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# Western Highway Duplication Beaufort to Ararat: Alternative Options, Hillside Road Area; Peer Review



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## 1 Background and Scope

Ecology Australia was commissioned on 24 December 2015 to undertake a Peer Review of the flora and fauna reports relating to alternative route options for the Western Highway Section 2 Upgrade, in the vicinity of Hillside Road, some 12 km east of Ararat.

The central issue for this review is the adequacy of the assessments, and the comparative impact of VicRoads proposed Option 1, which traverses farmland to the south of the existing highway, and the 'Northern Option' proposed by Ms MairiAnne Mackenzie, which parallels the existing highway.

The key documents relating to this review include:

- Ecology & Heritage Partners report: Western Highway Project: Section 2, Beaufort to Ararat, Victoria. Biodiversity and Habitat Impact Assessment Report – Flora, Fauna and Ecological Communities, August 2012, Technical Appendix H, EES, WHP Section 2;
- Practical Ecology report: Western Highway Duplication: Beaufort to Ararat. Alternative Options, Hillside Road area, 25 November 2012;
- Ecology & Heritage Partners report: Impact comparison for the Western Highway Project, Section 2, dated 3 September 2015. Review by E&HP of Vegetation Assessment of Option 1 prepared by BDC (Version 2.0 June 2015) dated 8 September 2015;
- Blue Devil Consulting Pty Ltd report: Vegetation assessment of VicRoads Option 1 By-pass on private land adjoining Langi Ghiran State Park Version 5.0, October 2015
- EES Scope of Works (EHP 2015 Section 1.3.2);
- Minister of Planning May 2013 Table 1 Evaluation Objectives Biodiversity.

The scope of this review is to assess the:

- comparative Net Gain implications of Option 1 and the Northern Option;
- potential impacts on EPBC Act 1999 and/or FFG Act 1988-listed species and communities; and
- potential impacts on key ecological processes including barriers to movement and habitat fragmentation.

Our key findings, detailed in the following sections include:

- potentially greater loss of vegetation associated with Option 1 (c. 25.74 ha) than the northern option (c. 10.62 ha);
- presence of the EPBC Act-listed community: White Box – Yellow Box – Blakely's Red Gum (abbreviated: Box-Gum) Grassy Woodlands and Derived Native Grassland, along Option 1;
- extensive habitat for Golden Sun Moth (EPBC) throughout Option 1;
- potential habitat for Striped Legless Lizard (EPBC) along Option 1;
- high likelihood of resident Brush-tailed Phascogale (FFG) populations along both options; and
- potentially greater barrier impacts and fragmentation associated with Option 1.

A site inspection was held on 20 – 21 January 2016. This included discussions with an independent construction engineer experienced with VicRoads design and construction requirements as to practical footprints for the Northern Option, and the likely construction footprint associated with Option 1.

## 2 Net Gain

There are significant flaws in Ecology and Heritage Partners (EHP's) (2012, 2015) assessments of the Net Gain for Option 1:

- large areas of remnant 'patch' vegetation were not identified;
- substantial areas of the above vegetation are threatened Ecological Vegetation Classes (EVCs) – Hills Herb-rich Woodland and/or Grassy Woodland – misidentified by the authors;
- no explanation or suggestion of why there were vastly more Large Old Trees (VLOTs and LOTs) mapped in 2015 (= 113) than 2012 (= 27);
- no indication of a change to the 2012 Habitat Condition Scores on the basis of the 2015 result, considering for example Habitat Zone GDF4 had 0 LOTs in 2012 and 16 present in 2015;
- inadequate consideration of best and remaining habitat for key threatened species, e.g. Golden Sun Moth, Striped Legless Lizard and Powerful Owl; and
- consequential errors in the calculation of losses and targets and meeting the like-for-like requirements.

Overall, we are of the opinion that due to these shortcomings, EHP (2012) provided no basis for reliance by decision makers during the EES.

Practical Ecology (2012) evaluated two Northern Options proposed by MairiAnne Mackenzie. Overall we consider this assessment to be reasonable, and following a brief field check of their habitat zones and condition scores, have substantially relied upon this information.

For Option 1, Practical Ecology (2012) used data provided in EHP (2012), so for route comparisons their results are subject to the same substantive limitations that are outlined above.

As a general comment, we have found the varying widths, buffers and alignments discussed by various authors for the Northern Option(s) somewhat confusing. In an attempt to simplify the issue, our assessment (see below) is based on a single configuration, which according to an independent road engineer is both practical, and routinely employed by VicRoads, including in sections of the current Western Highway upgrade.

Blue Devil Consulting (BDC) (2015) focused on Option 1. This report's primary strength is the provision of sound floristic data (quadrat based), and provides compelling evidence for the presence of the EPBC-listed Box-Gum Grassy Woodland and Derived Grassland Community. The relevance of this for Net Gain is that BDC (2015) estimate that the total area of remnant patch vegetation in Option 1 is 25.74 ha (Figure 4), some 15 ha more than that identified by EHP (2012).

BDC employed a novel approach to the Net Gain assessment which included:

- quadrat-based condition scores, rather than a habitat zone approach; and
- provided no 'best and remaining' habitat assessment.

Hence, there are some limitations around their total habitat hectare score (9.13 Hha) and conservation significance assessment (Figure 4, Appendix 9). However, considering the absence of a best and remaining habitat analysis for a number of threatened species (Striped Legless Lizard, Golden Sun Moth,

Brush-tailed Phascogale and Powerful Owl), the assigning of conservation significance is likely to be conservative.

Overall, and in the context of Net Gain, the most significant element of the BDC (2015 report) is the identification of an additional 15 ha of mostly vulnerable (Hills Herb-rich Woodland) or endangered (Grassy Woodland Complex) EVCs and the resultant substantial increase in vegetation loss.

In summary, and in view of providing a rigorous comparison of Option 1 and the Northern Option, the following constraints apply:

- Ecology and Heritage Partners (2012, 2015) – too many serious flaws to allow a meaningful comparison;
- Practical Ecology (2012) – investigation largely restricted to the Northern Options (x 2) and primarily focused on the Framework (Net Gain). Assessment very limited in terms of threatened fauna, but fundamentals of habitat hectare assessment adequate. Application of a 25 metre construction footprint for the existing carriageway, suggests an overestimate of potential losses;
- Blue Devil Consulting (2015) – focused on Option 1 and identified 25.74 ha of remnants, 15 ha over and above that identified by EHP (2012); most consisting of threatened EVCs including the EPBC-listed community. The balance of the BDC Net Gain assessment differs somewhat from accepted methodologies.

Overall, these are quite significant limitations and their resolution beyond the scope of this review. We have however undertaken two tasks in relation to Net Gain that highlight the need for a reassessment of the respective options:

- Northern Option – as previously mentioned, we have estimated the losses associated with a dual carriageway, separated by the existing southern road reserve, suggested as a practical and realistic option by an independent road engineer.
- Option 1 – as part of the site visit we confirmed the presence of substantially more remnants as documented by BDC (2015), but time and seasonal constraints didn't permit a confirmation of actual boundaries. Furthermore we agree with BDC's floristic determination of these remnants as threatened EVCs and the EPBC listed community.

The assumptions underpinning the Northern Option provided here are as follows:

- Loss of native vegetation is an estimate only to enable a comparison between the Northern Option and Option 1;
- Habitat scores are based on those recorded by Practical Ecology (2012);
- To construct the new two-lane carriageway, the construction footprint has been assumed to be c. 22 m across most of the alignment. The construction width has been extended to c. 35 m for where a new rail bridge (and road) is required. This 35 m wide footprint extends for approximately 300 m.
- Minimising the loss of native vegetation is a priority. As such:
  - Where the existing highway is utilized for east-bound traffic, it is assumed that no further loss of native vegetation will be required.
  - For the new carriageway the native vegetation within the road reserve is avoided and retained within the median strip unless the new road reconnects with the existing road and loss of vegetation is unavoidable.

Based on the above assumptions, the loss of native vegetation for this Northern Option is estimated to be 10.62 ha (Appendix 1). Based on the scores collected by Practical Ecology this would result in an estimated loss of 7.72 Hha.

### Comparative Losses

The following table presents the vegetation losses estimated by the various authors. These figures demonstrate that:

- loss estimates vary widely;
- losses are based on different footprints and/or alignments;
- PE (2012) relied on EHP (2012) data for Option 1 losses;
- losses incorporate any identified procedural issues (e.g. BDC 2015) and/or significant flaws (e.g. EHP 2012, 2015); and
- it is highly probable that far greater parity exists between the options than contended by EHP (2012, 2015).

	Option 1		Northern Option	
	Loss (ha)	Loss (Hha)	Loss (ha)	Loss (Hha)
EHP (2012)	NA	NA	NA	NA
PE (2012)	10.61	4.28	<sup>1</sup> 13.11 / 15.31	<sup>1</sup> 9.44 / 11.00
EHP (2015)	17.31	8.49	39.55	22.27
BDC (2015)	25.74	9.13	NA	NA
This review	NA	NA	10.62	7.72

NA – not available

<sup>1</sup> PE (2012) considered two northern options.

### 3 EPBC Act 1999

There are several EPBC listed items relevant to the study area:

- White Box – Yellow Box – Blakely’s Red Gum (Box-Gum) Grassy Woodlands and Derived Grassland community
- Golden Sun Moth
- Striped Legless Lizard

#### 3.1 Box-Gum Grassy Woodland and Derived Grassland

This listed community was identified by BDC (2015), and its occurrence along Option 1 confirmed during our site visit. BDC (2015) provide substantive floristic data and analysis to define the community, and provide a rigorous assessment against the EPBC criteria.

We support BDCs (2015) contention that this grassy woodland and derived grassland was widespread across Option 1. Remnants can be readily identified by a variably species rich native grass and herbaceous understory, with a (now) generally sparse overstorey of Yellow Box and Drooping Sheoak (*Allocasuarina verticillata*). In the simplest terms, this was a grassy woodland dominated by Yellow Box, of which various modified states persist along Option 1.

We also agree with the BDC (2015) recommendation that the remnant patches of this community (i.e. those that satisfy the ‘patch’ criteria of the Framework) need to be evaluated against the EPBC condition (namely that 50% of the perennial cover is native and 12 native species are present) and patch (0.1 ha or greater) thresholds to satisfy the presence of the listed community.

From our brief observations some remnants may also exist in the paddocks at the eastern end of the Northern Option, in the vicinity of Hillside Road. The roadsides of Hillside Road also support the community.

EHP (2012, 2015) make no mention of this listed community.

#### 3.2 Golden Sun Moth

EHP surveyed for Golden Sun Moth (GSM) as part of the EES (EHP 2012). There are however significant shortcomings with their investigation:

- There are EPBC protocols for the survey of this species (DEWHA 2009). These are not referenced by EHP, and reviewing the outline of their methods (EHP 2012 p28, Appendix 3.4) we have little confidence that they were either consulted or adhered to.
- EHP (2012) define GSM habitat as either Plains Grassland or Modified Treeless Vegetation supporting >25% wallaby grasses. However, it has been well understood since 2006 that GSM habitat is more dependent on structure than floristics, and the species can occur in a broad range of habitats, from exotic pasture to grassy woodland (Endersby and Koehler 2006, Gilmore et al. 2008, DEWHA 2009). EHP’s habitat definitions are arbitrary and are not supported by the substantial body of evidence on this species.

- EHP recorded GSM within the present study area to the east and west of Pope Road (EHP 2012 p. 61, Figs. 3G-H). Their western most records were at Hillside Road, but there is no explanation as to whether surveys finished there, or whether no GSM were found further west, despite the presence of widespread habitat.

From our site inspection there is abundant suitable GSM habitat throughout Option 1, which appears to have been either dismissed by EHP or simply not surveyed.

Overall there are substantive shortcomings with EHP's assessment of GSM, and their results do not warrant inclusion in any meaningful comparison of the respective options.

### 3.3 Striped Legless Lizard

EHP simply state that '... there is no suitable habitat for Striped Legless Lizard (SLL) within the study area' (EHP 2012 p. 62). They are of the view that the species is confined to Plains Grassland, and only that with surface rock.

As for GSM, this is a complete misunderstanding of the species' habitat across its range. SLLs are known from a range of grassland (including exotic) and grassy woodland habitats on sedimentary, alluvial and volcanic soils. Even a cursory look at the EPBC Referral Guidelines (DSEWPC Australia 2011) reveals that they are present in a range of grassy woodland communities including the listed White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Grassland Community, now identified along Option 1. From our observations there are substantial areas of potential SLL habitat along Option 1.

Overall, the treatment of SLLs in the EES documentation (EHP 2012) lacks foundation, and is contrary to mainstream knowledge of the species.

## 4 FFG Act 1988

There are several FFG-listed species (those not also EPBC-listed) relevant to the study area. Two species of particular interest are Powerful Owl and Brush-tailed Phascogale. EHP (2012 Appendix 3) noted 16 and 25 recent (last 10 years) records respectively, but failed to detect either species during their surveys. EHP provide no analysis of why these species were not detected, despite for example a 2009 University of Ballarat record of Brush-tailed Phascogale adjacent to Langi Ghiran State Park, and locals reporting regular sightings (EHP 2012 p. 63).

Despite this evidence, and acknowledging suitable habitat (EHP 2012 p. 63), EHP conclude only a moderate likelihood of the species occurrence.

From our observations, and further information provided by MairiAnne Mackenzie, it is almost certain that Phascogales are in the Section 2 study area, and very likely in the forested corridors and Hillside Road reserve traversed by Option 1. It is also likely that Phascogale habitat would be impacted by the Northern Option.

EHP (2012) apply a similar questionable logic to Powerful Owl:

- 16 recent records
- local reporting of regular calls
- ample suitable habitat
- EHP conclude (p. 64): low to moderate likelihood of occurrence.

These two examples illustrate a lack of reasoning, poorly-based conclusions, and notably, a lack of understanding of the ecology of both species.

## 5 Ecological Processes

The EES Scope of Works requires assessment of barriers to movement, habitat fragmentation and vehicle road kills (EHP 2012 p. 19). These are critical issues for fauna and central to a comparison of the long-term effects associated with the respective options.

Despite there being potentially substantive differences between Option 1 and the Northern Option – or VicRoads Option 2 as assessed by EHP (2012) – EHP's (2012) assessment is limited to motherhood statements regarding wildlife corridors (Section 4.2.1.1), stating the obvious that barriers will be created (Section 8.2.2 point 10), or there will be increased road mortality (Section 8.2.2 point 12). They provide no analysis in terms of landscape context (e.g. impact of existing highway), the vulnerability of species, and the variable capacity of species to 'close gaps' in the landscape.

Nor do they provide any comparison of the alternative options, and their mitigation strategy extends to general comments on road crossing structures (Section 9.2.1.2), including references to species (Mountain Pygmy-possum) that have no relevance.

While a sound analysis of this issue remains to be undertaken, there are several characteristics of Option 1 that suggest a poorer outcome for fauna movement and fragmentation. These include:

- creating an entirely new barrier in the landscape;
- potentially dissecting habitat for three EPBC-listed items;
- crossing some four existing linear habitat links including Hillside Road;
- a larger construction footprint;
- limited opportunity to include a well-vegetated median to help ameliorate barrier effects.

## 6 Conclusions

There are three central themes to our conclusions:

- Comparison of options
- EPBC Act issues
- Ministerial Evaluation Objectives (Minister for Planning 2013).

### 6.1 Options comparison

This review has identified significant flaws in the assessment of the respective options by EHP (2012, 2015). Having also reviewed the work of Practical Ecology (2012) and Blue Devil Consulting (2015), we conclude the following:

- the work of EHP (2012, 2015) cannot be used as a basis for informed decision-making;
- values associated with Option 1 were seriously underestimated by EHP (2012, 2015);
- vegetation loss in the context of Net Gain is likely to be at least on parity if not greater for Option 1, than for a realistic footprint for the Northern Option;
- disruption to ecological processes, namely barriers to fauna movement and habitat fragmentation is potentially greater for Option 1 than the Northern Option.

### 6.2 EPBC Act Issues

We conclude that there are outstanding EPBC Act issues relating to Option 1:

- potential habitat for Striped Legless Lizard (Endangered);
- extensive suitable habitat for Golden Sun Moth (Critically Endangered); and
- presence of White Box – Yellow Box – Blakely’s Red Gum Grassy Woodland and Derived Native Grassland community (Critically Endangered).

These items were either not addressed in the EES (SLL and the listed community) or inadequately dealt with (GSM). They add appreciably to the values of Option 1, and potentially have implications under the respective significant impact guidelines if Option 1 was to proceed.

### 6.3 Ministerial Evaluation Objectives

The evidence presented here suggests that the Minister for Planning (2013) had insufficient and/or incorrect information on which to base a well informed decision. In relation to the evaluation objectives for biodiversity we conclude that the following key items were either inadequately dealt with or not addressed for Option 1 as part of the EES:

- substantially greater remnant patch vegetation present and therefore much greater vegetation loss;
- presence of the EPBC listed Critically Endangered community;
- widespread habitat for Golden Sun Moth (EPBC);
- potential habitat for Striped Legless Lizard (EPBC).

## 6.4 Summary

In summary, we conclude the following:

- there were serious flaws in the assessment of Option 1 as part of the EES, including non-compliance with Victoria's Native Vegetation Framework and omission of EPBC-listed items;
- the contention that Option 1 is preferred from a biodiversity perspective cannot be sustained on the current evidence;
- there is a compelling requirement for the full complement of values associated with Option 1 to be thoroughly assessed, and this should include:
  - extent and distribution of the Box-Gum Grassy Woodland and Derived Grassland EPBC-listed community;
  - Striped Legless Lizard (EPBC) surveys conforming to the Department of Environment protocols;
  - Golden Sun Moth surveys conforming to Department of Environment protocols;
  - revised Net Gain assessment including re-evaluation of remnant patch vegetation, best and remaining habitat, conservation significance and losses and targets;
  - revised assessment of key FFG-listed species, including Brush-tailed Phascogale and Powerful Owl; and
  - investigation of other important values including linear habitat links and the groundwater-fed (soak) habitats identified by BDC (2015).

Following completion of this Peer Review in February 2016, two further requests have resulted in the inclusion of two addenda:

Addendum 1: a summary table of compliance of the EES study (EHP 2012) with the Native Vegetation Framework and Matters of National Environmental Significance (MNE) (EPBC Act 1999); and

Addendum 2: at the request of the Commonwealth Department of Environment in a phone conference on 13 May 2016, mapping and quantification of MNES omitted or inadequately addressed by EHP (2012).

The latter was the focus of a field survey on 26 May 2016.

## 7 References

- Blue Devil Consulting (2015). Vegetation Assessment of VicRoads Option 1 By-pass on private land adjoining Langi Ghiran State Park. Prepared for MairiAnne Mackenzie.
- Department of Environment and Heritage (2006). EPBC Act Policy Statements. White Box – Yellow Box – Blakely’s Red Gum grassy woodland derived native grassland. Australian Government.
- Department of Environment, Water, Heritage and the Arts (2009). Significant Impact Guidelines for the Critically Endangered Golden Sun Moth (*Synemon plana*). Australian Government.
- Department of Sustainability, Environment, Water, Population and Communities (2011). Environment Protection and Biodiversity Conservation Act 1999 referral guidelines for the vulnerable Striped Legless Lizard, *Delma impar*. Australian Government.
- Ecology and Heritage Partners (2012). Western Highway Project: Section 2, Beaufort to Ararat, Victoria. Biodiversity and Habitat Impact Assessment Report – Flora Fauna and Ecological Communities. Prepared for VicRoads.
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- Endersby I and Koehler S (2006). Golden Sun Moth *Synemon plana*: discovery of new populations around Melbourne. The Victorian Naturalist 123, 362-365.
- Gilmore D, Koehler S, O’Dwyer C and Moore W (2008). Golden Sun Moth *Synemon plana* (Lepidoptera: Castniidae: results of a broad survey of populations around Melbourne. Victorian Naturalist 125(2) 39-46.
- Minister for Planning (2013). Western Highway Project Section 2 Beaufort to Ararat. Assessment under Environment Effects Act 1978.
- Practical Ecology (2012). Western Highway Duplication: Beaufort to Ararat, Alternative Options, Hillside Road area. Prepared for Panels Victoria on behalf of MairiAnne Mackenzie.

**Appendix 1** Estimated losses for suggested footprint of Northern Option

Based on Practical Ecology (2012).

<b>HZ</b>	HDF1	HDF2	HHRW1	HHRW2	HHRW3	HHRW4	HHRW5	HHRW6	HHRW8	HHRW9	HHRW10
LOTS	5	7	0	9	0	5	10	0	5	7	2
CC	4	4	0	4	0	4	4	0	4	4	4
US	25	20	25	25	5	25	25	25	25	20	20
LW	13	13	7	7	4	7	11	7	7	13	13
Rec	10	5	6	10	5	10	10	6	10	10	10
OL	5	5	5	5	3	5	5	5	5	5	5
Log	5	5	2	5	0	5	5	2	5	5	4
Landscape	16	16	16	16	16	16	16	16	16	16	16
<b>Total</b>	83	75	61	81	33	77	86	61	77	80	74
<b>Area</b>	0.05	0.4	1.1	0.13	0.3	0.1	0.88	0.75	0.05	0.2	0.03
<b>Habitat hectares</b>	0.042	0.30	0.67	0.11	0.099	0.077	0.76	0.46	0.0385	0.16	0.022

<b>HZ</b>	HHRW11	HHRW12	HHRW13	HHRW14	HHRW15	HW1	HW2	HW3
LOTS	7	3	3	3	3	7	2	0
CC	4	2	2	2	2	4	4	0
US	20	20	20	20	20	20	25	20
LW	13	13	13	13	13	13	13	13
Rec	10	10	10	10	10	10	10	10
Litter	5	3	3	3	3	3	5	5
Log	2	3	3	3	3	3	4	0
Landscape	16	16	16	16	16	16	16	16
<b>Total</b>	77	70	70	70	70	76	79	64
<b>Area</b>	0.4	0.17	0.16	0.5	1.8		3.6	<b>10.62</b>
<b>Habitat hectares</b>	0.31	0.12	0.11	0.35	1.26	0	2.84	<b>7.72</b>

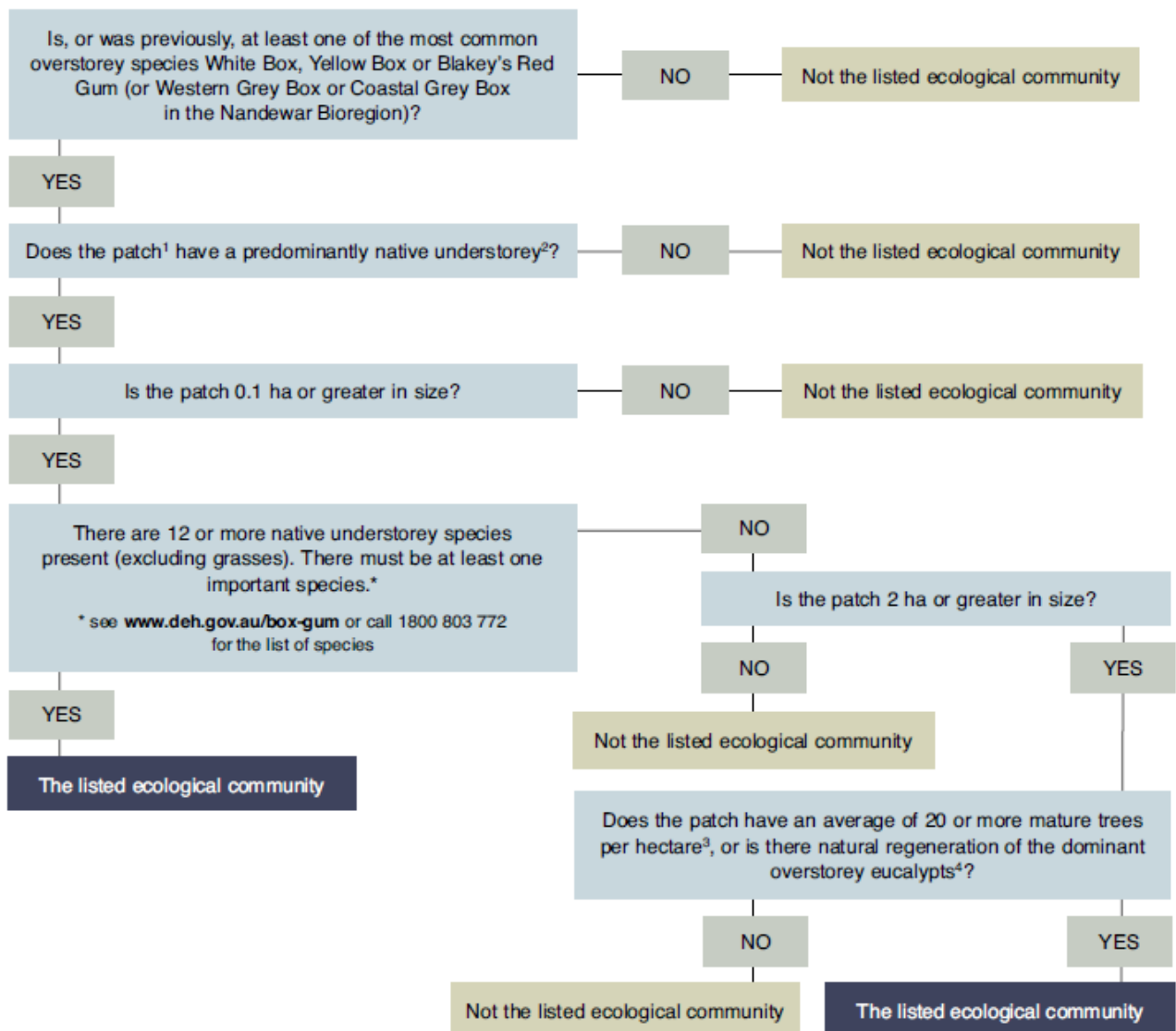
### Addendum 1. Summary of Compliance Option 1 – Ecology and Heritage Partners (2012).

Policy / Legislation	Item	Compliance	Reason	Reference
<b>Native Vegetation Framework / Net Gain</b>	Remnant patch area	Non-compliant	Underestimated by approximately 15 ha	BDC (2015), this study
	Ecological Vegetation Classes	Non-compliant	Incorrect identification and mapping	BDC (2015), this study
	Large Old Trees	Non-compliant	Gross underestimate of number	EHP (2015), this study
	Habitat Zones	Non-compliant	Area underestimated by 15 ha, and underscored	BDC (2015), this study
	Best and Remaining habitat	Non-compliant	No consideration of Golden Sun Moth and Striped Legless Lizard habitat	This study
	Type and extent of losses and targets	Non-compliant	Non-compliance with key inputs (above) to losses and targets	BDC (2015), this study
	Overall	Non-compliant	Non-compliance with key components	This study
<b>EPBC Act 1999</b>	Golden Sun Moth (Critically Endangered)	Omission / non-compliant	Methodology appears non-compliant and no habitat identified for Option 1	This study
	Striped Legless Lizard (Endangered)	Omission / non-compliant	Habitat not considered	This study
	Box-Gum Grassy Woodland and Derived Grassland (Critically Endangered)	Omission / non-compliant	Community not identified	BDC (2015), this study
	Significant Impact on Matters of National Environmental Significance	Omission / non-compliant	Significant Impacts likely: <ul style="list-style-type: none"> <li>reduced area of occupancy;</li> <li>fragmentation of existing population;</li> <li>adversely affects habitat critical to survival</li> </ul>	Significant Impact Guidelines 1.1 Commonwealth of Australia (2013)

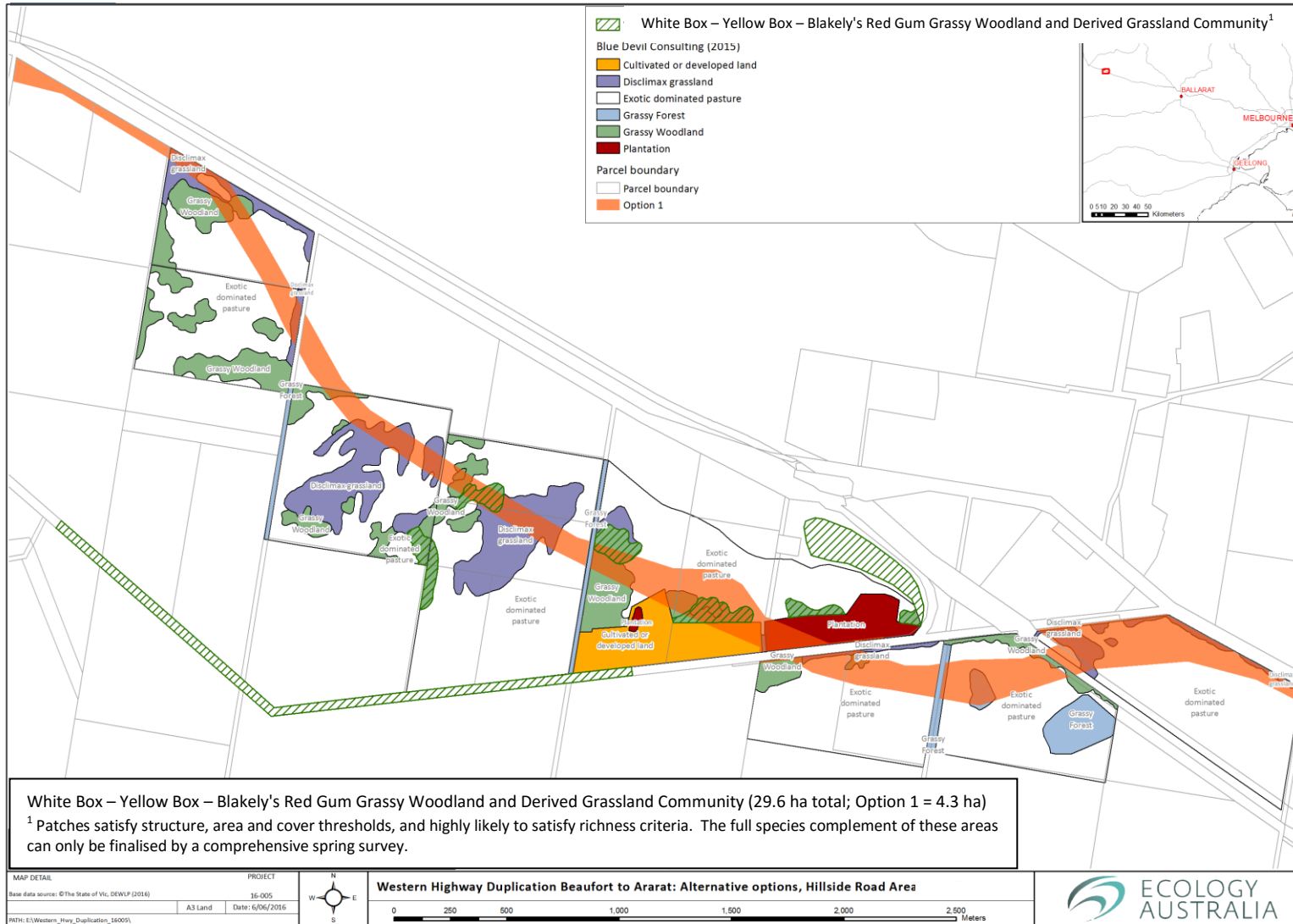
**Addendum 2. EPBC Act 1999 – Mapping of listed items Option 1 (site visit 26 May 2016).**

**a) Decision flowchart (Department of Environment and Heritage 2006) and mapping of White Box – Yellow Box – Blakely's Red Gum Grassy Woodlands and Derived Native Grasslands.**

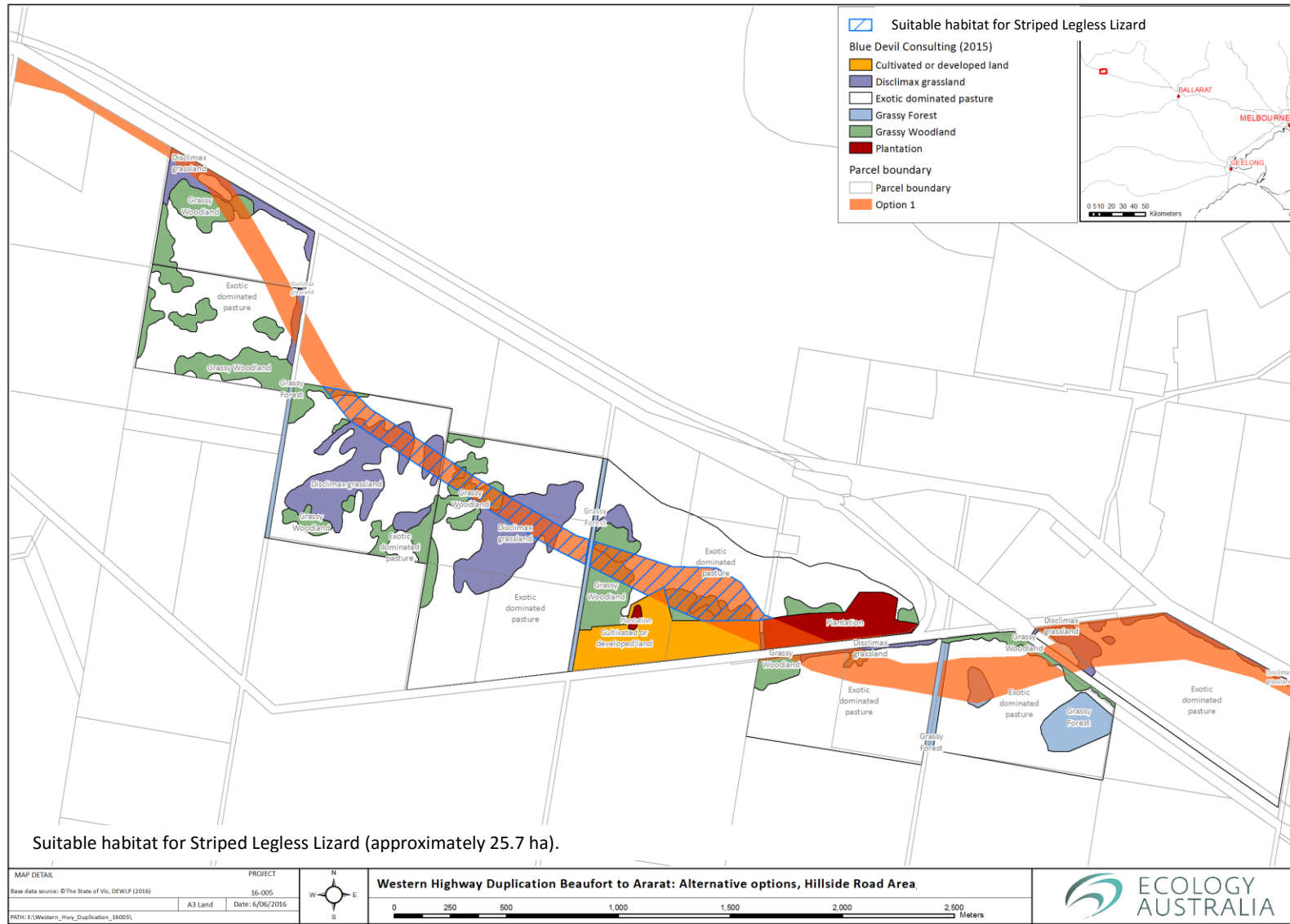
**Determining if your land has an area of the listed ecological community**



**a) Mapping of White Box – Yellow Box – Blakely's Red Gum Grassy Woodlands and Derived Native Grasslands.**



**b) Suitable Striped Legless Lizard habitat**



c) Suitable Golden Sun Moth habitat

