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DRAFT REPORT:

Targeted Golden Sun Moth Assessment for the Melbourne – Geelong Interconnection; Tarneit to Lovely Banks, Victoria

PREPARED FOR:

Kellogg, Brown & Root Pty Ltd

2 March 2010

Ecology Partners Pty Ltd

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Acknowledgments

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- Ruth Macdonald and Adam Rigg (Kellogg Brown & Root Pty Ltd.), for project and site assistance, provision of vegetation mapping maps and background information.
- The Department of Sustainability and Environment for access to the data available on the Atlas of Victorian Wildlife.

The following Ecology Partners Pty. Ltd. staff contributed to this report: Simon Scott, Denise Betts, Aaron Organ and Hannah Ferrier

SUMMARY

Introduction

Ecology Partners Pty. Ltd. was engaged by Kellogg Brown & Root Pty Ltd (KBR) to undertake targeted Golden Sun Moth *Synemon plana* surveys along the proposed Melbourne to Geelong water pipeline. The project called the 'Barwon Water Melbourne Geelong Interconnection' extends approximately 56.4 kilometres, from the Cowies Hill Reservoir, Tarneit, to the Lovely Banks Basin, Lovely Banks, Victoria. The proposed pipeline is required to secure the potable water supply to Geelong.

KBR has already completed a flora and fauna assessment including Net Gain analysis along the proposed pipeline. Maps showing areas of remnant native grassland, and description of the study area were provided to Ecology Partners Pty. Ltd.

Methods

A desktop assessment was undertaken to determine the historic records of Golden Sun Moths west of Melbourne. This included a review of the Atlas of Victorian Wildlife, published and unpublished reports (where appropriate) and liaison with Alan Webster, DSE.

Site assessments were undertaken on five occasions from 21 November 1009 to 5 January 2010 within areas of potential habitat along the pipeline alignment. These were generally undertaken by two assessors in a vehicle and on foot. When driving through an area of potential habitat, assessors regularly got out and walked transects, or into areas which had the highest cover of perennial tussock grasses.

The season and conditions were suitable for site assessments. Records were marked with a hand-held Global Positioning System (GPS).

Results

Few records of Golden Sun Moth have historically been recorded within the study area, although 12 individuals have been recorded near Edgars Road, Mambourin (DSE 2009a). The general lack of records is likely to be due to the lack of survey effort undertaken for the species, and not necessarily because they do not occur within the area.

The study area is generally comprised of exotic grasslands or highly modified grasslands which are unlikely to provide habitat for Golden Sun Moth. Seven Golden Sun Moths were recorded within two paddocks which were dominated by native grasses, albeit with low diversity. These paddocks within the study area contain native grasses throughout including the rocky outcrops. All Moths were males, and all were recorded on the last day of the assessment, 5 January 2010.

Environment Protection and Biodiversity Conservation Act 1999

It is deemed necessary to refer the proposed pipeline development to the Department of the Environment, Water, Heritage and the Arts (DEWHA). It is understood that a referral is currently being prepared by KBR, and this species should be included in that referral.

As part of a referral it would be necessary to supply information on proposed mitigation and offset measures for likely or potential impacts to Golden Sun Moth within the study area.

Potential Impacts

A summary of potential impacts associated with the proposed pipeline installation include:

- Direct mortality of adult and larval stages of Golden Sun Moth as a result of the direct removal and/or disturbance to suitable habitat;
- Increased soil disturbance, soil removal/dumping, unauthorised works and compaction which may have a negative impact on remnant native vegetation including Golden Sun Moth habitat within the study area; and,
- Potential fragmentation and isolation of suitable grassland habitat.

Indirect effects on adjacent areas are also possible if construction activities and drainage are not appropriately managed, and these include:

- Potential for further spread of weeds and soil pathogens from on-site activities and subsequent degradation of remaining native vegetation including suitable Golden Sun Moth habitat; and,
- Indirect impacts to adjoining native vegetation/habitat where contractors are required to extend the footprint beyond the alignment, (although it is noted that the footprint has been minimised where possible e.g. proposed stockpile locations are .outside the areas of suitable habitat).

Recommended Mitigation Measures

It is recommended that the following mitigation measures be undertaken as a minimum to offset the minor anticipated impact on Golden Sun Moth within Properties 311605 and 144021:

- Avoid HZ 39 if possible; it is anticipated that this vegetation may be avoided by moving the proposed construction corridor. This is not the case on Property 144021 which has a generally high cover of indigenous grasses across the property. It is unlikely that altering the proposed construction corridor (apart from avoiding the entire property altogether) is likely to reduce the impact on potential habitat for Golden Sun Moth;
- Micro realign impacts away from areas with a high cover abundance of tussock grasses where possible i.e. undertake construction in previously disturbed areas or introduced vegetation where possible;
- Minimise the construction corridor within these areas as far as practicable. Retained areas within known habitat should be fenced off with temporary high visibility fencing to exclude construction contractors entering these areas;
- Undertake revegetation of any disturbed soil using locally indigenous tussock grasses particularly spear grasses and wallaby grasses;

- Prepare a Conservation Management Plan (or Threatened Species Management Plan) for the Golden Sun Moth as part of the EPBC Act referral.

1 INTRODUCTION

1.1 Background

Ecology Partners Pty. Ltd. was engaged by Kellogg Brown & Root Pty Ltd (KBR) to undertake targeted Golden Sun Moth *Synemon plana* surveys along the proposed Melbourne to Geelong water pipeline. The project called the 'Barwon Water Melbourne Geelong Interconnection' extends approximately 56.4 kilometres, from the Cowies Hill Reservoir, Tarneit, to the Lovely Banks Basin, Lovely Banks, Victoria (Figure 1). The proposed pipeline is required to secure the potable water supply to Geelong.

KBR has already undertaken a flora and fauna assessment including Net Gain analysis along the proposed pipeline. Maps showing areas of remnant native grassland, and description of the study area were provided to Ecology Partners Pty. Ltd.

1.2 Objectives

The objectives of the targeted Golden Sun Moth surveys was to determine the status (i.e. the presence or absence within the study area), and if present, to discuss the overall importance of the study area for the species. Mitigation measures to avoid and/or minimise potential impacts to any resident populations along the proposed pipeline are also provided. This report is to assist with the proponent's requirements under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999. A detailed discussion of other legislation has therefore not been provided.

1.3 Study Area

The proposed pipeline includes road reserves and private property. Across private property the alignment generally follows a powerline easement. Historic and ongoing agricultural land use such as cropping, grazing and rock removal was evident along the proposed alignment, and the vegetation is largely modified. However, some relatively small areas of vegetation classified as remnant patches[1] of native vegetation occur along the alignment. Targeted surveys for Golden Sun Moth were undertaken in areas of potentially suitable habitat identified by KBR within the request for proposal.

The areas targeted for the surveys included:

'Areas targeted for surveys are scattered between chainages 29 kilometre and 53 kilometre [from Melbourne], with an isolated area at 11.25 kilometre. Present along the alignment are other potential habitat locations that do not contain greater than 25% native [vegetation] cover, including infestations of Nassella trichotoma *(Serrated Tussock) to the south of Werribee River, (43.5 kilometre to 44.75 kilometre) and to the south, (chainage 30.5*

[1] Remnant patches are defined as 'an area of vegetation where… at least 25% of the understorey cover is native' (DSE 2007).

kilometre), and north, (chainage 31.5 kilometre) of the Little River.' Adam Rigg (Ecologist, KBR), Request for Proposal, 16 November 2009.

This area, here forth termed 'the study area', is approximately 30 metes wide, reduced to 10 metres wide in areas of environmental sensitivity, although the targeted surveys generally were undertaken within 50 metres of the proposed pipeline alignment. The actual trench will be approximately two metres wide.

2 METHODS

2.1 Desktop Assessment

The Atlas of Victorian Wildlife (AVW) was reviewed to identify historic records of Golden Sun Moth along the proposed alignment and within 10 kilometres surrounding the proposed pipeline (AVW 2007).

Other literature reviewed (Biosis 2008) includes records of Golden Sun Moth in close proximity to Melbourne, up to approximately 10 km east of the study area (Figure 1).

The recently published '*Delivering Melbourne's Newest Sustainable Communities – Strategic Impact Assessment Report* (DSE 2009a) (another publicly available document) was also reviewed prior to the surveys being undertaken.

Liaison with Alan Webster, DSE was undertaken on 20 January 2010, and KBR have also spoken with Richard Boekel, DSE.

2.2 Targeted Golden Sun Moth Surveys

Golden Sun Moth is a diurnal moth generally found in areas of remnant indigenous grassland, particularly where wallaby-grasses *Austrodanthonia* spp. dominate the ground layer, but is also known to use areas dominated by exotic grass species. The species is known to be active from October to early January and emergence can vary within and between sites, and according to weather conditions. Surveys should be undertaken between 11am and 4pm on warm, sunny days with a minimum temperature of 20°C, and little wind to maximise the detection of the species at a given site.

Targeted surveys for Golden Sun Moth were undertaken at potentially suitable habitat over five separate days the study area; 21 November, 22 November, 15 December, 22 December and 5 January 2010. Targeted surveys were undertaken by qualified zoologists during optimal weather conditions for the detection of the species (Table 1).

Table 1. Weather Conditions during the targeted Golden Sun Moth assessments

Date	Temperature at approx 1pm (°C)	Wind	Cloud
21 November 2009	26	Gentle northerly	Light to moderate
22 November 2009	20	Gentle south-westerly	Moderate to heavy
15 December 2009	30	Gentle south-westerly	Nil
22 December 2009	27	Gentle south-westerly	Nil
5 January 2010	25	Gentle south-westerly	Light

Each survey involved two assessors (three on 22 November 2009) traversing the study area on foot and/or in a vehicle. In areas which contained perennial tussock grasses (particularly areas containing spear grasses *Austrostipa* spp. and wallaby grasses *Austrodanthonia* spp), the

assessors regularly got out of the vehicle and walked potential habitat. In such areas, assessors walked up to approximately 50 metres beyond the alignment. When waking, the assessors typically walked transects approximately 20 metes apart from each other, or meandered into areas which had the highest cover of native perennial tussocks.

The location of any moth sightings was recorded on a hand-held GPS unit, which has an accuracy of +/- 5 metres.

The survey period over 2009/10 was not typical of previous years with (anecdotally) generally lower maximum temperatures in December. For this reason, it was decided to space the surveys over a period of six weeks, into early January. Other sites known to support resident populations of Golden Sun Moths were visited by other assessors to confirm that the species was flying on that day, therefore demonstrating that the current surveys were undertaken during optimal survey conditions (i.e. conducive to detecting flying males). These reference sites revealed that there was little activity during early and mid December, and that there were more individuals detected at sites during warmer periods in November, late December and also early January. As such, these observations demonstrated that the spacing/timing of the surveys over a period of six weeks was suitable to maximise the detection of the species.

Fauna surveys were conducted under the Ecology Partners Pty. Ltd. research permit (#10004532) issued by DSE under the *Wildlife Act 1975*.

2.3 Assessment Qualifications and Limitations

Targeted Golden Sun Moth surveys were undertaken by experienced personnel during the known flight period of the species, and during appropriate survey/weather conditions. Reference sites were also used to determine if Golden Sun Moths were active at this time.

The data provided within this report includes a review of published information. The accuracy of the information relies on the source of the information. While we are aware that further targeted surveys throughout western Melbourne (within the revised Urban Growth Boundary) have been commissioned by DSE and the Growth Areas Authority (GAA), however, no data from these surveys (with regard to location, numbers or the relative importance of sites for the species across the region) is currently available. As such, the findings presented in this report are based on the best available information on the species' distribution at, and within the vicinity of, the study area.

Generally, it appears that targeted species assessments have not been undertaken along the study area. This means that historic records are unlikely to occur within the study area. It is possible that populations exist within these areas, but have not yet been recorded or published.

Surveys have been undertaken over a single season, and for relatively short amounts of time compared with the suitable survey period. As with any ecological assessment, greater time on an area may yield additional information on use of the study area by the targeted species. This notwithstanding, the survey effort is consistent with the standards provided within DEWHA (2009), and therefore considered appropriate o achieve the purposes of this report.

3 RESULTS

3.1 Golden Sun Moth *Synemon plana*

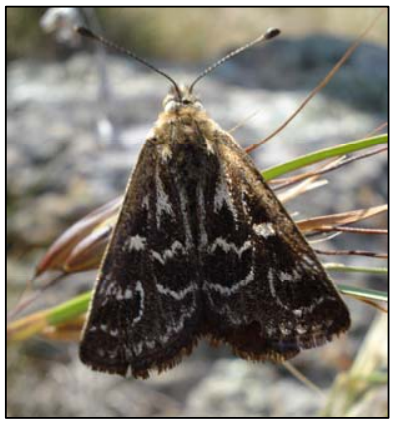
Golden Sun Moth is a nationally significant species which is currently listed as critically endangered under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). It is also listed as a threatened species under the Victorian *Flora and Fauna Guarantee Act 1988* (FFG Act).

Generally, areas of potential breeding habitat for Golden Sun Moth are likely to be in open grassland areas supporting a higher percentage cover of wallaby grass *Austrodanthonia* spp.

The species typically occurs in native grassland dominated by greater than 40% cover of wallaby grass, in particular Short Wallaby-grass *Austrodanthonia carphoides* (DSE 2004), but may also inhabit areas dominated by Kangaroo Grass *Themeda triandra* (Endersby and Koehler 2006), and introduced grassland (Organ, A. pers. comm. 5 January 2010). Male flight is typically low, to about a metre above the ground, fast and can be prolonged, but they are generally not recorded flying more than 100 metres from suitable habitat (Clarke and O'Dwyer 2000). Small, disjunct populations are vulnerable as there is little likelihood of recolonisation of an area in the event of a local extinction.

Prior to European settlement, Golden Sun Moth was widespread and relatively continuous throughout its range, inhabiting grassy open woodlands and grassland, although it currently inhabits small isolated sites (DSE 2004). The species is threatened by habitat loss, disturbance and fragmentation due to agricultural expansion and urbanisation. Populations have been isolated and fragmented, impeding the ability of the relatively immobile females to recolonise areas, thereby reducing the likelihood of genetic exchange (DSE 2004). Until 2006/07, the species was known to exist in less than a dozen sites in each of New South Wales and the Australian Capital Territory and, six sites in Victoria. However, recent targeted surveys around Melbourne have located the species from at least an additional 40 sites (Biosis 2008; Organ, A. pers. comm. 5 January 2010), and more recent unpublished data will increase this number of records further.

Plate 1. Golden Sun Moth (Source: Ecology Partners Pty. Ltd.)



3.2 Review of Previous Records

There are a number of records of Golden Sun Moth west of Melbourne (Figure 1). Most of these are concentrated close to Melbourne as they are areas which have been assessed for the purposes of potential property development. There are no previously published records within the study area as they are located within agricultural land which has not been surveyed previously.

Golden Sun Moths were recorded within the immediate vicinity of the proposed alignment during vegetation assessments for the Growth Areas Authority during 2008/09 (DSE 2009a). These include twelve individuals located approximately four kilometres south of the study area (Figure 1).

DSE Officers Alan Webster and Richard Boekel are unaware of any other populations which occur within the proposed pipeline although Mr Webster was aware of a population near Exford Road, Eynesbury, located approximately five kilometres north of the study area alignment (Webster, A, pers. comm. 20 January 2010, Macdonald, R, pers comm. 21 January 2010).

3.3 Current Survey Results

Seven male Golden Sun Moths were recorded at four locations during the targeted surveys within the proposed pipeline alignment. All of the records were on the last day of the survey period, 5 January 2009 (Figure 1). No female moths were observed either within or immediately adjacent to the study area during the targeted surveys.

Table 2. *Results of the targeted Golden Sun Moth surveys.*

Date	Number of Golden Sun Moths Observed	Location Description	Property Number	Corresponding Habitat Zone (No)	Latitude and Longitude
21 November 2009	0	N/A	N/A	N/A	N/A
22 November 2009	0	N/A	N/A	N/A	N/A
15 December 2009	0	N/A	N/A	N/A	N/A
22 December 2009	0	N/A	N/A	N/A	N/A
5 January 2010	3	North of the intersection with Little Ripley Road and Kirks Bridge Road	311605	HZ 39	55 277133 5802651
	1	North-east of Mount Mary Road	144021	HZ 57	55 284243 5810586
	2	North-east of Mount Mary Road	144021	HZ 58	55 284422 5810718
	1	North-east of Mount Mary Road	144021	HZ 59	55 284778 5810966

Notes: Datum WGS 84.

The three individual Golden Sun Moths observed within Property 311605 were located immediately north of Kirks Bridge Road containing a high cover (~50%) of spear grasses (Figure 2). Vegetation on HZ 39 (KBR 2009), and the remainder of Property 311605, is largely limited to rocky knolls with generally poor quality grasslands. The grasslands present support little diversity of native grasses and a high cover of weeds ≥50%. In addition, areas between knolls are cultivated and contain crops and sheep graze the property.

Observations of Golden Sun Moths occurred within HZ 57, 58 and 59 of Property 144021 (KBR 2009) (Figure 1). This property generally has a high cover (20-60%) of spear grasses, with the highest generally occurring across rocky knolls. However, the vegetation quality is considered low, due to a low cover abundance of other native plants including herbs. The cover of native plants was generally higher than that recorded during spring (when vegetation assessments were undertaken by KBR) where grazing pressures were higher and annual weeds had a higher cover abundance (Rigg, A, pers. comm. 22 November 2009). Despite the low quality (in terms of species richness), the entire property is considered to be habitat for Golden Sun Moth; as previously discussed (Section 3.1) Golden Sun Moth habitat includes areas dominated by tussock grasses, and therefore is not only associated with high quality grasslands. This property was grazed by cattle throughout the current survey period.

4 ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999

The EPBC Act establishes a Commonwealth process for assessment of proposed actions that are likely to have a significant impact on matters of National Environmental Significance (NES), or on Commonwealth land. An action (i.e. project, development, undertaking, activity, or series of activities), requires approval from the Commonwealth Environment Minister if it is likely to have a significant impact on any matters of NES.

Seven individual Golden Sun Moths were recorded within the study area during the current surveys. It is possible that a larger population exists, as estimates of total numbers would be required over several seasons. However, based on the known habitat use of the species, only a small proportion of the study area is likely to be regularly used by the species (i.e. rocky rises supporting a higher diversity and cover of native grasses).

Thresholds defining the "significant impact" the Golden Sun Moth are provided within DEWHA (2009). These are defined as:

- Habitat loss, degradation or fragmentation of >0.5 ha in large or contiguous habitat of >10 hectares; OR
- Any habitat loss, degradation or fragmentation in small of fragmented habitat of <10 hectares (DEWHA 2009).

Removal of potentially suitable habitat within Property 144021 will impact upon, or require the removal of, approximately 0.9 hectares (based on the assumption of a 30 x 300 metre area) of vegetation which is considered to be remnant native vegetation under the *Victoria's Native Vegetation Management – A Framework for Action* (DNRE 2002, DSE 2007). Furthermore, it will require the removal of adjoining vegetation which is also habitat for Golden Sun Moth due to the presence of other tussock grasses.

Whether the habitat is considered to be greater or smaller than ten hectares has not been established. However, the property is greater than ten hectares in size, and based on the observations made during the assessment, as well as same land use throughout, it is likely to contain greater than ten hectares of contiguous habitat for Golden Sun Moth. In any case, the proposed habitat clearance exceeds 0.5 hectares and therefore constitutes a significant impact to Golden Sun Moth.

As such, it is deemed necessary to refer the proposed pipeline development to the Department of the Environment, Water, Heritage and the Arts (DEWHA). It is understood that a referral is currently being prepared by KBR, and this species should be included in that referral.

As part of a referral it would be necessary to supply information on proposed mitigation and offset measures for likely or potential impacts to Golden Sun Moth within the study area.

5 POTENTIAL IMPACTS AND MITIGATION MEASURES

5.1 Potential Impacts

Any loss of ecological values should be viewed in the overall context of ongoing loss, fragmentation, and deterioration in the quality of remnant vegetation of Plains Grassland west of Melbourne. The proposed development will require the removal of a footprint which is five metres wide and extends approximately 56.4 kilometres. Of this, only a very small portion is located within suitable habitat for Golden Sun Moth. These areas include a small area located within Property 311605 and the areas with the highest cover of spear grasses located on Property 144021. Removal of small areas of habitat for the proposed pipeline is not expected to be a significant proportion of the potential habitat available on Property 144021, and therefore is not expected to significantly impact the resident Golden Sun Moth population.

A summary of potential impacts associated with the proposed pipeline installation include:

- Direct mortality of adult and larval stages of Golden Sun Moth as a result of the direct removal and/or disturbance to suitable habitat;
- Increased soil disturbance, soil removal/dumping, unauthorised works and compaction which may have a negative impact on remnant native vegetation including Golden Sun Moth habitat within the study area; and,
- Potential fragmentation and isolation of suitable grassland habitat.

Indirect effects on adjacent areas are also possible if construction activities and drainage are not appropriately managed, and these include:

- Potential for further spread of weeds and soil pathogens from on-site activities and subsequent degradation of remaining native vegetation including suitable Golden Sun Moth habitat; and,
- Indirect impacts to adjoining native vegetation/habitat.

5.2 Mitigation Measures

If the development was to proceed then the following measures should be adopted, although measures are more effective if adopted during the design and planning stages, rather than the construction phase. It is recommended that the following mitigation measures be undertaken as a minimum to offset the minor anticipated impact on Golden Sun Moth within Properties 311605 and 144021:

- Avoid HZ 39 if possible; it is anticipated that this vegetation may be avoided by moving the proposed construction corridor. This is not the case on Property 144021 which has a generally high cover of indigenous grasses across the property. It is unlikely that altering the proposed construction corridor (apart from avoiding the

entire property altogether) is likely to reduce the impact on potential habitat for Golden Sun Moth;

- Micro realign impacts away from areas with a high cover abundance of tussock grasses where possible i.e. undertake construction in previously disturbed areas or introduced vegetation where possible;
- Minimise the construction corridor within these areas as far as practicable. Retained areas within known habitat should be fenced off with temporary high visibility fencing to exclude construction contractors entering these areas;
- Undertake revegetation of any disturbed soil using locally indigenous tussock grasses particularly spear grasses and wallaby grasses. Success of this is greatly assisted when undertaken with weed management and ongoing maintenance of native plants (O'Dwyer and Attiwill 2000) ;
- It is understood that any native vegetation loss along the alignment will be offset in accordance with *Victoria's Native Vegetation Management – A Framework for Action* (Net Gain policy) (NRE 2002). It is therefore expected that there will be a net increase in the overall amount of vegetation that may form habitat for this species, and that this vegetation will be retained for conservation purposes in perpetuity;
- Vegetation offsets will most likely need to include grassland habitat occupied by Golden Sun Moth;
- A Conservation Management Plan (or Threatened Species Management Plan) for the Golden Sun Moth should be developed as part of the EPBC Act referral and this plan will need to formalise the measures outlined above and others that should occur (i.e. actions that are required pre-construction, during construction and post-construction).

In addition, while not considered a suitable mitigation measures *per se* individual Golden Sun Moths, including larvae, could potentially be salvaged and translocated into a suitable site within, or in the vicinity of the study area. However, this would be treated purely as experimental (DEWHA 2009). Other actions to compensate for any loss of Golden Sun Moth habitat within the study area should be consistent with the Draft Action Statement prepared for the species (DSE 2009b). For example, the proponent may negotiate with the referral authorities to contribute to a research project for the species, or fund a survey for the species throughout either the local area or though its former Victorian range.

6 CONCLUSION

Seven Golden Sun Moths were recorded on two properties during the targeted surveys (Figure 1). These two properties support the highest cover abundance of native spear grasses observed throughout the study area. Within these properties, Golden Sun Moths were observed within areas that contained the highest cover abundance of spear grasses.

Based on the low cover abundance of native species observed within other areas mapped as native grasslands within the study area, they are unlikely to provide habitat due to the relatively low cover abundance of perennial tussock grasses (particularly spear grasses), the isolation of small patches, or the historic and ongoing pressures associated with agricultural land use such as cropping, slashing, habitat destruction from rock removal, or grazing from livestock – all of which were observed within different parts of the study area. The properties which contained Golden Sun Moth appeared to have a low grazing intensity at the time of the assessment. It is likely that these historic and ongoing agricultural activities which have decreased the amount and quality of vegetation, is the reason for only observing small numbers of Golden Sun Moth.

The majority of the proposed pipeline alignment is highly modified and predominantly contains exotic vegetation. The proposed pipeline development represents a small area of habitat that is available to these species, and therefore is expected to impact the species on a local level, and not on a State or National level.

Several mitigation measures are recommended to minimise impacts on these two properties, while a Conservation Management Plan (or Threatened Species Management Plan), which includes an Offset Management Strategy for the species should also be prepared.

An EPBC Act referral to DEWHA is required for this species, and it is understood that this is currently being prepared for the project.

FIGURES

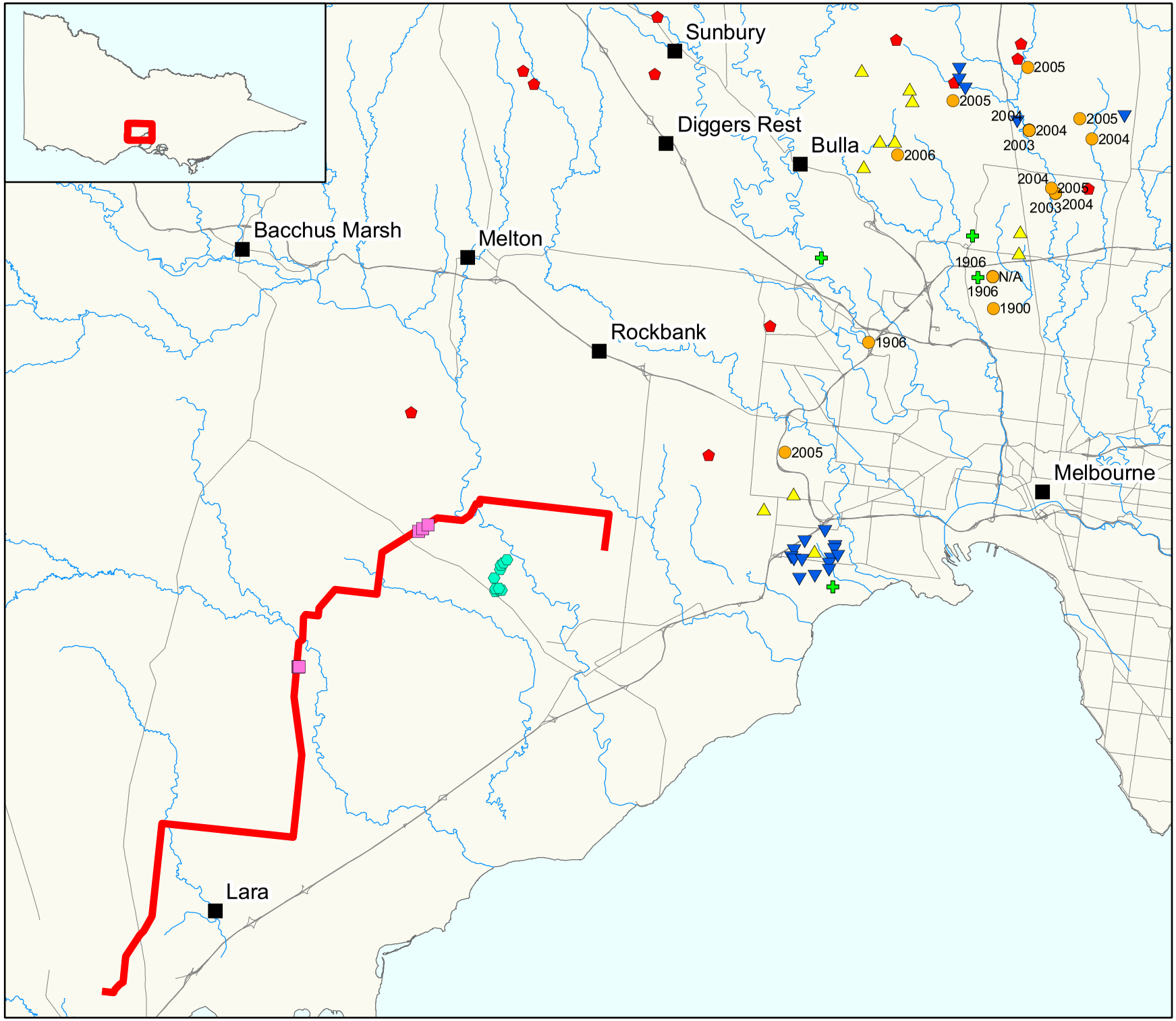


Figure 1
Study area and Golden Sun Moth records, Western Melbourne

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EP Map #: 1833 Figure 1
Issue Date: 2/2/2010

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