OUTER METROPOLITAN RING LINK TO MELBOURNE AIRPORT AND BULLA BYPASS

DESKTOP ASSESSMENT OF FLORA AND FAUNA

VicRoads

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1.1	15/02/2010	Justin Sullivan, Curtis Doughty	Brett Lane	Additional assessment of access restoration roads

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1. EXECUTIVE SUMMARY

VicRoads engaged BL&A to conduct a flora and fauna desktop study and ground-based overview of ten proposed alignments for the Outer Metropolitan Ring Link to Melbourne Airport and the Bulla Bypass. A total of ten possible route alignments have been investigated, each approximately 240 metres in width (see Figure 1). The area investigated included all land encompassed by these alignments in a zone 240 metres wide. Access restoration roads were also assessed as part of this investigation.

The key findings from the desktop assessment are summarised below.

- Other than small patches of woodland, scattered tress and creek line vegetation the vast majority of the study area supported introduced vegetation and planted trees;
- Two ecological communities under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) may occur within the study area. These are Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia, listed as endangered, and Grassy Eucalypt Woodland of the Victorian Volcanic Plain, listed as critically endangered.
- Six fauna species listed as threatened under the Act may occur within the study area if suitable habitat is present;
- Five fauna species listed under the *Flora and Fauna Guarantee Act 1988* may occur within the study area if suitable habitat is confirmed to be present;
- A field assessment would be required in order to confirm if any species or communities identified from the area occurs along any alignment and therefore the extent to which such an occurrence may constrain development within the study area.

The implications of the proposed road development discussed below arise from the findings of this desktop assessment.

- If any native vegetation or scattered native plants are present and are required to be removed, a Planning Permit will be required under Clause 52.17 of the City of Hume planning scheme.
- A planning permit will also be required if any native vegetation or fauna habitats are required to be removed within the ESO1 that covers Deep Creek and the adjacent escarpments near the Bulla township.
- The project will be referred to DSE if any of the criteria listed in Table 5 are met by the current development proposal. A detailed field assessment of affected areas will be required before this is known.
- The provisions of the Commonwealth EPBC Act may apply to the study area if any of the six listed fauna species thought likely to occur were found along any preferred alignment.
- The local planning authority is likely to consider any impacts on any threatened species found to occur or likely to occur in the study area.

- Any removal of native vegetation located on road reserves, being public land, may require a licence under the *Flora and Fauna Guarantee Act 1988*.
- A detailed field flora and fauna survey, at an appropriate time of year (late winter, spring and early summer), will be required to accurately determine the status along alignments of the species and communities that may occur in the study area.

2. INTRODUCTION

VicRoads engaged BL&A to conduct a desktop study and field based overview assessment for ten proposed alignments for the Outer Metropolitan Ring Road - Tullamarine Freeway Link and Bulla Bypass (Figure 1).

This investigation was commissioned to provide information on the extent of native vegetation and the potential for threatened flora and fauna species to occur within the proposed alignments. This report outlines any implications under various national, state and local legislation and policy, including Victoria's Native Vegetation Management Framework (DNRE 2002), referred to herein as the 'Framework'.

Specifically, the scope of the investigation included:

- Existing information has been reviewed (e.g. the Department of Sustainability and Environment (DSE) Flora Information System and web-based EVC mapping and Victorian Fauna Database; EPBC Act Protected Matters Search Tool, Biosites database and VROT Pop databases of DSE and the Australian Platypus Conservancy Database). Existing published reports prepared for the Growth Areas Authority and DSE, where relevant, and any relevant roadside management plans.
- A summary list of relevant flora and fauna issues that may affect future planning for the project has been prepared.
- The data from these relevant reports has been collated in a working table that enables comparison of the flora and fauna values of each route alignment option.
- A preliminary field assessment was undertaken of areas with ecological values identified during the desktop information review using observations from public roads only as private property access was not yet possible. This aimed, where possible, to ground-truth vegetation mapping and other existing biodiversity information.
- Based on the data gathered, a summary of confirmed or potential flora and fauna issues for each route option has been prepared. This includes information on the potential extent, and conservation significance (and rationale) of vegetation affected by each option within the limitations of this mostly desktop study;
- A GIS mapping layer has been prepared that integrates information from all consulted sources and overlays route options.

A copy of the Consultant Task Brief provided by VicRoads is presented in Appendix 1.

This report is divided into the following sections:

Section 3 describes the sources of information, including the methods used for the field survey.

Section 4 provides an overview of the proposed alignments.

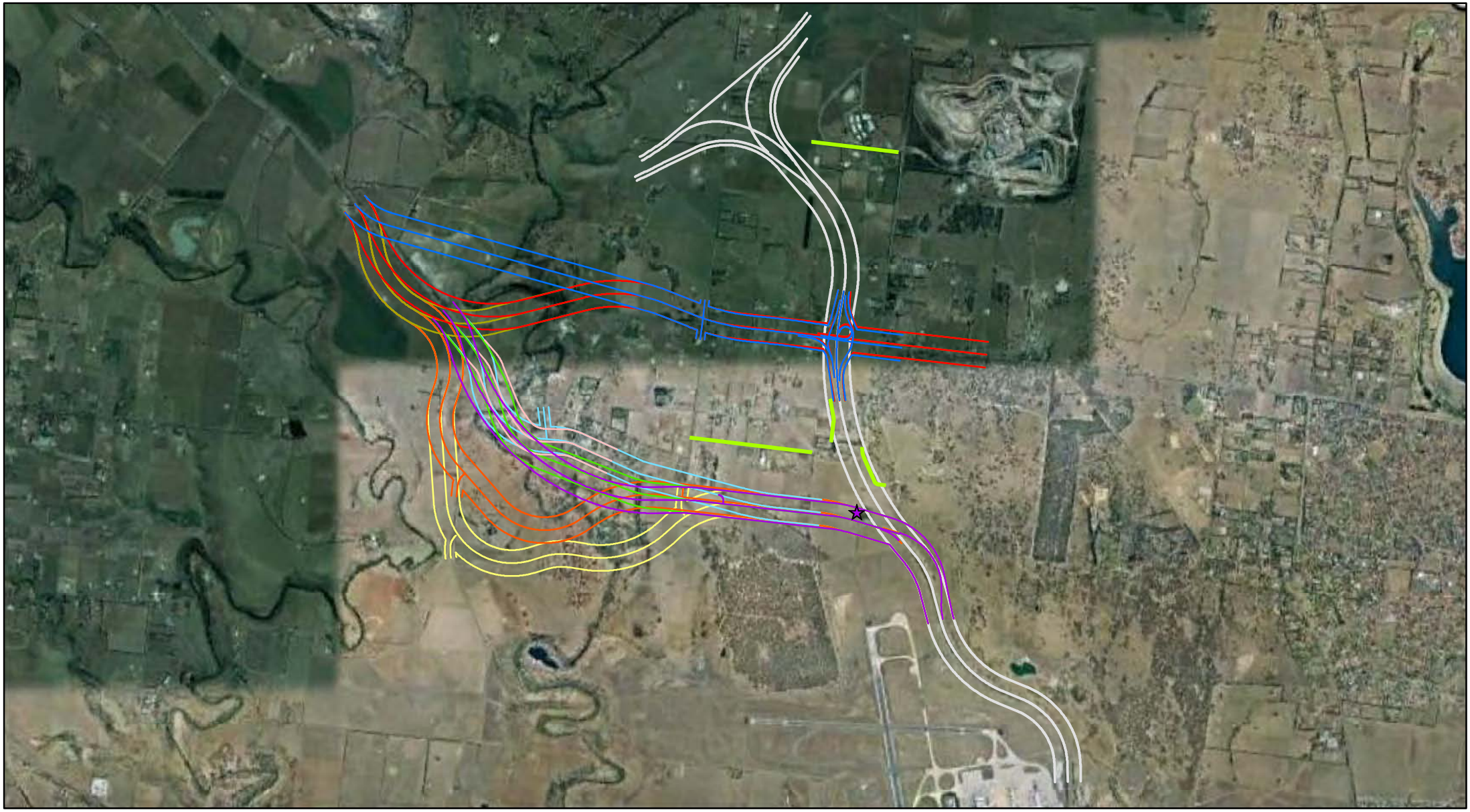
Section 5 provides an overview of the characteristics of the study area.

Section 6 presents the investigation results, describing the flora and fauna of the study area.

Section 7 compares the relative impacts of each route alignment and discusses the implications of the findings under relevant Commonwealth, State and local legislation and policies.

Section 8 provides recommendations assist in the development of a proposal that reduces impacts on indigenous biodiversity and complies with relevant regulatory requirements.

This investigation was undertaken by a team from Brett Lane & Associates Pty. Ltd., comprising Bill Wallach (Botanist), Justin Sullivan (Botanist), Curtis Doughty (Zoologist) and Brett Lane (Principal Consultant).



Legend

- Alignment A
- Alignment B
- Alignment C
- Alignment D
- Alignment E
- Alignment F
- Alignment G
- Alignment H
- Alignment F- G
- AlignmnetTulla OMR Interchange
- Access Restoration Roads
- ★ Native Peppercress

0 625 1,250 2,500 Meters

Figure 1: Alignments oveview

Project: Tullamarine Freeway Extension

Client: VicRoads

Project No.: 10155	Date: 15/02/2011	Created By: B.Wallach/ M.Ghasemi

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3. SOURCES OF INFORMATION

3.1. Assessment of the Tullamarine Freeway extension alignments

Electronic mapping were provided by VicRoads showing alternative alignments for the proposed road project. Alternative alignment footprints were overlayed with vegetation data to determine their location in relation to areas of modelled and mapped native vegetation as well as known records for threatened flora and fauna species.

3.2. Existing information

Existing information on flora and fauna used for this desktop study is described below. Note that 'study area' refers to the ten 240 meter wide road alignment corridors between Melbourne Airport to Sunbury Road and the proposed Outer Metropolitan Ringroad (OMR) E6 Functional Design. Existing information has been obtained from a wider area, termed the 'search region' defined for this assessment as an area with radius ten kilometres from the approximate centre point of the study area of coordinates: latitude 37˚ 37' 41" S and longitude 144˚ 48' 03" E.

No previous flora and fauna assessment has been undertaken for this project.

3.2.1. Flora

A list of the flora species recorded in the search region was obtained from the Viridans Flora Information System (FIS), a database administered by DSE (Viridans Biological Databases 2010a). This database search listed all plant species, including rare and threatened plants found in the search region. Plant taxonomy used throughout this report follows the FIS standards.

The likelihood of suitable habitat in the study area for nationally threatened flora species was ascertained through a search of the online *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) Protected Matters Search Tool (DEWHA 2010) using the same search region.

3.2.2. Ecological Vegetation Classes

Pre-1750 (pre-European settlement) vegetation mapping was reviewed to determine the type of native vegetation likely to occur in the study area. Information on Ecological Vegetation Classes was obtained from published EVC benchmarks. These sources included:

- Relevant EVC benchmarks for the Victorian Volcanic Plain and Central Victorian Uplands bioregion[1] (DSE 2010a)
- Biodiversity Interactive Maps (DSE 2010b), and specifically the 2005 Ecological Vegetation Class map.

[1] A bioregion is defined as "a geographic region that captures the patterns of ecological characteristics in the landscape, providing a natural framework for recognising and responding to biodiversity values". In general bioregions reflect underlying environmental features of the landscape (DNRE 1997).

3.2.3. Fauna

A list of the fauna species recorded in the search region was obtained from the Atlas of Victorian Wildlife (AVW), a database administered by DSE (Viridans Biological Databases 2010b). Fauna taxonomy used throughout this report follows the AVW nomenclature.

A report was provided by the Australian Platypus Conservancy (APC) that included an assessment of Platypus in Deep Creek.

Attempts were made to access the Victorian Fish Database from DSE; however personnel contacted at the Arthur Rylah Institute and at DSE's information centre could not help with this request as they were not aware of who now administers the database. Further investigations are proceeding to locate where the database is now held and the key personnel involved and, subject to obtaining the information, the results will be included in the final draft of this report.

The presence or likelihood of occurrence in the study area of nationally threatened fauna species was obtained through the EPBC Act Protected Matters Search Tool (DEWHA 2010).

3.3. Field methodology

The botanical overview field assessment was conducted on 19th November 2010. The zoological overview field assessment was conducted on 23rd November 2010. Additional flora and fauna assessments were undertaken on the morning of 15th February 2011 to assess the access restoration roads. During these assessments, the study area was inspected entirely by vehicle from public roads and road sides adjacent to the study area. Areas supporting or potentially supporting native vegetation and/or threatened species habitat were mapped using aerial photography interpretation, informed by visual assessment of vegetation and habitat.

The field assessment did not aim to document flora and fauna species occurring in the study area; it was designed to compare available vegetation mapping with current on-ground conditions, to obtain an overview of the nature, extent, quality and continuity of fauna habitats and to ascertain the location and suitability of any habitat for threatened flora and fauna species.

3.3.1. Flora

Incidental records of flora species were made from the vehicle.

3.3.2. Native vegetation

Native vegetation in Victoria has been defined by the DSE as belonging to three categories:

- Remnant patch
- Scattered trees
- Degraded treeless vegetation

A description of these is provided below with the prescribed DSE methods to assess them. Wetlands are not assessed as native vegetation under the Framework.

Remnant patch

Remnant patches of native vegetation comprise indigenous plant species considered part of a clearly definable EVC and are defined by the DSE as:

- An area of native vegetation, with or without trees, where at least 25% of the understorey cover is indigenous (excluding bare ground), and/or
- "A group (i.e. three or more) of trees where the tree canopy cover is at least 20%" (DSE 2007a).

Scattered trees

DSE (2007a) define scattered trees as indigenous canopy trees with a diameter at breast height (1.3 metres) (DBH) greater than ten centimetres "within an area where at least 75% of the total understorey plant cover is introduced vegetation and the overall canopy cover for a group (i.e. three or more) of trees is less than 20%".

Degraded treeless vegetation

Degraded treeless vegetation comprises all other vegetation (DSE 2007a) including:

- Treeless vegetation with less than 25% total cover of indigenous species (excluding bare ground), or
- Treeless vegetation that has greater than 25% total cover of indigenous species (excluding bare ground) but is dominated by a small number of opportunistic native species which were unlikely to have been dominant prior to a disturbance event (e.g. cropping).

3.3.3. Fauna

The fauna field assessment involved an overview assessment of fauna habitats in parts of the study area accessible via public roads. No private land could be inspected during this assessment. Habitats were assessed based on the presence of remnant native vegetation, scattered trees, rocky escarpments or outcrops and other structural features that may provide shelter and food sources for native fauna species.

The type and condition of habitats was also assessed and, in particular, the likelihood that areas supported habitat suitable for threatened fauna species that occur or may occur in the study area was also evaluated.

Fauna habitat types that were present or potentially present have been described in Section 6.2.1.

3.4. Limitations of field assessment

The main component of this assessment was a desktop study of the ten route alignments. The occurrence of some threatened species may have been missed due to minimal previous research in some parts of the study area. For this reason, the broader search area, with a ten kilometre radius from the centre of the study area was used to determine the likelihood that any additional species might occur in the study area.

As discussed earlier, the only field survey conducted for this assessment was limited to an overview assessment from public roads and road-sides within the study area. No private properties were accessed, therefore it was difficult to determine the condition and extent of native vegetation and/or threatened species habitat within many parts of the alignments. This report therefore provides general direction for the road planning investigation based on the area of native vegetation affected and the likelihood of impacts on habitats suitable for rare and threatened flora and fauna species, where this is known. A more detailed field survey in late winter, spring and summer has been recommended to overcome these limitations.

Not all native vegetation mapping from DSE has been ground-truthed. It is based on updated modelling from detailed Remote Sensing data. It is noteworthy that field inspections by Brett Lane & Associates Pty Ltd of areas mapped by DSE as Plains Grassland have indicated that some mapped areas of grassland are exotic (introduced) pasture, while some areas not mapped by DSE contain remnant native grassland. It should be noted that DSE 2005 EVC mapping appears to overestimate the extent of native vegetation present within the study area. Many areas have been cleared for farming or have degraded due to other causes. The analysis of the location and area of native vegetation provided in this report must therefore be considered preliminary and ground-truthing along route alignments chosen for further investigation is warranted.

Experience of road project development indicates that if native vegetation occurs near work areas it can be protected through best practice construction environmental management measures that ensure that inadvertent disturbance to or removal of native vegetation adjacent to and not required for development can be prevented. Therefore, estimates of the area of native vegetation affected within each 240 metre wide alignment are very conservative and may significantly over-estimate the area affected. More detailed design of the road alignments would be required before a more accurate estimate could be made of the actual area of native vegetation affected.

For this reason, this report has adopted a precautionary approach in considering the potential impacts of any alignment on native vegetation. In addition, a precautionary approach has been adopted in identifying potential impacts of each alignment on threatened flora and fauna, and if suitable habitat occurs along an alignment then it has been assumed that the relevant threatened species could occur there.

4. THE PROPOSED ALIGNMENTS

This section qualitatively contrasts alternative alignments being considered by VicRoads for the proposed OMR Link to Melbourne Airport and Bulla Bypass. It details the extent and condition of native vegetation; identifies known records of threatened species and assesses the presence of threatened species habitat within each of the alignments. The alignments are shown in Figure 1.

The comparative impacts of the alternative route alignments are considered later, in Section 6.

4.1. Alignment A Bulla Bypass

From the north western corner of the Melbourne Airport, the link diverts from the current route of Sunbury Road in a south west direction. The proposed alignment then winds its way west across Deep Creek until it replaces Loemans Road, travelling north across the OMR/E6 Transport Corridor before rejoining Sunbury Road.

4.2. Alignment B Bulla Bypass

This alignment is very similar to Alignment A, but does not lie as far south of Bulla township. Again, this alignment replaces Loemans Road before crossing the OMR/E6 Transport Corridor and rejoining Sunbury Road.

4.3. Alignment C Somerton Road, Sunbury Rd connection

This alignment involves a major extension of the current Somerton Road to connect with Sunbury Road, west of Bulla township. The new extension winds west from Oaklands Road, across Deep Creek (north of Bulla township) before it crosses the OMR/E6 Transport Corridor and connects with Sunbury Road.

4.4. Alignment D Somerton Road, Sunbury Rd connection

This alignment is a small deviation from Alignment C where the proposed road connects with Sunbury Road (

Figure 1). In this design, the angle of the bend is lower than in Alignment C

4.5. Alignment E Bulla Road realigned

This alignment involves minor realignments of the existing Bulla Road. From the north-west corner of Melbourne Airport the new road winds north-west through Bulla township, then passes over Deep Creek before crossing the OMR/E6 Transport Corridor and connecting with Sunbury Road.

4.6. Alignment F Bulla Road realigned

This alignment is one of the longest alignments. It extends from the north-east corner of Melbourne Airport, through Bulla township, across Deep Creek and crosses the OMR/E6 Transport Corridor to connect with Sunbury Road.

4.7. Alignment F-G Bulla Road realigned

This alignment runs south of Alignment E until it crosses Deep Creek then travels virtually the same route as E (Figure 1).

4.8. Alignment G Bulla Road realigned

This alignment travels virtually the same route as Alignment E through Bulla township and across Deep Creek. A noticeable difference is a sharper bend in Bulla.

4.9. Alignment H Somerton Road, Sunbury Rd connection

This alignment is a variation of Alignment C. Instead of winding across Deep Creek and connecting with Sunbury Road, this alignment continues straight and connects to Sunbury Road after passing over the OMR/E6 Transport Corridor.

4.10. Tullamarine Freeway - OMR Interchange

This alignment involves an upgrade and extension of the existing Tullamarine Freeway. The proposed alignment starts slightly north of Melbourne Airport terminal, and deviates from the existing road at Oaklands Road where it winds north toward a large intersection with the OMR/E6 Transport Corridor.

4.11. Access Restoration Roads

Several areas are proposed for the development of access restoration and occur adjacent to the Tullamarine Freeway – OMR interchange alignment.

5. DESCRIPTION OF THE STUDY AREA

The study area for this investigation (Figure 1) included the ten 240-metre wide road alignment corridors between Melbourne Airport at Sunbury Road and the proposed Outer Metropolitan Ring (OMR). The study area included both private and public land within Bulla and Tullamarine, 25 kilometres north-west of Melbourne.

The study area comprised undulating plains, low hills and incised creek valleys. Granite geology occurred in the north-eastern part of the study area and while the southern and western parts of the area were dominated by basalt-derived soils. Deep Creek runs roughly north to south through the study area and lies within a deeply incised valley with steep sides.

Observed vegetation consisted of degraded creek line, introduced pasture, degraded escarpments, high threat weedy areas and planted scattered trees.

Pre-1750 modelling and mapping of EVC's in the study area indicated that the area formerly supported the following EVC's:

- Escarpment Shrubland (EVC 895);
- Creekline Grassy Woodland (EVC 68);
- Riparian Woodland (EVC 641);
- Hills Herb-rich Woodland (EVC 71);
- Stream Bank Shrubland (EVC 851);
- Plains Grassland (EVC 132);
- Plains Grassy Woodland (EVC 55); and
- Grassy Woodland (EVC 175).

Comparison of pre-1750 mapping with the DSE's 2005 EVC mapping indicates that most native vegetation in the study area has declined in extent significantly. Most vegetation types remaining in the study area are either Endangered or Vulnerable in their respective bioregions due to the extent of past clearing. Vegetation that remains in the study area in significant patches includes:

- Plains Grassy Woodland (EVC55), considered endangered in the Victorian Volcanic Plain, and potentially one of two EPBC Act listed endangered communities:
    - Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia, considered endangered in the Victorian Volcanic Plain bioregion; and
    - Grassy Eucalypt Woodland of the Victorian Volcanic Plain, considered critically endangered in the Victorian Volcanic Plain bioregion.
- Hills Herb-rich Woodland (EVC 71) listed as vulnerable in the Central Victorian Uplands ;
- Stream Bank Shrubland (EVC 851), now endangered in the Victorian Volcanic Plain bioregion.

Figures 2 to 11 show the extent of remnant native vegetation in the study area and surrounding region. Comparison of DSE mapping with native vegetation recorded on site by BL&A indicates that the DSE mapping overestimates the extent of native vegetation present within the area. Areas that could not be assessed are also shown. Confirmation of the status and condition of native vegetation and habitats in these areas would require private land access and a detailed flora and fauna survey.

Creekline vegetation was distinguished by remnant River Red-gums, formerly part of the Riparian Woodland EVC (EVC 641). No intact remnant patches were present, with a highly degraded understorey consisting of introduced shrubs and ground cover present.

The escarpments along Deep Creek were dominated by high threat weeds, including African Box-thorn, Prickly Pear and Chilean Needle-grass. The cover of introduced flora, namely pasture grasses was high across the whole study area.

Deep Creek was the only wildlife corridor in the study area. Deep Creek provided opportunities for the movement of aquatic fauna and also for terrestrial fauna that use the treed vegetation along its banks. All other habitats were highly disturbed and fragmented and therefore did not provide good wildlife corridors.

The topography of the study area is such that there are no extensive wetlands and aquatic habitats are confined to creek lines.

Fauna habitat generally in the region has been significantly altered by development for agricultural and urban purposes. This has reduced the extent and quality of fauna habitat and lead to significant loss of habitat components, such as understorey and indigenous ground cover. Furthermore, the introduction of pest animals, such as rabbits, foxes and feral cats has placed native fauna populations in the region under heavy pressure, with many species formerly present now having either disappeared from the area or becoming restricted to the small areas of remaining treed vegetation.

The residential area of Bulla township lies east of Deep Creek. Low density residential, parkland and recreational land occurred between Bulla and Somerton Roads. The Bulla Tip and Quarry are located north of Sunbury Road to the west of Bulla.

A number of land uses have occurred or currently occur within the study area. These include pasture cropping, stone quarrying, stock grazing and residential areas. Surrounding land supports similar land uses. In addition the runways of Melbourne Airport occur approximately five kilometres from the central point of the study area. Parts of the proposed Bulla Bypass alignments may occur within Melbourne Airport land, but occur away from the airport runways and other infrastructure.

The study area lies within the Victorian Volcanic Plain and Central Victorian Uplands bioregions and falls within the Port Phillip and Westernport catchment management region.

In the Hume Planning Scheme, the majority of the study area is zoned Green Wedge, with Public Park and Recreation Zone (PPRZ) and Public Conservation and Resource Zone (PCRZ) in the parkland/recreational areas. The town of Bulla is

zoned Township. The banks of Jackson and Deep Creeks in the vicinity of Bulla Township are also subject to an Environmental Significance Overlay.

6. RESULTS OF THE DESKTOP STUDY

This section describes the flora and fauna of the study area based on the review of existing information and the limited field assessment. Flora species and native vegetation are considered first, followed by fauna habitats and populations.

6.1. Flora and Vegetation Assessment

This section describes flora species likely to occur and the vegetation and ecological communities of the study area.

6.1.1. Flora Species

Based on the FIS records, the search region is known to support 1120 species of plants. It is unlikely that all these species occur within the alignment, therefore a species list is not provided. A definitive species list would require more detailed botanical survey work in late winter, spring and early summer.

FIS records (Viridans Biological Databases 2010a) and the EPBC Protected Matters Search Tool (DEWHA 2010) indicated that within the search region there were records of, or there occurred potential suitable habitat for, 47 rare or threatened flora species. Of these, 12 species were listed under the federal EPBC Act, 20 on the state *Flora and Fauna Guarantee Act 1988* (FFG Act) and 45 on DSE's Advisory List for Rare and Threatened Flora (DSE 2005). No rare or threatened flora species were detected during the current field survey as this was not its purpose.

The likelihood of occurrence in the study area of threatened species listed under the FFG Act or the EPBC Act is addressed in Table 1. This analysis indicates that suitable habitat occurs in the study area for the following FFG Act listed flora species:

- Buloke.

The following DSE-listed rare or threatened species were considered potentially to occur in the study area due to the presence of suitable habitat, as well as nearby records in the FIS:

- Black Roly-poly;
- Austral Tobacco; and
- Fragrant Saltbush.

These species are not listed on any legislation.

6.1.2. Vegetation

Remnant native vegetation in the study area has been described in Section 5 as belonging to three remnant intact EVC's. One of these EVC's, Plains Grassy Woodland (EVC 55) may qualify, depending on condition, as either of two EPBC Act listed threatened ecological communities, namely:

- Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia; and
- Grassy Eucalypt Woodland of the Victorian Volcanic Plain.

The occurrence of Plains Grassy Woodland in the study area is shown in Figures 2 to 11. Remnant vegetation present on site differed from that on the DSE 2005 EVC mapping. The extent of multiple EVC's present has declined likely due to clearing for farmland and general degradation. It is also likely due to the overestimation of native vegetation by DSE mapping. Mapping of EVC's from DSE's 2005 database is shown in Figure 12.

Table 1: FFG Act and EPBC Act listed flora species potentially in the study area and their likelihood of occurrence

Common Name	Scientific Name	Conservation Status		Preferred Habitat	Likelihood of Occurrence	Last Recorded	No. Of Records in Region
		EPBC	FFG				
Adamson's Blown-grass	*Lachnagrostis adamsonii*	E	f	Adamson's Blown-grass is mainly found on roadside depressions and flats, associated with drainage lines and small sluggish creeks, particularly where these sites are protected from wind by surrounding rises or by stands of tall grasses such as Phalaris aquatica, or sedges and rushes such as Juncus spp. or Gahnia spp. (DSE 2000)	No suitable habitat present in the study area; roadsides were dominated by Chilean Needle-grass - **Unlikely to occur in the study area.**	No records exist	
Austral Moonwort	*Botrychium australe*		f	Rare occurrences range from lowland forest to subalpine grasslands in eastern Victoria. Formal distribution extended to near Melbourne (Entwisle 1994).	No suitable habitat present in the study area - **Unlikely to occur in the study area.**	1995	2
Austral Toad-flax	*Thesium australe*	V	f	Occurs on grasslands, grassy woodlands or sub-alpine grassy heathlands. Usually associated with Kangaroo Grass and Poa spp. However it will grow with other hosts, at least in the glasshouse.	No suitable habitat present in the study area - **Unlikely to occur in the study area.**	1995	1
Basalt Peppercress	*Lepidium hyssopifolium*	E	f	The original habitat of Basalt Peppercress is not precisely known, but was probably eucalypt and/or *Allocasuarina* woodland with a grassy understorey, and native temperate grasslands (Leigh *et al*. 1984 and Tumino 2009)	No suitable habitat present in the study area - **Unlikely to occur in the study area.**	1982	3
Brittle Greenhood	*Pterostylis truncata*		f	Open forest, often in flat open areas with shallow granite outcrops or on sheltered ridges (Jones 1994).	No suitable habitat present in the study area - **Unlikely to occur in the study area.**	1995	2
Buloke	*Allocasuarina luehmannii*		f	Woodlands on non-calcareous soils. Commonly grows with Grey Box (Entwisle 1996).	Suitable habitat present in the study area - **Potential to occur in the study area.**	1996	4
Button Wrinklewort	*Rutidosis leptorhynchoides*	E	f	Basaltic grasslands (Jeanes 1999).	No suitable habitat present in the study area - **Unlikely to occur in the study area.**	1995	6
Clover Glycine	*Glycine latrobeana*	V	f	Grasslands and grassy woodlands (Jeanes 1996).	No suitable habitat present in the study area - **Unlikely to occur in the study area.**	1995	2
Curly Sedge	*Carex tasmanica*	V	f	Seasonally damp sites in grassland or grassy woodland. Mean annual rainfall across the known geographic range is generally in the 300–600 mm range (Cheal 1990). Seasonally wet, fertile, heavy basalt clay soils, usually around the margins of slightly saline drainage lines or freshwater swamps	No suitable habitat present in the study area - **Unlikely to occur in the study area.**	No records exist	

Common Name	Scientific Name	Conservation Status		Preferred Habitat	Likelihood of Occurrence	Last Recorded	No. Of Records in Region
		EPBC	FFG				
				(DSE 2010).			
Large-headed Fireweed	*Senecio macrocarpus*	V	f	Themeda grasslands on basalt (Walsh 1999).	No suitable habitat present in the study area - **Unlikely to occur in the study area.**	2001	10
Maroon Leek-orchid	*Prasophyllum frenchii*	E	f	Favouring heathland and Grassland on black clays (Bates 1994).	No suitable habitat present in the study area - **Unlikely to occur in the study area.**	No records exist	
Matted Flax-lily	*Dianella amoena*	E		Lowland grassland and grassy woodlands on very well-drained to seasonally waterlogged fertile soils (Carr & Horsfall 1995).	No suitable habitat present in the study area - **Unlikely to occur in the study area.**	No records exist	
Pale Plover-daisy	*Leiocarpa leptolepis*		f	Confined to NW Victoria in woodland and grassy woodland (Jeanes 1999).	No suitable habitat present in the study area - **Unlikely to occur in the study area.**	1912	1
Purple Diuris	*Diuris punctata var. punctata*		f	Plains country with low heathland or grassland, on heavy soils, with or without trees (Bishop 1996).	No suitable habitat present in the study area - **Unlikely to occur in the study area.**	1982	4
River Swamp Wallaby-grass	*Amphibromus fluitans*	V		Wetlands and permanent swamps (Walsh 1994).	No suitable habitat present in the study area - **Unlikely to occur in the study area.**	1995	1
Rough Eyebright	*Euphrasia scabra*		f	Damp grassy situations, amongst shrubs, in sclerophyll forests, clearings or subalpine woodland (Barker 1999).	No suitable habitat present in the study area - **Unlikely to occur in the study area.**	1995	1
Small Milkwort	*Comesperma polygaloides*		f	Heavy soils supporting grasslands and grassy woodlands (Walsh 1999).	No suitable habitat present in the study area - **Unlikely to occur in the study area.**	1995	10
Small Scurf-pea	*Cullen parvum*		f	Seasonally wet areas with heavy soils in Grasslands and Grassy (River Red Gum) Woodlands: includes grazing country and table drains. In areas with rainfall of between 450 and 700 mm (Jeanes, 1996).	No suitable habitat present in the study area - **Unlikely to occur in the study area.**	1995	4
Spiny Rice-flower	*Pimelea spinescens subsp. spinescens*	C	f	Grasslands or open shrublands on basalt derived soils (Entwisle 1996a). Prefers shallow depressions and drainage lines with moderate soil moisture (D.Coppolino pers. obs.).	No suitable habitat present in the study area - **Unlikely to occur in the study area.**	1999	16
Sunshine Diuris	*Diuris fragrantissima*	E	f	Grassland in well-structured red-brown or blackish basaltic loam. Found in open areas on slopes or rock outcrops (Jones, 2006).	No suitable habitat present in the study area - **Unlikely to occur in the study area.**	1995	1

Common Name	Scientific Name	Conservation Status		Preferred Habitat	Likelihood of Occurrence	Last Recorded	No. Of Records in Region
		EPBC	FFG				
Swamp Diuris	*Diuris palustris*		f	Scattered distribution throughout western Victoria. Usually in swampy depressions in grassland or open woodland. Numbers have reduced due to agricultural clearing (Entwisle 1994).	No suitable habitat present in the study area - **Unlikely to occur in the study area.**	1995	4
Tough Scurf-pea	*Cullen tenax*		f	Grasslands and grassy woodlands on heavy soils in drier regions (Jeanes 1996).	No suitable habitat present in the study area - **Unlikely to occur in the study area.**	1995	4

C = Critically Endangered; **E** = Endangered; **V** = Vulnerable; **f** = Listed as threatened under FFG Act

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6.2. Fauna Assessment

This section describes the fauna habitat features of the study area and the fauna likely to occur.

6.2.1. Habitat assessment

The study area appears to support five different habitat types which include:

- Agricultural areas (grazed paddocks and cultivated land)
- Planted trees;
- Remnant scattered trees;
- Remnant woodland and
- Aquatic habitats (creek line and farm dams).

Areas of higher quality habitat for native fauna in the study area are habitats along Deep Creek, remnant Grey Box Woodland patches and indigenous scattered trees. The majority of the study area has been altered from its original vegetative state and is primarily used for agriculture including grazing and cropping. Overall the habitat is considered to be of low quality for native fauna.

Wildlife Corridors

Wildlife corridors are important habitat components that provide safe passage for fauna. Deep Creek provides shelter for fauna in creek line vegetation and also provides passage for aquatic fauna including Platypus, water birds and fish.

6.2.1. Fauna

The desktop assessment indicated the presence or likely occurrence of 224 vertebrae fauna species including 153 birds (11 introduced), 28 mammals (seven introduced), 19 reptiles, 11 frog species and 14 fish. Most of the fauna expected to utilise the study area were common farmland species. They are listed in Appendix 2.

The AVW and the EPBC Protected Matters Search Tool (DEWHA 2010) indicate that within the search region 36 threatened fauna species (24 birds, five mammals, two reptiles, two frogs, two fish and one invertebrate) occur or potentially occur due to the presence of suitable habitat.

The potential occurrence in the study area of threatened fauna species is assessed in Table 2. Fauna species that have potential to occur in the study area due to presence of suitable habitat are highlighted in grey. This table indicates that 19 species have potential to occur.

To conclusively determine the presence or otherwise of suitable habitat for the 19 species a detailed site assessment would be required. If suitable habitat for these species was recorded within the study area then targeted surveys would be required at appropriate times of year.

Table 2: Threatened Fauna that could potentially occur in the study area

Common Name	Scientific Name	EPBC	FFG	DSE	Habitat	Habitat suitability in study area	Likelihood of Occurrence
Birds							
Australasian Shoveler	*Anas rhynchotis*			VU	Large and deep permanent bodies of water and aquatic flora abundant. Also occurs on billabongs, watercourses and flood waters on alluvial plains, freshwater meadows, shallow swamps, reed swamps, wooded lakes, sewage farms and farm dams (Marchant and Higgins 1990).	None	Unlikely to occur.
Australian Painted Snipe	*Rostratula australis*	VU	L	CE	Lowlands on shallow freshwater swamps with emergent vegetation and flooded saltmarshes (Marchant and Higgins 1993).	None	Unlikely to occur.
Australian Pratincole	*Stiltia isabella*			NT	Open plains, sparsely wooded plains and tussock grasslands; usually in arid and semi-arid zones (Higgins and Davies 1996).	None	Unlikely to occur.
Black Falcon	*Falco subniger*			VU	Woodlands, open country and terrestrial wetlands; in arid and semi-arid zones; mainly over open plains and undulating land with large tracts of low vegetation (Marchant and Higgins 1993).	Open areas (grazing land)	Potential to occur.
Black-chinned Honeyeater	*Melithreptus gularis*			NT	Open box-ironbark forests and woodlands. Usually found in Red or Mugga Ironbarks, Grey Box, Yellow Gum and Yellow Box, especially mature tall trees along gullies, low-lying flats and lower slopes (Higgins *et al.* 2001; Tzaros 2005).	Woodlands	Potential to occur.
Black-eared Cuckoo	*Chrysococcyx osculans*			NT	Open woodlands and open shrublands; often those dominated by eucalypts; also often in saltbush or bluebush shrublands (Higgins 1999).	Woodlands	Potential to occur.
Blue-billed Duck	*Oxyura australis*		L	EN	Terrestrial wetlands and prefers deep permanent, well vegetated water bodies (Marchant and Higgins 1990).	None	Unlikely to occur.
Brown Quail	*Coturnix ypsilophora*			NT	Tall ground vegetation, such as grass, ferns, shrubs over damp or swampy ground; also grasslands, cereal crops, or stubble, leafy crops, heath, bracken and stands of vegetation fringing freshwater wetlands (Marchant and Higgins 1993).	Creekline vegetation	Potential to occur.
Brown Treecreeper	*Climacteris picumnus victoriae*			NT	Woodlands dominated by eucalyptus, especially Stringybarks or other rough-barked eucalypts usually with open grassy understorey (Higgins *et al.* 2001)	Woodlands	Potential to occur.
Diamond Dove	*Geopelia cuneata*		L	NT	Mostly arid and semi-arid grassland savannah, often of spinifex and in low open woodlands with grassy understorey; also often in open riparian woodlands (Higgins and Davies 1996).	Grassland, woodlands and creek line	Potential to occur.
Diamond Firetail	*Stagonopleura guttata*		L	VU	Commonly found in box-ironbark forests and woodlands and also occurs along watercourses and in farmland areas (Emison *et al.* 1987; Tzaros 2005).	Woodlands	Potential to occur.
Eastern Great Egret	*Ardea modesta*		L	VU	Occurs in a variety of wetlands including: permanent water bodies on flood plains; shallows of deep permanent lakes, either open or vegetated with shrubs or trees; semi-permanent swamps with tall emergent vegetation (e.g. Typha) and herb dominated seasonal swamps with abundant aquatic flora (Marchant and Higgins 1990).	Creek line	Potential to occur.
Hardhead	*Aythya australis*			VU	Inhabits large, deep waters where vegetation is abundant; particularly deep swamps and lakes, pools and creeks. Also occur on freshwater meadows, seasonal swamps with abundant aquatic flora, reed swamps, wooded lakes and swamps, rice fields, and sewage ponds (Marchant and Higgins 1990).	None	Unlikely to occur.
Lewin's Rail	*Lewinia pectoralis*		L	VU	Occurs in a variety of densely vegetated wetland habitats, fresh or saline and usually with areas of standing water; requires shallow water areas to forage in (Marchant and Higgins 1993).	Creekline	Potential to occur.
Little Egret	*Egretta garzetta*		L	EN	It occurs in a range of coastal and terrestrial wetlands, including freshwater wetlands with vegetation such as Typha and requires trees for roosting and nesting (Marchant and Higgins 1990).	None	Unlikely to occur.
Musk Duck	*Biziura lobata*			VU	It inhabits terrestrial wetlands, estuarine habitats and sheltered inland waters. Almost entirely aquatic; preferring deep water of large swamps, lakes and estuaries, where conditions are stable and aquatic flora abundant (Marchant and Higgins 1990).	None	Unlikely to occur.
Nankeen Night Heron	*Nycticorax caledonicus*			NT	Inhabits littoral and estuarine habitats and terrestrial wetlands. Mainly nocturnal; forage over soft or firm substrates in still or slow-moving shallow water, on exposed shores, banks and flats of wetlands, or swampy vegetation; often where sheltered by tall emergent or ground vegetation, and near trees used for roosting (Marchant and Higgins 1990).	Creekline	Potential to occur.

Common Name	Scientific Name	EPBC	FFG	DSE	Habitat	Habitat suitability in study area	Likelihood of Occurrence
Pied Cormorant	*Phalacrocorax varius*			NT	In marine and coastal habitats. They require trees in which to nest, such as dead eucalypts or melaleucas and also occurs in the Murray-Darling Basin and other large lakes (Marchant and Higgins 1990).	None	Unlikely to occur.
Plains-wanderer	*Pedionomus torquatus*	VU	L	CE	This species inhabits native grasslands with sparse cover, preferring grasslands that include Wallaby Grass and Stipa species (Marchant and Higgins 1993).	None	Unlikely to occur.
Regent Honeyeater	*Anthochaera phrygia*	EN	L	CE	Inhabits dry box-ironbark eucalypt forests near rivers and creeks on inland slopes of the Great Dividing Range. It could also occur in small remnant patches or in mature trees in farmland or partly cleared agricultural land (Higgins *et al.* 2001).	Scattered Trees and Woodland	Potential to occur.
Royal Spoonbill	*Platalea regia*			VU	Terrestrial wetlands, sheltered marine habitats and wet grasslands. Foraging limited to shallow waters; often among aquatic or emergent vegetation or submerged logs that shelter prey and favour coastal habitats (Marchant and Higgins 1990).	None	Unlikely to occur.
Speckled Warbler	*Pyrrholaemus sagittatus*		L	VU	Inhabits dry eucalypt forests and woodlands, especially those with box-ironbark eucalypt associations. It is also found in River Red Gum woodlands (Higgins and Peter 2002; Tzaros 2005).	None	Unlikely to occur.
Spotted Harrier	*Circus assimilis*			NT	It prefers open woodlands that do not obstruct low flight, and natural and exotic grasslands in arid and semi arid areas (Higgins and Davies 1996).	Open areas	Potential to occur.
Swift Parrot	*Lathamus discolor*	EN	L	EN	Prefers a narrow range of eucalypts in Victoria, including White Box, Red Ironbark and Yellow Gum as well as River Red Gum when this species supports abundant 'lerp' (Emison *et al.* 1987; Higgins 1999; Kennedy and Tzaros 2005).	Scattered Trees and Woodland	Potential to occur.
Mammals							
Eastern Barred Bandicoot	*Perameles gunnii*	EN	L	CE	Originally volcanic plain native grasslands, nowadays farmland, parkland and suburban gardens (Menkhorst 1995).	Woodlands and open farmland	Unlikely to occur.
Fat-tailed Dunnart	*Sminthopsis crassicaudata*			NT	Native grasslands associated with rocky areas, rough pastures and the edges of stubble paddocks (Menkhorst 1995).	None	Unlikely to occur.
Grey-headed Flying-fox	*Pteropus poliocephalus*	VU	L	VU	Roosts in riverine habitat in Melbourne and forages widely in flowereing eucalypts and fruit trees (Menkhorst 1995).	Scattered Trees and Woodland	Potential to occur.
New Holland Mouse	*Pseudomys novaehollandiae*	VU	L		Coastal heath and scrub, heathy woodland, open forest and vegeatated sand-dunes (Menkhorst 1995).	None	Unlikely to occur.
Spot-tailed Quoll	*Dasyurus maculatus maculatus*	EN	L	EN	Rainforest, wet and dry forest, coastal heath and scrub and River Red-gum woodlands along inland rivers (Menkhorst 1995).	None	Unlikely to occur.
Reptiles							
Bearded Dragon	*Pogona barbata*			DD	Woodland and dry forest (Wilson and Swan 2003).	Woodland	Potential to occur.
Striped Legless Lizard	*Delma impar*	VU	L	EN	Tussock grasslands on the volcanic plains, often associated with scattered rocks and cracked soils (Cogger 2000).	None	Unlikely to occur.
Frogs							
Brown Toadlet	*Pseudophryne bibronii*		L	EN	Wet and dry forest, grassy areas besides small creeks, alpine grasslands and mossy bogs (Cogger 2000).	Creekline vegetation	Potential to occur.
Growling Grass Frog	*Litoria raniformis*	VU	L	EN	Permanent, still or slow flowing water with fringing and emergent vegetation in streams, swamps, lagoons and artificial wetlands such as farm dams and abandoned quarries (Clemann and Gillespie 2004).	Creekline	Potential to occur.
Fish							
Australian Grayling	*Prototroctes maraena*	VU	L	VU	Large and small coastal streams and rivers with cool, clear waters with a gravel substrate and altering pools and riffles (Cadwallader and Backhouse 1983).	None	Unlikely to occur.
Dwarf Galaxias	*Galaxiella pusilla*	VU	L	VU	Vegetated margins of still water, ditches, swamps and backwaters of creeks, both ephemeral and permanent (Allen *et al.* 2002).	Creekline	Potential to occur.
Invertebrates							
Golden Sun Moth	*Synemon plana*	CE	L	EN	Areas that are, or have been native grasslands or grassy woodlands. It is known to inhabit degraded grasslands with introduced grasses being dominant, with a preference for the native wallaby grass being present (DEWHA 2009).	Grassland	Potential to occur.

6.3. Threatened species in the study area

This section will discuss known records of threatened flora and fauna species within each proposed alignment. Recommendations will be made where necessary to avoid and/or minimise any impacts on threatened species should any be considered likely to occur in any of the alignments

6.3.1. Flora species

FIS records (Viridans Biological Databases 2010a) and the EPBC Protected Matters Search Tool (DEWHA 2010) indicates that within the ten proposed alignments, there is a known record of one threatened flora species.

Native Peppercress is listed on DSE's Advisory List for Rare and Threatened Flora as *insufficiently known*. This threatened species record dates from 1984. The recorded location occurs within Alignments A, B, F and F-G. It is an uncommon plant, known from recent reports from heavy soils of the Murray River floodplain in the far north-west (Entwisle, 1996b). The site where the record was obtained was disturbed and consisted of introduced understorey vegetation. The speceis is unlikely to have persisted in the study area.

6.3.2. Fauna species

There are no existing records of threatened fauna within any of the alignments.

However the Platypus is an ecologically sensitive species and it resides in Deep Creek (Williams 2010). The Australian Platypus Conservancy has indicated that there are records of Platypus or that habitat is potentially better for breeding on the Deep Creek where alignments A, B, D and H cross the creek.

The following six EPBC Act listed fauna species have suitable habitat in the study area therefore have potential to occur:

- Regent Honeyeater (in Grey Box woodlands)
- Swift Parrot (in planted Sugar Gums, Grey Box woodlands and River Red Gum in Plains Grassy Woodlands)
- Grey-headed Flying-fox (generally in flowering trees)
- Growling Grass Frog (along Deep Creek and Moonee Ponds Creek);
- Dwarf Galaxias (along Deep Creek); and
- Golden Sun Moth (in Plains Grassy Woodland).

The five FFG Act listed fauna species belowhave suitable habitat in the study area therefore have potential to occur, in addition to the above six specis, which are also listed on the FFG Act.

- Diamond Dove (in Grey Box woodland);
- Diamond Firetail (in Grey Box woodland);
- Eastern Great Egret (along Deep Creek);
- Lewin's Rail (along Deep Creek); and
- Brown Toadlet (in Grey Box woodland and adjacent to Deep Creek).

Legend

- Native Peppercress
- Alignment A

Native Vegetation

- Hills Herb-rich Woodland (EVC 71)
- Plains Grassy Woodland (EVC 55)
- Scattered trees
- Stream Bark Shrubland (EVC 851)
- Could not assess

0 375 750 1,500 Meters

Figure 2: Alignment A and Native Vegetation

Project: Tullamarine Freeway Extension

Client: VicRoads

Project No.: 10155	Date: 29/11/2010	Created By: B.Wallach/ M.Ghasemi

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Legend

- Native Peppercress
- Alignment B

Native Vegetation

- Hills Herb-rich Woodland (EVC 71)
- Plains Grassy Woodland (EVC 55)
- Scattered trees
- Stream Bark Shrubland (EVC 851)
- Could not assess

0 375 750 1,500 Meters

Figure 3: Alignment B and Native Vegetation

Project: Tullamarine Freeway Extension

Client: VicRoads

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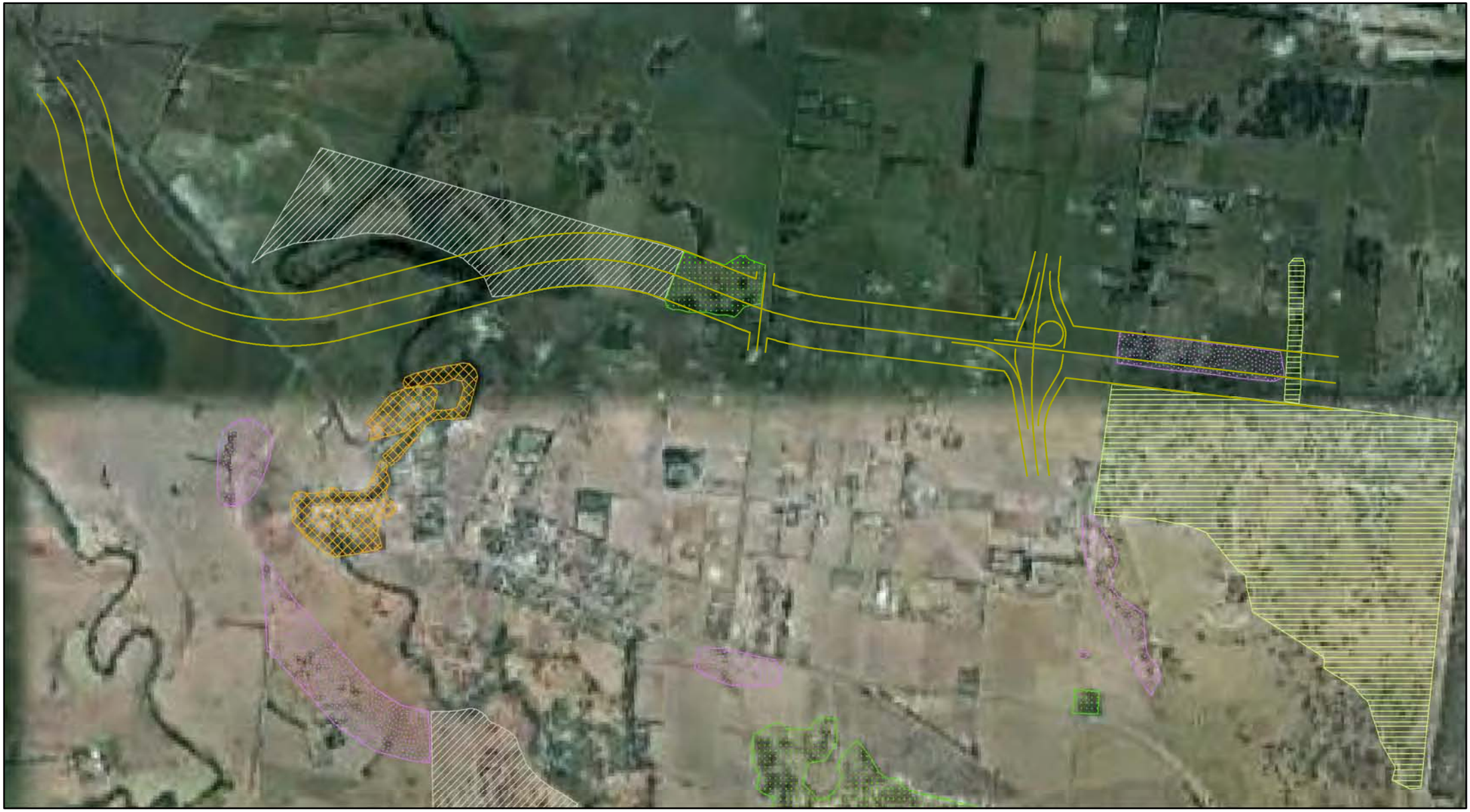

Legend

Alignment C

Native Vegetation

- Hills Herb-rich Woodland (EVC 71)
- Plains Grassy Woodland (EVC 55)
- Scattered trees
- Stream Bark Shrubland (EVC 851)
- Could not assess

0 325 650 1,300 Meters

Figure 4: Alignment C and Native Vegetation

Project: Tullamarine Freeway Extension

Client: VicRoads

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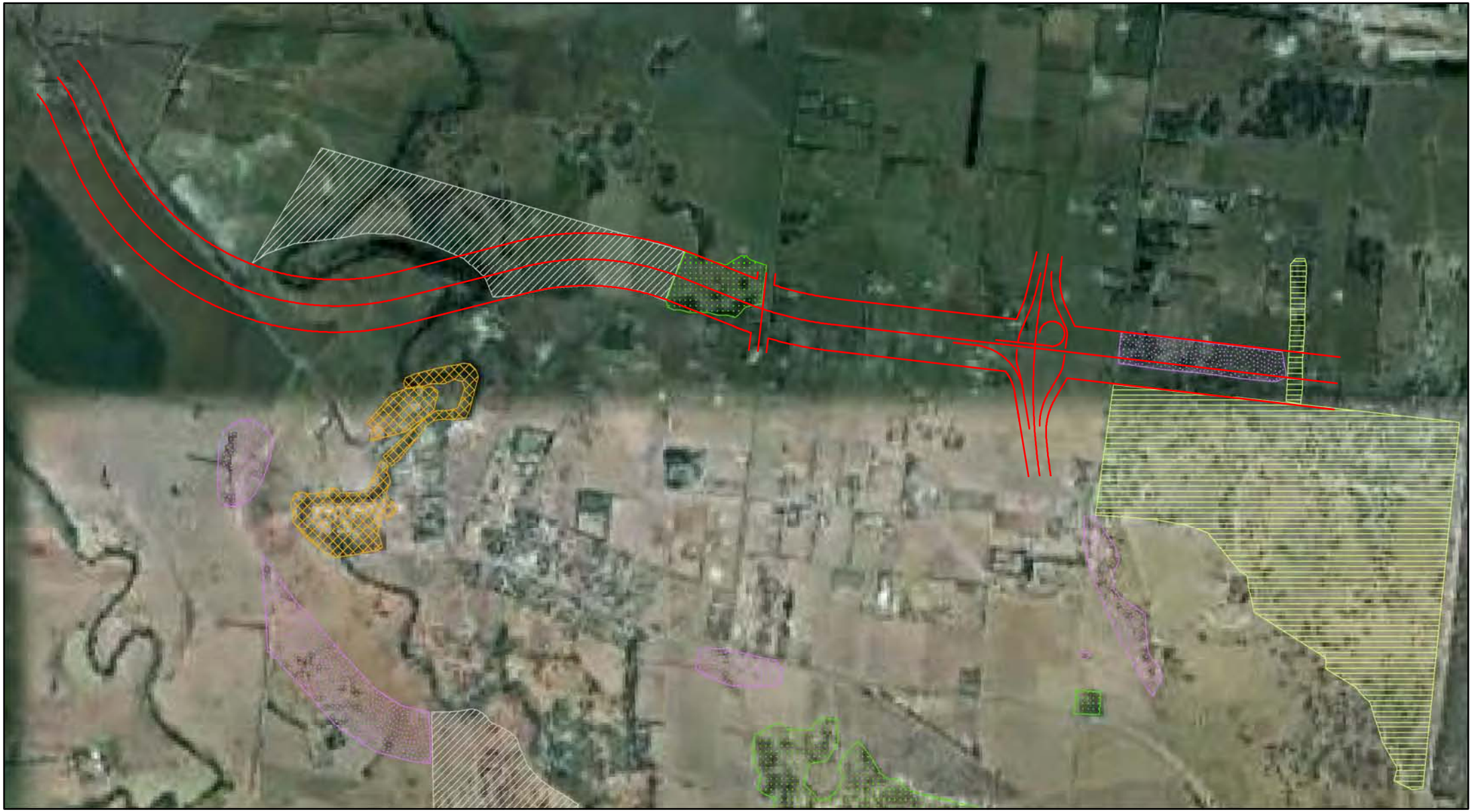

Legend

Alignment D

Native Vegetation

- Hills Herb-rich Woodland (EVC 71)
- Plains Grassy Woodland (EVC 55)
- Scattered trees
- Stream Bark Shrubland (EVC 851)
- Could not assess

0 325 650 1,300 Meters

Figure 5: Alignment D and Native Vegetation

Project: Tullamarine Freeway Extension

Client: VicRoads

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Legend

Alignment E

Native Vegetation

- Hills Herb-rich Woodland (EVC 71)
- Plains Grassy Woodland (EVC 55)
- Scattered trees
- Stream Bark Shrubland (EVC 851)
- Could not assess

0 275 550 1,100 Meters

Figure 6: Alignment E and Native Vegetation

Project: Tullamarine Freeway Extension

Client: VicRoads

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Legend

- Native Peppercress
- Alignment F

Native Vegetation

- Hills Herb-rich Woodland (EVC 71)
- Plains Grassy Woodland (EVC 55)
- Scattered trees
- Stream Bark Shrubland (EVC 851)
- Could not assess

0 350 700 1,400 Meters

Figure 7: Alignment F and Native Vegetation

Project: Tullamarine Freeway Extension

Client: VicRoads

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Legend

Alignment G

Native Vegetation

- Hills Herb-rich Woodland (EVC 71)
- Plains Grassy Woodland (EVC 55)
- Scattered trees
- Stream Bark Shrubland (EVC 851)
- Could not assess

0 250 500 1,000 Meters

Figure 8: Alignment G and Native Vegetation

Project: Tullamarine Freeway Extension

Client: VicRoads

Project No.: 10155	Date: 29/11/2010	Created By: B.Wallach/ M.Ghasemi

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Legend

Alignment H

Native Vegetation

- Hills Herb-rich Woodland (EVC 71)
- Plains Grassy Woodland (EVC 55)
- Scattered trees
- Stream Bark Shrubland (EVC 851)
- Could not assess

0 325 650 1,300 Meters

Figure 9: Alignment H and Native Vegetation

Project: Tullamarine Freeway Extension

Client: VicRoads

Project No.: 10155	Date: 29/11/2010	Created By: B.Wallach/ M.Ghasemi

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Legend

- Native Peppercress
- Alignment F- G

Native Vegetation

- Hills Herb-rich Woodland (EVC 71)
- Plains Grassy Woodland (EVC 55)
- Scattered trees
- Stream Bark Shrubland (EVC 851)
- Could not assess

0 375 750 1,500 Meters

Figure 10: Alignment F-G and Native Vegetation

Project: Tullamarine Freeway Extension

Client: VicRoads

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Legend

AlignmnetTulla OMR Interchange

Access Restoration Roads

EVC

Hills Herb-rich Woodland

Plains Grassland

Plains Grassy Woodland

Riparian Woodland

Stream Bank Shrubland

0 800 1,600 3,200 Meters

Figure 11: Tulla OMR Interchange and Access Restoration Roads

Project: Tullamarine Freeway Extension

Client: VicRoads

Project No.: 10155	Date: 15/02/2011	Created By: B.Wallach/ M.Ghasemi

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