Koo Wee Rup Bypass Environment Protection and Biodiversity Conservation Act 1999 Offsets Management Plan

Project: 13-026

Prepared for:

VicRoads

Document information

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Bioregion: Gippsland Plain

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Document History

Status	Changes	By	Date
Draft 1	**First Draft**	**Darren G. Quin and Andrew R.G McMahon**	**12 June 2013**
Draft 2	**Incorporates VicRoads comments**	**Darren G. Quin and Andrew R.G. McMahon**	**23 August 2013**
Final	**Incorporates VicRoads comments**	**Darren G. Quin**	**29 August 2013**

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This Offset Management Plan (OMP) is required as part of the approvals for the construction of the Koo Wee Rup Bypass under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The OMP is required to offset habitat losses and compensate for population fragmentation impacts to the Southern Brown Bandicoot and Growling Grass Frog that cannot be avoided during the construction of the Bypass. The EPBC Act OMP needs to be approved by the Federal Minister for the Environment before Bypass construction activities can commence.

The OMP addresses and describes:

- Impacts to the listed species associated with the construction of the Bypass;
- Commitments for offsetting the impacts to the Southern Brown Bandicoot and Growling Grass Frog;
- Commitments pertaining to current and future management to ensure ongoing restoration and improvement of offset sites;
- Commitments regarding the protection of the offset sites in perpetuity;
- Monitoring and reporting procedures on the progress of the offset sites; and
- How the proposed offsets align with the *EPBC Act Environmental Offsets Policy*.

The OMP includes four Management Elements:

1. Habitat Restoration and Revegetation;
2. Wetland and Drain Establishment;
3. Predator Control; and
4. Fauna-proof Fences and other Infrastructure.

Each Management Element outlines the objectives, procedures/management actions, performance indicators, monitoring and evaluation and adaptive management measures.

Key mitigation measures that contribute to offsets for the Southern Brown Bandicoot are:

i. revegetation of three habitat corridors to ameliorate connectivity impacts associated with the construction of the Bypass through core habitat and important connective corridors;

ii. predator control to reduce predator pressure, enhance the viability of local Southern Brown Bandicoot population to help mitigate the impacts of the Bypass, and assist with re-colonisation of the area post-construction;

iii. installation of fauna underpasses to facilitate fauna movement where existing connective corridors of vegetation are severed; and

iv. installation of fauna-proof fences in areas where Southern Brown Bandicoots are known to experience high road mortality and along the Bypass where it intersects known habitat.

Mitigation measures for the Growling Grass Frog are:

i. creation of five wetlands to provide significantly more breeding habitat for the Growling Grass Frog and potentially increase the local population and improve the chances of successful movements through underpasses

ii. creation of drains (linking habitat);

iii. installation of fauna underpasses where existing links are severed by the Bypass; and

iv. fauna-proof fences along sections of alignment.

1 Introduction

1.1 Objectives

Ecology Australia was commissioned by VicRoads South Eastern Projects to prepare an *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) Offsets Management Plan (OMP) for the Koo Wee Rup Bypass, or Stage 1A of the Healesville – Koo Wee Rup Road Upgrade. The OMP is required to offset habitat losses and compensate for population fragmentation impacts to key threatened fauna species associated with the construction of the Bypass and which cannot be avoided.

This OMP complements a number of other reports prepared for the Koo Wee Rup Bypass, with the most relevant being:

- The Koo Wee Rup Bypass Fauna Management Plan (FMP) which details mitigation strategies (Ecology Australia 2013a);
- A Revegetation and Habitat Restoration Plan (RHRP) which addresses revegetation of pasture to high quality habitat, creation of vegetated habitat links/corridors and construction of wetlands for key species (Australian Ecosystems 2012);
- Fauna Infrastructure Requirements Report (Ecology Australia 2013b), including design and location of protective fences (to minimise road kill), fauna underpasses or fauna-friendly culverts to restore habitat and population connectivity in the long-term and artificial habitat to restore habitat and population connectivity and rehabilitation of drain levees removed as part of construction; and
- VicRoads Project Environment Protection Strategy (PEPS), Construction Environmental Management Plan (CEMP) and best practice environmental management.

1.2 Scope

On 28 February 2013, the South-Eastern Australia Environment Assessments Branch of DSEWPaC approved the construction of the Koo Wee Rup Bypass under sections 130(1) and 133 of the EPBC Act subject to a number of conditions. Condition 10 required the preparation of an EPBC Act OMP to be approved by the Minister before construction activities can commence. The OMP was to include as a minimum:

- Commitments for offsetting the impact to the Southern Brown Bandicoot and Growling Grass Frog;
- Justification that the proposed offsets are in accordance with the *EPBC Act Environmental Offsets Policy* (DSEWPaC 2012a, 2012b and 2012c);
- Descriptions and maps that clearly define the locations and boundaries of Offset Areas, accompanied with the offset attributes and a shapefile;

- Information and commitments about current and future management that will be employed to ensure ongoing rehabilitation and improvement of offset sites;
- Commitments that demonstrate how offset sites will be protected in perpetuity; and
- Information and commitments to monitoring and reporting on the progress of the offset sites.

This EPBC Act OMP addresses the requirements outlined above and under Condition 10 of the approval documentation from DSEWPaC.

1.3 Impacts to key threatened fauna species

This document describes the offsets proposed in the FMP for two key terrestrial fauna species known to occur in the area and whose habitat is intersected by the Bypass alignment:

- Southern Brown Bandicoot (south-eastern mainland sub-species *Isoodon obesulus obesulus*) - listed as Endangered under the EPBC Act and as a threatened taxon under the Victorian *Flora and Fauna Guarantee Act 1988* (FFG Act), and classified as Near Threatened in Victoria (DSE 2013) and Vulnerable under a National Action Plan (Maxwell et al. 1996); and
- Growling Grass Frog (*Litoria raniformis*) - listed as Vulnerable under the EPBC Act and as a threatened taxon under the FFG Act and classified as Endangered in Victoria (DSE 2013) and Vulnerable under a National Action Plan (Tyler 1997).

Potential impacts to these species arising from construction of the Koo Wee Rup Bypass are addressed in the FMP (Ecology Australia 2013a).

Operational impacts from the Bypass identified in the FMP included road kill of Southern Brown Bandicoots and Growling Grass Frogs where the road alignment crosses or passes close to habitat of these species, such as McGregors Road Drain and the Railway Road/disused South Gippsland Railway Line corridor.

1.3.1 Southern Brown Bandicoot

The Southern Brown Bandicoot occupies remnant and exotic vegetation along waterways and roads to the south of Manks Road (Figure 1). Key impacts to the Southern Brown Bandicoot include (Ecology Australia 2013a):

- The loss of 1.44 ha and 1.67 ha of habitat for the “No Roundabout” and “Roundabout” options, respectively; and
- Loss of habitat connectivity at the Bunyip River Drain Complex and Railway Road/disused South Gippsland Railway Line, where loss or substantially reduced connectivity may occur for c. 3.5 years (construction 1 year, habitat restoration 2.5 years).

1.3.2 Growling Grass Frog

The population of Growling Grass Frogs impacted by the Koo Wee Rup Bypass extends from Officer/Pakenham to the South Gippsland Highway and potentially beyond (Ecology Australia 2013a). The species occupies dams, drains, creeks and ephemeral water bodies (Figure 1). No waterbodies where the species has been recorded will be removed as part of construction of the Bypass. Key impacts to the Growling Grass Frog from the Bypass are (Ecology Australia 2013a):

- the loss of 1.91 and 2.17 ha of indigenous (potential) habitat in drains for the "No Roundabout" and "Roundabout" options, respectively, which is considered most likely to be used for dispersal only; and
- an increase in barriers to movement, with connectivity reduced, particularly where the Bypass crosses paddocks or existing patches of native vegetation.

1.4 *Environment Protection and Biodiversity Conservation Act 1999* Offsets Policy (October 2012)

This section provides an evaluation of the proportion of impact offset after running the losses of habitat associated with construction of the Bypass for the Southern Brown Bandicoot and Growling Grass Frog through the EPBC Offsets calculator (or Excel spreadsheet) and assessing these losses against the proposed offsets.

An *Offsets Package* can comprise a combination of *Direct Offsets* (i.e. actions that provide a measurable conservation gain for an impacted protected matter, such as area of habitat secured or created against area of habitat lost) and *Other Compensatory Measures* (i.e. indirectly benefit the impacted protected matter) (DSEWPaC 2012a). *Direct Offsets* must account for a minimum of 90% of the offset requirements for any given impact.

The methods of calculating Offsets derived under the EPBC Act are described in DSEWPaC (2012a, 2012b and 2012c). For both species, offsets are derived for the Bypass option resulting in the worst case scenario and highest area of habitat loss (i.e. the "Roundabout" option). The printout from the Offsets Calculator is given in the Excel spreadsheet in Appendix 1.

1.4.1 Assumptions for calculations for Bypass options

Southern Brown Bandicoot

- The area of *Habitat Lost/Removed* for the Southern Brown Bandicoot is 1.67 ha for the "Roundabout" option;
- The *Habitat Quality* of the vegetation lost is estimated to be *7* for the Southern Brown Bandicoot based on: (i) repeated records of bandicoots, at least along Railway Road and the Bunyip River Drain Complex; (ii) the likelihood that the habitat supports a breeding population of bandicoots; and (iii) the important juxtaposition of habitat in the landscape in that it is contiguous with other habitat and is likely to provide a habitat link for bandicoot movement to other areas of habitat. However, the habitat

also comprises narrow, linear strips of vegetation which reduces the value of this habitat from receiving higher *Habitat Quality* scores;

- The *Total Quantum of Impact* amounts to 1.17 *Adjusted Hectares*;
- Revegetation will amount to c. 7.1 ha of Southern Brown Bandicoot habitat based on the revegetation plan dated 3 September 2012 (Australian Ecosystems 2012);
- An *Ecological Benefit* from revegetation is expected to be reached in 3 years from planting (i.e. revegetation is estimated to regenerate to a sufficient height and density in three years);
- The *Time Over Which Loss of the Offset Site is Averted* is given a maximum value of *20 years* and *the Risk of Loss With the Offset* is given a value of *0%*, as the land will be owned in perpetuity for conservation purposes for the Southern Brown Bandicoot;
- The *Starting Value* of the *Habitat Quality* of the offset land is given a value of *1*, as it is currently pasture with no Southern Brown Bandicoot habitat (though bandicoots may forage in pasture on the edges of dense vegetation);
- The *Future Habitat Quality Without the Offset* of the offset land is given a value of *1*, as it is currently grazed pasture with no Southern Brown Bandicoot habitat and without the offset there would be no perceived change of land management practice;
- The corresponding *Risk of Loss (%) Without the Offset* is given a risk value of 35%. Without the offset, the management of the land remains uncertain without security. The land could continue to be grazed, but could also potentially be cropped or become part of the Urban Growth Boundary in 20 years or left to regenerate. It is argued that it is more likely that habitat on the site will continue to be managed as pasture indefinitely, without security and revegetation under an offset strategy. Thus, a value of 35% is allocated to the *Risk of Loss Without the Offset*, to accommodate the fact that, even though the land is more likely to be grazed, there is some uncertainty regarding the future management;
- The *Future Habitat Quality With the Offset* of the offset land is given a value of *7*, based on the premise that it will be revegetated to Southern Brown Bandicoot habitat at least equal to the *Habitat Quality* of habitat lost/removed (higher *Future Habitat Quality* values of 8, 9 or 10 would require more certainty regarding whether fungal associations and/or other food resources regenerate sufficiently);
- There is a relatively high degree of confidence that revegetation will provide Southern Brown Bandicoot habitat, therefore, a *80% Confidence* value in achieving the result is included in the Offsets Calculator;
- The *Proposed Offset* of c.7.1 ha of habitat restoration for Southern Brown Bandicoot accounts for 107.2% of the *Percentage of the Impact Offset*, which well exceeds the 90% minimum that direct offsets must comprise of the proposed offsets for any given impact (Table 1; Appendix 1);

- *A Compensatory Measure* which has been scientifically demonstrated to benefit the Southern Brown Bandicoot and will be undertaken is predator control; and
- Protective fencing on the South Gippsland Highway is another *Compensatory Measure* that is designed to reduce road mortality and will be implemented.

Growling Grass Frog

- The area of *Habitat Lost/Removed* for the Growling Grass Frog is 2.17 ha of non-breeding habitat in drains for the "Roundabout" option;
- The *Habitat Quality* of the vegetation lost is estimated to be intermediate (*4)* for the Growing Grass Frog based on the likelihood that the drains support non-breeding dispersal habitat and provide habitat links for frog movement between higher quality breeding wetlands;
- The *Total Quantum of Impact* amounts to 0.87 *Adjusted Hectares*;
- An *Ecological Benefit* from rehabilitation of 2.17 ha of re-aligned drains is expected to be reached in three years from rehabilitation and planting (i.e. all drains removed must be replaced);
- The *Time Over Which Loss of the Offset Site is Averted* is given a maximum value of *20 years* as the land will be owned in perpetuity for conservation purposes for the Growling Grass Frog;
- The *Starting Value* of the *Habitat Quality* of the offset land is given a value of *1*, as it is currently pasture that may provide only limited foraging habitat;
- The *Future Habitat Quality Without the Offset* of the offset land is given a value of *1* as it is currently grazed pasture with limited habitat and without the offset there would be no perceived change of management practice;
- The corresponding *Risk of Loss (%) Without the Offset* is given a risk value of 35%. Without the offset and security, the future management of the land is uncertain. As for the Southern Brown Bandicoot, it is considered that as the offset site currently supports pasture and limited foraging habitat for the Growling Grass Frog, it is more likely that habitat on the site will continue to be managed as pasture, without security and restoration under an offset strategy. The 35% allocated to the *Risk of Loss Without the Offset* accommodates the fact that there is some uncertainty regarding the future management of the offset land;
- Restored habitat for the Growling Grass Frog will amount to 2.17 ha of replaced drains and c. 1.0 ha of breeding wetlands;
- The *Future Habitat Quality With the Offset* of the offset land is given a value of *8* for the breeding wetlands that will be created for Growling Grass Frogs, and *7* for the new drains that will be re-aligned and constructed (i.e. created wetlands and drains will be of better quality than the drains lost);

- There is a relatively high degree of confidence that (i) breeding wetlands and (ii) habitat links (i.e. replaced drains) can be created/constructed, therefore, a *80% confidence* value in achieving the result is included in the Offsets Calculator;
- The construction of wetlands and drains has been processed through the calculator separately, including 2.17 ha of replacement drains and 1.0 ha of breeding wetlands to replace the 2.17 ha of drains lost (see Appendix 1);
- For the drains, *the Risk of Loss With the Offset* is given a value of *0%*, as drains will remain *in situ* in perpetuity and provide habitat links for frogs;
- The *Proposed Offset* of loss of 2.17 ha of existing drains by 2.17 ha of replaced/created drains accounts for 47.1% the *Percentage of the Impact Offset* (Table 1; Appendix 1);
- For the wetlands, the Risk of Loss With the Offset is given a value of 0%, as the land will be owned and wetlands managed in perpetuity for conservation purposes for the Growling Grass Frog;
- The *Proposed Offset* of loss of the remaining 52.9% of drains (i.e. 1.15 ha) by habitat restoration of c.1.0 ha of breeding wetlands for the Growling Grass Frog accounts for 46.8% of the drains;
- Thus, the *Proposed Offsets* of 2.17 ha of replaced drains and 1.0 ha of created wetlands accounts for 93.9% of the drains lost, or more than the 90% minimum that direct offsets must comprise of the proposed offsets for any given impact; and
- As discussed in Section 2.1, for the Growing Grass Frog, the creation of wetlands is considered to be the primary mitigation strategy because there is currently no evidence that fauna underpasses will successfully mitigate loss of connectivity impacts (i.e. Growling Grass Frog-friendly culverts have uncertainty associated with their success).

Table 1 Koo Wee Rup Bypass (Stage 1A) EPBC Act 1999 Offset Management Plan: Estimated Losses (Total Quantum Impact) and Net Present Value and Percentage (based on Estimated Offset Areas)

Road Option	Loss (ha)	Quality	Total Quantum Impact = Adjusted Hectares = Target hectares	Offset Area ha	Offset Area Quality with restoration	Net Present Value = Adjusted Hectares	% of Impact Offset
Southern Brown Bandicoot							
"Roundabout"	1.67 ha	7	1.17 ha	7.1 ha revegetation	7	1.25 ha	*107.2%
Growling Grass Frog							
"Roundabout"	2.17 ha drains	4	0.87 ha	2.17 ha replacement drains	7	0.41 ha	47.1%
" " "	1.15 ha drains	4	0.46 ha	1.0 ha breeding wetlands	8	0.22 ha	46.8%
						TOTAL	***93.9%**

* The Proposed Offsets exceed the 90% minimum that direct offsets must comprise of the proposed offsets for any given impact. Further, for the Growing Grass Frog, the creation of wetlands is considered to be the primary mitigation strategy because there is currently no evidence that fauna underpasses will successfully mitigate loss of connectivity impacts.

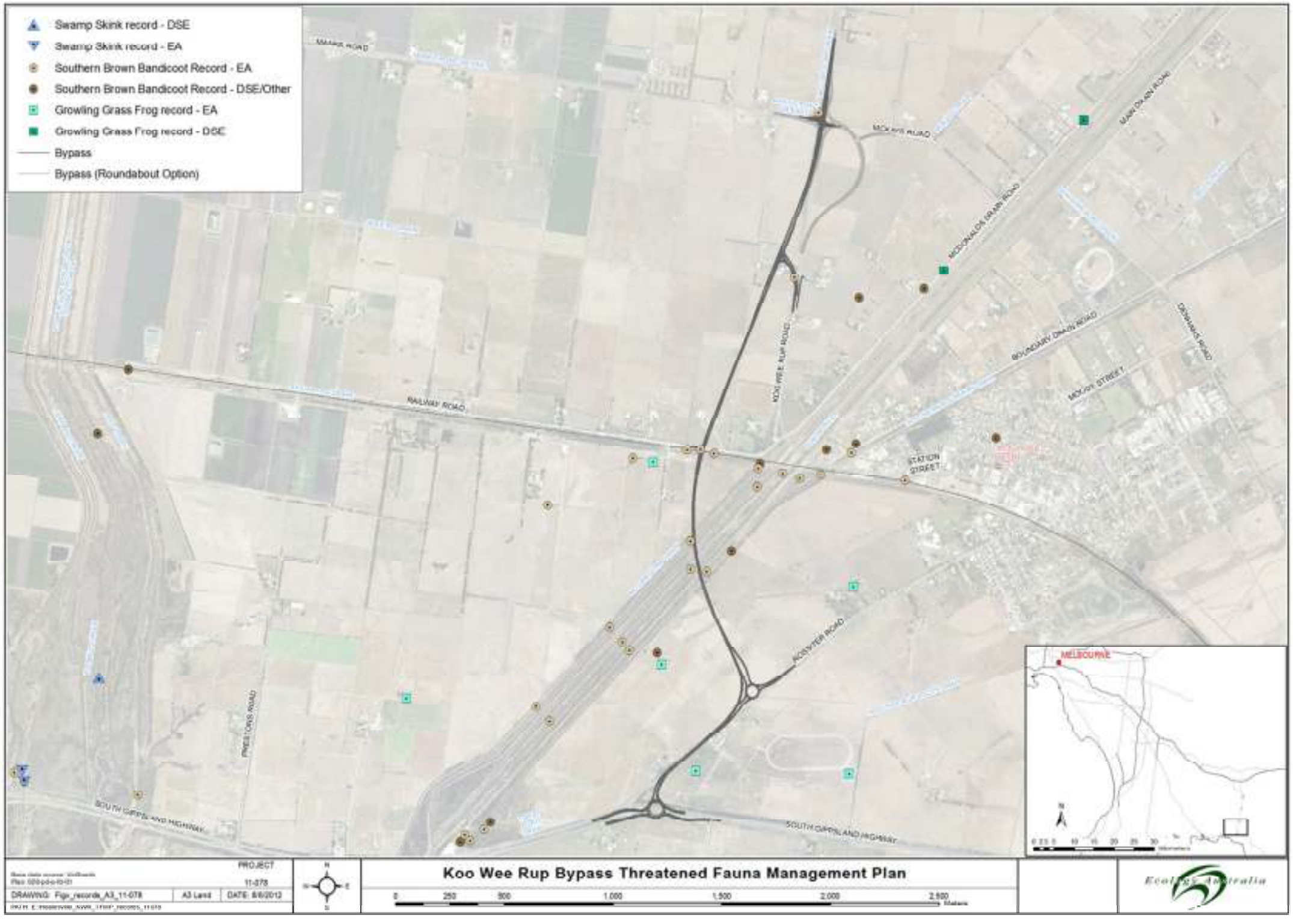

Figure 1 **Koo Wee Rup Bypass (Stage 1A) EPBC Act 1999 Offset Management Plan: Records of the Southern Brown Bandicoot and Growling Grass Frog in the project area (sources DSE and Ecology Australia). The "No Roundabout" and "Roundabout" options at Manks Road are both shown (from Ecology Australia 2013a).**

2 EPBC Act Offset Management Plan

2.1 Key mitigation measures

The key measures proposed to mitigate impacts of the Koo Wee Rup Bypass on the Southern Brown Bandicoot and Growling Grass Frog are outlined below (from Ecology Australia 2013a; Figure 2).

A number of the strategies that will be implemented to ameliorate impacts are initially considered to be mitigation measures. However, as the measures will remain indefinitely (e.g. habitat restoration), they are also considered to contribute to the offsets.

Offsets under the EPBC Act 1999 are only required if residual impacts are considered to be significant (DSEWPaC 2012a). For the Growing Grass Frog, the creation of wetlands is considered to be a primary mitigation strategy because there is currently no evidence of fauna underpasses successfully mitigating loss of connectivity impacts (i.e. Growling Grass Frog-friendly culverts have an uncertainty associated with their success).

Furthermore, metapopulation theory and genetic analyses have demonstrated that major roads fragment metapopulations of the Growling Grass Frog and pose significant barriers to frog dispersal, and population connectivity and gene flow for this species (see DSE 2009; Hale et al. 2012; Heard et al. 2012a and 2012b). It is anticipated that with provision of more breeding habitat in the landscape, there may also be more frogs in the landscape, and this may help overcome connectivity issues. Nonetheless, the created wetlands and new drains will remain *in situ* indefinitely, and thus, have also been processed through the EPBC Offsets Calculator to determine the proportion of impact offsets accounted for by the proposed offsets (Section 1.4.1).

2.1.1 Southern Brown Bandicoot

Habitat restoration of additional habitat corridors

Three corridors will be established amounting to c. 7.1 ha to ameliorate connectivity impacts at Railway Road/disused South Gippsland Railway Line, Bunyip River Drain Complex and Manks Road. These works will commence as follows:

- Western corridor - Railway Road/disused South Gippsland Railway Line to the Bunyip River Drain Complex (c. 2.6 ha) – 30 m wide corridor proposed to commence in Spring 2013;
- 'Triangle land' between Railway Road/disused South Gippsland Railway Line and the Bunyip River Drain Complex and (c. 2.3 ha) – proposed to commence in 2014; and
- Realigned McGregors Road Drain corridor (c. 1,120 m long by 20 m wide or c. 2.2 ha) – proposed to commence in 2014.

Predator Control Program

An intensive predator control program will be implemented focusing on the Bunyip River Drain Complex between Koo Wee Rup township and the South Gippsland Highway, and will extend to Manks Road. The program will be integrated with other predator control programs occurring in the region.

The aim is to provide a strategic measure to significantly reduce predator pressure, enhance the viability of the local Southern Brown Bandicoot population to help mitigate the impacts of the Bypass, and assist with recolonisation of the area post-construction. This program commenced in May 2013 and will run for five years.

Protective fences along the South Gippsland Highway

Protective fences will be installed along the South Gippsland Highway bridge crossings over the Bunyip River Drain Complex and 'the Inlets' (Cardinia/Deep Creek drains) to reduce the high level of road kill currently experienced at these locations by Southern Brown Bandicoots.

Fauna underpasses

Fauna underpasses (fauna-friendly culverts) will be installed at the following locations as part of the package to ameliorate connectivity impacts to the Southern Brown Bandicoot and to improve understanding of their efficacy through the monitoring program:

- Manks Road and the Bypass crossings of the re-aligned McGregors Drain;
- At the Bypass crossing of the habitat corridor along McGregors Road Drain, where this links back to the existing Healesville – Koo Wee Rup Road; and
- The Bypass crossing of Railway Road/disused South Gippsland Railway Line.

Habitat fencing

Southern Brown Bandicoot-proof fencing will be erected at strategic locations, mostly adjoining newly restored habitat, to reduce the risk of bandicoot road mortality on the Bypass.

2.1.2 Growling Grass Frog

Establishment of Growling Grass Frog ponds and drains

Five dedicated Growling Grass Frog breeding ponds will be constructed as part of the Bypass:

- Construction of the two of these wetlands that will be incorporated into the 'Triangle land' (c. 4,000 m^2; DSE 2010) and the Western habitat corridor (c. 2,000 m^2) will commence when the land is acquired by VicRoads; and
- The remaining three wetlands, including one near Manks Road/Healesville - Koo Wee Rup Road intersection (c. 2,000 m^2) and two on either side of the Bypass alignment between the Bunyip River Drain Complex and Rossiter Road (both 1,000 m^2), will be constructed during the construction phase.

The aim is to provide significantly more breeding habitat for the Growling Grass Frog, to potentially increase the local population and improve the chances of successful movements through underpasses.

All existing drains will be reconstructed to the same dimensions as those removed as part of the construction process. These drains will provide linking habitat between breeding wetlands.

Fauna underpasses

Fauna underpasses will be installed at the following locations as part of the package to mitigate connectivity impacts to the Growling Grass Frog and improve understanding of their suitability for use through monitoring:

- Manks Road and the Bypass crossings of the re-aligned McGregors Drain;
- At the Bypass crossing of the habitat corridor along McGregors Road Drain, where this links back to the existing Healesville – Koo Wee Rup Road;
- The Bypass crossing of Railway Road/disused South Gippsland Railway Line; and
- A bank of culverts, including Growling Grass Frog-friendly culverts, linking the two wetlands south of the Bunyip River Drain Complex.

Habitat fencing

Growling Grass Frog-proof fencing will be erected at strategic locations, mostly adjoining newly created habitat, to reduce the risk of frog road mortality on the Bypass.

2.2 Alignment of EPBC Act Offsets with Broader Strategic Environmental Objectives

2.2.1 Southern Brown Bandicoot

The Offsets proposed, for the Southern Brown Bandicoot including monitoring programs, align with other management, recovery, broader strategic environmental and/or research objectives recommended for this species, including:

- Identifying threats and threat abatement management practises to assist the recovery of the SBB;
- Undertaking predator control;
- Installing bandicoot-proof fences to reduce road mortality;
- Enhancing existing core habitat and habitat patches through targeted revegetation and restoration;
- Understanding the relationship between the species and its habitat; and
- Evaluating population responses to recovery actions and adapt actions as required.

These other programs or plans include:

- Draft Southern Brown Bandicoot National Recovery Plan (Brown and Main 2010);

- Integrated Predator Control Strategy for the Southern Brown Bandicoot in the South-east Sub-region (Ecology Australia 2013);
- Draft Sub-regional Strategy for the Southern Brown Bandicoot in the South-east of Melbourne (DSE 2011);
- Regional Recovery Plan for the Southern Brown Bandicoot in the Mornington Peninsula and Western Port Biosphere Reserve (MPWPBRF 2011); and
- Southern Brown Bandicoot Strategic Management Plan for the former Koo Wee Rup Swamp Area (Ecology Australia 2009).

2.2.2 Growling Grass Frog

The Offsets proposed for the Growling Grass Frog, including monitoring, also align with other management, recovery, broader strategic environmental and/or research actions and objectives recommended for this species, including:

- Ensuring that specific development activities do not negatively affect dispersal opportunities or modifications to habitat do not affect population viability;
- Address known or predicted threatening processes and implement management practises, where possible, to ensure that land use activities do not threaten the survival;
- Investigate opportunities to create habitat of strategic importance for maintenance of local populations;
- Determining the distribution, biology and ecology of Growling Grass Frog and identify causes of decline;
- Investigate the response of Growling Grass Frog to translocation, the creation of artificial habitats, and/or the rehabilitation of habitat.

These other programs or plans include:

- Draft Growling Grass Frog National Recovery Plan (Clemann and Gillespie 2010); and
- Guidelines for Managing the Endangered Growling Grass Frog in Urbanising Landscapes (DSE 2010).

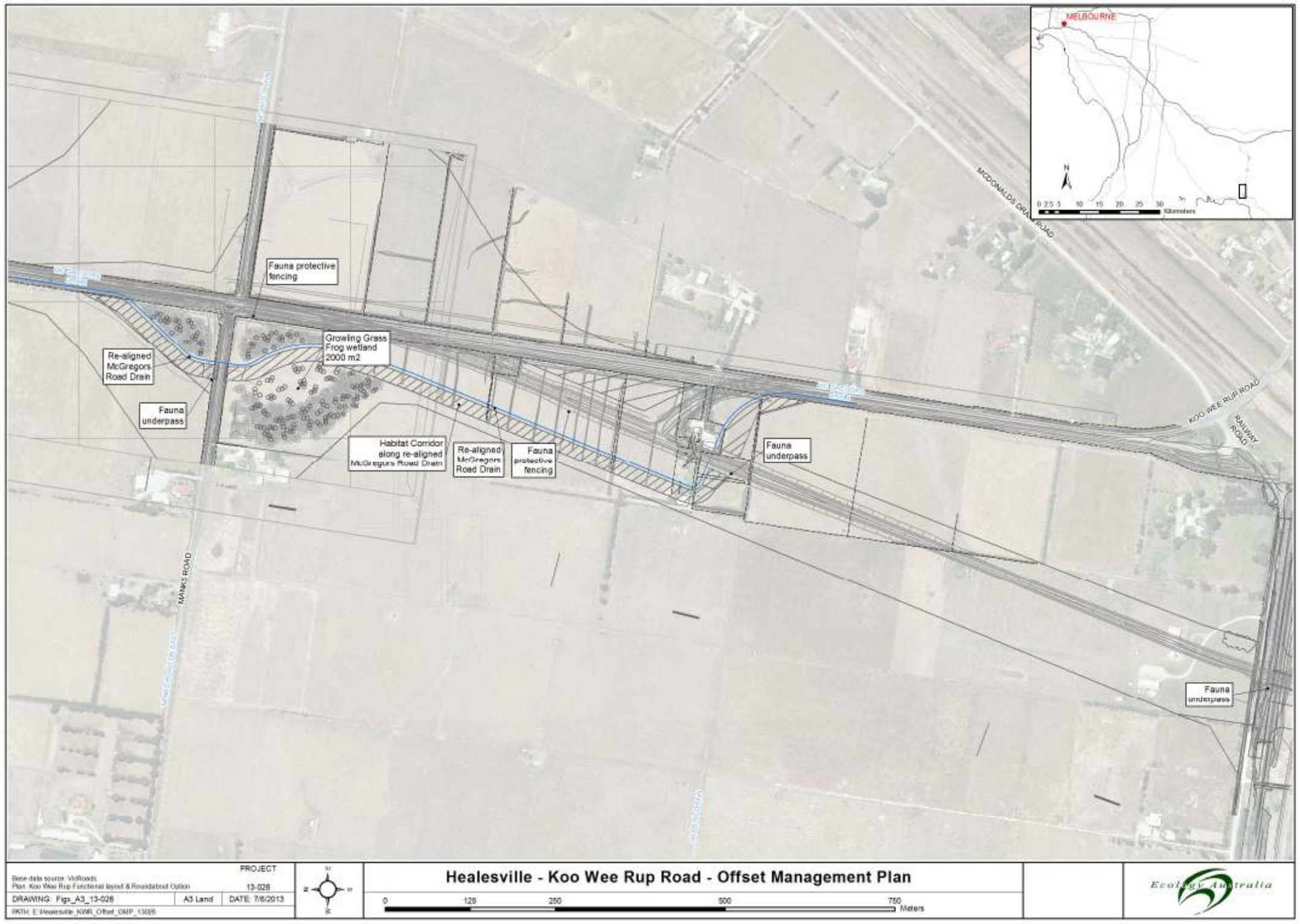

Figure 2 **Koo Wee Rup Bypass (Stage 1A) EPBC Act 1999 Offset Management Plan: Key mitigation measures to be implemented for the Southern Brown Bandicoot and Growling Grass Frog in the northern part of the project area. The "No Roundabout" and "Roundabout" options at Manks Road are both shown (base data supplied by VicRoads).**

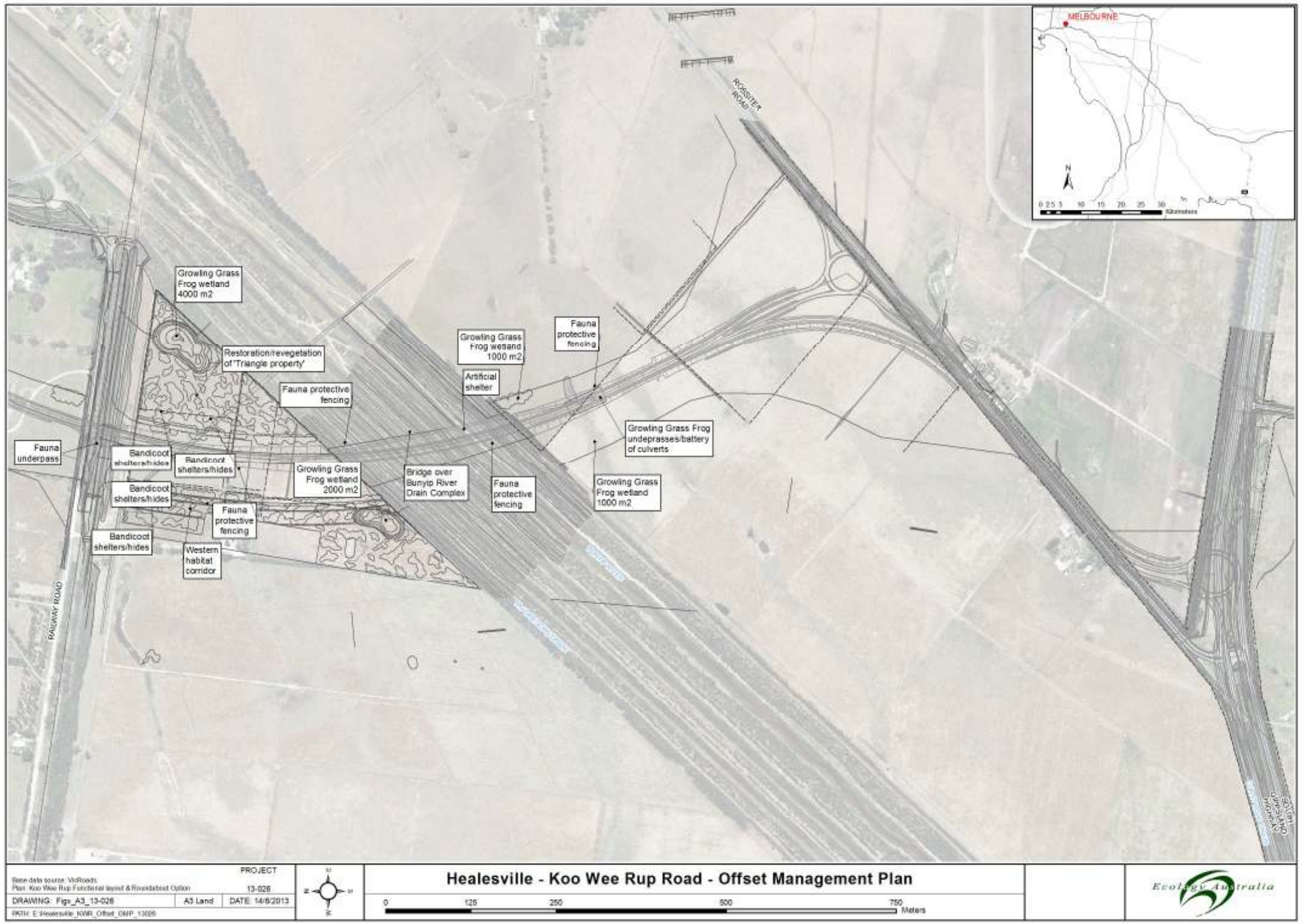

Figure 3 Koo Wee Rup Bypass (Stage 1A) EPBC Act 1999 Offset Management Plan: Key mitigation measures to be implemented for the Southern Brown Bandicoot and Growling Grass Frog in the southern part of the project (base data supplied by VicRoads).

3 EPBC Act Offset Management Plan Elements

3.1 Security

The offset properties will be secured under a Section 173 Agreement under Section 173 of the *Planning and Environment Act 1987*. VicRoads will make a legal contract with Cardinia Shire Council under the Act. This Section 173 Agreement will specify what actions will (e.g. protection of restoration areas for conservation) and will not be permitted on the properties.

3.2 Responsibility for enforcing the Offset Management Plan

VicRoads has the responsibility for managing this OMP.

3.3 Management Plan Format

The management of key environmental issues specific to the Koo Wee Rup Bypass Offset sites are outlined in the following four elements. The elements are developed and presented in the format below.

ELEMENT	ENVIRONMENTAL ISSUE
Objectives	Specific objectives to be achieved through the implementation of management measures/procedures.
Procedures	Outlines procedures to be followed and operational control measures to mitigate and/or prevent environmental impacts.
Performance Indicators	Identifies goals to reach environmental outcomes.
Monitoring and Evaluation	Outlines a program of monitoring and inspection to be undertaken for each element.
Adaptive Management	Identifies the procedures to be followed if the objectives have not been achieved.
Responsibility	Identifies the organisation and/or agency responsible.

3.4 Habitat Restoration and Revegetation

ELEMENT	HABITAT RESTORATION AND REVEGETATION
Objectives	• To provide greater certainty for ameliorating barrier impacts and re-establishing long-term connectivity for the Southern Brown Bandicoot where key connectivity corridors are severed. • To offset habitat losses and compensate for other impacts to the Southern Brown Bandicoot that cannot be avoided as required under the EPBC Act.
Procedures	• Engage an appropriately qualified revegetation contractor to propagate indigenous plant species and undertake revegetation and planting maintenance. • To ensure genetic quality and to allow adaptive potential, seed or cuttings for plants must be sourced from populations with at least 50 breeding individuals or from multiple populations. Seed shall be collected in accordance with Florabank Guidelines and Codes of Practice (http://www.florabank.org.au/). Further to these guidelines, seed and propagule supply will meet the qualities given in Table 2. • Implement intensive pre-planting weed control to reduce competition from weeds, and maintain control, especially through early establishment. • Planting will occur in Spring 2013 and Autumn and Spring 2014. • If necessary, implement rabbit control to reduce rabbit damage to plantings, (but only in conjunction with Predator Control, so as with reduced rabbit supply, predators do not switch to bandicoots). • Revegetation will aim to provide Southern Brown Bandicoot habitat with dimensions in accordance with the mitigation guidelines provided under the draft referral guidelines for the Southern Brown Bandicoot (DSEWPaC 2011). Habitat will consist of native vegetation with an understorey structure of 50-80% average foliage density in the 0.2-1.0 m height range. • Maintenance of plantings will include plant replacement, weed control and soil saver maintenance for three years. • The frequency of works and need to undertake future maintenance beyond the first three years will be subject to discussions with the Department of Environment and Primary Industries (DEPI). • Numerous artificial shelters/bandicoot hides will be placed in revegetation zones during the early phases of revegetation and remain *in situ*, to provide shelter while habitat is establishing.
Performance Indicators	• Plantings will be completed by Spring 2014 (supplementary plantings will be supplied beyond Spring 2014, if required). • Plantings must be consistent with the species and densities given in the Revegetation and Habitat Restoration Plan (Australian Ecosystems 2012). • All high threat weeds (as per DSE 2007) within revegetation areas should be effectively controlled or eliminated by the end of 2014.

	• Other weeds should not exceed 10% of cover by end of 2014. • Plantings should aim to achieve a 95% survival rate after three years. • If used, tree guards should be removed as soon as possible following establishment of plants.
Monitoring and Evaluation	• Document planting activities, including sources (provenance) of propagating material, species planted, densities and numbers. • Monitoring of plantings will be undertaken annually beginning in the first autumn or spring following planting. • Monitoring of plantings will ascertain the survival of plantings and consider replacement plantings. • Monitoring of the use of the habitat corridors by Southern Brown Bandicoots will be undertaken twice per year in autumn and spring as per the FMP (Ecology Australia 2013a). • Southern Brown Bandicoot monitoring reports will be provided annually to DSEWPaC, as outlined in the FMP (Ecology Australia 2013a).
Adaptive Management	Identify problem areas and respond accordingly. For example: • Improve methods and/or frequency of weed control; • Increase pest animal control, if needed; • Increase the use of tree guards, if needed; • Undertake additional plantings depending on the success of plant establishment. • Supply additional Southern Brown Bandicoot structures (e.g. shelters), if required; • Modify bandicoot structures prior to placement, if required; and • Increase Southern Brown Bandicoot monitoring use of revegetation areas, if required.
Responsibility	Managed by VicRoads.

Table 2 Koo Wee Rup Bypass EPBC Act Offsets Management Plan: source of parent population for an individual species (table supplied by Scott Watson, VicRoads).

Category	Local	Intermediate	Distant
Definition	• 30 km radius • 60 km for grasses and wetland species • Same subspecies, variety or form	• 50 km radius • Previously geographically continuous population • Sites of same or lesser rainfall (to minus 100 mm average Annual Rainfall Interval). • Same subspecies, variety or form • Same ploidy (if known)	• 100 km radius • Previously geographically continuous population • Sites of same or lesser rainfall (to minus 100 mm average Annual Rainfall Interval). • Same subspecies, variety or form • Same ploidy (if known)
Proportion	Minimum 70%	Maximum 20%	Maximum 10%

3.5 Wetland and Drain Establishment

ELEMENT	WETLAND AND DRAIN ESTABLISHMENT
Objectives	• To ameliorate barrier impacts and re-establish long-term connectivity for the Growling Grass Frog where key connectivity corridors are severed. • To offset habitat losses and compensate for other impacts to the Growling Grass Frog that cannot be avoided as required under the EPBC Act. • To create wetlands that provide significantly more breeding habitat in the landscape to increase the local population and improve the chances of successful movements through underpasses.
Procedures	• Engage an appropriately qualified revegetation contractor to propagate indigenous plant species and undertake wetland revegetation and planting maintenance. • To ensure genetic quality and to allow adaptive potential, seed or cuttings for plants must be sourced from populations with at least 50 breeding individuals or from multiple populations. Seed shall be collected in accordance with Florabank Guidelines and Codes of Practice (http://www.florabank.org.au/). Seed and propagule supply will meet the qualities given in Table 2. • Implement intensive pre-planting weed control to reduce competition from weeds, and maintain control, especially through early establishment. • Limit herbicide use within and adjacent to waterways/wetlands. • Only employ mowing/slashing in wetland fringing areas, as needed, to minimise potential impacts from spraying and grazing (e.g. erosion). • Planting will occur in Spring 2013 and Autumn and Spring 2014. • Investigate the possibility that contour/swale drains may be diverted to supply additional water, if water supply to created wetlands is found to be inadequate • Wetland creation will be based on the design for Growling Grass Frogs as given in (DSE 2010) and include a high cover of submergent, emergent, floating and fringing vegetation. • Between 20-30% of the wetland area will reach a depth of 2-3 m to provide the optimal hydroperiod (i.e. permanent or long hydroperiods). • Fringing habitat features, such as logs and rocks, will be supplied to provide overwintering habitat. • Temporary guards (i.e. netting) may need to be installed to protect palatable aquatic species (e.g. Common Water-ribbons *Triglochin procera*, Pondweeds *Potamogeton* and Milfoils *Myriophyllum* spp.) from waterfowl browsing. • Maintenance of plantings will include infill planting, weed control and general maintenance for three years. • The frequency of works and need to undertake future maintenance beyond the first three years will be subject to discussions with DEPI. • Manage water quality of water entering wetlands according to Melbourne Water's Water Sensitive Urban Design Guidelines -

	http://wsud.melbournewater.com.au/content/programs/stormwater_quality_offsets.asp
Performance Indicators	• Plantings will be completed by Spring 2014 (supplementary plantings will be supplied beyond Spring 2014, if required). • Plantings must be consistent with the species and densities given in the Revegetation and Habitat Restoration Plan (Australian Ecosystems 2012). • Plantings should aim to achieve a 95% survival rate after three years. • All high threat weeds (as per DSE 2008) within created wetlands should be effectively controlled or eliminated by end of 2014. • Other weeds should not exceed 10% of cover by the end of 2014. • If used, tree guards and temporary guards (netting) should be removed as soon as possible following establishment of plants.
Monitoring and Evaluation	• Document revegetation activities, including sources (provenance) of propagating material, species planted, densities and numbers. • Monitoring of plantings will be undertaken annually beginning in the first autumn or spring following planting. • Monitoring will ascertain the survival of plantings and consider replacement plantings. • Monitoring of the use of the created wetlands by Growling Grass Frogs will be undertaken annually during the active season of this species (October to March). • Growling Grass Frog monitoring reports will be provided annually to DSEWPaC, as outlined in the FMP (Ecology Australia 2013a).
Adaptive Management	Identify problem areas and respond accordingly. For example: • Improve methods and/or frequency of weed control; • Increase the use of tree guards and temporary guards (netting), if needed; • Undertake additional plantings depending on the success of plant establishment; • Supply additional shelter (e.g. rocks, logs and artificial structures), if required; and • Undertake additional Growling Grass Frog monitoring, if required.
Responsibility	Managed by VicRoads.

3.6 Predator Control

ELEMENT	PREDATOR CONTROL
Objectives	• To provide a strategic measure to significantly reduce predation pressure in surrounding habitat, namely the Bunyip River Drain Complex. • To enhance the viability of the local Southern Brown Bandicoot population to help mitigate the impacts of the Bypass. • To reduce the risk of higher levels of predation of bandicoots associated with removal of vegetation for construction of the Bypass. • To assist with re-colonisation of the area post-construction.
Procedures	• VicRoads will implement an on-going Predator Control Program adjoining the alignment of the Bypass which will run for five years. • The Predator Control Program commenced in May 2013 and will run for six months prior to construction commencing and for another four and a half years. • The Predator Control Program for the Koo Wee Rup Bypass will be integrated and co-ordinated with other programs occurring in the region (e.g. Ecology Australia 2013d). • A suitably qualified Predator Control Contractor will be engaged to undertake pest animal control. • Fox baiting will be undertaken on properties adjoining the Bunyip River Drain Complex from properties south of the Koo Wee Rup Swamp Lookout and along the existing Healesville – Koo Wee Rup Road, to as far north as north of Manks Road. • A maximum allowable fox bait density of 12 bait stations/km^2 will be used in the area. • Predator Control will be undertaken in accordance with Table 10 of the Koo Wee Rup Bypass Fauna Management Plan (Ecology Australia 2013a). • Motion sensing cameras will be installed at each bait-station and deployed for the duration of the fox control program to monitor target and non-target species visitation. • A Southern Brown Bandicoot monitoring program has been developed using motion-sensing infra-red cameras to collect baseline (and pre-construction, construction and post-construction phase) data over a four week period in autumn for the Predator Control Program (Ecology Australia 2013e). • Fox den fumigation and cat trapping will be undertaken on an as needed basis. • Revisit fox dens that have been fumigated, to monitor any den recolonisation. • Employ soft-jaw trapping and/or shooting where poison baiting is not

	possible (e.g. where the risk of baiting to domestic animals is high, or near watercourses). • Document all actions undertaken as part of the Predator Control Program. • Monitor and undertake rabbit control, as necessary. • Analyse data on fox bait uptake, fox activity (by cameras), den fumigation, soft-jaw capture rate and shooting (the latter two techniques if used).
Performance Indicators	• Detectable decline in the abundance (activity indices) of feral predators in the project area, as ascertained by camera monitoring and bait uptake (e.g. see Ecology Australia 2013e). • High initial rate of fox bait uptake (i.e. >60%), followed by subsequent decline in rate of bait uptake (see Ecology Australia 2013d). • Any active fox dens located in the project area are fumigated promptly following detection. • A decrease in the number of dens that require fumigation annually. • An increase in the detection of Southern Brown Bandicoots as gauged through activity indices and camera monitoring. • All monitoring and predator control activities are documented.
Monitoring and Evaluation	• The control and monitoring of feral predators will be reviewed and evaluated annually, especially in context of threatened species populations and any potential impacts upon them.
Adaptive Management	• Respond to monitoring data collected on predator and Southern Brown Bandicoot abundance, including predator reduction targets. • Review predator control regime, if required. • Consider using alternative bait types (e.g. chicken), or shifting bait station locations, if initial bait uptake is low (<30%). • Introduce new/up-to-date predator control techniques/strategies as they become available. • Consider whether baiting could be undertaken around active dens, or dens should be destroyed following fumigation, if there is no long-term decline in the number of dens that require fumigation. • Cease trapping, and consider shooting, if trap success is low (<20% capture success). • Cease shooting and consider other control techniques, if there is a low rate of kill or kill efficiency. • Increase monitoring effort, if required.
Responsibility	Managed by VicRoads.

3.7 Fauna-proof Fences and other Infrastructure

ELEMENT	FAUNA-PROOF FENCES AND OTHER INFRASTRUCTURE
Objectives	• To reduce the high level of mortality currently experienced by Southern Brown Bandicoots on the South Gippsland Highway. • To minimise Southern Brown Bandicoot and Growling Grass Frog mortality on the new road once it is constructed. • To guide bandicoots and frogs to underpass entrances to encourage fauna to use fauna underpasses to maintain population continuity.
Procedures	• Bandicoot-proof fencing will be installed at the South Gippsland Highway crossings of "the Inlets" and Bunyip River Drain Complex. • Fauna-proof fence types will be in accordance with the Fauna Infrastructure Plan (Ecology Australia 2013b). • Bandicoot-proof fencing along the South Gippsland Highway crossing of the "the Inlets" and Bunyip River Drain Complex will extend for 50 m either side of each waterway crossing (see Appendix 2). • Bandicoot and frog-proof fencing will be installed in key areas along the new Bypass road, including on the eastern side of the re-aligned McGregors Road Drain, Manks Road/existing Healesville Koo Wee Rup Road, Railway Road/disused South Gippsland Railway Line, Bunyip River Drain Complex and new road between the Bunyip River Drain Complex and Rossiter Road (see Figures 2 and 3). • The fauna-proof fences will be installed during construction for the operational phase. • A Southern Brown Bandicoot road mortality register will be established to monitor and gauge the effectiveness of the fences. • Fences will be monitored/inspected annually as part of a fauna-proof maintenance program. • The effectiveness of the frog-proof fence in minimising road kill will be monitored once during daylight hours and once a fortnight during the active season of the species (between October and March). • VicRoads will engage a qualified zoologist to develop a monitoring program to monitor the success of fauna underpasses in providing bandicoot and frog movement post-construction (e.g. Manks Road, Railway Road and battery of frog-friendly-culverts between the Bunyip River Drains and Rossiter Road). • Monitoring of the use of fauna underpasses and habitat structures by Southern Brown Bandicoots will be undertaken twice per year in autumn and spring for the life of the Plan. • Annual monitoring of Growling Grass Frog movements through fauna underpasses will be undertaken on a monthly basis during the active season (between October and March) for the life of the Plan.
Performance	• All monitoring activities of the use of fauna underpasses by Southern

Indicators	Brown Bandicoots and Growling Grass Frogs are documented. • Minimal evidence of road mortality of Southern Brown Bandicoots and Growling Grass Frogs.
Monitoring and Evaluation	• Review and evaluate the success or otherwise of fauna-proof fences. • Review and evaluate the success or otherwise of habitat connectivity measures.
Adaptive Management	• Respond to monitoring data collected on the use of fauna underpasses by Southern Brown Bandicoots and Growling Grass Frogs. • Install additional fencing or modify the fence design (e.g. install overhang or curtain), if bandicoots or frogs are recorded as being killed on the new road. • Trial additional furniture in fauna underpasses in order to facilitate use.
Responsibility	Managed by VicRoads.

4 Compliance with the *EPBC Act Environmental Offsets Policy*

This Section provides a justification of the manner in which the proposed offsets are in accordance with the *EPBC Act Environmental Offsets Policy* (DSEWPaC 2012a, 2012b and 2012c). Impacts and mitigation measures are described in the FMP and Fauna Infrastructure Plan (Ecology Australia 2013a and 2013b) and restoration of pasture to high quality habitat, creation of vegetated habitat links/corridors and construction of wetlands for key species are outlined in the Revegetation and Habitat Restoration Plan (Australian Ecosystems 2012).

4.1 Compliance with Offset Principles

1. **Offsets must deliver an overall conservation outcome that improves the viability of the aspect of the environment that is protected by national law and affected by the proposed action (page 6).**

Other related requirements

Offsets should align with the conservation priorities for the impacted protected matter and be tailored specifically to the attribute of the protected matter that is impacted in order to deliver a conservation gain (page 8).

A conservation gain (the benefit that a direct offset delivers to the protected matter, which maintains or increases its viability or reduces threats of damage, destruction or extinction) may be achieved by the following relevant listed actions relevant (page 8):

- creating new habitat for the protected matter; and
- reducing threats to the protected matter.

Compliance

Creation of New Habitat for the Southern Brown Bandicoot

Three areas of habitat will be established totalling c. 7.1 ha, including:

- 'Triangle land' at the intersection of Railway Road/disused South Gippsland Railway Line and Bunyip River Drain Complex (c. 2.3 ha);
- Western habitat corridor between Railway Road/disused South Gippsland Railway Line and the Bunyip River Drain Complex (c. 2.6 ha); and
- The 20 m wide habitat corridor along the realigned McGregors Road Drain (c. 2.2 ha).

Revegetation of the 'triangle land' at the intersection of Railway Road/disused South Gippsland Railway Line and Bunyip River Drain Complex will aim to provide Southern Brown Bandicoot habitat (Australian Ecosystems 2012). Revegetation will provide a mosaic of terrestrial habitat types (sedgelands, rushlands, grasslands, Swamp Scrub, low shrubland and open woodland) which meet the habitat requirements of the Southern Brown Bandicoot of native vegetation with an understorey structure of 50-80% average foliage density in the 0.2-1.0 m height range (DSEWPaC 2011).

The western habitat corridor and habitat corridor along the re-aligned McGregors Road Drain will similarly comprise native vegetation with an understorey structure of 50-80% average foliage density in the 0.2-1.0 m height range.

The aim is to offset the loss of habitat (1.44 for the "No Roundabout" option and 1.67 ha for the "Roundabout" option) and ameliorate fragmentation impacts and achieve a conservation gain by creating c. 2.3 ha of breeding, foraging and sheltering habitat and c. 4.8 ha of linking habitat for the Southern Brown Bandicoot.

Creation of New Habitat for the Growling Grass Frog

Wetlands and drains with habitat requirements of the Growling Grass Frog, including breeding, foraging and sheltering habitat will be created in the Public Acquisition Overlay (DSE 2010; Australian Ecosystems 2012) and include:

- a high cover of submergent, emergent and floating vegetation;
- a major breeding wetland will be constructed in the 'Triangle Land' Land' at the intersection of Railway Road and the Bunyip River Drain Complex and will measure c. 4,000 m^2, the average size of wetlands occupied by Growling Grass Frogs in the Merri Creek catchment (DSE 2010);
- a number of smaller wetlands to encourage movement, that will also be revegetated to a high standard with a similar mix of species to the larger breeding wetland, including a wetland at the southwest corner of Manks Road and the existing Healesville Koo Wee Rup Road (2000 m^2), on the 'Triangle Land' (a second smaller wetland of 2000 m^2) and on both sides of the Bypass alignment between the Bunyip River Drain Complex and Rossiter Road (both 1000 m^2);
- an appropriate hydroperiod (i.e. long);
- 20-30% of each wetland will reach a depth of 2 m as adequate water depth is an important determinant of habitat; and
- An abundance of logs and rocks placed around the wetland edge to provide cover and over-wintering habitat.

For the Growling Grass Frog, the aim is to deliver a conservation gain by offsetting loss of 1.91 and 2.17 ha of indigenous (potential) habitat in drains for the "No Roundabout" and "Roundabout" options, respectively (which is considered most likely to be used for dispersal only), by creating wetlands that provide significantly more breeding habitat in the landscape. This has the potential to increase the local population and improve the chances of successful movements through underpasses.

The re-aligned McGregors Drain will provide linking habitat.

Reducing Threats to the Southern Brown Bandicoot

Intensive predator control will be undertaken to provide a strategic measure to significantly reduce predator pressure, enhance the viability of the local Southern Brown Bandicoot population to help mitigate the impacts of the Bypass, and assist with recolonisation of the area

post-construction. This program commenced in mid-2013.

Bandicoot-proof fences will be installed along the South Gippsland Highway at 'the Inlets' and Bunyip River Drain Complex crossings to reduce the high level of bandicoot roadkill experienced at these locations.

2. Offsets must be built around direct offsets but may include other compensatory measures (page 6).

Other related requirements

An offsets package can comprise a combination of direct offsets (i.e. actions that provide a measurable conservation gain for an impacted protected matter) and other compensatory measures (i.e. indirectly benefit the impacted protected matter) (pages 8-10).

Direct offsets must account for a minimum of 90% of the offset requirements for any given impact (page 8).

Compliance

The loss of habitat for the Southern Brown Bandicoot and Growling Grass Frog has been processed through the EPBC Offsets calculator or Excel spreadsheet (DSEWPaC 2012b; see Section 1.4).

Habitat Restoration for the Southern Brown Bandicoot

The proposed offset of c.7.1 ha of habitat restoration for the Southern Brown Bandicoot exceeds the 90% minimum that direct offsets must comprise of the proposed offsets for any given impact. This comprises:

- Revegetation of the 'triangle land' at the intersection of Railway Road/disused South Gippsland Railway Line and Bunyip River Drain Complex;
- Western habitat corridor between Railway Road/disused South Gippsland Railway Line and the Bunyip River Drain Complex; and
- The 20 m wide habitat corridor along the realigned McGregors Road Drain.

Habitat Restoration for the Growling Grass Frog

The proposed direct offsets of five new drains and breeding wetlands for the Growling Grass Frog totalling 2.17 ha and 1.0 ha, respectively, accounts for 47.1% and 46.8% of the impact offsets. This is more than the 90% minimum that direct offsets must comprise of the proposed offsets for any given impact. The creation of breeding wetlands is considered to be a primary mitigation strategy for ameliorating loss of connectivity impacts by potentially putting more animals in the landscape (see Sections 1.4.1 and 2.1).

For the Growling Grass Frog, the proposed offset package comprises:

- construction of Growling Grass Frog breeding wetlands at the southwestern corner of

Manks Road and existing Healesville – Koo Wee Rup Road (c. 2,000 m^2 wetland), in the 'Triangle Land' (c. 4,000 m^2) and western habitat corridor (c. 2000 m^2) of the at the intersection of Railway Road/disused South Gippsland Railway Line and Bunyip River Drain Complex and on the east and west side of the Bypass alignment between the Bunyip River Drain Complex and Rossiter Road (both c. 1,000 m^2); and

- the re-aligned McGregors Drain and other re-constructed drains will provide linking habitat between breeding wetlands.

Other Compensatory Measures for the Southern Brown Bandicoot

For the Southern Brown Bandicoot, other compensatory (indirect) measures associated with the proposed offset package includes:

- Predator control for 5 years; and
- Bandicoot-proof fences along the South Gippsland Highway at the Highway crossings of 'the Inlets' and Bunyip River Drain Complex to reduce the high level of bandicoot roadkill experienced at these locations.

3. Offsets must be in proportion to the level of statutory protection that applies to the protected matter (page 6).

Compliance

The loss of habitat for the Southern Brown Bandicoot and Growling Grass Frog has been processed through the EPBC Offsets calculator (DSEWPaC 2012b; Section 1.4). The proposed offsets are in proportion to the level of statutory protection that applies to these species.

The EPBC Offsets calculator takes into account the threatened status of the Southern Brown Bandicoot (Endangered) and Growling Gras Frog (Vulnerable) under the EPBC Act 1999 when calculating the proportion of the required offsets that the proposed offsets provides (i.e. must be a minimum of 90%).

4. Offsets must be of a size and scale proportionate to the residual impacts on the protected matter (page 6).

Compliance

Offsets for the Southern Brown Bandicoot

The loss of habitat amounts to:

- 1.44 ha for the ”No Roundabout” option; and
- 1.67 ha for the “Roundabout” option.

These losses have been processed through the EPBC Offsets calculator (DSEWPaC 2012b; Section 1.4.1). The proposed offset of restoration of c. 7.1 ha of pasture accounts for 107.2% which exceeds the 90% minimum that direct offsets must comprise of the proposed offsets for any given impact and is in proportion to the size and scale of the residual impacts on the Southern Brown Bandicoot.

Offsets for the Growling Grass Frog

The loss of habitat amounts to:

- 1.91 ha for the ”No Roundabout” option; and
- 2.17 ha for the “Roundabout” options.

These losses have been processed through the EPBC Offsets calculator (DSEWPaC 2012b; Section 1.4.1). The proposed offset of creation of five breeding wetlands totalling c. 1.0 ha and drains/linking habitat measuring c. 2.17 ha, accounts for 47.1% and 46.8% of the impact offsets. This is more than the 90% minimum that direct offsets must comprise of the impact offsets.

The creation of breeding wetlands is considered to be a primary mitigation strategy for ameliorating loss of connectivity impacts (see Sections 1.4.1 and 2.1).

5. **Offsets must effectively account for and manage the risks of the offset not succeeding (page 6).**

Compliance

Monitoring requirements have been developed in the FMP (Ecology Australia 2013a) which has been approved for the planning phase under the EPBC Act 1999.

Monitoring requirements are also addressed in this OMP through each element with key performance indicators.

Adaptive management under each element will identify the procedures to be followed if the element objectives have not been met.

The project will report against any specific monitoring and auditing obligations established under the EPBC Act approval conditions.

Monitoring data will be reviewed as part of an Adaptive Management Framework and management will respond and adapt as necessary to the results of the review.

6. **Offsets must be additional to what is already required, determined by law or planning regulations, or agreed to under schemes or programs (this does not preclude the recognition of state or territory offsets that may be suitable as offsets under the EPBC Act for the same action) (page 6).**

Compliance

Predator control activities for the Koo Wee Rup Bypass are above and beyond VicRoads usual management commitments. Thus, VicRoads Predator Control Program, which is on-going and will run for 5 years adjoining the alignment of the Bypass, is considered to be above and beyond what is expected.

To mitigate Bypass impacts, including increased exposure to feral predators associated with vegetation clearing, 1080 baiting will be undertaken at the maximum allowable bait density, which is above and beyond what landscape predator control programs in the southeast of Melbourne will be undertaking (see Ecology Australia 2013d).

7. Offsets must be efficient, effective, timely, transparent, scientifically robust and reasonable (page 6).

Other related requirements

Offsets should compensate for an impact for the full duration of the impact (page 8).

Offsets that deliver an outcome prior to the impact commencing are encouraged as they minimise effects on the protected matter resulting from offset time delays (page 8).

Compliance

Offsets for the Southern Brown Bandicoot

The habitat requirements of the Southern Brown Bandicoot in the former Koo Wee Rup Swamp Area are relatively well understood and considered to be broad. These include patches of Swampy Riparian Woodland, very narrow linear vegetation corridors along drains and roadside/railway line reserves (i.e. 2-3 m wide), and artificial habitats, such as under houses and inside car bodies.

There is also sound evidence that Southern Brown Bandicoots will move into revegetated areas bordering occupied habitats, such as at the Royal Botanic Gardens Cranbourne. Revegetated habitat corridors have been proposed for this species to link known habitats, such as at the Botanic Ridge Precinct. Other evidence of bandicoots increasing in numbers following revegetation and fox control comes from Tooradin, to the west of Koo Wee Rup (see link).

http://www.theage.com.au/victoria/preserving-a-patch-for-the-bandicoot-20130503-2iyny.html

Therefore, creation of suitable habitat for the Southern Brown Bandicoot is relatively straight forward and the creation and use of habitat by bandicoots can be readily documented and measured through the monitoring program.

Habitat restoration of the 30 m wide western habitat corridor will be delivered during the first year of the project in spring 2013, coinciding with the pre-construction phase.

Habitat restoration of the habitat corridor along the re-aligned McGregors Road Drain, 'Triangle Land and remaining portions of the western habitat corridor will be delivered during the construction phase.

It is estimated that revegetation will take c. 3 years of growth to become suitable for use by the Southern Brown Bandicoot.

Revegetation will remain indefinitely.

Construction of the Bypass is expected to take in the order of 18 months. Predator Control has commenced c. 6 months prior to construction commencing and will continue for 5 years, by which time revegetation will have reached a suitable height and density for use by bandicoots.

Offsets for the Growling Grass Frog

The habitat requirements of the Growling Grass Frog are also reasonably well established and comprise well vegetated wetlands with an abundance of submergent, emergent and floating vegetation, which are well connected by dispersal habitat. Dispersal habitat may include drains,

creeks, low lying areas or unobstructed pasture.

Monitoring of created wetlands for the Pakenham Bypass has demonstrated that Growling Grass Frog occupation and breeding has occurred at several wetlands within two years of establishment (Ecology Partners 2009).

Five breeding wetlands will be constructed for the Growling Grass Frog. The aim is to provide significantly more breeding habitat for the Growling Grass Frog, to potentially increase the local population and improve the chances of successful movements through underpasses.

Construction of two of the wetlands, comprising those incorporated into the 'Triangle Property' and the Western habitat corridor will commence when the land is acquired by VicRoads in Spring 2013. Construction of the remaining three wetlands will be undertaken during the construction phase.

Construction of the re-aligned McGregors Road Drain will be delivered during the construction phase.

The creation of suitable habitat for the Growling Grass Frog is relatively straight forward and the creation and use of habitat by this species can be documented and measured through the monitoring program.

Constructed wetlands and drains will remain in indefinitely.

8. Offsets must have transparent governance arrangements, including being able to be readily monitored, measured, audited and enforced (page 6).

Compliance

Monitoring requirements are addressed in this OMP through each element with key performance indicators.

The project will report against any specific monitoring and auditing obligations established under the EPBC Act approval conditions.

Adaptive Management under each element will identify the procedures to be followed if the element objectives have not been met.

One of the key aims of the monitoring is to determine the success of habitat restoration as an offset measure, including the use of created habitats by Southern Brown Bandicoots and Growling Grass Frogs.

The findings from the monitoring programs will feedback into and inform the project of the success of management actions undertaken as established under an Adaptive Management Framework for Stage 1A and future stages of the Healesville - Koo Wee Rup Road Upgrade.

Acknowledgments

5 Acknowledgments

We would like to thank the following people for assistance with the production of this report:

- Nadia Arkoudis, Andrew Robilliard, Robert Pearson, Raymond Paterson, Charlie Broadhurst, Frank Kauhausen, Devduni Unantenne, Scott Watson and Dimuth Gammampila (VicRoads);
- Jake Urlus, Bernadette Schmidt, Jono Ricciardello, Jamie McMahon and Lisa Crowfoot (Ecology Australia).

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Appendix 1 Offsets Assessment Guide calculations

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999* 2 October 2012

Southern Brown Bandicoot – offset 1.67 ha of vegetation lost with 7.1 ha reveg.

Matter of National Environmental Significance	
Name	Southern Brown Bandicoot
EPBC Act status	Endangered
Annual probability of extinction Based on IUCN category definitions	**1.2%**

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator

Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Ecological communities						
Area of community	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Threatened species habitat						
Area of habitat	Yes	Habitat loss/removal	**Area**	1.67	Hectares	Consultancy reports and field data
			Quality	**7**	Scale 0-10	
			Total quantum of impact	1.17	Adjusted hectares	
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)	% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																				
Area of community	No				**Risk-related time horizon (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**									
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0								
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**									
Threatened species habitat																				
Area of habitat	Yes	1.17	Adjusted hectares	7.1 ha of revegetation	**Time over which loss is averted (max. 20 years)**	20	**Start area (hectares)**	7.1	**Risk of loss (%) without offset**	35%	**Risk of loss (%) with offset**	0%	2.49	80%	1.99	1.57	1.25	107.17%	Yes	
									Future area without offset (adjusted hectares)	4.6	**Future area with offset (adjusted hectares)**	7.1								
					Time until ecological benefit	3	**Start quality (scale of 0-10)**	**1**	**Future quality without offset (scale of 0-10)**	**1**	**Future quality with offset (scale of 0-10)**	**7**	7.00		0.00	0.00				

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)	Start value	Future value without offset	Future value with offset	Raw gain	Confidence in result (%)	Adjusted gain	Net present value	% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Number of features e.g. Nest hollows, habitat trees	Yes		Count						0		0.00	0.00	#DIV/0!	#DIV/0!		
Condition of habitat Change in habitat condition, but no change in extent	No															
Threatened species																
Birth rate e.g. Change in nest success	No															
Mortality rate e.g Change in number of road kills per year	No															
Number of individuals e.g. Individual plants/animals	No															

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0				$0.00		$0.00
Number of features	0	0.00	#DIV/0!	**#DIV/0!**	$0.00	#DIV/0!	#DIV/0!
Condition of habitat	0				$0.00		$0.00
Area of habitat	1.169	1.25	107.17%	**Yes**	$0.00	N/A	$0.00
Area of community	0				$0.00		$0.00
					$0.00	**#DIV/0!**	**#DIV/0!**

Growling Grass Frog – offset 2.17 ha of drains lost with 2.17 ha of new drains

Matter of National Environmental Significance	
Name	Growling Grass Frog
EPBC Act status	Vulnerable
Annual probability of extinction Based on IUCN category definitions	**0.2%**

Impact calculator

Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Ecological communities						
Area of community	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Threatened species habitat						
Area of habitat	Yes	Habitat loss/removal	**Area**	2.17	Hectares	Consultancy reports and field data
			Quality	**4**	Scale 0-10	
			Total quantum of impact	0.87	Adjusted hectares	
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)	% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																				
Area of community	No				**Risk-related time horizon (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**									
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0								
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**									
Threatened species habitat																				
Area of habitat	Yes	0.87	Adjusted hectares	2.17 ha of rehabilitated drains	**Time over which loss is averted (max. 20 years)**	20	**Start area (hectares)**	2.17	**Risk of loss (%) without offset**	35%	**Risk of loss (%) with offset**	0%	0.76	80%	0.61	0.58	0.41	47.08%	No	
									Future area without offset (adjusted hectares)	1.4	**Future area with offset (adjusted hectares)**	2.2								
					Time until ecological benefit	3	**Start quality (scale of 0-10)**	1	**Future quality without offset (scale of 0-10)**	1	**Future quality with offset (scale of 0-10)**	7	6.00		0.00	0.00				
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**	**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows,	Yes		Count										0		0.00	0.00	#DIV/0!	#DIV/0!		

	habitat trees																	
	Condition of habitat Change in habitat condition, but no change in extent	No																
	Threatened species																	
	Birth rate e.g. Change in nest success	No																
	Mortality rate e.g Change in number of road kills per year	No																
	Number of individuals e.g. Individual plants/animals	No																

Summary

Summary	Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
						Direct offset ($)	Other compensatory measures ($)	Total ($)
	Birth rate	0				$0.00		$0.00
	Mortality rate	0				$0.00		$0.00
	Number of individuals	0				$0.00		$0.00
	Number of features	0	0.00	#DIV/0!	**#DIV/0!**	$0.00	#DIV/0!	#DIV/0!
	Condition of habitat	0				$0.00		$0.00
	Area of habitat	0.868	0.41	47.08%	**No**	$0.00	N/A	$0.00
	Area of community	0				$0.00		$0.00
						$0.00	**#DIV/0!**	**#DIV/0!**

Growling Grass Frog – offset remaining 1.37 ha of drains lost with 1.0 ha of breeding wetlands

Impact calculator

Impact calculator	Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
	Ecological communities						
	Area of community	No		**Area**			
				Quality			
				Total quantum of impact	0.00		
	Threatened species habitat						
	Area of habitat	Yes	Habitat loss/removal	**Area**	1.15	Hectares	Consultancy reports and field data
				Quality	**4**	Scale 0-10	
				Total quantum of impact	0.46	Adjusted hectares	
	Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
	Number of features e.g. Nest hollows, habitat trees	No					
	Condition of habitat Change in habitat condition, but no change in extent	No					
	Threatened species						
	Birth rate e.g. Change in nest success	No					
	Mortality rate e.g Change in number of road kills per year	No					
	Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)	% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																				
Area of community	No				**Risk-related time horizon (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**									
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0								
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**									
Threatened species habitat																				
Area of habitat	Yes	0.46	Adjusted hectares	1.0 ha of created wetlands	**Time over which loss is averted (max. 20 years)**	20	**Start area (hectares)**	1.0	**Risk of loss (%) without offset**	35%	**Risk of loss (%) with offset**	0%								
									Future area without offset (adjusted hectares)	0.7	**Future area with offset (adjusted hectares)**	1.0	0.35	80%	0.28	0.27	0.22	46.79%	No	
					Time until ecological benefit	3	**Start quality (scale of 0-10)**	**1**	**Future quality without offset (scale of 0-10)**	**1**	**Future quality with offset (scale of 0-10)**	**8**	7.00		0.00	0.00				
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**	**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	Yes		Count										0		0.00	0.00	#DIV/0!	#DIV/0!		

	Condition of habitat Change in habitat condition, but no change in extent	No															
	Threatened species																
	Birth rate e.g. Change in nest success	No															
	Mortality rate e.g Change in number of road kills per year	No															
	Number of individuals e.g. Individual plants/animals	No															

Summary

	Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
						Direct offset ($)	Other compensatory measures ($)	Total ($)
Summary	**Birth rate**	0				$0.00		$0.00
	Mortality rate	0				$0.00		$0.00
	Number of individuals	0				$0.00		$0.00
	Number of features	0	0.00	#DIV/0!	**#DIV/0!**	$0.00	#DIV/0!	#DIV/0!
	Condition of habitat	0				$0.00		$0.00
	Area of habitat	0.46	0.22	46.79%	**No**	$0.00	N/A	$0.00
	Area of community	0				$0.00		$0.00
						$0.00	**#DIV/0!**	**#DIV/0!**

Appendix 2 Protective fences proposed for the South Gippsland Highway crossings of the Bunyip River Drain Complex and "The Inlets" as part of the EPBC offsets for the Koo Wee Rup Bypass.

Data from Malcolm Legg of Mal's Ecological and Environmental Services found that from 16 February to 15 April 2011, seven road-killed Southern Brown Bandicoots were found on the South Gippsland Highway, comprising:

- An adult female with two pouch young killed 100 m east of the Koo Wee Rup Swamp Lookout Tower (16 February 2011);
- A lactating adult female killed on the Cardinia Creek bridge (21 February 2011);
- An adult female with two pouch young killed on the Bunyip River bridge (4 March 2011);
- A young male killed on the Cardinia Creek bridge (18 March 2011);
- A young male killed 50 m east of the Koo Wee Rup Swamp Lookout Tower (1 April 2011);
- An adult female with two pouch young killed on the Bunyip River bridge (16 April 2011); and
- An young male with two pouch young killed on the Bunyip River bridge (15 April 2011).

The locations of these road-killed bandicoots coincide with the South Gippsland Highway crossing bandicoot habitat along the waterways (e.g. Swamp Scrub, Estuarine Flats Grassland, exotic grassland) or where habitat adjoins the highway (e.g. Swamp Scrub of the Koo Wee Rup Swamp Lookout bordering the north side of the South Gippsland Highway).

Protective fauna fencing has been proposed in these areas to prevent Southern Brown Bandicoots from moving onto the road from adjoining areas of habitat, by directing bandicoots under bridges or physically preventing animals from accessing the road (Figure 4).

Fence types are given in the Fauna Infrastructure Report (Ecology Australia 2013b).

The lengths of protective fauna fences proposed in Figure 4 are 50 m on each side of bridge crossings over known habitat corridors surrounding waterways and accommodate the road-kill records above. The 50 m is based on the EPBC Act draft Referral Guidelines for the Southern Brown Bandicoot (DSEWPaC 2011) which quotes a distance of reduced connectivity or fragmentation of suitable habitat that results in distances of greater than 50 m resulting in a significant impact on the species. In other words, Southern Brown Bandicoots are considered unlikely to move (laterally) more than 50 m from the corridors along the Bunyip River Drain Complex and the drains of "the Inlets". Thus, a fence length of 50 m is proposed on each side of a waterway crossing.

A 300 m length of fence is proposed to span the known bandicoot habitat of the Koo Wee Rup Swamp Lookout on the north side of the South Gippsland Highway.

Figure 4 **Koo Wee Rup Bypass EPBC Act Offset Management Plan: protective fences proposed for the South Gippsland Highway crossings of the Bunyip River Drain Complex and "The Inlets", and along the Koo Wee Rup Swamp Lookout, as part of the EPBC Act offsets for the Koo Wee Rup Bypass.**