Melbourne Water Corporation

Sheoak Ecological Monitoring Project

Striped Legless Lizard Monitoring

March 2015

Acknowledgements

The following individuals or groups have assisted in the preparation of this report. However, it is acknowledged that the contents and views expressed within this report are those of GHD Pty Ltd and do not necessarily reflect the views of those acknowledged below:

- Melbourne Water Corporation staff, including Andrea Burns, Paul Evans and Alex Sneskov for providing assistance, support and advice throughout the project.

Table of contents

Table index

Figure index

Appendices

1. Introduction

1.1 Introduction

1.1.1 Background

As part of the Sugarloaf Pipeline Project, Melbourne Water purchased the Sheoak property for the construction of a High-lift Pump Station. This property is located on the west side of the Melba Highway approximately 3 kilometres south of Yea, Victoria. During ecological surveys on this property prior to the commencement of construction, 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*.

As part of the offsets package agreed to by the Commonwealth Department of the Environment[1] (DotE) and the Victorian Department of Environment, Land, Water and Planning[2] (DEWLP), parts of the Sheoak property are to be managed in perpetuity for native grassland values, irrespective of land ownership in the future. Grassland values included 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.

In 2010, a two-year post-construction monitoring program of the SLL was established on the Sheoak property. This two-year program concluded at the end of 2011, but an additional three years of post-construction monitoring for SLL was initiated on the Sheoak property as part of a Conservation Management Plan (CMP).

1.1.2 Scope and purpose of this report

The purpose of this report is to present the results of the 2014 monitoring, provide recommendations for further monitoring (if required) and management actions for the Sheoak property (if necessary).

This report presents the results of the final year of this three-year monitoring program and provides context on the results from previous years, and thus provides the final report for the five-year monitoring program.

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] Formally the Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC)

[2] Formally the Department of Sustainability and Environment (DSE)

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 grids

Monitoring for SLL was done using shelter grids. For this project, a 'shelter' was a block of timber[3] (30 cm x 20 cm x 8 cm) lying on the ground within grassland, providing a basking opportunity and refuge for small ground-dwelling fauna such as SLL. Each grid included 50 shelters in a 5 x 10 array, separated by 5 m from each other.

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

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

2.2 Monitoring checks

Grid checks during the first three years of monitoring (2010, 2011 and 2012) were conducted four times over the course of each year (winter, spring, summer). In the final two years of monitoring (2013, 2014), every grid was checked three times per year, and all grid checks were conducted during early summer 2014 (28 November, 8 and 18 December). This change resulted from an increased understanding of the species' ecology and a focussing of efforts on the time of year most likely to yield the best detection results for this species (artificial shelter grid checks recommended between early September and December, DSEWPaC 2011) coupled with the efficiencies gained by checking grids at the same time as other scheduled ecological monitoring trips to the site. All fourteen grids were checked on each of the three rounds of monitoring.

Grid checks were conducted by two ecologists, and generally in the early morning (before temperatures rose too high) in order to detect individuals before they became active and began to move away from the artificial shelters into the surrounding grassland. All checks were done before approximately 10 am each day. Prior to each grid check, a range of location and environmental details were recorded (Table 1). 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.

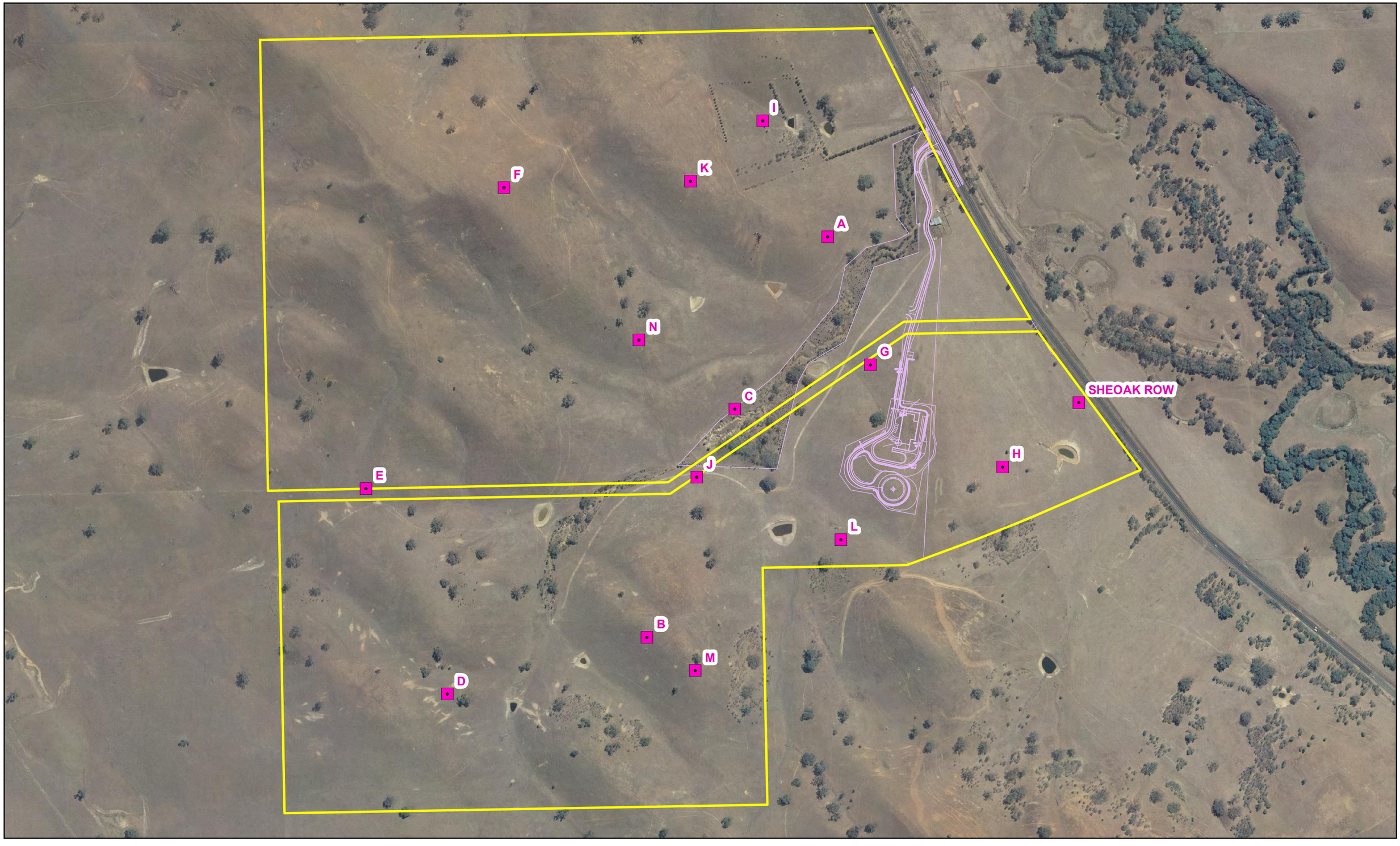
SLL detection included live individuals, deceased individuals, sections of tails and shed skins (sloughs). Live unharmed SLL that were captured during monitoring checks were photographed and replaced under the shelter from which they were captured. Photographs were taken of each individual SLL.

[3] This decision was made by DSE at the outset of the project on the basis that wood better represents the natural shelter (fallen timber, coarse woody debris) in the Sheoak area. Roof tiles, the typical artificial shelter used, represents or provide surrogates for rocky shelters which are less prevalent across much of the property.

Table 1 Survey conditions during the SLL monitoring in 2014

Visit No.	Date	Time Start	Time End	Temp-erature at Start of survey (Cº)	Temp-erature at End of Survey (Cº)	Cloud Cover at Start of Survey (%)	Wind at Start of Survey	Precipitation During Survey
1	28-Nov-14	0549	1030	9.2	18.1	100	Slight	None
2	08-Dec-14	0533	0950	14.8	19.2	100	Still	None
3	18-Dec-14	0530	0930	6.9	23.2	0	Still	None

NB: Temperatures are approximate and are collected from the Australian Government Bureau of Meteorology – Mangalore weather station from the nearest half hour to the start and end times of each visit.



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

N

LEGEND
- Sheoak Boundary
- Sheoak Pump Station Layout
- Tile Grid

GHD
CLIENTS PEOPLE PERFORMANCE

Melbourne Water Corporation
Sheoak Conservation Management Plan

Job Number 31-28217
Revision A
Date 31 Jan 2012

Location of SLL Tile Grids

Figure 1

G:\31\28217\GIS\Maps\Working\008_TileGrid.mxd

Data source: DSE, Vicmap. Created by:cillingworth

180 Lonsdale Street Melbourne VIC 3000 Australia **T** 61 3 8687 8000 **F** 61 3 8687 8111 **E** melmail@ghd.com **W** www.ghd.com

3. Results

3.1 2014 data

A total of 61 individuals of five vertebrate species (four reptile and one amphibian species) were detected beneath shelters over the course of the 2014 monitoring. Survey results are summarised below (Table 2) and presented in full in Appendix A.

Table 2 Summary of 2014 shelter grid results (counts of animals)

Date	Check No.	Striped Legless Lizard	Other species				
			Spotted Marsh Frog	Common Blue-tongue Skink	Eastern Brown Snake	Skink (Lampropholis sp.)	Total
28-Nov-14	1	7 (1)*	0	0	0	9	**16**
08-Dec-14	2	11	1	1	3	10	**26**
18-Dec-14	3	8 (1)*	7	0	0	4	**19**
	All checks	**26** (2)*	**8**	**1**	**3**	**23**	**61**

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

- **Striped Legless Lizard (*Delma impar*)** – Evidence of up to 26 SLL was detected beneath shelters across all checks (Table 3 and Table 4). This total is likely to be an overestimate of numbers of individuals detected, as it is likely to include repeat captures of the same individuals over multiple visits and sloughs of individuals already included. SLL was detected at eight of the 14 grid locations (see Table 4 or Appendix A).
- Spotted Marsh Frog (*Limnodynastes tasmaniensis*) – eight detected, all in one grid.
- Eastern Brown Snake (*Pseudonaja textilis*) – three detected across three grids.
- Skink species (*Lampropholis sp.*) - 23 detections across five grids. These are likely to have been the Grass Skink (*Lampropholis guichenoti*), which is a relatively common species, or the closely related and morphologically similar Garden Skink (*Lampropholis delicata*). Individuals were not caught consistently so identification of all individuals cannot be confirmed.
- Common Blue-tongue Skink (*Tiliqua scincoides*) – one detected in one grid.

Two grids (F and N) contained no evidence of any sheltering vertebrates during the 2014 monitoring period.

3.1 Five years of data

The first three years of monitoring (2010 - 2012) resulted in the detection of relatively small numbers of SLL (Table 3; Figure 2). The final two years (2013 and 2014), however, resulted in larger numbers detected, and the counts of SLL per grid were more than double those for any other year. This increase in numbers corresponds with the change of methods (particularly the season of checks) and addition of grids in the summer of 2011/2012.

Counts of SLL were highest in 2013, but remained relatively high in 2014. Thirteen fewer SLL were detected during 2014 than during 2013.

The number of vertebrate species observed during monitoring periods was highest in 2011, but has decreased since then (Table 3). This is discussed in Section 4.

The count of SLL captured/detected as a proportion of all animals captured/detected beneath shelters increased greatly after 2011; in 2013 and 2014, almost one in every two animals captured/detected was SLL.

Table 3 Summary of results over five-year monitoring period on Sheoak

Year	#s Grids	Total no. of SLL found	Total SLL Locations No. of grids (incidentals)	Total no. of Vertebrate Species	Total Individual Animals	#s SLL as a proportion (%) of animals captured
2010 (year 1)	10	2	2	5	49	4.1
2011 (year 2)	15	2	1 (1)	10	213	0.9
2012 (year 3)	15	12	6 (2)	7	80	15.0
2013 (year 4)	14	49	10	4	89	55.1
2014 (year 5)	14	26	8	4	61	42.6

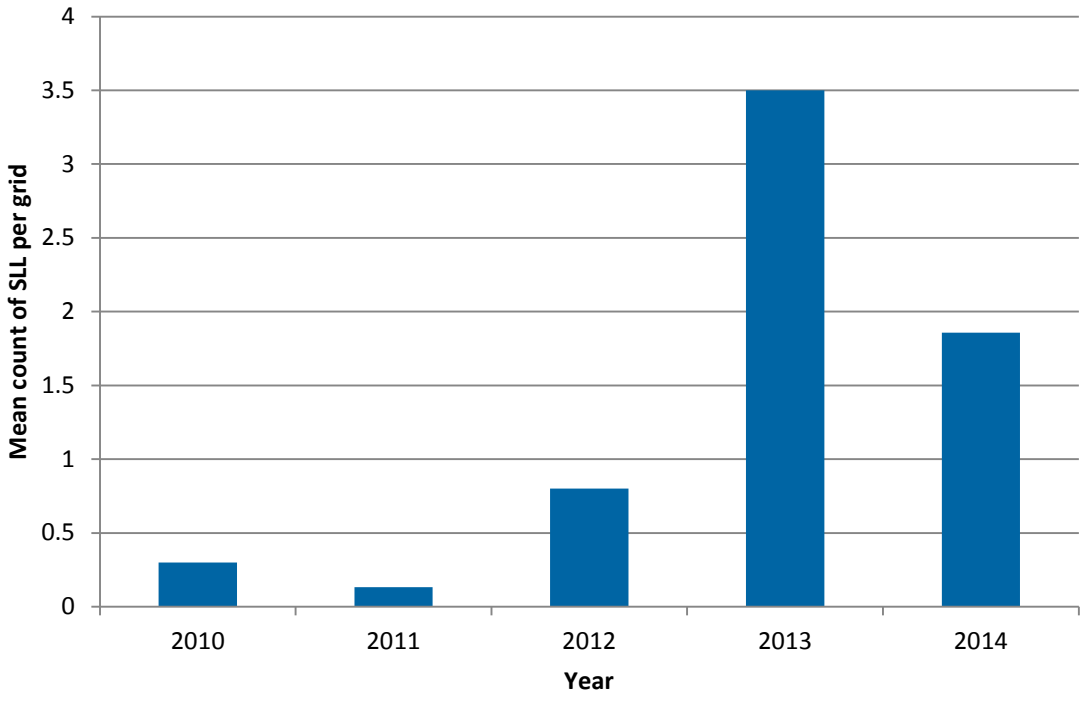


Figure 2 Mean count of SLL per grid over five years

Table 4 shows the distribution of SLL across grids in the property over the course of the five-year monitoring period. Most grids supported SLL across the years, but SLL were not detected at any grid in all years. One grid (H) supported SLL in four of the five years, and at four locations, SLL were detected over all of the last three years (E, H, K and L). Two grids (F and N) yielded no evidence of SLL over the five-year survey period (Table 4).

The post-2011 increase in SLL captured/detected as a proportion of all animals captured/detected beneath shelters (Table 3) suggests that the subsequent years were more successful at targeting SLL, as the distribution of habitats and SLL across Sheoak became better known, and as the seasonality of checks was refined. This is evident in the results shown in Table 4.

Table 4 Number of SLL at each grid location since 2010

Visit No.	ROW	A	B	C	D	E	F	G	H	I	J	K	L	M	N	*Incidental locations	Total Locations
2010 (year 1)				1					1		-	-	-	-	-	NA	2
2011 (year 2)										1						x 1 location	2
2012 (year 3)						3			1		2	1	2	1		x 2 locations	8
2013 (year 4)	-	4	1		1	5		9	2	3	2	8	9	5		NA	11
2014 (year 5)	-		1		2	3		5	3	3		4	5			NA	8

*Incidental locations are locations where SLL were detected from the property but not from grids.

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

4. Discussion

Over the course of the five years of monitoring, there were 91 detections of SLL on Sheoak (detections include sloughed/shed skins, which may have been from individuals counted separately, and are likely to include at least some multiple counts of the same individuals). Numbers of SLL detected varied widely, and were lowest in 2011 (two animals detected) and highest in 2013 (49 animals detected). In 2014, numbers of SLL were lower than in 2013, which may be attributed to a number of different factors such as weather during the monitoring period, such that SLL (and other vertebrate fauna) were less attracted to shelters in that period.

The paucity of SLL records between 2010 and 2012 (12 individuals or fewer) is likely a reflection of the difference in methods between this period and the 2013 and 2014 surveys. Differences between these periods include:

- The 2013 and 2014 surveys were concentrated to the known SLL active season compared to previous years where surveys were spread out over the year.
- Individual monitoring checks during the 2013 and 2014 surveys started much earlier in the morning to target the coolest part of the day before SLL individuals were active and were therefore more likely to be using the shelters (no survey went later than 1030 am during any individual check in 2013 or 2014).

Over the course of the monitoring, the number of shelter grids on Sheoak changed between the years. As a proportion of the grids checked, the 2013 and 2014 checks were each more than double the proportion of SLL found per year than any other year. Given the substantially larger proportion and number of individual SLL detected during both the 2013 and 2014 surveys, it is likely that the focus on seasonal and diurnal timing of survey (in accordance with new information and recommended guidelines (DSEWPaC 2011)) helped greatly to increase detection of the species.

In addition the following points are likely to have contributed to the notably larger numbers and proportions of SLL detected during the 2013 and 2014 monitoring periods compared to earlier years:

- Five additional grids were added to Sheoak in 2011 (J-N) but were unlikely to have enough time to establish properly to contribute to 2011 SLL detections.
- The longer the shelter grids are in situ, the higher the chance that individuals or populations of SLL can find and adopt them.

In early years, low numbers of SLL were thought to reflect potentially poor characteristics of the wooden shelters (e.g. thermal properties, texture, shape, complexity). Wooden tiles were used because they were thought to better represent the natural shelter available on Sheoak, compared with ceramic/concrete roof tiles, which are more commonly used as shelters for SLL monitoring. However, given the large numbers of SLL detected during 2013 and 2014, it is apparent that wooden shelters do provide suitable shelter for this species at Sheoak, and that other factors were responsible for low numbers early on.

Fewer vertebrate species were recorded during 2013 and 2014 compared to previous years. This is likely to reflect the seasonal change to the monitoring (winter, spring and summer in 2010, 2011 and 2012, summer only during 2013 and 2014). Most of the species that were recorded in earlier years but not in 2013 or 2014 were frog species[4]. Frogs may be less likely to move across the landscape in summer (hot, dry conditions), so less likely to be found using shelter grids across the drier areas of the property during summer. The peak in observations of frogs is also the cause of the peak total in animals observed in 2011.

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 all 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 would provide more insight into the population dynamics of SLL across Sheoak, such as whether SLL travel between grids, and rates of recapture of individuals over years and within grids. This more detailed information is likely to help inform management decisions (e.g., what area of habitat does SLL use and therefore require protection?).

Other reasons that could explain apparent changes in numbers of SLL and other vertebrates include changes in grazing regimes and/or changes in vegetation biomass between monitoring periods, although data are not available on either of these parameters. It is possible that changes in seasonal conditions between the years (e.g. significant rainfall preceding the 2011 season compared to hot dry conditions during the 2013 checks) could also partly explain variation in numbers of SLL and other vertebrates.

As discussed in earlier reports (GHD 2013 and 2014), the existing survey array is helpful for gaining a broad picture of the presence and apparent absence of SLL on Sheoak. However, the data as currently collected have no local (grid scale) contextual information on habitat condition/quality or vegetation patterns that would be needed to interpret what factors influence the occurrence and distribution of SLL (or other vertebrates using the shelters) at Sheoak. Future monitoring for this project or others should endeavour to collect such accompanying information.

[4] 170 frogs comprised of four species were recorded during the 2011 monitoring period

5. Conclusion

Observations during the most recent monitoring periods show an increase in the numbers of SLL detected (per year) compared to earlier years. While it is tempting to conclude that this represents an increase in SLL population size on the Sheoak property, there are many factors that have likely influenced these results. It is difficult to attribute this increase to any one parameter given the large number of variables between years, the lack of grid-specific habitat information and more accurate data on numbers of individuals present (i.e. removing replication between checks within a year).

Management measures (e.g. grazing regimes, with purposeful exclusion or inclusion of stock within any particular paddock) have not been systematically altered over the course of the monitoring program (five years). As a result, it is unknown if differing grazing regimes have contributed to the fluctuations in SLL numbers over the monitoring periods.

No habitat data was collected alongside SLL observations. In GHD 2013 and 2014, 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 holistic and property-wide information on grazing, aspect, slope, vegetation combinations, floristics and vegetation structure. The opportunity to implement this recommendation and obtain valuable information for the project has been missed thus far, but could still be adopted for future years of Golden Sun Moth and vegetation monitoring across the property. 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 better protect the species and its habitat.

Very informative data could be obtained by analysing the head scale photos of individual SLL, which would provide insight into the localised population dynamics of SLL. Such information is likely to be useful in informing the success of different grazing regimes and suitability of different habitat parameters should that information be collected.

6. References

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

DSEWPaC 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

GHD 2014. Sheoak Striped Legless lizard, Golden Sun Moth and Vegetation monitoring Project. Striped Legless Lizard monitoring. A report for Melbourne Water. Document number 31/30717/230448

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

Appendices

Appendix A – Raw Survey Results (2014)

Table A1 Results of survey grids within Sheoak

Grid ID	Check #	Date	Species	Count
A	1	28-Nov-14	Eastern Brown Snake, *Pseudonaja textilis (juv)*	1
	2	8-Dec-14	Common Blue-Tongue Lizard, Tiliqua scincoides scincoides	1
	3	18-Dec-14	-	
B	1	28-Nov-14	-	-
	2	8-Dec-14	-	
	3	18-Dec-14	**Striped Legless Lizard, *Delma impar (slough)***	1
C	1	28-Nov-14	-	
	2	8-Dec-14	Skink sp., *Lampropholis* sp.	1
	3	18-Dec-14	Skink sp., *Lampropholis* sp.	1
D	1	28-Nov-14	**Striped Legless Lizard, *Delma impar***	2
	2	8-Dec-14	-	
	3	18-Dec-14	-	
E	1	28-Nov-14	**Striped Legless Lizard, *Delma impar (slough)***	1
			Skink sp., *Lampropholis* sp.	3
	2	8-Dec-14	**Striped Legless Lizard, *Delma impar***	1
	3	18-Dec-14	**Striped Legless Lizard, *Delma impar***	1
			Skink sp., *Lampropholis* sp.	1
F	1	28-Nov-14	-	
	2	8-Dec-14	-	
	3	18-Dec-14	-	
G	1	28-Nov-14	**Striped Legless Lizard, *Delma impar***	1
			Skink sp., *Lampropholis* sp.	2
	2	8-Dec-14	**Striped Legless Lizard, *Delma impar (slough)***	3
			Skink sp., *Lampropholis* sp.	2
	3	18-Dec-14	**Striped Legless Lizard, *Delma impar***	1

Grid ID	Check #	Date	Species	Count
			Skink sp., *Lampropholis* sp.	2
H	1	28-Nov-14	-	
	2	8-Dec-14	-	
	3	18-Dec-14	**Striped Legless Lizard, *Delma impar***	3
I	1	28-Nov-14	-	
	2	8-Dec-14	**Striped Legless Lizard, *Delma impar***	3
			Spotted Marsh Frog, *Limnodynastes tasmaniensis*	1
	3	18-Dec-14	Spotted Marsh Frog, *Limnodynastes tasmaniensis*	7
J	1	28-Nov-14	Skink sp., *Lampropholis* sp.	2
	2	8-Dec-14	Skink sp., *Lampropholis* sp.	4
	3	18-Dec-14	-	-
K	1	28-Nov-14	Skink sp., *Lampropholis* sp.	2
	2	8-Dec-14	**Striped Legless Lizard, *Delma impar (dead)***	3
			Skink sp., *Lampropholis* sp.	3
			Eastern Brown Snake, *Pseudonaja textilis (juv)*	1
	3	18-Dec-14	**Striped Legless Lizard, *Delma impar***	1
L	1	28-Nov-14	**Striped Legless Lizard, *Delma impar***	3
	2	8-Dec-14	**Striped Legless Lizard, *Delma impar***	1
	3	18-Dec-14	**Striped Legless Lizard, *Delma impar***	1
M	1	28-Nov-14	-	
	2	8-Dec-14	Eastern Brown Snake, *Pseudonaja textilis (juv)*	1
	3	18-Dec-14	-	
N	1	28-Nov-14	-	0
	2	8-Dec-14	-	
	3	18-Dec-14	-	

Key

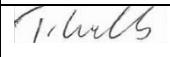
Indicates check during which SLL individual/s or slough was found.

GHD

180 Lonsdale Street
Melbourne, Victoria 3000
T: (03) 8687 8000 F: (03) 8687 8111 E: melmail@ghd.com.au

G:\31\32138\WP\239948.docx

Document Status

Rev No.	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
Draft						27/02/15
0	K Dalton	R Retallick		T Wills		03/03/15

www.ghd.com