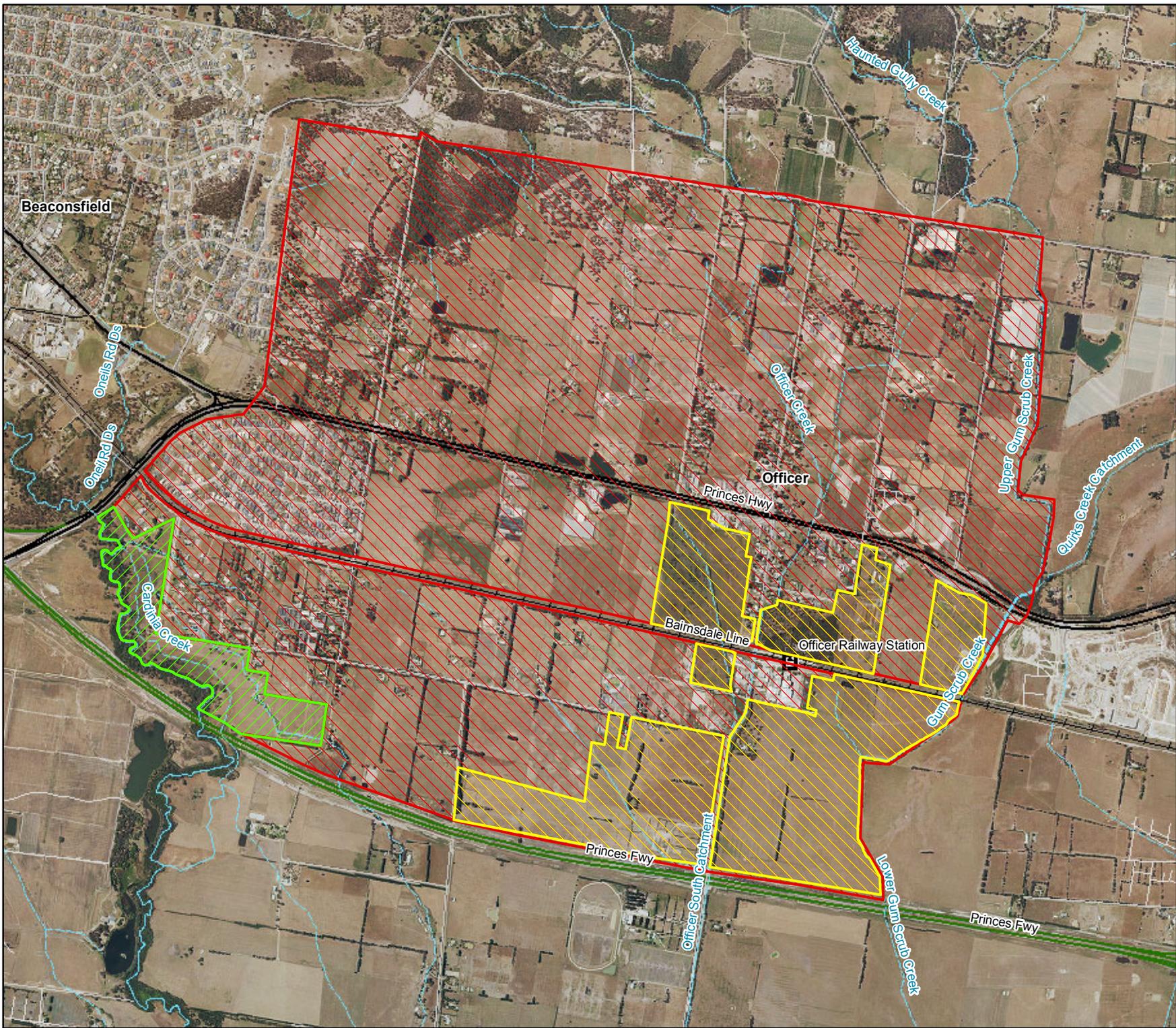
5 CONSERVATION MANAGEMENT PLAN – PHASE TWO

After the completion of Phase One under this CMP (which occurs 10 years after completion of construction works), Phase Two will be implemented in perpetuity. Relevant land owners will be responsible for undertaking and funding Phase Two of the CMP.

Phase Two will require the ongoing implementation of the following:

- Maintenance of waterway corridors by Melbourne Water and Cardinia Shire Council in accordance with the Memorandum of Understanding between the organisations and reflecting each organisation's standard maintenance policies and programs and maintain suitable habitat for Southern Brown Bandicoot.
- Maintenance of retained vegetation in the Gilbert and Leber properties by Cardinia Shire Council.
- Any ongoing monitoring and/or management of Matted Flax-lily retained in Roadside Reserves by Cardinia Shire Council.
- Any monitoring and/or management of translocated Matted Flax-lily specimens by the person/organisation responsible for development works that necessitated the translocation.
- The local connector road in the middle of the Gilbert property must provide minimum width and no on street parking on either side of the street. "No Standing Anytime" parking restrictions and signage are to be installed, maintained, and enforced on both sides of the street by Cardinia Shire Council, to DSE and Department of Transport satisfaction.

FIGURES



-  Officer Precinct Structure Plan:
Conservation Management Plan
(excluding Cardinia Creek)
by Ecology Partners Pty Ltd
-  Conservation Management Plan
(excluding Cardinia Creek) by
Ecology Partners Pty Ltd for all
species except for Growling Grass
Frog and Matted Flax-lily. Also
applying is the Growling Grass Frog
Conservation Management Plan for
VicUrban Development at Officer,
Victoria by Biosis Pty Ltd (2008).
-  Officer Precinct Structure Plan:
Cardinia Creek Conservation
Management Plan
by Ecology Australia Pty Ltd (2011)

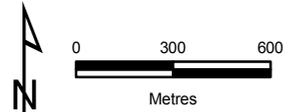
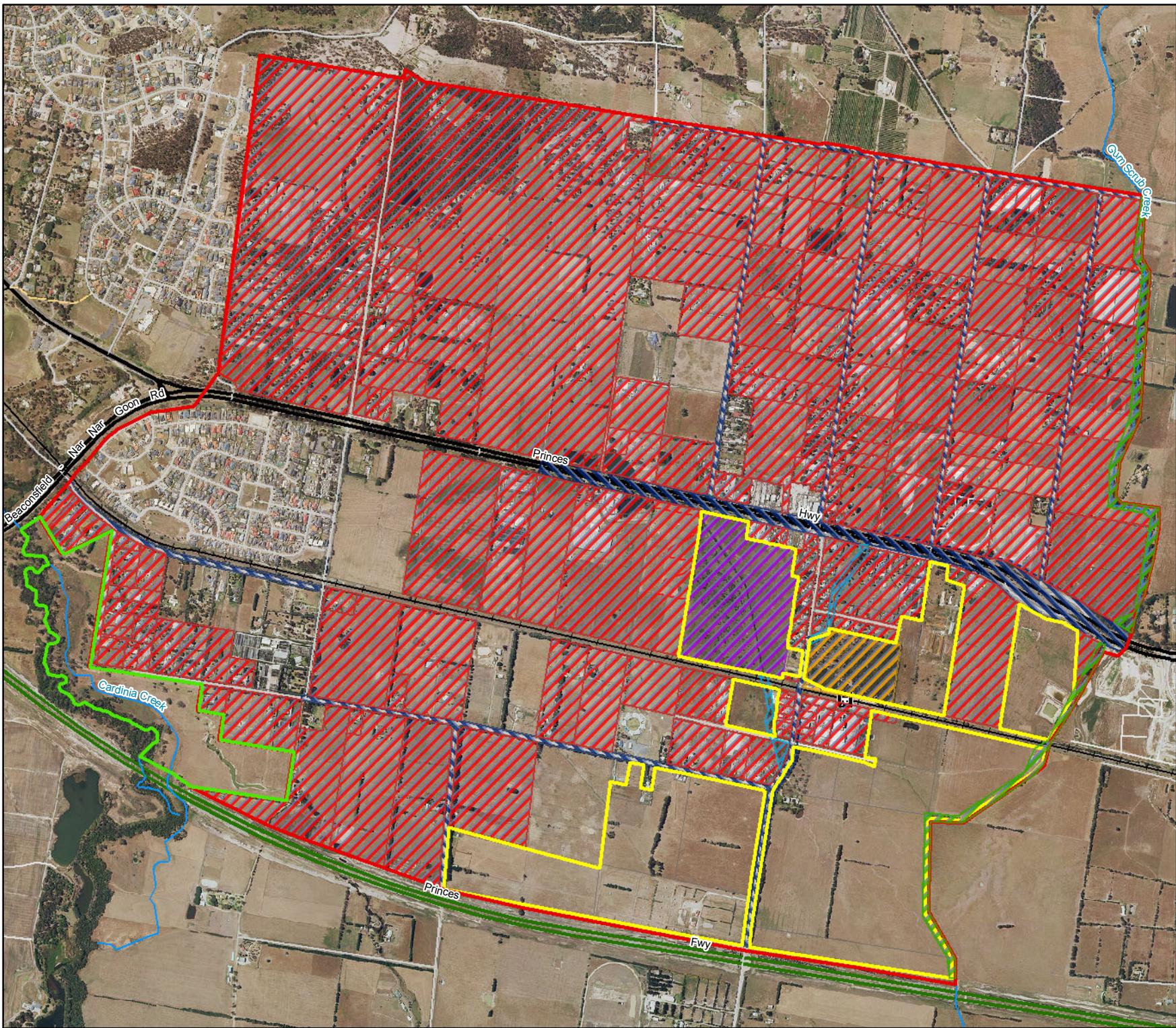


Figure 1a
Location Map
of the Study Area
Officer Structure Plan, Officer





-  Gilbert Block
 -  Leiber Block
 -  Private Property
 -  Gum Scrub Creek
 -  Drainage Line
 -  Roadside Reserve
- Conservation Management Plan (excluding Cardinia Creek) by Ecology Partners Pty Ltd for all species except for Growing Grass Frog and Matted Flax-lily. Also applying is the Growing Grass Frog Conservation Management Plan for VicUrban Development at Officer, Victoria by Biosis Pty Ltd (2008).
- Officer Precinct Structure Plan: Conservation Management Plan (excluding Cardinia Creek) by Ecology Partners Pty Ltd
- Officer Precinct Structure Plan: Cardinia Creek Conservation Management Plan by Ecology Australia Pty Ltd (2011)



Figure 1b
Management Areas of the CMP
Officer Structure Plan, Officer





- ◆ Arching Flax-lily
 - Great Swamp Gum
 - ▲ Green Scent-bark
 - ▲ Maroon Leek-orchid
 - Matted Flax-lily
 - ⊕ Purple Diuris
 - Veined Spear-grass
- Status**
- To be Removed
 - To be Retained
- Officer Precinct Structure Plan:
Conservation Management Plan
(excluding Cardinia Creek)
by Ecology Partners Pty Ltd
- Officer Precinct Structure Plan:
Cardinia Creek Conservation
Management Plan
by Ecology Australia Pty Ltd (2011)

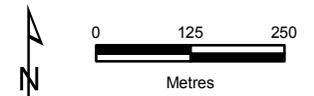
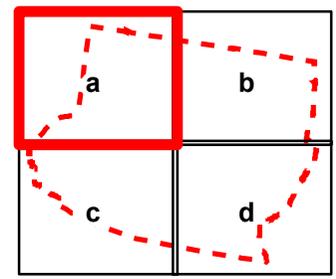


Figure 2a
Significant Flora records
within the Study Area
Officer Structure Plan, Officer





- ◆ Arching Flax-lily
 - Great Swamp Gum
 - ▲ Green Scent-bark
 - ▲ Maroon Leek-orchid
 - Matted Flax-lily
 - ✚ Purple Diuris
 - Veined Spear-grass
- Status**
- To be Removed
 - To be Retained
- Officer Precinct Structure Plan:
 Conservation Management Plan
 (excluding Cardinia Creek)
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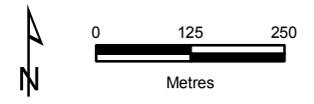
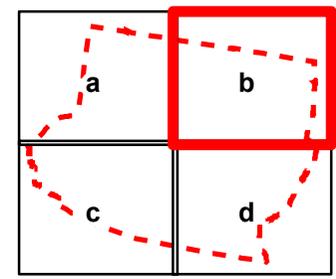
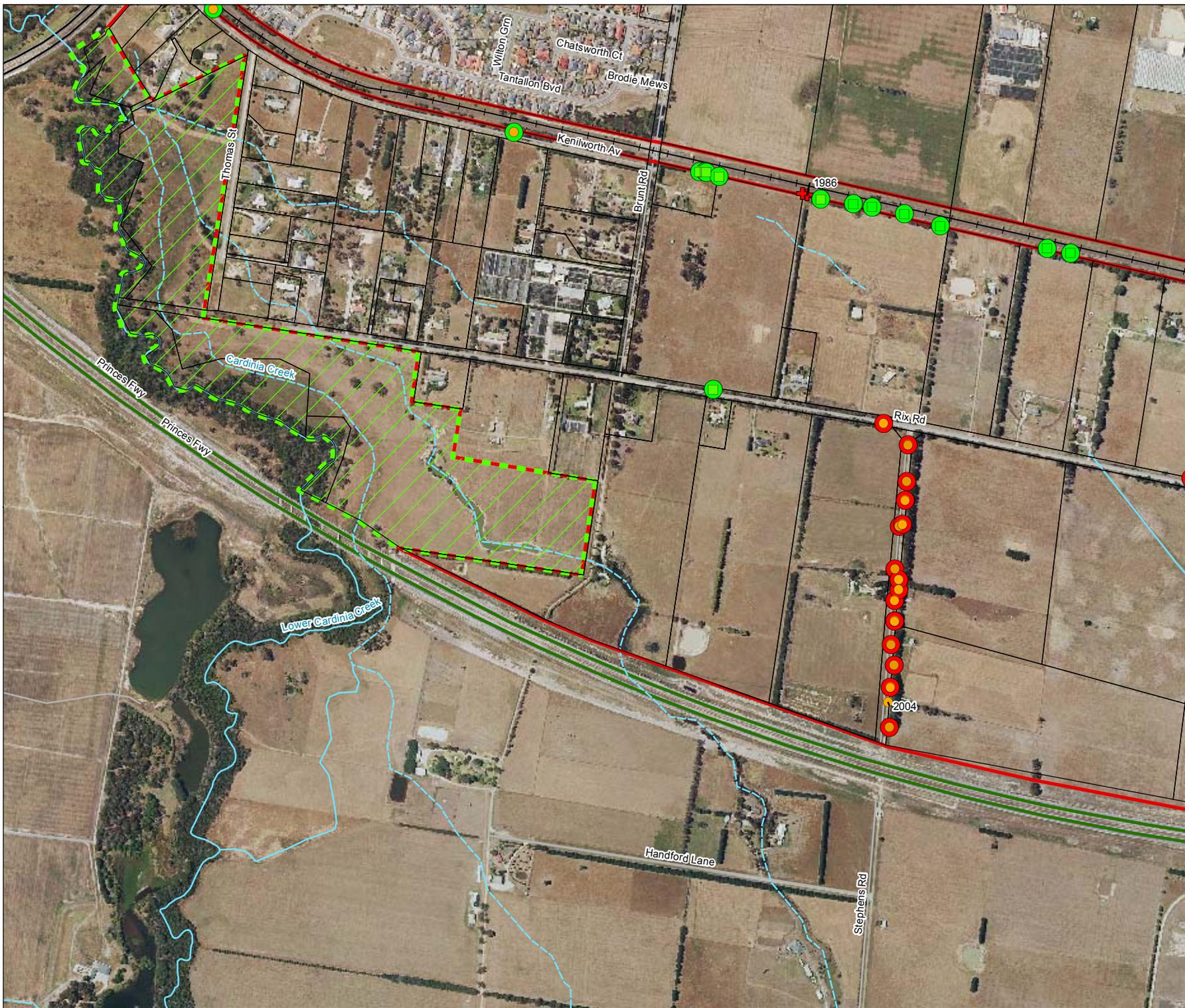


Figure 2b
 Significant Flora records
 within the Study Area
Officer Structure Plan, Officer





- ◆ Arching Flax-lily
 - Great Swamp Gum
 - ▲ Green Scent-bark
 - ▲ Maroon Leek-orchid
 - Matted Flax-lily
 - ✚ Purple Diuris
 - Veined Spear-grass
- Status**
- To be Removed
 - To be Retained
- Officer Precinct Structure Plan:
 Conservation Management Plan
 (excluding Cardinia Creek)
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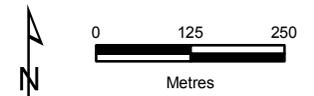
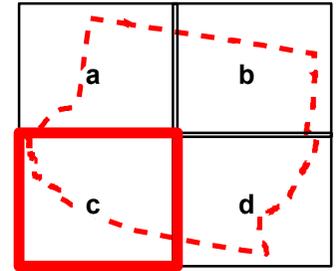
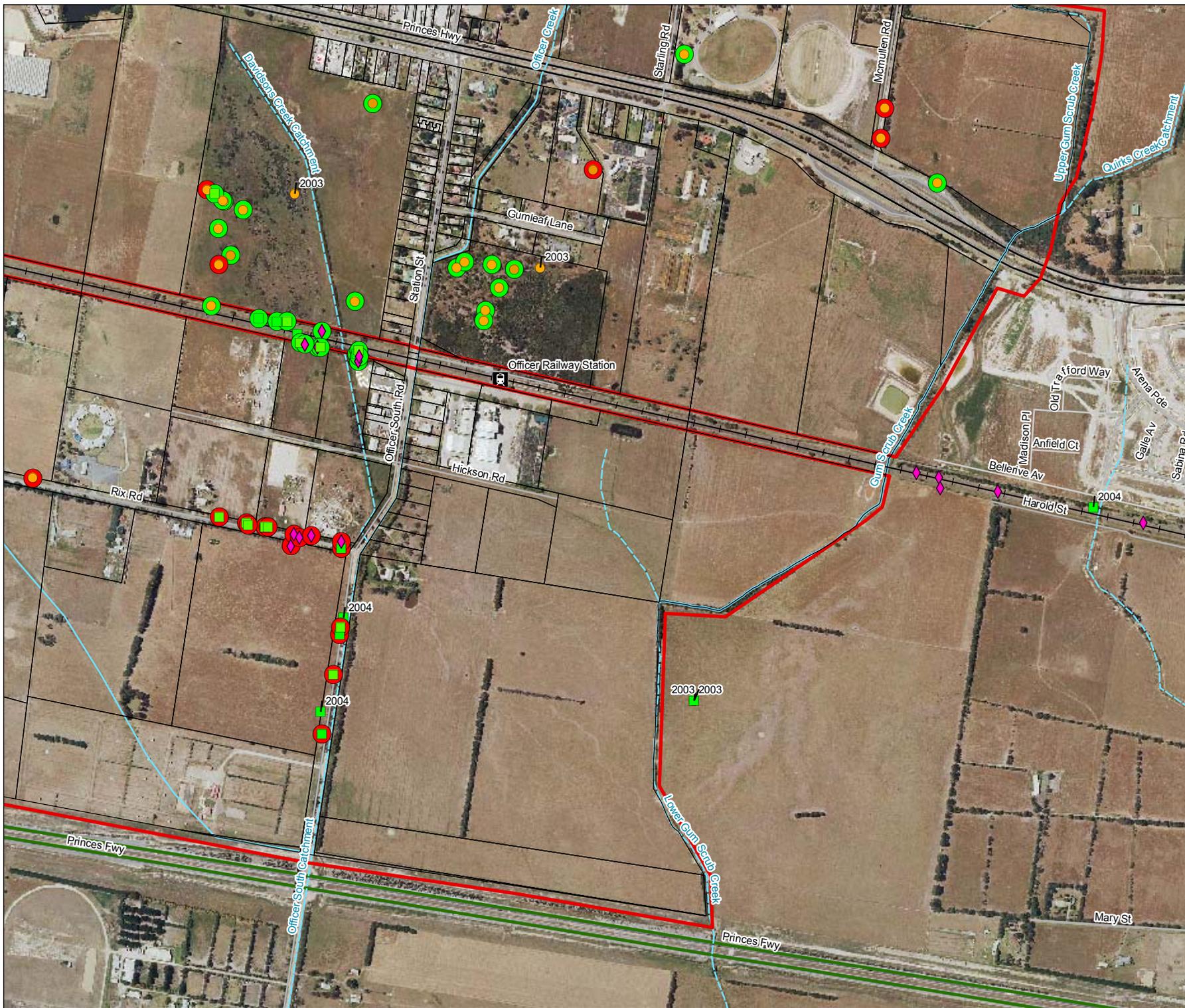


Figure 2c
 Significant Flora records
 within the Study Area
Officer Structure Plan, Officer





- ◆ Arching Flax-lily
 - Great Swamp Gum
 - ▲ Green Scent-bark
 - ▲ Maroon Leek-orchid
 - Matted Flax-lily
 - ⊕ Purple Diuris
 - Veined Spear-grass
- Status**
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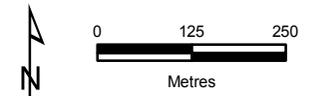
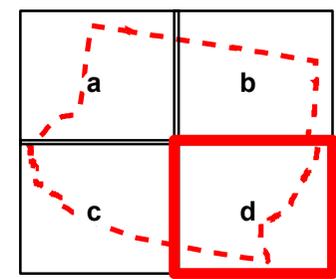
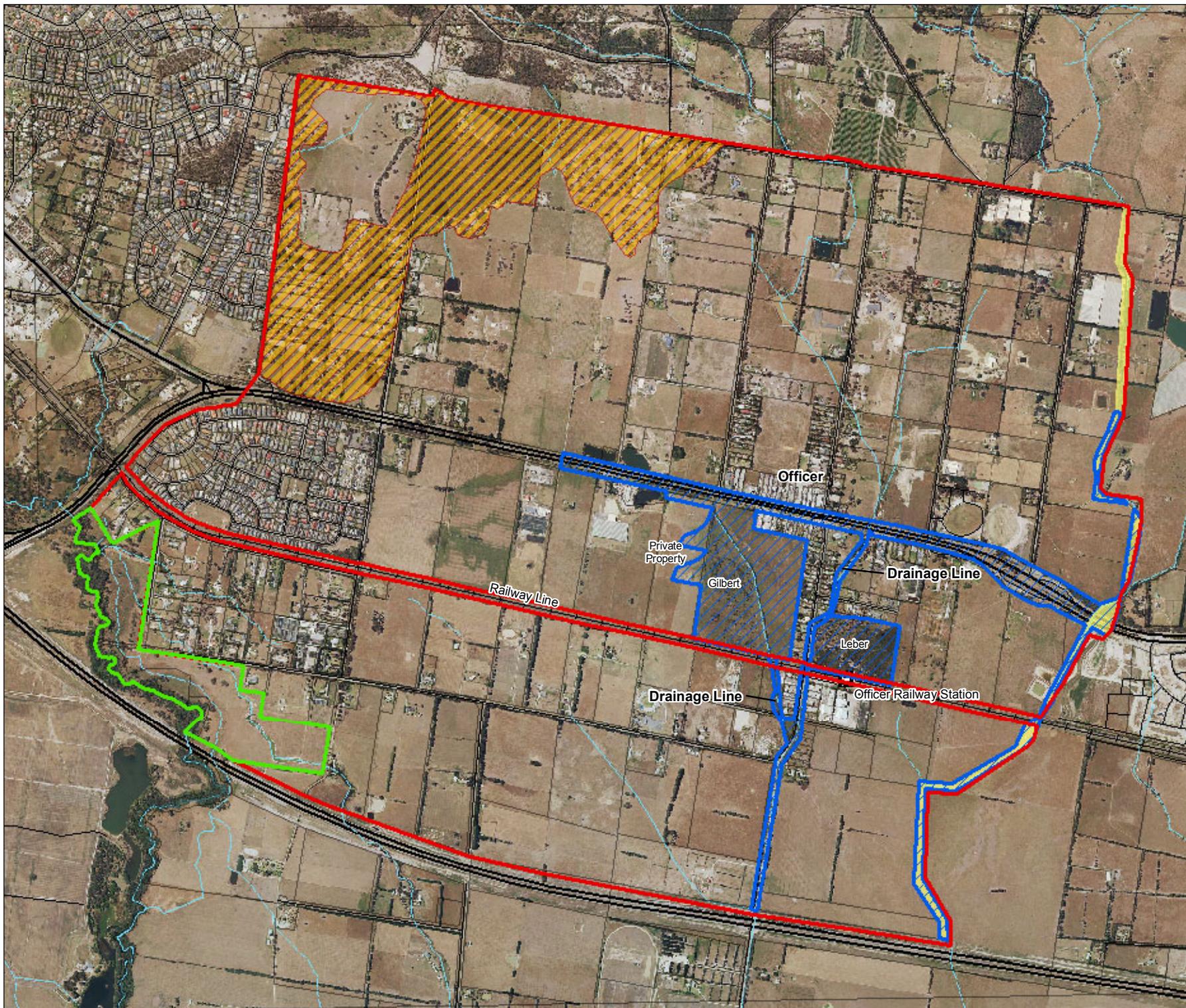


Figure 2d
Significant Flora records
within the Study Area
Officer Structure Plan, Officer





-  Suitable Habitat (Low Likelihood)
Southern Brown Bandicoot
-  Potential Habitat
(Moderate likelihood)
Swamp Skink, Glossy Grass Skink, Southern Toadlet
-  Southern Brown Bandicoot
Dispersal corridor (as outlined by the draft Sub Regional Strategy)
-  Officer Precinct Structure Plan:
Conservation Management Plan (excluding Cardinia Creek) by Ecology Partners Pty Ltd
-  Officer Precinct Structure Plan:
Cardinia Creek Conservation Management Plan by Ecology Australia Pty Ltd (2011)

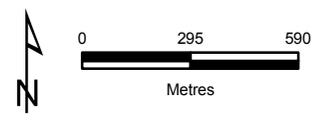
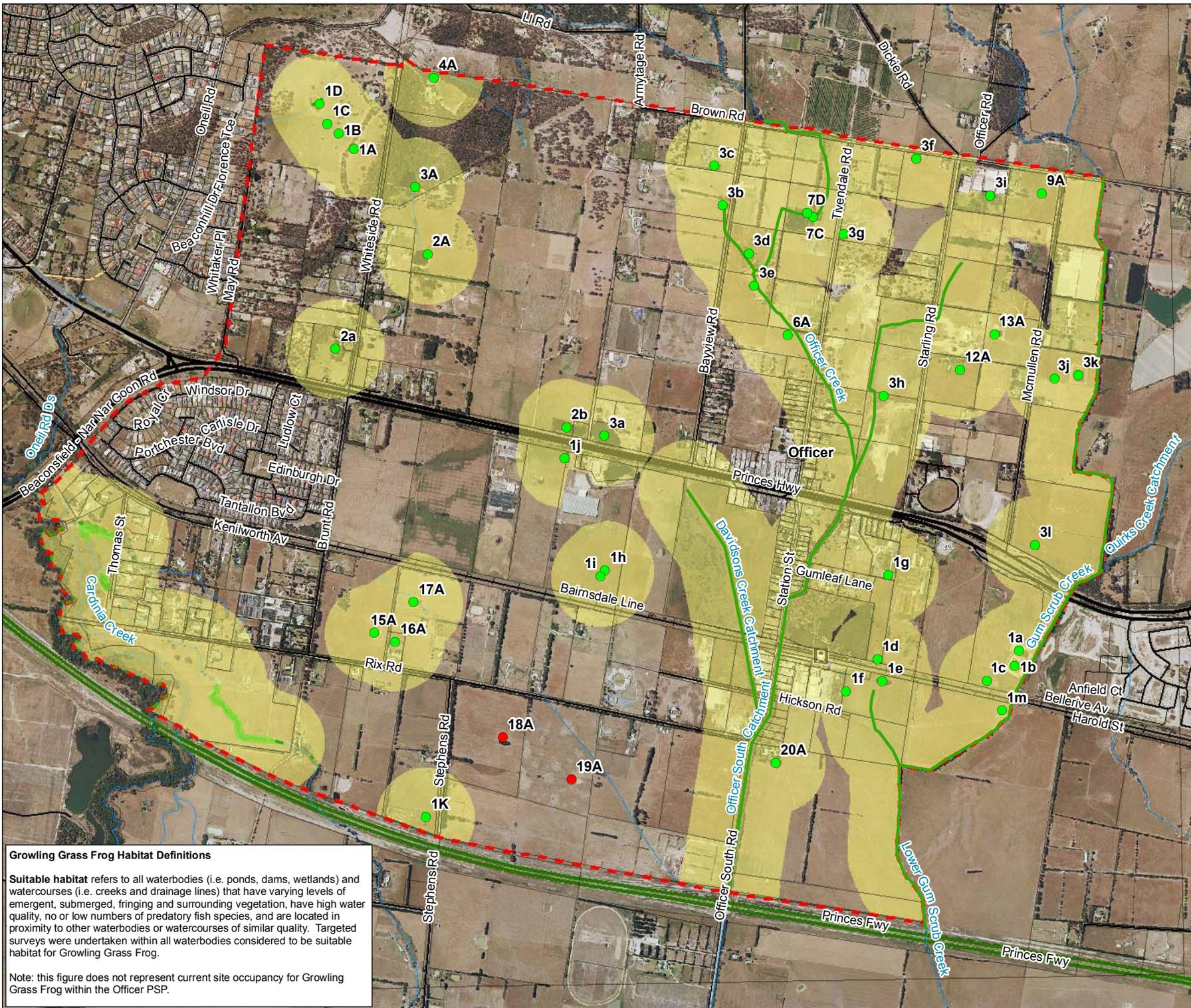


Figure 3a
Potential fauna habitat within the Study Area



- Suitable GGF Terrestrial Habitat**
- Suitable Waterbodies
 - 200m around Surveyed Waterbodies/
Suitable Habitat
 - Suitable Waterbodies
 - Unsuitable Waterbodies
 - Suitable Habitat
(Drainage Lines and Waterways)

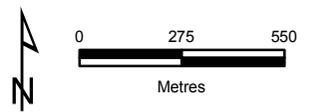
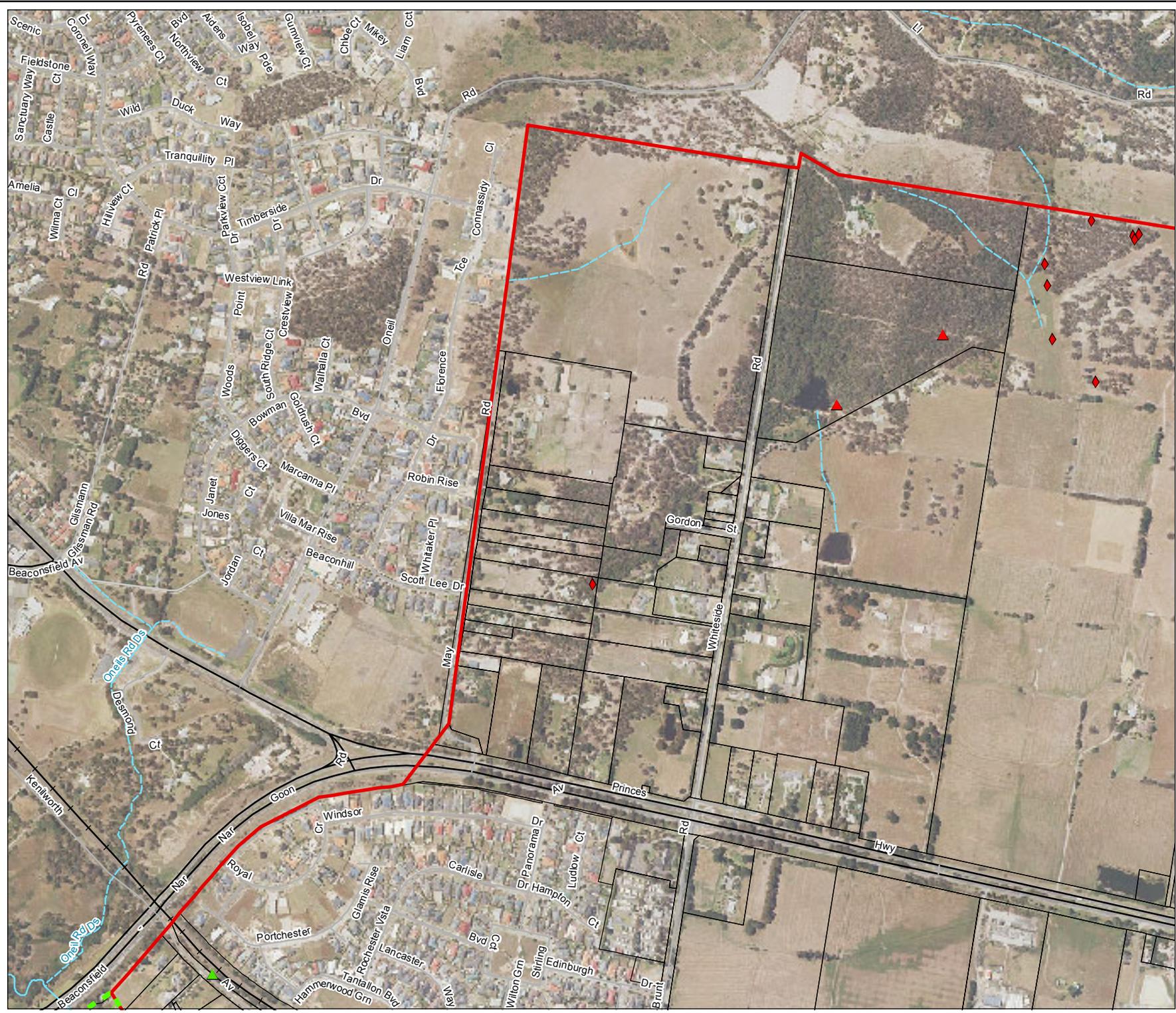


Figure 3b
Suitable Habitat for Growing
Grass Frog within the Officer
Precinct Structure Plan

Growing Grass Frog Habitat Definitions

Suitable habitat refers to all waterbodies (i.e. ponds, dams, wetlands) and watercourses (i.e. creeks and drainage lines) that have varying levels of emergent, submerged, fringing and surrounding vegetation, have high water quality, no or low numbers of predatory fish species, and are located in proximity to other waterbodies or watercourses of similar quality. Targeted surveys were undertaken within all waterbodies considered to be suitable habitat for Growing Grass Frog.

Note: this figure does not represent current site occupancy for Growing Grass Frog within the Officer PSP.



Officer Precinct Structure Plan: Conservation Management Plan (excluding Cardinia Creek) by Ecology Partners Pty Ltd
 Officer Precinct Structure Plan: Cardinia Creek Conservation Management Plan by Ecology Australia Pty Ltd (2011)

VicUrban

- ▲ Veined Spear-grass
- + Matted Flax-lily

Private Property

- ▲ Veined Spear-grass
- + Matted Flax-lily
- ★ Arching Flax-lily
- Purple Dirus
- ◆ Green Scent-bark

Cardinia Shire Council

- ▲ Veined Spear-grass
- + Matted Flax-lily
- ★ Arching Flax-lily
- ◆ Green Scent-bark
- Maroon Leek-orchid

VicRoads

- ▲ Veined Spear-grass
- + Matted Flax-lily
- ★ Arching Flax-lily
- ◆ Green Scent-bark
- Maroon Leek-orchid

Department of Transport

- ▲ Veined Spear-grass
- + Matted Flax-lily
- ★ Arching Flax-lily
- Purple Dirus

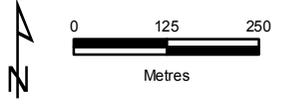
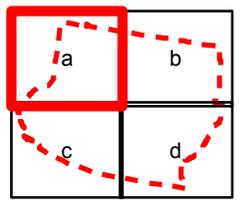


Figure 4a
 Management Responsibility Zones for Flora within the Study Area
 Officer Precinct Structure Plan, Officer





Officer Precinct Structure Plan: Conservation Management Plan (excluding Cardinia Creek) by Ecology Partners Pty Ltd
 Officer Precinct Structure Plan: Cardinia Creek Conservation Management Plan by Ecology Australia Pty Ltd (2011)

- VicUrban**
- ▲ Veined Spear-grass
 - + Matted Flax-lily
- Private Property**
- ▲ Veined Spear-grass
 - + Matted Flax-lily
 - ★ Arching Flax-lily
 - Purple Dirus
 - ◆ Green Scent-bark
- Cardinia Shire Council**
- ▲ Veined Spear-grass
 - + Matted Flax-lily
 - ★ Arching Flax-lily
 - ◆ Green Scent-bark
 - Maroon Leek-orchid
- VicRoads**
- ▲ Veined Spear-grass
 - + Matted Flax-lily
 - ★ Arching- Flax-lily
 - ◆ Green Scent-bark
 - Maroon Leek-orchid
- Department of Transport**
- ▲ Veined Spear-grass
 - + Matted Flax-lily
 - ★ Arching Flax-lily
 - Purple Dirus

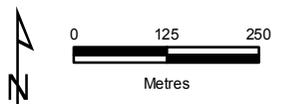
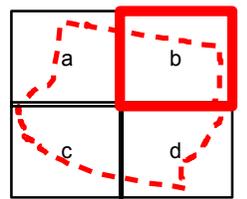
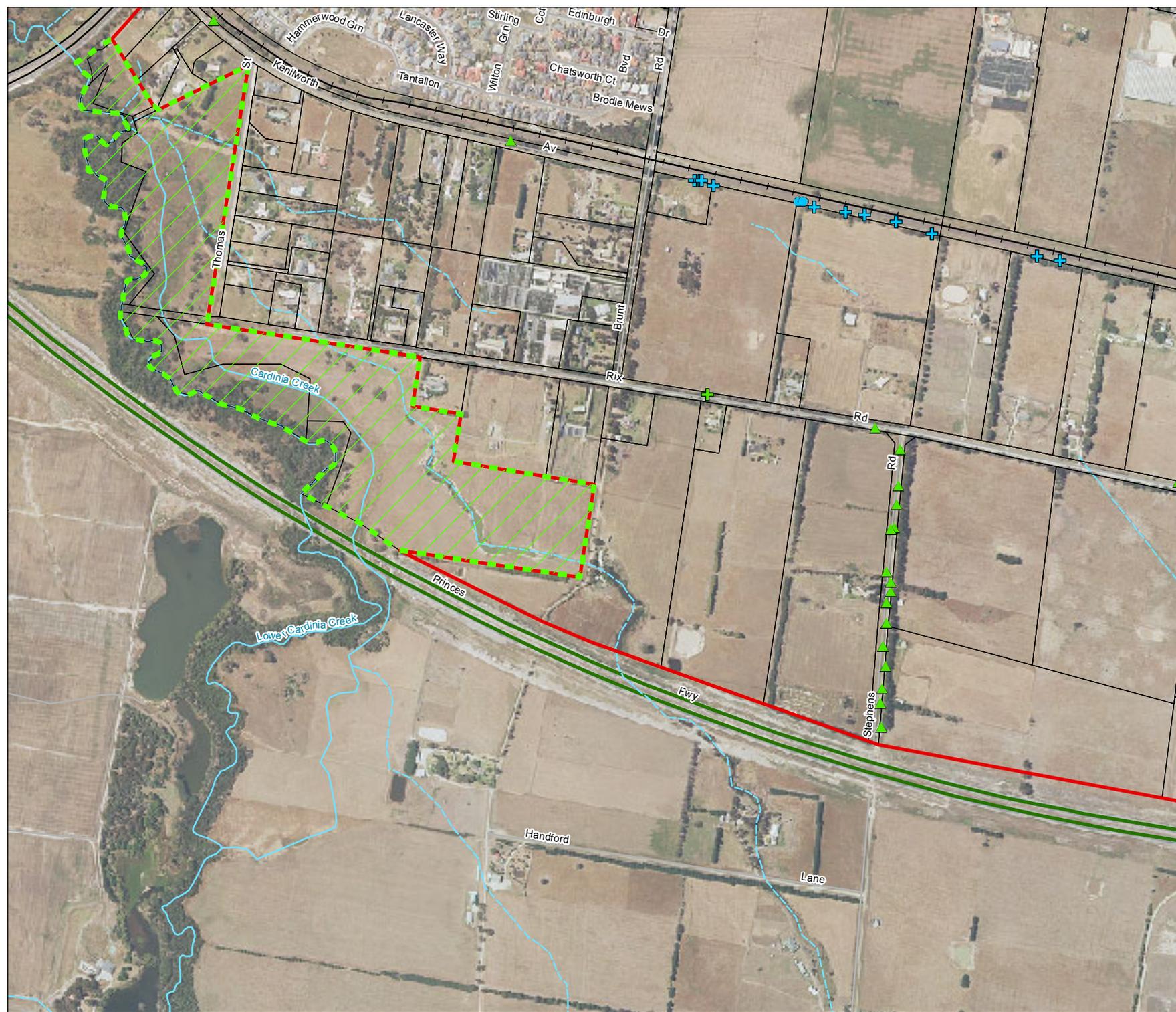


Figure 4b
 Management Responsibility Zones for Flora within the Study Area
 Officer Precinct Structure Plan, Officer





- Officer Precinct Structure Plan: Conservation Management Plan (excluding Cardinia Creek) by Ecology Partners Pty Ltd
- Officer Precinct Structure Plan: Cardinia Creek Conservation Management Plan by Ecology Australia Pty Ltd (2011)
- VicUrban**
 - ▲ Veined Spear-grass
 - + Matted Flax-lily
- Private Property**
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 - ★ Arching Flax-lily
 - Purple Dirus
 - ◆ Green Scent-bark
- Cardinia Shire Council**
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 - ★ Arching Flax-lily
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 - ◆ Green Scent-bark
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- Department of Transport**
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 - Purple Dirus

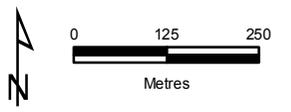
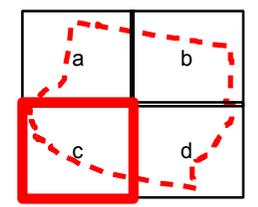
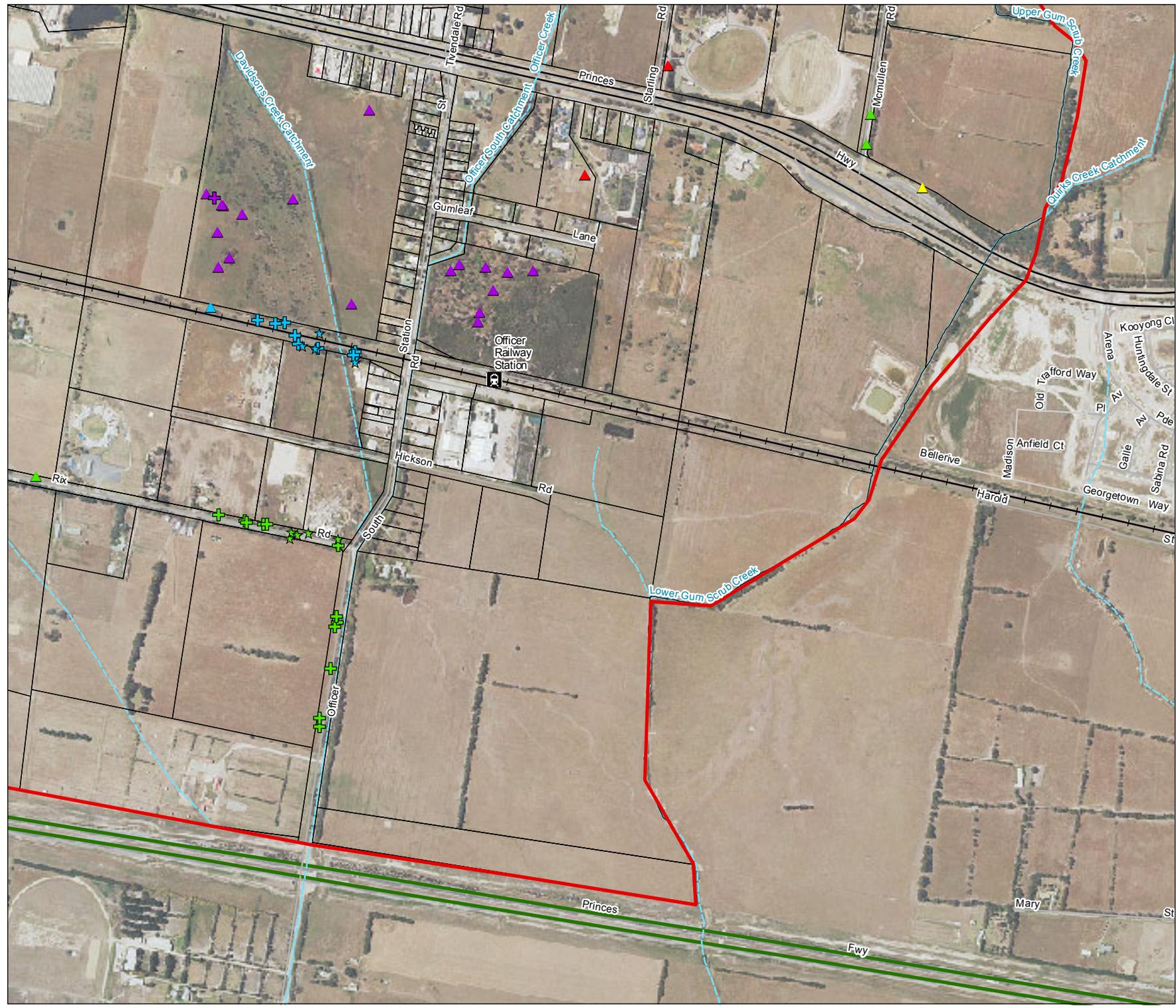


Figure 4c
 Management Responsibility Zones for Flora within the Study Area
 Officer Precinct Structure Plan, Officer





- Officer Precinct Structure Plan: Conservation Management Plan (excluding Cardinia Creek) by Ecology Partners Pty Ltd
- Officer Precinct Structure Plan: Cardinia Creek Conservation Management Plan by Ecology Australia Pty Ltd (2011)
- VicUrban**
 - ▲ Veined Spear-grass
 - + Matted Flax-lily
- Private Property**
 - ▲ Veined Spear-grass
 - + Matted Flax-lily
 - ★ Arching Flax-lily
 - Purple Dirus
 - ◆ Green Scent-bark
- Cardinia Shire Council**
 - ▲ Veined Spear-grass
 - + Matted Flax-lily
 - ★ Arching Flax-lily
 - ◆ Green Scent-bark
 - Maroon Leek-orchid
- VicRoads**
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 - + Matted Flax-lily
 - ★ Arching Flax-lily
 - ◆ Green Scent-bark
 - Maroon Leek-orchid
- Department of Transport**
 - ▲ Veined Spear-grass
 - + Matted Flax-lily
 - ★ Arching Flax-lily
 - Purple Dirus

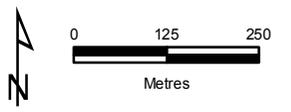
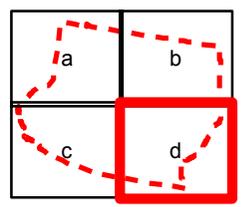
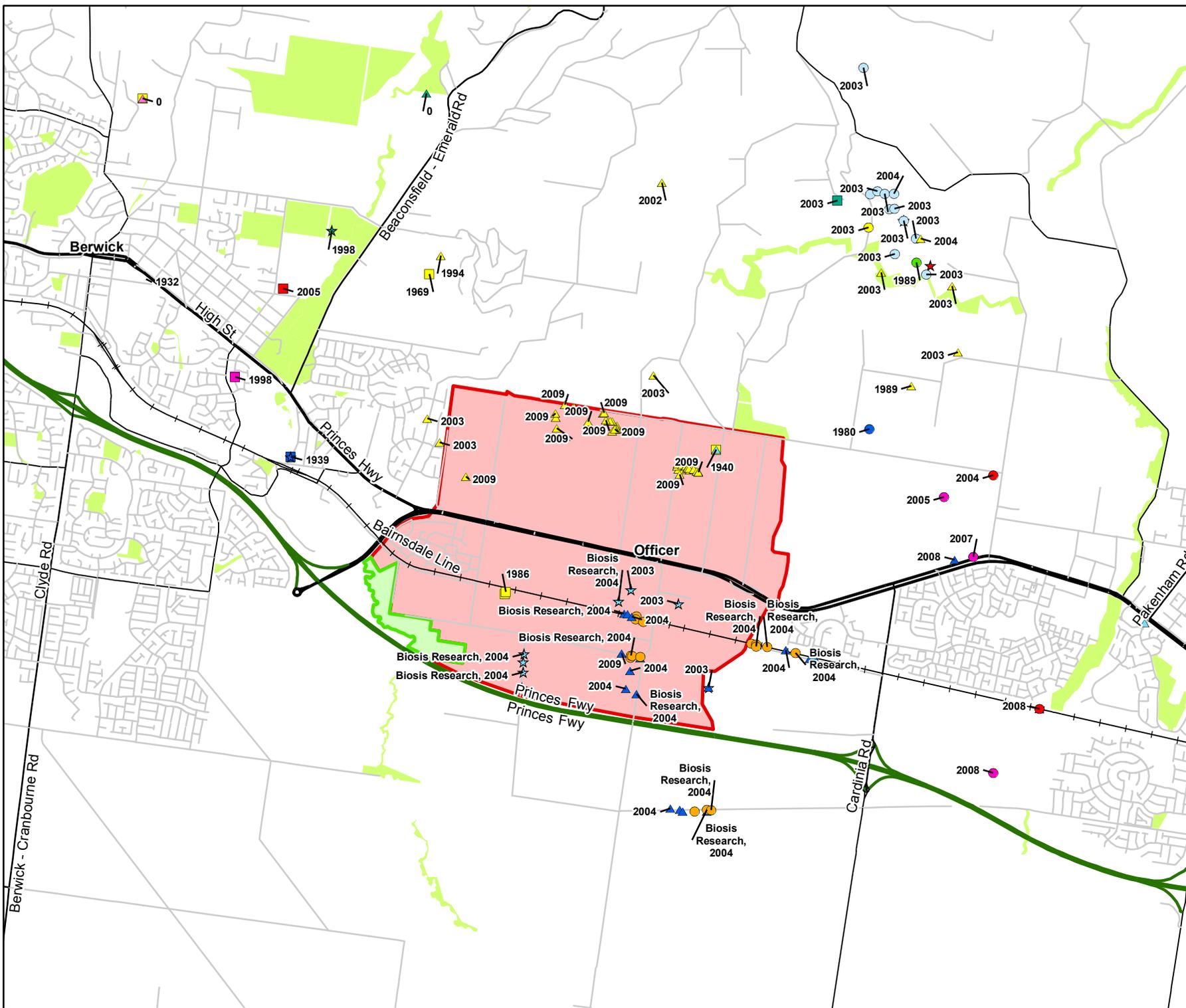


Figure 4d
 Management Responsibility Zones for Flora within the Study Area
 Officer Precinct Structure Plan, Officer





Threatened Flora RECORDS (FIS)

- Austral Crane's-bill (State)
- Clover Glycine (State)
- Cobra Greenhood (State)
- Dandenong Range
- Cinnamon Wattle (State)
- Forest Sedge (State)
- Giant Honey-myrtle (State)
- ▲ Green Leek-orchid (State)
- ▲ Green Scentbark (State)
- ▲ Lizard Orchid (State)
- ▲ Maroon Leek-orchid (National)
- ▲ Matted Flax-lily (State)
- ▲ Notched Leionema (State)
- Perfoliate Pondweed (State)
- Purple Diuris (State)
- Red-tip Greenhood (State)
- Rough Daisy-bush (State)
- Sharp Greenhood (State)
- Slender Bitter-cress (State)
- ★ Slender Tick-trefoil (State)
- ★ Southern Blue-gum (State)
- ★ Spurred Helmet-orchid (State)
- ★ Veined Spear-grass (State)
- ★ Wine-lipped Spider-orchid (State)

EP Survey (2009)

- ▲ Matted Flax-lily
- ▲ Green Scentbark

Biosis Survey (2006)

- ★ Veined Spear-grass
- ▲ Matted Flax-lily
- Arching Flax-lily
- Purple Diuris

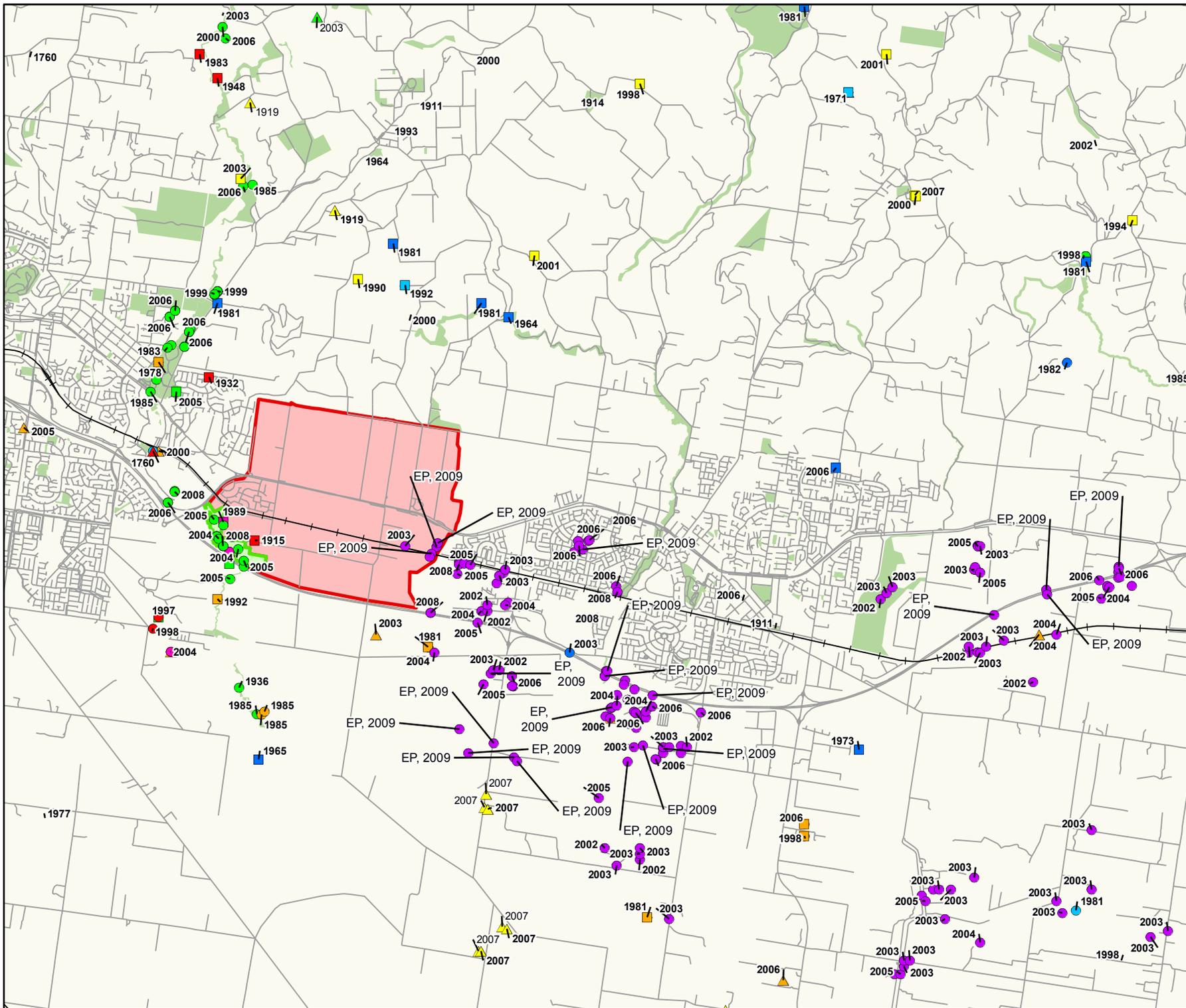
- Precinct Structure Plan:
- Conservation Management Plan (excluding Cardinia Creek) by Ecology Partners Pty Ltd
 - Officer Precinct Structure Plan: Cardinia Creek Conservation Management Plan by Ecology Australia Pty Ltd (2011)

Note:
Where multiple records occur in the same location only the most recent is shown.



Figure 5
Significant Flora Records
Officer Structure Plan, Officer





Threatened Fauna Records (VBA)

- Australasian Shoveler
 - Australian Grayling
 - Baillon's Crake
 - Dwarf Galaxias
 - Eastern Great Egret
 - Grey-headed Flying-fox
 - Growling Grass Frog
 - Hardhead
 - Helmeted Honeyeater
 - Musk Duck
 - Powerful Owl
 - Royal Spoonbill
 - Sooty Owl
 - Southern Toadlet
 - Superb Parrot
 - Swift Parrot
 - ▲ Southern Brown Bandicoot
 - ▲ White-bellied Sea-Eagle
 - ▲ Latham's Snipe
- Precinct Structure Plan:
 Conservation Management Plan (excluding Cardinia Creek) by Ecology Partners Pty Ltd
- Officer Precinct Structure Plan:
 Cardinia Creek Conservation Management Plan by Ecology Australia Pty Ltd (2011)

Note: Where multiple records occur in the same location only the most recent is shown.

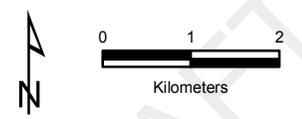
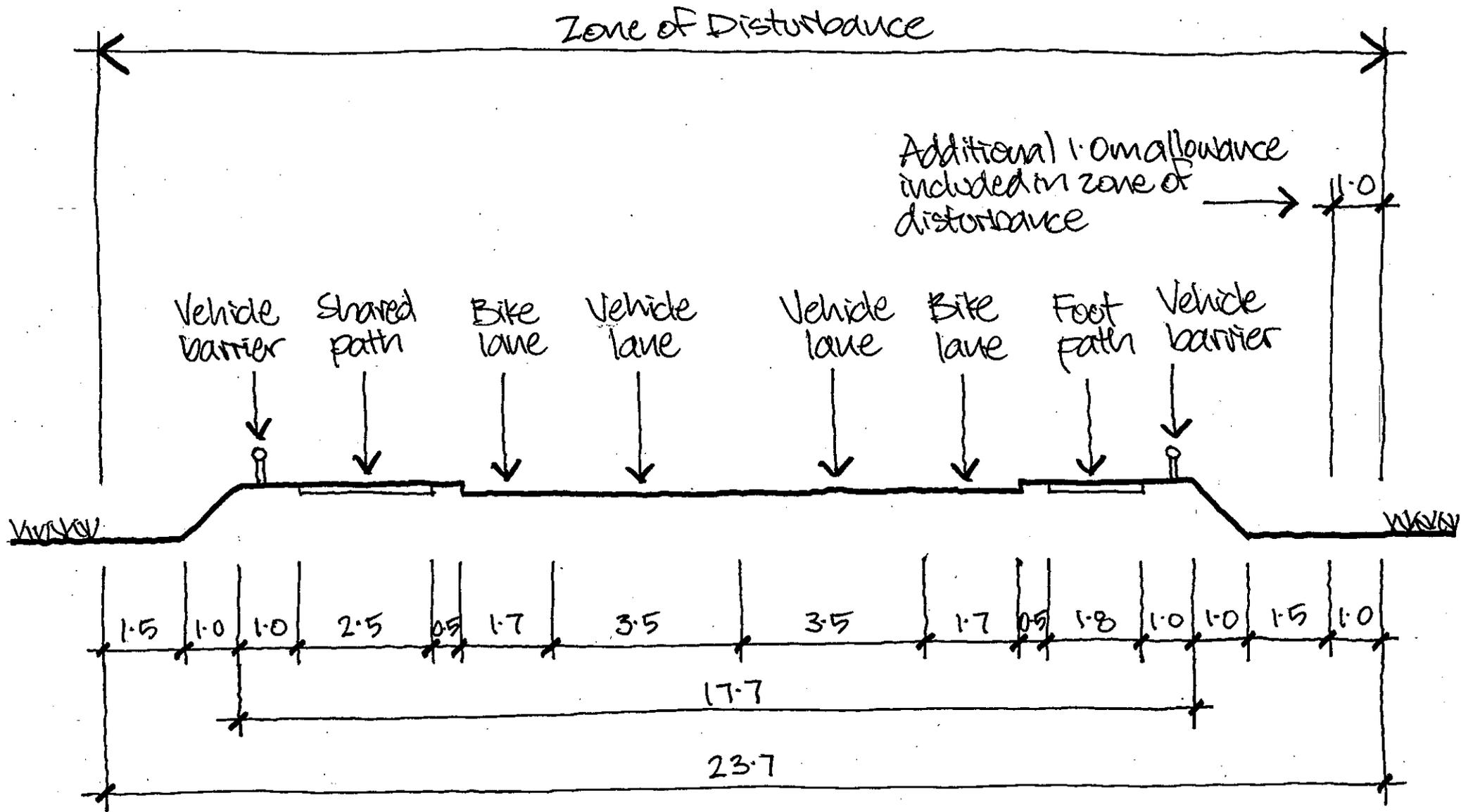


Figure 6
 Significant Fauna Records
 Officer Structure Plan, Officer





LOCAL ROAD CROSS SECTION
 Not to scale.

APPENDICES

Appendix 1 – Flora Species of Conservation Significance

Matted Flax-lily *Dianella amoena*

Plate 1 – Matted Flax-lily.

EPBC Act Conservation Status: Endangered

DSE 2005b Conservation Status: Endangered

FFG Act Conservation Status: Listed



Appearance and Habitat Requirements

Matted Flax-lily is a tufted perennial lily which can form loose ‘mats’ up to five metres wide or grow individually (Carr and Horsfall 1995). The leaves are grey-green in colour, narrow and linear approximately 40 centimetres in length (relatively small for a *Dianella* spp.) and taper to point (Plate 1). Ranging between 4–12 millimetres in width, leaves are broadly V-shaped to flat and the margins of leaf blades, sheaths and midribs exhibit distinguishing small, irregularly-spaced teeth (Carr and Horsfall 1995; FIS 2009).

Flowering occurs from October to April with flower stems reaching 20 to 90 centimetres long. The flowers are large, star-shaped, nodding and sweetly fragrant with petals that are pale to deep blue violet and bend backwards towards the stem. Each flower has six stamens with bright orange strumae before the anther; the anther is lime yellow (Plate 1). The species can be summer deciduous depending on conditions and will die back to a tuberous rootstock (Gray and Knight 2001).

Plants typically occur in grasslands, grassy woodlands and in grassy wetlands in Victoria and Tasmania (Gray and Knight 2001; Carter 2005). Grasses typically dominate the understorey layer (Carr and Horsfall 1995) whilst in grassy woodlands a variety of eucalypt species dominate with Blackwood *Acacia melanoxylon* a common understorey plant at many sites (Carter 2005).

The Matted Flax-lily is a plant of well-drained to seasonally waterlogged fertile sandy loams to heavy cracking clays, most Victorian populations have been recorded from locations with volcanic geology (Carr and Horsfall 1995).

Extant populations are fragments of much larger populations that have persisted in highly degraded vegetation, with most known populations recorded within extremely weedy and grossly degraded vegetation, sometimes with a known history of stock grazing and regular mowing (Carr and Horsfall 1995).

Occurrence within the Study Area

Throughout the entirety of the Precinct, 26 Matted Flax-lily populations were recorded by past assessments conducted by both Biosis Research (2004; 2006) and Ecology Partners (2010a; Figures 2c and 2d). These plants were of various sizes and health and due to the intensive survey effort over multiple dates and seasons; it is felt that very few populations, remain unidentified. All Matted Flax-lily populations were located south of the Princes Highway, with 15 located within the railway reserve, 10 sited on road reserves and only one situated on private property (Figures 2c and 2d).

Distribution within the Surrounding Area

According to FIS (2009), Matted Flax-lily has been recorded on eight occasions within the local area (i.e. within a 10 kilometre radius of the Precinct) (FIS 2009). Some of these records are from the initial surveys by Biosis Research (2004; 2006). All of these records are between 1999 and 2009 (FIS 2009).

Threatening Processes

As Matted Flax-lily populations commonly occur within highly degraded, semi-urban grassland areas, threats to the survival of the species are similar to threats faced by other rare or significant grassland flora species associated with native grassland communities.

Typical threats listed in the *Draft Recovery Plan* for the species (Carter 2005) include:

- Weed invasion;
- Reservation status;
- Vegetation clearance for urban development;
- Small population size;
- Inappropriate roadside/railway maintenance; and,
- Inappropriate biomass reduction/fire regimes.

Maroon Leek Orchid *Prasophyllum frenchii*

Plate 2: Maroon Leek Orchid (DSE 2003).

EPBC Act Conservation Status: Endangered

DSE 2005b Conservation Status: Vulnerable

FFG Act Conservation Status: Listed



Appearance and Habitat Requirements

The Maroon Leek-orchid emerges annually from an underground tuber, and is pollinated by nectarivorous insects.

Leaves are generally solitary or located at the base of the plant to 20 centimetres long (Walsh and Entwisle 1994) (Plate 2). Flowering season lasts from October to November, and plants have robust flowering stems to 60 centimetres tall, and occasionally to one metre.

Flowers are green with maroon markings, or entirely maroon, and are fragrant, and can be in a loose or dense spike arrangement (Plate 2). Numbers of flowers range between 20 and 60 per plant (FIS 2009). Maroon Leek-orchid prefers coastal or near-coastal swamps, usually not located more than 10 kilometres inland from these areas.

Occurrence within the Study Area

One specimen of Maroon Leek-orchid has been previously recorded within Officer along Browns Road (Figure 2b) in the north-east of the Precinct. According to the FIS this species was last recorded in 1940 and only has an accuracy of ± 4 kilometres. It will be noted that this is a small and inconspicuous species and therefore it is still possible that some individuals have been overlooked but persist within the Precinct.

Distribution within the Surrounding Area

Maroon Leek-orchid has not been recorded in any recent targeted flora survey. Maroon Leek-orchids has previously been recorded within 10 kilometres of the study area on five occasions, with the most recent record located approximately eight kilometres east of the study area in 2001 (FIS 2009).

Threatening Processes

Threats to populations of the Maroon Leek-orchid include loss of habitat, associated with disturbances such as weed invasion, soil disturbance, vegetation clearance, urban development, and grazing by stock or introduced pests such as rabbits.

Arching Flax-lily *Dianella* sp. aff. *longifolia* (Benambra)

DSE 2007 Conservation Status: Vulnerable

FFG Act Conservation Status: Not listed

Appearance and Habitat Requirements

Arching Flax-lily forms tufts to 40 centimetres wide and 1.3 metres tall. Leaves are straight with red or white bases, are 2.5 centimetres wide, and are more of a grey-green colour than the bright green leaves of Pale Flax-lily *Dianella longifolia* (Plate 3).

Flowers are pale green or white to pale blue, with flowering season occurring from November through to December (Plate 3). A more accurate description of this species' distribution will become available as the species becomes better known. Arching Flax-lily prefers rocky outcrops in open forests, and is found at higher altitudes than other variations of Pale Flax-lily.

Plate 3: Arching Flax-lily *Dianella* sp. aff. *longifolia* (Benambra) (Ecology Partners Pty Ltd).



Occurrence within the Study Area

Several Arching Flax-lily specimens have previously been recorded on Rix Road, McMullen Road, and along the railway line within the study area (Figures 2b and 2c) with the most recent targeted survey finding only four of these populations and no new records found. This species may have gone undetected, however, due to a potential lack of visible flowering structures, or may have experienced severe competition from other species in the years since Biosis Research (2006) recorded them along parts of the rail corridor.

Distribution within the Surrounding Area

Arching Flax-lily was located throughout the study area during previous assessments, however no records of this species exist on the FIS in the local vicinity (i.e. within a 10 kilometre radius of the Precinct) (FIS 2009).

In fact, there are currently only 50 records for this species scattered across Victoria (FIS 2009), with the species's stronghold being on the Keilor Plains to the west of Melbourne, the northern plains of Victoria, Benambra in the north east and also around north east Melbourne in the lowland hills. The species is considered endemic to Victoria. The current known distribution of this species may well underestimate its spread across the state and, at this stage, without further research including formal description of the species, a total population estimate is unknown.

Green Scentbark *Eucalyptus fulgens*

DSE 2007 Conservation Status: Rare

FFG Act Conservation Status: Invalid

Appearance and Habitat Requirements

Green Scentbark is a spreading tree which grows to 20 metres tall. Its leaves are a dark glossy green, which grow to 18 centimetres long and 1.8 centimetres wide (Plate 4). Buds occur in clusters of seven, and fruiting capsules take a hemispherical, cup-like shape. Flowering period is in autumn, with pale flowers. The trunk is covered with fissured, brittle bark, which covers all but the smallest branches. The bark is aromatic when handled, producing a distinct eucalyptus scent (FIS 2009; Costermans 2000) (Plate 4).

Plate 4: Green Scentbark *Eucalyptus fulgens* (Ecology Partners Pty Ltd)



Occurrence within the Study Area

Forty-three Green Scentbarks were recorded during the previous surveys (Figures 2a and 2b; Note: some points represent multiple records), all north of the Princes Highway.

Distribution within the Surrounding Area

The current known distribution of Green Scentbark is confined to south east Victoria, with populations extending from Healesville to the La Trobe Valley (Walsh and Entwisle 2003). There are 18 previously documented records of Green Scentbark within a 10 kilometre radius of Officer (FIS 2009).

Threatening Processes

Possible threats include damage to the root zone by livestock such as horses and cattle, and damage to limbs from urban development.

Veined Spear-grass *Austrostipa rudis* sub sp. *australis*

DSE 2007 Conservation Status: Vulnerable

FFG Act Conservation Status: Not listed

Appearance and Habitat Requirements

Veined Spear-grass is a tufted grass which grows to 1.3 metres tall. Leaves are usually rough, sometimes with small hairs. Inflorescences are open panicles to 50 centimetres long. Flowering period is typically from November to January. Veined Spear-grass prefers sandy soils in areas of cool climate and moderate altitudes (Walsh and Entwisle 1994), and has been recorded in open-forest environments.

This sub-species is distinct from other subspecies in the species complex through ‘ruler’ identification, with the awn often greater than 65mm in length.

Occurrence within the Study Area

The present surveys found numerous specimens of Veined Spear-grass throughout the study area (Figures 2a and 2d), and it must be noted that some points on these maps equate to large populations.

Distribution within the Surrounding Area

The current known distribution of Veined Spear-grass is across southern Victoria, from Nelson in the west, to Mallacoota in the east. Other than the previous assessments conducted within the current Precinct, there are an additional five previous records listed on the FIS (2009) of Veined Spear-grass in the Officer area (i.e. within a 10 kilometre radius).

Threatening Processes

Like many grassland species, Veined Spear-grass is under threat from ongoing loss of habitat throughout the species’ distribution.

Purple Diuris *Diuris punctata var punctata*

DSE 2007 Conservation Status: Vulnerable

FFG Act Conservation Status: Listed

Appearance and Habitat Requirements

Purple Diuris is considered to be vulnerable within Victoria and is also listed under the FFG Act (DSE 2005b). Purple Diuris is a deciduous, terrestrial orchid which grows to 50 centimetres in height with 1–10 large, purple flowers on erect, hairless stems. The leaves are linear to 25 centimetres long and 5 millimetres wide, and number between 1–3. The flowers are pale purple and 50 millimetres across and flower in October and November (FIS 2009).

Occurrence within the Study Area

This species has previously been recorded between 1982 and 1986 within the southern section of the rail reserve, west of Brunt Road (FIS 2009) (Figure 2c). However previous surveys by both Biosis Research (2004, 2006) and Ecology Partners (2010a) have failed to locate any Purple Diuris individuals at this location, or anywhere else within the Precinct. Like the Maroon Leek-orchid, it will be noted that this is a small and inconspicuous species and therefore individuals may still be present within the Precinct.

Distribution within the Surrounding Area

Together with the FIS record within the Precinct, there are a total of ten records of this species in the local area (i.e. within a 10 kilometre radius).

The date of these records range from 1887 to 1968. Therefore the persistence of this species within the study area is considered unlikely, due to the threatening processes listed below.

Threatening Processes

Threats to populations of the Purple Diuris include loss of habitat associated with disturbances such as weed invasion, soil disturbance, vegetation clearance, urban development, and grazing by stock or introduced pests such as rabbits.

Appendix 2 – Fauna Species of Conservation Significance

Southern Brown Bandicoot *Isoodon obesulus obesulus*

EPBC Act Conservation Status: Endangered

FFG Act Conservation Status: Invalid (I)

DSE 2007 Conservation Status: Near Threatened

National Action Plan *Conservation Status:* Near Threatened

Appearance and Habitat Requirements

Southern Brown Bandicoot has coarse, brindled, dark grey to yellow-brown fur on its back, with creamy white feet and underbelly (Plate 6). Ears are short and rounded, barely extending above the head. Animals tend to be 28–35 centimetres in length (head-body), with an 8–13 centimetre long tail. Females weigh 400–1000 grams, whilst males weigh 500–1500 grams (Menkhorst and Knight 2004).

Southern Brown Bandicoots are solitary usually foraging alone, territorial and mostly nocturnal but may be predominantly diurnal in the absence of predators (Menkhorst and Knight 2004). Research has shown that animals' home ranges tend to vary between 0.5 to 9 hectares (ha) (Schmidt *et al.* 2009) and overlap adjacent individuals' home ranges. However, the minimum area required per individual is not known.

Plate 6: Southern Brown Bandicoot, *Isoodon obesulus obesulus* (Strahan 2004).



They are omnivorous and forage within the topsoil for arthropods, seeds and underground fungi, leaving distinct conical pits in the topsoil (Menkhorst and Knight 2004). Breeding is usually seasonal, with most births occurring from late winter to late summer. Young remain in the pouch for two months, and become sexually mature at seven months, with females able to give birth to over eight young per year. The death rate of juveniles is usually high, although adults may live up to 3.5 years (Strahan 2004).

Southern Brown Bandicoots may be found in most mainland States and Tasmania, but have a very patchy distribution, even in continuous habitat, and occurs in a series of regionally isolated populations. In Victoria, it has been found on coastal or fluvial plains, rarely more than 50 kilometres from the coast (Menkhorst and Seebeck 1990).

The Southern Brown Bandicoot (eastern subspecies) occurs in a variety of habitats in south-eastern Australia, including heathland, swamp habitat, shrubland, open forest and dry sclerophyll forest with a heathy understorey (Menkhorst and Seebeck 1990). Favoured habitat requirements appear to comprise a range of native and exotic vegetation types with a dense ground cover and short understorey vegetation (approximately 0.5 – 1 metre high). For example, recent targeted surveys by Ecology Partners recorded a single bandicoot using a thin (approximately 5 metres in width) linear strip of modified vegetation throughout Koo Wee Rup (AT pers. obs.). This vegetation consisted primarily of modified swamp scrub with an understorey dominated by Blackberry (*Rubus fruticosus*) thickets, Toowoomba Canary Grass (*Phalaris aquatic*) and other common pasture grasses.

Bandicoots have also been commonly recorded in areas dominated by introduced vegetation including Gorse *Ulex europaeus*, African Boxthorn *Lycium ferocissimum* and Broom *Cytisus scoparius* thickets (Coates *et al.* 2008, Schmidt *et al.* 2009). Such vegetation cover is likely to provide some level of protection from predators beyond that of native vegetation.

Distribution within the Surrounding Area

Ecology Australia Pty Ltd (2008), herein referred to as Ecology Australia, identified the study area is part of a south-central population which extends from Melbourne through Mornington Peninsula to Western Port and Wilson's Promontory. Ecology Australia (2008) has also identified four population 'clusters' as part of developing the Strategic Management Plan for Southern Brown Bandicoots: Dalmore-Koo Wee Rup, Bayles, Cardinia-Rythdale and Garfield-Longwarry.

Of these 'clusters' the 'Cardinia-Rythdale' cluster is considered to be closest to the study area, consisting of several small patches of occupied habitat within private properties, roadside reserves and the drains/creeks including Lower Gum Scrub Creek (Ecology Australia Pty Ltd 2008). As mentioned previously, Southern Brown Bandicoot is able to persist throughout emaciated habitat corridors and small remnant patches of vegetation on private land. This is thought to be the mechanism allowing bandicoots to disperse and persist in an otherwise agricultural landscape (Ecology Australia Pty Ltd 2008).

There is a single documented record of Southern Brown Bandicoot on the Atlas of Victorian Wildlife within a 10 kilometre radius of the study area dating back to 1919 (AVW 2009; Figure 6). This record is from the Upper Beaconsfield region, approximately five kilometres north-west of Officer.

There are DSE verified unpublished records of Southern Brown Bandicoot in close proximity to the study area, approximately 3.5 kilometres south east of Officer South Road. There have also been four additional records that have been verified by DSE (Figure 6) and several records further north, towards Belgrave South and Lysterfield (i.e. Lysterfield Park) (AVW 2009).

This species may reside throughout Cardinia Creek corridor. The corridor has been identified as supporting suitable habitat for the species and forms an important dispersal corridor for the species. There are also small patches of suitable habitat throughout the north-west section of the study area within private property (DSE, pers. comm.; see Figure 3a).

Interestingly, within a 15 kilometre radius of Officer there are at least 37 records in areas south of the study area such as Cranbourne (i.e. Cranbourne Botanic Gardens) which is thought to support the largest population of this species within the south-central population (Coates *et al.* 2008; Ecology Australia Pty Ltd 2008).

Other important habitat areas south of the study area include; Dalmore East, Koo Wee Rup and Cardinia (AVW 2009). These areas are considered to be important source populations for Southern Brown Bandicoots in which seasonal dispersal throughout the local area is achieved (Ecology Australia Pty Ltd 2008). For example, there have been four recent records by DSE within six kilometres of the study area (Figure 6; AVW 2009). There is also several records further north, towards Belgrave South and Lysterfield (i.e. Lysterfield Park) (AVW 2009) in addition to recent records along Cardinia Creek approximately eight kilometres south-west of the study area (Ecology Australia Pty Ltd 2008).

Occurrence within the Study Area

Ecology Partners (2010a) recently carried out surveys of active searching throughout likely habitat for the species in large remnant woodland patches near the north-west corner of the study area and habitat adjacent to the Officer Train station. Although, there was no evidence of Southern Brown Bandicoot recorded during these surveys, they are not conclusive in relation to the presence of the species as targeted surveys using cameras and baits were not undertaken in the study area (as required by the Biodiversity Precinct Structure Planning Kit).

This species may enter the north-west corner of the study area occasionally as there is suitable habitat. Gum Scrub Creek has also been identified as a dispersal corridor for the species as outlined in the draft Sub-regional Strategy for Southern Brown Bandicoot.

Threatening Processes

There are a number of threatening processes and management practices throughout the local area which may impact Southern Brown Bandicoot. Extensive land clearing throughout the south-central region of Victoria on public and private property has been reduced due to urban development and agriculture (Coates *et al.* 2008). The depletion of native, remnant vegetation especially amongst the understorey layers is therefore considered to be a significant factor for south-central populations becoming more vulnerable to decline in comparison to other regions of Victoria (Coates *et al.* 2008).

This allows the incursion of exotic flora and fauna species into more open areas, and reduces the ability of Southern Brown Bandicoot to disperse throughout the landscape.

The reduction in the size of remaining fragments from increased edging effects may also pose a threat to Southern Brown Bandicoot and can even lead to the local extinction of populations as shown in various locations within Victoria (Menkhorst and Seebeck 1990). As a result, it is essential that ground and shrub layers are retained or enhanced where possible to maintain critical habitat resources for breeding, foraging and dispersal purposes.

Additional threatening processes include predation from foxes (Coates and Wright 2003), feral and domestic cats (Rees and Paull 2000) and competition for resources with rabbits (DEH 2005). These species have been commonly observed within the study area (AT pers. obs.) and are known to directly impact on Southern Brown Bandicoot. As a result, the future management of local predators and the improvement or retention of suitable habitat will play a critical role in the longevity of this species within the local area and beyond.

Growling Grass Frog *Litoria raniformis*

EPBC Act Conservation Status: Vulnerable

FFG Act Conservation Status: Listed

DSE 2007 Conservation Status: Endangered

National Action Plan Conservation Status: Vulnerable

Growling Grass Frog is listed as endangered in Victoria and vulnerable nationally (Tyler 1997) (Plate 7). It is also listed as a threatened taxon under the EPBC Act and the Victorian FFG Act. A draft Flora and Fauna Guarantee Action Statement (Robertson 2003) and a draft National Recovery Plan have been developed for the species. Overall the species is of national conservation significance.

Although formally widely distributed across south eastern Australia, including Tasmania (Littlejohn 1963; 1982; Hero *et al.* 1991), the species has declined markedly across much of its former range.

This has been most evident over the past two decades and in many areas, particularly in south and central Victoria, populations have experienced apparent declines and local extinctions (AVW 2007; Mahony 1999; Organ, A. pers. obs.).

Plate 7: Growling Grass Frog *Litoria raniformis* (Ecology Partners Pty Ltd).



This species is largely associated with permanent or semi-permanent still or slow flowing waterbodies (i.e. streams, lagoons, farm dams and old quarry sites) (Hero *et al.* 1991; Barker *et al.* 1995; Cogger 1996; Ashworth 1998). Frogs can also use temporarily inundated waterbodies for breeding purposes, providing they contain water over the breeding season (Organ 2003).

Based on previous investigations, there is a strong correlation between the presence of the species and key habitat attributes at a given waterbody. For example, the species is typically associated with waterbodies supporting extensive cover of emergent, submerged and floating vegetation (Robertson *et al.* 2002; Organ 2004; Organ 2005). Emergent vegetation provides basking sites for frogs and protection from predators, while floating vegetation provides suitable calling stages for adult males, and breeding and oviposition sites.

Terrestrial vegetation (e.g. grass and sedges), rocks and other ground debris around a wetland perimeter also provide foraging, dispersal and over-wintering sites for frogs.

Waterbodies supporting the above mentioned habitat characteristics and which are located within at least 500 metres of each other are more likely to support a population of Growling Grass Frog, compared with isolated sites lacking important habitat features.

Indeed, recent studies have revealed that the spatial orientation of waterbodies across the landscape is one of the most important habitat determinants influencing the presence of the species at a given site (Robertson *et al.* 2002; Heard *et al.* 2004a, 2004b; Hamer and Organ 2008).

For example, studies have shown there is a positive correlation between the presence of the species and the distance of freestanding waterbodies to another occupied site. This is comparable to the spatial dynamics of many amphibian populations, including the closely related Green and Golden Bell Frog *Litoria aurea* (Hamer *et al.* 2002).

Swamp Skink ***Egernia coventryi***

EPBC Act Conservation Status: Vulnerable

FFG Act Conservation Status: Listed.

Appearance and Habitat Requirements

Swamp Skink is an omnivorous, medium, robust skink (approximately 100 millimetres) with a fourth toe that is noticeably longer than the third, and the presence of separated parietal scales. The species produces live young, usually around January to February, and litter sizes vary from one to eight (Greer 1989).

They are black above, with coppery, bronze markings aligning to form ragged-edged stripes. The upper flanks are black and merge to grey on the lower flanks and are spotted with white.

Swamp Skink contains a patchy distribution and is considered to have specialised habitat requirements (AVW 2009; Clemann 2006). For example, Swamp Skink is associated with densely-vegetated freshwater swamps and watercourses, wet heaths, sedgeland (often sedge-rich, low-lying marshes or drainage lines) or saltmarshes (Clemann 2006). Swamp Skink can generally be found in areas of peaty soils, often in poorly-drained areas (Clemann 2006).

However, the species is not restricted to these vegetation types and it has been recorded in areas where vegetation structure consisted of dense ground cover, up to two metres, with sparse to no overstorey (Clemann 2006; Ecology Partners Pty Ltd 2009).

Plate 8: Swamp Skink *Egernia coventryi* (Ecology Partners Pty Ltd 2009).



Distribution within the Surrounding Area

The AVW (2009) lists no historic records of the species within the vicinity of the study area. However, due to the cryptic nature of this species, it may occupy areas within the study area without being detected. The species may persist in areas containing high weed invasion within and adjacent to suitable habitat in which Swamp Skinks have been recorded previously (Clemann 2006).

Occurrence within the Study Area

Ecology Partners (2010a) recently carried out targeted surveys within potentially suitable habitat for the species including (Figure 3a):

- Gilbert and Leber properties;
- Gum Scrub Creek;
- Road margins adjoining Officer South Road and the Princes Highway;
- A large remnant woodland patch located in the north-west corner of the Precinct; and,
- All associated drainage lines pertaining suitable habitat.

However, despite targeted survey using Elliott traps within these habitats. Swamp Skink was not detected during the current survey. According to Clemann (2006) the use of Elliott traps does not always provide certainty that the species will be detected, even in areas of known habitat, rather a combination of trapping, visual census and active searching is more effective. In consideration of these factors, it is considered possible that Swamp Skinks may reside within the study area and there is suitable habitat for the species in the study area (Figure 3a).

Threatening Processes

There are several threatening processes that have played a role in the decline of Swamp Skinks throughout its range. These include the loss, degradation and fragmentation of habitat, which has increased substantially since European settlement, affecting the size of lizard populations and the likelihood of this species becoming more susceptible to a range of threatening processes. These processes include:

- Alteration to the natural flow regimes of rivers and streams (i.e. damming of drainage lines of permanently flowing watercourses), which may lead to the alteration of inundated areas, in addition to changes in the floristic community composition over time;
- Increased disturbance and edge effects from water and pollution runoff (i.e. oil or petroleum) from adjacent road surfaces, which may potentially alter vegetation composition or structure within Swamp Skink habitat;

- Removal or degradation of the narrow habitat corridors that commonly supporting Swamp Skinks along rivers, streams and associated drainage lines and which may act as potential dispersal routes for the species; and,
- Introduction of weeds within potential Swamp Skink habitat caused by poor management which may ultimately lead to the alteration of floristic structure (i.e. increased canopy cover) leading to increased habitat unsuitability for the species.

Glossy Grass Skink

Pseudemoia rawlinsoni

DSE 2007 Conservation Status: Near Threatened

Appearance and Habitat Requirements

Glossy Grass Skinks are dark brown to black above, with a narrow dark brown vertebral stripe from the nape to the base of the tail (Cogger 1996). A narrow white or cream dorso-lateral stripe extends from the temporal region, to the base of the tail. Glossy Grass Skinks can grow to up to 62 millimetres in length and are known to inhabit areas close to waterbodies including dense vegetation coverage (i.e. rushes and grasses).

The Glossy Grass Skink prefers confined, humid microhabitats, including waterbodies such as swamps and wetlands, including dry sclerophyll forests that adjoin wet heathland areas that are exposed to frequent bouts of flooding (Cogger 1996). The Glossy Grass Skink uses dense vegetation, fallen logs, dead trees or rocky outcrops for shelter, and their distribution extends through the highlands of south-eastern Australia, with peripheral or outlying populations on the Blue Mountains, west of Sydney (NSW), and in the Gisborne region and Otway Ranges in Victoria (Cogger 1996).

Occurrence within the Study Area

Targeted surveys were recently undertaken within potentially suitable habitat within the Precinct, including (Ecology Partners Pty Ltd 2010a) (Figure 3a):

- Gilbert and Leber properties;
- Gum Scrub Creek;
- Road margins adjoining Officer South Road and the Princes Highway;
- A large remnant woodland patch located in the north-west corner of the Precinct; and,
- All associated drainage lines pertaining suitable habitat.

However, despite targeted survey efforts within these habitats the species was not detected during the current survey. The species is cryptic and hard to detect through surveys. There is potential habitat for the species along drainage lines and low lying areas (Figure 3a).

Threatening Processes

Similar to Swamp Skink, several threatening processes are likely to have lead to the contraction in Glossy Grass Skinks' range throughout Victoria. These include the loss, degradation and fragmentation of habitat increasing the likelihood of this species becoming more susceptible to a range of threatening processes as outlined above (Section 2.2.2).

Southern Toadlet ***Pseudophryne semimarmorata***

DSE 2007 Conservation Status: Vulnerable

Appearance and Habitat Requirements

The Southern Toadlet is a small frog, with adult body length up to 30 millimetres (Plate 10). The back is warty and varies from brown to dark olive-green with darker flecks (Barker *et al.* 1995; Robinson 2000). The chest has black and white marbling, while the throat, lower belly and underside of the limbs are tan to orange in colour (Barker *et al.* 1995; Robinson 2000). Males have a granular belly, while the female belly is smooth (Hero *et al.* 1991; Barker *et al.* 1995; Robinson 2000).

The species occurs throughout southern Australia, predominantly in Victoria and Tasmania. It is a ground-dwelling frog with a preference for walking (Hero *et al.* 1991). It is found in forest, woodland, scrubland, grassland and heathland habitats. Adults shelter under leaf litter, rocks, logs and other debris in damp, boggy areas and breed from March to May (Hero *et al.* 1991; Robinson 2000).

Plate 9: Southern Toadlet *Pseudophryne semimarmorata* (Peter Robertson – Wildlife Profiles Pty. Ltd.).



Distribution within the Surrounding Area

There have been 82 AVW (2009) records within a 10 kilometre radius of the study area (Figure 6).

Occurrence within the Study Area

Targeted surveys for Southern Toadlet were recently undertaken within potentially suitable habitat within the Precinct, including (Ecology Partners Pty Ltd 2010a):

- Gilbert and Leber properties;
- Gum Scrub Creek;
- Road margins adjoining Officer South Road and the Princes Highway;
- A large remnant woodland patch located in the north-west corner of the Precinct; and,
- All associated drainage lines pertaining suitable habitat.

However, Southern Toadlet was not detected within the study area during the current survey. There is potential habitat for the species along drainage lines and low lying areas (Figure 3a).

Threatening Processes

There are several threatening processes which have been known to influence Growling Grass Frog *Litoria raniformis*, and may therefore, also directly affect Southern Toadlet.

These processes include widespread native vegetation clearance, agricultural activities (e.g. grazing), changes in wetland hydrology and drought.

Additional factors that are likely to have contributed to the decline may also include:

- Habitat loss, fragmentation and degradation of habitat (such as land clearing for agriculture, grazing and urban development);
- Introduction of weeds caused by poor management of invasive native species;
- Deterioration of water quality and chemical or biocide pollution of ephemeral waterbodies;
- Introduced predators and disease (e.g. the amphibian chytrid fungus); and,
- Salinisation of aquatic habitats.

Appendix 3 – CMP objectives for each threatened species within the Precinct

Flora

Matted Flax-lily/Arching Flax-lily

- Overall in-situ retention and/or enhancement of habitat where populations have been recorded, which will enable the species to persist or even increase by natural recruitment;
- Adequate levels of biodiversity, particularly genetic variation of the species, are maintained through generations;
- Translocated populations are to be maintained in a secure reserve, with genetic stock from a range of individuals and greater than 70% of transplants surviving,;
- The new or enhanced populations to have similar characteristics to the natural populations; and,
- A reduction in edge effects through appropriate weed management.

Green Scentbark

- Overall retention and/or enhancement of vegetation patches that contain Green Scentbark, which will ensure that the species persists and increases through natural recruitment in the future;
- Adequate levels of genetic variation of the species are maintained through generations; and
- Where Green Scentbark trees are to be removed then seeds should be collected and propagated in a local nursery. These propagated seedlings should then be planted into suitable sites.

Veined Spear-grass

- In-situ retention and/or enhancement of Veined Spear-grass populations which will enable the species to persist or even increase by natural regeneration;
- Adequate levels of genetic variation of the species are maintained through generations;
- Seed to be collected and propagated in a local nursery where Veined Spear-grass individuals/populations are to be removed; and,

- If translocated then individuals are to be maintained in a secure reserve, with genetic stock from a range of individuals. There should be a survival rate greater than 70%.

Maroon Leek-orchid and Purple Diuris

- The translocation and/or propagation if located in pre-construction surveys.

Fauna

Southern Brown Bandicoot

- Provide for the ongoing retention and enhancement of potentially suitable habitats and movement corridors within the study area (e.g. Gum Scrub Creek), which may in turn promote suitable breeding and foraging habitat in an otherwise fragmented landscape;
- Establish a suitable methodology for the salvage and translocation of this species if the species is detected prior to, or during construction within the Precinct;
- Implementation of construction recommendations that mitigate the potential impacts of development to this species and associated habitats prior to, and after the construction within the Precinct; and,
- Provide appropriate recommendations to increase the potential for the species to colonise habitats within the Precinct.

Swamp Skink and Glossy Grass Skink

- Provide advice for the ongoing retention and enhancement of potentially suitable habitats and movement corridors within the study area (i.e. Gum Scrub Creek), which may in turn promote suitable breeding and foraging habitat in an otherwise fragmented landscape;
- Establish a suitable methodology for the salvage and translocation of this species will it be found prior to, or during construction within the Precinct;
- Implementation of construction recommendations that mitigate the potential impacts of development to this species before and after the study area development; and,
- Provide appropriate recommendations to enhance the likelihood of this threatened species survival throughout the local area to reduce potential future impacts.

Southern Toadlet

- Provide advice for the ongoing retention and enhancement of potentially suitable habitats and movement corridors within the study area (i.e. Gum Scrub Creek), which may in turn promote suitable breeding and foraging habitat in an otherwise fragmented landscape;

- Establish a suitable methodology for the salvage and translocation of this species will it be found prior to, or during construction within the Precinct;
- Implementation of construction recommendations that mitigate the potential impacts of development to this species before and after the development; and,
- Provide appropriate recommendations to enhance the likelihood of this threatened species survival throughout the local area to reduce potential future impacts.

Appendix 4 – ‘Salvage and Translocation Protocol – Flora’

The following section lists the various salvage and translocation protocols for significant flora which may arise during the development of the Officer PSP.

Permits and Approval

There are no further approvals required to translocate Matted Flax-lily and Arching Flax-lily or propagate Veined Spear Grass and Green Scentbark after this document is approved. However, if a recipient site is required, a management arrangement will need to be negotiated with the managing authority.

Timing

The proposed salvage of significant flora material will be undertaken where populations are to be impacted on by construction which will also vary between species. Supplementary watering of replanted material may be undertaken dependant on rainfall and soil conditions.
Matted Flax-lily and Arching Flax Lily

The ideal time for the salvaged material of Matted Flax-lily and Arching Flax-lily to be placed into the recipient site is winter (June/July), depending on rainfall and soil moisture.

Veined Spear-grass

Seeds should be salvaged the summer (November – January) prior to an affected area being disturbed. Seed should be collected from as many populations as possible within the study area by a suitably qualified contractor. This will help keep the genetic material diverse with seeds to be propagated in a suitably qualified native nursery. The ideal time for the propagated and translocated material to be placed into the recipient site is winter (June/July), depending on rainfall and soil moisture.

Green Scentbark

Due to the size of mature Green Scentbark individuals translocation of entire specimens is not possible. Therefore seed will be collected during winter (June/July) prior to the affected area being disturbed over as many seasons as possible. If seeds are viable and have been propagated in an appropriate nursery, the ideal time for propagated Green Scentbark seedlings should also be planted into a revegetation site during winter (June/July), depending on rainfall and soil moisture.

Proposed End Use of Salvaged Material

It is proposed that salvaged material will be placed into a recipient site, however given the amount of material which is likely to be removed, it is recommended that the contractor removing the material collect seeds from across the study area for propagation within a nursery for conservation purposes, this may include giving some material to a community group/local council and Parks Victoria for revegetation works within the Precinct in agreement with DSE and Cardinia Shire Council. Once the seeds/material is with any other organisation, the managing authority is not responsible for its maintenance costs unless they require it for other projects as agreed.

Removal Technique

The removal will be supervised by a qualified botanist. All vegetative material from patches proposed to be disturbed will be removed from the impact site. The procedure for removal will be (excluding Green Scentbark):

1. All patches to be removed will be identified with marker paint, and plants will be recorded against the monitoring sheet;
2. Plants will be watered the day before the proposed removal to loosen the soil and to ensure the plants are not drought stressed during salvage and movement;
3. Material will be dug from the ground by hand using spades clean of dirt; and,
4. During excavation, soil will be maintained around the root system, however plants will survive if exposed to air for short periods.

Matted Flax-lily and Arching Flax-lily

All patches and their full extent will be assessed by measuring the size of the patch, number of tillers, health and other characteristics. All plants will be marked and uniquely labelled before excavation. During removal, plants will be labelled according to the patch number and segment to ensure once they arrive at the recipient site and/or nursery they are easily identifiable as to which patch they were removed from and the total number of divided segments.

The patches will be required to be divided into a size that fits into a polystyrene box or similar to allow for ease of handling and transport.

Once plants are lifted from the ground and placed into the polystyrene boxes, they will be immediately taken to the recipient site and placed into pre-excavated and systematically arranged holes. If plants are to be taken to an experienced nursery for propagation then desired amounts (i.e. one third, two thirds etc) will need to be decided.

Veined Spear-grass

If deemed necessary, Veined Spear-grass tussocks will be marked and uniquely labelled before excavation. During removal, plants will be labelled according to the patch number and segment to ensure once they arrive at the recipient site and/or nursery they are easily identifiable as to which patch they were removed from and the total number of divided segments.

The tussocks may require division into a size that fits into a polystyrene box or similar to allow for ease of handling and transport. Once plants are lifted from the ground and placed into the polystyrene boxes, they will be immediately taken to the recipient site and placed into pre-excavated and systematically arranged holes. If plants are to be taken to an experienced nursery for propagation then desired amounts (i.e. one third, two thirds etc) will need to be decided.

Green Scentbark

A qualified contractor will be used to collect seeds. Seeds can be collected in fruits and are found in a mix which is commonly called ‘chaff’. There is no need to remove seeds from the ‘chaff’ as it can be simply be used as part of the propagating blend

Where seeds have been taken, they will need to be labelled with a number to ensure that once they arrive at a suitable nursery they are easily identifiable as to which patch/location they were removed from

Nursery Management

Disease and pest controls are important to ensure no diseases or pests are introduced to the recipient site. Any plants suspected of being diseased will be treated according to nursery guidelines and/or destroyed appropriately. At no time will plants suspected of carrying a disease or having pests, be introduced to the recipient site. Weeding of pots will also be undertaken periodically and correct hygiene procedures practiced at all times within the nursery.

If plants become pot bound, division and correct labelling must be undertaken. Before planting into the recipient site, plants need to be hardened off to ensure they are not stressed by a sudden change in conditions including frost, wind and reduced water.

Matted Flax-lily and Arching Flax-lily

If material is taken to an appropriate nursery, then any plant material other than the relative Flax-lilies will be removed, while excess soil will also be removed to allow plants fit into trays and/or pots. Rootstock/tillers will be divided into segments that will fit into an eight inch pot (or similar) and filled with a suitable medium (native potting mix).

After the plants are segmented and potted, they must be managed correctly to ensure survival within the nursery environment. Management will depend on conditions and the length of stay in the nursery - watering, weeding, and fertilisation will need to be undertaken correctly over the period.

Note: *Dianella* sp. within a nursery environment will do well and will spread within its container.

Veined Spear-grass

After the plants are segmented and potted, they must be managed correctly to ensure survival within the nursery environment. Management will depend on conditions and the length of stay in the nursery – watering, weeding, and fertilisation will need to be undertaken correctly over the period.

Green Scentbark

Once seeds of Green Scentbark individuals from across the study area are collected they will need to be potted and managed correctly to ensure survival within the nursery environment. Management will depend on conditions and the length of stay in the nursery – watering, weeding, and fertilisation will need to be undertaken correctly over the duration.

Direct Translocation

Matted Flax-lily, Arching Flax-lily and Veined Spear-grass

(Note: Green Scentbark does not apply to this section as direct translocation is not possible)

The direct translocation from the impact site to the recipient site will take place on the same day as the material is removed from the impact site, to minimise stress on the material. Several possible translocation sites within the study area have been suggested including the Gilbert and Leber properties and Gum Scrub Creek. Material will be removed as discussed in the removal technique section and transported directly to the recipient site.

1. Soil from around the salvaged material will be kept in place as a sod, to help the plants establish within the recipient site, this also helps with moisture retention around the root zone;
2. Holes at the recipient site will be prepared before the salvage of plants at the impact site, to minimise the time out of the ground for the salvaged material;
3. Holes will be dug deeper than the clod of soil from the impact site, soil will also be broken up at the base of the hole to allow quick penetration of the soil by the roots of the salvaged material;
4. Holes will be filled with water before the translocation to soften and loosen the surrounding soil, also helping to remove air pockets in the soil;

5. A weed free medium will be placed in the hole to allow an easy fit and manoeuvrability for the clod of soil;
6. The sod containing the material will be placed into the medium in the hole, ensuring the medium is tightly packed around the sod, removing air pockets and binding the medium together to prevent erosion of the medium;
7. The area around the plant will be mulched with certified weed free mulch, consisting of either wood chips or pea straw; and,
8. The plant will then be watered by hand until the sod containing the material is wet enough for water to no longer penetrate the soil.

The placement of the salvaged material will be recorded with a GPS. It is proposed the holes will be systematically lined up to allow for ease of monitoring, and the recipient sites pre existing vegetation will also be considered when choosing sites to dig holes.

Delayed Translocation

Matted Flax-lily and Arching Flax-lily

The delayed translocation will occur once plants have become established within the nursery and site conditions at the recipient site are favourable e.g. soil moisture, climatic conditions, weed control, and fencing, as required.

The ideal time to plant the salvaged material into the recipient site is during late autumn or winter, when rainfall is highest and conditions are cool. Adequate rainfall will reduce the potential requirement for supplementary watering of replanted material. Planting the material at the earliest stage before summer will also maximise the allowance for growth of the material, and allow for a higher rate of establishment, therefore maximising the potential for long-term survival within the recipient site.

The delayed translocation planting is similar to that of the direct translocation:

1. Holes need to be pre dug systematically and filled with water the day before material from the pots is removed;
2. Holes need to be dug approximately 100 millimetres wider and 50 millimetres deeper than the pot in which the material is grown in, this allows the soil to be loosened and increases the soils permeability and allows moisture to penetrate the soil to a deeper level;
3. Pots containing material will be well watered before planting into the hole;
4. Plants from the nursery will be ‘hardened’ and trimmed before they are planted;
5. Care will be taken when removing the material from the pot to keep the medium intact around the root system before placing into the hole.

6. Extra medium may need to be placed into the hole to ensure the material is tightly packed into the hole;
7. The material and medium will then be covered in certified weed free mulch, consisting of either wood chips or pea straw.
8. Watering by hand will then be undertaken; care will be undertaken not to wash medium away.

The plant will be labelled according to the nursery number and a waypoint taken with a GPS.

Veined Spear-grass and Green Scentbark

Direct translocation for Veined Spear-grass and planting techniques for Green Scentbark will include;

- Holes need to be pre dug systematically and filled with water the day before material from the pots is removed;
- Pots containing material will be well watered before planting into the hole;
- Plants from the nursery will be ‘hardened’ and trimmed before they are planted;
- Care will be taken when removing the material from the pot to keep the medium intact around the root system before placing into the hole.
- Extra medium may need to be placed into the hole to ensure the material is tightly packed into the hole;
- The material and medium will then be covered in certified weed free mulch, consisting of either wood chips or pea straw; and,
- Watering by hand will then be undertaken; care will be undertaken not to wash medium away.

The plant will be labelled according to the nursery number and a waypoint taken with a GPS.

Selection of Recipient and Revegetation Sites (for all significant species)

Several elements are required for an acceptable recipient site, firstly proximity to the impact site will be considered, along with similarities with vegetation type, vegetation conditions, topography, aspect and hydrological features (drainage, potential flooding etc.).

The recipient site must have long term protection for conservation of native vegetation consistent with the protection of an offset site under Victoria’s Native Vegetation Management: A Framework for Action.

Lastly, the long term threats need to be considered, areas such as proximity to roadsides, grazing, pest animals, pest plants and human disturbance.

Management of Salvaged Material within the Recipient Site

Monitoring of species which are not listed under the MSA agreement do not require monitoring once translocated. However if the relevant landowner and/or management authority deems it necessary, then a qualified consultant familiar with the ecology and growth habits of Arching Flax-lily should be contracted to ensure the ongoing survival of these plants. Monitoring should include details on pest animals/plants/watering/survivorship/flowering etc (see below).

Watering

The requirement for watering is dependent on a number of factors including timing of the planting, soil type and topography, rainfall and mulching. The monitoring of the plants will need to watch for drought and heat stress, and supplementary watering undertaken on a regular basis to ensure the health of the replanted salvaged material. A tanker should be used to water plants which has not previously been used for herbicides, pesticides or any other chemicals.

If translocation occurs during winter for Green Scentbark then plants will only require watering under extreme circumstances (i.e. no precipitation for more than one month). Additionally, the period between October and March is crucial for establishment of the replanted materials, and plants that survive this period in the first year after replanting are likely to establish successfully.

Once plants survive the initial summer, on-going watering is unlikely to be required. A suggested period for watering after replanting is provided below for Matted Flax-lily; Arching Flax-lily; Veined Spear-grass (Table A4.1.); and Green Scentbark, respectively (Table A4.2). However, the periods between watering may vary depending on climatic conditions. Monitoring of the plants will be important to ensure successful establishment.

The quantity of water used for watering must be sufficient to ensure survival. Monthly rainfall for the location of the recipient site must be monitored and watering undertaken to ensure plants are supplemented so that they receive at least the average monthly rainfall. Therefore a number of litres may be required for each plant using the guide of 1 litre /m² being equivalent to 1 ml of rain.

Table A.4.1. Suggested watering regimes for replanted salvaged material for Matted Flax-lily, Arching Flax-lily and Veined Spear-grass.

Months after planting	Period between significant rainfall events that will trigger watering	Watering Required
0 - 3	1 weeks	Weekly
3 - 9	2 weeks	Weekly
9 - 21	1 – 2 Months	Monthly
21 - 36	1 – 2 Months	Only if plants display signs of stress

Table A4.2. Watering requirements for replanted seedlings for Green Scentbark.

Months after planting	Period between significant rainfall events that will trigger watering	Watering Required
0 - 4	1 Months	Monthly
4 - 12	2 Months	Only if plants display signs of stress

Grazing

Grazing pressure by pest and native animals will need to be considered in the selection of the recipient site. Fencing the site may be recommended to remove grazing pressure upon replanted salvaged material. This will also enhance the existing biodiversity of the recipient site, and protect the site from accidental and potentially intentional disturbances.

Caging or the use of tree guards may also be required to protect individual plants. Pest animal control, primarily rabbits or hares, will be undertaken within the recipient site before planting the salvaged material. Fencing along with signage will also protect the site from accidental and potentially intentional disturbances.

Pest Plant Management

As part of the management of the recipient site pest plant control will need to be undertaken before and after the replanting of the salvaged material. The focus of control efforts will be on pest plants which compete with the salvaged material for available space, light, water and nutrients.

Initially the focus of the management will be on high threat/high impact species, however as the numbers of the high threat/high impact species reduce over time then the focus will shift to species which are not considered as higher threat but may still compete with the replanted salvaged material.

Biomass Reduction (applies to Matted Flax-lily and Arching Flax-lily only)

As Matted Flax-lily and Arching Flax-lily are generally found in grassy habitats, it can be self maintaining in areas of high ground storey biomass e.g. dense grassy swards. However, the closure of inter-tussock space from a lack of fire or grazing may reduce the areas of available occupancy within the recipient site. The grass length will be monitored around replanted salvaged material to ensure both native and exotic grass species are not limiting the growth of the salvaged material.

If required, measures such as hand weeding, slashing, crash grazing, mosaic burning or weed control may be employed to lower the levels of the recipient site biomass. All measures to lower biomass must be done in consultation with an expert familiar with the growth of Matted Flax-lily and also the management of native vegetation, to limit potential impacts on replanted salvaged material. Slashing, burning or grazing may also be used as forms of weed control.

Salvaged Material Placement at the Recipient/Revegetation Site(s)

The material when planted in the recipient site will be planted in a systematic order to help the monitoring of the plants. Material will be placed away from perimeter fencing, large trees which compete for resources, areas of pest animal or pest plants and in areas which limit impacts on native vegetation when digging holes.

Plants will be approximately placed no closer than two meters from one another to ensure over time, patches can be counted as individuals. Once placed into the recipient site, plants will be marked with a stake to enable identification and also a GPS waypoint taken to record on the location on a GIS layer.

Monitoring

Monitoring and reporting by a qualified consultant familiar with the ecology and growth habits of significant species is proposed to ensure the ongoing survival of the plants. Monitoring should include details on pest animals and plants, watering, survivorship and flowering.

Performance Targets

The translocation of any plants can be difficult and may put excessive stress on any material which is disturbed resulting in the death of the plant in extreme cases.

Dianella spp. have been successfully translocated for several projects within the Melbourne region where the possibilities of avoidance on the plant are not feasible. For example, Matted Flax-lily has been successfully translocated in the past due to its strong tuberous root system which is dividable and generally tolerates disturbance.

The aim of translocating flora species is to ensure genetics of the plant species are not lost from a single individual plant through to entire populations. Conserving genetic diversity drives the success of translocation, with any loss of genetic diversity from the death of material from a patch which has been salvaged can be seen as a failure to conserve the genetics of an individual.

Vallee *et al.* (2004) has detailed stringent criteria for determining the success of translocated plant species, criteria is broken into segments for short and long term success, and also the success of management of material in an *ex-situ* situation.

In the short term biological success can be determined through:

- Greater than 70% of transplants are surviving, with representatives from the range of genetic individuals planted;
- The new or enhanced populations have similar characteristics to the natural population(s), such as the survival and growth of translocated individuals;
- Survival of transplants to reproductive stage (producing flowers and fruit);
- The reproduction of translocated individuals, including the production of flowers and fruit at levels consistent with naturally occurring plants; and,
- Seed viability is consistent with that in naturally occurring plants.

Long Term Criteria includes:

- New seedlings are established;
- The number of individuals within the population is being sustained or increased by natural recruitment; and,
- Adequate levels of biodiversity, particularly genetic variation, are maintained through generations.

Appendix 5 – ‘Salvage and Translocation Protocol – Fauna’

Salvage and translocation within the study area should only be undertaken as a last resort.

Mitigation, Management and Reporting

Site Shed Requirements and Tool Box Meetings

Tool box meetings will be designed to inform all construction staff of the mitigation, salvage and translocation protocols outlined in this attachment. This will include the following:

- All contractors will undertake a pre-construction induction for the following threatened fauna species: Growling Grass Frog, Swamp Skink, Glossy Grass Skink and Southern Toadlet (within areas considered to be potential habitat for each species).
- Inductions will include a description of the appearance and typical habitat attributes for each threatened fauna species considered likely to occur within potential habitat (i.e. during construction works within roadside vegetation along Officer South Road);
- It will also be mandatory for each site shed to contain a relevant ‘Species Fact Sheet’, these should include; a picture and physical description, habitat requirements, current distribution, timing of breeding and threatening processes;
- The ‘Species Fact Sheet’ will also contain the relevant contact details of the ecological consultant, local veterinarian clinic (with a map) and nearest DSE office;
- A range of suitable salvage bags (i.e. calico or cotton) or containers will be provided by the ecological consultant and must be kept on site at all times in case of an emergency in which injured or salvaged fauna is located during construction. This will allow a relevant site supervisor or designated staff member from the construction team to keep the animal safe until the relevant ecological consultant is contacted and/or arrives on site (if required);
- At no point should the animal be released unless confirmed to be a non-threatened species. All released animals should be returned within 200 metres of their sourced location within a similar habitat to which it was found (i.e. long grass near a waterbody);
- Ecological Consultants / Site Supervisor will undertake specific inductions for new staff prior to working on site or during morning tool-box meetings who have not been informed about threatened fauna which may occur on site; and,
- Prior to construction works an ecological consultant will also certify that all relevant information is provided for each location within Precinct.

Salvage and Translocation Protocol

The following sections list the appropriate procedures for any animals caught or injured within areas containing ecological values or potential habitat for fauna within the Officer PSP. The procedures listed here should be transferred to any construction works to be undertaken within potential habitat or areas containing hollow-bearing trees which are proposed to be removed.

In doing so, the likelihood of fatality or injury may be reduced thus, minimising the overall impact on locally abundant or significant fauna species throughout the Officer PSP development. Salvage and translocation measures will be implemented in conjunction with the potential threats and mitigation measures previously discussed in this Plan. This will ensure that all the possible precautionary measures are undertaken to reduce any likely threats to locally abundant or threatened fauna species within the Officer PSP.

As a range of habitat types are likely to be altered or removed, the methods of fauna handling and translocation requirements will differ dependent on the animal. This ‘Salvage and Translocation Protocol’ will focus primarily on the following animal groups: mammals, amphibians, reptiles and fish. An additional salvage and translocation plan is provided for areas where suitable Growling Grass Frog habitat is to be removed during the construction phase (as per Figure 3b).

Mammals

As a number of native and non-native mammal species are likely to be affected by the Officer PSP throughout construction works, a salvage and translocation is outlined below. This is to be undertaken for any native mammal species which are caught or injured during construction works within potential habitat or suitable habitat (i.e. hollow-bearing trees to be removed) outside of the areas shown in Figure 3a.

Salvage and Translocation

If an animal is observed during construction activities that are likely to contribute to the risk of injury, mortality or stress to the animal, all works will be halted until the animal has been examined (i.e. species identification or any evidence of potential injuries). The Site Construction Manager will be immediately notified and the following tasks will be implemented:

1. A qualified ecologist or designated site supervisor (i.e. in the instance a qualified ecologist is on standby and not presently at the site) will determine if the animal is at any risk of injury or mortality (a local wildlife specialist or an ecologist may need to be contacted to help confirm this);

2. If the animal is at risk: all construction activities that contribute to the risk of injury, mortality or stress to the animal will be halted until the animal has been removed (which will be enforced with the co-operation of the Site Construction Manager);
3. An ecologist or a suitable wildlife specialist will be contacted by the Site Construction Manager to ‘capture and release’ the animal in accordance with the measures identified below:
 - As salvage will be undertaken on a construction site, all Personal Protective Equipment (PPE) must be worn during the capturing and handling of wildlife, unless it obstructs or has the potential to impact on the well being of the animal;
 - If the animal is injured during salvage, it should be placed in a dry carry bag (preferably made of cotton or a hessian type material) and transported immediately to the nearest veterinary clinic for further treatment;
 - If the animal is not harmed during construction (or as a result of further analysis from a certified veterinarian) the animal will be released within 200 metres of the construction zone or within suitable habitat adjacent to the work area if the present habitat is to be removed as part of the Officer PSP;
 - Construction activities that have been halted at a site due to the presence of an animal cannot recommence until an ecologist or wildlife specialist has successfully captured the at-risk animal from within the work site and informed the Site Construction Manager that the animal is no longer at risk;
 - All fauna which has been captured or injured during construction works should be recorded and reported to the relevant authorities (i.e. DSE and Cardinia Shire Council)

Pest Animals

Pest animals recovered or injured from construction activities will be humanely destroyed. This procedure may be discussed and implemented into the development of a Pest Animal Management Plan. Alternatively, all pest animals caught or injured should be taken to the local veterinarian clinic to be terminated humanely. The relevant landowner will be responsible for any costs involved.

Threatened Fauna Species

If the area where this individual was captured is within an area considered to be **potential** habitat, then that area would be reclassified as **known** habitat for this species.

The relevant ecologist will propose an appropriate future course of action for the construction process at this location.

This future course of action may involve implementing some additional mitigation measures appropriate for this species in **known** habitats, and it may also involve new or revised adaptive management actions including:

1. A rapid assessment within the immediate area to determine the extent of the habitat at that location for the particular threatened species, incorporating aspects of the biology of the particular species, and the risk that is posed by the construction activities that are occurring already or that are proposed to occur at that location;
2. On completion of an active search the relevant ecologist will propose an appropriate future course of action for the construction process at this location;
3. The proposed future course of action will be discussed between the construction team and DSE. DSE may determine that SEWPaC should also be involved in these discussions. It may not always be necessary for SEWPaC to be involved in the discussions (e.g. issues involving FFG-listed species only); and,
4. Once all parties have agreed on a resolution, only then can construction continue at this location and only in accordance with the agreed course of action.

Amphibians

Growling Grass Frog Salvage and Translocation

The salvage and translocation process outlined below will be required for the removal of any existing waterbody within the study area considered to be suitable Growling Grass Frog habitat (refer to Figure 3b). It should be noted that the protocol outlined in this section will be the sole responsibility of each landowner/developer as part of their subdivision/construction works.

As per the recommendations in Heard *et al.* (2004b) and Organ (2005), Growling Grass Frog salvage and translocation measures will be implemented both immediately prior, and during disturbance to any dams or creeks (including Gum Scrub Creek and Cardinia Creek) within the study area.

Salvage during active season (September – March)

All Suitable habitat areas (see Figure 3b)

- Salvage will take place prior to site disturbance, but as close as possible to proposed construction periods, i.e. one day to a week (a longer intervening period may mean frogs have moved back into the area).

Two observers will spend a minimum two nights surveying, by spotlighting in key areas within the study area prior to the commencement of works in their vicinity. All wetlands of suitable habitat (as identified on Figure 3b) to be salvaged unless agreed to in writing by DSE at the time of the works;

- Frog and tadpole salvage will also be undertaken during the drainage/pumping of any dams identified as known habitat by the species within the study area;
- Salvage during preliminary earthworks, drainage line construction, creekline augmentation and landscaping, and frog pond removal or filling will also be conducted. This will involve an observer actively searching surrounding terrestrial habitat (i.e. 200 metre from a waterbody) such as soil, vegetation and other ground debris for frogs immediately prior to, and during excavation around and/or filling of existing waterbodies; and,
- Footwear will be washed in disinfectant at the beginning and end of each salvage period to prevent the introduction and/or spread of any diseases.
- Dams that are completely dry will not require any salvage and translocation measures.

Salvage during inactive season (April to August)

All Suitable habitat areas (see Figure 3b)

As any Growling Grass Frog that may be present will be inactive during cooler months, no nocturnal surveys prior to construction activities will need to be undertaken.

- Salvage during construction will be conducted at all dams, even if they are dry;
- This will involve an observer actively searching areas around wetlands, creeklines, and drainage lines (i.e. 200m) including soil, vegetation and other ground debris for frogs immediately prior to, and during excavation works;
- Footwear will be washed in disinfectant at the beginning and end of each salvage period to prevent the introduction and/or spread of any diseases; and,
- Dams that are completely dry will not require any salvage and translocation measures.

Any frogs encountered during salvage operations will be removed from properties within the study area and released at a predetermined translocation site in the immediate area (in consultation with DSE). Salvage measures will be undertaken by a qualified zoologist experienced with these operations. All salvage procedures will be conducted in accordance with the hygiene protocol for the control of disease in frogs (NPWS 2001).

If a suitably qualified herpetologist/zoologist is not present at any waterbody during construction activities, contractors will be required to contact a nominated ecological consultant immediately in the event that any frogs are located, and cease works immediately, until the ecological consultant is present on site to supervise further works in the immediate area.

In the event that a zoologist is not on site and Growling Grass Frog is discovered, any individuals will be stored in an appropriate container (see below) and kept in a cool place out of direct sunlight until a qualified herpetologist/zoologist arrives. An emergency handling kit will need to be prepared prior to the commencement of construction works. It must be easily accessible on site and all contractors must be briefed on its location and how to use it. As a bare minimum it must contain:

- A Growling Grass Frog identification sheet;
- Plastic holding containers, at least 20 x 20cm in size, which are sealable but have adequate aeration (i.e. several holes in the lid to provide some air flow);
- Only one frog should be temporarily housed per container if there are multiple individuals located); and,
- Latex gloves (new pair to be used for each frog handled).

Given that Growling Grass Frog is active for only part of the year, generally between September and March, salvage procedures differ depending on the time of year they are undertaken.

Translocation Protocol

Potential translocation sites in the vicinity of the study area will be decided in conjunction with DSE. In order to translocate frogs to another site in the local area a number of national and Victorian legislation and conditions would need to be met.

Prior to frog translocation, owners or land managers of the translocation sites need to be notified and an agreement made to ensure that future land use and management does not compromise the longevity of the species within the study area. This should be in the form of a letter of support. Additionally, the chosen translocation sites would need to be agreed upon by the proponent and DSE.

A qualified zoologist, with specific translocation experience, must undertake frog translocation processes. The following applies:

- Prior to release a frog's morphological data including body size, sex and reproductive condition will be recorded for all frogs captured;

- Each individual captured will be marked by injection of a passive integrated transponder (PIT) tag. This technique is currently being used by Ecology Partners Pty Ltd as part of a detailed mark-recapture study on the species throughout the Officer and Pakenham area (Ecology Partners Pty Ltd 2006, 2008, 2010b);
- Frogs will be released at night into favourable micro-habitats such as areas containing rocks or dense vegetation around the perimeter of a waterbody where there is sufficient cover;
- Frogs will be translocated as soon as practicable after capture;
- Translocation of any frogs must be undertaken to minimise potential for the spread of diseases (chytrid fungus), and impacts on Growling Grass Frog and other frog populations at translocation sites;
- Any visibly sick or dying specimens will not be translocated and will be transported to a registered veterinarian for further analysis, to determine if infected with chytrid fungus;
- The introduction of Growling Grass Frog from nearby source populations into created (artificial) ponds may be considered if the species has not naturally colonised ponds after two years, and if habitats are considered suitable for the long-term persistence of populations (i.e. ongoing breeding and recruitment) within the study area. However, this would be subject to a separate approval process and permits would be required from DSE. SEWPaC may also need to be notified if frogs are to be translocated into ponds; and,
- The success or failure of frog translocation will be monitored and documented and submitted to SEWPaC and DSE for review on an annual basis, following the results of required monitoring procedures at all Growling Grass Frog habitats through the Precinct. This will involve the inclusion of the final translocation site in the annual monitoring surveys (if any Growling Grass Frog are translocated during the development of the study area).

Common Amphibian Salvage and Translocation

Translocation sites for the development have not yet been determined. However, if Southern Toadlet or any other individuals are detected prior to construction, translocation sites will be chosen and agreed upon by DSE prior to development, with salvage and translocation procedures being implemented immediately.

Salvage and Translocation Protocol

Any frogs encountered during salvage operations will need to be removed from the study area and released at a pre-determined translocation site.

Salvage measures should be undertaken by a qualified zoologist experienced with these operations, with the following methodology applied to salvage operations:

- Salvage shall be undertaken in any potential habitat(s) (Figure 3a), that are proposed to be disturbed, particularly drainage lines where within or adjacent to the study area;
- Salvage shall take place prior to site disturbance but as close as possible to proposed construction periods (a longer intervening period may mean frogs have moved back into the area). Two observers should spend two nights spotlighting within key areas prior to any construction works;
- A suitably qualified herpetologist/zoologist should be present at all times during the initial soil disturbance in areas where salvage is required. However, if this is not possible contractors will be required to contact a nominated person immediately should any threatened frogs be located, and cease works immediately, until the nominated person is present on site to supervise further works in the immediate area;
- The responsible landholder (i.e. depending of the location) will ensure that all contractors be made aware of the appearance of threatened frog species (i.e. Southern Toadlet), and in the event that a zoologist is not available, any specimens will be humanely captured, stored in an appropriate container and kept in a cool place out of direct sunlight, until a qualified herpetologist/zoologist arrives;
- Salvage procedures will be conducted in accordance with the hygiene protocol for the control of disease in frogs (NPWS 2001), this includes all footwear being washed at the beginning and end of each salvage period to prevent the introduction and/or spread of any diseases;
- Where frogs are located during salvage works, the following should be undertaken prior to translocating the frog(s);
- Prior to the release of the frog(s) morphological data including body size, sex and reproductive condition will be recorded for all frogs captured;
- Frogs will be released at night into favourable micro-habitats such as areas containing rocks or dense vegetation around the perimeter of a waterbody where there is sufficient cover;
- Frogs will be translocated as soon as practicable after capture; and,
- Any visibly sick or dying specimens will not be translocated and should be kept for further analysis to determine if infected with Chytrid fungus.

While exact translocation sites in the vicinity of the study areas are yet to be determined, salvaged frogs will most likely be moved no more than 500 metres from the development footprint in suitable microhabitat (i.e. areas adjacent to the proposed works).

The success or failure of frog translocation should be documented/reviewed and submitted to SEWPAC and DSE for review, upon completion of the project.

Reptiles

Salvage Protocol

If Swamp Skink and Glossy Grass Skink are encountered during salvage operations individuals should be removed from the site. Individuals are not to be released until approval from DSE is provided in writing. DSE must approve whether translocation is appropriate. If translocation is appropriate, then DSE must also approve on a site for translocation. Translocation of these species is not always appropriate.

Salvage measures undertaken during construction should include:

- Salvage should be undertaken along the working corridor in areas of habitat suitable for Swamp Skink and Glossy Grass Skink (Figure 3a);
- Salvage should take place in conjunction with zoologists' supervision for both Swamp Skink and Glossy Grass Skink prior to site disturbance, but as close as possible to proposed construction periods. (This aims to reduce the chances of any Swamp Skink and Glossy Grass Skink or other wildlife moving back into the active construction zone in the interim);
- Any animals located on site, when a zoologist is present should be captured. Salvaged lizards should be held in a clean calico bag (no more than one lizard per bag, with the bag disposed of once the lizard is released) and placed in a cool, quiet position out of direct sunlight until it can be released. All lizards should be released within one hour of capture, unless under exceptional circumstances where this may jeopardise the animals welfare; and,
- If a suitably qualified zoologist is not present during construction, contractors should be required to contact a nominated person (qualified zoologist) immediately should any Swamp Skink or Glossy Grass Skink be located. The Site Manager should ensure that all contractors should be made fully aware of the appearance of the Swamp Skink and Glossy Grass Skink prior to the commencement of works. Contractors should make note of where the animal was seen and attempt to maintain eye contact on the refuge site of the animal, to aid capture once the zoologist arrives on site. Contractors should not handle the animal under any circumstances.

Translocation Protocol

Swamp Skink and Glossy Grass Skink translocation should be undertaken by an approved zoologist experienced with the safe handling and transportation of reptiles:

- Prior to release each individual lizard should be processed for morphological data including body size, weight, sex and reproductive condition;
- Any Swamp Skink and Glossy Grass Skink injured on the construction site should be salvaged by the zoologist and immediately transported to a wildlife veterinarian for treatment. If the animal should recover, it should then be translocated to the recipient site, as per the methodology below. If any Swamp Skink or Glossy Grass Skink suffers fatal injuries on site, the specimen should first be offered to Museum of Victoria, then DSE. If both parties reject the specimen, it should be responsibly and hygienically disposed of;
- If translocation and a recipient site is approved by DSE, then animals should only be translocated to the recipient site in suitable weather conditions during daylight hours, to reduce predation risks. Animals should also be placed in suitable micro-habitat within the recipient site, in the vicinity of available refugia, to provide essential cover to animals in their new environment. If necessary, a holding area should be identified for animals which cannot be released on the same day of capture, or which may be required to be held for a prolonged period of time due to seasonal constraints or similar (to be agreed upon with DSE, prior to undertaking this procedure); and,
- The success or failure of Swamp Skink and Glossy Grass Skink translocation should be documented, monitored and reviewed with an annual report submitted to DSE for information and their records, or as part of a translocation/ permit conditions.

Fish

During construction within drainage lines any native fish which are captured will be translocated into suitable microhabitats at least 200 metres upstream of the proposed works. Potential translocation sites in the vicinity of the study areas will be assessed prior to the translocation process and individuals will be translocated to a minimum distance of 200 metres upstream.

Translocation will be undertaken by a qualified ecologist experienced with these procedures and operations. The following release procedure will be followed:

- The chosen translocation site(s) would need to be agreed upon by the proponent and DSE;
- All native fish are to be released into favourable micro-habitats such as dense bank vegetation and emergent and submerged macrophytes where possible;
- All fish will be translocated as soon as practicable after capture;
- The abundances of any threatened species translocated will be documented; and,
- All noxious species such as Plague Minnow *Gambusia holbrooki* will be humanely destroyed.

Appendix 6 – Potential Impacts

Potential Impacts

The following section lists the potential impacts to significant flora and fauna which may arise during the development of the Officer PSP.

Habitat Loss, Degradation and Modification

As many roadsides and drainage lines provide dispersal habitat for amphibians and reptiles, severance of habitat links may adversely impact fauna species' ability to colonise, or re-colonise other areas supporting suitable habitat. Impacts are likely to be minimised through implementation of the 'Salvage and Translocation Protocol – Fauna' (Appendix 5).

The removal, reduction or modification of vegetation patches within the study area may also:

- Influence the survival, persistence and reproduction of significant flora (i.e. Matted Flax-lily and Veined Spear Grass) and fauna species (i.e. Growling Grass Frog);
- Decrease the amount of available habitat for significant flora and fauna species, whilst potentially creating small isolated populations that may become less viable with regards to population dynamics or genetic diversity;
- Loss of potential habitat may have an impact on the survival, persistence and reproduction of significant fauna which have may reside within areas of the study area (including the Gilbert and Leber properties);
- Loss of breeding, foraging and dispersal habitat through ground disturbance activities may displace common native fauna species into less suitable habitat with insufficient cover and refugia (e.g. stones and logs), and may lead to an increase in the likelihood of mortality or predation;
- Loss of habitat, habitat alteration and habitat fragmentation potentially having a negative influence on the survival, persistence and reproduction of significant flora species such as Matted Flax-lily and Veined Spear-grass;
- Increase the risk of predation in exposed open areas due to the removal of vegetation and refugia (e.g. stones and logs) favoured by significant fauna species; and,
- Affect fauna species ability to disperse and colonise or re-colonise other areas of suitable habitat within and outside of the study area.

Construction Activities

Due to the patchiness and small areas of suitable habitat within the study area, construction works have the potential to further reduce available habitats for native flora and fauna species. Some of these potential impacts may include:

- Further reduce and fragment existing habitat areas, limiting fauna dispersal capabilities, as well as the potential increase to the severity of edge effects to significant flora and fauna species;
- If best practice sedimentation and erosion control measures are not in place when undertaken construction activities, there may be various physical and chemical consequences. This may affect the overall ecosystem health through increased sediment and erosion levels along roadsides, drainage lines and creeks which could ultimately influence significant flora and fauna species within the study area;
- The use of excavating machinery and heavy equipment has the potential to injure or fatally harm significant fauna species which may be seeking refuge in grass tussocks, under rocks/ logs or in the soil cracks or sub-surfaces in areas containing potential habitat;
- Accidental fuel spillages from construction machinery have the potential to pollute soils and deteriorate remnant vegetation throughout the study area;
- Further reduce and fragment existing habitat areas, limiting fauna dispersal capabilities, as well as increasing the severity of edge effects to significant flora and fauna species;
- Construction activities may cause changes in hydrology, and an increase in erosion and sedimentation;
- If appropriate fencing and signage is not set up around the perimeter of the property then human disturbance from construction in adjoining areas may result in inappropriate access which may potentially affect ecological values throughout the study area; and,
- If 'No Go' zones are not marked out correctly then construction material may be dumped onto areas of native vegetation which house significant flora species.

Weeds

The study area has been subject to historical land uses that have caused significant disturbance to the natural ecosystem.

Remnant vegetation throughout the study area is surrounded by a modified agricultural landscape where exotic plant species dominate. Consequently, weed diversity and density is high within the study area.

Increased weed encroachment into areas of indigenous or planted terrestrial and aquatic vegetation throughout drainage lines may occur due to runoff from surrounding disturbed areas. Weeds may also be transported via construction equipment and machinery, and people/animals entering the study area. Invasion of native vegetation by 'environmental weeds' is a threatening process under Schedule 3 of the FFG Act. Excessive weed growth may smother amphibian and reptile habitat, rendering it unsuitable for breeding, foraging or dispersal.

Exotic weed species can have a detrimental effect on remnant vegetation, especially on significant flora species, as they are easily outcompeted and smothered. Potential impacts of exotic weed species as a result of the development of the study area may include;

- Increased weed encroachment may occur during and after construction as a result of disturbance to the weed seed bank during excavations. This may have a detrimental effect on the health of significant flora populations including Matted Flax-lily which are to be retained in-situ within the study area (i.e. roadside reserves);
- As the study area contains a variety of annual and perennial weed species. It is important to prevent the further spread of these species during construction;
- Weeds may be transported via construction equipment and machinery, and people/animals entering the site. Weeds may further spread, dominate and outcompete native species such that there is an overall decline in biodiversity if not managed appropriately; and,
- Significant species within the property may be outcompeted and smothered if weed densities are not monitored and controlled appropriately (i.e. routine maintenance).

Human Access

Currently human occupation within the study area is relatively low due to its semi-rural land use. However, a large increase in human occupancy will occur following development of the study area, and the likelihood of potential impacts to significant flora and fauna will increase. Potential impacts of human access as a result of the development may include;

- Scattered occurrences of litter have been observed throughout the study area and are likely to be attributed to roadside littering or wind-blown litter;
- Population increases where litter levels could increase throughout the study area. This may reduce the overall habitat quality for significant flora and fauna species in the long term;

- With the increase in human activity as a result of the development of the study area, there will also be increased impacts to vegetation due to visitor access (i.e. compaction via trampling and spread of weeds), as well as an increased level of vehicle access (i.e. truck, cars and motorbikes) during and post construction;
- An increase in mowing/slashing practices (i.e. during spring and summer) within the study area may further degrade habitat quality or directly injure significant flora and fauna species;
- Humans can also introduce and spread the waterborne Chytridiomycosis disease, caused by the fungal pathogen *Batrachochytrium dendrobatidis* which can be lethal to many amphibians (including Southern Toadlet and Growling Grass Frog);
- The increase in human activity as a result of the development of the study area is likely to cause an increased impact on vegetation and soils as a result of increased visitor access (e.g. compaction via trampling and the spread of weeds); and,
- Indirect or direct impacts resulting from weed management actions (i.e. harmful waste spillages or misused herbicide application and spray drift) may also result in the reduction in habitat quality or the direct mortality of threatened flora and fauna species within the property.

Hydrology and Water Quality

Construction activities associated with the development have the potential to result in sedimentation of nearby waterways and produce sediment-laden runoff into drainage lines and creeks. Once the development is complete stormwater runoff from roads and paved surfaces has the potential to be of a higher volume and velocity than the existing runoff. This runoff has the potential to be transported to areas containing potential habitat for significant fauna species. There is also the potential for accidental spillage of chemicals from the construction area, which may runoff into culverts, drainage lines, and the creeks. Therefore, a reduction in water quality and weed invasion may occur in ponds, wetlands, Gum Scrub Creek, and in parts of the catchment further south as a result of the development of the study area. Increases to sediment input and input of toxic substances into Victorian rivers and streams due to human activities are both threatening processes under Schedule 3 of the FFG Act.

Pest Animals

Unrestrained dogs and cats are likely to roam through drainage lines within the study area. Cats in particular are known to prey upon dispersing or sheltering mammals, amphibians and reptiles. Predation of native wildlife by the cat is a threatening process under Schedule 3 of the FFG Act. Cat predation is also listed as a threatening process under the EPBC Act (DEWHA 2008a).

The presence of pest animals such as European Rabbits may also result in the alteration of extant habitat conditions and vegetation composition. In many instances, both common native and significant fauna species can be adversely affected by habitat degradation as a result of European Rabbit activities (i.e. burrowing and grazing).

The introduced Plague Minnow has been identified as a possible factor in the decline of species in the “bell frog species complex”, which includes the Growling Grass Frog (Mahony 1999; White and Pyke 1996; Hamer *et al.* 2002). The Plague Minnow eats the eggs and tadpoles of these frogs and can eliminate them from ponds in which they both live (Morgan and Buttermer 1996). Although there appears to be no research into the affects of Plague Minnows on the Southern Toadlet, there is a high likelihood of predation from Plague Minnow on all frog species potentially occurring within the drainage lines and waterways within the Precinct.

While Plague Minnow can reduce the potential of a site to support breeding populations of frogs, the extent of predation depends on the aquatic vegetation and habitat complexity, and waterbody permanency (Hamer *et al.* 2002). This fish has been recorded in Gum Scrub Creek and is likely to occur in other drainage lines and some farm dams in the area. The presence of this fish in Gum Scrub Creek, together with the lack of established emergent vegetation, limits the habitat potential of the creek for amphibian species.

The Red Fox is known to eat adult members of the bell frog species complex (NSW DEC 2005) and is likely to prey on other frog species occurring within the local area. Furthermore, it has been established that small and disconnected populations of bandicoots in fragmented remnants (i.e. Koo Wee Rup Swamp) have an elevated risk of local extinction due to the influence of Red Fox predation (Menkhorst and Seebeck 1990). Fox predation is also outlined as a threatening process in the Action Statement developed under the *FFG Act* (Mansergh and Markes 1993) in addition to being listed as a threatening process under the EPBC Act (DEWHA 2008b).

Encroachment by Swamp Paperbark

The vegetation along the artificial drain running through the Gilbert property has been classed as Swamp Scrub (EVC53) which is a treeless EVC that is dominated by the large shrub Swamp Paperbark *Melaleuca ericifolia*. The colonisation of Swamp Paperbark has significantly increased the extent of this vegetation class, particularly to the west of the drainage line through the Gilbert Property. This encroachment has the potential to;

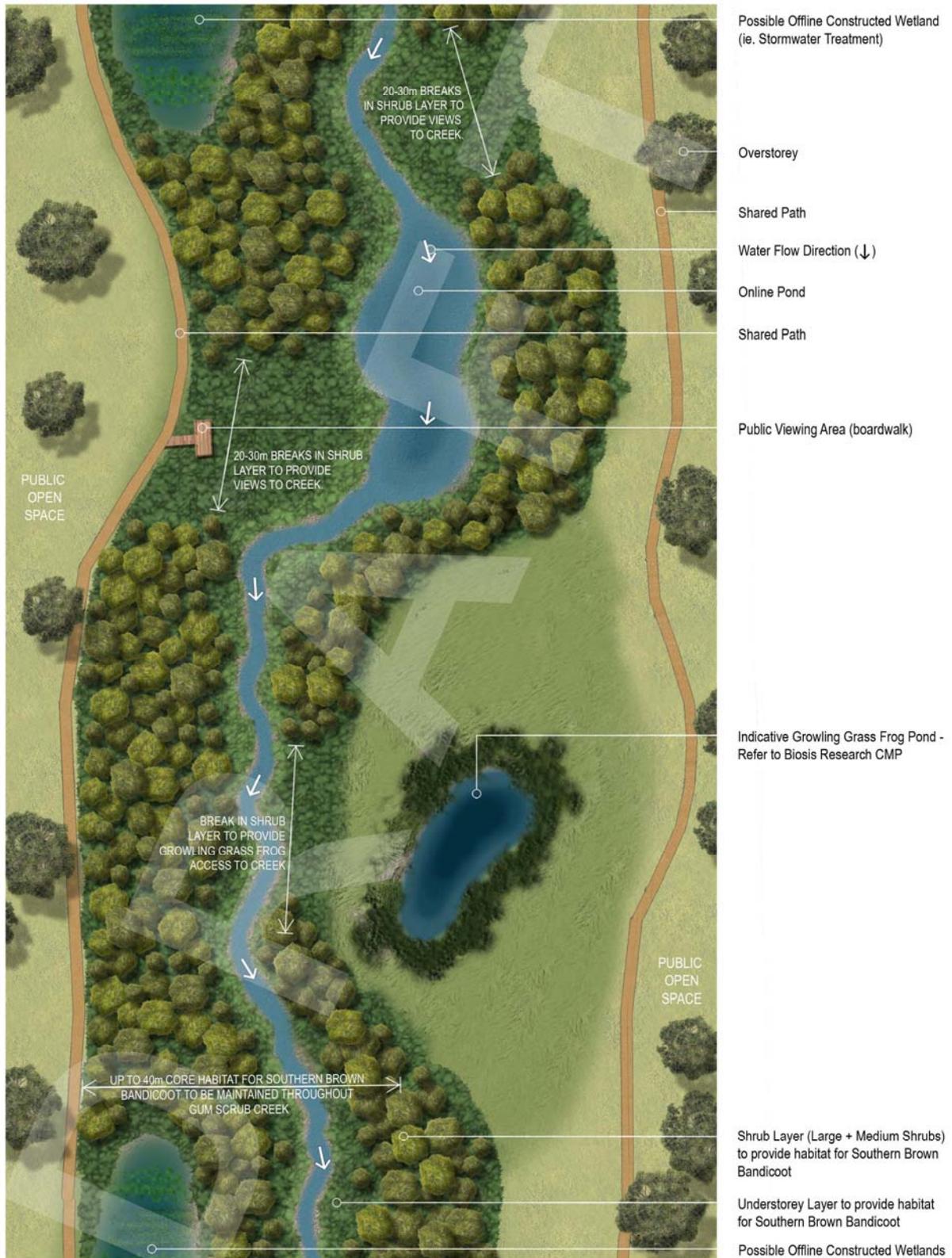
- Reduce the available habitat for significant flora species;
- Lead to an alteration in the natural flow regimes throughout the Gilbert property and change water levels in a regularly inundated area;

- Cause other threats that may ultimately lead to the alteration of floristic structure (i.e. increased canopy cover), decreasing habitat suitability for significant flora and fauna species which have a low likelihood of occurring within the Gilbert property; and,
- In an urbanised context, increase cover and breeding sites available for introduced pest animals such as the Fox, European Rabbit and Cat.

Appendix 7 – ACLA Consultants Landscape Architecture and Design – Gum Scrub Creek Concept Plan

List of Contents:

Appendix 7a: Gum Scrub Creek – Indicative Landscape Concept Design – DRAFT (Note that although this concept design includes public open space within the Gum Scrub Creek Corridor, in accordance with the Officer Precinct Structure Plan, public open space is to be achieved outside the 100m wide Gum Scrub Creek Corridor).



GUM SCRUB CREEK - INDICATIVE LANDSCAPE CONCEPT DESIGN -DRAFT



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