



Melbourne Water Corporation
Sheoak Striped Legless Lizard, Golden Sun Moth and
Vegetation Monitoring Project
Striped Legless Lizard Monitoring

February 2014

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Appendix A – Raw Survey Results

1. Introduction

1.1 Introduction

State and federal regulatory authorities approved the Sugarloaf Pipeline Project in mid-2008. As part of the project, the Sheoak property, located on the west side of the Melba Highway approximately 3 kilometres south of Yea, Victoria, was purchased by Melbourne Water for the construction of the High-lift Pump Station. During pre-construction ecological surveys associated with the Sugarloaf Project, it became evident that the property supported significant ecological values, including the Striped Legless Lizard (SLL) (*Delma impar*), which is listed as Vulnerable under the Commonwealth *Environment Protection and Biodiversity Conservation (EPBC) Act 1999*.

A key compensatory action under the offsets package agreed to by the Commonwealth Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC, now DoE) and the Victorian Department of Sustainability and Environment (DSE, now DEPI) was that parts of the Sheoak property were to be managed in perpetuity for native grassland values (irrespective of land ownership in the future), including threatened flora and fauna species such as the SLL. In accordance with the project's permit conditions, a monitoring program was implemented for this species within the Sheoak property.

One of the approved mitigation measures, stated within the project's Environment Management Strategy^{1,2} upon which approvals were based, was that a two-year, post-construction monitoring program for the SLL will be developed and implemented. The monitoring was to occur across the Sheoak property and at any location along the alignment where five or more SLL were captured during the course of the project (which included the entire construction phase and the targeted surveys for SLL that were done as part of the pre-approvals assessments). Through extensive consultation, discussion and revision, a monitoring plan for SLL³ was developed for the project and endorsed by DSE. The survey method and effort employed for the post-construction monitoring of the SLL was compliant with the approved mitigation plan for the species. This two-year post-construction monitoring plan concluded at the end of 2011, but three additional years of post-construction monitoring for SLL was initiated on the Sheoak property as part of the ongoing Conservation Management Plan (CMP). This report presents the second year's results of this three-year monitoring program. The program is expected to be completed after the survey at the end of 2014.

1.2 Limitations

This report has been prepared by GHD for Melbourne Water Corporation and may only be used and relied on by Melbourne Water Corporation for the purpose agreed between GHD and the Melbourne Water Corporation as set out in Section 1.1 of this report.

GHD otherwise disclaims responsibility to any person other than Melbourne Water Corporation arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

¹ Attachment 7 of the EMS (Mitigation Plan for EPBC Act and FFG Act Listed Fauna Species): Chapter 3.6.2.

² Also stated within Fauna Management Programs (which formed part of the Environment Management Plans) relevant to project areas north of Devlin Bridge.

³ SLL detection includes live individuals, deceased individuals, sections of tails and sloughs.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

2. Methods

2.1 Shelter Grid Array

Fourteen shelter grids (A – N) have been established across the broader Sheoak property. Figure 1 shows the location of the grids across Sheoak property. More detail of the set up methods was provided in SLPA (2010).

Each grid has 50 shelters in a 5 x 10 array.

2.2 Undertaking a monitoring check

A portion of the existing shelter grids on the Sheoak property (A-I and Sheoak ROW) were established during late 2009/early 2010 and were first checked in May 2010. Since this time additional shelter grids have been established on the property (J-N) and the Sheoak ROW grid has been removed (see Table 1 GHD 2013 for a full break down of grid additions and removals).

During the 2013 monitoring period, every grid was checked three times, and all grid checks were conducted during December (Table 1) contrary to all the previous years where checks were spread out across the seasons. This change is a result of an increased understanding of the species' ecology and the focussing efforts on the time of year likely to yield the best results for this species (artificial shelter grid checks recommended between early September and December, DSEWPac 2011).

Grid checks were conducted by two ecologists, and generally in the early morning (before temperatures were too high) in order to detect individuals before they became too active and began to move away from the artificial shelters to undertake foraging and other activities within the surrounding grassy habitats. All checks were done before 10 am each day. Prior to each grid check, a range of location and environmental details were recorded (Table 2). Every shelter within the grid was then carefully lifted from one end and checked for the presence of SLL (or other vertebrates) underneath. Attempts were made to capture all SLL found beneath shelters for identification.

SLL detection included live individuals, deceased individuals, sections of tails and shed skins (sloughs). Live unharmed SLL that were captured during monitoring checks were photographed and replaced under the shelter from which they were captured. Photographs were taken in a way that showed individual head-scale characteristics, so that recaptured SLL could be identified, and a general estimate of minimum numbers of SLL could be made.

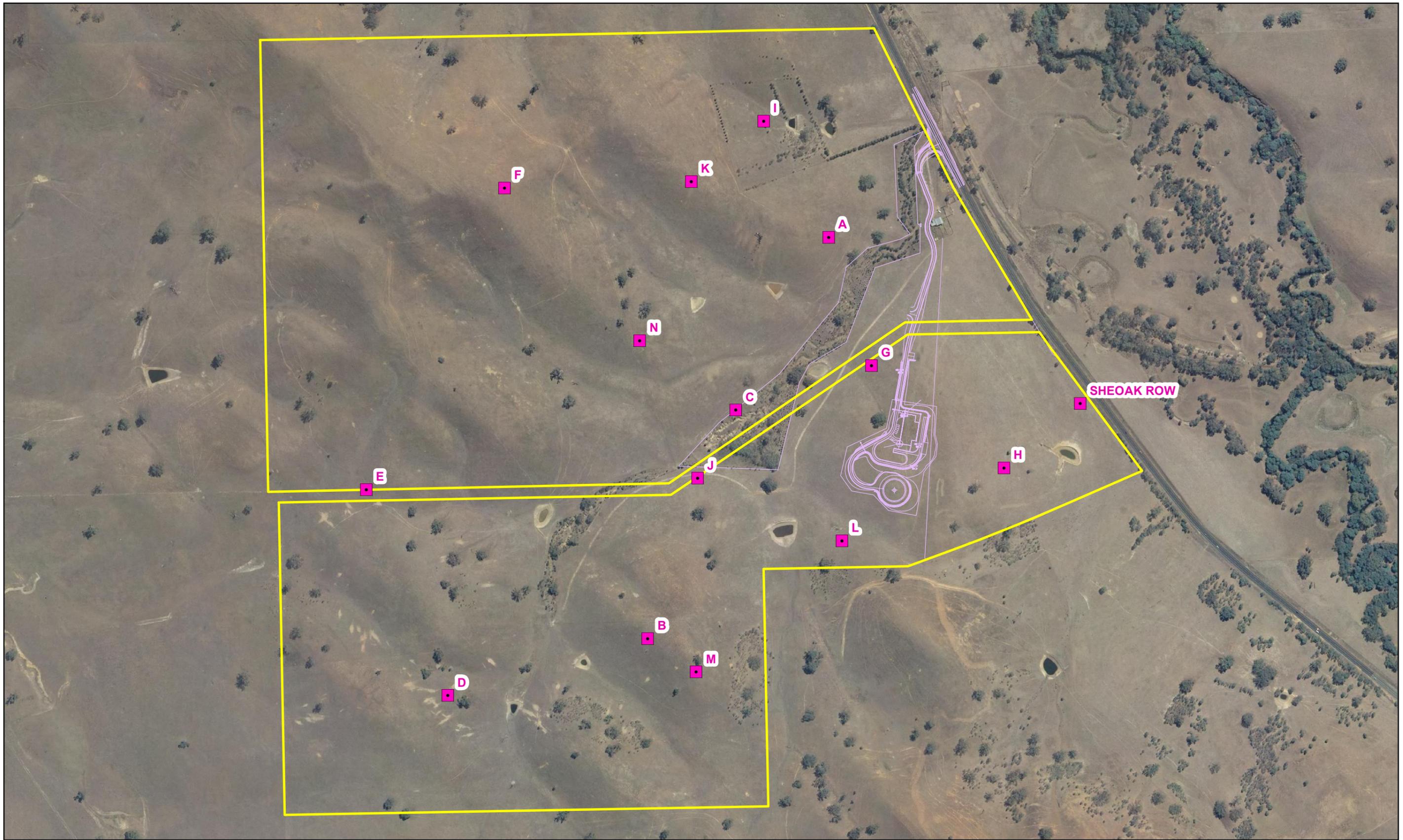
Table 1 Dates of shelter grid checks during the SLL monitoring in December 2013

Visit No.	Date	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	12-Dec-13		✓	✓	✓	✓	✓		✓		✓		✓	✓	
	13-Dec-13	✓						✓		✓		✓			✓
2	17-Dec-13	✓	✓	✓	✓	✓		✓	✓		✓		✓	✓	
	18-Dec-13						✓			✓		✓			✓
3	27-Dec-13	✓	✓	✓	✓	✓	✓	✓	✓	x	✓	x	✓	✓	✓

Table 2 Survey conditions for shelter grid surveys during the SLL monitoring in December 2013

Visit No.	Date	Time Start	Time End	Temperature at Start of survey (C°)	Temperature at End of Survey (C°)	Cloud Cover at Start of Survey (%)	Wind Speed at Start of Survey (kmph)	Wind Direction	Precipitation During Survey
1	12-Dec-13	0640	0955	8.4	16.3	100	7	SSW	None
	13-Dec-13	0655	0849	12.7	17.4	75	11	SSW	None
2	17-Dec-13	0713	0917	13.5	18.6	20	18	SSW	None
	18-Dec-13	0712	0817	13.8	16.6	15	20	SSW	None
3	27-Dec-13	0605	0950	14.6	20.4	90	13	SSW	None

NB: Temperatures are approximate and are collected from the Australian Government Bureau of Meteorology – Mangalore weather station.



1:6,500 Paper Size A3
 0 30 60 120 180 240 300
 Metres
 Map Projection: Transverse Mercator
 Horizontal Datum: GDA 1994
 Grid: GDA 1994 MGA Zone 55



LEGEND
 Sheoak Boundary
 Sheoak Pump Station Layout
 Tile Grid



Melbourne Water Corporation	Job Number	31-28217
Sheoak Conservation	Revision	A
Management Plan	Date	31 Jan 2012

Location of SLL Tile Grids **Figure 1**

G:\31\28217\GIS\Maps\Working\008_TileGrid.mxd
 © 2011. Whilst every care has been taken to prepare this map, GHD and DSE make no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and cannot accept liability and responsibility of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and/or costs (including indirect or consequential damage) which are or may be incurred by any party as a result of the map being inaccurate, incomplete or unsuitable in any way and for any reason.
 Data source: DSE, Vicmap. Created by:cillingworth

3. Results

A total of 89 individuals of at least five vertebrate species (four reptile and one amphibian species) were detected beneath shelters over the course of the December 2013 monitoring. Survey results are summarised below (Table 3) and presented in full in Appendix A.

Table 3 Summary of 2013 shelter grid results (counts of animals)

	Striped Legless Lizard	Other species				Total
		Spotted Marsh Frog	Common Blue-tongue Skink	Eastern Brown Snake	Skink (Lampropholis sp.)	
Check 1	19 (1)*	1	0	1	10	31
Check 2	13 (3)*	0	2	0	9	25
Check 3	17 (3)*	10	0	0	6	33
All checks	49 (7)*	11	2	1	25	89

*Numbers of sloughed or shed skins found beneath shelters are shown in parentheses, and included in totals

- **Striped Legless Lizard (*Delma impar*)** – evidence of up to 49 SLL were detected beneath shelters across all checks. This total is an overestimate of numbers of individuals detected, as it is likely to include repeat captures of the same individuals on multiple visits and sloughs of individuals already observed. Ten of the 14 grid locations contained evidence of SLL (see Table 4 or Appendix A) compared to six grids (plus two incidental locations) during the 2012 monitoring period, one grid (plus one incidental location) during the 2011 monitoring period and 2 grids during 2010 (Table 4).
- Spotted Marsh Frog (*Limnodynastes tasmaniensis*) – 11 detected in one grid
- Eastern Brown Snake (*Pseudonaja textilis*) - one detected
- Skink species (*Lampropholis sp.*) - 25 detections across nine grids
- Common Blue-tongue Skink (*Tiliqua scincoides*) – two detected across two grids

Two grids (F and C) contained no evidence of any animals during the 2013 monitoring period.

A reduction in the number of vertebrate species was observed between the 2012 and 2013 monitoring periods (2012; eight species, 2013; four species).

A number of small skinks were detected but not caught. These are likely to have been the Grass Skink (*Lampropholis guichenoti*), which is a relatively common species, or the closely related Garden Skink (*Lampropholis delicata*).

Of the five most recently added shelter grids (J-N, added during 2011/2012 summer), four yielded SLL observations.

Table 4 Location of SLL on Sheoak⁴ since 2011

Visit No.	ROW	A	B	C	D	E	F	G	H	I	J	K	L	M	N	Incidental	Total Locations
2013 (year 4)	NA	✓	✓		✓	✓		✓		✓	✓	✓	✓	✓		NA	10
2012 (year 3)						✓			✓		✓	✓	✓	✓		x 2 locations	8
2011 (year 2)										✓						x 1 location	2
2010 (year 1)				✓					✓		NA	NA	NA	NA	NA	NA	2

NA – indicates that grid shelter grid was not present to check in that year.

⁴ Note that SLL were found on properties other than Sheoak during the early stages of post-construction monitoring but which are not reported here.

4. Discussion

Over the course of the four monitoring years thus far, up to 66 SLL have now been detected during the post-construction monitoring on Sheoak⁵. There has been an increase in the observations of SLL individuals in each year of the post-construction monitoring. The paucity of records between 2010 and 2012 is thought to have been a function of effectiveness of wooden grid shelters for SLL, availability of alternative natural shelter, timing of survey (i.e. time of day at each grid site), and seasonal variation in resource availability or use of shelters by SLL. Given the substantially larger number of individual SLL detected during 2013, it is likely that the focus on seasonal and diurnal timing of survey helped greatly to detect the species.

During 2013, more SLL were detected than in any other monitoring year to date. There are a number of possible explanations for this, including:

- Grids outside the Sheoak property were moved onto Sheoak in 2011, resulting in five new grids on Sheoak (J-N).
- Using improved and updated information on the species the 2013 checks were only conducted during early summer (all within December, which is within the peak active season for this species).
- Surveys during 2013 were conducted earlier in the morning (no survey went later than 10 am during any individual check) than during earlier years.
- The longer the shelter grids are out, the higher the chance that individuals or populations of SLL find and adopt them.

Low numbers of SLL in previous years were also thought to reflect potentially poor characteristics of the wooden shelters (e.g. thermal properties, texture, shape) compared with ceramic/concrete roof tiles, which are the more traditional shelter used for SLL monitoring. However, given the large numbers of SLL detected during 2013, it is apparent that the wooden shelters used provide suitable shelter for this species.

Fewer species were recorded during 2013 compared to previous years. This is likely to reflect the seasonal change to the monitoring (winter, spring and summer during previous years, summer only during 2013). Most of the species that were recorded in earlier years but not in 2013 were frog species, which are less likely to move across the landscape in summer (hot, dry conditions), so less likely to find shelter grids during summer.

Information on the movements of individuals and overall population size could be obtained by analysing the head scales of SLL (using macro photos of individuals taken by GHD across years of monitoring). Each SLL individual has a unique pattern of head scales allowing individuals to be discerned from others. Comparing individuals within and between years is likely to provide some insight into the population of SLL across Sheoak such as potential for SLL to travel between multiple grids and reoccurrence of individuals over years, which can inform management decisions.

Other reasons that could explain apparent changes in numbers of SLL and other vertebrates include changes in grazing regimes, change in vegetation biomass, or changes in seasonal conditions between the years (e.g. significant rainfall preceding the 2011 season compared to hot dry conditions during the 2013 checks).

⁵ The phrase "up to" is used as it is possible that the same individual may have been counted more than once during this period. This figure also includes sloughs which may have been from individual SLL that were counted.

As discussed within GHD (2013), the current survey array is useful for gaining a broad picture of the presence and absence of SLL on Sheoak. However, the data as currently collected have no local (grid scale) contextual information on habitat or vegetation patterns to help interpret what factors might predict the occurrence and distribution of SLL (or other vertebrates using the shelters) at Sheoak.

5. Conclusion

Observations during the most recent monitoring period have shown an increase in the numbers of SLL detected (per year). However, it is difficult to attribute this increase to any one parameter given the large number of variables between years and the lack of grid-specific habitat information.

In GHD (2013), it was recommended that the SLL tile arrays be restructured to coincide with the Golden Sun Moth (*Synemon plana*) transects that have been established across Sheoak, in order to capture information on grazing, aspect, slope, vegetation combinations, floristics and vegetation structure. With only one year of monitoring remaining, the opportunity to implement this recommendation and obtain valuable information for this project has been missed. However, collecting this information in association with any future SLL monitoring has the potential to provide more insight into SLL distribution across the property and inform management measures to protect the species.

Analysis of head scales of SLL is recommended, as it may provide useful insight into the SLL population across Sheoak.

6. References

DSE 2007. Advisory List of Threatened Vertebrate Fauna in Victoria – 2007. Department of Sustainability and Environment, East Melbourne, Victoria

DSEWPC 2011. Survey Guidelines for Australia's Threatened Reptiles, Commonwealth of Australia. Available online from: <http://www.environment.gov.au/epbc/publications/threatened-reptiles.html>. Accessed 15 Feb 2012

GHD 2012. Report for 2011 Post-construction Monitoring Striped Legless Lizard. A report for Melbourne Water. Document number 207983

GHD 2013. 2012 Post-construction Monitoring Striped Legless Lizard. A report for Melbourne Water. Document number 31/28397/217978

SLPA 2010. Post Construction Monitoring Report Striped Legless lizard. Document Number: SPA-REP-GL-ENV-0047

Appendices

Appendix A – Raw Survey Results

Table A1 Results of survey grids within Sheoak

Grid ID	Check #	Date	Species	Count
A	1	12-Dec-13	Striped Legless Lizard, <i>Delma impar</i>	2
			Skink sp., <i>Lampropholis</i> sp.	2
	2	17-Dec-13	Striped Legless Lizard, <i>Delma impar</i> (slough)	1
	3	27-Dec-13	Striped Legless Lizard, <i>Delma impar</i>	1
B	1	12-Dec-13	Skink sp., <i>Lampropholis</i> sp.	1
	2	17-Dec-13	-	
	3	27-Dec-13	Striped Legless Lizard, <i>Delma impar</i> (slough)	1
C	1	12-Dec-13	-	
	2	17-Dec-13		
	3	27-Dec-13		
D	1	12-Dec-13	Striped Legless Lizard, <i>Delma impar</i>	1
	2	17-Dec-13	-	
	3	27-Dec-13		
E	1	12-Dec-13	Striped Legless Lizard, <i>Delma impar</i>	1
	2	17-Dec-13	Striped Legless Lizard, <i>Delma impar</i>	1
			Skink sp., <i>Lampropholis</i> sp.	4
3	27-Dec-13	Striped Legless Lizard, <i>Delma impar</i> Skink sp., <i>Lampropholis</i> sp.	3 1	
F	1	12-Dec-13	-	
	2	18-Dec-13		
	3	27-Dec-13		
G	1	13-Dec-13	Striped Legless Lizard, <i>Delma impar</i>	3
	2	17-Dec-13	Striped Legless Lizard, <i>Delma impar</i> (slough)	1
			Skink sp., <i>Lampropholis</i> sp. Common Blue-tongue Skink, <i>Tiliqua scincoides scincoides</i>	1 1
3	27-Dec-13	Striped Legless Lizard, <i>Delma impar</i> (includes 1 x slough) Skink sp., <i>Lampropholis</i> sp.	5 2	

Grid ID	Check #	Date	Species	Count
H	1	12-Dec-13	Skink sp., <i>Lampropholis</i> sp.	2
	2	17-Dec-13	-	
	3	27-Dec-13	Striped Legless Lizard, <i>Delma impar</i>	2
I	1	13-Dec-13	Striped Legless Lizard, <i>Delma impar</i>	1
			Spotted Marsh Frog, <i>Limnodynastes tasmaniensis</i>	1
	2	18-Dec-13	Striped Legless Lizard, <i>Delma impar</i> Skink sp., <i>Lampropholis</i> sp. (dead)	2 1
	3	27-Dec-13	Spotted Marsh Frog, <i>Limnodynastes tasmaniensis</i>	10
J	1	12-Dec-13	Skink sp., <i>Lampropholis</i> sp.	2
	2	17-Dec-13	Striped Legless Lizard, <i>Delma impar</i>	1
			Skink sp., <i>Lampropholis</i> sp.	1
	3	27-Dec-13	Striped Legless Lizard, <i>Delma impar</i> Skink sp., <i>Lampropholis</i> sp.	1 3
K	1	13-Dec-13	Striped Legless Lizard, <i>Delma impar</i>	5
	2	18-Dec-13	Striped Legless Lizard, <i>Delma impar</i>	3
			Common Blue-tongue Skink, <i>Tiliqua scincoides scincoides</i>	1
	3	27-Dec-13	-	
L	1	12-Dec-13	Striped Legless Lizard, <i>Delma impar</i>	5
			Skink sp., <i>Lampropholis</i> sp.	2
	2	17-Dec-13	Striped Legless Lizard, <i>Delma impar</i> Skink sp., <i>Lampropholis</i> sp.	3 1
	3	27-Dec-13	Striped Legless Lizard, <i>Delma impar</i>	1
M	1	12-Dec-13	Striped Legless Lizard, <i>Delma impar</i> (slough)	1
			Eastern Brown Snake, <i>Pseudonaja textilis</i>	1
	2	17-Dec-13	Striped Legless Lizard, <i>Delma impar</i> (slough)	1
	3	27-Dec-13	Striped Legless Lizard, <i>Delma impar</i> (includes 1 x slough and 1 x dead)	3
N	1	13-Dec-13	Skink sp., <i>Lampropholis</i> sp.	1
	2	18-Dec-13	Skink sp., <i>Lampropholis</i> sp.	2
	3	27-Dec-13	-	

Indicates check during which SLL individual/s or slough was found. All records are individuals unless otherwise specified.

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