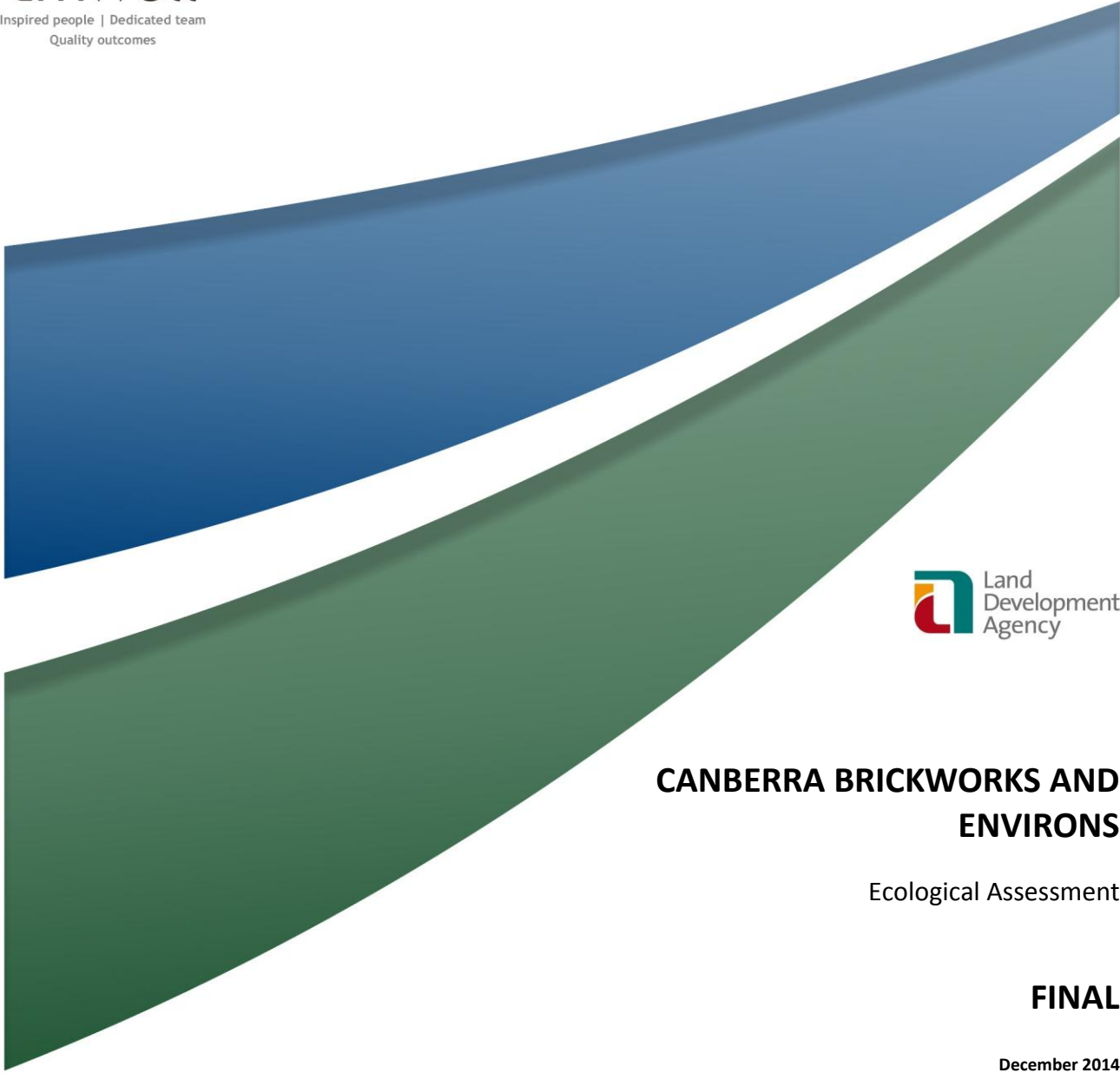


Attachment I

Canberra Brickworks and Environs
Ecological Assessment



CANBERRA BRICKWORKS AND ENVIRONS

Ecological Assessment

FINAL

December 2014



CANBERRA BRICKWORKS AND ENVIRONS

Ecological Assessment

FINAL

December 2014

Prepared by
Umwelt (Australia) Pty Limited
on behalf of
Land Development Agency

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Report No. **8043/R03/V3**
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APPENDIX

1	Floristic Survey Data
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1.0 Introduction

Umwelt (Australia) Pty Limited (Umwelt) was engaged by the ACT Land Development Agency (LDA) to conduct a range of ecological surveys in summer 2013 for the Canberra Brickworks and Environs future urban development area.

1.1 Background

The Canberra Brickworks and Environs are located on the southern edge of Yarralumla and north-western edge of Deakin in Canberra’s inner south and include the intersection of Cotter Road, Yarra Glen and Adelaide Avenue. The project area contains both Commonwealth and Territory land as well as a range of historically significant infrastructure. The project area comprises approximately 47 hectares as shown in **Figure 1.1**. The LDA propose to develop part of this area for residential purposes.

The project area contains known matters of national environmental significance (MNES) protected under the Commonwealth’s *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The south of the project area, adjacent to Cotter Road and Dudley Street, contains habitat for both the critically endangered golden sun moth (*Synemon plana*) and the endangered ecological community ‘Natural Temperate Grassland of the Southern Tablelands of NSW and the Australian Capital Territory’ (hereafter referred to as natural temperate grassland). These areas may also contain habitat for the vulnerable perunga grasshopper (*Perunga ochracea*) protected under the Territory’s *Nature Conservation Act 1980* (NC Act).

The ecological values of the project area have been subject to a number of assessments in the past, which have identified these MNES and monitored their condition over numerous seasons.

1.1.1 Previous Studies

Three reports pertaining to the project area were used as background for the project. These are briefly described below.

Table 1.1 – Summary of Previous Studies

Report Name	Summary
Rowell, A., 2010. Preliminary Assessment of Ecological Values of Land in Yarralumla, Curtin and Deakin, ACT, Prepared for the National Capital Authority, Canberra.	<p>This was a preliminary assessment for threatened species and communities listed under the EPBC and NC Acts. The scope of works were to map vegetation communities, habitat for golden sun moth, survey for presence of golden sun moth, and make recommendations for future surveys.</p> <p>The study confirmed the presence of golden sun moth and patches of diverse natural temperate grassland within the project area. It also identified the presence of golden sun moth in the North Curtin Horse Paddocks, which had not previously been identified.</p>

Report Name	Summary
<p>Rowell, A., 2011. Yarralumla Brickworks Site and Surrounds, Golden Sun Moth and Natural Temperate Grassland Survey, Prepared for Land Development Agency, Canberra.</p>	<p>As previous surveys had identified the presence of golden sun moth at the Yarralumla Brickworks, the aim of the 2010-2011 survey and report was to investigate the larger subject site, and determine the extent of occupancy of golden sun moth, its relative abundance, breeding sites and habitat quality.</p> <p>The site was also assessed for the extent of the threatened grassland community, and its potential as habitat for other threatened species.</p> <p>The study confirmed the presence of 1.5 hectares of natural temperate grassland, and about 5 hectares of golden sun moth habitat in both native and exotic dominated vegetation. The grassland and moth population were considered likely to be viable in the medium term.</p>
<p>Rowell, A., 2012. Environmental Assessment of Blocks for Proposed Diplomatic Subdivision (Stirling Ridge, Near Old Canberra Brickworks, and Land adjacent to Federal Golf Club), Prepared for the National Capital Authority, Canberra.</p>	<p>This project included assessment of three sites, including the Canberra Brickworks. The scope of the study was to map vegetation community extent and quality, and survey and map habitat for threatened fauna including golden sun moth, perunga grasshopper and woodland birds.</p> <p>Floristic value scores were calculated for the natural temperate grassland which has been used in Umwelt's assessment. Two locally uncommon flora species were also identified and discussed.</p> <p>No threatened bird species were recorded, nor was habitat identified. Potential for perunga grasshopper was discussed, however the species was not identified during targeted surveys. Golden sun moth were found in very low numbers, however it was noted that it was a poor season for observations across Canberra and this may have also affected results of surveys for the Brickworks site.</p> <p>Mapping prepared from this survey was used for Umwelt's report.</p>

1.1.2 Current Site Context

The project area is located within an urban environment, with established urban areas to the north (Yarralumla) and south (Deakin), with a number of major roads traversing the site (Cotter Road and Adelaide Avenue).

The project area is currently managed as a combination of open space, and road reserve, with management including regular slashing to manage grass height and fuel load.

A number of pressures exist on the site, including ongoing management, public access and walking tracks, road upgrades and increasing traffic numbers, all of which impact upon the long term viability of the site.

The golden sun moth habitat and natural temperate grassland within the project area are one of a small number of such remnants in Central Canberra, only one of which is protected – York Park in Barton (Rowell, 2012). The presence of this critically endangered species and endangered ecological community represent ecological value retained within the urban environment.

1.1.3 Project Area and Survey Effort

The survey area was determined through a number of considerations. Habitat mapped by Rowell (2012) formed the basis for targeted surveys and provided the polygons for habitat mapping.

Site reconnaissance visits were also undertaken early in the season to determine whether any additional areas of habitat, previously unidentified, were present on the site. This particularly targeted south of Adelaide Avenue in Deakin, and around the historic brickworks area. No additional areas of habitat were identified, therefore surveys focussed on areas mapped by Rowell (2012).

1.2 Scope of Work

Umwelt were engaged by the LDA to complete the following defined scope of work:

- conduct of ecological surveys targeting:
 - golden sun moth;
 - natural temperate grassland endangered ecological community; and
 - perunga grasshopper.
- preparation of a brief report summarising the methodologies and outcomes of the surveys.

The methodology applied for this assessment and results are detailed in the following sections.



Figure 1.1 – Project Area

2.0 Perunga Grasshopper

2.1 Background

Perunga Grasshopper (*Perunga ochracea*) is a short-winged, flightless grasshopper, with adults ranging from 15-20 mm long (males) to 26-35 mm long (females). Colours are variable, often ranging from brown to grey in dry years, to green in wet years. In the Canberra region, the species is distinguished by the presence on the dorsal surface of a pale 'X'. The species is listed as vulnerable under the ACT's NC Act. It is not listed under the EPBC Act.

Nymphs hatch in autumn and develop over winter and early spring from eggs laid in the soil, and adults are present from mid spring to late summer (ACT Government, 2006)¹.

Potential perunga grasshopper habitat was mapped by Rowell in (2012)² for the project area based on the presence of suitable vegetation. This potential habitat consisted of approximately 1.3 hectares of natural temperate grassland dominated by *Rytidosperma* spp., *Themeda triandra* and *Austrostipa bigeniculata*. Rowell (2012) undertook limited surveys for perunga grasshopper, but did not identify any individuals. Further survey was recommended.



Figure 2.1 – Perunga Grasshopper
(Copyright: ACT Government, Territory and Municipal Services³)

¹ ACT Government (2006). *Perunga Grasshopper (Perunga ochracea): A vulnerable species. Information Sheet*. Environment ACT, Canberra

² Rowell, A. (2012). *Environmental Assessment of Blocks for Proposed Diplomatic Subdivision (Stirling Ridge, Near Old Canberra Brickworks, and Land adjacent to Federal Golf Club)*. Prepared for the National Capital Authority, Canberra.

³http://www.tams.act.gov.au/parks-recreation/plants_and_animals/urban_wildlife/local_wildlife/kangaroos/conservation-impacts-of-grazing-by-eastern-grey-kangaroos

2.2 Methodology

Extensive literature review revealed that there is no formally established survey method for perunga grasshopper. Generally, this species is recorded opportunistically as part of survey for grassland/woodland vegetation or other fauna such as golden sun moth (*Synemon plana*) and striped legless lizard (*Delma impar*).

ACT Government (1999)⁴ developed an action plan for the perunga grasshopper in accordance with Section 21 of the *Nature Conservation Act 1980*. The action plan states that 'perunga grasshopper is a cryptic grasshopper which is difficult to see unless first disturbed. When disturbed, the species appears to actively seek shelter, jumping once or twice before burying itself into a grass tussock. It is a powerful jumper, covering distances of a metre or more.' Using species habitat, ecology, and behavioural information included in the action plan, a survey methodology was developed, along with advice and peer review from local biologist and grassland specialist Alison Rowell.

Due to the lack of detailed knowledge about the climatic conditions required to survey for perunga grasshopper, climatic conditions for golden sun moth survey guidelines (DEWHA 2009)⁵ were considered and modified to suit perunga grasshopper based on experience of observed preferred conditions. Target conditions under which perunga were considered most likely to be active and detectable were as follows:

- mild to warm day (above 15°C by 10.00 am);
- survey undertaken in warmest part of day (between 11.00 am and 3.00 pm); and
- dry tussocks at the time of survey (i.e. no survey in wet/moist conditions).

Surveys were timed for early November (earlier than standard grassland fauna surveys) to avoid confusion associated with activity of more common grasshoppers. Perunga grasshopper is active earlier than most other grasshoppers as they overwinter as nymphs rather than eggs.

Targeted searches were undertaken within potential habitat across three survey efforts (days) of 2 hours per day.

Two 20 x 20 metre quadrats were established within potential habitat areas, and within these, linear transects were walked with a five metre spacing between transects. Transects were walked slowly, observing grasshoppers being flushed from tussocks.

In the remainder of potential habitat and areas of marginal habitat, meander paths at approximately 10 metre spacing were walked slowly, observing grasshoppers being flushed from tussocks.

This methodology is illustrated in **Figure 2.1**.

⁴ ACT Government (1999). *Perunga Grasshopper (Perunga ochracea): A vulnerable species. Action Plan No. 21*. Environment ACT, Canberra

⁵ DEWHA (2009). *Significant Impact Guidelines for the Critically Endangered Golden Sun Moth (Synemon plana)*. EPBC Act Policy Statement 3.12. Department of Environment, Water, Heritage and the Arts, Canberra.

2.3 Observations

An initial survey was undertaken on 30 October 2013 by an Umwelt ecologist and Alison Rowell, to confirm survey methodology, with subsequent surveys by Umwelt on 5 and 14 November 2013. Each survey repeated the same methodology.

All survey days met climatic condition requirements. Weather conditions at the time of survey and survey results are summarised in **Table 2.1**.

Table 2.1 – Perunga Grasshopper Survey Effort and Conditions

Survey Date and Time	Weather Conditions	Observations
30/10/2013 11 am – 2 pm	Temp: Max 22.1°C Rainfall: 0 mm Wind: NNW 17 km/hr Sunny	No observations
5/11/2013 12 pm – 2 pm	Temp: Max 20.9°C Rainfall: 0 mm Wind: SE 13 km/hr Sunny	No observations
14/11/2013 12 pm – 2 pm	Temp: Max 22°C Rainfall: 2 mm (rained after survey) Wind: WNW 24 km/hr Partly Cloudy	No observations

Note: Weather observations are from the Canberra Airport and may differ slightly from actual conditions on site, particularly wind speed.

No perunga grasshoppers were observed during the survey, or during any subsequent visits to the project area.



Figure 2.2 – Perunga Grasshopper Survey Effort

3.0 Golden Sun Moth

3.1 Background

Golden sun moth inhabit natural temperate grasslands and open grassy woodlands where the ground layer is dominated by wallaby grass. They have also been found to have a tolerance for degraded grasslands dominated by exotic Chilean Needlegrass (*Nassella neesiana*), which is listed as a priority weed species in the ACT and a Weed of National Significance (WoNS).

Within the local area, golden sun moth populations occur at a number of sites in Yarralumla and surrounding areas in the Inner South, such as Black Street and Stirling Park Ridge in Yarralumla; Yarralumla Equestrian Park to the west of the site; and the North Curtin Horse Paddocks to the south. The species is known to be able to successfully persist within small fragmented areas of habitat, including within urban areas (Hogg 2010).

Within the project area, golden sun moth occur in association with natural temperate grassland. The native dominated grassland and road verges with a high component of Chilean needlegrass are also considered habitat. No suitable habitat was identified to the south of Adelaide Avenue, in Deakin.



Figure 3.1 – Golden Sun Moth in the Project Area
(Source: Umwelt)

3.2 Methodology

There are established survey guidelines for golden sun moth under the EPBC Act. These guidelines have been utilised in the conduct of this survey, and are discussed below.

As per the EPBC Act Golden Sun Moth survey guidelines (DEWHA 2009), survey is required to be undertaken over a period of four (4) non-consecutive days, with survey days targeted based on suitable climatic conditions.

The following survey parameters were used for selecting appropriate days to undertake monitoring:

- a warm to hot day (above 20°C by 10:00 am);
- the warmest part the day (i.e. between 10:00 am and 2:00 pm);
- clear or mostly cloudless sky;
- still or relatively still wind conditions during the survey period;
- ≥ 2 days since rain; and
- staggered to increase the likelihood of detection given the short adult life span (1-4 days between surveys).

Reconnaissance visits were undertaken for the project area prior surveys commencing to confirm whether golden sun moth had begun to actively fly.

Once flying was confirmed, two transects were established in the natural temperate grassland areas, and meandering searches were undertaken throughout all other areas of known habitat. For each transect, the location of each observation was recorded. Climatic conditions and results of the golden sun moth surveys are shown in **Table 3.2**.

3.3 Observations

Golden sun moths were observed throughout the project area during all survey days, however moth numbers varied throughout the survey period. Generally, moths were observed at low densities, with most observations being made in the Denman Street Road Reserve, the Uniting Church, north of Cotter Road, and the Cotter Road median.

Over the period when surveys were being conducted, a number of the areas of habitat were slashed very low, removing the vegetative cover for moths. In these areas, moths were observed at higher densities immediately following slashing, potentially due to the removal of cover and from the disturbance. This disturbance is likely to have influenced the survey results and may have affected the survival rates of adults and potentially also breeding success for the season (discussed further in **Section 5.2**).

Table 3.1 identifies locations of moth observations and should be cross referenced with **Table 3.2** and **Figure 3.1**. **Figure 3.1** shows an average of observations across the four days of survey to indicate areas of highest moth density.

Table 3.1 – Key to Observations (reference Table 3.2 and Figure 3.1)

i	Transect 1	ii	Transect 2
iii	Denman Street Road Reserve	iv	South of Dudley Street
v	North of Cotter Road	vi	Cotter Road Median
vii	Uniting Church		

Table 3.2 – Golden Sun Moth Survey Effort and Conditions

Survey Date and Time	Weather Conditions *	Observations							Notes
		i	ii	iii	iv	v	vi	vii	
14/11/2013; 12 pm – 2 pm	Temp: Max 22°C Rainfall: 2 mm (after survey) Wind: WNW 24 km/hr Partly Cloudy	-	-	-	-	-	-	-	Reconnaissance survey. No GSM observed.
26/11/2013; 10 am – 11.30 am	Temp: Max 20°C Rainfall: 0 mm Wind: NNW 11 km/hr Sunny	2	-	5	-	1	3	5	16 moths observed in 1.5 hours.
28/11/2013; 10 am – 11.30 am	Temp: Max 25°C Rainfall: 0 mm Wind: NW 20km/hr Sunny	1	-	-	-	2	4	8	North of Cotter Road (site v) had just been slashed at the time of survey. The Uniting Church (site vii) was being slashed at the time of survey. 15 moths observed in 1.5 hours.
4/12/2013; 9.50 am – 10.35 am	Temp: Max 25.3°C Rainfall: 0 mm Wind: NNW 20km/hr Cloudy but warm	-	-	1	2	2	1	-	No moths observed in recently slashed area of Uniting Church, and this area of habitat was being used as a parking area during survey. 6 moths observed in 40 minutes.
12/12/2013; 10.30 am – 11.10 am	Temp: Max 22°C Rainfall: 0 mm Wind: WSW 17km/hr Sunny, light breeze	-	1	2	-	8	3	3	The Cotter Road Median (site vi) had been slashed very recently and the majority of cover removed. 17 moths observed in 40 minutes.

Note: Weather observations are from the Canberra Airport and may differ slightly from actual conditions on site, particularly wind speed.



Legend

- Project Area
- Golden Sun Moth Habitat (Rowell, 2012)

- Transect Locations
- Approximate Meandering Survey Track

Average Observations

- 4
- 2
- 0.4



Figure 3.2 – Golden Sun Moth Survey

3.4 Interpretation of Results

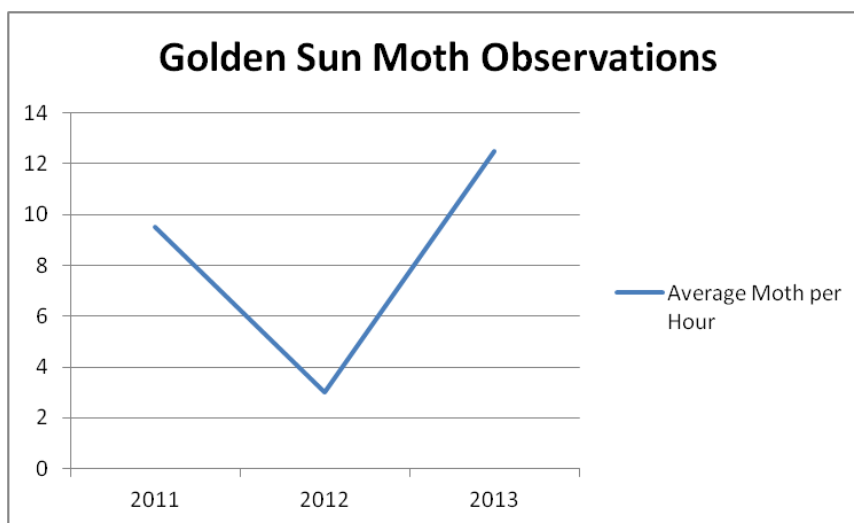
Due to the normal seasonal variation of golden sun moth observations due to prevailing weather among other factors, and variation in survey effort between years, it is difficult to determine the cause, if any or trends in population numbers with only 4 years of data. Observations relevant to the preceding years include:

- Wet, or mild summers generally result in low moth numbers and these conditions were experienced in 2010 and 2011. In 2009, very high numbers were observed, however in 2010, following poisoning of Chilean needlegrass, very low numbers were observed.
- Slashing during surveys in 2013 resulted in higher observations during these events, likely due to the loss of cover.

Results from the 2009 surveys (Rowell, 2010) have been excluded from **Graph 3.1** due to the extremely high numbers of moths observed, which have not been observed again in following years. As this was the first season we have records for, we cannot conclude whether this site had a very high population until the removal of Chilean needlegrass in 2010, or whether this was a unique year with an unusually high number of observations.

The following graph is not considered to provide a statistically accurate representation of population trends on site, due to the low number of samples, however does illustrate seasonal variability and generally very low numbers.

Graph 3.1 – Averaged Golden Sun Moth Observations (per hour) from 2011 - 2013



4.0 Natural Temperate Grassland

4.1 Background

Natural Temperate Grassland of the Southern Tablelands of New South Wales and the Australian Capital Territory' (natural temperate grassland) occurs across temperate lowland areas of south-eastern Australia where tree growth is limited (ACT Government, 2005)⁶. Distribution is generally between altitudes 560 metres and 1200 metres on open plains and in valleys with cold air drainage. The grassland is dominated by dense to open tussock grasses such as wallaby grass (*Rytidosperma* spp.), spear grass (*Austrostipa* spp.), red anther wallaby grass (*Bothriochloa macra*), poa tussock (*Poa* sp.), kangaroo grass (*Themeda australis*) in addition to a diversity of native, herbaceous forbs (DoE, 2013)⁷.

In the region, there are very small, scattered remnants of the community through central Canberra, with the majority of extant grassland retained within Gungahlin, and the Majura and Jerrabomberra Valleys.

Natural temperate grassland in the project area has been mapped and monitored for a number of years (Rowell 2010, 2011, 2012). The community exists in a range of condition-states throughout the project area. A low-lying area of natural temperate grassland near Dudley Street is dominated by Kangaroo Grass (*Themeda triandra*), and a band of natural temperate grassland between Denman and Dudley Streets is dominated by spear-grasses and wallaby grasses (*Austrostipa* spp. and *Rytidosperma* spp.). The strips on the verges of Dudley and Denman Streets dominated by *Rytidosperma* are weedier and less diverse than the core area of grassland, presumably due to increased disturbance and more frequent mowing of the roadsides.

No natural temperate grassland occurs in the project area south of Adelaide Avenue in Deakin.

⁶ ACT Government (2005). *Action Plan No. 28, A Vision Splendid of the Grassy Plains Extended, ACT Lowland Native Grassland Conservation Strategy*. Canberra: Environment ACT

⁷ Department of the Environment (2013). *Species Profile and Threats Database*. Accessed online: <http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl>



Figure 4.1 – *Rytidosperma/Austrostipa* Dominated Natural Temperate Grassland in the Project Area
(Source: Umwelt)



Figure 4.2 – *Themeda* Dominated Natural Temperate Grassland in the Project Area
(Source: Umwelt)

4.2 Background and Methodology

Umwelt surveyed natural temperate grassland areas on 28 November 2013. The survey focused on two components:

1. Validating the distribution of natural temperate grassland across the project area, including areas mapped as NTG by Rowell (2012), and determining their botanical significance rating (ACT Government 2006)⁸.

The Botanical Significance Rating (BSR) is considered an appropriate methodology for this assessment, as the National Recovery Plan for Natural Temperate Grassland suggests that individual States and Territories are tasked with developing appropriate guidelines for grassland assessment. BSR categories are defined in **Table 4.1** with results shown in **Figure 4.2**.

2. Assessing species richness and floristic values at two 20 x 20 metre plot locations surveyed by Rowell (2012) using 20 x 20 metre plot-based assessment and utilising the 'Floristic Values Score' method developed by Rehwinkel (2007)⁹.

This method gives value to sites containing 'significant' species which indicate higher condition grassland. **Table 4.2** presents historical and current FVS ratings for the project area.

Table 4.1 – Botanical Significance Rating Definitions for Natural Temperate Grassland in the ACT

Degree of disturbance	Ground layer species	Examples of characteristic species	Typical flora of the ground layer	BSR rating
Very low	Disturbance sensitive species	<i>Diuris</i> spp., <i>Caladenia</i> spp., <i>Thelymitra</i> spp.	Native species include orchids, lilies and other highly sensitive species, as well as more tolerant species.	1
Low	Moderately disturbance tolerant species	<i>Dichopogon</i> spp., <i>Bulbine bulbosa</i> , <i>Craspedia variabilis</i> , <i>Cryptandra amara</i> , <i>Themeda triandra</i> , <i>Pimelea</i> spp., <i>Wurmbea dioica</i> .	Species present include those moderately tolerant of disturbance, as well as more tolerant species.	2
Moderate	Disturbance tolerant species	<i>Chrysocephalum apiculatum</i> , <i>Convolvulus angustissimus</i> , <i>Plantago varia</i> , <i>Asperula conferta</i> , <i>Glycine</i> spp., <i>Hibbertia obtusifolia</i> .	Native species include those commonly found in a range of sites that have been subject to moderate disturbance; sensitive species are rarely present.	3, 4
High	Disturbance tolerant native grasses	<i>Poa</i> spp., <i>Rytidosperma</i> spp., <i>Austrostipa</i> spp., <i>Bothriochloa macra</i> , <i>Microlaena stipoides</i> .	Site may contain a variety of native grass species but few or no native forbs are present.	5 ¹

⁸ ACT Government (2006). *National Recovery Plan for Natural Temperate Grassland of the Southern Tablelands (NSW and ACT): An Endangered Ecological Community*, Environment ACT, Canberra.

⁹ Rehwinkel R (2007). *A Method to Assess Grassy Ecosystem Sites: Using Floristic Information to Assess a Sites Quality*. Version 2, November 2007. NSW Department of Environment and Climate Change, Queanbeyan

Degree of disturbance	Ground layer species	Examples of characteristic species	Typical flora of the ground layer	BSR rating
Very high	Exotic species	Perennial and annual* weeds, introduced or adventitious species.	Either dominated by perennial exotic species or a low cover and diversity of native species, of which most are native grasses.	E ¹

¹ Not considered part of the natural temperate grassland endangered ecological community.

4.3 Results

Results from the floristic survey are shown in **Appendix 1**. Considering the definitions provided in **Table 4.1**, the BSR of natural temperate grassland remnants across the project area were determined, and are shown in **Figure 4.1**. All areas are considered to be moderately disturbed, with a BSR of 3 or 4. Areas with a BSR of 5 or E were not mapped as they are not considered part of the natural temperate grassland endangered ecological community.

The patches of natural temperate grassland within the project area were confirmed to be small, however relatively diverse, with moderate to high floristic value scores (FVS) (Rehwinkel, 2007).

Two locally uncommon species were found within the *Rytidosperma* patch, Swainson's purple-pea (*Swainsona sericea*) and native storksbill (*Pelargonium australe*). While not threatened under Commonwealth or ACT legislation, Swainson's purple-pea is listed as Vulnerable under the NSW *Threatened Species Conservation Act 1995*. Both species are considered to be an indicator of diversity within the patch.

The following **Table 4.2** summarises the quality of natural temperate grassland as determined by Rowell (2012) and information collected as part of this study.

Table 4.2 – Diversity within Natural Temperate Grassland Quadrats

Quadrat	Number of Native Species			Number of Exotic Species			Floristic Value Score		
	Dec 2009	Jan 2012	Nov 2013	Dec 2009	Jan 2012	Nov 2013	Dec 2009	Jan 2012	Nov 2013
<i>Themeda</i> dominated	26	25	20	13	6	5	27	29	19
<i>Rytidosperma/Austrostipa</i> dominated	26	25	22	11	12	18	14	15	12



Legend

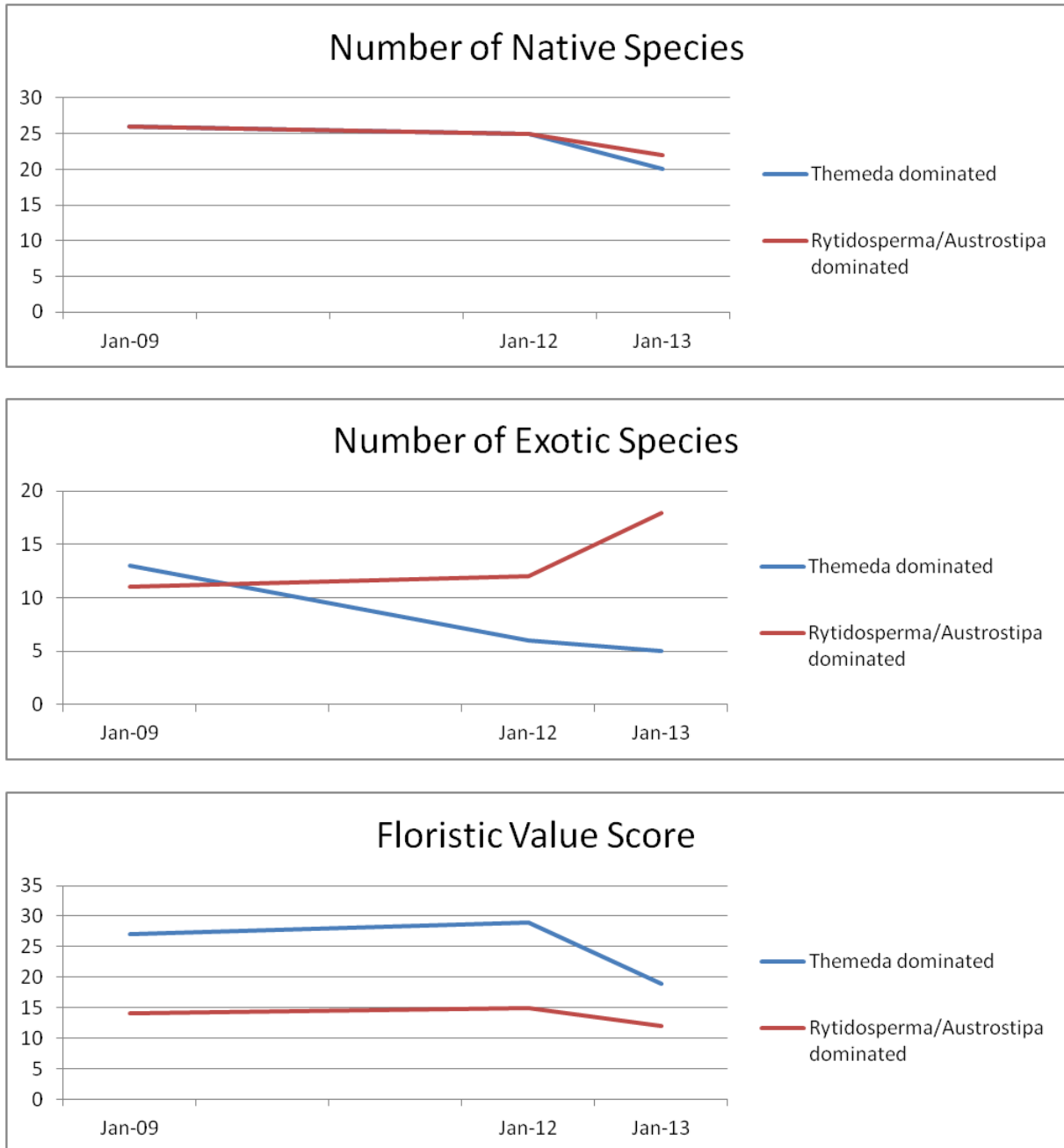
- Project Area
- NTG Dominated by Rytidosperma (Rowell, 2012)
- NTG Dominated by Themeda (Rowell, 2012)
- Quadrat Locations
- BSR 3
- BSR 4

Figure 4.3 – Natural Temperate Grassland Survey

4.4 Interpretation of Results

The following shows a graphical representation of the results shown in **Table 4.2**. The graphs show a minor, gradual decrease in the number of native species, and increase in the number of exotic species. While overall quality has slightly decreased in 2013, the FVS are still considered moderate to high, and the decline is not considered substantial.

Graph 4.1 – Representation of Diversity within Natural Temperate Grassland Quadrats



5.0 Discussion

5.1 Perunga Grasshopper

No perunga grasshoppers were recorded during the survey undertaken by Umwelt. In addition, no grasshoppers had previously been observed during grassland surveys of the project area. It is considered, based on the results of this survey, and the lack of previous opportunistic sighting of the species, that perunga grasshopper is unlikely to be present on the site. If it does occur, it is likely to be at very low densities that were undetectable during surveys.

5.2 Golden Sun Moth

Golden sun moth is present in a number of locations throughout the project area, as previously mapped by Rowell (2012). The far south-western patch of habitat mapped by Rowell (2012) had been removed by recent road works, however all other patches were resurveyed.

No moths were observed in the southern-most patch, or the small, western patch of natural temperate grassland as shown in **Figure 3.1**; however all other areas of mapped habitat were observed to contain the species. Due to the variation in observations between survey days, it cannot be definitively concluded that the southern-most, or small, western patches no longer contain habitat, however if present, golden sun moth numbers during the course of surveys by Umwelt were considered too low for detection within these areas.

In general, numbers of flying moths were low across the site. Across four days of survey, an average of 12.5 moths per hour was recorded. However, this is higher than observations in Rowell (2012) where less than 3 moths per hour of survey were recorded. Additionally, the comparatively higher result from the current survey by comparison to that of Rowell (2012) may have been influenced by the disturbance and removal of cover as a result of slashing that occurred mid-survey.

As noted previously, slashing of golden sun moth habitat during the flying season may have influenced the results of the survey. In addition to this, regular slashing during the flying season has the potential to be negatively impacting the resilience of the populations. The ACT Government's 2012-13 Ecological Guidelines for Fuel and Fire Management Operations¹⁰ state that for golden sun moth:

(PLAN 25.1) Where possible, slashing in GSM habitat should be minimised between Nov and Jan, to avoid the adult flying season.

(OPS 25.2) Slashing in GSM habitat should not be undertaken below 10 cm.

The current management regime would not appear to be consistent with biodiversity conservation objectives for golden sun moth. When the LDA take ownership of this site, the management regime should be reviewed with consideration to this, as well as general maintenance and bushfire hazard management.

¹⁰ ACT Government (2012). *2012-13 Ecological Guidelines for Fuel and Fire Management Operations*, Conservation Planning and Research, Canberra.

5.3 Natural Temperate Grassland

Both the *Themeda* and *Rytidosperma/Austrostipa* dominated areas meet the definition of the natural temperate grassland endangered ecological community under the EPBC Act.

FVS calculations suggest that the project area may have slightly declined in floristic values in the past two years, however the decline is not significant and may be an artefact of slightly different plot locations (the plots were not permanently marked) as some significant flora taxa recorded in low abundance by Rowell (2012) such as *Triptilodiscus pygmaeus* and *Gonocarpus tetragynus* were observed just outside plots surveyed as part of this study.

A decline in native and exotic species within the *Themeda* dominated area over time suggests that the dominance of kangaroo grass is likely to vary temporally, with higher species richness in times when inter-tussock spaces are prevalent (i.e. that the highest levels of biotic diversity are to be found at intermediate levels of disturbance and at intermediate time spans following the disturbance). However, data suggests that there may be an increase in the abundance of exotic species, with Chilean needlegrass (*Nassella neesiana*) and wild oats (*Avena* spp.) spreading further across the project area.

No EPBC Act threatened plant species were found to occur within the natural temperate grassland.

The areas of natural temperate grassland on the road verges of Dudley and Denman streets were less diverse and were reported by Rowell (2012) as having a higher proportion of weeds. This was verified as part of this study. Other areas were either dominated by exotic grasses such as Chilean needlegrass and wild oats, often with disturbance tolerant red-leg grass (*Bothriochloa macra*).

6.0 Conclusion

The following section summarises the key conclusions from this ecological assessment.

Perunga Grasshopper

It is concluded that it is unlikely that perunga grasshopper is present in the project area. No further survey is considered necessary for this species.

Golden Sun Moth

As previously recorded, a total of 2.5 hectares of golden sun moth habitat is present over a number of locations throughout the project area. In these areas, moths occur in varying densities, with the road reserves of Cotter Road, Denman Street, and the small Uniting Church patch maintaining the highest populations.

Species presence and density is understood, and despite some uncertainties associated with slashing conducted during surveys (discussed in **Section 5.2**), further surveys to describe or assess the conservation significance of the project area for this species are not necessary at this point in time; however an ongoing monitoring program should be considered.

Natural Temperate Grassland

The previously mapped 1.3 hectares of natural temperate grassland is still present within the site, and meets the definition of the endangered ecological community under the EPBC Act.

Community extent and quality are well understood, and further surveys are not considered necessary at this point in time.

Approvals Required

Any impact to golden sun moth habitat within the project area is considered significant under the EPBC Act due as a result of it being listed as a Critically Endangered species.

Any impact to natural temperate grassland would require assessment under the EPBC Act.

A referral under the EPBC Act is therefore required for any development of the project area.

Management Recommendations

The current management regime of the site has resulted in some ongoing degradation of habitat in particular the slashing regime during golden sun moth flying periods, and the management of weeds.

Management of identified areas of habitat to be retained as open space within the future urban area is recommended to be reviewed in light of the findings of this report, to promote the long term viability of golden sun moth.

Detrimental effects from shading, landscaping, weed invasion, foot traffic, changes to mowing frequency and alteration to site drainage could all result in loss of biodiversity within adjacent areas of habitat. Effects such as these could be partly mitigated by a buffer zone between habitat and the development edge, and the development and implementation of a conservation management plan.

7.0 References

- ACT Government (1999). *Perunga Grasshopper (Perunga ochracea): A vulnerable species. Action Plan No. 21*. Environment ACT, Canberra.
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- DEWHA (2009). *Significant Impact Guidelines for the Critically Endangered Golden Sun Moth (Synemon plana)*. EPBC Act Policy Statement 3.12. Department of Environment, Water, Heritage and the Arts, Canberra.
- Rehwinkel, R. (2007). *A Method to Assess Grassy Ecosystem Sites: Using floristic Information to Assess a Sites Quality*. NSW Department of Environment and Climate Change.
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APPENDIX 1

Floristic Survey Data

Plot 1 – Floristic Survey Data

Date	28/11/2013		
Description	<i>Rytidosperma</i> / <i>Austrostipa</i> dominated		
Location	GDA94 Zone 55 690377 E, 6090301 N		
Site Parameters			
Landform	Gentle midslope	Bare Ground	5%
Soil Type	Clay	Litter	2%
Rock	0%	Cryptograms	<1%

Native taxa	Sig 1/2	C/A	Exotic taxa	Sig 1/2	C/A
<i>Bothriochloa macra</i>	-	2	<i>Hypochaeris radicata</i>	-	1
<i>Chrysocephalum apiculatum</i>	1	1	<i>Vulpia myuros</i>	-	1
<i>Rytidosperma laevis</i>	-	2	<i>Tolpis barbata</i>	-	r
<i>Cheilanthes sieberi</i> subsp. <i>sieberi</i>	2	+	<i>Aira</i> spp.	-	1
<i>Acaena ovina</i>	-	r	<i>Hypochaeris glabra</i>	-	+
<i>Austrostipa bigeniculata</i>	-	4	<i>Nassella neesiana</i>	-	+
<i>Rytidosperma carphoides</i>	-	+	<i>Avena</i> spp.	-	+
<i>Plantago lanceolata</i>	-	1	<i>Poa sieberiana</i>	-	+
<i>Wurmbea dioica</i>	2	r	<i>Trifolium campestre</i>	-	+
<i>Hypericum gramineum</i>	2	1	<i>Tragopogon dubius</i>	-	r
<i>Euchiton sphaericus</i>	-	+	<i>Anagallis arvensis</i>	-	r
<i>Wahlenbergia communis</i>	-	+	<i>Bromus molliformis</i>	-	+
<i>Themeda triandra</i> (syn. <i>T. australis</i>)	-	1	<i>Centaurium erythraea</i>	-	+
<i>Swainsona sericea</i>	2	r	<i>Briza minor</i>	-	+
<i>Elymus scaber</i>	-	+	<i>Conyza</i> spp.	-	+
<i>Lomandra bracteata</i>	1	r	<i>Petrorhagia nanteuillii</i>	-	r
<i>Cymbonotus lawsonianus</i>	-	r	<i>Gamochoaeta purpurea</i>	-	+
<i>Goodenia pinnatifida</i>	2	+	<i>Paspalum dilatatum</i>	-	+
<i>Wahlenbergia luteola</i>	-	r	Floristic Value Score: 12		
<i>Schoenus apogon</i>	-	+			
<i>Rumex dumosus</i>	-	r			
<i>Epilobium billardierianum</i>	-	r			

Plot 2 – Floristic Survey Data

Date	28/11/2013		
Description	Themeda dominated		
Location	GDA94 Zone 55 690202 E, 6090280 N		
Site Parameters			
Landform	Footslope	Bare Ground	<1%
Soil Type	Clay loam	Litter	<1%
Rock	0%	Cryptograms	<0% (none observed)

Native Taxa	Sig 1/2	C/A	Exotic Taxa	Sig 1/2	C/A
<i>Themeda triandra</i> (syn. <i>T. australis</i>)	2	5	<i>Plantago lanceolata</i>	-	1
<i>Plantago varia</i>	2	1	<i>Centaurium erythraea</i>	-	1
<i>Goodenia pinnatifida</i>	2	1	<i>Hypochaeris radicata</i>	-	1
<i>Hypericum gramineum</i>	2	1	<i>Nassella neesiana</i>	-	r
<i>Poa sieberiana</i>	-	+	<i>Hypericum perforatum</i>	-	r
<i>Chrysocephalum apiculatum</i>	1	1			
<i>Elymus scaber</i>	-	+			
<i>Asperula conferta</i>	2	r			
<i>Schoenus apogon</i>	-	1			
<i>Eryngium rostratum</i> (syn. <i>E. ovinum</i>)	2	+			
<i>Rytidosperma laevis</i>	-	+			
<i>Lomandra bracteata</i>	-	r			
<i>Dianella longifolia</i>	-	r			
<i>Acaena ovina</i>	-	r			
<i>Rumex brownii</i>	-	r			
<i>Austrostipa bigeniculata</i>	-	r			
<i>Wahlenbergia communis</i>	-	r			
<i>Lomandra filiformis</i> subsp. <i>coriacea</i>	1	r			
<i>Leptorhynchus squamatus</i>	2	r			
<i>Carex inversa</i>	-	+			

Floristic Value Score: 19



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