C.2 Additional Heritage Survey

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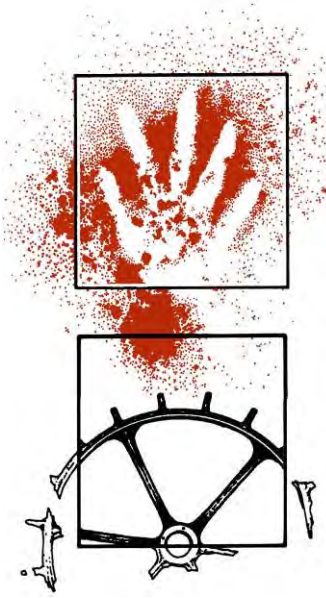

Navin Officer
heritage consultants pty ltd
abn: 28 092 901 605

Dear Kathryn

Re: Additional survey for Dalton Gas Pipeline – 11 August 2011

I'm writing to inform you of our results from the additional survey of the Dalton Gas Pipeline completed on 11 August 2011. No sites were recorded in Lots 23, 24, 27 and 30. While the artefact recorded at DGP1 (in Lot 26) was not re-found, another artefact was recorded about 10 m away from the original location (DGP1a). This site is located about 160 m from the western fence of Lot 26 so is outside the proposed impact area.

I also noted an area of archaeological potential (Dalton PAD3) in Lot 30 near Oolong Creek, however this area is about 270m from the eastern fence of the lot and therefore outside impact area.

Both DGP1a and Dalton PAD3 are illustrated on the attached map.

Please let me know if you need any further information.

Kind Regards,

Christine Gant-Thompson

(Ms) Christine Gant-Thompson

Attachment 1 Map showing location of site and PAD recorded during additional survey of Dalton Gas Pipeline on 11 August 2011.

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D

Appendix D Additional Ecology Survey

Appendix D-1: Reptile Supplementary Results

Pink-tailed Worm-lizard and Striped Legless Lizard Target Surveys

Proposed Dalton Power Project
Dalton, N.S.W

A report prepared for URS Australia

SEPTEMBER 2011

Report No. ER 0290

Citation

EnviroKey (2011) Pink-tailed Worm-lizard and Striped Legless Lizard Target Surveys, Proposed Dalton Power Project. A report prepared by S. Sass of EnviroKey for URS Australia. Report No. ER.0290. Final Report. Version 1.0. 29th September 2011.

Commercial In Confidence

Disclaimer

The scope of work for this report was defined by time and budgetary constraints and the availability of other reports and data.

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1 INTRODUCTION

EnviroKey were engaged by URS Australia (URS) to undertake a target survey for the Pink-tailed Worm-lizard (*Aprasia parapulchella*) (PTWL) and Striped Legless Lizard (*Delma impar*) (SLL) at the location of the proposed Dalton Power Project, north of Gunning, NSW.

To date, surveys for these species have been completed within and surrounding the proposed footprint of the project and offset area (EnviroKey 2011; URS 2011). However, recent discussions between URS and the NSW Office and Environment & Heritage (OEH) have resulted in the identification that target surveys for PTWL should also be completed in Spring to satisfy an OEH adequacy review. In addition, discussions between URS and the Department of Sustainability, Environmental, Water, Population and Communities (SEWP&C) identified that a Spring survey would also be required for SLL.

This report details the methodology and results of a Spring target survey. Discussion is also provided as to whether the PTWL and SLL are likely to occur within the study area.

2 METHODOLOGY

A target survey was conducted between the 25th – 29th September 2011 by a suitably qualified and experienced Herpetologist and an assistant Ecologist. The qualifications and experience of these personnel are provided (Appendix 1).

The field survey was conducted under the authority of current NSW Scientific License issued under Clause 23 of the *National Parks and Wildlife Regulation 2002* and section 132C of the *National Parks and Wildlife Act 1974* by the NSW OEH and an Animal Research Authority issued by the Director-General's Animal Care and Ethics Committee (ACEC) of Industry and Investment NSW. Survey design was guided with consideration of the 'Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities (working draft)' (DEC 2004) and the experience of the Herpetologist.

This study has utilised a range of sampling techniques as documented within DEC (2004) combined with using an experienced herpetologist to maximise the potential for detecting reptile fauna. Four methods were employed: Funnel trapping, Active hand searches, Walking Transects and Opportunistic surveys. Survey effort and timing is considered consistent with the those outlined within 'Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities (working draft)' (DEC 2004). As with previous target survey for PTWL and SLL conducted by **EnviroKey** within the study area (EnviroKey 2011), this target survey also meets these guidelines.

2.1 FUNNEL TRAPPING

Funnel trapping was chosen as the survey technique for SLL rather than pitfall traps due to their effectiveness in capturing a wide variety of reptile fauna including pygopods (Denny 2005; Garden *et al.* 2007; Sass 2009; Thompson and Thompson 2007), their time efficiency with trap activation and their ability to minimise disturbance impacts to reptile habitats (Smith and Robertson 1999). This method is also known to detect PTWL (Wong *et al.* inpress).

Funnel trapping was completed in areas mapped by URS as Natural Temperate Grassland and Box-Gum Woodland. Two trap lines were established within these two vegetation communities giving a total of four trap lines. Each trap line comprised a 25m long and 0.23m tall PVC drift fence and six funnel traps (3pr) evenly spaced along the drift fence. Trap lines were activated on the 25th September 2011 (mid-morning) and deactivated on 29th September 2011 (mid-morning) giving a survey effort of four nights/five days resulting in a total of 24 trap nights per vegetation community and 48 trap nights in total effort. Funnel traps were checked twice daily in accordance with ACEC protocol.

Spatial locations of trap locations are provided in Appendix 2.

Table 1: Total survey effort during this study.

Survey type	Survey effort
Funnel trapping	4 drift fences each with 3pr of funnel traps activated over 4 nights/5 days. Total trap nights is 48 nights.
Active hand searches	786 rocks in total, at nine locations.
Walking transects	Opportunistically while walking between survey sites throughout the five day survey period.
Opportunistic	Onsite for five days, collecting data on reptile fauna.

2.2 ACTIVE HAND SEARCHES

Searches of rock outcropping was undertaken across the study area during the study period as this method is known to detect both the SLL (Dorrough *et al.* 1996; EcologyPartners 2007; Koehler 2004; Smith and Robertson 1999) and the PTWL (Jones 1998; Michael and Herring 2005; NPWS 1999; Osborne and Jones 1995; PB 2007).

Previously mapped areas of rock outcropping completed by URS were visited and extensively searched resulting in nine survey locations. Loose surface and partially embedded rocks were gently lifted and checked for the presence of reptile fauna or signs of their past presence such as sloughs, scats or eggs. The soil was gently raked to detect any SLL or PTWL that are also known to refuge just beneath the soil surface. Rocks were then returned to their original position. Temperatures experienced during the survey period were conducive to detecting either species under rocks throughout daylight hours. The highest maximum temperature (recorded by a hand-held Kestrel Weather Station) during the hand searches was 13.9 degrees Celsius. A hand-held counter was utilised to enable an accurate count of the total number of rocks searched. Of relevance to PTWL, the number of rocks with small, black ants beneath was also recorded.

Systematic sampling of rock outcrops was conducted during this study to cover as many searchable rocks as possible. This method was chosen to ensure completeness of search extent during this study. Searches were also made of fallen timber and coarse woody debris, leaf litter, fallen bark and anthropogenic material such as corrugated iron wherever these attributes were observed.

Spatial locations of active hand searches are provided (Appendix 2).

2.3 WALKING TRANSECTS

Walking transects for SLL were undertaken opportunistically while traversing between rock outcrops during the survey period. SLL has been previously detected by walking through suitable habitat near Goulburn (Daly *et al.* 2008) and this method is considered appropriate given their diurnal foraging behavior (Coulson 1990).

2.4 OPPORTUNISTIC RECORDS

If any species of reptile was observed outside of the previous three survey methods, the species was recorded as an opportunistic sighting and included within the pooled dataset.

2.5 NOMENCLATURE

Nomenclature used during this study follows that of the field guide to the reptiles of NSW (Swan *et al.* 2004) with the exception of recent taxonomic revisions within Egernia (Gardner *et al.* 2008), the *Gehyra variegata* complex (Sistrom *et al.* 2009), the 'snake-eyed' skinks (Horner 2007) and the *Lerista* genera (Hutchinson 2008).

3 RESULTS

3.1 PINK-TAILED WORM-LIZARD

As with our February 2011 survey, no PTWL were recorded during this study. Across the nine survey locations, a total of 786 rocks were searched. Combined with the target survey completed by **EnviroKey** earlier this year, the search effort is now 1291 rocks. Additionally, previous surveys completed by URS have also undertaken rock searches giving both a large search effort with temporal variation. Previous surveys have also failed to detect PTWL.

Relevant to the life cycle of PTWL, rock searches revealed an increase in the number of rocks with black ants beneath from the February survey. A total of 81 rocks were noted with black ants present, around 10.3% of the total rocks searched.

3.2 STRIPED LEGLESS LIZARD

As with our February 2011 survey, no SLL were recorded during this study. As with previous surveys, another pygopod was recorded several times; *Delma inornata*. This species can be easily distinguished from SLL by the presence of three pre-anal scales rather than two in SLL, in the hands of an experienced herpetologist.

3.3 OTHER REPTILE FAUNA

A number of other reptile species were detected during this study. A total of nine species of reptile were recorded comprising of:

- one species of gecko
- one species of legless lizard
- five species of skink
- one species of dragon
- one species of snake

No threatened reptile species were recorded.

A full list of reptile species recorded and their method of detection is provided in Table 2.

Table 2: Reptile species recorded during this study and their method of detection (A=Active hand search, F=funnel trap, W=walking transect, O=opportunistic)

Common name	Scientific name	Method of detection
Eastern Stone Gecko	*Diplodactylus vittatus*	A
Plain snake-lizard	*Delma inornata*	A, F
Eastern bearded dragon	*Pogona barbata*	O
Eastern three-lined skink	*Acritoscincus duperreyi*	A
Southern rainbow skink	*Carlia tetradactyla*	F
Robust ctenotus	*Ctenotus robustus*	A
Grass sun-skink	*Lampropholis guichenoti*	F
Boulenger's morethia	*Morethia boulengeri*	F
Red-bellied black snake	*Pseudechis porphyriacus*	O

4 DISCUSSION

4.1 PINK-TAILED WORM-LIZARD

Two target surveys have been completed by an experienced herpetologist using methods commensurate with detecting PTWL - rock searches (Michael and Herring 2005) and funnel trapping (Wong *et al.* inpress). Search effort completed by **EnviroKey** has totaled 1291 rocks and 120 trap nights. This does not include the extensive search effort completed by URS ecologists within the study area.

Isolated populations are known from Lake Burrinjuck to the south-west and a number of populations in and around Canberra and adjoining areas of NSW but none within 60kms of the study area. Extensive surveys by the author in the Goulburn and Yass areas (Cullerin Range, Gullen Range and Yass Valley Wind Farms) have failed to reveal additional populations in this region. Over the past decade, additional survey effort across the Great Dividing Range and adjoining slopes has revealed new population of PTWL with only minor search effort.

Previous studies have suggested that the occurrence of PTWL is negatively associated with exotic flora (Jones 1998; Osborne *et al.* 1991). Life history traits (late maturity, low reproduction, low vagility) and the specialist habitat and dietary requirements of PTWL, also promote sensitivity to landscape change (Jones 1998; NPWS 1999; Wong *et al.* inpress). The existing environment within the study area has been compromised by both domestic stock grazing and extensive weed infestation (thistles) suggesting that if PTWL did once occur there, this is now unlikely.

With consideration of these factors and the comprehensive and temporal nature of surveys completed to date by **EnviroKey** and URS, it is reasonable to assert that PTWL does not occur within the study area.

4.2 STRIPED LEGLESS LIZARD

As for PTWL, extensive survey has been completed for SLL within the study area. It is the opinion of the author that SLL does not occur within the study area. This claim is based on several factors:

- Target surveys in the Yass/Gunning area failed to detect SLL (Lawler *et al.* 1999; Rowell *et al.* 2000).
- The study area is located within the Murrumbateman subregion of the Lachlan Catchment Management Authority. According to the DECCW Threatened Species Predictor Website, SLL is not predicted to occur (DECCW 2011).
- Extensive survey for windfarm developments in the Upper Lachlan local government area have failed to detect SLL.

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6 APPENDICES

APPENDIX 1 – QUALIFICATIONS AND EXPERIENCE OF PERSONNEL

Name and Qualifications	Experience
Steve Sass B.App.Sci (Env.Sci) (Hons) Principal Ecologist / Herpetologist Certified Environmental Practitioner, EIANZ Practicing Member, Ecological Consultants Association of Australia Member, Australian Society of Herpetologists	Steve is a highly experienced Ecologist and Herpetologist, having undertaken hundreds of ecological surveys, Threatened Species Assessments and provided specialist advice on frogs and reptiles across Australia for more than 10 years. Steve has extensive experience with more than 100 environmental assessments across Australia having provided specialist herpetofauna survey and assessment for a variety of projects including the Hume Highway duplication project, a 380km optic fibre cable in Western Australia, a 650km gas pipeline from Queensland to Newcastle and the Silverton, Nimmitabel, Yass Valley and Gullen Range Wind Farms in NSW. He is an Adjunct Associate of the Ecology and Biodiversity Group within the Institute for Land, Water and Society (ILWS), a leading research group at Charles Sturt University and he is accredited as a Certified Environmental Practitioner by the Environmental Institute of Australia and New Zealand.
Sam Parsell B. Env. Sci (on-going) Assistant Ecologist	Sam began her employ with EnviroKey as an Assistant Ecologist in early 2011. Sam provides value support to fauna surveys through her knowledge of a variety of fauna survey techniques including searches of rock outcrops for reptiles such as PTWL. For this project, Sam was under the direction supervision and guidance of Steve provide valuable field assistance.

APPENDIX 2 – SURVEY LOCATIONS

Dalton URS Survey Locations		
Easting	**Northing**	**Survey Type**
701052	6159749	Funnel Trap Line - NTG
701170	6159715	Funnel Trap Line - NTG
701331	6159833	Funnel Trap Line - BGW
701369	6159697	Funnel Trap Line - BGW
701445	6159724	Active Hand Search
701431	6159667	Active Hand Search
701377	6159658	Active Hand Search
701422	6159314	Active Hand Search
701457	6159213	Active Hand Search
701400	6159083	Active Hand Search
700928	6158603	Active Hand Search
700700	6158347	Active Hand Search
701240	6159543	Active Hand Search

Appendix D-2: Flora Supplementary Report

Report

Dalton Power Project

Targeted Threatened Flora Surveys

21/11/2011

Prepared for

AGL Energy Limited

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URS

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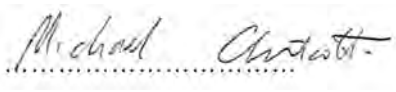


Michael Chilcott

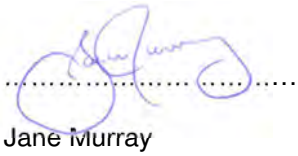
Principal Environmental Consultant

Author:

Kathryn Chesnut

Ecologist

Reviewer:



Jane Murray

Associate Ecologist

Date: **21/11/2011**
Reference: 43177661/0/1
Status: Final

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Abbreviations

Abbreviation	Description
ACT	Australian Capital Territory
AGL	AGL Energy Limited
DSEWPaC	Department of Sustainability, Environment, Water, Population and Communities
EA	Environmental Assessment
EECs	Endangered Ecological Communities
EP&A Act	*Environmental Planning and Assessment Act 1979*
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
GIS	Geographic Information System
GPS	Global Positioning System
km/h	kilometres per hour
m	metres
NSW	New South Wales
OEH	NSW Office of Environment and Heritage
TEC	Threatened Ecological Community
TSC Act	*Threatened Species Conservation Act 1995*
URS	URS Australia Pty Ltd

Executive Summary

URS Australia undertook a series of targeted threatened species searches to support the Environmental Assessment for the proposed Dalton Power Project to be submitted under Part 3A of the NSW *Environmental Planning and Assessment Act 1979*.

Despite extensive surveys already completed within the proposed offset and development areas by URS, no surveys had been undertaken during spring, when several threatened flora species with the potential to occur are likely to be visible and/or flowering. Consequently, and as proposed within the Environmental Assessment and following in depth discussions between URS, AGL and the Office of Environment and Heritage and the Department of Sustainability, Environment, Water, Population and Communities, the need for additional spring surveys was identified.

The spring survey, undertaken by URS botanists targeted the following threatened flora species considered to have the potential to occur within the site based on the presence of suitable habitat:

- Yass Daisy (*Ammobium craspedioides*);
- Hoary Sunray (*Leucochrysum albicans* var*. tricolor*);
- Button Wrinklewort (*Rutidosis leptorrhynchoides*); and
- Silky Swainson-pea (*Swainsona sericea*).

Surveys were undertaken in spring 2011, and did not locate any of the above listed species within the development footprint, gas pipeline and access roads or the offset site.

1

Introduction

1.1 Background

URS Australia (URS) has been commissioned by AGL Energy Limited (AGL) to undertake targeted threatened flora searches to support the Environmental Assessment (EA) for the proposed Dalton Power Project to be submitted under Part 3A of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act).

Targeted threatened flora surveys within the proposed offset, gas pipeline and access roads and development areas will enable the closure of the current spring survey gap, when several threatened flora species predicted to occur are likely to be flowering. Consequently, and following in depth discussions between URS, AGL and the Office of Environment and Heritage (OEH) and the Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC), the need for additional spring surveys was identified. This report provides the methodology and results of these surveys.

1.2 Scope of Work

The scope of works was to conduct field surveys within areas of suitable habitat within the proposed development footprint, gas pipeline and access roads and offset site (**Figure 1**). Field surveys were targeted towards the detection of the following four threatened flora species, identified within the EA for the project has having the potential to occur on site:

- Yass Daisy (*Ammobium craspedioides*)) - vulnerable, EPBC Act/TSC Act;
- Hoary Sunray (*Leucochrysum albicans* var. *tricolor*) – endangered, EPBC Act;
- Button Wrinklewort (*Rutidosis leptorrhynchoides*) – endangered, EPBC Act/TSC Act; and
- Silky Swainson-pea (*Swainsona sericea*) – vulnerable, TSC Act.

Potential habitat exists for these species within the proposed offset site, gas pipeline and access roads and the development footprint amongst the grassland and woodland communities. Objective of this Report

This report aims to outline the rationale, methodology and results of targeted threatened flora searches undertaken by URS botanists in spring, 2011.

1.3 Consultation and Current Species Records

Consultation has been undertaken by URS botanists with local grassland experts in order to determine the most appropriate survey times and locations. Rainer Rehwinkel from OEH has provided the following information based on his grassland flora expertise in the region:

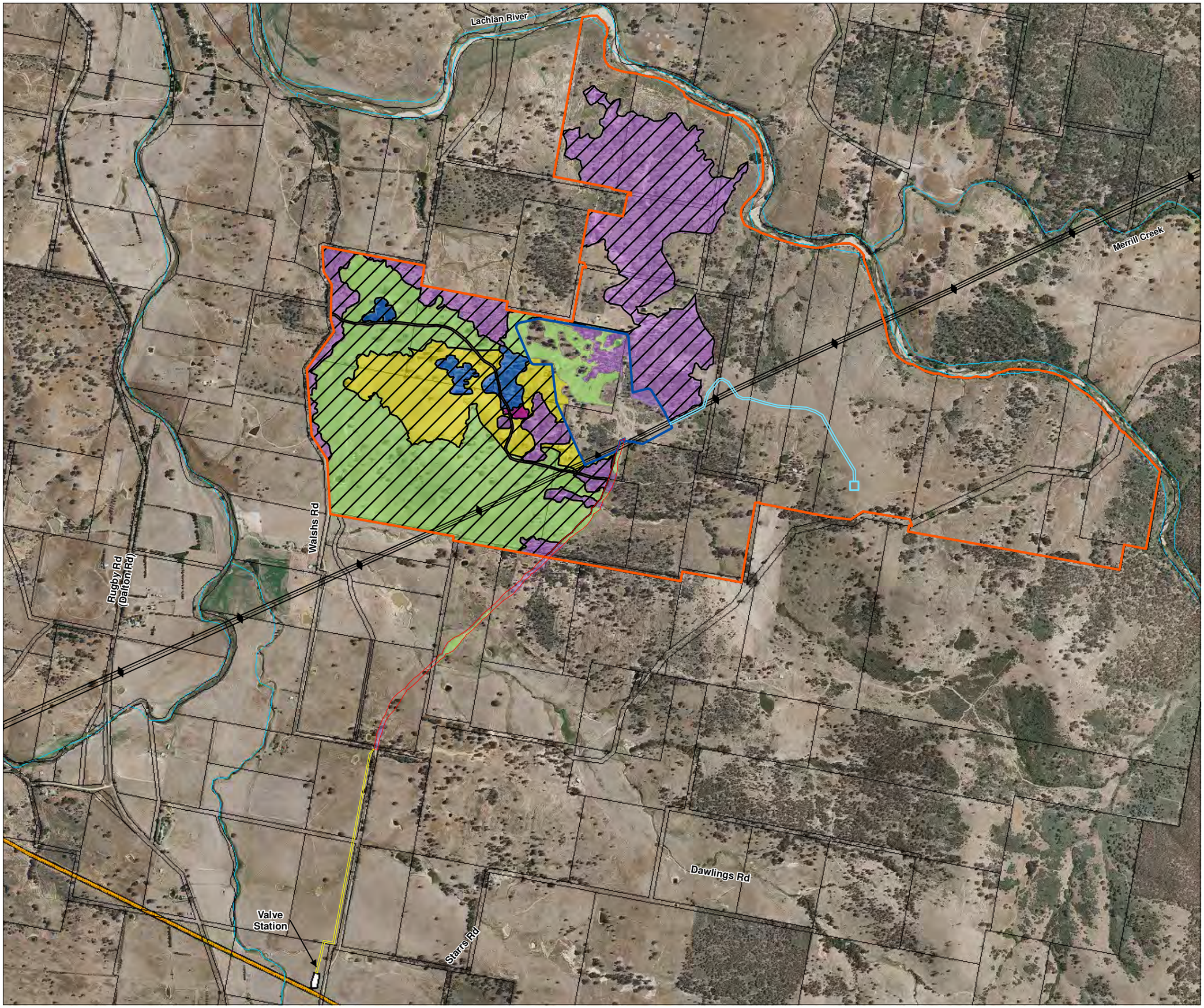
- *Yass Daisy; will be in full flower in late October/early November within the region, and the study area is within the species known range. Species may be present if suitable habitat exists.*
- *Hoary Sunray; will be flowering from October through to January. The site is within the species known range, and it may occur on site if suitable habitat exists.*
- *Button Wrinklewort; considered highly unlikely to be found within the site as it is located too far west of all previous records of the species.*
- *Silky Swainson-pea; considered highly unlikely to be found within the site. Nearest sighting is Yass* (R. Rehwinkel 12/10/11, *pers comm.*).

Despite some species being considered by grassland experts as unlikely to occur within the site in the southern tablelands, URS field surveys targeted all four of the species within any areas of suitable

1 Introduction

habitat, including grassland and fringing woodland areas. **Figure 2** illustrates current records of these species within the region, with data gathered from a Geographic Information System (GIS) data request sent to the Spatial Data Programs at OEH for all records of flora species within the Gunning 8728 1:100,000 map sheet on 14 November 2011.

The results of the GIS data request confirm that there are no records of Button Wrinklewort or Silky Swainson-pea within the Gunning 1:100,000 map sheet. Consequently, only records of Yass Daisy and Hoary Sunray are shown on **Figure 2.** This reinforces the information provided by Rainer Rehwinkel of OEH about the low likelihood of Button Wrinklewort and Silky Swainson-pea occurring within the Dalton Power Project site.



Legend

- Communications Tower and Hut Footprint
- Communications Tower Services and Access Track
- Gas Pipeline (northern) and Access Road
- Gas Pipeline (southern)
- Plant Footprint
- AGL Site Boundary
- Offset Area

Vegetation Communities (URS):

- Natural Temperate Grassland^
- Box-Gum Woodland*
- Grey Box over Exotic Pasture
- Red Stringybark over Exotic Pasture
- Exotic Pasture
- Moomba-Sydney Pipeline
- Transmission Line

* TSC Act Listed Community
^ EBPC Act Listed Community

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Datum: GDA94
Grid: MGA Zone 55

Source: Aerial Image from AGL

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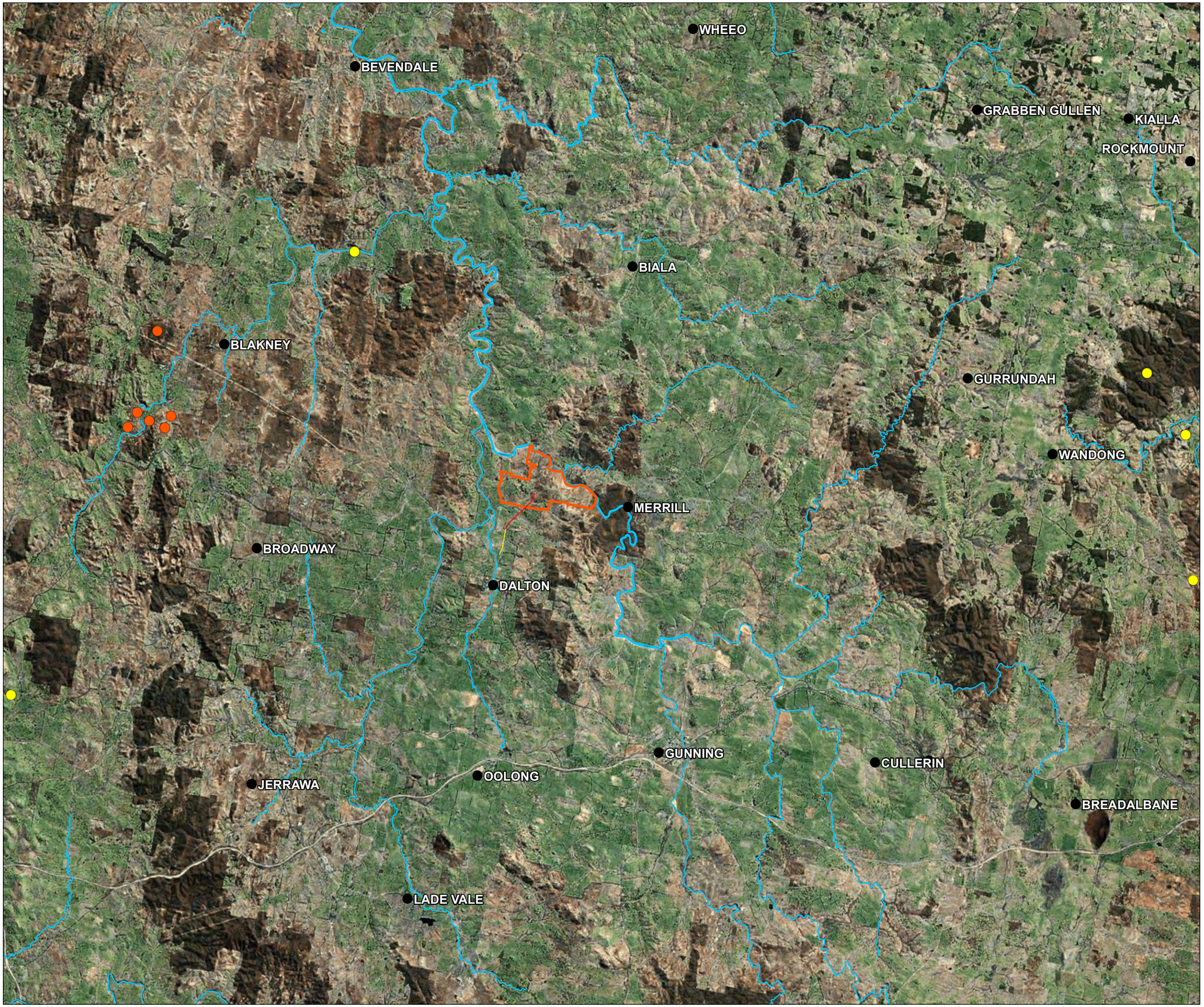
AGL

DALTON POWER PROJECT

SITE LAYOUT

URS | Figure: 1 | Rev. A | A3



Legend

- Hoary Sunray
- Yass Daisy
- Waterways
- Gas Pipeline (northern) and Access Road
- Gas Pipeline (southern)
- AGL Site Boundary

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0 1 2 4 Kilometers

Datum: GDA94
Grid: MGA Zone 55

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DRAWN:	STB	APPROVED: KC	DATE: 15/11/2011

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DALTON POWER PROJECT

PREVIOUS TARGET THREATENED FLORA RECORDS

URS | Figure: 2 | Rev. A | A3

1 Introduction

1.4 Targeted Threatened Species

The following species were identified within **Appendix H** of the EA as having the potential to occur within the site. Their potential to occur is based on the presence of suitable habitat, or the location of the project site within the species known range. Species are listed under the NSW *Threatened Species Conservation Act 1995* (TSC Act), and/or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The following section provides information on the suitable habitats of each of the target species.

1.4.1 Yass Daisy

Yass Daisy (*Ammobium craspedioides*) (Vulnerable TSC Act; Vulnerable EPBC Act) occurs in closed tussock grassland, dry forest, Box Gum Woodland and secondary grassland derived from clearing of these communities. It grows in association with a large range of grasses and forbs such as *Leptorhynchos squamatus*, *Rumex brownii, Wahlenbergia communis*, *Austrodanthonia caespitosa, Austrostipa bigeniculata Austrostipa scabra, Bothriochloa macra, Carex appressa, Poa sieberiana* var*. sieberiana, Themeda australis* as well as eucalypts (*Eucalyptus blakelyi, E. bridgesiana*, E*. dives, E. goniocalyx, E. macrorhyncha, E. mannifera, E. melliodora, E. polyanthemos and E. rubida*). The distribution of this species overlaps with the following TSC Act and EPBC Act listed threatened ecological communities (TEC):

- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (Box Gum Woodland) – listed under TSC Act and EPBC Act, and
- Natural Temperate Grassland of the Southern Tablelands of NSW and the Australian Capital Territory (ACT) (Native Temperate Grassland) – listed under EPBC Act (Threatened Species Scientific Community 2008).

Plate 1-1 shows the Yass Daisy flower and habit.

Plate 1-1 Yass Daisy[1]

[1] Taken from Australian Plant Image Index, Australian National Botanic Gardens, Australian National Herbarium. © G. Butler http://www.anbg.gov.au/images/photo_cd/LH3124GJ0132/003.html

1 Introduction

1.4.2 Hoary Sunray

Hoary Sunray (*Leucochrysum albicans* var. *tricolor*) (Endangered EPBC Act) is found in NSW, ACT, Victoria and Tasmania. Little detailed information is available on the preferred habitat of this species; however it is known to occur within grassland and woodland vegetation (DSEWPaC 2011a).

Plate 1-2 shows the Hoary Sunray flower and habit.

Plate 1-2 Hoary Sunray[2]

1.4.3 Button Wrinklewort

Button Wrinklewort (*Rutidosis leptorrhynchoides*) (Endangered TSC Act; Endangered EPBC Act) is found in three disjunct areas in south east Australia; the Southern Tablelands of NSW and ACT, the Gippsland Plains in eastern Victoria and the volcanic plains of western Victoria. The closest records in proximity to Dalton are to the south in the ACT, near Canberra, as illustrated in **Appendix C**.

In the ACT and NSW, this species occurs in box gum woodland, secondary grassland derived from box gum woodland or in natural temperate grassland; and often in the ecotone between the two communities. Button Wrinklewort is often more common at sites with recently disturbed substrate or where grass cover is sparse.in areas where soils are less fertile and conditions more harsh, such as the top of ridges (DSEWPaC 2011b).

Associated eucalypts at known NSW and ACT sites include Blakely's Red Gum (*Eucalyptus blakelyi*), Long-leaved Box (*E. goniocalyx*), Yellow Box (*E. melliodora*), Red Box (*E. polyanthemos*) and Apple Box (*E. bridgesiana*). Many sites are associated with Kangaroo Grass (*Themeda australis*) (DEC 2005a).

Plate 1-3 shows the Button Wrinklewort flower and habit.

[2] © K. Chesnut, 2011

1 Introduction

Plate 1-3 Button Wrinklewort[3]

1.4.4 Silky Swainson Pea

Silky Swainson-pea (*Swainsona sericea*) (Vulnerable TSC Act) has been found from the northern tablelands to the southern tablelands and Monaro region and further inland on the NSW slopes and plains. The species also occurs in Victoria and South Australia. Many collections are from the 1800s or early 1900s and recent collections indicate that the species has declined significantly across its former range.

The closest records in proximity to Dalton are depicted in **Appendix C**. Extensive surveys in the northern wheatbelt and southern box woodlands have failed to find the species, whilst is has been found very rarely in surveys of the northern tablelands and Riverina areas (NSW Scientific Committee 1999).

The species is found in the following habitats:

- Natural Temperate Grassland and Snow Gum *Eucalyptus pauciflora* Woodland on the Monaro;
- Box Gum Woodland in the Southern Tablelands and South West Slopes; and
- Occasionally found in association with cypress-pines *Callitris* spp (DEC 2005b).

Plate 1-4 shows the flower and habit of Silky Swainson-pea.

[3] Taken from DEC (2005a). © John Briggs
http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10739

1 Introduction

Plate 1-4 Silky Swainson-pea[4]

[4] Taken from DEC (2005b) © John Briggs
http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10783

2

Methodology

Surveys for threatened flora species were undertaken from October 24 to 26, 2001, and October 31 to November 3, 2011. Surveys were undertaken by the URS ecology staff outlined in **Table 2-1**.

Table 2-1 URS ecology staff undertaking field survey

Name	Position	Experience
Jane Murray	Ecology Team Leader. Associate Ecologist (Botanist)	10 years
Kathryn Chesnut	Ecologist (Botanist)	5 years

Surveys were designed to be consistent with the survey guidelines provided in *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities (Working Draft)* DEC (2004), which states that:

"threatened biodiversity may be identified during transect or plot surveys or by opportunistic observations such as walking or driving between sampling sites. Depending on the aims of the study, targeted surveys may be conducted for threatened biodiversity considered likely to occur in the locality. If this is the case, targeted searches should be carried out in areas of preferred habitat for these species.

Many plant species lie dormant for much of the year and there may be few or no above ground parts observable, for example orchids. If surveys are conducted at an inappropriate time of year, it cannot be assumed that the species does not occur in the study area. Checking the closest known site where such species are known to occur may assist with timing surveys when the species are most likely to be observable.

In areas of preferred habitat for threatened biodiversity, rather than undertaking transect or plot-based surveys, an area may be searched by the random meander technique. This technique can allow for greater coverage than a plot-based survey and is less time consuming. As the name suggests, the random meander technique involves traversing areas of suitable habitat in no set pattern, but roughly back and forth, whilst searching for a particular, or several, threatened plant species. If there is any uncertainty regarding identification of a threatened species, a voucher specimen should be collected and sent to the NSW Herbarium for confirmation.

Methods should be used consistently and be recorded and mapped in sufficient detail to allow replication…. The area and time spent searching and the personnel involved should also be noted."

Given the extensive area that had to be covered as part of the survey, methodology aimed to cover as much ground as possible during the survey period, with a focus on potential habitat for each of the four species. Consequently, the survey focused on vegetation including the TECs; Natural Temperate Grassland (EPBC Act) and fringing Box Gum Woodland (NSW TCS Act status only, does not meet EPBC Act criteria), in which the species are considered likely to occur, as well as the ecotone between the two communities.

2 Methodology

Quadrat surveys were not undertaken as part of the current survey methodology, given that they were considered impractical in regards to covering as much area as possible, so as to maximise the potential of sighting a threatened flora species.

In order to cover as much distance as possible within the development footprint and offset site, a series of random meander transects (Cropper 1993) were undertaken throughout suitable habitat. **Figure 3** shows the location of these transects. Transects were conducted in suitable habitat (outlined in section 1.5 of this report) on foot and/or from a slow moving vehicle being driven at approximately 2-5 kilometres per hour (km/h), with occupants of the vehicle stopping each time a flower (resembling one of the four targeted threatened flora species) or new plant (in addition to the species recorded in the EA) was spotted. Binoculars were used to scan the area during both foot and vehicle transects, ensuring that maximum coverage and visibility was achieved.

Areas that could not be driven, such as heavily timbered areas, or those with numerous rocks, lots of fallen timber, damp or very steep areas, were traversed on foot. The location of all random meanders was captured using a hand held Global Positioning System (GPS) accurate to 2 metres (m). Any new species that were observed during random meanders were identified and recorded, and any species bearing any resemblance to the four target species were double checked and identified.

It was considered that revised location for the gas pipeline (southern portion) (namely lots 23 and 27) did not contain suitable habitat for the target threatened species, as they are heavily grazed and comprised of exotic pasture. As such, no target searches were undertaken within this area.

Methodology employed included looking at and identifying every species that was seen flowering, as well as searching for any other plant material such as leaves with a dead seed head, or with an immature seed head. In the process of searching for the target threatened species, a number of new species for the site were recorded, provided in **Appendix B**.

2.1 Survey Effort

The survey effort is summarised in **Table 2-2**. **Figure 3** shows the location of all random meander transects undertaken as part of the survey. Areas of suitable habitat were determined based on the mapping undertaken by URS as part of the Environmental Assessment for the Dalton Power Project, shown on **Figure 6** of **Appendix H** of the EA.

Table 2-2 Targeted threatened flora species survey effort

Dates	Survey Method	Person Hours*
October 24, 25, 26, 2011	Random meander throughout areas of suitable habitat	48
October 31, 2011 1, 2 and 3 November, 2011	Random meander throughout areas of suitable habitat	50
Total Effort		**98**
*includes both botanical staff hours		

Optimum survey timing for each of the key species was guided by the following:

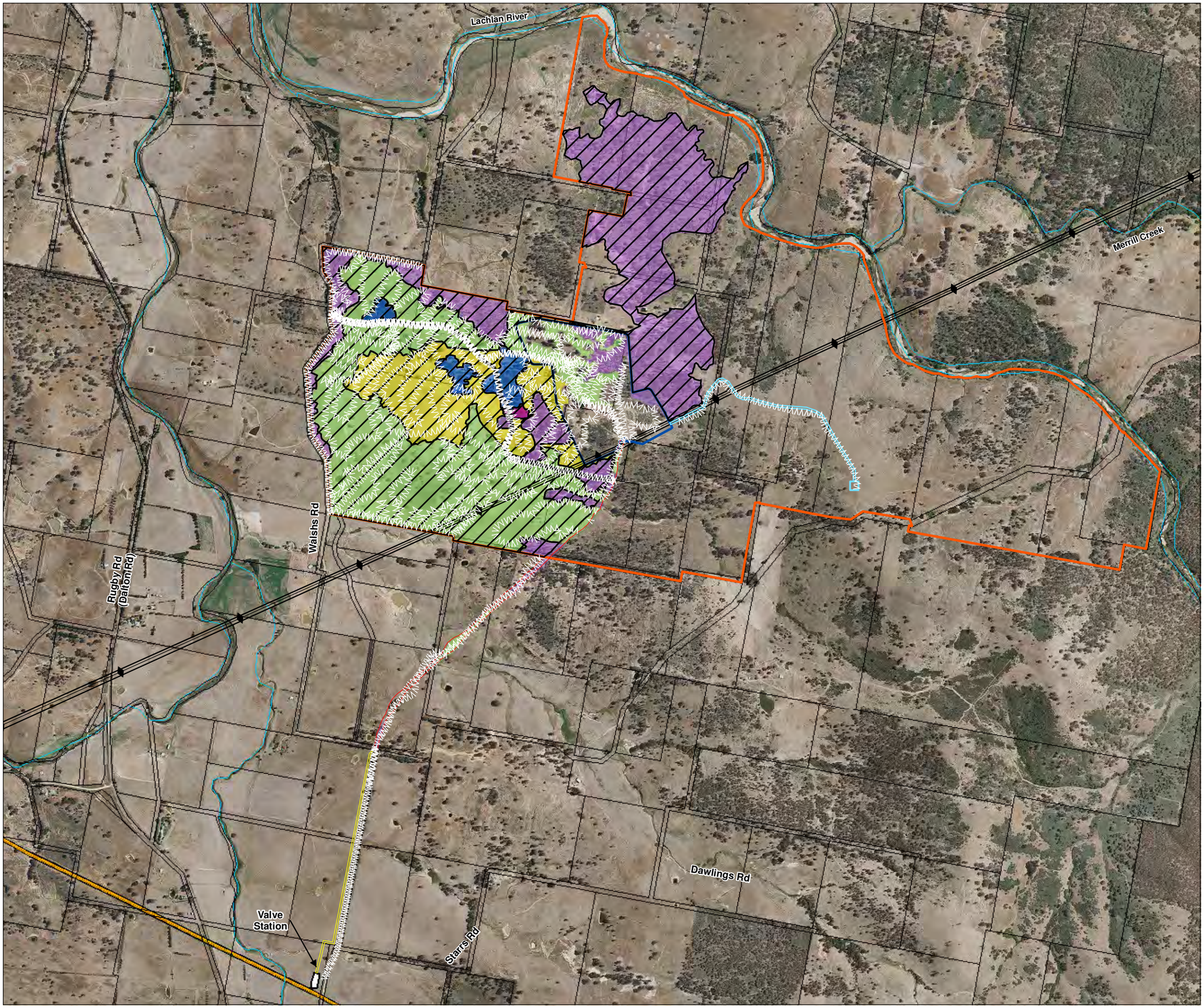
1. Yass Daisy (*Ammobium craspedioides*). Optimal survey timing to be conducted during September to November, according to DECC Profile: (http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10043); Threatened Species Profile Advice, 2008, http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=20758).
2. Hoary Sunray (*Leucochrysum albicans var. tricolor*). Optimal survey timing to be conducted during November to January, according to Threatened Species Profile Advice 2003: (http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=56204).
3. Button Wrinklewort (*Rutidosis leptorrhynchoides*). Optimal survey timing varies between advice on the DSEWPaC website, which indicates October to April, as per DECC Profile: (http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10739) as well as SPRAT Advice, which indicates Summer as well as December to February. (http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=7384).
4. Silky Swainson-pea (*Swainsona sericea*). Optimal survey timing to be conducted in spring, according to DECC Profile: (http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10783).

2.2 Survey Limitations

Surveys aimed to cover as much ground as possible during the survey period and hence random meanders were placed to provide as much coverage as possible.

Surveys were undertaken during the optimal survey period recommended for the four species with the potential to occur, based on extensive consultation with OEH and DSEWPaC. Surveys were carried out by two experienced botanists, both of whom are very familiar with the site.

Survey was undertaken following adequate recent rainfall, when vegetation was in relatively good condition. Light intensity grazing had occurred recently within some of the areas surveyed.



Legend

- Random Meander Transects
- Offset Area
- Communications Tower and Hut Footprint
- Communications Tower Services and Access Track
- Gas Pipeline (northern) and Access Road
- Gas Pipeline (southern)
- Plant Footprint
- AGL Site Boundary

Vegetation Communities (URS):

- Natural Temperate Grassland^
- Box-Gum Woodland*
- Grey Box over Exotic Pasture
- Red Stringybark over Exotic Pasture
- Exotic Pasture
- Moomba-Sydney Pipeline
- Transmission Line

* TSC Act Listed Community
^ EBPC Act Listed Community

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Datum: GDA94
Grid: MGA Zone 55

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DALTON POWER PROJECT

TARGETED THREATENED FLORA SURVEY EFFORT

URS | Figure: 3 | Rev. A | A3

Results

Vegetation during the targeted threatened flora survey was in moderate condition, with only light grazing having taken place within sections of the offset site. Grazing has resulted in a slight reduction in diversity compared to some previous field surveys, with reductions in small herb and forb diversity, and a slight increase in the density of exotic species in some locations.

Vegetation was surveyed during spring and flowering material was present on most species observed, including a range of grass species as well as exotic and native herbs and shrubs.

The majority of the vegetation throughout the site has relatively low species diversity, possibly resulting from previous land uses. Vegetation mapped as Natural Temperate Grassland generally has nearly complete ground coverage throughout much of its occurrence, with a dominance of the following grass species:

- *Austrostipa scabra*;
- *Themeda australis*;
- *Austrodanthonia* sp.; and
- *Austrostipa bigeniculata*.

Throughout much of the site, vegetation mapped as Box Gum Woodland also has relatively low species diversity in the understorey. Numerous traverses were undertaken in fringing areas with increased species diversity, as well as in areas that had not been grazed.

Given the species diversity of much the site, it was relatively simple to notice and identify any non-grass species within the site.

3.1 Yass Daisy

Suitable habitat for this species does exist within the site. However, this species was not found to occur within the development footprint, gas pipeline or access track or offset site. In the EA this species was considered to have the potential to occur within the study area, if suitable habitat was present. **Figure 3** indicates the closest records of this species to the site.

Given that the survey was undertaken by qualified ecologists (botanists), during the optimal flowering time, it is considered that Yass Daisy does not occur within the site.

3.2 Hoary Sunray

This species was not found to occur within the development footprint, gas pipeline or access track or offset site; however was found to occur within close proximity to the proposed gas pipeline, on the roadside verge of Walshs Road (**Figure 4**). Approximately 40 individual plants were recorded in this location, on both sides of the road. The majority of plants were recorded on the eastern side of Walshs Road, within roadside vegetation classified as Box Gum Woodland as listed under the TSC Act.

Samples of this species collected from Walshs Road were sent to the Royal Botanic Gardens Sydney National Herbarium of NSW for confirmation. **Appendix A** contains the letter confirming species identification.

The species was observed flowering and was clearly visible from some distance away. Given that qualified ecologists (botanists) identified this species during field surveys near to the site, but saw no

evidence of this species within the site, it is considered unlikely that Hoary Sunray occurs within the site.

3.3 Button Wrinklewort

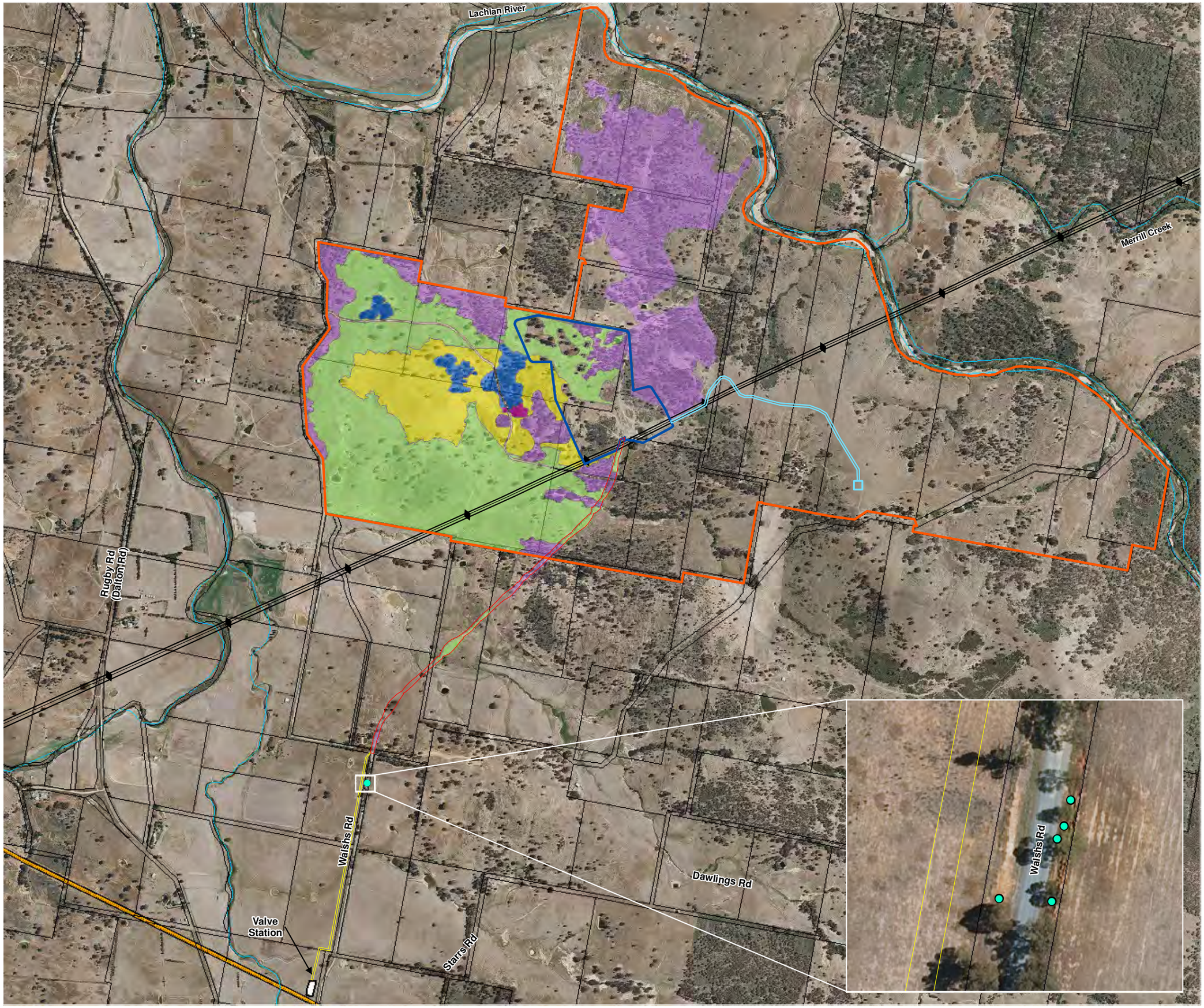
This species was not found to occur within the development footprint, gas pipeline or access track or offset site, nor were there any records of this species within the area covered by the Gunning 1:100,000 topographic map. Suitable habitat for this species exists within the site; however local experts considered it unlikely to occur based on previous records and known range. The known range in proximity to Dalton has been provided in **Appendix C**.

Given that the survey was undertaken by qualified ecologists (botanists) staff, during the optimal flowering time, it is considered that the Button Wrinklewort does not occur within the site.

3.4 Silky Swainson-pea

This species was not found to occur within the development footprint, gas pipeline or access track or offset site, nor were there any records of this species within the area covered by the Gunning 1:100,000 topographic map. Suitable habitat for this species exists within the site; however local experts considered it unlikely to occur based on previous records and known range. The known range in proximity to Dalton has been provided in **Appendix C**.

Given that the survey was undertaken by qualified ecologists (botanists) staff, during the optimal flowering time, it is considered that the Silky Swainson-pea does not occur within the site.



Legend

- Hoary Sunray (*Leucochrysum albicans* var. *tricolor*)
- Communications Tower and Hut Footprint
- Communications Tower Services and Access Track
- Gas Pipeline (northern) and Access Road
- Gas Pipeline (southern)
- Plant Footprint
- AGL Site Boundary

Vegetation Communities (URS):

- Natural Temperate Grassland^
- Box-Gum Woodland*
- Grey Box over Exotic Pasture
- Red Stringybark over Exotic Pasture
- Exotic Pasture
- Moomba-Sydney Pipeline
- Transmission Line

* TSC Act Listed Community
^ EBPC Act Listed Community

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Datum: GDA94
Grid: MGA Zone 55

Source: Aerial Image from AGL

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DALTON POWER PROJECT

THREATENED SPECIES RECORDED DURING SURVEY

URS Figure: 4
Rev. A A3

4

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5

Limitations

URS Australia Pty Ltd (URS) has prepared this report in accordance with the usual care and thoroughness of the consulting profession for the use of AGL and only those third parties who have been authorised in writing by URS to rely on the report. It is based on generally accepted practices and standards at the time it was prepared. No other warranty, expressed or implied, is made as to the professional advice included in this report.

The methodology adopted and sources of information used by URS are outlined in this report. URS has made no independent verification of this information beyond the agreed scope of works and URS assumes no responsibility for any inaccuracies or omissions. No indications were found during our investigations that information contained in this report as provided to URS was false.

This report was prepared in November 2011 and is based on the conditions encountered and information reviewed at the time of preparation. URS disclaims responsibility for any changes that may have occurred after this time.

This report should be read in full. No responsibility is accepted for use of any part of this report in any other context or for any other purpose or by third parties. This report does not purport to give legal advice. Legal advice can only be given by qualified legal practitioners.

A

Appendix A Royal Botanic Gardens Sydney National Herbarium of NSW Species Confirmation

The Royal
BOTANIC GARDEN
Sydney

National Herbarium of New South Wales

Ms Kathryn CHESNUT
URS Australia Pty Ltd
Level 4, 407 Pacific Hwy
Artarmon, NSW 2064
AUSTRALIA

Enquiry No: 16873
Botanical.Is@rbgsyd.nsw.gov.au
Fax No: (02) 9251 1952
Ph No: (02) 9231 8111
Date: 28 October 2011

Dear Ms CHESNUT,

Thank you for your enquiry of 28-Oct-11. We are happy to provide the following information:

1A *Austrostipa bigeniculata*
2A *Leucochrysum albicans* var *tricolor*
3A *Austrostipa* probably *scabra* (I would like to see the awns when they mature)

An invoice for $49.50 (incl. GST) will be forwarded to you separately by our finance section to cover cost of identification.

Thank you for your enquiry.

Yours sincerely

Barbara Więcek
Identification Botanist
Botanical Information Service

B

Appendix B Additional Species Recorded During Survey

Appendix B - Additional Species Recorded During Survey

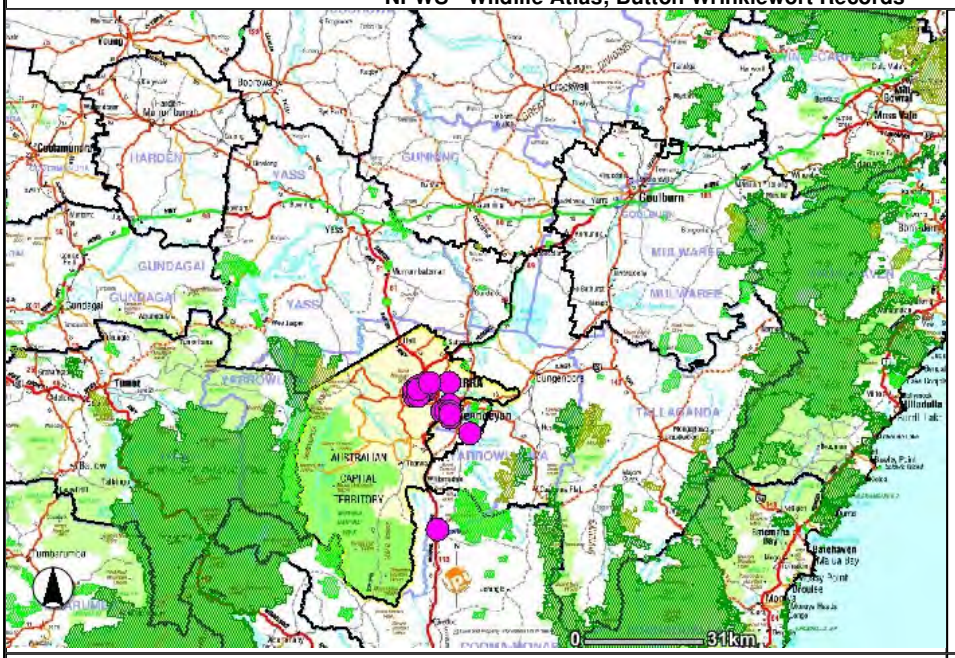
Table Appendix B-1 Additional flora species recorded during targeted threatened species searches, not previously identified on site.

Scientific Name	Common Name	Native/Exotic
Leptorhynchos squamatus	Scaly Buttons	Native
Diuris sulphurea	Tiger Orchid	Native
Arctotheca calendula	Capeweed	Exotic
Goodenia sp.	-	Native
Gompholobium huegelii	Pale Wedge Pea	Native
Wahlenbergia gracilis	Sprawling Bluebell	Native
Wahlenbergia stricta	Australian Bluebell	Native
Dichopogon fimbriatus	Nodding Chocolate Lily	Native
Xerochrysum viscosum	Sticky Everlasting	Native
Lolium perenne	Perennial Ryegrass	Exotic
Hordeum leporinum	Barley Grass	Exotic
Dillwynia brunioides	-	Native
Vinca major	Greater Periwinkle	Exotic
Vulpia sp.	--	Exotic
Bromus diandrus	Great Brome	Exotic
Oenothera stricta subsp. *stricta*	-	Exotic

C

Appendix C Button Wrinklewort and Silky Swainson-pea Locations

NPWS - Wildlife Atlas; Button Wrinklewort Records



Legend

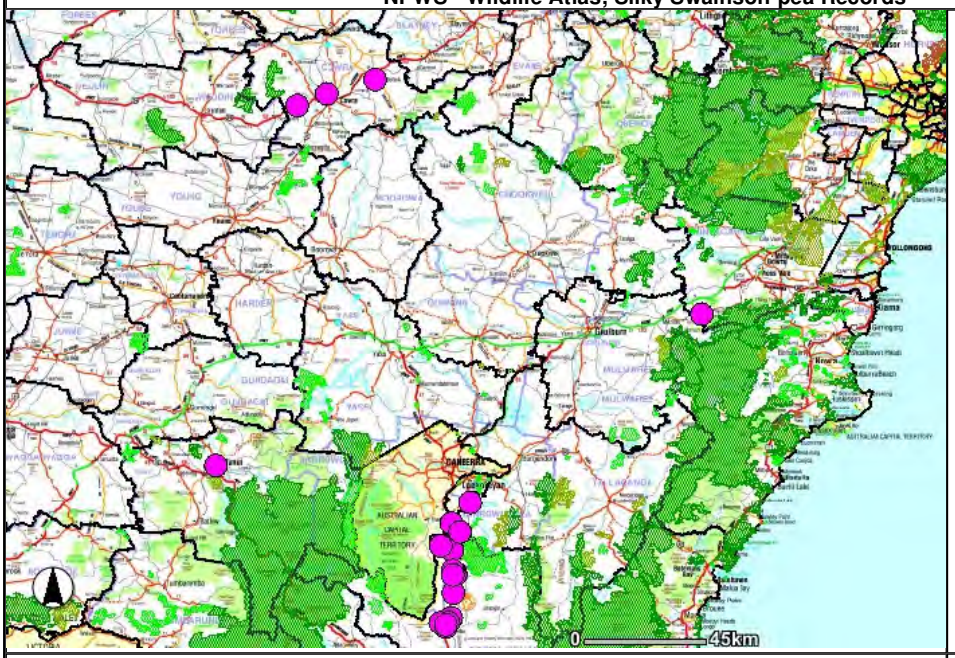
- Button Wrinklewort *Rutidosis leptorrhynchoides*
- Aboriginal Area
- Historic Site
- National Park
- Nature Reserve
- Regional Park
- State Conservation Area
- Local Government Area
- New South Wales

Map created by K. Chesnut on November 17, 2011

Search Extent: All of - NSW

Map Extent: 147.94927, -35.81079, 150.60466, -34.46244

NPWS - Wildlife Atlas; Silky Swainson-pea Records



Legend

- Silky Swainson-pea *Swainsona sericea*
- Aboriginal Area
- Historic Site
- National Park
- Nature Reserve
- Regional Park
- State Conservation Area
- Local Government Area
- New South Wales

Map created by K. Chesnut on November 17, 2011

Search Extent: All of - NSW

Map Extent: 147.38527, -35.71074, 151.13971, -33.80431

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Appendix D-3: GSM Supplementary Report

Dalton Power Project

Golden Sun Moth Targeted Survey

25/01/2012

Prepared for

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Reviewer: .....
Jane Murray
Associate Ecologist

Date: **25/01/2012**
Reference: 43177661/1/1
Status: FINAL

Pictures provided on the front cover are courtesy of DEWHA (2009) Background Paper to EPBC Policy Statement 3.12 – Nationally Threatened Species and Ecological Communities: Significant Impact Guidelines for the Critically Endangered Golden Sun Moth (Synemon plana).

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Abbreviations

Abbreviation	Description
AGL	AGL Energy Limited
the Project	Dalton Power Project
EA	Environmental Assessment
EP&A Act	NSW *Environmental Planning and Assessment Act, 1979*
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act, 1999*
GIS	Geographic Information System
GPS	Global Positioning System
GSM	Golden Sun Moth (*Synemon plana*)
km/hr	Kilometres per hour
NSW	New South Wales
OEH	NSW Office of Environment and Heritage
TSC Act	NSW *Threatened Species Conservation Act, 1995*
DSEWPaC	Commonwealth Department of Sustainability, Environment, Water, Populations and Communities
URS	URS Australia Pty Ltd
ACT	Australian Capital Territory
WoNS	Weed of National Significance

Executive Summary

As part of the project approval process for the Dalton Power Project, and its Environmental Assessment undertaken and submitted under Part 3A of the NSW *Environmental Planning and Assessment Act 1979*, URS undertook a series of targeted threatened species searches for the Golden Sun Moth (*Synemon plana*).

A previous Golden Sun Moth surveys was undertaken by EnviroKey in February 2011,. However, no surveys had been undertaken during the recommended survey period as per the *Commonwealth Significant Impact Guidelines* due to Project related survey limitations.

The recommended survey period for optimal detection of Golden Sun Moth is during the annual adult flying season (November – January), during warm summer cloudless and wind free days. Consequently, and following consultation between URS, AGL, the NSW Office of Environment and Heritage (OEH) and the Commonwealth Department of Sustainability Environment Water Populations and Communities (DSEWPaC), the need to undertake additional targeted Golden Sun Moth surveys as part of the project approval process was identified.

The survey, undertaken by URS ecologists, targeted Golden Sun Moth through the identification of a series of survey sites across the proposed development footprint, gas pipeline and access road, communications tower access track and offset site. These were considered to represent the most suitable habitat for the species.

Surveys were undertaken over a 6 week period between December 2011 and January 2012. The targeted threatened species survey did not detect Golden Sun Moth within the proposed development footprint, gas pipeline and access road, communications tower access track, or offset site.

1

Introduction

URS Australia Pty Ltd (URS) has been engaged by AGL to undertake a targeted threatened species survey for the Golden Sun Moth (*Synemon plana*) (hereafter referred to as GSM) in order to support the Environmental Assessment for the proposed Dalton Power Project (the Project), being undertaken under Part 3A of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act).

In addition to opportunistic surveys undertaken within the Project area by EnviroKey in February 2011, recent discussions between URS and AGL and NSW Office of Environment and Heritage (OEH) and Commonwealth Department of Sustainability, Environment, Water and Populations and Communities (DSEWPaC) identified the need for additional surveys to be conducted for this species during the optimal survey period.

1.1 Scope of Works

The scope of works for this study involved targeted surveys for GSM in line with relevant species survey guidelines to be undertaken within areas of suitable habitat within the Project area, inclusive of the following areas:

- Development footprint;
- Communications tower devices and access track;
- Gas pipeline and access road (northern portion); and
- Offset area.

Suitable habitat survey sites for GSM were identified using information included within the following NSW, ACT, Victorian and Commonwealth documents:

- Threatened Species Scientific Committee (2002) *Commonwealth Listing Advice on Synemon plana (Golden Sun Moth);*
- ACT Government (2005) *National Recovery Plan for Natural Temperate Grassland of the Southern Tablelands (NSW and ACT): An Endangered Ecological Community;*
- Department of the Environment, Water, Heritage and the Arts (2009) Policy Statements and Guidelines. *Background Paper to EPBC Act Policy Statement 3.12, Significant Impact Guidelines for the Critically Endangered Golden Sun Moth (Synemon plana);*
- Department of the Environment, Water, Heritage and the Arts (2009) EPBC Act Policy Statement 3.12, *Significant Impact Guidelines for the Critically Endangered Golden Sun Moth (Synemon plana);*
- Department of the Environment, Water, Heritage and the Arts (2009) Information Sheets, *EPBC Act Policy Statement 3.12 - Map 1 and 2;*
- ACT Government (1998) *Golden Sun Moth (Synemon plana) an endangered species, Action Plan No. 7;*
- Australian Capital Territory Department of Territory and Municipal Services (2006) *Threatened Species Fact Sheet No. 7. Golden Sun Moth (Synemon plana) - An endangered species;*
- Australian Capital Territory Department of Territory and Municipal Services (2006) Threatened Species and Communities of the ACT, *Golden Sun Moth (Synemon plana), An endangered species;*
- Department of the Environment and Climate Change (2005) Synemon plana: *Priority Actions NSW Threatened Species Priority Action Statement;*
- Department of Environment, Climate Change and Water (1996) *Golden Sun Moth: endangered species listing. NSW Scientific Committee - final determination;*
- Department of Environment, Climate Change and Water (2005) *Golden Sun Moth profile*; and

- Victorian Department of Sustainability and Environment (2003) *Flora and Fauna Guarantee Action Statement 146 - Five threatened Victorian Sun Moths (Synemon* species*).*

1.2 Objectives

The objectives of the survey were to establish whether GSM was present within the Project area, and if present, population densities and abundance data was to be collected.

Given the scope of works outlined above, and relevant species survey guidelines and requirements for GSM, this report documents the following:

- Background information;
- Survey methodology;
- Survey Limitations;
- Results of the field survey; and
- Survey Conclusion.

2

Background

2.1 Legislation

The Golden Sun Moth (GSM) is listed as Endangered under the NSW *Threatened Species Conservation Act 1995* (TSC Act) and as Critically Endangered under the *Commonwealth Environment Protection Biodiversity Conservation Act 1999* (EPBC Act) (**Plate 1**).

Plate 1 Golden Sun Moth (*Synemon plana*) – Photo (DEWHA 2009)

2.2 Habitat and Ecology

GSM is a medium-sized (wingspan 3.1–3.4 cm), day-flying moth. The species has two discrete life stages; the larval stage, which is spent underground and lasts for two to three years; and the adult stage, which is very brief, typically lasting only one to four days (DEWHA 2009).

The GSM flight season occurs between late Spring and Summer (mid-October to January).DEWHA (2009) recommends regular visits to known GSM sites during mid to late October to determine when flying has commenced, and hence, when surveys should begin.

Primary areas of habitat are considered to be native grasslands with some areas of bare or sparsely covered ground between grass tussocks (inter-tussock space), which are important in helping males locate females (DEWHA 2009).

Prior to European settlement, GSM was widespread and relatively continuous throughout its range, corresponding with the endangered ecological community *Natural Temperate Grassland of the Southern Tablelands of NSW and the Australian Capital Territory (*Natural Temperate Grasslands or NTG). This community is protected under the Commonwealth *Environmental Protection and Biodiversity Conservation Act, 1999* (EPBC Act). It occurs across NSW, the Australian Capital Territory (ACT), Victoria and South Australia. However, less than 1% of NTG now remains as a result of habitat loss, disturbance and fragmentation due to agricultural expansion and urbanisation.

As a result, remaining GSM populations are highly reduced in number and scale, and are fragmented. Furthermore, due to the reduced hind wings of females, and the inability of males to fly more than 100 m away from suitable habitat, populations separated by ≥ 200 m can be considered as effectively

genetically distinct. Consequently, sites from which the species has known to become extinct are considered highly unlikely to be re-colonised (Ecology Partners 2010; SEWPaC 2011).

Historically, GSM was considered to be dependent upon native grassland habitats with a cover of at least 40% Wallaby Grass (Austrodanthonia spp.) (O'Dwyer and Attiwill 1999; 2000). However, more recent studies have shown the species to have a much wider habitat tolerance (Braby and Dunford 2006; Gilmore et al. 2008). For example, GSM has been observed ovipositing (Oviposition is the process of laying eggs by oviparous animals) on exotic Chilean Needle Grass (*Nassella neesiana*), a weed of national significance (WoNS), in addition to native Spear Grasses *Austrostipa spp.*, *Bothriochloa spp.* and Weeping Grass (*Microlaena stipoides*). This suggests that the species may not be dependent solely upon Wallaby Grasses to complete its lifecycle (Braby and Dunford 2006; Gilmore et al. 2008).

Recent surveys undertaken within a single lot of the North Epping Structure Plan area in the City of Whittlesea in Victoria, recorded 92 GSM within a number of small and degraded patches of secondary native grassland, heavily infested with Chilean Needle Grass. As a result of this study, it is now accepted that grassland and grassy woodland supporting some native grasses, or introduced grasses from the genus *Nassella* provide potential suitable habitat for the species (GAA March 2010).

2.3 Species Distribution

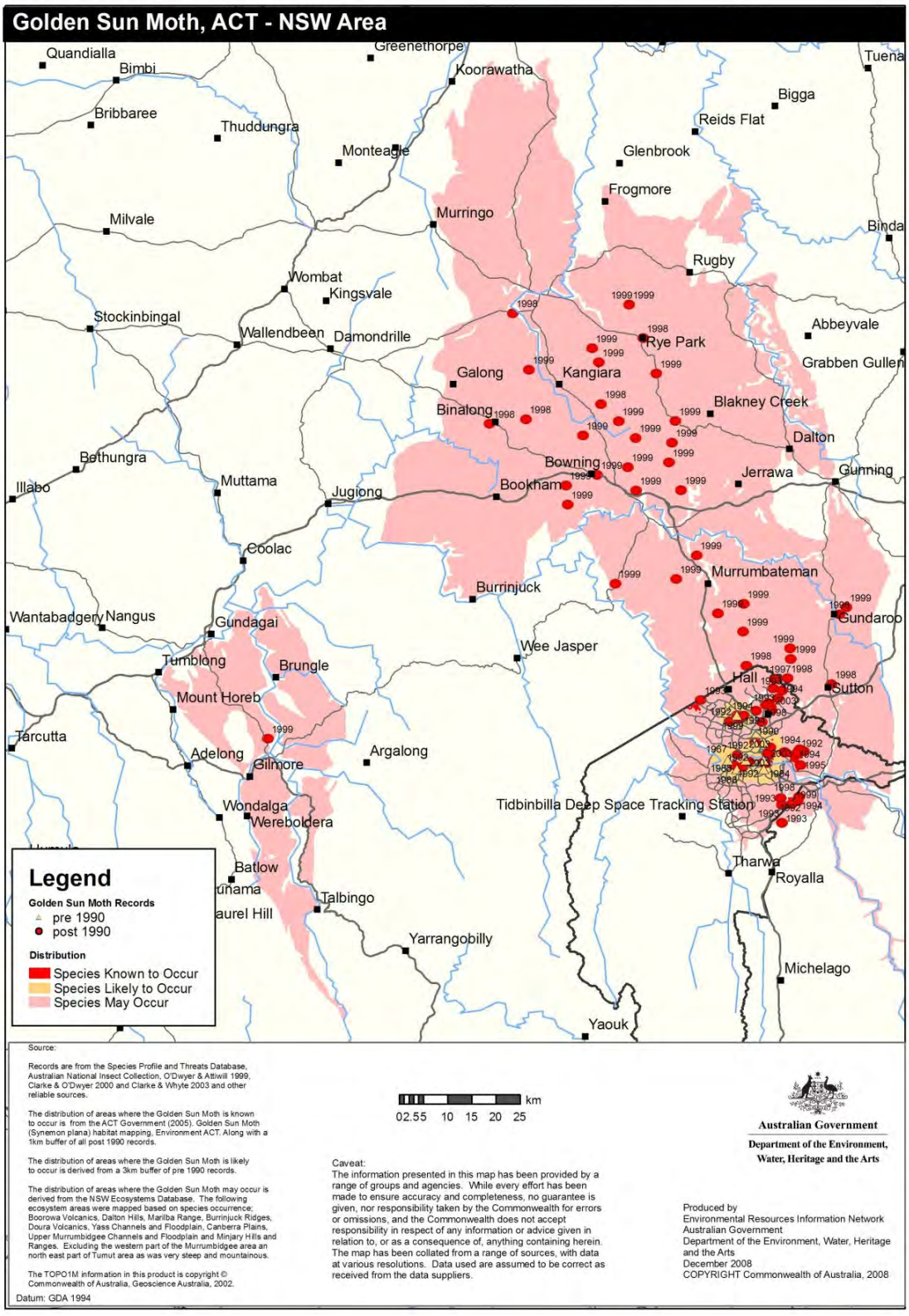
Currently, GSM is known to be present at approximately 48 locations in NSW, 30 in the ACT and 45 in Victoria (Friends of Grasslands (FOG) 2009). A number of documents have been sourced and reviewed in order to identify the location of historical records of GSM in the Southern Tablelands of NSW, including:

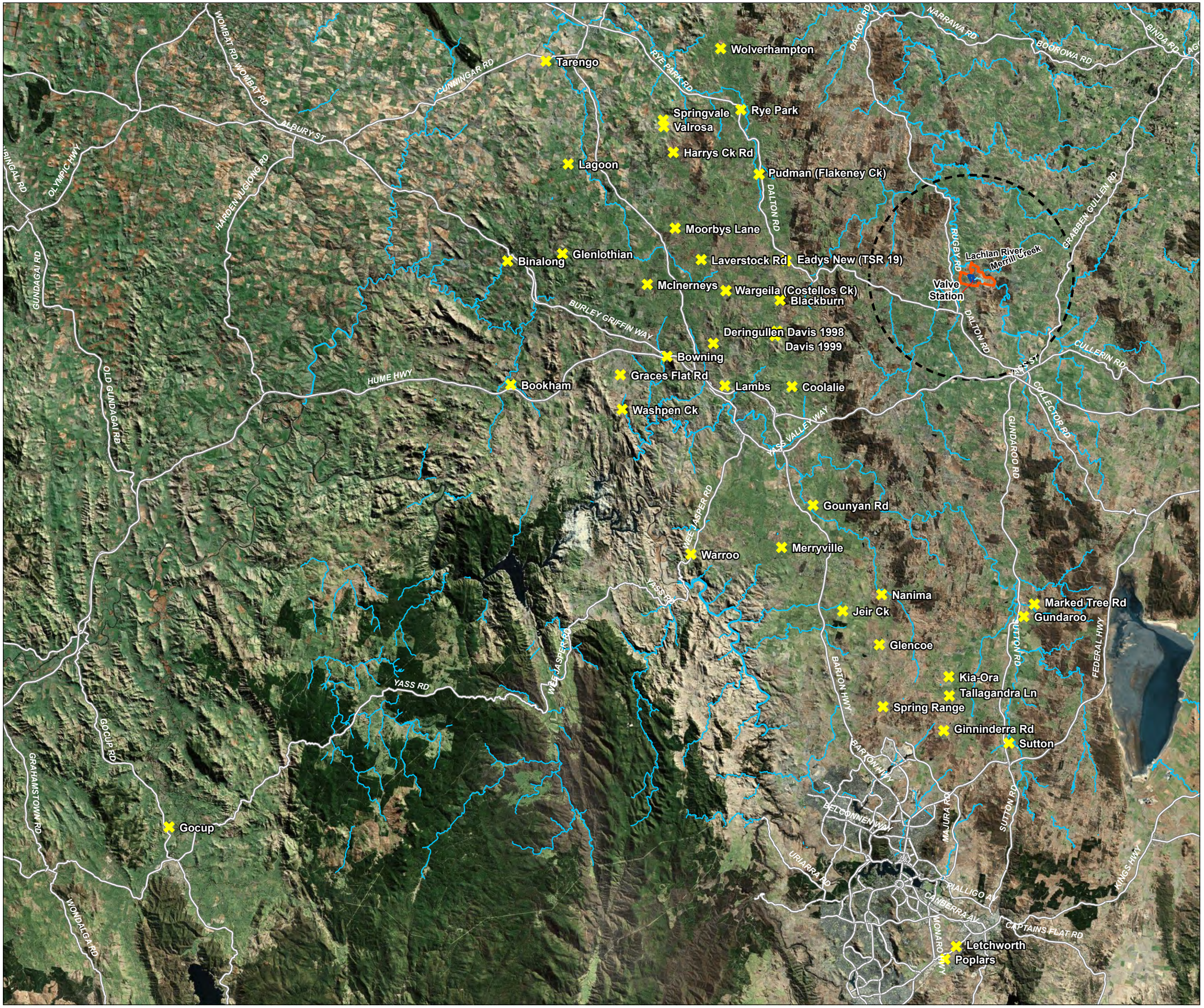
- DEWHA (2008) *Golden Sun Moth, ACT, NSW Area – EPBC Act Policy Statement: Map 1* (**Plate 1**).
- Clarke and O'Dwyer (1999) *Further survey in south-eastern New South Wales for the Endangered Golden Sun Moth, Synemon plana.* A report prepared for the Threatened Species Unit, NSW National Parks and Wildlife Service, Southern Zone. CSIRO Division of Entomology, Acton, Canberra;
- Clarke (2000) *Survey and Genetic Analysis of NSW Populations of the Endangered Golden Sun Moth Synemon plana 1999.* A report prepared for the Threatened Species Unit, NSW National Parks and Wildlife Service, Southern Zone. CSIRO Entemology, Canberra.
- Clarke and Whyte (2003) *Phylogeography and population history of the endangered Golden Sun Moth (Synemon plana) revealed by allozymes and mitochondrial DNA analysis.* Conservation Genetics 4: 719 - 734;

Figures 1A and **1B** have been developed based on a review of the available literature. They illustrate the location of recorded current/historical populations of GSM in the Southern Tablelands, and illustrate their proximity to the Project area.

2 Background

Plate 2 – Historical Records of Golden Sun Moth in the ACT, and NSW Southern Tablelands





Legend

- Known GSM Population Locations
- Waterways
- AGL Site Boundary
- 10km Buffer
- Plant Footprint

N
W E
S

0 2.5 5 10 Kilometres

Datum: GDA94
Grid: MGA Zone 55

Source:
Aerial Photo - Bing Maps © 2010 Microsoft Corporation and its data suppliers.
GSM Populations - Clarke GM and O'Dwyer (1999) Further survey in south-eastern New South Wales for the Endangered Golden Sun Moth, Synemon plana. A report prepared for the Threatened Species Unit, NSW National Parks and Wildlife Service, Southern Zone. CSIRO Division of Entomology, Acton, Canberra.

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DALTON POWER PROJECT

GOLDEN SUN MOTH POPULATIONS IN THE NSW SOUTHERN HIGHLANDS

URS | Figure: 1A | Rev. A | A3