Fauna Survey

(Level 2)

Phase 1 (September 2016) and Phase 2 (April 2017)

Lake Wells Potash Project

Australian Potash Ltd

September 2017

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VERSION 4

On behalf of:
Australian Potash Limited
PO Box 1941
WEST PERTH, WA 6872

Prepared by:
Greg Harewood
Zoologist
PO Box 755
BUNBURY WA 6231
M: 0402 141 197
E: gharewood@iinet.net.au

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Acronyms/Abbreviations:

ALA: Atlas of Living Australia www.ala.org.au

BA: Birdlife Australia (Formerly RAOU, Birds Australia).

BC Bill: Biodiversity Conservation Bill (2015). WA Government.

°C: Degrees Celsius.

CALM: Department of Conservation and Land Management (now DBCA), WA Government.

CAMBA: China Australia Migratory Bird Agreement 1998.

CBD: Central Business District.

DBCA: Department of Biodiversity, Conservation and Attractions (formerly DPaW, DEC, CALM, DoE), WA Government

DBH: Diametre at Breast Height – tree measurement.

DEC: Department of Environment and Conservation (now DBCA), WA Government.

DEH: Department of Environment and Heritage (now DotEE), Australian Government.

DEP: Department of Environment Protection (now DER), WA Government.

DER: Department of Environment Regulation (now DWER), WA Government.

DEWHA: Department of the Environment, Water, Heritage and the Arts (now DotEE), Australian Government

DMP: Department of Mines and Petroleum (formerly DoIR), WA Government.

DoE: Department of Environment (now DER/DBCA), WA Government.

DoP: Department of Planning, WA Government.

DotE: Department of the Environment (now DotEE), Australian Government.

DotEE: Department of the Environment and Energy (formerly SEWPaC, DWEHA, DEH & DotE), Australian Government.

DoIR: Department of Industry and Resources (now DMP), WA Government.

DoW: Department of Water (now DWER), WA Government.

DPaW: Department of Parks and Wildlife (now DBCA), WA Government.

DWER: Department of Water and Environmental Regulation (formed by the amalgamation of OEPA, DoW and DER), WA Government.

EP Act: *Environmental Protection Act 1986*, WA Government.

EPA: Environmental Protection Authority, WA Government.

EPBC Act: *Environment Protection and Biodiversity Conservation Act 1999,* Australian Government.

ha: Hectare (10,000 square metres).

IBRA: Interim Biogeographic Regionalisation for Australia.

IUCN: International Union for the Conservation of Nature and Natural Resources – commonly known as the World Conservation Union.

JAMBA: Japan Australia Migratory Bird Agreement 1981.

km: Kilometre.

m: Metre.

mm: Millimetre.

P: Priority - DBCA fauna conservation ranking.

POS: Public Open Space.

RAOU: Royal Australia Ornithologist Union.

ROKAMBA: Republic of Korea-Australia Migratory Bird Agreement 2007.

S: Schedule - Western Australian *Wildlife Conservation Act (1950)* Threatened Fauna Category.

SEWPaC: Department of Sustainability, Environment, Water, Population and Communities (now DotEE), Australian Government.

SRE: Short Range Endemic.

SSC: Species Survival Commission, International.

WA: Western Australia.

WAM: Western Australian Museum, WA Government.

WAPC: Western Australian Planning Commission, WA Government.

WC Act: *Wildlife Conservation Act 1950*, WA Government.

SUMMARY

This report details the results of a two phase (seasonal), Level 2 terrestrial fauna survey within sections of Australian Potash Limited's (APL) Lake Wells Potash (LWP) Project area (Project area). The Project area is situated within the Great Victoria Desert, approximately 160km NNE of Laverton, Western Australia (Figure 1 & 2).

The two phase seasonal Level 2 fauna survey within the Lake Wells Potash Project area was undertaken during September 2016 and April 2017 for the purposes of providing baseline data on the fauna assemblages present, to identify possible development constraints and to allow for the identification of subsequent information gaps.

The field survey recorded 156 native and eight introduced vertebrate species. The identified (native) assemblage includes four species of frog, 50 species of reptiles, 83 species of birds and 18 mammals (includes 8 species of bat). Evidence of one species of conservation significance was recorded during the survey period, this being the:

- Marsh sandpiper (*Tringa stagnatilis*) (S5, Migratory).

This migratory bird is not a threatened species and would only occur occasionally in wetland areas after significant spring/summer rain events.

Forty six terrestrial invertebrate specimens were collected during both phases of the fauna survey. Specimens collected included scorpions, myglamorph (trapdoor) spiders, wolf spiders, millipedes, centipedes, silverfish and slaters (isopods). The specimens collected represented 14 individually-recognised taxa from eight orders, 10 families and at least 11 genera. Of these, a total of nine are considered to include potential (data deficient) SRE species or taxa.

No invertebrate salt lake specialist species were identified from the specimens submitted, though during an independent survey Bennelongia identified a single terrestrial salt lake tiger beetle *Megacephala* sp. which they consider to have "potential conservation significance" (Bennelongia 2017).

1. INTRODUCTION

1.1 BACKGROUND

This report details the results of a two phase (seasonal), Level 2 terrestrial fauna survey within sections of Australian Potash Limited's (APL) Lake Wells Potash (LWP) Project area (Project area). The Project area is situated within the Great Victoria Desert, approximately 160km NNE of Laverton, Western Australia (Figure 1).

The Lake Wells Potash Project currently consists of a series of mining tenements over a significant area of palaeovalley and salt lake terrain in the northeast part of the Yilgarn Craton. Initial pit sampling, auger and air-core drilling demonstrated the presence of consistent high-grade potash brine concentrations to significant depths both on and adjacent to salt lakes. Australian Potash Limited is progressing a plan to capture this resource, and it is envisaged that the hypersaline brine will be extracted via a series of bores and then fed into evaporation ponds, with the resulting evaporite then being processed to produce Sulphate of Potash (SOP).

The fauna survey work reported on here has been carried out to provide baseline fauna datasets for areas within and near potential mine and associated infrastructure areas with a primary focus on identifying the potential for significant impacts on fauna species of conservation significance.

It is anticipated that ultimately the survey results will be taken into consideration by State and Federal environmental regulatory authorities when future applications to carry out exploration, testing and mining are submitted for approval. The results have also aided in identifying current information gaps so that recommendations for further work could be made.

1.2 SURVEY AREA

The Level 2 fauna survey area (which is approximately equivalent to the Project area) covers about 55,900 ha, of which approximately 3,600 ha overlaps Lake Wells (Figures 1 and 2). Lake Wells is a mosaic of ephemeral salt lakes (with some freshwater elements) with a total area of about 49,500 ha and extends well outside the survey area.

1.3 SURVEY SCOPE

The scope of the fauna survey reported on here was to:

- document the vertebrate fauna assemblages within the habitats of the Survey area using established sampling techniques;
- identify fauna of conservation significance (particularly state and federally listed threatened, migratory and priority fauna species) and SRE/salt lake specialist invertebrates present or potentially present within the areas surveyed;

- Identify potential mine development constraints relating to fauna including significant information gaps or uncertainties relating to possible impacts on fauna.

To comply with the scope of works and the likely requirements of environmental regulatory authorities the survey documented in this report was planned and implemented in accordance with:

- EPA (2016a). Statement of Environmental Principles, Factors and Objectives;
- EPA (2016b). Environmental Factor Guideline – Terrestrial Fauna Assessment;
- EPA (2016c). Technical Guidance – Terrestrial Vertebrate Fauna Surveys (replaces EPA (2004). Guidance for the Assessment of Environmental Factors No 56: Terrestrial Surveys for Environmental Impact Assessment, but not yet updated);
- EPA (2016d). Technical Guidance – Sampling Methods for Terrestrial Vertebrate Fauna (replaces EPA & DEC (2010). Technical Guide - Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment, but not yet updated);
- Department of Environment, Water, Heritage and the Arts (DEWHA) (2010a). Survey guidelines for Australia's threatened bats. Guidelines for detecting bats listed as threatened under the *Environment Protection and Biodiversity Conservation Act 1999*. Department of Sustainability, Environment, Water, Population and Communities, Canberra, Australian Capital Territory;
- Department of Environment, Water, Heritage and the Arts (DEWHA) (2010b). Survey guidelines for Australia's threatened birds. Guidelines for detecting birds listed as threatened under the *Environment Protection and Biodiversity Conservation Act 1999*. Department of Sustainability, Environment, Water, Population and Communities, Canberra, Australian Capital Territory;
- Department of Sustainability, Environment, Water, Population and Communities (SEWPaC) (2011a). Survey guidelines for Australia's threatened mammals. Guidelines for detecting mammals listed as threatened under the *Environment Protection and Biodiversity Conservation Act 1999.* Department of Sustainability, Environment, Water, Population and Communities, Canberra, Australian Capital Territory;
- Department of Sustainability, Environment, Water, Population and Communities (SEWPaC) (2011b). Survey guidelines for Australia's threatened reptiles. Guidelines for detecting reptiles listed as threatened under the *Environment Protection and Biodiversity Conservation Act 1999*. Department of Sustainability, Environment, Water, Population and Communities, Canberra, Australian Capital Territory.

2. METHODS

2.1 FAUNA INVENTORY - LITERATURE REVIEW

2.1.1 Database Searches

Searches of the following databases were undertaken to aid in the compilation of a list of vertebrate fauna potentially occurring within the survey area:

- DBCA's NatureMap database (combined data from DBCA, Western Australian Museum, Birds Australia and consultant's reports) (DBCA 2017); and
- DotEE's Protected matters search tool (DotEE 2017).

It should be noted that these lists may contain or be based on records from a broader region than the survey area and therefore may include species that would only ever occur as vagrants/transients due to a lack of suitable habitat or the presence of only marginal habitat. The databases also often included very old records and in some cases the species in question have become locally or regionally extinct.

Information from these sources should therefore be taken as indicative only and local knowledge and information needs also to be taken into consideration when determining what actual species may be present within the specific area being investigated.

2.1.2 Previous Fauna Surveys in the Area

Very few fauna surveys, assessments and reviews have been undertaken in nearby areas in the past. The limited number of reports available have been used to assist in compiling the potential fauna assemblage for the general area. Those reports referred to included, but were not limited to:

- Bennelongia Environmental Consultants (2017). Lake Wells Potash Project Wetland Ecology Baseline Survey. Unpublished report for Australia Potash Limited (Draft) June 2017.
- ecologia (2009a). Tropicana Gold Project. Operational Area Vertebrate Fauna Assessment. Unpublished report for Tropicana Joint Venture. February 2009.
- ecologia (2009b). Tropicana Gold Project. Tropicana-Transline Infrastructure Corridor, Level 1 Fauna Assessment. Unpublished report for Tropicana Joint Venture. July 2009.
- Hall, N. J., McKenzie, N. L. and Keighery, G. J. (eds) (1994). The Biological Survey of the Eastern Goldfields of WA - Pt 10: Sandstone-Sir Samuel and Laverton-Leonora Survey Areas. Records of the WAM, Supplement 47: 1 – 166.

- Harewood, G. (2011). Terrestrial Fauna Survey (Level 1) of Yamarna Gold Project (Central Bore, Attila, Alaric, Haul Road and Khan North). Unpublished report for Gold Road Resources. September 2011.

- Harewood G. (2014). Fauna Assessment (Level 1) Gruyere Project. Unpublished report for Gold Road Resources Ltd. July 2014.

- Kingfisher Environmental Consulting (2014a). Murrin Murrin – Sunrise Dam Infrastructure Corridor Level 1 Fauna Survey. Unpublished report for AngloGold.

- Kingfisher Environmental Consulting (2014b). Sunrise Dam – Tropicana Infrastructure Corridor Level 1 Fauna Survey. Unpublished report for AngloGold.

- Keith Lindbeck and Associates (2012). Fauna Assessment (Level 2) Yamarna Project. Unpublished report for Gold Road Resources. October 2012.

- Martnick and Associates Pty Ltd (1996). Environmental Appraisal – Yamarna Gold Project Area. Unpublished report for Zanex NL. January 1996.

- MBS Environmental (2014). Gruyere Project - Desktop Environmental Review and Work Program. Unpublished report for Gold Road Resources. February 2014.

- Rapallo Environmental (2015). Fauna Survey of the Gruyere Project Area. Unpublished report for Gold Road Resources Limited. May 2015.

- Terrestrial Ecosystems (2011). Level 2 Fauna Risk Assessment for the Granny Deeps Project Area. Unpublished report. February 2011.

As with the databases searches some reports refer to species that would not occur in the Lake Wells survey area due to a lack of suitable habitat (extent and/or quality) and this fact was taken into consideration when compiling the potential fauna species list for the survey area. It should also be noted that the NatureMap database is likely to include some records from previous fauna surveys in the area including some of those listed above.

2.1.3 Existing Publications

The following represent the main publications used to identify and refine the potential fauna species list for the survey area:

- Anstis, M. (2013). Tadpoles and Frogs of Australia. New Holland Publishers, Sydney.

- Barrett, G., Silcocks, A., Barry, S., Cunningham, R. and Poulter, R. (2003). The New Atlas of Australian Birds. Royal Australasian Ornithologists Union, Victoria.

- Churchill, S. (2008). Australian Bats. Second Edition, Allen & Unwin.

- Cogger, H.G. (2014). Reptiles and Amphibians of Australia. 7th Edition. CSIRO Publishing.
- Johnstone, R.E. and Storr, G.M. (1998). Handbook of Western Australian Birds: Volume 1 – Non-passerines (Emu to Dollarbird). Western Australian Museum, Perth Western Australia.
- Johnstone, R.E. and Storr, G.M. (2004). Handbook of Western Australian Birds: Volume 2 – Passerines (Blue-winged Pitta to Goldfinch). Western Australian Museum, Perth Western Australia.
- Menkhorst, P. and Knight, F. (2011). A Field Guide to the Mammals of Australia. Third Edition, Oxford University Press, Melbourne.
- Storr, G.M., Smith, L.A. and Johnstone R.E. (1983). Lizards of Western Australia II: Dragons and Monitors. WA Museum, Perth.
- Storr, G.M., Smith, L.A. and Johnstone R.E. (1990). Lizards of Western Australia III: Geckos and Pygopods. WA Museum, Perth.
- Storr, G.M., Smith, L.A. and Johnstone R.E. (1999). Lizards of Western Australia I: Skinks. Revised Edition, WA Museum, Perth.
- Storr, G.M., Smith, L.A. and Johnstone R.E. (2002). Snakes of Western Australia. Revised Edition, WA Museum, Perth.
- Thompson, S. & Thompson, G. (2006). Reptiles of the Western Australian Goldfields. Published by the Goldfields Environmental Management Group.
- Tyler M.J. & Doughty P. (2009). Field Guide to Frogs of Western Australia, Fourth Edition, WA Museum, Perth.
- Van Dyck, S., Gynther, I. & Baker, A. Eds (2013). Field Companion to The Mammals of Australia. Queensland Museum.
- Wilson, S. and Swan, G. (2013). A Complete Guide to Reptiles of Australia. Third Edition, Reed, New Holland, Sydney.

2.2 FAUNA INVENTORY – DETAILED FAUNA SURVEY

2.2.1 Survey Timing and Weather

The first phase seasonal survey was undertaken over a 10 day period in September 2016, the second over an eight day period in April 2017. Table 1 below shows the daily weather records from the Laverton Aero weather station (located approximately 143km south west of the Project area) during the two phases.

Because of the distance of the weather station from the actual survey area the climate data presented only represents an approximate indication of the prevailing conditions on site at the time of the survey.

Table 1: Daily Temperatures and Rainfall at the Laverton Aero rainfall station (#12035) During Phase 1 and Phase 2 Survey Periods (BOM 2017).

	Date	Min (°C)	Max (°C)	Rainfall (mm)
Phase 1	11/09/2016	9.8	25.8	0.0
	12/09/2016	8.8	17.9	0.0
	13/09/2016	5.8	16.7	0.0
	14/09/2016	6.4	16.6	0.0
	15/09/2016	3.8	21.9	0.0
	16/09/2016	8.6	19.1	0.0
	17/09/2016	4.5	18.3	0.0
	18/09/2016	6.9	23.5	0.0
	19/09/2016	9.3	15.0	2.0
	20/09/2016	1.8	19.5	2.2
Phase 2	24/04/2017	14.5	24.2	1.4
	25/04/2017	12.2	23.8	0.0
	26/04/2017	11.1	22.4	0.0
	27/04/2017	10.9	20.4	0.0
	28/04/2017	12.9	23.3	0.0
	29/04/2017	10.8	23.7	0.0
	30/04/2017	8.7	24.3	0.0
	01/05/2017	9.9	22.9	0.0

2.2.2 Survey Team

The field survey has been carried out under a “Licence to Take Fauna for Scientific Purposes” issued by the DBCA (Phase 1 - 01-000017-1, Phase 2 - 01-000017-2). The Phase 1 fauna survey team comprised Greg Harewood, Glen Murray and Aidan Williams. The Phase 2 fauna survey team comprised Greg Harewood and George Swann.

Analysis of bat recordings was completed by Mr Bob Bullen (Bat Call WA). Invertebrate identifications were undertaken by Alacran Environmental Sciences (Dr Erich S. Volschenk).

2.2.3 Trap Site Selection

The sampling approach for this survey consisted of a combination of systematic fauna sampling and targeted/opportunistic searches within the range of habitats present within the defined survey area.

The systematic component of the fauna survey involved the establishment of six main trap sites (Table 2 and Figure 3) during Phase 1. Sites were selected to provide representative examples of the major vegetation communities and landforms present within the survey area (with a focus on the main development area), though logistics (i.e. ease of access and travel time) also had to be considered.

Table 2: Trap Sites within the Survey Area

Trap Site	Description	Example Image
1	Sandplain Mid mallee shrubland of *Eucalyptus* spp. over mid open shrubland of *Acacia* spp. and low closed hummock grassland of *Triodia basedowii* on sandplain.	
2	Low Dune on Clay-Loam Plain Low woodland of *Acacia caesaneura* over mid open shrubland of *A. burkittii* and mid chenopod shrubland of *Maireana pyramidata*/ low open hummock grassland of *Triodia desertorum* on low dune within clay loam plain/playa.	
3	Clay-Loam Plain Low open forest of *Acacia incurvaneura* over mid shrubland of *Eremophila margarethae* and low open tussock grassland of *Eriachne mucronata*/ *Eragrostis eriopoda* on clay loam plain.	

Trap Site	Description	Example Image
4	Dune Crest Mid mallee woodland of *Eucalyptus concinna* over low open shrubland of *Aluta maisonneuvei, Dodonaea viscosa* and low closed hummock grassland of *Triodia desertorum* in dunefield.	
5	Clay-Loam Plain Low open forest of *Acacia incurvaneura* over mid shrubland of *Eremophila margarethae* and low open tussock grassland of *Eriachne mucronata/ Eragrostis eriopoda* on clay loam plain.	
6	Gypsum Dune Low open forest of *Casuarina pauper* over tall open shrubland of *Acacia burkittii* and low sparse chenopod shrubland of *Atriplex vesicaria* on gypsum dune.	

2.2.4 Ground Fauna Survey

To provide information on the abundance and distribution of ground fauna present (i.e. small mammals, reptile and amphibian species), trapping, utilising a combination of cage traps and Elliott traps (to target mammal species), fly wire drift fences with associated pit fall traps (to target small mammals, reptile and amphibian species) and funnel traps (to target larger reptile species) were utilised at each of the eight main trap sites detailed above.

Six trap lines were established at the previously selected sites with each line consisting of 10 trap arrays. Each trap array consisted of a ~7 long, 30 cm high fly wire drift fence with a centrally located pit trap (20L bucket) dug in underneath with one funnel trap located at each end. One small Elliott (A) or (B) trap was also placed in the vicinity of each trap array. Elliot traps were baited with "universal bait" (a mixture of peanut butter, rolled oats and sardines). Two cage traps were placed at the start and end of each trap line.

In total, trapping utilised 60 Elliott (A) traps, 12 cage traps, 60 (20L) buckets and 120 funnel traps. Pit traps were installed during the Phase 1 survey and left in place (sealed with a lid and secured with a pile of sand) for re-use during the Phase 2 survey. All traps were left open for seven nights during each phase.

A summary of trap nights carried out during each phase is provided in Table 3 below. The location of trap sites is shown in Figure 3. Additional details on trap locations (i.e. coordinates, dates open) are provided in Appendix B.

Table 3: Summary of Trap Nights – Phase 1 & 2

	Site Number	# Nights for Elliott (A) Traps	# Nights for Cage Traps	# Nights for Funnel Traps	# Nights for Bucket Pit Traps	Total # Trap Nights
PHASE 1 September	1	70	14	140	70	294
	2	70	14	140	70	294
	3	70	14	140	70	294
	4	70	14	140	70	294
	5	70	14	140	70	294
	6	70	14	140	70	294
	Total	**420**	**84**	**840**	**420**	**1,764**
PHASE 2 April 2017	1	70	14	140	70	294
	2	70	14	140	70	294
	3	70	14	140	70	294
	4	70	14	140	70	294
	5	70	14	140	70	294
	6	70	14	140	70	294
	Total	**420**	**84**	**840**	**420**	**1,764**
	Grand Total	**840**	**168**	**1,680**	**840**	**3,528**

2.2.5 Bird Surveys

Sampling of avifauna was carried out using a combination of techniques, including:

- 20 minute unbounded surveys conducted at each of the systematic sampling grids (i.e. Trap Sites 1 to 6) on several occasions;

- Traverses on foot between trap sites, within potential infrastructure areas and other sections of the survey area;
- Bird counts at freshwater wetlands and selected sites in and around Lake Wells; and
- Opportunistic observations of avifauna during other survey activities within and around the survey area (random over 18 days).

2.2.6 Acoustic Bat Recordings

Acoustic recordings were undertaken using a Wildlife Acoustics SM2+ Bat Detector from sunset to sunrise in each instance.

During the Phase 1 survey recordings were taken over six nights and during the Phase 2 survey over four nights (i.e. in excess of 110 hours recording time). The locations of each recording are shown in Figure 3.

The detectors convert ultrasonic echolocation signals produced by bats into audible electronic signals that are then recorded. The recordings were later processed by Bob Bullen to determine the presence of species specific calls.

Additional details (i.e. coordinates and dates) on the bat recordings carried out are contained in Appendix B.

2.2.7 Motion Sensing Cameras

Eight motion sensing infrared cameras ("camera traps") were placed at various locations within the survey area during the Phase 1 survey. Cameras were retrieved during the Phase 2 survey after about six months of operation, though the time each camera operated for did vary (i.e. before batteries went flat). Four cameras were re-deployed for the duration of the Phase 2 survey (seven or eight days) and then retrieved.

The location of cameras is shown in Figure 3 with additional details (i.e. coordinates) provided in Appendix B.

2.2.8 Spotlighting/Head Torching

Nocturnal surveys were carried out at selected trapping sites with the aim of locating nocturnal species that may be difficult to detect using alternative techniques. Vehicle transects were also carried out over four nights (two during each phase) along sections of the main access tracks.

2.2.9 Opportunistic and Targeted Surveys

During the course of all the survey work non-systematic opportunistic observations of fauna species were made and recorded. Secondary evidence of fauna such as tracks, diggings and scats were also noted.

At each trapping site microhabitats were actively searched with the aim of locating the more cryptic fauna species (including invertebrates) that may inhabit the site. Searches included but were not limited to investigating burrows, investigating scats, tracks and other traces, turning fallen timber and rocks, opening standing timber crevices, peeling bark and raking leaf litter. Active searching and transects were also carried out at random locations across the Project area, the locations of which are shown in Figure 3.

Two nocturnal night parrot (*Pezoporus occidentalis*) listening surveys were also undertaken during the Phase 2 survey in an attempt to determine the presence/absence of the species within the survey area. Targeted searches for evidence of the species (e.g. feathers) at water troughs were also undertaken. Two camera traps were also deployed at two water holes/troughs over a period of a few days.

The listening surveys were carried out at two locations, both of which contained long unburnt spinifex and were near areas of healthy stands of samphire. The nocturnal listening surveys were carried out by two personnel (GH and GS) at wide spaced (several hundred metres) intervals within the identified habitat.

The surveys commenced just before sunset and continued until approximately one hour after last light. Both personnel were familiar with WA night parrot calls. One survey was carried out at each location (i.e. one survey per night). The first survey was undertaken on the 25 April 2017 and the second on the 28 April 2017. The location of the two surveys is shown in Figure 3.

In addition to opportunistic observations, targeted searches for signs of activity, including burrows, tracks, scats and diggings of the great desert skink, mulgara and the greater bilby were also undertaken. These were done during the course of other survey work but also involved doing as many close spaced transects across proposed impact areas (e.g. harvest pond area) as time allowed while carrying out the main trapping survey.

2.2.10 Terrestrial Short-Range Endemic/Salt Lake Specialist Invertebrates

All invertebrates suspected of being SRE's (e.g. millipedes, scorpions, slaters, pseudoscorpions, mygalomorph spiders and snails) collected in traps or during other targeted opportunistic survey work during the Phase 1 and Phase 2 fauna survey were retained.

An additional small scale invertebrate survey was also carried out over playas making up Lake Wells and targeted potential salt lake specialists in addition to potential SREs. During each phase ten 2.5 litre plastic buckets were utilised as dry pit traps at three locations. The traps were dug into place at approximately 30 metre intervals out onto the lake bed. Traps were check each morning and mid-afternoon. Invertebrate specimens of interest were retained (spiders, beetles, scorpions, ants, crickets, earwigs etc.).

Invertebrates collected were submitted to Alacran Environmental Sciences (Dr Erich S. Volschenk) for formal identification and comments.

It should also be noted that Bennelongia Environmental Consultants carried out an independent aquatic invertebrate survey in March 2017, the results of which are contained in a separate report (Bennelongia 2017).

2.3 FAUNA CONSERVATION CATEGORIES

The conservation significance of fauna species has been assessed using data from the following sources:

- *Environment Protection and Biodiversity Conservation Act 1999* (*EPBC Act*). Administered by the Australian Government Department of the Environment and Energy (DotEE);
- *Wildlife Conservation Act 1950 (WC Act).* Administered by the Western Australian Department of Biodiversity Conservation and Attractions (DBCA) (Govt. of WA 2017);
- Red List produced by the Species Survival Commission (SSC) of the World Conservation Union (also known as the IUCN Red List - the acronym derived from its former name of the International Union for Conservation of Nature and Natural Resources). The Red List has no legislative power in Australia but is used as a framework for State and Commonwealth categories and criteria; and the
- DBCA Priority Fauna list. A non-legislative list maintained by DBCA for management purposes (DBCA 2017).

The *EPBC Act* also requires the compilation of a list of migratory species that are recognised under international treaties including the:

- Japan Australia Migratory Bird Agreement 1981 (JAMBA);
- China Australia Migratory Bird Agreement 1998 (CAMBA);
- Republic of Korea-Australia Migratory Bird Agreement 2007 (ROKAMBA); and
- Bonn Convention 1979 (The Convention on the Conservation of Migratory Species of Wild Animals).

(Note - Species listed under JAMBA are also protected under Schedule 3 of the *WC Act*.)

All migratory bird species listed in the annexes to these bilateral agreements are protected in Australia as matters of national environmental significance (NES) under the *EPBC Act*.

The conservation status of all vertebrate fauna species listed as occurring or possibly occurring in the vicinity of the Project area has been assessed using the most recent lists published in accordance with the above-mentioned instruments and is indicated as such in the fauna listings of this report. A full listing of conservation codes are provided in Appendix A.

2.4 TAXONOMY AND NOMENCLATURE

Taxonomy and nomenclature for fauna species used in this report is generally taken from the DBCA's WA Fauna Census Database which is assumed to follow Aplin and Smith (2001) for amphibians and reptiles and Johnstone (2001) for birds. Jackson and Groves (2015) has been used for mammals.

Common names are taken from the WAM recognised primary common name listings when specified, though where common names are not provided they have been acquired from other publications. Sources include Cogger (2014), Wilson and Swan (2013), Van Dyck & Strahan (2013), Christidis and Boles (2008), Bush *et al.* (2010), Bush *et al.* (2007), Tyler & Doughty (2009), and Glauret (1961). Not all common names are generally accepted.

2.5 LIKELIHOOD OF OCCURRENCE – FAUNA OF CONSERVATION SIGNIFICANCE

Fauna of conservation significance identified during the literature review as previously being recorded in the general area were assessed and ranked for their likelihood of occurrence within the study area itself if not directly recorded during the survey period. The rankings and criteria used were:

- Would Not Occur: There is no suitable habitat for the species in the study area and/or there is no documented record of the species in the general area since records have been kept and/or the species is generally accepted as being locally/regionally extinct (supported by a lack of recent records).
    - Locally Extinct: Populations no longer occur within a small part of the species natural range, in this case within 10 or 20km of the study area. Populations do however persist outside of this area.
    - Regionally Extinct: Populations no longer occur in a large part of the species natural range, in this case within the southern forest regions. Populations do however persist outside of this area.
- Unlikely to Occur: The study area is outside of the currently documented distribution for the species in question, or no suitable habitat (type, quality and extent) was identified as being present during the field assessment. Individuals of some species may occur occasionally as vagrants/transients especially if suitable habitat is located nearby but the study area itself would not support individuals or a population the species.
- Possibly Occurs: The study area is within the known distribution of the species in question and habitat of at least marginal quality was identified as being present during the field assessment, supported in some cases by recent records being documented in literature from within or near the study area. In some cases, while a species may be classified as possibly being present at times, habitat may be

marginal (e.g. poor quality, fragmented, limited in extent) and therefore the frequency of occurrence and/or population levels may be low.

- Known to Occur: The species in question was positively identified as being present (for sedentary species) or as using the study area as habitat for some other purpose (for non-sedentary/mobile species) during the field survey. This information may have been obtained by direct observation of individuals or by way of secondary evidence (e.g. foraging debris, tracks and scats). In some cases, while a species may be classified as known to occur, habitat may be marginal (e.g. poor quality, fragmented, limited in extent) and therefore the frequency of occurrence and/or population levels may be low.

2.6 SURVEY LIMITATIONS

The fauna assessment was designed and carried out to conform with a Level 2 survey as defined in EPA Guidance statement No. 56 (EPA 2016c). The assessment has included a desktop analysis aimed at providing a list of expected species and the completion of two phase seasonal survey involving a detailed trapping program, targeted and opportunistic fauna observations, and the use of motion sensing cameras and bat detector recordings.

Fauna species are indicated as potentially present within this report based on there being suitable (quality and extent) habitat within the survey area. With respect to trapping, targeted and opportunistic observations, the possibility exists that certain species may not have been detected during field investigations due to:

- seasonal inactivity during field survey;
- species present within micro habitats not surveyed;
- cryptic species able to avoid detection; and
- transient wide-ranging species not present during survey period.

The lack of observational data on some species should therefore not be taken as necessarily indicating that a species is absent from the site.

In recognition of survey limitations a precautionary approach has been adopted for this assessment. Any fauna species that would possibly occur within the survey area as identified through ecological databases, publications, discussions with local experts/residents and the habitat knowledge of the Author has been assumed to potentially occur in the survey area.

Fauna survey limitations and constraints are summarised in Table 4.

Table 4: Fauna Survey Limitations and Constraints

Potential Constraint	Survey Limitation (Yes/No) Significant Moderate Negligible	Comments on Survey Outcomes
Competency/Experience of the consultant carrying out the survey.	No	Consultant Zoologists that executed the survey have conducted many level 1 and level 2 surveys in WA and can be regarded as suitably qualified.
Scope.	No	The survey carried out was a Level Two survey, comprising of a desktop survey and a two phase seasonal survey that has included a habitat assessment, trapping program, and opportunistic observations. No constraints encountered.
Proportion of fauna identified, recorded and/or collected.	No	The field surveys recorded about 57% of listed potential vertebrate species considered likely to be present on site. It should be noted that the potential species list is very likely an over estimation of the species that use the proposal area on a regular basis.
Sources of information.	Yes, Moderate	The Project area has not been subject to detailed surveys in the past and specific fauna values are not well documented.
The proportion of the task achieved and further work.	Yes, Moderate	The two phase survey has been completed. Additional work on vertebrate species using the lake and habitat immediately bordering the Lake may be required once project footprints and potential impacts are better defined. Additional SRE invertebrate survey work may also be needed for these same areas.
Timing/weather/season/cycle.	No	The Level 2 survey was carried out in September and April to coincide with the recommended survey periods (EPA 2016d).
Disturbances (e.g. fire, flood, accidental human intervention etc.) which affected results of survey.	No	No disturbances of significance occurred.
Intensity (in retrospect, was the intensity adequate).	Yes, Moderate	Based on results achieved the survey is considered adequate for a two phase seasonal survey for the areas investigated. Some additional surveys targeting specific areas and species may be warranted.
Completeness (e.g. was relevant area fully surveyed).	Yes, Moderate	The overall large size of the survey area and some access restrictions (i.e. no vehicle tracks) made it difficult to survey the entire project area to the same degree. Current main impact area was therefore the focus. Some additional surveys targeting specific areas and species maybe warranted.
Resources (e.g. degree of expertise available in animal identification to taxon level).	Yes, Moderate	No unresolved problems/uncertainties arose with respect to identifying most of the observed vertebrate fauna species. Some invertebrates present may pose identification problems so establishing local and regional significance could be difficult.
Remoteness and/or access problems.	Yes, Moderate	Access to some areas difficult/time consuming.
Availability of contextual (e.g. biogeographic) information on the region.	No	Previous fauna survey data for the wider area is limited though general biogeographic data is available.

3. REGIONAL CONTEXT

3.1 BIOGEOGRAPHIC SETTING

The survey area lies within the Austin Botanical District and Helms Botanical District of WA. The Austin Botanical District consists of predominantly of Mulga low woodland on plains and scrub on hills (Beard, 1990). The Helms Botanical District is described as Mulga low woodland on hardpan soils between dunes. Where this is not prominent, tree steppes of *Eucalyptus gongylocarpa, E. youngiana* and *Triodia basedowii* occur (Beard, 1990).

Based on the Interim Biogeographic Regionalisation of Australia (IBRA), Version 7 (DotEE, 2012), the survey area is located within the Great Victoria Desert Bioregion of WA (Figure 1). The Great Victoria Desert Bioregion is further divided into four subregions; Shield, Central, Maralinga and Kintore, with the survey area located within the Shield (GVD1) subregion.

The Great Victoria Desert Bioregion is an active sand-ridge desert of deep Quaternary aeolian sands with a tree steppe of *Eucalyptus gongylocarpa*, Mulga and *E. youngiana* over hummock grassland, dominated by *Triodia basedowii.* The climate is arid, with summer and winter rain averaging between 150 and 190mm annually. Landforms consist of red sand plains with patches of aeolian dunefields, salt lakes on major valley floors with lake-derived dunes, and silcrete-capped (breakaway) mesas and plateaus (McKenzie, J.E. May and S. McKenna, 2002).

Landforms of the Shield Subregion (GVD1) consist of salt lakes and major valley floors with lake derived dunes, sandplains with patches of seif dunes running east west and areas of moderate relief with out-cropping and silcrete-capped mesas and plateaus (breakaways). The subregion contains a major palaeochannel of Ponton Creek. Spinifex (*Triodia* spp.) and mallee (*Eucalypt*us *kingsmillii, E. youngiana*) over hummock grassland dominated by *Triodia basedowii* occur on the aeolian sandplain. Scattered marble gum (*E. gongylocarpa*) and native pine (*Callitris*) occur on the deeper sands of the sand plains. Mulga and acacia woodlands occur mainly on the colluvial and residual soils. Salt bush (*Atriplex*), Bluebush (*Maireana*), and samphire (*Tecticornia*) occur on the margins of salt lakes and in saline drainage areas.

3.2 PHYSICAL ENVIRONMENT

3.2.1 Climate

The climate of the Shield subregion is characterised as arid, with summer and winter rain approximately 190mm per annum (Barton & Cowan, 2001). Rainfall and temperature data for the Laverton Aero weather station (#12035) obtained from the Bureau of Meteorology (BoM) located approximately 143 km south-west of the LWP Project is provided in Figure 4 (BoM, 2017a).

Annual rainfall (for 2016) was above average (302.1mm) recording a total of 338.6mm. Rainfall in 2017 was highest in January and March. From January to April 2017, the area recorded 422.8mm of rain rainfall, exceeding the annual average for the area (120.7mm above annual average).

3.2.2 Hydrology

The survey area encompasses the south-western region of Lake Wells as shown in Figure 1 which covers a total area of 49,480 ha (of which approximately 3,645 ha is located within the survey area). Lake Wells is an ephemeral salt lake and is therefore dry for most of the year except for short periods after rainfall. The lake does however have a very shallow water table positioned just below the surface and as a consequence the underlying sedimentary units are permanently saturated with salt brine. The survey area overlies one subsurface paleochannel; the Wells paleochannel.

According to the Department of Water (DoW) groundwater salinity database (DoW, 2017), groundwater salinities in the survey area ranges from TDS 1000-3000 mg/L (southern region of the survey area) to TDS >35,000 mg/L associated with Lake Wells. The groundwater flow system is an “intermediate flow system2 in Cainozoic sediments” (Botanica 2017).

With respect to the lake bed’s subsurface geology, historic and recent drilling has revealed a variable regolith horizon. It consists of surficial or near surface evaporite and sand/silt, silcrete +- laterite, common lake clays with some well sorted sand units and puggy lacustrine clays with minor sand/silt. Archaean basement rocks including transitional porphyry, granite, ultramafic and amphibolite types (Botanica 2017).

3.2.3 Landscape Systems, Geology and Soils

The dominating landforms within the Great Victoria Desert are dunes and swales. There are local occurrences of playa lakes, associated lee-sided mounds (lunettes) and rocky prominences (Commonwealth Government, 2008b). Playa lakes are a minor, but locally significant landform in the desert, occurring in topographically low-lying regions. Many represent the dried remnants of former drainage channels (Shephard 1995). The Great Victoria Desert (GVD) is an active sand-ridge desert of deep Quaternary (less than 65 million years ago) Aeolian sands overlying Permian (251 – 298 million years ago) and Mesozoic (65 - 251 million years ago) units of the Office Basin (Commonwealth Government 2008b). The GVD is underlain on its eastern, western and northern margins by an ancient crystalline basement comprising rocks at least 1000 million years old (Shephard 1995).

Based on geographic information provided by DAFWA (2014), the survey area is located within the North-western Great Victoria Desert Zone 122 of the Gunbarrel Province (12) and the Leemans Sandplain Zone 274 of the Murchison Province (27).

The North-western Great Victoria Desert Zone is characterised by sandplains and dunes (with some undulating plains and uplands) on sedimentary rocks of the Gunbarrel Basin.

Soils comprised sandy earths and red deep sands with some red loamy earths and red-brown hardpan shallow loams. Vegetation is predominantly Mulga shrublands and spinifex grasslands with mallee. This zone is located in the southern arid interior between Lake Carnegie, Lake Rason and Warburton (Tille 2006).

The Leemans Sandplain Zone is characterised by sandplains (with some gravel plains, mesas and salt lakes) on granitic rocks of the Yilgarn Craton (Eastern Goldfields Superterrane). Soils consist of red sandy earths with red loamy earths and some red deep sands, red-brown hardpan shallow loams and Calcareous loamy earths. Vegetation is predominantly spinifex grasslands with marble gum, mallee and mulga shrublands (and some halophytic shrublands). The zone is located in the south-western arid interior between Lake Wells and Minigwal, to the east of Laverton (Tille 2006).

3.2.4 Vegetation

Detailed vegetation mapping of the survey area has been undertaken by Botanica Consulting (2017). Seventeen vegetation types were identified within the survey area. These vegetation types were located within nine different landform types containing five major vegetation groups (Botanica 2017). The extent of the various mapped vegetation units is shown in Figure 5. A brief description is provided below.

Table 5: Main Landform and Vegetation Types within the Survey Area.

No.	Landform and Vegetation Description	Example Image
1	<u>Closed Depressions</u> Low samphire, shrubland or heathland in or adjacent to playa Total Area = ~11,351 ha (~20.3%)	
2	<u>Clay-Loam Plains</u> Low open forest or low woodland of *Acacia* sp. Over shrubland and hummock grassland. Total Area = ~8,185 ha (~14.6%)	

No.	Landform and Vegetation Description	Example Image
3	Drainage Depressions Low open forest of *Acacia caesaneura* over shrubland and tussock grassland. Total Area = ~1,538 ha (~2.8%)	
4	Rocky Hillslopes Low open forest or woodland of *Acacia* sp. Over shrubland or tussock grassland. Total Area = ~1,532 ha (~2.7%)	
5	Quartz/ Rocky Plains Low open woodlands of *Acacia* or *Casuarina* over shrubland or tussock grassland Total Area = ~3,050 ha (~5.5%)	
6a	Sand Dunes Low woodland of *Acacia* or mallee of *Eucalyptus* over shrubland and hummock grassland Total Area = ~4,870 ha (~8.7%)	

No.	Landform and Vegetation Description	Example Image
7	Gypsum Dunes Low open forest or open mallee over shrubland and sparse chenopods. Total Area = ~4,311 ha (~7.7%)	
8	Sand Loam Plains Low open forest *Acacia* over shrubland and hummock grass. Total Area = ~4,256 ha (~7.6%)	
9	Sandplains Low woodland or mallee shrubland of *Eucalyptus* sp. over shrubland and hummock grassland. Total Area = ~16,815 ha (~30.1%)	

4. SURVEY RESULTS

4.1 FAUNA INVENTORY - LITERATURE REVIEW

A list of expected fauna species likely to occur in the survey area was compiled from information obtained during the literature review and is presented in Appendix D. This listing was refined after information gathered during the various site surveys were reviewed. The DBCA NatureMap database search results are summarised in this species listing. The raw database search results from NatureMap (DBCA 2017) and the Protected Matters Search Tool (DotEE 2017) are contained within Appendix C.

Table 6 below provides a summary of the potential fauna species considered most likely to be present in the general area (but not necessarily within the Project Area itself) based on species group and conservation status.

Table 6: Summary of Potential Vertebrate Fauna Species (as listed in Appendix D)

Group	Total Number of Potential Species	Potential Number of Specially Protected Species	Potential Number of Migratory Species	Potential Number of Priority Species
Amphibians	10	0	0	0
Reptiles	110[1]	1	0	1
Birds	132	3	8	1
Non-Volant Mammals	28[8]	1	0	1
Volant Mammals (Bats)	10	0	0	0
Total	**290[9]**	**5**	**8**	**3**

Superscript = number of introduced species included in total. Note: Where a species has two classifications only one is tabled i.e. The Princess Parrot is tabled here as a threatened species (Vulnerable) but is also listed as a Priority 4 species.

The list of potential fauna takes into consideration that firstly the species in question is not known to be locally/regionally extinct and secondly that suitable habitat for each species, as identified during the field work, is present within the survey area or nearby, though compiling an accurate list has limitations.

The specific habitat and microhabitat requirements and ecology of many of the species known to occur in the wider area are often not well understood and/or documented. It can therefore be difficult to exclude species from the potential list based on a lack of a specific habitat or microhabitat. As a consequence of this limitation the potential fauna list produced is most likely an overestimation of those species that actually utilise the survey area for some purpose. Some species may be present in the general area but may only use the survey area itself on rare occasions or as vagrants/transients.

4.2 FAUNA INVENTORY – DETAILED FAUNA SURVEY

A summary of the number of species from each vertebrate group identified during the Phase 1 and Phase 2 fauna surveys is provided in Table 7 below. A complete list of the species identified is detailed in Appendix D. The raw trapping, bat recording, opportunistic and camera trap results are provided in Appendix F.

Table 7: Number of Vertebrate Fauna Species Recorded

Group	Combined Phase 1 & 2 Total	Species of Conservation Significance
Amphibians	4	0
Reptiles	51	0
Introduced Reptiles	1	0
Birds	83	1
Native Non-Volant Mammals	11	0
Bats	8	0
Introduced Mammals	7	0
Total	**164**	**1**

Total number of species recorded = the total number of species found to occur in the defined survey area, including species found outside of possible impact areas.

The survey identified approximately 57% of the predicted species considered likely to be present. Only one of the predicted 13 state or federally listed vertebrate fauna species of conservation significance considered as potential species (based on previous records, known distributions and/or habitat preferences) was observed (the marsh sandpiper (migratory)).

4.2.1 Amphibians

Only one species of frog (*Notaden nichollsi*) was captured during the Phase 1 survey which was consistent with the dry seasonal conditions prevailing at the time. An additional three species were recorded during the Phase 2 survey, a consequence of a significant rainfall event immediately prior to the survey commencing. Frogs were captured at all trap sites except trap site 6 (gypsum dune). All specimens of *Notaden nichollsi* were captured in the sand dune habitat (trap site 4).

Based on the literature review another six species may occur in the general area.

None of the identified or potential amphibian species that may occur in the area are listed as threatened or priority species.

4.2.2 Reptiles

A total of 50 species of native reptile were captured and/or observed during the field surveys. One introduced reptile was recorded (the Asian house gecko). All those species recorded can be considered to be common and widespread in the Great Victoria Desert Bioregion, where ever suitable habitat occurs. Based on the literature review another 60 species may occur in the general area.

No listed species of conservation significance were recorded.

Two reptile species of conservation significance are considered likely to occur in the general area (though not necessarily within the Lake Wells Project area) these being:

- Buff-snouted blind snake (*Anilios margaretae*) P2 (DBCA Priority Species);
- Great desert skink (*Liopholis kintorei)* S3 (*WC Act*), Vulnerable (*EPBC Act*)

The status of buff-snouted blind snake in the Lake Wells Project area is difficult to determine. Given suitable habitat occurs (i.e. playa and sheoak, sand dunes and sand plains) its presence cannot be discounted despite also not being recorded during this survey or previous fauna surveys in the wider area (ecologia 2009, KLA 2012, KEC 2014 and Rapallo 2015). While there are limited records for this species, it appears to have a wide distribution across the Great Victoria Desert into South Australia (ALA 2017). The overall lack of records could be attributed to the areas remoteness and the secretive habits of blind snakes and it may in fact be more common than records indicate.

The great desert skink lives in family groups and builds distinctive burrow systems with associated scat latrines which make its presence relatively easy to confirm, though in this instance this is made difficult by the large size of the survey area. Targeted searches at spot locations and along transects were carried out for this species during the survey period with no evidence being found. This would suggest it is absent from the areas investigated but its likely status in the Project area as a whole is difficult to confirm. Despite the fact that there are no nearby, recent records its presence in the general area (and not necessarily with the Project area) cannot be totally discounted given habitat in the area does appear superficially suitable (clay loam plains, sand loam plains, sand plains and sand dunes vegetated with spinifex) and when considering the fact that the site falls within the historical range of the species.

4.2.3 Birds

Eighty three bird species were observed in or near the survey area during the field survey. Excluding water birds/shorebirds, the majority of those species recorded can be considered to be common and widespread in the Great Victoria Desert Bioregion, where ever suitable habitat occurs. Based on the literature review another 46 species may occur in the general area.

Only one listed species of conservation significance was recorded, this being a single marsh sandpiper (*Tringa stagnatilis*), a migratory shorebird. This bird was observed in a large freshwater lake located near the north west boundary of the Project area during the Phase 2 survey.

Available information indicates that several other species of migratory waders are also recorded, albeit in some cases infrequently, in inland areas and therefore have the potential to occur in the general area on occasions. The most likely species (in addition to the marsh sandpiper) are:

- Sharp-tailed sandpiper (*Calidris acuminate*);
- Red-necked stint (*Calidris ruficollis*);

- Common greenshank (*Tringa nebularia*)
- Common sandpiper (Tringa hypoleucos*)*,
- Curlew sandpiper (*Calidris ferruginea);* and
- Wood sandpaper *Tringa glareola.*

As with other birds which rely on wetlands the presence of suitable habitat (and therefore the birds themselves) in nearby freshwater claypans or on Lake Wells itself is totally dependent on unpredictable, episodic rain events of a magnitude sufficient to supply the required amount of water.

It should be noted that all of the above mentioned migratory waders only breed in the northern hemisphere, and migrate to the southern hemisphere around spring onwards (~September) before returning north in summer/early autumn (~March/April), though a small number of individuals sometimes "over winter" in Australia.

Other bird species of conservation significance listed as potential species but not recorded during the Phase 1 or 2 survey periods are:

- Peregrine Falcon (*Falco peregrinus*) S7 (*WC Act*);
- Night Parrot (*Pezoporus occidentalis*) S1 (*WC Act*), Endangered (*EPBC Act*);
- Princess Parrot (*Polytelis alexandrae*) P4 (DBCA Priority Species), Vulnerable (*EPBC Act*);
- Rainbow Bee-eater (*Merops ornatus*) S5 (*WC Act*), Migratory (*EPBC Act*); and
- Striated Grasswren (sandplain) (*Amytornis striatus striatus*) P4 (DBCA).

The peregrine falcon was not recorded though individuals of this species potentially utilise some sections of the actual Project area given they have large home ranges, though it can be expected to occur only very occasionally.

The status of the night parrot within the Project area itself is difficult to determine. The two night listening surveys, carried out in what appeared to be good habitat (long unburnt spinifex adjacent to areas of samphire), failed to detect the species. While recent sightings (~200km NW of survey area – Hamilton *et al.* 2017) suggest this species may be present in the general area, current knowledge on the species suggests it is sparsely distributed and occurs in very low numbers making identifying populations difficult.

Princess parrots are highly nomadic, and its frequency of occurrence, if at all, within the Project area would be very low and generally only temporary. Much of the survey area appears to represent marginal habitat for this species given the lack of large trees required for roosting and nesting.

The rainbow bee-eater is a common late spring/early summer seasonal migrant to the southern parts of the state. It is very likely to occur but was probably not detected due to the timing of the field surveys early and late in its typical migration period. The rainbow bee-eater is not a threatened species and can be regarded as being common.

No evidence of the striated grasswren's presence within the survey area was made during the survey period making its status in the area difficult to determine. Its presence is areas of suitable habitat cannot however be discounted at this point in time.

4.2.4 Native Non-Volant Mammals

A total of 11 species of native, non-flying mammals were captured and/or other evidence observed during the field surveys. No species of conservation were detected and all those species recorded can be considered to be common and widespread in the Great Victoria Desert Bioregion, where ever suitable habitat occurs. Based on the literature review another nine species are considered potentially present.

Two undetected species of conservation significance are, based on available information, considered likely to occur in the general area (though not necessarily within the Project area itself), these being

- Brush-tailed Mulgara (*Dasycercus blythi)* P4 (DBCA Priority Species);
- Greater Bilby (*Macrotis lagotis*) S3 (*WC Act*), Vulnerable (*EPBC Act*).

Both species were the subject of targeted searches (i.e. trapping, spot surveys, transects, and camera traps) during the Level 2 survey reported on here, with no evidence of the presence of either species being found. At this stage, given the lack of actual observations and the level of survey carried out to date neither species is considered likely to occur within the areas investigated, though populations may persist in the wider area.

4.2.5 Bats

Eight of the predicted ten species of bats were recorded over the course of both phases of the survey. All of the identified and potential bat species can be considered to be common and widespread species with none classified as being of conservation significance.

4.2.6 Introduced Fauna

Ten introduced vertebrate animal species were identified as being present during the field survey, these being the:

- Asian house gecko (*Hemidactylus frenatus*);
- Camel (*Camelus dromedaries*);

- Donkey (*Equus asinus*);
- Horse (*Equus caballus*);
- European cattle (*Bos taurus*);
- Cat (*Felis catus*);
- House mouse (*Mus musculus*); and
- Rabbit (*Oryctolagus cuniculus*).

The red fox (*Vulpes vulpes*) is also considered a potential species even though not detected.

4.2.7 Terrestrial Short-Range Endemic/Salt Lake Specialist Invertebrates

Forty six individual invertebrate specimens were collected during both phases of the fauna survey and submitted to Alacran Environmental Sciences for identification. Specimens collected included scorpions, myglamorph (trapdoor) spiders, wolf spiders, millipedes, centipedes, silverfish and slaters (isopods).

The following is a summary of findings made by Alacran Environmental Sciences (Alacran 2016 & 2017), the full reports of which is held in Appendix G.

The specimens collected represented 14 individually-recognised taxa from eight orders, 10 families and at least 11 genera. Of these, a total of nine are considered to include potential (data deficient) SRE species or taxa, these being:

Phase 1 Survey (Alacran 2016)

- *Lychas '174'* (scorpion, family Buthidae) (Trap Site 1);
- *Urodacus* 'sp. indet.' (scorpion, family Urodacidae) (Trap Site 3 and 5);
- Idiopidae 'sp. indet' (trap door spider, family Idiopidae) (Trap Site 3); and
- *Buddelundia* ''27dv' (slater, family Armadillidae) (Trap Site 1 and 5);

Phase 2 Survey (Alacran 2017)

- *Lychas 'LW2'* (scorpion, family Buthidae) (Trap Site 3);
- Paradoxosomatidae 'LW'' (millipede, family Paradoxosomatidae) (Trap Site 5);
- *Megalosiphon* 'LW' (millipede, family Siphonotidae) (Trap Site 5);
- *Aganippe 'LW1'* (trap door spider, family Idiopidae) (Trap Site 5); and
- *Buddelundia* '10ld' (slater, family Armadillidae) (Trap Site 6);

Of the nine potential SREs collected during the field survey, six are currently known only from the survey area; these include the scorpion *Urodacus* 'sp. indet.' collected during the Phase 1 survey and all the specimens collected during the Phase 2 survey. The

collection of new invertebrate species and potential SRE taxa is expected for a previously unsurveyed area.

No salt lake specialist species were identified from the specimens submitted. It should however be noted that an independent survey by Bennelongia Environmental Consultants of aquatic invertebrates in the Project are in March 2017 resulted in the capture of a single terrestrial salt lake tiger beetle *Megacephala* sp. which they consider to have "potential conservation significance" (Bennelongia 2017).

Potential SREs specimens were collected from all the main trap sites except Trap Site 2. While the actual distribution of all potential SREs identified during the survey is unknown, it would be unlikely that any would be totally confined to the Project area itself (and in particular proposed development areas) given that similar (at least superficially) habitats also occur in adjoining areas.

The location where potential SREs and salt lake specialists were captured is shown in Figure 6.

However, given the fact that the majority of potential SE specimens collected appear to represent new species, a significant lack of knowledge on their distribution and abundance obviously exists. Alacran (2017) have therefore recommended a dedicated SRE survey be carried out to assess the extent of the distributions of the SRE invertebrates that may be present within the development footprint. The actual need to carry out this survey should be determined after consultation with the relevant regulatory authorities.

5. LIKELIHOOD OF OCCURRENCE - VERTEBRATE FAUNA OF CONSERVATION SIGNIFICANCE

Based on the literature review, current documented distributions, habitat preferences and field survey results, 16 fauna species of conservation significance have been listed as potentially occurring in the general area, though not all will necessarily occur within the study area itself. The species are:

- Buff-snouted Blind Snake *Anilios margaretae* – P2 (DBCA Priority Species)
- Great Desert Skink *Liopholis kintorei* – S3 *(WC Act),* Vulnerable *(EPBC Act)*
- Peregrine Falcon *Falco peregrinus* – S7 (*WC Act*)
- Migratory Shorebirds (7 species predicted) – S5 (*WC Act*), Migratory (*EPBC Act*)
- Night Parrot *Pezoporus occidentalis* – S1 (*WC Act*), Endangered (*EPBC Act*)

- Princess Parrot *Polytelis alexandrae* – P4 (DBCA Priority Species), Vulnerable (*EPBC Act*)
- Rainbow Bee-eater *Merops ornatus* – S5 (*WC Act*), Migratory (*EPBC Act*)
- Striated Grasswren (sandplain) *Amytornis striatus striatus* – P4 (DBCA Priority Species)
- Brush-tailed Mulgara *Dasycercus blythi* – P4 (DBCA Priority Species)
- Greater Bilby *Macrotis lagotis* – S3 (*WC Act*), Vulnerable (*EPBC Act*)

It should be noted that while habitats onsite for one or more of the species listed above are considered possibly suitable, some or all may be marginal in extent/quality and therefore the fauna species considered as possibly occurring may in fact only visit the area for short periods as infrequent vagrants.

A number of other species of conservation significance, while possibly present in the general area and/or the Great Victoria Desert region are not listed as potential species due to the Project area being outside of their main currently recognised range, a lack of suitable habitat or known/very likely local or regional extinction (and no subsequent recruitment from adjoining areas).

A summary of conservation significant species previously recorded in the wider area and reasons for their inclusion or omission from the list of potential species is provided in Table 8 below. Additional details on each species are provided in Appendix E.

Table 8: Likelihood of Occurrence – Vertebrate Fauna Species of Conservation Significance (continues on following pages)

Species	Conservation Status (see Appendix A for codes)			Habitat Present	Likelihood of Occurrence
	EPBC Act	WC Act	DBCA Priority		
Buff-snouted Blind Snake *Anilios margaretae*	-	-	P2	Yes	Possibly occurs, though no nearby, recent records.
Great Desert Skink *Liopholis kintorei*	Vulnerable	S3	-	Yes	Possibly occurs, though no nearby, recent records.
Malleefowl *Leipoa ocellata*	Vulnerable	S3	-	No	Unlikely to occur. Habitat unsuitable. No recent records. Very occasional transients only.
Eastern Great Egret *Ardea alba*	Migratory	S5	-	Yes/Marginal	Unlikely to occur. Outside main documented range. No previous records in the wider area. Very occasional transients only after significant rain events.
Peregrine Falcon *Falco peregrinus*	-	S7	-	Yes	Possibly occurs though frequency of occurrence and probability of breeding would be low.

Species	Conservation Status (see Appendix A for codes)			Habitat Present	Likelihood of Occurrence
	EPBC Act	WC Act	DBCA Priority		
Grey Falcon *Falco hypoleucos*	-	S3	-	No/Marginal	Unlikely to Occur. Outside main documented range. No previous records in the immediate vicinity.
Migratory Shorebirds	Migratory /Various	S5	-	Yes/Marginal	One species recorded, others possibly occur but all would be present only very occasionally as transients after significant rain events.
Oriental Plover *Charadis veredus*	Migratory	S5	-	No/Marginal	Unlikely but may occur very occasionally.
Night Parrot *Pezoporus occidentalis*	Endangered	S1	-	Yes	Possibly Occurs
Princess Parrot *Polytelis alexandrae*	Vulnerable	-	P4	Yes	Possibly occurs though frequency of occurrence and probability of breeding would be low.
Rainbow Bee-eater *Merops ornatus*	Migratory	S5	-	Yes	Possibly Occurs
Striated Grasswren (sandplain) *Amytornis striatus striatus*	-	-	P4	Yes	Possibly occurs, though no nearby, recent records.
Grey Wagtail *Motacilla cinerea*	Migratory	S5	-	No	Would Not Occur.
Yellow Wagtail *Motacilla flava*	Migratory	S5	-	No	Would Not Occur.
Brush-tailed Mulgara *Dasycercus blythi*	-	-	P4	Yes	Possibly occurs, though no nearby, recent records.
Southern Marsupial Mole *Notoryctes typhlops*	-	-	P4	Yes/Marginal	Unlikely. Habitat appears to be marginal, isolated and limited in extent.
Sandhill Dunnart *Sminthopsis psammophila*	Endangered	S2	-	Nol	Would not occur. Outside main documented range. No previous records in the wider area
Bilby *Macrotis lagotis*	Vulnerable	S3	-	Yes	Possibly occurs, though no nearby, recent records.

6. CONCLUSION

The two phase seasonal Level 2 fauna survey within the Lake Wells Potash Project area was undertaken during September 2016 and April 2017 for the purposes of providing baseline data on the fauna assemblages present, to identify possible development constraints and to allow for the identification of subsequent information gaps.

The field survey recorded 156 native and eight introduced vertebrate species. The identified (native) assemblage includes four species of frog, 50 species of reptiles, 83 species of birds and 18 mammals (includes 8 species of bat). Evidence of one species of conservation significance was recorded in the survey area, this being the:

- Marsh sandpiper (*Tringa stagnatilis*) (S5, Migratory).

This migratory bird is not a threatened species and would only occur occasionally in wetland areas after significant spring/summer rain events.

Forty six terrestrial invertebrate specimens were collected during both phases of the fauna survey. Specimens collected included scorpions, myglamorph (trapdoor) spiders, wolf spiders, millipedes, centipedes, silverfish and slaters (isopods). The specimens collected represented 14 individually-recognised taxa from eight orders, 10 families and at least 11 genera. Of these, a total of nine are considered to include potential (data deficient) SRE species or taxa.

No invertebrate salt lake specialist species were identified from the specimens submitted, though during an independent survey Bennelongia identified a single terrestrial salt lake tiger beetle *Megacephala* sp. which they consider to have “potential conservation significance” (Bennelongia 2017).

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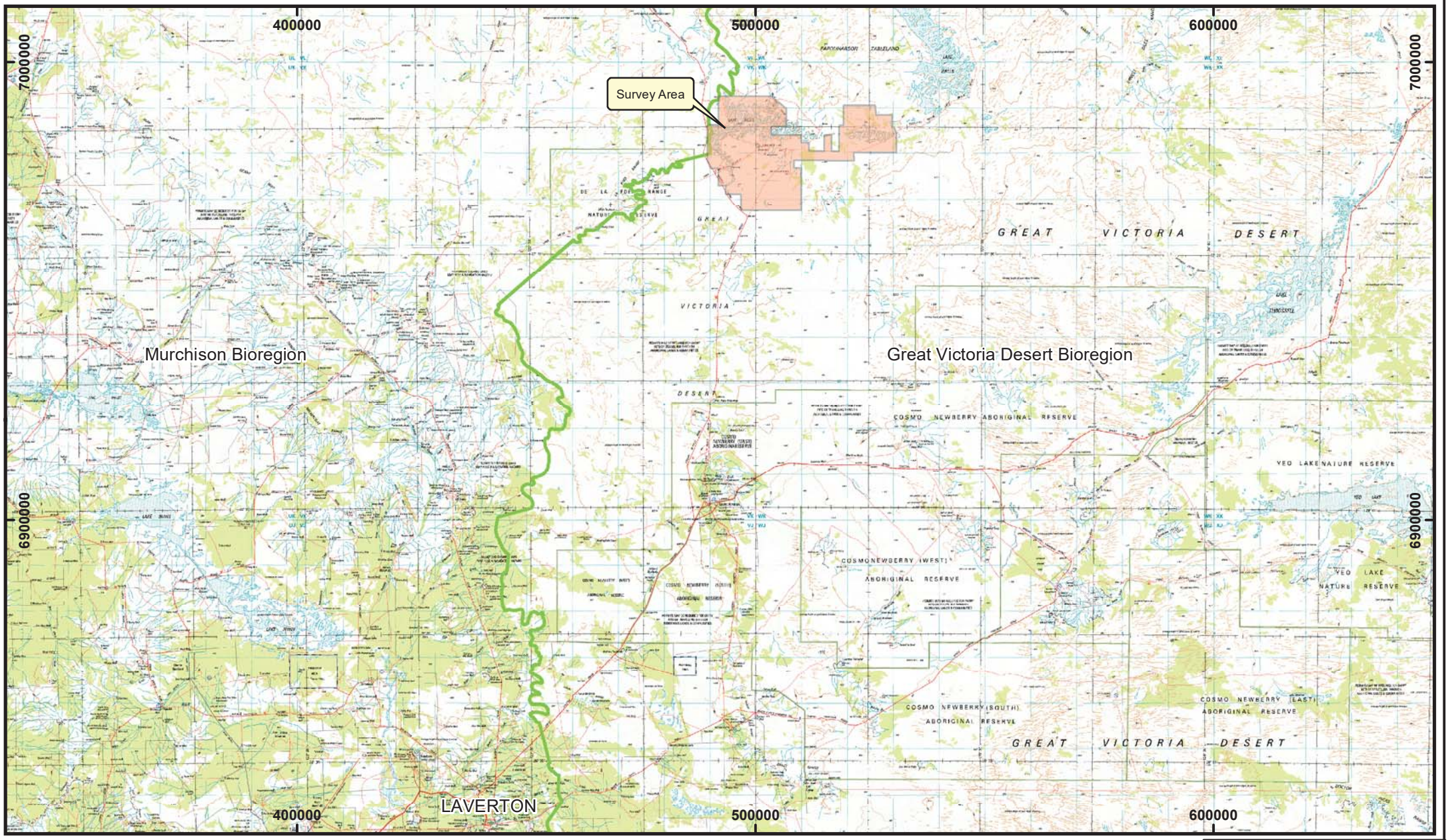
FIGURES



Legend

Survey Area

Bioregion Boundary

N

0 10 20 30 40 50

Kilometres

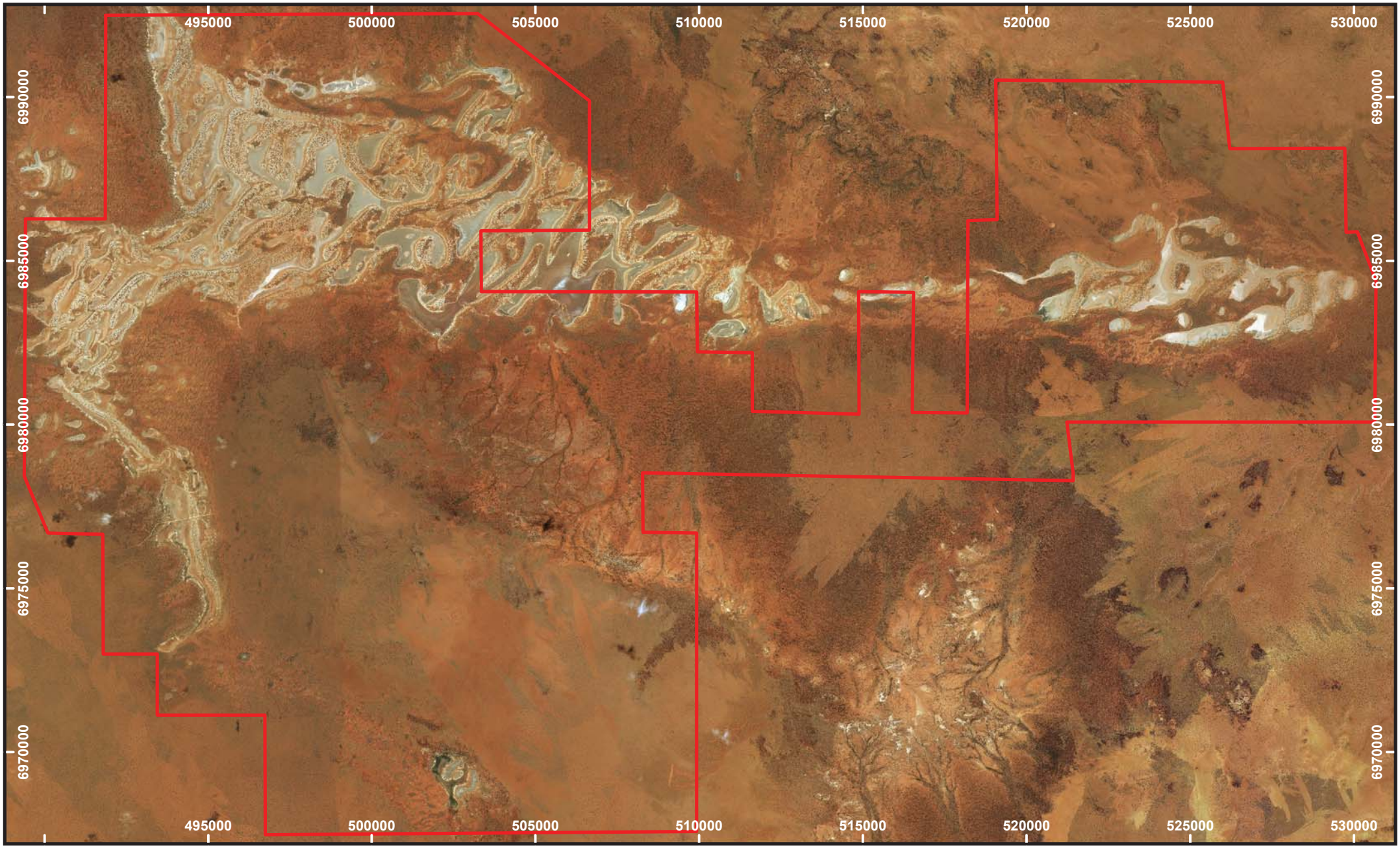
Fauna Survey

Australian Potash Limited
Lake Wells Potash Project

Survey Area and Surrounds

Drawn: G Harewood
Date: August 2017
Scale: 1:1,100,000
Projection/Coordinate System: UTM/MGA Zone 51

Figure: 1



Legend

Survey Area

0 2 4 6 8 10

Kilometres

Fauna Survey

Drawn: G. Harewood

Date: August 2017

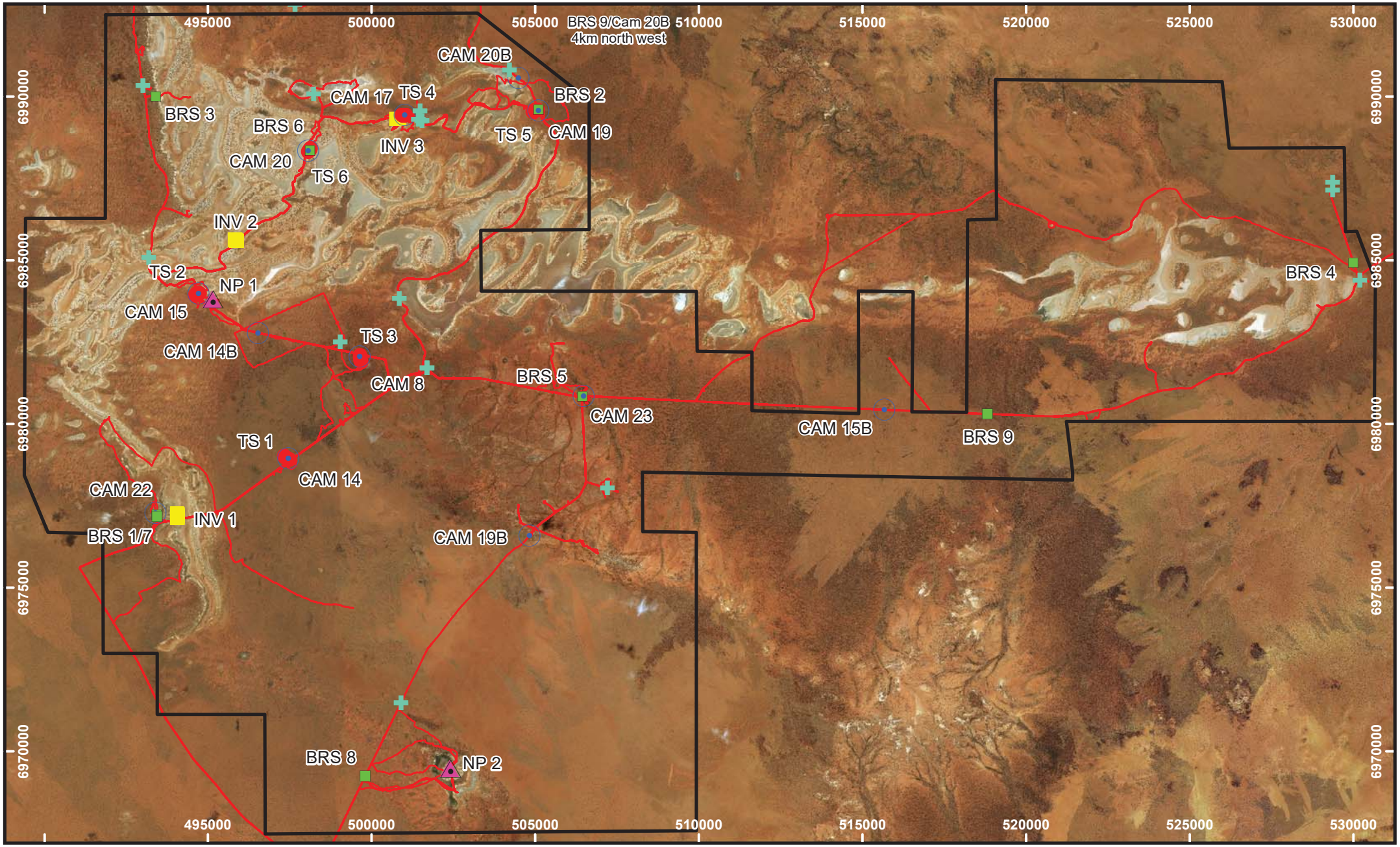
Scale: 1:150,000

Projection/Coordinate System: UTM/MGA Zone 51

Australian Potash Limited
Lake Wells Potash Project

Survey Area Air Photo

Figure: 2



Legend

- Survey Area
- Pit/Funnel/Elliot Trap Array (TS)
- Small Invertebrate Pit Traps (INV)
- Camera Trap (CAM)
- Active Searching
- Night Parrot Listening Survey (NP)
- Bat Recording Site (BRS)
- Vehicle and On-Foot Transects

0 1 2 3 4 5
Kilometres

Fauna Survey

Drawn: G. Harewood
Date: August 2017
Scale: 1:150,000
Projection/Coordinate System: UTM/MGA Zone 51

Australian Potash Limited
Lake Wells Potash Project

Survey Sites

Figure: 3

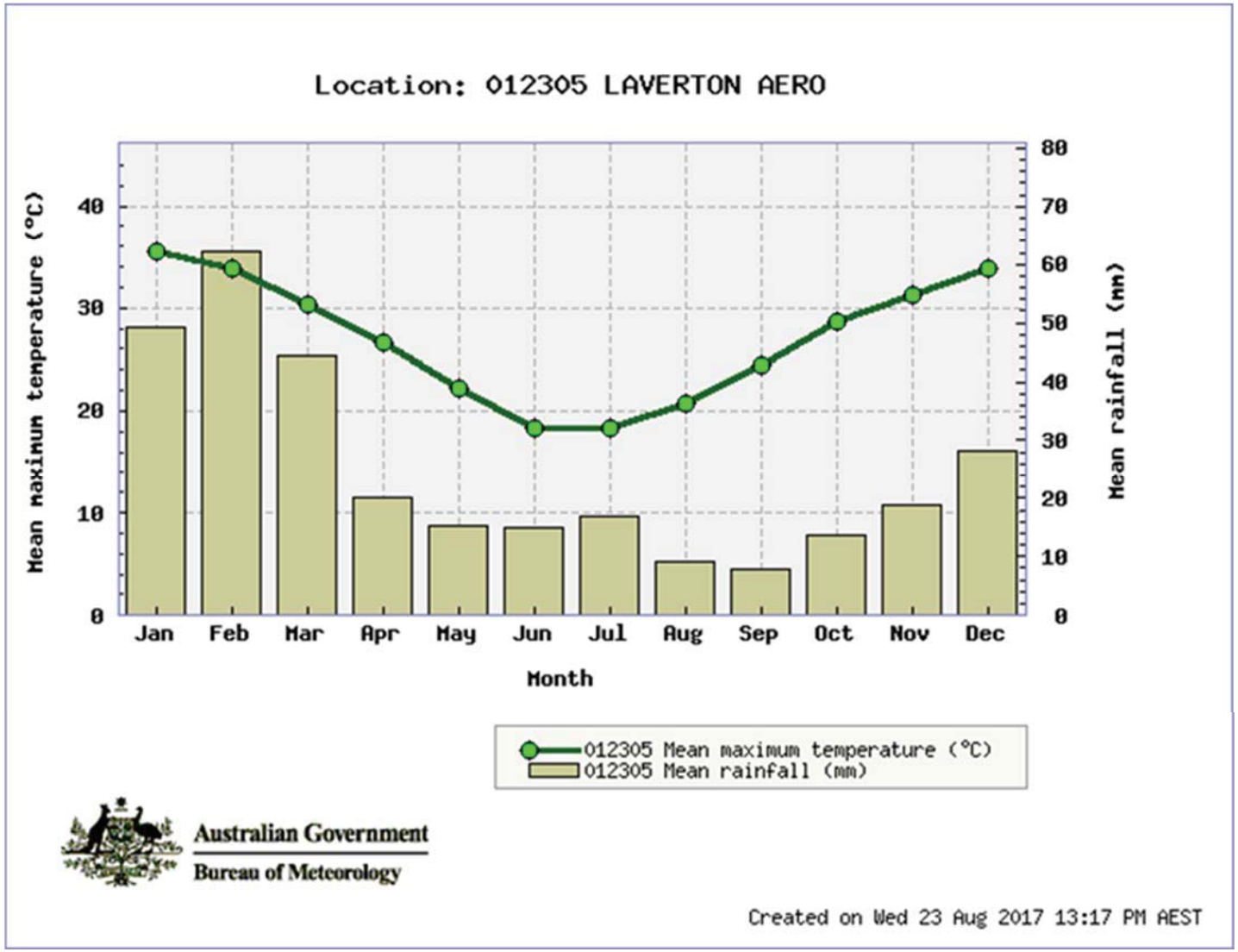


Figure 4: Mean monthly rainfall and maximum temperature (June 1994 to April 2017) for the Laverton Aero weather station (#12035) (BoM, 2017a)

N
W E
S

490,000 mE
500,000 mE
510,000 mE
520,000 mE
530,000 mE

6,990,000 mN
6,980,000 mN
6,970,000 mN

Closed Depression
- CD-CSSSF1
- CD-CSSSF2
- CD-CSSSF3

Clay Loam Plain
- CLP-AFW1
- CLP-AFW2

Drainage Depression
- DD-AFW1

Gypsum Dunefield
- D-CFW1
- D-MWS1

Quartz Rocky Plain
- QRP-AFW1
- QRP-CFW1

Rocky Hillslope
- RH-AFW1
- RH-AFW2

Sand Dunefield
- SD-AFW1
- SD-MWS1

Sandplain
- SP-EW1
- SP-MWS1

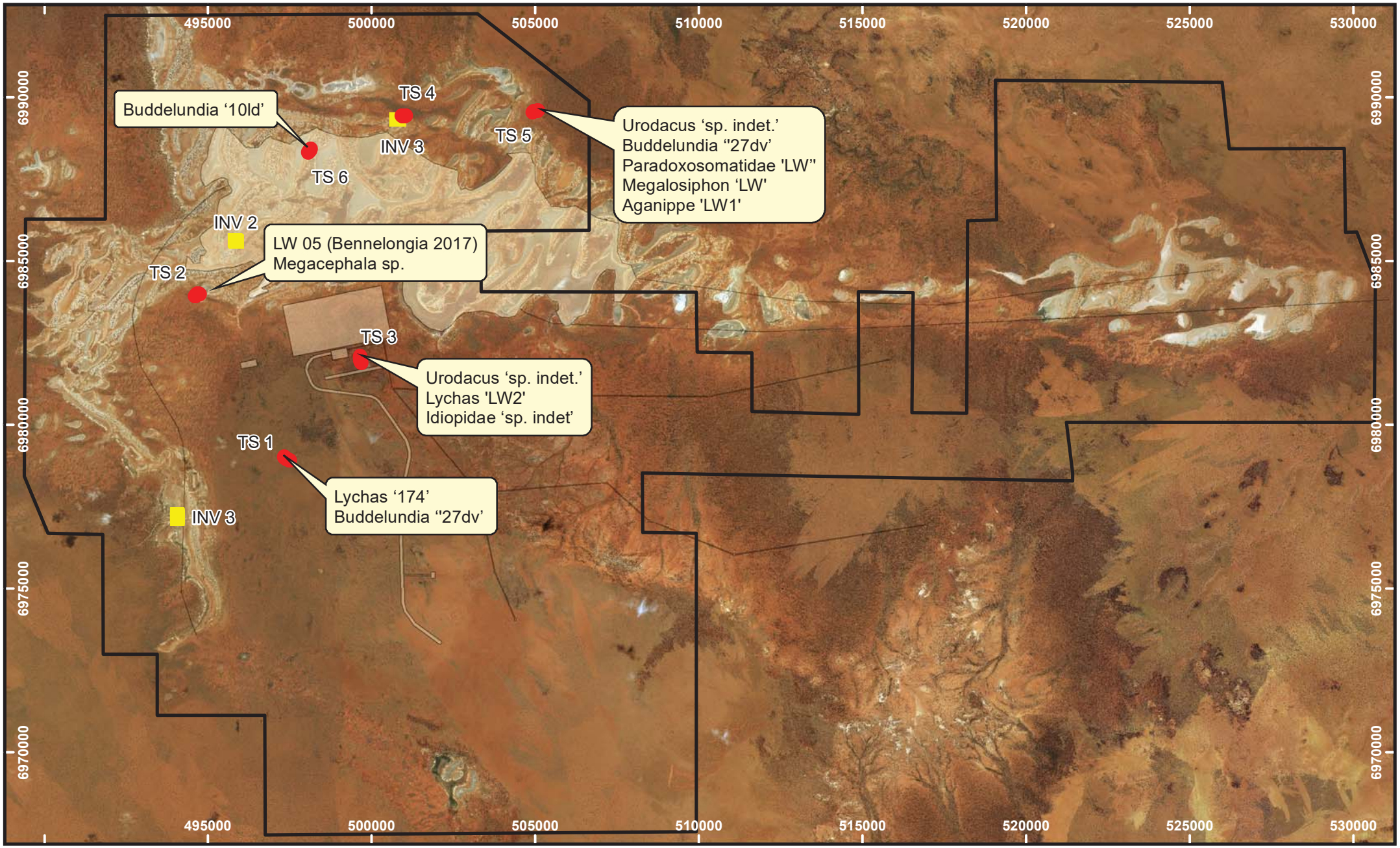
Sand Loam Plain
- SLP-AFW/MWS1

Botanica Consulting

Vegetation Communities
Lake Wells Potash Project

Date: 9/06/2017
Author: L. Pick
Scale: 1:125000
Projection: MGA Zone 51 (GDA 94)

0 1.25 2.5 5
kilometres



Legend

- Survey Area
- Proposed Infrastructure Footprint
- Pit/Funnel/Elliot Trap Array (TS)
- Small Invertebrate Pit Traps (INV)

0 1 2 3 4 5
Kilometres

Fauna Survey

Drawn: G. Harewood
Date: August 2017
Scale: 1:150,000
Projection/Coordinate System: UTM/MGA Zone 51

Australian Potash Limited
Lake Wells Potash Project

Potential SRE Invertebrates Records

Figure: 6

APPENDIX A

Conservation Codes and Categories

***EPBC Act (1999)* Threatened Fauna Categories**

Threatened fauna may be listed under Section 178 of the *Environment Protection and Biodiversity Conservation Act 1999* (*EPBC Act*) in any one of the following categories:

Category	Code	Description
Extinct	E	There is no reasonable doubt that the last member of the species has died.
*Extinct in the wild	EW	A species (a) is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or (b) has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.
*Critically Endangered	CE	A species is facing an extremely high risk of extinction in the wild in the immediate future.
*Endangered	EN	A species: (a) is not critically endangered; and (b) is facing a very high risk of extinction in the wild in the near future.
*Vulnerable	VU	A species (a) is not critically endangered or endangered; and (b) is facing a high risk of extinction in the wild in the medium-term future.
Conservation Dependent	CD	A species is the focus of a specific conservation program the cessation of which would result in the species becoming vulnerable, endangered or critically endangered
*Migratory	Migratory	(a) all migratory species that are: (i) native species; and (ii) from time to time included in the appendices to the Bonn Convention; and (b) all migratory species from time to time included in annexes established under JAMBA, CAMBA and ROKAMBA; and (c) all native species from time to time identified in a list established under, or an instrument made under, an international agreement approved by the Minister.
Marine	Ma	Species in the list established under s248 of the *EPBC Act*

Note: Only species in those categories marked with an asterix are matters of national environmental significance (NES) under the *EPBC Act*.

Wildlife Conservation (Specially Protected Fauna) Notice 2015 Categories

Published as Specially Protected under the *Wildlife Conservation Act 1950*, and listed under Schedules 1 to 7 of the Wildlife Conservation (Specially Protected Fauna) Notice.

The assessment of the conservation status of these species is based on their national extent and ranked according to their level of threat using IUCN Red List categories and criteria as detailed below.

Category	Code	Description
Schedule 1 Critically Endangered species	CR	Threatened species considered to be facing an extremely high risk of extinction in the wild.
Schedule 2 Endangered species	EN	Threatened species considered to be facing a very high risk of extinction in the wild.
Schedule 3 Vulnerable species	VU	Threatened species considered to be facing a high risk of extinction in the wild.
Schedule 4 Presumed extinct species	EX	Species which have been adequately searched for and there is no reasonable doubt that the last individual has died.
Schedule 5 Migratory birds protected under an international agreement	IA	Birds that are subject to an agreement between the government of Australia and the governments of Japan (JAMBA), China (CAMBA) and The Republic of Korea (ROKAMBA), and the Bonn Convention, relating to the protection of migratory birds.
Schedule 6 Fauna that is of special conservation need as conservation dependent fauna	CD	Fauna of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened.
Schedule 7 Other specially protected fauna.	OS	Fauna otherwise in need of special protection to ensure their conservation.

Western Australian DPaW Priority Fauna Categories

Possibly threatened species that do not meet survey criteria, or are otherwise data deficient, are added to the Priority Fauna under Priorities 1, 2 or 3. These three categories are ranked in order of priority for survey and evaluation of conservation status so that consideration can be given to their declaration as threatened flora or fauna.

Species that are adequately known, are rare but not threatened, or meet criteria for near threatened, or that have been recently removed from the threatened species or other specially protected fauna lists for other than taxonomic reasons, are placed in Priority 4. These species require regular monitoring.

Assessment of Priority codes is based on the Western Australian distribution of the species, unless the distribution in WA is part of a contiguous population extending into adjacent States, as defined by the known spread of locations.

Category	Code	Description
Priority 1 Poorly Known Species.	P1	Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey.
Priority 2 Poorly Known Species.	P2	Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey.
Priority 3 Poorly Known Species.	P3	Species that are known from several locations and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Such species are in need of further survey.
Priority 4 Rare, Near Threatened and other species in need of monitoring.	P4	(a) Rare: Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These species are usually represented on conservation lands. (b) Near Threatened: Species that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable. (c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

*Species includes all taxa (plural of taxon - a classificatory group of any taxonomic rank, e.g. a family, genus, species or any infraspecific category i.e. subspecies or variety, or a distinct population).

***IUCN Red List* Threatened Species Categories**

The *IUCN Red List of Threatened Species*™ is a checklist of taxa that have undergone an extinction risk assessment using the *IUCN Red List Categories and Criteria*.

Categories are summarized below.

Category	Code	Description
Extinct	EX	Taxa for which there is no reasonable doubt that the last individual has died.
Extinct in the Wild	EW	Taxa which is known only to survive in cultivation, in captivity or and as a naturalised population well outside its past range and it has not been recorded in known or expected habitat despite exhaustive survey over a time frame appropriate to its life cycle and form.
Critically Endangered	CR	Taxa facing an extremely high risk of extinction in the wild.
Endangered	EN	Taxa facing a very high risk of extinction in the wild.
Vulnerable	VU	Taxa facing a high risk of extinction in the wild.
Near Threatened	NT	Taxa which has been evaluated but does not qualify for CR, EN or VU now but is close to qualifying or likely to qualify in the near future.
Least Concern	LC	Taxa which has been evaluated but does not qualify for CR, EN, VU, or NT but is likely to qualify for NT in the near future.
Data Deficient	DD	Taxa for which there is inadequate information to make a direct or indirect assessment of its risk of extinction based on its distribution and/or population status.
Not Evaluated	NE	Taxa which has not been evaluated.

A full list of categories and their meanings are available at:

http://www.iucnredlist.org/technical-documents/categories-and-criteria/2001-categories-criteria

APPENDIX B

Fauna Trap, Recording and Search Sites – Details

Phase 1
Pit/Funnel/Elliot Trap Site Coordinates
Datum - Australian Geocentric 1994 (GDA94)

Trap Site	Zone	mE	mN	Opened	Closed	Nights
TS 1.01	51J	497503	6978903	11/09/2016	19/09/2016	8
TS 1.02	51J	497478	6978922	11/09/2016	19/09/2016	8
TS 1.03	51J	497462	6978937	11/09/2016	19/09/2016	8
TS 1.04	51J	497430	6978945	11/09/2016	19/09/2016	8
TS 1.05	51J	497407	6978959	11/09/2016	19/09/2016	8
TS 1.06	51J	497392	6978966	11/09/2016	19/09/2016	8
TS 1.07	51J	497368	6978986	11/09/2016	19/09/2016	8
TS 1.08	51J	497348	6978996	11/09/2016	19/09/2016	8
TS 1.09	51J	497335	6979007	11/09/2016	19/09/2016	8
TS 1.10	51J	497324	6979022	11/09/2016	19/09/2016	8
TS 2.01	51J	494754	6983988	11/09/2016	19/09/2016	8
TS 2.02	51J	494739	6983990	11/09/2016	19/09/2016	8
TS 2.03	51J	494711	6984002	11/09/2016	19/09/2016	8
TS 2.04	51J	494690	6984001	11/09/2016	19/09/2016	8
TS 2.05	51J	494677	6983996	11/09/2016	19/09/2016	8
TS 2.06	51J	494655	6983981	11/09/2016	19/09/2016	8
TS 2.07	51J	494645	6983969	11/09/2016	19/09/2016	8
TS 2.08	51J	494632	6983963	11/09/2016	19/09/2016	8
TS 2.09	51J	494622	6983939	11/09/2016	19/09/2016	8
TS 2.10	51J	494602	6983926	11/09/2016	19/09/2016	8
TS 3.01	51J	499651	6982106	12/09/2016	19/09/2016	7
TS 3.02	51J	499655	6982075	12/09/2016	19/09/2016	7
TS 3.03	51J	499655	6982053	12/09/2016	19/09/2016	7
TS 3.04	51J	499657	6982027	12/09/2016	19/09/2016	7
TS 3.05	51J	499663	6981998	12/09/2016	19/09/2016	7
TS 3.06	51J	499652	6981971	12/09/2016	19/09/2016	7
TS 3.07	51J	499665	6981950	12/09/2016	19/09/2016	7
TS 3.08	51J	499676	6981927	12/09/2016	19/09/2016	7
TS 3.09	51J	499675	6981900	12/09/2016	19/09/2016	7
TS 3.10	51J	499685	6981881	12/09/2016	19/09/2016	7

Trap Site	Zone	mE	mN	Opened	Closed	Nights
TS 4.01	51J	501049	6989442	13/09/2016	20/09/2016	7
TS 4.02	51J	501030	6989438	13/09/2016	20/09/2016	7
TS 4.03	51J	501012	6989435	13/09/2016	20/09/2016	7
TS 4.04	51J	501000	6989436	13/09/2016	20/09/2016	7
TS 4.05	51J	500986	6989434	13/09/2016	20/09/2016	7
TS 4.06	51J	500974	6989434	13/09/2016	20/09/2016	7
TS 4.07	51J	500962	6989435	13/09/2016	20/09/2016	7
TS 4.08	51J	500947	6989433	13/09/2016	20/09/2016	7
TS 4.09	51J	500933	6989437	13/09/2016	20/09/2016	7
TS 4.10	51J	500916	6989438	13/09/2016	20/09/2016	7
TS 5.01	51J	505084	6989599	13/09/2016	20/09/2016	7
TS 5.02	51J	505073	6989592	13/09/2016	20/09/2016	7
TS 5.03	51J	505055	6989576	13/09/2016	20/09/2016	7
TS 5.04	51J	505038	6989583	13/09/2016	20/09/2016	7
TS 5.05	51J	505018	6989585	13/09/2016	20/09/2016	7
TS 5.06	51J	505001	6989579	13/09/2016	20/09/2016	7
TS 5.07	51J	504979	6989579	13/09/2016	20/09/2016	7
TS 5.08	51J	504960	6989570	13/09/2016	20/09/2016	7
TS 5.09	51J	504938	6989558	13/09/2016	20/09/2016	7
TS 5.10	51J	504922	6989537	13/09/2016	20/09/2016	7
TS 6.01	51J	498070	6988305	13/09/2016	20/09/2016	7
TS 6.02	51J	498071	6988321	13/09/2016	20/09/2016	7
TS 6.03	51J	498082	6988336	13/09/2016	20/09/2016	7
TS 6.04	51J	498100	6988361	13/09/2016	20/09/2016	7
TS 6.05	51J	498113	6988359	13/09/2016	20/09/2016	7
TS 6.06	51J	498115	6988375	13/09/2016	20/09/2016	7
TS 6.07	51J	498117	6988396	13/09/2016	20/09/2016	7
TS 6.08	51J	498112	6988412	13/09/2016	20/09/2016	7
TS 6.09	51J	498125	6988421	13/09/2016	20/09/2016	7
TS 6.10	51J	498137	6988429	13/09/2016	20/09/2016	7

Invertebrate Pit Traps

Trap Site	Zone	mE	mN	Opened	Closed	Nights
wpt011	51J	494064	6977114	14/09/2016	19/09/2016	5
wpt012	51J	494060	6977126	14/09/2016	19/09/2016	5
wpt013	51J	494061	6977146	14/09/2016	19/09/2016	5
wpt014	51J	494064	6977160	14/09/2016	19/09/2016	5
wpt015	51J	494064	6977182	14/09/2016	19/09/2016	5
wpt016	51J	494063	6977195	14/09/2016	19/09/2016	5
wpt017	51J	494067	6977209	14/09/2016	19/09/2016	5
wpt018	51J	494062	6977224	14/09/2016	19/09/2016	5
wpt019	51J	494065	6977242	14/09/2016	19/09/2016	5
wpt020	51J	494060	6977257	14/09/2016	19/09/2016	5
wpt045	51J	495822	6985636	14/09/2016	19/09/2016	5
wpt046	51J	495828	6985630	14/09/2016	19/09/2016	5
wpt047	51J	495835	6985624	14/09/2016	19/09/2016	5
wpt048	51J	495840	6985621	14/09/2016	19/09/2016	5
wpt049	51J	495848	6985615	14/09/2016	19/09/2016	5

Trap Site	Zone	mE	mN	Opened	Closed	Nights
wpt050	51J	495854	6985606	14/09/2016	19/09/2016	5
wpt051	51J	495862	6985601	14/09/2016	19/09/2016	5
wpt052	51J	495869	6985593	14/09/2016	19/09/2016	5
wpt053	51J	495877	6985586	14/09/2016	19/09/2016	5
wpt054	51J	495883	6985581	14/09/2016	19/09/2016	5
wpt066	51J	500832	6989310	14/09/2016	19/09/2016	5
wpt067	51J	500826	6989311	14/09/2016	19/09/2016	5
wpt068	51J	500816	6989314	14/09/2016	19/09/2016	5
wpt069	51J	500807	6989317	14/09/2016	19/09/2016	5
wpt070	51J	500799	6989321	14/09/2016	19/09/2016	5
wpt071	51J	500791	6989322	14/09/2016	19/09/2016	5
wpt072	51J	500782	6989324	14/09/2016	19/09/2016	5
wpt073	51J	500774	6989324	14/09/2016	19/09/2016	5
wpt074	51J	500765	6989327	14/09/2016	19/09/2016	5
wpt075	51J	500756	6989329	14/09/2016	19/09/2016	5

Phase 2
Pit/Funnel/Elliot Trap Site Coordinates
Datum - Australian Geocentric 1994 (GDA94)

Trap Site	Zone	mE	mN	Opened	Closed	Nights
TS 1.01	51J	497503	6978903	24/04/2017	1/05/2017	7
TS 1.02	51J	497478	6978922	24/04/2017	1/05/2017	7
TS 1.03	51J	497462	6978937	24/04/2017	1/05/2017	7
TS 1.04	51J	497430	6978945	24/04/2017	1/05/2017	7
TS 1.05	51J	497407	6978959	24/04/2017	1/05/2017	7
TS 1.06	51J	497392	6978966	24/04/2017	1/05/2017	7
TS 1.07	51J	497368	6978986	24/04/2017	1/05/2017	7
TS 1.08	51J	497348	6978996	24/04/2017	1/05/2017	7
TS 1.09	51J	497335	6979007	24/04/2017	1/05/2017	7
TS 1.10	51J	497324	6979022	24/04/2017	1/05/2017	7
TS 2.01	51J	494754	6983988	24/04/2017	1/05/2017	7
TS 2.02	51J	494739	6983990	24/04/2017	1/05/2017	7
TS 2.03	51J	494711	6984002	24/04/2017	1/05/2017	7
TS 2.04	51J	494690	6984001	24/04/2017	1/05/2017	7
TS 2.05	51J	494677	6983996	24/04/2017	1/05/2017	7
TS 2.06	51J	494655	6983981	24/04/2017	1/05/2017	7
TS 2.07	51J	494645	6983969	24/04/2017	1/05/2017	7
TS 2.08	51J	494632	6983963	24/04/2017	1/05/2017	7
TS 2.09	51J	494622	6983939	24/04/2017	1/05/2017	7
TS 2.10	51J	494602	6983926	24/04/2017	1/05/2017	7
TS 3.01	51J	499651	6982106	24/04/2017	1/05/2017	7
TS 3.02	51J	499655	6982075	24/04/2017	1/05/2017	7
TS 3.03	51J	499655	6982053	24/04/2017	1/05/2017	7
TS 3.04	51J	499657	6982027	24/04/2017	1/05/2017	7
TS 3.05	51J	499663	6981998	24/04/2017	1/05/2017	7
TS 3.06	51J	499652	6981971	24/04/2017	1/05/2017	7
TS 3.07	51J	499665	6981950	24/04/2017	1/05/2017	7
TS 3.08	51J	499676	6981927	24/04/2017	1/05/2017	7
TS 3.09	51J	499675	6981900	24/04/2017	1/05/2017	7
TS 3.10	51J	499685	6981881	24/04/2017	1/05/2017	7

Trap Site	Zone	mE	mN	Opened	Closed	Nights
TS 4.01	51J	501049	6989442	24/04/2017	1/05/2017	7
TS 4.02	51J	501030	6989438	24/04/2017	1/05/2017	7
TS 4.03	51J	501012	6989435	24/04/2017	1/05/2017	7
TS 4.04	51J	501000	6989436	24/04/2017	1/05/2017	7
TS 4.05	51J	500986	6989434	24/04/2017	1/05/2017	7
TS 4.06	51J	500974	6989434	24/04/2017	1/05/2017	7
TS 4.07	51J	500962	6989435	24/04/2017	1/05/2017	7
TS 4.08	51J	500947	6989433	24/04/2017	1/05/2017	7
TS 4.09	51J	500933	6989437	24/04/2017	1/05/2017	7
TS 4.10	51J	500916	6989438	24/04/2017	1/05/2017	7
TS 5.01	51J	505084	6989599	24/04/2017	1/05/2017	7
TS 5.02	51J	505073	6989592	24/04/2017	1/05/2017	7
TS 5.03	51J	505055	6989576	24/04/2017	1/05/2017	7
TS 5.04	51J	505038	6989583	24/04/2017	1/05/2017	7
TS 5.05	51J	505018	6989585	24/04/2017	1/05/2017	7
TS 5.06	51J	505001	6989579	24/04/2017	1/05/2017	7
TS 5.07	51J	504979	6989579	24/04/2017	1/05/2017	7
TS 5.08	51J	504960	6989570	24/04/2017	1/05/2017	7
TS 5.09	51J	504938	6989558	24/04/2017	1/05/2017	7
TS 5.10	51J	504922	6989537	24/04/2017	1/05/2017	7
TS 6.01	51J	498070	6988305	24/04/2017	1/05/2017	7
TS 6.02	51J	498071	6988321	24/04/2017	1/05/2017	7
TS 6.03	51J	498082	6988336	24/04/2017	1/05/2017	7
TS 6.04	51J	498100	6988361	24/04/2017	1/05/2017	7
TS 6.05	51J	498113	6988359	24/04/2017	1/05/2017	7
TS 6.06	51J	498115	6988375	24/04/2017	1/05/2017	7
TS 6.07	51J	498117	6988396	24/04/2017	1/05/2017	7
TS 6.08	51J	498112	6988412	24/04/2017	1/05/2017	7
TS 6.09	51J	498125	6988421	24/04/2017	1/05/2017	7
TS 6.10	51J	498137	6988429	24/04/2017	1/05/2017	7

Invertebrate Pit Traps

Trap Site	Zone	mE	mN	Opened	Closed	Nights
wpt011	51J	494064	6977114	25/04/2017	30/04/2017	5
wpt012	51J	494060	6977126	25/04/2017	30/04/2017	5
wpt013	51J	494061	6977146	25/04/2017	30/04/2017	5
wpt014	51J	494064	6977160	25/04/2017	30/04/2017	5
wpt015	51J	494064	6977182	25/04/2017	30/04/2017	5
wpt016	51J	494063	6977195	25/04/2017	30/04/2017	5
wpt017	51J	494067	6977209	25/04/2017	30/04/2017	5
wpt018	51J	494062	6977224	25/04/2017	30/04/2017	5
wpt019	51J	494065	6977242	25/04/2017	30/04/2017	5
wpt020	51J	494060	6977257	25/04/2017	30/04/2017	5
wpt045	51J	495822	6985636	25/04/2017	30/04/2017	5
wpt046	51J	495828	6985630	25/04/2017	30/04/2017	5
wpt047	51J	495835	6985624	25/04/2017	30/04/2017	5
wpt048	51J	495840	6985621	25/04/2017	30/04/2017	5
wpt049	51J	495848	6985615	25/04/2017	30/04/2017	5

Trap Site	Zone	mE	mN	Opened	Closed	Nights
wpt050	51J	495854	6985606	25/04/2017	30/04/2017	5
wpt051	51J	495862	6985601	25/04/2017	30/04/2017	5
wpt052	51J	495869	6985593	25/04/2017	30/04/2017	5
wpt053	51J	495877	6985586	25/04/2017	30/04/2017	5
wpt054	51J	495883	6985581	25/04/2017	30/04/2017	5
wpt066	51J	500832	6989310	25/04/2017	30/04/2017	5
wpt067	51J	500826	6989311	25/04/2017	30/04/2017	5
wpt068	51J	500816	6989314	25/04/2017	30/04/2017	5
wpt069	51J	500807	6989317	25/04/2017	30/04/2017	5
wpt070	51J	500799	6989321	25/04/2017	30/04/2017	5
wpt071	51J	500791	6989322	25/04/2017	30/04/2017	5
wpt072	51J	500782	6989324	25/04/2017	30/04/2017	5
wpt073	51J	500774	6989324	25/04/2017	30/04/2017	5
wpt074	51J	500765	6989327	25/04/2017	30/04/2017	5
wpt075	51J	500756	6989329	25/04/2017	30/04/2017	5

Lake Wells
Camera Trap Locations
MGA Zone 51

Camera Id	Zone	mE	mN	Set	Retrieved
CAM 14	51J	497456	6978951	Sep-16	Apr-17
CAM 15	51J	494708	6983984	Sep-16	Apr-17
CAM 17	51J	501008	6989435	Sep-16	Apr-17
CAM 19	51J	505092	6989587	Sep-16	Apr-17
CAM 20	51J	498063	6988346	Sep-16	Apr-17
CAM 22	51J	493394	6977287	Sep-16	Apr-17
CAM 23	51J	506484	6980846	Sep-16	Apr-17
CAM 8	51J	499643	6982060	Sep-16	Apr-17
CAM 19B	51J	504825	6976592	Apr-17	Apr-17
CAM 15B	51J	515670	6980434	Apr-17	Apr-17
CAM 14B	51J	496526	6982768	Apr-17	Apr-17
CAM 20B	51J	501808	6997409	Apr-17	Apr-17
CAM 20C	51J	504491	6990572	Apr-17	Apr-17

Lake Wells

Bat Recording Sites

Datum: Australian Geocentric 1994 (GDA94)

Phase 1

	MGA			Sunset	Sunrise
ID	Zone	mE	mN	Commenced	Ended
BAT 1	51J	493437	6977226	11/09/2016	12/09/2016
BAT 2	51J	505093	6989590	13/09/2016	14/09/2016
BAT 3	51J	493409	6990005	14/09/2016	15/09/2016
BAT 4	51J	529997	6984927	15/09/2016	16/09/2016
BAT 5	51J	506438	6980840	16/09/2016	17/09/2016
BAT 6	51J	498115	6988346	18/09/2016	19/09/2016

Phase 2

	MGA			Sunset	Sunrise
ID	Zone	mE	mN	Commenced	Ended
BAT 6	51J	493443	6977188	24/04/2017	25/04/2017
BAT 7	51J	499810	6969252	25/04/2017	26/04/2017
BAT 8	51J	518822	6980304	26/04/2017	27/04/2017
BAT 9	51J	501808	6997409	28/04/2017	29/04/2017

Unit= Song Meter SM2BAT+

Miscellaneous Waypoints
Australian Geocentric 1994 (GDA94)

Phase 1

ID	Zone	mE	mN
wpt100	51J	501545	6989255
wpt106	51J	501425	6989304
wpt107	51J	500840	6983829
wpt108	51J	501547	6989254
wpt109	51J	501695	6981696
wpt110	51J	501474	6989560
wpt111	51J	501693	6981701

Phase 2

ID	Zone	mE	mN
wpt004	51J	502377	6969482
wpt005	51J	500893	6971479
wpt009	51J	530204	6984381
wpt010	51J	529358	6987133
wpt011	51J	529369	6987369
wpt012	51J	495120	6983825
wpt013	51J	498231	6990082
wpt016	51J	497660	6992809
wpt017	51J	493010	6990332
wpt018	51J	493191	6985075
wpt020	51J	504210	6990804
wpt022	51J	499043	6982503
wpt024	51J	523279	6986273
wpt025	51J	507205	6978029

APPENDIX C

DBCA & *EPBC* Database Search Results

NatureMap
Mapping Western Australia's biodiversity

NatureMap - Lake Wells

Created By Greg Harewood on 23/08/2017

Kingdom	Animalia
Current Names Only	Yes
Core Datasets Only	Yes
Method	'By Circle'
Centre	123° 06' 06" E,27° 17' 47" S
Buffer	40km
Group By	Species Group

Species Group	Species	Records
Amphibian	1	1
Bird	22	29
Invertebrate	2	2
Mammal	4	6
Reptile	12	15
TOTAL	**41**	**53**

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Amphibian					
1.	25375	*Cyclorana maini (Sheep Frog)*			
Bird					
2.	24559	*Acanthagenys rufogularis (Spiny-cheeked Honeyeater)*			
3.	24260	*Acanthiza apicalis (Broad-tailed Thornbill, Inland Thornbill)*			
4.	24267	*Aphelocephala leucopsis subsp. leucopsis (Southern Whiteface)*			
5.	24285	*Aquila audax (Wedge-tailed Eagle)*			
6.	25566	*Artamus cinereus (Black-faced Woodswallow)*			
7.		*Barnardius zonarius*			
8.	25675	*Colluricincla harmonica (Grey Shrike-thrush)*			
9.	24416	*Corvus bennetti (Little Crow)*			
10.	24420	*Cracticus nigrogularis (Pied Butcherbird)*			
11.	25595	*Cracticus tibicen (Australian Magpie)*			
12.	24606	*Daphoenositta chrysoptera subsp. pileata (Varied Sittella, Black-capped Sitella)*			
13.		*Eolophus roseicapillus*			
14.	24570	*Epthianura tricolor (Crimson Chat)*			
15.	24443	*Grallina cyanoleuca (Magpie-lark)*			
16.	24549	*Malurus leucopterus subsp. leuconotus (White-winged Fairy-wren)*			
17.	24583	*Manorina flavigula (Yellow-throated Miner)*			
18.	24618	*Oreoica gutturalis (Crested Bellbird)*			
19.	24630	*Pardalotus striatus subsp. westraliensis (Striated Pardalote)*			
20.		*Pardalotus striatus subsp. westraliensis Xmurchisoni*			
21.	24683	*Pomatostomus superciliosus (White-browed Babbler)*			
22.	42344	*Purnella albifrons (White-fronted Honeyeater)*			
23.	30948	*Smicrornis brevirostris (Weebill)*			
Invertebrate					
24.		*Isopeda leishmanni*			
25.		*Urodacus yaschenkoi*			
Mammal					
26.	30903	*Dasycercus blythi (Brush-tailed Mulgara, Ampurta)*		P4	
27.	24235	*Pseudomys desertor (Desert Mouse)*			
28.	24237	*Pseudomys hermannsburgensis (Sandy Inland Mouse)*			
29.	24116	*Sminthopsis macroura (Stripe-faced Dunnart)*			
Reptile					
30.	44633	*Anilios endoterus*			Y
31.	24988	*Aprasia inaurita (Red-tailed Worm-lizard)*			
32.	25037	*Ctenotus dux*			
33.	25042	*Ctenotus greeri*			
34.	25052	*Ctenotus leonhardii*			
35.	25062	*Ctenotus piankai*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
36.	24995	*Delma australis*			
37.	24959	*Gehyra variegata*			
38.	25125	*Lerista bipes*			
39.	25130	*Lerista desertorum*			
40.	25194	*Morethia ruficauda subsp. ruficauda*			
41.	25218	*Varanus gouldii (Bungarra or Sand Monitor)*			

Conservation Codes
T - Rare or likely to become extinct
X - Presumed extinct
IA - Protected under international agreement
S - Other specially protected fauna
1 - Priority 1
2 - Priority 2
3 - Priority 3
4 - Priority 4
5 - Priority 5

[1] For NatureMap's purposes, species flagged as endemic are those whose records are wholely contained within the search area. Note that only those records complying with the search criterion are included in the calculation. For example, if you limit records to those from a specific datasource, only records from that datasource are used to determine if a species is restricted to the query area.

Australian Government

Department of the Environment and Energy

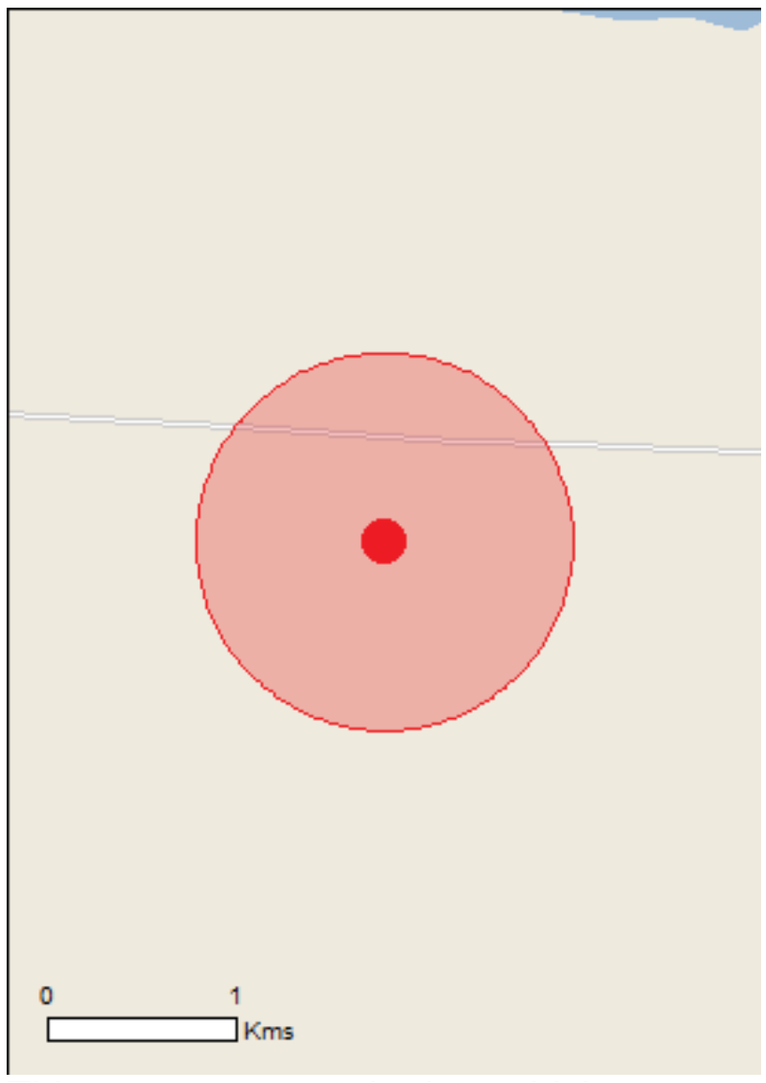
EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 23/08/17 20:37:00



This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2010

Coordinates
Buffer: 1.0Km

Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	4
Listed Migratory Species:	6

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	8
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Commonwealth Reserves Marine:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	5
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Listed Threatened Species		[Resource Information]
Name	Status	Type of Presence
Birds		
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat may occur within area
Pezoporus occidentalis Night Parrot [59350]	Endangered	Species or species habitat may occur within area
Polytelis alexandrae Princess Parrot, Alexandra's Parrot [758]	Vulnerable	Species or species habitat may occur within area
Mammals		
Sminthopsis psammophila Sandhill Dunnart [291]	Endangered	Species or species habitat may occur within area

Listed Migratory Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Migratory Terrestrial Species		
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species [Resource Information]		
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat likely to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area

Extra Information

Invasive Species [Resource Information]		
Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.		
Name	Status	Type of Presence
Mammals		
Camelus dromedarius Dromedary, Camel [7]		Species or species habitat likely to occur within area
Capra hircus Goat [2]		Species or species

Name	Status	Type of Presence
		habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-27.30123 123.09684

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

Department of the Environment
GPO Box 787
Canberra ACT 2601 Australia
+61 2 6274 1111

APPENDIX D

Vertebrate Fauna Observed or Potentially in Survey Area

APPENDIX E

Conservation Significant Vertebrate Species - Profiles

Buff-snouted Blind Snake *Anilios margaretae*

Status and Distribution: This species is listed as Priority 2 by DBCA. Limited number of records. Original specimen was collected at Lake Throssel in 1962 (~120 km east south-east of the Lake Wells Project area). Since this time it has been recorded at two other locations in WA, these being Neale Junction Nature Reserve (~200Km south east - 2008) and south of Neale Junction Nature Reserve (~ 200k south south east – 2011) (DBCA 2017), and twice in South Australia over 700 km away (Maralinga – 2010 and Oak Valley School – 2012) (Atlas of Living Things 2017), indicating a wide distribution across the Great Victoria Desert. Not recorded during Level 2 fauna surveys at Yamarna Station (KLA 2012, Rapallo 2015 - ~120km south east of the Lake Wells Project area).

Habitat: Recorded in playa and sheoak (*Casuarina cristata*) habitat associated with Lake Throssell while to the south the blind snake was recorded in *Acacia* shrublands on the border of tree and shrub steppe between sandhills and sandplains (MBS 2014). Like other blind snakes this is a burrowing worm-like snake that feeds mostly on the larvae and pupae of ants and termites.

Likely presence in Project area: The status of this species in the Project area is difficult to determine. Given suitable habitat occurs (i.e. playa and sheoak, sand dunes and sand plains) its presence cannot be discounted despite not being recorded during previously fauna surveys in the wider area (ecologia 2009, KLA 2012, KEC 2014 and Rapallo 2015). While there are limited records for this species, it appears to have a wide distribution across the Great Victoria Desert. The lack of records could be attributed to the areas remoteness and the secretive habits of blind snakes and it may in fact be more common than records indicate.

Listed as a potential species based on available information.

Great Desert Skink *Liopholis kintorei*

Status and Distribution: This species is listed as Schedule 3 under the *WC Act* and as Vulnerable under the *EPBC Act*. The species appears to have occurred in widespread, but connected, populations in the past in the Great Sandy, Gibson, Great Victoria and Tanami Deserts in the eastern interior of WA and adjacent areas in south-western NT and northwestern SA.

The reported distribution consists of but is not limited to seven isolated populations. Three populations occur in WA at Patjarr (population estimated to be less than 2500 individuals), near the Kiwirrkura community, including the vicinity of Lake Mackay (<500 individuals), and in Rudal River NP (unknown population size). Populations also occur in the NT in the Tanami Desert, including Rabbit Flat, Sangster's Bore, The Granites and near Kintore, (< 2250 individuals); in Uluru - Kata Tjuta NP including part of the Yulara borefields (< 500 individuals); and in the Yulara lease lands including part of the Yulara borefields (< 350 individuals). Only one population is known to persist in SA, near Watarru on the Anangu-Pitjantjatjara Lands (< 50 individuals) (McAlpin 2001).

Habitat: Arid sand flats and clay based loamy soils vegetated with spinifex (Wilson and Swan 2013). The species generally occurs on red sandplains and sand ridges (Cogger *et al*. 1993). Populations in the Gibson Desert occur on sandplains with a surface cover of fine gravel (Pearson *et al*. 2001). Vegetation usually consists of hummock grassland (*Triodia basedowii, T. pungens* and *T. schinzii*), with some scattered shrubs and occasional trees (e.g. *Acacia spp., Eucalyptus* spp*., Hakea* spp*., Grevillea* spp*. and Allocasuarina decaisneana*) (Cogger *et al.* 1993, McAlpin 2001).

Likely presence in Project area: The likely status of this species in the Project area is difficult to determine as there are no nearby recent records. Habitat in some sections of the Project area does however appear superficially suitable (clay loam plains, sand loam plains, sand plains and sand dunes vegetated with spinifex) and the site falls within the historical range of the species.

Closest DBCA records are from ~100 west of Laverton in 1967 and just south of Warburton in 1963. The closest, more recent records are from the Gibson Desert Nature Reserve (300 km north east of the Lake Wells Project area) in 1997 (DBCA 2017).

Listed as a potential species based on available information.

Malleefowl *Leipoa ocellata*

Status and Distribution: This species is listed as Schedule 3 under the *WC Act* and as Vulnerable under the *EPBC Act*. Originally common, but now generally rare to uncommon and patchily distributed.

Current distribution mainly southern arid and semi-arid zones, north to Shark Bay, Jingemarra, Colga Downs and Yeelirrie, east to Earnest Giles Range, Yeo Lake, lower Ponton Creek and to Eucla and west and south to Cockleshell Gully, the Wongan Hills, Stirling Range, Beaufort Inlet, Hatters Hill, Mt Ragged and Point Malcolm (Johnstone and Storr 1998).

Habitat: Mainly scrubs and thickets of mallee *Eucalyptus* spp., boree *Melaleuca lanceolata* and bowgada *Acacia linophylla*, dense litter forming shrublands and dense mulga woodland.

Likely presence in Project area: No evidence of this species (individuals, foot prints, feathers or recent/old nest mounds) was observed during the survey period. There are very few records of this species this far north east of its main documented range (DBCA 2017). Habitat within the Project area appears unsuitable primarily due to the generally sparse nature of the vegetation and/or a lack of leaf litter. Transient individuals may occur very rarely.

Not listed as a potential species as under normal circumstance this species would not be present, though transient individuals may occur very rarely.

Eastern Great Egret *Ardea alba*

Status and Distribution: This species of egret is listed as Schedule 5 under the *WC Act and as* Migratory under the *EPBC Act* including international agreements to which Australia is a signatory. The eastern great egret is common and very widespread in any suitable permanent or temporary habitat (Morcombe 2004).

Habitat: Wetlands, flooded pasture, dams, estuarine mudflats, mangroves and reefs (Morcombe 2004).

Likely presence in Project area: Very rarely recorded in this general area. Suitable habitat limited to open and closed depressions when inundated.

Not listed as a potential species as under normal circumstance this species would not be present, though individuals may occur very occasionally after significant rain events.

Peregrine Falcon *Falco peregrinus*

Status and Distribution: This species is listed as Schedule 7 under the *WC Act*. Individuals of this species are uncommon/rare but wide ranging across Australia. Moderately common at higher levels of the Stirling Range, uncommon in hilly, north west Kimberley, Hamersley and Darling Ranges; rare or scarce elsewhere (Johnstone and Storr 1998).

Habitat: Diverse from rainforest to arid shrublands, from coastal heath to alpine (Morcombe 2004). Mainly about cliffs along coasts, rivers and ranges and about wooded watercourses and lakes (Johnstone and Storr 1998). The species utilises the ledges, cliff faces and large hollows/broken spouts of trees for nesting. It will also occasionally use the abandoned nests of other birds of prey. Also known to utilise decommissioned open cut pit walls for nesting.

Likely presence in Project area: The species potentially utilises some sections of the Project area as part of a much larger home range for foraging purposes only. Would only be represented by a very small number of individuals for limited periods. Previously recorded at Tropicana (ecologia 2009).

Listed as a potential species based on available information, though frequency of occurrence and probability of breeding would be low.

Grey Falcon *Falco hypoleucos*

Status and Distribution: Listed as Schedule 3 under the *WC Act*. Within WA found in the northern half, south to about 26°S (Gascoyne, Lake Carnegie and Warburton), casual further south (Johnstone and Storr 1998).

Habitat: Lightly treed plains, gibber deserts, sand ridges, pastoral lands, timbered water courses but seldom in driest deserts (Pizzey & Knight 2012). It has a distribution centred

around ephemeral or permanent drainage lines, utilising old nests of other bird species situated in the tallest trees along the river systems (Garnett and Crowley 2000).

Likely presence in Project area: This paucity of recent records nearby and the lack of tree-lined watercourses within the Project area itself would suggest that grey falcons would only occur as nonbreeding, irregular visitors.

Not listed as a potential species as under normal circumstance this species would not be present, though individuals may occur very occasionally.

Migratory Shorebirds

A small number of migratory shorebird species have previously been recorded in the wider area. Not all specific species are discussed in detail. The most likely species to be found on central, inland lakes (after significant rainfall events only) are listed in Appendix B.

Status and Distribution: Migratory shorebirds are listed under the *EPBC Act,* the *WC Act* (Schedule 5) and under international agreements to which Australia is a signatory. All species are either widespread summer migrants to Australia or residents. State and Federal conservation status varies between species.

Habitat: Varies between species but includes beaches and permanent/temporary wetlands varying from billabongs, swamps, lakes, floodplains, sewerage farms, saltwork ponds, estuaries, lagoons, mudflats sandbars, pastures, airfields, sports fields and lawns.

Likely presence in study area: Salt lakes and claypans represent potential habitat for migratory shorebirds when inundated though this specific area is not recognised as significant to migratory shorebirds and the level of utilisation is likely to be very low (i.e. species diversity and numbers of individuals).

As with other birds which rely on wetlands the presence of suitable habitat (and therefore the birds themselves) in freshwater claypans or on the salt lake itself is totally dependent on unpredictable, episodic rain events of a magnitude sufficient to supply the required amount of water. It should be noted that migratory waders only breed in the northern hemisphere, but migrate to the southern hemisphere during spring and then leave late summer/early autumn.

Several migratory waders are listed as potential species based on available information, though frequency of occurrence would be very low and opportunistic.

Oriental Plover *Charadis veredus*

Status and Distribution: The oriental plover is listed as Schedule 5 under the WC Act and as Migratory under the EPBC Act including international agreements to which Australia is a signatory. Breeds in Mongolia and Manchuria – regular summer migrant to Australia (September to March) (Pizzey & Knight 2012). Kimberley, north western interior (Lake

Gregory) and north west coastal plains (south to tropic); casual or vagrant elsewhere (south to 32°15'S) (Johnstone and Storr 1998).

Habitat: Mainly sparsely vegetated plains including samphire and short grasses flats. Also beaches, tidal flats, salt works and sewage ponds (Johnstone and Storr 1998).

Likely presence in Project area: This species would only occur in the general area as a casual/vagrant on very rare occasions at best.

Not listed as a potential species as under normal circumstance this species would not be present, though individuals/small groups may occur on very rare occasions.

Princess Parrot *Polytelis alexandrae*

Status and Distribution: This species is listed as Priority 4 by the DBCA and as Vulnerable under the *EPBC Act*. Rare, highly nomadic (Pizzey & Knight 2012). Found in the eastern deserts north to the Edgar Ranges, west to the Gregory Range, Well 18, Mt Bates, Lake Throssell and Mt Luck and south to Queen Victoria Spring and Carlisle Lakes, casual further north (Fossil Downs, Bohemia Downs) and west (head of Gascoyne, head of the Murchison, Wiluna, Wanjarri, Sandstone, Laverton, Kookynie, Menzies, Kanowna). Also deserts of eastern Australia (Johnstone and Storr 1998).

Habitat: Arid shrubland, particularly mulga, desert oak and spinifex country including trees along watercourses (Simpson and Day 2010). The princess parrot inhabits sand dunes and sand flats supporting open woodlands and shrublands that usually consist of scattered stands of *Eucalyptus* (including *E. gongylocarpa* and mallee species), *Casuarina* or *Allocasuarina* trees and an understorey of shrubs such as *Acacia* (especially *A. aneura*), *Senna, Eremophila, Grevillea, Hakea* and a ground cover dominated by *Triodia* species (DotE 2017).

Likely presence in Project area: The species may frequent the Project area at times, but given it is highly nomadic, its frequency of occurrence would be very low and generally temporary. Areas containing *Euclayptus gongylocarpa* woodland are of most significance as they have the potential to contain larger trees with hollows that may represent potential breeding habitat.

Listed as a potential species based on available information, though frequency of occurrence and probability of breeding would be low.

Night Parrot *Pezoporus occidentalis*

Status and Distribution: This species is listed as Schedule 1 under the *WC Act* and as Endangered under the *EPBC Act*. Historical evidence indicates that night parrots were distributed over much of semi-arid and arid Australia (Garnett and Crowley 2000). Extremely secretive and hard to flush, in WA, up until recently, there were only three accepted records of night parrots since 1935, all from the Pilbara region (1979, 1980 and 2005; DotEE 2017). There have however been several recent records (one in March 2017) of the species in the

vicinity of Lorna Glen Station/Lake Carnegie (~ 200km north west of Lake Wells Station) (Hamilton *et al.* 2017).

Habitat: Preferred habitat is thought to be spinifex grasslands or samphire and chenopod shrublands on claypans, floodplains or the margins of salt lakes, creeks or other water bodies (Johnstone and Storr 1998; Higgins 1999; DotEE 2017).

Likely presence in Project area: Status in the project are very difficult determine given its apparent scarcity and secretive habitats. Recent sightings suggest this species may be present in the general area where ever suitable habitat is present.

Listed as a potential species based on currently available information.

Rainbow Bee-eater *Merops ornatus*

Status and Distribution: This species is listed as Schedule 5 under the *WC Act* and as Migratory under the *EPBC Act* including international agreements to which Australia is a signatory. The rainbow bee-eater is a common summer migrant to southern Australia but in the north they are resident (Morcombe 2004).

Habitat: Open country, of woodlands, open forest, semi arid scrub, grasslands, clearings in heavier forest, farmlands (Morcombe 2004). Breeds underground in areas of suitable soft soil firm enough to support tunnel building. Nest is a burrow usually dug at a slight angle in flat ground, sometimes into sandy banks or cuttings and often on margins of roads and tracks (Johnstone and Storr 1998).

Likely presence in Project area: The rainbow bee-eater is a very common and widespread seasonal visitor to the southern half of WA and would not be specifically attracted to the site. Nests within burrows made into soil and therefore some potential for the species to breed in parts of the Project area where ground conditions are suitable. Population levels would however not be significant as it usually breeds in pairs and rarely in small colonies (Johnstone and Storr, 1998).

Listed as a potential species based on available information.

Striated Grasswren (sandplain) *Amytornis striatus striatus*

Status and Distribution: This sub-species is listed as Priority 4 by DBCA. Found in the eastern deserts between lats.20° and 28°39'S (north to Sahara Track and Well 48 and including much of Great Sandy, Gibson and Great Victoria Deserts), west to Erliston and south to 39 km ENE of Laverton, 27 km S of Neale Junction and the Serpentine Lakes, with an apparently isolated population between Meekatharra and Wiluna and another near Queen Victoria Spring (Johnstone and Storr 1998).

Habitat: Mainly spinifex, with or without low shrubs (especially *Thryptomene maisonneuvei*) and herbage, on sandy or loamy plains; also bushy acacias (especially *A. ligulata* and *A. aneura*) on sandridges and interdunes, usually with spinifex (Johnstone and Storr 1998).

Likely presence in Project area: While records in the general area are sparse (DBCA 2017) the striated grasswren can be considered a potential species given the presence of suitable habitat.

Listed as a potential species based on available information.

Grey Wagtail *Motacilla cinerea*

Status and Distribution: The grey wagtail is listed as Schedule 5 under the *WC Act* and as Migratory under the *EPBC Act* including international agreements to which Australia is a signatory. A rarely recorded, accidental vagrant that has on a few occasions been recorded on widely separated parts of the Australian coastline (Pizzey & Knight 2012).

Habitat: In Australia, near running water in disused quarries, sandy, rocky streams in escarpments and rainforest, sewerage ponds, ploughed fields and airfields (Pizzey & Knight 2012).

Likely presence in Project area: This species preferred habitat is absent from the Project area and under normal circumstances it would not occur.

Not listed as a potential species based on currently available information.

Yellow Wagtail *Motacilla flava*

Status and Distribution: The yellow wagtail is listed as Schedule 5 under the *WC Act* and as Migratory under the *EPBC Act* including international agreements to which Australia is a signatory. A regular summer migrant to mostly coastal northern Australia, vagrant in southern Australia (Pizzey & Knight 2012).

Habitat: Habitat requirements for the yellow wagtail are highly variable, but typically include open grassy flats near water. Habitats include open areas with low vegetation such as grasslands, airstrips, pastures, sports fields; damp open areas such as muddy or grassy edges of wetlands, rivers, irrigated farmland, dams, waterholes; sewage farms, sometimes utilise tidal mudflats and edges of mangroves (Pizzey & Knight 2012).

Likely presence in Project area: This species preferred habitat is absent from the Project area and under normal circumstances it would not occur.

Not listed as a potential species based on currently available information.

Brush-tailed Mulgara *Dasycercus blythi*

Status and Distribution: Listed as Priority 4 by the DBCA. Because most previous records did not distinguish among the two species of mulgara now recognised (i.e. brush-tailed and crest-tailed), there is some ambiguity about the distribution of both species. Widespread but patchy in sandy regions of arid central Australia and WA. Has declined in the south and east of range (Menkhorst & Knight 2011).

Habitat: The brush-tailed mulgara occur in a range of vegetation types including hummock grass plains, sand ridges, mulga shrubland on loamy sand, however, the principal habitat is mature hummock grasslands of spinifex, especially *Triodia basedowii* and *T. pungens* where it lives in burrows that it digs on the flats between low sand dunes (Van Dyck & Strahan 2008). The location of brush-tailed mulgara colonies may be influenced by the presence of better watered areas such as paleo-drainage systems or drainage lines in sand plain or sand dune habitats (Masters *et al.* 2003).

Likely presence in Project area: The current status pf this species in the Project area is difficult to determine and there is a paucity of records of this species in the wider area, the closest (35 km south west), most recent being from 1994 (De La Poer Range NR – DBCA 2017). Habitat in some sections of the Project area does however appear suitable (e.g. sand plains, sand ridges, *Acacia* shrubland on loamy sand) and therefore it must be considered a potential species.

Listed as a potential species based on available information.

Southern Marsupial Mole *Notoryctes typhlops*

Status and Distribution: Listed as Priority 4 by the DBCA. The southern marsupial mole is widely distributed throughout the arid areas of central Australia, mainly in the central deserts of the Northern Territory, Western Australia and South Australia (Burbidge *et al*. 1988). These regions include the Great Sandy, Little Sandy, Gibson, Tanami, Great Victoria and western Simpson Deserts. Recent survey work suggests they are more widespread and common than previously thought (Van Dyck & Strahan 2008, Woinarski *et al.* 2014).

Habitat: Deep loose sand appears to be a requirement for the southern marsupial mole and the species is most often recorded in sandy dunes with various *Acacias* and other shrubs (Corbett 1975, Johnson & Walton 1989). Such habitat is widespread and typical of the sandy deserts. The southern marsupial mole may also occur in some sandy plains, and might also occupy sandy river flats, especially in areas where aeolian dunes also occur (Benshemesh 2004).

Likely presence in Project area: The status of this species within the Project area is difficult to determine. While the Project area does contain some areas of sand dunes which superficially represent suitable habitat for this species, the dune field is relatively small and isolated from other dune areas by considerable distances. This suggests that the probability of this species occurring is low.

Not listed as a potential species based on currently available information.

Sandhill Dunnart *Sminthopsis psammophila*

Status and Distribution: The sandhill dunnart is listed as Schedule 2 under the *WC Act* and as Endangered under the *EPBC Act*. The species is known from a limited number of locations including southern Northern Territory, South West Great Victoria Desert (Including Queen Victoria Springs Nature Reserve), Yellabinna sand dunes in Central South Australia and the Eyre Peninsula in South Australia (Menkhorst and Knight 2011). In Western Australia the species appears to be restricted to the south western fringe of the Great Victoria Desert inhabiting yellow sand dune systems with long unburnt mature hummock grasslands (*Triodia* sp.) and often in association with Mallee or Marble Gum, *Callitris* and an associated complex shrub understorey (GHD 2010, Churchill 2009, DBCA 2017).

Sandhill dunnarts in Western Australia have been captured in Queen Victoria Springs, (Pearson and Robinson, 1990) and near Mulga Rock in the Great Victoria Desert (Hart and Kitchener 1986) and in the Plumridge Nature Reserve (ecologia 2009). The sandhill dunnart has also recently been recorded at several locations along the Tropicana to Sunrise Dam pipeline route (KEC 2014).

Habitat: A variety of sandy habitats usually with sand dunes and an understorey of *Triodea* spp. hummock grass. Overstorey vegetation can vary but in Great Victoria region most often associated with low open *Eucalyptus* and *Callitris* woodlands (Van Dyck & Strahan 2008). Low parallel sand dunes carrying open woodland with diverse low shrub layer and hummock grass (Menkhorst and Knight 2011). Long unburnt spinifex sandplain between yellow sand dunes (KEC 2014).

Likely presence in Project area: This species optimum habitat in the Great Victoria Desert area is yellow sand dune systems with long unburnt mature hummock grasslands (*Triodia* sp.). This habitat is appears to be absent from the Project area and a lack of any records within 200 kms (DBCA 2017) suggests it is unlikely to be present.

Not listed as a potential species based on currently available information.

Greater Bilby *Macrotis lagotis*

Status and Distribution: The greater bilby is listed as Schedule 3 under the *WC Ac*t and as Vulnerable under the *EPBC Act*. Current known distribution in suitable habitat extends from Tanami Desert west to near Broome and south to Warburton. Former distribution extended south to Margaret River, though apparently absent from coastal plain (Burbidge 2004).

Habitat: Current habitat includes *Acacia* shrublands, spinifex and hummock grassland (Menkhorst and Knight 2011). Mitchell grass and stony downs country with cracking clay, also desert sand plains and dune fields sometimes with spinifex hummock grassland and acacia shrubland (Van Dyck *et al.* 2013).

Likely presence in Project area: Current status in the Project area is difficult to determine and there is a paucity of records of this species in the wider area (DBCA 2017), the closest, most recent ones being from Lorna Glen Station where the animals have been re-introduced. Habitat in some sections of the Project area does however appear suitable (e.g. sand plains, sand dunes, *Acacia* shrubland) and therefore it must be considered a potential species.

Listed as a potential species based on available information.

APPENDIX F

Raw Vertebrate Trapping & Recording Results

Trapping, Bat Call and Opportunistic Results

Date	Trap Site	Trap Type	Species	Common Name
11/09/2016	Bat Site 1	SM2+ Bat Call Recording	*Austronomus australis*	White-striped Freetail-bat
11/09/2016	Bat Site 1	SM2+ Bat Call Recording	*Chaerephon jobensis*	Northern Freetail-bat
11/09/2016	Bat Site 1	SM2+ Bat Call Recording	*Chalinolobus gouldii*	Gould's Wattled Bat
11/09/2016	Bat Site 1	SM2+ Bat Call Recording	*Nyctophilus geoffroyi*	Lesser Long-eared Bat
11/09/2016	Bat Site 1	SM2+ Bat Call Recording	*Ozimops petersi*	Inland Freetail-bat
11/09/2016	Bat Site 1	SM2+ Bat Call Recording	*Saccolaimus flaviventris*	Yellow-bellied Sheathtail-bat
11/09/2016	Bat Site 1	SM2+ Bat Call Recording	*Scotorepens balstoni*	Inland Broad-nosed Bat
11/09/2016	Bat Site 1	SM2+ Bat Call Recording	*Vespadelus finlaysoni*	Finlayson's Cave Bat
12/09/2016	TS 1.1	Funnel	*Ctenotus leonhardii*	Leonhardi's Skink
12/09/2016	TS 1.1	Funnel	*Gehyra purpurascens*	Purple Arid Dtella
12/09/2016	TS 1.1	Bucket	*Sminthopsis ooldea*	Ooldea Dunnart
12/09/2016	TS 1.2	Bucket	*Menetia greyii*	Dwarf Skink
12/09/2016	TS 1.3	Bucket	*Sminthopsis ooldea*	Ooldea Dunnart
12/09/2016	TS 1.5	Funnel	*Ctenotus leonhardii*	Leonhardi's Skink
12/09/2016	TS 1.5	Funnel	*Ctenotus pantherinus*	Leopard Ctenotus
12/09/2016	TS 1.5	Bucket	*Ningaui ridei*	Wongai Ningaui
12/09/2016	TS 2.1	Bucket	*Sminthopsis youngsoni*	Lesser Hairy-footed Dunnart
12/09/2016	TS 2.6	Bucket	*Gehyra variegata*	Variegated Dtella
12/09/2016	TS 2.9	Bucket	*Mus musculus*	House Mouse
12/09/2016	TS 2.9	Bucket	*Strophurus ciliaris*	Spiny-tailed Gecko
12/09/2016	TS 2.9	Funnel	*Strophurus ciliaris*	Spiny-tailed Gecko
13/09/2016	Bat Site 2	SM2+ Bat Call Recording	*Nyctophilus geoffroyi*	Lesser Long-eared Bat
13/09/2016	Trap Site 4	Opportunistic	*Pogona minor minor*	Western Bearded Dragon
13/09/2016	TS 1.4	Bucket	*Sminthopsis ooldea*	Ooldea Dunnart
13/09/2016	TS 1.6	Bucket	*Ctenotus leonhardii*	Leonhardi's Skink
13/09/2016	TS 2.3	Elliot (A)	*Notomys alexis*	Spinifex Hopping-mouse
13/09/2016	TS 3.1	Bucket	*Ctenotus leonhardii*	Leonhardi's Skink
13/09/2016	TS 3.2	Funnel	*Ctenophorus caudicinctus*	Ring-tailed Dragon
13/09/2016	TS 3.2	Bucket	*Ctenotus leonhardii*	Leonhardi's Skink
13/09/2016	TS 3.3	Bucket	*Liopholis inornata*	Desert Skink
13/09/2016	TS 3.3	Funnel	*Morethia butleri*	Woodland Dark-flecked Morethia
13/09/2016	TS 3.3	Bucket	*Sminthopsis ooldea*	Ooldea Dunnart
13/09/2016	TS 3.4	Funnel	*Ctenotus leonhardii*	Leonhardi's Skink
13/09/2016	TS 3.4	Funnel	*Ctenotus leonhardii*	Leonhardi's Skink
13/09/2016	TS 3.4	Bucket	*Ctenotus leonhardii*	Leonhardi's Skink
13/09/2016	TS 3.5	Funnel	*Ctenotus pantherinus*	Leopard Ctenotus
13/09/2016	TS 3.7	Funnel	*Ctenotus pantherinus*	Leopard Ctenotus
13/09/2016	TS 4.1	Funnel	*Ctenotus dux*	Narrow-lined Skink
13/09/2016	TS 4.4	Funnel	*Ctenotus quattuordecimlineatus*	Fourteen-lined Ctenotus
13/09/2016	TS 4.5	Bucket	*Sminthopsis youngsoni*	Lesser Hairy-footed Dunnart
14/09/2016	Bat Site 3	SM2+ Bat Call Recording	*Chalinolobus gouldii*	Gould's Wattled Bat
14/09/2016	TS 1.2	Bucket	*Ctenotus dux*	Narrow-lined Skink
14/09/2016	TS 1.4	Funnel	*Ctenotus dux*	Narrow-lined Skink
14/09/2016	TS 1.5	Funnel	*Menetia greyii*	Dwarf Skink
14/09/2016	TS 3.5	Bucket	*Pseudomys hermannsburgensis*	Sandy Inland Mouse
14/09/2016	TS 3.6	Bucket	*Ctenophorus caudicinctus*	Ring-tailed Dragon
14/09/2016	TS 4.1	Funnel	*Pseudonaja modesta*	Ringed Brown Snake
14/09/2016	TS 4.10	Funnel	*Ctenotus quattuordecimlineatus*	Fourteen-lined Ctenotus
14/09/2016	TS 4.3	Bucket	*Pseudomys hermannsburgensis*	Sandy Inland Mouse
14/09/2016	TS 4.5	Bucket	*Sminthopsis youngsoni*	Lesser Hairy-footed Dunnart
14/09/2016	TS 5.4	Bucket	*Pseudomys hermannsburgensis*	Sandy Inland Mouse
14/09/2016	TS 5.5	Funnel	*Ctenotus schomburgkii*	Barred Wedge-snout Ctenotus
14/09/2016	TS 5.5	Bucket	*Pseudomys hermannsburgensis*	Sandy Inland Mouse
14/09/2016	TS 5.5	Bucket	*Pseudomys hermannsburgensis*	Sandy Inland Mouse
14/09/2016	TS 5.6	Bucket	*Ctenotus leonhardii*	Leonhardi's Skink
14/09/2016	TS 5.8	Bucket	*Sminthopsis youngsoni*	Lesser Hairy-footed Dunnart
14/09/2016	Wpt 100	Opportunistic	*Anilios endoterus*	Interior Blind Snake
14/09/2016	Wpt 100	Opportunistic	*Gehyra variegata*	Variegated Dtella
14/09/2016	Wpt 100	Opportunistic	*Heteronotia binoei*	Bynoe's Gecko
14/09/2016	Wpt 100	Opportunistic	*Lerista desertorum*	Great Desert Slider

Date	Trap Site	Trap Type	Species	Common Name
14/09/2016	Wpt 99	Opportunistic	*Delma australis*	Marble-faced Delma
14/09/2016	Wpt 99	Opportunistic	*Delma butleri*	Unbanded Delma
14/09/2016	Wpt 99	Opportunistic	*Heteronotia binoei*	Bynoe's Gecko
15/09/2016	Bat Site 4	SM2+ Bat Call Recording	*Chaerephon jobensis*	Northern Freetail-bat
15/09/2016	Bat Site 4	SM2+ Bat Call Recording	*Chalinolobus gouldii*	Gould's Wattled Bat
15/09/2016	Bat Site 4	SM2+ Bat Call Recording	*Nyctophilus geoffroyi*	Lesser Long-eared Bat
15/09/2016	Bat Site 4	SM2+ Bat Call Recording	*Vespadelus finlaysoni*	Finlayson's Cave Bat
15/09/2016	TS 1.2	Bucket	*Ctenophorus isolepis*	Military Dragon
15/09/2016	TS 1.2	Funnel	*Ctenotus dux*	Narrow-lined Skink
15/09/2016	TS 1.5	Funnel	*Ctenotus dux*	Narrow-lined Skink
15/09/2016	TS 1.5	Funnel	*Menetia greyii*	Dwarf Skink
15/09/2016	TS 2.1	Funnel	*Ctenotus leonhardii*	Leonhardi's Skink
15/09/2016	TS 2.6	Funnel	*Ctenotus leonhardii*	Leonhardi's Skink
15/09/2016	TS 2.6	Funnel	*Ctenotus leonhardii*	Leonhardi's Skink
15/09/2016	TS 3.1	Bucket	*Ctenophorus reticulatus*	Western Netted Dragon
15/09/2016	TS 3.2	Bucket	*Ctenophorus scutulatus*	Lozenge-marked Bicycle Dragon
15/09/2016	TS 3.4	Funnel	*Ctenotus leonhardii*	Leonhardi's Skink
15/09/2016	TS 3.7	Funnel	*Ctenotus leonhardii*	Leonhardi's Skink
15/09/2016	TS 4.10	Bucket	*Ctenotus greeri*	Spotted-necked Ctenotus
15/09/2016	TS 4.4	Bucket	*Ctenotus quattuordecimlineatus*	Fourteen-lined Ctenotus
15/09/2016	TS 4.4	Funnel	*Pogona minor minor*	Western Bearded Dragon
15/09/2016	TS 4.7	Bucket	*Ningaui ridei*	Wongai Ningaui
15/09/2016	TS 4.7	Funnel	*Pogona minor minor*	Western Bearded Dragon
15/09/2016	TS 5.1	Bucket	*Pogona minor minor*	Western Bearded Dragon
15/09/2016	TS 5.10	Funnel	*Morethia butleri*	Woodland Dark-flecked Morethia
15/09/2016	TS 5.3	Bucket	*Ctenotus schomburgkii*	Barred Wedge-snout Ctenotus
15/09/2016	TS 5.4	Bucket	*Ctenotus leonhardii*	Leonhardi's Skink
15/09/2016	TS 5.4	Funnel	*Turnix varia*	Little Button-quail
15/09/2016	TS 5.5	Bucket	*Pseudomys hermannsburgensis*	Sandy Inland Mouse
15/09/2016	TS 5.5	Bucket	*Pseudomys hermannsburgensis*	Sandy Inland Mouse
15/09/2016	TS 5.6	Funnel	*Ctenotus leonhardii*	Leonhardi's Skink
15/09/2016	TS 6.4	Funnel	*Pseudonaja modesta*	Ringed Brown Snake
15/09/2016	Wpt 101	Opportunistic	*Egernia formosa*	Goldfields Crevise Skink
15/09/2016	Wpt 101	Opportunistic	*Egernia formosa*	Goldfields Crevise Skink
15/09/2016	Wpt 101	Opportunistic	*Gehyra variegata*	Variegated Dtella
15/09/2016	Wpt 101	Opportunistic	*Gehyra variegata*	Variegated Dtella
15/09/2016	Wpt 101	Opportunistic	*Gehyra variegata*	Variegated Dtella
15/09/2016	Wpt 101	Opportunistic	*Gehyra variegata*	Variegated Dtella
15/09/2016	Wpt 101	Opportunistic	*Heteronotia binoei*	Bynoe's Gecko
15/09/2016	Wpt 101	Opportunistic	*Heteronotia binoei*	Bynoe's Gecko
15/09/2016	Wpt 101	Opportunistic	*Heteronotia binoei*	Bynoe's Gecko
15/09/2016	Wpt 101	Opportunistic	*Heteronotia binoei*	Bynoe's Gecko
15/09/2016	Wpt 101	Opportunistic	*Heteronotia binoei*	Bynoe's Gecko
15/09/2016	Wpt 101	Opportunistic	*Heteronotia binoei*	Bynoe's Gecko
15/09/2016	Wpt 101	Opportunistic	*Heteronotia binoei*	Bynoe's Gecko
15/09/2016	Wpt 101	Opportunistic	*Heteronotia binoei*	Bynoe's Gecko
15/09/2016	Wpt 101	Opportunistic	*Heteronotia binoei*	Bynoe's Gecko
15/09/2016	Wpt 101	Opportunistic	*Heteronotia binoei*	Bynoe's Gecko
15/09/2016	Wpt 101	Opportunistic	*Heteronotia binoei*	Bynoe's Gecko
15/09/2016	Wpt 101	Opportunistic	*Heteronotia binoei*	Bynoe's Gecko
15/09/2016	Wpt 101	Opportunistic	*Heteronotia binoei*	Bynoe's Gecko
15/09/2016	Wpt 101	Opportunistic	*Lerista desertorum*	Great Desert Slider
15/09/2016	Wpt 101	Opportunistic	*Simoselaps bertholdi*	Jan's Banded Snake
16/09/2016	Bat Site 5	SM2+ Bat Call Recording	*Austronomus australis*	White-striped Freetail-bat
16/09/2016	Bat Site 5	SM2+ Bat Call Recording	*Chalinolobus gouldii*	Gould's Wattled Bat
16/09/2016	Opportunistic	Opportunistic	*Lerista bipes*	Western Two-toed Slider
16/09/2016	Opportunistic	Opportunistic	*Moloch horridus*	Thorny Devil
16/09/2016	Trap Site 5	Opportunistic	*Ctenophorus nuchalis*	Central Netted Dragon
16/09/2016	Trap Site 5	Opportunistic	*Moloch horridus*	Thorny Devil
16/09/2016	TS 1.1	Funnel	*Ctenotus leonhardii*	Leonhardi's Skink
16/09/2016	TS 1.2	Funnel	*Tiliqua multifasciata*	Central Blue-tongue
16/09/2016	TS 1.4	Funnel	*Morethia butleri*	Woodland Dark-flecked Morethia

Date	Trap Site	Trap Type	Species	Common Name
16/09/2016	TS 1.5	Funnel	*Ctenotus pantherinus*	Leopard Ctenotus
16/09/2016	TS 1.6	Bucket	*Ningaui ridei*	Wongai Ningaui
16/09/2016	TS 1.6	Funnel	*Tiliqua multifasciata*	Central Blue-tongue
16/09/2016	TS 1.7	Funnel	*Ctenotus pantherinus*	Leopard Ctenotus
16/09/2016	TS 1.8	Funnel	*Ctenotus dux*	Narrow-lined Skink
16/09/2016	TS 2.9	Bucket	*Menetia greyii*	Dwarf Skink
16/09/2016	TS 3.1	Funnel	*Ctenotus leonhardii*	Leonhardi's Skink
16/09/2016	TS 3.2	Bucket	*Sminthopsis ooldea*	Ooldea Dunnart
16/09/2016	TS 3.3	Funnel	*Ctenotus leonhardii*	Leonhardi's Skink
16/09/2016	TS 3.4	Funnel	*Ctenotus leonhardii*	Leonhardi's Skink
16/09/2016	TS 3.8	Funnel	*Pseudechis australis*	Mulga Snake
16/09/2016	TS 3.9	Funnel	*Ctenotus leonhardii*	Leonhardi's Skink
16/09/2016	TS 3.9	Funnel	*Ctenotus leonhardii*	Leonhardi's Skink
16/09/2016	TS 4.10	Bucket	*Pogona minor minor*	Western Bearded Dragon
16/09/2016	TS 5.1	Bucket	*Pogona minor minor*	Western Bearded Dragon
16/09/2016	TS 5.4	Bucket	*Pseudomys hermannsburgensis*	Sandy Inland Mouse
16/09/2016	TS 5.7	Bucket	*Pseudomys hermannsburgensis*	Sandy Inland Mouse
16/09/2016	TS 5.8	Bucket	*Ctenotus greeri*	Spotted-necked Ctenotus
16/09/2016	TS 5.8	Bucket	*Ctenotus schomburgkii*	Barred Wedge-snout Ctenotus
17/09/2016	TS 1.10	Bucket	*Ningaui ridei*	Wongai Ningaui
17/09/2016	TS 1.2	Funnel	*Ctenotus leonhardii*	Leonhardi's Skink
17/09/2016	TS 1.2	Funnel	*Lialis burtonis*	Burton’s Legless Lizard
17/09/2016	TS 1.2	Bucket	*Sminthopsis ooldea*	Ooldea Dunnart
17/09/2016	TS 1.8	Funnel	*Ctenotus leonhardii*	Leonhardi's Skink
17/09/2016	TS 1.8	Funnel	*Morethia butleri*	Woodland Dark-flecked Morethia
17/09/2016	TS 2.2	Funnel	*Ctenotus leonhardii*	Leonhardi's Skink
17/09/2016	TS 2.7	Bucket	*Ctenotus leonhardii*	Leonhardi's Skink
17/09/2016	TS 2.9	Elliot (A)	*Notomys alexis*	Spinifex Hopping-mouse
17/09/2016	TS 3.10	Bucket	*Ctenophorus reticulatus*	Western Netted Dragon
17/09/2016	TS 3.4	Bucket	*Ctenotus leonhardii*	Leonhardi's Skink
17/09/2016	TS 3.8	Bucket	*Ctenophorus reticulatus*	Western Netted Dragon
17/09/2016	TS 4.2	Bucket	*Nephrurus laevissimus*	Pale Knob-tailed Gecko
17/09/2016	TS 4.4	Funnel	*Ctenotus quattuordecimlineatus*	Fourteen-lined Ctenotus
17/09/2016	TS 4.4	Funnel	*Pogona minor minor*	Western Bearded Dragon
17/09/2016	TS 4.7	Funnel	*Pygopus nigriceps*	Hooded Scaly Foot
17/09/2016	TS 4.8	Bucket	*Pogona minor minor*	Western Bearded Dragon
17/09/2016	TS 5.1	Funnel	*Ctenotus leonhardii*	Leonhardi's Skink
17/09/2016	TS 5.10	Bucket	*Pseudomys hermannsburgensis*	Sandy Inland Mouse
17/09/2016	TS 5.5	Bucket	*Pseudomys hermannsburgensis*	Sandy Inland Mouse
17/09/2016	TS 6.5	Bucket	*Aprasia inaurita*	Red-tailed Worm Lizard
18/09/2016	Bat Site 6	SM2+ Bat Call Recording	*Chalinolobus gouldii*	Gould's Wattled Bat
18/09/2016	Opportunistic	Opportunistic	*Gehyra variegata*	Variegated Dtella
18/09/2016	Opportunistic	Opportunistic	*Lerista desertorum*	Great Desert Slider
18/09/2016	Trap Site 6	Opportunistic	*Lerista desertorum*	Great Desert Slider
18/09/2016	TS 1.1	Funnel	*Ctenotus greeri*	Spotted-necked Ctenotus
18/09/2016	TS 1.3	Funnel	*Ctenotus greeri*	Spotted-necked Ctenotus
18/09/2016	TS 1.3	Funnel	*Morethia butleri*	Woodland Dark-flecked Morethia
18/09/2016	TS 1.7	Bucket	*Ningaui ridei*	Wongai Ningaui
18/09/2016	TS 3.1	Bucket	*Ctenotus leonhardii*	Leonhardi's Skink
18/09/2016	TS 3.2	Funnel	*Ctenotus pantherinus*	Leopard Ctenotus
18/09/2016	TS 3.5	Bucket	*Ctenophorus reticulatus*	Western Netted Dragon
18/09/2016	TS 4.3	Bucket	*Notaden nichollsi*	Desert Spadefoot
18/09/2016	TS 4.4	Funnel	*Demansia psammophis*	Yellow-faced Whipsnake
18/09/2016	TS 4.4	Bucket	*Pogona minor minor*	Western Bearded Dragon
18/09/2016	TS 4.4	Bucket	*Pogona minor minor*	Western Bearded Dragon
18/09/2016	TS 4.9	Funnel	*Pogona minor minor*	Western Bearded Dragon
18/09/2016	TS 5.3	Funnel	*Ctenotus schomburgkii*	Barred Wedge-snout Ctenotus
18/09/2016	TS 5.5	Funnel	*Ctenotus schomburgkii*	Barred Wedge-snout Ctenotus
18/09/2016	TS 5.5	Bucket	*Menetia greyii*	Dwarf Skink
18/09/2016	TS 5.7	Bucket	*Pseudomys hermannsburgensis*	Sandy Inland Mouse
18/09/2016	TS 5.8	Funnel	*Ctenotus greeri*	Spotted-necked Ctenotus
18/09/2016	TS 5.8	Funnel	*Ctenotus schomburgkii*	Barred Wedge-snout Ctenotus

Date	Trap Site	Trap Type	Species	Common Name
18/09/2016	TS 6.3	Bucket	*Lerista timida*	Timid Slider
19/09/2016	Trap Site 4	Opportunistic	*Pogona minor minor*	Western Bearded Dragon
19/09/2016	TS 1.10	Bucket	*Morethia butleri*	Woodland Dark-flecked Morethia
19/09/2016	TS 1.2	Bucket	*Ctenotus pantherinus*	Leopard Ctenotus
19/09/2016	TS 1.3	Funnel	*Ctenotus uber*	Spotted Ctenotus
19/09/2016	TS 2.10	Bucket	*Ctenophorus nuchalis*	Central Netted Dragon
19/09/2016	TS 3.1	Funnel	*Ctenotus leonhardii*	Leonhardi's Skink
19/09/2016	TS 3.10	Bucket	*Liopholis inornata*	Desert Skink
19/09/2016	TS 3.2	Bucket	*Ctenophorus scutulatus*	Lozenge-marked Bicycle Dragon
19/09/2016	TS 3.3	Bucket	*Ctenophorus reticulatus*	Western Netted Dragon
19/09/2016	TS 3.6	Funnel	*Ctenotus leonhardii*	Leonhardi's Skink
19/09/2016	TS 3.6	Funnel	*Ctenotus leonhardii*	Leonhardi's Skink
19/09/2016	TS 3.8	Bucket	*Ctenophorus reticulatus*	Western Netted Dragon
19/09/2016	TS 3.8	Funnel	*Morethia butleri*	Woodland Dark-flecked Morethia
19/09/2016	TS 4.1	Funnel	*Ctenotus quattuordecimlineatus*	Fourteen-lined Ctenotus
19/09/2016	TS 4.1	Funnel	*Ctenotus quattuordecimlineatus*	Fourteen-lined Ctenotus
19/09/2016	TS 4.2	Funnel	*Ctenotus quattuordecimlineatus*	Fourteen-lined Ctenotus
19/09/2016	TS 4.6	Bucket	*Pogona minor minor*	Western Bearded Dragon
19/09/2016	TS 4.8	Bucket	*Ctenotus quattuordecimlineatus*	Fourteen-lined Ctenotus
19/09/2016	TS 4.9	Funnel	*Ctenotus quattuordecimlineatus*	Fourteen-lined Ctenotus
19/09/2016	TS 5.5	Bucket	*Ctenotus schomburgkii*	Barred Wedge-snout Ctenotus
19/09/2016	TS 5.5	Bucket	*Ctenotus schomburgkii*	Barred Wedge-snout Ctenotus
19/09/2016	TS 5.6	Bucket	*Ctenotus greeri*	Spotted-necked Ctenotus
19/09/2016	TS 5.6	Bucket	*Ctenotus schomburgkii*	Barred Wedge-snout Ctenotus
19/09/2016	TS 5.6	Funnel	*Ctenotus schomburgkii*	Barred Wedge-snout Ctenotus
19/09/2016	TS 5.6	Bucket	*Pseudomys hermannsburgensis*	Sandy Inland Mouse
19/09/2016	TS 5.7	Funnel	*Ctenotus schomburgkii*	Barred Wedge-snout Ctenotus
19/09/2016	TS 5.7	Funnel	*Pseudechis australis*	Mulga Snake
19/09/2016	TS 5.9	Funnel	*Ctenotus greeri*	Spotted-necked Ctenotus
19/09/2016	Wpt 105	Opportunistic	*Egernia formosa*	Goldfields Crevise Skink
19/09/2016	Wpt 105	Opportunistic	*Egernia formosa*	Goldfields Crevise Skink
19/09/2016	Wpt 105	Opportunistic	*Gehyra variegata*	Variegated Dtella
19/09/2016	Wpt 105	Opportunistic	*Gehyra variegata*	Variegated Dtella
19/09/2016	Wpt 105	Opportunistic	*Gehyra variegata*	Variegated Dtella
19/09/2016	Wpt 105	Opportunistic	*Gehyra variegata*	Variegated Dtella
19/09/2016	Wpt 105	Opportunistic	*Gehyra variegata*	Variegated Dtella
19/09/2016	Wpt 105	Opportunistic	*Gehyra variegata*	Variegated Dtella
19/09/2016	Wpt 105	Opportunistic	*Heteronotia binoei*	Bynoe's Gecko
19/09/2016	Wpt 105	Opportunistic	*Heteronotia binoei*	Bynoe's Gecko
19/09/2016	Wpt 105	Opportunistic	*Heteronotia binoei*	Bynoe's Gecko
19/09/2016	Wpt 105	Opportunistic	*Heteronotia binoei*	Bynoe's Gecko
19/09/2016	Wpt 105	Opportunistic	*Heteronotia binoei*	Bynoe's Gecko
19/09/2016	Wpt 105	Opportunistic	*Heteronotia binoei*	Bynoe's Gecko
19/09/2016	Wpt 105	Opportunistic	*Heteronotia binoei*	Bynoe's Gecko
19/09/2016	Wpt 105	Opportunistic	*Heteronotia binoei*	Bynoe's Gecko
19/09/2016	Wpt 105	Opportunistic	*Heteronotia binoei*	Bynoe's Gecko
19/09/2016	Wpt 105	Opportunistic	*Heteronotia binoei*	Bynoe's Gecko
19/09/2016	Wpt 105	Opportunistic	*Heteronotia binoei*	Bynoe's Gecko
19/09/2016	Wpt 105	Opportunistic	*Heteronotia binoei*	Bynoe's Gecko
19/09/2016	Wpt 105	Opportunistic	*Heteronotia binoei*	Bynoe's Gecko
19/09/2016	Wpt 105	Opportunistic	*Morethia butleri*	Woodland Dark-flecked Morethia
19/09/2016	Wpt 110	Opportunistic	*Delma butleri*	Unbanded Delma
20/09/2016	TS 2.4	Bucket	*Parasuta monachus*	Monk Snake
20/09/2016	TS 4.1	Funnel	*Ctenotus quattuordecimlineatus*	Fourteen-lined Ctenotus
20/09/2016	TS 4.2	Bucket	*Ningaui ridei*	Wongai Ningaui
20/09/2016	TS 4.3	Bucket	*Sminthopsis ooldea*	Ooldea Dunnart
20/09/2016	TS 4.6	Funnel	*Demansia psammophis*	Yellow-faced Whipsnake
20/09/2016	TS 4.6	Bucket	*Pogona minor minor*	Western Bearded Dragon
20/09/2016	TS 5.1	Bucket	*Sminthopsis ooldea*	Ooldea Dunnart
20/09/2016	TS 5.10	Bucket	*Pseudomys hermannsburgensis*	Sandy Inland Mouse
20/09/2016	TS 5.7	Bucket	*Ctenotus greeri*	Spotted-necked Ctenotus
20/09/2016	TS 5.9	Bucket	*Ctenotus greeri*	Spotted-necked Ctenotus

Date	Trap Site	Trap Type	Species	Common Name
20/09/2016	TS 5.9	Bucket	*Pseudomys hermannsburgensis*	Sandy Inland Mouse
20/09/2016	TS 5.9	Bucket	*Sminthopsis youngsoni*	Lesser Hairy-footed Dunnart
23/04/2017	Camp	Opportunistic	*Cyclorana maini*	Sheep Frog
23/04/2017	Trap Site 1	Opportunistic	*Macropus robustus*	Euro
23/04/2017	Trap Site 6	Opportunistic	*Pogona minor minor*	Western Bearded Dragon
24/04/2017	Bat Site 7	SM2+ Bat Call Recording	*Austronomus australis*	White-striped Freetail-bat
24/04/2017	Bat Site 7	SM2+ Bat Call Recording	*Chaerephon jobensis*	Northern Freetail-bat
24/04/2017	Bat Site 7	SM2+ Bat Call Recording	*Chalinolobus gouldii*	Gould's Wattled Bat
24/04/2017	Bat Site 7	SM2+ Bat Call Recording	*Scotorepens balstoni*	Inland Broad-nosed Bat
25/04/2017	Bat Site 8	SM2+ Bat Call Recording	*Chalinolobus gouldii*	Gould's Wattled Bat
25/04/2017	Bat Site 8	SM2+ Bat Call Recording	*Nyctophilus geoffroyi*	Lesser Long-eared Bat
25/04/2017	Bat Site 8	SM2+ Bat Call Recording	*Scotorepens balstoni*	Inland Broad-nosed Bat
25/04/2017	Bat Site 8	SM2+ Bat Call Recording	*Vespadelus finlaysoni*	Finlayson's Cave Bat
25/04/2017	Trap Site 2	Opportunistic	*Felis catus*	Cat
25/04/2017	Trap Site 5	Opportunistic	*Heteronotia binoei*	Bynoe's Gecko
25/04/2017	TS 1.1	Funnel	*Ctenotus dux*	Narrow-lined Skink
25/04/2017	TS 1.1	Bucket	*Cyclorana maini*	Sheep Frog
25/04/2017	TS 1.2	Funnel	*Ctenotus pantherinus*	Leopard Ctenotus
25/04/2017	TS 1.4	Funnel	*Ctenotus pantherinus*	Leopard Ctenotus
25/04/2017	TS 1.4	Funnel	*Ctenotus pantherinus*	Leopard Ctenotus
25/04/2017	TS 1.5	Funnel	*Ctenotus pantherinus*	Leopard Ctenotus
25/04/2017	TS 1.5	Funnel	*Ctenotus pantherinus*	Leopard Ctenotus
25/04/2017	TS 1.6	Funnel	*Ctenotus grandis*	Giant Desert Ctenotus
25/04/2017	TS 1.6	Funnel	*Ctenotus pantherinus*	Leopard Ctenotus
25/04/2017	TS 1.6	Bucket	*Ningaui ridei*	Wongai Ningaui
25/04/2017	TS 1.7	Funnel	*Ctenotus leonhardii*	Leonhardi's Skink
25/04/2017	TS 1.7	Funnel	*Ctenotus pantherinus*	Leopard Ctenotus
25/04/2017	TS 1.7	Bucket	*Menetia greyii*	Dwarf Skink
25/04/2017	TS 1.8	Funnel	*Ctenotus helenae*	Dusky Ctenotus
25/04/2017	TS 1.8	Funnel	*Ctenotus helenae*	Dusky Ctenotus
25/04/2017	TS 1.8	Bucket	*Cyclorana maini*	Sheep Frog
25/04/2017	TS 2.10	Funnel	*Ctenotus leonhardii*	Leonhardi's Skink
25/04/2017	TS 2.3	Elliot (A)	*Notomys alexis*	Spinifex Hopping-mouse
25/04/2017	TS 2.7	Bucket	*Neobatrachus aquilonius*	Northern Burrowing Frog
25/04/2017	TS 2.7	Bucket	*Neobatrachus aquilonius*	Northern Burrowing Frog
25/04/2017	TS 2.7	Bucket	*Pseudomys hermannsburgensis*	Sandy Inland Mouse
25/04/2017	TS 3.2	Bucket	*Neobatrachus sutor*	Shoemaker Frog
25/04/2017	TS 3.5	Funnel	*Ctenotus pantherinus*	Leopard Ctenotus
25/04/2017	TS 3.5	Bucket	*Mus musculus*	House Mouse
25/04/2017	TS 3.6	Bucket	*Sminthopsis dolichura*	Little long-tailed Dunnart
25/04/2017	TS 3.7	Elliot (A)	*Notomys alexis*	Spinifex Hopping-mouse
25/04/2017	TS 4.1	Bucket	*Notaden nichollsi*	Desert Spadefoot
25/04/2017	TS 4.2	Bucket	*Notaden nichollsi*	Desert Spadefoot
25/04/2017	TS 4.2	Bucket	*Notaden nichollsi*	Desert Spadefoot
25/04/2017	TS 4.2	Bucket	*Notaden nichollsi*	Desert Spadefoot
25/04/2017	TS 4.2	Bucket	*Notaden nichollsi*	Desert Spadefoot
25/04/2017	TS 4.3	Funnel	*Ctenotus dux*	Narrow-lined Skink
25/04/2017	TS 4.3	Bucket	*Notaden nichollsi*	Desert Spadefoot
25/04/2017	TS 4.3	Bucket	*Notomys alexis*	Spinifex Hopping-mouse
25/04/2017	TS 4.3	Bucket	*Pogona minor minor*	Western Bearded Dragon
25/04/2017	TS 4.4	Bucket	*Notaden nichollsi*	Desert Spadefoot
25/04/2017	TS 4.4	Bucket	*Notaden nichollsi*	Desert Spadefoot
25/04/2017	TS 4.4	Bucket	*Notaden nichollsi*	Desert Spadefoot
25/04/2017	TS 4.4	Bucket	*Notaden nichollsi*	Desert Spadefoot
25/04/2017	TS 4.4	Bucket	*Pseudomys hermannsburgensis*	Sandy Inland Mouse
25/04/2017	TS 4.5	Bucket	*Notaden nichollsi*	Desert Spadefoot
25/04/2017	TS 4.5	Bucket	*Notaden nichollsi*	Desert Spadefoot
25/04/2017	TS 4.5	Bucket	*Notomys alexis*	Spinifex Hopping-mouse
25/04/2017	TS 5.1	Bucket	*Ctenotus quattuordecimlineatus*	Fourteen-lined Ctenotus
25/04/2017	TS 5.10	Funnel	*Ctenotus helenae*	Dusky Ctenotus
25/04/2017	TS 5.10	Bucket	*Neobatrachus aquilonius*	Northern Burrowing Frog
25/04/2017	TS 5.2	Bucket	*Mus musculus*	House Mouse

Date	Trap Site	Trap Type	Species	Common Name
25/04/2017	TS 5.5	Bucket	*Ctenotus greeri*	Spotted-necked Ctenotus
25/04/2017	TS 5.5	Bucket	*Ctenotus greeri*	Spotted-necked Ctenotus
25/04/2017	TS 5.5	Bucket	*Ctenotus helenae*	Dusky Ctenotus
25/04/2017	TS 5.6	Bucket	*Sminthopsis ooldea*	Ooldea Dunnart
26/04/2017	Bat Site 9	SM2+ Bat Call Recording	*Austronomus australis*	White-striped Freetail-bat
26/04/2017	Bat Site 9	SM2+ Bat Call Recording	*Chalinolobus gouldii*	Gould's Wattled Bat
26/04/2017	Bat Site 9	SM2+ Bat Call Recording	*Scotorepens balstoni*	Inland Broad-nosed Bat
26/04/2017	Bat Site 9	SM2+ Bat Call Recording	*Vespadelus finlaysoni*	Finlayson's Cave Bat
26/04/2017	TS 1.1	Funnel	*Ctenotus helenae*	Dusky Ctenotus
26/04/2017	TS 1.1	Funnel	*Ctenotus leonhardii*	Leonhardi's Skink
26/04/2017	TS 1.1	Bucket	*Cyclorana maini*	Sheep Frog
26/04/2017	TS 1.1	Bucket	*Cyclorana maini*	Sheep Frog
26/04/2017	TS 1.10	Funnel	*Ctenotus helenae*	Dusky Ctenotus
26/04/2017	TS 1.10	Funnel	*Ctenotus helenae*	Dusky Ctenotus
26/04/2017	TS 1.2	Funnel	*Ctenotus leonhardii*	Leonhardi's Skink
26/04/2017	TS 1.2	Bucket	*Ctenotus leonhardii*	Leonhardi's Skink
26/04/2017	TS 1.2	Funnel	*Ctenotus pantherinus*	Leopard Ctenotus
26/04/2017	TS 1.2	Funnel	*Ctenotus pantherinus*	Leopard Ctenotus
26/04/2017	TS 1.3	Bucket	*Ctenotus leonhardii*	Leonhardi's Skink
26/04/2017	TS 1.3	Bucket	*Ctenotus leonhardii*	Leonhardi's Skink
26/04/2017	TS 1.3	Funnel	*Ctenotus pantherinus*	Leopard Ctenotus
26/04/2017	TS 1.4	Funnel	*Ctenotus pantherinus*	Leopard Ctenotus
26/04/2017	TS 1.5	Funnel	*Ctenotus helenae*	Dusky Ctenotus
26/04/2017	TS 1.6	Bucket	*Ctenotus quattuordecimlineatus*	Fourteen-lined Ctenotus
26/04/2017	TS 1.7	Funnel	*Ctenotus pantherinus*	Leopard Ctenotus
26/04/2017	TS 1.7	Funnel	*Ctenotus pantherinus*	Leopard Ctenotus
26/04/2017	TS 1.7	Funnel	*Ctenotus pantherinus*	Leopard Ctenotus
26/04/2017	TS 1.7	Funnel	*Ctenotus pantherinus*	Leopard Ctenotus
26/04/2017	TS 1.8	Bucket	*Ctenotus helenae*	Dusky Ctenotus
26/04/2017	TS 1.8	Bucket	*Ctenotus leonhardii*	Leonhardi's Skink
26/04/2017	TS 1.9	Funnel	*Ctenotus helenae*	Dusky Ctenotus
26/04/2017	TS 1.9	Funnel	*Ctenotus pantherinus*	Leopard Ctenotus
26/04/2017	TS 2.3	Elliot (A)	*Pseudomys hermannsburgensis*	Sandy Inland Mouse
26/04/2017	TS 2.6	Bucket	*Mus musculus*	House Mouse
26/04/2017	TS 2.7	Elliot (A)	*Pseudomys hermannsburgensis*	Sandy Inland Mouse
26/04/2017	TS 3.10	Funnel	*Ctenotus leonhardii*	Leonhardi's Skink
26/04/2017	TS 3.2	Funnel	*Ctenotus leonhardii*	Leonhardi's Skink
26/04/2017	TS 3.3	Funnel	*Ctenotus helenae*	Dusky Ctenotus
26/04/2017	TS 3.4	Funnel	*Ctenotus helenae*	Dusky Ctenotus
26/04/2017	TS 3.5	Funnel	*Ctenotus leonhardii*	Leonhardi's Skink
26/04/2017	TS 3.7	Funnel	*Ctenotus helenae*	Dusky Ctenotus
26/04/2017	TS 4.1	Bucket	*Pseudomys bolami*	Bolam's Mouse
26/04/2017	TS 4.2	Bucket	*Notaden nichollsi*	Desert Spadefoot
26/04/2017	TS 4.3	Funnel	*Pseudomys hermannsburgensis*	Sandy Inland Mouse
26/04/2017	TS 4.7	Bucket	*Notomys alexis*	Spinifex Hopping-mouse
26/04/2017	TS 4.9	Bucket	*Pseudomys hermannsburgensis*	Sandy Inland Mouse
26/04/2017	TS 5.1	Bucket	*Neobatrachus aquilonius*	Northern Burrowing Frog
26/04/2017	TS 5.8	Bucket	*Pseudomys bolami*	Bolam's Mouse
26/04/2017	TS 5.8	Bucket	*Pseudomys bolami*	Bolam's Mouse
26/04/2017	TS 6.5	Bucket	*Pseudomys hermannsburgensis*	Sandy Inland Mouse
26/04/2017	TS 6.5	Bucket	*Pseudomys hermannsburgensis*	Sandy Inland Mouse
26/04/2017	Wpt 009	Opportunistic	*Eremiascincus pallidus*	Pale Sand-swimmer
26/04/2017	Wpt 009	Opportunistic	*Heteronotia binoei*	Bynoe's Gecko
26/04/2017	Wpt 009	Opportunistic	*Heteronotia binoei*	Bynoe's Gecko
26/04/2017	Wpt 009	Opportunistic	*Heteronotia binoei*	Bynoe's Gecko
27/04/2017	TS 1.1	Funnel	*Ctenotus helenae*	Dusky Ctenotus
27/04/2017	TS 1.1	Bucket	*Mus musculus*	House Mouse
27/04/2017	TS 1.10	Funnel	*Ctenotus helenae*	Dusky Ctenotus
27/04/2017	TS 1.2	Funnel	*Varanus eremius*	Pygmy Desert Monitor
27/04/2017	TS 1.3	Bucket	*Ctenotus helenae*	Dusky Ctenotus
27/04/2017	TS 1.3	Bucket	*Ctenotus pantherinus*	Leopard Ctenotus
27/04/2017	TS 1.7	Funnel	*Ctenotus helenae*	Dusky Ctenotus

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27/04/2017	TS 1.7	Bucket	*Ctenotus leonhardii*	Leonhardi's Skink
27/04/2017	TS 1.8	Funnel	*Ctenotus helenae*	Dusky Ctenotus
27/04/2017	TS 1.8	Funnel	*Ctenotus helenae*	Dusky Ctenotus
27/04/2017	TS 1.8	Funnel	*Ctenotus pantherinus*	Leopard Ctenotus
27/04/2017	TS 1.9	Funnel	*Ctenotus helenae*	Dusky Ctenotus
27/04/2017	TS 2.7	Elliot (A)	*Pseudomys hermannsburgensis*	Sandy Inland Mouse
27/04/2017	TS 2.7	Bucket	*Sminthopsis youngsoni*	Lesser Hairy-footed Dunnart
27/04/2017	TS 2.8	Bucket	*Simoselaps anomalus*	Desert Banded Snake
27/04/2017	TS 3.5	Funnel	*Ctenotus helenae*	Dusky Ctenotus
27/04/2017	TS 3.7	Funnel	*Ctenotus helenae*	Dusky Ctenotus
27/04/2017	TS 5.10	Bucket	*Sminthopsis dolichura*	Little long-tailed Dunnart
27/04/2017	TS 5.2	Funnel	*Demansia psammophis*	Yellow-faced Whipsnake
27/04/2017	TS 5.2	Bucket	*Lialis burtonis*	Burton’s Legless Lizard
27/04/2017	TS 5.4	Elliot (A)	*Pseudomys bolami*	Bolam's Mouse
27/04/2017	TS 5.6	Bucket	*Pseudomys bolami*	Bolam's Mouse
27/04/2017	TS 5.7	Funnel	*Ctenotus helenae*	Dusky Ctenotus
27/04/2017	TS 5.8	Bucket	*Pseudomys bolami*	Bolam's Mouse
27/04/2017	TS 6.3	Bucket	*Underwoodisaurus milii*	Barking Gecko
27/04/2017	TS 6.5	Bucket	*Pseudomys hermannsburgensis*	Sandy Inland Mouse
27/04/2017	TS 6.8	Bucket	*Pogona minor minor*	Western Bearded Dragon
27/04/2017	TS 6.9	Funnel	*Pseudomys hermannsburgensis*	Sandy Inland Mouse
27/04/2017	Wpt 105	Opportunistic	*Ctenophorus isolepis*	Military Dragon
27/04/2017	Wpt 105	Opportunistic	*Varanus giganteus*	Perentie
27/04/2017	Wpt 105	Opportunistic	*Varanus giganteus*	Perentie
28/04/2017	Bat Site 10	SM2+ Bat Call Recording	*Chalinolobus gouldii*	Gould's Wattled Bat
28/04/2017	Bat Site 10	SM2+ Bat Call Recording	*Nyctophilus geoffroyi*	Lesser Long-eared Bat
28/04/2017	Bat Site 10	SM2+ Bat Call Recording	*Vespadelus finlaysoni*	Finlayson's Cave Bat
28/04/2017	TS 1.10	Funnel	*Ctenotus helenae*	Dusky Ctenotus
28/04/2017	TS 1.4	Funnel	*Ctenotus helenae*	Dusky Ctenotus
28/04/2017	TS 1.4	Bucket	*Ctenotus leonhardii*	Leonhardi's Skink
28/04/2017	TS 1.5	Funnel	*Ctenotus helenae*	Dusky Ctenotus
28/04/2017	TS 1.5	Funnel	*Ctenotus leonhardii*	Leonhardi's Skink
28/04/2017	TS 1.6	Funnel	*Ctenotus pantherinus*	Leopard Ctenotus
28/04/2017	TS 1.6	Funnel	*Ctenotus pantherinus*	Leopard Ctenotus
28/04/2017	TS 1.6	Funnel	*Ctenotus pantherinus*	Leopard Ctenotus
28/04/2017	TS 1.7	Funnel	*Ctenotus pantherinus*	Leopard Ctenotus
28/04/2017	TS 1.7	Funnel	*Ctenotus pantherinus*	Leopard Ctenotus
28/04/2017	TS 1.8	Funnel	*Ctenotus helenae*	Dusky Ctenotus
28/04/2017	TS 1.9	Funnel	*Ctenotus helenae*	Dusky Ctenotus
28/04/2017	TS 2.10	Elliot (A)	*Pseudomys hermannsburgensis*	Sandy Inland Mouse
28/04/2017	TS 2.9	Funnel	*Ctenotus leonhardii*	Leonhardi's Skink
28/04/2017	TS 3.1	Funnel	*Ctenotus leonhardii*	Leonhardi's Skink
28/04/2017	TS 3.2	Bucket	*Mus musculus*	House Mouse
28/04/2017	TS 3.4	Funnel	*Ctenotus helenae*	Dusky Ctenotus
28/04/2017	TS 3.4	Funnel	*Ctenotus pantherinus*	Leopard Ctenotus
28/04/2017	TS 3.6	Funnel	*Ctenotus pantherinus*	Leopard Ctenotus
28/04/2017	TS 4.10	Bucket	*Pseudomys bolami*	Bolam's Mouse
28/04/2017	TS 5.1	Funnel	*Ctenotus leonhardii*	Leonhardi's Skink
28/04/2017	TS 5.10	Bucket	*Pseudomys bolami*	Bolam's Mouse
28/04/2017	TS 5.2	Bucket	*Pseudomys hermannsburgensis*	Sandy Inland Mouse
28/04/2017	TS 5.3	Bucket	*Pseudomys hermannsburgensis*	Sandy Inland Mouse
28/04/2017	TS 5.5	Funnel	*Ctenotus schomburgkii*	Barred Wedge-snout Ctenotus
28/04/2017	TS 5.5	Elliot (A)	*Mus musculus*	House Mouse
28/04/2017	TS 5.8	Bucket	*Mus musculus*	House Mouse
28/04/2017	TS 5.9	Elliot (A)	*Pseudomys bolami*	Bolam's Mouse
28/04/2017	Wpt 017	Opportunistic	*Ctenophorus reticulatus*	Western Netted Dragon
28/04/2017	Wpt 017	Opportunistic	*Lerista timida*	Timid Slider
28/04/2017	Wpt 017	Opportunistic	*Lerista timida*	Timid Slider
29/04/2017	TS 1.1	Bucket	*Ctenotus leonhardii*	Leonhardi's Skink
29/04/2017	TS 1.2	Funnel	*Ctenotus helenae*	Dusky Ctenotus
29/04/2017	TS 1.2	Funnel	*Ctenotus pantherinus*	Leopard Ctenotus
29/04/2017	TS 1.3	Funnel	*Ctenotus helenae*	Dusky Ctenotus

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29/04/2017	TS 1.5	Funnel	*Ctenotus helenae*	Dusky Ctenotus
29/04/2017	TS 1.7	Funnel	*Ctenotus helenae*	Dusky Ctenotus
29/04/2017	TS 1.7	Funnel	*Ctenotus helenae*	Dusky Ctenotus
29/04/2017	TS 1.7	Funnel	*Ctenotus helenae*	Dusky Ctenotus
29/04/2017	TS 1.7	Funnel	*Ctenotus pantherinus*	Leopard Ctenotus
29/04/2017	TS 1.8	Funnel	*Ctenotus pantherinus*	Leopard Ctenotus
29/04/2017	TS 1.8	Bucket	*Sminthopsis ooldea*	Ooldea Dunnart
29/04/2017	TS 2.10	Funnel	*Ctenotus leonhardii*	Leonhardi's Skink
29/04/2017	TS 2.10	Funnel	*Ctenotus leonhardii*	Leonhardi's Skink
29/04/2017	TS 2.2	Bucket	*Neobatrachus aquilonius*	Northern Burrowing Frog
29/04/2017	TS 2.6	Bucket	*Pseudomys hermannsburgensis*	Sandy Inland Mouse
29/04/2017	TS 2.7	Elliot (A)	*Pseudomys hermannsburgensis*	Sandy Inland Mouse
29/04/2017	TS 2.7	Bucket	*Pseudomys hermannsburgensis*	Sandy Inland Mouse
29/04/2017	TS 3.1	Bucket	*Ctenotus leonhardii*	Leonhardi's Skink
29/04/2017	TS 3.1	Bucket	*Ctenotus leonhardii*	Leonhardi's Skink
29/04/2017	TS 3.10	Funnel	*Ctenotus leonhardii*	Leonhardi's Skink
29/04/2017	TS 3.10	Funnel	*Ctenotus leonhardii*	Leonhardi's Skink
29/04/2017	TS 3.2	Bucket	*Ctenotus leonhardii*	Leonhardi's Skink
29/04/2017	TS 3.5	Funnel	*Ctenotus helenae*	Dusky Ctenotus
29/04/2017	TS 3.6	Bucket	*Ningaui ridei*	Wongai Ningaui
29/04/2017	TS 4.1	Bucket	*Ningaui ridei*	Wongai Ningaui
29/04/2017	TS 4.4	Funnel	*Ctenotus dux*	Narrow-lined Skink
29/04/2017	TS 5.1	Elliot (A)	*Pseudomys bolami*	Bolam's Mouse
29/04/2017	TS 5.1	Bucket	*Pseudomys hermannsburgensis*	Sandy Inland Mouse
29/04/2017	TS 5.1	Funnel	*Varanus gilleni*	Pygmy Mulga Monitor
29/04/2017	TS 5.2	Elliot (A)	*Pseudomys bolami*	Bolam's Mouse
29/04/2017	TS 5.2	Bucket	*Pseudomys hermannsburgensis*	Sandy Inland Mouse
29/04/2017	TS 5.2	Funnel	*Pseudonaja modesta*	Ringed Brown Snake
29/04/2017	TS 5.2	Bucket	*Sminthopsis dolichura*	Little long-tailed Dunnart
29/04/2017	TS 5.3	Bucket	*Ctenotus leonhardii*	Leonhardi's Skink
29/04/2017	TS 5.5	Bucket	*Ctenotus leonhardii*	Leonhardi's Skink
29/04/2017	TS 6.8	Bucket	*Diplodactylus granariensis*	Western Stone Gecko
29/04/2017	Wpt 020	Opportunistic	*Varanus giganteus*	Perentie
30/04/2017	TS 1.1	Funnel	*Ctenotus helenae*	Dusky Ctenotus
30/04/2017	TS 1.1	Funnel	*Ctenotus helenae*	Dusky Ctenotus
30/04/2017	TS 1.1	Funnel	*Ctenotus leonhardii*	Leonhardi's Skink
30/04/2017	TS 1.10	Funnel	*Ctenotus helenae*	Dusky Ctenotus
30/04/2017	TS 1.10	Funnel	*Ctenotus helenae*	Dusky Ctenotus
30/04/2017	TS 1.10	Funnel	*Ctenotus leonhardii*	Leonhardi's Skink
30/04/2017	TS 1.10	Funnel	*Ctenotus pantherinus*	Leopard Ctenotus
30/04/2017	TS 1.5	Funnel	*Ctenotus helenae*	Dusky Ctenotus
30/04/2017	TS 1.5	Bucket	*Ctenotus leonhardii*	Leonhardi's Skink
30/04/2017	TS 1.5	Funnel	*Ctenotus pantherinus*	Leopard Ctenotus
30/04/2017	TS 1.5	Funnel	*Ctenotus pantherinus*	Leopard Ctenotus
30/04/2017	TS 1.6	Funnel	*Ctenotus pantherinus*	Leopard Ctenotus
30/04/2017	TS 1.6	Funnel	*Ctenotus pantherinus*	Leopard Ctenotus
30/04/2017	TS 1.8	Bucket	*Ctenotus leonhardii*	Leonhardi's Skink
30/04/2017	TS 1.8	Funnel	*Ctenotus pantherinus*	Leopard Ctenotus
30/04/2017	TS 1.9	Funnel	*Ctenotus helenae*	Dusky Ctenotus
30/04/2017	TS 2.2	Funnel	*Varanus tristis*	Black-headed Monitor
30/04/2017	TS 2.6	Funnel	*Ctenotus helenae*	Dusky Ctenotus
30/04/2017	TS 2.7	Elliot (A)	*Pseudomys hermannsburgensis*	Sandy Inland Mouse
30/04/2017	TS 3.10	Elliot (A)	*Pseudomys hermannsburgensis*	Sandy Inland Mouse
30/04/2017	TS 3.3	Elliot (A)	*Mus musculus*	House Mouse
30/04/2017	TS 3.4	Funnel	*Ctenotus helenae*	Dusky Ctenotus
30/04/2017	TS 3.4	Bucket	*Ctenotus pantherinus*	Leopard Ctenotus
30/04/2017	TS 3.5	Funnel	*Ctenophorus reticulatus*	Western Netted Dragon
30/04/2017	TS 3.9	Funnel	*Ctenotus leonhardii*	Leonhardi's Skink
30/04/2017	TS 4.1	Funnel	*Pseudonaja modesta*	Ringed Brown Snake
30/04/2017	TS 4.3	Bucket	*Pseudomys hermannsburgensis*	Sandy Inland Mouse
30/04/2017	TS 4.4	Bucket	*Neobatrachus aquilonius*	Northern Burrowing Frog
30/04/2017	TS 4.4	Elliot (A)	*Pseudomys hermannsburgensis*	Sandy Inland Mouse

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30/04/2017	TS 5.1	Bucket	*Pseudomys hermannsburgensis*	Sandy Inland Mouse
30/04/2017	TS 5.2	Elliot (A)	*Pseudomys hermannsburgensis*	Sandy Inland Mouse
30/04/2017	TS 5.5	Bucket	*Sminthopsis dolichura*	Little long-tailed Dunnart
30/04/2017	TS 5.5	Funnel	*Varanus gilleni*	Pygmy Mulga Monitor
30/04/2017	TS 5.6	Funnel	*Varanus gilleni*	Pygmy Mulga Monitor
30/04/2017	TS 5.7	Funnel	*Ctenotus leonhardii*	Leonhardi's Skink
30/04/2017	TS 5.7	Funnel	*Furina ornata*	Moon Snake
30/04/2017	TS 5.8	Funnel	*Ctenotus leonhardii*	Leonhardi's Skink
30/04/2017	Wpt 025	Opportunistic	*Ctenotus leonhardii*	Leonhardi's Skink
30/04/2017	Wpt 025	Opportunistic	*Egernia formosa*	Goldfields Crevise Skink
30/04/2017	Wpt 025	Opportunistic	*Egernia formosa*	Goldfields Crevise Skink
30/04/2017	Wpt 025	Opportunistic	*Egernia formosa*	Goldfields Crevise Skink
1/05/2017	TS 1.1	Funnel	*Ctenotus leonhardii*	Leonhardi's Skink
1/05/2017	TS 1.2	Funnel	*Pseudechis australis*	Mulga Snake
1/05/2017	TS 1.4	Funnel	*Ctenotus leonhardii*	Leonhardi's Skink
1/05/2017	TS 1.4	Funnel	*Ctenotus leonhardii*	Leonhardi's Skink
1/05/2017	TS 1.4	Funnel	*Ctenotus pantherinus*	Leopard Ctenotus
1/05/2017	TS 1.6	Funnel	*Ctenotus pantherinus*	Leopard Ctenotus
1/05/2017	TS 2.1	Funnel	*Ctenotus leonhardii*	Leonhardi's Skink
1/05/2017	TS 2.1	Funnel	*Menetia greyii*	Dwarf Skink
1/05/2017	TS 2.2	Elliot (A)	*Pseudomys hermannsburgensis*	Sandy Inland Mouse
1/05/2017	TS 2.4	Funnel	*Morethia butleri*	Woodland Dark-flecked Morethia
1/05/2017	TS 2.7	Elliot (A)	*Pseudomys hermannsburgensis*	Sandy Inland Mouse
1/05/2017	TS 2.9	Funnel	*Ctenotus leonhardii*	Leonhardi's Skink
1/05/2017	TS 3.1	Funnel	*Ctenotus leonhardii*	Leonhardi's Skink
1/05/2017	TS 3.10	Funnel	*Ctenotus leonhardii*	Leonhardi's Skink
1/05/2017	TS 3.2	Bucket	*Ctenotus leonhardii*	Leonhardi's Skink
1/05/2017	TS 3.3	Bucket	*Ctenotus leonhardii*	Leonhardi's Skink
1/05/2017	TS 3.4	Bucket	*Ctenophorus reticulatus*	Western Netted Dragon
1/05/2017	TS 3.5	Bucket	*Delma butleri*	Unbanded Delma
1/05/2017	TS 4.10	Bucket	*Pseudomys bolami*	Bolam's Mouse
1/05/2017	TS 4.2	Bucket	*Lerista bipes*	Western Two-toed Slider
1/05/2017	TS 4.4	Funnel	*Ctenotus dux*	Narrow-lined Skink
1/05/2017	TS 4.4	Bucket	*Pseudomys hermannsburgensis*	Sandy Inland Mouse
1/05/2017	TS 5.1	Funnel	*Ctenotus leonhardii*	Leonhardi's Skink
1/05/2017	TS 5.1	Bucket	*Sminthopsis dolichura*	Little long-tailed Dunnart
1/05/2017	TS 5.4	Funnel	*Ctenotus leonhardii*	Leonhardi's Skink
1/05/2017	TS 5.4	Funnel	*Pseudonaja nuchalis*	Gwardar
1/05/2017	TS 5.5	Funnel	*Ctenotus leonhardii*	Leonhardi's Skink

Camera Trap results

Camera Number	Date	Species	Common Name	Number
GH 14	11/09/2016	*Bos taurus*	European Cattle	1
GH 14	15/09/2016	*Rhipidura leucophrys*	Willie Wagtail	1
GH 14	27/09/2016	*Oreoica gutturalis*	Crested Bellbird	1
GH 14	20/10/2016	*Rhipidura leucophrys*	Willie Wagtail	1
GH 14	26/10/2016	*Macropus rufus*	Red Kangaroo	1
GH 14	31/10/2016	*Dromaius novaehollandiae*	Emu	6
GH 14	18/11/2016	*Dromaius novaehollandiae*	Emu	2
GH 14	2/12/2016	*Camelus dromedarius*	Camel	2
GH 14	20/12/2016	*Dromaius novaehollandiae*	Emu	1
GH 14	6/01/2017	*Dromaius novaehollandiae*	Emu	1
GH 14	7/02/2017	*Malurus leucopterus*	White-winged Fairy-wren	1
GH 14	20/02/2017	*Malurus leucopterus*	White-winged Fairy-wren	1
GH 14	26/02/2017	*Oreoica gutturalis*	Crested Bellbird	1
GH 14	6/03/2017	*Corvus bennetti*	Little Crow	1
GH 14	11/03/2017	*Varanus gouldii*	Gould's Sand Monitor	1
GH 14B	28/04/2017	*Ocyphaps lophotes*	Crested Pigeon	2
GH 14B	28/04/2017	*Cacatua roseicapilla*	Galah	2
GH 14B	28/04/2017	*Equus caballus*	Horse	1
GH 14B	28/04/2017	*Grallina cyanoleuca*	Magpie-lark	1
GH 14B	28/04/2017	*Ptilonorhynchus maculatus*	Western Bowerbird	1
GH 14B	28/04/2017	*Manorina flavigula*	Yellow-throated Miner	1
GH 14B	29/04/2017	*Cracticus tibicen*	Australian Magpie	2
GH 14B	29/04/2017	*Ocyphaps lophotes*	Crested Pigeon	3
GH 14B	29/04/2017	*Cacatua roseicapilla*	Galah	3
GH 14B	29/04/2017	*Equus caballus*	Horse	3
GH 14B	29/04/2017	*Grallina cyanoleuca*	Magpie-lark	1
GH 14B	29/04/2017	*Cracticus nigrogularis*	Pied Butcherbird	1
GH 14B	30/04/2017	*Ocyphaps lophotes*	Crested Pigeon	2
GH 14B	30/04/2017	*Cacatua roseicapilla*	Galah	2
GH 14B	30/04/2017	*Equus caballus*	Horse	2
GH 14B	30/04/2017	*Grallina cyanoleuca*	Magpie-lark	1
GH 14B	30/04/2017	*Platycercus varius*	Mulga Parrot	2
GH 14B	30/04/2017	*Corvus orru*	Torresian Crow	2
GH 14B	30/04/2017	*Manorina flavigula*	Yellow-throated Miner	3
GH 14B	1/05/2017	*Cracticus tibicen*	Australian Magpie	1
GH 14B	1/05/2017	*Ocyphaps lophotes*	Crested Pigeon	3
GH 14B	1/05/2017	*Cacatua roseicapilla*	Galah	1
GH 14B	1/05/2017	*Equus caballus*	Horse	1
GH 14B	1/05/2017	*Grallina cyanoleuca*	Magpie-lark	1
GH 14B	1/05/2017	*Cracticus nigrogularis*	Pied Butcherbird	1
GH 14B	1/05/2017	*Manorina flavigula*	Yellow-throated Miner	4
GH15	17/09/2016	*Felis catus*	Cat	1
GH15	19/09/2016	*Oryctolagus cuniculus*	Rabbit	1
GH15	21/09/2016	*Grallina cyanoleuca*	Magpie-lark	1
GH15	21/09/2016	*Oryctolagus cuniculus*	Rabbit	1
GH15	22/09/2016	*Oryctolagus cuniculus*	Rabbit	1
GH15	23/09/2016	*Oreoica gutturalis*	Crested Bellbird	1
GH15	24/09/2016	*Ctenophorus nuchalis*	Central Netted Dragon	1
GH15	24/09/2016	*Bos taurus*	European Cattle	1

Camera Number	Date	Species	Common Name	Number
GH15	25/09/2016	*Notomys alexis*	Spinifex Hopping-mouse	1
GH15	26/09/2016	*Oryctolagus cuniculus*	Rabbit	1
GH15	27/09/2016	*Felis catus*	Cat	1
GH15	30/09/2016	*Oryctolagus cuniculus*	Rabbit	1
GH15	3/10/2016	*Notomys alexis*	Spinifex Hopping-mouse	1
GH15	7/10/2016	*Notomys alexis*	Spinifex Hopping-mouse	1
GH15	8/10/2016	*Notomys alexis*	Spinifex Hopping-mouse	1
GH15	12/10/2016	*Oryctolagus cuniculus*	Rabbit	1
GH15	14/10/2016	*Notomys alexis*	Spinifex Hopping-mouse	1
GH15	22/10/2016	*Oryctolagus cuniculus*	Rabbit	1
GH15	26/10/2016	*Oreoica gutturalis*	Crested Bellbird	1
GH15	27/10/2016	*Oryctolagus cuniculus*	Rabbit	1
GH15	30/10/2016	*Oreoica gutturalis*	Crested Bellbird	1
GH15	30/10/2016	*Rhipidura leucophrys*	Willie Wagtail	1
GH15	1/11/2016	*Rhipidura leucophrys*	Willie Wagtail	1
GH15	2/11/2016	*Oryctolagus cuniculus*	Rabbit	1
GH15	4/11/2016	*Bos taurus*	European Cattle	1
GH15	8/11/2016	*Oreoica gutturalis*	Crested Bellbird	1
GH15	11/11/2016	*Oryctolagus cuniculus*	Rabbit	1
GH15	12/11/2016	*Ocyphaps lophotes*	Crested Pigeon	2
GH15	12/11/2016	*Rhipidura leucophrys*	Willie Wagtail	1
GH15	18/11/2016	*Macropus rufus*	Red Kangaroo	1
GH15	21/11/2016	*Ctenophorus scutulatus*	Lozenge-marked Bicycle Dragon	1
GH15	23/11/2016	*Oryctolagus cuniculus*	Rabbit	1
GH15	25/11/2016	*Bos taurus*	European Cattle	1
GH15	25/11/2016	*Notomys alexis*	Spinifex Hopping-mouse	1
GH15	26/11/2016	*Ctenophorus scutulatus*	Lozenge-marked Bicycle Dragon	1
GH15	27/11/2016	*Notomys alexis*	Spinifex Hopping-mouse	1
GH15	3/12/2016	*Lichenostomus virescens*	Singing Honeyeater	1
GH15	8/12/2016	*Rhipidura leucophrys*	Willie Wagtail	1
GH15	15/12/2016	*Oreoica gutturalis*	Crested Bellbird	1
GH15	22/12/2016	*Pseudomys bolami*	Bolam's Mouse	2
GH15	24/12/2016	*Pseudomys bolami*	Bolam's Mouse	2
GH15	24/12/2016	*Oryctolagus cuniculus*	Rabbit	1
GH15	27/12/2016	*Bos taurus*	European Cattle	1
GH15	28/12/2016	*Oryctolagus cuniculus*	Rabbit	1
GH15	2/01/2017	*Anthus novaeseelandiae*	Australian Pipit	1
GH15	7/01/2017	*Oryctolagus cuniculus*	Rabbit	1
GH15	11/01/2017	*Colluricincla harmonica*	Grey Shrike-thrush	1
GH15	13/01/2017	*Oryctolagus cuniculus*	Rabbit	1
GH15	14/01/2017	*Oryctolagus cuniculus*	Rabbit	1
GH15	18/01/2017	*Oryctolagus cuniculus*	Rabbit	1
GH15	26/01/2017	*Oreoica gutturalis*	Crested Bellbird	1
GH15	27/01/2017	*Epthianura tricolor*	Crimson Chat	1
GH15	30/01/2017	*Varanus gouldii*	Gould's Sand Monitor	1
GH15	1/02/2017	*Oreoica gutturalis*	Crested Bellbird	1
GH15	5/02/2017	*Oryctolagus cuniculus*	Rabbit	1
GH15	16/02/2017	*Rhipidura leucophrys*	Willie Wagtail	1
GH15	18/02/2017	*Rhipidura leucophrys*	Willie Wagtail	1
GH15	19/02/2017	*Oreoica gutturalis*	Crested Bellbird	1
GH15	21/02/2017	*Epthianura tricolor*	Crimson Chat	1

Camera Number	Date	Species	Common Name	Number
GH15	21/02/2017	*Artamus personatus*	Masked Woodswallow	1
GH15	22/02/2017	*Artamus personatus*	Masked Woodswallow	1
GH18	14/09/2016	*Macropus rufus*	Red Kangaroo	1
GH18	17/09/2016	*Felis catus*	Cat	1
GH18	21/09/2016	*Felis catus*	Cat	1
GH18	22/09/2016	*Ctenophorus scutulatus*	Lozenge-marked Bicycle Dragon	1
GH18	25/09/2016	*Felis catus*	Cat	1
GH18	26/09/2016	*Felis catus*	Cat	1
GH18	27/09/2016	*Notomys alexis*	Spinifex Hopping-mouse	1
GH18	28/09/2016	*Felis catus*	Cat	1
GH18	1/10/2016	*Felis catus*	Cat	1
GH18	19/10/2016	*Felis catus*	Cat	1
GH18	19/10/2016	*Ctenophorus scutulatus*	Lozenge-marked Bicycle Dragon	1
GH18	18/11/2016	*Macropus rufus*	Red Kangaroo	1
GH18	19/11/2016	*Macropus rufus*	Red Kangaroo	1
GH18	9/12/2016	*Corvus orru*	Torresian Crow	1
GH18	10/12/2016	*Ctenophorus scutulatus*	Lozenge-marked Bicycle Dragon	1
GH18	19/12/2016	*Macropus rufus*	Red Kangaroo	1
GH18	29/12/2016	*Ctenophorus scutulatus*	Lozenge-marked Bicycle Dragon	1
GH18	15/01/2017	*Ctenophorus scutulatus*	Lozenge-marked Bicycle Dragon	1
GH18	16/01/2017	*Oreoica gutturalis*	Crested Bellbird	1
GH18	22/01/2017	*Varanus gouldii*	Gould's Sand Monitor	1
GH18	27/01/2017	*Ctenophorus scutulatus*	Lozenge-marked Bicycle Dragon	1
GH18	10/02/2017	*Ctenophorus scutulatus*	Lozenge-marked Bicycle Dragon	1
GH18	11/02/2017	*Ctenophorus scutulatus*	Lozenge-marked Bicycle Dragon	1
GH18	14/02/2017	*Ctenophorus scutulatus*	Lozenge-marked Bicycle Dragon	1
GH18	16/02/2017	*Ctenophorus scutulatus*	Lozenge-marked Bicycle Dragon	1
GH18	19/02/2017	*Ctenophorus scutulatus*	Lozenge-marked Bicycle Dragon	1
GH18	20/02/2017	*Ctenophorus scutulatus*	Lozenge-marked Bicycle Dragon	1
GH18	20/02/2017	*Ctenotus leonhardii*	Leonhardi's Skink	1
GH18	21/02/2017	*Ctenophorus scutulatus*	Lozenge-marked Bicycle Dragon	1
GH18	3/03/2017	*Ctenophorus scutulatus*	Lozenge-marked Bicycle Dragon	1
GH18	9/03/2017	*Ctenophorus scutulatus*	Lozenge-marked Bicycle Dragon	1
GH18	15/03/2017	*Ctenophorus scutulatus*	Lozenge-marked Bicycle Dragon	1
GH18	17/03/2017	*Varanus gouldii*	Gould's Sand Monitor	1
GH18	19/03/2017	*Corvus orru*	Torresian Crow	1
GH19	15/09/2016	*Ptilonorhynchus maculatus*	Western Bowerbird	1
GH19	18/09/2016	*Ptilonorhynchus maculatus*	Western Bowerbird	1
GH19	19/09/2016	*Ptilonorhynchus maculatus*	Western Bowerbird	1
GH19	20/09/2016	*Corvus bennetti*	Little Crow	3
GH19	20/09/2016	*Ptilonorhynchus maculatus*	Western Bowerbird	1
GH19	21/09/2016	*Felis catus*	Cat	1
GH19	21/09/2016	*Corvus bennetti*	Little Crow	6
GH19	22/09/2016	*Corvus bennetti*	Little Crow	1
GH19	23/09/2016	*Corvus bennetti*	Little Crow	1
GH19	25/09/2016	*Pseudomys bolami*	Bolam's Mouse	1
GH19	25/09/2016	*Felis catus*	Cat	1
GH19	26/09/2016	*Corvus orru*	Torresian Crow	1
GH19	27/09/2016	*Taeniopygia guttata*	Zebra Finch	2
GH19	6/10/2016	*Pseudomys bolami*	Bolam's Mouse	1
GH19	9/10/2016	*Ptilonorhynchus maculatus*	Western Bowerbird	1

Camera Number	Date	Species	Common Name	Number
GH19	10/10/2016	*Pseudomys bolami*	Bolam's Mouse	1
GH19	11/10/2016	*Macropus rufus*	Red Kangaroo	1
GH19	14/10/2016	*Felis catus*	Cat	1
GH19	16/10/2016	*Ptilonorhynchus maculatus*	Western Bowerbird	1
GH19	17/10/2016	*Ptilonorhynchus maculatus*	Western Bowerbird	1
GH19	17/10/2016	*Taeniopygia guttata*	Zebra Finch	2
GH19	18/10/2016	*Oreoica gutturalis*	Crested Bellbird	1
GH19	18/10/2016	*Lichenostomus virescens*	Singing Honeyeater	1
GH19	19/10/2016	*Ptilonorhynchus maculatus*	Western Bowerbird	1
GH19	22/10/2016	*Corvus orru*	Torresian Crow	2
GH19	22/10/2016	*Ptilonorhynchus maculatus*	Western Bowerbird	1
GH19	23/10/2016	*Oreoica gutturalis*	Crested Bellbird	1
GH19	23/10/2016	*Ptilonorhynchus maculatus*	Western Bowerbird	1
GH19	24/10/2016	*Felis catus*	Cat	1
GH19	24/10/2016	*Oreoica gutturalis*	Crested Bellbird	1
GH19	26/10/2016	*Lichenostomus virescens*	Singing Honeyeater	1
GH19	26/10/2016	*Ptilonorhynchus maculatus*	Western Bowerbird	1
GH19	28/10/2016	*Ptilonorhynchus maculatus*	Western Bowerbird	1
GH19	29/10/2016	*Felis catus*	Cat	1
GH19	2/11/2016	*Oreoica gutturalis*	Crested Bellbird	1
GH19	4/11/2016	*Lichenostomus virescens*	Singing Honeyeater	1
GH19	9/11/2016	*Dromaius novaehollandiae*	Emu	1
GH19	9/11/2016	*Ctenophorus scutulatus*	Lozenge-marked Bicycle Dragon	1
GH19B	26/04/2017	*Corvus orru*	Torresian Crow	1
GH19B	28/04/2017	*Oryctolagus cuniculus*	Rabbit	1
GH20	17/11/2016	*Oryctolagus cuniculus*	Rabbit	1
GH20	21/11/2016	*Oryctolagus cuniculus*	Rabbit	1
GH20	28/11/2016	*Oryctolagus cuniculus*	Rabbit	1
GH20	12/01/2017	*Oryctolagus cuniculus*	Rabbit	1
GH20	13/01/2017	*Varanus giganteus*	Perentie	1
GH20	21/01/2017	*Oryctolagus cuniculus*	Rabbit	1
GH20	25/01/2017	*Oryctolagus cuniculus*	Rabbit	1
GH20	28/01/2017	*Oryctolagus cuniculus*	Rabbit	1
GH20	20/02/2017	*Oryctolagus cuniculus*	Rabbit	1
GH20	1/03/2017	*Oryctolagus cuniculus*	Rabbit	1
GH20	2/03/2017	*Oryctolagus cuniculus*	Rabbit	1
GH20	3/03/2017	*Oryctolagus cuniculus*	Rabbit	1
GH20	5/03/2017	*Oryctolagus cuniculus*	Rabbit	1
GH20	18/03/2017	*Oryctolagus cuniculus*	Rabbit	1
GH20C	28/04/2017	*Macropus rufus*	Red Kangaroo	1
GH22	19/09/2016	*Corvus orru*	Torresian Crow	1
GH22	21/09/2016	*Felis catus*	Cat	1
GH22	21/09/2016	*Varanus giganteus*	Perentie	1
GH22	22/09/2016	*Felis catus*	Cat	1
GH22	23/09/2016	*Varanus giganteus*	Perentie	1
GH22	23/09/2016	*Manorina flavigula*	Yellow-throated Miner	1
GH22	24/09/2016	*Oryctolagus cuniculus*	Rabbit	2
GH22	25/09/2016	*Platycercus zonarius*	Australian Ringneck	1
GH22	28/09/2016	*Dromaius novaehollandiae*	Emu	2
GH22	5/10/2016	*Cracticus tibicen*	Australian Magpie	3
GH22	9/10/2016	*Cracticus tibicen*	Australian Magpie	1

Camera Number	Date	Species	Common Name	Number
GH22	12/10/2016	*Corvus orru*	Torresian Crow	1
GH22	16/10/2016	*Cracticus nigrogularis*	Pied Butcherbird	1
GH22	21/10/2016	*Cracticus tibicen*	Australian Magpie	1
GH22	6/11/2016	*Felis catus*	Cat	1
GH22	8/11/2016	*Cracticus tibicen*	Australian Magpie	1
GH22	21/11/2016	*Felis catus*	Cat	1
GH22	22/11/2016	*Varanus giganteus*	Perentie	1
GH22	24/11/2016	*Cracticus tibicen*	Australian Magpie	1
GH22	25/11/2016	*Cracticus nigrogularis*	Pied Butcherbird	1
GH22	5/12/2016	*Oryctolagus cuniculus*	Rabbit	1
GH22	11/12/2016	*Cracticus nigrogularis*	Pied Butcherbird	1
GH22	18/12/2016	*Oryctolagus cuniculus*	Rabbit	1
GH22	19/12/2016	*Oryctolagus cuniculus*	Rabbit	1
GH22	23/12/2016	*Oryctolagus cuniculus*	Rabbit	1
GH22	25/12/2016	*Felis catus*	Cat	1
GH22	28/12/2016	*Oryctolagus cuniculus*	Rabbit	1
GH22	29/12/2016	*Cracticus tibicen*	Australian Magpie	1
GH22	29/12/2016	*Oryctolagus cuniculus*	Rabbit	1
GH22	30/12/2016	*Cracticus tibicen*	Australian Magpie	1
GH22	6/01/2017	*Oryctolagus cuniculus*	Rabbit	1
GH22	10/01/2017	*Oryctolagus cuniculus*	Rabbit	1
GH22	11/01/2017	*Cracticus nigrogularis*	Pied Butcherbird	1
GH22	11/01/2017	*Oryctolagus cuniculus*	Rabbit	1
GH22	13/01/2017	*Oryctolagus cuniculus*	Rabbit	1
GH22	15/01/2017	*Cracticus nigrogularis*	Pied Butcherbird	1
GH22	16/01/2017	*Canis lupus*	Dingo/Dog	1
GH22	22/01/2017	*Oryctolagus cuniculus*	Rabbit	1
GH22	23/01/2017	*Felis catus*	Cat	1
GH22	24/01/2017	*Cracticus tibicen*	Australian Magpie	1
GH22	25/01/2017	*Cracticus tibicen*	Australian Magpie	1
GH22	27/01/2017	*Cacatua roseicapilla*	Galah	1
GH22	27/01/2017	*Corvus orru*	Torresian Crow	1
GH22	29/01/2017	*Cracticus nigrogularis*	Pied Butcherbird	1
GH22	30/01/2017	*Cracticus tibicen*	Australian Magpie	1
GH22	30/01/2017	*Cracticus tibicen*	Australian Magpie	1
GH22	30/01/2017	*Cacatua roseicapilla*	Galah	4
GH22	30/01/2017	*Macropus rufus*	Red Kangaroo	1
GH22	31/01/2017	*Cacatua roseicapilla*	Galah	1
GH22	6/02/2017	*Oryctolagus cuniculus*	Rabbit	1
GH22	9/02/2017	*Oryctolagus cuniculus*	Rabbit	1
GH22	10/02/2017	*Camelus dromedarius*	Camel	2
GH22	12/02/2017	*Macropus rufus*	Red Kangaroo	1
GH22	14/02/2017	*Oryctolagus cuniculus*	Rabbit	1
GH22	15/02/2017	*Oryctolagus cuniculus*	Rabbit	1
GH22	16/02/2017	*Oryctolagus cuniculus*	Rabbit	1
GH22	17/02/2017	*Macropus rufus*	Red Kangaroo	1
GH22	18/02/2017	*Cracticus nigrogularis*	Pied Butcherbird	1
GH22	19/02/2017	*Macropus rufus*	Red Kangaroo	1
GH22	22/02/2017	*Cracticus tibicen*	Australian Magpie	1
GH22	22/02/2017	*Oryctolagus cuniculus*	Rabbit	1
GH22	22/02/2017	*Macropus rufus*	Red Kangaroo	1

Camera Number	Date	Species	Common Name	Number
GH22	23/02/2017	*Cracticus tibicen*	Australian Magpie	1
GH22	23/02/2017	*Oryctolagus cuniculus*	Rabbit	1
GH22	24/02/2017	*Oryctolagus cuniculus*	Rabbit	1
GH23	17/09/2016	*Dromaius novaehollandiae*	Emu	1
GH23	17/09/2016	*Bos taurus*	European Cattle	1
GH23	18/09/2016	*Macropus rufus*	Red Kangaroo	1
GH23	18/09/2016	*Corvus orru*	Torresian Crow	1
GH23	19/09/2016	*Equus caballus*	Horse	1
GH23	20/09/2016	*Macropus rufus*	Red Kangaroo	1
GH23	20/09/2016	*Corvus orru*	Torresian Crow	1
GH23	21/09/2016	*Phaps chalcoptera*	Common Bronzewing	3
GH23	22/09/2016	*Dromaius novaehollandiae*	Emu	1
GH23	22/09/2016	*Macropus rufus*	Red Kangaroo	2
GH23	22/09/2016	*Petroica goodenovii*	Red-capped Robin	1
GH23	22/09/2016	*Acanthiza chrysorrhoa*	Yellow-rumped Thornbill	2
GH23	23/09/2016	*Petroica goodenovii*	Red-capped Robin	1
GH23	24/09/2016	*Dromaius novaehollandiae*	Emu	1
GH23	24/09/2016	*Macropus rufus*	Red Kangaroo	1
GH23	25/09/2016	*Bos taurus*	European Cattle	1
GH23	26/09/2016	*Macropus rufus*	Red Kangaroo	2
GH23	26/09/2016	*Corvus orru*	Torresian Crow	1
GH23	27/09/2016	*Dromaius novaehollandiae*	Emu	1
GH23	28/09/2016	*Equus asinus*	Donkey	10
GH23	2/10/2016	*Corvus orru*	Torresian Crow	1
GH23	6/10/2016	*Acanthiza chrysorrhoa*	Yellow-rumped Thornbill	1
GH23	7/10/2016	*Macropus rufus*	Red Kangaroo	1
GH23	9/10/2016	*Corvus orru*	Torresian Crow	1
GH23	22/10/2016	*Corvus orru*	Torresian Crow	1
GH23	24/10/2016	*Bos taurus*	European Cattle	1
GH23	26/10/2016	*Equus caballus*	Horse	1
GH23	26/10/2016	*Macropus rufus*	Red Kangaroo	1
GH23	29/10/2016	*Macropus rufus*	Red Kangaroo	1
GH23	31/10/2016	*Macropus rufus*	Red Kangaroo	1
GH23	5/11/2016	*Macropus rufus*	Red Kangaroo	2
GH23	6/11/2016	*Macropus rufus*	Red Kangaroo	1
GH23	8/11/2016	*Varanus giganteus*	Perentie	1
GH23	9/11/2016	*Macropus rufus*	Red Kangaroo	1
GH23	10/11/2016	*Equus caballus*	Horse	1
GH23	11/11/2016	*Dromaius novaehollandiae*	Emu	1
GH23	12/11/2016	*Dromaius novaehollandiae*	Emu	4
GH23	13/11/2016	*Dromaius novaehollandiae*	Emu	3
GH23	14/11/2016	*Dromaius novaehollandiae*	Emu	3

APPENDIX G

Invertebrate Reports – Alacran Environmental Sciences

ABN: 33577027061
Phone: 0457111317
email: erich@alacranenvironmental.com

TAXONOMY AND SHORT-RANGE ENDEMIC ASSESSMENT OF INVERTEBRATES FROM LAKE WELLS

Prepared for Zootopia Environmental Services

Invertebrates from Lake Wells were identified to species and assessed for short-range endemism. Of the nine taxon groups identified, four represent potential SRE's: ***Lychas* '174'** and ***Urodacus* sp. indet.** (scorpions), **Idiopidae sp. indet.** (trap door spider) and ***Buddelundia* '27dv'** (slater). The remaining five groups represent non-target and or widespread taxa.

Author:	Dr Erich S. Volschenk
Date:	Thursday, 22 December 2016
Submitted to	Greg Harewood
Report ID:	1625
Version	1

SCOPE OF WORK

In October, 2016, Zootopia Environmental Services submitted a collection of 37 samples from Lale Wells, comprising: 20 spiders, six scorpions, one centipede, seven silverfish and three terrestrial isopods.

The following services were requested:

- taxonomic identifications of samples;
- SRE assessment of these species; and
- Labelling and lodgement of these samples in the WAM (Western Australian Museum) Arachnology collection.

BACKGROUND AND METHODS

The methods used to make species identifications and assess SRE categories closely follow those used by the WAM. A more detailed description of the methods and principals used to assess SRE categories are detailed in Appendix 1.

Isopods were Identified by Dr Simon Judd and remaining taxa were identified by the author.

RESULTS

The collection contained at least nine species of which five are potential SRE's and these are summarised below in Table 1 and Discussion.

Table 1. List of species present with assigned SRE categories.

Order	Family	Species	SRE category
Scorpiones	Buthidae	*Lychas* 'adonis'	Widespread
		Lychas '174'	Potential
	Urodacidae	*Urodacus* sp. indet.	Potential
Scolopendromorpha	Scolopendridae	*Scolopendra morsitans*	Widespread
Araneae (Araneomorphae)	-	Araneomorphae sp.	Non-Target
Araneae (Mygalomorphae)	Nemesiidae	*Aname* 'MYG251'	Widespread
	Idiopidae	Idiopidae sp. indet	Potential
Thysanura	Lepismatidae	*Lepismatidae* sp. indet.	Non-Target
Isopoda	Armadilidae	**Buddelundia* '27dv'	Potential

*isentified by Dr Simon Judd

The complete record of the specimens identified is presented in Appendix 2

DISCUSSION

Three potential SRE species and two widespread species were present in this collection. These species and the justification for these rankings is given below.

ARACHNIDA

Araneae (Araneomorphae)

***Araneomorphae* spp.** few species of araneomorph spiders are known to be SRE's in W.A. None of the specimens present in this collection are known to contain SRE's.

Araneae (Mygalomorphae)

***Aname* 'MYG251'** This species was represented by a single adult male specimen. Direct comparison against morphospecies of *Aname* in the WA Museum, revealed a match with *Aname* 'MYG251'. That morphospecies is only known from a single specimen (T121527) from Mt Ida, 80 km NW. of Menzies, -29.2211°S 120.396°E. The distance between these two specimens is *ca* 320 km, indicating that it is not an SRE as defined by Harvey {, 2002 #31719}; however, the absence of this species from numerous other surveys in the area suggest that its distribution does not reflect its area of occupancy. The present data (two locality records from two species) does not allow for adequate conservation management decisions to be made about this species.

***Idiopidae* sp. indet.** was represented by a single juvenile specimen. Adult male specimens are necessary to determine the genus and species of most trapdoor spiders, so this specimen could not be unambiguously identified to genus or species. While much of the WA diversity of this family is not formally described, a study of the genetics of the Pilbara trapdoor spiders (including many samples of Idiopidae) found both widespread and locally endemic species. In the absence of male characteristics or DNA sequences with which to characterise this species, it is considered a potential SRE. Genetic identification methods such as DNA bar-coding may be able to provide better identification of this species.

Scorpiones

Lychas 'adonis' was represented by two specimens. This is a widespread species occurring from the WA Goldfields eastwards through South Australia and central Victoria and South Western NSW.

Lychas '174' was represented by a single adult female specimen. This is an undescribed species and the record collected is the one known. It is therefore considered to be a potential SRE owing to the lack of knowledge about its distribution and the presence of SRE species in morphologically similar (related) species.

***Urodacus* sp. indet.** is represented by three specimens, all of which are juveniles. Adult males are necessary for unambiguous identification based on morphology and in the absence of such specimens the identity is uncertain. Some species of *Urodacus* are SRE's therefore these specimens are potential SRE's in the absence of clear identification.

MYRIAPODA

Scolopendromorpha

Scolopendra morsitans was represented by a single specimen. This is a widespread species found throughout Australia.

HEXAPODA

Thysanura

Lepismatidae sp. indet was represented by seven specimens. Members of this family are generally considered to be widespread with rare troglobitic exceptions. None of these specimens were representatives of the genus and are therefore not considered to be SRE's.

CRUSTACEA

Isopoda

Buddelundia '27dv' was represented by five male and one female specimens: 23°08′43″S 122° 48′57″E (SJ5177). The only other record of this species was also from Lake Disappointment (SJ3633) from 23°16`0, 122°48`57. This, and the current specimens, are the only 2 locations from which the species has been collected, therefore, it is considered a potential SRE.

C:\Users\Erich\Desktop\New Briefcase\16-25 - Greg Harewood - Lake Wells\Appendix 1. Background and methods (scorpions and pseudoscorpions).docx

APPENDIX 2. LIST OF SPECIMENS IDENTIFIED FROM LAKE WELLS

Species	Site code	Latitude (South)	Longitude (East)	Males	Females	Juveniles	Total
Araneomorphae sp. indet.	WPT 15	27°19'42	122°56'24				1
	TS 1.01	27°18'46	122°58'29				1
	TS 3.08	27°17'08	122°59'48				1
	WPT 107	27°16'06	123°00'31				1
	WPT 107	27°16'06	123°00'31				1
	WPT 51	27°15'09	122°57'30				1
	TS 1.04	27°18'45	122°58'26				1
	WPT 51	27°15'09	122°57'30				1
	WPT 107	27°16'06	123°00'31				1
	WPT 16	27°19'42	122°56'24				1
	TS 1.02	27°18'46	122°58'28				1
	WPT 74	27°13'08	123°00'28				1
	WPT 68	27°13'08	123°00'30				1
	TS 1.04	27°18'45	122°58'26				1
	WPT 107	27°16'06	123°00'31				1
	WPT 107	27°16'06	123°00'31				1
	TS 2.04	27°16'01	122°56'49				1
	WPT 110	27°13'00	123°00'54				1
Aname 'MYG251'	TS 3.07	27°17'08	122°59'48	1			1
Idiopidae sp. indet	TS 3.06	27°17'06	122°59'47			1	1
Lychas 'adonis'	TS 5.08	27°13'00	123°03'00	1			1
	TS 4.09	27°13'04	123°00'34		1		1
Lychas '174'	TS 1.02	27°18'46	122°58'28		1		1

Species	Site code	Latitude (South)	Longitude (East)	Males	Females	Juveniles	Total
Urodacus sp. indet.	TS 5.08	27°13'00	123°03'00			1	1
	TS 5.06	27°13'00	123°03'02			1	1
	TS 3.03	27°17'04	122°59'47			1	1
Scolopendra morsitans	TS 3.08	27°17'08	122°59'48				1
Lepismatidae sp. indet.	WPT 54	27°15'09	122°57'30				1
	WPT 13	27°19'44	122°56'24				1
	TS 2.06	27°16'01	122°56'46				1
	WPT 20	27°19'40	122°56'23				1
	TS 5.02	27°12'59	123°03'04				1
	TS 3.10	27°17'10	122°59'49				1
	TS 6.06	27°13'39	122°58'51				1
Buddelundia '27dv'	TS 5.04	27°12'59	123°03'03				1
	TS 1.01	27°18'46	122°58'29				1
	TS 5.03	27°13'00	123°03'04				1

Alacran Environmental Science

Report No. 1708

Identification and short-range endemic assessment of invertebrates from Lake Wells

Prepared for

Zootopia

'Megalosiphon LW'

ABN: 33577027061

Phone: 0457111317

email: erich@alacranenvironmental.com

Identification and short-range endemic assessment of invertebrates from Lake Wells

Report No. 1708 | Version 1 | Prepared by Erich Volschenk | Submitted to Greg Harewood | 18 July 2017

EXECUTIVE SUMMARY

In April 2017 Zootopia requested taxonomic identification and SRE assessment of a collection of scorpions, millipedes and a trapdoor spider and isopod from Lake Wells. This collection was dominated by potential SRE species:

- one spiny trapdoor spider, *Aganippe* 'LW';
- one scorpion, *Lychas* 'LW2';
- one terrestrial Isopod, *Buddelundia* '10ld';
- one sucking millipede, 'Megalosiphon' 'LW'; and
- one flatback millipede, Paradoxosomatidae 'LW'.

One widespread species of scorpion, *Lychas* 'adonis' was present in the collection.

This collection contains two particularly unexpected SRE species groups given the arid nature of Lake Wells. Lake Wells is located in central Western Australia on the western edge of the Great Victoria Desert Bioregion. The presence of sucking millipedes and flat-back millipedes in this region is atypical but not without precedent and representatives of both millipede orders were sampled from the vicinity of the Tropicana Gold Mine approximately 300 km south east of Lake Wells. Sucking millipedes are more usually expected from mesic forests in the south and south west of the state, while flatback millipedes are known from mesic to semi-arid habitats.

A previous survey from Lake Wells in 2016 yielded a very different suite of invertebrates with only one species in common between these surveys: *Lychas* 'adonis'. This suggests a poor knowledge of SRE invertebrates from the vicinity of Lake Wells. A baseline SRE survey is recommended to assess the extent of SRE invertebrates within the development footprint.

***Alacran* Environmental Science**

Address	32 Amalfi Way, Canning Vale 6155 Western Australia, AUSTRALIA
Email	erich@alacranenvironmental.com
Phone	+61 (0) 457 111 317
Web	www.alacranenvironmental.com

SCOPE

In April 2017, Zootopia requested identification and SRE assessment of a collection of six invertebrate samples obtained from dry pitfall traps at Lake Wells. The sample identifications are presented below.

BACKGROUND AND METHODS

The methods used to make species identifications and assess SRE categories closely follow those used by the WA Museum. A more detailed description of the methods and principals used to assess SRE categories are detailed in Appendix 1.

RESULTS

The collection contained one trapdoor spider (Mygalomorphae) representing an undescribed species of *Aganippe*; two scorpions, represented by two undescribed species of the genus *Lychas*; two undescribed millipedes from the orders Polydesmida and Polyzoniida and an undescribed Isopod from the genus *Buddelundia*. These taxa and their corresponding SRE categories are summarised in Table 1. The complete record of the samples identified is presented in Appendix 2.

Table 1. List of species present in this collection with assigned SRE categories.

Order	Family	Species	SRE category	Sample Count	Individual Count
Arachnida					
Araneae	Idiopidae	*Aganippe* 'LW1'	Potential (DD)	1	1
Scorpiones	Buthidae	*Lychas* 'adonis'	Widespread	1	1
Scorpiones	Buthidae	*Lychas* 'LW2'	Potential (DD)	1	1
Diplopoda					
Polydesmida	Paradoxosomatidae	Paradoxosomatidae 'LW'	Potential (DD)	1	1
Polyzoniida	Siphonotidae	'Megalosiphon LW'	Potential (DD)	1	2
Malacostraca					
Isopoda	Armadillidae	*Buddelundia* '10ld'	Potential (DD)	1	3
			Totals	**6**	**9**

DISCUSSION

ARACHNIDA

Araneae, Mygalomorphae (Trapdoor spiders)

Trapdoor spiders are known to contain numerous SRE species and nearly all of the families present in Western Australia contain representatives with confirmed or potential short-range distributions (Harvey et al. 2012; Castalanelli et al. 2014; Rix et al. 2017). Species identification of trapdoor spiders is heavily based on

characteristics of adult male palps and identification of most species is impossible from, juveniles and females. It is however possible to determine the identity of females and juveniles in most families using DNA Bar-coding methods (Hebert et al. 2003a; Hebert et al. 2003b; Castalanelli et al. 2014).

Idiopidae (True Trapdoor Spiders)

The Australian Idiopidae are currently under revision and the status of several genera are about to be revised considerably (Rix et al. 2017 (in press)). One of the major outcomes of that research will be the synonymy of the genus *Aganippe* with *Idiosoma*. Since the formal name change has not occurred yet, the name *Aganippe* is used here, but the name change to *Idiosoma* is imminent and will affect the species in this collection. The genus *Aganippe* contains numerous undescribed species many of which are SREs while some are widespread.

***Aganippe* 'LW'**

A single trapdoor spider was present in the collection. This species was identified to a new species of *Aganippe*, based on the adult male palp morphology. Direct comparison of this specimen with WA Museum vouchers was impossible owing to the entire collection of adult males currently being on loan to researchers in Qld. In the absence of these specimens, plates of diagnostic characters of this morphospecies were presented to Dr M. Rix (currently revising the family Idiopidae) for examination and comment. This species could not be attributed to any of the morphospecies currently recognised (M. Rix Pers. Comm. 2017) and is regarded as a **potential SRE (data deficient)**.

Scorpiones (Scorpions)

Four scorpion families are known from Western Australia. Short-range endemic species are known from Buthidae, Urodacidae and Hormuridae. Research currently being undertaken at the WA Museum (Volschenk et al. 2000; Volschenk 2008; Volschenk et al. 2010; Volschenk et al. 2012; Harvey 2014) has identified numerous undescribed species. As little as 15% of the scorpion fauna of Australia appears to be described. Species delineation in scorpions varies in complexity: species from the family Buthidae can be identified from all but 1st and 2nd instars; however, species identification of Bothriuridae, Urodacidae and Hormuridae is often heavily dependent on characteristics only present in adult males. The families Buthidae and Urodacidae also contain several species complexes containing cryptic species, which presently can only be identified using DNA barcoding methods.

Buthidae (Narrow handed scorpions)

In Western Australia, the family Buthidae is represented by three genera, *Lychas*, *Isometroides* and *Isometrus*. Representatives of *Lychas* are frequently collected in surveys of WA and current investigations on the genus *Lychas* (WA Museum) indicates the presence of several species complexes, some of which appear to contain SREs.

***Lychas* 'adonis'**

A single specimen of this species was present in this collection. This species appears to be widespread and has been recorded from The W.A. Goldfields to the Western Victoria and is regarded as a **widespread species**.

***Lychas* 'LW'**

This species was represented by a single specimen in this collection. It could not be attributed to any known species or morphospecies. *Lychas* 'LW' appears to be related to the *Lychas* 'annulatus complex', a group of cryptic species some of which appear to be SREs. This species is regarded as a **potential SRE (data deficient)** owing to the uncertainty of its distribution and the presence of SRE species in the related *Lychas* 'annulatus complex'.

DIPLOPODA (MILLIPEDES)

Polyzoniida (sucking millipedes)

Siphonotidae

In Western Australia, this order of millipedes is only represented by the family Siphonotidae. The family was revised in an unpublished thesis (Black 1994); however, since those names are not formally published, they are treated as morphospecies. The Western Australian fauna is mostly restricted to the mesic forests in the south west of the state; however rare exceptions are known from more arid parts.

'Megalosiphon LW'

A single sample containing two specimens (male and female) of this species were present in this collection. These were tentatively placed in the unpublished genus 'Megalosiphon' (Black 1994). These records are unusual as they are from the arid centre of the state. The nearest records to this locality are unidentified representatives from the Tropicana Gold Mine (Ecologia 2009) in the Great Victoria Desert. Those specimens are significantly smaller than the specimens in this collection and it is likely that they are different species. This species is regarded as **potential SRE (data deficient)** because it is unlikely to be widespread, owing to the mesic requirements of other representatives of the family. Harvey (2002) considered this order as having potential to contain SREs.

Polydesmida (flatback millipedes)

Paradoxosomatidae (flatback millipedes)

The order Polydesmida (flatback millipedes) has received significant attention over recent years, particularly the family Paradoxosomatidae (Car and Harvey 2013; Car et al. 2013; Car and Harvey 2014). In Western Australia, the family is represented by the genera *Akomptogonus*, *Antichiropus*, *Boreohesperus, Helicopodosoma*, *Orthomorpha*, *Oxidus* and *Solaenodolichopus*. Genus and species level identification of Paradoxosomatidae is heavily dependent on characteristics of the adult male gonopods (Car and Harvey 2013; Car et al. 2013; Car and Harvey 2014).

Paradoxosomatidae 'LW'

A single subadult specimen was present in this collection. Adult male specimens are needed to make a more resolved identification using morphology. Paradoxosomatid millipedes are rare from central WA and it is unlikely that this species is widespread. The nearest records of Paradoxosomatidae to this locality, two species of *Antichiropus*, are from the vicinity of the Tropicana Gold Mine in the Great Victoria Desert (Ecologia 2009).

The absence of an adult male in this collection make it impossible to determine if Paradoxosomatidae 'LW' is conspecific with the two species from Tropicana. This species is regarded as a **potential SRE (data deficient)** since most paradoxosomatids in Western Australia are SREs.

ISOPODA

Isopoda represent the only order of epigean crustaceans known to contain SREs. The suborder Oniscidae represents terrestrial and secondarily aquatic isopods with approximately 190 species described in Australia (Martin et al. 2011). The W.A. terrestrial isopod fauna is largely undescribed and is diverse (Judd and Horwitz 2003; Judd and Perina 2013). Isopods have poor dispersal capabilities and often have specific habitat preferences, making them target SRE taxa in WA.

Armadilidae (slaters or woodlice)

In Western Australia, Armadilidae is dominated by the genus *Buddelundia* which contains both widespread and SRE taxa.

***Buddelundia* '10ld'**

The *Buddelundia* 10 form is common in the arid zone; however, this morphospecies has only been previously recorded from near Lake Disappointment. The morpho-species should be considered a **potential SRE** (data deficient) since the distribution is unknown and the taxonomy is uncertain.

RECOMMENDATIONS

This collection is dominated by SRE species with five of the six species being potential SREs. Two of these species are particularly unexpected given the collection locality, Lake Wells. Lake Wells is located in central Western Australia, near the western margin of the Great Victoria Desert Bioregion (IBRA7 2012). While the presence of sucking millipedes and flat-back millipedes in this Bioregion is very unusual, it is not without precedent. Representatives of both orders were previously sampled near the Tropicana Gold Mine approximately 300 km south east of Lake Wells.

A previous survey from Lake Wells yielded a very different suite of invertebrates (Alacran 2016) with only one species in common between these surveys: *Lychas* 'adonis'. This suggests a poor knowledge of SRE invertebrates from the vicinity of Lake Wells.

A dedicated SRE survey is recommended to assess the extent of the distributions of these millipedes (and other SRE invertebrates) that may be present within the development footprint.

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APPENDIX 1. BACKGROUND AND METHODS

SHORT-RANGE ENDEMISM

Short-range endemics are organisms with small geographic distributions (Harvey 2002; Ponder and Colgan 2002), nominally less than 10,000 km^2 (Harvey 2002). These organisms are typically characterised by one or more of the following characteristics:

- limited dispersal capabilities,
- seasonal activity (cooler or wetter periods),
- slow growth, and
- low levels of fecundity.

Isolating mechanisms are typically inhospitable habitat such as rivers, rocky ridges or plains that act to prevent dispersal (gene flow) between populations. Two types of short-range endemism have been recognised: Relictual Endemism and Habitat Specialist Endemism (Harvey 2002; Ponder and Colgan 2002).

Relictual SREs result when speciation occurs following the fragmentation of continuous habitat into two or more refugia. In Australia, the primary driver of this over the last 65 million years has been aridification, which acted to isolate formerly widespread species living in mesic forests to small patches of mesic refugia. Relictual SREs include scorpions in the genus *Aops* (Volschenk and Prendini 2008), pseudoscorpions in the genera *Tyrannochthonius* (Edward and Harvey 2008; Harvey 1991), *Indohya* (Harvey 1993b; Harvey and Volschenk 2007) and *Idioblothrus* (Harvey 1993a; Harvey and Leng 2008; Muchmore 1982) and millipedes in the genus *Antichiropus* (Car and Harvey 2014; Car *et al.* 2013b). Troglobites (obligate subterranean species) are thought to be extreme examples of relictual SREs; most troglobites from the Pilbara have surface dwelling relatives living in the more mesic forests of northern Australia (Harvey 2002; Ponder and Colgan 2002).

Habitat specialist SREs are species that have adapted to very specific environment types, including those found in arid environments (e.g. rocky outcrops or isolated dune systems). Such habitats are often relatively young (<10 million years) and therefore are not refugial. Examples of habitat specialist SREs include spiders in the family Selenopidae and pseudoscorpions in the genera *Synsphyronus* (Harvey 2011, 2012) and *Feaella* (Harvey 1989; Harvey and Volschenk 2007), and scorpions in the genera *Lychas* and *Urodacus*.

DEFINING SHORT-RANGE ENDEMISM

Assessment of short-range endemism can be challenging when data for evaluation are absent or limited. Limitations may include any of the following:

- **Poor survey coverage,** e.g. the fauna of an area has not been sampled extensively enough to enable assessment of species distributions. The absence of a species from survey records may not mean that it is absent from the area.
- **Poor taxonomic resolution,** e.g. a species has not been subject to systematic investigation, and/or the identity is either difficult or impossible to determine. Good taxonomic resolution does not necessarily need to be in the form of published revisions, as it can be facilitated by any of the following:
  - a researcher actively working on the group who can authorise identifications,
  - a publicly accessible reference collection, and/or;
  - assessment of species boundaries using genomic methods such as DNA barcoding (Hebert et al. 2003a; Hebert et al. 2003b).
- **Identification issues**, e.g. surveys sampled life stages of potential SREs that are impossible to identify based on morphological characters. Examples of relevant taxa include juvenile or female millipedes,

mygalomorph spiders and *Urodacus* scorpions. Genomic methods have great potential to overcome this type of limitation.

There are no published systems for assessing the SRE potential for a species. Given this, I employ a three-category system used by the WA Museum to assess SRE-status of invertebrates:

- **Confirmed SRE:** This category applies when the identity of the taxon is unambiguous and its distribution is less than 10 000km^2 based on publicly available vouchered records. Supporting data can be either genomic (from DNA sequences) or morphological, ideally both.
- **Potential SRE:** This category applies to situations where there are knowledge gaps for the taxon. The following sub-categories further elucidate this status:
    - **Data Deficiency:** This category covers taxa for which there is insufficient data available to determine SRE status. Factors that fall under this category include:
        - insufficient geographic information,
        - insufficient taxonomic information, and/or
        - inappropriate life stages prevent identification to species level.
    - **Habitat Indicators:** This category employs habitat characteristics to evaluate SRE status when habitats are known to support SRE taxa. For example, many species sampled from subterranean habitats are known to be range restricted; a new species discovered from such habitat therefore has greater potential to be range restricted (i.e. a SRE) than widespread.
    - **Morphological Evidence:** This category uses one or more morphological characters that are characteristic of SRE taxa inhabiting restricted environments, e.g. the specialised morphological features of animals adapted to subterranean habitats, including body markings that are absent or significantly paler than surface dwelling relatives, eyes that are absent or significantly reduced, and/or longer appendages (legs and antennae) than surface relatives.
    - **Unpublished Research & Expertise:** This category relies on unpublished research or expertise to develop SRE status.

  These categories of categories of potential SRE may be helpful in developing conservation priorities, however, each taxon should be assessed on its merit and in accordance with the *Precautionary Principle* (EPA 2002):

  > "*where there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason to postpone measures to prevent environmental degradation*".

- **Widespread (not an SRE)**: This category applies when vouchered evidence demonstrates a distribution greater than 10,000 km^2.

TAXONOMY

The taxonomic nomenclature of invertebrates follows the references detailed in Table 1. Morphospecies designations follow the parataxonomy of the scientist(s) working on the group; these informal names are written between single quotation marks rather than being italicised as they are not valid under the International Code of Zoological Nomenclature (1999).

The Phylogenetic Species Concept (Cracraft 1983) is used for delineating morphospecies:

> "A species is the smallest diagnosable cluster of individual organisms within which there is a parental pattern of ancestry and descent."

IDENTIFICATION

Unless otherwise stated, species identifications were carried out by the author. The references used for species determination are summarised in Table 1. Unpublished morphospecies were compare directly with vouchers at the WA Museum.

Table 1. The following 'general' references and collections were used to assist with morphospecies designations

Order	Taxonomic reference	Morphospecies and reference collection
Araneae	(Raven et al. 2002; World Spider Catalog 2014)	Reference collection and morphospecies codes of the WA
Pseudoscorpiones	(Harvey 1992; Harvey 2012, 2013; Murienne et al. 2008)	Reference collection and morphospecies codes of the WA
Scorpiones	(Acosta 1990; Fet *et al.* 2000; Glauert 1925a, b; Kovařík 1997; Monod *et al.* 2013; Volschenk *et al.* 2010; Volschenk and Prendini 2008; Volschenk *et al.* 2000)	Reference collection at the WA Museum. Morphospecies designation by E.S. Volschenk.
Isopoda	(Schmalfuss 2003; Schmidt and Leistikow 2004; Schotte et al. 2008)	Reference collection at the WA Museum. Morphospecies designation by Dr Simon Judd.
Chilopoda	(Colloff et al. 2005; Lewis 1981)	Reference collection and morphospecies codes of the WA
Diplopoda	(Car and Harvey 2013, 2014; Car et al. 2013a; Car et al. 2013b; Edward and Harvey 2010; Sierwald 2006)	Reference collection and morphospecies codes of the WA Museum.
Insecta	(CSIRO 1991)	Reference collection within the WA Museum. Morphospecies designation by E.S. Volschenk or as otherwise noted.

SPECIMEN LODGEMENT

In accordance with EPA Guidance Statement 20 (2009), specimens submitted to Alacran Environmental Science for taxonomic identification will be offered to the WA Museum for inclusion in their biological collections.

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CLIENT REG.	ORDER	FAMILY	SPECIES	Site Code	LATITUDE	LONGITUDE	TOTAL
GP 041	Araneae	Idiopidae	*Aganippe* 'LW1'	TS 5.04	1	27°12'59	123°03'03
GP 045	Scorpiones	Buthidae	*Lychas* 'adonis'	TS 3.04	1	27°17'04	122°59'47
GP 043	Scorpiones	Buthidae	*Lychas* 'LW2'	TS 3.04	1	27o17'04	122o59'47
GP 040a	Polydesmida	Paradoxosomatidae	Paradoxosomatidae 'LW'	TS 5.06	1	27o13'00	123o03'02
GP 040b	Polyzoniida	Polyzoniidae	'Megalosiphon LW'	TS 5.06	2	27o13'00	123o03'02
GP 042	Isopoda	Armadillidae	*Buddelundia* '10ld'	TS 6.02	3	27°13'39	122°58'51

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